CITY OF PUYALLUP
STATE OF WASHINGTON

Knutson Farms Industrial Park Project
Draft Environmental Impact Statement (DEIS)

Knutson Farms Project Site

DEIS Issued - December, 2023

FACT SHEET

Proposal Name

Knutson Farms Industrial Park Project

Proposed Project

Knutson Farms, Inc. (Applicant) is seeking to develop up to 2.6 million square feet of building area in a warehouse complex (Project) on the approximately 188-acre Knutson Farms property (Project site) located within unincorporated Pierce County, Washington, and the City of Puyallup’s Urban Growth Area. Pierce County Code classifies the site as an Employment Center (EC) zone, which primarily allows industrial uses. The City of Puyallup’s Comprehensive Plan designates the area for a mix of future land uses, including warehousing, manufacturing, business park, auto oriented commercial, and rural buffer residential.

The Applicant and the City of Puyallup recorded a Declaration of Restrictive Covenant in August 2022 that establishes a stated intent to develop the Project as an “Industrial Park” consistent with the Institute for Traffic Engineers (ITE) Land Use Code (LUC) 130 (ITE manual, 11th edition). According to ITE LUC 130, “(a)n industrial park contains several individual industrial or related facilities. It is characterized by a mix of manufacturing, service, and warehouse facilities with a wide variation in the proportion of each type of use from one location to another.” As of the preparation of this document, the Applicant has yet to make a binding commitment on the final end user(s) of the proposed facilities. The restrictive covenant does establish that no “high cube fulfillment center” uses will be occupying the structures on site.

Based on the several uses allowed under the EC zone, and information provided by the Applicant, the Project could consist of the following possible uses: basic manufacturing, contractor yards, food and related products, industrial services and repairs, intermediate manufacturing and intermediate/final assembly, off-site hazardous waste treatment and storage facilities, recycling collection and processing facilities, salvage yards/vehicle storage, and warehousing distribution and freight movement.

The proposed Project would include construction of seven warehouse buildings. Site work activities would include grading;

	paving of parking and truck maneuvering areas; landscaping; water and sanitary sewer extensions; construction of stormwater facilities; franchise utility improvements; and roadway improvements, including establishment of new access to and use of City roads.
Alternatives	Two build alternatives and a No Action alternative were studied. Under Alternative 1, the facility constructed would be the same as described for the Proposed Project; however, rail lines would also be constructed to facilitate movement of materials into and out of the proposed facility. The proposed rail lines would be constructed to enable rail access to the seven proposed warehouses from the existing Meeker Southern rail line, which is located south of the Project site. Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility, as outlined in this Draft Environmental Impact Statement (EIS) for the Proposed Project, were adopted by the Applicant. The total footprint of the Alternative 2 facilities would be reduced from about 2.6 million square feet to about 1.8 million square feet. Under the No Action Alternative, none of the proposed facilities would be constructed.
Location	The 188-acre site is situated east of Shaw Road East and East Main Avenue, north of East Pioneer and 88th Street East, and west of the Puyallup River within Sections 25 and 26, Township 20 North, Range 4 East in the Willamette Meridian baseline.
Proponent/Applicant	Knutson Farms, Inc.
Lead Agency	City of Puyallup
Responsible Official	Jeff Wilson, Development Services Director, City of Puyallup
Lead Agency Contact	Chris Beale, Senior Planner City of Puyallup 333 S. Meridian Puyallup, WA 98371 253.841.5418 cbeale@puyallupwa.gov
Required Approvals and/or Permits	**<u>United States Army Corps of Engineers (USACE)</u>** Nationwide Permit

Washington Department of Ecology (Ecology)
National Pollutant Discharge Elimination System Permit
Construction Stormwater General Permit
Industrial Stormwater General Permit
Water Quality Certification

Washington Department of Fish and Wildlife (WDFW)
Hydraulic Permit Approval

Pierce County Planning
Site Development Permit
Preliminary Short Plat Permit
Administrative Design Review
Administrative Use Permit
Shoreline Substantial Development Permit
Wetland Development Permit
Clearing and Grading Permit
Building Permit

Pierce County Public Works
Right-of-Way Permit
Plumbing/Electrical/Mechanical Permits

City of Puyallup
Utility Permit (sewer and water)

City of Puyallup Public Works
Street Right-of-Way (civil) Permit

Valley Water District
Water connection authorization/permit

Williams Northwest Pipeline
Encroachment Agreement

Puget Sound Energy
Natural Gas and Power Utility Extension Permit/Agreements

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Location of Background Information

Background material and supporting documents are located:
City of Puyallup
333 S. Meridian
Puyallup, WA 98371

Draft EIS Issuance Date

December 14, 2023

Availability of Draft EIS

This Draft EIS has been distributed to agencies, organizations, and individuals noted on the Distribution List contained in Appendix B of this document.

This Draft EIS is available for download on the Project website: https://knutsonfarmseis.org/

Copies of the Draft EIS are also available for review at City of Puyallup Development and Permitting Services Center at 333 S. Meridian, Puyallup, Washington, during business hours of 9:00 a.m. to 3:00 p.m.

A printed copy may also be requested at cost (see Lead Agency Contact above).

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Acronyms and Abbreviations

6PPD-q	6PPD-quinone
°F	degrees Fahrenheit
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
AC	asphaltic concrete
ACS	American Community Survey
AI	Area of Impacts
AQ	air quality
ARL	Agricultural Resource Lands
ARO	Agriculture, Recreation, and Open Space
Ave	Avenue
BACT	Best Available Control Technology
BAS	Best Available Science
B/IP	Business/Industrial Park
BMPs	Best Management Practices
BP	years before present
ca.	circa
CARA	Critical Aquifer Recharge Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFP	Capital Facilities Plan
CFR	Code of Federal Regulations
CH^4	methane
CIP	Capital Improvement Program
cmbs	centimeters below ground surface
cmf	crash modification factor
CMX	Mixed Use

CMZ	channel migration zone
CO	carbon monoxide
CO_2	carbon dioxide
CO_2-e	CO_2 equivalents
CPCP	City of Puyallup Comprehensive Plan
CSCSL	Confirmed and Suspected Contaminated Sites List
CSZ	Cascadia Subduction Zone
CWA	Clean Water Act
CY	cubic yards
DAHP	Department of Archaeology and Historic Preservation
dB	decibels
dBA	A-weighted decibels
DEM	Department of Emergency Management
DO	dissolved oxygen
DPM	diesel particulate matter
DPS	Distinct Population Segment
DS	Determination of Significance
E	East
EB	eastbound
EC	Employment Center
Ecology	Washington State Department of Ecology
EDNA	environmental designation for noise abatement
EFH	Essential Fish Habitat
EHS	Extremely Hazardous Substances
EIS	environmental impact statement
ESAL	Equivalent Single-Axle Loads
ESNW	Earth Solutions NW, LLC
ESA	Endangered Species Act

ESU	Environmentally Significant Unit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FLUM	Future Land Use Map
FR	*Federal Register*
FTA	Federal Transit Authority
ft^3/s	cubic feet per second
FWD	falling weight deflectometer
GHG	greenhouse gases
GIS	Geographic Information Systems
GLO	General Land Office
GMA	Growth Management Act
HAP	hazardous air pollutant
HASP	Health and Safety Plan
HFC	hydrofluorocarbons
HPA	Hydraulic Permit Application
HRA	Historical Research Associates, Inc.
HVAC	heating, ventilation, and air conditioning
HWA	HWA GeoSciences Inc.
IPaC	Information for Planning and Consultation
KFIP	Knutson Farms Industrial Park
KOP	key observation point
LC50	lethal concentration 50
Leq	equivalent noise level
LID	low-impact development
Lmax	maximum noise level
LM/W	Light Manufacturing/Warehousing
LOS	level of service

LRE	long-range estimates
LUC	Land Use Code
LUST	leaking underground storage tank
MDNS	Mitigated Determination of Non-Significance
ML	Limited Manufacturing
ML-SPO	Limited Manufacturing, Shaw-East Pioneer Overlay
MOE	measures of effectiveness
mph	miles per hour
MS4	municipal storm sewer system
MSAT	mobile source air toxics
MSW	Municipal Solid Waste
mtpy	metric tons per year
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NB	northbound
NE	Northeast
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O_2	carbon dioxide
O_3	ozone
OHWM	Ordinary High Water Mark
OSHA	Occupational Safety and Health Act
PAHs	polynuclear aromatic hydrocarbons
Pb	lead

PCBs	polychlorinated biphenyls
PCC	Pierce County Code
PCE	Primary Constituent Element
PCRHP	Pierce County Register of Historic Places
PCSD	Pierce County Sheriff’s Department
PCSWDM	Pierce County Stormwater Management and Site Development Manual
PEM	Palustrine Emergent
PF	Public Facilities
PFC	perfluorocarbons
PM	particulate matter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PMC	City of Puyallup Municipal Code
ppb	parts per billion
PPD	Puyallup Police Department
PRHP	Puyallup Register of Historic Places
Project	warehouse complex
PROS Plan	Parks, Recreation and Open Space Plan
PSCAA	Puget Sound Clean Air Agency
PSD	Prevention of Significant Deterioration
PSE	Puget Sound Energy
PSMFC	Pacific State Maine Fisheries Commission
RBR	Rural Buffer Residential
RCW	Revised Code of Washington
RM	River Mile
RM-10	Multiple-Family Residential
ROW	right-of-way
S	South

SB	southbound
SE	Southeast
SED	Shoreline Environment Designation
SEPA	State Environmental Policy Act
SERC	State Emergency Response Commission
SF	square feet
SF_6	sulfur hexafluoride
SIP	State Implementation Plan
SMA	Washington State Shoreline Management Act
SMP	Shoreline Master Program
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SR	State Route
St	Street
SVC	Soundview Consultants
SWMPP	City of Puyallup Stormwater Management Program Plan
SMMWW	Stormwater Management Plan for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TDMP 2018	2018 Talasea Detailed Mitigation Plan
THPO	Tribal Historic Preservation Officer
tpy	tons per year
TRB	Transportation Research Board
TTR	Technical Traffic Report
UGA	Urban Growth Area
USACE	United States. Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency

USSG	United States Surveyor General
USFWS	United States Fish and Wildlife Service
v/c	volume-to-capacity
vpd	vehicles per day
vph	vehicles per hour
VOC	volatile organic compounds
WAC	Washington Administrative Code
WB	westbound
WCI	West Consultants Inc.
WDFW	Washington State Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources
WHR	Washington Heritage Register
WISAARD	Washington Information System for Architectural and Archaeological Records Database
WISHA	Washington Industrial Safety and Health Act
WOTUS	Waters of the United States
WPCP	Water Pollution Control Plant
WQ	water quality
WSDOT	Washington State Department of Transportation
WSU	Washington State University
Wy	Way

1. EIS SUMMARY

1.1 Introduction

The City of Puyallup is preparing this environmental impact statement (EIS) under the Washington State Environmental Policy Act (SEPA) for the Knutson Farms Industrial Park (KFIP) Project. Knutson Farms, Inc. (Applicant) proposes to construct and operate a warehouse complex (Project) of up to 2.6 million square feet of building area on the approximate 188-acre Knutson Farm property located within unincorporated Pierce County, Washington.

1.2 Project Objective

A SEPA EIS requires clear definition of the proposed Project's objective, which creates a foundation for the analyses of existing conditions, potential impacts, and mitigation for impacts identified as a result of independent analysis conducted in the EIS. The Applicant's Project objective is to construct a warehouse complex facility of up to 2.6 million square feet of building area.

1.3 Project Description

1.3.1 Project Location

The Project is in the Urban Growth Area (UGA) of the City of Puyallup in unincorporated Pierce County. The 188-acre site is situated east of Shaw Road East and East Main Avenue, north of East Pioneer and 88th Street East, and west of the Puyallup River within Sections 25 and 26, Township 20 North (N), Range 4 East (E) in the Willamette Meridian baseline.

1.3.2 Proposed Project

The Applicant is seeking to develop a Project (Figure 1-1) of up to 2.6 million square feet of building area in seven warehouses on the approximately 188-acre Knutson Farm property located within unincorporated Pierce County, Washington, and the UGA of the City of Puyallup. Pierce County Code classifies the site as an Employment Center (EC) zone, which primarily allows industrial uses. Based on the uses allowed within the county EC, the Project could consist of uses allowed by county zoning, including basic manufacturing, contractor yards, food and related products, industrial services and repairs, intermediate manufacturing and intermediate/final assembly, off-site hazardous waste treatment and storage facilities, recycling collection and processing facilities, salvage yards/vehicle storage, and warehousing distribution and freight movement. The City of Puyallup's Comprehensive Plan (CPCP) designates the area a mix of future land uses, including warehousing, manufacturing, business park, auto oriented commercial, and rural buffer residential. As of the preparation of this document, the Applicant has yet to make a binding commitment on a final end user(s) of the proposed facilities; a restrictive covenant is recorded on the site that establishes no high cube fulfillment centers will occupy the structures in the Project area. The restrictive covenant further establishes that the site will be built out consistent with the International Traffic Engineering definition of Industrial Park, which includes a range of industrial/warehouse uses and intensities.

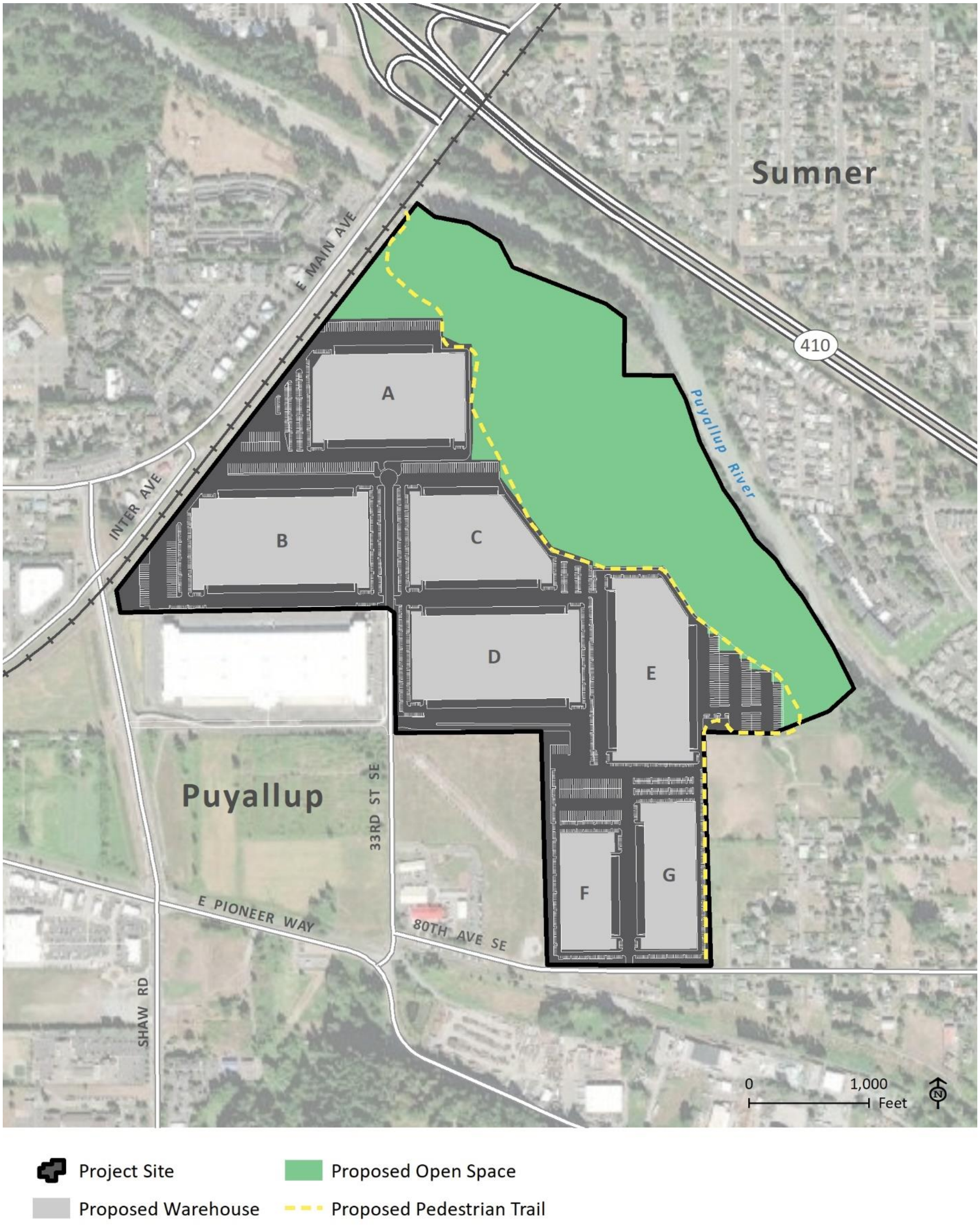


Figure 1-1. Development Map

The Project would include construction of seven warehouse buildings. Site work activities would include grading; paving of parking and truck maneuvering areas; landscaping; water and sanitary sewer extensions; construction of stormwater facilities; franchise utility improvements; and roadway improvements, including establishment of new access to and use of City roads. See Section 3.4, proposed Project, for further details.

1.3.3 Alternative 1 – Rail Transport

Under Alternative 1 (Figure 1-2), the facility constructed would be the same as described under Section 3.4, Proposed Project; however, rail lines would also be constructed to facilitate movement of materials into and out of the proposed facility. The proposed rail lines would be constructed to enable rail access to the seven proposed warehouses from the existing Meeker Southern rail line, which is located south of the Project site. See Section 3.5, Alternative 1 – Rail Transport for further details.

1.3.4 Alternative 2 – Reduced Intensity Alternative

Washington Administrative Code (WAC) 197-11-440(4)–(5) describes alternatives to be considered in an EIS and states that “reasonable alternatives may be those over which an agency with jurisdiction has authority to control impacts either directly, or indirectly through requirement of mitigation measures.” As such, Alternative 2 (Figure 1-3) considers the potential reduction in impacts that would result if the necessary mitigation measures that reduce the site footprint of the facility, as outlined in this Draft EIS for the proposed Project, implemented consistently with the analysis in this EIS. The implementation of mitigation measures would reduce the total footprint of the facility from about 2.6 million square feet to about 1.8 million square feet. See Section 3.6, Alternative 2 – Reduced Intensity Alternative, for further details.

1.3.5 No Action Alternative

SEPA requires evaluation of a No Action Alternative as a benchmark from which other alternatives can be compared (WAC 197-11-440(5)). Under the No Action Alternative, none of the proposed facilities would be constructed.

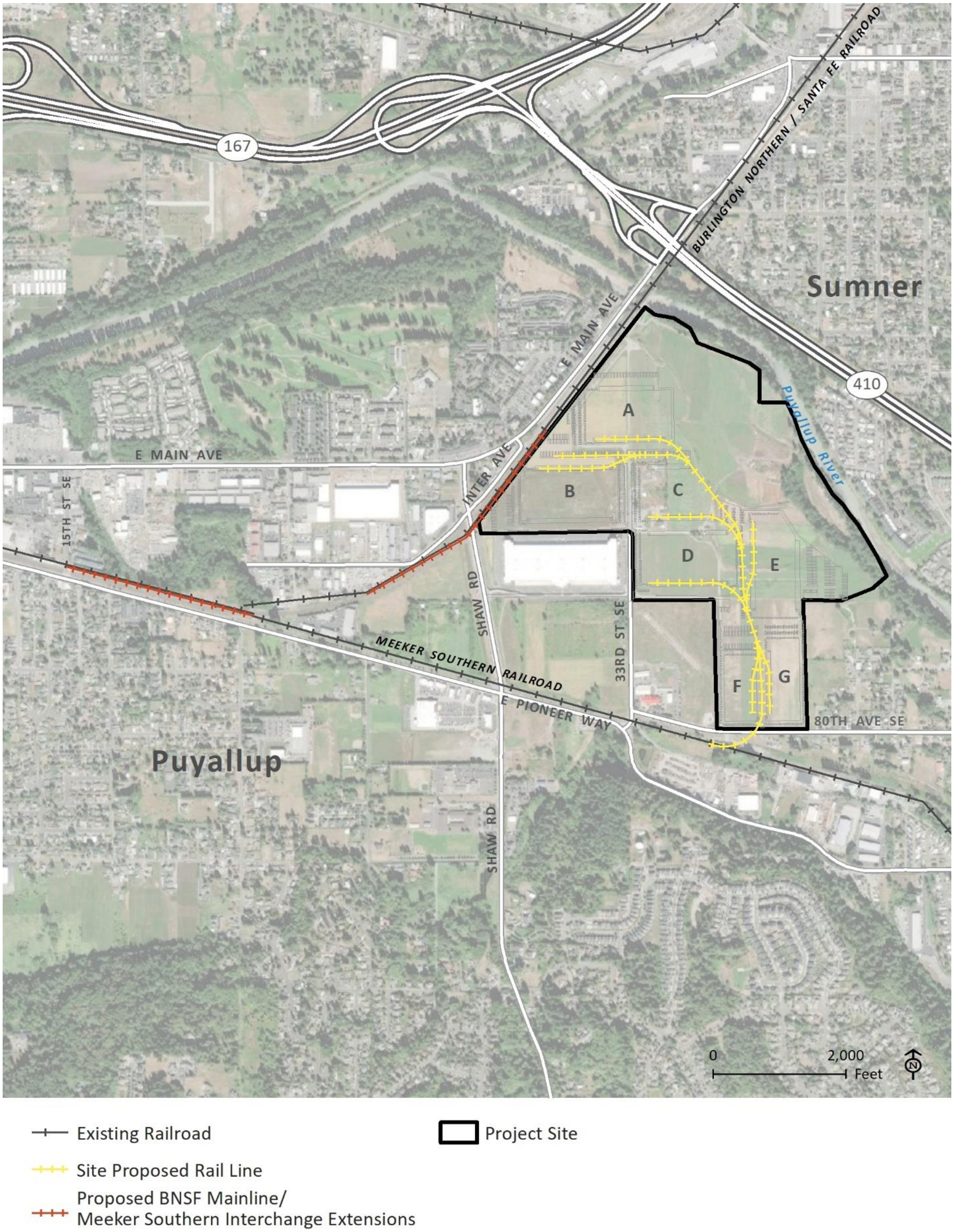
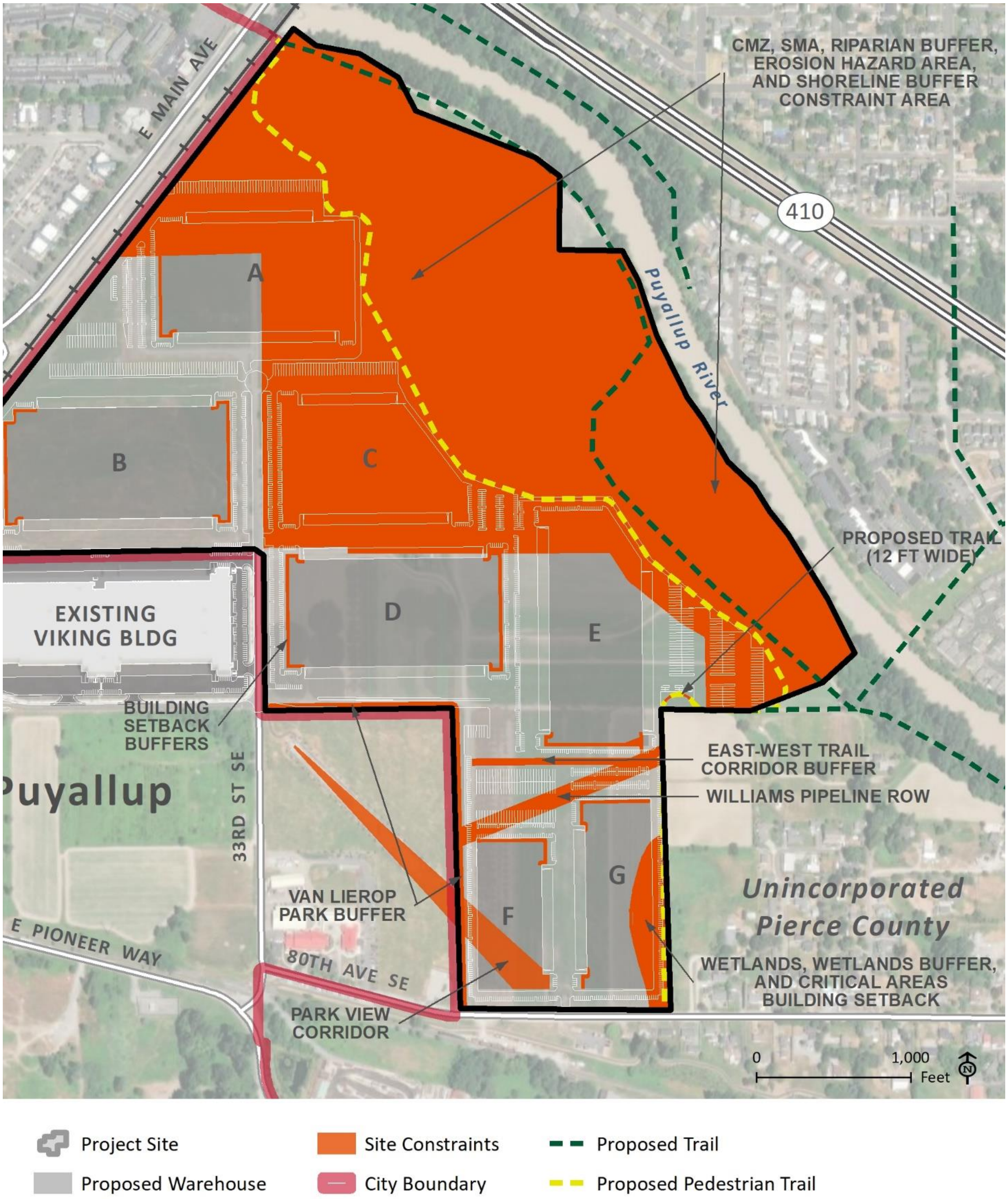


Figure 1-2. Alternative 1 – Rail Line Layout



See Figure 4-55 for the Van Lierop Park Concept Plan

Figure 1-3. Alternative 2 – Reduced Intensity Alternative

1.4 Policy Background

1.4.1 SEPA Substantive Authority

SEPA is generally described as having two aspects: one procedural and the other substantive. The procedural aspect of SEPA is what underlies the process of SEPA Checklist review; threshold determination; and, in some instances such as this one, preparation of an EIS.

The substantive component of SEPA established in Revised Code of Washington (RCW) 43.21C.060 and WAC 197-11-660 authorizes application of SEPA to condition or deny a proposal even when it may comply with the immediately applicable development regulations. The statute and regulations set out prerequisites for jurisdictions' use of this substantive SEPA authority. One aspect of substantive SEPA authority that differs from application of zoning regulations is that an application's vesting date does not govern what plans and policies may be applied through substantive SEPA authority. Instead, per the SEPA statute and regulations, plans and policies in effect when the Draft EIS is issued may be applied.

Consistent with the prerequisites, Pierce County has adopted Pierce County Code 18D.40.060, found at https://pierce.county.codes/PCC/18D.40.060 and incorporated by reference here, which specifies when the County may exercise its SEPA substantive authority and the regulations, plans, and codes that Pierce County may rely upon in doing so. Pierce County may utilize this authority in connection with permits and approvals for the Project, which is located within the County. Among the specified plans is "Title 19A, Pierce County Comprehensive Plan."

The City of Puyallup in PMC 21.04.210, incorporated here by reference and at this link https://www.codepublishing.com/WA/Puyallup/html/Puyallup21/Puyallup2104.html#21.04.210, has similarly provided in its Code for use of substantive SEPA authority per the SEPA statute. The City of Puyallup may therefore also utilize substantive SEPA authority in connection with its jurisdiction over approvals needed, for example, for Project access to City streets.

1.4.2 Application of Comprehensive Plan and Policies

Comprehensive plans and policies are not typically viewed as "regulatory." However, with adoption of the Growth Management Act (GMA), development regulations are mandated to treat comprehensive plans as blueprints: the regulations must implement and be consistent with them. Although comprehensive plans do not themselves apply as development regulations, they still can be brought to bear on review of a proposal such as the Project. As already noted, comprehensive plans can be utilized in exercise of substantive SEPA authority, assuming that the underlying prerequisites are met.

In addition, apart from SEPA, various types of development application decision-making involve consideration of comprehensive plans and local jurisdictions' policies. For example, Pierce County Code provisions that govern the Knutson application require that, to approve, the County must find that it is in the public interest; that "appropriate" provisions are made with respect to, among other things, open space, drainage/stormwater, streets/roads, water/sewer, etc.; and that "the proposal conforms with the intent of the County's Comprehensive Plan, applicable community plans, other applicable County codes, state laws and the criteria contained in this Title." See Pierce County Code 18F.50.040.D and 18F.50.040.E.

One of the purposes of an EIS, such as this one, is to inform the decisions that must take into account such criteria. Therefore, this EIS addresses both City and County potentially applicable regulations, plans, and policies as appropriate.

1.4.3 Mitigation, WAC 197-11-660

Mitigation measures or denials, per WAC 197-11-660(1)(a), shall be based on policies, plans, rules, or regulations formally designated by the agency (or appropriate legislative body, in the case of local government) as a basis for the exercise of substantive authority and in effect when the Draft EIS is issued. As such, the analysis in this Draft EIS uses the most current codes, plans, comprehensive plan policies, and regulations available in assessing impacts and assigning mitigation. This includes the review and application of both Pierce County's Comprehensive Plan and CPCP policies, where applicable, as the proposed Project is located in unincorporated Pierce County but within the City of Puyallup's UGA.

1.5 Summary of Environmental Impacts and Mitigation Measures

SEPA requires that an EIS analyze the adverse environmental impacts of a proposal and identify possible mitigation measures that would reduce or eliminate those impacts. For each environmental resource area, the following thresholds were considered for impacts:

- **Significant Impact:** the impact is irrevocable; there are no regulatory requirements, design measures, and/or mitigation measures that would avoid, minimize, or reduce the potential impacts identified.
- **Mitigated Significant Impact:** the potential impact identified is substantial and adverse; however, impacts could be avoided, minimized, or reduced with implementation of regulatory requirements, design measures, and/or mitigation measures.
- **Less than Significant:** the potential impact is neither substantial nor adverse; no mitigation is required. However, Best Management Practices (BMPs) would be implemented to reduce impacts as appropriate.
- **No Impact:** there are no identified impacts to the resource area.

Table 1-1 summarizes the potential environmental impacts associated with the No Action Alternative, proposed Project, Alternative 1, and Alternative 2 as well as the potential mitigation for the identified impacts.

SEPA defines mitigation as avoiding, minimizing, rectifying, reducing, eliminating, compensating, or monitoring environmental impacts (WAC 197-11-768). Mitigation may be suggested by the Applicant; mandated through local, state, and/or federal regulations; or required through conditions of approval of permits for the proposed Project (WAC 197-11-660). The intended environmental benefits of mitigation measures for significant impacts should be described in the EIS and considered by decision makers. Identification of mitigation measures in the EIS alone does not provide a mechanism for enforcement. Mitigation measures must be reasonable and capable of being accomplished. The applicant may be required to implement mitigation measures only to the extent attributable to the identified adverse impacts of the proposal. Additional voluntary mitigation may occur.

Under WAC 197-11-060(4)(b), “the lead agency shall not limit its consideration of a proposal’s impacts only to those aspects within its jurisdiction, including local or state boundaries.” In addition, the range of impacts to be analyzed in an EIS may be wider than the impacts for which mitigation measures are required of applicants (WAC 197-11-060(4)(e)). This would depend upon the specific impacts, the extent to which the adverse impacts are attributable to the applicant’s proposal, and the capability of applicants or agencies to control the impacts in each situation (WAC 197-11-060(4)(e)).

Mitigation measures identified in the EIS shall be related to specific, adverse environmental impacts. (WAC 197-11-660(1)(b)). An EIS should briefly indicate the intended environmental benefits of mitigation measures for significant impacts under WAC 197-11-440(6). SEPA requires the decision makers to judge whether possible mitigation measures are likely to protect or enhance environmental quality (WAC 197-11-660(2)).

Table 1-1. Summary of Impacts by Resources and Alternative

Resource(s)/Alternative		**Impact**	**Mitigation**
Earth Resources (Section 4.1)			
No Action Alternative		*No impacts.* Existing conditions regarding the potential for geologic hazards, including earthquakes, soil liquefaction, and volcanic activity, would remain. The No Action Alternative would have no impact associated with development of the Project in geologically hazardous areas. Permanent conversion of the Project site on soils that lend to agricultural practices would not occur.	No mitigation required.
Proposed Project	**Construction**	**Soils and Erosion** *Mitigated Significant Impact.* Construction of the Project would result in permanent impacts from alterations to the surface geology, topography, and soils that would be less than significant with the implementation of mitigation measures ER-1 to ER-5. **Volcanic Hazards** *Mitigated significant impact.* The probability of an impact from either ashfall and/or lahar debris flow occurring on site during construction is low. However, the subsequent damage or safety risk should a volcanic eruption occur would be significant; therefore, mitigation measures ER-6 to ER-8 would be required to minimize the potential for significant/catastrophic impacts. **Landslide Hazards** *Mitigated Significant Impact.* Warehouses A and C are mapped within a potential landslide hazard area. There is a potential risk of a landslide impacting the construction of Warehouses A and C. This would require a geotechnical assessment to minimize the potential for significant impacts as outlined in mitigation measure ER-3. **Seismic Hazards** *Mitigated Significant Impact.* The Project site is in an area with the potential for seismic activity and mapped as having moderate to high susceptibility for liquefaction in the event of an earthquake. An emergency response plan (ER-9) and a geotechnical assessment (ER-3) would be required to assess the site conditions and seismic design parameters (ER-10)	**Soils and Erosion** • ER-1. Implement BMPs during construction. • ER-2. Implement low impact development principles. • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. • ER-4. Prepare and Implement SWPPP for Erosion and Sedimentation Hazards. • ER-5. Prepare Emergency Site Management Plans for large scale weather events for Erosion and Sedimentation Hazards. **Volcanic Hazards** • ER-6. Comply with Title 18E.60 PCC for Volcanic Hazards. • ER-7. Prepare Emergency Management Plan for Volcanic Activity. • ER-8. Building Occupancy Limits for Volcanic Hazards. **Landslide Hazards** • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. **Seismic Hazards** • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. • ER-9. Prepare Emergency Management Plan for Seismic Events. • ER-10. Conform with Title 17C PCC for Seismic Design. **Channel Migration Zones** • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer.

Resource(s)/Alternative		Impact	Mitigation
		implemented to minimize the potential for significant impacts. **Channel Migration Zones** *Mitigated Significant Impact.* The proposed stormwater outfall is located within the mapped severe channel migration zone (CMZ) of the Puyallup River. Portions of the development site building area is located within low to moderate mapped CMZ of the Puyallup River. Anticipated impacts from development in low to moderate CMZs on the site is limited, as BMPs to address channel migration could be reasonably expected to be applied to protect, preserve, or modify the site to prevent losses or damage. The risk of CMZ erosion in the severe CMZ as a result of the proposed Project is considered less than significant with implementation of the design measures required per a geotechnical assessment as outlined in mitigation measure ER-3.	
	Operations	**Soils and Erosion** *Mitigated Significant Impact.* The addition of impervious surfaces to 77 percent of the development site would increase the amount of stormwater generated in the Project site. Left unmanaged, this stormwater would increase soil erosion on and off site. Implementation of SW-1 and SW-2 would reduce the impacts from erosion. **Volcanic Hazards** *Mitigated Significant Impact.* During operations, the same risk of volcanic hazards in the Project site would be present as identified for construction; therefore, mitigation measures ER-6 to ER-8 would be required to minimize the potential for significant impacts. **Landslide Hazards** *Mitigated Significant Impact.* During operations, the same risk of landslide hazards in the Project site would be present as identified for construction; therefore, mitigation measure ER-3 would be required to minimize the potential for significant impacts. The proposed stormwater outfall and infiltration trenches would be located within a mapped	**Soils and Erosion** • SW-1 Evaluate the outfall erosion issues prior to Hearing Examiner hearing and prior to County and Hearing Examiner approval and final Project permitting and take corrective action as needed to redesign, repair, or relocate the stormwater outfall structure or components of the Project-wide stormwater management plan in relation to future flow increases from the Project site. • SW-2. Re-evaluate current stormwater management strategy. **Volcanic Hazards** • ER-6. Comply with Title 18E.60 PCC for Volcanic Hazards. • ER-7. Prepare Emergency Management Plan for Volcanic Activity. • ER-8. Building Occupancy Limits for Volcanic Hazards. **Landslide Hazards** • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. **Seismic Hazards** • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer.

Resource(s)/Alternative		**Impact**	**Mitigation**
		shallow-susceptibility landslide hazard area. Implementation of ER-3 would reduce the potential for significant impacts. **<u>Seismic Hazards</u>** *Mitigated Significant Impact.* During operations, the same risk of seismic hazards in the Project site would be present as identified for construction. An emergency response plan (ER-9) and a geotechnical assessment (ER-3) would be required to assess the site conditions and seismic design parameters (ER-10) implemented to minimize the potential for significant impacts. **<u>Channel Migration Zones</u>** *Mitigated Significant Impact.* The proposed stormwater outfall is located within the severe CMZ of the Puyallup River. Portions of the site development building area are located in the low to moderate CMZ areas mapped by Pierce County. However, the risk of severe CMZ erosion as a result of the proposed Project is considered less than significant with implementation of the design measures required per a geotechnical assessment as outlined in mitigation measure ER-3. If channel migration occurs in the low to moderate CMZ, the impacts could include risk of damage to improvements (utility, paving, and other appurtenances) and buildings, although the probability of that scenario is low due to the anticipated timeline for moderate to low CMZ changes to uplands.	• ER-9. Prepare Emergency Management Plan for Seismic Events. • ER-10. Conform with Title 17C PCC for Seismic Design. **<u>Channel Migration Zones</u>** • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer.
Alternative 1 – Rail Alternative	**Construction**	*Mitigated Significant Impact.* The construction impacts associated with Alternative 1 would be similar to those described for the proposed Project. Alternative 1 would result in alterations to surface geology, topography, and soils, as described for the proposed Project, but would include a slightly larger disturbance area due to the addition of the area between the Project site and the Meeker Southern railroad where construction of the track extensions from BNSF mainline/Meeker Southern interchange. In addition, Alternative 1 would have the same risk of seismic, landslide, and volcanic hazards and would require construction in the CMZ. Implementation of mitigation measure ER-1 through ER-10 would reduce impacts associated with the construction of Alternative 1.	• ER-1. Implement BMPs during construction. • ER-2. Implement low impact development principles. • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. • ER-4. Prepare and Implement SWPPP for Erosion and Sedimentation Hazards. • ER-5. Prepare Emergency Site Management Plans for large scale weather events for Erosion and Sedimentation Hazards. • ER-6. Comply with Title 18E.60 PCC for Volcanic Hazards. • ER-7. Prepare Emergency Management Plan for Volcanic Activity. • ER-8. Building Occupancy Limits for Volcanic Hazards.

Resource(s)/Alternative		Impact	Mitigation
			• ER-9. Prepare Emergency Management Plan for Seismic Events. • ER-10. Conform with Title 17C PCC for Seismic Design.
	Operations	*Mitigated Significant Impact.* The operations impacts associated with Alternative 1 would be similar to those described for the proposed Project. The amount of impervious surface is not expected to increase when compared to the proposed Project, as the rail line is considered pervious surface. In addition, Alternative 1 would have the same risk of seismic, landslide, and volcanic hazards and would require construction in the CMZ. Implementation of mitigation measure SW-1, SW-2, ER-3, ER-6, ER-7, ER-8, ER-9, and ER-10 would minimize impacts associated with the operation of Alternative 1.	• SW-1. Evaluate the outfall erosion issues prior to Hearing Examiner hearing and prior to County and Hearing Examiner approval and final Project permitting and take corrective action as needed to redesign, repair, or relocate the stormwater outfall structure or components of the Project-wide stormwater management plan in relation to future flow increases from the Project site. • SW-2. Re-evaluate current stormwater management strategy. • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. • ER-6. Comply with Title 18E.60 PCC for Volcanic Hazards. • ER-7. Prepare Emergency Management Plan for Volcanic Activity. • ER-8. Building Occupancy Limits for Volcanic Hazards. • ER-9. Prepare Emergency Management Plan for Seismic Events. • ER-10. Conform with Title 17C PCC for Seismic Design.
Alternative 2 – Reduced Intensity Alternative	**Construction**	*Mitigated Significant Impact.* The construction impacts associated with Alternative 2 would be less than those described for the proposed Project. Similar to the proposed Project, construction of Alternative 2 would result in alterations to surface geology, topography, and soils, but the smaller site footprint would result in less disturbance and less potential for impacts. The potential for exposure to geologic hazards would be the same as the proposed Project under Alternative 2, except for landslide hazards. Under Alternative 2, landslide hazard areas would be outside of the Alternative 2 Project footprint and would no longer be of concern. Even with a smaller footprint, mitigation for soil and erosion impacts would still be required as outlined under the proposed Project. ER-1 through ER-10 would reduce impacts associated with the construction of Alternative 2 to the extent feasible.	• ER-1. Implement BMPs during construction. • ER-2. Implement low impact development principles. • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. • ER-4. Prepare and Implement SWPPP for Erosion and Sedimentation Hazards. • ER-5. Prepare Emergency Site Management Plans for large scale weather events for Erosion and Sedimentation Hazards. • ER-6. Comply with Title 18E.60 PCC for Volcanic Hazards. • ER-7. Prepare Emergency Management Plan for Volcanic Activity. • ER-8. Building Occupancy Limits for Volcanic Hazards. • ER-9. Prepare Emergency Management Plan for Seismic Events. • ER-10. Conform with Title 17C PCC for Seismic Design.

Resource(s)/Alternative		Impact	Mitigation
	Operations	*Mitigated Significant Impact*. Operational impacts related to Alternative 2 would be less than the impacts listed for the proposed Project. This includes decreasing the potential for increased stormwater runoff generated in the Project site from impervious surfaces, the long term or permanent loss of soil productivity for local agricultural production, and potential for exposure to geologic hazards. The potential for exposure to geologic hazards would be the same under Alternative 2, except for landslide hazards and CMZs. Under Alternative 2, landslide hazard areas would be outside of the Alternative 2 Project footprint and would no longer be of concern; additionally, although not entirely, the majority of the portions of the Project within the moderate and low CMZs would be removed from those mapped hazard areas, limiting the need for long-term monitoring of impacts from changes to the Puyallup River channel area relative to site improvements and buildings. Even with a smaller footprint, mitigation would still be required as outlined under the proposed Project. Implementation of mitigation measures ER-3, ER-6, ER-7, ER-8, ER-9, and ER-10 would minimize impacts associated with the operation of Alternative 1 to the extent feasible.	• ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. • ER-6. Comply with Title 18E.60 PCC for Volcanic Hazards. • ER-7. Prepare Emergency Management Plan for Volcanic Activity. • ER-8. Building Occupancy Limits for Volcanic Hazards. • ER-9. Prepare Emergency Management Plan for Seismic Events. • ER-10. Conform with Title 17C PCC for Seismic Design.
Surface Water (Section 4.2)			
No Action Alternative		Under the No Action Alternative, the construction and operation of the Project would not occur. No Project-related impacts to surface water resources would result. The Project site floodplain and uplands would continue to be farmed, left fallow or potentially developed differently in the future, as limited or allowed in regulations. If current management does not change, existing water quality impacts on the Puyallup River would not change, meaning that the same agricultural impacts would persist.	No mitigation required.
Proposed Project	**Construction**	**<u>Puyallup River</u>** During construction on the high terrace, direct impacts to surface water quality could occur from grading, which contributes to erosion and sediment movement; water flows that cause turbidity through erosion; sediment transport downstream of soil disturbance activities; or	**<u>Puyallup River</u>** • SW-1. Evaluate the outfall erosion issues prior to Hearing Examiner hearing and prior to County and Hearing Examiner approval and final Project permitting and take corrective action as needed to redesign, repair, or relocate the stormwater outfall structure or components of the Project-

Resource(s)/Alternative		Impact	Mitigation
		release of pollutants from construction equipment. Oil, fuel, and other chemicals could inadvertently spill or leak from construction equipment or materials, leading to contamination of surface water through runoff. The 42-inch diameter outfall pipe intended to receive future runoff from the Project site is already installed at the existing stormwater outfall structure in the floodplain at the northern end of the Project site. The outfall structure is currently impacted by collection of sandy river sediment during seasonal river flooding and by channelized erosion of these sediments from stormwater runoff flowing from the Viking facility outfall pipe. Current conditions indicate that increasing future flows to the outfall structure by adding new runoff volumes from the Project warehouse complex and from the greater surrounding stormwater basins would significantly increase erosion and instability at the riverbank. **Wetlands** On-site wetlands would shrink or be entirely lost unless current hydrology sources are identified and maintained. In order to preserve on-site wetland hydroperiods on the floodplain (Wetlands A, B and C) and at Wetland D, targeted, properly located and designed wet season infiltration facilities that would capture and infiltrate appropriate volumes of surface runoff are needed to seasonally recharge groundwater in locations that would ensure maintenance of wetland hydroperiods during construction and in the future. **Floodplains and Shorelines** Impacts to floodplain wetlands in relation to ongoing erosion within the outfall and at the riverbank are discussed above. Therefore, the discussion below addresses other aspects of potential floodplain impacts. During construction, no new grading or mobilization activities related to the Project warehouse development would occur in the floodplain, and no new impacts to the floodplain are expected until such time as future Project site stormwater runoff is directed to the existing outfall on the floodplain.	wide stormwater management plan in relation to future flow increases from the Project site • SW-2. Re-evaluate current stormwater management strategy. **Wetlands** • SW-3. Hydrogeologist/Geotechnical engineer assessment of steep slopes and location of proposed infiltration facilities. • SW-4. Surface and Groundwater Hydrology monitoring prior to final site design and construction in all onsite wetlands to define hydroperiods, as needed to develop effective plans to preserve current wetland hydrology, as required in Code. • SW-5. Long-term groundwater monitoring during operations to document success of proposed hydrology support. • SW-6. Wetland D impact avoidance. • SW-7. Mitigation and monitoring plan. **Floodplain and Shorelines** • SW-8. Reduction of on-site erosion and sediment movement.

Resource(s)/Alternative		Impact	Mitigation
	Operation	**<u>Puyallup River</u>** <u>Water Quality</u> Without proper management, this pollutant carried in new runoff volumes from the Project site could cause significant new impacts to surface water quality at the outfall and related significant increase in mortal impacts to listed salmonid species in the river. <u>Riverbank Flood and Erosion</u> Under the proposed Project, future increased runoff volumes from the Project site would greatly increase current flow volumes through the outfall structure, inevitably increasing current erosion at the riverbank below the outfall structure. Sending significantly greater runoff volumes to the outfall in the future when the riverbank is already failing under current conditions would further degrade the outfall system and erode the riverbank. Without significant repair or revision of the outfall structure and properly designed bank stabilization installations, the ongoing erosion would eventually undermine the outfall structure, and result in additional loss of boulders, concrete, and other construction materials into the river—a significant impact to water quality and fish habitat. **<u>Wetlands</u>** Under the proposed Project, the Project would be required to comply with code provisions for the protection of water resources from grading activities and Operational Stormwater Permit conditions. Therefore, minimal impacts to water quality in wetlands are expected during Project operation, as long as mitigation plans designed to address potential water quality issues at Wetland D are prepared and followed. Under the current proposal, the groundwater source for Wetlands A, B, and C would decrease over time during both Construction and Operational phases as most of the currently permeable Project surface area would be paved over a period of several years during Construction phases, while the warehouses are being built and subsequently occupied. This would result in a decrease over	**<u>Puyallup River</u>** • SW-1. Evaluate the outfall erosion issues prior to Hearing Examiner hearing and prior to County and Hearing Examiner approval and final Project permitting and take corrective action as needed to redesign, repair, or relocate the stormwater outfall structure or components of the Project-wide stormwater management plan in relation to future flow increases from the Project site • SW-2. Re-evaluate current stormwater management strategy. **<u>Wetlands</u>** • SW-3. Hydrogeologist/Geotechnical engineer assessment of steep slopes and location of proposed infiltration facilities. • SW-4. Surface and Groundwater Hydrology monitoring prior to final site design and construction in all on-site wetlands to define hydroperiods, as needed to develop effective plans to preserve current wetland hydrology, as required in Code. • SW-5. Long-term groundwater monitoring during operations to document success of proposed hydrology support. • SW-6. Wetland D impact avoidance. • SW-7. Mitigation and monitoring plan. **<u>Floodplain and Shorelines</u>** • SW-8. Reduction of on-site erosion and sediment movement.

Resource(s)/Alternative		Impact	Mitigation
		time of on-site infiltration and no replenishment of groundwater on the high terrace, where the new warehouses, roads, and parking areas are sited. **Floodplains** During proposed Project operations, the primary long-term impact on the floodplain related to the Project would be from the stormwater outfall structure and backwater flooding through the outfall, which is discussed in detail above and would continue throughout the operational lifetime of the Project facilities. **Shorelines** Under the proposed Project operations, impacts to the shoreline zone are effectively the same as those to the floodplain, and are discussed above.	
Alternative 1	**Construction**	The Alternative 1 proposal is likely to result in similar significant impacts on the river, on-site wetlands, the floodplain, and the shoreline area. Most of those impacts would be initiated during construction phases, but would continue during long-term operations.	**Puyallup River** • SW-1. Evaluate the outfall erosion issues prior to Hearing Examiner hearing and prior to County and Hearing Examiner approval and final Project permitting and take corrective action as needed to redesign, repair, or relocate the stormwater outfall structure or components of the Project-wide stormwater management plan in relation to future flow increases from the Project site • SW-2. Re-evaluate current stormwater management strategy. **Wetlands** • SW-3. Hydrogeologist/Geotechnical engineer assessment of steep slopes and location of proposed infiltration facilities. • SW-4. Surface and Groundwater Hydrology monitoring prior to final site design and construction in all on-site wetlands to define hydroperiods, as needed to develop effective plans to preserve current wetland hydrology, as required in Code. • SW-5. Long-term groundwater monitoring during operations to document success of proposed hydrology support. • SW-6. Wetland D impact avoidance. • SW-7. Mitigation and monitoring plan.

Resource(s)/Alternative		Impact	Mitigation
			Floodplain and Shorelines • SW-8. Reduction of on-site erosion and sediment movement.
	Operation	The Alternative 1 proposal is likely to result in similar significant impacts on the river, on-site wetlands, the floodplain, and the shoreline area. Most of those impacts would be initiated during construction phases, but would continue during long-term operations, as described above.	**Puyallup River** • SW-1. Evaluate the outfall erosion issues prior to Hearing Examiner hearing and prior to County and Hearing Examiner approval and final Project permitting and take corrective action as needed to redesign, repair, or relocate the stormwater outfall structure or components of the Project-wide stormwater management plan in relation to future flow increases from the Project site. • SW-2. Re-Evaluate current stormwater management strategy. **Wetlands** • SW-3. Hydrogeologist/Geotechnical engineer assessment of steep slopes and location of proposed infiltration facilities. • SW-4. Surface and Groundwater Hydrology monitoring prior to final site design and construction in all on-site wetlands to define hydroperiods, as needed to develop effective plans to preserve current wetland hydrology, as required in Code. • SW-5. Long-term groundwater monitoring during operations to document success of proposed hydrology support. • SW-6. Wetland D impact avoidance. • SW-7. Mitigation and monitoring plan. **Floodplain and Shorelines** • SW-8. Reduction of on-site erosion and sediment movement.
Alternative 2	**Construction**	Construction of Alternative 2 would result in similar but slightly reduced impacts during construction as compared to the proposed Project. Due to Alternative 2's reduced footprint, temporary and permanent impacts analogous to the proposed Project would occur, but at a smaller scale and farther from some of the environmentally sensitive areas on site—specifically, fill impacts at Wetland D and its on-site buffer would not occur, and the potential landslide hazard	**Puyallup River** • SW-1. Evaluate the outfall erosion issues prior to Hearing Examiner hearing and prior to County and Hearing Examiner approval and final Project permitting and take corrective action as needed to redesign, repair, or relocate the stormwater outfall structure or components of the Project-wide stormwater management plan in relation to future flow increases from the Project site.

Resource(s)/Alternative	Impact	Mitigation
	areas near the top of steep slopes at the eastern edge of the high terrace would not be developed. However, Alternative 2 does not change the current proposal to redirect most site runoff to the Puyallup River, and therefore, does not address ongoing erosion at the riverbank, does not address water quality and listed species impacts from 6PPD pollutants, nor the need to protect and maintain current groundwater-fed hydrology sources for the on-site wetlands. Neither does it propose revegetation of the undeveloped surfaces between the terrace edge and the warehouse zone, which would be expected to become weed-dominated unless properly managed. These impacts to surface water would occur during Construction because the timing of paving and construction of stormwater systems during Construction would overlap with impacts from new warehouse traffic runoff during Operations.	• SW-2. Re-evaluate current stormwater management strategy. **Wetlands** • SW-3. Hydrogeologist/Geotechnical engineer assessment of steep slopes and location of proposed infiltration facilities. • SW-4. Surface and Groundwater Hydrology monitoring prior to final site design and construction in all on-site wetlands to define hydroperiods, as needed to develop effective plans to preserve current wetland hydrology, as required in Code. • SW-5. Long-term groundwater monitoring during operations to document success of proposed hydrology support. • SW-6. Wetland D impact avoidance. • SW-7. Mitigation and monitoring plan. **Floodplain and Shorelines** • SW-8. Reduction of on-site erosion and sediment movement.
Operation	The Operations Impacts associated with Alternative 2 would be similar but slightly less than those described for the proposed Project, due to the smaller Project site footprint. As a result of the Alternative 2 reduced impacts approach, there would be a reduction in total impervious surface and a decrease in the number of daily traffic trips. But the general approach to stormwater management would remain the same. Impacts to surface water wetlands from lack of hydrology, ongoing riverbank erosion and water quality impacts from 6PPD still remain. Thus, under Alternative 2, wetlands are still expected to become smaller or disappear entirely due to a decrease in infiltration and associated groundwater hydrology volumes. Ongoing erosion at the riverbank is expected to increase as a result of increased runoff from Project pavement through the outfall. New impacts to listed salmonids from new inputs of 6PPD laden water from pavement still remain, although would be slightly reduced by having less pavement.	**Puyallup River** • SW-1. Evaluate the outfall erosion issues prior to Hearing Examiner hearing and prior to County and Hearing Examiner approval and final Project permitting and take corrective action as needed to redesign, repair, or relocate the stormwater outfall structure or components of the Project-wide stormwater management plan in relation to future flow increases from the Project site. • SW-2. Re-evaluate current stormwater management strategy. **Wetlands** • SW-3. Hydrogeologist/Geotechnical engineer assessment of steep slopes and location of proposed infiltration facilities. • SW-4. Surface and Groundwater Hydrology monitoring prior to final site design and construction in all on-site wetlands to define hydroperiods, as needed to develop effective plans to preserve current wetland hydrology, as required in Code. • SW-5. Long-term groundwater monitoring during operations to document success of proposed hydrology support. • SW-6. Wetland D impact avoidance.

Resource(s)/Alternative		Impact	Mitigation
			- SW-7. Mitigation and monitoring plan. **Floodplain and Shorelines** - SW-8. Reduction of on-site erosion and sediment movement.
Groundwater (Section 4.3)			
No Action Alternative		Under the No Action Alternative, the construction of the Project would not occur. No Project-related impacts to groundwater resources would result. Agriculture could continue on site, and groundwater would continue to be recharged by direct infiltration from farmed surfaces. Groundwater recharge through the upland terrace surfaces would continue to provide the same recharge volumes during similar time periods that currently support the existing floodplain wetlands to the east. There would be no significant excavation, grading, or clearing on site beyond what is normal and allowed for agricultural operations.	No mitigation required.
Proposed Project	**Construction**	**Groundwater Infiltration and Wetland Recharge Potential** The current proposal is likely to result in significant impacts to on-site wetlands, and most of those impacts would be initiated during construction phases. Therefore, the two primary impacts caused by changes to groundwater functions during construction phases would be: - potential slope stability impacts along the top of slope or eastern slope face of the high terrace, and - changes to the timing and total volumes of groundwater recharge to the Puyallup River and to on-site wetlands in the eastern floodplain (Wetlands A, B, and C) and in the southeastern high terrace (Wetland D). **Groundwater Contamination** Construction of the Project site would require the use of heavy equipment and dewatering, both of which could cause contamination of groundwater. Uncontrolled spills are unlikely because required Spill Prevention, Control, and	- GW-1. Re-evaluate current stormwater management strategy. - GW-2. Consider benefits of meeting rather than exceeding EC impervious surface limits and applying LID techniques - GW-3. Assess steep slope stability adjacent to proposed infiltration facilities. - GW-4. Test infiltration facilities location and function - GW-5. Monitor ground and surface water depth and duration in trenches and wetlands. - GW-6. Long-term wetland groundwater monitoring plan

Resource(s)/Alternative		Impact	Mitigation
		Countermeasure plans, and local and state permit requirements would presumably be implemented and followed. Construction stormwater also has the potential to transport contaminants into local groundwater. Potentially contaminated materials during site excavation and grading could be encountered. **Critical Aquifer Recharge Areas, Wellhead Protection Areas and Water Wells** Minor decrease in groundwater discharge to the Puyallup River would be expected to have an undetectable impact on the overall flow of the river. During construction, the Project would not use any on-site water wells for water supply. No impacts on drinking water wells are expected.	
	Operation	Potential operational impacts to groundwater include the following: • Permanent subsurface modifications related to drainage systems, which may reduce or eliminate groundwater sources that support the on-site floodplain wetlands. • Stormwater management design that redirects most surface runoff to the river rather than infiltrating, which would reduce historic infiltration volumes and timing of seeps to wetlands from the high terrace, and which may eliminate on-site floodplain and high terrace wetlands. • Oil leaks and spills in the warehouse complex over time, which may contaminate shallow groundwater if not managed properly.	• GW-1. Re-evaluate current stormwater management strategy. • GW-2. Consider benefits of meeting rather than exceeding EC impervious surface limits and applying LID techniques • GW-3. Assess steep slope stability adjacent to proposed infiltration facilities. • GW-4. Test infiltration facilities location and function • GW-5. Monitor ground and surface water depth and duration in trenches and wetlands. • GW-6. Long-term wetland groundwater monitoring plan
Alternative 1	**Construction**	Construction of Alternative 1 would result in similar construction impacts as the proposed Project. Except for a small area between the Project site and the Meeker Southern railroad, and construction of the track extensions from the BNSF mainline/Meeker Southern interchange, most of the ground disturbance for the construction of the	• GW-1. Re-evaluate current stormwater management strategy. • GW-2. Consider benefits of meeting rather than exceeding EC impervious surface limits and applying LID techniques • GW-3. Assess steep slope stability adjacent to proposed infiltration facilities.

Resource(s)/Alternative		Impact	Mitigation
		rail line would occur within the same construction footprint as the proposed Project; therefore, the impacts would be similar to those described for construction of the proposed Project.	• GW-4. Test infiltration facilities location and function • GW-5. Monitor ground and surface water depth and duration in trenches and wetlands. • GW-6. Long-term wetland groundwater monitoring plan
	Operation	The operations impacts associated with Alternative 1 would be the same as those described for the proposed Project. There might be a slight difference in total impervious surface, but it is assumed that the general approach to stormwater management would remain the same, and the risks would remain the same.	• GW-1. Re-evaluate current stormwater management strategy. • GW-2. Consider benefits of meeting rather than exceeding EC impervious surface limits and applying LID techniques • GW-3. Assess steep slope stability adjacent to proposed infiltration facilities. • GW-4. Test infiltration facilities location and function • GW-5. Monitor ground and surface water depth and duration in trenches and wetlands. • GW-6. Long-term wetland groundwater monitoring plan
Alternative 2	**Construction**	Construction of Alternative 2 would result in similar, but slightly reduced impacts during construction as compared to the proposed Project. Due to Alternative 2's reduced footprint, temporary and permanent impacts analogous to what was described above for the proposed Project would occur, but at a smaller scale and farther from some of the environmentally sensitive areas on site. However, Alternative 2 does not change the current proposal to redirect most site runoff to the Puyallup River, and therefore, does not address the need to protect and maintain current groundwater-fed hydrology sources for the on-site wetlands. Neither does it propose revegetation of the undeveloped surfaces between the terrace edge and the warehouse zone, without which would be expected to revegetate naturally with a weed-dominated vegetation community.	• GW-1. Re-evaluate current stormwater management strategy. • GW-2. Consider benefits of meeting rather than exceeding EC impervious surface limits and applying LID techniques • GW-3. Assess steep slope stability adjacent to proposed infiltration facilities. • GW-4. Test infiltration facilities location and function • GW-5. Monitor ground and surface water depth and duration in trenches and wetlands. • GW-6. Long-term wetland groundwater monitoring plan
	Operation	The Operations Impacts associated with Alternative 2 would be similar but slightly reduced compared to those described for the proposed Project, due to the smaller Project site footprint. As a result of the Alternative 2 reduced impacts approach, there would be a reduction in total impervious surface and a decrease in the number of daily traffic trips, but the general approach to stormwater management would remain the same, and the impacts to wetland groundwater hydrology sources remain the same. Thus,	• GW-1. Re-evaluate current stormwater management strategy. • GW-2. Consider benefits of meeting rather than exceeding EC impervious surface limits and applying LID techniques • GW-3. Assess steep slope stability adjacent to proposed infiltration facilities. • GW-4. Test infiltration facilities location and function

Resource(s)/Alternative		Impact	Mitigation
		under Alternative 2, wetlands are still expected to become smaller or disappear entirely due to a decrease in infiltration on the high terrace and associated reduction in groundwater hydrology volumes.	• GW-5. Monitor ground and surface water depth and duration in trenches and wetlands. • GW-6. Long-term wetland groundwater monitoring plan
Plants and Animals (Section 4.4)			
No Action Alternative		Under the No Action Alternative, the construction and operation of the Project would not occur. No Project-related impacts to plants and animals would result. Assuming the same agricultural activities would continue on site, then existing plant and animal communities would continue to function as they do currently. No new development or increased human activity would be introduced on site and no additional vegetation clearing would occur outside of what is standard and allowed under farming practices; no additional wildlife habitat would be disrupted; impacts to special status species would remain the same. The current degraded vegetation communities and animal habitat conditions associated with continued farming practices would persist indefinitely. Existing levels of the 6PPD pollutant in the Puyallup River would not increase as a result of proposed new flow volumes from the Project site.	No mitigation required.
Proposed Project	**Construction**	During construction, direct impacts to plants and animals could occur from release of pollutants from construction equipment—gas, diesel and/or oil spills, and from grading and clearing activities—which would gradually reduce infiltration across the upper terrace, affecting hydrology sources supporting floodplain wetland habitats. As impervious surface increases over the course of construction—pavement and buildings—potential for greater volumes of runoff containing 6PPD pollutants flowing into the Puyallup River also increases.	• P&A-1. Clearing and grading work causing spread and colonization of noxious weeds. • P&A-2. Evaluate riverine and floodplain habitat conditions in and around the outfall. • P&A-3. Re-evaluate current stormwater management strategy. • P&A-4. Wetlands A, B, C, and D Habitat and Hydroperiod Protection • P&A-5. Wetland D Habitat Protection (more details provided in Section 4.2 Surface Water, Mitigation SW-7)
	Operation	During Operations, the most significant continued impact to plants and animals would be from the significant increase in runoff volumes and an associated increase in 6PPD pollutants in the new runoff being sent to the Puyallup	• P&A-1. Clearing and grading work causing spread and colonization of noxious weeds. • P&A-2. Evaluate riverine and floodplain habitat conditions in and around the outfall.

Resource(s)/Alternative		Impact	Mitigation
		River. The increased runoff volumes may further destabilize the existing outfall structure, affecting bank stability and sending eroded materials into the river, and may continue to cause habitat planting area failures in the Puyallup River riparian buffer. Other impacts may include a decrease in Wetlands A, B, and C acreage over time due to loss of hydrology sources, a direct loss of one-acre of Wetland and its buffers at Wetland D, and impacts to remaining off-site portions of Wetland D—water quantity and water quality.	• P&A-3. Re-evaluate current stormwater management strategy. • P&A-4. Wetlands A, B, C, and D Habitat and Hydroperiod Protection • P&A-5. Wetland D Habitat Protection (more details provided in Section 4.2 Surface Water, Mitigation SW-7)
Alternative 1	**Construction**	Construction of Alternative 1 would result in similar construction impacts as the proposed Project. Except for a small area between the Project site and the Meeker Southern railroad, and construction of the track extensions from BNSF mainline/Meeker Southern interchange, most of the ground disturbance for the construction of the rail line would occur within the same construction footprint as the proposed Project; therefore, the impacts would be similar to those described for construction of the proposed Project.	• P&A-1. Clearing and grading work causing spread and colonization of noxious weeds. • P&A-2. Evaluate riverine and floodplain habitat conditions in and around the outfall. • P&A-3. Re-evaluate current stormwater management strategy. • P&A-4. Wetlands A, B, C, and D Habitat and Hydroperiod Protection • P&A-5. Wetland D Habitat Protection (more details provided in Section 4.2 Surface Water, Mitigation SW-7)
	Operation	Alternative 1, which involves using rail rather than roads in some of the warehouse complex area, is unlikely to have a different operational impact on vegetation and wildlife—including sensitive or listed aquatic species—than the proposed Project. Despite the possibility that train noise may be more concentrated, and therefore louder near tracked areas, overall noise levels in the floodplain, most being at a distance from the primary train track (assumed to run along the western Project edge) would be similar, and it is assumed that the general approach to stormwater management would remain the same. There would be a slight decrease in the total number of trucks on site—suggesting that the level of tire oxidant pollutant would be decreased—but the trip reduction is not significant enough, based on the information in the Transportation section of this EIS, to change the analysis regarding 6PPD impacts. Therefore, Alternative 1 is likely to result in similar impacts to plants and animals, including the listed salmonids in the Puyallup River.	• P&A-1. Clearing and grading work causing spread and colonization of noxious weeds. • P&A-2. Evaluate riverine and floodplain habitat conditions in and around the outfall. • P&A-3. Re-evaluate current stormwater management strategy. • P&A-4. Wetlands A, B, C, and D Habitat and Hydroperiod Protection • P&A-5. Wetland D Habitat Protection (more details provided in Section 4.2 Surface Water, Mitigation SW-7)

Resource(s)/Alternative		Impact	Mitigation
Alternative 2	**Construction**	Construction of Alternative 2 would result in similar impacts during construction as the proposed Project. Due to Alternative 2's reduced footprint, temporary and permanent impacts analogous to the proposed Project would occur, but at a smaller scale and farther from some of the environmentally sensitive areas on site.	• P&A-1. Clearing and grading work causing spread and colonization of noxious weeds. • P&A-2. Evaluate riverine and floodplain habitat conditions in and around the outfall. • P&A-3. Re-evaluate current stormwater management strategy. • P&A-4. Wetlands A, B, C, and D Habitat and Hydroperiod Protection • P&A-5. Wetland D Habitat Protection (more details provided in Section 4.2 Surface Water, Mitigation SW-7)
	Operation	The Operations Impacts associated with Alternative 2 would be similar but slightly reduced compared to those described for the proposed Project, due to the smaller Project site footprint. As a result of the Alternative 2 reduced impacts approach, there would be a reduction in total impervious surface and a decrease in the number of daily traffic trips, but the general approach to stormwater management would remain the same, and the impacts to wetland groundwater hydrology sources remain the same. Thus, under Alternative 2, wetlands are still expected to become smaller or disappear entirely due to a decrease in infiltration on the high terrace and associated reduction in groundwater hydrology volumes.	• P&A-1. Clearing and grading work causing spread and colonization of noxious weeds. • P&A-2. Evaluate riverine and floodplain habitat conditions in and around the outfall. • P&A-3. Re-evaluate current stormwater management strategy. • P&A-4. Wetlands A, B, C, and D Habitat and Hydroperiod Protection • P&A-5. Wetland D Habitat Protection (more details provided in Section 4.2 Surface Water, Mitigation SW-7)
Land and Shoreline Use (Section 4.5)			
No Action Alternative		*No impacts.* Under the No Action Alternative, the Project would not occur, the site would still be a subject of potential annexation, and collaboration between the City and County in planning for this area would still need to occur. If the Project did not occur, other opportunities for job-generating development on the site remain and there is a potential for inconsistency with the City and County Comprehensive Plan policies that require planning for economic and employment growth. The No Action Alternative would be consistent with the intent of the Pierce County Comprehensive Plan if a future proposed development aligned with the future land uses allowed in the EC designation—a mixture of future land uses under the Light Manufacturing/Warehousing, Rural Buffer	No mitigation required.

Resource(s)/Alternative		Impact	Mitigation
		Residential, Business/Industrial Parks, and Auto-oriented Commercial zones.	
Proposed Project	**Construction**	*Significant with Mitigation.* Construction would be conducted in accordance with applicable policies and regulations of agencies with jurisdiction or discretionary authority over one or more of the Project components. The Project site includes prime farmland, currently used as farmed agricultural lands and associated single-family residences. During construction, these agricultural uses and residences would be removed. Construction of the Project would result in temporary environmental impacts within the Project site, as identified and addressed in sections of this EIS (Section 4.1, Earth Resources mitigation measures ER-1 through ER-10; Section 4.5, Land Use mitigation measures LU-1 through LU-4; Section 4.6, Recreation mitigation measures REC-1 through REC-3; Section 4.7, Aesthetics mitigation measure AES-1; Section 4.10, Health and Safety mitigation measures HS-1 through HS-5; and Section 4.13, Noise mitigation measures N-1 and N-2).	• ER-1. Implement BMPs during construction. • ER-2. Implement low impact development principles. • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. • ER-4. Prepare and Implement SWPPP for Erosion and Sedimentation Hazards. • ER-5. Prepare Emergency Site Management Plans for large scale weather events for Erosion and Sedimentation Hazards. • ER-6. Comply with Title 18E.60 PCC for Volcanic Hazards. • ER-7. Prepare Emergency Management Plan for Volcanic Activity. • ER-8. Building Occupancy Limits for Volcanic Hazards. • ER-9. Prepare Emergency Management Plan for Seismic Events. • ER-10. Conform with Title 17C PCC for Seismic Design. • LU-1. Development limits on city Comprehensive Plan designation areas. • LU-2. Consider a broader mix of uses for the Project. • LU-3. Consider the compatibility with surrounding land uses. • LU-4. Conservation Easement • REC-1. Eliminate Van Lierop Park Prime View Corridor Obstructions • REC-2. Identify and address recreation closures. • REC-3. Implement visual screening. • AES-1. Comply with Construction Lighting Requirements • HS-1. Prepare a Project Health and Safety Plan • HS-2. Prepare Emergency Response Plan • HS-3. Survey for Lead Based Paint and Asbestos • HS-4. Comply with MTCA Regulations for Unexpected Encounter with Hazardous Materials. • HS-5. Comply with WISHA Rules • HS-6. Comply with Pierce County Public Works Inspection and Enforcement. • HS-7. Obtain and comply with Williams Northwest Pipeline Encroachment Agreement

Resource(s)/Alternative		Impact	Mitigation
			• HS-8. Comply with PHSMA's Minimum Design Requirements. • N-1. Develop Construction Noise Control Plan • N-2. Prioritize Construction of Noise Restricting Project Elements
	Operation	*Mitigated Significant Impact T*he Project would be inconsistent with County policies around intensity of the site's use; compatibility with surrounding uses, critical areas, and utility and street capacity (Pierce County Comprehensive Plan Policies LU-44.6, LU-46.1, LU-46.2, LU-47.4, LU-47.9, LU-47.11); the Project's interference with connecting the surrounding community (Pierce County Comprehensive Plan Goal PR-10, Policy PR-17.1); preservation of prime farmland and community character (AM D-1); and absence of a proposal to include restoration of shoreline ecological functions as part of industrial development (Pierce County SMP Policy B-1).	• LU-1. Development limits on city Comprehensive Plan designation areas. • LU-2. Consider a broader mix of uses for the Project. • LU-3. Consider the compatibility with surrounding land uses. • LU-4. Conservation Easement
Alternative 1	**Construction**	*Mitigated Significant Impact.* The construction impacts associated with Alternative 1 would be similar to those described for the proposed Project in that the Project would result in temporary environmental impacts within the Project site as identified and addressed in sections of this EIS. Additional impacts for Alternative 1 would be associated with the extension of the existing rail line outside of the Project site on a County-owned parcel and County ROW (Figure 4-2). Construction of Alternative 1 would be temporary in nature and would require construction in accordance with applicable policies and regulations of Pierce County.	• ER-1. Implement BMPs during construction. • ER-2. Implement low impact development principles. • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. • ER-4. Prepare and Implement SWPPP for Erosion and Sedimentation Hazards. • ER-5. Prepare Emergency Site Management Plans for large scale weather events for Erosion and Sedimentation Hazards. • ER-6. Comply with Title 18E.60 PCC for Volcanic Hazards. • ER-7. Prepare Emergency Management Plan for Volcanic Activity. • ER-8. Building Occupancy Limits for Volcanic Hazards. • ER-9. Prepare Emergency Management Plan for Seismic Events. • ER-10. Conform with Title 17C PCC for Seismic Design. • LU-1. Development limits on city Comprehensive Plan designation areas. • LU-2. Consider a broader mix of uses for the Project. • LU-3. Consider the compatibility with surrounding land uses. • LU-4. Conservation Easement

Resource(s)/Alternative		Impact	Mitigation
			• REC-1. Eliminate Van Lierop Park Prime View Corridor Obstructions • REC-2. Identify and address recreation closures. • REC-3. Implement visual screening. • AES-1. Comply with Construction Lighting Requirements • HS-1. Prepare a Project Health and Safety Plan • HS-2. Prepare Emergency Response Plan • HS-3. Survey for Lead Based Paint and Asbestos • HS-4. Comply with MTCA Regulations for Unexpected Encounter with Hazardous Materials. • HS-5. Comply with WISHA Rules • HS-6. Comply with Pierce County Public Works Inspection and Enforcement. • HS-7. Obtain and comply with Williams Northwest Pipeline Encroachment Agreement • HS-8. Comply with PHSMA’s Minimum Design Requirements. • N-1. Develop Construction Noise Control Plan • N-2. Prioritize Construction of Noise Restricting Project Elements
	Operation	*Mitigated Significant Impact.* The operations impacts associated with Alternative 1 would be similar to those described for the proposed Project in that it would be consistent with County zoning and future land use designations, but inconsistent with the City’s future land use designations. Alternative 1 would interfere with planned land uses in the Project site and with policy that calls for connectivity through systems of trails that link communities and parks (Pierce County Parks and Recreation Element, Goal PR-10, PR-17 and PR 17.1). Therefore, Alternative 1 would cause a significant environmental impact due to conflict with land use plans, policies, or regulations pertaining to non-conformance of future land use designations and planned land uses laid out in City and County planning documents. Mitigation measures LU-1 through LU-4 would reduce these impacts to the extent feasible.	• LU-1. Development limits on city Comprehensive Plan designation areas. • LU-2. Consider a broader mix of uses for the Project. • LU-3. Consider the compatibility with surrounding land uses. • LU-4. Conservation Easement

Resource(s)/Alternative		Impact	Mitigation
Alternative 2	**Construction**	*Mitigated Significant Impact.* Compared to the proposed Project, Alternative 2 would have a reduced footprint and construction could be expected to be at a smaller scale. However, temporary land-use related environmental impacts analogous to the proposed Project would occur as identified and addressed in sections of this EIS.	• ER-1. Implement BMPs during construction. • ER-2. Implement low impact development principles. • ER-3. Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer. • ER-4. Prepare and Implement SWPPP for Erosion and Sedimentation Hazards. • ER-5. Prepare Emergency Site Management Plans for large scale weather events for Erosion and Sedimentation Hazards. • ER-6. Comply with Title 18E.60 PCC for Volcanic Hazards. • ER-7. Prepare Emergency Management Plan for Volcanic Activity. • ER-8. Building Occupancy Limits for Volcanic Hazards. • ER-9. Prepare Emergency Management Plan for Seismic Events. • ER-10. Conform with Title 17C PCC for Seismic Design. • LU-2. Consider a broader mix of uses for the Project. • LU-3. Consider the compatibility with surrounding land uses. • LU-4. Conservation Easement • REC-2. Identify and address recreation closures. • REC-3. Implement visual screening. • AES-1. Comply with Construction Lighting Requirements • HS-1. Prepare a Project Health and Safety Plan • HS-2. Prepare Emergency Response Plan • HS-3. Survey for Lead Based Paint and Asbestos • HS-4. Comply with MTCA Regulations for Unexpected Encounter with Hazardous Materials. • HS-5. Comply with WISHA Rules • HS-6. Comply with Pierce County Public Works Inspection and Enforcement. • HS-7. Obtain and comply with Williams Northwest Pipeline Encroachment Agreement • HS-8. Comply with PHSMA’s Minimum Design Requirements. • N-1. Develop Construction Noise Control Plan • N-2. Prioritize Construction of Noise Restricting Project Elements

Resource(s)/Alternative		Impact	Mitigation
	Operation	*Mitigated Significant Impact.* Alternative 2 may conflict with land use plans, policies, or regulations pertaining to non-conformance of future land uses if established inconsistent with both jurisdiction policies around broad uses and compatibility with the local environment. Mitigation measures LU-2 and LU-3 would reduce impacts to the extent feasible.	• LU-2. Consider a broader mix of uses for the Project. • LU-3. Consider the compatibility with surrounding land uses.
Aesthetics (Section 4.6)			
No Action Alternative		*No impacts.* Under the No Action Alternative, the existing aesthetic quality of the Project site would be preserved until future development is proposed. No substantial new infrastructure would be introduced into the aesthetic environment until future development is proposed, and no significant contrast would be created.	No mitigation required.
Proposed Project	**Construction**	*Mitigated Significant Impact.* During construction, increased activity and the presence of construction equipment would result in visual impacts in the Project site, a disruption and displacement of the community's sense of place during this time. To mitigate these impacts, mitigation measure AES-1 would be required.	• AES-1. Comply with Construction Lighting Requirements
	Operations	*Mitigated Significant Impact.* The Project would permanently convert the area from a visual environment that is generally characterized presently by rural development and agricultural uses to an industrial warehousing park. The Project would create a permanent change to the aesthetic resources in the Project site. The natural environment, the built environment, and the visual quality within those environments in the Project Mitigation measure REC-1 would eliminate the potential for impacts to the park view corridor associated with Van Lierop Park. Mitigation measures AES-2 and AES-3 would further reduce visual impacts to park users and the surrounding community.	• REC-1. Eliminate Van Lierop Park Prime View Corridor Obstructions • AES-2. Comply with Screening, Landscape and Buffering Requirements • AES-3. Comply with Operation Lighting Requirements
Alternative 1	**Construction**	*Mitigated Significant Impact.* During construction, increased activity and the presence of construction equipment would result in visual impacts in the Project site, a disruption and	• AES-1. Comply with Construction Lighting Requirements

Resource(s)/Alternative		Impact	Mitigation
		displacement of the community's sense of place during this time. To mitigate these impacts, mitigation measure AES-1 would be required.	
	Operations	*Mitigated Significant Impact.* The aesthetic impacts associated with Alternative 1 would be the same as those described for the proposed Project in that it would permanently convert the area from a visual environment that is generally characterized presently by rural development and agricultural uses to an industrial warehousing park. Alternative 1 would compound the aesthetic environmental impacts with the addition of rail lines and rail cars in the built environment. Operation would include rail movement to and from the site and the BNSF mainline/Meeker Southern interchange extensions would be adjacent to existing rail lines. Alternative 1 would introduce a more intense level of contrast in the aesthetic environment, causing the aesthetic value of the environment to change. Impacts would be considered Mitigated Significant Impact. Mitigation measure REC-1 would eliminate the potential for impacts to the park view corridor associated with Van Lierop Park. Mitigation measures AES-2 and AES-3 would reduce impacts to the extent feasible.	• REC-1. Eliminate Van Lierop Park Prime View Corridor Obstructions • AES-2. Comply with Screening, Landscape and Buffering Requirements • AES-3. Comply with Operation Lighting Requirements
Alternative 2	**Construction**	*Mitigated Significant Impact.* Although at a slightly smaller scale than the proposed Project, during construction, increased activity and the presence of construction equipment would result in visual impacts in the Project site, a disruption and displacement of the community's sense of place during this time. To mitigate these impacts, mitigation measure AES-1 would be required.	• AES-1. Comply with Construction Lighting Requirements
	Operations	*Mitigated Significant Impact.* The Project would permanently convert the area from a visual environment that is generally characterized presently by rural development and agricultural uses to an industrial warehousing park. The natural environment, the built environment, and the visual quality within those environments in the Project site would impact users of Van	• AES-3. Comply with Operation Lighting Requirements

Resource(s)/Alternative		Impact	Mitigation
		Lierop Park. Mitigation measure AES-3 would further reduce visual impacts to park users and the surrounding community.	
Recreation (Section 4.7)			
No Action Alternative		*No impacts.* Under the No Action Alternative, the potential for trail enhancements associated with the Project would not occur until either Pierce County or the City of Puyallup Parks Department(s) built the trail extensions, as planned. No new infrastructure would be placed adjacent to the existing recreation sites until future development is proposed. Potential future development could either preserve existing recreation, lead to recreation opportunities including those potentially implemented in locations closer to the shoreline.	No mitigation required.
Proposed Project	**Construction**	*Mitigated Significant Impact*. During construction, construction equipment and activity could interfere with the existing uses of surrounding recreation sites and opportunities, including Sumner Link Trail, the Foothills Trail Trailhead and Van Lierop Park's view corridor of Mount Rainier. Impacts would be minimized with the implementation of Mitigation measures REC-1, REC-2, and REC-3.	• REC-1. Eliminate Van Lierop Park Prime View Corridor Obstructions • REC-2. Identify and address recreation closures. • REC-3. Implement visual screening
	Operation	*Mitigated Significant Impact.* During operations, the Project would introduce structures and associated truck activity that would interfere with the intended uses of surrounding recreation opportunities in the area. The proposed pedestrian trail route would be visually and physically separated from the shoreline and from trails intended to connect large community park space to the regional trail network. Implementation of mitigation measures REC-1, REC-4 and REC-5 would reduce impacts to the extent feasible.	• REC-1. Eliminate Van Lierop Park Prime View Corridor Obstructions • REC-4. Modify the Site Plan to Provide a New Trail Location • REC-5. Provide a Trail Connection to Van Lierop Park
Alternative 1	**Construction**	*Mitigated Significant Impact.* The construction impacts associated with Alternative 1 would be the same as those described for the proposed Project and would require	• REC-1. Eliminate Van Lierop Park Prime View Corridor Obstructions • REC-2. Identify and address recreation closures. • REC-3. Implement visual screening.

Resource(s)/Alternative		Impact	Mitigation
		implementation of mitigation measures REC-1, REC-2, and REC-3 to minimize impacts. Alternative 1 would include rail construction across 80th Street, close to the Foothills Trailhead parking. This would impact the experience of the Foothills Trail users as the aesthetic quality of their use of the trail would be interrupted. The Alternative 1 rail line on the Project site, especially outside of Warehouse C, would conflict with the proposed pedestrian trail. Further, trail users could potentially experience temporary trail closures, because of the interference of construction activity and construction equipment. Impacts would be minimized with the implementation of mitigation measure REC-6.	• REC-6. Modify Alternative 1 Site Plan to Avoid Trail Impacts
	Operation	*Mitigated Significant Impact.* The recreation impacts associated with Alternative 1 would be the same as those described for the proposed Project. Alternative 1 would introduce structures and associated truck activity that would interfere with the intended uses of surrounding recreation opportunities in the area. Implementation of mitigation measures REC-1, REC-2, and REC-3 would be required to minimize impacts. Alternative 1 would add to the recreation impacts by introducing rail activity. The experience of existing recreation users would likely include increased noise from train engines both running and idling, and whistles at at-grade crossings. Additionally, recreation users might experience a less safe environment, as the proposed rail would cross within direct proximity to the East Puyallup Trailhead and Trail, the Foothills Trail, and the proposed trail extension from the East Puyallup Trailhead and Trail across 80th Avenue SE. The proposed rail line on the Project site, especially outside of Warehouse C, would conflict with the proposed pedestrian trail.	• REC-1. Eliminate Van Lierop Park Prime View Corridor Obstructions • REC-2. Identify and address recreation closures. • REC-3. Implement visual screening. • REC-6. Modify Alternative 1 Site Plan to Avoid Trail Impacts
Alternative 2	**Construction**	*Mitigated Significant Impact*. Alternative 2 would have similar but lesser impacts during construction than the proposed Project due to the decreased site footprint of the facility. During construction, construction equipment and	• REC-2. Identify and address recreation closures. • REC-3. Implement visual screening

Resource(s)/Alternative		Impact	Mitigation
		activity could interfere with the existing uses of surrounding recreation sites and opportunities, including the Puyallup Riverwalk Trail, the Foothills Trail Trailhead, and Van Lierop Park's view corridor of Mount Rainier. Impacts would be minimized with the implementation of mitigation measures REC-2 and REC-3.	
	Operation	*Mitigated Significant Impact*. Alternative 2 would interfere with the intended uses of surrounding recreation, including the Puyallup Riverwalk Trail or the Foothills Trail Trailhead as operations would bring increased truck and other vehicular traffic to the area and compromise the user's experience. The reduced building footprints of Buildings A, C, and E as well as the addition of trail and building buffers would allow the trail location to be visually screened from the industrial uses under Scenario 2, but the recreational use would still conflict with the character of the industrial warehouse development. However, under Scenario 2, the proposed on-site trail would shift to a shoreline alignment (starting to the east of Building E, due north), lessening impacts on future recreationalists and separating incompatible uses. Scenario 2 would also reduce the building footprints of Buildings F and G by removing the portions of each building blockage of Mount Rainier from Van Lierop Park in accordance with REC-1, thereby lessening impacts on the park and recreational resources. The location of the proposed trail as shown on the proposed Project site plan would not connect to Van Lierop Park and would place the proposed development in a manner that would have substantial impacts on a community-wide park resource. Under Scenario 2, the trail would be moved from the proposed location parallel to Building G (east of Building G), and consolidated with the built and future planned extension of the trail on the eastern side of Van Lierop Park. Scenario 2 would also require that the site plan be separated by the east-west trail corridor so that no vehicular crossing of the trail would occur. Additional pedestrian improvement to facilitate safe access across 80th Street/8th Avenue SE would also need to occur under Scenario 2. Impacts would be minimized with the implementation of mitigation measures REC-2 and REC-3.	• REC-2. Identify and address recreation closures. • REC-3. Implement visual screening

Resource(s)/Alternative		Impact	Mitigation
Air Quality and Greenhouse Gases (Section 4.8)			
No Action Alternative		*No impacts.* Under the No Action Alternative, the construction and operation of the proposed Project would not occur. Existing conditions in the study area related to air quality would continue under the No Action Alternative.	No mitigation required.
Proposed Project	**Construction**	*Less than Significant.* The construction emissions from the proposed Project are not expected to cause a significant air quality impact and are not expected to cause an exceedance of the NAAQS. The construction emissions would be intermittent in nature, temporary and spatially dispersed, and are not expected to represent a significant adverse impact.	No mitigation required. However, BMPs would be implemented during construction to minimize potential for air quality impacts during construction in accordance with Pierce County Comprehensive Plan Goals ENV-3 and ENV-4.2, CPCP Goal NE-11.5 and Puget Sound Clean Air Agency Regulation 1, Section 9.15.
	Operation	*Less than Significant.* Operations emissions from the proposed Project are not expected to cause a significant air quality impact and are not expected to cause an exceedance of the NAAQS. Criteria pollutant and MSAT impacts due to operational emissions from transport trucks and employee commuting would be adverse, but less than significant. Greenhouse gas emissions are expected to be less than significant.	No mitigation required. However, BMPs would be implemented during operations to minimize potential for localized air quality impacts during construction in accordance with Pierce County Comprehensive Plan Goals ENV-3.5 to 3.7, 3.10 and 4.1; CPCP Goal T-6.2; Title 10.50 PCC; and Chapter 21.16 PCC.
Alternative 1	**Construction**	*Less than Significant.* The construction emissions from the proposed Project are not expected to cause a significant air quality impact and are not expected to cause an exceedance of the NAAQS. The construction emissions would be intermittent in nature, temporary and spatially dispersed, and are not expected to represent a significant adverse impact.	No mitigation required. However, BMPs would be implemented during construction to minimize potential for air quality impacts during construction in accordance with Pierce County Comprehensive Plan Goals ENV-3 and ENV-4.2, CPCP Goal NE-11.5 and Puget Sound Clean Air Agency Regulation 1, Section 9.15.
	Operation	*Less than Significant.* Operations emissions from the proposed Project are not expected to cause a significant air quality impact and are not expected to cause an exceedance of the NAAQS. Criteria pollutant and MSAT impacts due to operational emissions from transport trucks, employee commuting and operation of the rail line. Would be adverse, but less than significant. Greenhouse gas emissions are expected to be less than significant.	No mitigation required. However, BMPs would be implemented during construction to minimize potential for localized air quality impacts during operations in accordance with Pierce County Comprehensive Plan Goals ENV-3.5 to 3.7, 3.10 and 4.1; CPCP Goal T-6.2; Title 10.50 PCC; and Chapter 21.16 PCC.

Resource(s)/Alternative		Impact	Mitigation
Alternative 2	**Construction**	*Less than Significant.* The construction emissions from the proposed Project are not expected to cause a significant air quality impact and are not expected to cause an exceedance of the NAAQS. The construction emissions would be intermittent in nature, temporary and spatially dispersed, and are not expected to represent a significant adverse impact.	No mitigation required. However, BMPs would be implemented during construction to minimize potential for air quality impacts during construction in accordance with Pierce County Comprehensive Plan Goals ENV-3 and ENV-4.2, CPCP Goal NE-11.5 and Puget Sound Clean Air Agency Regulation 1, Section 9.15.
	Operation	*Less than Significant.* Operations emissions from the proposed Project are not expected to cause a significant air quality impact and are not expected to cause an exceedance of the NAAQS. Criteria pollutant and MSAT impacts due to operational emissions from transport trucks and employee commuting would be adverse, but less than significant. Greenhouse gas emissions are expected to be less than significant.	No mitigation required. However, BMPs would be implemented during operations to minimize potential for localized air quality impacts during construction in accordance with Pierce County Comprehensive Plan Goals ENV-3.5 to 3.7, 3.10 and 4.1; CPCP Goal T-6.2; Pierce County Code Chapter 10.50; and Puyallup Municipal Code Chapter 21.16.
Transportation (Section 4.9)			
No Action Alternative		*No impacts.* Under the No Action Alternative, the construction and operation of the proposed Project would not occur. Existing conditions in the study area related to transportation and traffic would continue under the No Action Alternative.	No Mitigation
Proposed Project	**Construction**	Less than Significant. Traffic operations and safety will be impacted within the proposed Project area. The construction of the proposed Project will generate construction traffic and may require temporary lane closures, detours, or other construction related impacts. Construction traffic will contribute to deterioration of local roads and major arterials.	Applicant will be required to develop and implement a traffic management plan for all construction traffic. Applicant will be required to repair any damage and restore roadways to a condition similar to or better than that prior to construction.
	Operation	*Mitigated Significant Impact. The Project will generate 8,724 total daily trips including 1,482 heavy trucks, reducing the capacity along the existing roadway corridors resulting in an increase delay, reduced level of service, extensive queue lengths, and increase travel time during the peak periods. The increase traffic demand and heavy trucks will reduce the remaining pavement life along the corridors within the study area.*	• Retime and coordinate the signal at Traffic Avenue/Fryar Avene & Main Street/Cannery Way • Retime and coordinate signal at Traffic Avenue & State Street • Retime and coordinate signal at E Main Avenue & SR 410 westbound. Modify lane configuration and striping to allow eastbound and westbound left turns to run on the same signal phase.

Resource(s)/Alternative		Impact	Mitigation
			• Retime and coordinate signal at E Main Avenue & SR 410 eastbound • Widen 5th Avenue to a three-lane section between Shaw Road E and 33rd Street SE. Install new signal at 5th Avenue & Shaw Road E. • Convert existing SR 162 & 80th Street unsignalized intersection into a roundabout. • Apply capacity Proportional Factor to long range estimates to determine fee in lieu to widen and vehicular capacity along E Main Avenue, Shaw Road E, E Pioneer, and SR 162 within the study area. • Improve existing roadways within the study area to meet ADA requirements. • Improve existing transit stations within the study area. • Widen 33rd Street SE from 5th Avenue SE to E Pioneer Avenue to meet City standards and the future designation in the City's Comprehensive Plan. • Widen 80th Street E/8th Avenue SE to meet City standards.
Alternative 1	**Construction**	Less than Significant. Traffic operations and safety will be impacted within the proposed Project area. The construction of the proposed Project will generate construction traffic and may require temporary lane closures, detours, or other construction related impacts. Construction traffic will contribute to deterioration of local roads and major arterials.	Applicant will be required to develop and implement a traffic management plan for all construction traffic. Applicant will be required to repair any damage and restore roadways to a condition similar to or better than that prior to construction.
	Operation	*Mitigated Significant Impact. The Project will generate 8,487 total daily trips including 1,207 heavy trucks, reducing the capacity along the existing roadway corridors resulting in an increase delay, reduced level of service, extensive queue lengths, and increase travel time during the peak periods. The increase traffic demand and heavy trucks will reduce the remaining pavement life along the corridors within the study area.*	• Retime and coordinate the signal at Traffic Avenue/Fryar Avene & Main Street/Cannery Way • Retime and coordinate signal at Traffic Avenue & State Street • Retime and coordinate signal at E Main Avenue & SR 410 westbound. Modify lane configuration and striping to allow eastbound and westbound left turns to run on the same signal phase. • Retime and coordinate signal at E Main Avenue & SR 410 eastbound

Resource(s)/Alternative		**Impact**	**Mitigation**
			• Widen 5th Avenue to a three-lane section between Shaw Road E and 33rd Street SE. Install new signal at 5th Avenue & Shaw Road E. • Convert existing SR 162 & 80th Street unsignalized intersection into a roundabout. • Apply capacity Proportional Factor to long range estimates to determine fee in lieu to widen and vehicular capacity along E Main Avenue, Shaw Road E, E Pioneer, and SR 162 within the study area. • Improve existing roadways within the study area to meet ADA requirements. • Improve existing transit stations within the study area. • Widen 33rd Street SE from 5th Avenue SE to E Pioneer Avenue to meet City standards and the future designation in the City's Comprehensive Plan. Widen 80th Street E/8th Avenue SE to meet City standards.
Alternative 2	**Construction**	Less than Significant. Traffic operations and safety will be impacted within the proposed Project area. The construction of the proposed Project will generate construction traffic and may require temporary lane closures, detours, or other construction related impacts. Construction traffic will contribute to deterioration of local roads and major arterials.	Applicant will be required to develop and implement a traffic management plan for all construction traffic. Applicant will be required to repair any damage and restore roadways to a condition similar to or better than that prior to construction.
	Operation	*Mitigated Significant Impact. The Project will generate 5,844 total daily trips including 998 heavy trucks, reducing the capacity along the existing roadway corridors resulting in an increase delay, reduced level of service, extensive queue lengths, and increase travel time during the peak periods. The increase traffic demand and heavy trucks will reduce the remaining pavement life along the corridors within the study area.*	• Retime and coordinate the signal at Traffic Avenue/Fryar Avene & Main Street/Cannery Way • Retime and coordinate signal at Traffic Avenue & State Street • Retime and coordinate signal at E Main Avenue & SR 410 westbound. Modify lane configuration and striping to allow eastbound and westbound left turns to run on the same signal phase. • Retime and coordinate signal at E Main Avenue & SR 410 eastbound • Widen 5th Avenue to a three-lane section between Shaw Road E and 33rd Street SE. Install new signal at 5th Avenue & Shaw Road E. • Convert existing SR 162 & 80th Street unsignalized intersection into a roundabout.

Resource(s)/Alternative		Impact	Mitigation
			- Apply capacity Proportional Factor to long range estimates to determine fee in lieu to widen and vehicular capacity along E Main Avenue, Shaw Road E, E Pioneer, and SR 162 within the study area. - Improve existing roadways within the study area to meet ADA requirements. - Improve existing transit stations within the study area. - Widen 33rd Street SE from 5th Avenue SE to E Pioneer Avenue to meet City standards and the future designation in the City's Comprehensive Plan. Widen 80th Street E/8th Avenue SE to meet City standards.
Health and Safety (Section 4.10)			
No Action Alternative		*No impacts.* Under the No Action Alternative, the proposed Project would not be constructed, and existing health and safety hazards would remain in the study area.	No mitigation required.
Proposed Project	**Construction**	**Construction Hazards** *Mitigated Significant Impact.* Public and occupational health and safety risks during construction of the Project include the potential exposure to electrical and mechanical hazards for construction workers; inadvertent release of hazardous materials; and exposure to existing hazardous materials sites. Mitigation measures HS-1 through HS-6 are identified to avoid, minimize, or reduce impacts to the extent feasible. **Natural Gas Pipeline Safety** *Mitigated Significant Impact.* As currently designed, the proposed Project is sited above the Williams Natural Gas Pipeline and associated 75-foot-wide easement. The pipeline is located below the parking area between Warehouses E, F, and G and these warehouses are proposed within the pipeline ROW. Any Project development activity within the 75-foot easement requires approval by Williams Northwest Pipeline LLC Construction of the Project would require excavation, grading, utility installation, and warehouse construction	**Construction Hazards** - HS-1. Prepare a Project Health and Safety Plan - HS-2. Prepare Emergency Response Plan - HS-3. Survey for Lead Based Paint and Asbestos - HS-4. Comply with MTCA Regulations for Unexpected Encounter with Hazardous Materials. - HS-5. Comply with WISHA Rules - HS-6. Comply with Pierce County Public Works Inspection and Enforcement. **Natural Gas Pipeline Safety** - HS-7. Obtain and comply with Williams Northwest Pipeline Encroachment Agreement. - HS-8. Comply with PHSMA's Minimum Design Requirements.

Resource(s)/Alternative	Impact	Mitigation
	above or near the Williams Natural Gas Pipeline. Although a release or incident involving the pipeline is unlikely, unintentional force or excavation could cause releases from the pipeline, placing construction workers and the public at risk. Depending on environmental factors such as wind, proximity of vegetation or other fuels, and dryness of the environment, a fire could spread to other nearby structures or wooded natural environments; the extent of damage would depend on various unpredictable elements. To minimize the potential for an incident to occur and resulting significant impacts, mitigation measures HS-7 and HS-8 would be required.	
Operation	**Chemical Use and Storage** *Mitigated Significant Impact.* Potential hazardous materials associated with future tenants may include solvents, petroleum products, and metals. The Project could result in an inadvertent release of hazardous materials during operation. In the event of an inadvertent hazardous materials release, both the physical and natural environments as well as their occupants and inhabitants could be affected. Mitigation measures HS-9 and HS-10 would be required to reduce the probability of a release of stored chemicals and exposure to hazardous materials to the extent feasible. **Natural Gas Pipeline Safety** *Mitigated Significant Impact.* As currently designed, the proposed Project is sited above the Williams Natural Gas Pipeline and associated 75-foot-wide easement. The pipeline is located below the parking area between Warehouses E, F, and G and these warehouses are proposed within the pipeline ROW. Any Project development activity within the 75-foot easement requires approval by Williams Northwest Pipeline LLC Construction of the Project would require excavation, grading, utility installation, and warehouse construction above or near the Williams Natura Gas Pipeline. Although a release or incident involving the pipeline is unlikely,	**Chemical Use and Storage** • HS-9. Designate and carry out duties of a Facility Emergency Coordinator • HS-10. Comply with HCS of the U.S. OSHA Standards. **Natural Gas Pipeline Safety** • HS-7. Obtain and comply with Williams Northwest Pipeline Encroachment Agreement • HS-8. Comply with PHSMA's Minimum Design Requirements.

Resource(s)/Alternative		Impact	Mitigation
		unintentional force or excavation could cause releases from the pipeline, placing construction workers and the public at risk. Depending on environmental factors such as wind, proximity of vegetation or other fuels, and dryness of the environment, a fire could spread to other nearby structures or wooded natural environments; the extent of damage would depend on various unpredictable elements. To minimize the potential for an incident to occur and resulting significant impacts, mitigation measures HS-7 and HS-8 would be required.	
Alternative 1	**Construction**	*Mitigated Significant Impact.* The impacts from construction of Alternative 1 would be similar to those described for the proposed Project in that the potential exposure to electrical and mechanical hazards for construction workers; inadvertent release of hazardous materials; and exposure to existing hazardous materials sites would still occur. Construction over the Williams Pipeline ROW would risk unintentional force or excavation that could cause releases from the pipeline, placing construction workers and the public at risk. Mitigation measures HS-1 through HS-8 are identified to avoid, minimize, or reduce impacts to the extent feasible.	**Construction Hazards** • HS-1. Prepare a Project Health and Safety Plan • HS-2. Prepare Emergency Response Plan • HS-3. Survey for Lead Based Paint and Asbestos • HS-4. Comply with MTCA Regulations for Unexpected Encounter with Hazardous Materials. • HS-5. Comply with WISHA Rules • HS-6. Comply with Pierce County Public Works Inspection and Enforcement. **Natural Gas Pipeline Safety** • HS-7. Obtain and comply with Williams Northwest Pipeline Encroachment Agreement • HS-8. Comply with PHSMA's Minimum Design Requirements.
	Operation	*Mitigated Significant Impact.* The impacts from operation of Alternative 1 would be similar to those described for the proposed Project in that Alternative 1 could also result in an inadvertent release of hazardous materials during operation. Under Alternative 1, the addition of rail activity during operations would allow for the transportation by rail of hazardous materials. Under Alternative 1, the proposed facility and rail line are sited above the Williams Pipeline. Similar to the proposed Project, there is a potential risk associated with operation of the facility above the Williams Pipeline. Based on these considerations, impacts would be Mitigated Significant Impact. Mitigation measures HS-7 and	**Natural Gas Pipeline Safety** • HS-7. Obtain and comply with Williams Northwest Pipeline Encroachment Agreement • HS-8. Comply with PHSMA's Minimum Design Requirements. **Chemical Use and Storage** • HS-9. Designate and carry out duties of a Facility Emergency Coordinator • HS-10. Comply with HCS of the U.S. OSHA Standards.

Resource(s)/Alternative		**Impact**	**Mitigation**
		HS-8 are identified to avoid, minimize, or reduce operation of Alternative 1 Williams Pipeline impacts to the extent feasible. Mitigation measures HS-9 and HS-10 would further reduce the probability of a release of stored chemicals and exposure to hazardous materials to the extent feasible.	
Alternative 2	**Construction**	*Mitigated Significant Impact*. Compared to the proposed Project, Alternative 2 would have reduced footprint and construction could be expected to be at a smaller scale. However, the same construction-related environmental impacts analogous to the proposed Project could still occur. A mitigated significant impact is anticipated. Mitigation measures HS-1 through HS-8 are identified to avoid, minimize, or reduce impacts to the extent feasible.	**Construction Hazards** • HS-1. Prepare a Project Health and Safety Plan • HS-2. Prepare Emergency Response Plan • HS-3. Survey for Lead Based Paint and Asbestos • HS-4. Comply with MTCA Regulations for Unexpected Encounter with Hazardous Materials. • HS-5. Comply with WISHA Rules. • HS-6. Comply with Pierce County Public Works Inspection and Enforcement. **Natural Gas Pipeline Safety** • HS-7. Obtain and comply with Williams Northwest Pipeline Encroachment Agreement • HS-8. Comply with PHSMA's Minimum Design Requirements.
	Operation	*Mitigated Significant Impact.* Compared to the proposed Project, Alternative 2 would be a reduced footprint and operation could be expected to be at a smaller scale. However, the same operation-related environmental impacts analogous to the proposed Project could still occur. Based on these considerations, a mitigated significant impact is anticipated. Mitigation measures HS-7 and HS-8 are identified to avoid, minimize, or reduce operation of Alternative 2 Williams Pipeline impacts to the extent feasible. Mitigation measures HS-9 and HS-10 would further reduce the probability of a release of stored chemicals and exposure to hazardous materials to the extent feasible.	**Natural Gas Pipeline Safety** • HS-7. Obtain and comply with Williams Northwest Pipeline Encroachment Agreement • HS-8. Comply with PHSMA's Minimum Design Requirements. **Chemical Use and Storage** • HS-9. Designate and carry out duties of a Facility Emergency Coordinator • HS-10. Comply with HCS of the U.S. OSHA Standards.
Public Services and Utilities (Section 4.11)			
No Action Alternative		*No impacts.* Under the No Action Alternative, the proposed Project would not be constructed at the Project site. No	No mitigation required.

Resource(s)/Alternative		Impact	Mitigation
		changes to existing public services or utilities would occur as a result of Project activities. Development at the Project site and in adjacent areas would continue according to current planning goals and service demands outlined within the UGA.	
Proposed Project	**Construction**	*Less than Significant.* Available service levels for any public service or utility during construction would not be exceeded.	No mitigation required.
	Operation	**Police/Sheriff Services, Fire Services, Electricity, Natural Gas and Solid Waste** *Less than Significant.* Available service levels for public services or utility during operations would not be exceeded. **Domestic Water** *Mitigated Significant Impact.* The City anticipates having water capacity to serve the Project; however, a final determination, including any appropriate utility permit conditions or system development charges will be made following publication of the EIS. City of Puyallup Code Chapter 14.02 sets forth water system development charges that may be required once an end user and final water usage projections are known. As such, implementation of mitigation measure PS-1 is required to avoid a significant impact to the City of Puyallup water system. **Sanitary Sewer** *Mitigated Significant Impact.* During the preparation of the utility permit application, physical capacity improvements may be required by the City of Puyallup to correct any failures in the downstream system resulting from the Project occupancy (final user(s)) build out. If there are potential failures, mitigation measure PS-2 would be required to avoid, minimize, or reduce impacts to the extent feasible. **Stormwater**	**Police/Sheriff Services, Fire Services, Electricity, Natural Gas and Solid Waste** No mitigation required. **Domestic Water** • PS-1. Comply with Title 14.02 PCC for Water Usage **Sanitary Sewer** • PS-2. Conduct a Sanitary Sewer Assessment **Stormwater** • PS-3. Comply with Stormwater Quality Requirements • PS-4. Conduct Groundwater Monitoring • PS-5. Comply with Infiltration and Dispersion Trench Design Requirements

Resource(s)/Alternative		Impact	Mitigation
		Mitigated Significant Impact. The Project would result in substantial increases in the impervious surface of the Project site and, thus, the rate and amount of surface runoff is expected to increase with Project implementation. Implementation of mitigation measure PS-3 would be required to avoid, minimize, or reduce impacts to the extent feasible. There have been issues with the stormwater system at the Viking Warehouse on the property adjacent to the Project site. Groundwater was encountered that was nearer the surface than expected during design, which has necessitated the installation of dewatering trenches to manage post construction groundwater intrusion coming through the surface through pavement and foundations on the adjacent Viking warehouse site. Given the proximity of the Viking warehouse to the Project site, it is likely that similar issues would be encountered with the stormwater system for the proposed Project. Implementation of groundwater monitoring in accordance with mitigation measure PS-4 would be required to ensure that facilities are designed to avoid groundwater intrusion issues. The second stormwater system would convey rooftop runoff from Warehouses A, C, D, and E to one of three infiltration/dispersion systems along the northeast bench of the site. Design of the infiltration/dispersion systems appears feasible based on the preliminary geotechnical information provided; however, it is unclear where flows above the Minimum Requirement would be directed. Therefore, the infiltration and dispersion trench design need to take into account the requirements of the Stormwater Management Manual for Western Washington (Ecology 2019), in accordance with mitigation measure PS-5.	
Alternative 1	**Construction**	*Less than Significant.* Available service levels for any public service or utility during construction would not be exceeded.	No mitigation required.

Resource(s)/Alternative		Impact	Mitigation
	Operation	*Mitigated Significant Impact.* The public services and utilities impacts associated with operation of Alternative 1 would be similar to those described for the proposed Project. The addition of rail operations would not notably increase the demand for any public service or utility. The domestic water, stormwater and sanitary sewer issues identified under the proposed Project would also occur under Alternative 1. Implementation of mitigation measures PS-1, PS-2, PS-3, PS-4, and PS-5 would be required to minimize potential impacts to stormwater and sanitary sewer services.	**Police/Sheriff Services, Fire Services, Domestic Water, Electricity, Natural Gas and Solid Waste** No Mitigation required. **Domestic Water** • PS-1. Comply with Title 14.02 PCC for Water Usage **Sanitary Sewer** • PS-2. Conduct a Sanitary Sewer Assessment **Stormwater** • PS-3. Comply with Stormwater Quality Requirements • PS-4. Conduct Groundwater Monitoring • PS-5. Comply with Infiltration and Dispersion Trench Design Requirements
Alternative 2	**Construction**	*Less than Significant.* Available service levels for any public service or utility during construction would not be exceeded.	No Mitigation required.
	Operation	*Mitigated Significant Impact.* The public services and utilities impacts associated with operation of Alternative 2 would be similar to but less than those described for the proposed Project. The stormwater and sanitary sewer issues identified under the proposed Project would also occur under Alternative 2. Implementation of mitigation measures PS-1, PS-2, PS-3, PS-4, and PS-5 would be required to minimize potential impacts to domestic water, stormwater and sanitary sewer services.	**Police/Sheriff Services, Fire Services, Domestic Water, Electricity, Natural Gas and Solid Waste** No mitigation required. **Domestic Water** • PS-1. Comply with Title 14.02 PCC for Water Usage **Sanitary Sewer** • PS-2. Conduct a Sanitary Sewer Assessment **Stormwater** • PS-3. Comply with Stormwater Quality Requirements • PS-4. Conduct Groundwater Monitoring • PS-5. Comply with Infiltration and Dispersion Trench Design Requirements
Cultural Resources (Section 4.12)			

Resource(s)/Alternative		Impact	Mitigation
No Action Alternative		*No impacts.* Under the No Action Alternative, the Project would not be built and the recommended NRHP, WHR, and PCRHP-eligible historic built environment resource would remain in its current state and not be impacted.	No mitigation required.
Proposed Project	**Construction**	*Significant Impact.* The recommended-eligible historic built environment resource is located within the right-of-way (ROW) of 74th Street E and the northeast corner of the proposed footprint of Building D. As such, the residence and its functionally related units would be demolished and the associated farmland would be converted to new uses, which would be a significant impact because the resource is recommended as eligible for listing in local, state, and national registers of historic places.	No mitigation required.
	Operations	*No impacts.* No operational impacts to archaeology resources or the recommended-eligible historic built environment resource are anticipated since it would have been demolished prior to construction.	No mitigation required.
Alternative 1	**Construction**	*Significant Impact*. The recommended-eligible historic built environment resource is located within the ROW of 74th Street E and the northeast corner of the proposed footprint of Building D. As such, the residence and its functionally related units would be demolished and the associated farmland would be converted to new uses, which would be a significant impact because the resource is recommended as eligible for listing in local, state, and national registers of historic places.	No mitigation required.
	Operations	*No impacts.* No operational impacts to archaeology resources or the recommended-eligible historic built environment resource are anticipated since it would have been demolished prior to construction.	No mitigation required.
Alternative 2	**Construction**	*Significant Impact*. The recommended-eligible historic built environment resource is located within the ROW of 74th Street E and the northeast corner of the proposed footprint of Building D. As such, the residence and its functionally related units would be demolished and the associated farmland would be converted to new uses, which would be a significant impact because the resource is recommended	No mitigation required.

Resource(s)/Alternative		**Impact**	**Mitigation**
		as eligible for listing in local, state, and national registers of historic places.	
	Operations	*No impacts.* No operational impacts to archaeology resources or the recommended-eligible historic built environment resource are anticipated since it would have been demolished prior to construction.	No mitigation required.
Noise (Section 4.13)			
No Action Alternative		*No impacts.* Under the No Action Alternative, Project construction activities would not occur. Because no construction or operation would take place under this alternative, there would be no noise impacts.	No mitigation required.
Proposed Project	**Construction**	*Mitigated Significant Impact.* Day-time construction would temporarily increase noise levels in the study area. Although daytime construction noise is exempt from regulation, the exemption is not intended to preclude requirements for implementation of BMPs to abate noise (WAC 173-60-050[6]). The Applicant and its construction contractors are required to ensure that noise from construction equipment and activities complies with applicable noise rules and minimizes the potential for annoyance/disturbance. As such, implementation of mitigation measures N-1 and N-2 would be required to minimize potential noise disturbance.	• N-1. Develop Construction Noise Control Plan • N-2. Prioritize Construction of Noise Restricting Project Elements
	Operations	*Mitigated Significant Impact.* Truck and passenger/light duty vehicles would generate noise during operations and would be subject to the maximum permissible noise levels under WAC 173-60-040. As such, Project-related heavy trucks would not be permitted to be closer than 50 feet to a Class A EDNA parcel during daytime hours, and 200 feet during nighttime hours. Project-related passenger/light duty vehicles cannot be closer than 25 feet to a Class A EDNA parcel during daytime or nighttime hours. This vehicle activity on the site would constitute a significant impact on these Class A environments that would require implementation of mitigation measure N-3 to minimize noise impacts at the park and nearby residential areas.	• N-3. Construct Noise Walls.

Resource(s)/Alternative		Impact	Mitigation
		The wide range of potential end uses outlined in Table 3-2 precludes identification of all potential operation-related noise impacts. As such, once a final end-user has been identified for the proposed facility, the specific noise levels would be required to be measured and analyzed during permitting and appropriate mitigation measures would be identified by the permitting agency.	
Alternative 1	**Construction**	*Mitigated Significant Impact.* Day-time construction would temporarily increase noise levels in the study area. Although daytime construction noise is exempt from regulation, the exemption is not intended to preclude requirements for implementation of BMPs to abate noise (WAC 173-60-050[6]). The Applicant and its construction contractors are required to ensure that noise from construction equipment and activities complies with applicable noise rules and minimizes the potential for annoyance/disturbance. As such, implementation of mitigation measures N-1 and N-2 would be required to minimize potential noise disturbance.	• N-1. Develop Construction Noise Control Plan • N-2. Prioritize Construction of Noise Restricting Project Elements
	Operations	*Mitigated Significant Impact.* Alternative 1 would eliminate up to 330 trucks from daily traffic levels, which would reduce noise levels on noise-sensitive lands. This would be offset by increased noise from up to two trains per day arriving at the site. The net effect would be a reduction in the areal extent of transportation-related noise and a reduction in the amount of time the noise events occur, thus reducing the overall Project-related noise exposure. However, as discussed under the proposed Project, truck traffic on site would still be anticipated to generate noise levels that exceed maximum permissible noise levels at Class A noise environments (i.e., Van Lierop Park and nearby residential zones); therefore, implementation of mitigation measure N-1 would be required. The wide range of potential end uses outlined in Table 3-2 precludes identification of all potential operation-related noise impacts. As such, once a final end-user has been identified for the proposed facility, the specific noise levels would be required to be measured and analyzed during permitting and appropriate mitigation measures would be identified by the permitting agency.	• N-3. Construct Noise Walls

Resource(s)/Alternative		Impact	Mitigation
Alternative 2	**Construction**	*Mitigated Significant Impact.* The size and scale of the proposed development is smaller under Alternative 2; therefore, construction noise impacts associated with Alternative 2 are expected to be less than those discussed for the proposed Project. The nature of the construction noise would be similar to the proposed Project, but the duration of construction would be lessened. Although daytime construction noise is exempt from regulation, the exemption is not intended to preclude requirements for implementation of BMPs to abate noise (WAC 173-60-050[6]). The Applicant and its construction contractors are required to ensure that noise from construction equipment and activities complies with applicable noise rules and minimizes the potential for annoyance/disturbance. As such, implementation of mitigation measures N-1 and N-2 would be required to minimize potential noise disturbance.	• N-1. Develop Construction Noise Control Plan • N-2. Prioritize Construction of Noise Restricting Project Elements
	Operations	*Mitigated Significant Impact.* Operations impacts associated with Alternative 2 are expected to generally be similar to those discussed for proposed Project, although the size and scale of the proposed development is smaller in Alternative 2. Truck traffic on site would still be anticipated to generate noise levels that exceed maximum permissible noise levels at Class A noise environments (i.e., Van Lierop Park and nearby residential zones); therefore, implementation of mitigation measure N-3 would be required.	• N-3. Construct Noise Walls

2. INTRODUCTION

The City of Puyallup is preparing this EIS under SEPA for the proposed Project. The Applicant proposes to construct and operate a warehouse complex of up to 2.6 million square feet of building area in seven buildings on the approximate 188-acre Knutson Farm property located within unincorporated Pierce County. This chapter describes the Project history, summarizes the SEPA environmental review process, and provides an outline of organization of the EIS.

2.1 Project History

Initial land use permit applications for the proposed Project were submitted by the Applicant to Pierce County in 2014 and later revised in 2016. In June 2016, the City proposed that Pierce County and the City jointly prepare an EIS for the Project, but the proposal was rejected by the County. On April 26, 2017, Pierce County issued a Mitigated Determination of Non-Significance (MDNS) with a determination that an EIS was not required if specified conditions were met (Pierce County Permit #792210). Given the number of unaddressed concerns about the proposal and location within the City's UGA, the City did not accept the County's MDNS, and pursuant to SEPA on May 10, 2017, issued a Notice of Assumption of Lead Agency Status and a Determination of Significance (DS) with a request for comments on the scope of the EIS. When the County and the Applicant refused to honor the City DS and Assumption of Lead Agency Status, the City filed suit in Thurston County Superior Court. The Superior Court ruled for the County and the Applicant. The City appealed to the Court of Appeals to reverse the Superior Court ruling. On April 3, 2019, the Court of Appeals issued a unanimous decision to reverse the Superior Court ruling in favor of the City. The Court of Appeals concluded that the City is an "agency with jurisdiction" over the Project and is authorized to assume lead agency status, a decision that the Washington Supreme Court later refused to overturn. This EIS is being prepared pursuant to the City's DS.

Before the Court of Appeals' unanimous decision upholding the City's right to require an EIS, the City and the Puyallup Tribe of Indians appealed the County MDNS to the County Hearing Examiner. The County's Hearing Examiner conducted an appeal hearing in July 2018 on the MDNS as well as a hearing on the underlying preliminary short plat application. The Puyallup Tribe of Indians withdrew their appeal while the Hearing Examiner proceeding was pending. In November 2018, the Pierce County Hearing Examiner issued decisions denying the City's MDNS appeal and approving the preliminary short plat imposing several modified mitigation measures. However, as stated previously, the Hearing Examiner's decisions were issued without the benefit of an EIS. The City therefore appealed them in Pierce County Superior Court. The City sought to have that appeal stayed until the EIS had been finally issued and the matter was back before the Hearing Examiner. The County and the Applicant sought to have certain issues that had been resolved by the Hearing Examiner litigated in superior court without delay, characterizing them as non-environmental. On review, the Court of Appeals agreed that nonenvironmental issues could be considered and resolved in superior court before issuance of the EIS and without fresh review by the Hearing Examiner. The superior court subsequently conducted that review and on October 18, 2023 denied Puyallup's Land Use Petition Act (LUPA) petition challenging discrete aspects of the November 21, 2018 Pierce County Hearing Examiner Decision. Meanwhile, on November 17, 2020, to move the Draft EIS preparation process forward, the City of Puyallup issued a "Second Notice" requesting further comments on the scope of a previously issued DS and after receipt of comments began preparation of this EIS (Appendix A, SEPA Register #202005873).

2.2 Regulatory and Policy Context

The Project site is located within unincorporated Pierce County, in the City of Puyallup's UGA and identified as a Potential Annexation Area; consistent with the GMA, the UGA is expected to annex and develop under designated policies and future land development and growth scenarios consistent with the affected city's Comprehensive Plan. In this case, the development is subject to the policies in both agencies' Comprehensive Plans (Pierce County and City of Puyallup); analysis in this EIS subjects the proposed development to analysis of consistency with both Plans. The Project is subject to Pierce County Code and in most cases is not subject to the City of Puyallup Code, as it relates to private property outside the city limits. In some cases, where the Project is served by and is impacting city municipal services (such as sewer, roads, and water), portions of the city municipal code, city standards, and other plans (such as utility comprehensive plans) apply to the Project. In relation to state highway system impacted by the Project (State Route [SR] 512, SR 410, SR 167, SR 162), the standards of the Washington State Department of Transportation (WSDOT) also apply to the Project. Other private utilities also have relevant standards and comprehensive plans that the Project must comply with substantially. The Project is served by the following utilities and agencies:

- Public roadways: Pierce County, City of Puyallup, WSDOT
- Sanitary sewer: City of Puyallup
- Domestic water: Valley Water District, City of Puyallup
- Electricity, natural gas: Puget Sound Energy
- Police services: Pierce County Sheriff's Department (PCSD))
- Fire Protection: East Pierce Fire and Rescue

2.3 Summary of the Environmental Review Process

2.3.1 EIS Scoping Process

The first step in the development of an EIS is called scoping. During the scoping process, agencies, tribes, local communities, organizations, and the public are invited to comment on factors that should be analyzed and considered in the EIS. Specifically, the process is intended to collect input on a reasonable range of alternatives; potentially affected resources and extent of analysis to determine impacts; measures to avoid, minimize, and mitigate impacts of the proposal; and cumulative impacts.

The City of Puyallup issued a DS on the proposed development on May 10, 2017. Preparation of an EIS was delayed due to appeals (subsequently withdrawn) of the DS by Pierce County and the Applicant, as well as litigation (now resolved) concerning the City's authority to issue a DS. Recognizing that significant time had passed since the initial scoping notice, the City issued a second notice of the 2017 DS on November 17, 2020, to invite the public, tribal governments, and agencies to renew and/or update comments on the scope of the EIS. An extended 30-day scoping comment period was issued for this Project to give the public additional time to provide comments. The scoping process was documented in the Knutson Farms Industrial Park Environmental Impact Statement Scoping Summary Report (Appendix A).

The City notified key stakeholders, interested parties, agencies, and the general public of the DS, the scoping comment period, and the ways in which they could provide comments using a variety of communication tools. Notifications included:

- Tacoma News Tribune Legal Notice (November 18, 2020)
- Email Listserv (November 17, 2020)
- Mailed notice to property owners within 500 feet of the Project site (November 23, 2020)
- City website (https://www.cityofpuyallup.org/1115/Puyallup-Valley-Warehouse-Development)
- Project website (online open house; https://www.knutsonfarmseis.org) launched on November 17, 2020
- Social media posts (Facebook; November 17 and 23; December 8 and 15, 2020)

The key issues identified during scoping and a summary of the scoping process are documented in the Knutson Farms Industrial Park Environmental Impact Statement Scoping Summary Report (Appendix A). Key comment topics received during scoping included the Project objective; Project description; alternatives; geology/soils; surface water; groundwater; plants and animals; land use; recreation and aesthetics; air quality and greenhouse gases; transportation; health and safety; public services and utilities; cultural resources; noise; social elements; mitigation; and permitting. The comments received were used in developing the scope of the analysis of this EIS.

2.3.2 Draft EIS Preparation, Publication and Review

A Draft EIS is prepared using the results of the scoping process. The purpose of an EIS is to provide an impartial discussion of significant environmental impacts and reasonable alternatives and mitigation measures to avoid or minimize adverse environmental impacts. The information in this Draft EIS is provided for review and comment by interested parties and will also be used by Pierce County and the City of Puyallup to evaluate the proposed Project. The environmental information provided in the EIS is used by agency officials—in conjunction with applicable regulations and other relevant information—to make decisions to approve, condition, or deny the proposal.

The City of Puyallup will seek comments on the Draft EIS from agencies, tribes, local communities, organizations, and the public during a 90-day comment period from December 14, 2023 to March 14, 2024. During the comment period, public meetings will be held January 11, 2024 and January 17, 2024. Comments will also be accepted by means of a U.S. Post Office box, in person via the City of Puyallup, by attending a public meeting, at an online open house (which will include an online comment submittal feature), and via e-mail and voicemail. Comments received during the comment period will be addressed in the Final EIS. The distribution list for the Draft EIS is provided in Appendix B.

2.3.3 Final EIS Publication

Following the comment period, the City of Puyallup will issue the Final EIS. The Final EIS will address comments received during the comment period, identify final mitigation measures, and may include additional information and input received from the Applicant, other agencies with jurisdiction or concern, tribes, and the public regarding the proposed Project.

2.4 Document Organization

This EIS contains the following chapters:

- Chapter 1 – EIS Summary, provides a summary of the main issues pertinent to the EIS.
- Chapter 2 – Introduction, provides an overview of the Project history and describes the environmental review process.
- Chapter 3 – Project Description, describes the No Action Alternative, other alternatives considered, and the proposed Project, including details on Project construction and operation.
- Chapter 4 – Environmental Analysis, describes the analysis of potential impacts associated with the No Action Alternative, the proposed Project, Alternative 1 and Alternative 2. Chapter 4 is divided into 13 sub-chapters that address specific environmental resource topics. For each topic, the chapter explains the methodology used to analyze impacts, the existing conditions of the affected environment, the potential impacts associated with the alternatives, and any proposed mitigation.
- Chapter 5 – Cumulative Impacts, describes the potential cumulative impacts associated with the Project.
- Chapter 6 – References, provides a list of the literature cited throughout this EIS.

3. PROJECT DESCRIPTION

The Applicant seeks to develop a warehouse complex (Project) of up to seven warehouses with up to 2.6 million square feet of building space on the approximately 188-acre Knutson Farms property (Project site) located in unincorporated Pierce County, Washington within the City of Puyallup's UGA and Potential Annexation Area. The Applicant has not made a binding commitment to an end use for the facility, and a diverse set of end uses could be allowed under Pierce County Code. However, the Applicant and the City of Puyallup recorded a Declaration of Restrictive Covenant (Recording Number 4874-8301-9788) in August 2022 that establishes a stated intent to develop the Project as an "Industrial Park" consistent with the Institute for Traffic Engineers (ITE) Land Use Code (LUC) 130 (ITE manual, 11th edition). According to ITE LUC 130, "*(a)n industrial park contains several individual industrial or related facilities. It is characterized by a mix of manufacturing, service, and warehouse facilities with a wide variation in the proportion of each type of use from one location to another.*" The covenant further strictly prohibits the applicant from developing the site for use as a high-cube fulfillment center warehouse (LUC 155) or high-cube parcel hub warehouse (LUC 156), as defined in the 11th edition of the ITE Trip Generation Manual.

The Project site is located within the County's Alderton- McMillin Community Plan boundary and zoned by Pierce County as an Employment Center (EC), which primarily allows industrial uses (Table 3-1). The City of Puyallup's future land use map designations for the subject Project site are Rural Buffer Residential (RBR) adjacent to the Puyallup River, Business/Industrial Parks (BIP), as well as Light Manufacturing/Warehouse (LMW) and Auto Oriented Commercial (AOC). The implementing zoning for the CPCP designations would allow a mixture of auto-oriented commercial, very low density residential, agricultural, open space, business park/industrial, and limited manufacturing/warehousing.

PCC 18A.10.080A.2.a., Employment Center

An Employment Center (EC) is a concentration of low- to high-intensity office parks, manufacturing, other industrial development, or a combination of activities. It may also include commercial development as a part of the center if the commercial development is incidental to the employment activities of the center and supports and serves the needs of the workforce.

Based on the uses allowed within the County EC zone and information provided by the Applicant, the Project could consist of uses allowed by county zoning, including basic manufacturing, contractor yards, food and related products, industrial services and repairs, intermediate manufacturing and intermediate/final assembly, off-site hazardous waste treatment and storage facilities, recycling collection and processing facilities, salvage yards/vehicle storage, and warehousing distribution and freight movement. Under the Employment Center zone, the Project would fit within the Industrial Use Category. The Industrial Use Category is described as "the on-site production, processing, storage, movement, servicing, or repair of goods and materials" (Pierce County 2021a).

Table 3-1. Impacted Parcels

PARCEL #	Project Acreage	Pierce County Comprehensive Plan Land Use Map Designation	City of Puyallup Comprehensive Plan Future Land Use Map Designation	Pierce County Zoning
0420252006 [a]	0.04	Employment Center	Rural Buffer Residential	Employment Center
0420252045 [a]	0.09	Employment Center	Rural Buffer Residential	Employment Center
0420252055 [a]	0.30	Employment Center	Rural Buffer Residential	Employment Center
0420252056 [a]	0.81	Employment Center	Rural Buffer Residential	Employment Center
0420252057 [a]	8.40	Employment Center	Rural Buffer Residential	Employment Center
0420252702 [a]	20.02	Employment Center	Rural Buffer Residential	Employment Center
0420252703 [a]	12.35	Employment Center	Rural Buffer Residential	Employment Center
0420253007	3.08	Employment Center	Rural Buffer Residential	Employment Center
0420253022	0.03	Employment Center	Auto-Oriented Commercial	Employment Center
0420253036	0.45	Employment Center	Rural Buffer Residential	Employment Center
0420253057	0.88	Employment Center	Rural Buffer Residential	Employment Center
0420253063	1.09	Employment Center	Rural Buffer Residential	Employment Center
0420253064	0.72	Employment Center	Rural Buffer Residential	Employment Center
0420253073	18.95	Employment Center	Auto-Oriented Commercial	Employment Center
0420253702	9.18	Employment Center	Auto-Oriented Commercial	Employment Center
0420253706	18.17	Employment Center	Rural Buffer Residential, Business/Industrial Parks	Employment Center
0420253707[a]	4.47	Employment Center	Rural Buffer Residential, Business/Industrial Parks	Employment Center
0420253708 [a]	10.55	Employment Center	Rural Buffer Residential	Employment Center
0420253709 [a]	11.17	Employment Center	Rural Buffer Residential, Business/Industrial Parks	Employment Center
0420253710 [a]	25.16	Employment Center	Rural Buffer Residential, Business/Industrial Parks	Employment Center
0420264066 [a]	14.91	Employment Center	Rural Buffer Residential, Light Manufacturing/Warehouse	Employment Center
0420264067	23.35	Employment Center	Light Manufacturing/ Warehouse	Employment Center

[a] Parcels that would be set aside partially or wholly as open space.

3.1 Applicant's Project Objective

Defining a proposed Project's objective plays a key role in determining the range of alternatives that will be considered and analyzed in an EIS. The objective guides the lead agencies in selecting a preferred alternative and in eliminating some alternatives from further consideration. In August 2022, the Applicant recorded a Declaration of Restrictive Covenant that establishes a stated intent to develop the Project as an "Industrial Park" consistent with ITE LUC 130 (ITE manual, 11th edition). According to ITE LUC 130, "(a)n industrial park contains several individual industrial or related facilities. It is characterized by a mix of manufacturing, service, and warehouse facilities with a wide variation in the proportion of each type of use from one location to another." Many industrial parks contain highly diversified facilities. Some industrial parks in the ITE database have a large number of small businesses and others have one or two dominant industries. The Declaration of Restrictive Covenant specifically prohibits high-cube fulfillment center warehousing (sort) and high-cube parcel hub warehousing as part of any future Project build-out.

The Applicant, in response to two requests for information in December 2020 and January 2021, made varying nonbinding statements concerning the Project objectives, including: “specific uses are not yet known,” and “anticipated uses will be a mix of industrial and manufacturing uses as allowed under zoning code.” In other nonbinding Project descriptions developed during the EIS process, the Applicant has variously identified distribution warehousing as the only proposed use and a mix of high-cube fulfillment center and “…manufacturing, service, and warehouse facilities with a wide variation in the proportion of each type of use from one location to another…” These descriptions have been nullified by the description of the Project agreed to in the Declaration of Restrictive Covenant. In October 2023, the Applicant further clarified the Project objective.

The Applicant’s objectives for the Project include:

- Provide additional manufacturing, warehousing, and shipping capacity in Pierce County;
- Improve nearby arterial traffic corridors to meet the growing economic demands for such services in the Sumner/Puyallup valley;
- Create new manufacturing/warehousing/shipping jobs in Pierce County; and
- Preserve and integrate open space into development plans for the site to provide for flood storage, habitat, environmental mitigation, and passive recreation.
- Complete construction within 5 years of the issuance of a Final EIS, or by 2029.

3.2 Location

The Project is in the UGA of the City of Puyallup in unincorporated Pierce County (see Figure 3-1). The 188-acre Project site is situated east of Shaw Road East and East Main Avenue, north of East Pioneer Avenue and 88th Street East, and west of the Puyallup River within Sections 25 and 26, Township 20N, Range 4E in the Willamette Meridian baseline.

3.3 No Action Alternative

SEPA requires evaluation of a No Action Alternative as a benchmark from which other alternatives can be compared (WAC 197-11-440(5)). Under the No Action Alternative, none of the proposed facilities would be constructed.

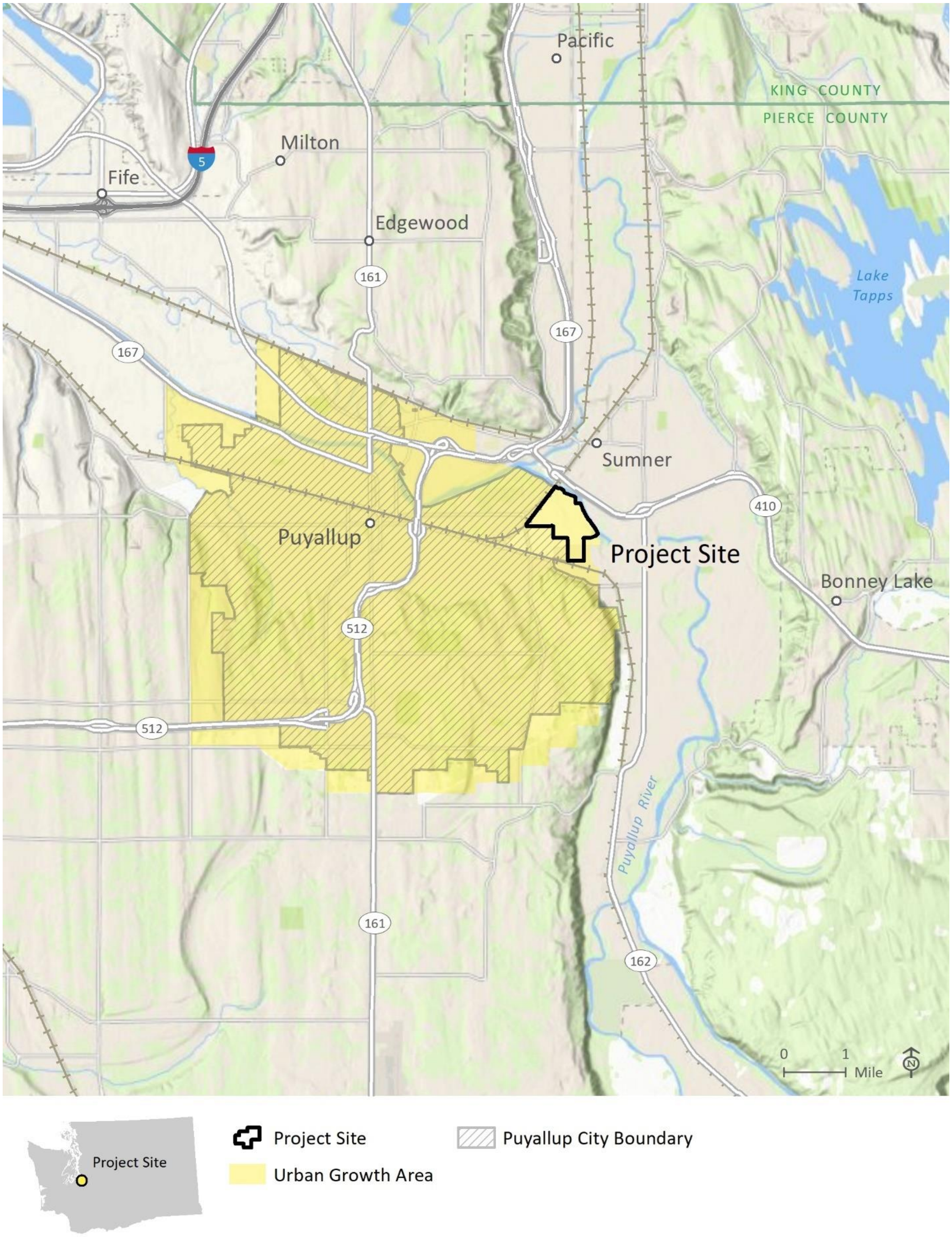


Figure 3-1. Location/Vicinity Map

3.4 Proposed Project

The Applicant's proposal is to develop a total of approximately 2.56 million square feet (SF) of building area (Figure 3-2) potentially configured as seven 45-foot-tall warehouses (Warehouses A–G), each varying in size from approximately 190,000 SF to 490,000 SF. The development would have 1,730 parking spaces for cars and 473 parking spaces for trailers (Table 3-2).

Table 3-2. Project Building Characteristics

Warehouse	Proposed Warehouse Size	Parking Spaces (Car/Trailer)
A	417,000 SF	235/156
B	492,000 SF	260/46
C	341,000 SF	225/46
D	458,000 SF	277/0
E	416,000 SF	187/138
F	193,000 SF	224/87
G	244,000 SF	322/0
Total	**2,561,000 SF**	**1,730/473**

The Project would include grading, paving of parking and truck maneuvering areas, landscaping, site lighting, water and sanitary sewer extensions, construction of stormwater facilities, utility improvements, and roadway improvements including establishment of new access to and use of City roads. The proposal also includes the construction of a new pedestrian trail near Warehouses A, C, and E.

The Project site includes lands that are currently used for agriculture, with a few associated houses. During construction, some of these agricultural lands, houses, and other buildings associated with farming would be removed (it is anticipated that agriculture production will continue on portions of the project site area in the lower bench floodplain, indicated as set aside open space by the applicant). Two Pierce County roadways within the Project site would be proposed to be vacated during construction: the northern portions of 134th Avenue East and 74th Street East. There is an existing stormwater outfall at the Puyallup River north of proposed Warehouse A that serves the existing Viking Warehouse facility. There is also an existing natural gas pipeline (Williams Pipeline) that runs between proposed Warehouse E and Warehouses F and G.

The proposed Project would maintain approximately 62 acres of open space on the northern portion of the site. The open space in this portion of the Project site is not proposed for development.

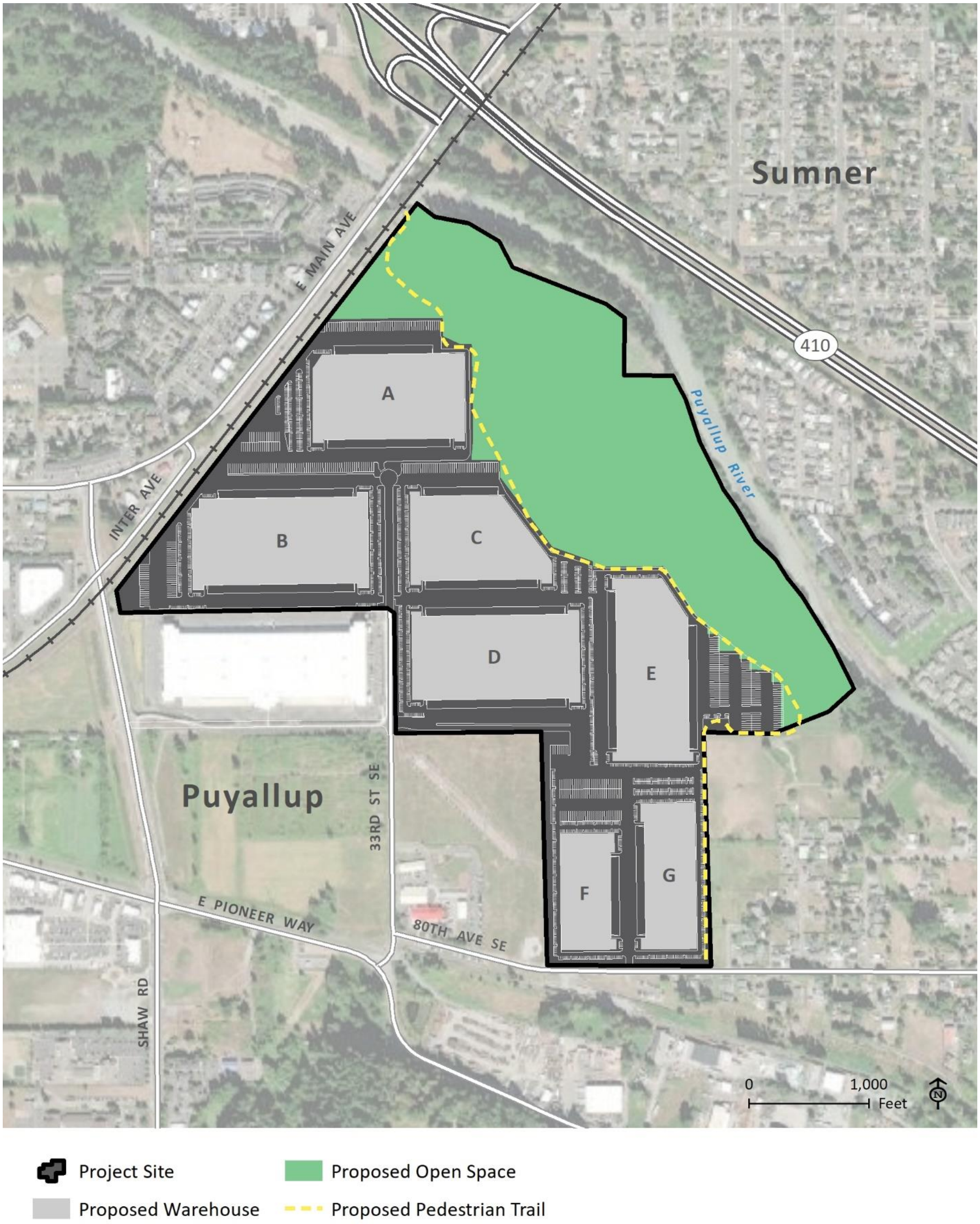


Figure 3-2. Development Map

3.4.1 Proposed Facilities

The proposed Project development has not been identified with any specified end uses; as outlined in Table 3-3, a diverse set of end uses is allowed under PCC for the Industrial Use Category C. The Applicant and the City of Puyallup recorded a Declaration of Restrictive Covenant (Recording Number 4874-8301-9788) in August 2022 that establishes a stated intent to develop the Project as an "Industrial Park" consistent with the Institute for Traffic Engineers (ITE) Land Use Code (LUC) 130 (ITE manual, 11th edition). According to ITE LUC 130, "*(a)n industrial park contains several individual industrial or related facilities. It is characterized by a mix of manufacturing, service, and warehouse facilities with a wide variation in the proportion of each type of use from one location to another.*" The covenant further strictly prohibits the applicant from developing the site for use as a high-cube fulfillment center warehouse (LUC 155) or high-cube parcel hub warehouse (LUC 156), as defined in the 11th edition of the ITE Trip Generation Manual.

Table 3-3. Industrial Use Category Examples

Use Category	Description	Examples
Basic Manufacturing	Uses that involve the primary processing of a raw or initially processed material into a product that requires additional processing, manufacture, or assembly in order to become a consumer good.	1. The production of basic chemicals; 2. The manufacture of castings and other basic metal products and the manufacture of nails, spikes, and insulated wire and cable; 3. The tanning, curing, or storage of raw hides or skins; 4. The manufacture of cement, ready-mix concrete, cut stone, and crushed rock and other primary products from materials taken principally from the earth in the form of stone, clay, and sand; 5. The manufacture of asphalt and asphalt reclamation processes; 6. Soil remediation facilities; 7. Saw, lath, shingle, planing, plywood, and veneer mills engaged in producing lumber and basic wood materials; 8. The manufacture of pulps from woods and other cellulose fibers and from rags; 9. Petroleum and natural gas refining and processing; and 10. The smelting and refining of ferrous and non-ferrous metals from ore or scrap, rolling, drawing, and alloying metals.
Contractor Yards	An area for construction or contracting business offices, interior or outdoor storage, repair, or maintenance of heavy equipment, vehicles, or construction supplies and materials.	Level 1: Contractor Yards that include an outdoor storage area of less than or equal to 2 acres. Level 2: Contractor Yards with outdoor storage areas greater than 2 acres in size.

Use Category	Description	Examples
Food and Related Products	Uses that involve the processing of non-animal food materials, raw milk, ice manufacturing, and other food products manufacturing, processing, storage, and packaging.	Level 1: Small scale wineries, distilleries, breweries, cideries (up to 2,500 SF; no exterior storage). Level 2: Food processing and packaging facilities (up to 10,000 SF). Level 3: Food processing and packaging facilities (up to 80,000 SF). Level 4: Food processing and packaging facilities (greater than 10,000 SF).
Industrial Services and Repair	Refers to businesses that support industrial and commercial uses.	Repair of equipment or vehicles; fuel, gas, and oil storage and distribution; bio-tech or high-tech research and laboratories. Other services integral to the functioning of the industrial or commercial use.
Intermediate Manufacturing and Intermediate/Final Assembly	Refers to uses that involve intermediate processing of semi-processed material into a consumer good and to uses that involve the assembly of semi-processed and/or intermediate processed products into a consumer good.	Production, manufacture, fabrication or assembly of one or more of the following product types: 1. Clothing and fabricated products; 2. Products manufactured by predominately chemical processes and which are to be used for ultimate consumer or industrial consumption; 3. Products manufactured by predominately chemical processes and which are to be used in further manufacture of other products; 4. Electronic computers, computer hardware components and related equipment, and other machinery, apparatus and supplies for the generation, storage, transmission, transformation, and utilization of electrical energy; 5. Industrial and commercial machinery and equipment; 6. Finished products made entirely or mainly from wood for use in construction; 7. Paper and paperboard and its conversion into other paper-based products; 8. Ferrous and non-ferrous metal products and a variety of metal and wire products manufacturing; 9. Products manufactured or assembled from plastic resins and from natural, synthetic, or reclaimed rubber; 10. Paving and roofing materials, compounding lubricating oils and greases, rubber reclaiming, manufacture of synthetic rubber; 11. Instruments for measuring, testing, analyzing and controlling, optical instruments and lenses, surveying and drafting instruments, medical instruments and equipment, photographic equipment, watches and clocks, and supplies associated with the previous products;

Use Category	Description	Examples
		12. Glass and glass products, clay products, pottery, concrete and gypsum products, abrasive and asbestos products, and other secondary products from materials taken principally from the earth in the form of stone, clay and sand; 13. Woven and knit fabrics, and carpets and rugs from yarn; 14. Dyeing, finishing, coating, waterproofing, and other treating of fiber, yarn, and fabrics; 15. Felt, lace goods, non-woven fabrics, and miscellaneous textiles; 16. Equipment for transportation of people or cargo by land, air, rail, or water; and 17. Other manufacturing and/or assembly processes in which processed or semi-processed materials are made or assembled into consumer products.
Off-Site Hazardous Waste Treatment and Storage Facilities	Facilities that treat and store hazardous waste generated off-site and are authorized pursuant to Revised Code of Washington 70.105.	Contiguous land and structures used for recycling, reusing, reclaiming, transferring, storing, or treating hazardous wastes.
Recycling Collection and Processing Facilities	Commercial and industrial activities that specialize in accepting, buying, collecting, storing, or processing recyclable materials, excluding activities that fall under the following specific use types: “Organic Waste Processing Facilities,” “Waste Disposal Facilities,” or “Waste Transfer Facilities.”	Level 1: Recycling collection sites at staffed or unstaffed locations which accept source-separated recyclable materials from off-site household or commercial generators. Patrons place recyclable materials into containers designed and marked to receive specific recyclable commodities or a combination of commodities. All containers are removed from the site for sorting, grading, packaging, manual processing, mechanical processing, remanufacturing or reuse. Level 2: Buy-back centers or any small-scale business operated solely indoors which collects, receives, or buys recyclable materials from household, commercial, or industrial sources for the purpose of sorting, grading, or packaging recyclables for subsequent shipment and marketing, not to include processing and crushing activities. Recyclable materials must have been separated from non-recyclable municipal garbage at the source of generation prior to delivery to the buy-back center. Level 3: Industrial activities that specialize in accepting, storing, and processing any waste, other than hazardous waste or municipal garbage, for reuse and that may use heavy mechanical equipment to do the processing and include outdoor processing and storage of recycled materials. This includes material recovery facilities designed and operated to accept and process recyclable materials that were separated from non-

Use Category	Description	Examples
		recyclable municipal garbage at the source of generation. This also includes buy-back centers that involve materials stored outside in containers, dumpsters, piles, or bales. Facilities that collect, store, and process recyclables still co-mingled with municipal garbage are classified as a Waste Transfer Facility Level 4.
Salvage Yards/Vehicle Storage	Uses that involve the salvage of wrecked vehicles, vehicle parts, and appliances; and the storage of vehicles.	Level 1: Salvage yards dealing with salvage of wrecked motor vehicles, vehicle parts, and appliances in which all vehicles and merchandise are stored within an enclosed building(s). Level 2: Salvage yards dealing with salvage of wrecked motor vehicles, vehicle parts, mobile and manufactured homes, and appliances in which vehicles and merchandise are stored in an outdoor storage area. Level 3: The area for vehicle storage shall be no more than 10,000 SF for storage of parking tow-aways, impound yards, and storage lots for automobiles, trucks, buses, and recreational vehicles. The area for vehicle storage shall be fenced. It does not include parking lots or the storage of vehicles for repair, sale, or the sale of vehicle parts. Level 4: Vehicle storage areas of more than 10,000 SF for storage of parking tow-aways, impound yards, and storage lots for automobiles, trucks, buses, and recreational vehicles. The area for vehicle storage shall be fenced. It does not include parking lots or the storage of vehicles for repair, sale, or the sale of vehicle parts.
Warehousing, Distribution, and Freight Movement	The large-scale warehousing and distribution of manufactured or processed products for one or more businesses; the large-scale distribution of raw, manufactured, or processed products for one or more businesses at a central location; and the central dispatch and servicing of a delivery truck fleet, where no reloading (transfer facility), warehousing, or consolidation of materials takes place on site.	Level 1: Transported or stored products that are manufactured, processed, semi-processed products, and raw materials on a lot or combination of less than 2 acres. Level 2: Same as Level 1 on a lot or combination of from 2 to 5 acres. Level 3: Same as Level 1 on a lot or combination of exceeding 5 acres. Level 4: Transported or stored products that are high- and low-level explosive materials and blasting agents as defined by the relevant federal regulatory agencies. Must meet federal standards for setbacks, buffers, and separation, and not be less than 10 acres in size. Level 4 requires a conditional use permit pursuant to PCC 18A.18.010.

Source: PCC 18A.33.280 (A – I)
Note: Some uses would not be allowed per development restrictions within the Critical Areas code (PCC 18E).

Additional Facilities

Additional facilities to be constructed within the Project site boundary include roads, parking lots, sanitary sewer lines, a new public sewer lift station, extension of new 8-inch and 12-inch water mains, new stormwater drainage conveyance and water quality treatment systems, and a new private stormwater discharge to the Puyallup River.

The Project would include two separate stormwater systems to manage runoff from proposed impervious surfaces. The first consists of trench drains, catch basins, a storm drain network, and water quality vaults to collect, convey, and treat stormwater runoff from pavement areas and roof runoff from Warehouses B, F, and G. Approximately 70 acres of impervious surfaces would drain to this system. Following water quality treatment, the runoff would be directed to a new 42-inch-diameter stormwater trunk line, which would discharge to the Puyallup River at the northeast corner of the Project site at a recently constructed engineered outfall (see Section 4.2 for outfall information). The engineered outfall is intended to function with a large armored and vegetated energy dissipator located above the ordinary high-water mark of the Puyallup River. The outfall has two existing discharges pipes: the first is currently receiving flow through a 42-inch-diameter trunk line and the second is a “dry pipe” that does not presently receive storm water and will receive additional new flows from this Project.

The second stormwater system would convey rooftop runoff from Warehouses A, C, D, and E to one of three infiltration/dispersion systems along the northeast upper topographical “bench” of the site. The infiltration systems are intended to reduce surface runoff rates from the Project site and maintain hydrology of the adjacent wetlands and riparian areas in compliance with Minimum Requirement 8: Wetlands Protection of the Pierce County Stormwater Management and Site Development Manual (PCSWDM; Pierce County 2021b). Approximately 38 acres of impervious surfaces would drain to these facilities.

The Project is required to comply with Minimum Requirements 1 through 10 of the PCSWDM (PCC 11.05.050) (Pierce County 2021b) to control the quantity and quality of stormwater produced by the site to meet water quality standards and beneficial uses of the receiving waters.

3.4.2 Construction Equipment and Staging

Construction is anticipated to require standard equipment, including bulldozers, loaders, high lifts, dump trucks, concrete trucks, trash trucks, street sweepers, water trucks, skid steers, pickup trucks, cranes, back hoes, and excavators. No use of pile-driving equipment is proposed.

Access to the site during construction would be from Shaw Road via 5th Avenue Southeast and Pioneer Way via 134th Avenue East. The primary access for semi-truck traffic would be Shaw Road via 5th Avenue Southeast.

Staging areas would be located on the property but outside of the public right-of-way (ROW), typically far away from the warehouse being constructed, in areas used for parking or maneuvering. The exact locations of construction staging areas would be determined prior to the commencement of construction of each warehouse.

3.4.3 Construction Methods and Sequencing

The Applicant's stated objective would be to complete construction within 5 years of the issuance of a Final EIS, or by 2029. Construction would begin at the northern portion of the site with Warehouses A to E, followed by construction of Warehouses F and G. Construction of each warehouse would take 15–18 months, with construction of some warehouses occurring simultaneously to meet the overall 5-year construction schedule. Construction could be anticipated to begin in 2024. Construction would generally be anticipated to occur between 7 a.m. and 5 p.m., Monday through Friday; utility or road work on heavily trafficked arterials may require nighttime work. Up to 150 employees would be expected on site at any one-time during construction.

Construction of each warehouse would occur in the following three stages:

1. Grading and filling
2. Installation of on-site utilities
3. Warehouse construction

Grading and Filling

Grading and filling for each warehouse is anticipated to take about 6 weeks. Grade and fill work would prepare the site and warehouse pads for development. On-site and off-site roadway improvements would also occur during grading and filling.

As provided by the Applicant, the estimated earthwork quantity for the overall Project would be up to 450,000 cubic yards (CY) of on-site excavation and fill, approximately 120,000 CY of imported fill, and approximately 80,000–110,000 CY of excavated material. A portion of the stripping material (existing site cover, debris, weeds, and the like), primarily topsoil, would remain on site and would be used for berms in landscaping areas. The remaining stripping material would be exported from the site to an approved receiving site. Approved receiving sites and their capacities in the area are discussed in Section 4.11, Utilities. Depending on groundwater elevations determined for each individual phase, there may be a need to raise the warehouse and site elevations by importing additional fill material. Imported fill is estimated to be between 20,000 and 40,000 CY of material for each warehouse. Most of the import fill would be used for preparation or preloading of the warehouse pads.

The grading and filling phase for construction of each warehouse would require approximately 1,900 total truck trips, including:

- General equipment deliveries and pickups: 100 trips
- Site work (dirt, pipe, materials, landscaping): 1,500 trips
- Material stripping export: 300 trips

Over the course of grading and filling for each warehouse, up to 320 truck trips per day would be expected.

Installation of On-site Utilities

Installation of on-site utilities is anticipated to take approximately 27 weeks. The primary activities associated with construction of utilities include trenching to place new sewer, water, and stormwater conveyance lines. New roads and parking lots would require preparation and grading of the surface and laying of asphalt. On average, installation of on-site utilities would require approximately 100 trips for general equipment deliveries and pickups, resulting in about 4 truck trips per day.

Warehouse Construction

For each warehouse building, construction is anticipated to occur over approximately 40 weeks. Pre-construction civil work would occur prior to concrete work. Concrete work includes laying slab, panels, and the roof structure, and installing interior and exterior sprinklers.

On average, construction of each warehouse would require approximately 2,330 total truck trips, including:

- General equipment deliveries and pickups: 300 trips
- Concrete trucks: 1,500 trips
- Site paving: 400 trips
- Lumber/steel package: 130 trips

Over the course of construction of each warehouse, up to 60 truck trips per day would be expected.

3.4.4 Operations

In accordance with the Declaration of Restrictive Covenant, the Applicant has provided a stated intent to develop the Project as an “Industrial Park” consistent with the ITE LUC 130 (ITE manual, 11th edition). During operations, the seven warehouses are anticipated to employ up to approximately 1,500 individuals. There would be three shifts per day, which would result in approximately 500 employees on the Project site at any time.

The primary vehicle traffic routes to and from the Project site driveways would be via 5th Avenue Southeast as an east-west roadway between Shaw Road East and 134th Avenue/33rd Street Southeast and from 80th Street East, in Pierce County. Secondary routing is expected at 134th Avenue East (33rd Street Southeast in the City of Puyallup) south with connection to 8th Avenue Southeast/80th Street East, and East Pioneer Avenue. The access via 134th Avenue East/33rd Street Southeast, between 5th Avenue and 8th Avenue Southeast, is presently limited to use by passenger vehicles only; restrictions to the section of 33rd Street Southeast between 5th Avenue and 8th Avenue Southeast would not change. All trucks would enter and exit the site via the new 5th Street Southeast east-west roadway between Shaw Road and 134th Avenue East or along 80th Street East between Van Lierop Park and 139th Avenue Court East.

Operations are expected to occur 7 days per week, 24 hours per day. Per the Declaration of Restrictive Covenant, the maximum total number of daily trips in the AM or PM peak hours is 884. Total daily for heavy-duty vehicles would be 1,482 and for passenger cars/light-duty trucks (i.e., delivery vans) would be 8,724. The PM peak period generates the greatest demand traffic from the proposed site, 776 passenger car/light-duty vehicles and 104 heavy-duty trucks. On-site speed limits are anticipated to be 25 miles per hour (mph) on the public streets within the development and 10 to 15 mph on private access routes within the development and on-site maneuvering areas.

The internal operations of the warehouses would be dependent on the final use of the buildings in accordance with Table 3-3 and the Declaration of Restrictive Covenant. Outside the warehouses, the on-site driveway system would accommodate the loading, unloading, and movement of goods off site toward their destinations.

Maintenance activities would include preventive and routine maintenance of the warehouses, associated structures, equipment, and internal road system; and landscaping.

3.5 Alternative 1 – Rail Transport

Under Alternative 1, the facility constructed would be the same as described under Section 3.4, Proposed Project; however, rail lines would also be constructed to facilitate movement of materials into and out of the proposed facility. This alternative would shift some of the truck traffic generated by the Project off of local roadways and onto the nearby existing rail lines. The alternative was developed in coordination with BNSF and Meeker Southern rail line by evaluating the feasibility of constructing new interchanges to the existing rail lines; evaluating the on-site requirements to access the warehouses via rail; and determining how many truckloads could be shifted to rail based on the site constraints. The alternative development and feasibility were documented in a Rail Mitigation Analysis technical memorandum (HDR, 2021)

The proposed rail lines would be constructed to enable rail access to the seven proposed warehouses from the existing Meeker Southern rail line, which is located south of the Project site (Figure 3-3). To connect to the Meeker Southern rail line, the proposed rail line would extend outside of the Project site. In addition, to facilitate the ability of the Meeker Southern rail line to handle additional train traffic:

- The track from the interchange between the Meeker Southern rail line and the BNSF main line would be extended by about 2,000 feet to the northeast. This would involve extending the existing interchange track parallel to the BNSF mainline along Inter Avenue from its existing terminus near Kassel Motorsports to the northeast to near the northern terminus of 33rd Street NE.
- The track from the interchange between the Meeker Southern rail line and the BNSF main line would be extended by about 1,000 feet to the west. This would involve extending the existing interchange track parallel to the BNSF mainline along East Pioneer from near 18th Street SE to the east of the at-grade crossing with 15th Street SE.

Both extensions would occur within BNSF ROW, and the details would be negotiated between BNSF and the Meeker Southern rail line.

The construction of the rail line would not result in additional site disturbance beyond that described for the proposed Project except for the portion required to connect to the Meeker Southern rail line south of 80th Avenue SE and the BNSF-Meeker Southern interchange extensions. Rail line construction south of the Project site would require a ROW width of 50 feet and about 300 feet of track. Within the ROW, the constructed track would be about 10 feet wide and would require excavation depths of up to 3 feet. Construction would require equipment similar to that required for the proposed Project.

Once operational, trains would arrive via the BNSF mainline with switching operations required to transfer the trains to the Meeker Southern rail line for delivery to the proposed facility. Alternative 1 would generate 8,487 total trips per day consisting of 1,207 daily heavy-duty vehicle trips, 7,280 passenger car/light-duty truck (i.e., delivery van) trips, and two trains per day. Each train would have up to 55 rail cars. This would be the equivalent of removing up to 275 trucks per day from the number of heavy-duty vehicles expected under the proposed Project.

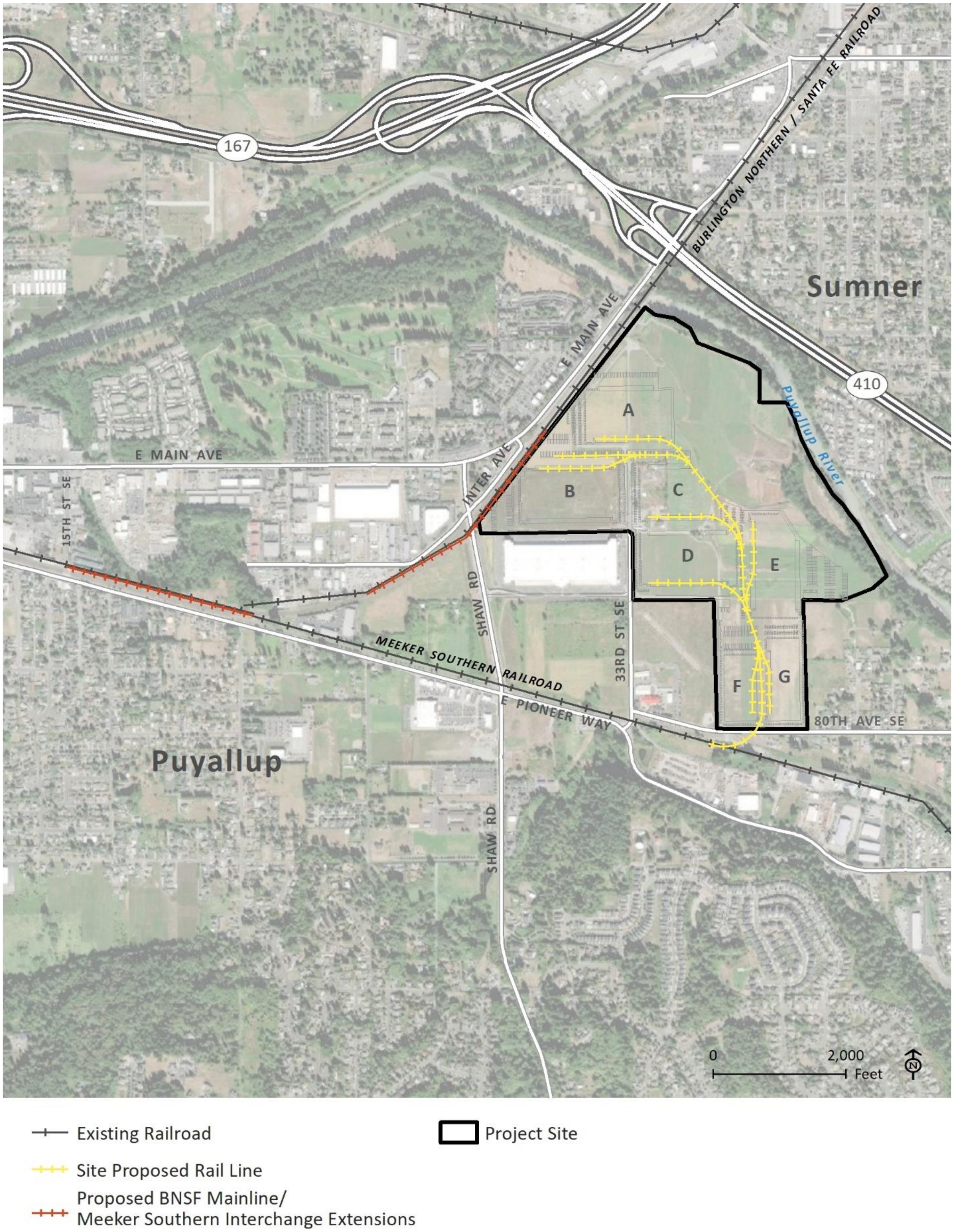


Figure 3-3. Alternative 1 – Rail Line Layout

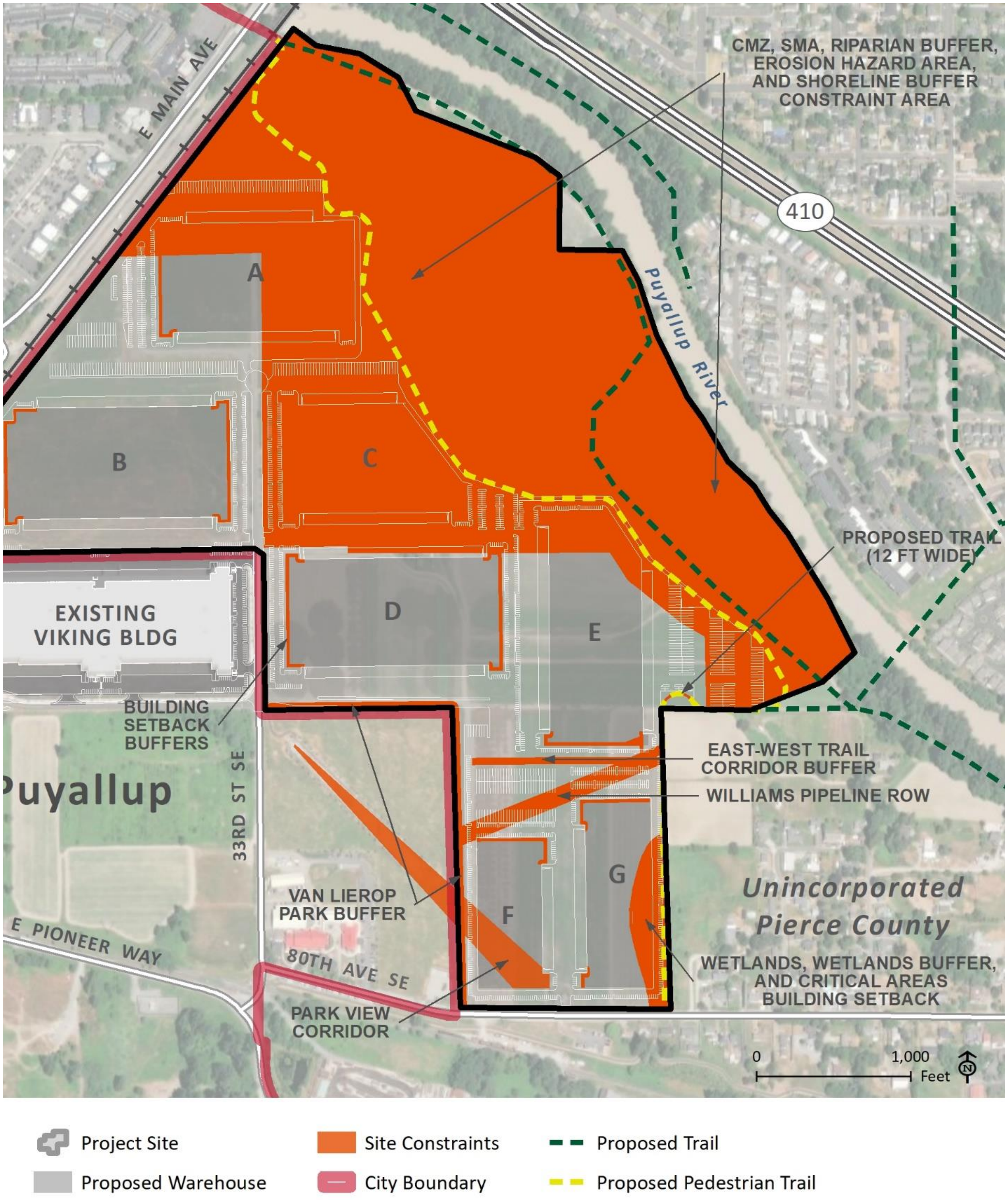
3.6 Alternative 2 – Reduced Intensity Alternative

Under WAC 197-11-440(4)(5), the Lead Agency preparing an EIS is directed to analyze reasonable alternatives, which "shall include actions that could feasibly attain or approximate a proposal's objectives, but at a lower environmental cost or decreased level of environmental degradation." As such, Alternative 2 considers the potential reduction of impacts that would result if the mitigation measures that reduce the site footprint of the facility, as outlined in this Draft EIS for the proposed Project, were implemented by the permitting agency (Pierce County), consistent with the analysis in this EIS (Figure 3-4). As shown in Table 3-4, the total footprint of the facility would be reduced from about 2.6 million SF to about 1.7 million SF. The reductions would result from the following mitigation measures:

- All warehouses would include a minimum 15-foot-wide landscape bed to be provided along the entire length of blank wall facades of buildings (see mitigation measure AES-2, Section 4.6.4).
- Warehouses would not be constructed on lands designated Rural Buffer Residential (RBR) on the Future Land Use Map City of Puyallup's Comprehensive Plan Future Land Use Map. This would eliminate Warehouse C and would reduce the footprint of Warehouses A and E (see mitigation measure LU-1, Section 4.5.4).
- Warehouse F (and potentially portions of Warehouse G) and the associated site improvements (parking, landscaping) would be reduced in size to avoid blocking or obscuring the prime view corridor from Van Lierop Park (see mitigation measure REC-1, Section 4.7.4).
- Warehouse G would be reduced to avoid Wetland D and buffer, in accordance with Pierce County Code 18E.40.050, and critical areas setback requirements, in accordance with PCC 18E.10.080H (see mitigation measure SW-6, Section 4.2.4).
- Alternative 2 would be constructed in the same manner as described for the proposed Project in Section 3.4.3. The primary change would be a reduction in construction vehicle trips due to the reduced Project size and footprint of the facility. During grading and filing, up to 1,270 total construction vehicle trips (or up to 215 trips per day) would be expected; during utilities installation, up to 100 total construction vehicle trips (or up to 4 trips per day) would be expected; and during warehouse construction, a total of up to 1,560 construction vehicle trips (or up to 40 trips per day) would be expected.
- Alternative 2 would be operated in the same manner as described for the proposed Project in Section 3.4.4, but the number of vehicle trips generated by the Project would be lessened. Alternative 2 would generate at total of 5,844 total trips per day consisting of 998 daily heavy-duty vehicle trips and 4,846 passenger car/light-duty truck (i.e., delivery van) trips. Alternative 2 would require up to 1,000 employees during operations. There would be three shifts per day, which would result in approximately 333 employees on the Project site at any time.

Table 3-4. Reduced-Intensity Alternative

Warehouse	Proposed Project Building Footprint (SF)	Alternative 2 Building Footprint (SF)	Reason for Reduction
A	417,000	159,036	• Reduced to account for Landscape Bed mitigation requirement (AES-2) • Partially within the RBR future land use (LU-1)
B	492,000	470,296	• Reduced to account for Landscape Bed mitigation requirement (AES-2)
C	341,000	0	• Entirely within the RBR future land use (LU-1)
D	458,000	438,065	• Reduced to account for Landscape Bed mitigation requirement (AES-2)
E	416,000	327,882	• Partially within the RBR future land use (LU-1) • Reduced to account for Landscape Bed mitigation requirement (AES-2)
F	193,000	129,000	• Within the Van Lierop Park Prime View Corridor (REC-1) • Reduced to account for Landscape Bed mitigation requirement (AES-2)
G	244,000	199,458	• Wetland D and buffer are within building footprint (SW-6) • Reduced to account for Landscape Bed mitigation requirement (AES-2) • The required 15-foot critical areas setback for Wetland D and buffer are within the building footprint (PCC 18E.10.080H)
Total	**2,561,000**	**1,723,737**	



See Figure 4-55 for the Van Lierop Park Concept Plan

Figure 3-4. Alternative 2 – Reduced Intensity Alternative

3.7 Benefits and Disadvantages of Delaying Implementation

SEPA requires that an EIS discuss the benefits and disadvantages of delaying implementation of a proposed proposal (WAC 197-11-440(5)(vii)). The urgency of implementing the proposal can be compared with any benefits of delay. The foreclosure of other options should also be considered; that is, if implementation of the proposal would preclude implementation of another project at a later time.

If the proposed Project were postponed, the direct, indirect, and cumulative effects associated with the Project would be delayed. This would include potential lost economic benefits from sustained or increased employment, and tax revenues generated from construction and operation of the proposed Project. Delaying implementation may benefit the environment with less land impacts, including longer preservation of on-site agriculture activities for crop cultivation, preservation of ambient noise quality, limiting visual and air quality impacts in the short term, and fewer vehicle trips prior to construction and operations.

3.8 Alternatives

SEPA requires lead agencies to evaluate reasonable alternatives to a proposed project (WAC 197-11-786, 197-11-440(5)). As defined in the SEPA Handbook (Ecology 2018a), “a reasonable alternative is a feasible alternate course of action that meets the proposal’s objective at a lower environmental cost.” The objective of this proposal is described in Section 1.2.

Alternatives considered included on-site alternatives and alternatives suggested by commenters during the scoping process. Each potential Project alternative was analyzed to determine if it would meet the proposal’s objective at a lower environmental cost or decreased level of environmental degradation. Alternatives that failed to meet these criteria were eliminated from further study.

3.8.1 On-Site Alternatives

Within the Project site, the configuration of the proposed development is limited by site and design constraints; therefore, no on-site alternatives outside of the proposed Project, Alternative 1 and Alternative 2 are evaluated in this EIS.

3.8.2 Off-Site Alternatives

When a proposal is presented for a project on a specific, privately owned site, SEPA requires the lead agency to evaluate a No Action Alternative and other reasonable alternatives on the same site but does not require evaluation of off-site alternatives (WAC 197-11-440(5)(d)). Therefore, alternative site locations are not evaluated in this EIS.

3.8.3 Alternatives Suggested During the EIS Scoping Process

Commenters suggested that the site remain under agricultural use (i.e., no action be taken) or be redeveloped for mixed-use, residential, open space, commercial, and other non-industrial uses. However, these uses would not meet the objective of the Project and are not considered further in this EIS. Commenters suggested alternative locations for the Project. However, as described above, off-site alternatives were considered as a result of scoping and were not taken further because they either did not meet the Project’s objective, would not adhere to zoning requirements, or were not technically feasible.

4. ENVIRONMENTAL ANALYSIS

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4.1 Earth Resources

This section provides an analysis of potential impacts on geology and soils.

4.1.1 Study Area

The study area for geology and soils includes the 188-acre Knutson Farm Project site.

4.1.2 Relevant Plans, Policies, and Regulations

Relevant policies and regulations related to geology and soils are summarized in Table 4-1.

Table 4-1. Applicable Regulations and Policies for Geology and Soils

Law and Regulation	Description
State	
Growth Management Act (GMA)	Requires all cities and counties in Washington to adopt development regulations that protect critical areas, including geologically hazardous areas.
Clean Water Act (CWA) Section 402, National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit	The United States Environmental Protection Agency (USEPA) has delegated authority to the Washington State Department of Ecology (Ecology) to regulate construction by issuing coverage under the CWA Section 402 NPDES Construction Stormwater General Permit.
Local – Pierce County	
Pierce County Comprehensive Plan	As required by the GMA, each county and city in the state of Washington must develop a Comprehensive Plan and periodic updates that address policies related to growth, including land use, housing, capital facilities, utilities, rural development, and transportation. Select goals and policies from Pierce County's Comprehensive Plan related to earth resource hazards are listed below. These are incorporated in the mitigation measures in Section 4.1.4. **Environmental Element** *Hazardous Areas* • Goal ENV-10: Avoid endangerment of lives, property, and resources in hazardous areas. – Policy ENV-10.2. Develop standards so that future development minimizes threats to lives, property, and resources. – Policy ENV-10.2.1. Require appropriate standards for site development and structural design in areas where the effects of the hazards can be mitigated. • Policy ENV-10.7.1. Maintain an evacuation plan and lahar warning system for volcanic hazard areas. – Design and Character Element • Sustainable Design

	• Policy D-18.6: The preferred approach to on-site water quality treatment is by using low-impact development techniques and practices.
Title 18E PCC, Development Regulations – Critical Areas	This ordinance was developed under the directives of the GMA to designate and protect critical areas and to assist in conserving the value of property, safeguarding the public welfare, and providing protection for these areas. Geologic critical areas defined in PCC Title 18E include volcanic, landslide, seismic, mine, and flood hazard, and erosion hazard areas. Pierce County has identified the Puyallup River as a CMZ with a severe risk of migration to avoid the effects of potential river migration on hazards in river valleys. Under Policy D-18.6, the preferred approach to on-site water quality treatment is by using low-impact development techniques and practices.
Title 17A PCC, Construction and Infrastructure Regulations – Site Development and Stormwater Drainage	A Site Development Permit allows for the performance of work (e.g., storm drainage system construction, road construction, driveway construction, clearing, grading, filling, excavating, ditching, and creation of impervious surfaces) on a piece of land.
Title 17C PCC, Construction and Infrastructure Regulations – Building and Fire Codes	Pierce County has adopted the International Building Code, which is a model code that provides the minimum requirements to safeguard the public health and general welfare of the occupants of new and existing buildings.
Local – City of Puyallup	
Chapter 21.06 PMC, Critical Areas	The City's critical area ordinance designates and classifies environmentally critical areas to protect these areas and their functions and values, while also allowing for economically beneficial or productive use of land on private property. The City seeks to protect members of the public and public resources and facilities from injury, loss of life, or property damage due to landslides, steep slope failures, erosion, seismic events, volcanic eruptions, or flooding. Geologically hazardous areas defined in Chapter 21.06 PMC include landslide and erosion hazard areas, seismic hazard areas, and volcanic hazard areas.

4.1.3 Affected Environment

This section summarizes the environmental setting related to geology and soils within the study area.

Geography and Topography

The proposed Project is located in the Puget Lowland Geologic Province, which lies between the Cascade Mountain Range on the east and the Olympic Mountains on the west. Geologic units in the Project site consist of unconsolidated deposits of Quaternary sediment and Quaternary glacial deposits (Washington State Department of Natural Resources [WDNR] 2021a).

The overall topography of the Project site is relatively flat with slight undulation, with approximately 10 feet of total elevation change. A lower bench feature is located in the northeastern portion of the

Project site that is approximately 8 to 10 feet lower than the rest of the Project site (Earth Solutions NW, LLC 2015).

Soils

Per the U.S. Department of Agriculture Natural Resources Conservation Service soil survey map, soils in the Project site consist mainly of Briscot loam, with areas of Pilchuck fine sand and Puyallup fine sandy loam (USDA 2021). Figure 4-1 illustrates the soils mapped in the Project site. Briscot loam and Pilchuck fine sand soils are prime farmland if drained and either protected from flooding or not frequently flooded during the growing season. Puyallup fine sandy loam is considered prime farmland. In the preliminary geotechnical report prepared for the Project site, these soils typically present a slight erosion hazard (Earth Solutions NW, LLC 2015). Topsoil was observed to a depth of approximately 12 inches, with native soils underlying the topsoil. Fill was not observed during the preliminary geotechnical site investigation (Earth Solutions NW, LLC 2015).

Geological Hazards

Pierce County defines geological hazards as hazards caused by natural or artificial causes that may damage persons or property and that include but are not limited to slides, slippage, or instability of earth, rock, and soil. Pierce County regulates the following geologic hazards as part of its Critical Areas development regulations (Title 18E PCC): volcanic, landslide, seismic (earthquake), mine, and erosion hazard areas. The following sections describe the potential geologic hazard areas found within the proposed study area and highlights applicable county standards.

Volcanic Hazards

Mount Rainier is located approximately 27 miles southeast of the study area and has erupted at least 10 times in the last 4,000 years. Mount Rainier poses a threat to adjacent communities from lahars and volcanic ash (USGS 2008). The largest eruption was 2,200 years ago. The Pierce County Hazard Identification and Risk Assessment (Pierce County 2019c) estimates that the recurrence rate for damaging volcanic activity, be it a damaging tephra eruption or a lahar coming down a valley, to be between 500 and 1,000 years. In other words, there is between 0.1 and 0.2 percent annual probability that a damaging eruption would occur.

A **lahar** is a hot or cold mixture of water and rock fragments that flows down the slopes of a volcano and typically enters a river valley.

Ash may also be a concern during a volcanic event. However, ash deposits based on prevailing winds would likely be distributed downwind of Mount Rainier towards the east and away from the Project site (Pierce County 2019c). In general, the annual probability of 1 centimeter (0.4 inch) or more of ash fall occurring on the Project site is between 0.2 and 0.1 percent (USGS 1998). In other words, the recurrence rate for 1 centimeter of ash fall would be between 500 and 1,000 years.

The study area is in an inundation zone for Case I and Case II lahars and Travel Time Zone C (Figure 4-2, Pierce County 2017). Pierce County critical area development regulations for Volcanic Hazard Areas (Title 18E.60 PCC) includes standards and review procedures intended to minimize the loss of life that may occur as a result of volcanic events emanating from Mount Rainer. Per Title 18E.60.020 PCC, inundation zones for Case I lahars could be affected by cohesive lahars that originate as enormous avalanches of weak chemically altered rock from the volcano. Case I lahars can occur with or without eruptive activity. The average reoccurrence rate for Case I lahars on Mount Rainier is about 500 to 1,000 years. Most Case I flows have reached some part of the Puget Sound lowland. The Electron Mudflow reached the lowland about 600 years ago along the Puyallup River, and its deposits at Orting are as much as 18 feet (Pierce County 2020).

Travel Time Zone: The ability to evacuate people from within a volcanic hazard area correlates to the distance from the source of an event (i.e., those areas closest to the event will have less time to evacuate than those areas farther away from the source of an event) and the amount of time for evacuation from the public notification (via a warning alarm system) that a lahar event has occurred. The amount of time that is anticipated for a debris flow, lahar, flood, or avalanche (estimated at 100,000,000 cubic feet of volume) to travel from either the source of the event or the point where the acoustic flow monitor alarm is sounded is classified into four travel time zones in Title 18E.60.020.C PCC.

Case II lahars are relatively large and non-cohesive, and most are caused by melting of snow and glacier ice by hot rock fragments during eruption. A few Case II lahars have reached the Puget Sound lowlands. One lahar occurred approximately 2,000 years ago and inundated the Nisqually River valley to depths of 30 to 120 feet. About 1,200 years ago, another lahar filled valleys of both forks of the White River to depths of 60 to 90 feet and flowed 60 miles to Auburn. The average time interval between Case II lahars from Mount Rainier is approximately 100 to 500 years (Pierce County 2019c). In other words, there is between 0.2 and 1.0 percent annual probability that a Case II lahar would occur.

The Project site is within Travel Time Zone C. Travel Time Zone C is the area that is an estimated 1.5- to 2-hour travel distance from the point where an acoustic flow monitor is sounded (Title 18E.60.020.C.3.b. PCC). Restrictions on occupancy in buildings within Travel Time Zone C are outlined in Table 4-2.

Pursuant to PCC Critical Areas regulations for development within a Volcanic Hazard Area, Hazardous Facilities and Essential Facilities are not allowed on the Project site. Special Occupancies and Covered Assemblies are limited to a 1,000-person occupant load. Standards on types of land uses and building occupancy limits allowed within the Project site for Inundation Zones for Case I and II lahars are provided in Title 18E. 60.040 PCC and summarized in Table 4-2.

Table 4-2. Project Site Volcanic Hazard Area Standards

Facility/Occupancy List	Case I Lahar Inundation Zone	Case II Lahar Inundation Zone
Bonus Densities[a]	Not Allowed	Not Allowed
Essential Facilities[b]	Not Allowed	Not Allowed
Hazardous Facilities[c]	Not Allowed	Not Allowed
Special Occupancies[d]	In Travel Time Zone C – Limited to 1,000-person occupant load	In Travel Time Zone C – Limited to 1,000-person occupant load
Covered Assemblies[e]	In Travel Time Zone C – Limited to 1,000-person occupant load	In Travel Time Zone C – Limited to 1,000-person occupant load
Other Occupancies	No Limitation	No Limitation

Source: Title 18E.60.040 PCC

[a] Bonus Density as set forth in Chapter 18A.35 PCC, Development Regulations – Zoning.

[b] Essential Facility as defined in PCC 18.25.030.

[c] Hazardous Facility as defined in PCC 18.25.030.

[d] Special Occupancy structures as defined in PCC 18.25.030.

[e] Covered Assemblies as defined in PCC 18.25.030.

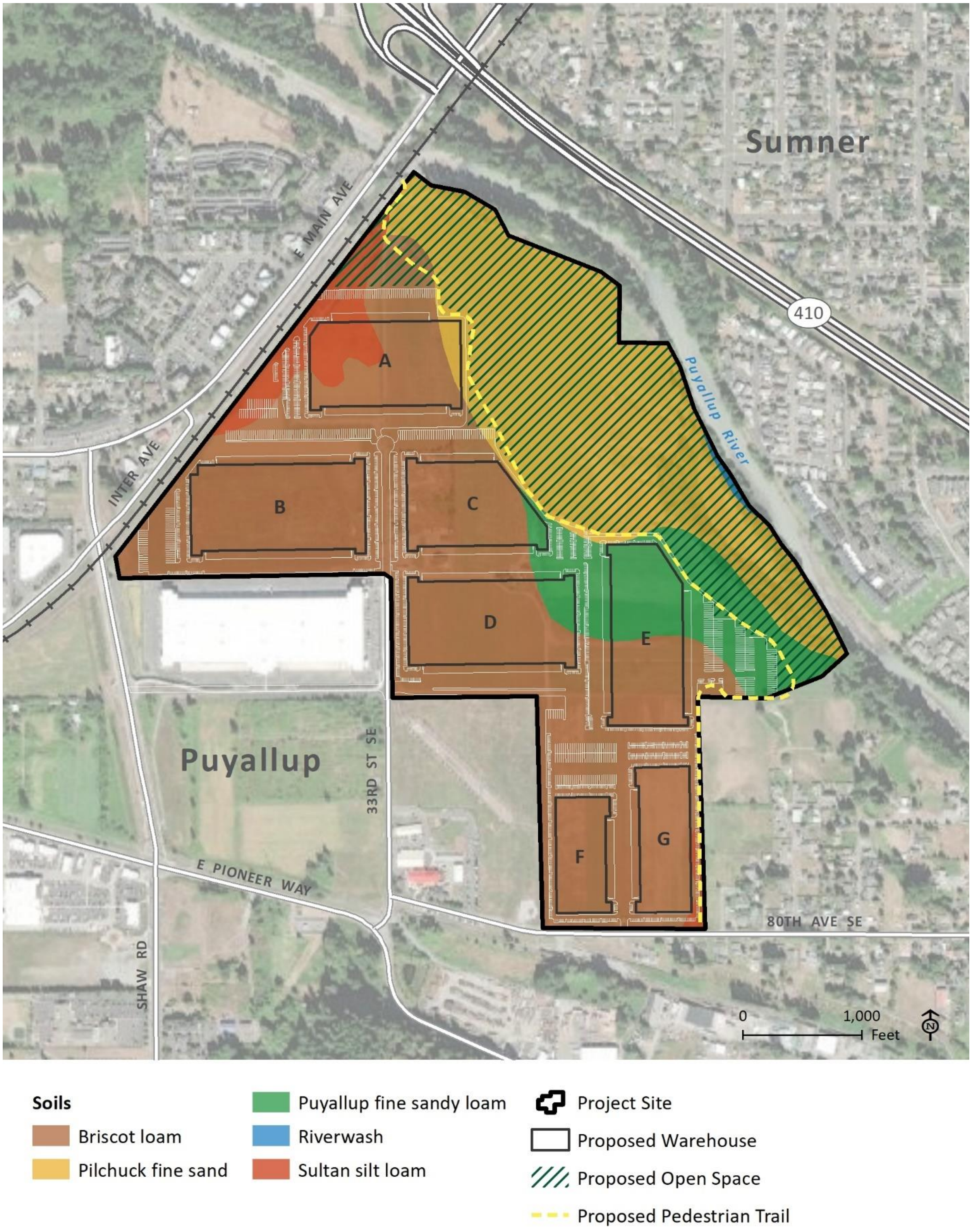

Figure 4-1. Soils Mapped in the Project Site

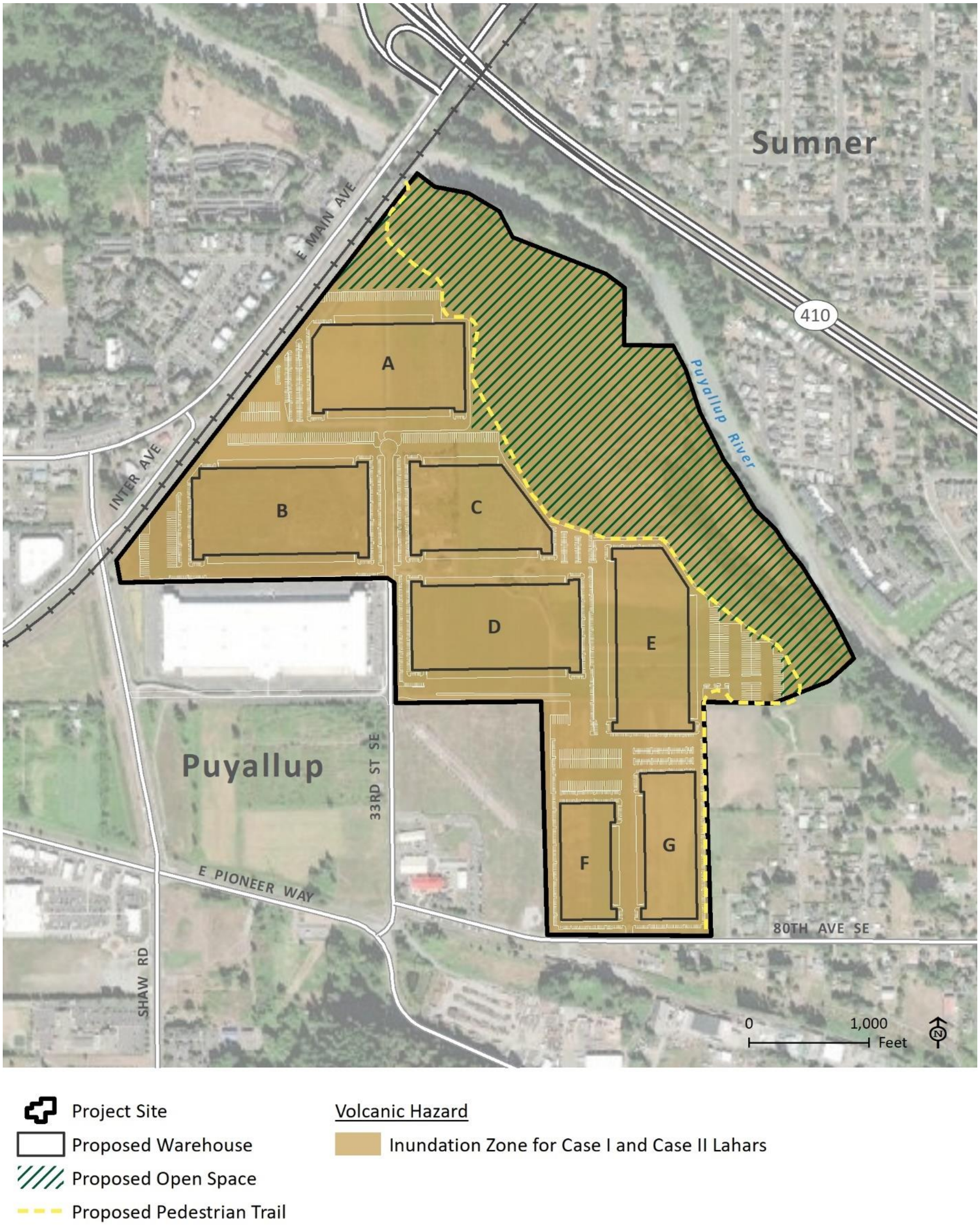

Figure 4-2. Volcanic Hazards in the Project Site

Landslides

When slopes are not stable, disturbances can cause mass movements of soil, rock, or debris known as landslides. The occurrence of a landslide depends on multiple factors, including but not limited to slope steepness, soil profile, slope shape, frequency of extreme weather events or earthquakes, and the density of vegetation in a given area.

Pierce County Landslide Hazard Areas regulations use multiple criteria to define landslide hazard areas (Title 18E.80.020 PCC). Some of these criteria include areas with slopes of greater than 20 percent or areas that have experienced a “historic failure” in the past, including areas of unstable, old, and recent landslides or landslide debris within a head scarp (the upslope portion of a landslide).

No historic landslides have been mapped on the Project site (WA DNR 2023); however, portions of the Project site near the Puyallup River and near the proposed locations of Warehouses A and E are mapped as landslide hazard areas having shallow susceptibility to landslides in accordance with Title 18E.80.020 PCC (Figure 4-3; Pierce County 2022).

Development in areas mapped as being within a landslide hazard area requires preparation of geological assessment as outlined in mitigation measure ER-3 (see Section 4.1.4). The assessment will categorize the landslide hazard area as being either active or stable (Title 18E.80.020 PCC). If the assessment determines that the area is stable, development of the site is permitted. If the assessment determines that the area is active, development within that site is prohibited per the requirements of Title 18E.80.040 PCC with some exceptions. There are some exceptions for stormwater conveyance lines, utility lines, and trails in active landslide areas. For development near active landslide areas, a buffer shall be required that is the larger of either 50 feet from the edge of the landslide hazard area limits, a distance of one-third the height of the slope if the regulated activity is at the top of the active landslide hazard area and a distance of one-half the height of the slope if the regulated activity is at the bottom of an active landslide hazard area, or the distance recommended by the geotechnical professional (Title 18E.80.050 PCC).

Seismic Earthquake Hazards

As outlined in Title 18E.90.020 PCC, seismic hazard areas are areas subject to severe risk of damage as a result of fault rupture, seismic ground shaking, soil liquefaction, flooding caused by tsunamis and seiches, or earthquake-induced landslides. As applicable, the design standards required per PCC 18E.90.040 are discussed further under each risk area below.

The level of seismic hazards in the Pacific Northwest vary from low to high depending on the location within the region, as indicated by historical seismicity; regional geological, geophysical, and tectonic data; and aerial imagery. Earthquake hazards in the Pacific Northwest are related primarily to the convergence of the North American and Juan de Fuca tectonic plates, which forms the subduction zone known as the Cascadia Subduction Zone (CSZ). Subduction of the Juan de Fuca plate below the North American continent is capable of producing earthquakes of magnitude 9 or greater. Earthquakes on the CSZ are believed to have a recurrence interval of between 200 and 700 years. The last CSZ earthquake was recorded in 1700 (PNSN 2021).

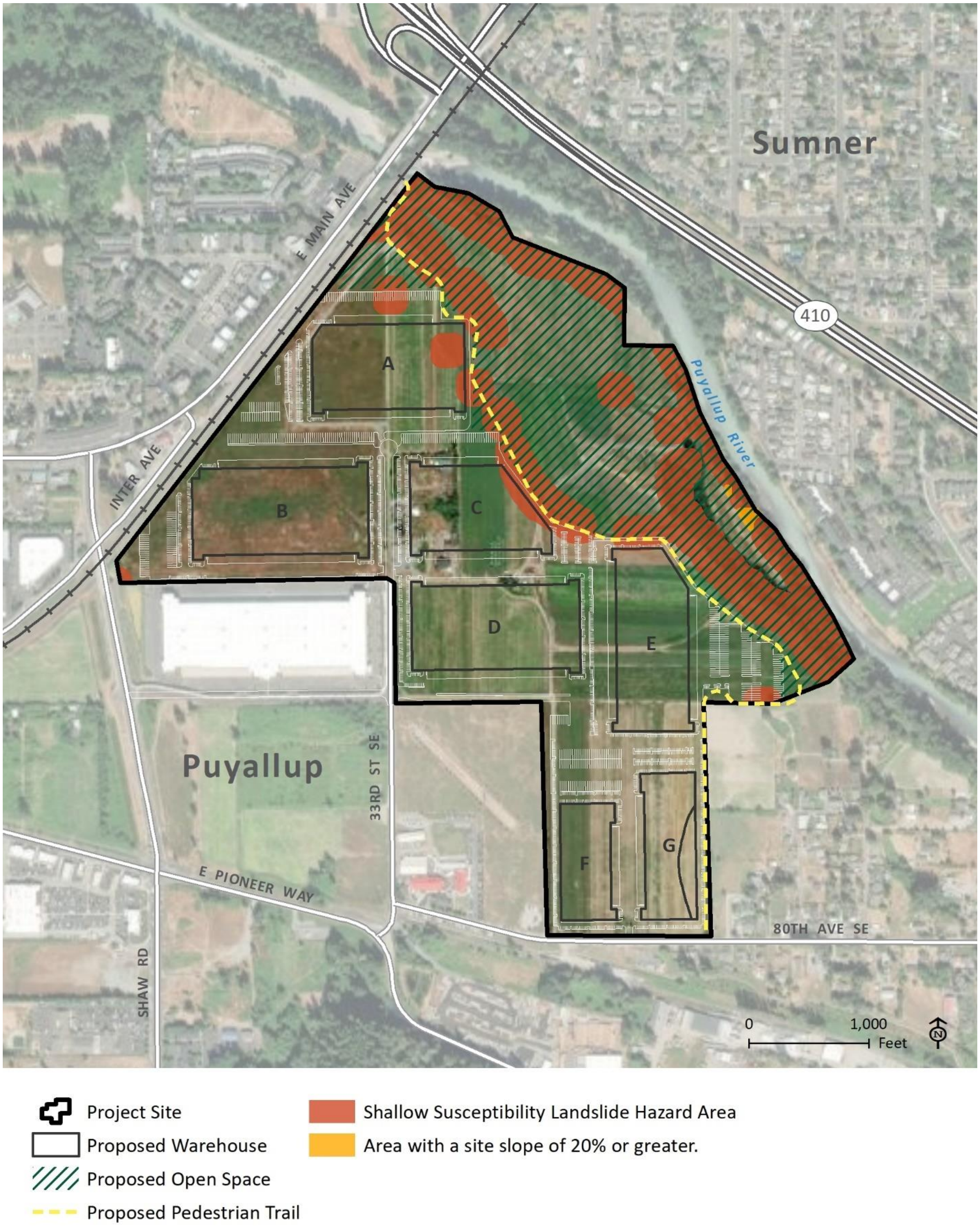

Figure 4-3. Landslide Hazards in the Project Site

Earthquakes can also result from movement along shallow fault lines. According to the WDNR, there are no fault trenches at the proposed Project site. The closest fault is approximately 3 miles north of the proposed Project site, east of Tacoma, Washington. Historical data show no earthquakes occurring within the study area (WDNR 2021b).

Earthquakes can also occur in association with volcanic activity. Volcanic earthquakes are not caused by tectonic plate motion, but rather by the movement of magma upward beneath active volcanoes. These earthquakes are localized to volcanic centers and rarely impact areas distant from the volcano. In the case of large volcanic eruptions, such as that of Mount St. Helens in 1980, volcanic earthquakes may cause shaking several miles from the volcano.

Fault Rupture

The initial motion along a fault (fault rupture) causes compressional seismic waves that release strong jolts of energy on the surface. Fault rupture can lead to structural damage of nearby buildings, bridges, and other infrastructure. If infrastructure is located directly on top of a fault that ruptures, damage can be significant. According to the WDNR, there are no fault trenches at the proposed Project site or in the surrounding region (WDNR 2021b). Fault rupture is not a seismic hazard risk at the Project site; therefore, the relevant design standards for fault rupture in Title 18E.90.040 PCC are not applicable.

Ground Motion/Shaking

Following an initial fault rupture, seismic waves cause shaking of the ground surface. The ground shaking that occurs during an earthquake is generally what causes damage to overlying structures, especially when the shaking lasts for more than a minute. Earthquake damage from ground motion at a given location depends on the properties of the arriving seismic waves, the properties of the soil at the site, and the structures involved. The amount of ground motion that may occur during an earthquake can be predicted based on the rock and soil properties in a given area.

Some geologic areas are more susceptible to ground shaking during a seismic event than others. The structures of certain soils can amplify shaking and create an increased hazard. Site classes are established and categorized by the National Earthquake Hazard Reduction Program to evaluate this risk. Site classes are designated as B through F, in which site class B represents geologic areas that do not dampen or amplify shaking; site classes C through E are areas that amplify shaking; and site class F represents areas that have unusual soil conditions that need to be evaluated in person. The soils in the proposed Project site are categorized as site classes D though E, suggesting that they have high potential to amplify ground shaking during an earthquake event (WDNR 2021b). Although the Project site is mapped as having high potential to amplify ground shaking and it is noted as a potential seismic hazard area, there are no seismic design standards in Title 18E.90.040 PCC related to ground shaking.

Soil Liquefaction

Soil liquefaction can occur from shaking during a seismic event when loose, water-saturated soils or artificial fills behave like a liquid. Risk of liquefaction was noted as a concern in the geotechnical report for the proposed Project site (Earth Solutions NW, LLC 2015). Risk in the proposed Project site of this hazard is confirmed by the WDNR liquefaction susceptibility map, which classifies the area as “Moderate to High” and “High” (WDNR 2021b). Moderate to high liquefaction susceptibility areas are defined as seismic hazard areas per Title 18E.90.020 PCC. See Figure 4-4 for soil liquefaction susceptibilities in the Project site.

Per Title 18E.90.030 PCC, facilities sited within a seismic hazard area are required to have a geological assessment performed. A geotechnical letter shall be prepared per the requirements outlined in Title 18E.90.060 PCC if the assessment determines that no liquefaction hazard exists. A geotechnical evaluation shall be prepared If the assessment determines that a liquefaction hazard exists on the site but is outside of the proposed Project area per the requirements outlined in Title 18E.90.060 PCC. A geotechnical report shall be prepared if the assessment determines that a liquefaction hazard exists within the proposed Project area per the requirements outlined in Title 18E.90.060 PCC. The geotechnical report shall include a detailed engineering evaluation of expected ground displacements or other liquefaction and/or dynamic settlement effects (e.g., bearing failures, flotation of buried tanks) and proposed mitigation measures to ensure an acceptable level of risk for the proposed structure type or other development facilities, as well as the proposed land use type (i.e., occupancy category). The minimum level of acceptable risk for any proposed structure or development facility shall ensure the life safety of any occupant. Designs shall evaluate the range of alternatives for achieving limited structural damage to no structural damage based on the proposed use intended for the structure.

Tsunamis and Seiches

During a seismic event, a large amount of water can be displaced, possibly triggering a tsunami. Since the Project site is not located adjacent to Puget Sound marine waters, lakes, or ponds, the Project site is unlikely to be affected by a seiche, as seiches do not occur in free-flowing water bodies. Tsunamis and seiches are not a seismic hazard risk at the Project site; therefore, the relevant design standards in Title 18E.90.040 PCC are not applicable.

Seiches are temporary disturbances or oscillations in water level typically caused when strong winds and rapid changes in atmospheric pressure push water from one end of a body of water to the other.

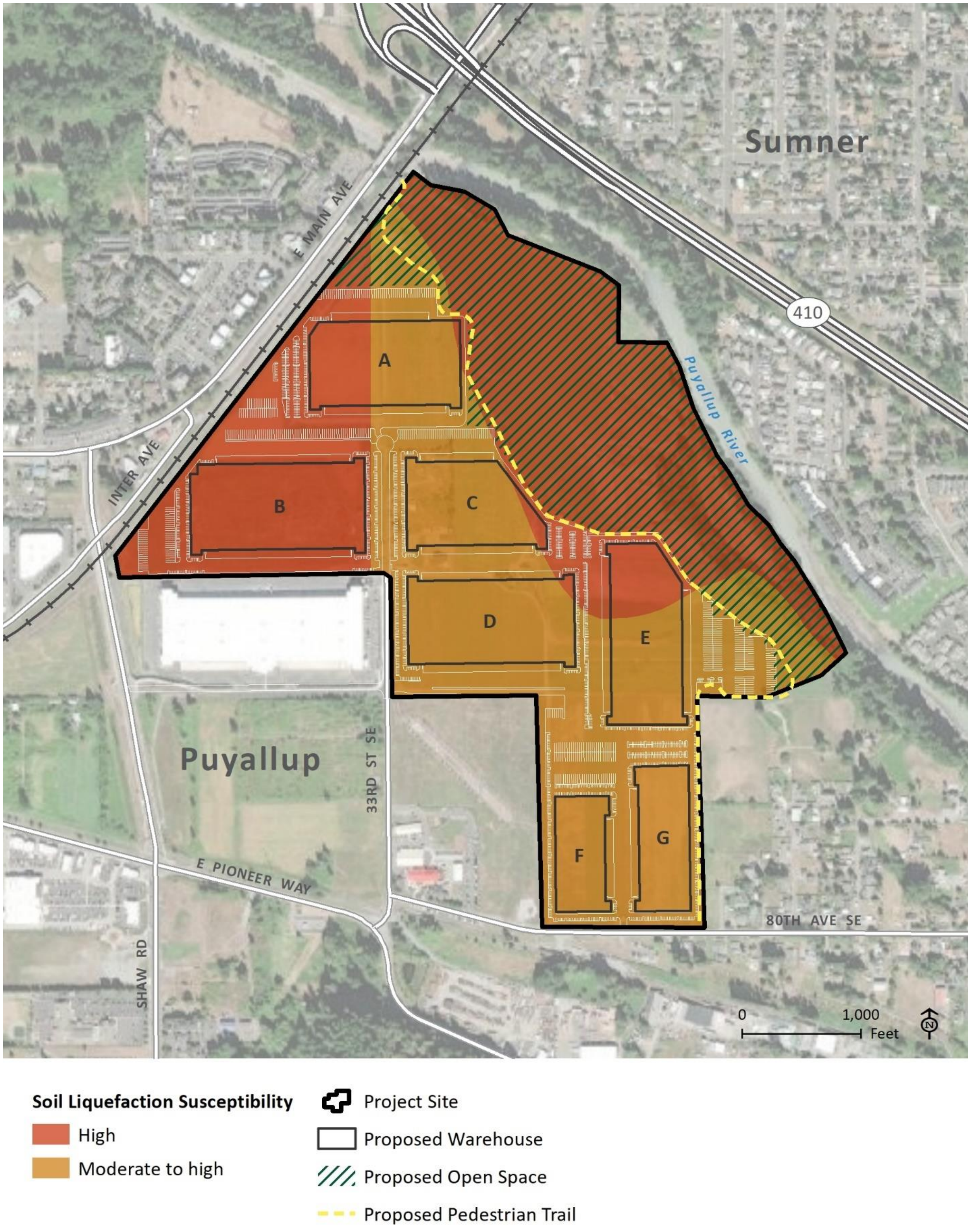

Figure 4-4. Soil Liquefaction Susceptibilities in the Project Site

Mines

Pierce County defines a mine hazard area as an area directly underlain by, adjacent to, or directly affected by mine workings such as mine entrances, tunnels, drifts, or air shafts. No known mine hazards are present within the Project site (WDNR 2021b).

Erosion

Pierce County defines erosion hazard areas as those areas that, because of natural characteristics including vegetative cover, soil texture, slope, gradient, and rainfall patterns, or because of human-induced changes to such characteristics, are vulnerable to erosion (Title 18.25.030 PCC) and can include hazards from shoreline, riverine (also referred to as Channel Migration Zones [CMZs]), or soil erosion. Pierce County Critical Areas development regulations includes specific requirements and standards for identified Erosion Hazard Areas (Title 18E.110 PCC and 18E.70.020). No shoreline or soil erosion hazard areas are mapped on the site.

A CMZ is an area where a channel is likely to move over a period of time. The Pierce County CMZ study for the Puyallup, White, and Carbon rivers and adopted by Pierce County for CMZ delineation, identifies areas at a severe, moderate, or low risk of erosion per the criteria below (GeoEngineers 2003).

Severe Migration Potential Area: Areas adjacent to the outside edges of the historic channel occupation tract boundaries, as determined by the results of the historic aerial photographic evaluation. The width of the severe migration potential area will be determined for each individual geomorphic stream reach, based on the distance the channel edge could travel in 5 years of steady lateral migration. The rate of migration used in the calculation will be the maximum rate of migration measured for each geomorphic reach. This distance will be measured from the outside boundary of the historic channel occupation tract.

Moderate Migration Potential Area: Areas adjacent to the outside boundaries of severe migration potential areas. The width of the moderate migration potential area will be determined for each individual geomorphic stream reach, based on the distance the channel could travel in 10 years of steady lateral migration at the maximum rate of migration for each reach.

Low Migration Potential Areas: Areas unlikely to experience channel migration within a 15- to 20-year period, depending on the presence of geomorphic features in the moderate migration potential area.

Severe risk CMZ areas are regulated under Pierce County’s floodway code (PCC 18E.70.020). The portion of the Project site that is set aside for open space located near the Puyallup River is mapped as a severe CMZ (Figure 4-5). The existing stormwater outfall is located within the CMZ of the Puyallup River as shown on Figure 4-5. Per Title 18E.70.040 PCC, any development, encroachment, filling, clearing, grading, new construction, and substantial improvement is prohibited within the floodway (including the CMZ floodway). With the exception of the stormwater outfall, proposed Project structures would be located outside of the mapped severe CMZ of the Puyallup River (for more information on the outfall, see Section 4.2 Surface Water).

Portions of Buildings A and E and the parking area would be located in low and moderate CMZ areas. Portions of Buildings C and D would be located in a moderate CMZ area. Pierce County has taken the position that under the version of the County Code that applies to the Project application, development may occur in low and moderate risk CMZ areas.

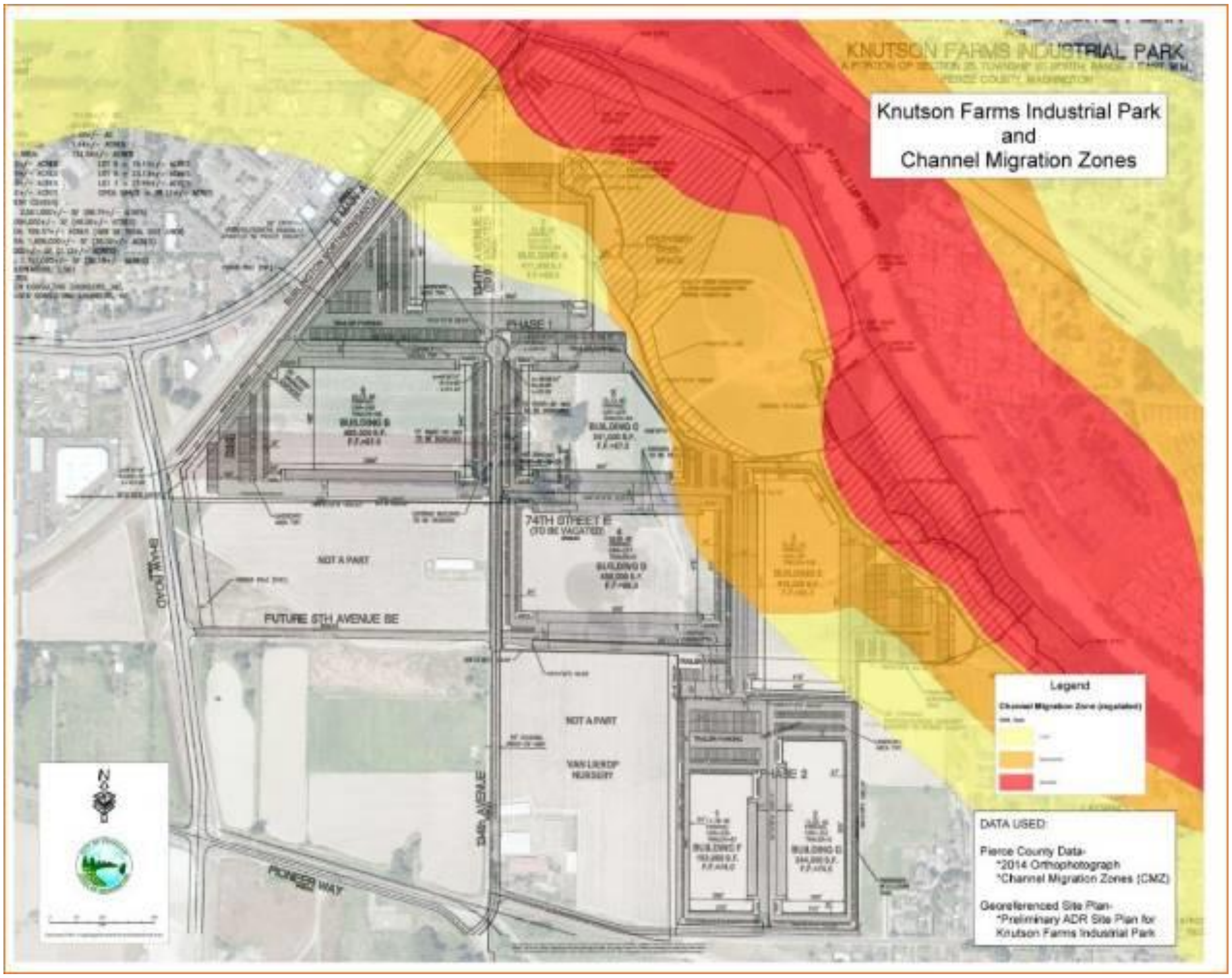

Figure 4-5. Erosion Hazard Areas and Channel Migration Zones

When the Pierce County's maps, sources, or field investigations indicate that the proposed Project area for a regulated activity is located within a riverine erosion hazard area (CMZ), the standards set forth in Title 18E.70 PCC would apply to riverine erosion hazard areas (CMZs); see Figure 4-6.

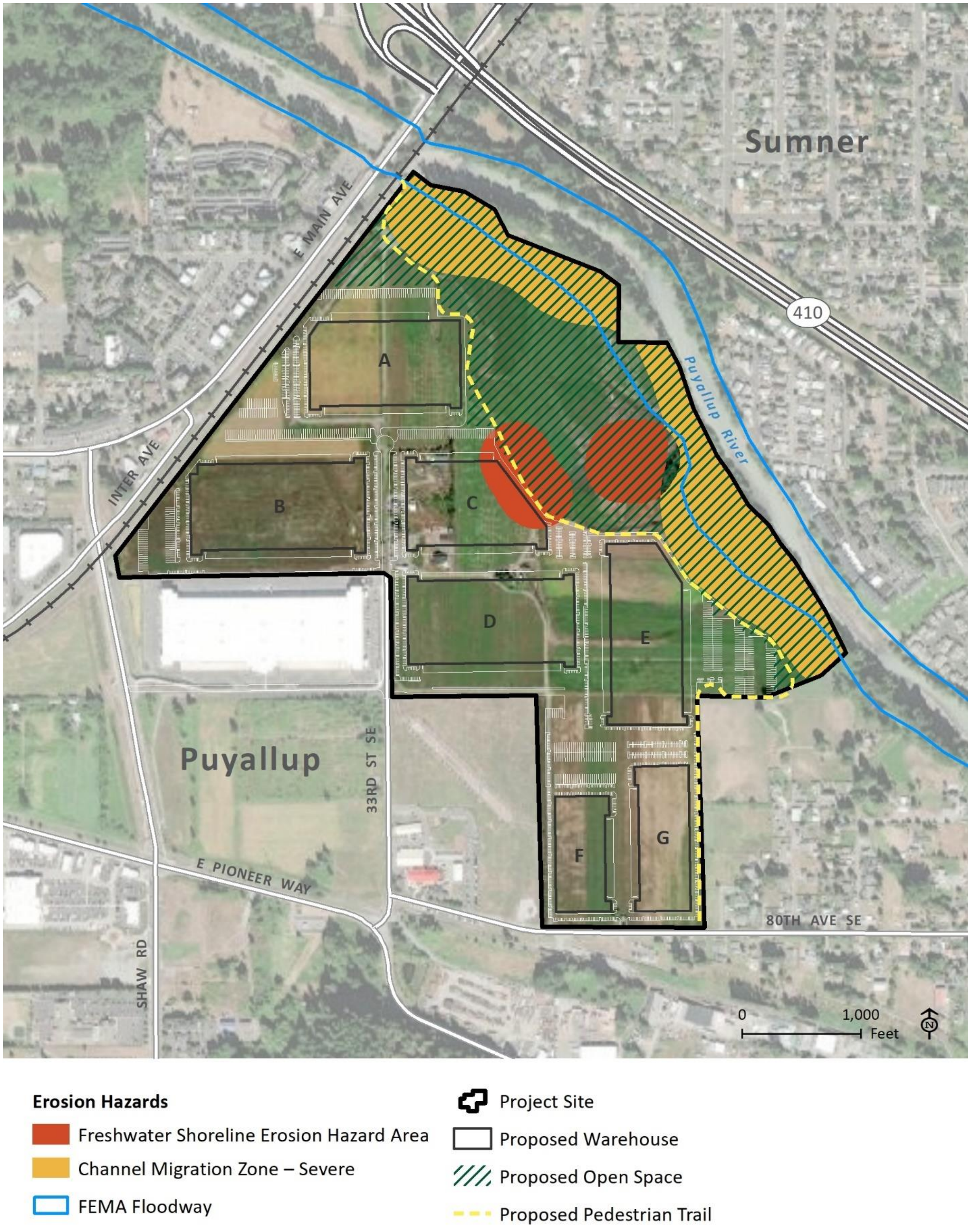

Figure 4-6. Erosion Hazard Areas and Channel Migration Zones

4.1.4 Impacts

Methodology

The potential impacts of the proposed Project construction on slopes and soils were determined based on locations of site grading, cuts, and fills relative to soil types and topographic features and the permanence of activity. Potential impacts related to soil erosion and sediment transport are discussed in qualitative terms.

The potential for the proposed Project to result in operational impacts was assessed based on geologic processes and geologic hazards that could impact slope stability, soil structure, and ground motion. The potential for the proposed Project to be altered or damaged by geologic hazards was determined based on the Project's proximity to the hazard and the existing geologic features that would influence the relative risk.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, the construction and operation of the proposed Project would not occur. Existing conditions regarding the potential for geologic hazards including earthquakes, soil liquefaction, and volcanic activity would be maintained. The No Action Alternative would have no impact associated with development of the Project in geologically hazardous areas. Permanent conversion of the Project site on soils that lend to agricultural practices would not occur.

Project

Construction Impacts

Soils and Erosion

Mitigated Significant Impact. Construction activities such as soil removal, grading, and clearing necessary to complete construction of the Project would cause permanent alterations to the topography of the Project site. Construction impacts would include ground disturbance, which would include up to 450,000 CY of on-site excavation and fill. Excavated material would be tested for contamination. If contaminants were found, the materials would be removed from the proposed Project site and disposed of in accordance with state and local regulations. Clearing and excavation during construction could result in impacts from erosion as bare soils become exposed to wind, rainfall, a major flood event, or vehicle activity within the proposed Project site.

Prior to construction, the Applicant would be required to comply with Washington State Department of Ecology (Ecology) Stormwater Quality Regulations, obtain coverage under the National Pollutant Discharge Elimination System (NPDES) through a Construction Stormwater General Permit to help control runoff and reduce water pollution from the construction site. Prior to construction, the Applicant would be required to develop a Stormwater Pollution Prevention Plan (SWPPP) in conformance with requirements in the PCSWDM, implement sediment erosion and pollution prevention control measures, and receive an approved permit under the NPDES program.

The topography of the proposed Project site would be permanently altered during construction. Site grading for utilities, paving, and building construction would result in a large quantity of earth movement and filling. Because much of the area has been altered by only minimally invasive agricultural practices, the changes from the proposed site development and soil grading would alter the use of the existing landscape form. The soils classified as prime farmland would no longer be available for agricultural land uses. This impact is discussed further in Section 4.5 – Land and Shoreline Use (see mitigation measure LU-4).

Construction of the Project would result in permanent impacts from alterations to the surface geology, topography, and soils. Impacts would be less than significant with the implementation of mitigation measures ER-1 through ER-5:

- ***ER-1: Implement BMPs during construction.*** Implementation of BMPs during construction to limit soil erosion to the maximum extent possible, consistent with Pierce County Comprehensive Plan Goal ENV-10 and City of Puyallup's Comprehensive Plan Policy NE-4.5.
- ***ER-2: Implement low impact development principles.*** Implementation of low-impact development (LID) principles during site planning to the maximum extent feasible to minimize impacts to soils and geological resources, consistent with Pierce County Comprehensive Plan Policies ENV-10.2.1 and D-18.6 and City of Puyallup's Comprehensive Plan Policy NE-5.6.
- ***ER-3: Develop Geotechnical Assessment from a WA Licensed Geotechnical Engineer.*** A geotechnical engineer licensed in Washington State would be retained to develop a geotechnical assessment to determine the presence of geologic hazards, including active landslide hazards, seismic hazards, and shoreline erosion hazard areas, in accordance with Title 18E.80.030 PCC, Title 18E.90.030 PCC, and Title 18E.110.030 PCC. The geotechnical engineer should also review and approve all grading, erosion, and drainage control plans prior to construction to assist in reducing liquefaction and landslide risks from and to the Project. The licensed engineer of record should determine the appropriate foundation, footing, and structural design to conform to the International Building Code standards for seismic and landslide hazards and establish buffers to site the Project away from shoreline erosion/ channel migration hazard zones in accordance with best practices.
- ***ER-4: Prepare and Implement SWPPP for Erosion and Sedimentation Hazards.*** Consistent with the Clean Water Act (CWA) and NPDES permit program, and the PCSWDM, the Applicant should implement a Construction SWPPP that will satisfy the requirements of the NPDES General Permit for Stormwater Discharges Associated with Construction Activities. The Construction SWPPP should include measures for temporary erosion and sedimentation control and identify a regular inspection and maintenance schedule for all erosion control structures. The SWPPP should include descriptions of all BMPs to be implemented during construction to minimize erosion and sediment entering surface waters.

  Erosion and sedimentation control measures should be implemented at the beginning of the construction process and maintained throughout all phases of construction. Measures may include, but are not limited to, installation of a stabilized construction entrance, a wheel wash, silt fences, seeding, mulching, and dust control, and all other BMPs as recommended by a licensed civil engineer. Additional erosion control supplies, including sandbags and channel-lining materials, should be stored on-site for emergency use.

The Project site should be monitored for erosion on a weekly basis and after large rainfall events, and corrective action should be taken as needed. Soil stockpiles should be stabilized and protected from erosion, and soils should also be stabilized before a holiday or weekend if needed, based on forecasts of precipitation.

- ***ER-5: Prepare Emergency Site Management Plans for large scale weather events for Erosion and Sedimentation Hazards.*** Due to the presence of active floodway, floodplain, and known severe CMZ areas that present a risk of large-scale geological impacts to the site, the Applicant should prepare emergency site management plans that would be implemented in the event of large-scale weather events that may cause flooding on or directly adjacent to the Project site. The Applicant should consult with Pierce County Surface Water Management, Emergency Management, and Planning Departments on the site emergency management planning pursuant to approval during site development approval permitting processes.

Volcanic Hazards

Mitigated Significant Impact. Lahar debris flow and/or ashfall caused by the eruption of Mount Rainier could occur on site. Impacts from a lahar debris flow could include inundation of the Project site. Impacts from ashfall could include ash accumulation on infrastructure and suspension of fine particles in the air. However, as described, there is between 0.1 and 0.2 percent probability that a damaging eruption would occur in any given year.

Development of the Project would be required to comply with Pierce County Critical Areas regulations for developments within Lahar Inundation zones (Title 18E.60 PCC). The Pierce County Critical Areas regulations prohibits development of specific facilities within Case II Lahar Inundation Zones (Title 18E.60.040 PCC). This includes essential facilities (i.e., facilities that are meant to maintain life, health, welfare, and safety functions) and hazardous facilities (i.e., occupancies or structures housing or supporting toxic or explosive chemicals or substances and any non-building structures housing, supporting, or containing quantities of toxic or explosive substances that, if contained within a building, would cause that building to be defined as a hazardous facility) as defined in Title 18.25 PCC. Any use within either of these two categories at the proposed facility would be in violation of the County’s Critical Areas development regulations and would have potential impacts to safety and disaster responsiveness in the event of an eruption of Mount Rainier.

The City of Puyallup has similar regulations for development in lahar zones. Following annexation, operation of the Project would be required to comply with City codes for developments within Lahar Inundation zones. In addition to generally prohibiting hazardous facilities, the code limits building occupancy to 1,000 people or less (Chapter 21.06.1260 PMC). Pierce County’s Critical Areas development regulations also regulates occupancies in Case I or Case II lahar inundation zone in time zone C but does not appear to limit warehouse uses (Title 18E.60.040 PCC). Limiting occupancy of the Project facilities could reduce risk to life posed by lahars and would make it easier to evacuate in a timely manner.

Due to the infrequency of eruptions, the probability of an impact from either ashfall or lahars during construction is low. However, the subsequent damage or safety risk should a volcanic eruption occur would be significant/catastrophic. Implementation of mitigation measures ER-6, ER-7, and ER-8 would be required to minimize the potential for significant impacts.

- ***ER-6. Comply with Title 18E.60 PCC for Volcanic Hazards.*** Consistent with Pierce County Critical Areas development regulations for Lahar Inundation Zones, no hazardous facilities (those supporting toxic or explosive chemicals or substances) should operate on the Project site (Title 18E.60 PCC). The prohibition on uses should include essential facilities (i.e., facilities that are meant to maintain life, health, welfare, and safety functions). The Applicant should comply with this guidance as they determine final uses for the site.
- ***ER-7. Prepare Emergency Management Plan for Volcanic Activity.*** An emergency management plan should be put in place prior to construction for use in the event of volcanic activity, consistent with Pierce County Comprehensive Plan Policy ENV-10.7.1, including the following elements in accordance with Title 18E.60.010 PCC and the Mount Rainier Volcanic Hazards Plan (Pierce County 2008a):
  - A campus-wide critical alert notification system in place which coordinates with local and regional emergency monitoring systems;
  - An emergency evacuation plan that adequately demonstrates the ability to evacuate all expected occupants in a lahar situation to an acceptable area outside of the volcanic hazard lahar area, in coordination with regional and local emergency management plans;
  - That the warehouse complex has procedures in place to ensure the emergency evacuation plan is maintained over the life of the development and that occupants are involved in periodic drills and/or other instruction regarding those emergency evacuation procedures; and
  - Record on the title of each parcel included in the Project site a notice of the presence of active volcanic hazards and limitations on certain types of land uses and building occupancies, consistent with the Critical Areas regulations (Title 18E.10.080C.2 PCC).
- ***ER-8. Building Occupancy Limits for Volcanic Hazards.*** When identifying an end user, consider uses that will have building occupancies of less than 1,000 people. This would minimize risks to life posed by volcanic hazards.

Landslide Hazards

Mitigated Significant Impact. Portions of Warehouses A and C are mapped within a landslide hazard area, and there are portions of the Project site topography that would be susceptible to landslides. Construction of the Project would mostly occur outside of the mapped landslide hazard areas and away from the associated buffer area of such landslide features. Except for stormwater facilities, utility lines, and trails, development would not be allowed within an *active* landslide area (Title 18E.80.040A PCC). Per Title 18E.80.020 PCC, when a proposed regulated activity may be located within a mapped active or potential landslide hazard area, a geological assessment conducted in accordance with Title 18E.80.030 PCC is required. As such, areas mapped as a *potential* landslide hazard may be deemed to be stable per a geotechnical analysis and the criteria set forth in Title 18E.80.20C(2) PCC. Therefore, the potential risk of a landslide impacting the construction of Warehouses A and C would need to be minimized by adhering to the results of a geotechnical assessment as outlined in mitigation measure ER-3.

Seismic Hazards

Mitigated Significant Impact. There is the potential for earthquakes to occur in the Project site during construction. Prolonged earthquake-related ground shaking has the potential to disrupt construction activities, damage equipment and existing utilities, and expose construction workers to outcomes of those risks. The potential for ground motion to disrupt construction activities and cause damage depends on the type and strength of seismic motion and the ground/soil conditions. Soils in the Project site are mapped as having a moderate-to-high to high susceptibility for liquefaction in the event of an earthquake, and liquefaction-induced settlement may occur during a strong seismic event. The required geological assessment identified under mitigation measure ER-3, also requires a seismicity review and risk evaluation relative to the proposed development be included (Title 18E.90.060(A(3)(f)(2) PCC). Prior to construction, the Applicant would need approved permits (Grading, Site Development, and Building) for earth-disturbing activities, which would reflect conditions of the site. When a spontaneous incident occurs, such as a severe earthquake, the contractor would implement and follow their own Standard Operating Procedures and Emergency Operations Plans. This plan would need to be developed as outlined in mitigation measure ER-9. Therefore, the potential earthquake hazards during construction are considered a less than significant impact with mitigation. Implementation of mitigation measures ER-9 and ER-10 would reduce impacts to the extent feasible.

- ***ER-9: Prepare Emergency Management Plan for Seismic Events.*** An emergency management plan should be put in place prior to construction for use in the event of an earthquake, consistent with Pierce County Comprehensive Plan Goal ENV-10.
- ***ER-10: Conform with Title 17C PCC for Seismic Design.*** Seismic design parameters would be incorporated into the design of Project facilities to minimize potential damage due to liquefaction in conformance with the standards set forth in Title 17C PCC, Construction and Infrastructure Standards – Building and Fire Codes.

Mines

No Impact. No mines are mapped within the Project site; no impacts during construction are anticipated. No mitigation is required.

Channel Migration Zones

Mitigated Significant Impact. Per Title 18E.70.040 PCC, any development, encroachment, filling, clearing, grading, new construction, and substantial improvement is prohibited within the floodway (including the CMZ floodway). With the exception of the stormwater outfall and open space area, proposed Project structures would be located outside of the mapped severe CMZ of the Puyallup River. Portions of the development site building area is located within the low to moderate mapped CMZ. Low to moderate CMZs are anticipated to have a 10–20-year time window in which lateral movement of the river toward the site might occur, allowing for potential adaptation on site against catastrophic impacts. As such, anticipated impacts from development in low to moderate CMZs on the site is limited, as BMPs to address channel migration could be reasonably expected to be applied to protect, preserve, or modify the site to prevent losses or damage.

If severe channel migration occurs south toward the Project site, the stormwater outfall could become permanently modified by the river and would no longer be functional as designed. Some of these impacts are observed to be occurring; see Section 4.2 – Surface Water for additional detail. If severe channel migration occurs near the north bank of the Puyallup River, the riverbank could shift away from the stormwater outfall and the stormwater outfall may no longer be located adjacent to the river and would no longer function as designed. The risk of CMZ erosion because of the proposed Project is considered less than significant with implementation of the design measures required per a geotechnical assessment as outlined in mitigation measure ER-3.

Operations Impacts

Soils and Erosion

Mitigated Significant Impact. During operation, no additional excavation or disturbance of ground surfaces would be required during the operation of the Project. However, impervious surfaces are proposed to cover about 77 percent of the site. Additional impervious surfaces would increase the amount of stormwater runoff generated in the Project site, leading to the increased potential of erosion of receiving water bodies. Additionally, sources of runoff discharged from the site through storm water conveyance systems could cause erosion or earth movement if inappropriately designed or placed. Mitigation measure SW-1 is identified to reduce impacts related to increased impervious surfaces. See the discussion of operational surface water impacts and identified mitigation related to stormwater runoff and stormwater conveyance systems in Section 4.2.5.

A loss of soil productivity and quality for local agricultural production would occur because of the construction of permanent Project facilities and infrastructure. The soils classified as prime farmland would no longer be available for agricultural uses. This impact is discussed further in Section 4.5 – Land and Shoreline Use (see mitigation measure LU-4).

Volcanic Hazards

Mitigated Significant Impact. During operations, the same risk of volcanic hazards in the Project site would be present, and there would be an increase of employees and facilities on site. Due to the infrequency of eruptions, the probability of an impact from either ashfall or lahars during operation is low, but the potential subsequent damage or safety risks during operation is considered a significant impact. Implementation of code requirements for developments within Lahar Inundation zones mitigation measures ER-7 and ER-8 would reduce impacts to the extent feasible.

Landslide Hazards

Mitigated Significant Impact. During operations, the same risk of landslide hazards as during construction in the Project site would be present, but established infrastructure and the presence of employees would be at risk. The requirement for geotechnical assessment per Title 18E.80.020 PCC (mitigation measure ER-3) and the limitation of development within *active* landslide hazard area, would avoid the potential risk of a landslide impacting the operation of warehouses to the extent practical. Therefore, impacts to landslide hazard areas during operations would be less than significant.

The existing stormwater outfall is located within a mapped, shallow-susceptibility landslide hazard area near the Puyallup River. Impacts on the stormwater outfall could occur from a landslide or scour from discharge that could cause mass erosion into the Puyallup River. The proposed infiltration trenches are located near the top of the upper topographical bench landform; inappropriate siting of such trenches and the associated discharge near the slopes could cause erosion and/or landslides during operation. Mitigation measure SW-8 is identified to reduce potential landslide hazard impacts to the stormwater outfall and infiltration trenches.

Seismic Hazards

Mitigated Significant Impact. During operations, the same risk of seismic hazards in the Project site would be present but established infrastructure and employees would be on-site. The potential for ground motion to damage infrastructure depends on the type and strength of seismic motion and the ground/soil conditions. Soils in the Project site are mapped as having a moderate-to-high to high susceptibility for liquefaction in the event of an earthquake, and liquefaction-induced settlement may occur during a strong seismic event. As outlined in mitigation measure ER-10, seismic design parameters would be incorporated into the design of Project facilities to minimize potential damage in conformance with the standards set forth in Title 17C PCC, Construction and Infrastructure Standards – Building and Fire Codes. If these design standards are implemented, the risk of severe structural damage or failure of facility elements from shaking because of ground motion associated with earthquakes from the CSZ or other faults would be minimized, but not eliminated irrespective of design of a facility. The required geological assessment conducted in accordance with Title 18E.80.030 PCC and identified under mitigation measure ER-3, also requires a seismicity review and risk evaluation relative to the proposed development be included. Therefore, the potential risk of a seismic hazards impacting the operation of proposed Project is considered less than significant.

Mines

No Impact. No mines are mapped within the Project site; no impacts during operation are anticipated.

Channel Migration Zones

Less than Significant. The existing stormwater outfall is located within the severe CMZ of the Puyallup River as shown on Figure 4-4. Portions of the site development building area are located in the low to moderate CMZ areas mapped by Pierce County. If severe channel migration occurs south towards the Project site, the stormwater outfall could become inundated by the river and would no longer be functional as designed. If severe channel migration occurs near the north bank of the Puyallup River, the stormwater outfall may no longer be on the shoreline of the river since the river moved north and would no longer function as designed, as it would be too far from the riverbank to function. If channel migration occurs in the low to moderate CMZ, the impacts could include risk of damage to improvements (utility, paving, and other appurtenances) and buildings, although the probability of that scenario is low due to the anticipated timeline for moderate to low CMZ changes to uplands. The risk of CMZ erosion as a result of the proposed Project is considered less than significant with implementation of the design measures required per a geotechnical assessment as outlined in mitigation measure ER-3.

Alternative 1 – Rail Transport

Construction Impacts

Mitigated Significant Impact. The construction impacts associated with Alternative 1 would be similar to those described for the proposed Project; Alternative 1 would result in alterations to surface geology, topography, and soils. Additional impacts for Alternative 1 would be associated with the small area between the Project site and the Meeker Southern railroad where construction of track extensions from the BNSF mainline/Meeker Southern interchange. Most of the ground disturbance for the construction of the rail line would occur within the same construction footprint as the proposed Project, and the additional ground disturbance would result in an incremental increase in soil removal, grading, and clearing necessary to complete construction. This additional ground disturbance would result in erosion as bare soils become exposed to wind, rainfall, or vehicle activity. In addition, Alternative 1 would have the same risk of seismic, landslide, and volcanic hazards and would require construction in the CMZ. Implementation of mitigation measures ER-1 through ER-10 would reduce impacts associated with the construction of Alternative 1.

Operations Impacts

Mitigated Significant Impact. The operations impacts associated with Alternative 1 would be similar to those described for the proposed Project. The amount of impervious surface is not expected to increase when compared to the proposed Project, as the rail line may be considered pervious surface. No additional excavation or disturbance of ground surface would be required during the operation of the Project. As such, Alternative 1 operations impacts include a permanent increase in impervious surfaces, resulting in increased runoff and potential erosion or earth movement. In addition, Alternative 1 would have the same risk of seismic, landslide, and volcanic hazards and would require construction in the CMZ. Implementation of mitigation measures SW-8, ER-3, ER-6, ER-7, ER-8, ER-9, and ER-10 would minimize impacts associated with the operation of Alternative 1.

Alternative 2 – Reduced Intensity Alternative

Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility (AES-2, LU-1, REC-1, and SW-4) as outlined in this Draft EIS for the proposed Project) were adopted by the Applicant. As noted below, Alternative 2 would still require Project implementation mitigation measures to reduce impacts to earth resources.

Construction Impacts

Mitigated Significant Impact. The construction impacts associated with Alternative 2 would be less than those described for the proposed Project. Similar to the proposed Project, construction of Alternative 2 would result in alterations to surface geology, topography, and soils. Site grading for utilities, paving, and building construction would result in earth movement and filing at a smaller quantity under Alternative 2. The potential for exposure to geologic hazards would be the same as the proposed Project under Alternative 2, except for landslide hazards. Under Alternative 2, landslide hazard areas would be outside of the Alternative 2 Project footprint and would no longer be of concern. Even with a smaller footprint, mitigation for soil and erosion impacts would still be required as outlined under the proposed

Project. Mitigation measures ER-1 through ER-10 would reduce impacts associated with the construction of Alternative 2 to the extent feasible.

Operations Impacts

Mitigated Significant Impact. Operational impacts related to Alternative 2 would be less than the impacts listed for the proposed Project. This includes decreasing the potential for increased stormwater runoff generated in the Project site from impervious surfaces, the long-term or permanent loss of soil productivity for local agricultural production, and the potential for exposure to geologic hazards. The potential for exposure to geologic hazards would be the same under Alternative 2, except for landslide hazards and CMZs. Under Alternative 2, landslide hazard areas would be outside of the Alternative 2 Project footprint and would no longer be of concern; additionally, although not entirely, the majority of the portions of the Project within the moderate and low CMZs would be removed from those mapped hazard areas, limiting the need for long-term monitoring of impacts from changes to the Puyallup River channel area relative to site improvements and buildings. Even with a smaller footprint, mitigation would still be required as outlined under the proposed Project. Implementation of mitigation measures ER-3, ER-6, ER-7, ER-8, ER-9, and ER-10 would minimize impacts associated with the operation of Alternative 2 to the extent feasible.

4.2 Surface Water

This section provides an analysis of potential impacts to surface waters. Surface water impacts from the proposed KFIP Project development have been evaluated and weighed to determine whether the proposed Project would have significant surface water quantity and quality impacts affecting river functions, on-site wetlands, or listed salmonids.

The KFIP Project includes a lower elevation floodplain area along the Puyallup River, and a higher elevation, older river terrace to the south, where it is proposed to build seven warehouses. The higher elevation terrace will be referred to as “high terrace” in the following discussion.

Surface waters considered in this analysis include the Puyallup River and its floodplain, on-site wetlands in the floodplain to the east (Wetlands A, B, and C) and Wetland D, a depressional wetland located on the high terrace in the southeast KFIP Project site.

4.2.1 Study Area

The study area for surface water impacts includes the Middle Reach of the Puyallup River (River Mile [RM] 10.3 to 17.4, as defined by the U.S. Army Corps of Engineers [USACE], Figure 4-7), the on-site floodplain, and the upland contributing basin that sends surface water flows toward the site from the south.

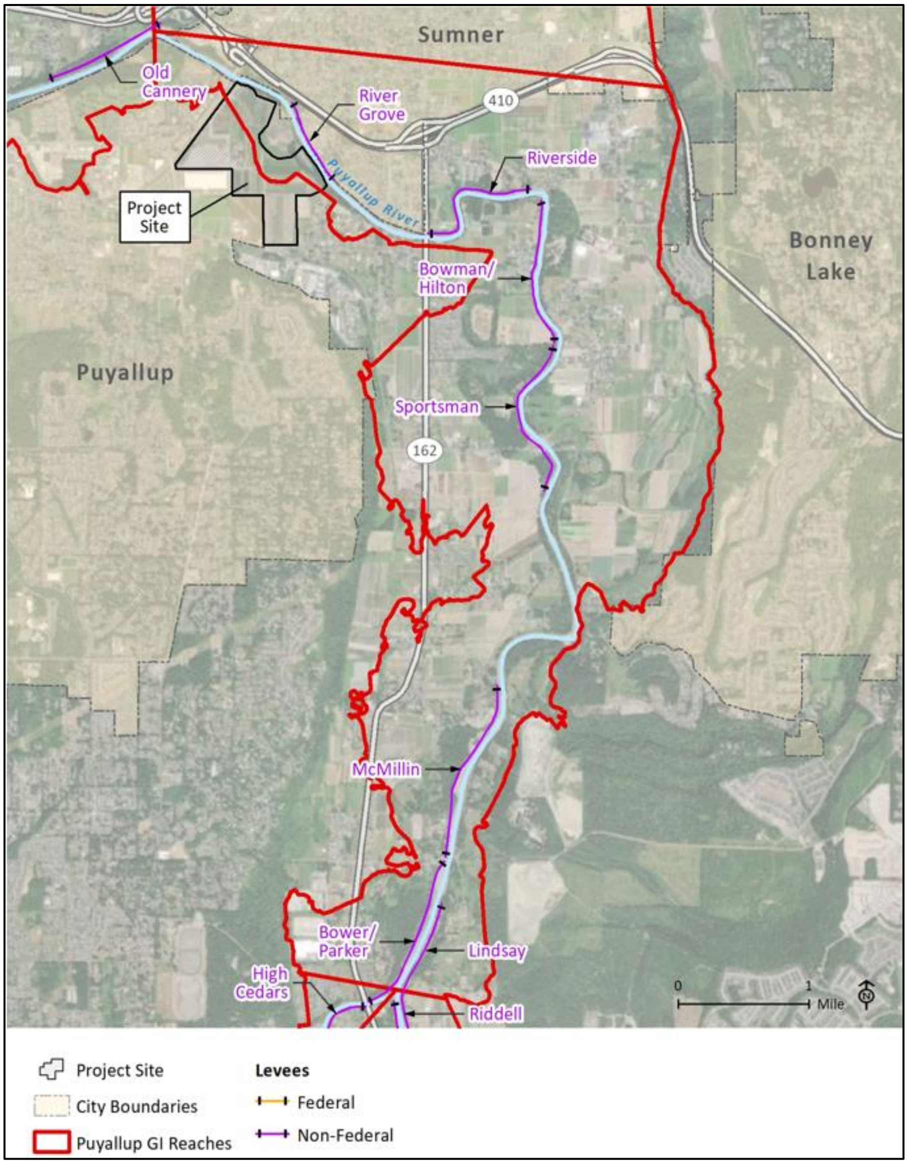

Figure 4-7. Middle Reach of the Puyallup River, Showing Dikes and Levees

4.2.2 Relevant Plans Policies, and Regulations

This section and Table 4-3 provided below summarizes federal, state, and local regulations related to surface water that are relevant to the KFIP Project.

Table 4-3. Overview of Relevant Regulations

Law and Regulation	**Description**
Federal	
Sections 404 and 401 of the Clean Water Act (CWA; 33 Code of Federal Regulations [CFR] 26, Subchapter 4, Section 1344)	Section 404 is administered primarily by the USACE and Section 401 by Ecology as a state-agent of the United States Environmental Protection Agency (USEPA). These agencies review and permit projects proposing in-water work related to fill and/or water quality impacts in Waters of the United States (WOTUS).
FEMA Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP), Model Ordinance, Region 10 (2012)	FEMA and NFIP provide flood insurance to City, County, and state governments. The model ordinance requires a biological assessment of impacts to Endangered Species Act (ESA) species for any project proposed in a floodplain. In general, new development in the floodplain is discouraged, but if allowed, cannot have negative impacts on flood storage or listed species. See PCC Chapter 18E.70 Flood Hazard Areas for local implementation of these federal regulations.
Endangered Species Act (ESA, 16 USC 1531 et seq.)	To ensure that the proposed action is not likely to jeopardize existence of any listed threatened or endangered animal species or result in adverse modification of designated critical habitat.
Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267)	Defines essential fish habitat (EFH) and requires federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that may adversely affect EFH.
State	
Growth Management Act (GMA)	Requires all cities and counties in Washington to adopt development regulations that protect critical areas, which include frequently flooded areas, wetlands, streams, and fish and wildlife habitat conservation areas.
Section 401 of the Clean Water Act (CWA; 33 CFR 26, Subchapter 4, Section 1344)	Section 401 is administered at a federal level by the USEPA, which has delegated review authority to Ecology. Ecology reviews and certifies Section 401 water quality permits for projects proposing in-water work in WOTUS.
Washington State Water Pollution Control Act (90.48 RCW)	Ecology regulates wetlands under the state Water Pollution Control Act (RCW 90.48) and the Washington State Shoreline Management Act (SMA; RCW 90.58). Ecology also provides guidance to local jurisdictions under SEPA to identify wetland-related issues early in permit and review processes. Administrative orders are issued under RCW 90.48.120. Ecology requires that all projects affecting surface waters in the state must comply with the provisions of the state's Water Pollution Control Act, including those waters or wetlands that are not subject to the federal CWA regulations.

Law and Regulation	Description
Washington State Department of Ecology NPDES Permit Program	The NPDES permit program controls water pollution by regulating sources that discharge pollutants into WOTUS (CWA, 33 USC Sections 1251 et seq. and WAC2 197-11-200 through 240). Ecology develops and administers NPDES municipal stormwater permits in Washington State. These permits regulate discharges to both surface waters (via surface conveyances) and to groundwaters (via infiltration facilities) of the state.
Washington State Shoreline Management Act (SMA; RCW 90.58)	The SMA provides for the management of water bodies or watercourses identified as “shorelines of the state”. Areas under SMA jurisdiction include the designated shoreline water body; lands within 200 feet upland of the ordinary high-water mark; and associated wetlands and floodplains. With this state law as a foundation, local shoreline management plans are to be developed and regulated by counties and cities.
Washington State Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA; WAC 220-660)	The WDFW HPA program, regulated under Washington State law (RCW 77.55), is intended to ensure that construction in or near state waters is done in such a way as to protect fish and their aquatic habitats. An HPA must be obtained from WDFW by anyone planning hydraulic projects in most marine and fresh waters. WAC 220-660-130 is the streambank protection chapter of the WAC and is applied by WDFW on streambank restoration projects.
Local	
Pierce County Critical Areas Regulations (Pierce County Code [PCC] Title 18E)	This ordinance was developed under the directives of the GMA. PCC 18E Critical Areas Regulations were adopted to protect the critical areas of Pierce County from the impacts of development and protect development from the impacts of hazard areas by establishing minimum standards for development of sites which contain or are adjacent to identified critical areas.
Pierce County Shoreline Master Program (PCC Title 18S)	The Pierce County Shoreline Master Program identifies the Puyallup River as a Shoreline of the state (designated Urban Conservancy). The regulated shoreline area includes all lands within 200 feet of the ordinary high water mark, plus all floodplains within 200 feet of the edge of the floodway and to the outer edge of all associated wetlands.
Pierce County Stormwater Management and Site Development Manual (PCSWDM)	The PCSWDM includes LID requirements for stormwater treatment systems. Among their purposes are promotion stormwater infiltration where practicable and the return of filtered stormwater to the groundwater aquifer close to where the water (i.e., rainfall) originates. The Manual also provides rules designed to protect wetland hydrology, from both a water quality and water quantity standpoint.

Law and Regulation	Description
Pierce County Construction Regulations	Title 17A regulations relate to grading and stormwater drainage, intended to minimize detrimental downstream impacts from uncontrolled runoff during construction.
Pierce County Comprehensive Plan Policies	The Pierce County Comprehensive Plan is a tool to assist County Councilmembers, planning commissioners, County staff, and others in making land use and public infrastructure decisions. It provides the framework for the County's Development Regulations.
City of Puyallup Stormwater Management Program Plan (SWMPP)	The SWMPP provides guidance on how the City manages its stormwater to meet requirements of the City's NPDES Phase 2 permit, as administered by Ecology.
City of Puyallup Critical Areas Regulations (PMC Chapter 21.06 CRITICAL AREAS)	The Puyallup Critical Areas regulations (PMC Chapter 21.06) are similar to those of Pierce County, as both are designed to meet standards defined in the GMA. However, some regulatory details are different.
City of Puyallup Comprehensive Plan (CPCP)	The CPCP includes government planning policies that call for the protection, preservation and enhancement of water resources and other natural environment components. It is "*the long-term vision and plan for managing the built and natural environment in the City of Puyallup,*" and provides policy guidance used by City staff to make decisions related to growth and development.

Federal

United States Army Corps of Engineers, Clean Water Act Sections 401 and 404

The CWA regulations require fill permits (Section 404) and a water quality impact assessment and certification (Section 401) for any direct impacts to Waters of the United States (WOTUS).

In general, since the mid-1980s, WOTUS included all coastal marine waters, freshwater lakes, rivers, and streams in addition to wetlands[1] that were adjacent to or that had either permanent or ephemeral surface water connections to those waters. Inclusion of wetlands in the regulatory definition was based partly on the fact that many large wetland systems that cross states lines are used for hunting, fishing, mining, and other interstate commerce activities. Isolated wetlands, those which do not have a surface water connection to other WOTUS at any time, were not typically regulated under federal law.

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[1] Wetland definition: "*Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.*" This definition of wetlands has been used by the USACE and the USEPA since the 1970s for regulatory purposes.

In March 2023, the Biden Administration finalized a definition of WOTUS, which included wetlands with a significant nexus[2] to other WOTUS, in response to a series of previous court cases and findings which had resulted in a fluctuating regulatory definition since 2015. However, a recent Supreme Court decision (May 25, 2023 – Sackett v. Environmental Protection Agency) has revised the federal definition of WOTUS to include wetlands only if they have a continuous surface water connection to rivers, lakes, or marine water bodies.

In order to conform with the May 25, 2023, Supreme Court decision, on August 29, 2023, the United States Environmental Protection Agency (USEPA) issued a Final Rule to amend the CWA WOTUS definition that was previously published in the Federal Register on January 18, 2023. The new federal definition of WOTUS "*removes the significant nexus test from consideration when identifying tributaries and other waters as federally protected*". Effectively, the new definition of WOTUS includes only relatively permanent bodies of navigable water and directly adjacent wetlands sharing the same water table. Therefore, wetlands and smaller tributary seasonal streams that are not directly adjacent to larger rivers, lakes and marine waters are no longer protected under federal law.

Please see discussion below about State of Washington wetland regulations, which will effectively replace the review and permitting functions provided previously under federal Section 404 regulations.

The CWA also regulates water quality through the NPDES permit process, which is administered at the state level by Ecology under Section 402 of the CWA (discussed below).

Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP), Model Ordinance, Region 10 (2012)

FEMA and NFIP provide flood insurance to City, County, and state governments. The model ordinance for Region 10 requires a biological assessment of impacts to Endangered Species Act (ESA) species for any project proposed in a floodplain. In general, the FEMA model ordinance does not prevent development, but it indicates that new development in the floodplain is not encouraged if there is a possible alternative location outside of the floodplain, and it recommends certain development accommodations to reduce flood risk. However, if allowed, any new development in the floodplain should not result in loss of flood storage, riparian habitat, nor result in significant impacts to listed species.

See PCC Chapter 18E.70 Flood Hazard Areas, discussed below for local implementation regulations.

Endangered Species Act (ESA – 16 USC 1531 et seq.)

The ESA requires that applicants seeking a federal action, such as issuing a permit under a federal regulation, undergo consultation with United States Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS). This is intended to ensure that the action is not likely to

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[2] Per the USEPA December 2022 definition: "*A significant nexus exists if the waterbody (alone or in combination) significantly affects the chemical, physical, or biological integrity of traditional navigable waters, the territorial seas, or interstate waters.*"

jeopardize the continued existence of any listed threatened or endangered animal species or result in the destruction or adverse modification of designated critical habitat. NMFS is responsible for managing, conserving, and protecting ESA-listed marine species. USFWS is responsible for terrestrial and freshwater species. Both NMFS and USFWS are responsible for designating critical habitat for ESA-listed species.

This Act prohibits “taking” of listed species. “Take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any species listed as threatened or endangered under the ESA (16 USC 1531 through 1544), or attempt to engage in any such conduct. Such an act may include significant habitat modification or degradation where wildlife is killed or injured by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267)

Requires fishery management councils to include descriptions of essential fish habitat (EFH) and potential threats to EFH in all federal fishery management plans. Also requires federal agencies to consult with NMFS on activities that may adversely affect EFH.

State

Washington State Water Pollution Control Act (90.48 RCW)

Requires that all projects affecting surface waters in the state must comply with the provisions of the state’s Water Pollution Control Act, including those waters that are not necessarily subject to the federal CWA regulations.

As a result of the recent Supreme Court decision described above (May 25, 2023 – Sackett v. Environmental Protection Agency), the USACE will take a lesser role in regulation of fill impacts to wetlands under Section 404 of the CWA.

However, the State of Washington is still responsible for protecting water quality under Section 401 of the CWA, and Ecology will take over as the primary review agency when a project proposes direct fill impacts to wetlands, as defined under state law. In the past, Ecology applied the same authority when regulating isolated wetlands (which were not regulated under federal law).

Per guidance from the Ecology website: “*For* [impacts to] *non-federally regulated wetlands, applicants must submit a request for an Administrative Order to comply with the state Water Pollution Control Act (Chapter 90.48 RCW).* [Ecology] *issue*[s] *Administrative Orders under this act for impacts to wetlands that are not jurisdictional under the federal regulations (e.g., non-federally regulated wetlands or NFRs). These wetlands remain protected under state and local laws and rules.*”

Washington State Department of Ecology NPDES Permit Program

The NPDES permit program controls water pollution by regulating sources that discharge pollutants into WOTUS (CWA, 33 USC Sections 1251 et seq. and WAC2 197-11-200 through 240). Ecology develops and administers NPDES municipal stormwater permits in Washington state. These permits regulate discharges to both surface waters (via surface conveyances) and to groundwaters (via infiltration facilities) of the state.

There are two types of permits:

- Phase I Municipal Stormwater Permits regulate discharges from municipal storm sewer systems (MS4s) owned or operated by large cities and counties, including Pierce County.
- Phase II Municipal Stormwater Permits regulate discharges from certain “small” MS4s in Washington, including the City of Puyallup.

The current Phase I and Phase II permits were effective Aug. 1, 2019, and will expire on July 31, 2024. New permits will replace the old, applying any regulatory updates to previous permit requirements. These permits require local governments to develop and implement a stormwater management program designed to reduce pollution in stormwater runoff. Typically, the local stormwater management program requires creation of a stormwater management plan for a proposed development. That plan is submitted for review by the local jurisdiction to ensure concurrence with the Stormwater Management Manual for Western Washington (SMMWW; Ecology 2019), or a locally developed and adopted equivalent manual, such as the PCSWDM.

Construction projects that disturb more than one acre of land and which discharge to surface water or a conveyance system that drains to surface waters must obtain NPDES coverage under a Construction Stormwater General Permit.

Washington State Shoreline Management Act (RCW Ch. 90.58)

The Washington State Shoreline Management Act (SMA) provides for the management of water bodies or watercourses identified as “shorelines of the state”. Areas under jurisdiction of the SMA include the designated shoreline water body, lands within 200 feet upland of the ordinary high water mark, and associated wetlands and floodplains. With this state law as a foundation, local shoreline management plans are to be developed and regulated by counties and cities.

The Puyallup River is regulated as a Shoreline of the State, and therefore, each City and County where it is found is required to development a management plan for this river.

Washington State Department of Fish & Wildlife Hydraulic Project Approval (WAC 220-660)

The Washington State Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) program, regulated under Washington State law (RCW 77.55), is intended to ensure that construction in or near state waters is done in such a way as to protect fish and their aquatic habitats. An HPA must be obtained from WDFW by anyone planning hydraulic projects in most marine and fresh waters.

Specific to streambank restoration projects, regulations and specific guidance is provided in WAC-220-660-130, intended to avoid additional impacts to fish habitat from eroding and unstable riverbanks.

Local (County and City)

The KFIP site is located in unincorporated Pierce County, within the City of Puyallup’s UGA. It is served by and affects city infrastructure and critical areas in the City of Puyallup as well as areas of its UGA within Pierce County. Surface water quality and quantity protection is generally addressed at a local level in a wide range of city or county stormwater and critical area management regulations, but also in related codes that regulate disposal of pollutants or hazardous waste.

Various Pierce County Regulations that impact management of surface water will be reviewed first, followed by a short, comparative discussion about equivalent or parallel regulation in the City of Puyallup. City of Puyallup codes does not currently apply to the Project but is provided to provide context in relation to the potential for future annexation into the City.

Pierce County Regulatory Review

Pierce County Stormwater Management and Site Development Manual (PCSWDM)

An updated PCSWDM was adopted, effective on July 1, 2021. In relation to the discussion below, changes between the 2015 and 2021 versions were insignificant.

The PCSWDM provides regulations and detailed guidance on stormwater management, designed to meet Ecology's standards (as defined by the USEPA NPDES program), and as required under the County NPDES permit.

The manual also provides rules designed to protect wetland hydrology, from both a water quality and water quantity standpoint. Floodplain wetlands, such as Wetlands A, B, and C on site, are surface water systems, but are usually hydrologically dependent on a combination of surface and groundwater inflows. The stormwater management system for new development is required under the manual to maintain wetland hydroperiods (i.e., the hydrologic volumes, timing, and duration that define and support functions and values of the on-site wetlands) (PCSWDM Section B.4.2 Guide Sheets 3B and 3C, details below).

According to the current USEPA NPDES impervious surface growth model, runoff from impervious surfaces in urban and urbanized areas results in greater runoff volumes and faster rates and is the major contributor of pollutants. This results in changes in hydrology and water quality that often result in changes to habitat, increased flooding, less aquatic biological diversity, and increased impacts from sediment movement and surface erosion.

> "*Traditional stormwater management approaches that rely on peak flow storage have generally not targeted pollutant reduction and can exacerbate problems associated with changes in hydrology and hydraulics*."

To meet these federal and state standards, the PCSWDM lists minimum requirements and provides guidance as to how to accomplish these goals in Pierce County. Specific to this Project, the following guidance is noted:

- Minimum Requirement #4 in the PCSWDM is related to Preservation of Natural Drainage Systems and Outfalls. It states that runoff cannot cause significant adverse impacts to downstream waters and downgradient properties. It further states that all outfalls are required to use energy dissipation systems*, and to "prevent erosion at and downstream of the discharge location".*

A wetland **hydroperiod** is defined as having hydrology at the same time of year and in the same volume as historical conditions.

- In Section B.4.2 Guide Sheet 3B: Protecting Wetlands from Changes in Water Flows (Hydroperiod), the manual states that a wetland's hydroperiod must be protected and maintained, and that the "*total volume of water into a wetland on daily basis should not be more than 20 percent higher or lower than the pre-project volumes*" and "*total volume of water into a wetland on a monthly basis should not be more than 15 percent higher or lower than the pre-project volumes.*"
- Section B.4.2 Guide Sheet 3C: Guidelines for Protecting Wetlands from Pollutants, provides methods to ensure that a wetland is protected from pollutants generated by a development, including use of effective erosion control.

These stormwater management regulations indicate that a project site must be managed to protect on-site wetlands and downstream water bodies from both direct and indirect impacts to water quantity and quality. Therefore, these regulations apply directly to potential impacts from the KFIP site, the associated outfall structure which has already been constructed on the floodplain, in addition to protection of on-site wetland hydroperiod and water quality.

Under this requirement, runoff cannot cause significant adverse impacts to downstream waters and downgradient properties; all outfalls are required to use energy dissipation systems; and prevent erosion at and downstream of the discharge location.

The Puyallup River is deemed flow control exempt, and therefore despite promoting infiltration in most areas, the PCSWDM only requires that volumes equivalent to "*91% of the runoff volume as estimated by an approved continuous runoff model*" (which approximately equates to the 6-month 24-hour storm event) must receive some form of 'basic' treatment prior to release to the Puyallup River[3]. Thus, all volume flows greater than the minimum treatment volumes that result from larger storms can be released directly to the river without any treatment, and infiltration is not required. Therefore, the future developed KFIP site (which was previously farmed and infiltrated most direct rainfall) is allowed under the PCSWDM to capture and treat the required minimum storm volumes and send the remainder of the runoff to the Puyallup River untreated.

Table 4-4 below is from the PCSWDM, *Vol. V – Runoff Treatment BMPs, Figure 2.1 Treatment Facility Selection Flow Chart*). The table provides a list of facilities that can be used to provide basic versus enhanced treatment of stormwater.

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[3] To understand the relation between the 91 percent runoff volume and the 6-month, 24-hour storm event (as estimated by an approved continuous runoff model, and storm intensity and duration), please refer to City of Tacoma 2003 Storm Water Management Manual, Appendix I-B Water Quality Treatment Design Storm, Volume, and Flow Rate at https://cms.cityoftacoma.org/enviro/Surfacewater_1/SWMM2003/V1-AppB.pdf.

Table 4-4. Runoff Treatment

Basic Treatment	Enhanced Treatment
Biofiltration Swales	Large Sand Filter[a]
Filter Strips	Treatment Wetland[a]
Basic Wet Ponds	Compost Amended Vegetated Filter Strip[a]
Wet Vault	Two-Facility Treatment Train
Treatment Wetlands	Bioretention[a]
Combined Detention/Wet Pool	Media Filter Train
Sand Filters	Emerging Technologies[a]
Bioretention	
Media Filter Drain	
Emerging Technologies[b]	

Source: Adapted from PCSWDM Vol. V – Runoff Treatment BMPs, Figure 2.1 Treatment Facility Selection Flow Chart

[a] When Phosphorous Control and Enhanced Treatment are required, the Large Wet Pond and certain types of emerging technologies will not meet both types of treatment requirements. A different or an additional treatment facility will be required to meet Enhanced treatment.

[b] Emerging Technologies are simply other techniques not specifically listed above that can be documented to attain the same or greater level of water quality.

The KFIP stormwater design information describes that enhanced rather than basic treatment will be used prior to releasing stormwater runoff to the Puyallup River (Table 4-4). In addition, the current proposal is to infiltrate roof runoff from four of the warehouse roofs in trenches sited along the top of slope at the northeastern edge of the high terrace. However, the infiltration facility design does not provide modeled data to show how the wetland hydroperiods of the on-site wetlands will be preserved by this proposal, as required by the PCSWDM.

The PCSWDM does allow for direct discharge of site runoff to the Puyallup River, but this does not relieve the applicant of ensuring that the on-site wetland hydroperiods are maintained, as required in the PCSWDM. Under current conditions, groundwater that was recharged by surface stormwater infiltrating through the high terrace surface provides hydrology to the on-site wetlands from approximately mid-winter through early summer months, i.e., to Wetlands A, B and C on the floodplain to the east, and also to Wetland D located in the southeastern portion of the high terrace.

These regulations and their intended effects on protecting wetland hydrology, habitat and water quality in the Puyallup River are also discussed in Sections 4.3 Groundwater and 4.4 Plants and Animals.

Pierce County Construction Regulations

Title 17A describes regulations related to on-site grading and stormwater drainage during construction phases, intended to minimize detrimental downstream impacts from uncontrolled runoff. The regulations implement the County NPDES stormwater permit and incorporate the PCSWDM.

Pierce County Shoreline Master Program (PCC Title 18S Development Policies and Regulations – Shorelines)

PCC Title 18S, the current Pierce County Shoreline Master Program, was adopted in 2018 and is in the process of being updated (Ordinance 2022-37s, effective December 2022). PCC Title 18S establishes allowed uses, and defines buffers, setback requirements, and mitigation requirements for regulated waterways. PCC Title 18S identifies the Puyallup River at the KFIP site as a Shoreline of the state with a shoreline environmental designation of Conservancy (Pierce County Shoreline Designations maps, October 2019). The regulated shoreline area includes all lands within 200 feet of the ordinary high water mark (OHWM), plus all floodplains within 200 feet of the edge of the floodway and to the outer edge of all associated wetlands.

Thus, the entire floodplain and the floodplain wetlands at the KFIP site are in the regulated Shoreline jurisdiction and are subject to Shoreline Master Program (SMP) regulations.

> *PCC 18S.20.040 Conservancy Shoreline Environment Designation (SED). "The intent of the Conservancy SED is to conserve and manage existing natural resources and valuable historic and cultural areas while providing recreational benefits to the public and while achieving sustained resource utilization and maintenance of floodplain processes. Shoreline ecological functions should be preserved by avoiding development that would be incompatible with existing functions and processes, locating restoration efforts in areas where benefits to ecological functions can be realized, keeping overall intensity of development or use low, and maintaining most of the area's natural character."*

Pierce County Critical Areas Regulations (PCC Chapters 18E.10-18E.120)

Under the GMA (RCW 36.70A.060), local governments are required to establish policies and development guidelines to protect the functions and values of critical areas: rivers, streams, lakes, wetlands, floodplains, aquifer recharge areas, and others. The Pierce County Critical Areas Regulations, Title 18E includes regulations designed to provide protection pertaining to surface waters on the KFIP site, including the following critical areas, all of which are present on the KFIP site.

- wetlands (PCC 18E.30),
- regulated fish and wildlife species and habitat conservation areas (PCC 18E.40),
- flood hazard areas (PCC 18E.70),
- erosion hazard areas (PCC 18E.110), and
- landslide hazard areas (PCC 18E.80).

Mitigation Sequencing (PCC Chapter 18E.40.050) is required in Pierce County when a developer is considering potential impacts to critical areas. Avoidance of the impact is required if possible. If not possible, the impact must be minimized and mitigated as outlined below. Mitigation for alterations to habitat areas must achieve equivalent or greater biological functions and must address adverse impacts upstream and downstream of the development site.

> *PCC 18E.030.050*
>
> *A. Mitigation. All regulated development activities in wetlands or buffers shall be mitigated according to this Title subject to the following order:*
>
> > *1. Avoiding the impact altogether by not taking a certain action or parts of actions;*

> *2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology or by taking affirmative steps to reduce impacts;*
>
> *3. The following types of mitigation (in the following order of preference):*
>
> > *a. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;*
> >
> > *b. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;*
> >
> > *c. Compensating for the impact by replacing or providing substitute resources or environments. The purchase of credits from an in-lieu fee mitigation program (ILF program) or wetland mitigation bank may be an acceptable means of meeting this requirement for compensation (see Chapters 18G.20 and 18G.30 PCC);*
>
> *4. Monitoring the impact and compensation and taking appropriate corrective measures; and*
>
> *5. Mitigation for individual actions may include a combination of the above measures.*

PCC Chapter 18E.30 (Wetlands) defines standard wetland buffer widths in relation to the Category Rating score and Land Use Intensity (Table 4-5 and Table 4-6). The County does not impose mitigation requirements on Category III wetlands smaller than 2,500 square feet and Category IV wetlands smaller than 10,000 square feet, as long as they are not contiguous to other wetlands, are not in a shoreline zone and are not part of a wetland mosaic.

Table 4-5. PCC Chapter 18E.30: Wetland Buffer Widths

Generalized Category of Wetland	Base Buffer Width
Category I	150 feet
Category II	100 feet
Category III	50 feet
Category IV	25 feet

Table 4-6. PCC Chapter 18E.30: Land Use Intensity Types

Land Use Impact "Intensity" Based on Development Types	
Rating of Impact from Proposed Changes in Land Use	**Types of Land Uses that Cause the Impact Based on Common Zoning Categories**
High	Commercial, Urban, Industrial, Institutional, Retail Sales, Residential with more than 1 unit/acre, New agriculture (high- intensity processing such as dairies, nurseries and green houses, raising and harvesting crops requiring annual tilling, raising and maintaining animals), High intensity recreation (golf courses, ball fields), hobby farms
Moderate	Residential with 1unit/acre or less, Moderate-Intensity Open Space (parks), New agriculture (moderate-intensity such as orchards and hay fields)
Low	Forestry, Open space (low-intensity such as passive recreation and natural resources preservation)

PCC Chapter 18E.40 (Regulated Fish and Wildlife Species and Habitat Conservation Areas), defines activities allowed in stream buffer areas and defines stream buffer widths in relation to Stream Type (Table 4-7).

Table 4-7. PCC Chapter 18E.40 Stream Buffers and Water Type

Water Type	Water Body Criteria	Buffer Width
Type S1	Marine Shoreline Critical Salmon Habitat	100 feet from the OHWM
Type F1	Fish-bearing streams, including waters diverted for fish hatcheries, and 1,500 feet upstream from the point of diversion, and tributaries, if important to protect downstream water quality.	150 feet from the OHWM
Type F2	Fish-bearing streams adjacent to a landslide hazard area as set forth in Chapter 18E.80 PCC.	150 feet from the OHWM or the minimum buffer distance required in PCC Chapter 18E.80, whichever is greatest
Type N1	Perennial or seasonal non-fish bearing streams within 0.25 mile of the confluence with a Type F stream.	115 feet from the OHWM
Type N2	Perennial or seasonal non-fish bearing streams that are either more than 0.25 mile upstream from the confluence with a Type F stream or are not connected at all to a Type F stream.	65 feet from the OHWM
Type N3	Lakes or ponds that do not support any critical fish species	35 feet from the OHWM

PCC Chapter 18E.70 (Flood Hazard) describes limitations on development in a regulated floodplain. The regulations are intended to minimize losses due to floods and to provide rules about activities allowed within flood hazard areas. These rules specifically describe an intent to minimize damage to critical fish and wildlife habitat areas. Depending on the type of flooding and precision of flood mapping available, areas within 150 to 300 feet horizontal from a flood zone, and 2 to 10 feet elevation above a base flood elevation may require analysis to determine what activities may be allowed. In general, new development in a flood zone is discouraged, but may be allowed with proper engineering, mitigation and floodproofing.

PCC Chapter 18E.110 (Erosion Hazard Areas) defines areas with potential erosion hazard that may result in land retreat, usually related to impacts from an adjacent water body, but also from unprotected surface erosion. At the KFIP site, the Riverine Erosion Hazard Area definition applies, which regulates "*the suspected risk of erosion through either loss of soil, slope instability, or land regression* [which] *is sufficient to require additional review to assess the potential for active erosion activity or apply additional standards*." This regulation applies on river floodplains mapped by FEMA, specifically within the mapped CMZ[4] on the on-site floodplain adjacent to the Puyallup River. In general, new structures are generally discouraged. Erosion and flow conveyance protection is required in the floodplain to minimize risk of riverine erosion.

> ***Flow Conveyance.*** *New excavated conveyance areas shall be equivalent to existing conveyance within the flood fringe. Equivalent shall mean a mechanism for transporting water from one point to another using an open channel system."*
>
> *"**Erosion Protection.** Development shall be protected from flow velocities greater than 2 feet per second through the use of bio-engineering methods or, when bio-engineering methods have been deemed insufficient to protect development, then hard armoring may be utilized. All erosion protection shall extend 1 to 3 feet, depending on development requirements, above the base flood elevation and shall be covered with topsoil and planted with native vegetation. (See Figure 18E.70-14 in Chapter 18E.120 PCC.).*

PCC Chapter 18E.80 (Landslide Hazard Area) defines areas that may be subject to mass movement due to a combination of geologic, seismic, topographic, hydrologic, or manmade factors. Indicators of a potential hazard include obvious evidence of failure, but also include area with slopes greater than 20 percent and relief greater than 20 feet, or slopes greater than 40 percent and relief greater than 15 feet, or sloped areas with soft or liquifiable soils, etc. Areas that meet these slope characteristics have been provisionally identified by Pierce County and require a geological assessment.

The standard buffer is the greater of these two – 50 ft from top of slope or a distance of one-third the height of the slope, for facilities located at the top of slope, or as recommended by the geologist to ensure safe operations. The setback may be increased if there is considered to be an increased risk downslope from stormwater drainage impacts.

The slopes along the northeast edge of the high terrace include several Landslide Hazard Areas Indicators (PCC 18E.80.020.A) and meet the definition of a Potential Landslide Hazard Area (PCC 18E.80.020.B). The proposed infiltration trench sites may not meet PCC setback requirements, and they have not apparently been assessed by a geotechnical professional (as required by PCC 18E.80.040.B.7) to ensure they will provide effective infiltration function and will not impact slope stability.

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[4] Please refer to Section 4.1 Geology for CMZ details.

Pierce County Comprehensive Plan Policies

The Pierce County Comprehensive Plan was developed under the provisions of the GMA (Chapter 365-196, WAC). This Comprehensive Plan is a tool to assist County Councilmembers, planning commissioners, County staff, and others involved in making land use and public infrastructure decisions. It provides the framework for the County's Development Regulations. The current Pierce County Comprehensive Plan (effective October 1, 2021) defines goals and policies used by the County when making decisions related to growth and development, as relates to long-range county planning.

The GMA outlines 14 goals for the development and adoption of a comprehensive plan and development regulations. Specific to this section (4.2 Surface Water), the following planning goals specifically apply:

- Environment: Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.

The Environmental Element (Chapter 7) of Pierce County's Comprehensive Plan describes approaches for maintaining the natural environment, including sections on how to protect and manage surface water systems, including wetlands. Specific to surface water management, many of the goals require or strongly encourage use of mitigation sequencing and application of LID techniques—such as infiltration of stormwater—to avoid and reduce potential impacts to floodplains, wetlands, fish habitat and water quality. Specific primary goals in the Environmental Element related to surface water management include (but are not limited to):

- Policy ENV-15.5 Require that regulated activities occur with avoidance of impacts as the highest priority, and apply lower priority measures only when higher priority measures are determined to be infeasible or inapplicable.

A list of additional Comprehensive Plan policies specific to protection of surface water is provided below:

Overall Goals:

- *GOAL ENV-1: Conserve and protect critical and environmentally sensitive areas.*
  - *Policy ENV-1.5: Coordinate with other entities to protect critical areas, address environmental issues, and fulfill ecosystem restoration obligations.*

Water Quality Goals:

- *GOAL ENV-5: Protect aquifers and surface waters to ensure that water quality and quantity are maintained or improved.*
  - *Policy ENV-5.6: Require performance standards for new development and retrofitting of existing facilities.*
  - *Policy ENV-5.11: Protect water quality and quantity necessary to support healthy fish populations.*
  - *Policy ENV-5.13: Reduce runoff pollutants into surface and groundwater.*

- – *Policy ENV-5.14: Require the use of low impact development principles and best management practices for stormwater drainage including use of infiltration systems, such as bioretention, rain gardens, and permeable pavement, to maintain water quality for fish and wildlife.*

Fish and Wildlife Goals:

- *GOAL ENV-8: Maintain and protect habitat conservation areas for fish and wildlife.*
  - – *Policy ENV-8.2: Place regulatory emphasis on protecting and achieving no net loss of critical habitat areas.*

Hazardous Areas (including floodplains) Goals:

- *GOAL ENV-10: Avoid endangerment of lives, property, and resources in hazardous areas.*
  - – *Policy ENV-10.2.1: Require appropriate standards for site development and structural design in areas where the effects of the hazards can be mitigated.*
  - – *Policy ENV-10.2.4: Direct sewer lines, utilities, and public facilities away from hazardous areas.*
  - – *Policy ENV-10.4: Maintain natural river channel configurations whenever possible.*

Wetlands Goals:

- *GOAL ENV-11: Establish appropriate long-term protection to ensure no net loss of wetlands.*
  - – *Policy ENV-11.4: Require wetland mitigation for impacts that cannot be avoided.*

Best Available Science, Review, and Adaptive Management Goals:

- *GOAL ENV-14: Designate and protect all critical areas using best available science.*
  - – *Policy ENV-14.1: Give special consideration to conservation and protection of anadromous fisheries.*
- *GOAL ENV-15: Recognize the value of adaptive management for providing flexibility in administering critical area and shoreline regulations.*
  - – *Policy ENV-15.2: Prioritize post-project compliance monitoring.*
  - – *Policy ENV-15.3: Utilize new technologies and methodologies where appropriate to resolve environmental problems.*
  - – *Policy ENV-15.5: Require that regulated activities occur with avoidance of impacts as the highest priority, and apply lower priority measures only when higher priority measures are determined to be infeasible or inapplicable.*

Storm Drainage and Surface Water Management Goals:

- *GOAL U-32: Improve surface water and groundwater quality.*
  - – *Policy U-32.1: Address water quality in stormwater facility maintenance and capital improvement projects.*
  - – *Policy U-32.2: Reduce and eventually eliminate harm to water quality from stormwater discharges. Do this through use of on-site infiltration and best management practices and*

source control of pollutants; control of development density and location; preservation of stream corridors, wetlands and buffers; and development, maintenance of a system of stormwater retention and detention facilities, and retrofit of existing facilities to eliminate or reduce untreated stormwater flows

- *GOAL U-35: Manage stormwater in consideration of the varied uses associated with natural drainage systems.*
  - *Policy U-35.2.5:* Promote infiltration, bioretention, dispersion, and permeable pavement.
- *GOAL U-37: Reduce or eliminate the stormwater drainage impacts from roadways onto adjacent properties and into surface waters.*
- *GOAL U-38: Make the use of Low Impact Development (LID) techniques in public and private developments the preferred and most widely used method of land development.*
- *GOAL U-39: Ensure that negative downstream impacts will not occur from on-site runoff.*
- *GOAL U-45: Coordinate the general flood control strategy with the federal fisheries service approved salmon recovery plan for Puget Sound.*

City of Puyallup Regulations (Comparison to Pierce County)

As described above, the Project site is located in unincorporated Pierce County, within the City of Puyallup's UGA. It is served by and affects city infrastructure and critical areas in the City of Puyallup and its UGA. Surface water quality and quantity protection is generally addressed at a local level in a wide range of city or county stormwater and critical area management regulations, but also in related codes that regulate disposal of pollutants or hazardous waste.

Various Pierce County Regulations that impact management of surface water were reviewed first above, but are followed below by a short, comparative discussion about equivalent or parallel regulation in the City of Puyallup. But City regulations do not apply until such time as the UGA is annexed into the City.

City of Puyallup Stormwater Management Program Plan (SWMPP)

The City of Puyallup's SWMPP is updated each year, to describe actions Puyallup will take to maintain compliance during the 2020 Permit period, as required by the City's Phase 2 NPDES Permit (i.e., August 1, 2019, through July 31, 2024). The 2023 SWMPP provides guidance on how the City manages its stormwater to meet requirements of the City's NPDES Phase 2 permit, as administered by Ecology. Under the SWMPP, the City has made LID the preferred approach for new development, in order to "*minimize impervious surfaces, native vegetation loss, and stormwater runoff in all types of development situations where feasible*".

The Phase 2 Permit allows the City to discharge stormwater runoff Into Waters of the State (i.e., streams, rivers, lakes, wetlands) as long as the City implements certain water quality programs designed to protect water quality. This goal is to be attained by reducing discharge of pollutants "*to the maximum extent practicable*" by using specific BMPs.

The BMPs are grouped under several program categories, including but not limited to Stormwater Planning, MS4 Mapping and Documentation, Controlling Runoff from Development, Redevelopment, and Construction Sites, Operations and Maintenance, and Monitoring

The SWMPP (Section S5.C.8) requires the City to implement a program designed to prevent and reduce runoff pollutants from surfaces that discharge to the City stormwater system. This would include requiring implementation of source control BMPs from current operations or, as needed, requiring construction of treatment facilities to reduce pollutants associated with existing land use.

In addition, under Section 9.1, the city is required to define maintenance standards that are "*as protective, or more protective [SIC] of facility function*" than those specified in the Ecology Manual. And for stormwater facilities that do not have maintenance standards, the City is required to develop a maintenance standard.

Under Section 10, the City is required to have a program in place to ensure that permanent stormwater facilities are checked after major storm events to determine whether the facility was damaged or requires maintenance, and as such, applies to the existing KFIP stormwater outfall structure.

City of Puyallup Shoreline Master Program (PSMP)

The City's Shoreline Master Program (PSMP) establishes "*allowed uses*", and defines buffers, setback requirements, and mitigation requirements for regulated waterways. The Puyallup River at the KFIP site is a Shoreline of the state with a designation of Urban Conservancy in the City. The regulated shoreline area in both the City and County includes all lands within 200 feet of the OHWM, plus all floodplains within 200 ft of the edge of the floodway and to the outer edge of all associated wetlands.

Thus, similar to County regulations (which apply to the KFIP site until it is annexed into the City), the entire floodplain and the floodplain wetlands at the KFIP site are assumed in this analysis to be in the regulated Shoreline zone and if annexed in the future, will be subject to PSMP regulations.

City of Puyallup Critical Areas Regulations (Chapter 21.06 CRITICAL AREAS)

Under the CMA (RCW 36.70A.060), local governments are required to establish policies and development guidelines to protect the functions and values of critical areas: rivers, streams, lakes, wetlands, floodplains, wildlife habitat, erosion and landslide hazard areas, and others. The Puyallup Critical Areas regulations (Puyallup Municipal Code Chapter 21.06 Critical Areas, PMC Chapter 21.06) includes regulations similar to those of Pierce County, as both are designed to meet standards defined in the GMA. However, some regulatory details are different.

PMC Chapter 21.06 regulations were most recently updated in 2022. These regulations apply to lands directly west of the KFIP site, which are within the City of Puyallup, and will apply to any future KFIP site development after annexation into the City. Ideally, the PMC Chapter 21.06 regulations are not in conflict with similar and parallel County regulations, which apply to the current KFIP Category III wetlands smaller than 1,000 square feet (if not along a riparian corridor or part of a wetland mosaic), and does not regulate Category IV wetlands smaller than 4,000 square feet as long as the wetland is not associated with a shoreline, is not part of a wetland mosaic, does not score 5 or more points when rated, does not contain priority or critical habitat, and the impacts are fully mitigated in accordance with conditions from Ecology and USACE.

PMC Sections 21.06.1010-1080 (Article X Fish and Wildlife Species and Habitat Conservation Areas) defines activities allowed in stream buffer areas and defines stream buffer widths in relation to Stream Type and habitat type, as listed below in Table 4-8.

Table 4-8. PMC Section 21.06.1050 Stream, Riparian and Non-Riparian Habitat Buffer widths

Water Type	Water Body Criteria	Standard Buffer Width
Type I	"Shorelines of the State" within the city's corporate limits and the urban growth area—specifically the Puyallup River and Clarks Creek, below Maplewood Springs;	150 feet from the OHWM
Type II	Other fish-bearing streams or streams with significant recreational value, or with significant wildlife habitat functions. Within the city's corporate limits and the urban growth area, known Type II streams such as Deer Creek, Diru Creek, Meeker Ditch, Rody Creek, Silver Creek, Wildwood Creek, Woodland Creek, and Wapato Creek	100 feet from the OHWM
Type III	Streams with perennial or intermittent flow that are not used by anadromous fish.	50 feet from the OHWM
Type IV	Intermittent or ephemeral streams less than two feet wide at the OHWM that are not used by anadromous or resident fish	35 feet from the OHWM
Non-riparian habitat areas	These habitat areas must support or have a primary association with federally listed species, state priority habitats and species, or habitats and species of local importance	Determined on a site-by-site basis

PMC Section 21.06.12 (Article XII Geologically Hazardous Areas) defines areas that are susceptible to erosion, landslides, earthquakes, volcanic activity, or other potentially hazardous geological processes. Alteration of geologically hazardous areas and their buffers may be allowed based on the degree to which risks can be mitigated. Removal of vegetation with soil-stabilizing functions from an erosion or landslide hazard area or related buffer is generally prohibited.

Point discharges from surface water facilities and roof drains onto or up-slope from an erosion or landslide hazard area is prohibited except when water can be tightlined to a point where there are no erosion hazard areas, or where the discharge flow rate matches predeveloped conditions with adequate energy dissipation, or where discharge is dispersed across a steep slope onto a low-gradient undisturbed buffer where the released water would infiltrate in the buffer and not increase slope saturation (as certified by a geotechnical professional).

PMC Chapter 21.07 (Flood Damage Protection, a separate chapter from the Critical Areas Chapter 21.06) describes limitations on development in a regulated floodplain. The regulations are intended to protect human life and health, minimize public costs associated with flood control and relief projects, minimize damage to public facilities, and meet requirements for maintaining eligibility for flood insurance and disaster relief.

These rules specifically describe methods intended to control alterations to natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters, and to control or minimize filling, grading, dredging and other development which may increase flood damage.

Applicants for development permits in a floodplain area are to submit a professional habitat assessment report describing effects of the proposed development (during both construction and operation) on floodplain functions and documenting that the proposed development will not result in “take” of any species listed as threatened or endangered under the ESA. The functional impacts that are to be described include a requirement for hydrologic and hydraulic analyses in accordance with standard engineering practice to ensure that the proposal avoids “take” of listed species. The report must also describe flood storage capacity impacts; channel migration and bank stability impacts; riparian vegetation impacts; habitat forming and isolation impacts; impacts to floodplain refuge for fish during higher velocity flows; and impacts to spawning substrate.

Development permits will be denied if the proposal will result in “take” of any species listed as threatened or endangered under the ESA, unless the Applicant provides the City with evidence that the federal and state permits required to authorize such take have been obtained.

City of Puyallup Comprehensive Plan Goals and Policies

The 2020 CPCP includes government planning goals and policies that call for the protection, preservation and enhancement of water resources and other Natural Environment Elements. These City policies are provided for context because the proposed development is within the City’s UGA, which includes shared natural and constructed surface water systems with the County, and because the already constructed outfall structure intended to receive runoff from the KFIP Project site is shared with an already operating outfall managed by the City of Puyallup– the Viking Warehouse facility.

The CPCP is described as “*the long-term vision and plan for managing the built and natural environment in the City of Puyallup*.” It provides policy guidance used by City staff to make decisions related to growth and development. Key strategies to be implemented in order to maintain the City’s environmental assets—as related to surface water management—are summarized below:

- Use a science-based approach to ensure no net loss of critical areas’ ecological functions and values;
- Maintain and strive to enhance a healthy natural ecosystem through environmental stewardship programs that engage the citizens of Puyallup; and
- Adoption of a ‘no-net loss’ approach.

Chapter 2 describes approaches for managing the environment. Goals and Policies that relate to surface water management at the KFIP site include (but are not limited to):

<u>Sustainability and Environmental Stewardship:</u>

- *Goal NE-1 Safeguard the natural environment by meeting the needs of the present without compromising the ability of future generations to meet their own needs.*
  - *Policy NE-1.1 Establish policy and regulations that consider and implement Best Available Science when making environmental decisions, where applicable.*
- *Goal NE-2 Lead and support efforts to protect and improve the natural environment, protect and preserve environmentally critical areas, minimize pollution, and reduce waste of energy and materials*.

Critical Areas:

- *Goal NE-3 Protect, integrate and restore critical areas and their aesthetic and functional qualities through conservation, enhancement and stewardship of the natural environment.*
  - *Policy NE–- 3.1 Implement projects and programs that include adaptive management based on Best Available Science to revise policies, regulations and programs as needed to reflect changes in scientific advancement and local circumstances.*
  - *Policy NE–- 3.3 Implement monitoring and adaptive management to programs and critical areas mitigation projects to ensure that the intended functions are retained and, when required, enhanced over time.*
  - *Policy NE–- 3.5 Conserve and protect environmentally critical areas from loss or degradation. Maintain as open space hazardous areas and significant areas of steep slopes, undeveloped shorelines and wetlands.*
  - *Policy NE–- 3.6 Avoid land uses and developments that are incompatible with environmentally critical areas; protect critical area functions based on the intensity of land uses near them.*

Geologically Hazardous Areas (including erosion hazard areas):

- *Goal NE-4 Preserve and enhance the natural scenic qualities, ecological function and value, and the structural integrity of hillsides to protect life, property and improvements from landslide, erosion and volcanic hazards.*
  - *Policy NE–- 4.2 Require appropriate levels of study and analysis as a condition to permitting construction within Geologically Hazardous Areas (and etc.).*
  - *Policy NE–- 4.8 Establish setbacks around the perimeter of site-specific Landslide Hazard Areas to avoid the potential to undermine these areas, cause erosion and sedimentat*ion…and etc.

Frequently Flooded Areas:

- *Goal NE-6 Minimize the potential for injury and property loss associated with flooding while preserving and restoring the ecological function and value of flood prone areas.*
  - *Policy NE–- 6.1 Reduce the amount of effective impervious surface in floodplains and uplands contributing runoff to downstream floodplains.*
  - *Policy NE–- 6.2 Employ no net impact floodplain management to avoid impacts to both upstream and downstream properties.*
  - *Policy NE–- 6.5 Direct uses that require substantial improvements or structures away from areas within the 100-year floodplain.*
  - *Policy NE–- 6.12 Explore new methods to limit effective impervious surface to protect environmental resources such as streams and allow for groundwater recharge, allow for efficient land use, mandate low impact development techniques throughout all phases of site planning and development and accommodate the level of development intensity planned for the area.*

Wetlands:

- *Goal NE-7 Identify and protect wetland resources and ensure "no net loss" of wetland function, value and area within the city.*
  - *Policy* NE–- 7.3 Use mitigation sequencing guidelines when reviewing projects impacting wetlands.

Water Quality:

- *Goal NE-8 Protect, improve and enhance the quality of all aquatic resources city-wide through best management practices, with a distinct emphasis on mimicking natural processes and use of low impact development techniques.*
  - *Policy NE–- 8.1 Maintain surface water quality necessary to support native fish and wildlife meeting state and federal standards over the long term.*
  - *Policy NE–- 8.8 Protect and enhance rivers, streams and lakes, including riparian and shoreline habitat, to protect water quality, reduce public costs, protect and enhance fish and wildlife habitat, and prevent environmental degradation.*
  - *Policy NE–- 8.11 Avoid development impacts to riparian corridors by taking the following measures:*
    - a. Protect riparian vegetation within stream buffers to maintain ecological functions.
    - b. Enhance and rehabilitate these areas if they are impacted by development and encourage this when development takes place on adjacent uplands.
    - c. Establish stream buffers to protect riparian ecological functions that contribute to healthy stream systems.
    - d. Promote activities and programs that will establish additional native vegetation along the city's stream corridors.
  - *Policy NE-8.13 Encourage restoration and enhancement of the Puyallup River…, other riparian stream corridors, wetlands, and associated buffers with priority given to areas associated with listed species and TMDL water-cleanup plans.*

Fish and Wildlife Habitat:

- *Goal NE-9: Identify and protect fish and wildlife areas within the city by engaging citizens in restoration, protection and stewardship of those habitats throughout the city.*
  - *Policy NE-9.14: Protect salmon, steelhead and other fish, plants, and wildlife that rely on the aquatic environment by protecting and improving water quality.*

4.2.3 Affected Environment

The affected environment, for purposes of this section (4.2 Surface Water), includes the KFIP site and the Middle Reach of the Puyallup River (Figure 4-7), the on-site floodplain, and the upland contributing basin that sends surface water flows toward the site from the south (Figure 4-8). The study area is within Water Resource Inventory Area (WRIA) 10, Puyallup/White River. This section summarizes the environmental setting related to existing surface waters and associated features within and near the Project site.

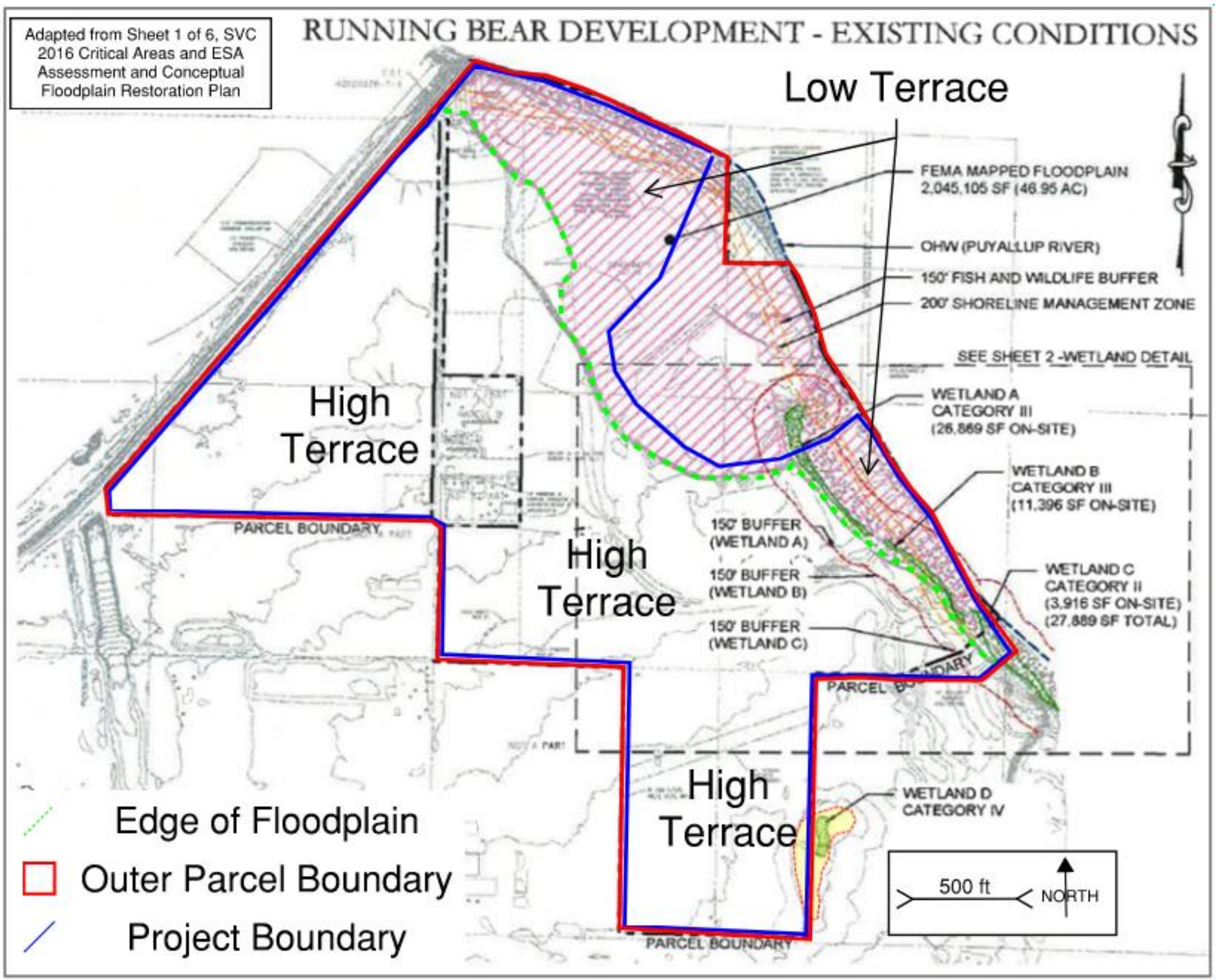

Figure 4-8. Map of FEMA Floodplain and Wetlands A, B and C Delineated by Soundview Consultants (SVC 2016) and Expanded Outline of Wetland D per EIS Team Delineation 2020 (yellow polygon).

The KFIP site is proposed for future construction of seven warehouses and associated infrastructure. The site is currently actively managed as farmland. It is located on a post-glacial, alluvial terrace located on the left bank of the Puyallup River. There are two terrace features on site, a high elevation terrace to the southwest, where it is proposed to build the KFIP warehouses (high terrace), and a low elevation terrace to the northeast along the Puyallup River, which is an active floodplain (floodplain). The entire high terrace and parts of the 100-year floodplain have been regularly plowed and planted with agricultural crops.

Surface waters within or directly adjacent to the KFIP site include the Puyallup River and its associated floodplain, and four (4) wetlands. The Puyallup River is regulated as a Shoreline, and most of these surface waters are within the Puyallup River Shoreline zone (which includes the entire floodplain and three of the four on-site wetlands).

The EIS team carried out on-site visits during various times of the year from 2019 through 2023 to document conditions and collect data related to ongoing EIS work. Previous reports prepared by the developer's consultants related to assessment of stormwater management, wetlands, and plants and animals impacts on site were also reviewed by the EIS team, including but not limited to:

- Barghausen Engineering: Various stormwater reports and stamped design drawings:
    - Barghausen Engineering *Conceptual Grading and Storm Drainage Plan*, stamped 03/26/2021.
    - Barghausen [KFIP] Engineering *Offsite Conveyance Analysis Report*, prepared for Michelson Puyallup Partners, LLC. April 2,2018.
    - Barghausen Engineering *Offsite Conveyance Analysis Report* for Van Lierop property, prepared for Running Bear Development Partners. March 1, 2018, revised June 14, 2018.

- Soundview Consultants: reports prepared for the KFIP site:
    - March 2016: *Draft Critical Areas and ESA Assessment and Conceptual Floodplain Restoration Plan*
    - September 2016: Draft Critical Areas Assessment report replaced the March 2016 report
    - December 2016: Critical Areas Assessment final report updated and replaced the September 2016 Draft report; and was accepted by Pierce County
    - October 2020: *As-Built Report*, Technical Memorandum describing baseline site conditions after construction of the outfall and installation of plant materials was complete.
    - December 2022: *Year 1 and 2 Monitoring Report*, describing conditions at the Viking Outfall
    - May 2023: Memorandum related to HPA and riverbank erosion

- Talasea Consultants: reports prepared for the Viking warehouse site.
  The stormwater outfall structure described in the report was initially intended to support the Viking warehouse development but was also intended to accept future stormwater flows from the KFIP site. Therefore, aspects of the Talasea reports also apply to the KFIP site—specifically information related to the outfall structure, mitigation plans and assessment of conditions in the Puyallup River.
    - January 2017: Biological Evaluation
    - March 2018: JARPA form and Detailed Mitigation Plan

Puyallup River

The KFIP site is directly adjacent to the Puyallup River. The Middle Reach of the river (which includes the KFIP site) starts at RM 10.3 (the confluence with the White River) and extends upstream to RM 17.4 (the confluence with the Carbon River). The basin that flows to this section of the River is approximately 438 square miles (Geoengineers 2003).

The Puyallup River is regulated by Pierce County as a shoreline of statewide significance (PCC Title 18S – Conservancy Designation) and as a Type F1 fish-bearing stream (PCC Chapter 18E.40 – Fish and Wildlife Habitat Conservation Area).

In Pierce County, FI streams are assigned a standard buffer of 150 feet (PCC Chapter 18E.40, Table 18E.40.060-1), measured landward from the river's OHWM. The County's SMP standard Shoreline jurisdiction extends 200 feet landward from the OHWM, but is wider within the KFIP Project area because the shoreline jurisdiction also includes the entire floodplain and wetlands A, B and C. The

Conservancy Shoreline standard buffer/setback from the OHWM is 100 feet wide, as measured from the OHWM at the river. When there are differences between the Critical Area and the SMP regulations, the most protective setback or buffer is applied. The 150-foot critical area buffer is most restrictive, and therefore applies.

Water quality in the Puyallup River adjacent to the KFIP site is currently documented as having Category 1 (Low risk) impacts from occasional exceedance of bacteria and Ammonia-N criteria; Category 2 (Moderately Low risk) impacts from high copper content (per Puyallup Tribe data), high pH and low dissolved oxygen readings, and Category 5 (High risk) exceedance of 32 degrees Fahrenheit (°F) temperature limits. However, data detailing ongoing water quality monitoring work in the Puyallup River is limited. New research about a potentially significant water quality impact to the Puyallup River associated with stormwater runoff from paved areas is described below.

Surface Water Impacts to Listed Species

Water quality and fish habitat in the river is affected by scouring, erosion and sediment loads from regular riverine flooding. Some of these impacts are natural and ongoing in the Puyallup River. However, the outfall structure at the edge of the river was originally approved to provide an outfall for the Viking warehouse site, which only sends water to the western side of the structure. The eastern side was built at the same time with apparent intent to serve the future KFIP development, but without appropriate assessment of additional hydraulic impacts from significantly greater future KFIP outfall volumes.

Construction of the outfall has resulted in unpermitted placement of large boulders below the OHWM and increased bank erosion under current conditions. Undercutting at the riverbank has resulted in some materials from the outfall construction—some boulders and A-jacks originally installed at top of slope and bioengineered sections of the riverbank slope face—starting to slump and fail. Some of these materials have fallen down the bank and into the river. Ongoing riverbank erosion (described in more detail below) has resulted and will result in impacts to fish and fish habitat in the Puyallup River (Confluence 2023).

The WDFW has been tracking this situation through the HPA originally issued for the Viking project. WDFW staff met with KFIP consultants on site at the end of 2022 to assess conditions at the end of a 3-year monitoring period at the riverbank in relation to how the riverbank has been impacted by outfall construction. In their 2022 Correction Request concerning the outfall facility HPA, WDFW documented unpermitted placement of several boulders below the OHWM, failure of the plants installed for riverbank impacts mitigation to survive at required rates (minimum required survival was 80 percent), and documented riverbank erosion where previously installed plantings had been washed away in winter floods. WDFW required repair of the riverbank, through a new HPA. This work is described in detail in the following section and below.

To assess impacts of the bank failure and ongoing erosion on listed species and habitat in the river, the City's fisheries biologist consultant (Confluence Environmental) reviewed the WDFW HPAs and assessed streambank stabilization repairs that were installed under the most recent HPA in May 2023. In their report (Confluence, August 2023), Confluence noted that streambank stabilization protocols that are to be applied under the WDFW HPA permit are defined in the *Integrated Streambank Protection Guidelines*

(ISPG). WAC 220-660-130 codifies the ISPG, which represents the best available science and provides critical technical guidance for designing and permitting bank stabilization projects in Washington State. The ISPG requires that streambank stabilization projects be grounded in sound scientific and engineering principles. For that reason, a successful bank stabilization design must be engineered to incorporate fluvial geomorphic processes and to address local ecological conditions.

The WAC defines stream bank protection as any structure (permanent or temporary) that is built to reduce or prevent stream bank and shoreline erosion in Waters of the State, such as the Puyallup River. Structural techniques may include armoring the bank with riprap, concrete, or timber, or use of live plantings, rootwads, and large woody material, depending on site-specific hydraulic and ecologic conditions. Some projects integrate both structural and biotechnical techniques, particularly in high energy environments when hard armoring is needed, but benefits from using biotechnical techniques can also be applied.

In particular, the intent of this work is to protect fish life and fish habitat, particularly where listed species are present. *"Direct loss of habitat from bank erosion may include loss of aquatic vegetation, spawning gravel, large woody material, riparian zone vegetation, and flood plain connectivity as well as alteration of the channel"* (WAC 220-660-130[2]). Durable and effective bank stabilization will avoid and minimize adverse impacts to fish and fish habitat.

Confluence reviewed the intent of WAC 220-660-130, specifically subsections 3(a), 4(b) and 4(b)(i, ii, iii, v, vi, vii, and viii), and evaluated whether the streambank stabilization work either from the original 2018 bank stabilization installation pursuant to the original HPA or the May 2023 repair work met requirements of the WAC.

Confluence's review identified shortcomings and failures to meet WAC requirements in the 2018 and in 2023 HPAs:

- The streambank stabilization design work in 2018 and in 2023 was not carried out by qualified professionals (i.e., with expertise in geomorphology or hydraulic engineering).
- The work did not take into account immediately adjacent fluvial morphology or hydraulics, such as the location of the river thalweg directly adjacent to the bank or the intensity and duration of wet season flows.
- The work did not apply basic mitigation sequencing, which should start with avoidance of the impact, then progress to minimizing impacts as much as possible.
- There was no "Basis of Design" report, which would document the engineering and hydraulics foundation of various design components, as required to incorporate ecological and geomorphological processes at the site.
- There was no site and reach assessment conducted to support the initial 2018 design, and the subsequent 2021 scour report (WCI 2021) did not apply current riverine morphology, did not take ecological processes into account and did not address efficacy of the existing bank stabilization installation or outfall structure design.
- The 2023 repair work did not provide a site reach assessment report, and thus was similarly flawed and compromised with numerous design deficiencies and predictable modes of failure.

There was no stamped or scaled engineering design drawing, but rather only a hand-sketched concept drawing with minimal detail.

- Unpermitted placement of boulders below the OHWM (a violation of the CWA and state law) was not addressed in the May 2023 repair work.
- The original 2018 design as well as the May 2023 repair work does not protect spawning and rearing habitat in the River, as flood events comparable to past winters are expected to undercut the new installation and continue to erode the riverbank at the outfall. This is expected to lead to delivery of additional boulders and concrete debris from upslope into the Puyallup River, which would further degrade habitat.

Confluence concluded:

> *There is no evidence that the [streambank protection] work was based on sound engineering principles and required hydraulic and geomorphic assessments of erosion risk. City hydraulics experts [NHC, 2023] have evaluated the installation and have indicated that the installation is likely to fail under expected future conditions. More extensive bank stabilization will be required to protect the outfall, leading to additional expense and additional adverse impacts to fish and fish habitat.*

In addition to bank failure at the site associated with the stormwater outfall resulting in impacts to fish life and fish habitat in the river, recent research from Tian et al. (2021, 2022) and others (McIntyre and Kolodjiez 2021) has identified another impact of the stormwater. That is a release of a tire rubber derived chemical in stormwater runoff, the antioxidant 6PPD (often found in microscopic tire wear particles) and its soluble byproduct 6PPD-quinone (6PPD-q). This research is also discussed in Section 4.4 Plants and Animals.

This pollutant is commonly found in stormwater runoff from paved surfaces throughout the world. In the Pacific Northwest, this chemical has recently been found to have lethal effects, specifically, on trout and salmon species, with the highest sensitivity to date reported in coho salmon, but also high sensitivity reported for other listed salmonids and fish. Research on other salmonids is ongoing. Characteristic toxicity symptoms include increased ventilation, gasping, spiraling, and loss of equilibrium shortly before death, which is reported to occur within 1–96 hours of exposure at very low concentrations of the pollutant.

Tian et al. (2022) reported a revised juvenile Coho salmon lethal concentration 50 (LC50)[5] of less than 0.1 micrograms per liter (µg/L), indicating substantial lethal sensitivity to 6PPD-q. Research to determine how this sensitivity is expressed in other salmonid species is ongoing. Brinkmann et al. (2022) evaluated potential for acute toxicity of 6PPD-q to rainbow trout, brook trout, arctic char, and white sturgeon. They reported 96-hour acute toxicity thresholds (LC50) of 1.0 µg/L or less for the two trout species,

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[5] LC50 is the amount of a substance suspended in the air required to kill 50 percent of a test animals during a predetermined observation period. LC50 values are frequently used as a general indicator of a substance's acute toxicity.

indicating lethal sensitivity in these trout species. Lethal impacts to other salmon species are assumed but not yet fully documented.

Current stormwater regulations and manuals adopted prior to this research, reported in 2021, do not directly address this new research or new recognition of a pollutant, but generally indicate that best available science is to be applied in relation to providing adequate treatment for any critical stormwater runoff pollutant known to have a lethal effect on listed species (which are protected under both federal and state law).

Ecology has published new guidance about 6PPD as of June 2022 and October 2022 (Ecology (D and E) 2022), which advises how jurisdictions under NPDES permits should best manage this critical pollutant to avoid illegal take of listed species. This guidance reported that the primary pathway of 6PPD-q transport to a river is via runoff from paved roads and parking areas or through conveyance systems (storm drainpipes and catch basins) that discharge to surface waters or direct discharges to surface waters.

Two categories of BMPs that can be used to reduce impacts from the tire oxidant pollutant were identified in the June 2022 guidance:

- Stormwater Flow and Treatment BMPs
- Source Control BMPs.

Stormwater dispersion, infiltration or biofiltration Flow and Treatment BMPs were described as having high potential to minimize impacts from the 6PPD chemical, with specific requirements as to the composition of the underlying soil or infiltration media—usually related to having a minimum content of organic material, clay, or another material with comparable sorption characteristics (i.e., high Cation Exchange Capacity).

Alternately, under Source Control BMPs, polluted parking lot and road runoff could be separated from relatively clean roof runoff and redirected to water quality treatment facilities designed to remove the pollutant prior to release.

Sedimentation (i.e., settling ponds) as a Flow and Treatment BMP was considered only moderately effective, because the 6PPD tire oxidant particles tend to float and some of the pollutant is soluble, so does not settle. Filtration as a Flow and Treatment BMP (such as filtration through pure sand, which has low sorption capabilities) was also considered less effective due to varying 6PPD particle sizes and chemical solubility allowing some of the pollutant to escape.

If no BMPs are provided using prescriptive infiltration, sorption, filtration, or sedimentation treatment, then potential for pollutant removal from stormwater runoff sent via surface flow from the KFIP site to the river is low. The current PCSWDM allows for direct surface stormwater outfall to the Puyallup River after ‘basic’ water quality treatment of smaller storms, i.e., volumes equivalent to 91 percent of the runoff volume as estimated by an approved continuous runoff model[6]. This runoff volume is approximately equal to what was previously called the 6-month 24-hour storm event (i.e., a 24-hour storm volume that might be expected twice a year, or once every 6 months). As described above, the KFIP stormwater design information indicates that enhanced rather than basic treatment will be used prior to releasing stormwater runoff volumes equivalent the 6-month storm to the Puyallup River (Table 4-4). However, the PCSWDM allows flows from storms larger than the 6-month, 24-hour event to be released to the river without any treatment, assuming that dilution by the greater water volumes will be adequate to reduce risks from stormwater pollutants.

Some, but not all of the enhanced treatment options listed in Table 4-4 may be effective at removal of 6PPD from the KFIP runoff prior to release to the Puyallup River. These methods should be compared to the recommended treatment options described in Ecology guidance and recent research publications cited above to determine what best treatments can be applied to remove 6PPD from new KFIP stormwater runoff volumes.

The PCSWDM allows volumes in excess of the 6-month storm minimum to be released without any water quality treatment, but this does not relieve the applicant of ensuring that listed species in the river near the outfall are adequately protected from impacts of the 6PPD pollutant. As described above, recent guidance from Ecology indicates that specific stormwater dispersion, infiltration or biofiltration approaches using infiltration media with high Cation Exchange Capacity (CEC) can be used to minimize lethal impacts to listed species from the 6PPD chemical.

Because the 6PPD pollutant has lethal effects on salmonids at very low concentrations, applying the “basic” or “enhanced” treatment standards alone may not provide enough protection to ensure no harm (i.e., take) to listed species in the Puyallup River near the new outfall. In addition, because this is a new outfall that will introduce new volumes of 6PPD to the river, it presents an increased risk to salmonids relative to pre-outfall conditions. Therefore, it does not maintain or improve the current status quo, but rather will increase the current background level of 6PPD pollution in the river.

Protection of listed species is required under federal, state and local law, and in relation to current KFIP site design, this newly identified impact to surface water quality which increases risk to listed salmonids in the river adjacent to the KFIP site suggests a need for reassessment or redesign of KFIP stormwater management plan and/or facilities. Protecting listed salmonids in response to the new information about tire chemicals would also be consistent with Pierce County’s Comprehensive Plan policies for using best available science and adaptive management for critical areas (Goal ENV-14, Goal ENV-15, Policy ENV-15.3).

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[6] To understand the relation between the 91 percent runoff volume and the 6-month, 24-hour storm event (as estimated by an approved continuous runoff model, and storm intensity and duration), please refer to City of Tacoma 2003 Storm Water Management Manual, Appendix I-B Water Quality Treatment Design Storm, Volume, and Flow Rate at https://cms.cityoftacoma.org/enviro/Surfacewater_1/SWMM2003/V1-AppB.pdf.

Erosion and Bank Failure

As described above, water quality in the river is affected by scouring, erosion and sediment loads from regular riverine flooding. Some of these impacts are natural and ongoing. However, construction of the outfall structure at the edge of the river has resulted in an increase in bank erosion. The KFIP outfall structure is located in the floodplain directly adjacent to the river channel on the left riverbank. Recent observations by the EIS team indicate new and ongoing erosion and undercutting from surface flows at the riverbank at the outfall structure location. New sediment deposits within the outfall structure from regular river flooding and scouring and subsequent erosion impacts at the top of bank at the edge of the structure have resulted from the removal of pre-outfall bank vegetation (riverine buffer vegetation) and from the loss of mitigation plantings on the riverbank (willow wands). Lack of effective protection of the riverbank at the downslope edge of the outfall structure has exacerbated baseline scouring along the riverbank. Over time, riverbank erosion at the outfall could have secondary impacts to the railroad trestle, located directly downstream from the KFIP site outfall structure (Figure 4-10).

Minimum Requirement #4 in the PCSWDM (related to preservation of natural drainage systems and outfalls) states that runoff cannot cause significant adverse impacts to downstream waters and downgradient properties, that all outfalls are required to use energy dissipation systems, and are required to "*prevent erosion at and downstream of the discharge location*". This requirement has not been met in that there are no effective energy dissipation measures in place between the leading edge of the outfall at top of bank and the river surface below. Energy dissipation measures are needed to protect the riverbank from erosive impacts caused by stormwater flows from the outfall. The river OHWM at this location is 38.5 feet elevation, and the leading edge of the outfall is approximately 41.5 feet elevation, resulting in a 3-plus-foot drop to the river and continually exposing the riverbank to considerable erosive forces.

In August 2021, WEST Consultants Inc. (WCI, 2021) prepared a river scour analysis for Viking LLC and Running Bear Development Partners, LLC. The stated purpose of the analysis was only to define scour potential in the Puyallup River near the BNSF Trestle Bridge which could result from notching the levee embankment to build the new outfall structure. Thus, the WCI analysis was limited to assessment of potential for river scouring during flooding events at the embankment below the new stormwater outfall structure, and assessment of potential for impacts to the BNSF RR trestle directly downstream. It did not include any assessment of potential scour impacts that might result from existing or future surface stormwater discharges from the existing Viking warehouse facility or the future KFIP warehouse complex.

In the analysis, WCI focused on the fact that the new outfall created a wide "notch" in the old levee embankment at the north end of the KFIP site. The report outcome indicates that the notch (i.e., the outfall structure location) increases potential for scouring, due to more water flowing through the notch or across the floodplain and back into the river through the notch/outfall structure during flood events than would previously have occurred. The WCI model assessed potential scour impacts of the 10-, 50- and 100-year floods. The model results indicated that the scour potential would increase during flooding events at the river embankment below the outfall as a result of construction of the outfall—particularly for the comparatively smaller events (such as the 10-year flood). The WCI model also indicated that scour potential would decrease a negligible amount at the BNSF railroad bridge abutments and piers just downstream from the outfall. Therefore, the WCI model predicts that the “notch” would increase river scour potential at the outfall, particularly during the 10-year storm (when floodwater depths are only moderately high), and when shallower flood waters have direct erosive impact on the outfall structure surface and the unprotected riverbank.

Removal of the levee and then further lowering the ground level for the outfall to create the notch has created a point of concentration for these overbank flows returning to the river during floods. While this was always the case at this location, the outfall has increased flow velocities, concentration of flow, and shear stresses (NHC and SCJ, February 2023). Based on observations by the EIS team, during high water events, the wide notch at the new outfall structure has allowed the river to backwater flood through the outfall structure and over farm fields to the southeast, with surface flooding extending 200–300 feet from the edge of the river. When the river surface drops, flood water flows back out to the river through the notch and over the exposed riverbank, leaving deep deposits of silts and fine sands in the base of the outfall from suspended river sediments and surface erosion of the farmed floodplain.

The WCI report concludes that the constructed outfall “*is expected to increase the risk of local scour at the base of the outfall embankment for each of the modeled flood scenarios if the existing countermeasures in place at the outfall are not sufficient.*” “Existing countermeasures” refers to how the outfall structure is constructed or designed to control erosion and sediment movement at the new “notched” location. However, the scour report specifically notes that WCI *“did not evaluate whether the existing scour countermeasures at the constructed outfall provide adequate scour protection as built.”* Thus, no guidance was provided by WCI as to whether the design of the outfall structure is adequate to resist and survive impacts from increased riverine flooding and scouring under current conditions, and no guidance was provided to describe potential impacts to the river or outfall structure from new upland surface flows (i.e., current runoff from the Viking warehouse site and future runoff from the KFIP warehouse complex discharging through the outfall).

City of Puyallup engineers reviewed the scour analysis report and noted that the model used channel bathymetry derived from riverbed surveys completed in 2002 for the 2017 FEMA Flood Insurance Study (FEMA, 2017). However, their local experience with the Puyallup River indicated the 2002 riverbed survey was outdated. This is supported by Google Earth photos, which indicate that a more recent gravel bar has formed on the right bank upstream of the railroad trestle. The new gravel bar has pushed the central flow channel against the left bank at the KFIP site. Therefore, the changed river hydraulics caused by the new gravel bar location might not be adequately represented in the 2002 riverbed survey, which was used as a basis for the WCI scour model analysis. This suggests that under existing conditions, scour potential along the left bank might be even greater than was indicated in the WCI analysis.

City of Puyallup engineers suggest that more recent cross sections of the river surveyed by the USGS and reported in a 2010 USGS Channel Conveyance Report (USGS 2010) should have been used for the scour analysis to better define potential impacts at the outfall from the river. Puyallup River data in the 2010 USGS report (based on river surveys from the summer of 2009) supports the contention that the main flow channel had moved closer to the left bank of the river since 2002. Under current conditions, the thalweg is at the toe of the left riverbank at the outfall.

To document and assess on-site evidence of scouring indicated by the WCI model, City of Puyallup engineers, stormwater management staff and hydraulics consultants have evaluated the outfall structure condition and performance during several site visits from September 2021 through June 2023. They also evaluated the condition of the levee embankment and organization of gravel bars in the river whenever on site in the past.

As described above, the Viking outfall structure currently discharges stormwater from a single warehouse facility into the Puyallup River. It is proposed to use the same outfall structure to receive runoff from the future KFIP seven warehouse development, which would be located directly adjacent to and east of the Viking facility. The review of current site conditions at the outfall by the City's hydraulics consultants (Northwest Hydraulic Consultants, NHC) did not distinguish between the two sides of the outfall, because the design is identical, as are the river processes acting on it. Therefore, their results describe current conditions affecting the entire outfall.

From field observations and as indicated from Google Earth photos, the EIS team and NHC hydraulics consultants verified that the center of the river channel (thalweg) was being forced to the left bank of the river near the KFIP outfall location due to the gravel bar along the right bank aggrading over time. During medium flows, the thalweg appeared to be running diagonally from right bank to left bank upstream of the outfall location and was directed at the KFIP site riverbank about 200 feet upstream of the outfall structure. They also noted that there was significant erosion along the left bank face of the levee, hydraulic impacts that affect the outfall location. During lower flows, the majority of the force of the thalweg is directed at the bank just upstream of the outfall due to a gravel bar constriction at this location. This existing condition does not appear to be considered in the WCI scour analysis and likely results in underestimation of the outfall toe slope scour risk.

WDFW Hydraulic Project Approval Technical Review

Since 2018, the outfall structure has been undergoing a separate and parallel permit and review process through the WDFW Hydraulic Project Approval (HPA) program (original permit 2018-6-194, issued 4 October 2018). The outfall construction was completed in fall of 2019. The 2018 HPA performance standards included site revegetation along the top and slope of the cleared riverbank with a minimum 80 percent plant survival requirement at the end of the 3-year monitoring period and required that the revegetated riverbank slope be able to withstand a 100-year flood event. No work was to occur waterward of the OHWM, as was depicted on 2018 outfall structure design drawings at the time (shown as being at 38.5 feet elevation).

At the end of the 3-year monitoring period in late 2022, WDFW met with KFIP consultants at the site to review conditions along the riverbank area regulated under the HPA. Based on results of that site assessment, WDFW issued a Correction Request on November 16, 2022, which noted that the riverbank was eroding. In addition, WDFW noted that there were 10 to 20 two-man boulders at or below the OHWM of the river, which were not allowed in the permit. The Correction Request documented that KFIP's consultant acknowledged that they had placed the boulders on the riverbank slope without permission. WDFW further noted that the required riparian area plant survival was less than the 80 percent required minimum.

Therefore, site conditions at the end of the three-year monitoring period in 2022 did not meet the 2018 HPA performance standards and were in violation of requirements that no materials would be placed waterward of the OHWM. Streambank stabilization work was required by WDFW to solve the problem.

SVC (KFIP wetland consultants) provided a concept sketch of a streambank stabilization plan to WDFW in late 2022, and a new HPA that defined the limits and intent of the proposed work was issued by WDFW on April 24, 2023. The proposed repair was approved with a requirement that the work be completed between April and August 2023. The work was completed in May 2023.

The 2023 HPA Project Description (Permit Number 2023-6-161+01) was as follows:

> *Placement of interwoven live willow brush, fascines, and root wads (36-inch diameter and 10 foot length) within an approximately 400 square foot area to address recent erosion that has occurred at the interface of the Puyallup R bank and outlet of the Viking stormwater facility. Intent is to infill and stabilize an area of pocket erosion and encourage the development of a live willow mattress (similar to what has already formed on the western half of the outfall) where high stem densities provide roughness and help recruit and retain sediment and resist surface erosion. Approximately 100 willow stakes will be planted.*
>
> *Proposed willow stakes may be subject to the planting and survival requirement conditions contained in a separate HPA (Permit # 2018-6-194+02, Application ID: 11998).*[7]
>
> *This work is considered a mitigative action to offset fish life impacts associated with the previous placement of 10-20 large cobbles/1-man boulders in the project area without prior HPA authorization. Proposed project is consistent with corrective actions required to attain voluntary compliance under Administrative Enforcement Identification Number 73.*

SVC's bank stabilization concept sketch was attached to the HCP. It showed installation of 8 feet long[8] willow tree boles with 3-foot-diameter rootwads extending below the OHWM at the river. No information was provided as to how the new OHWM was determined (more on this below). Notes in the concept sketch described the tree stems as being woven with two layers of branches at least 2 inches in diameter and 10 feet long. This "brush mattress" was to be backfilled with alluvium, then live stakes were to be installed at 2-foot centers throughout the brush mattress. Additional live stakes were to be placed at 1-foot centers along the riverbank upslope from and around the brush mattress perimeter and along the entire eroding bank slope about 20–30 feet upstream from the brush mattress. The brush mattress structure was to be anchored with chain to "existing buried wood" and to two ground anchors.

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[7] Indicating that 80 percent percent survival of plantings after three years and withstanding 100-year storm forces that were required in the original 2018 HPA will apply to the 2023 streambank stabilization work.

[8] The HCP required 10-foot-long tree boles.

The City was the lead agency in the original 2015 SEPA determination, which was part of permit review process for construction of the Viking warehouse in 2018. The Viking storm trunkline and one-half of the spillway (the physical outfall facilities) was dedicated to the City as a condition of the Viking project. The City received an easement for the area of the trunkline pipe and one-half of the spillway together with a maintenance agreement that covers the Viking portion of the outfall structure. The 2015 SEPA determination was apparently relied upon by WDFW as the basis for the 2018 and 2023 HPA actions, which reviewed the outfall under WDFW regulations. However, WDFW did not consult with the City about or give the City notice of the 2022 Correction Request decision or the 2023 HPA until after it was issued.

For this reason, the City sought feedback from its own experts as to the efficacy and impacts of the outfall structure as well as the proposed streambank stabilization repair work being undertaken for the 2023 HPA. The City is actively seeking resolution and additional information from WDFW as to the process, approval, and design for any future work that may be carried out under an HPA permit.

The City's hydraulics consultant (NHC) evaluated both HPAs and the eroding riverbank at the outfall both before and after May 2023 repair work was carried out. NHC and SCJ prepared a deficiencies report outlining critical hydraulic functions affecting bank stability and associated habitat mitigation conditions in and near the outfall structure (NHC and SCJ, February 2023). In June 2023, NHC prepared a separate HPA Mitigation Action Assessment (NHC, June 2023), a memorandum specifically addressing the May 2023 repair work required under the 2023 HPA and carried out by SVC, KFIP's wetland consultant. In August 2023, the City's fisheries biologist consultant (Confluence Environmental) reviewed both HPAs as well as the May 2023 streambank stabilization work and prepared a report describing typical standards for this work as well as an assessment of how the May 2023 repair work would affect listed fish and fish habitat in the Puyallup River.

In the Deficiencies Report, NHC noted that the 2018 HPA for the project includes conditions which address the hydraulic performance of the outfall structure and requirements for bank protection:

> *Provision 24. The biotechnical bank protection technique design must withstand the 100-year peak flow.*

NHC also noted the lack of surveyed benchmarks in the KFIP design drawings (as required in the HPA permit[9]). This baseline information is needed to inform future outfall structure and riverbank monitoring and functional assessments.

As described in the Deficiencies Report, since completion of the outfall structure in fall 2019, there has been an almost complete failure of the biotechnical bank protection where the outfall discharges to the Puyallup River; however, there has not been a 100-year event. The 100-year peak flow on the Puyallup River just upstream from its confluence with the White River (less than 0.5 mile downstream from the

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[9] HPA 11998, Permit #2018-6-194+02: "*Requirement 23. Establish the waterward distance of the structure from a permanent benchmark(s) (fixed objects). Locate and mark the benchmark(s) in the field prior to the start of work. Protect the benchmark to serve as a post-project reference for ten years.*"

outfall) is estimated by FEMA as 43,500 cfs. The peak flow experienced to date since completion of the outfall structure in 2019, as reported by the USGS for the Puyallup River at E. Main Bridge (USGS gage 12096505, immediately downstream from the outfall), was 33,500 cfs on 7 February 2020. This was approximately a 25-year peak flow, well below the 100-year peak flow. It is evident that the bank protection as originally designed and built has failed to meet the 100-year peak flow performance standard required under the HPA. NHC simulated main channel velocities "*to be around 7-8 ft/second at the outfall, with some high velocity zones on the bank due to converging return flows from the floodplain,*" and therefore they expect more bank erosion in the future.

As described in the NHC Mitigation Action Assessment report, it is doubtful that the May 2023 installation would meet this same 100-yr flow requirement (NHC, June 2023). To assess the May 2023 streambank stabilization treatment, NHC visited the site on June 8, 2023, less than a month after the installation was complete. They documented bank slumping between the newly installed brush mattress and live stakes; They observed that the tree boles with rootwads were secured to an existing stump with manila rope (not with chain, as described in the sketch drawing) on the upstream side and to a mechanical anchor on the downstream side of the installation; They noted that the clean sandy material that was used to rebuild the slope is cohesionless and likely to re-erode during expected future flood events.

> *…we do not expect the brush mattress to provide significant long-term bank protection or stability. The mitigation effort also did not address stormwater discharge related erosion concerns, namely the creation of incised single threaded channels and cascading flow conditions at the interface of the outfall and Puyallup River. Both of which are anticipated to result in long-term stability and maintenance issues.*

In the Deficiencies Report, NHC noted that both the current PCSWDM (Minimum Req. #4) and SMMWW (Ecology 2019) require that new outfalls must not cause a significant adverse impact to downstream receiving waters and downgradient properties and are required to provide for energy dissipation. However, there are no energy dissipation measures in place between the leading edge of the outfall at top of bank and the river surface below. During periods between floods, this results in a 3-plus-foot drop to the river from the outside edge of the stormwater outfall, which results in erosion and undermining the bank at the structure.

Since outfall construction was completed in 2019, much of the bank near the outfall structure has been severely eroded. In Figure 4-9, Figure 4-10, and Figure 4-11 (from the Deficiencies Report), note the areas of severe erosion and scalloping just upstream from the outfall in 2019 and 2020 where there is minimal riparian tree vegetation (Figure 4-9 and Figure 4-10). Also note the subsequent loss of riverbank on both sides of the central line of Ecology blocks when comparing the 2019 aerial photo (Figure 4-10) to the 2022 site photo (Figure 4-11). NHC noted in both reports that five to ten feet of riverbank was eroded away along the outside edge of the outfall.

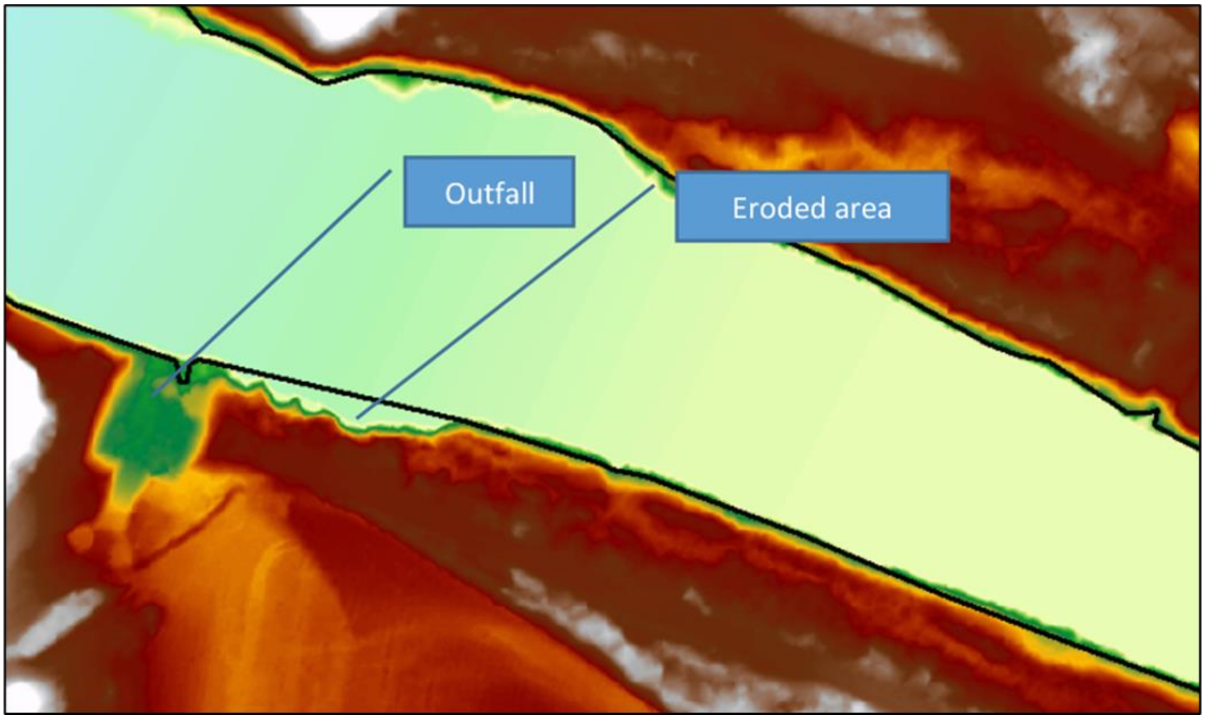

Figure 4-9. 2020 LiDAR topography with 2011 bank line in black showing more recent bank erosion upstream of the outfall, which has occurred since clearing for construction was initiated in 2018. Final mitigation plantings installed in 2020.

Figure 4-10. December 2019 UAV image annotated with erosional features. The riverbank waterward of the edge of outfall has eroded 5–10 feet since this photo was taken.

The May 2023 repair work was limited to soft armoring installations comparable to what had already failed in the past. This continued attempt to address the bank erosion problem in this high energy hydraulic environment with soft armoring and low energy bank stabilization techniques does not address the significant hydraulic forces indicated by past flood events and river data, and it does not address the lack of appropriately sized and engineered energy dissipation devises or materials that are still needed at the interface between the outfall and the river.

Figure 4-11. Concentrated flow spilling over, eroding, and undercutting vegetated bank. Photo taken on March 15, 2022, NHC.

Most of the originally installed streambank stabilization efforts (draped coir fabric and willow wands) on the top of bank and down the sloped face of the river bank at the outfall structure are gone (scoured away during annual rainy season flooding), and some of the A-Jacks at the outside edge of the outfall structure have been undermined and are only prevented from falling into the river by their retaining cables.

City engineers and other permitting agencies (including but not limited to WDFW and Ecology) prefer to first consider use of softer or more natural mitigation measures designed to push the river thalweg away from the left bank and outfall structure, such as barbs or constructed log jams. These would be designed to deflect flow away from the bank and mitigate for the increased shear stress at the edge of the structure while also increasing channel complexity, improving habitat, and restoring natural riverine functions.

However, the May 2023 streambank repair is not adequately robust to counteract the significant river hydraulic forces at this location. Properly engineered “soft armoring” structures could be used at the western end of the remaining levee (eastern side of the new outfall) on the river side. However, these measures must be designed to withstand considerable hydraulic forces during high flows, and most likely would need to be interlaced with some hard armoring structures or materials.

Reports from both the City's hydraulics experts (NHC) and KFIP's scour analysis report (WCI, August 2021) indicate that scouring at the riverbank is expected and hard armoring would be needed to counteract those forces.

The WCI report recommended riprap at the riverbank toe slope if needed to address the predicted increased scour problem from the river (more discussion on this below). Recent analysis by NHC indicated that the riprap sizes recommended by WCI were unlikely to be sufficient to withstand the hydraulic forces present at the outfall location. To address the increased scour potential and ongoing erosion in the present environment (ignoring future impacts from KFIP stormwater), consideration should be given to riprap protection along the toe of the bank at the outfall and should extend from the railroad bridge to a suitable point upstream of the outfall. This hard armoring could be integrated with certain soft armoring and/or professionally designed bioengineering measures in more protected areas that are better able to withstand this high energy riverine environment. Further analysis is needed before deciding on specific solutions, riprap sizes and engineering design, and all in-stream structures will require review and permitting from federal and state agencies.

Other Outfall Design Issues

During EIS Team site visits in 2021, 2022, and 2023, in addition to documenting ongoing riverbank erosion problems, the EIS team noted that the outfall structure had flooded many times since construction was completed in 2018–2019 (as documented in Figure 4-12).

Stamped engineering drawings from 2018 show that the base of the outfall has a surface elevation ranging between 41.5 and 42.4 feet and an Ordinary High Water Mark elevation of 38.5 feet. However, OHWM guidance from Ecology (Ecology [F], 2016) indicates that the OHWM should be higher than any unvegetated gravel or sand bars in the adjacent river and indicates that the OHWM elevation is typically equivalent to the 2-year flood stage, as would be determined from river gages adjacent to the Project site location. A quick analysis of the directly downstream E Main USGS 12096505 stage data (with data from water years 2011 through 2023), shows that the 2-year stage is about 42.8 feet NGVD29 (46.29 NAVD88). And this gage is a foot or two lower in elevation than the outfall location. This gage data, as depicted in Figure 4-12 below, indicates that the OHWM elevation of 38.5feet marked on the site design drawings may require revision and updating to reflect current conditions and river gage data, and as may affect expected permitting and review processes. With new site conditions that have resulted from riverbank erosion and outfall construction, a new assessment and determination of OHWM elevation and location that follows guidance from Ecology should be carried out, and a new OHWM report should be provided.

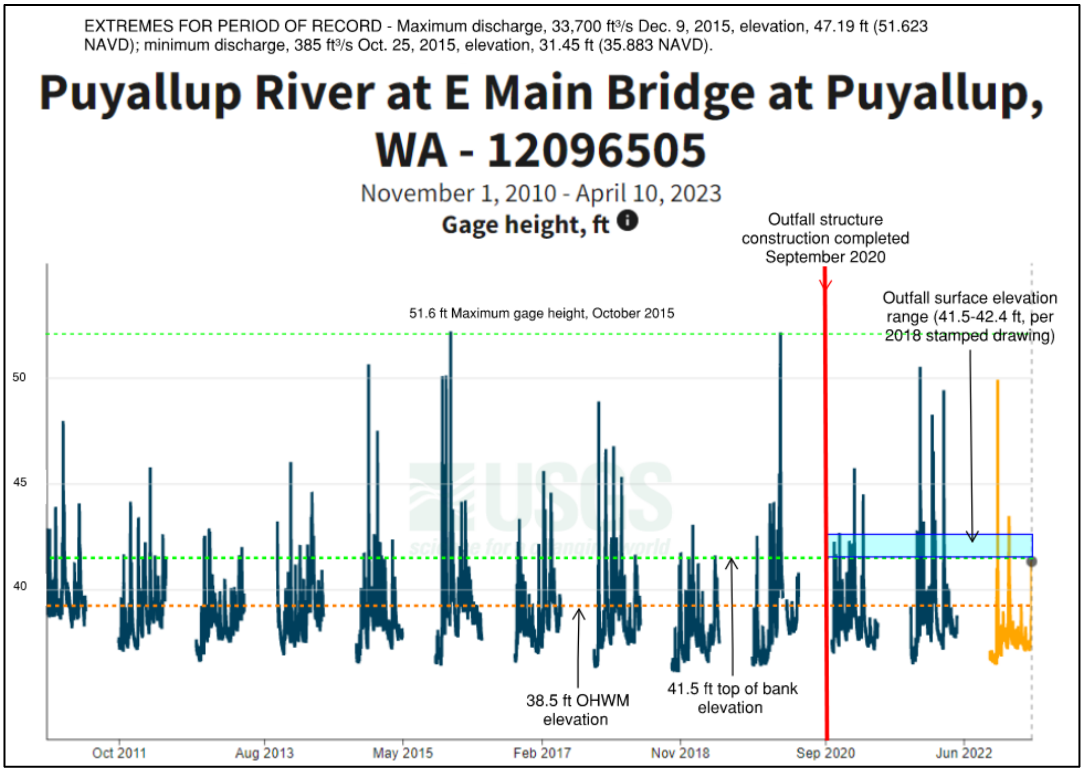

Figure 4-12. Showing flood events record in relation to the outfall structure elevation (indicated with a blue polygon).

In a related issue, the Puyallup River typically carries suspended fine sand and silt sediments from glacial meltwater, which have settled within the base of the outfall structure during repeated flooding events over the years. The flood sediment deposits may also be affected by erosion and translocation of sandy floodplain sediments from unvegetated farmed surfaces within the on-site floodplain (Figure 4-13) during backwater flooding events, which have occurred at least two times since outfall construction was completed. This has resulted in deep sandy flood sediment deposits within the outfall structure, over three feet deep in some areas, which periodically bury or scour away existing vegetation and impact outfall structures, such as Ecology blocks, logs, and boulders. Stormwater discharges from the Viking site have eroded deep channels through these flood sediments to reach the riverbank (Figure 4-14), indicating that the sediment filled outfall base does not provide significant energy dissipation function.

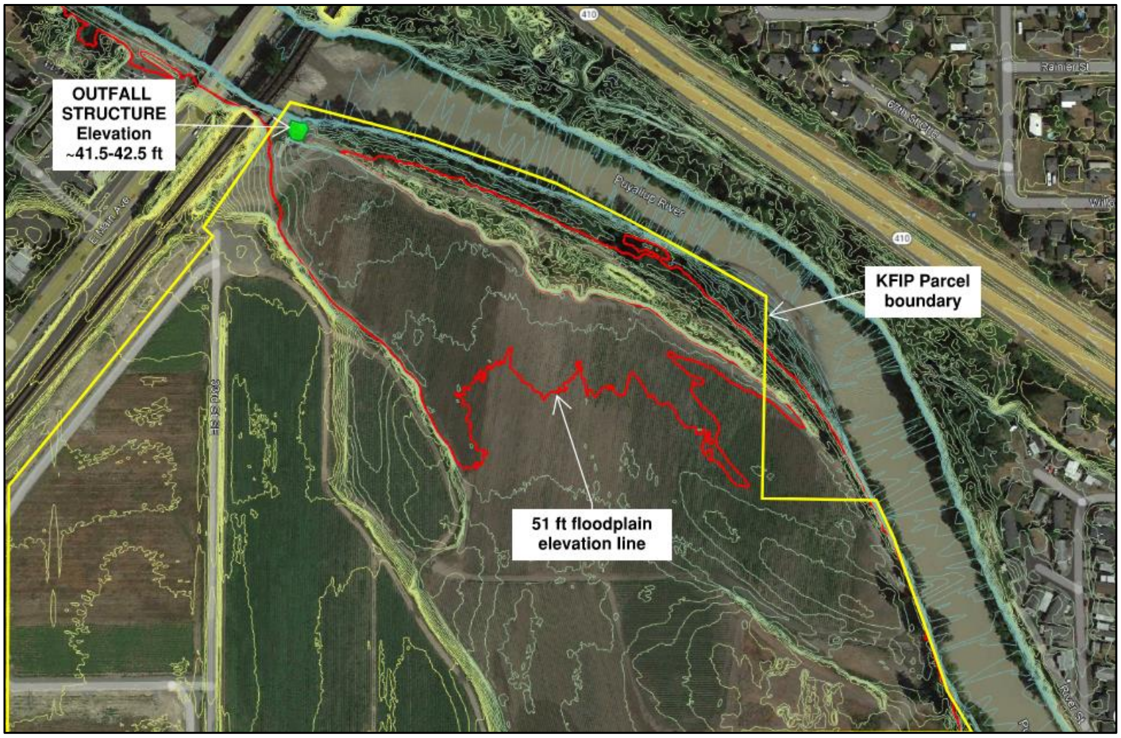

Figure 4-13. LiDAR topography showing the 51 ft elevation line on the floodplain, as relates to the 25-year flood event (51.6 ft elevation) recorded in October 2015.

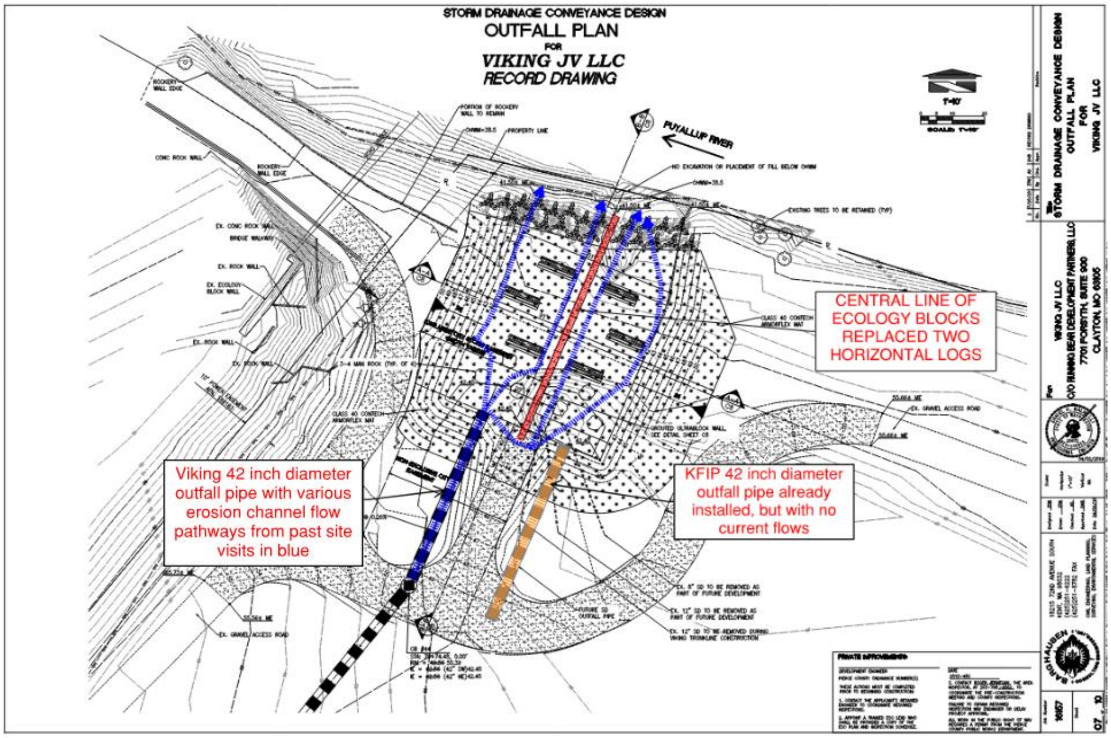

Figure 4-14. Figure adapted from Soundview 2020 Sheet C7, As-Built outfall facility showing deep eroded stormwater channels observed during various Viking outfall site visits (blue lines). The erosion channels reform each year in response to new flood deposits and subsequent runoff events.

The 2018 *Offsite Conveyance Report* prepared for the KFIP site (Barghausen 2018) indicates that the outfall design assumed sheet flow of stormwater discharge through the outfall structure. There are no calculations or detailed information in the report showing that intent, and under current conditions, there is minimal if any sheet flow through the outfall, but rather there is deep channelized flow through flood-deposited sediments. The 2018 report does not mention any expectation of flood sediment deposits in the outfall base. An outfall structure designed to provide for energy dissipation during storm events would typically include hydraulic analysis and engineering specifications in its design drawings or monitoring plans. Such materials have not been available with regard to this application. There are no documents or outfall design descriptions indicating that significant sediment deposition and the subsequent channelization of stormwater discharges was expected and accounted for in design of the outfall structure; nor whether the sediment deposits and channelization presents a concern related to the performance of the structure.

Observations by the EIS team experts of current conditions in and around the outfall raised concerns about the possibility of failure and associated significant adverse harm to the riverbank and river system as a result. Failure would mean there is no available engineered outfall to effectively serve the current Viking site or the fully developed future KFIP site. Current conditions indicate the outfall would not disperse or control impacts of stormwater outfall flow and would not protect the riverbank and downstream areas from erosion when at full flow discharge capacity under current or future developed site conditions.

Design drawings depicting changes to the outfall structure design over time show that at least two different outfall facility designs were considered. A detailed analysis of the changes to design over time is provided in the recent deficiencies report (NHC and SCJ, 2023). The original outfall design was included in the Talasea Mitigation Plan report (March 1, 2018) and was approved by Pierce County. That outfall design plan showed eight anchored logs installed in staggered offsets, presumably intended to force water from the two 42-inch-diameter outfall pipes to meander and spread throughout the structure base, a dissipation function. The western pipe currently receives flows from the existing Viking warehouse. The eastern pipe is not yet active but is intended to receive future flows from the not yet constructed KFIP seven-warehouse complex.

A revised outfall facility design was submitted to Pierce County by the KFIP engineer on March 27, 2018 (Figure 4-14). The updated design removed the previously proposed Armor Flex mat that was to extend down the riverbank to below the OHWM. In the revised design drawing, the Armor Flex mat terminates approximately 10 to 15 feet landward of the riverbank, several feet above and landward from the designated OHWM location. The design change also removed two of the eight logs from the center of the facility and replaced the central logs with a line of Ecology blocks oriented perpendicular to the riverbank shoreline, separating the west (Viking warehouse) from the east side (future KFIP warehouses) of the structure, and retaining three staggered logs (a total of six logs) on each side of the central line of Ecology blocks (Figure 4-14). Installing the line of Ecology blocks was apparently in response to a regulatory need to delineate the Puyallup side of the outfall from the KFIP side. The intent was to separate current stormwater flows from the Viking warehouse through the western side of the outfall (managed by the City of Puyallup through an easement agreement) from future proposed stormwater flows through the east side of the outfall (i.e., from the KFIP warehouses stormwater runoff). The KFIP site is located in unincorporated Pierce County.

Removing the Armor Flex mat from below the OHWM meant that there was no longer a plan for direct in-river impacts. This eliminated a requirement for Section 404/401 permit review by state and federal agencies but did not eliminate the requirement to protect the bank from erosion, as required under state law and County regulations. The previously proposed Armor Flex mat that was originally shown as extending downslope to below the OHWM at the riverbank was replaced by a soil berm at the top of the riverbank covered by a coir mat fabric and planted with willow wands. As discussed above, since 2019, most of the soil berm, coir fabric and willow wands have subsided or been washed away during annual winter floods.

Within the outfall structure, flood sediments have mostly buried the log and rock features in the base that were intended to provide for stormwater energy dissipation. At least one of the previously anchored logs is no longer in place and was carried away during a past flood. Stormwater flows from the Viking site periodically back up behind the flood sediment “dam” at the riverbank. Depending on flood and storm duration, the dammed water backs up enough to flow around the upslope end of the central line of Ecology blocks. This has created seasonally variable, deep erosion channels through the sediment along both sides of the central Ecology blocks, dumping sediment laden water directly into the river with minimal dispersion, detention, or treatment.

As of this writing, City requests to the Applicant asking for structure engineering details specific to this outfall that may be used to assess performance standards have not been met. No specifically defined structural indicators or guidance have been provided that could be used to determine how or whether the engineered outfall structure is performing as designed versus whether some component of the structure is failing now or might fail in the future. As mentioned above, the 2018 HPA Permit required surveyed benchmarks to provide a baseline for assessment of erosion volumes, and to inform future outfall structure monitoring and functional assessments. This baseline information has not yet been provided by the KFIP design team.

Therefore, evaluation of the structural integrity, intent, and function of the outfall structure in its current condition has been and will be based on monitoring, direct observations, and data collection by the EIS team. These direct assessments by the EIS team indicate that the structure is not operating as intended or expected and is degrading. Maintenance and upgrades are needed to ensure the outfall does not further degrade and impact the riverbank and water quality under current and future conditions.

Mitigation and Monitoring

The outfall structure is supposed to have two purposes:

1) Energy dissipation for the maximum flows that are proposed to be discharged from both stormwater pipes (current Viking site outfalls and future KFIP site outfalls) through the outfall structure, down the bank and into the river.
2) Mitigation for critical area and shoreline habitat impacts to the river buffer and shoreline, i.e., to compensate for loss of riverine buffer habitat (vegetation) caused by grading and clearing to construct the outfall structure.

To reduce the likelihood of future failure and potential harm to the outfall and river, and to assist with outfall structure monitoring over time by City and County maintenance staff, a separate engineering design report and monitoring plan for the outfall structure is needed, and should be prepared by a qualified engineer, and monitoring of the structure should be carried out by similarly qualified experts or professionals.

- The engineering report would provide a clear record of design and purpose of each structural component of the outfall and would explain the range of expected impacts of river flood hydraulics, sediment deposition and stormwater discharges. It would also provide guidance as to how much sediment deposition, erosion or loss of riverbank is allowed or expected as part of "normal" outfall facility function.
- The engineering monitoring plan would provide specific performance standards intended to assess or measure changes in energy dissipation performance and structural integrity of the engineered outfall structure over time. The definition of structural component "failure" must be provided, and a contingency plan response would be required.
- Any monitoring work and the associated report intended to assess structural condition and function of the outfall must be carried out and written by a qualified engineer or equivalent professional. If the monitoring indicates degradation or failure, a contingency plan to resolve the problem must be developed.

In contrast, the monitoring work described in the mitigation and monitoring plan (2018 TDMP, Talasea) is designed to assess success or failure in relation to mitigating for loss of shoreline and critical area habitat, as required in Pierce County code due to removing the naturally vegetated riverine buffer in the outfall area as needed to allow for construction of the stormwater outfall.

To meet PCC 18E.40.070 habitat mitigation monitoring requirements (provided below), once the initial mitigation plant installation was reported as complete (Soundview Consultants As-Built Report, SVC 2020), the follow up annual monitoring site visits and reports are intended to determine and document whether the mitigation site has met specific performance standards defined in the 2018 TDMP, such as a minimum required percent cover from native vegetation or minimum required percent survival after a certain time period.

> *PCC 18E.40.070.3.: Monitoring reports for mitigation projects specific to vegetative restoration or enhancement shall comply with the following:*
>
> *a. Monitor for a period of time appropriate to the nature of the project (single-family versus commercial) and the complexity of the mitigation project. The majority of monitoring programs will last a minimum of three years and are to be submitted according to the following schedule:*
>
> *(1) At completion of construction of mitigation project (as-built report);*
> *(2) Thirty days after completion;*
> *(3) Early in the first growing season after construction;*
> *(4) End of the first growing season after construction;*
> *(5) Twice the second year; and*
> *(6) Annually after the second year.*
>
> *b. Deviation from this schedule may be allowed based upon project specific conditions*

The annual monitoring and report preparation needed to meet PCC 18E.40-070 requirements is typically carried out by the Project wetland scientist. Until recently, only the As-Built report had been provided. A combined Year 1 and Year 2 report was submitted to Pierce County in December 2022, which has been reviewed. However, in absence of annual monitoring reports since 2020, the EIS team evaluated the mitigation area conditions during several site visits throughout 2021 and in early 2022, documenting the following:

- Planted and native vegetation losses along the riverbank and within the outfall structure due to scouring impacts from flooding and being buried by sandy flood sediments,
- Die off of installed mitigation plantings just outside the upland perimeter of the outfall structure.
- Expansion of non-native invasive plants in and around the outfall facility (including but not limited to water cress, Japanese knotweed, reed canarygrass and Himalayan blackberry),
- Cloudy and discolored water discharging from the currently active Viking outfall.
  - Section 5.6, page 9 of the Talasea Mitigation and Monitoring Plan (2018) indicated that cloudy water might be a water quality indicator and should be tested to determine the source of the discoloration if observed during the annual monitoring visits.

The loss of planted vegetation intended to provide for habitat replacement, an increase in weedy species cover, and evidence of potential for water quality problems (cloudy water from the Viking outfall) all indicated a need for additional monitoring and testing, and potential failure to meet the performance standards defined in the 2018 TDMP.

The December 2022 Year 1 and 2 Monitoring Report (SVC 2022) agrees with some of the EIS team observations. SVC noted loss of some of the mitigation area plants, and directed KFIP to order and install 57 new plants, with species selected from the approved plant list. SVC reported that those plants were installed in December 2022, but did not describe what specific plants were installed, or in what areas. By carrying out the replanting work, SVC stated that the mitigation area currently meets Performance standards A1 (at least 6 species of desirable native plants) and A2 (at least 80 percent survival of new plants by the end of Year 2, as supplemented by the recent plantings, which presumably would survive) and Performance standard A3 (at least 20 percent cover by woody species by the end of Year 2).

Objective B, which includes Performance Standards B1 and B2, is specifically described as being a "non-mitigation area", in that it was not intended to meet Critical Areas Rules intended to replace lost habitat functions, but rather is simply plantings that were installed in and near the outfall structure either to provide some water quality treatment or bank stabilization function.

SVC stated that the site meets requirements of Performance Standard B1, which was that 100 percent of the plants within the bioengineered stormwater release area must be alive by the end of Year 1, but they fail to mention loss of most of the planted willow area at the top of the riverbank (which occurred in Year 1), or that at least 10–20 percent of the outfall base is periodically covered with deep sandy flood sediments, which buried some of the originally installed plants in the outfall base during the first winter after planting. For this reason, it does not appear that the site has met requirements of B1, but this Performance standard is not intended to be a habitat mitigation standard.

SVC's ongoing and parallel work with WDFW in relation to the HPA and efforts to control erosion at the riverbank indicates an effort to solve at least some of this deficiency, but it does not address impacts of the repeated sandy flood deposits on outfall vegetation, which effectively eliminate the water quality treatment and dispersion function of the outfall structure.

Performance Standard B2 requires that at least 40 percent of the articulated mat (outfall base and sidewalls) must be covered by vegetation by the end of Year 2, and because the areas not completely covered by sandy flood sediments are mostly vegetated, they appear to have met that minimum standard. However, we note that almost 100 percent of the herbaceous vegetation on the Viking side of the outfall is watercress (a non-native, invasive plant), which should be controlled and removed if possible.

They also noted presence of certain weedy species, specifically reed canarygrass and Japanese knotweed as well as a small area of Himalayan blackberry, which they estimated were less than 1 percent cover in the planted mitigation areas. The EIS team assessment indicated a higher, but still less than 10 percent cover by weedy species within the planted area, but a definite higher percent cover just outside of the planted area, which indicates potential for reinvasion by weedy species later. The monitoring report recommended ongoing weed control and treatment, and specifically described ongoing eradication efforts being undertaken with the knotweed.

In summary, most of the mitigation planting area outside of the outfall structure does appear to be on track to meet the habitat replacement and weed control requirement, but Performance Standard B1 requirements are not met, and cannot be met until the ongoing erosion problems at the riverbank are resolved.

Wetlands

The KFIP Study Area was evaluated for the presence of wetlands in 2016, and a wetland report describing four on-site wetlands was prepared by Soundview Consultants (SVC 2016). In 2021, the EIS team field-checked the results of that work.

Wetlands which were mapped in the past as covering more than half of the floodplain to the south are currently reduced to the three mapped narrow linear wetland depressions (Wetlands A, B, and C), which are located along the base of the high terrace to the east. These three wetlands are fed primarily by groundwater seeping from the upper slope terrace and are mostly isolated from the Puyallup River except during extreme flooding events. Wetland D is located on the high terrace near the southeast corner of the proposed KFIP warehouse complex. The locations of these wetlands in relation to the proposed KFIP Project are shown on Figure 4-15; details are provided in Table 4-9.

What wetland classes occur at the Project site?

Cowardin Classification

- **Palustrine emergent (PEM)**
  Areas dominated by sedges, rushes, grasses, cattails, and bulrushes.
- **Palustrine scrub-shrub (PSS)**
  Areas dominated by woody vegetation less than 20 feet tall.

All four Wetlands are Palustrine Emergent/Palustrine Scrub-Shrub (PEM/PSS) wetlands. Wetlands A, B and C have formed in linear, old oxbow depressions at the toe slope of the high terrace, in the Puyallup River floodplain at the eastern end of the KFIP site. Their hydrology is primarily supported by groundwater seeping from the upslope terrace to the west, but also by direct precipitation during winter months.

Wetland D has formed in a depression on farm and pasture uplands in the southeastern portion of the high terrace, outside of the river floodplain. Wetland D is supported by rising groundwater in winter months and surface water runoff from the south, inflow from drainages that conduct runoff along 80th Street East.

According to the 2016 SVC report, Wetlands A and B were rated as Category III, Wetland C was rated as Category II, and Wetland D was rated as Category IV.

Wetlands A, B, and C were assigned 150-foot buffers, based on Pierce County Code (PCC 18E.30.060). The SVC report described Wetland D as being off site and too small to be regulated or buffered by Pierce County under the PCC 18E.30 (Wetlands). However, subsequent field work and review by EIS team consultants in 2019 and 2020 found that Wetland D was larger (about 3 acres) and about 1 acre of the wetland extended onto the KFIP site (SCJ Alliance, September 2021).

Wetland **Category** ratings range from Category I to IV, highest quality to lowest quality, respectively. The category is determined by scoring, based on the 2015 Western Washington Wetland Rating System, developed by the Washington State Department of Ecology and adopted by Pierce County.

Thus, as required under Pierce County and state wetland protection regulations (administered by Ecology), mitigation will be required if portions of Wetland D and/or its buffers are impacted by the proposed KFIP Project (as is proposed).

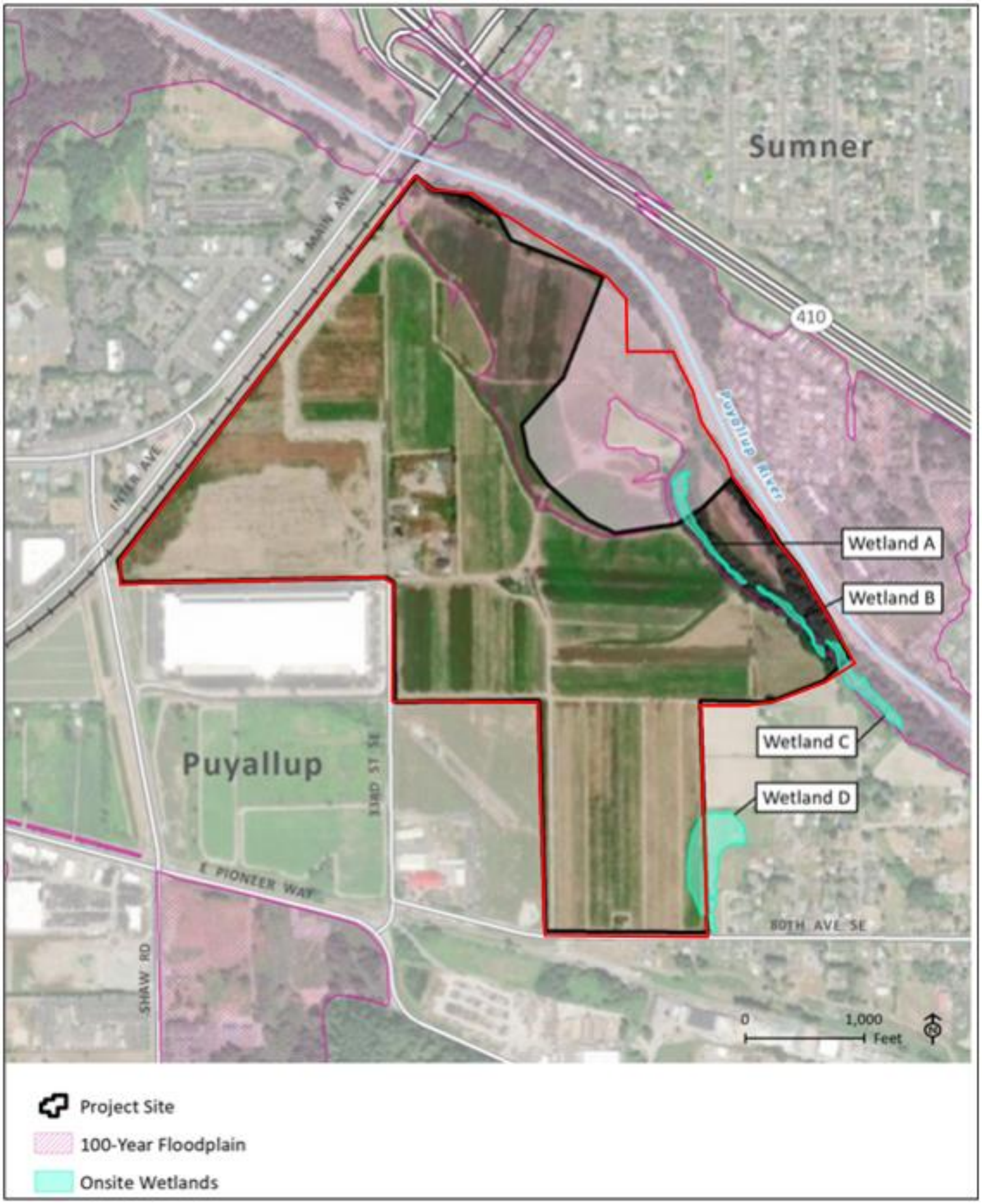

Figure 4-15. On-site Wetlands, floodplain, and farming on the floodplain

Table 4-9. Wetlands at the KFIP Site

Wetland	Type	Category	Buffer (feet)	Wetland Acreage[a]
A	PEM/PSS	III	150	0.6 acres (26,869 square feet) (per SVC 2015)
B	PEM/PSS	III	150	0.26 acres (11,396 square feet) (per SVC 2015)
C	PEM/PSS	II	150	0.72 ac (31,547 square feet total); 0.09 ac on site (3,916 square feet on-site)
D	PEM/PSS	IV	50	3.03 acres (132,237 square feet) (per EIS team 2021)

[a] On-site wetland area for WL A, B and C is from SVC 2015 wetland report; Off-site WL C area and WL-D area is from EIS team, 2021 work

Wetland D was re-rated by the EIS team in 2021 (SCJ Alliance, September 2021). The rating result was a Category IV wetland (in agreement with 2016 SVC report). However, because Wetland D is larger than described in the 2016 Soundview Consultants report, it will be regulated and buffered under Pierce County code with a standard buffer width of 50 ft.

All four wetlands and their buffers are impacted by periodic flooding and by farming practices. Several floods over the past 20-plus years have deposited and transported sediment across the floodplain and scoured the surface, resulting in habitat modifications at Wetlands A, B, and C, which formed in old river flood oxbows. Ongoing farming practices, such as plowing, draining, cropping, and clearing vegetation in the wetland buffers and greater floodplain have removed native plants in most of the floodplain, affecting surface water and associated groundwater systems. The on-site portions of Wetland D and its buffers are plowed and planted to crops every season. Off-site areas to the east are used as seasonal pasture for farm animals.

Floodplains

Most of the floodplain at the KFIP site is a broad, relatively flat terrace with surface elevation ranging from about 50 to 54 feet (KFIP site survey map, stamped 03/23/2021). Survey maps and the USGS river stage gage data (USGS gage 12096505, Puyallup River at E. Main Bridge) indicate that the floodplain surface is about 8 to 10 ft higher than the adjacent Puyallup River surface during periods of low flow in summer months. However, USGS river gage data documents that the river rises and floods across parts of the floodplain surface regularly during winter months (Figure 4-12).

USGS gage data shows that the greater KFIP site floodplain has flooded at least five times since 2015 (elevations above 50 feet), and that the river water surface has risen above 41 to 42 feet elevation (the outfall structure surface elevation) several times each winter. Since outfall construction was completed in 2019, there have been several events that flooded across or through the notched outfall, covering the entire outfall structure with several feet of water. Some of the backwater floods have extended a few hundred feet into the adjacent upslope farm fields. These period floods have deposited three or more feet of sandy sediments within the base of the outfall and at least a few inches of sediment across adjacent farm roads and fields.

A large portion of the on-site floodplain, particularly the areas near the outfall structure, continues to be farmed during summer months. Long-term farming across the on-site floodplain has resulted in loss of most native vegetation (visible in Figure 4-13). The only remnant native vegetation occurs in a narrow riparian strip along the Puyallup River, about 25 to 50 feet wide, and immediately around the perimeters and terrace backslopes of Wetlands A, B and C. These areas include a mixture of mostly native trees, shrubs, grasses, herbs, and vines, but also include many non-native weedy tree, shrub, and herbaceous species. The deep-rooted woody plants act to hold and trap sediments wherever present. But there is minimal protection from surface water erosion and sediment movement during winter flood events across most of the farmed and cleared floodplain areas near the outfall, and loss of riparian vegetation at the river edge at and directly upstream of the outfall structure has also resulted in an increase in surface water erosion at the riverbank. Floodplain protection rules specifically describe an intent to minimize damage to critical fish and wildlife habitat areas, which includes a need for protection of the riverbank at the edge of the floodplain to control and not increase erosion.

As described above, the stormwater outfall structure was constructed in the floodplain at the northern end of the KFIP site at the edge of the Puyallup River. The outfall structure currently receives runoff from the existing Viking Warehouse facility; The eastern half of the outfall structure is intended to receive future runoff from the KFIP facility.

Future flows to the outfall are intended to include all of the Viking contributing stormwater basin as well as all of the KFIP warehouse site and its contributing stormwater basin. Thus, future flows would be significantly greater than under current conditions.

Despite recent repair efforts (required under the HPA, as discussed above), current conditions indicate ongoing erosion of the riverbank at the edge of the outfall structure and significant annual sediment deposits from flooding within the outfall structure with deeply eroded flow channels which change over time (Figure 4-14[10]). The PCSWDM (Minimum Requirement #4) which requires that the facility be designed, installed, and maintained to use energy dissipation systems and to "*prevent erosion at and downstream of the discharge location.*"

Flood sediment deposition from surface water flooding and subsequent erosion of flood sediments on a floodplain are a natural component of the river flooding and dynamics, and therefore, are not necessarily in violation of the stormwater manual's regulations regarding erosion. However, the outfall is not a natural part of the floodplain, and regulations regarding proper engineering of structures in a floodplain require energy dissipation and erosion control. Stormwater discharges are eroding the bank and falling several feet into the Puyallup River during periods of lower flows. Absence of effective energy dissipation within the outfall base and poor erosion control at the downstream end of the constructed outfall facility appears to be in violation of the PCSWDM regulations (Minimum Requirement #4) related to preventing erosion at the discharge location.

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[10] Figure 4.2-8 adapted from Soundview (2020) Sheet C7, As-Built Outfall Facility, showing deep eroded stormwater channels observed during various Viking outfall site visits (blue lines). The erosion channels reform each year in response to new flood deposits and subsequent runoff events.

As discussed previously, an expanded hydraulic analysis is needed to study the interacting effects of hydraulics in the river, the floodplain and from the current and future outfall volumes. This work is needed to determine how these interdependent hydraulic systems would perform together during peak rain fall events, low to high river flows and flooding. Results of this study can be used to determine whether the floodplain functions are adequately protected, and if riverbank stability is ensured. The results should also provide guidance or baseline performance standards to determine whether erosion at the outfall would eventually destabilize the structure, resulting in failure and impacts to the River.

Shorelines

Shorelines on the KFIP site include lands extending landward 200 feet from the OHWM of the Puyallup River, plus any floodplain within 200 ft of the edge of the floodway, and to the outer edge of any associated wetlands within the floodplain. Therefore, the entire floodplain on site to the toe slope of the high terrace, including the floodplain wetlands, is within the regulated Shoreline zone (Figure 4-16). Conditions in the Shoreline Zone (i.e., conditions in the floodplain, floodplain wetlands, and riparian wildlife habitat) have been described above, and in Sections 4.3 Groundwater and 4.4 Plants and Animals. No further discussion is provided.

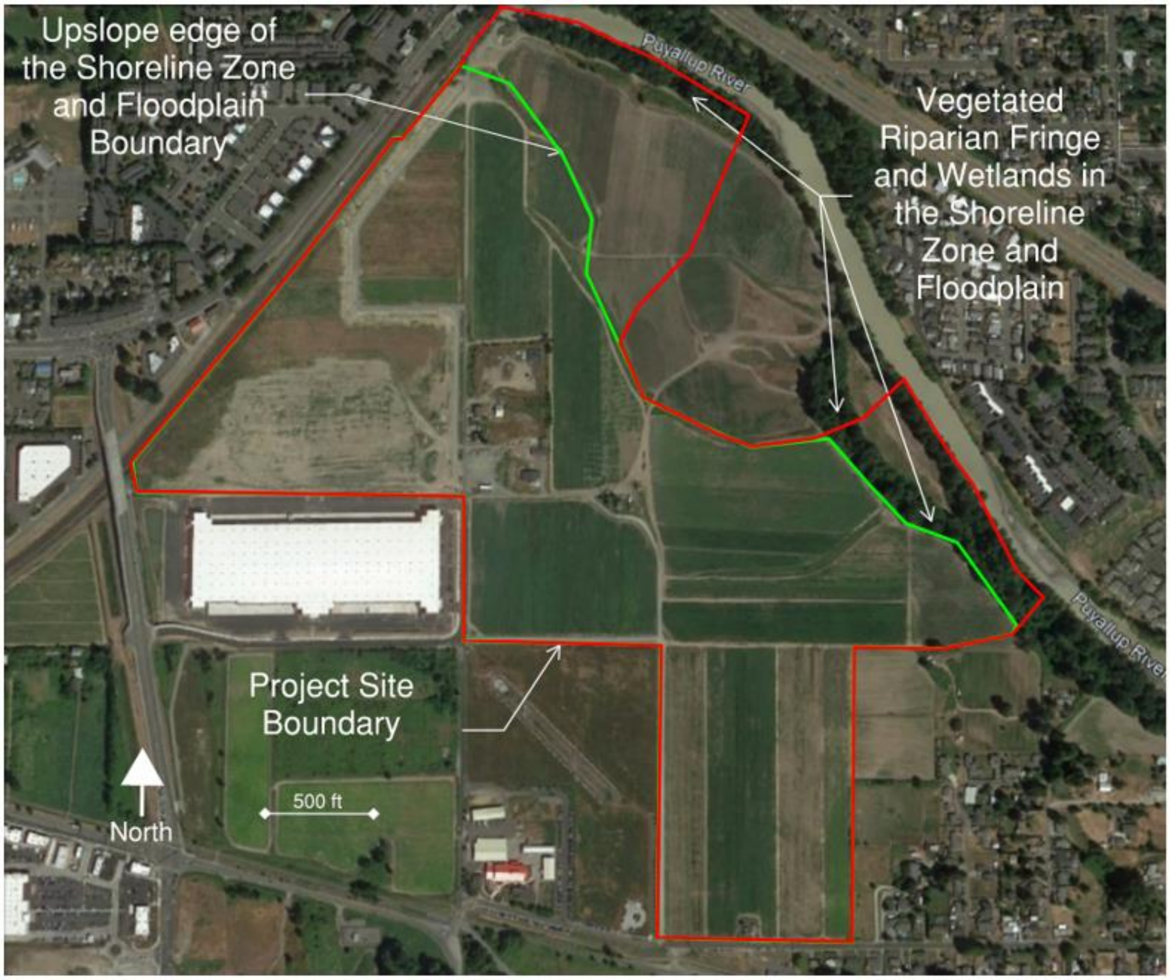

Figure 4-16. Shoreline Zone Boundary at the KFIP Project Site

4.2.4 Impacts

This section describes the potential for environmental impacts related to surface water as a result of KFIP Project construction and operations. It describes the thresholds used to determine whether an impact would be significant. If impacts are significant, the following section discusses measures to mitigate potentially significant impacts, where appropriate.

Methodology

This analysis evaluates potential for construction and operations at the KFIP site to impact surface water resources. Impacts were characterized by comparing existing conditions (described above) with the potential for water quality and water quantity impacts from the KFIP Project as they may affect the Puyallup River and its shoreline zone, including the floodplain, and on-site wetlands. This evaluation was performed by undertaking several sites visit to document conditions, reviewing public reports and public databases, publicly available geographic information system (GIS) mapping layers on land cover, wetlands, and listed species presence; and technical reports prepared for the proposed Project.

The following public records and literature, among others, were reviewed:

- USGS National Water Information System, USGS gages in the Puyallup River near Puyallup, Washington – Parameters Discharge, Gage Height, and Flood Stage
- NRCS Long-Term Climate data, AgACIS for Pierce County – WETS Station: TACOMA NO. 1, WA: 1971–2023
- Pierce County Office of the Hearing Examiner, July 11, 2018, The Puyallup Tribe of Indians v. Director, Pierce Co. Public Works and Knutson Farms, Inc., Running Bear development Partners LLC, and Barghausen Consulting Engineers, Inc. Joint Stipulated Motion to Dismiss the Puyallup Tribe's Appeal (case no. 863309)
- Puyallup River Watershed Assessment (PRWC 2014)
- WDFW's HPA Permit program, including 2018 and 2023 HPAs for the Viking Project
- Climate Change Impact Assessment and Adaptation Options (Puyallup Tribe 2016)

The following technical reports were reviewed (and others):

- Biological Evaluation – Van Lierop Property Stormwater Outfall Project, Talasea Consultants, Inc. (2017)
- Detailed Mitigation Plan (TDMP 2018), Puyallup River Outfall, Talasea Consultants Inc., March 2018
- Critical Areas Assessment Report – Knutson Farms Industrial Park, Soundview Consultants (September 2016, Revised December 2016)
- October 2020: As-Built Report, Technical Memorandum describing baseline site conditions after construction of the outfall and installation of plant materials was complete
- December 2022: Year 1 and 2 Monitoring Report, describing conditions at the Viking Outfall
- May 2023: Memorandum related to HPA and riverbank erosion
- Revised Knutson Industrial Transportation Impact Analysis, TENW Transportation and Engineering Northwest for Michelson Commercial Realty and Development, LLC (2017)
- Barghausen Engineering Project site survey map, stamped 03/23/2021

- Barghausen Engineering *Conceptual Grading and Storm Drainage Plan*, stamped 03/26/2021
- Barghausen Engineering *Offsite Conveyance Analysis Report*, prepared for Michelson Puyallup Partners, LLC, April 2, 2018
- Barghausen Engineering *Offsite Conveyance Analysis Report* for Van Lierop property, prepared for Running Bear Development Partners, March 1, 2018, revised June 14, 2018
- Welch, W.B., Johnson, K.H., Savoca, M.E., Lane, R.C., Fasser, E.T., Gendaszek, A.S., Marshall, C., Clothier, B.G., and Knoedler, E.N., 2015, Hydrogeologic framework, groundwater movement, and water budget in the Puyallup River Watershed and vicinity, Pierce and King Counties, Washington: U.S. Geological Survey Scientific Investigations Report 2015–5068, 54 p., 4 pls. (http://dx.doi.org/10.3133/sir20155068)
- WCI (West Consultants Inc.) August 17, 2021. Knutson Farm Scour Analysis model of the Puyallup River near the BNSF Trestle Bridge, prepared for Viking LLC and Running Bear development Partners, LLC

A significant impact from construction and/or operations would include:

- Injury, death, or harassment of federal or state listed endangered or threatened species from water quality degradation;
- Reduction or loss of on-site wetlands systems over time;
- Erosive impacts to the Puyallup River banks at the Project site from current and planned future direct flow discharges;
- Noncompliance with critical areas regulations and stormwater regulations intended to protect and preserve water quality and quantity in the Puyallup River and its buffers, its riverbank and on-site wetland systems and their buffers; or
- If any the impacts described above cannot be mitigated through compliance with critical areas ordinances or implementation of BMPs.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, the construction and operation of the KFIP Project would not occur. No KFIP-related impacts to surface water resources would result.

The KFIP site floodplain and uplands would continue to be farmed, left fallow or potentially developed differently in the future, as limited or allowed in regulations. If current management does not change, existing water quality impacts to the Puyallup River would not change, meaning that the same agricultural impacts would persist.

The EIS team could find no documentation of a Farm Management Plan for the current agricultural operation, and therefore, cannot document the degree to which the current operation applies BMPs in relation to use of pesticides, herbicides, fertilizers, or other standard agricultural chemicals that might have current impacts to surface water quality. But there is no known exceedance or documented surface water pollution on the KFIP site related to agriculture.

The hydrology sources and current hydroperiods for Wetlands A, B, C, and D would persist with similar volumes and timing. However, the wetlands might become smaller over time from impacts of continued farming and flooding of the floodplain surface and high terrace surface, which causes alluvial and surface runoff sediment to redistribute and collect in depressional areas.

Under the No Action Alternative, floodplain conditions would continue to evolve in response to ongoing farming and flood recurrence patterns. Flooding has increased in frequency over time as upstream areas are developed over time. Riverine erosion and new sediment deposits on the floodplain in combination with ongoing effects of farming, plowing, ditching, and draining would change floodplain surface elevation and terrain over time.

The Shoreline zone, floodplain surface and upland terrace to the southwest would continue to be farmed, and thus would typically be unvegetated in winter months, increasing potential for erosion and sediment movement during flood events. Riparian areas would continue to be influenced by flooding and farming, which affects riparian vegetation, floodplain wetlands, and their buffers.

The existing outfall structure at the north end of the site, which currently serves the Viking warehouse facility, would continue to impact erosion at the Puyallup riverbank as it does under existing conditions, and would continue to be impacted from periodic river flooding and sediment deposition.

Pierce County has designated the KFIP site with an Urban Zone Classification of Employment Center (EC) (*a "concentration of low to high intensity office parks, manufacturing, other industrial*" PCC 18A.10.080) and thus it is possible that other future development within the constraints of this zoning would occur, and agriculture would no longer be the primary land use.

Any increase in future flows as areas within the Viking contributing stormwater basin are developed are likely to increase erosion at the existing outfall structure if no effective corrective actions are taken. The outfall may be subject to enforcement, redesign, or repair if continued erosion results in environmental damage or failure at the riverbank.

Proposed Action

Impacts to surface waters (Puyallup River and floodplain wetlands) from the Proposed Action at the KFIP site would be related to erosion, water quality and water quantity volumes at the stormwater outfall structure, and to changing hydrology conditions and fill impacts to on-site wetlands. KFIP proposes to build seven warehouses and associated pavement and road infrastructure on the site. Stormwater, which previously infiltrated when the site was farmed, would be collected from pavement and roofs surfaces and sent via a piped system into the river. KFIP has agreed to infiltrate roof runoff from four warehouse roofs, intended to support on-site wetland hydrology. Runoff from the rest of the site would be piped to the outfall and into the Puyallup River after meeting the PCSWDM minimum treatment standards (Figure 4-17).

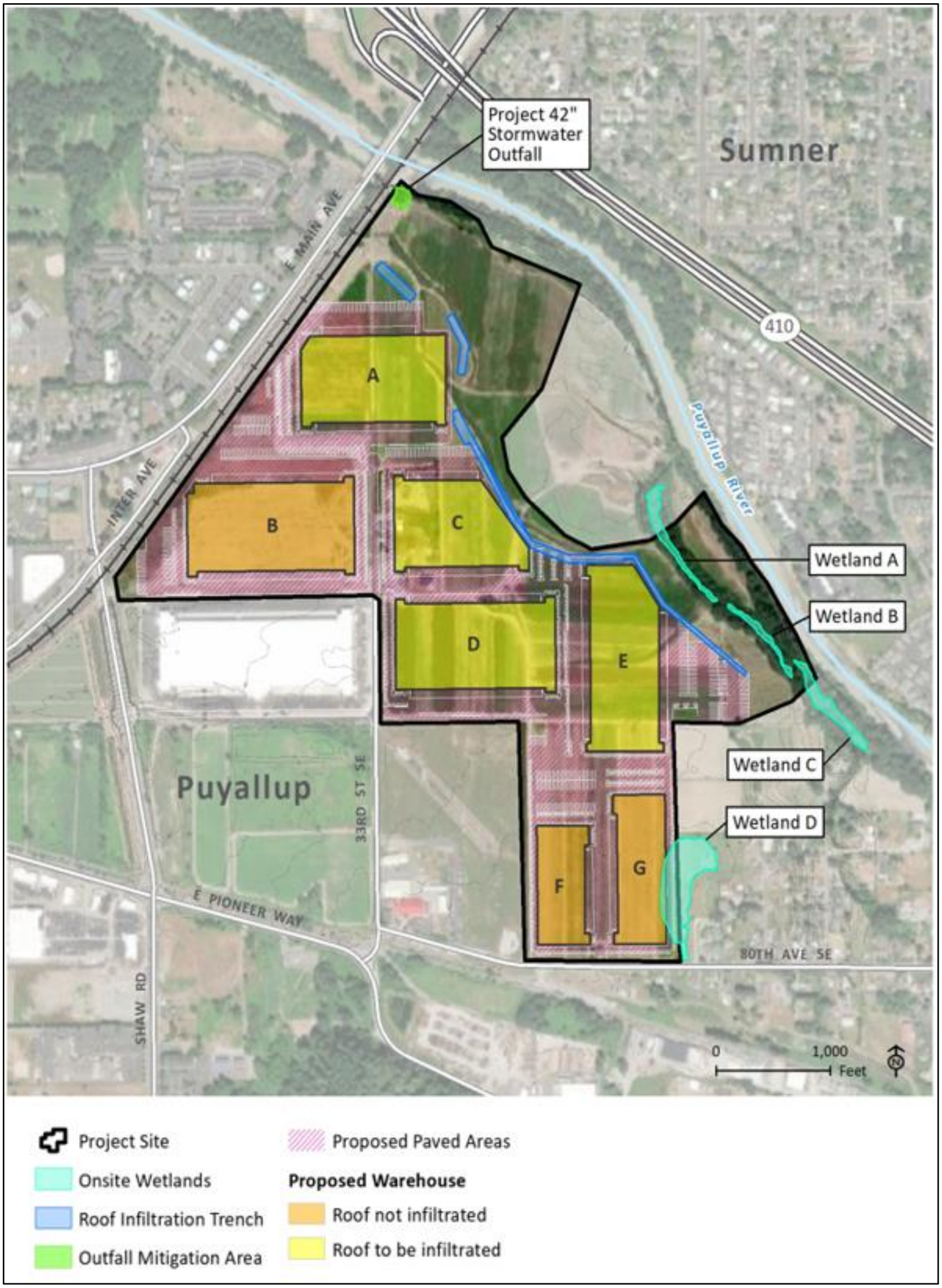

Figure 4-17. March 2021 Proposed Stormwater Outfall (green), Infiltration Trenches (dark blue), and Wetlands (cyan)

However, there is overlap in the schedule between construction and operations phases at this site. The Applicant has indicated that they plan to complete construction over a period of 4 years, with construction starting at the north end of the site (Warehouses A to E), followed by construction of Warehouses F and G. Construction of each warehouse would take 15–18 months, with construction of some warehouses occurring simultaneously to meet the overall 4-year construction schedule. Up to 150 employees would be expected on site at any one time during construction.

Construction of each warehouse would occur in three stages:

1. Grading and filling
2. Installation of on-site utilities
3. Warehouse construction

Construction Impacts

The construction timeline would overlap with operational timelines as the seven warehouses would be constructed one at a time in phases over a period of four years. Construction impacts would be related to uncontrolled surface runoff from areas with bare or unstable soil surfaces, and also from potential spills or leaks of fuels or hydraulic fluid in either paved or unpaved areas when the stormwater management system is not yet fully functional.

For wetland areas, construction impacts would be related to the timing of when surface water is effectively captured and diverted to either the river or to effective, properly designed infiltration facilities, as would be needed to maintain current wetland hydroperiods (as required by law, as described above).

The current KFIP plan shows that the on-site portions of Wetland D (about one acre) and its on-site buffers would be filled during construction phases to build one of the proposed warehouses. More details are provided below.

Puyallup River

During construction on the high terrace, direct impacts to surface water quality could occur from grading, which contributes to erosion and sediment movement; water flows that cause turbidity through erosion; sediment transport downstream of soil disturbance activities; or release of pollutants from construction equipment. Oil, fuel, and other chemicals could inadvertently spill or leak from construction equipment or materials, leading to contamination of surface water through runoff.

Per standard requirements of the construction stormwater permit, a stormwater management plan and a Spill Prevention Control and Countermeasure Plan would be developed to minimize impacts to water quality. BMPs would be implemented consistent with federal, state, and local regulations, including but not limited to: operating procedures to prevent spills; control measures such as secondary containment to prevent spills from entering nearby stormwater pipes that outfall to the River; countermeasures to contain, clean up and mitigate the effects of a spill; construction vehicle storage and maintenance and fueling of construction equipment would be located outside of the floodplain and away from the River and wetlands. With full implementation of the required BMPs, the impacts to Puyallup River water quality from inadvertent spills during construction would be less than significant.

The 42-inch diameter outfall pipe intended to receive future runoff from the KFIP site is already installed at the existing stormwater outfall structure in the floodplain at the northern end of the KFIP site. The outfall structure is currently impacted by collection of sandy river sediment during seasonal river flooding and by channelized erosion of these sediments from stormwater runoff flowing from the Viking facility outfall pipe. Current conditions indicate that increasing future flows to the outfall structure by adding new runoff volumes from the KFIP warehouse complex and from the greater surrounding stormwater basins would significantly increase erosion and instability at the riverbank.

During construction phases as currently proposed, the outfall structure would require regular monitoring, assessment, repair and/or stabilization to avoid further degradation. This monitoring and repair work must fully address impacts from future increased stormwater volumes from the KFIP warehouse complex.

The stormwater outfall system would be completed over time as each new warehouse is built during construction phases. This would result in direct stormwater outfalls to the River prior to the warehouse complex being fully operational. The Project is required to comply with code provisions for the protection of water resources from grading activities and NPDES Construction Stormwater General Permit conditions.

Water quality impacts to the river from recently discovered tire oxidant pollutants (6PPD, Tien et al. 2020) have been documented as having significant lethal effects on salmonids at relatively low concentrations. Stormwater treatments specifically designed to minimize risk from 6PPD are not directly addressed in current BMPs or NPDES permits and are not proposed in the current KFIP stormwater management plan. Without application of specific recommended water quality treatments that address this recently identified surface water pollutant, impacts to Puyallup River water quality and to listed fish species during construction phases could be significant. Mitigation to address this water pollution issue may be required in order to avoid illegal take of listed species.

Water quality impacts from Viking facility runoff or from erosion at the outfall discussed above would need to be addressed prior to or during KFIP construction phases in order to differentiate pre-existing conditions from indications of new water quality impacts during KFIP site construction.

The Talasea Mitigation and Monitoring Plan (TDMP 2018) for the adjacent Viking Warehouse facility and its associated stormwater outfall at the edge of the Puyallup River indicated that during annual monitoring, water quality impacts at the outfall would be assessed qualitatively, using visual indicators such as oil sheens, abnormal water color or odor, stressed vegetation, turbidity, etc. Section 5.6, page 9 of the Talasea Mitigation and Monitoring Plan (2018) indicated that cloudy water might be a water quality indicator and should be tested to determine the source of the discoloration if observed during the annual monitoring visits. However, no water quality testing or qualitative description was reported in the Year 1 and 2 Monitoring report that was submitted to Pierce County in December 2022.

During the EIS team March 2021 site visit, water quality at the existing warehouse facility outfall was visually assessed, to provide a baseline indicator of future potential water quality from the proposed KFIP warehouse complex. The water being emitted from the Viking outfall pipe was cloudy and grey (Figure 4-18). The cloudy water condition did not change as water flowed through the outfall structure, then through deep eroded channels in flood sediments, then finally into the River; therefore, no treatment effect from the outfall structure was apparent. The source of the cloudy condition has not yet been identified, but as indicated in the Talasea Mitigation Plan, should be assessed to determine whether the facility is currently in compliance with water quality standards, and to determine whether this baseline condition is likely to occur or expand with the increase in future runoff from the proposed KFIP warehouse facility.

Monitoring of planted vegetation in the mitigation area around the outfall may be needed during construction to ensure that the mitigation areas are unaffected by KFIP construction phases, including increases in surface water runoff through the outfall over time.

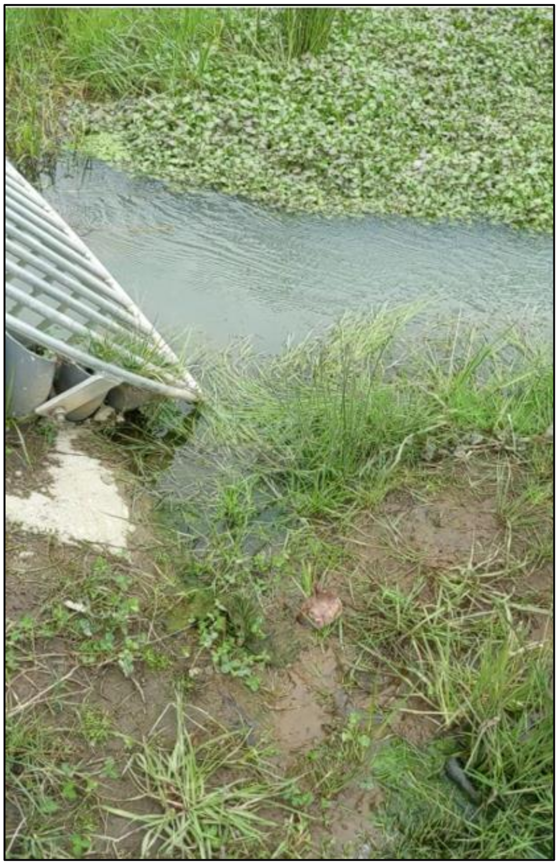

Figure 4-18. Cloudy Water from the Viking Warehouse Outfall, March 2021

Under current conditions, much of the installed vegetation along the riverbank below the outfall has been scoured away, and plant survival in other upslope mitigation areas was less than 80 percent until recent replanting work was carried out in December 2022. The replanting work might bring the site into compliance with plant survival requirements, as long as the newly installed plants survive for three additional years.

Additional assessment and replanting of the mitigation area and increased protection of the eroding riverbank may be warranted as flows increase from the KFIP site during construction phases.

Ongoing monitoring performance and structural competence at the outfall structure (as differentiated from the mitigation planting areas) must be carried out by qualified engineers during construction phases, to ensure that the facility does not further degrade. Currently available documentation does not provide any specifically defined engineering performance standards for the outfall structure. This information would be needed by site inspectors when they are evaluating the structure during KFIP construction phases to determine whether it is performing as designed versus failing as stormwater volumes from the KFIP site increase over time. This information is currently lacking but would provide critical guidance on how to address potential structural performance or failure.

Clear engineering guidance is needed to clarify how the A-Jacks at the top of riverbank are critical to the outfall structure stability and function. Other engineering guidance is needed to assess ongoing erosion at the downstream end of the outfall and its impact on the outfall structure function or integrity.

Degradation of the riverbank below the stormwater outfall structure during construction, plus previously described (Section 4.2-3, Listed Species) impacts from unmitigated 6PPD tire oxidant pollutants in the stormwater runoff (which may kill or harm listed salmonid species in the river), in combination with future significant increase in pollution generating impervious area all indicate potential for significant harmful impacts to water quality in the Puyallup River during construction phases as well as during operational phases (discussed below).

As discussed in more detail in Section 4.3 Groundwater, according to the 2018 *Offsite Conveyance Report* for the KFIP site (Barghausen 2018), the estimated future discharge rates for the 5- to 100-year storms ranged between 39 and 73 cubic feet per second (ft^3/s), respectively. Compared to the 1 to 2 ft^3/s late summer groundwater discharge rates to the River estimated from the data provided in Welch, 2015, the KFIP estimated future surface discharge rates during winter months would be 26 to 49 times higher, and those flows would be concentrated through one outfall to the Puyallup River at the north end of the site, rather than spread and infiltrated across the high terrace and floodplain as occurs under current conditions.

By the end of the Construction phase, under the current development plan, the discharge rates of stormwater containing new levels of highly lethal 6PPD pollutants would be significantly greater than current conditions, which would significantly increase current background 6PPD levels in the river near the outfall and downstream, (i.e., would degrade background conditions).

Wetlands

For wetland areas, construction impacts would be related to the timing of when surface water is effectively captured and diverted to appropriately located and designed infiltration facilities, as needed to compensate for reduced surface infiltration on the high terrace and impacts to groundwater recharge (described in more detail in Section 4.3 Groundwater). The wetland hydroperiods for all four on-site wetlands must be maintained throughout construction to avoid adverse impacts and loss of wetland area, and loss of critical wetland functions and values.

On-site wetlands would shrink or be entirely lost unless current hydrology sources are identified and maintained. In order to preserve on-site wetland hydroperiods on the floodplain (Wetlands A, B, and C) and at Wetland D, targeted, properly located and designed wet season infiltration facilities that would capture and infiltrate appropriate volumes of surface runoff are needed to seasonally recharge groundwater in locations that would ensure maintenance of wetland hydroperiods during construction and in the future.

Wetlands A, B, and C

During construction phases, as currently proposed, the KFIP Project would result in loss of at least 50 percent of surface water infiltration on the high terrace, which feeds to groundwater. the primary hydrology source for Wetlands A, B, and C. Protection of wetland hydrology timing and volume is required under Pierce County stormwater code and the Pierce County Critical Areas Ordinance. Standard avoidance, minimization, and mitigation sequencing review is required by PCC 18E.30.050.

Wetlands A, B and C Water Quality. Direct impacts to water quality could result from grading that contributes to erosion and sediment movement; water flows that cause turbidity through erosion; or release of pollutants from construction equipment. The KFIP Project would be required to comply with code provisions for the protection of water resources from grading activities and Construction Stormwater General Permit conditions.

During construction, grading and clearing work is not proposed within Wetlands A, B, and C or their respective buffers. Standard erosion and sediment control BMPs are required in code, and if fully implemented, would protect the surface water quality of Wetlands A, B, and C. Therefore, as long as these standards are upheld, construction phases of the KFIP Project would be expected to result in less than significant impacts to water quality in the three floodplain wetlands.

Wetlands A, B and C Water Quantity. During construction, surface infiltration (source of groundwater hydrology for Wetlands A, B, and C) would slowly decrease over time as the surface is graded, dewatered, compacted, and paved in preparation for building the warehouses, resulting in less on-site infiltration over time. Temporary disruption of the hydrologic cycle could result in permanent loss of the floodplain wetland areas. As described previously, stormwater regulations require that the wetland hydroperiods are protected. Therefore, additional site design planning and monitoring work is needed to ensure long-term protection and maintenance of wetland hydrology sources and timing during construction.

Per an agreement between the Puyallup Tribe and the developer, the KFIP design was revised in 2018 to include construction of infiltration trenches at top of slope along the eastern edge of the warehouse complex (Figure 4-17). The agreement says that the trenches would infiltrate a minimum volume of "*50% of a 2-year storm event*[11]" collected from four of the new warehouse roofs. It is possible, but unclear, that the current minimum treatment standard in the PCSWDM is the intended minimum requirement per the agreement between KFIP and the Puyallup Tribe.

There was no specific agreement as to when and how the infiltration trenches would be installed, and how the wetland hydroperiod would be maintained throughout construction and operational phases. To ensure that on-site wetlands persist throughout construction phases, there must be no change to the wetland hydroperiods during construction.

As a result of that agreement, the current stormwater management proposal is to infiltrate roof runoff from four of the warehouse roofs in trenches sited along the top of slope at the northeast edge of the high terrace, but only if infiltration is deemed to be feasible from this area. This proposal to infiltrate stormwater is currently the only indication that there is a plan to maintain hydroperiods at Wetlands A,

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[11] There is no such storm (50 percent of the 2-year event) described in the PCSWDM. The agreement indicates they will meet the current minimum treatment standard, as defined in the PCSWDM, but this is unclear.

B, and C, as required by law. But it does not provide any protection or assurance that the hydroperiod for remaining portions of Wetland D (directly off site to the east of Warehouse G) would be maintained.

The four roofs account for less than half of the total KFIP impervious surface area, and most of the proposed trenches are not sited hydrologically upslope from the three floodplain wetlands. Field analysis by the EIS team indicates that direct discharge into the Puyallup River of more than half of the runoff volumes from future impervious surfaces at the KFIP site would result in loss of more than half of current floodplain and wetland hydrology volumes and is likely to affect the timing and duration of wetland hydroperiods on site. The current infiltration facility design does not provide modeled data to show how the wetland hydroperiods of the four on-site wetlands would be preserved during construction and long-term operations by this proposal, as required by the PCSWDM.

There is no current permitted or technically documented plan to ensure effective hydrologic support to the on-site wetlands during construction. Hydroperiod studies are needed to define the minimum required flow volumes and timing needed to provide for continuous support and to maintain wetland hydrology in Wetlands A, B, and C.

Any infiltration facilities intended to support wetland hydrology over time must be constructed in advance of other impervious surfaces in the KFIP complex. The infiltration facilities must be fully functional and receiving adequate volumes of runoff throughout construction, prior to completion of the four targeted warehouse roofs. This may require that runoff from other paved or impervious surfaces would be directed to the infiltration facilities until such time as adequate volumes of roof runoff are available.

The current proposal does not ensure effective maintenance of Wetland A, B C and D hydroperiods. Without ongoing monitoring and maintenance of wetland hydrology volumes throughout construction, there would be a loss or reduction in wetland area coverage on-site, a significant impact and counter to County, state, and federal no-net-loss goals and regulations.

Wetland D

An updated wetland delineation was carried out and described in a wetland report by the EIS team (SCJ Alliance, September 2021). The field work and related research, documented that about 1 acre of Wetland D was on site and found that the whole wetland (on- and off-site portions) was about 3 acres, larger than previously described, and was large enough to be regulated and buffered under County regulations and state law (Ecology, Water Pollution Control Act [90.48 RCW]).

As currently proposed, one-acre of Wetland D (about 1/3 of the whole Wetland D area) and its on-site buffer areas would be filled and lost. This would also result in indirect impacts to approximately 2 acres of off-site wetland and buffers (owned by others) by displacing current wetland hydrology, potentially causing flooding by increasing water levels and converting current upland areas to wetlands. There currently is not a mitigation plan describing how the lost wetland and buffer acreage would be replaced on or near the Project site, as required to meet no-net-loss goals and regulatory requirements.

Any proposed fill impacts to Wetland D must be reviewed and permitted by Pierce County under PCC 18E.30.050, and by Ecology (Water Pollution Control Act [90.48 RCW]). The County is expected to conduct standard avoidance, minimization, and mitigation sequencing review as required by PCC 18E.30.050. Depending on results of that review, impacts to Wetland D are not certain to be approved as currently proposed. Site plan modifications may be required if Pierce County determines that impacts to Wetland D and its on-site buffers can and should be avoided based on analysis of avoidance and impact minimization criteria.

Filling one-acre of Wetland D must also comply with the conditions of an Ecology wetland impact permit/certification. (Please see discussion in Section 4.2.2 regarding the recent revisions to the definition of WOTUS). A mitigation and monitoring plan must be permitted and approved by all relevant regulatory agencies prior to final Project permitting and approval, and prior to construction. Installation or construction of approved mitigation actions would typically be required prior to or concurrent with early Project construction phases, as described or limited in the approved permits.

Wetland D Water Quality. Water quality and other functional impacts to off-site portions of Wetland D must also be specifically described and addressed in the not yet developed mitigation plan. Water quality impacts during construction from turbidity or sediment movement when filling the on-site wetland areas must be minimized to reduce the impacts to a less than significant level using appropriate engineering design and erosion control BMPs, in accordance with federal law and County regulations.

Wetland D Water Quantity. The source of Wetland D hydrology is a combination of on-site collection of groundwater and off-site inflows of surface stormwater from the south. Water quantity impacts to off-site portions of Wetland D east of the KFIP Project boundary (owned by others) must be specifically addressed in the not yet developed mitigation plan.

Wetland D Functions and Values. Typically, initial mitigation plan actions—such as planting new native vegetation or installation of mitigation structures—must be substantially completed before KFIP construction is complete, and bonding is required to cover the not yet defined cost of implementation of the mitigation and monitoring plan, including both plant installation and long-term monitoring, reporting and maintenance, as would be defined in the permit.

The site is not located within a currently licensed Pierce County mitigation bank service area; therefore, no mitigation credits may be purchased to meet the “No Net Loss” requirement. Lacking an appropriately designed mitigation plan, the current proposal would result in a net loss of wetland and buffer area on site and would result in significant impacts to wetland and buffer areas off site. These are significant impacts, and are counter to county, state, and federal no-net-loss goals and regulations.

Floodplains

Impacts to floodplain wetlands in relation to ongoing erosion within the outfall and at the riverbank are discussed above. Therefore, the discussion below will address other aspects of potential floodplain impacts.

During construction, no new grading or mobilization activities related to the KFIP warehouse development would occur in the floodplain, and no new impacts to the floodplain are expected until such time as future KFIP site stormwater runoff is directed to the existing outfall on the floodplain.

Under the KFIP proposal, the previous land owner (farmer) can continue to farm on the floodplain[12]. Therefore, current surface water quality and quantity impacts to the Puyallup River and floodplain from existing agricultural activities in the floodplain are not expected to change during construction. Typical farming impacts include soil disturbance from plowing and cultivating, surface erosion, sediment movement and associated translocation of fertilizers, herbicides, and pesticides.

Shorelines

Impacts to the Shoreline zone during construction are the same as what is described above for floodplain impacts, and therefore, no additional discussion is provided.

Operations Impacts

Operations impacts to surface water **quality** under the current proposal would primarily be related to inadequately treated 6PPD pollutants in KFIP storm water runoff being sent to the Puyallup River, with resultant impacts to listed salmonids. Under the Proposed Alternative, according to the KFIP traffic impact study, the maximum net vehicle trips are predicted to be 8,724 per day, as compared to current conditions, with vehicle trips limited to what is needed for day to day farming operations and minimal runoff.

Water **quantity** impacts to the Puyallup River would result from the increase in future stormwater runoff volumes during winter months, which affects timing of inflows to the River and would increase current erosion at the outfall riverbank. Currently, inflows to the river from the site are from surface infiltration and subsequent slow transmission of groundwater over a period of at least several months or more. As a result, the river receives inflows from the floodplain throughout the winter and following summer months. Once 100 percent developed, most site surface runoff would be collected in pipes and redirected to the river within a day or two of the rain event.

Water **quantity** impact to on-site wetlands would be impacted by the location and function of proposed infiltration facilities. These would provide critical hydrology sources to Wetlands A, B, C, and D, as needed, and required to ensure that the wetland hydroperiods are maintained. But neither the current site plan nor mitigation plan describe any long-term monitoring or management of infiltration facilities or wetland hydroperiods. In addition, there is no county or state permit, nor any long-term mitigation and monitoring plan to address proposed fill impacts to on- and off-site portions of Wetland D. Without these mitigation and management plans, the wetlands are expected to degrade or disappear over time.

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[12] Page 13, November 2018 Shoreline Hearing Staff Report: "*15. The quit claim dedication area is subject to a lease for a period of ten years allowing Knutson Farms Industrial Park LLC, or its assigns, to use the property dedication area for agricultural purposes in consideration of a lease payment of $3,000 per year.*"

Puyallup River Water Quality

Once the site is developed, an NPDES Industrial Stormwater General Permit will be required, which would include development of an Operations SWPPP. The Operations SWPPPs are intended to identify appropriate BMPs to minimize water quality impacts from stormwater, which have been developed in accordance with the current SMMWW (Ecology 2019), Ecology standards, and PCSWDM requirements. Accidental spills of fuels, solvents and related industrial chemicals during operations should be addressed by a standard safety plan, which is typically required on industrial sites.

However, as mentioned previously, a critical new pollutant that is not directly addressed in the current PCSWDM has been identified in recent research and is recognized by Ecology as an urgent concern. The implications of this new pollutant, 6PPD, are discussed in more detail below.

Under the Proposed Action Alternative, approximately 107 acres of the 131.04 acres of previously permeable farmed surface area would be impervious—roof or pavement (Barghausen Drainage Plan, 03/26/2021). The 2018 *Offsite Conveyance Report* indicates that runoff from 93.57 acres would be sent to the river via the stormwater trunkline (i.e., to the outfall structure); however, that measurement appears to include acres in the floodplain in addition to new impervious surface. The site plan does not appear to include any stormwater capture or drainage systems within the floodplain. Thus, most on-site runoff would bypass the floodplain and would emanate from new pavement or roof surfaces.

As a result of a 2018 agreement between KFIP and the Puyallup Tribes (described previously), the original stormwater management plan (which sent 100 percent of site runoff to the River) was revised with a proposal to infiltrate runoff from approximately 37 acres of roof area, but only if the proposed infiltration was deemed feasible. However, there was no description of how the feasibility determination would be made; no requirement for consideration of other infiltration locations or methods; and no specific language that clarified that the infiltrated stormwater was necessary to ensure long term support to on-site wetlands hydroperiods (as required in law).

Therefore, this infiltration proposal does not solve the 6PPD water quality problem caused by new runoff from paved areas being sent to the river. Per the current PCSWDM, runoff from the rest of the KFIP site—approximately 70–80 acres of paved roads, parking lots, and three warehouse roofs—would only be required to receive the minimum treatment standard, which is equivalent to sand filter treatment of the 6-month/24-hour storm. As discussed previously, sand filters alone do not remove the 6PPD pollutant. The filter media must be amended with organic matter, or some other equivalent chemically sorptive material.

Per the PCSWDM, stormwater runoff volumes greater than the 6-month, 24-hour storm would be sent directly to the Puyallup River without any treatment. Therefore, the PCSWDM treatment standard is not adequate to protect the river from new water quality impacts caused by new KFIP pavement runoff volumes that would include the 6PPD pollutant.

This would result in increases to the current levels of 6PPD in the river and associated increased impacts to listed species.

Salmon populations are decreasing throughout the Puget Sound and the greater Salish Sea. These impacts to listed salmonids have associated impact to apex predators in the Puget Sound, such as the endangered Southern Resident Orcas, which preferentially feed on Chinook, but also eat coho and other salmonids. In June 2022, the Puget Soundkeeper organization initiated notices to sue five municipalities in King County for violating the CWA by not implementing treatment for 6PPD in those watersheds, which have documented high rates of salmon mortality. In August 2023, Earthjustice (https://earthjustice.org/) filed a citizen petition to the USEPA on behalf of the Yurok Tribe, the Port Gamble S'Klallam Tribe, and the Puyallup Tribe of Indians (under section 21 of the Toxic Substances Control Act). The petition asked the USEPA to establish regulations ASAP prohibiting the use of 6PPD in the tire manufacturing processes. 6PPD is used as an antioxidant and antiozonant to prevent tire degradation (Earthjustice, August 1, 2023).

Recent Washington State University (WSU) research publications (Tian et al. 2021) found that tire oxidants (6PPD) in stormwater runoff at very low concentrations result in brain bleeding and other lethal impacts to salmonids passing near outfalls. Khan at al. (2019) documented that *Hyallela Azteca (*a type of krill or small crustacean, a food source for many fish species) consume small floating tire particles, resulting in bioaccumulation downstream. Capolupo et al. (2020) documented toxic levels of tire particulate chemicals in microalgae and mussels from European water bodies (bioaccumulation). Johannessen et al. (2022) documented presence of 6PPDq at toxic levels maintained for over 10 hours after sampled storm events in all samples collected from an urban watershed in Canada. These documented impacts from water bodies throughout the world indicate that 6PPD is in stormwater and the food chain, resulting in direct mortality in some species, and bio-accumulation in other species that are often prey for listed salmonids and other sensitive species.

The fact that stormwater runoff has lethal impacts on salmonids is not new information. But this new research has identified the specific hazardous chemical that causes salmon mortality at very low concentrations. Toxic levels of the 6PPD compound have been documented in waterbodies and animal tissue samples throughout the world by other researchers. This research indicates high potential for significant surface water quality impacts to listed species from minimally treated direct runoff from parking lots and roads.

Soluble forms of 6PPD have been shown to kill coho at concentrations of 0.1u/l (micrograms/liter). Other precipitated or less soluble forms of 6PPD are attached to soil particles or are in the form of tiny floating tire particles, both of which are low density and easily translocated in runoff, and subsequently consumed by small prey species or filter feeders.

The most effective treatment for removing (adsorbing) the soluble form of 6PPD is infiltration through an amended soil or comparable media containing organic matter or another high Cation Exchange Capacity (CEC) material (McIntyre, 2021). A similar treatment option evaluated by Tian et al. (2019) is a compost amended bioswale designed to pond less than an inch of water and to infiltrate most runoff. Less soluble forms of 6PPD (tire particulates) may be physically removed from the water column by filtration through a properly designed sand filter, but should be followed up by chemical filtration through a more sorptive material in order to remove most soluble 6PPD from stormwater runoff.

Because the reported research is relatively new, this information has not yet been directly addressed in current Washington state stormwater management manuals or defined BMPs. However, federal, state, and local laws preclude harm to listed species, and require application of Best Available Science (BAS). Applying current BAS BMPs to the KFIP stormwater management system would significantly decrease potential for increased harm to listed salmonid species in the river and associated species downstream. The currently proposed KFIP stormwater management plan does not meet this standard, creating potential for violation of the Endangered Species Act.

Without proper management, this pollutant carried in new runoff volumes from the KFIP Project site could cause significant new impacts to surface water quality at the outfall and related significant increase in mortal impacts to listed salmonid species in the river.

Puyallup Riverbank Flood and Erosion Impacts

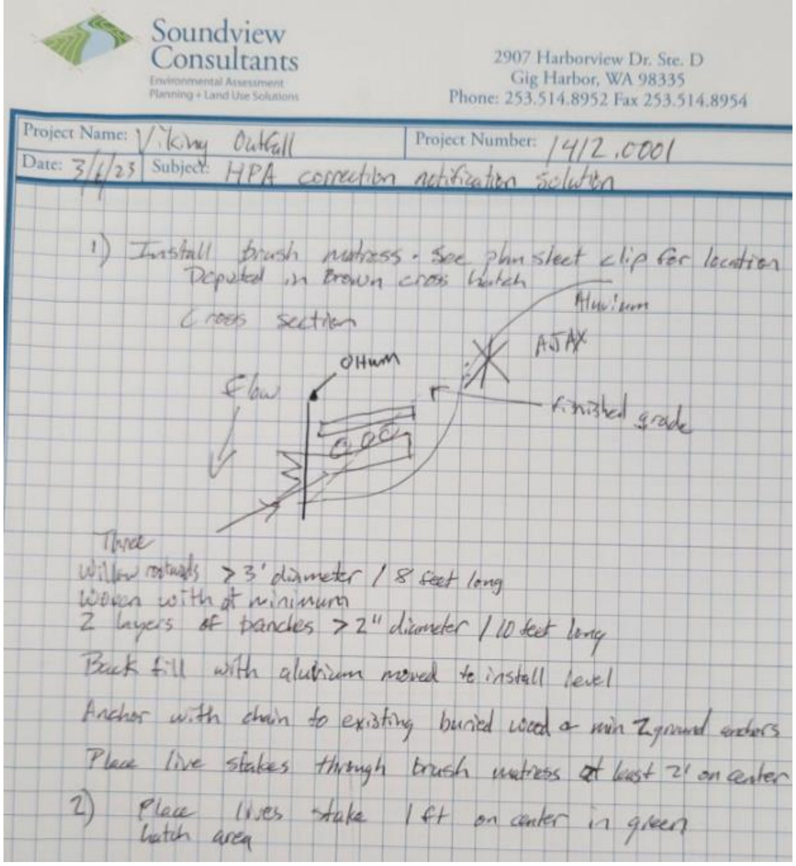
Since completion of the outfall structure in fall 2019, there has been an almost complete failure of the biotechnical bank protection where the outfall discharges to the Puyallup River. In comparison to drone flight footage from December 2019, while the outfall was under construction (Figure 4-19, a duplicate of Figure 4-12 and Figure 4-20), overall, it appears that 5 to 10 feet of bank has subsided or was lost along the riverside edge of the outfall, as was documented in the field during EIS team site visits in 2021, 2022, and 2023.

At the end of the 2018 HPA 3-year monitoring period (end of 2022), WDFW staff met on site with KFIP consultants to verify that riverbank conditions complied with the permit standards. The conditions at the riverbank did not meet the standard described in the 2018 HPA (i.e., it was not stable for at least 3 years, the duration of the monitoring period); it did not withstand the 100-year flood stage (it failed, despite the worst event during the 3-year period being a 25-year stage flood), and more than 80 percent of the newly installed plant materials were lost, scoured away during winter flood events. In response to the bank failure, WDFW filed a Correction Request and prepared a new HPA (2023) with new standards intended to address the new streambank stabilization requirements. KFIP consultants subsequently installed new bank stabilization structures in the failing riverbank directly below the outfall in May 2023—willow root wads anchored by manila rope, a “live willow mattress” and additional willow wands installed in and around the willow mattress (sketch map plan provided in Figure 4-21)—in an effort to stabilize the bank. Based on an assessment of that repair work in June 2023 by EIS team hydraulics and fisheries experts, the new streambank stabilization installation is considered unlikely to survive the significant hydraulic forces of next winter’s floods.

As described previously, the 100-year peak flow on the Puyallup River upstream confluence with the White River (less than 0.5 mile downstream from the outfall) is estimated by FEMA as 43,500 cfs. A 25-year peak flow was documented since completion of the outfall structure (33,500 cfs on February 7, 2020), as reported by the USGS for the Puyallup River at E. Main Bridge (USGS gage 12096505, immediately downstream from the outfall). Thus, the area around the outfall has not yet experienced 100-year flows yet is eroding and failing. It is evident that the original 2018 bank protection installation failed to meet the 100-year peak flow performance standard required under the Project’s HPA permit.

Figure 4-19. Photo above from December 2019, showing flooding as well as willow wands and large boulders on the top of riverbank at the outside edge of the outfall structure. Photo below is from December 2022, showing the riverbank erosion, willow wands stripped away, boulders falling down the slope into the river, and deep sand deposits.

Figure 4-20. December 2019 UAV image annotated with erosional features. The riverbank shown above waterward of the edge of outfall has slumped or eroded back 5-10 feet since this photo was taken.



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Project Name: Viking Outfall
Project Number: 1412.0001
Date: 3/6/23
Subject: HPA correction notification solution

1) Install brush mattress - See plan sheet clip for location
Depicted in Brown cross hatch

Cross section

Three
Willow rootwads > 3' diameter / 8 feet long
woven with at minimum
2 layers of branches > 2" diameter / 10 feet long

Back fill with alluvium moved to install level

Anchor with chain to existing buried wood or min 2 ground anchors

Place live stakes through brush mattress at least 2' on center

2) Place lives stake 1 ft on center in green
hatch area

Figure 4-21. Sketch map of riverbank stabilization plan, attached to 2023 HPA documentation.

In addition, as previously described, the new streambank stabilization Project has not defined a new OHWM, as needed to document the new, eroded riverbank location and conditions. Based on Ecology OHWM guidance which indicates that the nearby river gage can be used to define the 2-year river stage considered to equate with the OHWM), the updated OHWM elevation is also expected to be higher in elevation and farther landward than the previously defined OHWM location. These corrections may affect permitting requirements for ongoing streambank stabilization repair work.

Under the Proposed Action, future increased runoff volumes from the KFIP site would greatly increase current flow volumes through the outfall structure, inevitably increasing current erosion at the riverbank below the outfall structure. Sending significantly greater runoff volumes to the outfall in the future when the riverbank is already failing under current conditions would further degrade the outfall system and erode the riverbank. Without significant repair or revision of the outfall structure and properly designed bank stabilization installations, the ongoing erosion would eventually undermine the outfall structure, and result in additional loss of boulders, concrete and other construction materials into the river, a significant impact to water quality and fish habitat.

Outfall Area Habitat Mitigation Area Conditions

An As-Built and Baseline Monitoring Report was prepared by Soundview Consultants (SVC, October 2020), following guidance provided in the approved Talasea 2018 Mitigation and Monitoring Plan (2018 TDMP). Outfall structure functions and condition (as distinct from its various habitat mitigation features) were evaluated in an SVC 2020 report prepared by a Soundview wetland scientist, not by an engineer. The report described outfall structure conditions after its first year of operation, including impacts to the structure from the Puyallup River flooding in February 2020 (winter of 2019/2020, Figure 4-22). SVC described the structure after the February 2020 flood as being "*fully covered with redistributed river sediment*."

Figure 4-22. SVC 2020 photo 9, taken from the north, showing floodwater covering the entire outfall facility in February 2020.

The impacts of repeated flooding and sediment deposition within the outfall and at the riverbank were documented by the EIS Team in March and November 2021 and were further documented during various EIS team site visits in 2022, and in March and June 2023.

When the EIS team visited the KFIP site in March 2021 (after the 2020/2021 winter), they photo documented conditions at the outfall. Photos from the SVC report (dated October 2020 – end of the 2020 growing season) and from the March 2021 EIS team site visit (end of the 2020-2021 winter flood season) are compared in Figure 4-23.

Both Figure 4-23 photos show the concrete A-jacks, which are partially buried in sediment and undercut near the top of slope on the riverbank. The March 2021 EIS team photo (above) also shows about 6-12 inches of new sandy sediment deposits from the 2020/2021 winter floods covering surface vegetation in the outfall base, and also shows that the riverbank vegetation below the A-Jacks (which was planted in September 2020, and can be seen in the lower October 14, 2020, photo) was flattened or scoured away by floodwaters over the previous winter.

Figure 4-23. Similar view above (EIS Team, March 2021) as below (SVC, October 2020).

Photograph 11. Post-construction baseline condition at connection of outfall release area to Puyallup River, from upriver (east). (October 14, 2020).

Photos of the same area in December 2022 (Figure 4-24) showed deep sandy flood deposits 1–3-plus feet deep covering about one third of the base of the outfall near the river in an area extending about 30–40 feet landward from the riverbank. The deep sandy flood sediments completely buried the two most northerly logs in the outfall base and buried several of the central Ecology blocks with more than a foot of sediment. One of the six anchored logs in the outfall base was entirely gone (carried away during a flood event). The coir reinforced soil berm at the riverbank that previously extended 5–10 feet riverward from the edge of the outfall base had slumped or eroded away, as had most of the willow wands intended to stabilize the top of bank.

These photos (as well as river gage data previously presented) document that the outfall structure has flooded every winter since it was installed– during the 2019/2020, 2020/2021, 2021/2022, and 2022/2023 winters. River gage data indicates that regular winter flooding events above the 41–42-foot elevation (outfall base elevation) would continue.

Figure 4-24. December 2022 photo showing deep sandy deposits and eroded riverbank.

As discussed previously, this flood data also brings into question how the OHWM at the river—which according to Ecology guidance (Ecology [F], October 2016) should be relatively close to the 2-year flood stage elevation—was originally defined, and whether it has been revisited and corrected to address changes at the riverbank since construction was completed in 2019.

The outfall structure as well as planted vegetation within the outfall were significantly impacted by sediment from river flooding—an impact that was not anticipated or addressed in the 2018 TDMP (approved mitigation plan). At the end of 2022, most of the previously planted vegetation (willow wands from 2019-2020 plantings) along the riverbank—where sediment loads are highest and scouring impacts are greatest—had not survived and did not meet performance standards of the Talasea mitigation plan or the WDFW 2018 HPA. As described previously, recent (May 2023) repair efforts at the riverbank (required by WDFW under the 2023 HPA) have replaced some of the lost bank stabilization materials, and therefore, may currently meet the 2023 HPA permit requirement. However, based on assessments by EIS team hydraulics engineers and fisheries experts, the stability of the newly installed materials does not appear to be adequate to survive hydraulic impacts from expected flooding in the upcoming 2023–2024 winter. Continued flooding and scouring from the river in combination with erosion impacts from the Viking outfall runoff indicates that the brush mattress, willow wands and other bank stabilization materials associated with recent bank erosion repairs in and around the outfall would most likely be negatively impacted during upcoming winter floods and are not expected to persist.

Analysis carried out by the EIS team hydraulics experts indicates the need for a more robust approach to bank stabilization under current conditions. Erosive impacts to the outfall structure and riverbank would be significantly greater under future increased KFIP runoff volumes.

Mitigation plantings in the upland area away from the riverbank and surrounding the outfall had experienced some mortality and loss, which was addressed in the Year 1 and 2 Monitoring report (SVC 2022) by planting 57 new plants, with species selected from the accepted plant schedule. However, the exact species selected and the areas that were replanted were not identified in the monitoring report, and it is unclear whether site monitoring would continue long enough to document that the new plants have survived to meet the minimum 3-year survival standard defined in the 2018 Talasea Mitigation Plan. If carried out correctly and if the new plants survive for three years, the replanting would compensate for previous mortality and would bring the site into compliance for this growing season by meeting current percent survival performance standards in the habitat mitigation areas away from the riverbank.

Presence of weedy vegetation—Japanese knotweed, reed canarygrass and Himalayan blackberry—was documented and described in the SVC report as being actively managed and controlled to keep percent cover below the 10 percent allowed maximum. However, the non-native invasive watercress that dominates the Viking side of the outfall base was not mentioned or addressed.

The site maintenance directions provided in the December 2022 Year 1 and 2 Monitoring Report for Pierce County indicate that there is an intent to continue monitoring and repairing the mitigation areas until the system is stable. However, the required monitoring period is 3 years, which requires only 1 more year of monitoring (report expected in December 2023) to meet minimum Pierce County regulations. With new plantings, typically a mitigation monitoring period would be extended to ensure that the new plants survive at rates adequate to meet the same standard as described in the original plan.

Because the original 2018 HPA required that the bank be stable after three years, it is assumed that the 2023 HPA repair work would also require 3 years of monitoring following installation. The past and current trajectory of site conditions at the riverbank indicates a high potential for failure of the May 2023 bank stabilization plantings during upcoming rainy season flooding, suggesting that extension of the monitoring periods for both the WDFW HPA permit and the Pierce County mitigation area monitoring work would be prudent until both the outfall structure and the riverbank are deemed stable.

Under current conditions, erosion, and bank failure impacts to at the riverbank adjacent to and near the outfall are significant and would result in a net loss of shoreline, fish habitat, and riparian buffer function.

Wetlands

Wetland water quality. Under the Proposed Action, the KFIP Project would be required to comply with code provisions for the protection of water resources from grading activities and Operational Stormwater Permit conditions. Therefore, minimal impacts to water quality in wetlands are expected during KFIP operation, as long as mitigation plans designed to address potential water quality issues at Wetland D are prepared and followed. During operations, due to required protections of the standard wetland buffers, no water quality impacts are expected within Wetlands A, B and C or their respective buffers. No untreated surface water would be sent directly to these wetlands and vegetated buffers would remain vegetated , as required in code. The only potential hydrology inputs would be from currently proposed infiltration of roof stormwater runoff, which is typically high quality, particularly after filtration through soil. However, there is no current monitoring plan designed to document water quality at Wetlands A, B, and C.

There is no approved mitigation and monitoring plan for filling Wetland D and its on-site buffer. The mitigation and monitoring plan would be expected to include a plan for protection of water quality in the remaining off-site portions of the wetland (land to the east, owned by others). The proposed fill impacts have not yet been formally described or permitted, and can only occur if permitted and after applying standard mitigation sequencing approaches that demonstrate that the fill is unavoidable and necessary, and that the mitigation actions proposed to compensate for the loss of an acre of wetland and its on-site buffer has been reviewed and approved by the appropriate agencies, including but not limited to Pierce County and Ecology.

Wetlands A, B, and C Water quantity. Under the current proposal, the groundwater source for Wetlands A, B, and C would decrease over time during both Construction and Operational phases as most of the currently permeable KFIP surface area would be paved over a period of several years during Construction phases, while the warehouses are being built and subsequently occupied. This would result in a decrease over time of on-site infiltration and no replenishment of groundwater on the high terrace, where the new warehouses, roads, and parking areas are sited.

As discussed above, despite an agreement to infiltrate roof runoff from four warehouses, the current stormwater management system does not provide details to show that the proposed infiltration is feasible or adequate at the proposed locations, and does not provide an alternate plan to support the wetland hydroperiods if this plan fails. If the proposed infiltration plan is not feasible, that does not relieve KFIP of the requirement to ensure that the on-site wetland hydroperiods are protected during construction and after site development is complete.

Without a clear plan describing how KFIP would incorporate actions into site design to replace the loss of groundwater hydrology sources and timing, and to provide for monitoring to ensure long-term protection of on-site wetland hydroperiods, there is no assurance that the on-site wetlands would persist. Without a clear plan for preserving and replacing lost hydrology sources, Wetlands A, B and C would be expected to get smaller or disappear entirely over time. This outcome is counter to no-net-loss requirements in federal, state and County code and policy.

Wetland D Water quantity. As described previously, there is no current approved permit or mitigation plan that would allow filling one acre of Wetland D (a water quantity loss or displacement) and its on-site buffers. However, because the site plan has not been revised to remove or redesign Warehouse G, this discussion assumes that the current plan is to fill part of Wetland D and its on-site buffer area.

During operations, Warehouse G and its adjacent parking stalls to the east would overlay the on-site portion of Wetland D and its on-site buffers which would have been filled during construction phases.

Warehouse G would be located adjacent to the eastern site boundary, and therefore would directly border the off-site remnant portions of Wetland D with no buffer.

Because the fill would displace about an acre of currently available surface water storage and would fill part of the current surface water inflow pathway to Wetland D from the south, there may be flooding impacts to off-site portions of Wetland D on the neighboring parcel (owned by others) which is located directly east of the KFIP site boundary. These flooding impacts may cause the remaining off-site portions of Wetland D to expand, or may flood parts of the neighboring parcel that have not previously flooded. If not addressed and mitigated in advance to ensure no changes to the pre-development water quantity conditions, the flooding or expanded wetland boundary would impact off-site property owners. There is no current plan to avoid or address this impact.

Wetland D Functions and Values. If fill is permitted, the western edge of the off-site portion of Wetland D would be at the property line, and thus would have no buffer. It would border the directly adjacent warehouse and parking lot. Loss of an acre of wetland typically would require creation of new wetland and buffer area at a higher than 1:1 replacement ratio. But there is no current mitigation or functional replacement plan for either wetland or buffer impacts.

In addition to impacts from loss of about 1/3 of the Wetland D area, the lack of a vegetated buffer for the remaining off-site portions of Wetland D at the property line would exacerbate other negative impacts to the remaining off-site wetland area functions and values and may require additional compensatory buffer mitigation.

There is no current plan to avoid or address these impacts. Without adequate compensatory mitigation, these proposed impacts to wetland functions and values are significant and counter to the no net wetland loss policies of state and county governments.

Floodplains

During Proposed Action operations, the primary long-term impact to the floodplain related to the KFIP Project would be from the stormwater outfall structure and backwater flooding through the outfall, which is discussed in detail above and would continue throughout the operational lifetime of the KFIP facilities.

PCC 18E.70 and PCC 18E.110 both discourage placement of structures on a floodplain, but also require that any structure on the floodplain is properly engineered (i.e., it should be stable and should not cause erosion of the floodplain or riverbank). The outfall structure is clearly degrading, and there is no current proposal to repair, stabilize, redesign and/or relocate portions of the existing outfall structure or other components of stormwater management system to ensure more effective long-term function of the KFIP stormwater management plan. Without implementation of additional engineering assessment, subsequent repair, possible redesign to minimize future KFIP flows through the outfall and regular monitoring, the outfall structure is considered likely to degrade further and result in significant impacts to the riverbank at the edge of the floodplain over time, impacts which would increase during future KFIP operations as a result of more water flowing through the outfall relative to current conditions.

Shorelines

Under the Proposed Action operations, impacts to the Shoreline zone are effectively the same as those to the floodplain, and are discussed above.

Alternative 1 – Rail Transport

Construction and Operations Impacts

Puyallup River, Wetlands, Floodplains, Shorelines

The Alternative 1 proposal, which involves using rail rather than roads in some of the warehouse complex area, is unlikely to have significantly different impacts to surface water than the standard proposal. There might be a slight difference in total impervious surface, but it is assumed that the general approach to stormwater management and the risks would remain the same.

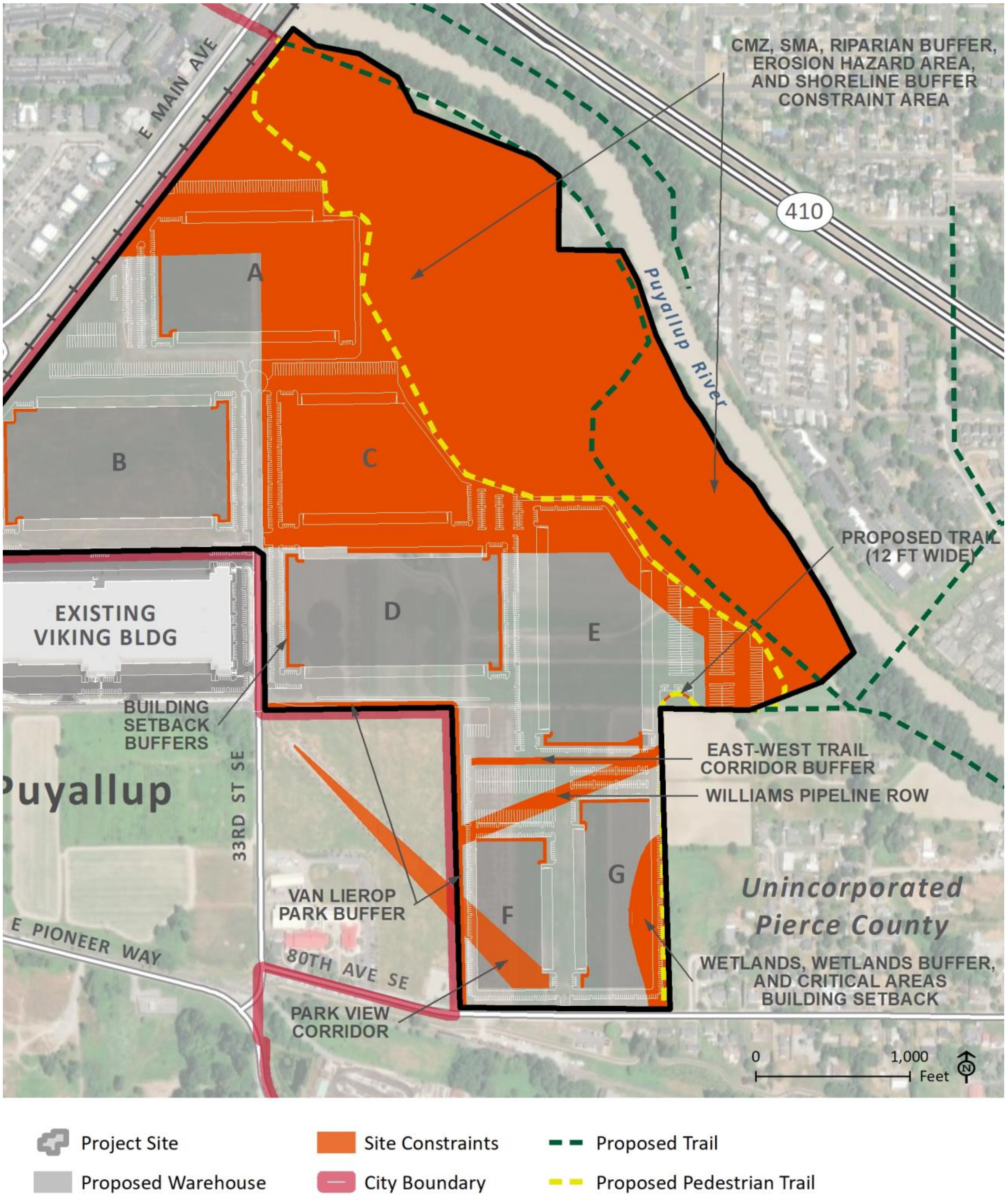
Therefore, the Alternative 1 proposal is likely to result in similar significant impacts to the river, on-site wetlands, floodplain, and shoreline area. Most of those impacts would be initiated during construction phases, but would continue during long-term operations, as described in detail above.

Alternative 2 – Reduced Intensity Alternative

Under WAC 197-11-440(4)(5), an EIS is directed to analyze reasonable alternatives, which "shall include actions that could feasibly attain or approximate a proposal's objectives, but at a lower environmental cost or decreased level of environmental degradation."

As such, Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility, as outlined in Section 3 of this EIS, were adopted by the Applicant (Figure 4-25). Under Alterative 2, the total footprint of the facility would be reduced from about 2.6 million SF to about 1.7 million SF (about 35 percent footprint reduction). The following mitigation measures to reduce intensity would be applied:

- All warehouses would include a minimum 15-foot-wide landscape bed to be provided along the entire length of blank wall facades of buildings.
- Warehouses would not be constructed on lands designated Rural Buffer Residential (RBR) in the City's Comprehensive Plan. The RBR designation reflects development restrictions associated with the shoreline buffer constraint area, the riparian buffer adjacent to the Puyallup River, and the erosion hazard area. This would eliminate Warehouse C and would reduce the footprint of Warehouses A and E.
- Warehouse F would be reduced in size to avoid blocking the prime view corridor from Van Lierop Park.
- Warehouse G would be reduced to avoid fill impacts to on-site portions of Wetland D and its on-site buffer, in accordance with Pierce County Code 18E.40.050.



*See Figure 4-55 for the
Van Lierop Park Concept Plan

Figure 4-25. Alternative 2 – Reduced Intensity Alternative

Construction Impacts

Construction of Alternative 2 would result in similar but slightly reduced impacts during construction as compared to the Proposed Action. During construction phases, Alternative 2 would result in fewer construction vehicle trips due to the reduced Project size and footprint of the facility. During grading and filling phases, up to 1,270 total construction vehicle trips (or up to 215 trips per day) would be expected. During utilities installation work, up to 100 total construction vehicle trips (or up to 4 trips per day) would be expected. During warehouse construction (which includes building and paving roads and parking areas), up to 1,560 construction vehicle trips (or up to 40 trips per day) would be expected.

Due to Alternative 2's reduced footprint, temporary and permanent impacts analogous to the Proposed Action would occur, but at a smaller scale and farther from some of the environmentally sensitive areas on site—specifically, fill impacts at Wetland D and its on-site buffer—would not occur, and the potential landslide hazard areas near the top of steep slopes at the eastern edge of the high terrace would not be developed.

However, Alternative 2 does not change the current proposal to redirect most site runoff to the Puyallup River, and therefore, does not address ongoing erosion at the riverbank, does not address water quality and listed species impacts from 6PPD pollutants, nor the need to protect and maintain current groundwater-fed hydrology sources for the on-site wetlands. Neither does it propose revegetation of the undeveloped surfaces between the terrace edge and the warehouse zone, which would be expected to become weed-dominated unless properly managed. These impacts to surface water would occur during Construction because the timing of paving and construction of stormwater systems during Construction would overlap with impacts from new warehouse traffic runoff during Operations.

Mitigation actions that may be applied to reduce impacts to groundwater during Construction phases are described in the Mitigation Measures section (4.2.5) below.

Mitigations actions for other impacts associated with a smaller construction footprint were identified and described in other sections of this EIS (Section 4.1, Earth Resources mitigation measures ER-1 through ER-10; Section 4.5, Land Use mitigation measures LU-2 through LU-4; Section 4.6, Recreation mitigation measures REC-2 through REC-3; Section 4.7, Aesthetics mitigation measure AES-1; Section 4.10, Health and Safety mitigation measures HS-1 through HS-5; and Section 4.13, Noise mitigation measures N-1 and N-2).

Operations Impacts

The Operations Impacts associated with Alternative 2 would be similar but slightly less than those described for the Proposed Action, due to the smaller Project area footprint. The number of daily vehicle trips generated by the KFIP warehouse complex under Operational phases for Alternative 2 would be reduced by about 21 percent and the overall impervious surface cover on the high terrace would be decreased by about 33 percent, as compared to the Proposed Action.

Under the Proposed Action, there would be a maximum of 8,724 trips per day. In comparison, Alternative 2 would generate a total of 5,844 trips per day. Alternative 2 would also require up to 1,000 employees/day during operations (i.e., 1000 trips/day from commuting employees). In sum, Alternative 2 would result in a daily traffic volume decrease of about 21 percent.

As a result of the Alternative 2 reduced impacts approach, there would be a reduction in total impervious surface and a decrease in the number of daily traffic trips. But the general approach to stormwater management would remain the same. Impacts to surface water wetlands from lack of hydrology, ongoing riverbank erosion and water quality impacts from 6PPD still remain. Thus, under Alternative 2, wetlands are still expected to become smaller or disappear entirely due to a decrease in infiltration and associated groundwater hydrology volumes. Ongoing erosion at the riverbank is expected to increase as a result of increased runoff from KFIP pavement through the outfall. New impacts to listed salmonids from new inputs of 6PPD laden water from pavement still remain, although would be slightly reduced by having less pavement. These are all significant impacts. Mitigation actions that may be applied to reduce these impacts to surface water are described in the Mitigation Measures section (4.2.5) below.

4.2.5 Mitigation Measures

This section summarizes KFIP impacts and mitigation measures that could be implemented to avoid or minimize surface water impacts of the currently proposed KFIP Project, both during Construction Phases and during full Operational Phases after construction is complete. Prior to initiation of construction, the proponent is expected to obtain the necessary federal, state and local permits and to prepare the appropriate plans that are required to protect surface water, including but not limited to an NPDES Construction Stormwater General permit, a Spill Prevention, Control, and Countermeasure (SPCC) Plan, a construction SWPPP, a federal/state 404/401 permit (for fill impacts to the Puyallup River), a State Water Pollution Control Act (90.48) certification, and an HPA (through WDFW). Plans and reports are expected to show concurrence with the PCSWDM, with relevant Pierce County Development Permit approvals, to comply with conditions of approval.

Construction and Operational Impacts

Impacts during Construction Phases would be from initial clearing, grading, and filling; installation of utilities (trenching and installation or conduit and pipe); stormwater runoff; and work associated with construction and paving of parking lots, roads, and warehouses.

Impacts during Operational Phases would primarily result from methods used to manage stormwater runoff and from traffic, both on and off site. Operational impacts specific to the not yet defined businesses that would operate out of the warehouses are not addressed in this EIS.

Because the timing on Construction phases is planned to overlap during a period of 4 years with Operational Phases, and because some of the operational impacts to surface water would start during construction, the impacts discussion is combined below to simplify and avoid redundant discussion.

Puyallup River

During construction, direct impacts to water quality could occur from grading that contributes to erosion and sediment movement; increased flow volumes on site and to the river that cause turbidity through erosion; sedimentation downstream of soil disturbance activities; or release of pollutants from construction equipment. As pavement coverage increase, so would runoff volumes, and at some point during the proposed 4 years of construction, excess runoff would be sent to the existing outfall at the river using the same stormwater management systems as are proposed for long-term operational conditions.

With the BMPs required as part of the Construction Stormwater General Permit and SPCC Plan, sediment impacts to Puyallup River from on-site erosion during construction could be reduced. But under the current proposal, potential water **quality** impacts to listed species in the River during both Construction Phases and Operations Phases from the increase in direct flows to the river from paved areas containing the 6PPD pollutant are neither avoided nor minimized. No effective treatment designed to remove 6PPD from the pavement runoff prior to sending it to the river is proposed.

Potential water **quantity** impacts to Wetlands A, B, and C during construction phases and operations phases are neither avoided nor minimized, due to a lack of any information about on-site wetland hydroperiods, as is needed to properly design infiltration facilities that could be used to maintain these wetlands. Potential water quality and quantity impacts to Wetland D are neither avoided nor minimized, due to the lack of any fill permit review and approval process and lack of an associated approved mitigation plan.

Mitigation options that may be applied to reduce long term impacts from the significant increase in on-site stormwater runoff quantities causing an increase in ongoing erosion at the riverbank; from the associated increase in 6PPD pollution to the Puyallup River from the new stormwater runoff volumes; from fill impacts at Wetland D, and from expected degradation of the floodplain outfall structure during construction phases and later during operations phases are discussed below.

SW-1. Evaluate the outfall erosion issues prior to Hearing Examiner hearing and prior to County and Hearing Examiner approval and final KFIP permitting and take corrective action as needed to redesign, repair, or relocate the stormwater outfall structure or components of the Project-wide stormwater management plan in relation to future flow increases from the KFIP Project site. Based on EIS Team field observations of the condition of the outfall in 2020, 2021, 2022, and 2023, portions of the structure appear to be failing or not operating as designed due to scour and erosion from the combined effects of seasonal flooding, sediment deposition, high energy fall and winter river flows and current stormwater discharge. In light of these indications of degradation at the existing outfall location, adding significantly greater future stormwater discharges from KFIP to the outfall could cause additional stress on the system and exacerbate current problems. The existing outfall requires further design evaluation, adaptation, and mitigation measures prior to permitting to determine whether the outfall and eroding riverbank can be effectively stabilized so as to receive new, increased discharge volumes from the KFIP site.

- Evaluate the outfall prior to Hearing Examiner hearing and prior to County and Hearing Examiner approval and final KFIP permitting and take corrective action as needed to meet PCC 18E Performance Standards over time and to be consistent with the Pierce County Comprehensive Plan policies listed in Section 4.2.2 and with the standard for subdivision approval. This mitigation should include:

- Provide a new and updated OHWM elevation report which describes how the OHWM is determined, following standard guidance protocols from Ecology (Ecology [F], 2016).
  - Guidance indicates that the OHWM elevation can be determined by defining the 2-year stage from nearby river gages. Data from the directly downstream E Main USGS 12096505 gage indicates that the 2-year stage is about 42.8 feet NGVD29 (46.29 feet NAVD88). This indicates that the OHWM elevation of 38.5 feet marked on the site design maps is incorrect or outdated.
  - Verifying and updating the location and elevation of the OHWM to reflect current conditions at the riverbank is needed for permit review processes as well as for effective design of outfall or riverbank repairs.
- Prepare a separate monitoring plan specific to the outfall engineering and design intent and performance limits of the current outfall structure.
  - The new monitoring plan prepared by an engineer should consider recent flooding and sediment loads (discussed in Section 4.2.4), high energy river flows, and should provide a clear record of design and purpose of each component of the outfall. The monitoring plan should explain the range of expected impacts of river flood hydraulics during standard and extreme (10 to 100-year storms) flood events, sediment deposition within the outfall, and both current and future stormwater discharge volumes and rates. The plan should provide specific guidance about how much sediment deposition, erosion or loss of planted vegetation is allowed or expected as part of "normal" outfall facility function and should provide maintenance recommendations for repair when the outfall functions are failing to meet defined performance standards.
  - The definition of "failure" must be provided, as well as contingency plans designed to address indications of current failure or imminent failure.
- To ensure that any redesign or repair is adequate, the Project proponent should monitor the structure at least annually in perpetuity, and ideally after each overbank flood event, to ensure that the structure is still safe, intact, and functioning as designed. Regular monitoring would ensure that responses to indications of degradation would be timely and would not wait for serious or catastrophic failures.
- To provide information critical to assessment of outfall function, KFIP should carry out a new scour analysis using current cross sections of the river, since the previous cross section surveys discussed in Section 4.2.3 are now more than 10 years old. The new scour analysis should include assessment of impacts of both current and future flow volumes from upland basins—both Viking (current) and all future indicated basin runoff in the Viking and KFIP contributing basins. The new scour analysis should provide updated feedback as to the type, minimum size, orientation, and extent (along the riverbank) of any proposed riverbank protection or stabilization materials.
- If required based on the updated scour evaluation results, identify, and implement mitigation measures prior to KFIP Project approval and construction to improve the outfall, to eliminate erosion within the outfall and at the riverbank, and to ensure that the outfall

can adequately manage significantly greater future flows from the KFIP Project site as well as future planned regional inflows from upslope basins. This response could include redesigning and/or repairing the outfall, or partially relocating parts of the overall KFIP stormwater management system, and may include the following actions, or other similar responses:

- Design a stormwater conveyance channel that provides for full and effective stormwater runoff energy dispersion prior to reaching the river, and thus safely conveying all current and future flows to the river under the full range of river stages without erosion at the riverbank. This channel should be lined with durable materials such as riprap or concrete, and its energy dissipation function should not be affected by annual flood sediment deposits from the river.
- Evaluate the existing riverbank for the existence and adequacy of toe rock, and design the bank with adequate armor below the OHWM to resist hydraulic impacts of 100-year river flows and upstream flanking erosion risk.
- Outside the re-designed stormwater riverbank spillway described above, design a properly engineered stabilized riverbank, with appropriate slope stability function below the OHWM and native vegetation above the OHWM that can survive the expected periodic high river floods and velocities. At this high energy location, this design may require a combination of hardscape riprap and designed bioengineering structures.
- Design the outfall to accommodate permanent and transient sedimentation from the river without the need for routine maintenance. The current outfall no longer provides for stormwater sheet flow or energy dissipation due to collection of deep sediment and subsequent development of deep erosion channels.

SW-2. Re-evaluate current stormwater management strategy. The current proposal is to send all pavement runoff and runoff from four warehouse roofs to the river. If instead LID practices were broadly applied and if all parking lot and roads runoff were infiltrated using BMPs such as amended soils (as described in research by WSU scientists and others) or infiltrators below the pavement, the potential for significant water quality impacts from 6PPD and water quantity impacts from increased KFIP flows to the outfall would be greatly diminished.

- Re-evaluate the current stormwater management strategy and consider broadly applying LID practices and infiltrating all parking lot and road runoff. This should include:
  - Consider the benefits of reducing future flows to the outfall structure at the northern end of the site, in relation to PCC 18E Performance Standards and the evaluation called for in SW-1.
    - Example concept: If properly engineered and allowed by the reviewing agencies, upslope infiltration facilities could be designed to safely overflow to infiltration trenches or spreaders at the landward edge of the floodplain rather than to the river. This would reduce both water quantity and water quality impacts to the river, and would support the natural floodplain hydrologic systems, including hydrologic support for Wetlands A, B, and C.

  - Consider BAS, including broad research on tire chemical impacts on listed salmonids and LID treatment options (discussed in Section 4.2.3). Application of BAS regarding protection of listed fish in the river from documented lethal impacts of 6PPD is consistent with protection of listed species required under federal and local law, and also with Pierce County's Comprehensive Plan policies listed in Section 4.2.2., particularly those for using BAS and adaptive management for critical areas, using LID practices to maintain water quality for fish, and eliminating harm to water quality from stormwater discharges through use of on-site infiltration and other means (Goal ENV-14, Goal ENV-15, Policy ENV-15.3, Policy ENV-5.14, Policy U-32.2).
  - Consider overall reduction of site hard surfaces and apply LID techniques as needed to reduce water quality impact concerns, and to maintain current ground water functions and hydrology volumes flowing to the floodplain. This stormwater management approach would also benefit floodplain wetlands.

Wetlands

The groundwater source for hydrology supporting Wetlands A, B and C would decrease as a direct result of an increase in impervious surface on the high terrace—paving and buildings in the future KFIP warehouse complex. This condition in combination with the stormwater management system being designed to capture and send most site runoff directly to the river results in less on-site infiltration and replenishment of groundwater. Proposed infiltration from four warehouse roofs would be sent to top of slope trenches that are mostly sited hydrologically downstream from the floodplain wetlands, and thus may not support wetland hydrology. If these results are left unabated, Wetlands A, B and C are expected to shrink, or even disappear, due to lack of on-site infiltration, the main source of the floodplain wetlands' hydrology. Mitigation Measure SW-2 would minimize the impacts of site surface changes to groundwater functions. However, there is not currently enough information about wetland hydroperiods describing how the wetlands function over the entire water year to confidently design an effective wetland hydrology support strategy.

Protecting wetland hydrology is required in law (PCSWDM), and thus the methods used to provide hydrology to these wetlands as well as to monitor and document that the wetland hydrologic support system works as designed must be fully addressed in the site design and mitigation plans.

SW-3. Hydrogeologist/Geotechnical engineer assessment of steep slopes and location of proposed infiltration facilities.

- As part of permit review and consistent with PCC 18E.80 (Landslide Hazard Areas), a geotechnical engineer or equivalent should evaluate the steep, sandy slopes below the currently proposed infiltration trench locations to determine whether the sandy floodplain terrace slopes would withstand hydraulic loading pressures from the proposed infiltration facilities. This work is intended to ensure that the slopes would not fail and erode to the floodplain below from hydraulic loading impacts, and to ensure stability of the directly adjacent upslope parking, roads, and warehouses' infrastructure. The advisability and impact of the trenches located in landslide hazard areas should be weighed, and application of appropriate setbacks from top of slope should also be considered. Alternate infiltration facility locations farther from the top of slope may be required to ensure slope stability is protected.

SW-4. Surface and Groundwater Hydrology monitoring prior to final site design and construction in all on-site wetlands to define hydroperiods[13], as needed to develop effective plans to preserve current wetland hydrology, as required in Code.

Assessment of hydroperiod is the technical standard applied to projects with wetland hydrology impacts that require proper management to avoid loss of wetland acreage (No-Net Loss goals). The hydroperiods of the on-site wetlands have not been defined. This information provides a baseline to inform infiltration facility design and location, and to ensure that wetland hydrology volumes and timing of inflows are supported both during and after construction, which is expected to take several years to complete. Site design and scheduling must have a specific plan for providing adequate hydrology during appropriate time periods to the on-site wetlands throughout KFIP construction activities as well as during long-term operations.

- Conduct groundwater and surface water monitoring prior to final KFIP site design and permitting to define the hydroperiod for on-site wetlands (A, B, C, and D), and use the resulting information to put plans in place for providing adequate wetland hydrology during both construction and operation phases.
  - Wait to finalize site design and construction plans until at least one water-year of monitoring is complete, so adequate information is available to ensure that KFIP can redirect on-site stormwater to maintain current hydrology functions (water quality and water quantities) of on-site wetlands and to support off-site remnant portions of Wetland D. Protection of wetland hydrology and avoidance of impacts to wetlands is required by law (PCSWDM, Minimum Req. #4 and PCC 18E.40.050, respectively).
  - Hydroperiod monitoring should take place over at least one wet season and include initial infiltration testing in proposed infiltration areas, and installation of long-term monitoring wells with water level dataloggers in constructed infiltration areas and in wetland areas to determine groundwater levels and document that hydrology timing and volumes are adequate to maintain and preserve historic wetland conditions.
  - Monitoring should also evaluate and define the purpose of each infiltration trench within the context that most of the currently proposed infiltration trench locations are not sited hydrologically upslope from Wetlands A, B and C, and none are proposed near Wetland D. Therefore, the currently proposed infiltration facilities may not provide hydrology at the right locations to effectively support the on-site wetlands but may provide other floodplain benefits.

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[13] Wetland Mitigation in Washington State Part 1: Agency Policies and Guidance, Chapter 8.2 and SMMWW (Ecology 2019), Appendix I-C.4 Wetland Hydroperiod Protection

  - There is no current mitigation strategy designed to preserve current hydrology in the remaining off-site portions of Wetland D, as is required by law.
  - If fill of Wetland D is allowed, conduct surface water monitoring in off-site areas of Wetland D to address loss of surface water storage and resultant increased potential for displacement of flood waters on off-site areas to the east.

- Ensure plans are in place to maintain wetland hydrology and protect wetlands throughout construction.
  - Currently there is no information on how the KFIP Project would preserve wetland hydroperiods during construction, prior to installation of the infiltration trenches and construction of warehouse roofs that are intended to provide stormwater volumes for infiltration (as discussed in section 4.2.4).
  - Properly designed and located infiltration facilities must be in place early in construction phases to ensure that there is no extended lapse in pre-existing wetland hydrology patterns either during construction or during operations.
- Redesign or relocate infiltration facilities as needed to ensure maintenance of adequate hydrology during construction and long-term operations.

SW-5. Long-term groundwater monitoring during operations to document success of proposed hydrology support. Due to uncertainties about the effectiveness of proposed infiltration trenches to replenish Wetlands A, B, and C:

- Groundwater wells should be maintained and continuously monitored (use of water level dataloggers is indicated) for at least ten years during and after construction is complete to document long term conditions with ground and near-surface water levels in the vicinity of Wetlands A, B, and C, and at Wetland D. Ten years of monitoring is standard under federal and state regulations when mitigation involving proof of wetland hydrology requires verification. The same monitoring would apply to remaining off-site portions of Wetland D, pending development of a mitigation and monitoring plan for the proposed fill.
- Per requirements of the PCSWDM and PCC 18E, compensatory mitigation requirements apply if groundwater replenishment and associated wetland hydrology functions are shown to be reduced over time. This may require redirection of some stormwater runoff volumes from upland areas to infiltration facilities or development of new infiltration facilities.

SW-6. Wetland D impact avoidance.

- If the Project were revised to avoid all impacts to Wetland D and its regulated buffer, no significant impacts would occur to this resource on site.
- The permitting agencies (Pierce County, and Ecology) should determine how the Applicant has properly followed standard mitigation sequencing, including initial avoidance of the impact altogether and site planning design changes needed to avoid or minimize loss of wetland and buffer area at Wetland D.

- The permitting agencies should document if an alternate site plan that does not fill Wetland D still allows for reasonable economic use and if the Project objective can still be fulfilled without fill of and construction over Wetland D of the KFIP site.
- If the mitigation sequencing were to be fulfilled, the Applicant is expected to prepare a mitigation plan and file a JARPA form with Ecology and Pierce County to initiate regulatory review of the current KFIP proposal, which is to fill a portion of Wetland D and its associated on-site buffer.
- If fill of Wetland D and its buffer is permitted by all of the agencies listed above, a final detailed mitigation plan addressing Wetland D fill should be completed and implemented prior to construction, following standard mitigation and minimization sequencing protocols.

SW-7. Mitigation and monitoring plan.

- Depending on the outcomes of SW-6, per PCC 18E and Ecology requirements, a JARPA permit process would require a detailed mitigation and monitoring plan to be developed as conditioned during the review described above. The Plan is required to define the full range of mitigation measures needed to compensate for impacts to the remnant Wetland D, off site to the east, and to mitigate for loss of approximately one-acre of wetland plus associated buffer area impacts on site. To meet no net loss goals, as described in Ecology mitigation guidance (Ecology [F], 2009), the not yet developed mitigation and monitoring plan should evaluate previous wetland and buffer losses to the basin as a whole, and should provide for mitigation at appropriate replacement ratio levels, as described in code, that would replace the lost water quantity, water quality and wetland habitat functions during construction as well as during long-term operations.

    - The Wetland D delineation and report prepared by the EIS Team in 2021 should be used by the permitting agency as a basis for developing an appropriate mitigation and monitoring plan per County mitigation regulatory standards. Additional work and/or reporting may be needed, as required during the permitting and review process.
    - The mitigation plan should determine potential for impacts to adjacent, off-site properties (owned by others) due to the proposed fill action, and the permitting agency should approve a fill design only if the Applicant can show that wetland and upland properties to the east at Wetland D would not be flooded or inadvertently converted to wetlands as a result of bisecting and filling portions of Wetland D on the KFIP site.
    - Surface water inflows from the south that currently support this wetland system must be monitored and realigned to ensure that they still provide adequate hydrology to support the remaining eastern (off-site) portions of Wetland D.
    - During long-term operations, if allowed by the adjacent landowner, the Applicant would typically need to install groundwater wells to monitor hydrology in the remnant Wetland D to ensure that similar wetland conditions persist after construction is complete. The mitigation plan may include improvement of the off-site wetland system, as may be allowed by the adjacent landowner. If not, other mitigation may be required.

  - Other contingency mitigation plans may be needed to address potential hydrology source impacts to Wetland A, B, and C, as described above, if monitoring indicates that wetland hydrology is decreasing over time.
  - Mitigation for buffer impacts could include revegetation of currently farmed or weedy areas in the floodplain using native plants.
  - To meet general requirements of County and federal regulations, related to mitigation timing, at least initial stages of implementation of the mitigation plan should typically be completed prior to final permitting and site design approval.

Floodplains and Shorelines

The existing outfall that was constructed as part of the Viking Warehouse Project is degrading and potentially failing. Mitigation Measure SW-1 above would minimize erosion and sedimentation impacts on water quality in the Puyallup River and erosion impacts in the floodplain.

SW-8. Reduction of on-site erosion and sediment movement.

- Replanting currently farmed or cleared areas in the floodplain upslope from the outfall with native trees and shrubs would act to trap sediment during surface flood events, reducing sediment impacts to the river and to the outfall structure. This approach would also provide for a more effective replacement of lost riverine buffer habitat functions near the outfall as well as lost buffer function at Wetland D.

4.2.6 Significant Unavoidable Adverse Impacts

There are significant adverse impacts to surface water quality and quantity from the current proposal.

- Surface water quality impacts that would result from directing paved areas runoff directly to the Puyallup river without adequate treatment to remove 6PPD tire oxidant pollutants have potential for lethal impacts to listed salmonids in the river. Directing new volumes of stormwater from paved surfaces to the river would increase current levels of the pollutant in the river and thus would degrade water quality relative to the current condition, and thus is expected to increase fish mortality.
- Surface water quality impacts from erosion, sedimentation and potential structural failure of the existing stormwater outfall facility sited on the floodplain at the edge of the Puyallup require repair, redesign, or relocation of some of the outfall functions or associated upland KFIP stormwater management system. This is necessary to reduce or eliminate new impacts to fish habitat in the river, impacts that have resulted from the outfall and riverbank stabilization efforts not addressing hydraulic impacts to the outfall and riverbank from normal seasonal flooding and scouring.
- Surface water quantity impacts to floodplain wetlands would result from redirection of surface water and inadequate infiltration facility design, and is expected to result in loss or decline of the floodplain wetlands surface area.
- Filling at Wetland D would result in direct loss of about one acre of wetland and its associated on-site wetland buffer, in addition to unavoidable impacts to functions and values to the

remaining off-site portions of Wetland D. There is no current fill permit or mitigation plan designed to compensate for those losses.

The current proposal results in significant adverse impacts to surface water systems.

4.3 Groundwater

This section provides an analysis of potential impacts to groundwater. Groundwater impacts from the proposed KFIP development have been evaluated and weighed to determine whether the proposed KFIP Project would have significant groundwater quantity or quality impacts affecting river functions and on-site wetlands.

Groundwater is water that collects or flows beneath the Earth's surface, filling the porous spaces in soil, sediment, and rock. Groundwater that is stored in and moves through these subsurface layers is called an aquifer. Groundwater aquifers are recharged by infiltration of rain, melting snow and ice through the ground surface. Groundwater discharges into streams, rivers, and oceans, and/or is pumped from these layers via wells to provide drinking water.

Groundwater below the KFIP site is stored in subsurface geologic and soil layers, most of which are annual sediment deposits from post-glacial alluvial floods. These layers recharge and drain in response to surface conditions, annual weather patterns, and the ability of these materials to infiltrate and transport water in subsurface layers below the KFIP site. Complex geology and soil characteristics both on site and in the contributing basin (surfaces outside of the site that send hydrology toward the site) determine how, when, and where groundwater would infiltrate and flow through the site and thus would define how groundwater functions may be affected by surface development.

There are three geomorphic surfaces on the KFIP site where infiltration systems may be employed. For purposes of this discussion, the surfaces would be called the *high terrace*, the *middle terrace* (a slightly lower elevation subarea in the central eastern high terrace surface), and the *floodplain* (Figure 4-26).

4.3.1 Study Area

The study area for groundwater includes the KFIP site and surrounding upslope basins, which influence groundwater recharge, groundwater depth and how fast or slow groundwater flows through the KFIP site and to the associated floodplain and Puyallup River. The contributing recharge basin includes the KFIP site (mapped as Quaternary alluvium – Qa) and higher elevation uplands to the south (mapped primarily as glacial outwash – Qgoi, and glacial till – Qgt) (Figure 4-26).

Groundwater recharges as it infiltrates and drains toward and through the KFIP site from these surfaces. Groundwater discharges from the KFIP site to the Puyallup River and to its floodplain located along the northeastern side of the KFIP Project site.

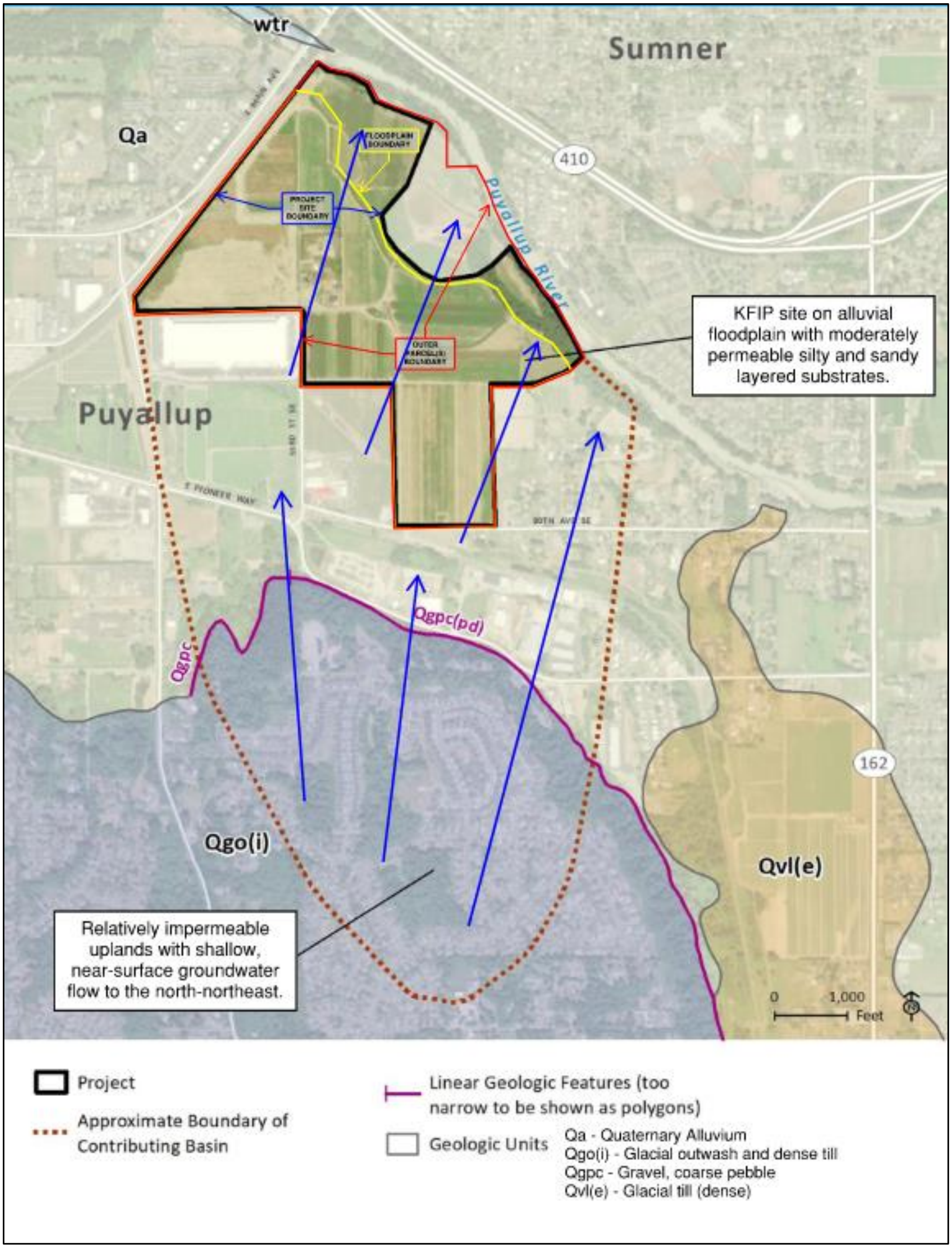

Figure 4-26. 100K WADNR Geology Mapping in the Contributing Groundwater Basin

4.3.2 Relevant Plans Policies, and Regulations

This section and Table 4-10 provided below summarizes federal, state, and local regulations related to groundwater that are relevant to the KFIP Project.

Table 4-10. Overview of Relevant Regulations

Law and Regulation	Description
Federal	
Sections 404 and 401 of the Clean Water Act (CWA; 33 Code of Federal Regulations [CFR] 26, Subchapter 4, Section 1344)	Section 404 is administered primarily by the USACE and Section 401 by Ecology as a state-agent of the USEPA. These agencies review and permit projects proposing in-water work related to fill in WOTUS.
State	
Section 401 of the Clean Water Act (CWA; 33 CFR 26, Subchapter 4, Section 1344)	Section 401 is administered at a federal level by the USEPA, which has delegated review authority to Ecology. Ecology reviews and certifies Section 401 water quality permits for projects proposing in-water work in WOTUS.
Washington State Water Pollution Control Act (90.48 RCW)	Ecology regulates wetlands under the state Water Pollution Control Act (RCW 90.48) and the SMA (RCW 90.58). Ecology also provides guidance to local jurisdictions under SEPA to identify wetland-related issues early in permit and review processes. Administrative orders are issued under RCW 90.48.120. Ecology requires that all projects affecting surface waters in the state must comply with the provisions of the state's Water Pollution Control Act, including those waters or wetlands that are not subject to the federal CWA regulations.
Water Quality Standards for Groundwaters of the State of Washington (WAC 173-100 and 200)	WAC 173-100 establishes procedures to designate groundwater management areas and to develop programs designed to protect groundwater quality. WAC 173-200 defines water quality standards for groundwater, which specifies an anti-degradation policy.
Washington Underground Injection Control Program (WAC 173-218)	WAC 173-218 protects groundwater quality by regulating the disposal of fluids into the subsurface. State groundwater protection regulations apply when drinking water aquifers are at risk, or when groundwater flows to surface waters that are used as a drinking water source, or when groundwater flows to surface waters which contain listed species.
Washington State Department of Ecology NPDES Permit Program	The NPDES permit program controls water pollution by regulating sources that discharge pollutants into WOTUS (CWA, 33 USC Sections 1251 et seq. and WAC2 197-11-200 through 240). The state Department of Ecology develops and administers NPDES municipal stormwater permits in Washington state. These permits regulate discharges to both surface waters (via surface conveyances) and to groundwaters (via infiltration facilities) of the state.

Law and Regulation	Description
Local (County and City)	
Pierce County Stormwater Management and Site Development Manual (PCSWDM)	The PCSWDM includes LID requirements for stormwater treatment systems which are intended to promote stormwater infiltration where practicable and to return filtered stormwater to the groundwater aquifer close to where the water (i.e., rainfall) originates. The manual also provides rules designed to protect wetland hydrology, from both a water quality and water quantity standpoint.
Pierce County Comprehensive Plan Policies	The Pierce County Comprehensive Plan is a tool to assist County Councilmembers, planning commissioners, County staff, and others in making land use and public infrastructure decisions. It provides the framework for the County's Development Regulations.
City of Puyallup Stormwater Management Program Plan (SWMPP)	The SWMPP provides guidance on how the City manages its stormwater to meet requirements of the City's NPDES Phase 2 permit, as administered by Ecology.
City of Puyallup Critical Areas Regulations (PMC Chapter 21.06 CRITICAL AREAS)	The Puyallup Critical Areas regulations (PMC Chapter 21.06) are similar to those of Pierce County, as both are designed to meet standards defined in the GMA. However, some regulatory details are different.
City of Puyallup Comprehensive Plan	The City of Puyallup Comprehensive Plan includes government planning policies that call for the protection, preservation and enhancement of water resources and other natural environment components. It is "the long-term vision and plan for managing the built and natural environment in the City of Puyallup", and provides policy guidance used by City staff to make decisions related to growth and development.

Federal

Clean Water Act (Code of Federal Regulations)

Section 431.02 of the federal CWA, and corresponding State of Washington regulations (outlined below) establishes the mechanism for regulating discharges of pollutants to groundwater through the NPDES, a permit program that regulates point sources of polluted water that may be discharged into WOTUS.

CWA regulations apply to groundwater when groundwater flows to surface waters that contain listed species, drinking water aquifers are at risk, or groundwater flows to surface waters that are used as a drinking water source. The KFIP site is within the northeastern boundary of the Central Pierce County Aquifer Area Sole Source Aquifer (Figure 4-27Figure 4-27), which is bounded by the Nisqually River to the southwest, Puget Sound to the west, and the Puyallup River to the east.

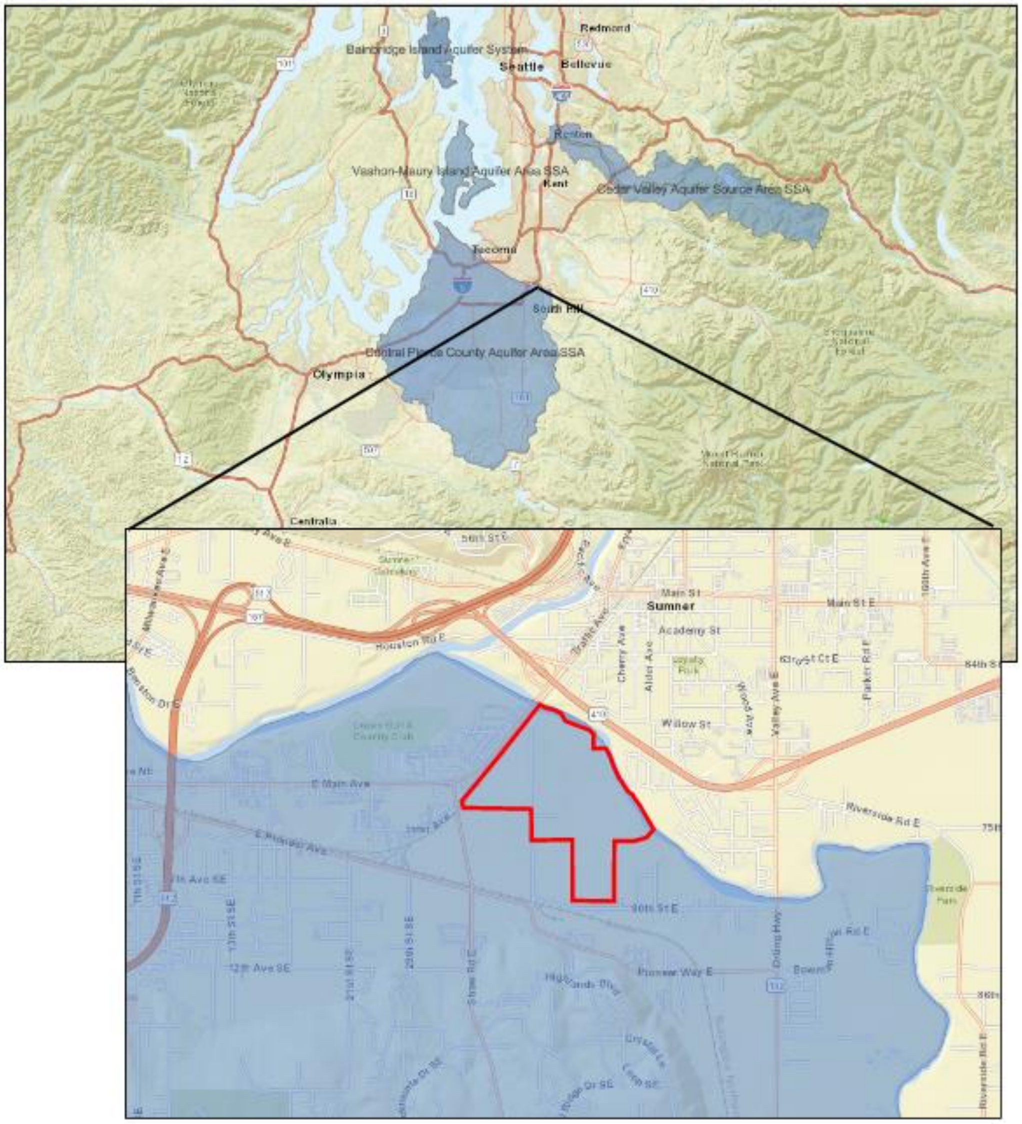

Figure 4-27. Sole Source Aquifer Map (Pierce County GeoSpatial Data mapping)

The Safe Drinking Water Act of 1974 (under the USEPA) protects sole-source drinking water aquifers, including rivers, lakes, reservoirs, springs, and groundwater wells that serve 25 or more individuals. This regulation gives USEPA review authority over any “*projects that are to receive federal financial assistance and which have the potential to contaminate the aquifer.*” The aquifers designated as sole source by USEPA have been incorporated into state and local regulations. State and local critical area regulations are also intended to protect local drinking water systems in addition to USEPA designation, rules, and regulations.

State

Washington State Department of Ecology

Water Quality Standards for Groundwaters of the State of Washington (WAC 173-100 and 200)

WAC 173-100 establishes procedures to designate groundwater management areas and develop groundwater management programs with the goal of protecting groundwater quality.

WAC 173-200 defines water quality standards for groundwater, which specifies an anti-degradation policy.

Washington Underground Injection Control Program (WAC 173-218)

WAC 173-218 protects groundwater quality by regulating the disposal of fluids into the subsurface.

Similar to federal regulations, state groundwater protection regulations apply when drinking water aquifers are at risk, or when groundwater flows to surface waters that are used as a drinking water source, or when groundwater flows to surface waters that contain listed species.

Washington State Department of Ecology NPDES Permit Program

The NPDES permit program controls water pollution by regulating sources that discharge pollutants into WOTUS (CWA, 33 USC Sections 1251 et seq. and WAC2 197-11-200 through 240). Ecology develops and administers NPDES municipal stormwater permits in Washington State. These permits regulate discharges to both surface waters (via surface conveyances) and to groundwaters (via infiltration facilities) of the state.

There are two types of permits:

- Phase I Municipal Stormwater Permits regulate discharges from MS4s owned or operated by large cities and counties, including Pierce County.
- Phase II Municipal Stormwater Permits regulate discharges from certain ”small” MS4s in Washington, including the City of Puyallup.

The current Phase I and Phase II permits were effective August 1, 2019, and will expire on July 31, 2024. New permits will replace the old, applying any regulatory updates to previous permit requirements. These permits require local governments to manage and control stormwater runoff so that it does not pollute downstream waters, including groundwater.

Local (County and City)

The KFIP site is located in unincorporated Pierce County within the City of Puyallup’s UGA, and is served by and affects city infrastructure and critical areas in the City of Puyallup and its UGA. Groundwater quality and quantity protection is generally addressed at a local level in a wide range of city or county stormwater and critical area management regulations, but also in related code that regulates disposal of pollutants or hazardous waste.

Various Pierce County regulations that impact management of groundwater will be reviewed first followed by a short comparative discussion about equivalent or parallel regulation in the City of Puyallup. But City regulations do not apply until such a time as the UGA is annexed into the City.

Pierce County Regulatory Review

Pierce County Stormwater Management and Site Development Manual (PCSWDM)

An updated PCSWDM was adopted, effective on July 1, 2021. In relation to the discussion below, changes between the 2015 and 2021 versions were insignificant.

The PCSWDM includes LID requirements for stormwater treatment systems, which are intended to promote stormwater infiltration where practicable and to return filtered stormwater to the groundwater aquifer close to where the water (i.e., rainfall) originates. Pierce County promotes the use of LID techniques in newly developed areas to reduce impermeable pavement and roof cover, and to maximize permeable areas to increase potential for stormwater infiltration into the ground.

The manual also provides rules designed to protect wetland hydrology, from both a water quality and water quantity standpoint. Floodplain wetlands, such as Wetlands A, B, and C on site, are usually dependent on a combination of surface and groundwater inflows. The stormwater management system for new development is required under the manual to maintain wetland hydroperiods (i.e., the hydrologic volumes, timing, and duration that define and support functions and values of the on-site floodplain wetlands).

Despite promoting infiltration of stormwater, the PCSWDM also allows for direct surface stormwater outfall to the Puyallup River with “basic” water quality treatment. The PCSWDM requires that volumes equivalent to 91 percent of the runoff volume as estimated by an approved continuous runoff model (which approximately equates to the 6-month, 24-hour storm event), must receive some form of “basic” treatment prior to release to the Puyallup River.[14]

The Puyallup River is deemed flow control exempt, and therefore only “basic” treatment of early stormwater runoff volumes (equivalent to the 6-month, 24-hour storm as described above) is required by the PCSWDM prior to releasing to the Puyallup River. Volume flows greater than this minimum can be released directly to the river without basic treatment, and infiltration is not required. Therefore, in areas such as the KFIP site that was previously farmed and infiltrated most direct rainfall, recharge of groundwater would be minimal once the KFIP site is fully developed.

The current stormwater management proposal is to infiltrate roof runoff from four of the warehouse roofs in trenches sited along the top of slope at the northeast edge of the high terrace. The four roofs account for less than half of the total KFIP impervious surface area, and most of the proposed trenches are not sited hydrologically upslope from the target wetlands. Direct discharge into the Puyallup River of more than half of the runoff volumes from future impervious surfaces at the KFIP site may result in loss of more than half of current wetland hydrology volumes and may affect the timing and duration of future wetland hydrology. The current infiltration facility design does not provide modeled data to show

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[14] To understand the relation between the 91 percent runoff volume and the 6-month, 24-hour storm event (as estimated by an approved continuous runoff model, and storm intensity and duration), please refer to City of Tacoma 2003 Storm Water Management Manual, Appendix I-B Water Quality Treatment Design Storm, Volume, and Flow Rate https://cms.cityoftacoma.org/enviro/Surfacewater_1/SWMM2003/V1-AppB.pdf.

how the wetland hydroperiods of the on-site wetlands would be preserved by this proposal, as required by the PCSWDM.

In order to preserve on-site wetland hydrology on the floodplain (Wetlands A, B, and C) and at Wetland D, targeted and properly located wet season infiltration facilities that would capture and infiltrate surface runoff are needed to seasonally recharge groundwater at key locations on the high terrace (future site of warehouses, roads, and parking areas). Under current conditions, groundwater that was recharged by seasonal infiltration through the high terrace surface provides hydrology to the on-site wetlands from approximately mid-winter through early summer months (i.e., to Wetlands A, B, and C on the floodplain to the east, and also to Wetland D located in the southeastern portion of the high terrace).

The PCSWDM does allow for direct discharge to the Puyallup River, but allowing for direct discharge does not relieve the applicant of ensuring the wetland hydroperiods are analyzed and ensuring that the existing on-site wetland hydrology sources are supported or replaced in kind, as required in the PCSWDM.

The PCSWDM lists minimum stormwater management requirements and provides guidance as to how to accomplish these goals in Pierce County. Specific to this Project, the following guidance about protection of wetland hydroperiods is noted:

- In Section B.4.2 Guide Sheet 3B: Protecting Wetlands from Changes in Water Flows (Hydroperiod), the manual states that a wetland's hydroperiod must be protected and maintained, and that the "*total volume of water into a wetland on daily basis should not be more than 20 percent higher or lower than the pre-project volumes*" and "*total volume of water into a wetland on a monthly basis should not be more than 15 percent higher or lower than the pre-project volumes.*"

These stormwater management regulations indicate that a project site must be managed to protect on- and off-site wetlands and downstream waterbodies from both direct and indirect impacts from changes in water quantity and quality caused by the development. Therefore, these regulations apply directly to potential impacts from the KFIP site stormwater management plan, which, as proposed, does not effectively address the requirements for defining and protecting the hydroperiods of the on-site wetlands.

Pierce County Critical Areas Regulations Issues (PCC Chapters 18E.10- 18E.120)

Under the GMA (RCW 36.70A.060), local governments are required to established policies and development guidelines to protect the functions and values of critical areas: rivers, streams, lakes, wetlands, floodplains, aquifer recharge areas, and others. The Pierce County Critical Areas Regulations, Title 18E includes regulations designed to provide protection pertaining to surface and groundwater on the KFIP site, including the following critical areas, all of which are present on the KFIP site:

- Wetlands (PCC 18E.30),
- Regulated fish and wildlife species and habitat conservation areas (PCC 18E.40),
- Flood hazard areas (PCC 18E.70),

- Erosion hazard areas (PCC 18E.110), and
- Landslide hazard areas (PCC 18E.80).

Wetland hydrology at the KFIP site floodplain is groundwater driven, and these wetlands also provide for important wildlife habitat on site, and affect floodplain and erosion control functions.

Pierce County regulates the Central Pierce County Aquifer Area Sole Source Aquifer under PCC Chapter 18E.50 Aquifer Recharge and Wellhead Protection Areas. The aquifer is bounded by the Nisqually River to the southwest, Puget Sound to the west, and the Puyallup River to the east (Figure 4-27).

PCC Chapter 18E.50 has specific regulations for development in the aquifer recharge area, *including a maximum impervious area of 60 percent in areas zoned as Employment Center (EC),* per PCC 18E.50.040 Aquifer Recharge and Wellhead Protection Area Standards, such as the KFIP site. The following uses are prohibited within aquifer recharge and wellhead protection areas:

- Landfills (other than inert and demolition landfills)
- Underground injection wells (Class I, III, and IV)
- Metals mining
- Wood treatment facilities
- Pesticide manufacturing
- Petroleum refining facilities (including distilled petroleum facilities)
- Storage of more than 70,000 gallons of liquid petroleum or other hazardous products

Pierce County regulates Landslide Hazard Management Areas under PCC 18E.80.040.B.7, which specifies that "*stormwater retention facilities, including infiltration systems utilizing perforated pipe, are prohibited unless the slope stability impacts of such systems have been analyzed and mitigated by a geotechnical professional and appropriate analysis indicates that the impacts are negligible.*"

The slopes along the northeast edge of the high terrace include several Landslide Hazard Areas Indicators (PCC 18E.80.020.A) and meet the definition of a Potential Landslide Hazard Area (PCC 18E.80.020.B). As mentioned above, the current proposed method to provide hydrology to the floodplain wetland involves infiltration trenches located at the top of slope at the northeastern edge of the high terrace. The proposed infiltration trench sites may not meet setback requirements described in code, and have not been assessed by a geotechnical professional (as required by PCC 18E.80.040.B.7) to ensure they would provide effective infiltration function and would not impact slope stability.

Pierce County Comprehensive Plan Policies

The Pierce County Comprehensive Plan was developed under the provisions of the GMA (Chapter 365-196, WAC). The Comprehensive Plan is a tool to assist County Councilmembers, planning commissioners, County staff, and others involved in making land use and public infrastructure decisions. It provides the framework for the County's Development Regulations. The current Pierce County Comprehensive Plan (effective October 1, 2021) defines goals and policies used by the County when making decisions related to growth and development, as relates to long-range county planning.

The GMA outlines 14 goals for the development and adoption of a comprehensive plan and development regulations, but specific to this section 4.3 Groundwater, the following planning goals specifically apply:

- Open Space and Recreation: Retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks and recreation facilities.
- Environment: Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.

The Environmental Element (Chapter 7) of Pierce County's Comprehensive Plan describes approaches for maintaining the natural environment, including sections on how to protect and manage fish and wildlife habitat and wetlands. Specific primary goals in the Environmental Element related to groundwater management include (but are not limited to):

Overall Goals:

- *GOAL ENV-1: Conserve and protect critical and environmentally sensitive areas.*
  - *Policy ENV-1.5: Coordinate with other entities to protect critical areas, address environmental issues, and fulfill ecosystem restoration obligations*

Water Quality Goals:

- *GOAL ENV-5: Protect aquifers and surface waters to ensure that water quality and quantity are maintained or improved.*
  - *Policy ENV-5.6: Require performance standards for new development and retrofitting of existing facilities.*
  - *Policy ENV-5.11: Protect water quality and quantity necessary to support healthy fish populations.*
  - *Policy ENV-5.13: Reduce runoff pollutants into surface and groundwater.*
  - *Policy ENV-5.14: Require the use of low impact development principles and best management practices for stormwater drainage including use of infiltration systems, such as bioretention, rain gardens, and permeable pavement, to maintain water quality for fish and wildlife.*

Fish and Wildlife Goals:

- *GOAL ENV-8: Maintain and protect habitat conservation areas for fish and wildlife.*
  - *Policy ENV-8.2: Place regulatory emphasis on protecting and achieving no net loss of critical habitat areas.*

Hazardous Areas [including floodplains and steep slopes] Goals:

- *GOAL ENV-10: Avoid endangerment of lives, property, and resources in hazardous areas.*
  - *Policy ENV-10.2.1: Require appropriate standards for site development and structural design in areas where the effects of the hazards can be mitigated.*

  - *Policy ENV-10.2.4: Direct sewer lines, utilities, and public facilities away from hazardous areas.*

Wetlands Goals:

- *GOAL ENV-11: Establish appropriate long-term protection to ensure no net loss of wetlands.*
  - *Policy ENV-11.4: Require wetland mitigation for impacts that cannot be avoided.*

Best Available Science, Review, and Adaptive Management Goals:

- *GOAL ENV-14: Designate and protect all critical areas using best available science.*
  - *Policy ENV-14.1: Give special consideration to conservation and protection of anadromous fisheries.*
- *GOAL ENV-15: Recognize the value of adaptive management for providing flexibility in administering critical area and shoreline regulations.*
  - *Policy ENV-15.2: Prioritize post-project compliance monitoring.*
  - *Policy ENV-15.3: Utilize new technologies and methodologies where appropriate to resolve environmental problems.*
  - *Policy ENV-15.5: Require that regulated activities occur with avoidance of impacts as the highest priority, and apply lower priority measures only when higher priority measures are determined to be infeasible or inapplicable.*

Storm Drainage and Surface Water Management Goals:

- *GOAL U-32: Improve surface water and groundwater quality.*
  - *Policy U-32.2: Reduce and eventually eliminate harm to water quality from stormwater discharges. Do this through use of on-site infiltration and best management practices and source control of pollutants; control of development density and location; preservation of stream corridors, wetlands and buffers; and development, maintenance of a system of stormwater retention and detention facilities, and retrofit of existing facilities to eliminate or reduce untreated stormwater flows*
- *GOAL U-35: Manage stormwater in consideration of the varied uses associated with natural drainage systems.*
  - *Policy U-35.2.5: Promote infiltration, bioretention, dispersion, and permeable pavement.*
- *GOAL U-37: Reduce or eliminate the stormwater drainage impacts from roadways onto adjacent properties and into surface waters.*
- *GOAL U-38: Make the use of Low Impact Development (LID) techniques in public and private developments the preferred and most widely used method of land development.*

City of Puyallup Regulatory Review

As described above, the KFIP site is located in unincorporated Pierce County, within the City of Puyallup's UGA. It is served by and affects city infrastructure and critical areas in the City of Puyallup and its UGA. Groundwater protection is generally addressed at a local level in a wide range of city or county stormwater and critical area management regulations, but also in related code that regulates disposal of pollutants or hazardous waste.

Various Pierce County Regulations that impact management of groundwater were reviewed first above, but are followed below by a short, comparative discussion about equivalent or parallel regulation in the City of Puyallup. But City regulations do not apply until such a time as the UGA is annexed into the City.

City of Puyallup Stormwater Management Program Plan (SWMPP)

The City of Puyallup's SWMPP is updated each year, to describe actions Puyallup would take to maintain compliance during the 2020 Permit period, as required by the City's Phase 2 NPDES Permit (i.e., August 1, 2019, through July 31, 2024). The 2023 SWMPP provides guidance on how the City manages its stormwater to meet requirements of the City's NPDES Phase 2 permit, as administered by Ecology. Under the SWMPP, the City has made LID the preferred approach for new development, in order to "*minimize impervious surfaces, native vegetation loss, and stormwater runoff in all types of development situations where feasible."*

The Phase 2 Permit allows the City to discharge stormwater runoff into Waters of the State (i.e., streams, rivers, lakes, wetlands) as long as the City implements certain programs designed to protect water quality. This goal is to be attained by reducing discharge of pollutants "*to the maximum extent practicable*" by using specific BMPs. This would include requiring implementation of source control BMPs from current operations or, as needed, requiring construction of treatment and/or infiltration facilities to reduce pollutants associated with existing land use.

City of Puyallup Critical Areas Regulations (Chapter 21.06 CRITICAL AREAS)

Under the GMA (RCW 36.70A.060), local governments are required to establish policies and development guidelines to protect the functions and values of critical areas: rivers, streams, lakes, wetlands, floodplains, wildlife habitat, erosion and landslide hazard areas, and others. The Puyallup Critical Areas regulations (Puyallup Municipal Code Chapter 21.06 Critical Areas, [PMC Chapter 21.06]) includes regulations similar to those of Pierce County, as both are designed to meet standards defined in the GMA. However, some regulatory details are different.

The PMC Chapter 21.06 regulations were most recently updated in 2022. These regulations apply to lands directly west of the KFIP site, which are within the City of Puyallup, and will apply to any future KFIP site development after annexation into the City. Ideally, the PMC Chapter 21.06 regulations are not in conflict with similar and parallel County regulations, which apply to the current KFIP site located in the City's UGA.

Under PMC Section 21.06.930, (Article IX Wetlands), the City of Puyallup defines standard wetland protections, such as assigning buffer widths in relation to Category rating score (Categories I, II, III, and IV) and land use intensity (Low, Moderate, and High). Buffer widths range from a minimum of 25 feet up to 300 feet.

The City does not regulate (i.e., buffer or impose mitigation requirements) wetlands smaller than 1,000 square feet (if not along a riparian corridor or part of a wetland mosaic), and does not regulate Category IV wetlands smaller than 4,000 square feet as long as the wetland is not associated with a shoreline, is not part of a wetland mosaic, does not score more than five or more points when rated, does not contain priority or critical habitat, and the impacts are fully mitigated in accordance with conditions from Ecology and USACE.

Critical Aquifer Recharge Areas (CARAs) include groundwater areas that are regulated per PMC Sections 21.06.110-1150 (Article XI. Critical Aquifer Recharge Areas). The City regulates its mapped CARAs by establishing protective criteria, such as prohibiting certain facilities that would reduce recharge to drinking water aquifers, recharge that provides baseflow to a stream, or recharge that would affect groundwater quality.

PMC Sections 21.06.1010-1080 (Article X. Fish and Wildlife Species and Habitat Conservation Areas) defines standards for protection of fish and wildlife habitat, including activities allowed in stream buffer areas and a recognition of the importance of wetland habitats.

PMC Sections 21.06.1210-1270 (Article XII. Geologically Hazardous Areas) defines areas that are susceptible to erosion, landslides, earthquakes, volcanic activity, or other potentially hazardous geological processes. Point discharges from surface water facilities and roof drains onto or up-slope from an erosion or landslide hazard area is prohibited except when water can be tightlined to a point where there are no erosion hazard areas, or where the discharge flow rate matches predeveloped conditions with adequate energy dissipation, or where discharge is dispersed across a steep slope onto a low-gradient undisturbed buffer where the released water would infiltrate in the buffer and not increase slope saturation (as certified by a geotechnical professional).

PMC Chapter 21.07 (Flood Damage Protection, a separate chapter from the Critical Areas Chapter) describes limitations on development in a regulated floodplain. The regulations are intended to protect human life and health, minimize public costs associated with flood control and relief projects, minimize damage to public facilities, and meet requirements for maintaining eligibility for flood insurance and disaster relief. These rules are intended to control alterations to natural hydrologic functions in floodplains.

City of Puyallup Comprehensive Plan policies

The current CPCP (2020) is described as "*the long-term vision and plan for managing the built and natural environment in the City of Puyallup.*" It provides policy guidance used by City staff to make decisions related to growth and development. Key strategies listed to maintain the city's environmental assets—as related to groundwater management—are summarized below:

- Use a science-based approach to ensure no net loss of critical areas' ecological functions and values
- Maintain and strive to enhance a healthy natural ecosystem through environmental stewardship programs that engage the citizens of Puyallup
- Adoption of a "no-net loss" approach

Chapter 2 describes approaches for managing the environment. Goals and Policies that relate to groundwater management at the KFIP site include (but are not limited to):

Sustainability and Environmental Stewardship:

- *NE-2: Lead and support efforts to protect and improve the natural environment, protect and preserve environmentally critical areas, minimize pollution, and reduce waste of energy and materials.*

Critical Areas:

- *NE-3: Protect, integrate and restore critical areas and their aesthetic and functional qualities through conservation, enhancement and stewardship of the natural environment.*
    - *NE–3.3: Implement monitoring and adaptive management to programs and critical areas mitigation projects to ensure that the intended functions are retained and, when required, enhanced over time.*

Geologically Hazardous Areas:

- *NE-4: Preserve and enhance the natural scenic qualities, ecological function and value, and the structural integrity of hillsides to protect life, property and improvements from landslide, erosion and volcanic hazards.*
    - *NE–4.2: Require appropriate levels of study and analysis as a condition to permitting construction within Geologically Hazardous Areas (and etc.).*
    - *NE–4.8: Establish setbacks around the perimeter of site-specific Landslide Hazard Areas to avoid the potential to undermine these areas, cause erosion and sedimentation…and etc.*

Critical Aquifer Recharge Areas:

- *NE-5: Preserve and protect aquifer recharge and well-head protection zones from hazardous substances and land uses which could denigrate ground water quality.*
    - *NE-5.5: Encourage retention of open spaces, tree protection areas, and other areas of protected native vegetation with a high potential for groundwater recharge.*
    - *NE-5.6: Utilize low impact development techniques—such as pervious surfacing materials and rain gardens—to mimic natural processes of stormwater infiltration.*

Wetlands:

- *NE-7: Identify and protect wetland resources and ensure “no net loss” of wetland function, value and area within the city.*
    - *NE-7.3: Use mitigation sequencing guidelines when reviewing projects impacting wetlands.*

Water Quality:

- *NE-8: Protect, improve and enhance the quality of all aquatic resources city-wide through best management practices, with a distinct emphasis on mimicking natural processes and use of low impact development techniques.*

4.3.3 Affected Environment

The KFIP site proposal is to construct seven warehouses and associated utility and pavement infrastructure. The site is located on currently farmed land adjacent to the Puyallup River, which is regulated by Pierce County as a shoreline of statewide significance and a fish-bearing stream (PCC Title 18S and Title 18E).

The affected environment, for purposes of this section (4.3 Groundwater) includes areas upslope to the south and on-site soil surfaces that would be expected to infiltrate and contribute groundwater flows toward the river (Figure 4-26 and Figure 4-28). At the KFIP site, groundwater aquifer recharge occurs annually when rainfall during winter months soaks into the ground and is stored in subsoils. The KFIP site groundwater aquifer is also recharged by groundwater inflows from the south (Figure 4-26 and Figure 4-28). Groundwater stored below the site eventually flows to the floodplain and Puyallup River to the north. The timing and magnitude of rainfall patterns in combination with geology and soil conditions would control whether precipitation infiltrates to the groundwater aquifer or flows over the surface and in farm ditches to nearby wetlands or streams. Groundwater flow rates are very slow while surface water flow rates are fast. Converting groundwater flows to surface water flows would change the timing of when winter rainfall reaches the river.

Geologic Conditions

Section 4.1 (Earth Resources) describes the overall geologic and soils setting, which controls how groundwater recharges from infiltration of rainfall. Figure 4-26 shows the geologic mapping of the contributing groundwater basin as needed to explain and show groundwater flow direction. The geology mapping of the contributing groundwater basin includes areas with highly permeable surfaces (sandy glacial outwash sediments), and other areas with limited infiltration potential (shallow glacial till soils to the south or silt loam sediment soils). The underlying glacial till layers are relatively impermeable, and therefore cause infiltrating stormwater to drain in subsurface layers toward the north-northeast, eventually feeding into the Puyallup River.

The KFIP site is covered with many layers of post glacial floodplain sediments and volcanic lahars (mudflows) that have repeatedly washed across the KFIP Project area since the end of the last glaciation about 10,000 years ago. These layered flood deposits affect groundwater storage, flow direction and infiltration potential at the KFIP site.

Figure 4-28 shows soil mapping on and near the KFIP site. The floodplain deposits range from fine textured silt loams on the high terrace (mapped as Briscot loam soils) to more sandy, recent floodplain deposits on the middle and lower floodplain terraces (mapped as Puyallup fine sand and Pilchuck fine sandy loam soils) (USDA 2021).

Under current farmed conditions, which include surface and subsurface agricultural drainage systems in the areas mapped as Briscot loam, most direct rainfall infiltrates and seasonally recharges the underlying groundwater aquifer. Effectiveness of infiltration varies across the site, dependent on site-specific soil variability. In areas where silt loam soils dominate, groundwater is typically shallower and infiltration is slower; in other areas where sand dominates, infiltration is more rapid. Connectivity of the subsurface flood deposit layers is random and also affects site specific infiltration rates. However, on average, Puyallup river flood sediments are dominantly sandy.

Farming practices and existing agricultural drainage systems on the KFIP site add to this complexity, as they affect surface infiltration potential as well as groundwater conditions and drainage potential near the surface drains and drainpipes.

Groundwater – Infiltration Potential

Groundwater aquifers at the KFIP site are recharged by infiltration of seasonal rainfall. The greater Puyallup area has a temperate marine climate, meaning that it typically has warm, dry summers, and cool, wet winters. Mean annual precipitation is 40.05 inches, with most rain fall occurring between October and March (NRCS, AgACIS 2021). Therefore, most groundwater recharge occurs during the winter months. The recharged aquifer drains slowly subsurface toward nearby slopes or surface water, discharging to local floodplains, stream, wetlands, and rivers, typically during winter, spring, and early summer months.

Infiltration of surface runoff is needed to seasonally recharge groundwater volumes that are stored in subsurface soil layers in the high terrace. This stored groundwater slowly seeps to floodplain wetlands from the sloped outside edge of the high terrace throughout most of the winter and into early spring months and provides hydrology to the on-site floodplain wetlands (Wetlands A, B, and C). Both groundwater and surface water contribute hydrology to Wetland D.

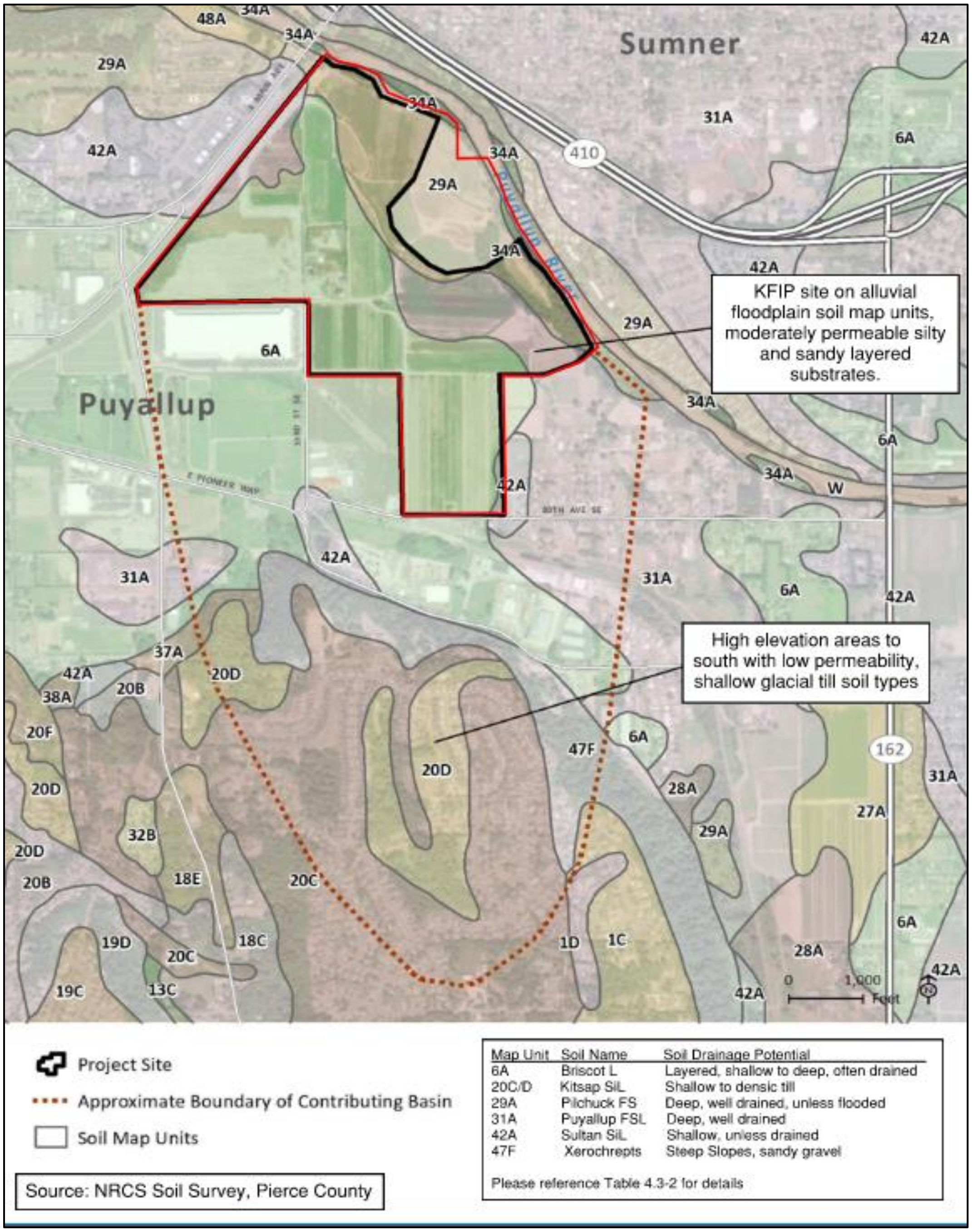
The current KFIP stormwater management system proposes conveyance of most future surface stormwater runoff directly to the Puyallup River through a piped outfall. This stormwater would be collected from new impervious surfaces throughout the future warehouse complex. Direct outfall to the Puyallup River is allowed in the PCSWDM, but at the KFIP site, this action redirects surface runoff that previously infiltrated on site, and therefore potentially results in decreased groundwater volumes below the high terrace which feed to and support on-site wetlands.

The PCSWDM requires protection of the on-site wetland hydroperiods (as described previously) in Section B.4.2 Guide Sheet 3B: Protecting Wetlands from Changes in Water Flows (Hydroperiod). The manual states that a wetland's hydroperiod must be protected and maintained, and that the "*total volume of water into a wetland on daily basis should not be more than 20 percent higher or lower than the pre-project volumes*" and "*total volume of water into a wetland on a monthly basis should not be more than 15 percent higher or lower than the pre-project volumes.*" In order to ensure that the on-site wetland hydroperiods are being maintained, a hydroperiod analysis needs to be carried out. This work is performed prior to determining how much of the on-site stormwater runoff water can be sent to the direct discharge outfall versus to on-site infiltration facilities designed to sustain the wetland hydroperiods' timing, duration, and volumes.

In an effort to address this conflict, the original proposed stormwater system design was changed to provide trench infiltration at the northeastern high terrace edge, fed by roof runoff from four of the seven warehouse roofs. However, this design was proposed without a hydroperiod analysis, and the proposed infiltration trench locations are not in compliance with Pierce County Critical Areas Regulations in Section 18E.80.040.B.7: "*Stormwater retention facilities, including infiltration systems utilizing perforated pipe, are prohibited unless the slope stability impacts of such systems have been analyzed and mitigated by a geotechnical professional and appropriate analysis indicates that the* *impacts are negligible*." The proposed trench locations do not meet slope setbacks or trench design requirements near a steep slope, as defined in Section 18E.80.050.A Determining Buffer Widths. Furthermore, the trenches are located hydrologically downstream from the wetlands, which would have been determined if a hydroperiod analysis had been carried out, and thus may not provide enough groundwater hydrology at the right location to support current wetland conditions.

In combination, the issues discussed above indicate that the proposed infiltration system design is not adequately informed to ensure support of the on-site wetlands' hydrologic baseline.

Natural Resources Conservations Services (NRCS) Soil survey mapping (Figure 4-28; Table 4-11 and Table 4-12) provides a generalized assessment of potential depth to groundwater and infiltration potential across a broad soil map unit. But for purposes of design, site specific soil mapping and infiltration testing work is needed to determine the exact areas on site where the groundwater table is deep versus shallow, and where infiltration and recharge conditions may be good versus poor. Results of an on-site groundwater study (depth and permeability conditions) carried out by KFIP consultants are discussed below.



KFIP site on alluvial floodplain soil map units, moderately permeable silty and sandy layered substrates.

High elevation areas to south with low permeability, shallow glacial till soil types

Map Unit	Soil Name	Soil Drainage Potential
6A	Briscot L	Layered, shallow to deep, often drained
20C/D	Kitsap SiL	Shallow to densic till
29A	Pilchuck FS	Deep, well drained, unless flooded
31A	Puyallup FSL	Deep, well drained
42A	Sultan SiL	Shallow, unless drained
47F	Xerochrepts	Steep Slopes, sandy gravel

Please reference Table 4.3-2 for details

Source: NRCS Soil Survey, Pierce County

Figure 4-28. Soil Mapping at the KFIP Site and Groundwater Basin

Table 4-11. NRCS Pierce County Soil Survey Mapping Units Summary Descriptions

Soil Map Unit	Map Unit Name	Parent Material	NRCS Texture description
6A	Briscot loam	Floodplain sediment	Coarse-loamy, mixed
29A	Pilchuck fine sand	Recent floodplain sediment	gravelly and sandy alluvium
31A	Puyallup fine sandy loam	Recent floodplain sediment	Sandy alluvium
42A	Sultan silt loam	Floodplain sediment	Fine silty

Table 4-12 summarizes the expected groundwater depth and infiltration potential across the KFIP site based on generalized NRCS soil mapping. There are three geomorphic surfaces on the KFIP site where infiltration systems may be employed. For purposes of this discussion, the surfaces would be called the *high terrace*, the *middle terrace* (a slightly lower elevation subarea in the central eastern high terrace surface), and the *floodplain* (Figure 4-29).

Table 4-12. Expected Groundwater Depth and Permeability Characteristics based on NRCS Soil Mapping

Infiltration Area	Soil Map Units	Average Seasonal Groundwater Table Depth[a]	Typical Permeability Rate	Potential for Flooding at the Site
High **terrace** (Warehouses A, B, C, D, E, F, G	Briscot loam	0–1-foot depth unless drained[b]	Moderate	Low
	Sultan silt loam	2–4-foot depth	Moderately slow	Low
Middle Terrace (Warehouses C, D, E)	Puyallup fine sandy loam	>6 foot depth	High	Low
Floodplain	Pilchuck fine sand	Periodic surface floods, but typically >6-foot depth between floods	High	Frequent to occasional
	Riverwash		High	Frequent

[a] Groundwater table = the level at which the ground saturation begins (USEPA 2003).

[b] The high terrace is partially drained from past farming activities, and as a result, the seasonal water table is deeper and variable (NRCS Pierce County Soil Survey, online data accessed 2023).

These three surfaces are either currently actively farmed and artificially drained, or they are areas that have been cleared, partially drained, and farmed in the past. The high terrace and middle terrace are both targeted development surfaces for the KFIP warehouses. The primary difference between the two surfaces is that the middle terrace is mapped as Puyallup soils rather than Briscot soils (mapped across the high terrace) and is a several feet lower in elevation. Therefore, the middle terrace area would need to be filled several feet to bring the surface up to the same elevation as the high terrace prior to paving and building warehouses. Fill soils are typically compacted, and therefore do not infiltrate effectively or predictably near the surface unless carefully managed. For that reason, any infiltration trenches proposed in the fill area is unlikely to be effective unless trench bases are located below the fill depth zone.

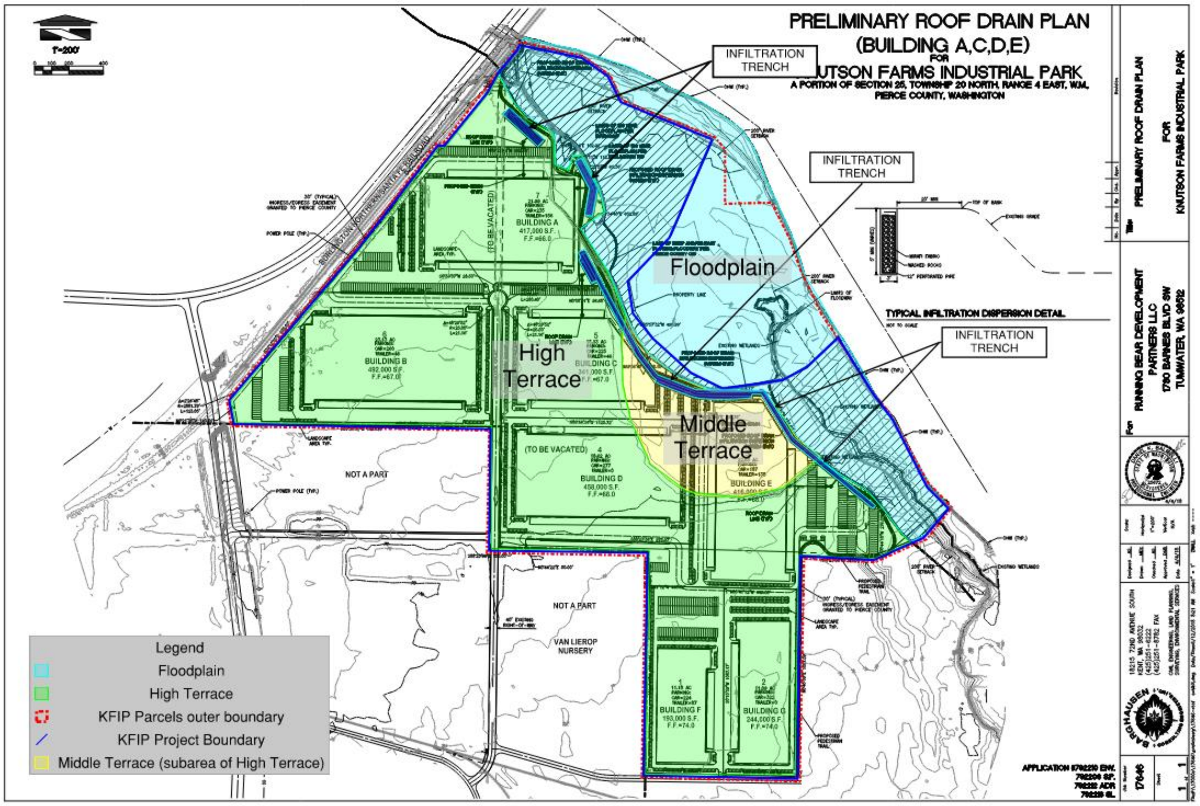


Figure 4-29. Adapted from Preliminary Roof Drain Plan, Showing Potential Infiltration Areas and Proposed Infiltration Trench Locations at the Outer Edge of the High Terrace.

The floodplain is not proposed for development, aside from the KFIP site stormwater outfall structure, which is discussed in more detail in Section 4.2 Plants and Animals, and Section 4.4 Surface Water. The southern end of the floodplain includes three wetlands (Wetlands A, B, and C). The hydrology that supports those wetlands is dependent on groundwater, which seeps from the outer edge of the high terrace and drains to collect on the lower elevation floodplain surface. The shallow groundwater aquifer below the high terrace is currently recharged through infiltration of seasonal rainfall that falls on the terrace surface. If the groundwater source is gone or diminished, the current floodplain wetland characteristics would not persist, and may disappear entirely.

Groundwater Depth Studies at KFIP Site

Earth Solutions NW, LLC (ESNW, KFIP consultant), documented depth to the groundwater table at the KFIP site in 37 soil pits dug to depths ranging between 7 and 15 feet across the site in July 2015 (late summer [i.e., when groundwater is expected to be deepest due to lack of recent infiltration]). Depth to groundwater documented in some of soil pits ranged between 6 and 13 feet below the surface, but 18 of the 37 soil pits (approximately 50 percent) were entirely dry in July 2015 and did not have a groundwater table within the soil pit depth limits. This work indicates that groundwater elevation is not controlled by river surface elevation, but instead indicates that groundwater on the site drains from the high terrace toward the river.

Past observations by City of Puyallup staff at the Viking warehouse site (located directly west of the KFIP Project site) indicated that the groundwater table during winter months at that site was within a few feet of the surface after development was complete. However, the Viking warehouse area is mapped as a Sultan silt loam, which is finer textured and less layered than the Briscot loam—the soil series that is mapped across most of the high terrace to the east. Reworking a silt loam soil when grading with heavy equipment often eliminates infiltration potential in the upper 2–3 feet of the final grade soil surface and would often result in a sealed surface in the base of an infiltration facility due to settling of fine silts and sand from suspended sediment in stormwater. Therefore, shallow groundwater and drainage conditions at the Viking site do not automatically apply to the adjacent KFIP site.

The groundwater mapping documented by ESNW reflects a pre-development condition. The post-development condition depends greatly on how the surface is graded and compacted. Infiltration trenches can still work if the base of the trench is sited in a more permeable layer below the zone of surface mixing and compaction.

The ESNW 2015 summer groundwater depth assessment can be taken to represent a lower or the lowest expected annual groundwater surface elevations at the KFIP site. Wet season assessment of ground water depth would provide a better understanding of ground water depth variability throughout the year.

Table 4-13 averages the ESNW reported July 2015 groundwater depths across each of the three potential infiltration surfaces on the KFIP site and converts average groundwater depth to average groundwater surface elevation, which makes it easier to compare results across the site as the ground surface elevation changes. Surface elevation on the high terrace ranged between 62–76 feet (68.6 feet average). Surface elevation on the middle terrace ranged from 56-64 ft (61 ft average). Elevation on the floodplain ranges from 50–56 feet (53.2 feet average). The OHWM elevation of the Puyallup River adjacent to the northern end of the KFIP site is defined as 38.5 feet, about 23 feet below the lowest high terrace surface elevation.

Table 4-13. Groundwater Depth at Infiltration Surface Areas on the KFIP Site

Infiltration Area	Average and Range of Groundwater Depth/Elevation (July 2015)	Approximate Average and Range of Surface Elevation	KFIP Development
High Terrace (26 soil pits)	10-foot average depth/58.6-foot average elevation (8- to 12-foot depth range in 10 pits; 16 dry pits)	68.6-foot average elevation (62- to 76-foot range)	Warehouses A, B, C, D, E, F, G
Middle Terrace (4 soil pits)	10.5-foot average depth/50.5-foot average elevation (9- to 12-foot depth range in 2 pits; 2 dry pits)	61-foot average elevation (56- to 64-foot range)	Parts of Warehouses C, D, E
Lower Floodplain (7 soil pits)	7.6-foot average depth/45.6-foot average elevation (6- to 9-foot depth range; no dry pits)	53.2-foot average elevation (50- to 56-foot range)	NA

Source: ESNW 2015 and 2021 Site Survey Topography Map
Note: NA = not applicable

The ESNW data indicates that depth to groundwater in the high and middle terraces is highly variable (3–4-plus-foot variation) but averaged around 10-foot depth below the surface during the July 2015 sampling period. On the floodplain, depth to groundwater during the same time period averaged around 7.5-foot depth (3-foot variation). These results indicate potential for effective on-site infiltration systems during winter months in some areas with deeper groundwater tables, which are an artifact of the layered alluvial soils. The varied groundwater elevations indicate that the groundwater layer is trapped in layered floodplain soil deposits that vary in thickness and depth. There is not a consistent one-elevation water table across the site, which indicates a need to utilize deep trench infiltration systems if the layered soils are to be fully utilized.

However, for best results with the proposed infiltration facilities, this information should be substantiated by winter water studies designed to document how the depth to the water table fluctuates across the site and across the winter season. For the best results, the winter monitoring would be carried out using water level dataloggers at individual proposed trench locations. At the least, the areas currently targeted for siting infiltration trenches, as shown in Figure 4-29, should be tested, both for infiltration potential and soil stability. The water table testing would serve to define areas where sandy soils along the edge of the high terrace may fail under additional hydraulic loading. Areas with fill soils in the middle terrace area would not provide for effective infiltration unless the trench base is sited in permeable native soils 2–3 feet below the base of the compacted fill zone.

On the lower floodplain, the groundwater table in July 2015 was documented at 6–9-foot depth below the surface. According to KFIP site plan topography maps, the floodplain slopes with the river from south to north. Surface elevation in the northern portion of the floodplain ranges from 50–56 feet, while the adjacent river surface elevation in July 2015 (a period of low river flows) was approximately 31–32 feet elevation (per USGS 12096505 Puyallup E. Main river gauge data). This shows that the river surface in July 2015 was about 20–26 feet lower than the floodplain surface during the July sampling period, while the groundwater depths in the floodplain ranged between 6–9 feet. Thus, groundwater tables in the floodplain during late summer are higher than the river. This provides support for the assumption that under current conditions, the groundwater table would provide discharge volumes to the river during late summer months. Late summer groundwater discharge volumes from the KFIP site would be reduced once the site is developed, as most winter surface water runoff from the high and middle terraces would be sent to the Puyallup River rather than infiltrated and stored in groundwater for late summer discharge to the floodplain and river.

ESNW monitored changes in groundwater depth over the winter of 2015–2016 in three of the 37 soil pits. The three monitored soil pits were all located on the floodplain, and thus do not document or directly address groundwater depth variations in the high or middle terraces below the future KFIP warehouse development area. However, based on the floodplain data, the average water table in the floodplain was reported as rising from about 9-foot late summer depth (as reported in July 2015) up to 5-foot winter depth. This limited sample does not represent conditions across the whole KFIP site, but suggests that under current conditions, groundwater tables on the high terrace are also likely to rise a few feet during winter months, as this condition is driven by infiltration of winter precipitation on both the high/middle terrace and the floodplain. This seasonal rise and fall of the groundwater table below the KFIP site may no longer occur once the site is fully developed and most stormwater from the high and middle terrace surfaces is rerouted to the piped outfall at the Puyallup River.

Under the current proposal, this change in groundwater hydrology at the KFIP site is expected to result in eventual loss of the floodplain wetlands (A, B, and C) and would also impact hydrology at Wetland D, a depressional wetland located in the southeastern corner of the high terrace that is dependent on both groundwater and surface water inflows.

Regional Groundwater Aquifer and Recharge Studies

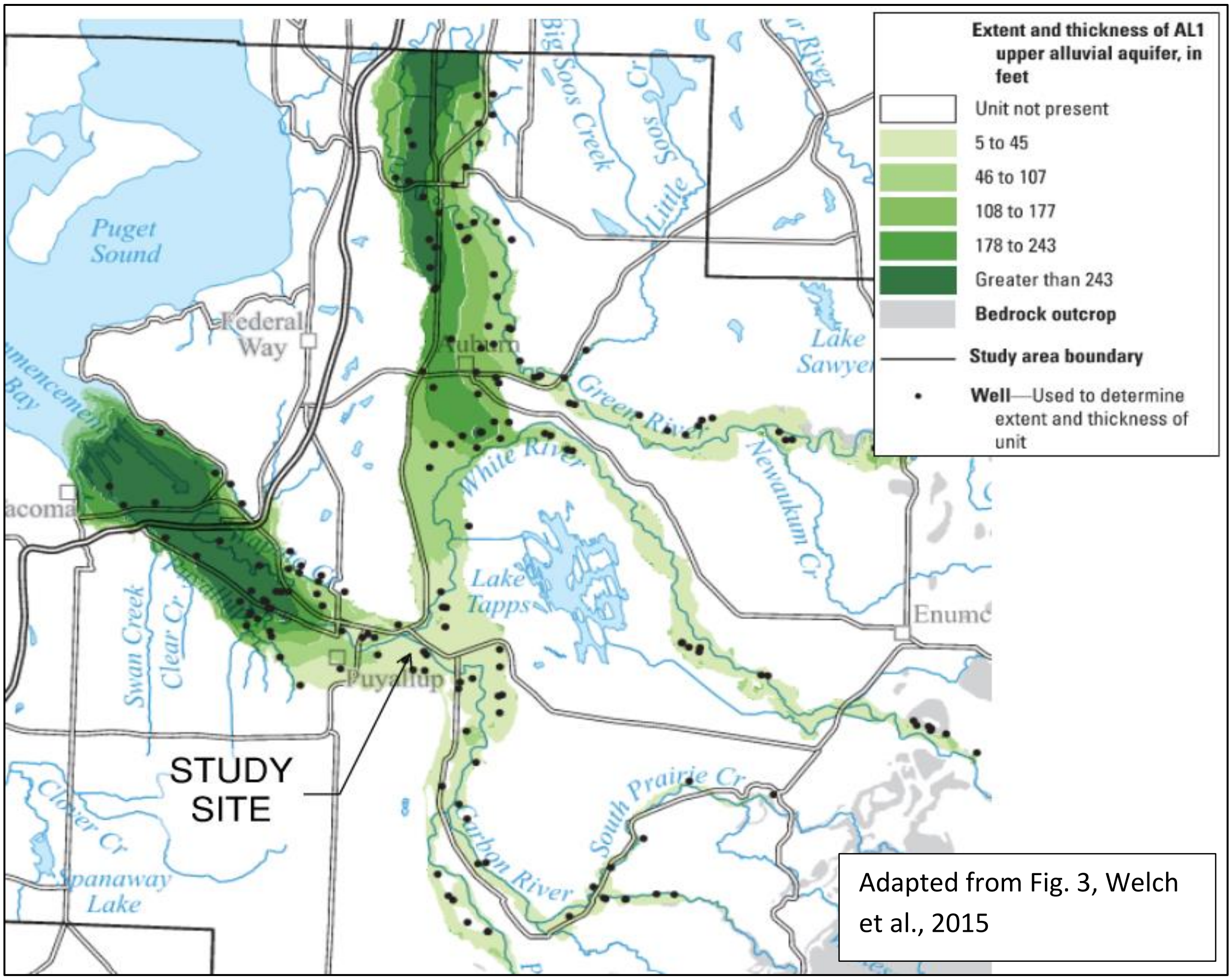
Under current conditions at the KFIP site, seasonal rainfall infiltrates into the high and middle terraces to recharge groundwater, filtering through layered flood deposits on site. These surfaces, which are targeted for future paving and building, are either currently actively farmed and artificially drained or are areas that have been cleared and farmed in the past.

Welch et al. (2015) completed a large study of groundwater conditions and hydrologic drivers in the Puyallup River watershed, which included assessment and mapping of various surface and subsurface geology and related water bearing layers. They mapped the KFIP site surface as the AL1 aquifer—a water-bearing layer composed of an alluvial silt, sand, and gravel deposit. The AL1 is described as being generally less than 100 feet thick but increasing in thickness farther downstream. At the KFIP site, the AL1 layer is mapped as ranging between 5–45 feet thick (Figure 4-30).

Typical horizontal rates of groundwater flow in the AL1 aquifer were reported as being 350 feet per day. This estimated flow rate indicates that groundwater at the outside edge of the KFIP area would take 7–9 days to flow through the site to the Puyallup River, a relatively fast groundwater flow rate if all soil conditions are equal.

Below the AL1 surface alluvial deposits is the MFL confining unit—which is essentially an artifact of the Electron mudflow—a lahar that flowed down the Puyallup Valley about 500–600 years ago. This MFL layer protects water quality in deep aquifer groundwater wells with bases below the KFIP site, and will be discussed further below. Based on Ecology well logs (Ecology 2021a), the on-site water wells are assumed to be drawing from the aquifer below the MFL layer, and thus are assumed to be protected from surface conditions.

The Puyallup River Gauge (No. 12096505) is located at the East Main Avenue bridge, directly downstream from the northern end of the KFIP site. The discharge rates at this gauge station in comparison to the rates expressed at the Alderton River Gauge (No 12096500, the nearest gauge, located about 1.5 miles upstream) provide a direct assessment of the timing and volumes of groundwater contributions from the KFIP site to the Puyallup River and to reaches downstream from the KFIP Project site.



Adapted from Fig. 3, Welch et al., 2015

Figure 4-30. Mapping of the AL1 Aquifer Thickness at the KFIP Site

Welch et al. (2015, Table 5, page 41) river gauge data can be used to estimate potential groundwater discharge rates in the order of 1–2 ft^3/s from the KFIP site during the driest time of the year in late summer to early fall, based on the measured gain between the Alderton and E Main Avenue gauges in October 2011 and October 2012 (as reported in Welch et al. 2015). However, the reported measurement error at those two stations is about the same as the reported gain, indicating that this section could be either a gaining or losing reach from year to year.

This data indicates that groundwater discharge contributions from the KFIP site to the Puyallup River are small in comparison to total flows in the River, which are reported as ranging between about 500 ft^3/s and 600 ft^3/s at the E Main Bridge gauge during the same low flow period in October 2011. However, these contributions to floodplain wetland provide critical support.

In comparison to the rest of the year, October groundwater discharge rates (reported in Welch et al.) are expected to be very low. According to long-term climate data (NRCS AgACIS, Tacoma station), average monthly rainfall during the three wettest months of the year (November, December, January) is 6.15 inches. Average monthly rainfall in the three driest months of the year (July, August, September) is 0.96 inches. Thus, wet season rainfall is about 6.4 times higher than dry season rainfall. October discharge rates are a result of minimal preceding rain fall (and minimal groundwater recharge from infiltration) during the late, dry summer months.

According to the 2018 *Offsite Conveyance Report* for the KFIP site (Barghausen, 2018), the estimated future discharge rates for the 5yr to 100yr storms ranged between 39 ft^3/s and 73 ft^3/s respectively. Compared to the 1 to 2 ft^3/s late summer groundwater discharge rates to the River estimated from the data provided in Welch, 2015, the KFIP estimated future surface discharge rates during winter months would be 26 to 49 times higher, and those flows would be concentrated through one outfall to the Puyallup River at the north end of the site, rather than spread and infiltrated across the high terrace and floodplain as occurs under current conditions. This represents a significant change to groundwater functions and timing across the seasons.

Stormwater System Design Revisions in Response to Appeals

In May 2017, the City of Puyallup and the Puyallup Indian Tribe appealed the County's Preliminary Short Plat approval for the KFIP Project site. The Tribe was concerned about potential impacts to the river and salmonids from new stormwater inflows. They were also concerned about changes to groundwater recharge resulting in water quality problems in the River. In July 2018 (County records Case # 863309, documented in November 21, 2018 Hearing Examiner Report and Decision [HEX November 2018] and associated documents), the Puyallup Indian Tribe withdrew their appeal with prejudice in exchange for KFIP complying with certain commitments regarding infiltration of stormwater at the KFIP site—including required infiltration and/or enhanced treatment of runoff from four warehouse roofs, and including a requirement that KFIP show that the stormwater system does not adversely affect Wetlands A, B, and C.

This appeal and subsequent agreement precipitated a change to the original KFIP stormwater system design, which previously had proposed to outfall 100 percent of the on-site runoff to the river. The new plan involved diverting runoff from four warehouse roofs to infiltration trenches to be located at top of slope along the eastern side of the high terrace. According to testimony recorded in the HEX November 2018 decision, the KFIP civil engineer (Dan Balmelli, Barghausen Engineering) stated that even though the stormwater manual does not require infiltration of stormwater on the site, preliminary geotechnical work indicates that some on-site soils have the capacity to infiltrate stormwater.

According to the KFIP *Offsite Conveyance Report*, total KFIP impervious area (buildings plus new pavement) is 106.87 acres (81.5 percent of net developable site area, 131.04 acres). Most of the remaining pervious surface area is in the floodplain. The report provides estimated surface discharge flow rates (not volumes) from the post-development Knutson property for the 5- to 100-year storms. The estimated discharge rates from the *Offsite Conveyance Report* include modeled runoff from the paved areas and three of the seven warehouse roofs, about 65 percent (69.5 acres) of the 106.87 acres total impervious surface area. Runoff collected from the other four warehouse roofs (Bldgs. A, C, D and E—about 35 percent [37.4 acres] of the total impervious surface area) is described in the report as being "dispersed to the floodplain." However, according to the agreement between the Puyallup Indian Tribe and KFIP, depending on results of slope stability and infiltration testing studies, although encouraged to infiltrate as much as possible, KFIP is only required to infiltrate "*50% of the two year storm event*" or to provide enhanced treatment prior to discharge into the River through the existing outfall.

However, there is no description of or definition for "*50% of the two year storm event*" in the current PCSWDM. Past manuals referenced a 6-month, 24-hour storm event (i.e., a 24-hour storm volume expected to fall at least two times every year). However, this is an outdated term, and has been replaced in the current PCSWDM manual by a requirement that 91 percent of the runoff volume as estimated by the WWHM continuous runoff model (which approximately equates to the 6-month, 24-hour storm event), must receive some form of 'basic' treatment prior to release to the Puyallup River. It is possible, but unclear, that the current manual minimum treatment standard in the PCSWDM is the intended minimum infiltration/treatment requirement per the agreement between KFIP and the Puyallup Tribe.

Per the agreement, if infiltration was found to be less than feasible, then runoff volumes from the four roofs could be released to the outfall, and estimated surface discharge rates during the 5- to 100-year storm events would increase by an additional 35 percent, i.e., or would be about 53 to 66 times greater than the pre-development groundwater discharge rates described in Welch et al. (2015). Under any scenario, these high future discharge rates indicate that the outfall would be receiving larger flows than what it is currently designed to receive.

In the absence of infiltration testing data, slope stability analysis results or wetland hydroperiod testing results, it is not possible to determine whether this infiltration proposal would provide adequate hydrology volumes needed by on-site wetlands. Therefore, under current conditions, the Project would likely result in a significant change to future on-site groundwater functions and conditions relative to current discharge timing, duration and rates in the Puyallup River and floodplain.

Groundwater Contamination

No instances of groundwater contamination at the KFIP site are currently listed in state databases in the study area vicinity (Ecology 2021). No contamination was reported during geotechnical investigations on the KFIP site (ESNW 2015).

Critical Aquifer Recharge Areas, Wellhead Protection Areas, and Water Wells

Aquifer recharge and wellhead protection areas are areas that have a critical recharging effect on groundwater used for potable water supplies and/or that demonstrate a high level of susceptibility or vulnerability to groundwater contamination from land use activities (Pierce County 2021). The KFIP site is within a CARA and wellhead protection area for the Central Pierce County Aquifer (Pierce County mapping, last referenced in 2023).

A **confining layer** is material that stops any flow from passing through.

Washington state well log records for drinking water wells show that there are at least three deep water wells located on or near the KFIP site; and at least one of those is within the KFIP site boundaries (Ecology 2021b). The well logs show that all three wells are accessing a deep, artesian-pressure aquifer below a confining layer, which is assumed to protect the wells from surface impacts. These wells are used as both drinking water and as irrigation sources. Groundwater impacts at the KFIP site to the near-surface aquifer are not expected to impact local drinking water wells which access water in an aquifer below the confining layer.

KFIP Site Stormwater Management

The current stormwater management plan proposes to collect roof runoff from four of the seven warehouse roofs (Warehouses A, C, D and E) for infiltration to groundwater. The rest of the site runoff—from parking lots, road and the other three of the seven warehouse roofs (Warehouses B, F and G)—would be diverted to a piped outfall at the Puyallup River bank after receiving basic treatment.

Roof runoff is considered comparatively clean, and thus is not required to be pre-treated prior to infiltration. However, enhanced treatment of any roof runoff volumes that might be sent to the stormwater outfall is proposed (per a 2018 agreement with the Puyallup Tribe). The runoff volumes from the four warehouse roofs would be sent to infiltration trenches that are currently proposed for construction at the outer edge of the high terrace slope above the floodplain, east of the four warehouses.

As described previously, the infiltration trenches are intended to provide hydrology to the floodplain wetlands. But under the current design, most of the trenches are not located upslope from the wetlands, and thus would not provide groundwater hydrology at the right location to support wetland conditions. Furthermore, the proposed top of slope location is designated as a landslide hazard area. Therefore, the proposed siting of installation of trenches in that area may not be feasible as designed, and further studies would be needed to ensure that the top of slope position is stable, and that the hydrology would reach its intended targets—Wetlands A, B and C. A hydroperiod analysis for each wetland is needed to define the water volumes, timing and duration required to ensure that the wetlands persist with similar functions and values after development is complete.

Per the PCSWDM: "*Infiltration trenches should not be built on slopes steeper than 25% (4:1). A geotechnical analysis and report may be required on slopes over 15 percent or if located within 200 feet of the top of slope steeper than 40%, or in a landslide hazard area.*" In addition, a mounding analysis and infiltration testing is required for infiltration facilities to show that the trenches would infiltrate at the design rate.

The proposed infiltration/dispersion trenches do not appear to meet Critical Area regulations (Title 18E DEVELOPMENT REGULATIONS – CRITICAL AREAS) or PCSWDM assessment, design, and siting requirements. The required infiltration testing, wet weather groundwater study and mounding analysis is not known to have yet been carried out; nor have the steep, sandy slopes to the east been assessed by a geotechnical engineer to determine whether they have potential to fail under hydraulic loading from infiltration trenches.

In addition, trench design is required to address dispersion function, which is needed to describe how potential overflow from the infiltration trenches during periods of above average rainfall would be managed to avoid erosion problems on the slope below. For dispersion, the Stormwater Manual requires design of "*a vegetated flow path of at least 25 feet in length…between the outlet of the trench* *and any property line, structure, stream, wetland, or impervious surface. A vegetated flow path of at least 50 feet in length must be maintained between the outlet of the trench and any slope steeper than 15%. Sensitive area buffers may count towards flow path lengths*."

Because the trenches are sited at the top of slope, potential for erosion during overflow events is high, but there is no apparent dispersion design feature addressing this erosion control requirement.

4.3.4 Impacts

Methodology

This analysis evaluates potential for construction and operations at the KFIP site to impact plant and animal resources. Impacts were characterized by reviewing public reports and public database records on groundwater and hydrogeology in the study area and comparing existing study area conditions to the proposed KFIP actions, and by assessing potential for changes to critical groundwater functions. The potential for the KFIP to result in construction or long-term operational effects was assessed based on the location and volume of proposed infiltration facilities, dewatering systems and related soil processes and regulated geologic hazards that could affect slope stability and erosion. The potential for KFIP impacts to alter or damage the site groundwater system was determined based on the KFIP's design of infiltration facilities and existing geologic and soil conditions that would influence the relative risk. Potential impacts related to groundwater recharge of on-site wetlands and the Puyallup River are discussed in qualitative terms.

The following public records and literature were reviewed (and others):

- USGS National Water Information System, USGS gages in the Puyallup River near Puyallup, WA – parameters Discharge, Gage height and Flood Stage,
- NRCS Long-Term Climate data, AgACIS for Pierce County – WETS Station: TACOMA NO. 1, WA: 1971–2023
- Pierce County Office of the Hearing Examiner, July 11, 2018, The Puyallup Tribe of Indians v. Director, Pierce Co. Public Works and Knutsen Farms, Inc., Running Bear development Partners LLC, and Barghausen Consulting Engineers, Inc. Joint Stipulated Motion to Dismiss the Puyallup Tribe's Appeal (case no. 863309)
- Puyallup River Watershed Assessment (PRWC 2014)
- Climate Change Impact Assessment and Adaptation Options (Puyallup Tribe 2016)

The following technical reports were reviewed (and others):

- Biological Evaluation – Van Lierop Property Stormwater Outfall Project, Talasea Consultants, Inc. (2017)
- Detailed Mitigation Plan (TDMP 2018), Puyallup River Outfall, Talasea Consultants Inc., March 2018
- Critical Areas Assessment Report – Knutson Farms Industrial Park. Soundview Consultants (September 2016, Revised December 2016)
- Revised Knutson Industrial Transportation Impact Analysis, TENW Transportation and Engineering Northwest for Michelson Commercial Realty and Development, LLC (2017)

- Barghausen Engineering Project site survey map, stamped 03/23/2021
- Barghausen Engineering Conceptual Grading and Storm Drainage Plan, stamped 03/26/2021
- Barghausen Engineering *Offsite Conveyance Analysis Report*, prepared for Michelson Puyallup Partners, LLC, April 2, 2018
- Barghausen Engineering *Offsite Conveyance Analysis Report* for Van Lierop property, prepared for Running Bear Development Partners, March 1, 2018, revised June 14, 2018
- Welch, W.B., Johnson, K.H., Savoca, M.E., Lane, R.C., Fasser, E.T., Gendaszek, A.S., Marshall, C., Clothier, B.G., and Knoedler, E.N., 2015, Hydrogeologic framework, groundwater movement, and water budget in the Puyallup River Watershed and vicinity, Pierce and King Counties, Washington: U.S. Geological Survey Scientific Investigations Report 2015–5068, 54 p., 4 pls. (http://dx.doi.org/10.3133/sir20155068)
- WCI (West Consultants Inc.) August 17, 2021. Knutsen Farm Scour Analysis model of the Puyallup River near the BNSF Trestle Bridge, prepared for Viking LLC and Running Bear development Partners, LLC

A significant impact from construction and/or operations would occur if there was:

- Reduction or loss of wetland groundwater hydrology sources that would result in loss of on-site wetlands systems over time;
- Conversion of groundwater systems to surface water systems, resulting in impacts to the Puyallup River from significant increases in direct flow discharges and loss of late summer river recharge from groundwater systems;
- Noncompliance with critical areas regulations and stormwater regulations intended to protect and preserve wetland systems and their buffers; or
- If these impacts cannot be mitigated through compliance with critical areas ordinances or implementation of BMPs.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, the construction of the KFIP would not occur. No KFIP-related impacts to groundwater resources would result.

Agriculture could continue on site, and groundwater would continue to be recharged by direct infiltration from farmed surfaces. Groundwater recharge through the upland terrace surfaces would continue to provide the same recharge volumes during similar time periods that currently support the existing floodplain wetlands to the east. There would be no significant excavation, grading, or clearing on site beyond what is normal and allowed for agricultural operations.

No documentation of a Farm Management Plan for the current agricultural operation was located, and therefore, cannot document the degree to which the current operation applies BMPs in relation to use of pesticides, herbicides, fertilizers, or other standard agricultural chemicals. Groundwater quality could be impacted by mismanagement of farm practices, but there is no known exceedance or documented pollution on the KFIP site related to agriculture.

If KFIP does not abandon the wells (as is planned), the two existing water wells would be retained and be utilized similar to existing conditions as either drinking water or irrigation wells. According to the Ecology Water Rights search tool, there is no water right for withdrawal from the Puyallup River at the KFIP site.

Pierce County has designated the KFIP site with an Urban Zone Classification of Employment Center (EC) (a "*concentration of low to high intensity office parks, manufacturing, other industrial*")(PCC 18A.10.080) and thus it is possible that other future development within the constraints of this zoning would occur, and agriculture would no longer be the primary land use.

Proposed Action

Construction Impacts

Groundwater Infiltration and Wetland Recharge Potential

The current proposal is likely to result in significant impacts to on-site wetlands, and most of those impacts would be initiated during construction phases. However, there is overlap in the schedule between construction and operations phases at this site.

The Applicant's has indicated that they plan to complete construction over a period of 4 years, with construction starting at the north end of the site (warehouses A to E), followed by construction of Warehouses F and G. Construction of each warehouse would take 15–18 months, with construction of some warehouses occurring simultaneously to meet the overall 4 year construction schedule. Up to 150 employees would be expected on site at any one time during construction.

Construction of each warehouse would occur in three stages:

1. Grading and filling
2. Installation of on-site utilities
3. Warehouse construction

Heavy construction equipment would compact the soil surface and reduce surface infiltration potential both during and after construction phases. According to current site plans, construction of the KFIP Project would require excavation (cut and fill) of up to 450,000 CY of soil. According to KFIP site groundwater studies (ESNW 2015 and 2018), depth to the groundwater table for the KFIP site ranges between 6–13 feet in summer, and based on limited winter groundwater monitoring in the floodplain, is expected to be about 3 feet higher (i.e., closer to the surface) during winter. Therefore, construction excavation activities that extend 6 feet or more below existing grades—such as may occur when building the proposed infiltration trenches or installing stormwater conveyance pipes—might result in groundwater contact and a need for control and diversion of groundwater. Excavation and dewatering during construction would change or interfere with the flow patterns of shallow groundwater and would cause localized drawdown of groundwater levels. When building the proposed infiltration trenches, this may also result in hydraulic or erosion impacts to steep slope areas.

Therefore, the two primary impacts caused by changes to groundwater functions during construction phases would be:

- Potential slope stability impacts along the top of slope or eastern slope face of the high terrace, and
- Changes to the timing and total volumes of groundwater recharge to the Puyallup River and to on-site wetlands in the eastern floodplain (Wetlands A, B, and C) and in the southeastern high terrace (Wetland D).

Impacts caused by changes in groundwater flow timing and flow volumes would continue during operations after construction, as described in more detail in the following section.

There has been no detailed infiltration testing or hydrogeological assessment of the targeted top of slope infiltration areas. These top of slope areas are mapped as landslide hazard areas, and thus, the currently proposed infiltration sites are prohibited by PCC, unless the slope stability impacts of such systems have been analyzed and mitigated by a geotechnical professional and appropriate analysis indicates that the impacts are “negligible” (PCC 18E.80.040.B.7). Furthermore, most of the proposed trenches are sited north and hydrologically downstream of the target wetlands, and thus may not provide adequate hydrology at the right location to ensure that the wetlands persist. Finally, some of the proposed top of slope areas would be comprised of partially compacted fill adjacent to Warehouses C, D, and E, and thus may not be suitable for infiltration.

A detailed hydrogeologic assessment of infiltration trench hydraulic loading effect on slope stability coupled with monitoring the floodplain wetlands’ hydroperiod (hydrology volumes and timing) over at least one water year would be needed to answer these questions and/or to indicate a more suitable location and design for infiltration facilities. This work should be carried out before construction starts, to allow time for redesign and to avoid failures.

The KFIP site is currently estimated to provide 1 to 2 ft^3/s late summer groundwater discharge rates to the Puyallup River at the northern end of the KFIP site (Welch et al. 2015). Lacking any better information about groundwater volumes contributed to the floodplain, these groundwater discharge volume estimates might be used to very roughly estimate the minimum discharge needed to support hydrology in the on-site floodplain wetlands to the east during and after construction. However, a more standard and technically correct approach is needed to document the wetland hydroperiods over the course of at least one water year, in order to more precisely determine the hydrology volumes, timing and durations needed to maintain existing wetland conditions. Any reduction in groundwater inputs to the on-site wetlands during or after construction could have significant long-term impacts to on-site wetlands functions and values, with potential for entire loss of the wetland areas.

Once appropriate information is gathered to allow for proper design, siting, and construction of the infiltration trenches or other appropriate wetland hydrology support systems, the timing of construction may significantly adversely impact continuity of wetland hydrology. The trenches are currently intended to infiltrate roof runoff from Warehouses A, C, D, and E. However, unless some other accommodation is provided, the trenches would receive no roof runoff until the warehouse construction is complete. The timing of warehouse construction and associated infiltration facility construction is unknown but is considered likely to take at least 1 year or longer. However, wetland hydroperiods must be maintained with no break throughout construction, to ensure that the wetlands are maintained and protected as required by law.

Adjusting the schedule to prioritize construction of effective infiltration facilities and providing temporary diversion of other site water as needed to support on-site wetland hydrology during construction phases could reduce potential for loss of wetlands. These impacts could be moderated if properly addressed through construction scheduling and proper infiltration facility siting, testing and design. But the current proposed stormwater management plan does not provide that assurance.

Groundwater Contamination

Construction of the KFIP site would require the use of heavy equipment and dewatering, both of which could cause contamination of groundwater. Oil, fuel, and other chemicals could inadvertently spill or leak from construction equipment, leading to contamination of groundwater through seepage. Uncontrolled spills are unlikely because required SPCC Plans and local and state permit requirements would presumably be implemented and followed.

Construction stormwater also has the potential to transport contaminants into local groundwater. Construction Stormwater Permit conditions are designed to would minimize runoff and the introduction of pollutants into the stormwater. Construction stormwater would be managed by establishing the limits of construction and temporary erosion and sediment control measures.

Potentially contaminated materials during site excavation and grading could be encountered. Contaminated materials would be managed in accordance with the relevant regulations, including the NPDES Construction Stormwater General Permit.

Critical Aquifer Recharge Areas, Wellhead Protection Areas, and Water Wells

The lower Puyallup River does not currently experience low summer flow rates, primarily because it is supported by glacier and snowmelt inputs at Mount Rainier (Welch et al. 2015). That said, the current glacier surface area is about 40 percent of its original area (measured in 1896), and recent climate trends indicate more rapid melting rates (Beason et al. 2022). As long as the glacier persists, the minor decrease in groundwater discharge to the Puyallup River would be expected to have an undetectable impact on the overall flow of the river.

Ecology well records indicate that drinking water wells in and near the study area access deeper aquifers that are protected from surface impacts by a confining layer. KFIP has indicated that they will abandon any on-site wells, but the timing of well abandonment is unknown. During construction, the KFIP would not use any on-site water wells for water supply. No impacts on drinking water wells are expected.

Operations Impacts

Potential operational impacts to groundwater include the following:

- Permanent subsurface modifications related to drainage systems, which may reduce or eliminate groundwater sources that support the on-site floodplain wetlands

- Stormwater management design that redirects most surface runoff to the river rather than infiltrating, which would reduce historic infiltration volumes and timing of seeps to wetlands from the high terrace, and which may eliminate on-site floodplain and high terrace wetlands
- Oil leaks and spills in the warehouse complex over time, which may contaminate shallow groundwater if not managed properly

Groundwater Infiltration and Wetland Recharge Potential

The KFIP Project would significantly increase current impervious surface on site from a current estimated condition of less than 5 percent (mostly farmland with some compacted farm roads) to more than 75 percent once all warehouses, roads and parking areas are constructed. The remaining 25 percent permeable surface is in the floodplain, which is undeveloped aside from the stormwater outfall structure at the edge of the river in northern corner of the Project site but would continue to be farmed for an undefined time period. Under the Proposed Alternative, according to the KFIP traffic impact study, the maximum net vehicle trips is predicted to be 8,724 per day.

PCC 18E.50.040-A, Table 18E.50.040 Aquifer Recharge Area indicates that areas such as the KFIP site that are zoned as EC are allowed a maximum impervious surface coverage of 60 percent. Personal communication from Pierce County planning staff (2021) notes that these limits can be exceeded with proper engineering, but no details were provided about what type of engineering is required to assess or exceed that limit.

The current proposal is to infiltrate relatively clean roof runoff from Warehouses A, C, D, and E in trenches located at the top of the high terrace slope along the eastern side of the warehouse complex. The rest of the site, including all paved surfaces, any groundwater collected from the subsurface piped system, and the remaining warehouse roofs would be sent to the already constructed piped surface outfall structure on the floodplain at the edge of the Puyallup River.

This method of stormwater management would lead to faster runoff to the river, and a reduction in stored groundwater volumes below the high terrace on the KFIP site, which currently slowly flows to the floodplain and river over time. Based on data presented in Welch et al. (2015), the impact of permanent changes to timing and volumes of recharge sent to the Puyallup River would be minor relative to total flow volumes in the Puyallup River. However, without design changes to the currently proposed method and location of infiltration facilities (discussed above), on-site wetland hydrology would not be maintained, and the on-site wetland hydroperiods would change over time, eventually resulting in loss or reduction in surface area of on-site floodplain Wetlands A, B, and C on the eastern floodplain, and Wetland D on the high terrace.

As mentioned above, the currently proposed location and design of the infiltration trenches may not meet setback and safety requirements of Pierce County Landslide Hazard Area regulations and may not function as required to maintain the wetland hydroperiods. The trenches are sited at top of slope in a landslide hazard area, and so far, no infiltration testing or geotechnical assessment has been carried out to determine whether the sandy soils on the steep slope below the trenches would fail under hydrologic loading, or whether the trenches would provide adequate hydrology volumes at times and durations needed to maintain the current wetland hydroperiods. In addition, most of the trenches are not sited upslope from the target wetlands, but rather are located north and hydrologically downstream from the wetlands, so would not provide hydrology at the correct location.

The on-site wetland hydroperiods have not been studied or documented, and therefore, the minimum flow volumes and timing of flows needed to support current functions and values are unknown, making it impossible to determine whether or not the proposed infiltration facilities would perform as intended. Neither are there any known available plans for post installation monitoring, as would typically be required to determine whether the wetland hydroperiods change over time during long-term operations. Long-term monitoring is typically required when maintaining or supporting wetland hydrology is required under a project mitigation permit.

Under the current proposal, which would result in changes to groundwater volumes and timing of groundwater flows to the floodplain, the on-site wetlands are unlikely to persist in the future—a significant impact.

Groundwater Contamination

On-site delivery vehicles and equipment could generate substances that might contaminate groundwater through unmitigated impervious surface runoff. The KFIP does not propose to infiltrate untreated stormwater generated at the impervious paved surfaces, and therefore, no groundwater contamination would be expected from untreated infiltrated stormwater. Under the current proposal, no potentially polluted surface stormwater or septic effluent would be infiltrated to the ground, therefore, no impacts to groundwater quality during operation of the KFIP are anticipated.

PCC 18E.50.040 (Aquifer Recharge and Wellhead Protection Area Standards) describes general rules that prohibit certain kind of development (uses) that may cause hazardous substances to be released on site or to groundwater, such as certain businesses that might want to occupy KFIP warehouse space in the future. Typically, these activities and use limitations are addressed during future site occupancy permitting phases and through use of site-specific mitigation standards. It is assumed that the restrictions on certain uses will be applied, as required by law, and will be incorporated into future occupancy permit conditions.

Critical Aquifer Recharge Areas, Wellhead Protection Areas, and Water Wells

Similar to the discussion above during construction phases, the lower Puyallup River does not currently experience low summer flow rates, primarily because it is supported by glacier and snowmelt inputs at Mount Rainier (Welch et al. 2015). As long as the glaciers persist, the minor decrease in groundwater discharge to the Puyallup River as a result of redirection of surface water to the river rather than infiltration in upland areas would be expected to have an undetectable impact on the overall flow volumes in the river throughout the year.

The KFIP Project has indicated that they will abandon the on-site wells and will be served by municipal water during future operation phases. The wells must be decommissioned consistent with the requirements of Ecology. The KFIP site would, therefore, not be drawing water from the deep aquifer and this would result in no impact (or possibly a beneficial impact) to the volume of water available within the deeper aquifer for other uses.

Ecology well records indicate that drinking water wells in the study area access deeper aquifers that are protected from surface impacts by a confining layer. During operations, the KFIP site would not use any water wells for water supply. No impacts on drinking water wells are expected.

Alternative 1 – Rail Transport

Construction Impacts

Construction of Alternative 1 would result in similar construction impacts as the Proposed Action. Except for a small area between the KFIP site and the Meeker Southern railroad as well as construction of the track extensions from the BNSF mainline/Meeker Southern interchange, most of the ground disturbance for the construction of the rail line would occur within the same construction footprint as the Proposed Action; therefore, the impacts would be similar to those described for construction of the Proposed Action.

Operations Impacts

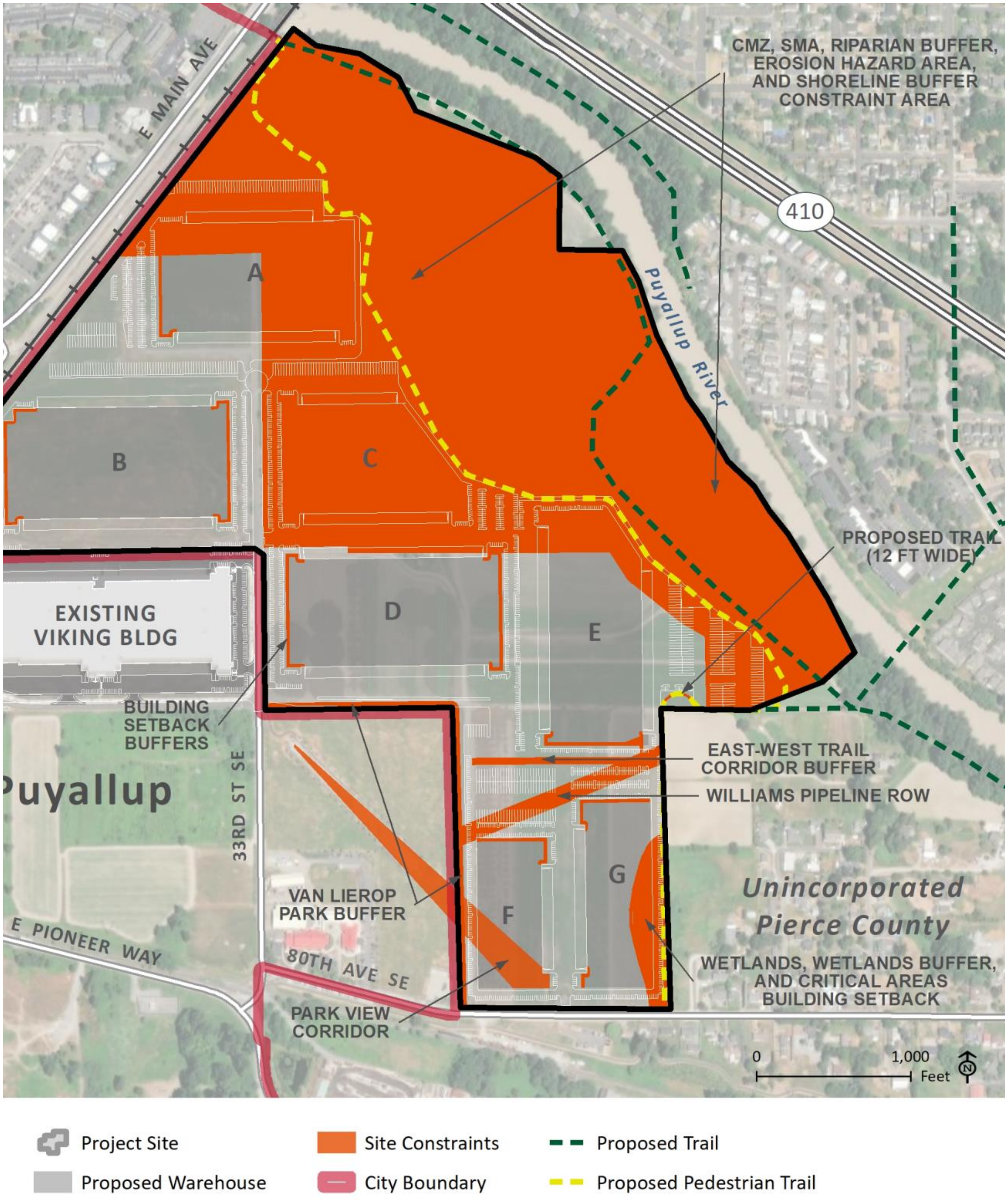
The operations impacts associated with Alternative 1 would be the same as those described for the Proposed Action. There might be a slight difference in total impervious surface, but it is assumed that the general approach to stormwater management and the risks would remain the same.

Alternative 2 – Reduced Intensity Alternative

Under WAC 197-11-440(4)(5), an EIS is directed to analyze reasonable alternatives, which "*shall include actions that could feasibly attain or approximate a proposal's objectives, but at a lower environmental cost or decreased level of environmental degradation*."

As such, Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility, as outlined in Section 3 Project Description, were adopted by the Applicant (Figure 4-31). Under Alterative 2, the total footprint of the facility would be reduced from about 2.6 million SF to about 1.7 million SF (about 35 percent footprint reduction). The following mitigation measures to reduce intensity would be applied:

- All warehouses would include a minimum 15-foot-wide landscape bed to be provided along the entire length of blank wall facades of buildings.
- Warehouses would not be constructed on lands designated Rural Buffer Residential (RBR) in the CPCP. The RBR designation reflects development restrictions associated with the shoreline buffer constraint area, the riparian buffer adjacent to the Puyallup River, and the erosion hazard area. This would eliminate Warehouse C and would reduce the footprint of Warehouses A and E.
- Warehouse F would be reduced in size to avoid blocking the prime view corridor from Van Lierop Park.
- Warehouse G would be reduced to avoid fill impacts to on-site portions of Wetland D and its on-site buffer, in accordance with Pierce County Code 18E.40.050.



*See Figure 4-55 for the
Van Lierop Park Concept Plan

Figure 4-31. Alternative 2 – Reduced Intensity Alternative

Construction Impacts

Construction of Alternative 2 would result in similar, but slightly reduced impacts during construction as compared to the Proposed Action. During construction phases, Alternative 2 would result in fewer construction vehicle trips due to the reduced Project size and footprint of the facility. During grading and filling phases, up to 1,270 total construction vehicle trips (or up to 215 trips per day) would be expected. During utilities installation work, up to 100 total construction vehicle trips (or up to 4 trips per day) would be expected. During warehouse construction (which includes building and paving roads and parking areas), up to 1,560 construction vehicle trips (or up to 40 trips per day) would be expected.

Due to Alternative 2's reduced footprint, temporary and permanent impacts analogous to what was described above for the Proposed Action would occur, but at a smaller scale and farther from some of the environmentally sensitive areas on site. Fill impacts at Wetland D and its on-site buffer would not occur, and potential landslide hazard areas near the top of slope at the eastern edge of the high terrace would not be developed.

However, Alternative 2 does not change the current proposal to redirect most site runoff to the Puyallup River, therefore, it does not address the need to protect and maintain current groundwater-fed hydrology sources for the on-site wetlands. Neither does it propose revegetation of the undeveloped surfaces between the terrace edge and the warehouse zone, without which would be expected to revegetate naturally with a weed-dominated vegetation community.

Mitigation actions that may be applied to reduce impacts to groundwater during Construction phases are described in Mitigation Measures (Section 4.3.5).

Mitigations actions for other impacts associated with a smaller construction footprint were identified and described in other sections of this EIS (Section 4.1 Earth Resources, mitigation measures ER-1 through ER-10; Section 4.5 Land Use, mitigation measures LU-2 through LU-4; Section 4.6 Recreation, mitigation measures REC-2 through REC-3; Section 4.7 Aesthetics, mitigation measure AES-1; Section 4.10 Health and Safety, mitigation measures HS-1 through HS-5; and Section 4.13 Noise, mitigation measures N-1 and N-2).

Operations Impacts

The Operations impacts associated with Alternative 2 would be similar but slightly reduced compared to those described for the Proposed Action, due to the smaller Project area footprint. The number of daily vehicle trips generated by the KFIP warehouse complex under Operational phases for Alternative 2 would be reduced by about 21 percent, and the overall impervious surface cover on the high terrace would be decreased by about 33 percent, as compared to the Proposed Action.

Under the Proposed Action, there would be a maximum of 8,724 daily net vehicle trips (KFIP Traffic Impact Analysis). In comparison, Alternative 2 would generate 998 daily heavy-duty vehicle trips and 4,846 passenger car/light-duty truck (i.e., delivery van) trips, a total of 5,844 trips per day. Alternative 2 would also require up to 1,000 employees/day during operations (i.e., 1000 trips/day from commuting employees). In sum, Alternative 2 would result in a daily traffic volume decrease of about 21 percent.

As a result of the Alternative 2 reduced impacts approach, there would be a reduction in total impervious surface and a decrease in the number of daily traffic trips, but the general approach to stormwater management would remain the same, and the impacts to wetland groundwater hydrology sources remain the same. Thus, under Alternative 2, wetlands are still expected to become smaller or disappear entirely due to a decrease in infiltration on the high terrace and associated reduction in groundwater hydrology volumes. This is considered a significant impact. Mitigation actions that may be applied to reduce these impacts to groundwater during long-term Operational phases are described in Mitigation Measures (Section 4.3.5).

4.3.5 Mitigation Measures

This section summarizes KFIP impacts and the mitigation measures that could be implemented to avoid or minimize impacts of the currently proposed KFIP Project, both during Construction Phases and during full Operational Phases after construction is complete. Prior to initiation of construction, the proponent is expected to obtain the necessary federal, state, and local permits and to prepare the appropriate plans that are required to protect groundwater functions, including but not limited to a NPDES Construction Stormwater General permit, Dewatering Permit, Grading Permit, and a SPCC Plan. In areas where it is proposed to direct some on-site runoff to infiltration facilities, the proponent is expected to carry out infiltration tests and to obtain the necessary permits that are required to verify infiltration function, to monitor and document wetland hydroperiods, and to protect groundwater during infiltration testing.

Plans and reports resulting from monitoring work are expected to show concurrence with the PCSWDM, with relevant Pierce County Development Permit approvals, and to comply with other federal and state permit conditions of approval.

Construction and Operational Impacts

Impacts during Construction Phases would be from initial clearing, grading, and filling; installation of utilities (trenching and installation or conduit and pipe); stormwater runoff; and work associated with construction and paving of parking lots, roads, and warehouses.

Impacts during Operational Phases would primarily result from methods used to manage stormwater runoff, and from traffic—both on and off site. Operational impacts specific to the not yet defined businesses that would operate out of the warehouses are not addressed in this Draft EIS.

Impacts most likely to result in significant changes to long-term groundwater functions at the KFIP site would occur during construction phases, when the currently permeable surface is slowly paved or covered with warehouses over time. The seven warehouse complex is proposed to be constructed over a period of four years. Therefore, some warehouses could be operating while others are still under construction.

Depending on construction timing, sequencing, and relative success of infiltration design (as required to support wetland hydrology functions), impacts to groundwater systems are likely to continue through early operational phases, as the surface transitions from being mostly permeable (farmland) to being mostly impermeable (pavement or buildings). Once construction is complete, the primary impacts to groundwater during full operational phases would be from stormwater infiltration facilities, as required to support on-site wetland hydrology systems. There is no clear boundary between construction and operational phases in terms of groundwater impacts. Therefore, we have combined discussion about Construction and Operation Impacts below.

Groundwater Volumes

During construction and operations, as currently proposed, direct impacts to groundwater depths and volumes could occur due to slow elimination over a period of four years of most direct infiltration across the KFIP site. The PSWDM encourages but does not require infiltration. However, it does require protection of on-site wetlands, which would be affected by changes to current on-site groundwater system functions. Implementation of mitigation measures designed to increase infiltration in key areas on site would minimize impacts to groundwater and would reduce potential for loss of wetland areas on site. Most of these initial impacts that change groundwater functions would occur during construction, and the same impacts would simply continue during operations.

Some of the suggested mitigation options below are similar to strategies suggested in other chapters, but are adapted to specifically address impacts to groundwater, and secondary related impacts to wetlands. Wetlands are surface water systems but are controlled by groundwater sources on the KFIP site.

GW-1. Re-evaluate current stormwater management strategy (also addressed in Section 4.2 Surface Water).

- The current proposal is to infiltrate runoff from four warehouse roofs (Warehouses A, C, D, and E). Runoff from all other surfaces on site would be captured and redirected to the river through pipes. If instead, LID practices were broadly applied, and more stormwater runoff were infiltrated, the potential for significant groundwater quantity impacts and related potential for loss of wetland areas on site would be diminished.
- Consider broadly applying LID practices by infiltrating more parking lot and road runoff volumes near wetland areas. This can be done below parking lots using deep gravel-filled trenches or properly designed half-pipe infiltrator systems. It may also be permittable to locate some infiltration trenches or rock-filled galleries within the floodplain, as may be allowed if the goal is to support floodplain hydrology functions. Any infiltration increase on site would increase potential for maintaining on-site wetland hydrology sources, as required by law.
- Develop a stormwater system design and construction scheduling plan designed to ensure that adequate hydrology is directed to the on-site wetlands throughout Project construction periods, prior to construction of warehouse roofs and associated proposed infiltration trenches.
    - See below for details on how to ensure that hydrology is adequate.

These actions would be consistent with Pierce County's Comprehensive Plan policies listed in Section 4.3.2, related to applying best available science and adaptive management for critical areas, using LID practices to maintain water quality for fish, and eliminating harm to water quality from stormwater discharges through use of on-site infiltration and other means (Goal ENV-1, Goal ENV-5, Goal ENV-8, Goal ENV-11, and Goal U-38).

GW-2. Consider benefits of meeting rather than exceeding EC impervious surface limits and applying LID techniques.

- The site currently exceeds the 60 percent impervious surface limit. Redesign the site to meet the 60 percent impervious surface maximum described in PCC 18E.50.040 and Table 18E.040(A), and maximize potential for construction of LID facilities and natural infiltration through permeable surfaces and bioretention and landscaping areas across the KFIP site.

Wetlands

The groundwater source for hydrology that currently supports floodplain Wetlands A, B, and C as well as Wetland D located on the high terrace would decrease as a direct result of increases in impervious surface—paving and buildings—and redirection of surface runoff to the river. The four on-site wetlands are dependent on groundwater contributions, and disruptions to the current hydroperiods are expected to result in wetland loss or reduction in wetland surface area at Wetlands A, B, C, and D. Increasing infiltration would partially mitigate these potential losses, but no detailed information has been collected to define the wetlands' hydroperiods, and little to no information is available regarding infiltration function of the currently proposed trenches. Therefore, more information must be gathered to design an effective, long-term wetland hydrology support system.

GW-3. Assess steep slope stability adjacent to proposed infiltration facilities.

- Consistent with requirements described in the Pierce County Landslide Hazard Area Regulations, an appropriately qualified and experienced professional should evaluate the steep, sandy slopes below the proposed infiltration trenches to determine whether the sandy floodplain terrace slopes would withstand hydraulic loading pressures from the proposed infiltration facilities—to ensure that groundwater seeping from trenches installed in the sandy slopes would not fail and impact the floodplain below as well as stability of upland infrastructure and warehouses.
- Alternate infiltration facility locations and slope stability buffers that move the trenches farther from the top of slope may be indicated.

GW-4. Test infiltration facilities location and function.

- Consistent with requirements described in PCSWDM and Landslide Hazard Area regulations, an appropriately qualified and experienced professional should carry out infiltration testing at each of the proposed infiltration trench locations, and should evaluate whether appropriate volumes of hydrology from the trenches would reach any or all the target wetland areas at the right times and duration to ensure continued function of the current wetland hydroperiods.
- Infiltration trenches should not be constructed until after the wetland hydroperiod monitoring has been completed and appropriate volumes and timing of flow have been defined, as needed to support the wetlands in their current form.
- If the proposed trench locations are infeasible, that does not eliminate the requirement in law and in the 2018 Puyallup Tribe agreement to ensure a hydrology source to the wetlands. Other infiltration or hydrology support options must be defined.

GW-5. Monitor ground and surface water depth and duration in trenches and wetlands.

- Prior to final permitting and construction, the Applicant should monitor variations in groundwater levels at potential infiltration locations in response to daily precipitation events through at least one wet season (wet season as defined by the SMMWW (Ecology 2019) in order collect enough data to properly design KFIP infiltration facilities.
- Monitoring wetland hydroperiod at each wetland in relation to seasonal daily precipitation events through at least one wet season or water year is a standard BAS approach when the proposed mitigation involves managing or maintaining historic wetland hydrology. The hydroperiods of the on-site wetlands have not yet been monitored or defined.

GW-6. Long-term wetland groundwater monitoring plan.

- Maintain groundwater monitoring wells that were established during hydroperiod testing. Monitoring to document long-term wetland hydrology typically is carried out for 5 or more years (as conditions warrant). This work is intended to document that long term hydrology conditions and timing in Wetlands A, B, and C have been protected as required in code and permits. The same monitoring requirement would apply to Wetland D (additional discussion is provided in Section 4.2 Surface Water).
- As would be defined in the not yet developed or approved mitigation and monitoring plan for proposed fill impacts to Wetland D, the Applicant should expect to apply additional compensatory mitigation requirements if groundwater replenishment and related wetland hydrology is shown to be reduced relative to what would be described in the updated mitigation plan performance standards.

4.3.6 Significant Unavoidable Adverse Impacts

Under the current site design, impacts to groundwater recharge, and resultant changes to discharge volumes and timing in on-site wetlands would result in reduction in on-site wetland area or complete loss of wetland conditions over time. This would be a significant impact.

4.4 Plants and Animals

This section provides an analysis of potential impacts to plant and animal communities and their available habitat within the study area. Impacts to plants and animals from the proposed Project development have been evaluated and weighed to determine whether the proposed Project would have significant impacts affecting on-site wildlife habitat, native plant communities, priority species, designated locally important species, or listed species (federal and state).

Species of particular concern include listed salmonids that currently use the Puyallup River adjacent to the Project site for critical stages of their life cycle: migration, spawning, egg incubation, fry colonization and rearing.

4.4.1 Study Area

The study area for plants and animals includes the Project site and a 0.5-mile radius around the site (Figure 4-32). The 0.5-mile radius accommodates noise and visual disturbance thresholds set by the USFWS for listed species (USFWS 2006). The study area encompasses a range of habitat areas that support both aquatic and terrestrial species, and includes existing agricultural farmland.

Figure 4-32. Approximate Project Area and 0.5-mile-radius Study Area

4.4.2 Relevant Plans, Policies, and Regulations

This section summarizes federal, state, and local regulations related to plants and animals that are applicable to the Project proposal in Table 4-14 and in the following discussion.

Table 4-14. Regulations Overview

Law and Regulation	Description
Federal	
Endangered Species Act (ESA, 16 USC 1531 et seq.)	To ensure that the proposed action is not likely to jeopardize existence of any listed threatened or endangered animal species or result in adverse modification of designated critical habitat.
Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267)	Defines EFH and requires federal agencies to consult with NMFS on activities that may adversely affect EFH.
Sections 404 and 401 of the Clean Water Act (CWA; 33 Code of Federal Regulations [CFR] 26, Subchapter 4, Section 1344)	Section 404 is administered primarily by the USACE and Section 401 by Ecology as a state-agent of the USEPA. These agencies review and permit or certify projects proposing in-water work related to fill in WOTUS.
State	
Growth Management Act (GMA)	Requires all cities and counties in Washington to adopt development regulations that protect critical areas, which include frequently flooded areas, wetlands, streams, and fish and wildlife habitat conservation areas.
Section 401 of the Clean Water Act (CWA; 33 CFR 26, Subchapter 4, Section 1344)	Section 401 is administered at a federal level by the USEPA, which has delegated review authority to Ecology. Ecology reviews and certifies Section 401 water quality permits for projects proposing in-water work in WOTUS.
Washington State Water Pollution Control Act (90.48 RCW)	Ecology regulates wetlands under the state Water Pollution Control Act (RCW 90.48) and the **SMA** (RCW 90.58). Ecology also provides guidance to local jurisdictions under SEPA to identify wetland-related issues early in permit and review processes. Administrative orders are issued under RCW 90.48.120. Ecology requires that all projects affecting surface waters in the state must comply with the provisions of the state's Water Pollution Control Act, including those waters or wetlands that are not subject to the federal **CWA** regulations.
Washington State Shoreline Management Act (SMA; RCW 90.58)	The SMA provides for the management of water bodies or watercourses identified as "shorelines of the state." Areas under SMA jurisdiction include the designated shoreline water body; lands within 200 feet upland of the ordinary high-water mark; and associated wetlands and floodplains. With this state law as a foundation, local shoreline management plans are to be developed and regulated by counties and cities.

Law and Regulation	Description
Washington State Department of Fish and Wildlife (WDFW) Hydraulic Permit Approval (HPA) (WAC 220-660)	The WDFW HPA program, regulated under Washington State law (RCW 77.55), ensures that construction in or near state waters is done in such a way as to protect fish and their aquatic habitats. An HPA must be obtained from WDFW by anyone planning hydraulic projects in most marine and fresh waters.
Washington State Department of Ecology NPDES Permit Program	The NPDES permit program controls water pollution by regulating sources that discharge pollutants into WOTUS (CWA, 33 USC Sections 1251 et seq. and WAC2 197-11-200 through 240). Ecology develops and administers NPDES municipal stormwater permits in Washington State. These permits regulate discharges to both surface waters (via surface conveyances) and to groundwaters (via infiltration facilities) of the state.
Local	
Pierce County Critical Areas Regulations (Pierce County Code [PCC] Title 18E)	This ordinance was developed under the directives of the GMA to designate and protect critical areas and to assist in conserving the value of property, safeguarding the public welfare, and providing protection for these areas. Geologic critical areas defined in PCC 18E include volcanic, landslide, seismic, mine, and erosion hazard areas.
Pierce County Stormwater Management and Site Development Manual (PCSWDM)	The PCSWDM provides regulations and detailed guidance on stormwater management, designed to meet Ecology standards (as defined by the USEPA NPDES program), and as required under the County NPDES permit.
Pierce County Critical Areas Regulations (PCC Title 18E Critical Area Regulations)	PCC 18E Critical Areas Regulations were adopted to protect the critical areas of Pierce County from the impacts of development and protect development from the impacts of hazard areas by establishing minimum standards for development of sites that contain or are adjacent to identified critical areas.
Pierce County Comprehensive Plan Policies	The Pierce County Comprehensive Plan is a tool to assist County Councilmembers, planning commissioners, County staff, and others in making land use and public infrastructure decisions. It provides the framework for the County's Development Regulations.
City of Puyallup Stormwater Management Program Plan (SWMPP)	The SWMPP provides guidance on how the City manages its stormwater to meet requirements of the City's NPDES Phase 2 permit, as administered by Ecology.
City of Puyallup Critical Areas Regulations (PMC Chapter 21.06 CRITICAL AREAS)	The Puyallup Critical Areas regulations (PMC Chapter 21.06) are similar to those of Pierce County, as both are designed to meet standards defined in the GMA. However, some regulatory details are different.

Law and Regulation	Description
City of Puyallup Comprehensive Plan (CPCP)	The CPCP includes government planning policies that call for the protection, preservation and enhancement of water resources and other natural environment components. It is "*the long-term vision and plan for managing the built and natural environment in the City of Puyallup*," and provides policy guidance used by City staff to make decisions related to growth and development.

Federal

Endangered Species Act (ESA;- 16 USC 1531 et seq.)

The ESA requires that applicants seeking a federal action, such as issuing a permit under a federal regulation, undergo consultation with USFWS and/or NMFS. This is intended to ensure that the action is not likely to jeopardize the continued existence of any listed threatened or endangered animal species or result in the destruction or adverse modification of designated critical habitat. NMFS is responsible for managing, conserving, and protecting ESA-listed marine species. USFWS is responsible for terrestrial and freshwater species. Both NMFS and USFWS are responsible for designating critical habitat for ESA-listed species.

This Act prohibits "taking" of listed species, whether or not consultation with USFWS or NMFS takes place. "Take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any species listed as threatened or endangered under the ESA (16 USC 1531 through 1544), or attempt to engage in any such conduct. Such an act may include significant habitat modification or degradation where wildlife is killed or injured wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267)

This act requires fishery management councils to include descriptions of EFH and potential threats to EFH in all federal fishery management plans. It also requires federal agencies to consult with NMFS on activities that may adversely affect EFH.

Sections 404 and 401 of the Clean Water Act (33 Code of Federal Regulations 26, Subchapter 4, Section 1344)

Section 404 of the CWA requires authorization from the Secretary of the Army, acting through the USACE, for the discharge of dredged or fill material into all WOTUS, including wetlands.

In general, since the mid-1980s, WOTUS included all coastal marine waters, freshwater lakes, rivers, and streams in addition to wetlands[15] that were adjacent to or which had either permanent or ephemeral surface water connections to those waters (i.e., "*significant nexus*"). Inclusion of wetlands in the regulatory definition of WOTUS was based partly on the fact that many large wetland systems that cross states lines are used for hunting, fishing, mining, and other interstate commerce activities. Isolated wetlands, those which do not have a surface water connection to other WOTUS at any time, were not typically regulated under federal law.

In March 2023, the Biden Administration finalized a definition of WOTUS (which included wetlands with significant nexus), in response to a series of previous court cases and findings which had resulted in a fluctuating regulatory definition since 2015. However, a recent Supreme Court decision (May 25, 2023 – Sackett v. Environmental Protection Agency) has revised the federal definition of WOTUS to include wetlands only if they have a continuous surface water connection to rivers, lakes, or marine water bodies.

In order to conform with the May 25, 2023, Supreme Court decision, on August 29, 2023, USEPA issued a Final Rule to amend the CWA WOTUS definition that was previously published in the Federal Register on January 18, 2023. The new federal definition of WOTUS "*removes the significant nexus test from consideration when identifying tributaries and other waters as federally protected.*" Effectively, the new definition of WOTUS includes only relatively permanent bodies of navigable water and directly adjacent wetlands sharing the same water table. Therefore, upslope wetlands and smaller tributary seasonal streams that are not directly adjacent to larger rivers, lakes and marine waters are no longer protected under federal law.

Please see the discussion below about state of Washington wetland regulations, which effectively replace the review and permitting functions provided previously under federal Section 404 regulations.

Discharges of fill material in WOTUS or in Waters of the State generally include, without limitation: placement of fill that is necessary for the construction of any structure, or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands; property protection or reclamation devices such as riprap, groins, seawalls, breakwaters, and revetments; beach nourishment; levees; fill for intake and outfall pipes and subaqueous utility lines; fill associated with the creation of ponds; and any other work involving the discharge of fill or dredged material.

A USACE permit (for fill impacts to WOTUS) or a certification from Ecology (for fill impacts to Waters of the State) is generally required whether the work is permanent or temporary. Examples of temporary

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[15] Wetland definition: "*Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.*" This definition of wetlands has been used by the USACE and USEPA since the 1970s for regulatory purposes, and is also applied under Washington State wetland regulations.

discharges include dewatering of dredged material prior to final disposal, and temporary fills for access roadways, cofferdams, storage, and work areas.

Migratory Bird Treaty Act of 1918, as amended (16 USC 703–713)

This act makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations. It is under the regulatory authority of USFWS.

State

Washington State Growth Management Act (RCW 36.70A)

The Washington State GMA (RCW 36.70A) requires all county and local municipalities to identify and protect critical areas by adopting local critical area regulations. The GMA was amended in 1995 to require counties and cities to include the BAS when creating polies and development regulations (RCW 36.70A. 172). Ecology developed guidance for local jurisdictions to implement these requirements in a model critical area ordinance. Critical areas include frequently flooded areas, wetlands, streams, and fish and wildlife habitat conservation areas.

Washington State Shoreline Management Act (RCW 90.58)

The SMA provides for the management of waterbodies or watercourses identified as “shorelines of the state.” Areas under jurisdiction of the SMA include the designated shoreline water body; lands within 200 feet upland of the ordinary high-water mark; and associated wetlands and floodplains. With this state law as a foundation, local shoreline management plans are to be developed and regulated by counties and cities.

Washington State Department of Fish and Wildlife Hydraulic Permit Approval (WAC 220-660)

The WDFW HPA program, regulated under Washington State law (RCW 77.55), ensures that construction in or near state waters is done in such a way as to protect fish and their aquatic habitats. An HPA must be obtained from WDFW by anyone planning hydraulic projects in most marine and fresh waters.

Washington State Water Pollution Control Act (90.48 RCW)

This act requires that all projects affecting surface waters in the state must comply with the provisions of the state’s Water Pollution Control Act, including those waters that are not necessarily subject to the federal CWA regulations.

As a result of the recent Supreme Court decision described above (May 25, 2023 – Sackett v. Environmental Protection Agency), USACE will take a lesser role in regulation of impacts to wetlands that are no longer regulated as WOTUS under Section 404 of the CWA.

However, the State of Washington is still responsible for protecting water quality under Section 401 of the CWA, and Ecology will take over as the primary review agency when a project proposes direct impacts to wetlands that may result in a loss of wetland area (quantity) as defined under the state

Water Pollution Control Act (Chapter 90.48 RCW). In the past, Ecology applied the same authority when regulating isolated wetlands, which were not regulated under federal law.

Per guidance from Ecology's website: "*For non-federally regulated wetlands, applicants must submit a request for an Administrative Order to comply with the state Water Pollution Control Act (Chapter 90.48 RCW).* [Ecology] *issue[s] Administrative Orders under this act for impacts to wetlands that are not jurisdictional under the federal regulations (e.g., non-federally regulated wetlands or NFRs). These wetlands remain protected under state and local laws and rules.*"

Washington State Department of Ecology NPDES Permit Program

The NPDES permit program controls water pollution by regulating sources that discharge pollutants into WOTUS (CWA; 33 USC Sections 1251 et seq. and WAC2 197-11-200 through 240). Ecology develops and administers NPDES municipal stormwater permits in Washington State. These permits regulate discharges to both surface waters (via surface conveyances) and groundwaters (via infiltration facilities) of the state.

There are two types of permits:

- Phase I Municipal Stormwater Permits regulate discharges from MS4s owned or operated by large cities and counties, including Pierce County.
- Phase II Municipal Stormwater Permits regulate discharges from certain "small" MS4s in Washington, including the City of Puyallup.

These permits require local governments to manage and control stormwater runoff so that it does not pollute downstream waters. The current Phase I and Phase II permits were effective Aug. 1, 2019, and will expire on July 31, 2024. New permits will replace the old, applying any regulatory updates to previous permit requirements.

These permits also require local governments to develop and implement a stormwater management program designed to reduce the contamination of stormwater runoff. Typically, this requires creation of a stormwater management site plan for a proposed development, to be submitted for review by the local jurisdiction to ensure concurrence with the state Stormwater Manual for Western Washington (or a locally developed and adopted equivalent manual).

Construction projects that disturb more than 1 acre of land and discharge to surface water or a conveyance system that drains to surface waters must obtain NPDES coverage under the Construction Stormwater General Permit.

Local (County and City)

The Project site is located in unincorporated Pierce County, within the City of Puyallup's UGA and is served by and affects city infrastructure as well as critical areas in the City of Puyallup and its UGA. Wildlife habitat (plants and animals) protection is generally addressed at a local level in a wide range of city or county critical area and stormwater management regulations.

Various Pierce County regulations that impact management of wildlife habitat will be reviewed first followed by a summary of the equivalent or parallel regulation in the City of Puyallup. But City regulations do not apply until such time as the UGA is annexed into the City.

Pierce County Regulatory Review

Pierce County Stormwater Management and Site Development Manual (PCSWDM)

An updated PCSWDM was adopted, effective on July 1, 2021. In relation to the discussion below, changes between the 2015 and 2021 versions were insignificant.

The PCSWDM provides regulations and detailed guidance on stormwater management, designed to meet Ecology standards (as defined by the USEPA NPDES program), and as required under the County NPDES permit.

According to the USEPA NPDES information page, runoff from impervious surfaces in urban and urbanized areas results in greater runoff volumes and faster rates, and is the major contributor of pollutants. This results in changes in hydrology and water quality that often result in changes to habitat, increased flooding, less aquatic biological diversity, and increased impacts from sediment and erosion.

> *Traditional stormwater management approaches that rely on peak flow storage have generally not targeted pollutant reduction and can exacerbate problems associated with changes in hydrology and hydraulics.*

To meet these federal and state standards, the PCSWDM lists minimum requirements and provides guidance as to how to accomplish these goals in Pierce County. Specific to this Project, the following guidance is noted:

- Minimum Requirement #4 in the PCSWDM is related to Preservation of Natural Drainage Systems and Outfalls. It states that runoff cannot cause significant adverse impacts to downstream waters and downgradient properties. It further states that all outfalls are required to use energy dissipation systems, and to "*prevent erosion at and downstream of the discharge location.*"
- In Section B.4.2 Guide Sheet 3B: Protecting Wetlands from Changes in Water Flows (Hydroperiod), the manual states that a wetland's hydroperiod must be protected and maintained, and that the "*total volume of water into a wetland on daily basis should not be more than 20 percent higher or lower than the pre-project volumes*" and "*total volume of water into a wetland on a monthly basis should not be more than 15 percent higher or lower than the pre-project volumes.*"
- Section B.3: Protection from Pollutants, provides methods to ensure that a wetland is protected from pollutants generated by a development, including use of effective erosion control, application of LID techniques, and provision for treatment of runoff.

A wetland **hydroperiod** is defined as having hydrology at the same time of year and in the same volume as historical conditions.

These stormwater management regulations indicate that the Project site must be managed to protect on-site wetlands and downstream waterbodies from both direct and indirect impacts to water quantity and quality. Therefore, these regulations apply directly to stormwater system design at the Project site and to future impacts from the already constructed Viking warehouse outfall facility located at the edge of the Puyallup River at the northern end of the Project site. The outfall structure was permitted in 2018 and built in 2020. The eastern portion of the structure is intended for future use as an outfall facility for the Project. However, the already in use western portion of the structure that receives runoff from the Viking Warehouse facility is not performing as intended, as has been described in a separate Deficiencies Report (NHC&SCJ, February 2023). According to the Project Shoreline Substantial Development Permit Hearing Examiner decision from 2018, future permit review will be required to determine whether the eastern half of the outfall structure is code compliant and can be safely used as an outfall for the Project site.

Under this requirement, runoff cannot cause significant adverse impacts to downstream waters and downgradient properties; all outfalls are required to use energy dissipation systems; and erosion must be prevented at and downstream of the discharge location.

The PCSWDM requires that volumes equivalent to 91 percent of the runoff volume, as estimated by an approved continuous runoff model (approximately equivalent to the 6-month, 24-hour storm event) must receive some form of basic treatment prior to release to the Puyallup River. Volumes/flows greater than this can be released to the river without treatment. Volume V of the PCSWDM provides guidance as to the definition of basic treatment and facilities that may be used to meet the standard.

Project stormwater design information describes that enhanced rather than basic treatment would be used prior to releasing overflow to the Puyallup River. Table 4-15 below is from the PCSWDM, Vol. V – Runoff Treatment BMPs, Figure 2.1 Treatment Facility Selection Flow Chart. Table 4-15 provides a list of facilities that can be used for basic versus enhanced treatment of stormwater.

Table 4-15. Runoff Treatment Facilities

Basic Treatment	Enhanced Treatment
Biofiltration Swales	Large Sand Filter[a]
Filter Strips	Treatment Wetland[a]
Basic Wet Ponds	Compost Amended Vegetated Filter Strip[a]
Wet Vault	Two-Facility Treatment Train
Treatment Wetlands	Bioretention[a]
Combined Detention/Wet Pool	Media Filter Train
Sand Filters	Emerging Technologies[a]
Bioretention	
Media Filter Drain	
Emerging Technologies[b]	

Source: Adapted from PCSWDM Vol. V – Runoff Treatment BMPs, Figure 2.1 Treatment Facility Selection Flow Chart

[a] When Phosphorous Control and Enhanced Treatment are required, the Large Wet Pond and certain types of emerging technologies will not meet both types of treatment requirements. A different or an additional treatment facility will be required to meet Enhanced treatment.

[b] Emerging Technologies are simply other techniques not specifically listed above that can be documented to attain the same or greater level of water quality.

These regulations and their intended effects on protecting wetlands and water quality in the Puyallup River (i.e., plant communities and associated wildlife habitat) are also discussed in Sections 4.2 Surface Water and 4.3 Groundwater.

Pierce County Critical Areas Regulations (PCC Title 18E Critical Area Regulations)

Under the GMA (RCW 36.70A.060), local governments are required to establish policies and development guidelines to protect the functions and values of critical areas: rivers, streams, lakes, wetlands, floodplains, aquifer recharge areas, and others.

PCC 18E Critical Areas Regulations were adopted to protect the critical areas of Pierce County from the impacts of development and protect development from the impacts of hazard areas by establishing minimum standards for development of sites that contain or are adjacent to identified critical areas. Pierce County is in the process of reviewing an update to critical areas regulations, which is expected to be complete in 2024. The current version of Title 18E was last updated in 2021.

PCC 18E Critical Areas Regulations include the following sections designed to provide protection to critical areas and/or their buffers, all of which have some impact on fish and wildlife habitat, and all of which are present on the Project site.

- Wetlands,
- Regulated fish and wildlife species and habitat conservation areas,
- Flood hazard areas,
- Erosion hazard areas, and
- Landslide hazard areas.

Mitigation Sequencing (PCC 18E.40.050) is required in Pierce County when a developer is considering potential impacts to critical areas. Under Mitigation Sequencing rules, initial avoidance of the impact is required if possible. However, if avoidance is not possible, the impact must be minimized and mitigated as outlined below. Mitigation for alterations to habitat areas must achieve equivalent or greater biological functions and must address adverse impacts upstream and downstream of the development site.

> *PCC 18E.030.050 Mitigation Sequencing*
>
> *A. Mitigation. All regulated development activities in wetlands or buffers shall be mitigated according to this Title subject to the following order:*
>
> > *1. Avoiding the impact altogether by not taking a certain action or parts of actions;*
> >
> > *2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology or by taking affirmative steps to reduce impacts;*
> >
> > *3. The following types of mitigation (in the following order of preference):*
> >
> > > *a. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;*
> > > *b. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;*

> *c. Compensating for the impact by replacing or providing substitute resources or environments. The purchase of credits from an in-lieu fee mitigation program (ILF program) or wetland mitigation bank may be an acceptable means of meeting this requirement for compensation (see Chapters 18G.20 and 18G.30 PCC);*
>
> *4. Monitoring the impact and compensation and taking appropriate corrective measures; and*
>
> *5. Mitigation for individual actions may include a combination of the above measures.*

PCC 18E.30 (Wetlands) assigns standard wetland buffer widths based on an initial Category Rating score (Categories I, II, III, or IV), then adjusts the baseline buffer based on the proposed Land Use Intensity (High, Moderate, or Low). Wetland buffer widths range from a minimum of 25 feet to greater than 150 feet.

The County does not impose mitigation requirements on Category III wetlands smaller than 2,500 square feet and Category IV wetlands smaller than 10,000 square feet, as long as they are not contiguous to other wetlands, are not in a shoreline jurisdiction and are not part of a wetland mosaic. (However, federal law still protects and regulates these smaller wetland systems under Section 404/401 of the CWA, as described above.)

PCC Section 18E.40 (Regulated Fish and Wildlife Species and Habitat Conservation Areas), defines activities allowed in stream buffer areas and defines stream buffer widths in relation to Stream Type and Water Type, as listed below in Table 4-16.

Table 4-16. PCC 18E.40 Stream Buffers and Water Type

Water Type	Water Body Criteria	Buffer Width
Type S1	Marine Shoreline Critical Salmon Habitat	100 feet from the OHWM
Type F1	Fish-bearing streams, including waters diverted for fish hatcheries, and 1,500 feet upstream from the point of diversion, and tributaries, if important to protect downstream water quality.	150 feet from the OHWM
Type F2	Fish-bearing streams adjacent to a landslide hazard area as set forth in Chapter 18E.80 PCC.	150 feet from the OHWM or the minimum buffer distance required in PCC Chapter 18E.80, whichever is greatest
Type N1	Perennial or seasonal non-fish bearing streams within 0.25 mile of the confluence with a Type F stream.	115 feet from the OHWM
Type N2	Perennial or seasonal non-fish bearing streams that are either more than 0.25 mile upstream from the confluence with a Type F stream or are not connected at all to a Type F stream.	65 feet from the OHWM
Type N3	Lakes or ponds that do not support any critical fish species	35 feet from the OHWM

Source: PCC Title 18E, Table 18E.40.060-1 Fish and Wildlife Habitat Conservation Areas Buffer Requirements (updated in 2018)

In areas where impacts to the Shoreline are proposed, the Project will be subject to Mitigation Requirements (PCC 18E.40.050), and a Habitat Assessment report is required (PCC 18E.40.030.B.4 [Fish and Wildlife Conservation Area Review Procedures, Habitat Assessment]). Information about what is required in the report is detailed in PCC 18E.40.030.B.5.c and PCC 18E.40.070, but must include specific discussion about the following:

- How natural shoreline processes will be maintained and will not result in increased erosion or alterations to, or loss of, shoreline substrate within 0.25 mile of the site.
- How erosion control measures will not adversely impact critical fish or wildlife habitat areas or associated wetlands.
- How the proposed mitigation measures (per PCC 18E.40.050) will ensure that no net loss of intertidal or riparian habitat or function occurs as a result of erosion control measure.

Details about what areas will be planted to achieve "*equivalent or greater biological functions*" than the pre-existing condition. PCC Section 18E.40.040(B)5 (Streambank Stabilization): Streambank stabilization to protect new structures from future channel migration is only permitted when using bioengineering or soft armoring techniques, and will comply with requirements described in PCC Chapter 18E.70 (Flood Hazard).

PCC Chapter 18E.40.040(B)11 (Stormwater Conveyance Facilities) describes limitations to placing stormwater conveyance structures (such as an outfall and pipes) in the riverine buffer zone. They may be allowed subject to all of the following standards:

- No other feasible alternatives with less impact exist;
- Mitigation for impacts is provided;
- Stormwater conveyance facilities shall incorporate fish habitat features;
- Vegetation shall be maintained and, if necessary, added adjacent to all open channels and ponds in order to retard erosion, filter out sediments, and shade the water.

PCC Chapter 18E.70 (Flood Hazard) describes limitations on development in a regulated floodplain. The regulations are intended to minimize losses due to floods and to provide rules about activities allowed within flood hazard areas. These rules specifically describe an intent to minimize adverse impacts to critical fish and wildlife habitat areas (18E.70.040 A.1.a). Depending on the type of flooding and precision of flood mapping available, areas within 150–300 feet horizontal from a flood zone, and 2–10 feet elevation above a base flood elevation may require analysis to determine what activities may be allowed. In general, new development in a flood zone is discouraged, but may be allowed with proper engineering, mitigation and floodproofing, as long as the Project does not "*cause an adverse impact to crucial fish or wildlife habitat*."

Erosion and flow conveyance protection is required in the floodplain to minimize risk of riverine erosion.

> ***Flow Conveyance.*** *New excavated conveyance areas shall be equivalent to existing conveyance within the flood fringe. Equivalent shall mean a mechanism for transporting water from one point to another using an open channel system.*

> ***Erosion Protection.*** *Development shall be protected from flow velocities greater than 2 feet per second through the use of bio-engineering methods or, when bio-engineering methods have been deemed insufficient to protect development, then hard armoring may be utilized. All erosion protection shall extend 1 to 3 feet, depending on development requirements, above the base flood elevation and shall be covered with topsoil and planted with native vegetation. (See Figure 18E.70-14 in Chapter 18E.120 PCC.).*

PCC Chapter 18E.110 (Erosion Hazard Areas) defines areas with potential erosion hazard that may result in land retreat, usually related to impacts from an adjacent water body, but also from unprotected surface erosion. At the Project site, the Riverine Erosion Hazard Area definition applies, which regulates "*the suspected risk of erosion through either loss of soil, slope instability, or land regression* [which] *is sufficient to require additional review to assess the potential for active erosion activity or apply additional standards*." This regulation applies on river floodplains mapped by FEMA adjacent to the Puyallup River. In general, new structures are prohibited, but may be allowed with proper engineering, mitigation, maintenance and floodproofing.

PCC Chapter 18E.80 (Landslide Hazard Area) defines areas that may be subject to mass movement due to a combination of geologic, seismic, topographic, hydrologic, or manmade factors. Indicators of a potential hazard include obvious evidence of failure, but also include area with slopes greater than 20 percent and relief greater than 20 feet, or slopes greater than 40 percent and relief greater than 15 feet, or sloped areas with soft or liquifiable soils, and others. Pierce County has provisionally identified areas that meet these slope characteristics, and these areas require a geological assessment.

The standard buffer from top of slope is the greater of these two—50 feet from top of slope or a distance of one-third the height of the slope, for facilities located at the top of slope, or as recommended by the geologist to ensure safe operations. The setback may be increased if there is considered to be an increased risk downslope from stormwater drainage impacts.

Pierce County Shoreline Master Program (PCC Title 18S Development Policies and Regulations – Shorelines)

PCC Title 18S—the current Pierce County Shoreline Master Program—was adopted in 2018 and is in the process of being updated (Ordinance 2022-37s, effective December 2022). PCC Title 18S establishes allowed uses, and defines buffers, setback requirements, and mitigation requirements for regulated waterways. PCC Title 18S identifies the Puyallup River at the Project site as a shoreline of the state with a shoreline environmental designation of Conservancy (Pierce County Shoreline Designations maps, October 2019). The regulated shoreline area includes all lands within 200 feet of the OHWM, plus all floodplains within 200 feet of the edge of the floodway and to the outer edge of all associated wetlands.

Thus, the entire floodplain and the floodplain wetlands at the Project site are in the regulated Shoreline jurisdiction and are subject to SMP regulations.

> *PCC Section 18S.20.040 Conservancy Shoreline Environment Designation (SED). "The intent of the Conservancy SED is to conserve and manage existing natural resources*

> *and valuable historic and cultural areas while providing recreational benefits to the public and while achieving sustained resource utilization and maintenance of floodplain processes. Shoreline ecological functions should be preserved by avoiding development that would be incompatible with existing functions and processes, locating restoration efforts in areas where benefits to ecological functions can be realized, keeping overall intensity of development or use low, and maintaining most of the area's natural character. "*

Pierce County Comprehensive Plan Policies

The Pierce County Comprehensive Plan was developed under the provisions of the GMA (Chapter 365-196, WAC). The Comprehensive Plan is a tool to assist County Councilmembers, planning commissioners, County staff, and others involved in making land use and public infrastructure decisions. It provides the framework for the County's Development Regulations. The current Pierce County Comprehensive Plan (effective October 1, 2021) defines goals and policies used by the County when making decisions related to growth and development, as relates to long-range County planning.

The GMA outlines 14 goals for the development and adoption of a comprehensive plan and development regulations, but specific to this section (4.4 Plants and Animals), the following GMA planning goals specifically apply:

- Open Space and Recreation: Retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks and recreation facilities. (RCW 36.70A.020(9))
- Environment: Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water. (RCW 36.70A.020(10))

The Environmental Element (Chapter 7) of Pierce County's Comprehensive Plan describes approaches for maintaining the natural environment, including sections on fish and wildlife, vegetation retention, water quality, and wetlands. Specific primary goal groups in the Environmental Element include (each with associated specific, detailed goals):

Working to ensure application of current best available science:

- *GOAL ENV-6: Recognize the adopted Pierce County Shoreline Master Program is the Shoreline Element of the Comprehensive Plan.*
- *GOAL ENV-7: Establish a long-term plan to evaluate and mitigate the cumulative impacts of land use activities on shorelines.*
- *GOAL ENV-14: Designate and protect all critical areas using best available science.*

Conserving and restoring native vegetation, particularly in wetland and riparian areas:

- *GOAL ENV-1: Conserve and protect critical and environmentally sensitive areas.*
- *GOAL ENV-2: Ensure native vegetation is retained and protected in public and private development*
- *GOAL ENV-11: Establish appropriate long-term protection to ensure no net loss of wetlands*
  - *Policy ENV-11.4: Require wetland mitigation for impacts that cannot be avoided.*

Protecting water quality and quantity necessary to support healthy fish populations:

- *GOAL ENV-5: Protect aquifers and surface waters to ensure that water quality and quantity are maintained or improved.*
- *GOAL ENV-8: Maintain and protect habitat conservation areas for fish and wildlife.*
- *GOAL ENV-9: Maintain and where necessary improve terrestrial and aquatic ecosystems so that they maintain viable, reproducing populations of plants and animals.*

Giving preference to natural solutions for maintaining aquifer recharge quantity and quality:

- *GOAL ENV-11: Establish appropriate long-term protection to ensure no net loss of wetlands.*

  – *Policy ENV 15.5: Require that regulated activities occur with avoidance of impacts as the highest priority and apply lower priority measures only when higher priority measures are determined to be infeasible or inapplicable (see Table 7-A [Mitigation Sequencing] in Figure 4-33).*

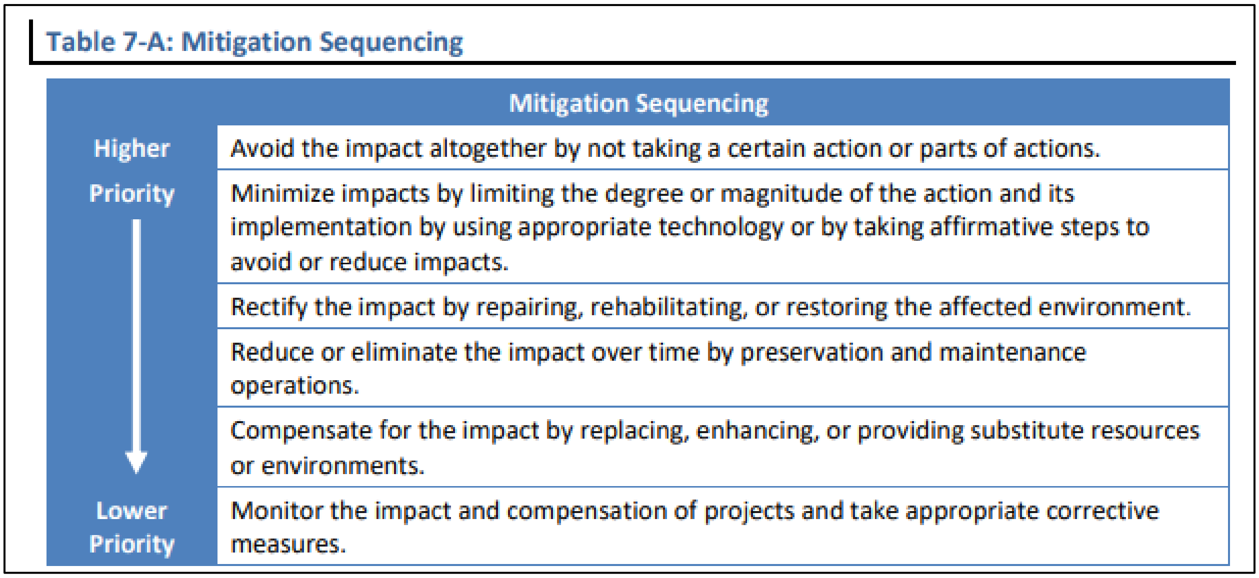


Table 7-A: Mitigation Sequencing

	Mitigation Sequencing
Higher Priority	Avoid the impact altogether by not taking a certain action or parts of actions.
	Minimize impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology or by taking affirmative steps to avoid or reduce impacts.
	Rectify the impact by repairing, rehabilitating, or restoring the affected environment.
	Reduce or eliminate the impact over time by preservation and maintenance operations.
	Compensate for the impact by replacing, enhancing, or providing substitute resources or environments.
Lower Priority	Monitor the impact and compensation of projects and take appropriate corrective measures.

Figure 4-33. Copy of Table 7-A from Pierce County Comprehensive Plan (chapter 7, page 7-11)

Requiring use of LID to reduce potential for flooding hazards, to manage stormwater drainage, including use of infiltration systems (and etc.), to maintain water quality for fish and wildlife:

- *Policy ENV-5.14: Require the use of low impact development principles and best management practices for stormwater drainage as implemented by the Pierce County Stormwater Management Manual, including use of infiltration systems, such as bioretention, rain gardens, and permeable pavement, to maintain water quality for fish and wildlife.*

  – *ENV-5.14.3: Make the use of Low Impact Development (LID) techniques in public and private developments the preferred and most widely used method of land development*

a. GOAL ENV-10: Avoid endangerment of lives, property, and resources in hazardous areas
b. GOAL ENV-11: Establish appropriate long-term protection to ensure no net loss of wetlands

Maintaining and/or improving terrestrial and aquatic ecosystems to maintain viable, reproducing populations of plants and animals.

c. GOAL ENV-5: Protect aquifers and surface waters to ensure that water quality and quantity are maintained or improved.
    i. Policy ENV-5.11: Protect water quality and quantity necessary to support healthy fish populations.
d. GOAL ENV-8: Maintain and protect habitat conservation areas for fish and wildlife.
    i. Policy ENV-8.2: Place regulatory emphasis on protecting and achieving no net loss of critical habitat areas.
    ii. Policy ENV-8.3: Maintain fish and wildlife movement corridors.
    iii. Policy ENV-8.4: Emphasize the importance of healthy riparian corridors.
e. GOAL ENV-9: Maintain and where necessary improve terrestrial and aquatic ecosystems so that they maintain viable, reproducing populations of plants and animals.
f. GOAL ENV-11: Establish appropriate long-term protection to ensure no net loss of wetlands

City of Puyallup Regulatory Review

As described above, the Project site is located in unincorporated Pierce County, within the City of Puyallup's UGA. It is served by and affects city infrastructure and critical areas in the City of Puyallup and its UGA. Protection of plants and animals is generally addressed at a local level in a wide range of city or county stormwater and critical area management regulations, but also in related code that regulates impacts to wildlife habitat.

Various Pierce County Regulations that impact wildlife habitat were reviewed first above, but are followed below by a short, comparative discussion about equivalent or parallel regulation in the City of Puyallup. But City regulations do not apply until such time as the UGA is annexed into the City.

City of Puyallup Stormwater Management Program Plan (SWMPP)

The City of Puyallup's 2020 SWMPP was updated in 2022 to describe actions Puyallup will take to maintain compliance during the 2020 Permit period, as required by the City's Phase 2 NPDES Permit (i.e., August 1, 2019, through July 31, 2024). The 2022 SWMPP provides guidance on how the City manages its stormwater to meet requirements of the City's NPDES Phase 2 permit, as administered by Ecology. Under the SWMPP, the City has made LID the preferred approach for new development, in order to "*minimize impervious surfaces, native vegetation loss, and stormwater runoff in all types of development situations where feasible.*"

The Phase 2 Permit allows the City to discharge stormwater runoff into Waters of the State (i.e., streams, rivers, lakes, wetlands) as long as the City implements certain water quality programs designed to protect water quality. This goal is to be attained by reducing discharge of pollutants "*to the maximum extent practicable*" by using specific BMPs.

The BMPs are grouped under several program categories, including but not limited to Stormwater Planning; MS4 Mapping and Documentation; Controlling Runoff from Development; Redevelopment; and Construction Sites, Operations and Maintenance, and Monitoring

The NPDES Phase 2 Permit (SWMPP Section S5.C.8) requires the City to implement a program designed to prevent and reduce runoff pollutants from surfaces that discharge to the City stormwater system. This would include requiring implementation of source control BMPs from current operations or, as needed, requiring construction of treatment facilities to reduce pollutants associated with existing land use.

In addition, under SWMPP Section 9.1, the city is required to define maintenance standards that are "*as protective, or more protective [SIC] of facility function*" than those specified in the Ecology Manual. And for facilities that do not have maintenance standards, the City is required to develop a maintenance standard.

Under SWMPP Section 10, the City is required to have a program in place to ensure that permanent stormwater facilities are checked after major storm events to determine whether the facility was damaged damage or requires maintenance.

City of Puyallup Critical Areas Regulations (PMC Chapter 21.06 CRITICAL AREAS)

Under the GMA (RCW 36.70A.060), local governments are required to establish policies and development guidelines to protect the functions and values of critical areas: rivers, streams, lakes, wetlands, floodplains, wildlife habitat, erosion and landslide hazard areas, and others. The Puyallup Critical Areas regulations (PMC Chapter 21.06) are similar to those of Pierce County, as both are designed to meet standards defined in the GMA. However, some regulatory details are different.

The PMC critical area regulations were most recently updated in 2022. These regulations apply to lands directly west of the Project site, which are within the City of Puyallup, and will apply to any future Project site development after annexation into the City. Ideally, the PMC Chapter 21.06 Critical Areas regulations are not in conflict with similar and parallel County regulations, which apply to the current Project site located in the City's UGA.

Under PMC Section 21.06.930, the City of Puyallup defines standard wetland buffer widths in relation to Category rating score (Categories I, II, III, and IV) and land use intensity (Low, Moderate, and High). Buffer widths range from a minimum of 25 feet up to 300 feet.

The City does not regulate (i.e., buffer or impose mitigation requirements) wetlands smaller than 1,000 square feet (if not along a riparian corridor or part of a wetland mosaic), and does not regulate Category IV wetlands smaller than 4,000 square feet as long as the wetland is not associated with a shoreline, is not part of a wetland mosaic, does not score more than five or more points when rated, does not contain priority or critical habitat, and the impacts are fully mitigated in accordance with conditions from Ecology and/or USACE.

PMC Article X (Sections 21.06.1010 through 21.06.1080) (Fish and Wildlife Species and Habitat Conservation Areas) defines activities allowed in stream buffer areas and defines stream buffer widths in relation to Stream Type and Water Type, as listed below in Table 4-17.

Table 4-17. Stream and Riparian Buffer Widths

Water Type	Water Body Criteria	Standard Buffer Width
Type I	"Shorelines of the State" within the city's corporate limits and the urban growth area, specifically the Puyallup River and Clarks Creek, below Maplewood Springs	150 feet from the OHWM
Type II	Other fish-bearing streams or streams with significant recreational value, or with significant wildlife habitat functions; within the city's corporate limits and UGA, known Type II streams, including but not limited to Deer Creek, Diru Creek, Meeker Ditch, Rody Creek, Silver Creek, Wildwood Creek, Woodland Creek, and Wapato Creek	100 feet from the OHWM
Type III	Streams with perennial or intermittent flow that are not used by anadromous fish	50 feet from the OHWM
Type IV	Intermittent or ephemeral streams less than 2 feet wide at the OHWM that are not used by anadromous or resident fish	35 feet from the OHWM
Non-riparian habitat areas	Must support or have a primary association with federally listed species, state priority habitats and species, or habitats and species of local importance	Determined on a site-by-site basis

Source: Adapted from PMC Section 21.06.1050 Stream and Riparian Buffer Widths
PMC Chapter 21.06, Section 21.06.1050 Fish and Wildlife Habitat Conservation Areas, Performance Standards – Stream and Riparian Buffer Widths (Chapter 21.06 effective date 2022; Section 21.06.1050 last updated in 2006)

PMC Chapter 21.07 (Flood Damage Protection, a separate chapter but incorporated by reference in PMC Chapter 21.06 Critical Area regulations) describes limitations on development in a regulated floodplain. The Flood Damage Protection regulations are intended to protect human life and health, minimize public costs associated with flood control and relief projects, minimize damage to public facilities, and meet requirements for maintaining eligibility for flood insurance and disaster relief.

These rules specifically describe methods intended to control alterations to natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters, and to controlling filling, grading, dredging and other development which may increase flood damage.

Applicants for development permits in a floodplain area are to submit a professional habitat assessment report (described previously) describing effects of the proposed development (during both construction and operation) on floodplain functions and documenting that the proposed development will not result in "take" of any species listed as threatened or endangered under the ESA. The functional impacts that are to be described include a requirement for a hydrologic and hydraulic analyses in accordance with standard engineering practice to ensure that the proposal avoids "take" of listed species. The report must also describe flood storage capacity impacts; channel migration and bank stability impacts; riparian vegetation impacts; habitat forming and isolation impacts; impacts to floodplain refuge for fish during higher velocity flows; and impacts to spawning substrate.

Development permits will be denied if the proposal will result in "take" of any species listed as threatened or endangered under the ESA, unless the Applicant provides the City with evidence that the federal and state permits required to authorize such take have been obtained.

PMC (Article XII. Geologically Hazardous Areas) defines areas that are susceptible to erosion, landslides, earthquake, volcanic activity, or other potentially hazardous geological processes. Alteration of geologically hazardous areas and their buffers is initially prohibited but may be allowed based on the degree to which risks posed by geologically hazardous areas to public and private property and to public health and safety can be mitigated. Removal of vegetation with soil-stabilizing functions from an erosion or landslide hazard area or related buffer is prohibited.

Erosion hazard areas and Landslide hazard areas may affect wildlife habitat through either erosion impacts to downslope wetlands or slope failures cause loss of slope vegetation or loss of downslope habitat features. For that reason, point discharges from surface water facilities and roof drains onto or up-slope from an erosion or landslide hazard area is prohibited except where the release can be controlled in a way to avoid erosion or slope failure, and only when the release water can be infiltrated in the downslope buffer surface.

- Section 21.06.1240 Performance standards – Landslide and erosion hazard area buffers. This section describes when and how to apply buffers near these hazard areas when a slope is steeper than 15 percent and has a height of more than 10 feet. The two slope classes are 16–39 percent and greater than 40 percent. Standard buffers are calculated as follows but may be increased based on geotechnical recommendations: for slopes greater than 15 percent and less than 40 percent, the standard buffer is the slope height divided by 2.
- For slopes great than 40 percent, the standard buffer is the same as slope height or 25 feet, whichever is greater.
- For slopes with vertical elevation between 10–25 feet, the minimum buffer is the height divided by 2, regardless of slope, as long as there are no other risk factors.
- To protect slope stability (and associated wildlife habitat), the slope and buffer are to remain or be replanted in dense native woody vegetation.

City of Puyallup Shoreline Master Program (PSMP) (Ordinance No. 3101 updated in 2016)

The Puyallup Shoreline Master Program (PSMP) establishes allowed uses, and defines buffers, setback requirements, and mitigation requirements for regulated waterways. The Puyallup SMP regulates land uses and modifications, restoration goals, and public access plans for the Puyallup River and Clarks Creek. The Puyallup River at the Project site is a Shoreline of the state and is recognized as a shoreline of statewide significance (Chapter 6, PSMP). The City has assigned an environmental designation of Puyallup River Urban Conservancy. The regulated shoreline jurisdiction includes all lands within 200 feet of the OHWM, plus all floodplains within 200 feet of the edge of the floodway and to the outer edge of all associated wetlands.

Thus, the entire floodplain and the floodplain wetlands in the City directly adjacent to the Project site are in the regulated shoreline jurisdiction and are subject to PSMP regulations.

Chapter 6 of the PSMP also describes management policies that are to be applied in addition to other regulations in the PSMP:

- Manage designated critical areas along the Puyallup River shoreline, including fish and wildlife habitat areas, wetlands, and frequently flooded areas to protect or restore ecological functions provided by such areas.

- Utilize buffers, setbacks, water quality measures, and vegetation conservation or enhancement measures to regulate and inform the design of proposed development along the Puyallup River shoreline.
- Allow a variety of urban uses as established by the Comprehensive Plan and zoning code, where the development of such uses is done in a manner that protects or enhances ecological functions and/or public access.
- Prioritize uses and development that are water-oriented or incorporate public access, recreation, or shoreline restoration elements.
- **Work cooperatively with Pierce County, neighboring cities, tribes, and state natural resource agencies in development of flood control and/or habitat restoration along the Puyallup River.**

City of Puyallup Comprehensive Plan

The 2015 City of Puyallup Comprehensive Plan (CPCP) was last updated in 2020. The CPCP includes government planning policies that call for the protection, preservation and enhancement of water resources and other natural environment components. These City policies are provided for context because the proposed development is within the City's UGA, which includes shared habitat and associated natural systems with the County. The CPCP is described as "*the long-term vision and plan for managing the built and natural environment in the City of Puyallup*."

The CPCP is described as "*the long-term vision and plan for managing the built and natural environment in the City of Puyallup.*" It provides policy guidance used by City staff to make decisions related to growth and development while still recognizing that the City's "green infrastructure" is the foundation to healthy growth. Key strategies listed to maintain the city's environmental assets—as related to management of plants and animals—are summarized below:

- Establish and maintain City-wide critical areas and habitat corridor maps as needed to assess interaction between key environmental assets
- Use a science-based approach to ensure no net loss of critical areas' ecological functions and values
- Maintain and strive to enhance a healthy natural ecosystem through environmental stewardship programs that engage the citizens of Puyallup
- Foster high quality of life through tree retention, fostering clean air, minimizing noise and light pollution, and maintaining scenic vistas

The Natural Environment Element (Chapter 2) describes approaches for managing the environment to meet requirements of the GMA. This includes protecting and assessing potential impacts to critical areas, such as wetlands, CARAs, fish and wildlife habitat, frequently flooded areas and geologically hazardous areas, and adoption of a "no-net loss" approach. Specifically, salmon are described as being keystone species that are used as benchmark indicators of environmental health.

Goals and Policies that relate to management of fish and wildlife habitat conservation area management at and near the Project site include (but are not limited to):

<u>Sustainability and Environmental Stewardship:</u>

- *Goal NE-1: Safeguard the natural environment by meeting the needs of the present without compromising the ability of future generations to meet their own needs.*
  - *Policy NE-1.1: Establish policy and regulations that consider and implement Best Available Science when making environmental decisions, where applicable.*
- *Goal NE-2: Lead and support efforts to protect and improve the natural environment, protect and preserve environmentally critical areas, minimize pollution, and reduce waste of energy and materials.*

Critical Areas:

- *Goal NE-3: Protect, integrate and restore critical areas and their aesthetic and functional qualities through conservation, enhancement and stewardship of the natural environment.*
  - *Policy NE-3.1: Implement projects and programs that include adaptive management based on Best Available Science to revise policies, regulations and programs as needed to reflect changes in scientific advancement and local circumstances.*
  - *Policy NE-3.3: Implement monitoring and adaptive management to programs and critical areas mitigation projects to ensure that the intended functions are retained and, when required, enhanced over time.*
  - *Policy NE-3.5: Conserve and protect environmentally critical areas from loss or degradation. Maintain as open space hazardous areas and significant areas of steep slopes, and undeveloped shorelines and wetlands.*
  - *Policy NE-3.6: Avoid land uses and developments that are incompatible with environmentally critical areas; protect critical area functions based on the intensity of land uses near them.*

Geologically Hazardous Areas:

- *Goal NE-4: Preserve and enhance the natural scenic qualities, ecological function and value, and the structural integrity of hillsides to protect life, property and improvements from landslide, erosion and volcanic hazards.*
  - *Policy NE-4.6: Promote soils stability by the use of natural drainage systems and retention of existing vegetation in Geologically Hazardous Areas.*

Critical Aquifer Recharge Areas:

- *Goal NE-5: Preserve and protect aquifer recharge and well-head protection zones from hazardous substances and land uses which could denigrate ground water quality.*
  - *Policy NE-5.5: Encourage retention of open spaces, tree protection areas, and other areas of protected native vegetation with a high potential for groundwater recharge.*
  - *Policy NE-5.6: Utilize low impact development techniques—such as pervious surfacing materials and rain gardens—to mimic natural processes of stormwater infiltration.*

Frequently Flooded Areas:

- *Goal NE-6: Minimize the potential for injury and property loss associated with flooding while preserving and restoring the ecological function and value of flood prone areas.*

  - *Policy NE-6.1: Reduce the amount of effective impervious surface in floodplains and uplands contributing runoff to downstream floodplains.*
  - *Policy NE-6.3: Strive towards no net loss of the structure, value, and functions of natural systems constituting Frequently Flooded Areas by requiring that all development actions in Frequently Flooded Areas to provide analysis for potential habitat related to listed endangered species, in accordance with federal FEMA requirements.*
  - *Policy NE-6.5: Direct uses that require substantial improvements or structures away from areas within the 100-year floodplain.*

<u>Wetlands:</u>

- *Goal NE-7: Identify and protect wetland resources and ensure "no net loss" of wetland function, value and area within the city.*

  - *Policy NE-7.2: Require buffers adjacent to wetlands to protect the ecological functions integral to healthy wetland ecosystems. Buffer sizes should be tailored to protect the wetland's functions within the surrounding landscape and buffer, particularly when the wetland provides a high level of habitat value.*
  - *Policy NE-7.3: Use mitigation sequencing guidelines when reviewing projects impacting wetlands. This involves, in the following order:*

    a. avoiding the impact altogether by not taking a certain action or parts of actions;
    b. minimizing the impact by limiting the degree or magnitude of the action and its implementation;
    c. rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
    d. reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
    e. compensating for the impact by replacing or providing substitute resources or environments.

  - *Policy NE-7.4: Ensure the amount of mitigation required reflects the value and function of the wetlands affected by the project, the risk that the mitigation may fail, the temporal loss of wetlands functions and values, the spatial locations of the mitigation, and the difficulty of replacing many wetlands functions and values. For these reasons, require in general a significantly larger area of mitigation than the area of wetlands impacted.*

<u>Water Quality:</u>

- *Goal NE-8: Protect, improve and enhance the quality of all aquatic resources city-wide through best management practices, with a distinct emphasis on mimicking natural processes and use of low impact development techniques.*

  - *Policy NE-8.1: Maintain surface water quality necessary to support native fish and wildlife meeting state and federal standards over the long term. Restore surface waters that have become degraded to provide for fish, wildlife, plants, and environmentally conscious human use of the water body.*

  - *Policy NE-8.5: Control the flow of nutrients (especially phosphorus), heavy metals, and other pollutants into streams, rivers, local ponds and lakes and natural wetlands. Require treatment measures where the development results in discharges to surface or groundwaters.*
  - *Policy NE-8.8: Protect and enhance rivers, streams and lakes, including riparian and shoreline habitat, to protect water quality, reduce public costs, protect and enhance fish and wildlife habitat, and prevent environmental degradation. Protect both perennial and intermittent streams to preserve natural hydraulic and ecological functions, fish and wildlife habitat, recreational resources, and aesthetics.*
  - *Policy NE-8.9: Maintain natural hydrological functions within the city's ecosystems and watersheds and encourage their restoration to a more natural state.*
  - *Policy NE-8.13: Encourage restoration and enhancement of the Puyallup River, Clarks Creek and associated tributaries (such as Meeker Creek), other riparian stream corridors, wetlands, and associated buffers with priority given to areas associated with listed species and TMDL water-cleanup plans.*

Fish and Wildlife Habitat:

- *Goal NE-9: Identify and protect fish and wildlife areas within the city by engaging citizens in restoration.*

  - *Policy NE-9.2: Protect and restore native vegetative buffers adjacent to all stream bodies throughout the city. Preserve and restore regional biodiversity with a focus on promoting native species and avoiding and eliminating invasive species.*
  - *Policy NE-9.4: Protect and restore native vegetative buffers adjacent to all stream bodies throughout the city.*
  - *Policy NE-9.5: Protect and regulate land uses within 200' of Clarks Creek, the Puyallup River and associated wetland areas, through the Puyallup Shoreline Master Program (SMP).*
  - *Policy NE-9.10: Protect natural resources having a primary association with Species of Concern, Priority Species, and Species of Local Importance.*
  - *Policy NE-9.11: Participate in regional efforts to recover species listed under the Endangered Species Act (ESA), such as the Chinook Salmon.*
  - *Policy NE-9.14: Protect salmon, steelhead and other fish, plants, and wildlife that rely on the aquatic environment by protecting and improving water quality.*
  - *Policy NE-9.20: Encourage conservation and sustainability throughout the city by minimizing impacts to wildlife and water quality through practices, such as limiting the use of toxic pesticides and fertilizers, incorporating alternative pest management methods, and providing public education about such practices.*
  - *Policy NE-9.25: Ensure management of noxious weeds and invasive species are an integral part of landscape plans for new development. Work with Pierce County, Pierce Conservation District and Washington State Departments to target the management of noxious weeds.*

4.4.3 Affected Environment

The Project site proposal is to construct seven warehouses and associated utility and pavement infrastructure. The site is located on currently farmed land adjacent to the Puyallup River, which is regulated by Pierce County as a shoreline of statewide significance and a fish-bearing stream (PCC Title 18S and Title 18E). Water quality in the Puyallup River adjacent to the Project site is currently documented as having Category 1 (Low risk) impacts from occasional exceedance of bacteria and Ammonia-N criteria; Category 2 (Moderately Low risk) impacts from high copper content (per Puyallup Tribe data), high pH and low dissolved oxygen readings, and Category 5 (High risk) exceedance of 32°F temperature limits. However, data detailing ongoing water quality monitoring work in the Puyallup River is limited.

The EIS team carried out on-site visits in March 2019 and during March and August 2021 to collect data about site conditions for the EIS work. Previous reports prepared by the developer’s consultants related to assessment of plants and animals impacts on site were also reviewed by the EIS team, including but not limited to:

- SoundView Consultants: reports prepared for the Project site:
    - March 2016 Critical Areas and ESA Assessment and Conceptual Floodplain Restoration Plan
    - March 2016 report was updated and replaced by a September 2016 Critical Areas Assessment report; which was subsequently updated and replaced by the final draft (accepted by Pierce County) December 2016 Critical Areas Assessment
- Talasea Consultants: reports were prepared for the Viking warehouse site. The stormwater outfall structure described in the report was intended to accept future stormwater flows from the Project site. Therefore, aspects of the Talasea reports also apply to the Project site, specifically information related to the outfall structure and assessment of conditions in the Puyallup River.
    - January 2017 Biological Evaluation
    - March 2018 JARPA form and Detailed Mitigation Plan

The affected environment for purposes of this section (4.4 Plants and Animals) includes the Project site and adjacent habitats within 0.5 mile (Figure 4-32). The Project site is actively managed agricultural land on a post-glacial alluvial terrace located on the left bank of the Puyallup River. There are two terrace features on site, a high elevation terrace to the southwest, where it is proposed to build the Project warehouses, and a low elevation terrace to the northeast along the Puyallup River, which is an active floodplain. There are four identified scrub/shrub and emergent wetlands on the property and a well-developed, but narrow, naturally vegetated riparian buffer plant community along edge of the Puyallup River that contains mostly native vegetation (Figure 4-34). Portions of the 100-yr floodplain have been regularly plowed and planted with agricultural crops.

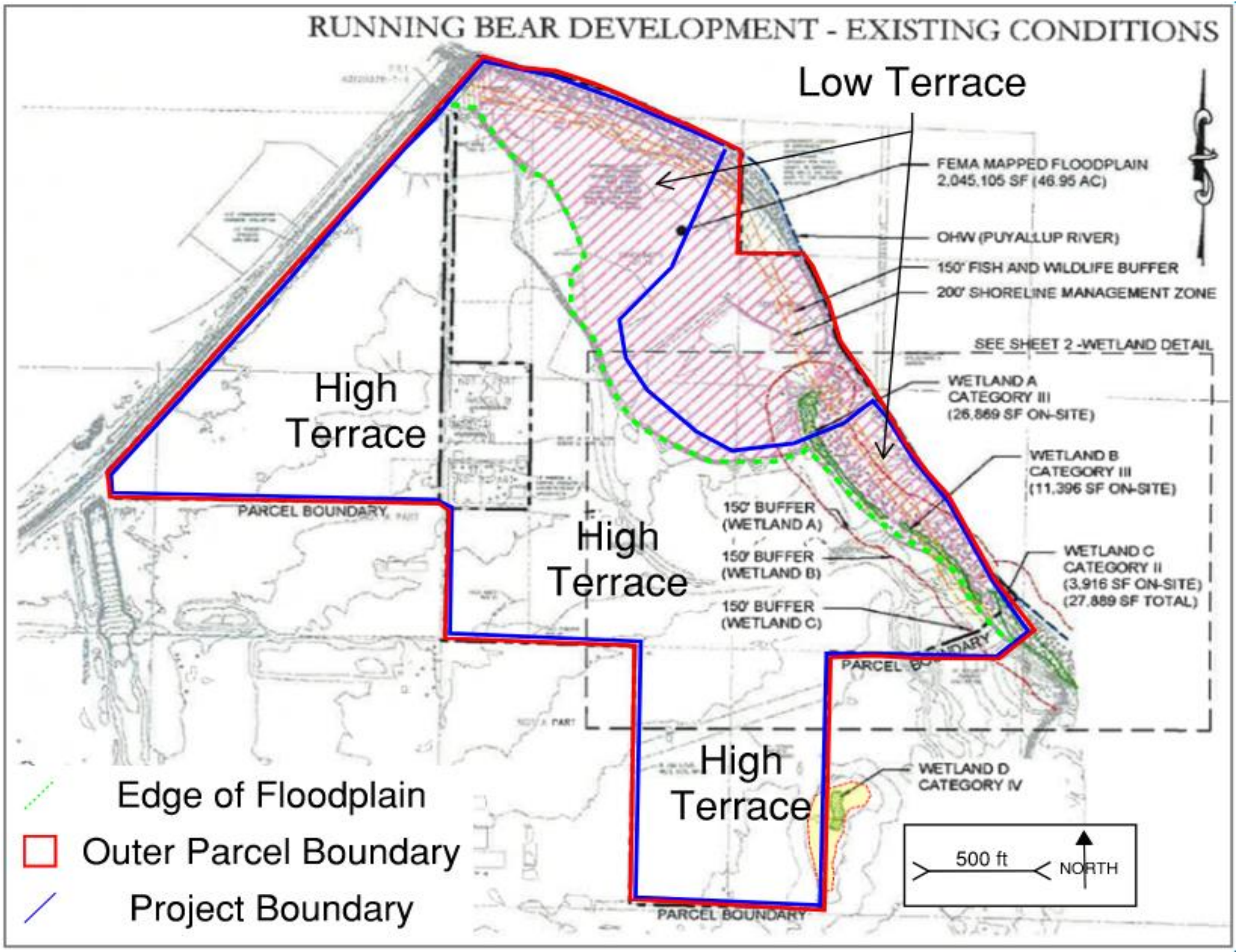


Figure 4-34. Map of FEMA Floodplain and Wetlands A, B, and C Delineated by SoundView Consultants (SVC 2016) and Expanded Outline of Wetland D per EIS Team Delineation 2020 (yellow polygon).

The Puyallup River borders the northeastern boundary of the Project site and is regulated under Title 18E PCC Development Regulations- Critical Areas as a Fish and Wildlife Habitat Conservation Area and under Title 18S PCC Development Policies and Regulations- Shorelines, with a Shoreline Environmental Designation of Conservancy. The Puyallup River is also classified as a Type FI (fish-bearing) waterbody, for which Pierce County Critical Area regulations requires a buffer width of 150 feet from ordinary high water (PCC Title 18E 2021). The County's SMP Shoreline jurisdiction extends 200 feet landward from the OHWM, but is wider within the Project area as the shoreline jurisdiction also includes the entire floodplain and wetlands A, B and C. The Conservancy Shoreline standard buffer/setback is 100 feet wide, as measured from the OHWM at the River. When there are differences between the Critical Area and the SMP regulations the most protective setback or buffer is applied. The 150 ft critical area buffer is most restrictive, and therefore applies.

Vegetation and Wildlife Habitat

Most of the Project site is currently used for agriculture, growing various crops including bulb flowers and rhubarb. Wildlife habitats in the Project study area range from urban development and agricultural areas (low quality) to riparian forested and wetland habitats (moderate to high quality). Research and field reconnaissance carried out in February 2021 documented four Priority Habitats in the Project site, including snags and logs, riparian areas, freshwater wetlands, and riverine habitats.

Agricultural Areas

The agricultural fields in the uplands and floodplains are regularly tilled between crops, and no plants aside from common weeds grow between the rows or in the alleyways. This results in minimal native vegetation and wildlife habitat in upland and farmed floodplain areas. Weedy or invasive species along the edges of the agricultural fields were documented by the EIS team during a field reconnaissance site visit in February 2021. These included native species, such as mullein (*Verbascum thapsus*), western dock (*Rumex occidentalis*), and stinging nettle (*Urtica dioica*), and introduced species, such as Japanese knotweed (*Fallopia japonica*), Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), English holly (*Ilex aquifolium*), English ivy (*Hedera helix*), poison hemlock (*Conium maculatum*), common evening primrose (*Oenothera biennis*), redstem filaree (*Erodium cicutarium*), birdseye speedwell (*Veronica persica*), and tansy ragwort (*Jacobaea vulgaris*).

Aquatic Habitat Conditions

The Project site is located adjacent to the Middle Reach of the Puyallup River. The Puyallup River which is regulated by Pierce County as a shoreline of statewide significance and a fish-bearing stream (PCC Chapter 18S.10 and Title 18E). The Middle Reach starts at RM 10.3 (the confluence with the White River) and extends upstream to RM 17.4 (the confluence with the Carbon River). The basin that flows to this section of the River is approximately 438 square miles (Geoengineers 2003).

The Puyallup-White Watershed supports several salmonid species. The reach of the Puyallup River adjacent to the site near RM 10 (“Project reach”) is used as a migration corridor to access tributaries in the upper Puyallup River basin. The upper Puyallup provides spawning and rearing habitats for all of these salmonids, and the reach adjacent to the Project site also provides documented rearing or spawning habitat for some of these salmon species.

The White River merges with the Puyallup River approximately 0.5 mile downstream from the Project site and supports the last Spring Chinook salmon (*Oncorhynchus tshawytscha*) run in the South Puget Sound (Pierce County 2018).

6PPD Pollutant

New research from Tian et al. (2021, 2022) and others (McIntyre and Kolodjiez 2021) has identified a tire rubber derived chemical in stormwater runoff—the antioxidant 6PPD (often found in microscopic tire wear particles) and its soluble byproduct 6PPD-q. Road friction causes tiny tire particles break off and fall to the road surface. As a result, this pollutant is common in stormwater runoff from paved surfaces. This chemical has been found to have toxic effects on trout and salmon species, with highest sensitivity to date reported in coho salmon, and moderately high sensitivity in brook trout and rainbow trout (i.e., steelhead species). Research on impacts to other salmonids is ongoing. Characteristic toxicity symptoms include increased ventilation, gasping, spiraling, and loss of equilibrium shortly before death, which is reported to occur within 1–96 hours of exposure at very low concentrations of the pollutant.

Brinkmann et al. (2022) evaluated potential for acute toxicity of 6PPD-q to rainbow trout, brook trout, arctic char, and white sturgeon and reported 96-hr acute toxicity thresholds (LC50) of 1.0 µg/L or less for the two trout species, indicating lethal sensitivity in these trout species. Tian et al. (2022) reported a revised juvenile Coho salmon LC50 of less than 0.1 µg/L, indicating substantial lethal sensitivity to 6PPD-q in coho. Lethal impacts to other salmon species are assumed but not yet fully documented.

Stormwater impacts to coho and other salmonids that affect ability to survive and reproduce during various life stages have been clearly documented. However, most of those studies focused on impacts during juvenile life stages, and not much research was carried out to assess impacts on spawning salmonids.

A basin-level study assessing impacts of stormwater runoff on salmon was conducted in the Puget Sound in 2011 and 2017 (Feist et al. 2011, 2017). This work was completed prior to more recent 6PPD research (described above) that was initially reported in 2019. The Feist et al. (2011, 2017) research showed that increased mortality to coho during the fall spawning season (i.e., which precluded successful spawning) were caused by toxic contaminants in runoff to urban streams. Field surveys carried over the past 10–20 years have documented high coho mortality rates prior to successful spawning in the central Puget Sound Basin (Feist et al. 2011, 2017). Affected fish "*become disoriented and show surface swimming, gaping, a loss of equilibrium, and finally death on a timescale of a few hours*. *Loss rates to die-offs are typically high, e.g., 60–90% of an entire fall run within a given urban stream.*"

The 2011 study carried out spatial analyses designed to identify the relationship between land cover types (e.g., roadways, impervious surfaces, forests) and coho mortality. Results indicated that spawner mortality was positively correlated with the relative proportion of roads, impervious surfaces, and commercial property within a basin. The data was used to identify and map basins throughout the Puget Sound where coho spawner die-offs were considered likely.

The 2011 map analysis was carried out prior to construction of the Viking warehouse and the outfall (which occurred in 2018/2019), and thus did not include assessment of impacts from the Viking warehouse impervious surfaces in the basin mapping assessment. However, in the Puyallup River at the Project site, the predicted mortality rate in the 2011 analysis was 10–50 percent—a moderate to high risk of coho mortality during spawning periods. The Deer Creek basin directly west (which flows to the Puyallup) was mapped as having a high risk of mortality.

Follow up research by Feist et al. in 2017 was expanded to include 51 spawning sites in both urbanized and rural basins throughout the Puget Sound and was re-evaluated to include consideration of possible interactions between landscape and climate. The statistical analysis in 2017 was more conservative and included a prediction uncertainty assessment. The updated study verified that urbanization associated with road density and traffic intensity, among other variables, were positively related to coho spawning mortality, but adjusted the predicted mortality rates in the basins with moderate road and traffic intensity to 10–40 percent, and in the high intensity basins, adjusted predicted mortality rates to more than 40 percent (Figure 4-35).

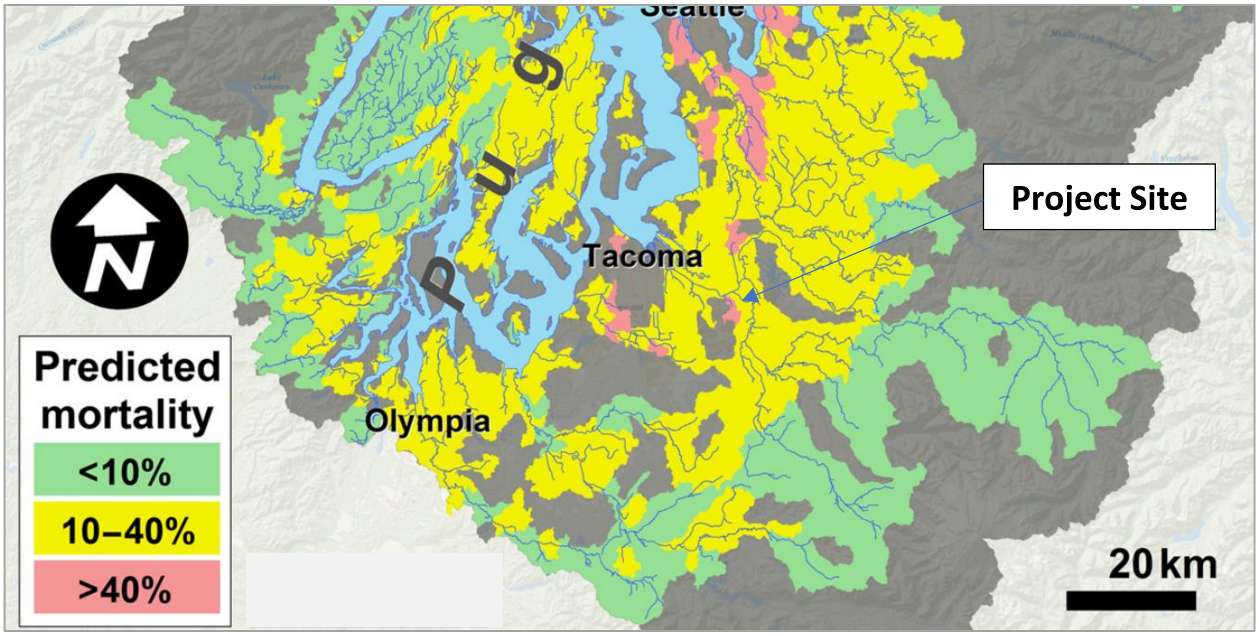


Figure 4-35. Figure Copied from Feist et. al, (2017) Showing 10–40 Percent Coho Mortality was Expected in the Puyallup River at the Project Site, Based on 2017 Land Use Conditions, as a Result of Urban Runoff Pollutants

Under future conditions proposed at the Project site, which would convert more than 100 acres of farmland to impervious surface with 100 percent of runoff from paved surfaces directed to the river, the mortality prediction of the combined Viking/Project basin is expected to be grouped with the high intensity Deer Creek basin, located directly adjacent to the west (i.e., a predicted mortality rate of more than 40 percent).

Impacts to other salmonids were not directly addressed in the Feist et al. (2011, 2017) studies, which were focused on assessing vulnerability of the Puget Sound coho population segment, considered a sentinel or indicator species and a species of concern under the ESA. More recent research by others, described above (Tian et al. 2021, 2022; McIntyre and Kolodjiez 2021; Brinkman et al. 2022) indicates that coho are also most sensitive to 6PPD, but also show that steelhead and chinook (listed species) are also sensitive to 6PPD, and thus may be similarly affected during spawning and other life cycle periods.

T Ecology published new guidance in June 2022 (Ecology [D]) and October 2022 (Ecology [E]), which provides information about this pollutant. The primary pathway of 6PPD-q transport is runoff from roads and parking areas or through conveyance systems (storm drainpipes and catch basins) to surface waters or direct discharges to surface waters, such as is proposed at the Project site.

> *Stormwater treatment infrastructures that use infiltration, sorption, filtration, and/or effectively capture tire wear particles are expected to reduce the toxicity from 6PPD-q. Preventive operation and maintenance, such as street sweeping and catch basin cleaning, are likely helpful in preventing the transport of tire wear debris and reducing the magnitude of the problem. (Ecology [D], October 2022)*

The currently proposed Project stormwater management plan does not implement BMPs that may be used to minimize this pollutant prior to discharge into the Puyallup River. With no BMPs using prescriptive infiltration, sorption, filtration or sedimentation treatment, potential for minimizing levels of 6PPD-q (soluble) and fine sediment or tire particles containing 6PPD (solid or precipitate) is low. Without appropriate treatment, research indicates a moderate to high potential for illegal take of listed and sensitive species near the stormwater outfall, and potential for downstream impacts to other species from bioaccumulation.

Salmon Habitat Documentation

According to WDFW SalmonScape mapping (WDFW SalmonScape 2023), the Puyallup River provides documented habitat for both a fall run and spring run of chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*Oncorhynchus nerka*), coho salmon (*Oncorhynchus kisutch*), pink salmon (*Oncorhynchus gorbuscha*), chum salmon (*Oncorhynchus keta*), winter steelhead (*Oncorhynchus mykiss*), and bull trout (*Salvelinus confluentus*). The White River, which merges with the Puyallup River approximately 0.5 mile downstream from the Project reach, diverts the sockeye salmon) run as well as the last spring Chinook salmon run in the South Puget Sound (WDFW SalmonScape 2023). All other species listed above use the reach adjacent to the Project site.

Talasea Consultants prepared a biological evaluation report in 2017, which assessed baseline conditions in the Puyallup River adjacent to the Project site. They described most water quality and habitat parameters as being either “at risk” or “not properly functioning” (Talasea 2017), indicating a degraded baseline condition. According to Talasea (2017), due to the general lack of pool-riffle complexes or gravel beds, the Project reach does not contain optimal spawning or rearing habitat for state or federally listed salmonids (Talasea 2017).

However, WDFW SalmonScape mapping indicates that the Project reach includes documented spawning for the pink salmon, documented rearing for the fall Chinook and coho, and documented presence (i.e., migration) of bull trout, winter steelhead, and fall chum. Therefore, the reach adjacent to the Project site provides critical habitat and a migration corridor for listed salmon species, allowing them to move between the open ocean and the upper Puyallup watershed where high-quality spawning and rearing habitat is present.

The Puyallup River up to River-Mile 14 has been identified as EFH for chinook, coho, and pink salmon (NOAA 2021b). The surrounding basin (and entire Puget Sound basin) is also mapped as EFH for Pacific groundfish, which depend on saltwater habitats and estuaries, including the furthest extent of saltwater intrusion upriver (Pacific Fishery Management Council 2020).

Of the salmonids present, the chinook, steelhead, and bull trout are federally listed as threatened species, and the coho is federally considered a species of concern. Protection of listed species is required under federal and local law. In addition, the coastal cutthroat and pink salmon are listed by Pierce County as Species of Local Importance (PCC 18E.40), and thus are to be protected.

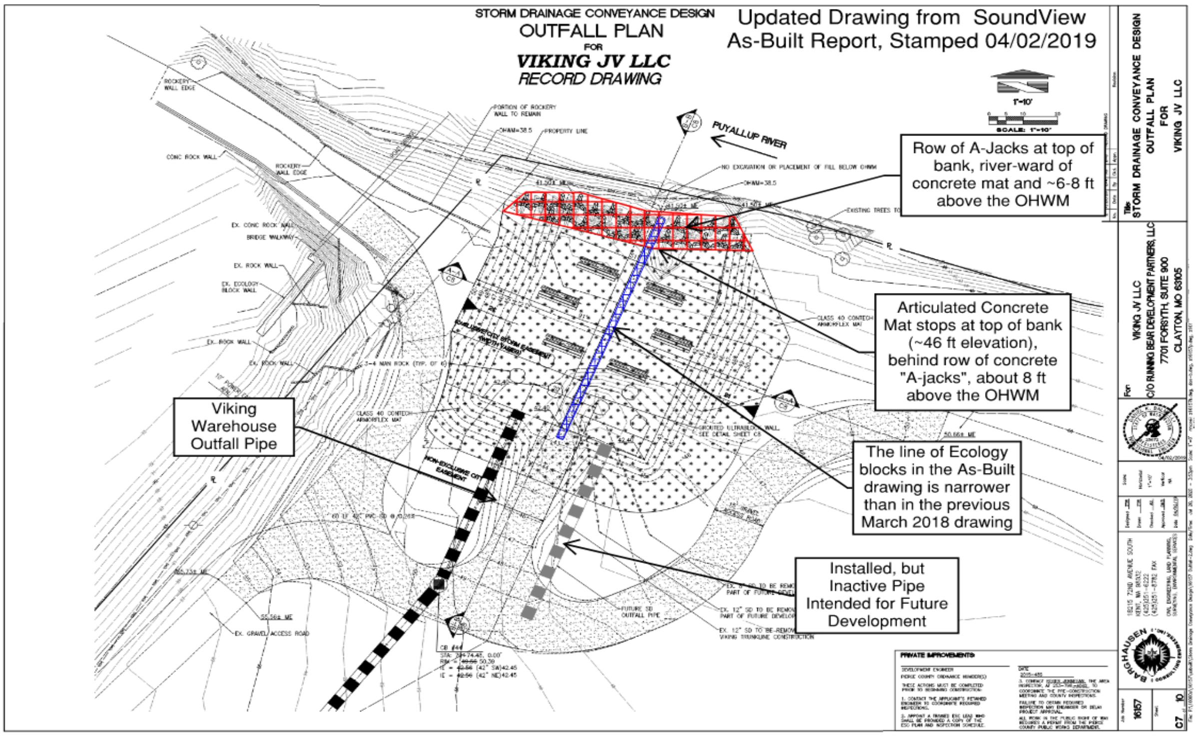
Salmon might access the Project floodplain during high-water flood events, but due to ongoing farming and plowing actions in the floodplain, there are no significant current off-channel habitat swales or drainages to provide effective and safe refuge during or after floods, which indicates potential for stranding during flood events.

Outfall Structure on the Floodplain

An existing outfall structure is located on the bank of the Puyallup River at the far northern end of the Project site (Figure 4-36 and Figure 4-37). The outfall structure was purposefully built to create a lower elevation notch in the riverbank, which was previously part of the high bank river levee at that location.

The ponding behind the levee in the past had affected farm fields in the floodplain by limiting access during flood events and by depositing significant volumes of sandy sediment. Creating the notch was intended to allow floodwaters to flow across the floodplain and back into the river, without ponding behind the levee.

In addition to providing throughflow for Puyallup River flood waters, the outfall receives stormwater runoff volumes from the already constructed Viking warehouse, roads, and parking surfaces, which are located directly adjacent to and southwest of the Project site. The outfall structure is intended to control and dissipate power from runoff flow velocities, and to reduce potential for scouring and erosion at the edge of the river. The outfall structure is also intended to receive future stormwater runoff volumes from the Project warehouse complex (seven warehouses, parking areas, and roads) and the greater stormwater basins upslope from both the Viking and Project sites.



Updated Drawing from SoundView As-Built Report, Stamped 04/02/2019

Row of A-Jacks at top of bank, river-ward of concrete mat and ~6-8 ft above the OHWM

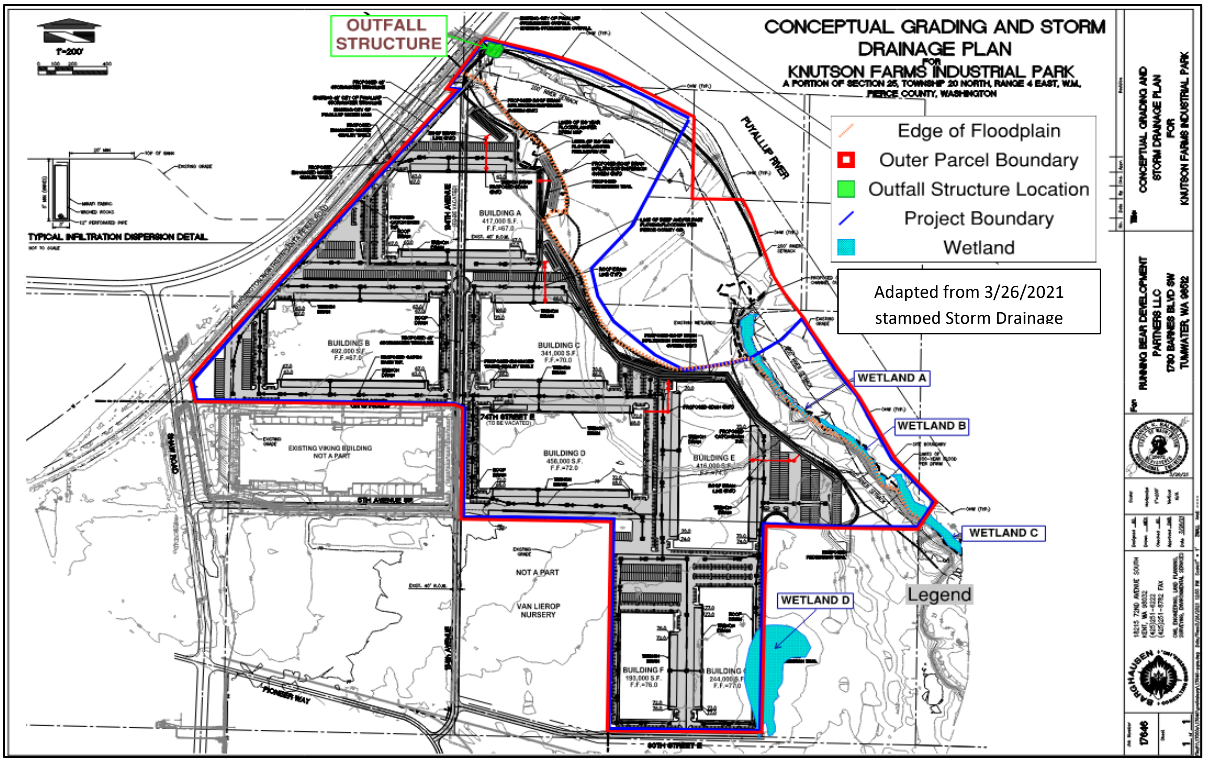
Articulated Concrete Mat stops at top of bank (~46 ft elevation), behind row of concrete "A-jacks", about 8 ft above the OHWM

Viking Warehouse Outfall Pipe

The line of Ecology blocks in the As-Built drawing is narrower than in the previous March 2018 drawing

Installed, but Inactive Pipe Intended for Future Development

Figure 4-36. Adapted Plan View of As-Built Changes from the Originally Approved Outfall Structure Design



Adapted from 3/26/2021 stamped Storm Drainage

Figure 4-37. Showing Location of Stormwater Outfall Structure at Northern End of the Project Site

Chapter 18E.40.040(B)11 (Stormwater Conveyance Facilities) describes limitations to placing stormwater conveyance structures (such as an outfall and pipes) in the riverine buffer zone. They may be allowed subject to all of the following standards:

- No other feasible alternatives with less impact exist;
- Mitigation for impacts is provided;
- Stormwater conveyance facilities shall incorporate fish habitat features; and
- Vegetation shall be maintained and, if necessary, added adjacent to all open channels and ponds in order to retard erosion, filter out sediments, and shade the water.

PCC Chapter 18E.70 (Flood Hazard) describes limitations on development in a regulated floodplain. These rules specifically describe an intent to minimize damage to critical fish and wildlife habitat areas (18E.70.040 A.1.a). In general, new development in a flood zone is discouraged, but may be allowed with proper engineering, mitigation and floodproofing, as long as the Project does not "*cause an adverse impact to crucial fish or wildlife habitat.*"

A detailed mitigation plan (TDMP 2018) for the Viking Warehouse project prepared by Talasea Consultants in 2018 indicated that plantings in and around the outfall structure were intended as mitigation to compensate for loss of vegetated riparian buffer habitat that had previously existed at the outfall location. The TDMP 2018 also described a requirement for at least three years of monitoring once planting was complete.

An As-Built report prepared by SoundView Consultants in September 2020 (SVC 2020) was submitted to Pierce County, intended to document that the mitigation plan had been implemented as described in the TDMP 2018. Pierce County code requires that both the plant installation phase and the monitoring phase are bonded. Specific mitigation plan requirements are provided in PCC 18E.30.070 – Appendix C. Financial guarantees are required during the installation and monitoring phases, as described in Chapter 18E.10.080 Critical Area Protective Measures.

Pierce County accepted the SVC 2020 report and released the plant installation phase bond. However, the monitoring phase, which was described in TDMP 2018 as starting immediately following planting was not initiated until December 2022. A combined Year 1 and Year 2 Monitoring Report was submitted to Pierce County in December 2022. The report indicated that by planting 57 new plants, the mitigation area was brought into compliance and met Performance Standard requirements of the approved Mitigation Plan (Talasea 2018). However, the monitoring report did not describe whether additional monitoring would be needed to document survival of the newly installed plants, nor did it address significant impacts from sediment collection within the outfall, and erosive loss of the riverbank and associated plant materials at the outside edge of the outfall structure.

The impacts at the riverbank were also being addressed through a parallel WDFW HPA permit review process, which was initiated in 2018 (Permit 2018-6-194, issued October 2018). Under that HPA, at least 80 percent of the riverbank vegetation (installed in fall 2019) was required to survive for at least 3 years (the duration of required HPA monitoring). The bioengineering erosion control treatment at the riverbank, which included a cover of coir netting, creation of a sandy bank and installation of willow wands, was required to survive the 100-year event. However, most of the plant and soil materials were washed away during subsequent winter floods in 2019, 2020, 2021, and 2022 (none of which were 100-

year events). This failure, in addition to some large boulders from the outfall construction eroding and falling into the river, precipitated a correction request (November 16, 2022) from WDFW and a new HPA (issued April 24, 2023). Repair efforts at the riverbank in early 2023 (required 2023 HPA) have placed new willows wands, installed some coarse woody debris (willow root wads and trunk) and installed a brush mattress intended to replace the lost bioengineering functions. However, according to feedback from EIS hydraulics experts, the strength and stability of the newly installed materials are not expected to survive hydraulic impacts from expected flooding in the upcoming 2023–2024 winter.

Mitigation area conditions will be discussed in more detail below and in Section 4.2 Surface Water, but current conditions at the outfall structure, as evaluated by the EIS team, indicate that due to a combination of scouring and erosion from flooding and the existing stormwater outfall volumes emanating from the Viking warehouse site, the mitigation plan designed to protect the riverbank and replace wildlife habitat functions has failed. Additional corrective measures, such as installation of hard armoring (as recommended by EIS team hydraulics experts) along key sections of the riverbank, repairs to the outfall structure and/or replanting less impacted native vegetation areas along the riverbank would be needed to ensure that the mitigation area meets the WDFW HPA standards as well as the Talasea 2018 mitigation plan performance standards associated with preservation of native vegetation at the riverbank, and other critical area protection requirements described in Pierce County critical area regulations (PCC 18E.40.050). This work is needed to ensure that the Project does not further degrade habitat in the mitigation area and along the riverbank, future repairs and replanting plans should address and mitigate for expected future impacts from significantly greater proposed future flows from the Project site.

Terrestrial Habitat Conditions

The most valuable terrestrial wildlife habitats on the Project site are the vegetated riparian buffers and wetlands. This includes a narrow strip of riparian forest plant community, ranging from 25–50 feet in width, that occurs along the river at the northeastern edge of the site floodplain, separated from the rest of the floodplain by a narrow dirt farm road that provides access to currently farmed areas within the floodplain. There are three PEM/PSS wetlands (Wetlands A, B, and C) in the floodplain to the southeast. The fourth on-site wetland (Wetland D, PEM/PSS) is located in upland farm and pasture areas in the southeastern portion of the Project proposed warehouse area, outside of the floodplain (Figure 4-37 and Figure 4-38).

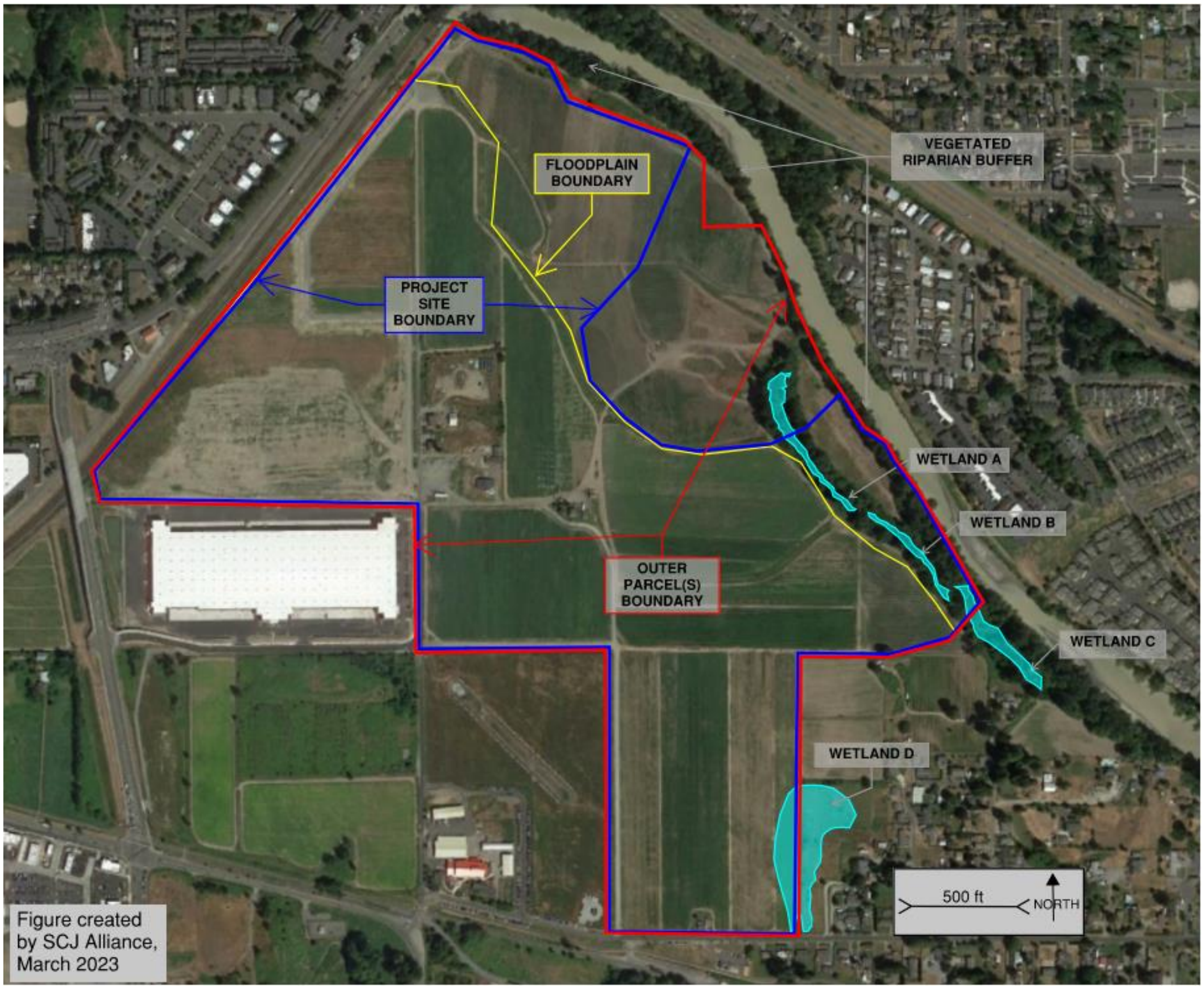


Figure 4-38. Showing Vegetated Riparian Buffer and Wetland Habitats in the Project Site

The existing 25- to 50-foot-wide riparian forested areas along the Puyallup River provide nesting, resting and forage habitat for migratory and resident songbirds and provide cover for mammals and birds. Snags and logs were observed within these areas, which are priority habitats due to their high value to wildlife and their relative scarcity within highly developed reaches of the Puyallup River. Small cavities observed in these on-site snags provide support for small mammals, woodpeckers, or cavity nesting ducks, which have been infrequently documented on site (Cornell 2021).

The Puyallup River and the Wetlands A, B, C, and D provide a water source for wildlife in the floodplain during various parts of the year, and the vegetated riparian area along the river provides an important local wildlife corridor for both terrestrial and aquatic species.

Riparian Buffer and Floodplain Habitat Areas (Shoreline Jurisdiction)

Under Title 18E PCC Development Regulations – Critical Areas (PCC Title 18E), the Puyallup River (a Type F1 fish-bearing stream) is assigned a 150-foot riparian buffer. The River is also regulated as a shoreline under Title 18S Development Policies and Regulations – Shorelines. The regulated Shoreline Jurisdiction includes all areas within 200 feet of the OHWM at the river, plus all associated floodplains within 200 feet of the floodway (as mapped by Pierce County), and wetlands on the floodplain. Figure 4-38 shows the Pierce County mapped floodway in relation to the proposed warehouse development boundary. The Project's regulated Shoreline Jurisdiction extends from the edge of the river to the outer or landward edge of the floodplain boundary.

Approximately 47 acres of the study area are designated as FEMA mapped floodplain (Figure 4-38), all of which falls within the Project site Shoreline jurisdiction. The Project site does not contain a full levee, due to construction of the outfall structure described above, and due to past breaches during flood events rendering some sections of the levee non-functional. There is periodic but overall minimal protective armoring along most of the Project site shoreline.

Riparian floodplains downstream of the Project site have been disconnected from the riverine environment by dikes and in some cases have been substantially affected or eliminated by filling. However, there is some remnant riparian habitat along the river's edge within the Project site and on commonly owned parcels outside of the Project site boundary, but within commonly owned areas of the floodplain (Figure 4-38). This riparian habitat was described previously as being a narrow strip of riparian forest plant community that occurs along the river at the northeastern edge of the site floodplain. The 25–50-foot-wide forested strip is significantly less than the standard 150-foot-wide critical area buffer required for the Puyallup River. The rest of the 150-foot buffer zone includes a dirt farm road and annually plowed and planted farmlands.

The northern portion of the floodplain is mostly plowed and farmed. The southern portion of the floodplain is partially cleared from past farming, but also contains three narrow, linear wetlands at the outer, landward edge of the floodplain, running along the base of the upper terrace (described in more detail below).

The riparian strip at the river's edge is forested with black cottonwood trees (*Populus balsamifera*), various willow species (*Salix spp.*), red alder (*Alnus rubra)*, big-leaf maple (*Acer macrophyllum*), and western red cedar (*Thuja plicata*). The understory includes native shrubs, such as osoberry (*Oemleria cerasiformis*), baldhip rose (*Rosa gymnocarpa*), and herbaceous plants like coltsfoot (*Petasites palmatus)*, stinging nettle, and ladyfern (*Athyrium filix-femina*).

Introduced invasive species are also present in the riparian area, including but not limited to several non-native blackberry species, Japanese knotweed (*Reynoutria japonica*) and reed canarygrass (*Phalaris arundinacea*). In the western side of the constructed stormwater outfall, non-native invasive watercress *(Nasturtium officinale)* is the dominant volunteer plant species. Some of the farm fields are currently fallow, supporting various pasture grasses interspersed with invasive or weedy species, such as Japanese knotweed, Scotch broom, and Himalayan blackberry.

At the northern end of the Project site, south of the existing outfall structure (shown above in Figure 4-36 and Figure 4-37), a berm along the west side of the dirt farm road mentioned previously appears to be composed of sandy flood deposits that were cleared from the adjacent farm field in the floodplain following past flood events. The berm is vegetated with many weedy species, such as Himalayan blackberry, poison hemlock, tansy ragwort, and common evening primrose.

Freshwater Wetlands On Site

There are four depressional wetlands on the Project site: Wetlands A, B, C, and D. Their locations and shapes are depicted in Figure 4-38, and their characteristics are described below in Table 4-18. Wetland hydrology is further detailed in Section 4.2 Surface Water. These wetlands are also described in a Critical Areas Assessment Report prepared by Soundview Consultants and submitted to Pierce County in December 2016 (SVC 2016).

Table 4-18. Project Site Wetland Characteristics

Wetland Title	Classification	Approximate Wetland Size/Area (square feet)	Buffer condition	Buffer Width[a] (feet)
Wetland A	Category III	26,869	Forested	150
Wetland B	Category III	11,396	Forested	150
Wetland C	Category II	31,547[b]	Forested	150
Wetland D	Category IV	132,237[c]	Farmed	50

Source: Adapted from SVC 2016 report

[a] PCC 18E.30.070, Appendix F

[b] Approximately 3,900 square feet on site

[c] Previously incorrectly described as being < 0.5 acres and entirely off site to the east.

Wetland A (Category III), B (Category III), and C (Category II) are depressional wetlands located in the floodplain at the base of steep slopes between the currently farmed upper terrace and the Puyallup River. The hydrology of Wetlands A, B, and C was previously described by others as being driven by a seasonally high water table, surface water runoff, and direct precipitation (SVC 2016). However, the EIS team found that although Wetlands A, B and C may occasionally receive hydrology from periodic flooding, groundwater seeps emanating from the edge of the upslope terraces are instead the primary source of hydrology, as described in Section 4.2 Surface Water.

Wetlands A, B, and C are Palustrine Scrub-Shrub/Palustrine Emergent (PSS/PEM) wetlands, but the surrounding buffer is dominated by a forest plant community. The forested overstory is dominated by willows (Pacific and Scouler's), red alder, and black cottonwood, while the understory contains a diverse assemblage of native woody shrubs, including salmonberry (*Rubus spectabilis*), red-osier dogwood (*Cornus sericea*), elderberry (*Sambucus racemosa*), western hazelnut (*Corylus cornuta*), and snowberry (*Symphoricarpos albus*), as well as herbaceous plants such as soft rush (*Juncus effusus*), manna grass (*Glyceria sp.*), stinging nettle (*Urtica dioica)*, and American vetch (*Vicia americana)*. Invasive species present in uplands around the wetlands include Himalayan blackberry, Japanese knotweed, and reed canarygrass (SVC 2016; EIS team field work 2019 and 2021).

Wetlands A and B offer moderate foraging and nesting for small birds, amphibian breeding sites protected from fish, and wildlife migration corridors. Wetland C provides a higher quality habitat for aquatic invertebrates, amphibians, and wetland associated mammals (SVC 2016).

Wetland D is a Category IV PEM/PSS wetland that straddles the Project site boundary near the southeast corner of the site. It was previously described by the Applicant's biologist(s) as being too small to be regulated (i.e., buffered) by Pierce County and only occurring east and outside of the Project site boundary (SVC 2016). However, the EIS team re-delineated Wetland D in 2019, and found that it extended onto the Project site, and was about 3 acres in size—large enough to be regulated under

County and federal regulations. This finding was corroborated by the Pierce County Hearing Examiner in 2018. An updated Wetland D report was prepared by the EIS team in 2021.

Wetland D is highly disturbed from ongoing farming and pasture use, and, being formed in the base of an internally draining depression, is naturally disconnected from the river and floodplain. It receives hydrology from seasonally rising groundwater on and adjacent to the Project site and from surface water inflows from 80th Street East. Wetland hydrology was documented by the EIS team as persisting and/or ponding from -1 foot to +1 foot relative to the soil surface well into the growing season both in the field and in the aerial photo record.

Wetland Buffers

PCC Critical Area regulations for wetlands and the proposed use on the Project site resulted in Wetlands A, B, and C being assigned 150-foot buffers. The existing vegetated habitat buffer areas to the west of these three wetlands are steeply sloped up to the edge of the upper terrace (i.e., the surface where warehouse development is proposed). These buffers are dominated by bigleaf maple, black cottonwood, and red alder, but also are dominated by invasive woody shrubs and vines in the understory, especially Himalayan blackberry and Japanese knotweed. Buffers north and east of the wetlands are in the floodplain, and include forest and shrub dominated areas and also previously plowed and farmed surfaces that are grass dominated.

While no new activity was observed, aged evidence of beaver activity was documented in the Wetland C buffer during the February 2021 site reconnaissance by the EIS team.

Under Pierce County regulations, Wetland D is assigned a 50-foot buffer. On-site portions of Wetland D and its buffer are farmed, limited by when the seasonal wetland hydrology diminishes by early summer. The on-site wetland and its buffer (west of the eastern Project boundary) are currently dominated by annually planted agricultural crops, common pasture weeds and dirt farm roads. Because Wetland D occurs on both sides of the eastern parcel boundary, the 50-foot buffer area also extends off site to the east into a wet pasture. The off-site wetland and its buffer include small areas with young trees and shrubs, but is dominated by actively grazed pasture grasses and Himalayan blackberry.

Sensitive or Protected Fish and Wildlife

Table 4-19 summarizes the list of potentially regulated species per federal and state records and describes the likelihood of occurrence in the study area.

Table 4-19. Regulated Species with Potential Occurrence in the Study Area

Species	Listing Status and Local Importance	Presence of Designated Critical Habitat (Federal)	Likelihood of Occurrence in the Study Area (higher potential indicated by BOLD text)
Terrestrial Species			
Gray Wolf (*Canis lupus*)	Federal: Recently delisted State: Endangered Local: NA	Population: Western DPS. No critical habitat has been designated for this species.	No indication of gray wolf in the study area (WDFW 2021a). The nearest known pack is the Teanaway Pack, located approximately 64 miles from the site.
Osprey (*Pandion haliaetus*)	Federal: Not warranted State: NA Local: **Local Importance** (PCC 18E.40)	There is no designated critical habitat for this species.	**No osprey nests observed on site, but they are likely to use the Puyallup River project reach for hunting. The Puyallup River is mapped as breeding habitat for Osprey (Seattle Audubon 2021), and their hunting ranges can extend 16–14 miles from the nest** (Rodrick and Milner 1991).
Marbled Murrelet (*Brachyramphus marmoratus*)	Federal: Threatened State: Endangered Local: NA	Population: USA (CA, OR, WA). There is designated critical habitat for this species.	No indication of the presence of marbled murrelets in the study area (WDFW 2021a). There is no designated critical habitat (nesting areas) for the Marbled Murrelet near the study area and they are not believed to use habitats within the populated Puget Sound lowlands. Birds may traverse the site when accessing a nest site in the Cascade Mountains from a feeding area within the Puget Sound.
Streaked Horned Lark (*Eremophila alpestris strigata*)	Federal: Threatened State: Endangered Local: NA	There is designated critical habitat for this species.	No indication of the presence of the Streaked Horned Lark in the study area (WDFW 2021a); they are not likely to use habitats in or near the study area.
Yellow-billed Cuckoo (*Coccyzus americanus*)	Federal: Threatened State: Endangered Local: NA	Population: Western U.S. DPS. There is designated critical habitat for this species. None occurs within the study area	No indication of the presence of the yellow-billed cuckoo in the study area (WDFW 2021a). It is highly unlikely to occur in the study area. The yellow-billed cuckoo was last known to breed in Washington in 1930 and is considered extirpated from the state.
Aquatic Species			
Bull Trout (*Salvelinus confluentus*)	Federal: **Threatened** State: **Candidate** Local: NA	Population: Coastal U.S. DPS **There is designated critical habitat within the study area.**	**Bull Trout are documented within the Project reach of the Puyallup River (WDFW 2021a). Critical habitat of the bull trout occurs within the project reach of the Puyallup River.** The primary constituent elements (PCE) of designated critical habitats are described in 70 FR 185.

Species	Listing Status and Local Importance	Presence of Designated Critical Habitat (Federal)	Likelihood of Occurrence in the Study Area (higher potential indicated by BOLD text)
Chinook Salmon (*Oncorhynchus tshawytscha*)	Federal: **Threatened** State: **Candidate** Local: NA	Population: Puget Sound ESU **There is designated critical habitat within the study area.**	**Chinook salmon are documented within the Project reach of the Puyallup River. Habitat uses designated for the Puyallup River reach adjacent to the Project are: rearing and migration (StreamNet) and documented rearing (SalmonScape). Critical habitat of Chinook occurs within the Project reach of the Puyallup River (NOAA 2021).** The PCE of designated critical habitats are described in 70 FR 52629.
Coho Salmon (*Oncorhynchus kisutch*)	Federal: **Species of Concern** State: NA Local: NA	Population: Puget Sound/Strait of Georgia DPS No critical habitat has been designated for this population.	**Coho salmon are documented within the Project reach of the Puyallup River (WDFW 2021a). Habitat uses designated for the Puyallup River reach adjacent to the Project are rearing and migration (StreamNet) and documented rearing (SalmonScape).**
Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii*)	Federal: Not warranted State: NA Local: **Local Importance** (PCC 18E.40)	Population: Resident Coastal Cutthroat Trout. No critical habitat has been designated for this population.	**Coastal cutthroat are mapped as using the Project reach (WDFW 2021a). These anadromous fish migrate between the ocean and spawning habitats higher in the watershed and are likely to use the Project reach as a migratory corridor.**
Fall Chum Salmon (*Oncorhynchus keta*)	Federal: Not warranted State: NA Local: Local Importance (PCC 18E.40)	Population: Puget Sound/Strait of Georgia Chum ESU. No critical habitat has been designated for this population	**Chum salmon are mapped as using the Project reach for migration (WDFW 2021a), as well as tributaries upstream and downstream of the Project reach for spawning and rearing. Documented use of the Project reach includes: migration only (StreamNet) and documented presence (SalmonScape).**
Pink Salmon (Odd Year) (*Oncorhynchus gorbuscha*)	Federal: Not warranted State: NA Local: **Local Importance** (PCC 18E.40)	No critical habitat has been designated.	**Pink salmon have been documented rearing in the Project reach. Documented use of the Project reach includes: migration, spawning, and rearing (StreamNet) and documented spawning and rearing (SalmonScape)**
Rainbow Trout (*Oncorhynchus mykiss*)	Federal: Not warranted State: NA Local: **Local Importance** (PCC 18E.40)	No critical habitat has been designated.	**Rainbow trout are a species of local importance (PCC 18E.40). They are mapped as using the Project reach in the WDFW PHS maps (WDFW 2021a).**
Sockeye Salmon (*Oncorhynchus nerka*)	Federal: Not warranted State: NA	No critical habitat has been designated for this population.	**Sockeye salmon are a species of local importance (PCC 18E.40). They are mapped as using the Puyallup River through the confluence with the White River, as a migratory corridor (WDFW 2021a).**

Species	Listing Status and Local Importance	Presence of Designated Critical Habitat (Federal)	Likelihood of Occurrence in the Study Area (higher potential indicated by BOLD text)
	Local: **Local Importance** (PCC 18E.40)		
Winter Steelhead (*Oncorhynchus mykiss*)	Federal: **Threatened** State: NA Local: NA	Population: Puget Sound DPS **There is designated critical habitat within the study area (81 FR 9251)**	**Steelhead are documented within the Project reach of the Puyallup River. Habitat uses designated for the Puyallup River reach adjacent to the Project are: migration only (StreamNet) and documented presence (SalmonScape). Critical habitat of Steelhead occurs within the Project reach of the Puyallup River (NOAA 2021).** The PCEs of designated critical habitats are described in 78 FR 2725.

Source: IPaC 2021, NOAA 2021, StreamNet 2021, WDFW PHS 2021, and WDFW SalmonScape 2021
Note: NA = not applicable

Federal, state, and local data reported in Table 4-19 indicates potential for five federally listed (threatened, endangered, or proposed for listing) terrestrial species to occur in or near the Project study area (USFWS 2021), including the gray wolf, marbled murrelet, streaked horned lark, and yellow-billed cuckoo. However, none of these species are known to occur in the Project study area, and occurrence is considered highly unlikely. There is no documentation of any state or federally listed terrestrial species or any terrestrial species of concern within the Project study area (WDFW PHS 2021).

Three state and/or federally listed fish species (chinook salmon, winter steelhead, and bull trout) and one species of concern (coho salmon) have been documented to occur within the Project study area, which includes the confluence with the White River (WDFW 2021a). Four additional, but currently unlisted priority fish species are described in WDFW databases as occurring within the Project study area. These species include pink salmon, fall chum salmon, cutthroat trout, and sockeye salmon.

The WDFW database indicates that spring-run chinook salmon and sockeye salmon (federally listed) do not pass the Project site, but instead migrate up the White River at the confluence with the Puyallup River 0.5 mile downstream of the Project reach. All other species described above have been documented as using the Project reach (WDFW 2021b) during migration. According to others (Talasea 2017), no spawning or rearing of any the listed species of fish is expected to occur within the reach adjacent to the Project site. However, the WDFW SalmonScape database indicates that pink salmon have been documented as spawning within the reach adjacent to the Project site, and both Fall chinook and coho have been documented as using the same reach for rearing habitat.

The Project site is located within the Pacific flyway migration route, which extends from Alaska to Patagonia, and thus may periodically support migratory birds, including waterfowl, neotropical migrant songbirds, shorebirds and other birds that may use habitats at the Project site seasonally or during migration.

Areas within the Project study area have been mapped as having waterfowl concentration areas by the WDFW. Similar birds may be expected to congregate in wetlands on site during the winter or during spring and fall migration seasons.

Two additional species of local importance and their associated habitat areas, defined in PCC Chapter 18E.40 (Regulated Fish and Wildlife Species and Habitat Conservation Areas), were identified as likely to utilize the Project study area. These species are osprey (*Pandion haliaetus*), and native/wild rainbow trout (*Oncorhynchus mykiss*).

Listed Plant Species

No federal or state-listed plant species are documented or were observed within the Project study area (WDNR 2021c).

During EIS Project scoping, there was a comment saying that wild lupine grow in the Project site. There are at least 20 lupine species in Washington, but most are not listed species. Kincaid’s Lupine (*Lupinus sulphureus*, also known as sulfur lupine or *Lupinus oreganus*) is listed, but is a prairie species, found in oak savannah habitats mostly in northwest Oregon and southwest Washington. This species has variable flower colors, from light bluish or purple to yellowish or cream, fading to an orangish brown. None were observed on site. *Lupinus sabinianus* (Sabin's lupine) is on some lists as being rare or threatened. It has a distinctive yellow flower, but it only grows in southeast Washington and northeast Oregon.

4.4.4 Impacts

This section describes the potential for environmental impacts to plants and animals that may result from Project implementation.

Methodology

This analysis evaluates potential for construction and operations at the Project site to impact plant and animal resources. Impacts were characterized by comparing existing conditions with the potential for habitat loss, and by evaluating proximity of construction activities to suitable or occupied fish and wildlife habitat, sensitive plant communities, critical area and shoreline buffer requirements and critical areas. This evaluation was performed by reviewing public reports and public databases, publicly available GIS mapping layers on land cover, wetlands, and species presence; and technical reports prepared for the proposed Project.

The following public records and literature were reviewed (and others):

- USFWS and NMFS habitat recovery plans available for ESA listed species
- Puyallup River Watershed Assessment (PRWC 2014)
- Climate Change Impact Assessment and Adaptation Options (Puyallup Tribe 2016)
- WDFW’s Priority Habitats and Species (WDFW 2019a)
- USFWS’s endangered species information (USFWS 2020)
- WDNR Natural Heritage Program Rare Plants List (WDNR 2021c)
- State Wildlife Action Plan (WDFW 2015)

The following technical reports were reviewed (and others):

- Biological Evaluation - Van Lierop Property Stormwater Outfall Project, Talasea Consultants, Inc. (2017).
- Detailed Mitigation Plan (TDMP 2018), Puyallup River Outfall, Talasea Consultants Inc., March 2018,
- Critical Areas Assessment Report – Knutson Farms Industrial Park. Soundview Consultants (September 2016, Revised December 2016).
- Revised Knutson Industrial Transportation Impact Analysis, TENW Transportation and Engineering Northwest for Michelson Commercial Realty and Development, LLC (2017).

A significant impact from construction and/or operations would occur if there was:

- Injury, death, or harassment of federal or state listed endangered or threatened species;
- Reduction of habitat quality or quantity that could substantially affect the critical survival activities (breeding, rearing, and foraging) of listed species;
- Substantial interference with the breeding, feeding, or movement of native resident or migratory fish, bird, amphibian, or mammal species;
- Noncompliance with critical areas regulations, or
- If these impacts cannot be mitigated through compliance with critical areas ordinances or implementation of BMPs.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, the construction and operation of the Project would not occur. No Project-related impacts to plants and animals would result.

Assuming the same agricultural activities would continue on site, then existing plant and animal communities would continue to function as they do currently. No new development or increased human activity would be introduced on site and no additional vegetation clearing would occur outside of what is standard and allowed under farming practices; no additional wildlife habitat would be disrupted; impacts to special status species would remain the same. The current degraded vegetation communities and animal habitat conditions associated with continued farming practices would persist indefinitely.

Existing levels of the 6PPD pollutant in the Puyallup River would not increase as a result of proposed new flow volumes from the Project site.

Proposed Project

Construction Impacts

The Project schedule indicates an overlap between construction and operations phases at the Project site. The Applicant has indicated that they plan to complete construction over a period of 4 years, with construction starting at the north end of the site (warehouses A to E), followed by construction of warehouses F and G. Construction of each warehouse would take 15–18 months, with construction of some warehouses occurring simultaneously to meet the overall 4 year construction schedule. Up to 150 employees would be expected on site at any one time during construction.

Construction of each warehouse would occur in three stages:

1. Grading and filling
2. Installation of on-site utilities
3. Warehouse construction

Therefore, once construction of basic infrastructure (roads and utilities) is complete around each new warehouse, operations would be initiated while other warehouses are still under construction. Thus construction impacts would overlap with operations impacts for three to four years until the entire warehouse complex has been built.

Vegetation

According to the 2017 Talasea Biological Evaluation report, during construction of the existing outfall structure (which was completed in fall of 2020), approximately 2,500 square feet of the left bank of the River would be impacted by construction of the existing stormwater outfall (Figure 4-35 and Figure 4-36). The outfall structure construction was completed in September 2020, and therefore, impacts related to initial clearing of the riverine buffer and site excavation and grading needed to build the outfall structure have already occurred. However, based on several recent and ongoing site assessments by the EIS team, the outfall structure is currently unstable and eroding. Conditions at the outfall were recently documented in a separate report, Viking Warehouse Facility Stormwater Outfall Deficiencies Report, prepared for the City of Puyallup by NHC and SCJ Alliance, February 2023. A more detailed discussion is provided in Section 4.2 Surface Water.

Most of the vegetation that was planted in and around the outfall structure per the approved Talasea mitigation plan (TDMP 2018) has been scoured or washed away during winter flooding events or has been buried by flood sediments. Under current conditions, impacts to vegetation in and near the outfall in the Puyallup riparian zone are significant. Recent repairs and plantings at the riverbank carried out to satisfy a WDFW HPA Correction Request and addition of 57 new plants to the native planting areas around the outfall have addressed some of these issues but have not yet been proven to meet the required standards through subsequent monitoring work.

Because no monitoring work was carried out and no monitoring reports were provided until late December 2022, the EIS team carried out mitigation planting area and outfall assessments during 2020, 2021, 2022 and 2023. Results of this work indicated that to meet the Pierce County permit monitoring and maintenance requirements and related stormwater and WDFW HPA regulations, both the outfall structure and the mitigation planting areas and would require ongoing monitoring, repair, replanting, and potentially redesign prior to Project construction phases, which would eventually result in sending new stormwater volumes to the riverbank through the outfall before it is performing adequately.

During construction phases on the rest of the Project site, all vegetation on the high terrace where the warehouses would be sited would be cleared. This part of the Project site is currently farmed and plowed semi-annually. Therefore, impacts to native vegetation and animal habitat across the upper terrace would be negligible. Aside from the outfall structure, no construction is proposed on the lower terrace floodplain. However, the floodplain would continue to be farmed as it has been historically for an undefined period. Therefore, aside from vegetation impacts described above near the stormwater outfall structure, vegetation conditions in the floodplain are not expected to change during construction phases.

Impacts to Wetland Habitat

Under the current proposal, construction impacts on the high terrace (where the warehouses would be sited) are expected to eliminate or reduce the volumes of seasonal stormwater infiltration, which would result in changes to the timing or volumes of groundwater hydrology feeding from the upper terrace to Wetlands A, B, and C (located in the floodplain to the east), and to Wetland D (located on the high terrace in the southeast corner of the proposed warehouse complex).

Impacts to wetland or buffer vegetation that is dependent on current hydrologic patterns (timing and volumes of seasonal stormwater infiltration) may result in significant impacts to native plant communities and associated wetland habitat ecosystems in the Project site. The Applicant proposes to infiltrate roof runoff from several warehouses, with the proposed infiltration galleries located along the top of slope at the outer edge of the high terrace. However, there is no associated geotechnical assessment report describing how the galleries were designed to ensure that they do not affect downslope stability (as required in code), and no hydroperiod assessment has been carried out, as would be needed to define the timing and volumes of hydrology needed to sustain the wetlands. There is no mitigation proposal provided by the Project developer describing how potential impacts to Wetland A, B, C, and D hydroperiods will be mitigated.

Wetland D was previously described in the 2016 SVC Critical Areas Assessment Report as being located off site to the east and too small to be regulated (i.e., buffered) by Pierce County. However, subsequent work by the EIS Team determined that Wetland D was large enough to be regulated (approximately 3 acres) with about 1/3 of the wetland area occurring within the Project site boundary (as described in Knutsen Farms Industrial Park Wetland D Report, 2021, prepared by SCJ Alliance for the City of Puyallup). Therefore, the wetland is regulated and buffered under Pierce County regulations. To date, no mitigation proposal has been provided by the Applicant to address proposed fill of the on-site portions of Wetland D and its buffer.

It is currently proposed by the Project developer to build a warehouse in the area currently covered by part of Wetland D and its on-site buffer. Unless the site design plans are revised to change the warehouse coverage or location, this plan would result in (not-yet permitted) fill of approximately one-acre of Wetland D and the on-site portions of its 50-foot buffer during construction.

According to Pierce County regulations, filling a wetland and its buffer cannot be permitted without first evaluating the fill option through a mitigation sequencing protocol (PCC 18E.030.050). Mitigation sequencing requires that the impact is avoided if at all possible, but if not possible, as described in code, the impacts must be minimized and fully mitigated, as prescribed in County (PCC 18E.030.050) and federal law (Section 404 and 401 of the CWA). Pierce County Critical Areas Regulations allow exceptions (PCC 18E.20.050) if application of the regulations would deny all reasonable use of a site and a proposed project cannot meet the prescriptive standards for critical areas. However, even if the fill is approved under a Pierce County permit review process, the proposed wetland fill must still be evaluated and permitted through a permit process administered under Ecology.

Currently, there is no mitigation proposal or permit describing how mitigation sequencing was evaluated to avoid all impacts to Wetland D critical areas, or if by not taking certain actions, impacts could be minimized by limiting the degree or magnitude of the action, or how the impacts will be mitigated. Therefore, until there is an approved mitigation plan addressing Wetland D impacts, any fill at Wetland D as currently proposed would result in a net loss of wetland and buffer area during construction phases. This is a significant impact and is in conflict with no-net loss policies at a federal, state, and local level.

If fill is allowed, impacts of on-site fill would potentially displace surface hydrology or may change the pattern of hydrology sources, either of which can impact vegetation and hydrology in the remaining off-site portions of Wetland D, which are located east of the property line on parcels owned by others and not controlled by the Applicant. Despite the fact that off-site areas are currently used as animal pasture with low value habitat conditions, without an appropriate mitigation plan designed to ensure that off-site impacts at least maintained and do not degrade current habitat conditions, potential vegetation and hydrologic impacts to off-site areas are deemed significant.

These wetland hydrology and fill impact issues must be addressed before any new construction grading or clearing occurs on the upland terrace.

Weedy and Invasive Plant Species

Construction activities could result in the spread and colonization of existing on-site noxious weeds during site grading. Implementation of standard construction BMPs could be used minimize the potential for significant weed seed transmission impacts during construction. These impacts could be further minimized by active pre-emptive control of certain high-risk species on site, such as Japanese knotweed and Scotch broom. Noxious weed control throughout the Project site is one of many mitigation opportunities.

Terrestrial Wildlife

Impacts to wildlife and habitat due to loss of seasonal agricultural vegetation in currently farmed areas, grading earthwork, and noise and light pollution could occur during Project construction activities. Removal of agricultural vegetation on the upper terrace would reduce marginal foraging habitat for birds, small mammals, and bats that currently utilize the agricultural crops and associated insects as part of their diet. Earthwork could result in mortality of individual ground-dwelling species, such as amphibians and small mammals. Construction clearing and grading activities and construction of proposed infiltration trenches (described in detail in Section 4.2 Surface Water and displayed in Figure 4-39) along the upland edge of the high terrace (near buffers associated with Wetlands A, B, and C) and along the eastern fence line at Wetland D could result in permanent loss of breeding, feeding and nesting habitat.

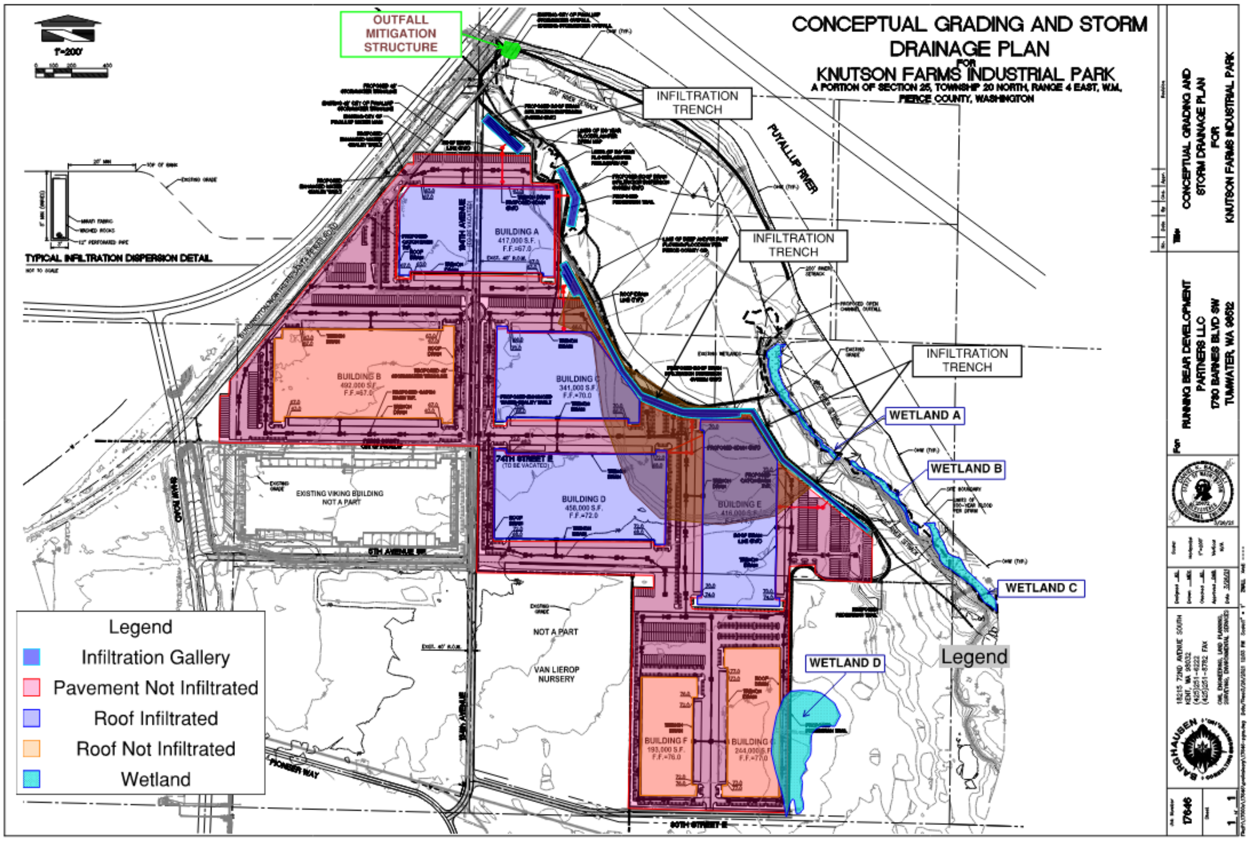


Figure 4-39. Showing Proposed Locations of the Infiltration Trenches at the Outer Edge of the High Terrace.

Most of the current on-site breeding, feeding and nesting habitat occurs in the adjacent floodplain wetlands (Wetlands A, B, and C) and in the 25–50-foot-wide strip of vegetated riparian area along the Puyallup River, described previously. Wetland D provides some habitat, but because it managed as farm and pasture, it does not provide as valuable habitat as the floodplain wetlands and riparian buffer. The narrow strips of shrub and tree habitat in and near the floodplain are currently used by a wide variety of birds, mammals, or waterfowl at various times of the year. To ensure that impacts to on-site wildlife habitat are insignificant, preservation and expansion of riparian habitat along the river (which is currently significantly less than the standard 150-foot critical area buffer) and preservation of hydrology timing and volumes feeding to Wetlands A, B, and C are of primary importance. Action necessary to preserve ongoing wetland hydroperiods must occur during construction phases to ensure there is no gap in the hydrology source or timing that would change or eliminate wetland habitats or vegetation communities in the floodplain.

Noise and light impacts associated with Project construction could cause wildlife to move elsewhere or discourage them from using adjacent floodplain or riparian habitats. These impacts could stress or disturb wildlife, causing alteration of behavior patterns, or interference with reproduction and feeding activities. During spring and summer, when nesting and rearing activities occur, amphibians and songbirds with breeding habitat near the proposed construction activities might be disturbed. The degree of disturbance would depend on noise level, timing, and duration of construction activities, as well as the sensitivity of the individual species. If most construction activities occur during standard working hours, impacts from noise would be limited to about one third of the day, and would not typically be considered significant, since none of the common urban bird, amphibian or mammal species expected to occupy on-site habitats are listed or considered sensitive.

Light impacts to existing wetland and floodplain habitats could be minimized by preservation or expansion of the existing buffer vegetation and other naturally vegetated habitat areas adjacent to Wetlands A, B, and C, and ensuring that safety or construction lights point down and/or away from the adjacent wetlands. Light and noise impacts at the remaining off-site portions of Wetland D are not expected to be as significant, as the wetland is already subject to light and noise impacts from regular farming activities.

This noise and light disturbance during construction phases would be temporary and is not expected to result in long-term impacts to the more valuable on-site wildlife habitat in the floodplain after construction is complete. Therefore, noise and light impacts to wildlife habitat during construction are expected to be non-significant following implementation of standard mitigation practices used to minimize these impacts.

Sensitive Plant and Animal Species

Construction of the proposed Project is not expected to affect special-status plant species because no plant species or potentially suitable habitat were identified. Neither are any federal or state-listed terrestrial animal species expected to occur in the study area.

In relation to potential for impacts to listed salmonids in the Puyallup River, no new stormwater impacts to the floodplain or river are anticipated during early construction phases, since surface would still be relatively permeable and construction erosion control BMPs usually involve ensuring no release of construction runoff to surface waters. However, runoff from impervious paved areas and warehouse roofs would increase over time as construction progresses, and at some point would direct stormwater overflows to the outfall structure. Without assessment and repairs to the outfall discussed previously, this may result in increased erosion and bank failure at the River, a significant impact during construction phases.

In addition to potential for erosion and sediment impacts to the Puyallup River from the existing outfall structure, increased runoff volumes from paved surfaces within the new warehouse complex may have significant impacts to listed and sensitive salmonids in the Puyallup River. Feist et al. (2011, 2017) documented a direct relationship between coho spawner mortality and the relative proportion of roads, impervious surfaces, and commercial property within a basin, associated with pollutants in stormwater runoff, and predicted 10–40 percent mortality to coho spawners in the Puyallup adjacent to the Project site from current stormwater runoff pollutants. Recent research from Tian et al. (2021, 2022) and others (McIntyre and Kolodjiez 2021) has identified a tire rubber derived chemical in stormwater runoff—the antioxidant 6PPD (often found in microscopic tire wear particles) and its soluble byproduct 6PPD-q. This pollutant is common in stormwater runoff from paved surfaces. This chemical has been found to have toxic effects on trout and salmon species, with highest sensitivity to date reported in coho salmon, and moderately high sensitivity in brook trout and rainbow trout (i.e., steelhead species). Research on impacts to other salmonids is ongoing. Characteristic toxicity symptoms include increased ventilation, gasping, spiraling, and loss of equilibrium shortly before death, which is reported to occur within 1–96 hours of exposure at very low concentrations of the pollutant.

Brinkmann et al. (2022) evaluated potential for acute toxicity of 6PPD-q to rainbow trout, brook trout, arctic char, and white sturgeon and reported 96-hr acute toxicity thresholds (LC50) of 1.0 µg/L or less for the two trout species, indicating lethal sensitivity in these trout species. Tian et al. (2022) reported a revised juvenile Coho salmon LC50 of less than 0.1 µg/L, indicating substantial lethal sensitivity to 6PPD-q. Lethal impacts to other salmon species are assumed but not yet fully documented.

Ecology published new guidance about 6PPD in June 2022 (Ecology [D]) and October 2022 (Ecology [E]), which provides BAS information and feedback about how to best manage this serious pollutant in order to avoid take of listed species, as required in federal law. The primary pathway of 6PPD-q transport is runoff from roads and parking areas or through conveyance systems (storm drainpipes and catch basins) to surface waters or direct discharges to surface waters, such as is proposed at the Project site.

Properly designed dispersion, infiltration, or biofiltration BMPs work best for minimizing impacts from 6PPD due to its high tendency to adsorb to organic matter. The most effective treatment media would include organic material, clay, or another material with comparable sorption characteristics (i.e., high Cation Exchange Capacity).

Two categories of BMPs designed to reduce impacts from the tire oxidant pollutant have been preliminarily identified and described by researchers:

- Stormwater Flow and Treatment BMPs
- Source Control BMPs

The currently proposed stormwater management plan does not implement BMPs that can effectively remove this pollutant prior to directing excess runoff into the Puyallup River. With no BMPs using prescriptive infiltration, sorption, filtration or sedimentation treatment, potential for effective removal of 6PPDq (soluble) and fine sediment or tire particles containing 6PPD (solid or precipitate) is low. Without appropriate treatment research indicates moderate to high potential for take of listed species near the stormwater outfall, and potential for downstream impacts to other species from bioaccumulation.

Protection of listed species is required under federal and local law, and in relation to current Project site design, this newly identified impact to surface water quality which increases risk to listed salmonids in the river adjacent to the Project site may require re-assessment or redesign of stormwater management facilities. Protecting listed salmonids in response to the new information about tire chemicals would also be consistent with Pierce County’s Comprehensive Plan policies for using best available science and adaptive management for critical areas (Goal ENV-14, Goal ENV-15, Policy ENV-15.3).

Impacts from this pollutant to surface water quality and related potential for significant impacts to listed salmonids are discussed in more detail in Section 4.2 Surface Water.

Operations Impacts

Vegetation

Following construction of the proposed Project, operation of the warehouse facility on the high terrace is not anticipated to result in new impacts to remaining vegetation communities. The vegetation within the warehouse complex on the high terrace would be limited to landscaping. The only remaining unmanaged plant communities would be those that still persist in the lower elevation, farmed, but otherwise undeveloped floodplain areas. This assertion includes an assumption that farming activities in the lower floodplain would not be expanded in such a way as to clear and farm new areas that currently support mostly native forest and shrub plant communities. However, weeds in the floodplain are expected to expand over time if no direct control mechanisms are proposed. Active noxious weed control, planting native trees and shrubs in the floodplain, and restoration planting of native species in previously farmed areas can be used to minimize this impact.

The already constructed stormwater outfall structure in the northern floodplain is expected to require periodic repair and maintenance over time, which may result in clearing or replanting vegetation in and around the outfall structure. This work is expected to be carried out under requirements of the mitigation plan permit, as would be reviewed and approved by the appropriate regulatory agencies.

However, there is no current plan from the Project for assessment, repair, or replanting to address existing current conditions, including loss of planted habitat mitigation vegetation surrounding and outside of the outfall structure, and including loss of bioengineering vegetation within the outfall structure, and erosion and loss of the riverbank at the outside edge of the outfall. Without this work to correct deficiencies in the outfall structure (as described in the NHC and SCJ, February 2023, Viking Warehouse Facility Stormwater Outfall Deficiencies Report), future impacts to the outfall from a significant increase in future stormwater volumes from the new Project warehouse complex may result in significant impacts from loss of vegetation, erosion, and bank failure.

Impacts to Wetland Habitat

The proposed infiltration facilities must be specifically designed to send adequate volumes of infiltrated stormwater from the outer edge of the high terrace toward the floodplain wetlands. If these infiltration facilities do not provide enough hydrology during the rainy season (winter and spring months), a loss of wetland area in the floodplain (Wetlands A, B, and C); and degradation of wetland-associated plant communities in the floodplain is expected. No detailed information has been provided regarding the expected volume flows from the infiltration trenches, and most of the proposed trench locations are not upslope from the targeted wetlands. Therefore, hydrology from the trenches may not be enough to reach or support the intended target wetlands.

Furthermore, the proposed locations for the infiltration trenches have not been assessed by a geotechnical specialist. The proposed infiltration facilities are sited at the outer edge of the high terrace, at the top of a steep slope, an area that meets the definition of a landslide hazard area, per PCC Chapter 18E.80 Landslide Hazard Area (i.e., areas that may be subject to mass movement). Potential hazard areas include slopes greater than 20 percent and relief greater than 20 feet, or slopes greater than 40 percent and relief greater than 15 feet, or sloped areas with soft or liquifiable soils, and others. The standard buffer from top of slope is defined by a combination of slope steepness and height. The standard setback is the greater of these two—50 feet from top of slope or a setback distance of on-third the height of the slope measured from the top of slope, or as recommended by the geologist to ensure safe operations. The setback may be increased if there is considered to be an increased risk downslope from stormwater drainage impacts. The proposed trench locations do not appear to meet the setback requirements described above.

In relation to not yet permitted fill impacts at Wetland D, there is no current description of the required mitigation sequencing assessment and no mitigation plan that would describe what is proposed to compensate for fill at Wetland D. Without this information, a similar degradation of wetland functions and values in the remaining off-site portions of Wetland D is expected. The impacts would result from changes in wetland and buffer area, and changes to hydrology timing, volume, and duration (hydroperiod).

As described in more detail in Section 4.2 (Surface Water), hydrology related impacts to wetland vegetation communities might be mitigated by building properly designed and located infiltration facilities, which would direct water to these wetlands in timing, volumes, and duration patterns similar to the current hydroperiod pattern. The current proposal does not provide this assurance. Under the current proposal, significant impacts to vegetation and associated animal habitats in and abutting the floodplain wetlands (A, B, and C) and at Wetland D are anticipated when the warehouse facility is operational.

These impacts are not consistent with requirements of PCC Chapter 18E – Critical Area Regulations, nor with guidance in the Pierce County Shoreline Master Plan, which requires that a project is designed to "*ensure that shoreline development is established and managed in a manner that protects existing ecological functions and ecosystem-wide process and that mitigates adverse impacts to ecological functions*."

Terrestrial Wildlife

There are no listed or sensitive terrestrial species likely to be found in the study area. Only aquatic species in the study area are listed.

The Project could result in long-term disturbance to wildlife habitat on the floodplain and along the Puyallup River as a result of noise, light and glare, and stormwater runoff. Because there is minimal if any wildlife habitat on the actively farmed upper terrace, most habitat impacts at the Project site are expected to be to the floodplain areas and steep terrace slope faces rather than on the upper terrace.

Operational noise, light and glare and the increase of human activity could result in wildlife avoidance, disruption of species' social structures, avoidance, or abandonment of previously occupied habitat in floodplain areas. Operational noise may result in species avoidance of the adjacent floodplain and riparian area due to the introduction of new noises associated with Project operations. However, these impacts are expected to be limited to common wildlife species and are not expected to affect any listed terrestrial species (gray wolf, marbled murrelet, streaked horned lark, and yellow-billed cuckoo), as they are not known to occur in the Project area. Therefore, no significant impacts to listed wildlife species would be expected.

Appendix A: Setting in the Parks, Recreation and Open Space (PROS) plan (Chapter 10 of the City of Puyallup Comprehensive Plan) provides a description of various habitats and species that occur within the City. Most of these animals are tolerant of urban impacts as long as habitat and migration corridors remain undisturbed. But migratory songbirds are considered less tolerant of urban development impacts and related noise.

Common small mammals in wooded areas include chipmunks, rabbits, marmots, skunks, and raccoons. Larger mammals include black-tailed deer, coyote, and occasional bears, bobcats, and cougars. Bird species include crows, jays, nuthatches, woodpeckers, sparrows, winter wrens, ruffled grouse, blue grouse, quail, band-tailed pigeon, turtle dove, pheasant, partridge, Merriam's turkey, owls, hawks, Osprey, and eagles.

Wetlands and agricultural areas within the Project study area have been mapped as waterfowl concentration areas by the WDFW. Habitat changes on the farmed upper terrace would occur as a result of removal of existing undeveloped or agricultural lands, which would eliminate marginal forage and habitat previously available for birds and small mammals common throughout the Project area. Operation of the facility could result in the decrease in wildlife habitat, and common species use of existing habitat could change. However, because there are no listed terrestrial species, and only common urban wildlife species already considered to be tolerant of urban impacts are expected to occupy the site, no significant impacts to these species are expected.

Discussion related to potential aquatic habitat impacts is provided in the section below.

Sensitive Plant and Animal Species

As previously described, federally listed species documented as occurring in the Puyallup River adjacent to the Project site include the coastal–Puget Sound bull trout (*threatened*), Puget Sound ESU chinook salmon (*threatened)*, Puget Sound DPS Winter Steelhead (*threatened*) and Puget Sound DPS coho salmon (species of concern). The Puyallup River is a primary migration corridor for these species and other salmonids, and both forage and potential floodplain refugia are available within the Puyallup River and some of its associated floodplains.

Four additional, but currently unlisted priority fish species are described in WDFW databases as occurring within the Project study area. These species include pink salmon, fall chum salmon, cutthroat trout, and sockeye salmon.

The WDFW database indicates that spring-run chinook salmon and sockeye salmon (federally listed) do not pass the PROJECT site, but instead migrate up the White River, about 0.5 mile downstream of the Project site at the confluence with the Puyallup River. In addition to the above species being documented as using the Project reach during migration, the WDFW SalmonScape database indicates that pink salmon have been documented as spawning within the reach adjacent to the Project site, and both Fall chinook and coho have been documented as using the same reach for rearing habitat.

Recent research (not yet addressed in current stormwater manuals) indicates that exposure to very small concentrations of oxidized tire degradants in stormwater can cause injury and acute mortality in salmonids (Chow et al. 2019; Tian et al. 2020, 2021; French et al. in prep.; Ecology (D), June 2022, and Ecology (E), October 2022). Project-related increased impervious surfaces and increased traffic are expected to result in greater concentrations of the 6PPD toxins in new volumes of stormwater runoff. Runoff volumes from all paved areas and from some roof areas are currently proposed to be sent to the river. The plan indicates that the stormwater will receive “enhanced” rather than “basic” treatment, both of which have a specific definition in the manual. Basic treatment is allowed for outfalls to the Puyallup River, but both basic and enhanced treatment protocols still allow storm volumes in excess of the 6-month, 24-hour storm to overflow directly to the river with no treatment. This is allowed in the current Stormwater manual for the Puyallup, a river that is considered to have high volume flows year-round and thus is assumed to be less susceptible to pollution impacts from stormwater inflows.

According to WSU scientists (Dr. J. McIntyre, personal communication, 2020; Tian et al. 2019), treatment to reduce or remove these tire degradants from stormwater runoff is most likely to be accomplished by either infiltration through an organic rich sand media or by directing runoff across a broad, shallow grass-lined swale of a specific length. Work to define adequate treatment methods is ongoing. Without specific stormwater treatment design to address this newly defined pollutant, there is potential for impacts from inadequately treated runoff to harm or kill resident or migratory listed fish species at or near the outfall, as well as potential impacts to downstream areas from bioaccumulation.

State and local stormwater permit general requirements require the applicant to control surface water runoff and minimize the potential for damage from uncontrolled runoff, including impacts to listed species. However, the recommended BMPs in the stormwater manual in combination with the fact that direct outfall is allowed in the Puyallup River may not be sufficient to reduce impacts from 6PPD.

Adding new volumes of storm water runoff to the River from new paved surfaces in the Project complex that would contain the 6PPD pollutant would increase current levels of the pollutant in the river. Cumulative impacts from direct outfalls to rivers and streams throughout the Puget Sound over time has already resulted in many documented mortality events. This recently discovered pollutant has been identified as the most toxic and causes salmon to die at very low concentrations (less than 1 micron/liter). It was previously unidentified, and thus could not be effectively treated. This incremental increase in 6PPD over time from direct inflows to the Puyallup River may cause a significant impact to the fishery resource and result in take of listed species.

PCC Critical Areas Regulations require that mitigation for alterations to habitat areas must achieve *equivalent or greater* biological functions and must address adverse impacts upstream and downstream of the development site.

Federal law precludes “take” of listed species, and new research documents that mortal effects to salmonids occur from very low concentrations of the 6PPD pollutant. Therefore, without stormwater management revisions designed to treat and reduce this pollutant of concern, potential for “take of listed species” is high, due to mortal impacts from introducing new volumes of this pollutant to the Puyallup River at the proposed outfall location. This potential unmitigated impact to listed species is considered significant.

Alternative 1 – Rail Transport

Construction Impacts

Construction of Alternative 1 would result in similar construction impacts as the proposed Project. Except for a small area between the Project site and Meeker Southern railroad, and construction of the track extensions from the BNSF mainline/Meeker Southern interchange, most of the ground disturbance for construction of the rail line would occur within the same construction footprint as the proposed Project; therefore, the impacts would be similar to those described for construction of the proposed Project.

Operations Impacts

Alternative 1, which involves using rail rather than roads in some of the warehouse complex area, is unlikely to have a different operational impact on vegetation and wildlife—including sensitive or listed aquatic species—than the Proposed Project. Despite the possibility that train noise may be more concentrated, and thus louder near tracked areas, overall noise levels in the floodplain, most being at a distance from the primary train track (assumed to run along the western Project edge) would be similar, and it is assumed that the general approach to stormwater management would remain the same. There would be a slight decrease in the total number of trucks on site—suggesting that the level of tire oxidant pollutant would be decreased—but the trip reduction is not significant enough, based on the information in Section 4.9 Transportation, to change the analysis regarding 6PPD impacts. Therefore, Alternative 1 is likely to result in similar impacts to plants and animals, including the listed salmonids in the Puyallup River.

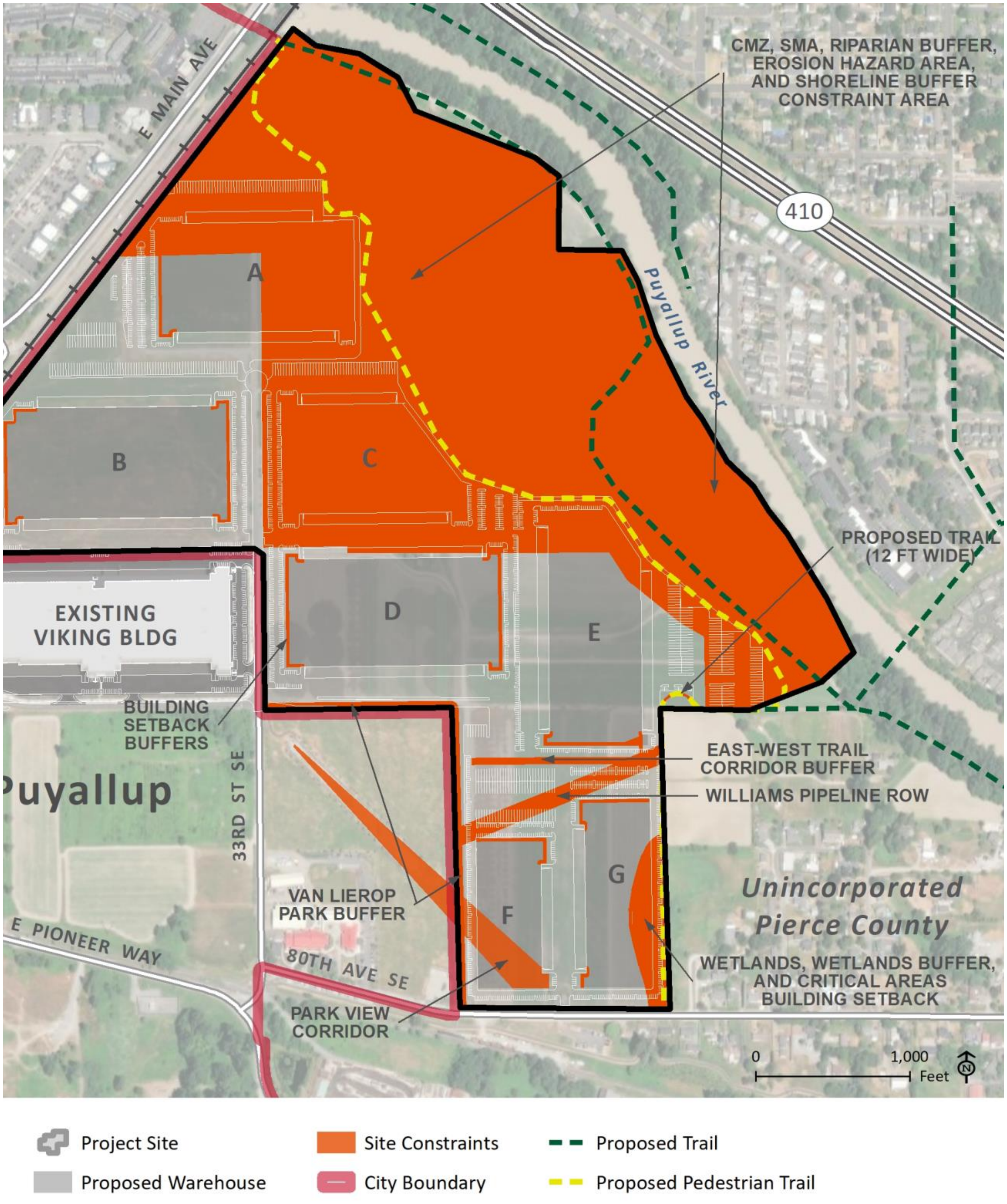
Alternative 2 – Reduced Intensity Alternative

Under WAC 197-11-440(4)(5), an EIS is directed to analyze reasonable alternatives, which "*shall include actions that could feasibly attain or approximate a proposal's objectives, but at a lower environmental cost or decreased level of environmental degradation*."

As such, Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility, as outlined in Section 3 Project Description, were adopted by the Applicant (Figure 4-40). Under Alterative 2, the total footprint of the facility would be reduced from about 2.6 million SF to about 1.7 million SF (about 35 percent footprint reduction). The following mitigation measures to reduce intensity would be applied:

- All warehouses would include a minimum 15-foot-wide landscape bed to be provided along the entire length of blank wall facades of buildings.
- Warehouses would not be constructed on lands designated Rural Buffer Residential (RBR) in the city Comprehensive Plan. The RBR designation reflects development restrictions associated with the shoreline buffer constraint area, the riparian buffer adjacent to the Puyallup River, and the erosion hazard area. This would eliminate Warehouse C and would reduce the footprint of Warehouses A and E.
- Warehouse F would be reduced in size to avoid blocking the prime view corridor from Van Lierop Park.

- Warehouse G would be reduced to avoid fill impacts to on-site portions of Wetland D and its on-site buffer, in accordance with Pierce County Code 18E.40.050.



*See Figure 4-55 for the
Van Lierop Park Concept Plan

Figure 4-40. Alternative 2 – Reduced Intensity Alternative

Construction Impacts

Construction of Alternative 2 would result in similar impacts during construction as the proposed Project. During construction phases, Alternative 2 would result in fewer construction vehicle trips due to the reduced Project size and footprint of the facility. During grading and filing phases, up to 1,270 total construction vehicle trips (or up to 215 trips per day) would be expected. During utilities installation work, up to 100 total construction vehicle trips (or up to four trips per day) would be expected. During warehouse construction (which includes building and paving roads and parking areas), up to 1,560 construction vehicle trips (or up to 40 trips per day) would be expected.

Due to Alternative 2's reduced footprint, temporary and permanent impacts analogous to the proposed Project would occur, but at a smaller scale and farther from some of the environmentally sensitive areas on site. Fill impacts at Wetland D and its on-site buffer would not occur, and potential landslide hazard areas near the top of slope at the eastern edge of the high terrace would not be developed.

However, Alternative 2 does not change the current proposal to redirect most site runoff to the Puyallup River, and therefore, does not address the need to correct erosion related failures at the outfall structure, which are affecting riverine habitat. Alternative 2 does not address the need to protect listed species in the River from new impacts of 6PPD, which would result from introduction of new runoff volumes from newly paved areas being directed to the river, and it does not specifically address the need to maintain current hydrology sources for the on-site wetland habitats during construction phases. Additionally, no description of actions would be needed to control infestation by weedy species in the undeveloped areas between the edge of the high terrace and the new warehouse area boundary. Mitigation actions that may be applied to reduce these impacts on plants and animal habitat during Construction phases are described in the Mitigation Measures (Section 4.4.5) below.

Mitigation actions for other impacts associated with a smaller construction footprint were identified and described in other sections of this EIS (Section 4.1 Earth Resources, mitigation measures ER-1 through ER-10; Section 4.5 Land Use mitigation, measures LU-2 through LU-4; Section 4.6 Recreation, mitigation measures REC-2 through REC-3; Section 4.7 Aesthetics, mitigation measure AES-1; Section 4.10 Health and Safety, mitigation measures HS-1 through HS-5; and Section 4.13 Noise, mitigation measures N-1 and N-2).

Operations Impacts

The Operations impacts associated with Alternative 2 would be similar but slightly less than those described for the proposed Project, due to the smaller Project area footprint. The number of daily vehicle trips generated by the Project warehouse complex under Operational phases for Alternative 2 would be reduced by about 21 percent and the overall impervious surface cover on the high terrace would be decreased by about 33 percent, as compared to the proposed Project.

Under the proposed Project, there would be a maximum of 8,724 daily net vehicle trips (Project Traffic Impact Analysis). In comparison, Alternative 2 would generate 998 daily heavy-duty vehicle trips and 4,846 passenger car/light-duty truck (i.e., delivery van) trips, a total of 5,844 trips per day. Alternative 2 would also require up to 1,000 employees/day during operations (i.e., 1000 trips/day from commuting employees). In sum, Alternative 2 would result in a daily traffic volume decrease of about 21 percent.

As a result of the Alternative 2 reduced impacts approach, there would be a reduction in total impervious surface and a decrease in the number of daily traffic trips, but the general approach to stormwater management would remain the same; therefore, the impacts to water quality and impacts to listed species at the river remain the same. Thus, under Alternative 2, the current levels of 6PPD in the river would still increase relative to current background conditions in the river due to new inputs from new paved surfaces, and on-site wetland habitats are still expected to become smaller or disappear entirely due to a decrease in infiltration and associated groundwater hydrology volumes. These are both are considered significant impacts. Mitigation actions that may be applied to reduce these impacts to plants and animal habitat during long-term Operational phases are described in Mitigation Measures (Section 4.3.5).

4.4.5 Mitigation Measures

This section summarizes Project impacts on plants and animals under the current proposal and describes mitigation measures that could be implemented to avoid or minimize impacts both during Construction phases and during full Operational phases after construction is complete. Prior to initiation of construction, the proponent is expected to obtain the necessary federal, state and local permits and to prepare the appropriate plans that are required to protect plants and animals, which at this location would be substantially the same as described in Section 4.2 Surface Water, including but not limited to an NPDES Construction Stormwater General permit, a SPCC Plan, a construction SWPPP, and a federal 404/401 permit. The proponent would be expected to comply with the conditions of approval under any permit issued.

Construction and Operational Impacts

Impacts on plants and animal habitat during the Construction phases would be from initial clearing, grading, and filling; installation of utilities (trenching and installation or conduit and pipe); stormwater runoff; and work associated with construction and paving of parking lots, roads, and warehouses.

Impacts during the Operational phases would primarily result from methods used to manage stormwater runoff, and from traffic both on and off site. Operational impacts specific to the not-yet-defined businesses that would operate out of the warehouses are not addressed in this EIS.

During construction, direct impacts on plants and animals could occur from release of pollutants from construction equipment—gas, diesel and/or oil spills, and from grading and clearing activities—which would gradually reduce infiltration across the upper terrace, affecting hydrology sources supporting floodplain wetland habitats. As impervious surface increases over the course of construction—pavement and buildings—potential for greater volumes of runoff containing 6PPD pollutants flowing into the Puyallup River also increases.

During Operations, the most significant continued impact to plants and animals would be from the significant increase in runoff volumes and an associated increase in 6PPD pollutants in the new runoff being sent to the Puyallup River. The increased runoff volumes may further destabilize the existing outfall structure, affecting bank stability and sending eroded materials into the river, and may continue to cause habitat planting area failures in the Puyallup River riparian buffer. Other impacts may include a decrease in Wetlands A, B, and C acreage over time due to loss of hydrology sources; a direct loss of

1 acre of wetlands and its buffers at Wetland D ,and impacts to remaining off-site portions of Wetland D water quantity and quality.

As currently proposed, the Project stormwater management plan would decrease seasonal stormwater infiltration across the upper terrace which may result in a decrease in floodplain wetland habitats, an increase in erosion potential and sediment movement at the edge of the river, and an increase in polluted runoff from upland paved surfaces. This would impact the Puyallup River and floodplain habitats during both Construction and Operational phases. Mitigation options that may help to avoid or minimize impacts during construction and operations are discussed below. Some of the mitigation options are substantially similar to mitigations described in Section 4.2 Surface Water, but in this chapter are instead focused on mitigating for impacts to plant communities and animal habitats (P&A).

P&A-1. Clearing and grading work causing spread and colonization of noxious weeds.

Pre-emptive control of problem weedy species is consistent with Pierce County Comprehensive Plan Policy ENV-2 for protecting native vegetation in public and private development.

- Proper implementation of key BMPs would minimize the potential for these impacts, such as:
  - Hydro-mulching and direct seeding of bare ground as soon as possible after clearing and grading would control erosion while also minimizing expansion of invasive species.
  - Pre-emptive targeted clearing and appropriate annual use of herbicides to remove and control high-risk species (such as Japanese Knotweed, Scotch broom and Himalayan blackberry) in and around construction areas, would greatly reduce the risk of spreading.
- Develop a native planting plan and weed control plan for any vacated farmland area, both on the floodplain and on the upper and middle terraces.

P&A-2. Evaluate riverine and floodplain habitat conditions in and around the outfall.

The outfall is located in the floodplain and riverine buffer zone at the edge of the Puyallup River at the northern end of the site. The accepted 2018 Talasea mitigation plan (TDMP 2018) proposed habitat plantings in the area surrounding the outfall. The 150-foot riverine buffer zone in that area was previously impacted by farming activities, but also included some naturally vegetated riverbank areas.

No annual monitoring work was carried out and no annual reports (per PCC 18E.40.070 – Appendix E Monitoring Requirement) were provided until December 2022. To cover this gap in information, the EIS team carried out field assessment of the outfall and surrounding mitigation planting area, and identified problems caused by scour and erosion from repeated river flooding and stormwater discharge from the upland areas (Viking warehouse and pavement).

Significant future increases from new Project stormwater discharge to the outfall would most likely exacerbate the existing scour and erosion problems and would increase direct outfall volumes of runoff to the river. Increased future flows would increase current scour and erosion impacts to fish and wildlife habitats associated with the riverine ecosystem and with the replanted riparian areas around the outfall structure. Corrective mitigation action is needed to redesign, replant, and repair the outfall and mitigation planting areas prior to sending new Project flows from the Project site through the outfall.

- The area within and surrounding an outfall structure is not an appropriate location for a habitat mitigation planting area, because a managed stormwater control structure would require regular access and vegetation removal/maintenance actions and thus would not effectively replace the lost forested riverine buffer habitat with a comparable or better condition buffer habitat.
  - Update the existing TDMP 2018 mitigation plan to consider designing and installing a new habitat mitigation planting site away from the stormwater outfall location, such as increasing the forested buffer width upstream of the outfall structure within the vegetated riparian buffer for the Puyallup River, to replace lost floodplain and riverine buffer habitat functions more effectively and sustainably long-term.
- The Project engineer should provide a separate outfall structural engineering monitoring plan specific to the outfall structure design intent and should provide key Performance Standards that will be applied during monitoring to determine if the structure is performing within its intended limits and to differentiate from the TDMP 2018 habitat planting plan goals.
  - The outfall structure condition and continued function should be evaluated and monitored annually by a qualified, independent engineer, to ensure that the outfall structure, floodplain, and river bank habitat areas do not degrade over time.
- If the updated TDMP habitat mitigation plan leaves the mitigation planting site in the same location (surrounding the outfall structure), the plan should clearly describe and address:
  - How to address expected habitat vegetation impacts from annual flooding, sediment deposition, and bank erosion, and should clearly describe how bank failure at the edge of the outfall structure will be mitigated to avoid new erosion and sediment impacts to the riverine ecosystem habitats and riverine buffer habitat functions.
  - A need for monitoring stormwater runoff quality (first flush and during standard storms) to document levels of 6PPD and other new pollutants introduced by new Project pavement runoff that may affect listed species in the river.
    - A Contingency Plan is needed in the updated TDMP describing how impacts to listed species would be minimized if monitoring reveals 6PPD in new runoff volumes.
  - Develop new performance standards designed to document:
    - How new mitigation plantings will thrive within the range of expected annual scour and sediment deposition events;
    - When changes to habitat vegetation cover or survival indicate failure of the TDMP habitat replacement plan; and
    - New performance standards that define clear levels of effective control and reduced cover by invasive weedy species in and around the outfall structure.
  - Remove all assessments of outfall **structural** issues from the updated TDMP (habitat mitigation plan) and concentrate on describing the habitat mitigation plan design intent, how to measure success of key habitat features.

    - Technical monitoring of the structure and function of the engineered outfall structure should be carried out by a licensed professional engineer or hydrogeologist, not by wetland or habitat specialists.
  - To ensure that the intended riverine forested buffer habitat replacement functions are well-established in the highly variable floodplain ecosystem before the end of the monitoring period, the updated TDMP time period should be increased from 3 years to 5 years following the necessary replanting of the buffer habitat areas.
  - Take other corrective actions as needed to meet TDMP Performance Standards over time and to be consistent with the Pierce County Comprehensive Plan policies listed in Section 4.4.2.

P&A-3. Re-evaluate current stormwater management strategy.

The current proposal is to send all runoff from on-site parking lots, roads, and three warehouse roofs to the river, and to send runoff from four roofs to infiltration trenches sited at the top of the terrace slope to the east. If instead, all parking lot and roads runoff were infiltrated using BMPs designed to remove the 6PPD pollutant (and other pollutants) from the runoff (as described in research by WSU scientists, Ecology, and others), the potential for significant water quality and water quantity impacts affecting listed salmon species in the river described above could be reduced.

- Re-evaluate the current stormwater management strategy and consider broadly applying LID infiltration practices to treat all parking lot and road runoff prior to directing to the river. These mitigation actions would be consistent with protection of listed species required under federal and local law, and also with Pierce County's Comprehensive Plan policies listed in Section 4.4.2, particularly those policies and goals that require application of best available science and adaptive management for critical areas, using LID practices to maintain water quality for fish, and eliminating harm to water quality from stormwater discharges through use of on-site infiltration and other means (Goal ENV-14, Goal ENV-15, Policy ENV-15.3, Policy ENV-5.14, Policy U-32.2). This should include:
  - Making design changes to significantly reduce or eliminate new flows to the outfall structure at the north end of the site, to ensure that existing stormwater systems on site are designed to protect existing plant and animal habitat functions as needed to meet Pierce County Critical Area Regulations requirements.
  - Apply mitigation strategies in accordance with storm water regulations and effective BMPs identified by recent research related to 6PPD tire chemical impacts on listed salmonids.
  - Apply other LID treatment options (discussed above and in Section 4.2.3) where shown to effectively address the 6PPD water quality impact on fisheries resources.
  - Reduce impervious surfaces on site and apply LID techniques as needed to maintain the floodplain wetland hydrology sources -- to support current ground water storage and transmission functions and to maintain current hydrology volumes flowing to Wetlands A, B and C wetland habitats.

P&A-4. Wetlands A, B, C and D Habitat and Hydroperiod Protection

The groundwater source for hydrology supporting Wetlands A, B, C, and D is likely to decrease as a direct result of increase in impervious surface on the high terrace—paving and buildings. The proposed stormwater management system would divert most site runoff directly to the river and would disrupt groundwater inputs by paving and developing most of the high terrace surface area; additionally, there is not currently enough information about the wetland hydroperiod to design an effective and successful wetland hydrology support strategy. Without an active plan to maintain the current wetland hydroperiod (i.e., hydrology volumes and hydrology timing) throughout both construction and operations phases, current habitat functions at Wetlands A, B, C, and D are expected to shrink or disappear over time. Mitigation Measure P&A-3 would reduce potential for changes to the wetland hydroperiods:

- The location and design of the proposed infiltration trenches must be evaluated by an appropriately qualified and experienced professional engineer or hydrogeologist, and a technical report describing the results and mitigation options is needed.
  - The steep, sandy slopes below the proposed trench locations must be able to withstand hydraulic loading pressures to ensure that the slopes will not fail as a result of the added water at top of slope. Failure could impact floodplain habitats at the toe slopes but could also affect stability of immediately adjacent upland infrastructure and warehouses. Other infiltration facility designs or locations may be needed to protect high terrace warehouse complex infrastructure as well as wetland habitat.
  - Carry out infiltration testing in proposed infiltration areas, to determine potential volume and flow rates during winter months when stormwater is available and soils are fully charged.
  - Redesign or relocate infiltration facilities as needed to ensure maintenance of adequate hydrology to Wetlands A, B, C and D during long-term operations.
- The hydroperiod of the on-site wetlands has not been monitored or documented. This information is critical to properly design and locate infiltration facilities and other design features intended to provide wetland hydrology to on-site wetland wildlife habitats in appropriate volumes at the right times of year, as required under Pierce County stormwater regulations and critical area regulations (as described previously).
  - The Applicant should conduct groundwater and surface water monitoring prior to final site design as needed to define the hydroperiod for on-site wetlands (A, B, C, and D), and use the resulting information to put plans in place for maintaining future wetland hydroperiods during both construction and operation.
  - A hydroperiod assessment report is needed to define the timing and volumes of hydrology needed to sustain the wetlands, including a mitigation plan describing how potential impacts to Wetland A, B, C and D hydroperiods will be mitigated.

  - The Applicant should finalize site design and construction plans after hydroperiod monitoring is complete as needed to allow for revisions to the stormwater management plan.
  - Pre-design wetland hydroperiod monitoring should take place over at least one wet season.
  - Long-term monitoring wells in wetland areas should be installed to document during construction and operations that hydrology timing and volumes are adequate to maintain historic wetland conditions, as required under both stormwater regulations and critical area regulations (as described previously).

P&A-5. Wetland D Habitat Protection (more details provided in Section 4.2 Surface Water, Mitigation SW-7)

- An updated Wetland D report was prepared by the EIS team, describing a larger wetland area that extends onto the Project site, and which also includes a wetland buffer.
- Because Wetland D is larger than what was previously evaluated by Pierce County, a new critical area assessment addressing consistency with mitigation sequencing requirements should be conducted with County staff to determine if the proposed site development plan, which would result in partial filling of Wetland D, complies with mitigation sequencing requirements set forth in PCC 18E.30.050. This would ensure that the Applicant has properly followed standard avoidance and site planning design as needed to avoid or minimize loss of approximately one acre of wetland plus its associated on-site buffer at Wetland D.

  - County staff should consider that avoiding fill impacts at Wetland D and its on-site buffer appears to still allow for reasonable economic use of the Project site.
  - County staff should also consider that other mitigation issues discussed in the EIS indicate environmental impacts (e.g., land use, recreation, aesthetics) that may also indicate a need for site redesign in the area of Wetland D to avoid other significant impacts.

- If the County (the permitting agency) determines that appropriate avoidance and minimization mitigation sequencing has been followed, and thus allows Wetland D and its buffer to be filled -- a new state and county permit review process addressing fill impacts to Wetland D and its on-site buffers would be needed prior to construction. The updated TDMP will be expanded to document the mitigation sequencing process and the planned fill impacts at Wetland D. The updated TDMP will also describe the additional mitigation that will be carried out to compensate for loss of on-site portions of Wetland D and its buffer.

  - Off-site impacts from filling (sediment movement and hydroperiod impacts) and translocation of water storage volumes must be taken into account in the updated TDMP.
  - To meet general requirements of County and federal regulations, related to mitigation timing, at least initial stages of implementation of the TDMP should typically be completed prior to final permitting and site design approval.

4.4.6 Significant Unavoidable Adverse Impacts

Under the current proposal, there are unavoidable significant impacts to plants and animals on and adjacent to the Project site, related to proposed filling at Wetland D, stormwater management impacts on water quality at the outfall related to erosion, sediment, and new volumes of 6PPD laden stormwater runoff to the river, and changes to plant communities in the on-site wetlands, floodplains, and riparian buffer areas.

4.5 Land and Shoreline Use

This section provides an analysis of potential impacts on land and shoreline use.

4.5.1 Study Area

The study area for land and shoreline use includes the Project site and the 34 parcels immediately adjacent to the Project site. This study area was selected because the properties abutting the Project site would have the greatest potential to be impacted by the change of land use on the Project site.

4.5.2 Relevant Plans, Policies, and Regulations

This section summarizes state and local regulations related to land or shoreline use that are applicable to the Project. There are no known federal regulations on land or shoreline use applicable to the Project.

The proposed Project is located in unincorporated Pierce County within the City of Puyallup's UGA, a Potential Annexation Area identified as such in both the County and the City's Comprehensive Plans. The proposed site development plan was submitted to Pierce County on for review under Pierce County Code (PCC). Future development will be reviewed for compliance with PCC development regulations until such time as the City of Puyallup annexes the area.

Relevant state and local policies and regulations related to land and shoreline use are summarized in Table 4-20.

Table 4-20. Applicable Regulations and Policies for Land and Shoreline Use

Law and Regulation	Description
State	
State Environmental Policy Act (Chapter 43.21C RCW)	SEPA helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the SEPA review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels. SEPA requires that land and shoreline use, recreation, and aesthetic environmental components be addressed.
Washington State Growth Management Act (GMA) (Chapter 36.70A RCW)	Under the GMA (RCW 36.70A), regions, counties, and large cities must create and regularly update comprehensive plans to identify where growth would occur and to plan for housing, transportation, water, sewer, and other necessary facilities. Both the County and the City are required to plan for growth under the GMA by preparing and periodically updating countywide planning policies that coordinate planning between the county and the cities. Pierce County's strategy for growth, transportation and economic development are captured in the GMA-mandatory multicounty planning policy (MPP) document produced by the Puget Sound Regional Council (PSRC) Vision 2050 (October 2020). Vision 2050 contains information and policies that Pierce County Regional Council (PCRC) uses to guide the Pierce County Countywide Planning Policies. Both Vision 2050 and the Countywide Planning Policies apply to the Project site. The PCRC includes a body of elected officials set up to coordinate growth management planning efforts county-wide. The City of Puyallup is identified as a Core City, a regional geography within Vision 2050

Law and Regulation	Description
	that refers to a city that contains one or more regionally designated centers and is connected to the high-capacity transit network (Vision 2050). **Vision 2050 Multicounty Planning Policies (MPP)** MPP-DP-28: Support joint planning between cities, counties, and service providers to work cooperatively in planning for urban unincorporated areas to ensure an orderly transition to city governance, including efforts such as: (a) establishing urban development standards, (b) addressing service and infrastructure financing, and (c) transferring permitting authority.
Washington State Shoreline Management Act (SMA; Chapter 90.58 RCW)	The SMA provides for the management of water bodies or watercourses identified as "shorelines of the state." Areas under jurisdiction of the SMA include all marine waters along the Pacific Ocean and Puget Sound; streams and rivers with an annual mean flow of more than 20 cubic feet per second, lakes greater than 20 acres in size, shorelines adjacent to these water bodies (typically within 200 feet of the water body) and associated wetlands. Comprehensive shoreline master programs are tailored to the local jurisdiction, containing maps and legal descriptions of the delineated streams, rivers, lakes, shorelines, and wetlands.
Local – Pierce County	
Pierce County Comprehensive Plan (Title 19A PCC)	The Pierce County Comprehensive Plan (Pierce County 2021d) is a policy document that guides growth and future land-use decisions in the County. The County's Comprehensive Plan was developed to address growth over a 20-year period. The most recent GMA update to the County's Comprehensive Plan was adopted on June 30, 2015, and became effective on June 30, 2016, with the latest amendments effective October 1, 2021. Table 4-22 includes applicable Pierce County Comprehensive Plan goals and policies pertaining to the Project. Community plans within the Pierce County Comprehensive Plan provide more detailed policies for the specific geographic area. The Project site is located within the Alderton-McMillin community plan area. Goals and policies and a consistency analysis of the Alderton-McMillin Community Plan that relate to the Project are included in Table 4-22. The County is currently reviewing and updating the comprehensive plan to ensure consistency with GMA with a new 20-year planning horizon (2024–2044).
Pierce County Code (PCC)	The PCC (Pierce County 2021a) contains the regulatory, penal, and administrative laws that apply to the County. The PCC was passed through Ordinance 2022-43 on July 19, 2022, and is the primary tool for implementing the goals and policies contained in the Pierce County Comprehensive Plan. The Pierce County Zoning Code (Title 18A Development Regulations – Zoning; Title 18C Development Regulations – Storm Drainage and Site Development; Title 18D Development Regulations – Environmental; Title 18E Development Regulations Critical Areas; Title 18F Development Regulations- Land Divisions and Boundary Changes; Title 18J Design Standards and Guidelines; Title 18S Development Policies and Regulation D) regulates the implementation of growth and development of the City, consistent with the Comprehensive Plan, using methods such as establishing zoning districts and standards for specific land uses.
Pierce County Shoreline Master Program (Title 18S PCC)	The County SMP (Pierce County 2018b) guides the development of the shorelines in the County. The most recent Pierce County SMP was adopted in 2015 and updated in 2018. It includes policies for uses and conservation of

Law and Regulation	Description
	ecological functions of the identified shorelines, including the Puyallup River. Specific policies relating to the Project are included in Table 4-22. The County's SMP incorporates by reference Title 18E Critical Area regulations (except Chapter 18.70 Flood Hazard Areas)
Local – City of Puyallup	
City of Puyallup Comprehensive Plan (CPCP)	The CPCP (City of Puyallup 2015a) is the long-term vision and plan for managing the built and natural environment in the City and within its UGAs. It includes policy direction for community development, housing, economic development, environmentally sensitive areas, public services, annexation, and related issues. The CPCP was developed under the provisions of the GMA (WAC 365-196) and was initially adopted in September 1994 (Pierce County 2021d). Table 4-22 includes applicable CPCP goals and policies pertaining to the Project.
City of Puyallup Municipal Code (PMC)	The PMC (City of Puyallup 2021d) contains the regulatory, penal, and administrative laws for the City. The PMC is the primary tool for implementing the goals and policies contained in the City of Puyallup Comprehensive Plan. Chapter 20 PMC regulates the implementation of growth and development of the City, consistent with the City of Puyallup Comprehensive Plan, using methods such as establishing zoning districts and standards for specific land uses. The PMC was passed through Ordinance 3258 on September 27, 2022. Per the PMC, and as shown in the City's Zoning Map (2023), the Project is within the boundaries of the City's UGA. A UGA is a geographic area established by a comprehensive plan, and its purpose is to designate areas within which urban growth is encouraged and outside of which growth can only occur if it is not urban in nature (RCW 36.70A.110). The City's land use goals and policies should be consistent with the County's Countywide Planning Policies, specifically pertaining to UGAs (City of Puyallup 2020a).
City of Puyallup Shoreline Master Program	The City SMP (City of Puyallup 2023) guides the development of the shorelines in the City. The most recent City SMP was adopted in December 2022 and includes policies for uses and conservation of ecological functions of the identified shorelines. Specific policies relating to the Project are included in Table 4-22. Within the City, shorelines of the state are designated into three types of environments: Puyallup River – Urban Conservancy, Clarks Creek – Urban Conservancy, and Clarks Creek – Natural. These shoreline environment designations provide a systematic, rational, and equitable basis to guide and regulate development within specific shoreline areas. The designations apply to areas of the shoreline that have similar ecological conditions and similar land uses or potential development patterns. (City of Puyallup 2023).

Source: HDR 2023

Current, planned, and proposed zoning in the Project site is presented in Table 4-21. Uses allowed in these zones are discussed below in Zoning.

Table 4-21. Existing, Future, and Proposed Project Site Zoning by Acre

Site	Zoning	Acres
Existing (Pierce County)	Employment Center	184.17[a]
EIS - No Action Alterative (Pre-Annexation: Pierce County Comprehensive Plan Land Use - Alderton-McMillin Community Plan)	Employment Center (same as proposed Project)	184.17
EIS - No Action Alternative (Post-Annexation: City of Puyallup Comprehensive Plan Land Use)	Light Manufacturing/Warehousing (LM/W)[b]	38.26
	Business/Industrial Parks (BPI)[b]	58.98
	Auto Oriented Commercial (AOC)[b]	28.16
	Rural Buffer Residential (RBR)[a, b]	58.78
Proposed Project (Pierce County)	Employment Center	184.17
Alternative 1 (Pierce County)	Employment Center (same as proposed Project)	184.17
Alternative 2 (Pierce County)	Employment Center (same as proposed Project)	184.17

Source: Comprehensive Plan data from City of Puyallup and Pierce County GIS portals.

[a] The total is less than 188 acres as there are approximately 4 acres of public transportation ROW within the Project site.

[b] Each of the City of Puyallup designations in this column represents Future Land Use map designations from the CPCP. Various zoning designations could apply upon annexation; no pre-annexation zoning map has yet been developed or adopted by the City.

The County and City have different future land use designations for the Project site; therefore, Table 4-21 shows two potential zoning acreage scenarios for the No Action Alternative: one pre-annexation and one post-annexation. Currently, Pierce County has permitting authority over the site development plans, and its zoning applies to the Project. The City's zoning designations are not currently applicable but its future land use designations and Comp Plan apply as the project area is located in the City's UGA. Upon annexation, the City would assume jurisdiction, and its land use (zoning) regulations would go into effect. State, regional, County, and City policy guidance calls for coordination in planning for annexation areas. The jurisdiction in control at the time of completed and submitted land use application will be the applicable authority. As such, both current and future land uses are being evaluated.

4.5.3 Affected Environment

The Project is in the UGA of the City of Puyallup in unincorporated Pierce County. The 188-acre Project site is situated east of Shaw Road East and East Main Avenue, north of East Pioneer Avenue and 88th Street East, and west of the Puyallup River within Sections 25 and 26, Township 20N, Range 4E in the Willamette Meridian baseline. The Project site includes lands that are currently used as farmed agricultural lands and associated single-family residences and is intersected by a 75-foot-wide, high-pressure natural gas transmission pipeline (Williams Northwest Pipeline) easement and an existing stormwater outfall.

This section summarizes the environmental setting related to land use and zoning within the study area.

Land Use

Pierce County

The Project site is within the boundaries of the Alderton-McMillin Community Plan, adopted as part of the Pierce County Code, which describes the dominant land use pattern as resource-based agriculture, forestry, fishing, and mining. A small portion (351 acres) of the community plan area is classified as EC in the Urban zoning designation in the Alderton-McMillin Community Plan (Pierce County 2007).

Figure 4-41 presents Future Land Use Map (FLUM) designations identified in the Pierce County Comprehensive Plan (Pierce County 2019a). FLUM designations on property adjacent to the Project site include Moderate Density Single Family Residential to the southeast and Parks and Recreation to the south. Existing land uses within the Project site boundary include farmed agricultural lands, associated single-family residences, and the Williams Pipeline that transects Parcels #0420253703 and #0420253702. Current uses (unincorporated Pierce County) adjacent to the site include the East Puyallup Foothills Trailhead to the south, Puyallup River to the north and east, and single-family residences to the east and south/southeast.

Land Use is the way the parcel is used; for example: residential, commercial, retail, or industrial, depending on the specific community or environmental context. Comprehensive plans determine the future distribution of land uses around the spaces available in the planning jurisdiction.

City of Puyallup

The study area is located within the valley of a developed commercial, light manufacturing, single-family and multifamily residential area, intermixed with active agriculture activities, adjacent to the Puyallup River, which meanders along the eastern boundary of the Project site.

Figure 4-42 presents the Future Land Use Map (FLUM) designations identified in the CPCP (City of Puyallup 2019a). Puyallup FLUM designations of the parcels within the Project site boundary include Light Manufacturing/Warehousing, Rural Buffer Residential, and Auto-Oriented Commercial. Existing land uses adjacent to the Project site consist of a rail corridor, Limited Manufacturing, Agriculture, Recreation and Open Space Zone (ARO), Shaw-Pioneer Mixed Use (CMX), and Public Facilities (PF). Currently, the Limited Manufacturing parcel is being used as warehouse and distribution (Viking/Life Science Logistics facility), and the Public Facilities parcel is a public park and open space (Van Lierop Park). The ARO parcel is owned and operated by a non-profit (Step-by-Step), and the CMX zoned parcels in the area are generally vacant or being used as active agriculture uses.

City of Puyallup – Agricultural set asides

In 2004, Pierce County tried to preserve agricultural resource lands as required by GMA and Countywide Planning Policies during the 2004 Pierce County Comp Plan amendment process. At that time, the County proposed removal of 22 parcels (186 acres) from the City's UGA in the Shaw/Pioneer vicinity, including portions of the project site area. The County also proposed to change the County zoning from EC and MSF to Rural Ten and an agricultural resource designation, Agricultural Resource Lands (ARL). The new ARL designation would have restricted use allowances far more significantly than the existing

EC zoning. This proposal stemmed from the County's required 10-year GMA update and compliance with the preservation of agricultural resource lands as required through GMA and the County CPPs.

This led to discussions with City, County and landowners. This lead to a verbal agreement with Pierce County that guided the City Council to adopt Resolution No. 1903 in November, 2004; resolution required adoption of an approach to planning the area that would set aside at least 160 acres of land for farmland. In 2008, the County staff further documented the importance of agricultural set asides for the area where the project site is located, indicating conclusively that “Pierce County would not accept the preservation of less than 160 acres of agricultural lands. (Cardwell, 2008).” The County also outlined that preservation of ag lands in the area of the project site could be reviewed by the Boundary Review Board and would be consistent with RCW 36.93.180 (9) (“Protection of agricultural and rural lands which are designated for long term productive agricultural and resource use by a comprehensive plan adopted by the county legislative authority”).

As discussed, the City has designated large areas of the project site as Rural Buffer Residential, mostly as a result of cooperation with County planning efforts and policy objectives under GMA. The zoning implementing RBR includes a zone district known as Agriculture, Recreation and Open Space (ARO). While formal pre-annexation zoning does not apply to the project site areas, the ARO zone designation criteria would support its application in this area. The City’s Comprehensive Plan FLUM was formed around planning efforts with Pierce County to accomodate the County’s stated priorities to preserve prime agricultural land from conversion to other intensive uses.

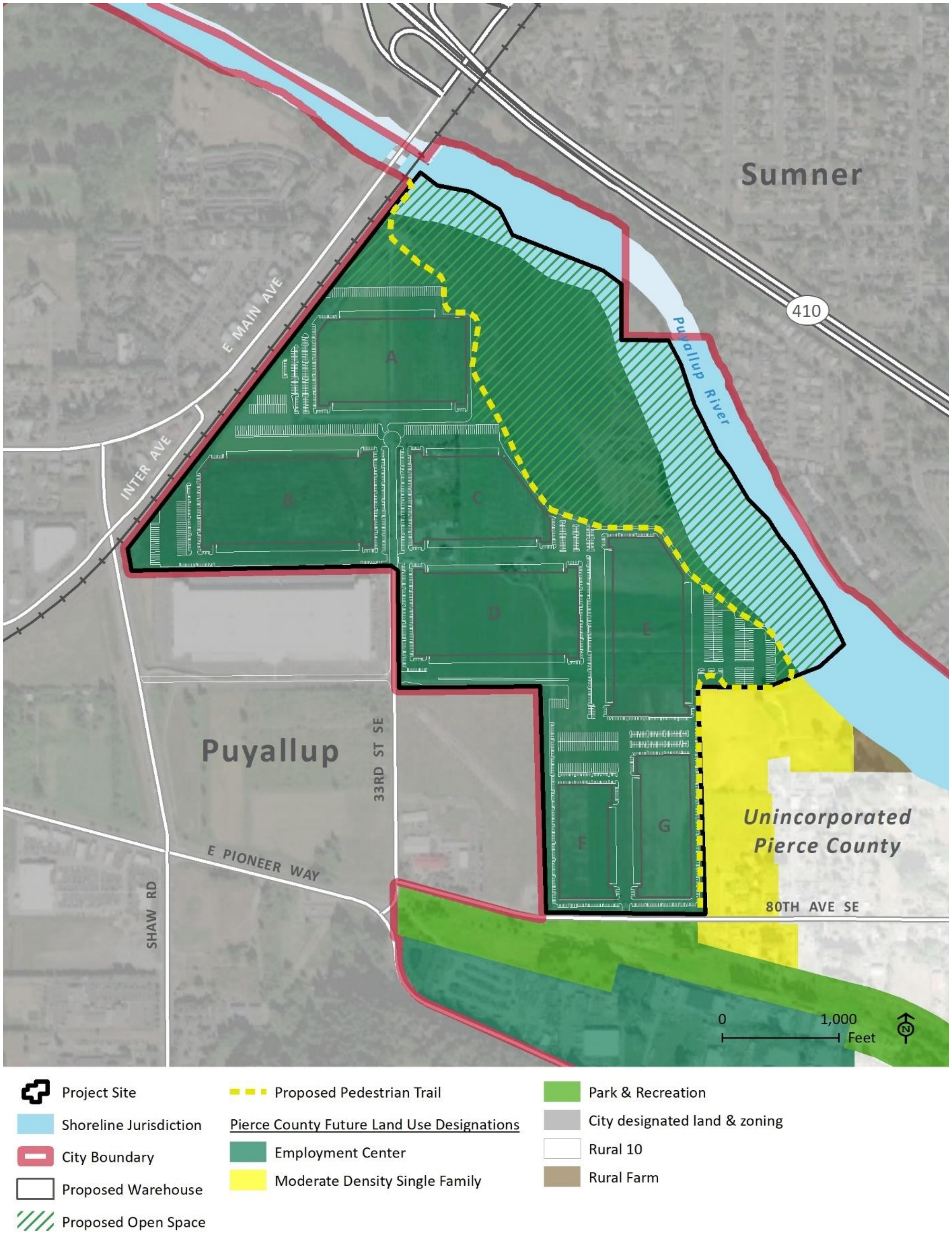


Figure 4-41. Future Land Use Designations (Pierce County Comprehensive Future Land Use Map)

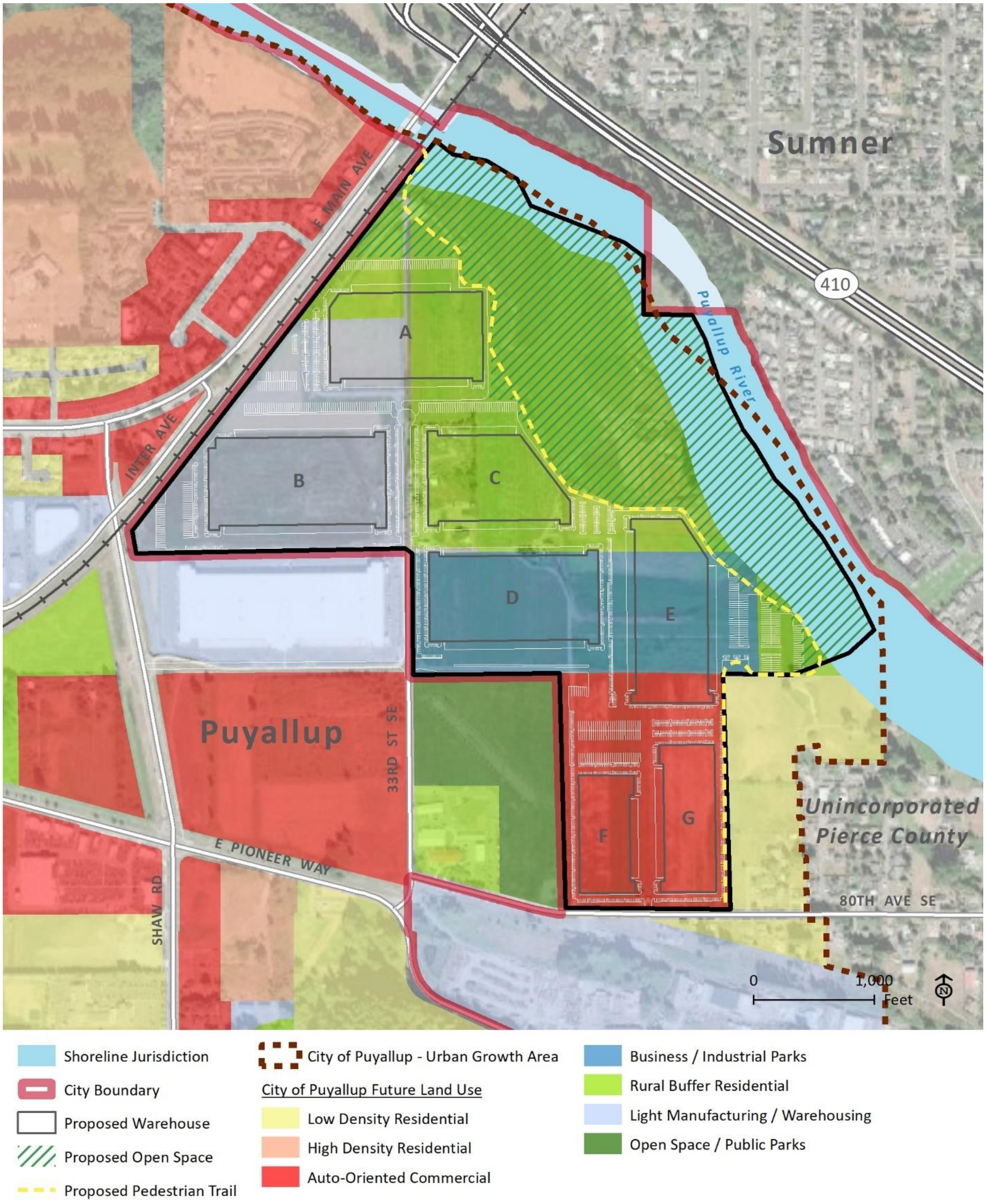


Figure 4-42. Future Land Use Designations (City of Puyallup Comprehensive Land Use Maps)

Pierce County Zoning

Zoning is the process by which a county or a municipality legally controls the use of property and physical configuration of development upon tracts of land within its jurisdiction. Zoning is an exercise of police power, and as such must be enacted for the protection of public health, safety, and welfare (Title 18.25.030 PCC)

Figure 4-43 presents the current zoning districts within the County. These data identify current as well as proposed zoning and land use designations that are adopted by ordinances for unincorporated Pierce County. The Project site has an Urban Zone classification of Employment Center (EC). Per the PCC, an EC is a concentration of low- to high-intensity office parks, manufacturing, and other industrial development, or a combination of activities. The EC zone may also include commercial development as a part of the center if the commercial development is incidental to the employment activities of the center and supports and serves the needs of the workforce (Title 18A.10.080 PCC). Under the EC zone, the Project would be identified in the Industrial Use Category. The Industrial Use Category is described as "*the on-site production, processing, storage, movement, servicing, or repair of goods and materials*" (Title 18A.33.280 PCC).

According to the Alderton-McMillin Community Plan Urban Zone Classifications in Table 18A.18.010 in the EC zone, the Industrial Use Category includes the following types of land uses: basic manufacturing, contractor yards, food and related products, industrial services and repairs, intermediate manufacturing and intermediate/final assembly, off-site hazardous waste treatment and storage facilities, recycling collection and processing facilities, salvage yards/vehicle storage, and warehousing distribution and freight movement. The following are descriptions of use categories based on Title 18A.33.280(A)-(I) PCC and if that use is a permitted use or requires a conditional use permit pursuant to the Alderton-McMillin Community Plan (PCC Table 18.18.010):

- **Basic Manufacturing** (Permitted Use)**:** Uses that involve the primary processing of a raw or initially processed material into a product that requires additional processing, manufacture, or assembly in order to become a consumer good.
- **Contractor Yards** (Permitted Use)**:** An area for construction or contracting business offices, interior or outdoor storage, repair, or maintenance of heavy equipment, vehicles, or construction supplies and materials.
- **Food and Related Products** (Permitted Use)**:** Uses that involve the processing of non-animal food materials, raw milk, ice manufacturing, and other food products manufacturing, processing, storage, and packaging.
- **Industrial Services and Repair** (Permitted Use)**:** Refers to businesses that support industrial and commercial uses by repairing equipment or vehicles; fuel, gas, and oil storage and distribution; bio-tech or high-tech research and laboratories; and/or providing other services integral to the functioning of the industrial or commercial use.
- **Intermediate Manufacturing and Intermediate/Final Assembly** (Permitted Use)**:** Refers to uses that involve intermediate processing of semi-processed material into a consumer good and to uses that involve the assembly of semi-processed and/or intermediate processed products into a consumer good.

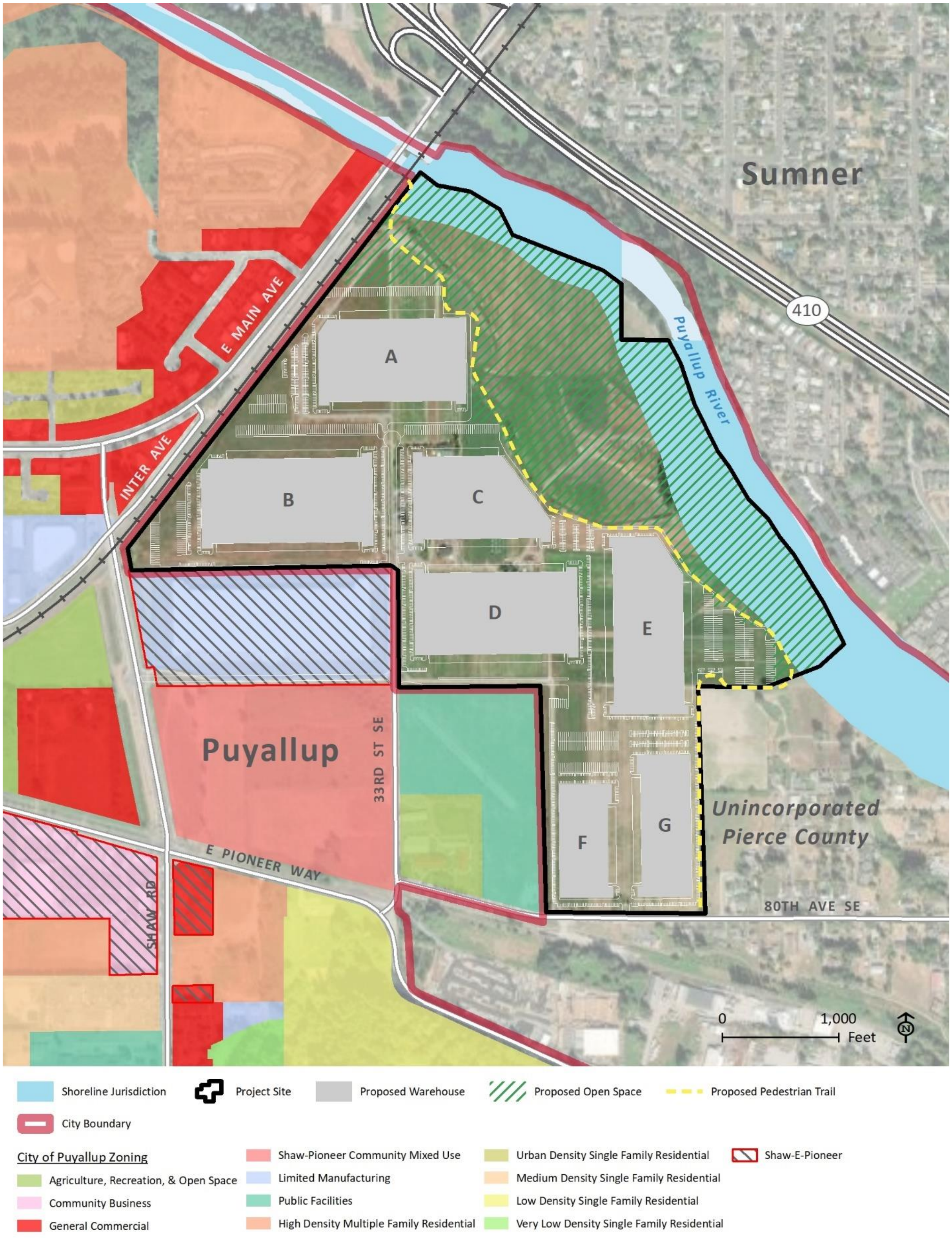


Figure 4-43. Current Zoning Districts within the City of Puyallup

- **Off-Site Hazardous Waste Treatment and Storage Facilities** (Requires a Conditional Use Permit)**:** Facilities that treat and store hazardous waste generated off-site and are authorized pursuant to RCW 70.105. All contiguous land and structures used for recycling, reusing, reclaiming, transferring, storing, or treating hazardous wastes are included. The Project Site's location within a volcanic hazard area does not allow for this type of use. See additional discussion in Section 4.1 Earth Resources and Section 4.10 Health and Safety.
- **Recycling Collection and Processing Facilities** (Permitted Use)**:** Commercial and industrial activities that specialize in accepting, buying, collecting, storing, or processing recyclable materials, excluding activities that fall under the following specific use types: "Organic Waste Processing Facilities," "Waste Disposal Facilities," or "Waste Transfer Facilities."
- **Salvage Yards/Vehicle Storage** (Permitted Use)**:** Uses that involve the salvage of wrecked vehicles, vehicle parts, and appliances; and the storage of vehicles.
- **Warehousing, Distribution and Freight Movement** (Level 1-3 Permitted Uses; Level 4 Requires a Conditional Use Permit)**:** The large-scale warehousing and distribution of manufactured or processed products for one or more businesses; the large-scale distribution of raw, manufactured, or processed products for one or more businesses at a central location; and the central dispatch and servicing of a delivery truck fleet, where no reloading (transfer facility), warehousing, or consolidation of materials takes place on site. PCC Table 18A.33.280-3 provides a description of levels for this use type.

In the EC zone, structures of up to 60 feet in height are permitted (Title 18A.15.040-3 PCC). Building height is defined as "*the height of a building is the vertical distance from the average elevation of the finished grade on each wall of a building to the top of a flat or shed roof, or the deck level on a mansard roof, and the average distance between the bottom of the eaves to the highest point of a pitched, hipped, gambrel, or gable roof*" (Title 18A.15.040(A)(3)) PCC and minimum setbacks of 35 feet front-arterial and 15 feet front-non arterial (Title 18A.15.040.B PCC).

City of Puyallup – adjacent zoning

Figure 4-42 depicts the City of Puyallup's Comprehensive Plan Future Land Use Map designations for land within the City limits and its UGA. Figure 4-43 provides the City's zoning designation for land located within the City limits in the vicinity of the Project site. Puyallup zoning designations adjacent to the Project site include Limited Manufacturing (ML), Shaw-East Pioneer overlay (ML-SPO) zoning on parcel #0420268013 (Viking Warehouse site), and Public Facilities (PF) zoning on parcel #0420253069 and parcel #0420253068 (Van Lierop Park site). As discussed, the City does not have adopted pre-annexation zoning designations on the parcels located within the Project site. City zoning designations of land in the UGA will be determined at the time of annexation.

Zoning Overlays are a regulatory tool that jurisdictions use to create a special zoning district, placed over existing base zoning. An overlay district generally identifies special provisions in addition to those in the underlying base zone, which may regulate or incentivize a specific type of development or resource pattern.

The intent of the ML-SPO designation is to encourage quality development within a framework of neighborhood consistency while still allowing flexibility and creativity; provide streetscape standards that create a walkable, safe, pedestrian-friendly community; and encourage the use of LID principles, techniques, and practices (Chapter 20.46.005 PMC). As an overlay zone, it establishes standards to supplement base zoning standards (City of Puyallup 2020a). The underlying ML zone regulations that govern uses apply to properties in the ML-SPO overlay zone, with the following additional use standards:

- Outdoor storage uses such as equipment, material, junk, scrap, or vehicle storage areas shall be allowed only if such areas are thoroughly obscured from off-site vantage points, which have the same, similar, or lower elevations than the storage area, by locating such storage area behind street-facing buildings or other structures including walls or vegetation with sufficient growth.
- Outdoor storage uses shall be partially obscured from off-site vantage points, which have higher elevations than such storage areas, by on-site structures or vegetation with sufficient growth.
- Any building area containing loading docks, or parking or impound areas used for equipment or vehicle storage, shall be considered outdoor storage uses for purposes of this section (Chapter 20.46.016 PMC).

The PF designation is for public facilities and applies only to lands owned by governmental agencies for public use or benefit. The City recognizes that public agencies, in attempting to serve the public, have unique needs that cannot be adequately addressed through standard zoning regulations, yet adjacent property owners should be aware of the potential use of neighboring public lands and have assurance of minimum performance standards (City of Puyallup 2020a).

Shorelines

Pierce County

The portion of the Project site that is within the County's shoreline jurisdiction is designated as the Conservancy Shoreline Environment (Conservancy SED) associated with the Puyallup River. The purpose of the Conservancy SED is to conserve and manage existing natural resources and valuable historic and cultural areas while providing recreational benefits to the public and achieving sustained resource utilization and maintenance of floodplain processes (Title 18S.20.040 PCC) (Pierce County 2021d). Commercial and industrial development should be limited to water-oriented commercial and industrial development in instances where those uses have been located in the past, or at unique sites that possess shoreline conditions and services necessary to support the development (County SMP 18S.20.040(B)(7)). Table 4-20 includes applicable County SMP criteria pertaining to the Project; Section 4.2 Surface Water discusses the shoreline as it relates to this chapter.

City of Puyallup

The portion of the Project site that is within the shoreline jurisdiction is designated as the Puyallup River Urban Conservancy Shoreline Environment. The purpose of the Puyallup River Urban Conservancy designation is to protect and restore ecological functions of open space, floodplains, and other sensitive lands along the Puyallup River where they exist in urban and developed settings. This designation allows for a variety of compatible urban uses, including appropriate flood hazard prevention measures, public access, and recreational uses (City of Puyallup 2023). Commercial and industrial developments are allowed uses in the Puyallup River Urban Conservancy designation (City SMP 6(F)(5)(b)), subject to applicable policies, regulations, and permitting procedures of the City SMP and underlying zoning code requirements. No new or expanded building or structure more than 35 feet in height that would obstruct the view of a substantial number of residences is permitted on areas adjoining such shorelines (City SMP Chapter 4 Shoreline Public Access Plan (3.2)(IV)). Table 4-20 includes applicable City SMP criteria pertaining to the Project. Note that the Project is currently in the County jurisdiction and only the County's shoreline designation applies. Post-annexation, the City of Puyallup's shoreline designation would apply.

4.5.4 Impacts

This section describes the potential for environmental impacts related to land use as a result of Project implementation. It describes the thresholds used to determine whether an impact would be significant, as well as measures to mitigate potentially significant impacts, where appropriate.

Methodology

The land use analysis evaluates the Project's potential to result in land use conflicts and/or plan and policy inconsistencies that would consequently be considered land use impacts. If the Project is determined to be inconsistent with the intent of the County's or City's Comprehensive Plan, applicable zoning codes, or other local plans identified, an impact would occur.

This section establishes an evaluation of consistency with the specific applicable goals and policies of both the County and City's adopted Comprehensive Plans and SMPs, the City and County's PROS Plans, and the County's Alderton-McMillin Community Plan; see Table 4-20.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, the Project would not occur. The site would still be a subject of potential annexation, and collaboration between the City and County in planning for this area would still need to occur. The No Action Alternative would be inconsistent with the intent of the County's FLUM and zoning (Employment Center (EC)); however, the No Action Alternative would be more consistent with the Alderton/McMillian neighborhood plan goals for preservation of existing character and the County's Comprehensive Plan objectives to preserve prime farmland. If the Project did not occur, other opportunities for job-generating development on the site remain in the form of agricultural employment. There is a potential for inconsistency with both the City and County's Comprehensive Plan policies that require planning for economic and employment growth. The CPCP designates large areas of the Project site area as set aside for ARO, but some future land use map areas designate this area for business park, industrial, and commercial development.

Proposed Project

Construction Impacts

Significant with Mitigation. Construction would be conducted in accordance with applicable policies and regulations of agencies with jurisdiction or discretionary authority over one or more of the Project components. The Project site includes prime farmland, currently used as farmed agricultural lands and associated single-family residences. During construction, these agricultural uses and residences would be removed. Construction of the Project would result in temporary environmental impacts within the Project site, as identified and addressed in sections of this EIS (Section 4.1 Earth Resources, mitigation measures ER-1 through ER-10; Section 4.5 Land and Shoreline Use, mitigation measures LU-1 through LU-4; Section 4.6 Aesthetics, mitigation measure AES-1; Section 4.7 Recreation, mitigation measures REC-1 through REC-3; Section 4.10 Health and Safety, mitigation measures HS-1 through HS-5; and Section 4.13 Noise, mitigation measures N-1 and N-2).

Operations Impacts

Mitigated Significant Impact. The County currently has jurisdiction over the Project site; however, the City's future land use designations and Comprehensive Plan policies for the Project site are also relevant given that the area is within the City's UGA in a Potential Annexation Area recognized by both the City and County.

The Project is inconsistent with development regulations including critical areas (Title 18E). Currently, there is no approved mitigation plan addressing Wetland D impacts, and any fill at Wetland D as currently proposed would result in a net loss of wetland and buffer area during construction phases. This is a significant impact and is in conflict with no-net loss policies at federal, state, and local levels. Protection of listed species is required under federal and local law and in relation to current Project site design. Stormwater flow and treatment and source control BMPs designed to reduce impacts from the tire oxidant pollutant are currently not implemented in the proposed stormwater management plan. Without appropriate treatment, research indicates moderate to high potential for take of listed species near the stormwater outfall and potential for downstream impacts to other species from bioaccumulation. This would be inconsistent with Pierce County's Comprehensive Plan policies for using best available science and adaptive management for critical areas (Goal ENV-14, Goal ENV-15, Policy ENV-15.3). See Section 4.4 Plants and Animals for a discussion of impacts to wetlands and listed species.

The Project is consistent with County zoning and future land use designations, but the Project is inconsistent with the City's future land use designations. As such, development of the Project as planned could result in nonconforming uses post-annexation that create challenges for the City in implementing the long-range vision outlined in its Comprehensive Plan. Regional, County, and City policies call for interjurisdictional collaboration in planning for annexation areas and future needs (Vision 2050 MPP-DP-28, Pierce County Countywide Planning Policies UGA 4.3, Pierce County Comprehensive Plan LU-4 and LU-4.2.6, and City of Puyallup Goal LU-8).

Table 4-22 provides an evaluation of the Project's consistency with the goals and policies of both the County's and City's adopted Comprehensive Plans, SMPs, PROS Plans, and the Pierce County Alderton-McMillin Community Plan. Table 4-22 also provides a consistency analysis of goals and policies related to the City's UGA, regional growth, and employment center development in the County, or similar, that are contained in applicable plans and regulations. The corresponding statement identifies whether the Project is consistent, inconsistent, or inconclusive with the goal or policy.

As provided in Table 4-22, the evaluation indicates that the Project would be inconsistent with County policies around intensity of the site's use; compatibility with surrounding uses, critical areas, and utility and street capacity (Pierce County Comprehensive Plan Policies LU-44.6, LU-46.1, LU-46.2, LU-47.4, LU-47.9, LU-47.11); the Project's interference with connecting the surrounding community (Pierce County Comprehensive Plan Goal PR-10, Policy PR-17.1); preservation of prime farmland and community character (AM D-1); and absence of a proposal to include restoration of shoreline ecological functions as part of industrial development (Pierce County SMP Policy B-1).

Table 4-22. Project Consistency with Applicable Plans and Regulations

Plan	Goal/Policy	Consistency Determination
Pierce County Comprehensive Plan	**Environmental Element**	
	GOAL ENV-8. Maintain and protect habitat conservation areas for fish and wildlife.	**Inconsistent.** In addition to potential for erosion and sediment impacts to the Puyallup River from the existing outfall structure, increased runoff volumes from paved surfaces within the new warehouse complex may have significant impacts to listed and sensitive salmonids in the Puyallup River. Stormwater flow and treatment and source control BMPs designed to reduce impacts from the tire oxidant pollutant are currently not implemented in the proposed stormwater management plan.
	Policy ENV-8.4. Emphasize the importance of healthy riparian corridors.	**Inconsistent.** There is no current plan from the Project for assessment, repair or replanting to address existing current conditions, including loss of planted habitat mitigation vegetation surrounding and outside of the outfall structure, and including loss of bioengineering vegetation within the outfall structure, and erosion and loss of the riverbank at the outside edge of the outfall. Without this work to correct deficiencies in the outfall structure (as described in the NHC and SCJ, February 2023, Viking Warehouse Facility Stormwater Outfall Deficiencies Report), future impacts to the outfall from a significant increase in future stormwater volumes from the new Project warehouse complex may result in significant impacts from loss of vegetation, erosion and bank failure.
	ENV-8.7. Encourage landowners to maintain and enhance habitat areas.	**Inconclusive.** There is no current plan from the Project that identifies maintenance or enhancement of habitat areas.
	GOAL ENV-9. Maintain and where necessary improve terrestrial and aquatic ecosystems so that they maintain viable, reproducing populations of plants and animals.	**Inconsistent.** As currently proposed, the Project stormwater management plan would decrease seasonal stormwater infiltration across the upper terrace which may result in a decrease in floodplain wetland habitats, an increase in erosion potential and sediment movement at the edge of the river, and an increase in polluted runoff from upland paved surfaces. This would impact the Puyallup River and floodplain habitats during both Construction and Operational phases.

Plan	Goal/Policy	Consistency Determination
	GOAL ENV-15. Recognize the value of adaptive management for providing flexibility in administering critical area and shoreline regulations.	**Inconsistent.** As currently proposed, the Project does not include adaptive management for critical areas. Mitigation Measure P&A-3 and SW-2 recommend re-evaluating the current stormwater management strategy for the Project and potentially use LID infiltration.
	Policy ENV-15.2. Prioritize post-project compliance monitoring.	**Consistent.** Mitigation Measure SW-5 proposes long-term groundwater monitoring during operations to document the success of proposed hydrology support.
	Policy ENV-15.5. Require that regulated activities occur with avoidance of impacts as the highest priority and apply lower priority measures only when higher priority measures are determined to be infeasible or inapplicable (see Table 7-A).	**Consistent.** Mitigation Measure SW-4 proposes groundwater and surface water monitoring prior to final Project site design and permitting to define the hydroperiod for on-site wetlands (A, B, C, and D), and use the resulting information to put plans in place for providing adequate wetland hydrology during both construction and operation phases. Mitigation Measure SW-6 outlines the steps for Wetland D impacts avoidance.
Pierce County Comprehensive Plan	**Land Use Element – Employment Center (EC) Section**	
	Policy LU-4.2.6. Ensure that the County’s land use designations and associated development regulations are consistent with a city or town’s land use plans within its respective Potential Annexation Areas.	**Inconsistent.** If the land is developed under the County's jurisdiction, it would be inconsistent with the long-range planning of the City and would impact local control of how the City's planning goals can be implemented. The County under CPPs has an obligation to coordinate with cities regarding development within their UGA/Potential Annexation Area (PAA). The County is required to work with local jurisdictions on how land within UGA/PAA are zoned, what the allowed uses are, and development.
	Goal LU-44. Designate industrial areas. Policy LU-44.2. Adjacent to or in proximity to land designated EC.	**Consistent.** Per uses allowed within the Pierce County Zoning Code for areas designated as “Employment Center,” the Project is anticipated to consist of basic manufacturing, contractor yards, food and related products, industrial services and repairs, intermediate manufacturing and intermediate/final assembly, off-site hazardous waste treatment and storage facilities, recycling collection and processing facilities, salvage yards/vehicle storage, and warehousing distribution and freight movement.

Plan	Goal/Policy	Consistency Determination
	Policy LU-44.3. Within proximity to major transportation thoroughfares, including rail.	**Consistent.** The Project is near major transportation thoroughfares of Highways 410, 167, and 512. Additionally, a rail line runs north-east diagonally along the westernmost Project boundary.
	Policy LU-44.5. Near historical employment generating operations.	**Inconsistent.** The Project is within an area of the Alderton-McMillin Community Plan, which is characterized as rural development. The Economic section of the Alderton-McMillin Community Plan does not address the Employment Center designation, but rather focuses on agriculture. Development of the Project proposal would be inconsistent with that Community Plan objective.
	Policy LU-44.6. On properties that are not constrained by significant critical areas such as wetlands, steep slopes or other environmental factors limiting development potential.	**Inconsistent.** The Project is on a property that is constrained by critical areas and other environmental constraints.
	Policy LU-44.7. Characterized by larger parcels, typically averaging more than five acres.	**Consistent.** The Project is proposing up to 2.6 million SF of building area on the approximately 188-acre Knutson Farm property.
	Policy LU-44.9. In a manner which attracts and retains businesses.	**Inconclusive.** The Project would attract business by seeking occupants of the development, once completed. Currently, businesses are not known and so the attraction and retention of businesses cannot be predicted.
	Policy LU-44.10. Geographically dispersed throughout the County to meet the industrial and manufacturing needs of a growing jobs-based economy.	**Consistent.** The Project would be one development that is part of County efforts to meet the industrial and manufacturing needs of the County economy. The final occupancies are currently unknown; the proposal anticipates approximately 1,500 full-time employees.
	Policy LU-44.11 (Designate industrial areas). Only if there is a demonstrated need to provide for more land in the area based on shortages of developable land, and when the expansion is compatible with any applicable community plan.	**Inconsistent.** It has not been demonstrated that there is a need to provide more land based on shortages of developable land. Further, this development would be incompatible with the Alderton-McMillan Community Plan, so even if there is a demonstratable need, this location would be incompatible.
	Goal LU-46. Promote the grouping of uses that will mutually benefit each other or provide needed services.	**Inconclusive.** The Project is anticipated to consist of uses consistent with the restrictive covenant (Industrial Park permitted; high cube fulfillment centers prohibited) and EC

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	Policy LU-46.1. Encourage planned developments of multiple buildings or uses which provide a mixture of low and moderate-intensity industrial, research, office, and supporting commercial uses.	zoning. The final occupancies are currently unknown; therefore, ambiguity of the end user(s) of the site do not allow for a clear determination of consistency with this policy of a mix of user types and/or development intensities.
	Policy LU-46.2. Encourage intensive manufacturing businesses to be clustered in industrial parks along major transportation links to minimize the impact on less intensive surrounding land uses.	**Inconclusive.** The Project is anticipated to consist of uses consistent with the restrictive covenant (Industrial Park permitted; high cube fulfillment centers prohibited) and EC zoning. The final occupancies are currently unknown; therefore, ambiguity of the end user(s) of the site do not allow for a clear determination of consistency with this policy of a mix of user types and/or development intensities.
	Goal LU-47. Provide a diverse range of goods and services to ensure that as the economy changes, employment opportunities are balanced with a wide range of other land uses. Policy LU-47.4. Location and design should facilitate access and circulation by transit, car and van pools, pedestrians, bicyclists, and other alternative transportation modes.	**Inconsistent.** The Project may be able to accommodate transit, car, and van pool access; however, end users of the site may or may not facilitate alternate modes of transport, so a finding of consistency is not possible at this stage. Limited pedestrians and bicyclists access through the construction of an on-site pedestrian trail that connections to the Puyallup Riverwalk regional trails, but does not allow for an east/west trail connection from the Van Lierop Park.
	Policy LU-47.5. Encourage developments to consider visibility and convenient access from major arterials and highways, proximity to environmentally sensitive lands, and the desired character of the industrial area.	**Inconsistent.** The Project would be near Highways 410, 167, and 512 and major arterials, such as Shaw Road, East Main, and East Pioneer Avenue; however, the impacts of the Project would more broadly impact the ease and convenience of access to these transportation corridors and network by the general public. The intensity of the development near environmentally sensitive lands and the visual impacts of the development's characteristics would cause visual impacts on the area, in particular to Van Lierop Park which was established to preserve the view corridor to Mount Rainier.
	Policy LU-47.7. Prohibit new detached single-family residential with limited exceptions.	**Consistent.** The Project does not propose new detached single-family residential and would not interfere with this policy.
	Policy LU-47.8. Development should be required to undergo a formal site plan review process to minimize impacts on neighboring properties.	**Inconclusive.** The policy is consistent in that the County requires site plan design and is required to notify neighbors of the review process, to allow public input and consideration of local impact minimization. Prior to approval for construction, the Project

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		would be subject to design review during the permitting process with Pierce County. According to Pierce County Planning and Land Services, "The design review process is a tool intended to ensure that new development enhances the visual quality and identity of communities and is compatible with the community character. Through design review, builders, developers, business owners, residents, and property owners work with Planning and Public Works (PPW) staff and/or the applicable land use advisory commission (LUAC) to protect identified community values through the application of design principles. (…) principles illustrated in the individual design standards are intended to implement the goals, objectives, and policies of community plans and the Pierce County Comprehensive Plan by encouraging development that is compatible with and complementary to the examples of good design observed within the community(ies) (Title 18J.15.085 PCC)."
	Policy LU-47.9. Encourage master planning for industrial areas, including such features as open space, landscaping, integrated signage, traffic control, and overall management and maintenance through covenants or other property management techniques.	**Inconsistent.** The Project is inconsistent due to the clear lack of master planning of the overall Project, despite the substantial size of the Project site and total building square footage; the Project lacks a coherent plan for open spaces within the development envelope, minimal landscaping set asides, no signage plan presently, traffic impacts that are significant without a clear presentation of controls to adequately mitigate an unknown set of end user(s) and a lack of details regarding overall site management and maintenance approaches to meet this policy.
	Policy LU-47.10. Encourage large, contiguously owned properties to be developed as a unified whole.	**Consistent.** The Project would be developed on contiguously owned parcels as one development.
	Policy LU-47.11. Provide sites with a variety of parcel sizes to accommodate both large and small businesses, and particularly those of sufficient size to permit development of large industrial facilities.	**Inconsistent.** The Project is proposing development of seven warehouses, each varying in size from approximately 190,000 SF to 490,000 SF; the Project application lacks a substantiated set of factors that would allow a clear determination about the end user size as small or large businesses. Given that the Project is a large industrial facility, a lack of clarity on business sizes and the clear policy desire to provide space for small and large businesses on the site, the Project is presently inconsistent.

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Pierce County Comprehensive Plan	**Land Use Element – Employment Center (EC) Section**	
	Goal LU-4: Facilitate the transformation of unincorporated urban areas into cities and towns through annexation. LU-4.2.6: Ensure that the County's land use designations and associated development regulations are consistent with a city or town's land use plans within its respective Potential Annexation Areas	**Inconsistent.** If the land is developed under the County's jurisdiction, it would be inconsistent with the long-range planning of the City (as noted, the development of the City's FLUM was directly a result of the County's efforts to preserve agricultural land on the Project site) and would impact local control of how the City's planning goals can be implemented. The County under CPPs has an obligation to coordinate with cities regarding development within their UGA/PAA. The County is required to be working with local jurisdictions on how land within UGA/PAA are zoned, what the allowed uses are and development.
	Parks and Recreation Element (Note: contains same policies as Pierce County PROS Plan)	
	Policy PR-1.3. Ensure the park system is integrated with and complements other park and recreation service providers in Pierce County.	**Inconsistent.** The Project would disrupt the existing park system that supports region-wide park and recreation opportunities, including within the City of Puyallup and the City of Sumner.
	GOAL PR-5: Develop facilities that exemplify sustainable practices, connect to surrounding neighborhoods, universally accessible, safe, and cost effective to maintain. PR-5.6. Incorporate scenic viewpoints.	**Inconsistent.** The Project proposes construction of Building F, which would interfere with the Van Lierop Park's view corridor of Mount Rainier. Additionally, the viewshed of Mount Rainier from viewer groups to the north of the Project site, including those on the nearby Riverwalk Trail and members of the public using roadways, sidewalks, and surrounding businesses and residents.
	PR-5.7. Buffer facilities from incompatible uses.	**Inconsistent.** The Project is a warehouse development proposal and would be incompatible with neighboring uses. A lack of physical separation and landscape buffer planning on the site plan does not demonstrate buffering the site from lower intensity uses, such as low density residential, agricultural land uses, public parks and trails and other institutional uses in the area. These factors are wholly under-considered and not addressed by the proposed development's adopted PROS plans for the Riverwalk Trail and is adjacent to the proposed intense industrial/ warehouse activity, which could discourage use. Additionally, the Applicant is proposing to vacate public ROWs that would not

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		encourage connection to the area, but rather could introduce a disconnect in and to the Project site.
	Goal PR-10. Provide a connected system of trails that link communities to parks, open spaces, public facilities, and areas of interest and provide nonmotorized transportation and recreation opportunities.	**Inconsistent.** The Project is a development proposal, which includes a pedestrian trail connecting the existing Puyallup River Riverwalk Trail and Foothills Trail. However, the trail would not conform to the Pierce County Parks, Recreation and Open Space Plan (PROS) adopted PROS plans for the Riverwalk Trail and is adjacent to the proposed intense industrial/warehouse activity, which could discourage use. Additionally, the Applicant is proposing to vacate public ROW that would not encourage connection to the area, but rather could introduce a disconnect in and to the Project site.
	GOAL PR-17 Provide and enhance connectivity to important County and regional destinations, between multiple jurisdictions, and to neighboring counties. PR-17.1. Create connections between key community destinations.	**Inconsistent.** The Project is a development proposal, which includes a pedestrian trail connecting the existing Puyallup River Riverwalk Trail and Foothills Trail. However, the trail would not conform to the Pierce County Parks, Recreation and Open Space Plan (PROS) adopted PROS plans for the Riverwalk Trail and is adjacent to the proposed intense industrial/warehouse activity, which could discourage use. Additionally, the Applicant is proposing to vacate public ROWs that would not encourage connection to the area, but rather could introduce a disconnect in and to the Project site.
	GOAL PR-19. Provide public waterfront access through the provision of public piers, swimming beaches, motorized and nonmotorized boat launches, public boat moorage, and water viewpoints.	**Inconsistent.** The Project would not provide public waterfront access. The proposed pedestrian trail is largely through, and on the edges of, the proposed Project and is not visually or physically connected to the shoreline.
	PR-19.3. Provide access to shorelines in a manner that is aesthetically compatible with the adjacent properties and sensitive to ecological function.	**Inconsistent.** The Project is a development proposal that does not include a pedestrian trail in the preferred shoreline location.
	Goal PR-21. Provide a system of open space experiences and corridors to support livable communities, offer relief from the built environment, allow people to connect with nature, and ensure the long-term health of the natural environment and citizens.	**Inconsistent.** The proposed trail would not conform to the Pierce County Parks, Recreation and adopted PROS plans for the Riverwalk Trail and is adjacent to the proposed intense industrial/warehouse activity, which could discourage use and open spaces for people to enjoy.

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	Policy PR-21.3. Provide open space corridors within the City's UGA to protect wildlife corridors, provide open spaces for people to enjoy and to create buffers between communities.	
Pierce County Alderton-McMillin Community Plan	**Land Use Policies**	
	GOAL AM LU-1 Ensure the Alderton-McMillin community remains rural in character over the next 20 years.	**Inconsistent**. The Project is proposing development of seven warehouses, each varying in size from approximately 190,000 SF to 490,000 SF, which is inconsistent with the rural character.
	Policy AM LU-1.2. To maintain and preserve the rural character of the Alderton-McMillin community, the following types of non-agricultural activities are considered incompatible with rural character: Activities that generate constant, ongoing noise (AM LU 1.2.1); Activities that generate large amounts of traffic within a short duration (AM LU-1.2.2); Activities that operate into night hours (AM LU 1.2.4); or activities that require extensive lighting or lighting that spills onto neighboring properties (AM LU-1.2.5).	**Inconsistent**. As proposed, the Project would generate noise, traffic operations at night, modify an area of the community with significant rural qualities, and require extensive lighting.
	Community Design	
	GOAL AM D-1. Promote commercial and industrial development that is visually attractive, and compatible with the residential character and agricultural identity of the community while being respectful to the natural environment. Policy AM D-1.1. Implement low impact development design standards where feasible. Policy AM D-1.2. Locate required vegetation in a manner that provides buffering/screening between industrial and non-industrial lands. Policy AM D-1.3. Outdoor lighting should enhance visibility and security without projecting excessive glare on surrounding property or into the night sky.	**Inconsistent**. The Project would convert the existing 188-acre property, currently either in agricultural use or vacant land to a warehouse development, which is not conducive to rural and agricultural character, and is wholly inconsistent with the Community Plan goals around preservation of agricultural land and rural character. Further, with respect to the natural environment, the Project could result in the spread and colonization of noxious weeks; cause erosion and sediment movement degrading nearby native wetland and riparian vegetation communities in the floodplain.
	Title 18S.40.050 PCC Commercial, Civic and Industrial	

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Pierce County Shoreline Master Program	Policy B-1. Encourage restoration of impaired shoreline ecological functions and processes as part of commercial, civic, and industrial development.	**Inconsistent.** The existing shoreline ecological functions of the portion of the Puyallup River shoreline jurisdiction within which the Project is located is currently impaired. The Project, as proposed, does not include restoration of shoreline ecological functions. Therefore, the Project would interfere with implementation of this policy.
	Policy B-3. Encourage multiple-use concepts such as including open space and recreation in commercial, civic, and industrial development.	**Inconsistent.** The Project would maintain approximately 62 acres of open space on the northern portion of the site and includes some trail recreational aspects; however, the Project does not include an overall multi-use plan that integrates open spaces, recreation or public access to shorelines in a comprehensive or coherent fashion. The open space set aside appears to be only connected to critical area protections and not a comprehensive approach to shoreline open space planning. The Project appears to be entirely disconnected from shoreline planning in this regard and is therefore inconsistent with balancing multiple use concepts.
	Policy B-4. Maximize use of existing ports and other industrial areas prior to expansion or development of new industrial sites.	**Inconsistent.** There is only one other existing warehouse adjacent to the site (Viking warehouse structure, 0.3 mile from the Puyallup River); there are no other similar uses adjacent to the site. The Project's need for newly expanded industrial areas adjacent to and within the Puyallup River shoreline has not been established. .
	SMP Management Polices for the Conservancy SED PCC 8S.20.040B - 3, 6, 7 SMP policies PCC 18S.30.030B. Ecological Protection 5. Plan for the enhancement of impaired ecological functions where feasible and appropriate while accommodating permitted uses and development. As shoreline modifications occur, incorporate all feasible measures to protect ecological shoreline functions and ecosystem-wide processes. 6. Preserve and protect existing trees and native vegetation within shorelines to maintain shoreline ecological functions and	**Inconsistent.** There is no current plan from the Project for assessment, repair or replanting to address existing current conditions, including loss of planted habitat mitigation vegetation surrounding and outside of the outfall structure, and including loss of bioengineering vegetation within the outfall structure, and erosion and loss of the riverbank at the outside edge of the outfall. Without this work to correct deficiencies in the outfall structure (as described in the NHC and SCJ, February 2023, Viking Warehouse Facility Stormwater Outfall Deficiencies Report), future impacts to the outfall from a significant increase in future stormwater volumes from the new Project warehouse complex

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	mitigate the direct, indirect, and cumulative impacts of shoreline development. Where shoreline vegetation is inadequate to protect against the impact of new uses or development, native vegetation should be enhanced. 7. Avoid impacts to shorelines through application of mitigation sequencing, giving highest priority to impact avoidance whenever new uses or development are proposed in shorelines.	may result in significant impacts from loss of vegetation, erosion, and bank failure.
City of Puyallup Comprehensive Plan	**Natural Environment Element**	
	Policy NE-13.2. Design and construct night lighting to minimize excessive glare and to avoid spillover onto nearby properties.	**Inconclusive.** The Applicant has not provided building designs and a conclusion cannot be made at this time. During building permit and design, the Project would be checked for compliance with local building code regulations, including Title 18J.15.085 PCC Exterior Illumination, which requires installation of lighting that would not spill over onto nearby properties, promotes compatibility between land uses by reducing light impacts on users of the site and surrounding areas, and avoids and minimize glares and light trespass beyond the illuminated area.
	Land Use Element	
	Policy LU-2.3. Promote economic development projects which contribute to making Puyallup a major employment center.	**Consistent.** The Project would employ approximately 1,500 employees.
	Policy LU-23.3. Limit the percentage of any business/industrial park development devoted to warehouse uses to encourage relatively high employee generation and high intensity of space utilization	**Inconclusive.** Due to the lack of certainty and specificity regarding end users of the site structures, the ultimate build out of the development could be consistent or inconsistent.
	Goal LU-6. The City shall maintain an urban growth area and develop a strategy for annexation within said area.	**Inconsistent.** The Project would not comply with the City's strategy for annexation areas. The Project is inconsistent with the City's future land use designations and as such development of the Project as planned could result in nonconforming uses post-annexation that create challenges for the City in implementing the long-range vision outlined in its Comprehensive Plan.
	Goal LU-8. Coordinate and cooperate with regional jurisdictions and agencies to meet present day needs and continually plan for the future.	**Inconsistent.** The Project is in the UGA of the City in the unincorporated County and a Potential Annexation area recognized by both the City and County. The Project would be

Plan	Goal/Policy	Consistency Determination
		inconsistent with the City's future land use designations, which would also conflict with interjurisdictional collaboration in planning for annexation areas and future needs.
	LU – 11. Designate rural buffer residential in limited areas in the city, allowing 1 dwelling unit per acre. LU - 11.1. Preserve areas of residential development, which are encumbered by critical areas or unserved by utilities that would facilitate urban levels of development and intended to serve as a permanent buffer at the edges of or within the community. LU - 11.2. Rural buffer residential areas shall be allowed levels of service generally lower than for areas designated for urban uses.	**Inconsistent.** The Project is proposing development of seven warehouses, each varying in size from approximately 190,000 SF to 490,000 SF. The Project would not be consistent with the rural buffer residential designation of the site with development consisting of an intense urban use.
	Goal LU – 21. Provide industrial, business and research centers that promote economic growth, provide living wage jobs and meet the employment growth targets set by Pierce County Planning Policies.	**Inconclusive.** The Project would encompass uses similar to industrial, business, and research centers. Pierce County's adopted employment growth targets includes 9,000 jobs between 2008 and 2030 in Puyallup (Pierce County Ordinance No. 2011-36s). Unincorporated Pierce County is currently in need of fulfilling approximately 16,569 jobs between 2008 and 2030. The Project would contribute to the economic growth and jobs market by adding up to approximately 300 employees for construction of each warehouse and approximately 1,500 employees during operations. However, it is unknown what the wages of employees as the occupation of the warehouses is unknown. The minimum wage in Washington State in 2023 is $15.74 per hour (WA DLI 2022).
	Policy LU-22.3. Buffer industrial areas from single-family residential zones through the use of extensive vegetative buffers or landscaped berms.	**Inconsistent.** The Project includes the construction of seven warehouses, some of which are in the rural buffer residential future land use area. The rural buffer residential area is intended to serve as a permanent buffer (See LU-11.1). While City code requires landscaping and landscape buffers, urban level commercial construction with the RBR overlay is contrary to goals of LU-22.3 and LU-11.

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	Policy LU-22.5. If agricultural lands are converted to industrial uses, they should be phased in a manner that provides high employee generation and visual amenities.	**Inconclusive.** The Project site includes lands currently used for agriculture, with associated single-family residences. During construction, these agricultural lands, residences, and other farming-related structures would be removed. Construction of the Project would employ approximately 300 employees for the 5-year construction period and 1,500 employees during operation, which is approximately 16 percent of Pierce County's adopted employment growth target. The Project would not provide visual amenities as there is a visual impact to Van Lierop Park.
	LU - 23.3. Limit the percentage of any business/industrial park development devoted to warehouse uses to encourage relatively high employee generation and high intensity of space utilization.	**Inconsistent.** The Project would generate approximately 1,500 employees during operations. The Project footprint would be approximately 68 percent of the parcel, but the Project would result in a high intensity of space utilization as it would be 100 percent the same use. The number of employees generated over a 188-acre site is low considering the high-intensity utilization of space.
	LU – 24. Focus most of the City's employment and residential growth within the two Regional Growth Centers (RGCs).	**Inconsistent.** The City has two RGCs, Puyallup Downtown and Puyallup South Hill. The Project is not within either of the City's RGCs.
	Community Character Element	
	Policy CC-1.1. Maintain the identity and character of established residential neighborhoods through appropriate landscaping and site design of new developments and infill projects.	**Inconsistent**. The Project would introduce new facilities into an environment that is characterized by rural development and agricultural uses. As proposed, appropriate landscaping and site design does not maintain the identity and character of the established neighborhoods such as the residential neighborhood on 78th Street E adjacent to the Project site.
	Policy CC-1.3. Create a sensitive interface between residential and non-residential areas through various measures such as setbacks, screening, vegetative buffering and shielded lighting.	**Inconsistent**. The Project would introduce new facilities into an environment that is characterized by rural development and agricultural uses. As proposed, appropriate buffering measures would not create a sensitive interface between residential and non-residential areas.
	Policy CC-1.6. Encourage industrial development projects which complement and contribute positively to the character of the community through sensitive site design, buffering from	**Inconsistent**. The Project would introduce new facilities into an environment that is characterized by rural development and agricultural uses. As proposed, appropriate site design and buffering does not contribute to the character of the community

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	adjacent uses, and facilitation/acknowledgement of the pedestrian experience.	and the Project would contrast with the existing environment. The Project, as proposed, would not have sensitive site design in that it blocks the view corridor of Van Lierop Park. The Project would include a pedestrian trail, allowing for increased access recreational resources for the area. However, the location of the trail is not connected to Van Lierop Park, which is part of the pedestrian experience and planned public access in the study area. Further, the trail would not facilitate a positive pedestrian user experience due to the proximity of adjacent high-vehicle and traffic truck areas and warehouse environment.
	Goal CC-2. Puyallup's built environment is characterized by high-quality urban design that accommodates a mix of compatible residential, commercial and light industrial uses.	**Inconsistent.** The Project, by its nature as an approximately 2.6 million square foot warehouse development, would be a single use type of development and does not include a mix of compatible residential, commercial, and light industrial uses. Further, the Applicant has not provided design plans, but based on similar proposals of this size and type, the size, scale and massing of warehouse facilities typically do not encompass high-quality urban design, but rather design focused efficiency and function.
	Policy CC-2.1. Adopt urban design principles that recognize the unique characteristics of different types of development, including single-family, multi-family, mixed-use, and various types and sizes of commercial and industrial development.	**Inconclusive**. The overall pattern of development and use of the land is inconsistent with some of the City of Puyallup's future land uses. Future land use designations identified in the City of Puyallup Comprehensive Plan include LM/W, B/IP, RBR and AOC. The Project would be inconsistent with the RBR designated areas and may be inconsistent with the B/IP designation, which is implemented by the Business Park zone, and therefore uses proposed and could largely be non-conforming once annexed to the City in large areas of land in the city's UGA. The Project would be inconsistent with the AOC designation as the proposed Project is not retail commercial development. The Project may be consistent with LM/W.
	Policy CC-2.2. Encourage building design that creates distinctive places in the community.	**Inconsistent**. The Project is proposing development of seven warehouses, each varying in size from approximately 190,000 SF to 490,000 SF. The Applicant has not provided design plans, but

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		based on similar proposals of this size and type, the size, scale, and massing of warehouse facilities typically do not encompass high-quality urban design, but rather design focused efficiency and function. Further, the Project would be for use by businesses occupants and employees, which would not create a distinctive place for community members.
	Goal CC-3. Natural landforms, vegetation, and scenic areas that contribute to the City's identity and visually define the community, its neighborhoods and districts are preserved.	**Inconsistent.** The Project proposes construction of Building F, which would interfere with the Van Lierop Park's view corridor of Mount Rainier. Additionally, the Project would interfere with the viewshed of Mount Rainier from viewer groups and residents to the north of the Project site, including those on the nearby Riverwalk Trail and members of the public using roadways, sidewalks, and surrounding businesses.
	Policy CC-3.1. Encourage development to consolidate on-site landscape areas to be large enough to balance the scale of development.	**Inconsistent**. The Project would introduce new warehouse facilities into an environment that is characterized by rural development and agricultural uses. As proposed, on-site landscaping would not be large enough to balance the scale of the development.
	Policy CC-3.2. To the greatest extent feasible, preserve significant trees and mature vegetation.	**Inconclusive.** The Project site includes lands currently used for agriculture and no identified significant trees or mature vegetation exists on site.
	Policy CC-3.4. Maximize canopy coverage throughout the City to create comfortable pedestrian environments, provide stormwater benefits and mitigate microclimate impacts.	**Inconsistent**. The Project does not propose canopy coverage, especially along the pedestrian trail, which would greatly benefit trail users.
	Policy CC-4.2. Establish and maintain attractive landscaped gateways at entry points and key corridors into the City.	**Inconsistent**. As proposed, the Project does not include landscaped gateways along corridors of the eastern boundaries of the City.
	Policy CC-4.5. Allow the use of shared driveways in both commercial and residential zones to reduce curb-cuts and enhance pedestrian accessibility.	**Inconsistent.** The Project would be developed on contiguously owned parcels as one development. The Project would create driveways that would accommodate the approximately 8,724 trips per day (1,482 heavy-duty vehicles and 7,242 passenger cars and light-duty trucks) and would not be shared driveways.
	Policy CC-7.8. Work cooperatively with other jurisdictions, agencies, organizations, and property owners, specifically	**Inconsistent.** The Project is in the UGA of the City in the unincorporated County and involves cooperation of both

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	including local Tribal entities and the Department of Archeology and Historic Preservation, to identify and preserve historic resources.	jurisdictions through the environmental review and permitting process. The Project is also subject to RCW 27.44 Indian Graves and Records, and RCW 27.53 Archaeological Sites and Resources and is required to comply with these regulations. The Puyallup Tribe of Indians and the Muckleshoot Indian Tribe have been contacted. For more information, see Section 4.12, Cultural Resources.
	Policy CC-7.9. Ensure that the potential for the existence of archeological sites is considered during development of new construction projects.	**Consistent**. The potential for existing archaeological sites is being considered through subsurface surveys, testing, and documentation. For more information, see Section 4.12, Cultural Resources.
	Policy CC-7.10. Based on local resource identification, conduct site-specific cultural resource assessments to ensure cultural artifacts are protected.	**Consistent.** A compliance-level architectural survey would be conducted, findings would be recorded and evaluated for their eligibility for listing in federal, state, and local registers. For more information, see Section 4.12, Cultural Resources.
	Goal CC-11. Citizens receive minimal exposure to the harmful physiological and psychological effects of excessive noise.	**Inconclusive.** During construction, noise emissions would be minimized through best practices, such as muffling equipment, keeping equipment in good repair, and scheduling activities that occur closest to noise-sensitive parcels for midday rather than early morning. During operation, the various types of uses that could occur within the warehouses could emit noise at differing levels. Long-term operation noise from future land uses on the Project site can be mitigated through design and configuration of the warehouse campus (see Section 4.13, Noise).
	Policy CC-11.1. Enforce regulations to control excessive, repetitive or continuous noises within its practical and legal abilities.	**Inconclusive**. During operation, there could be various types of uses that could occur within the warehouses. Land uses that employ manufacturing processes or any other known or anticipated operational noises that would emanate frequent, repetitive, or continuous noise that would otherwise unreasonably disturb or interfere with the peace, comfort, and repose of residential occupants and/or users of public parks in the direct vicinity would be permitted (see Section 4.13, Noise).

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City of Puyallup Shoreline Management Program	Policy 2(I). In securing shoreline locations for commercial or industrial use, preference should be given first to water-dependent uses, then to water-related and enjoyment uses.	**Inconsistent.** The Project is a development proposal and would not include buildings or construction within the shoreline jurisdiction, including the proposed pedestrian trail. The Project is not a water-dependent, water-related, or enjoyment use. The Proposed Project is providing public access but not in the shoreline environment.
	Policy 2(II). Commercial and industrial development should not result in a net loss of shoreline ecological functions or have an adverse impact to other shoreline uses, resources and values such as recreation and public access.	**Consistent.** The Project would be required to comply with the policies in the City and Pierce County Shoreline Master Programs, which are in place to ensure achievement of no net loss of ecological functions of the shoreline. This will be reviewed during the shoreline permitting process for the Project. There are currently no recreation opportunities or public access to the shoreline of the Puyallup River from the Project site. The Project does not propose buildings within the shoreline jurisdiction. The Project proposes the construction of a trail outside of the shoreline jurisdiction and therefore would not result in a loss of shoreline ecological functions or have an adverse impact to other shoreline uses.
	Policy 2(III). Restoration of impaired shoreline ecological functions and processes should be encouraged as part of commercial and industrial development.	**Inconsistent.** The Project is a development proposal and would not include buildings or construction within the shoreline jurisdiction, including the proposed pedestrian trail. The existing shoreline ecological functions of the portion of the Puyallup River shoreline jurisdiction within which the Project is located is currently impaired. The Project does not include restoration of impaired shoreline ecological functions and processes as part of its proposal. The Project would not contribute to shoreline restoration and would not comply with this policy.
	Policy 2(V). Commercial and industrial development should be required to provide physical or visual access to the shoreline or other opportunities for the public to enjoy shorelines of statewide significance whenever possible, provided such access is commensurate and proportional to development impacts, does not cause significant ecological impact, interfere with operations, or create risk to public safety.	**Inconsistent.** The Project is not proposing construction within the shoreline. The Project would provide a pedestrian trail on site, allowing connection to existing regional trails that are within the Puyallup River shoreline jurisdiction, but the pedestrian trail itself would not provide physical or visual access to the shoreline.

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	Policy 2.1(I). Establish a public access system that capitalizes on Puyallup's unique and varied shorelines with a combination of vistas, view areas, view corridors, scenic drives, trails, hiking paths, and bike paths that connect to and along the City's shorelines to the maximum extent feasible.	**Inconsistent.** The Project would not contribute to the public access system, as the proposed pedestrian trail is largely on the edges of the proposed Project and is not visually or physically connected to the shoreline.
	Policy 2.1(III). Public access improvements should be established to provide recreational opportunities along the city's shoreline areas.	**Inconsistent.** The Project would not contribute to public access improvements for recreational opportunities along the City's shoreline areas. The proposed pedestrian trail is largely on the edges of the proposed Project and is not visually or physically connected to the shoreline.
	Policy 3.1(VII). Public access shall consist of a dedication of land or a physical improvement in the form of a walkway, trail bikeway, corridor, viewpoint, park, or other area serving as a means of view and/or physical approach to the shoreline and may include informational kiosks. Public access sites shall be connected directly to the nearest public street or public ROW and shall include improvements that conform to the requirements of the Americans with Disabilities Act (ADA).	**Inconsistent.** The Project would not contribute to means of view and/or physical approach to the shoreline. The proposed pedestrian trail is largely on the edges of the proposed Project and is not visually or physically connected to the shoreline.
City of Puyallup PROS Plan	Policy 2.3. Promote the development of trails for bicycle and pedestrian recreational and commuter use, linking community activity areas and focusing on areas suited to interpretive activities and facilities.	**Inconsistent.** The Project proposes an on-site pedestrian trail as part of the development; the trail would not contribute to the broad range of park and recreation activities as the trail would not be conducive to those uses given that it is largely through, and on the edges of, the warehouse and truck activity. Such trail development cannot be determined as promoting recreation development consistent with the shoreline policies substantially.
	Policy 2.4. Provide a visual connection to the Puyallup River and physical access where appropriate through the Riverwalk Trail, and opportunities for fishing and low-impact access through the trails system.	**Inconsistent.** The Project would not contribute to the visual connection to the Puyallup River, as the proposed pedestrian trail is largely on the edges of the proposed Project and is not visually or physically connected to the shoreline.

Considering City policies, the Project would be inconsistent with the City's future land use designations, and would conflict with interjurisdictional collaboration in planning for annexation areas and future needs (Goal LU-8). The Project would also be inconsistent with policies that require complementing and integration with existing community character, as it would introduce new facilities into a built environment that is characterized by rural development and agricultural uses (City of Puyallup Comprehensive Plan, Policies CC-1.2 and 1.3). The Project also does not include restoration of impaired shoreline ecological functions and processes as part of its proposal (Puyallup SMP Policy 2(III)).

Based on these land use consistency considerations, the Project would cause less than significant impacts with mitigation applied. Mitigation measures LU-1, LU-2, LU-3, SW-6, and SW-7 would reduce impacts to the extent they are fully implemented by the permitting agency in future land use approvals for the Project. Mitigation measure LU-4 would reduce impacts to the loss of prime farmland soil the extent feasible. See Section 4.2.5 for a discussion of mitigation measures SW-6 and SW-7.

- ***LU-1: Development limits on city Comprehensive Plan designation areas.*** During building permit review and prior to design approval, the Applicant should provide a revised site plan that limits development to areas designated as Auto-Oriented Commercial, B/IP, and LM/W as shown on the City's Comprehensive Plan future land use map only; any future development permit applications would not construct or develop on lands designated RBR in the city Comprehensive Plan. This could result in Building C being removed and Buildings A and E being shifted, relocated, redesigned, and/or reduced in size. Eliminating development from areas designated RBR on the CPCP map would be consistent with the City's FLUM, which was developed in cooperation with County policy priorities to preserve agricultural land.
- ***LU-2: Consider a broader mix of uses for the Project.*** In determining Project end uses, consider a broader mix of uses other than just warehousing, in order to support the policy objectives around promoting both small and large businesses and to support diverse employment opportunities. This would be consistent with Pierce County Comprehensive Plan Policies LU-46.1 and LU-47.11, and City of Puyallup Comprehensive Plan Policy LU-21.
- ***LU-3. Consider the compatibility with surrounding land uses.*** To maintain community character and a connection with the surrounding community and built environment, consider harmonizing development features with adjacent land uses, shoreline, and critical areas. This would be consistent with Pierce County Comprehensive Plan Policies CC-1.2 and 1.3 and Puyallup SMP Policy 2(III).
- ***LU-4 Conservation Easement:*** The Applicant should voluntarily place a conservation easement on areas of the Project site that are currently identified as planned for open space uses. This would be consistent with the Pierce County Alderton-McMillin Community Plan's desired conditions to "*maintain the rural character of the community into the future*" (A-25) and with the CPCP Policy LU-9.2, which calls for using conservation incentives for preservation of agricultural lands as part of an urban growth strategy and the Project site being located within a mapped Open Space Corridor network (Pierce County Comprehensive Plan Goal LU-115, Goal LU-119, Goal PR-21 and Policy PR-21.3).

Alternative 1 – Rail Transport

Construction Impacts

Mitigated Significant Impact. The construction impacts associated with Alternative 1 would be similar to those described for the proposed Project in that the Project would result in temporary environmental impacts within the Project site, as identified and addressed in sections of this EIS (Section 4.1, Earth Resources mitigation measures ER-1 through ER-10; Section 4.5, Land Use mitigation measures LU-1 through LU-4; Section 4.6, Recreation mitigation measures REC-1 through REC-3; Section 4.7, Aesthetics mitigation measure AES-1; Section 4.10, Health and Safety mitigation measures HS-1 through HS-5; and Section 4.13, Noise mitigation measures N-1 and N-2).

Additional impacts for Alternative 1 would be associated with the extension of the existing rail line outside of the Project site on a County-owned parcel and County ROW (Figure 4-44). Construction within the County ROW would require a construction guarantee prior to approval of the site development and ROW permits for the Project (Title 17A.20.030 PCC). The County-owned parcel (Parcel No. 0420361078) is zoned Park and Recreation, Rural 10 (R10), and is in a “right-of-way needs” area. This means that the County has set this land aside in the instance that it is needed for future ROW development; other development in this specific area is not allowed. The Applicant would be required to consult with the Pierce County Planning and Public Works Department prior to submitting a permit for construction to discuss the Project in the context of zoning constraints. Construction of both extensions of the track from the BNSF mainline/Meeker Southern interchange would not impact land use, as construction is anticipated to occur within the BNSF ROW.

Operations Impacts

Mitigated Significant Impact. The operations impacts associated with Alternative 1 would be similar to those described for the proposed Project in that they would be consistent with County zoning and future land use designations, but inconsistent with the City’s future land use designations. Additionally, during operations, Alternative 1 would include operation of a rail line off-site, across County ROW and a County-owned parcel. Extension of the rail line outside of the Project site would be on a County-owned parcel and in the County ROW. Alternative 1 has the potential to interfere with existing recreation land uses, like the Foothills National Recreation Trail and the East Puyallup Trailhead and Trail, as well as planned trails and recreation in the area. The PROS Plan identifies a priority to grow the regional trail system by connecting regional and connector trails in Pierce County. Alternative 1 would interfere with planned land uses in the Project site and with policy that calls for connectivity through systems of trails that link communities and parks (Pierce County Parks and Recreation Element, Goals PR-10, PR-17, and PR 17.1). Therefore, Alternative 1 would cause a significant environmental impact due to conflict with land use plans, policies, or regulations pertaining to non-conformance of future land use designations and planned land uses laid out in City and County planning documents.

Based on these considerations, operation of Alternative 1 would cause significant environmental impacts due to conflict with land use plans, policies, or regulations pertaining to non-conformance of future land use designations. Mitigation measures LU-1 through LU-4 would reduce these impacts to the extent feasible.

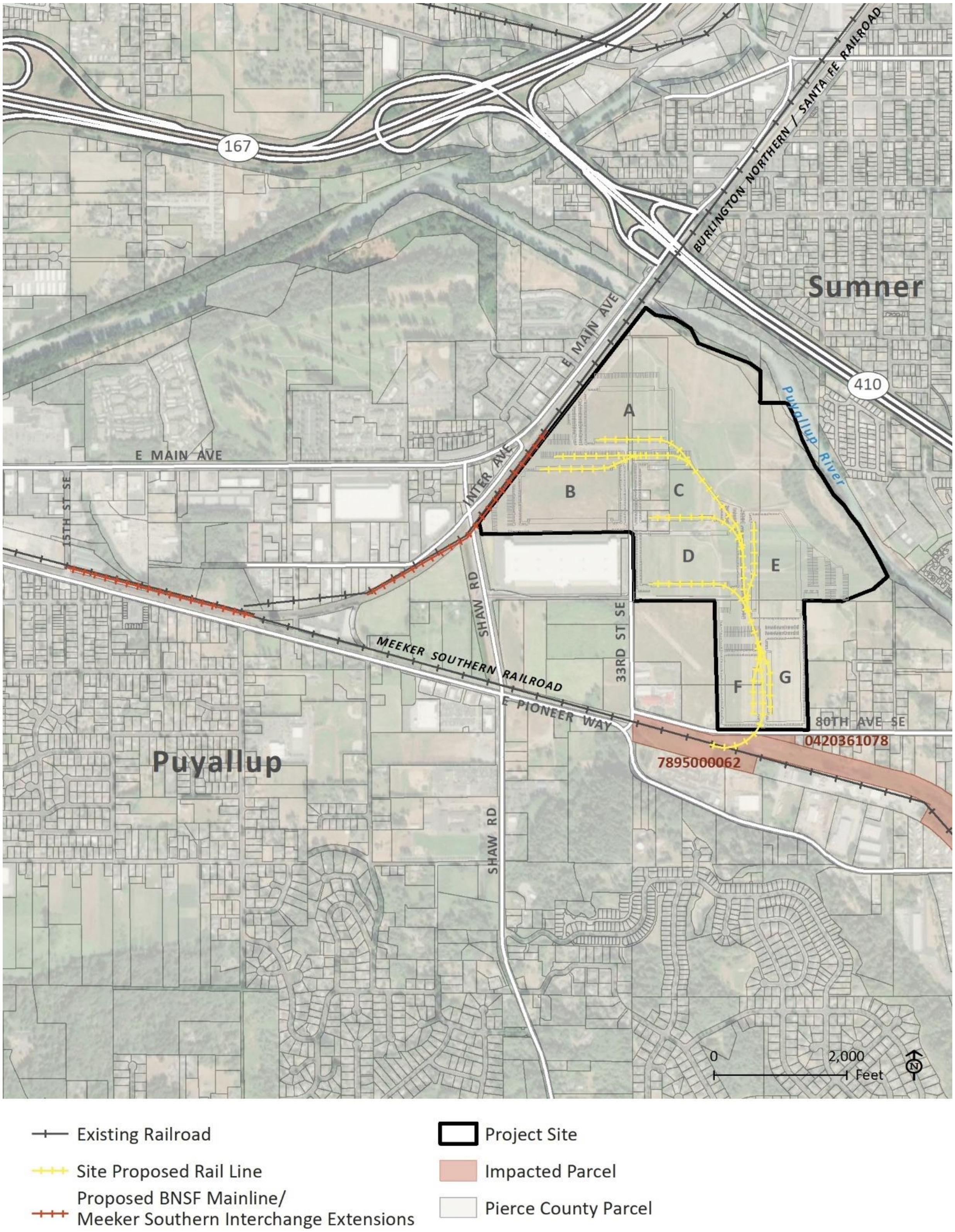


Figure 4-44. Land Use Parcels Impacted by the Proposed Rail Line

Alternative 2 – Reduced Intensity Alternative

Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility (AES-2, LU-1, REC-1, and SW-4) as outlined in this EIS for the proposed Project) were adopted by the Applicant. As noted below, Alternative 2 would still require Project implementation mitigation measures to reduce land use impacts.

Construction Impacts

Mitigated Significant Impact. Mitigation measure LU-1 would result in Warehouse C being eliminated and Warehouses A, G, E, and F being reduced in size. Therefore, compared to the proposed Project, Alternative 2 would have a reduced footprint and construction could be expected to be at a smaller scale (Figure 3-4). However, temporary land-use-related environmental impacts analogous to the proposed Project would occur, as identified and addressed in sections of this EIS (Section 4.1 Earth Resources, mitigation measures ER-1 through ER-10; Section 4.5 Land Use, mitigation measures LU-2 through LU-4; Section 4.6 Aesthetics, mitigation measure AES-1; Section 4.7 Recreation, mitigation measures REC-2 through REC-3; Section 4.10 Health and Safety, mitigation measures HS-1 through HS-5; and Section 4.13 Noise, mitigation measures N-1 and N-2).

Operations Impacts

Mitigated Significant Impact. Mitigation measure LU-1 would result in Warehouse C being eliminated and Warehouses A, G, E, and F being reduced in size. Elimination of land development in areas of the Project site that the City and County previously agreed to set aside as agriculture and/or open space would be more consistent with both jurisdictional Comprehensive Plans. Alternative 2 may conflict with both County and City land use plans, policies, or regulations pertaining to non-conformance of future land uses if established inconsistent with both jurisdiction policies around broad uses and compatibility with the local environment. Mitigation measures LU-2 and LU-3 would reduce impacts to the extent feasible.

4.6 Aesthetics

This section provides an analysis of potential impacts on aesthetics.

4.6.1 Study Area

The study area for aesthetics includes the natural environment, the built environment, and the visual quality within those environments on the Project site and adjacent land uses with views of and through the Project site. These are included to provide an analysis of the Project's context and placement within an existing semi-rural/urban transition/agricultural developed setting and to qualitatively describe the potential visual impacts related to the Project.

4.6.2 Relevant Plans, Policies, and Regulations

This section summarizes state and local regulations related to aesthetics that are applicable to the Project. There are no federal regulations related to aesthetics that are applicable to the Project.

Relevant policies and regulations related to aesthetics are summarized in the Land and Shoreline Use Section 4.5 Land and Shoreline Use and Table 4-23.

Table 4-23. Applicable Regulations and Policies for Aesthetics

Law and Regulation	Description
State	
State Environmental Policy Act	SEPA helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the SEPA review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels. SEPA requires that land and shoreline use, recreation, and aesthetic environmental components be addressed.
Washington State Growth Management Act (GMA)	Under the GMA (RCW 36.70A), regions, counties, and large cities must create and regularly update comprehensive plans to identify where growth would occur and to plan for housing, transportation, water, sewer, and other necessary facilities. Both the County and City are required to plan for growth under the GMA by preparing and periodically updating countywide planning policies that coordinate planning between the county and the cities. Pierce County's strategy for growth, transportation and economic development are captured in the GMA-mandatory multicounty planning policy (MPP) document produced by the Puget Sound Regional Council (PSRC) Vision 2050 (October 2020). Vision 2050 contains information and policies that Pierce County Regional Council (PCRC) uses to guide the Pierce County Countywide Planning Policies. Both Vision 2050 and the Countywide Planning Policies apply to the Project site. The PCRC includes a body of elected officials set up to coordinate growth management planning efforts county-wide. The City of Puyallup is classified as a Core City, a type of regional geography within Vision 2050, used for planning and growth distribution purposes. A Core City refers to a city that contains

Law and Regulation	Description
	one or more regionally designated centers and is connected to the high-capacity transit network (Vision 2050).
Washington State Shoreline Management Act (SMA)	The SMA provides for the management of water bodies or watercourses identified as “shorelines of the state.” Areas under jurisdiction of the SMA include all marine waters along the Pacific Ocean and Puget Sound; streams and rivers with an annual mean flow of more than 20 cubic feet per second, lakes greater than 20 acres in size, shorelines adjacent to these water bodies (typically within 200 feet of the water body) and associated wetland. Comprehensive shoreline master programs are tailored to the local jurisdiction, containing maps and legal descriptions of the delineated streams, rivers, lakes shorelines and wetlands.
Local	
Pierce County Comprehensive Plan	The Pierce County Comprehensive Plan (Pierce County 2021d) includes goals and policies related to aesthetics within their Parks and Recreation, Land Use elements and the Alderton McMillin Community Plan. A consistency analysis of aesthetic goals and policies that relate to the Project are included in Table 4-22.
Pierce County Code (PCC)	PCC 18J Countywide Design Standards and Guidelines sets forth requirements for site clearing (18J15.020) landscape buffers (PCC 18J.040; exterior illumination (PCC 18J.15.085); surface parking lot landscaping (18J.15.090); mechanical equipment and outdoor screening standards (18J.15.155); and stormwater facility standards (18J.15.170) to minimize visual impact from development and to implement the goals and policies related to aesthetics in the Pierce County Comprehensive Plan.
City of Puyallup Comprehensive Plan	The City of Puyallup Comprehensive Plan (City of Puyallup 2015a) includes goals and policies related to aesthetics within their Land Use, Community Character elements and PROS Plan. A consistency analysis of aesthetic goals and policies that relate to the Project are included in Table 4-22.
Puyallup Municipal Code (PMC)	PMC 20.58 (landscaping requirements) and PMC 20.26.300 (Nonresidential design review standards) set forth requirements to minimize visual impacts for development in accordance with the City of Puyallup Comprehensive Plan goals and policies related to aesthetics.

4.6.3 Affected Environment

This section summarizes the environmental setting related to existing and planned aesthetic resources within the study area.

The Project is in the UGA of the City of Puyallup in unincorporated Pierce County. The 188-acre Project site is situated east of Shaw Road East and East Main Avenue, north of East Pioneer and 88th Street East, and west of the Puyallup River within Sections 25 and 26, Township 20N, Range 4E in the Willamette Meridian baseline. The Project site includes lands that are currently used for agriculture, with a few associated houses.

Mount Rainier is identified as a scenic view within the Alderton-McMillin Community Plan, as is the vegetation along hillsides and ridgelines (Pierce County 2007). Design Review Goals of the Community Plan speak to the aesthetic values of the community including striving for development that is visually attractive, compatible with the rural and agricultural identity of the community, harmonious with the atmosphere and residential character of the area and respectful of the natural environment (Title 18J.100.010 PCC). Many comments received on the Draft EIS Scoping Notice noted that the agricultural land use of the area (current and historic) has allowed the rural community character to remain an aesthetic asset.

PCC 18J.100.010 Goals

The goals of design review within the Alderton-McMillin Community Plan area are:

A. To strive for development that is visually attractive, compatible with the rural and agricultural identity of the community, harmonious with the atmosphere and residential character of the area and respectful of the natural environment;

B. To utilize existing site characteristics such as clusters of trees, vegetative screening and topography to separate potentially conflicting land uses and soften the appearance of new development;

C. To encourage the enhancement and preservation of land or buildings of unique or outstanding scenic or historical significance;

D. To encourage well designed buildings and sites;

E. To size new buildings to the human scale; and

F. To implement LID design standards where feasible.

The Project site has historically been used for farming and other agricultural uses (e.g., the Van Lierop bulb farm.) The Project site is within the Alderton-McMillan community plan boundaries. There is a historic industrial development that is located in a small area south of the Project site separated by 80th Street East and the County’s Foothills trail/linear park.

To characterize the existing visual character of the study area for aesthetics, five KOPs were identified. In selecting potential KOPs, two components were considered: the existing landscape and viewer groups.

The existing landscape comprises of vegetation, water features, color, landform, and other characteristics that combine to form the landscape scenery.

The term “viewer groups” refers to the group of individuals who might be affected by the installation of the Project due to sensitivities to changes in the existing landscape. Below is a description of the existing viewer groups in the study area for aesthetics. These include viewers from recreational areas and residential areas.

Residential Areas: Single-family residences are included in the immediate Project vicinity, directly east of the southern portion of the Project site, between 80th Street East and the Puyallup River. The residential properties are single-family residences on a range of lot sizes.

Recreational Areas: Recreationists using Van Lierop Park and the Foothills Trail, and East Puyallup Trailhead and Trail have views of open farm fields to the north and Mount Rainier to the south of the park. Recreationists using the Puyallup Riverwalk Trail have views of the Puyallup River and associated vegetation to the east. Recreationalists using the Van Lierop Park have a view of Mount Rainier through the park's sightline view corridor.

Figure 4-45 illustrates the KOP locations selected to support the EIS analysis and provide representative views of the Project site. These KOPs were selected based on the existing land uses that border the Project alignment and are qualitatively described below.

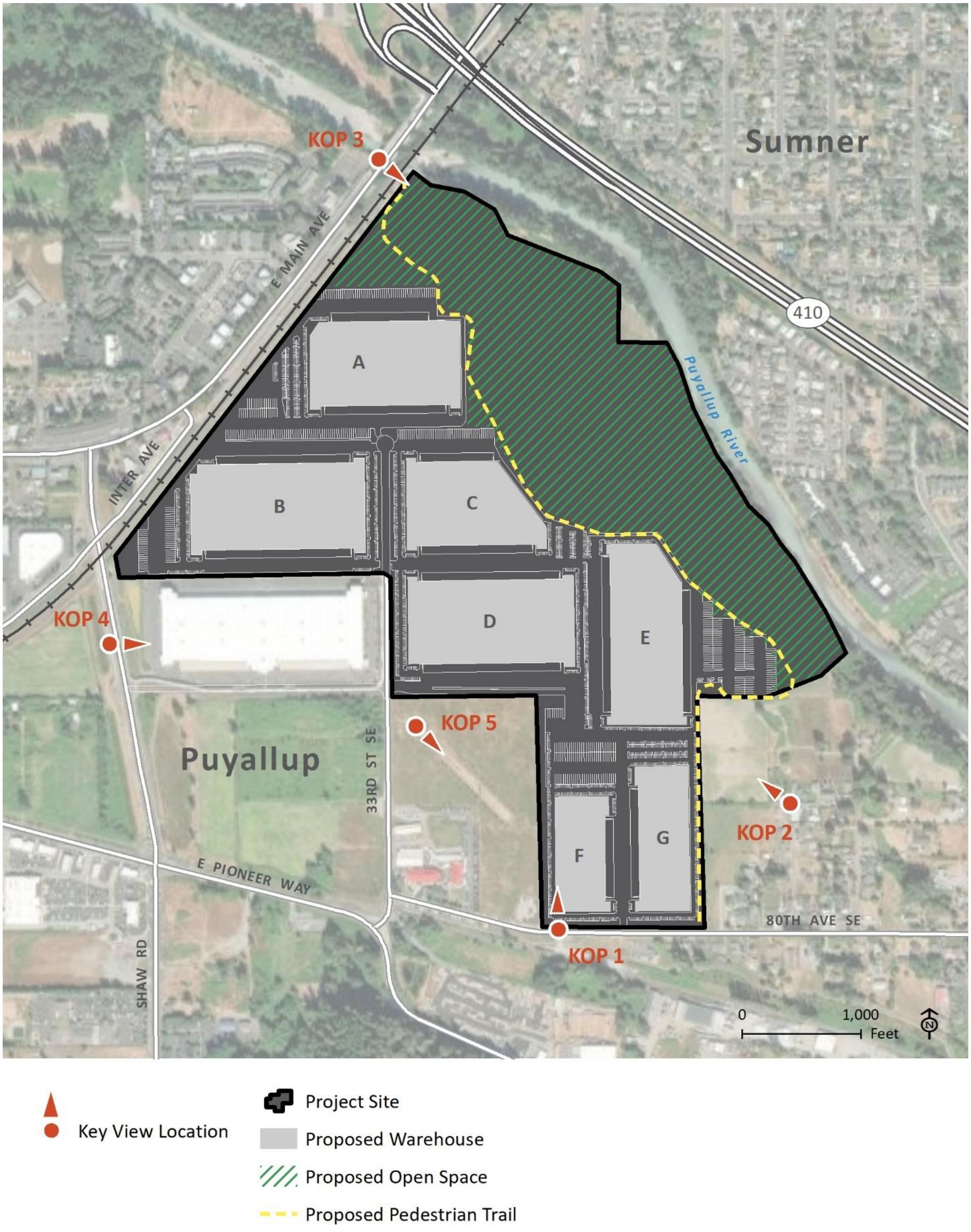


Figure 4-45. Key Observation Points

KOP 1 provides a view of the Project site, looking north from the Meeker Trailhead of the Foothills trail network and is characterized by open and expansive views of agricultural lands (see Figure 4-46). Generally, views from Van Lierop Park are open. Although Van Lierop Park is typically not used for recreational activities during nighttime hours, it should be noted that few sources of nighttime lighting are present, including surrounding single-family residences and vehicles passing on nearby roads. Viewer groups for KOP 1 include those using Van Lierop Park for recreation. KOP 1 shows the generally flat topography of the rural valley and subsequently the Project site and adjacent parcels. Trees in the background generally line the Puyallup River. This KOP also provides representative views of the Project site from vehicles travelling along 80th Street East and from recreationists using the Foothills Trail.

Figure 4-46. KOP 1: View of the Existing Project Site from Van Lierop Park Looking North toward the Project Site

Source: Digital Image, May 2019, “Street View,” GoogleMaps. Available: google.com. Accessed: April 6, 2021.

KOP 2 provides a view from the nearest single-family residential area adjacent to the Project site on 141st Avenue East and 78th Street East looking northwest toward the Project site (see Figure 4-47). The hills that surround the City provide a natural topographical feature to the citizens residing both in and around the City as well as people traveling the surrounding streets. Additionally, the natural topography includes ridgelines, woodlands, rolling hillsides, and knolls visible from the rural valley. Viewer groups for KOP 2 include the single-family residences adjacent to the Project site. From public roadways, views of the Project site are glancing and typically obstructed by single-family residences and associated structures (sheds/outbuildings) and fencing.

Figure 4-47. KOP 2: View from 141st Avenue East and 78th Street East Looking Northwest toward the Project Site

Source: Digital Image, May 2019, "Street View," GoogleMaps. Available: google.com. Accessed: April 6, 2021.

KOP 3 provides a view from northwest of the Project site on East Main Avenue and 5th Avenue Northeast looking southeast toward the Project site (see Figure 4-48). There are multiple visual encroachments from north of the Project site in the immediate foreground, including the rail corridor berm and overhead power lines. Visual elements, such as ridgelines, woodlands, Mount Rainier, and commercial and transportation infrastructure, make up the areas north and northwest of the Project site. Viewer groups for KOP 3 include members of the public using roadways and sidewalks and surrounding businesses. As the Riverwalk Trail terminus is approximately 0.15 mile northeast, this KOP also provides representative views of the Project site for recreationists.

Figure 4-48. KOP 3: View from North of the Project site on East Main Avenue Looking Southeast towards the Project Site

Source: Digital Image, May 2019, "Street View," GoogleMaps. Available: google.com. Accessed: August 30, 2021.

KOP 4 provides a view from the western portion of the Project site at Shaw Road East (see Figure 4-49). Views from this portion of the Project site are a mix of open agriculture fields, the Viking warehouse building, power poles and power lines, and the rail line. Visual elements, such as open fields, ridgelines, and woodlands, make up the views. Viewer groups for KOP 4 include travelers (drivers, pedestrians, or cyclists) along Shaw Road East and those who use or are employed at the neighboring Viking warehouse.

Figure 4-49. KOP 4: View from Shaw Road East Looking East toward the Project Site

Source: Digital Image, May 2019, “Street View,” GoogleMaps. Available: google.com. Accessed: April 6, 2021.

KOP 5 provides a view from the Van Lierop Park’s sightline view corridor (see Figure 4-50). Views from the view corridor of Van Lierop Park include Van Lierop Park in the foreground, trees, and a direct view corridor of Mount Rainier in the background. Viewer groups for KOP 5 include recreationalists at Van Lierop Park.

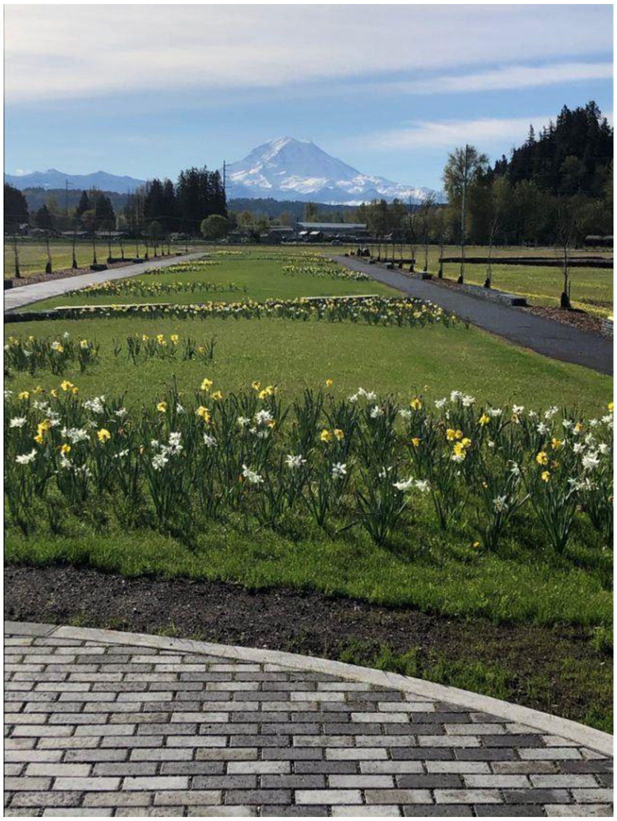


Figure 4-50. KOP 4. View from Van Lierop Park Looking Southeast toward the Project Site

4.6.4 Impacts

This section describes the potential for environmental impacts related to aesthetics as a result of Project implementation. It describes the thresholds used to determine whether an impact would be significant, as well as measures to mitigate potentially significant impacts, where appropriate.

Methodology

Aesthetic experiences can be highly subjective; therefore, Project-related impacts are evaluated based on the extent of the modifications to existing physical conditions on the Project site as a result of the Project. Given the Project's context and placement within an existing rural developed setting, this analysis follows a qualitative approach to assess the potential visual impacts related to the Project. This analysis was performed by defining the Project location and setting; identifying and characterizing the existing visual resources and key viewers; and assessing resource change and viewer response.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, the existing aesthetic quality of the Project site would be preserved until future development is proposed. No substantial new infrastructure would be introduced into the aesthetic environment until future development is proposed and no significant contrast would be created.

Proposed Project

Construction Impacts

Mitigated Significant Impact. The Project is in a semi-rural/urban transition/agricultural developed area within the UGA of the City in unincorporated Pierce County on land that is currently an open area used for agriculture and occupied single-family residences. From the Project site, residents and city park and trail users can experience the aesthetic resources of Mount Rainer to the southeast, trees lining the Puyallup River at the eastern portion of the Project site and surrounding vegetated hills.

Long-established open areas where agricultural activities are conducted provide the community with a visual familiarity and identification of the built environment around them. During construction, increased activity and the presence of construction equipment would result in visual impacts in the Project site, a disruption and displacement of the community's sense of place during this time. These impacts could occur during the anticipated 5 years of construction. To mitigate these impacts, mitigation measure AES-1 would be required:

- ***AES-1. Comply with Construction Lighting Requirements.*** The Contractor should ensure that construction activities that need lighting near residential areas would be avoided to the extent practicable. If lighting is required, the Contractor would be required to comply with Title 18J.15.220(C)(3) PCC temporary lighting in a manner that directs light toward the construction area and would install temporary shields as necessary so that light does not spill over into residential areas.

Operations Impacts

Mitigated Significant Impact. The Project would permanently convert the area from a visual environment that is generally characterized presently by rural development and agricultural uses (see KOP 1 to KOP 5, see Figure 4-45) to an industrial warehousing park. This is a significant environmental impact. As provided in Table 4-22, the evaluation indicates that the Project would be inconsistent with County policies related to visibility (Pierce County Comprehensive Plan, Policy LU-47.5) and compatibility with residential character and agricultural identity of the community (Pierce County Alderton-McMillin Community Plan, Goal AM D-1). The natural environment, the built environment, and the visual quality within those environments in the Project site would impact viewer groups, including recreationists, nearby residents, and the traveling public. The Project would result in a new contrast in the aesthetic environment, causing the aesthetic value of the environment to change.

KOP 1

As KOP 1 shows, views from south of the Project site looking north are open. The Project would introduce new facilities into a visual environment that is generally characterized by rural development and agricultural uses. The generally flat topography of the rural valley and the trees that line the Puyallup River would be obstructed by Project operation. Further, the Project would introduce lighting to a previously unlit area. Structure heights, exterior building materials, and landscaping requirements would be determined during the permitting process.

The Project would create a permanent change to the aesthetic resources south of the Project site. The natural environment, the built environment, and the visual quality within those environments in the Project site would impact viewer groups, including recreationists using Foothills Trail and Van Lierop Park and the traveling public on nearby roads.

KOP 2

As KOP 2 shows, there can be a number of existing visual encroachments looking toward the Project site from the single-family residential area to the southeast of the Project site. From public roadways, views of the Project site are glancing and typically obstructed by single-family residences and associated structures (sheds/outbuildings and fencing).

The Project would create a permanent change to the aesthetic resources southeast of the Project site. The natural environment, the built environment, and the visual quality within those environments in the Project site would impact viewer groups, including nearby residents and the traveling public.

KOP 3

As KOP 3 shows, there can be a number of existing visual encroachments looking southeast from north of the Project site. However, the Project could obstruct the viewshed of Mount Rainier from viewer groups to the north and northwest of the Project site, including those on the nearby Riverwalk Trail and members of the public using roadways, sidewalks, and surrounding businesses. Additionally, the natural topography such as major ridgelines, woodlands, rolling hillsides, and knolls that are visible from the Project site would be obstructed by Project operation. Structure heights, exterior building materials, and landscaping requirements would be determined during the permitting process.

The Project would create a permanent change to the aesthetic resources north and northwest of the Project site. The natural environment, the built environment, and the visual quality within those environments in the Project site would impact viewer groups, including members of the public using roadways and sidewalks and surrounding businesses.

KOP 4

As KOP 4 shows, views from west of the Project site looking east are open at the Project site, and there is a warehouse on the neighboring property. The Project would introduce new facilities into a visual environment that is generally characterized by rural development and agricultural uses. The generally flat topography of the rural valley, open fields, ridgelines, woodlands, and trees that line the Puyallup River would be obstructed by Project operation. Further, the Project would introduce lighting to a previously unlit area. Structure heights, exterior building materials, and landscaping requirements would be determined during the permitting process.

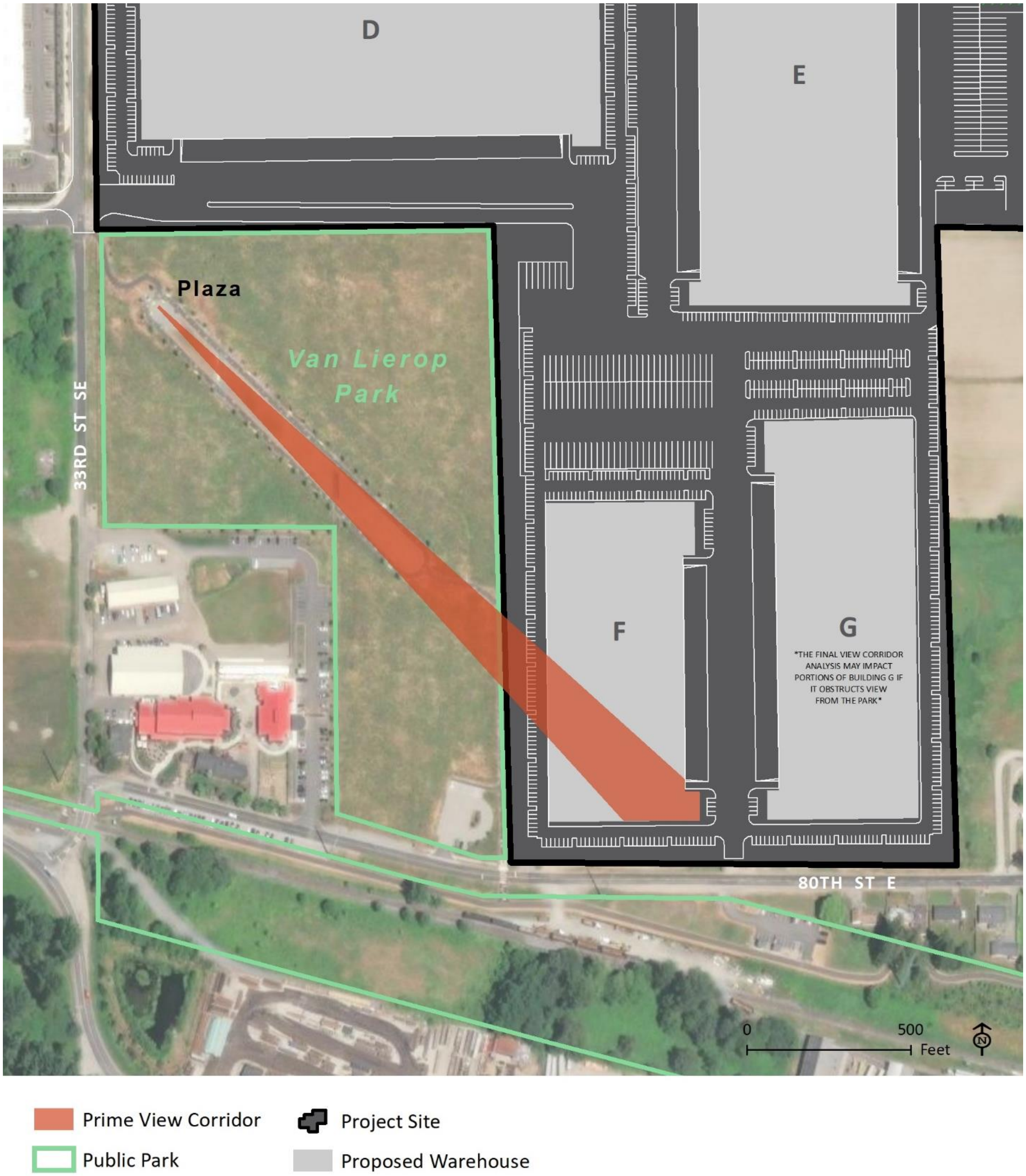
The Project would create a permanent change to the aesthetic resources in the Project site. The natural environment, the built environment, and the visual quality within those environments in the Project site would impact viewer groups, those who use Shaw Road East, and those who use the neighboring properties.

KOP 5

As KOP 5 shows, views from Van Lierop Park southeast include Mount Rainier (see Figure 4-51). The Project would introduce new facilities into a visual environment that is characterized by a view corridor of Mount Rainier. The view corridor of Mount Rainier would be obstructed by Project operation, most notably Building F. Maintaining the view corridor was the primary focus of the site layout of Van Lierop Park. Further, the Project would introduce lighting to a previously unlit area. Structure heights, site plan design, exterior building materials, and landscaping requirements would be determined during the permitting process.

The Project would create a permanent change to the aesthetic resources in the Project site. The natural environment, the built environment, and the visual quality within those environments in the Project site would impact users of Van Lierop Park. Mitigation measure REC-1 would eliminate the potential for impacts to the park view corridor associated with Van Lierop Park. Mitigation measures AES-2 and AES-3 would further reduce visual impacts to park users and the surrounding community.

- ***AES-2: Comply with Screening, Landscape and Buffering Requirements.*** The Applicant should use landscaping buffering to promote compatibility between land uses and to reduce the visual impacts of development on users of the site and abutting uses, including the proposed trail. The Project should comply with local building code regulations, including Title 18J.10.055(6) PCC, which requires landscape plans that include the locations and types of landscape buffers and maintenance measures. The landscape buffering should also comply with Title 18J.15.040 PCC, a Level 3 Landscape Buffers requirement, and provide a substantial mix of evergreen and other landscaping elements, including berms and sound walls that buffer the visual and auditory impacts. Consistent with the site design of the Viking Project (Phase 1 of the Knutson Farms industrial warehouse complex), the site plan shall be revised to include a minimum 15-foot-wide landscape strip to be provided along the entire length of blank wall facades of buildings to reduce the visual impacts to surrounding park land and residential land uses. A mixture of medium to large evergreen conifer and deciduous trees and shrubs (evergreen and/or deciduous shrub mix) shall be planted for all buildings along the entire length of all visible façades on buildings. Pierce County policies supporting this mitigation measure include LU-47.8, LU-47.9, and AM D-1. City policies supporting this mitigation measure include LU-22.3, CC-1.1, CC-1.2, and CC-1.3. Implementation of this mitigation would lessen the visual impact of large, undifferentiated façade area impacts related to the warehouse structures, thereby breaking up the visual environment with additional green infrastructure and tree canopy.



THE FINAL VIEW CORRIDOR ANALYSIS MAY IMPACT PORTIONS OF BUILDING G IF IT OBSTRUCTS VIEW FROM THE PARK

Figure 4-51. Van Lierop Park View Corridor of Mount Rainier with Proposed Project

The Applicant should provide a 30-foot Level 3 (full evergreen sight obscuring) buffer area around all areas abutting public park space; the buffer should be graded and constructed with a 3:1 slope with a retaining wall interior to the Project site, with a sight-obscuring 12--foot-tall masonry sound wall on the interior side of the buffer area/top of sloped buffer area (see Figure 4-52 as an example). The 12-foot sound wall is required by mitigation N-3. The landscaping should be irrigated and a proper drainage system installed to ensure that water does not collect in open space, parks, or residential areas adjacent to the berm. Landscaping and berming should be tapered to grade level and landscaping limited to low-growing shrubs and ground cover within the prime view corridor area related to KOP 5 and in areas intended to connect the Park trail to the proposed east-west on site trail connection. The Project Applicant and Pierce County should seek input from the City of Puyallup Parks Department and Development and Permitting Services Department as the site plan is revised to meet this mitigation measure. Pierce County policies supporting this mitigation measure include LU-47.8, LU-47.9, AM D-1, and PR-5.7. City policy CC-1.3 supports this mitigation measure.

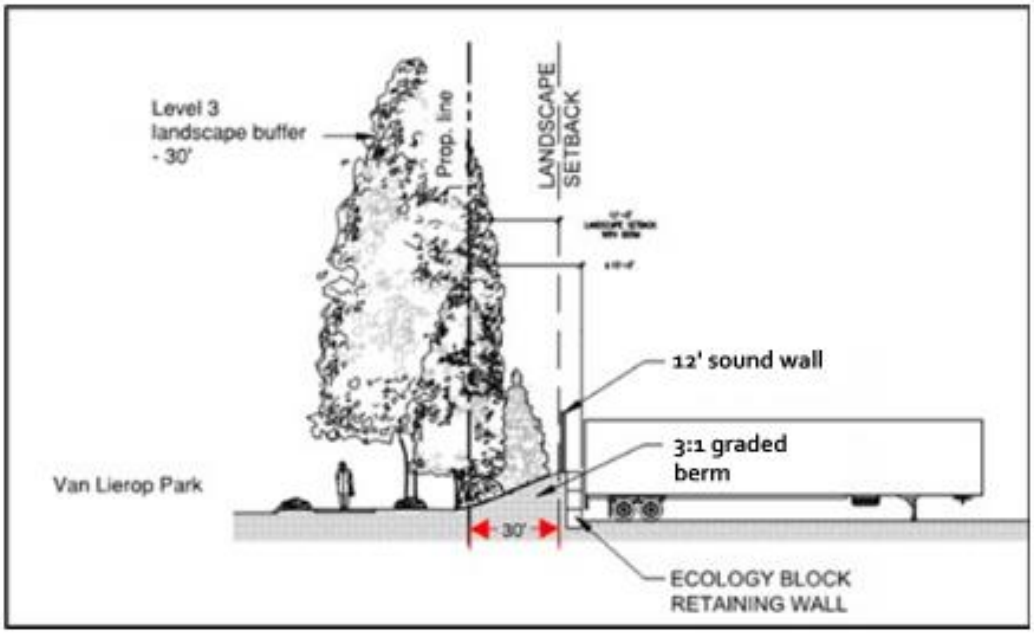


Figure 4-52. Proposed Buffer Area from Other Approved Development Plans Sets (Sourced from publicly available documents from CoP DPS).

- ***AES-3: Comply with Operation Lighting Requirements.*** The Applicant should comply with Title 18J.15.085 PCC, which requires installation of lighting that would not spill over onto nearby properties, promotes compatibility between land uses by reducing light impacts on users of the site and surrounding areas, and avoids and minimize glares and light trespass beyond the illuminated area. Additionally, the Applicant should minimize the impacts of light on neighboring properties in accordance with recommendations from the International Dark Sky Association Best Practices for Enhanced Exterior Lighting Standards (Pierce County Ordinance No. 2019-101), which include installing full cut-off light boxes, adjusting light direction, and providing additional screens with supplemental light shields. The Applicant should provide a post-construction photo metric analysis to the permitting agency and the City of Puyallup Parks Department to ensure implementation of energy efficient lighting such as light emitting diode (LED) lighting and a no-light-spill standard on adjacent residential, critical areas, and park land. City of Puyallup Comprehensive Plan Policy NE-13.2 also supports this mitigation measure.

Alternative 1 – Rail Transport

Construction Impacts

Mitigated Significant Impact. The construction impacts associated with Alternative 1 would be the same as those described for the proposed Project in that it would introduce the presence of construction equipment and activity from an area in which the visual environment is generally characterized presently by rural development and agricultural uses. Additional impacts for Alternative 1 would be associated with the construction across 80th Street and closer to the Foothills Trailhead parking. This would impact the experience of the Foothills Trail users as the aesthetic quality of their use of the trail would be interrupted with construction activity and construction equipment. This aesthetic interruption associated with the construction of Alternative 1 could occur during the anticipated 5 years of construction. A mitigated significant impact is anticipated. Mitigation measure AES-1 would reduce impacts to the extent feasible.

Operations Impacts

Mitigated Significant Impact. The aesthetic impacts associated with Alternative 1 would be the same as those described for the proposed Project in that it would permanently convert the area from a visual environment that is generally characterized presently by rural development and agricultural uses to an industrial warehousing park. Alternative 1 would compound the aesthetic environmental impacts with the addition of rail lines and rail cars in the built environment. Operation would include rail movement to and from the site and the BNSF mainline/Meeker Southern interchange extensions would be adjacent to existing rail lines. Alternative 1 would introduce a more intense level of contrast in the aesthetic environment, causing the aesthetic value of the environment to change. Impacts would be considered Mitigated Significant Impact. Mitigation measure REC-1 would eliminate the potential for impacts to the park view corridor associated with Van Lierop Park. Mitigation measures AES-2 and AES-3 would reduce impacts to the extent feasible.

Alternative 2 – Reduced Intensity Alternative

Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility (AES-2, LU-1, REC-1, and SW-4) as outlined in this Draft EIS for the proposed Project) were adopted by the Applicant. As noted below, Alternative 2 would still require Project implementation mitigation measures to reduce aesthetics impacts.

Construction Impacts

Mitigated Significant Impact. The aesthetic-related construction impacts associated with Alternative 2 would be similar to those described for the proposed Project in that it would be introducing the presence of construction equipment and activity from an area which the visual environment is generally characterized presently by rural development and agricultural uses. Alternative 2 would provide a reduced footprint and construction could be at a smaller scale. During this time, viewer groups adjacent to the Project site would still be subjected to disruption and displacement of agricultural activities and low intensity uses resulting in visual impacts on residential and city parks. A mitigated significant impact is anticipated. Mitigation measure AES-1 would reduce impacts to the extent feasible.

Operations Impacts

Mitigated Significant Impact. Similar to the proposed Project, Alternative 2 would result in a new contrast in the aesthetic environment, causing the aesthetic value of the environment to change permanently. Alternative 2 would reduce the building footprints of Building F and allow for the aesthetic visual to Mount Rainier from Van Lierop Park to be maintained. However, Alternative 2 would still be inconsistent with County policies around compatibility with residential character and agricultural identity of the community (Pierce County Alderton-McMillin Community Plan, Goal AM D-1). A mitigated significant impact is anticipated. Mitigation measure AES-3 would reduce impacts to the extent feasible.

4.7 Recreation

This section provides an analysis of potential impacts on recreation.

4.7.1 Study Area

The study area for recreation includes existing recreation sites on or adjacent to the Project site, including the Puyallup River.

4.7.2 Relevant Plans, Policies, and Regulations

This section summarizes state and local plans and regulations related to recreation that are applicable to the Project. There are no federal regulations related to recreation that are applicable to the Project.

Relevant policies and regulations related to recreation are summarized in Table 4-24.

Table 4-24. Applicable Regulations and Policies for Recreation

Law and Regulation	Description
State	
State Environmental Policy Act (SEPA) (Chapter 43.21C RCW)	SEPA helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the SEPA review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels. SEPA requires that land and shoreline use, recreation, and aesthetic environmental components be addressed.
Washington State Growth Management Act (GMA) (Chapter 36.70A RCW)	Under the GMA (RCW 36.70A), regions, counties, and large cities must create and regularly update comprehensive plans to identify where growth would occur and to plan for housing, transportation, water, sewer, and other necessary facilities. Both the County and City are required to plan for growth under the GMA by preparing and periodically updating countywide planning policies that coordinate planning between the county and the cities. Pierce County's strategy for growth, transportation and economic development are captured in the GMA-mandatory multicounty planning policy (MPP) document produced by the Puget Sound Regional Council (PSRC) Vision 2050 (October 2020). Vision 2050 contains information and policies that Pierce County Regional Council (PCRC) uses to guide the Pierce County Countywide Planning Policies. Both Vision 2050 and the Countywide Planning Policies apply to the Project site. The PCRC includes a body of elected officials set up to coordinate growth management planning efforts county-wide. The City of Puyallup is identified as a Core City, a regional geography within Vision 2050 that refers to a city that contains one or more regionally designated centers and is connected to the high-capacity transit network (Vision 2050).
Washington State Shoreline Management Act (SMA) (Chapter 90.58 RCW)	The SMA provides for the management of water bodies or watercourses identified as "shorelines of the state." Areas under jurisdiction of the SMA include all marine waters along the Pacific Ocean and Puget Sound; streams and rivers with an annual mean flow

Law and Regulation	Description
	of more than 20 cubic feet per second, lakes greater than 20 acres, shorelines adjacent to these water bodies (typically within 200 feet of the water body) and associated wetlands. Comprehensive shoreline master programs are tailored to the local jurisdiction, containing maps and legal descriptions of the delineated streams, rivers, lakes shorelines and wetlands.
Local	
Pierce County Comprehensive Plan – Pierce County Parks, Recreation and Open Space Plan (Pierce County PROS Plan)	The Pierce County Parks, Recreation and Open Space (PROS) Plan identifies opportunities to enhance the County's extensive park and recreation system. The Pierce County PROS Plan is required to be updated every 6 years to maintain eligibility for state park and recreation grant funding. The Pierce County PROS Plan establishes specific goals, objectives, recommendations, and actions for developing, conserving, and maintaining quality parks, trails, facilities, and open space (Pierce County 2008b).
Pierce County Shoreline Master Program (Title 18S.10.010 PCC)	The Pierce County Shoreline Master Program guides the development of the shoreline environment in Pierce County.
City of Puyallup Comprehensive Plan - Parks, Recreation and Open Space Plan (City PROS Plan)	The City of Puyallup PROS Plan, included as Chapter 10 of the City of Puyallup Comprehensive Plan, identifies the community's park, facility, and programming needs for the coming years, and is the 6-year planning document in accordance with state Recreation Conservation Office requirements. The City of Puyallup PROS Plan evaluates existing park and recreation areas; assesses the need for additional park land, open space, and recreation facilities; establishes goals and objectives for the City's recreation services; and offers specific policies and recommendations to achieve the goals and objectives (City of Puyallup 2020b). The current City of Puyallup PROS Plan was adopted by the City (Resolution No. 2403) on April 7, 2020. The 2020 City PROS Plan update was adopted as a standalone plan document. The plan includes proposals concerning elements of the open space, trail, and park plan are based on the results of environmental inventories, field analysis, demand analysis, workshop planning sessions, and surveys of resident households. The proposals outline the vision developed for open space, trails, and parks in Puyallup for the next 20 years. The proposals are CONCEPTUAL, in some instances, subject to further study and coordination with public and private participants that may modify the eventual Project components.
City of Puyallup Shoreline Master Program (SMP)	The City SMP (City of Puyallup 2023) guides the development of the shorelines in the City.

4.7.3 Affected Environment

This section summarizes the environmental setting related to existing and planned recreation within the study area.

Recreation

The Project site does not include any existing designated parks, recreation, or open space facilities (City of Puyallup 2014a; Pierce County 2019b). The Project has the following sites or opportunities in the study area for recreation:

- **Van Lierop Park**: Located immediately east of the southernmost portion of the Project site and bordering southern portions of some site (see site plan), within Puyallup city limits, Van Lierop Park is an 18-acre special use/community park. The City of Puyallup acquired this historic farmland in 2015 for the purposes of serving the community broadly. The City's PROS Plan identifies this park as a Resource Conservancy and a Community Park. The Park is also located adjacent to the Step by Step Germaine Korum Center, a nonprofit facility devoted to at-risk pregnant women that provides job training and workforce experience. The City PROS Plan identifies the Korum Center as a special use facility that includes the Farm 12 restaurant with banquet rooms, an event hall and private dining, greenhouses incorporating the Van Lierop bulb farm and Edgewood Flower Farm, Bee King's honey production facilities, and the Pole Barn and Festival Barn rentals.

  Van Lierop Park is designed to preserve a large open space of land and to provide an unobstructed scenic corridor view of Mount Rainier (Figure 4-53). Existing improvements in Van Lierop Park include a scenic wildflower view corridor, a view plaza, a 0.33-mile asphalt trail, and an off-street paved parking lot (Figure 4-54). Van Lierop Park is included in the City's PROS Plan for future facility improvements including picnic shelters and tables; agricultural walk, loop trails with distance markers; dog park; drinking fountains, benches, and tables; farm-themed play area; a spray park, skate dots; outdoor basketball/sports courts; multi-purpose turf soccer/baseball field; community garden; and restrooms. Van Lierop Park is a community park facility that is designed to provide a specialized function as a community-wide asset park facility, serving the entire community in a location within the city previously underserved by parks. The excerpt below from the City's PROS Plan shows the concept of Van Lierop Park (Figure 4-55).

Figure 4-53. Van Lierop Park Design for Unobstructed Scenic Corridor view of Mount Rainier

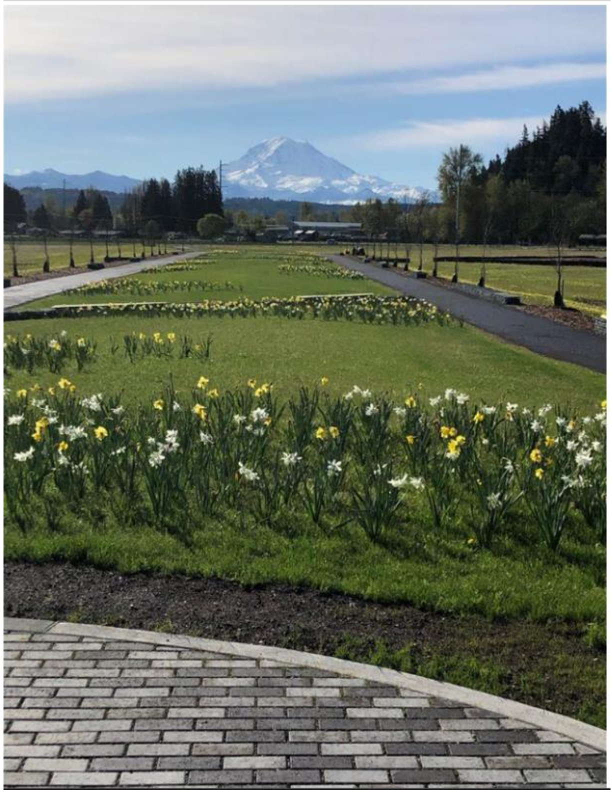


Figure 4-54. Existing Improvements in Van Lierop Park

Figure 4-55. Van Lierop Park Concept Plan, City of Puyallup July 18, 2017

- **Foothills National Recreation Trail (Foothills Trail), East Puyallup Trailhead and Trail:** The Pierce County Foothills Trail is a 21-mile-long, multiuse trail, that sits atop a historic railroad bed. The Foothills Trail is a 12-foot-wide, non-motorized, asphalt trail/linear park suitable for bicycles, walking, in-line skates, and wheelchairs. It also has a soft shoulder path for equestrians. Parking for the East Puyallup Trailhead of the regional Foothills Trail begins at 13810 80th Street and features a restroom facility. In 2023, a County project would increase parking at the East Puyallup Trailhead from its current 26 stalls to 81 stalls and add Americans with Disabilities Act (ADA) improvements, lighting, and landscaping. From the East Puyallup Trailhead, the trail continues west and then veers north along Shaw Road and Inter Avenue, meeting the Puyallup River and continuing through the Puyallup Valley to the City of Orting, the town of South Prairie, and the City of Buckley (Pierce County Undated). There are plans for the Foothills Trail to connect to the Riverwalk Trail (PROS Plan 2020).
- **Sumner Link Trail's** south end links the Foothills Trail and the Riverwalk Trail just north of the Project site boundary. The Sumner Link Trail is a total of 5.8 miles along the White River and is managed by the City of Sumner.
- **Puyallup Riverwalk Trail** (generally follows the southern banks of the Puyallup River): The Riverwalk Trail is a 4.3-mile-long, 10-foot-wide, paved (asphalt), off-street multiuse trail located along the southern banks of the Puyallup River northwest of the Project site (City of Puyallup 2015a). The Puyallup Riverwalk Trail eastern trailhead/terminus is northwest of the intersection of East Main Avenue and the Puyallup River (south of the river) and extends northwest toward the Puyallup River before heading west away from the Project site. The Puyallup Riverwalk Trail is managed by the City. The City is planning for Phase IV, which would connect the trail with Pierce County's Foothills Trail at the trailhead on east 80th Street. The adopted preferred trail alignment plan for Phase IV (referred to as the "shoreline alignment" in Figure 4-56) is to continue the trail adjacent to the Project site within the shoreline area in an area closest to the river; this would allow the continuity of the Riverwalk trail design intent (a walk along the river) and improve public access (physical and visual) to the shoreline of statewide significance (Puyallup River). The City's 2020 PROS plan includes the trail alignment along the southern bank of the Puyallup River.

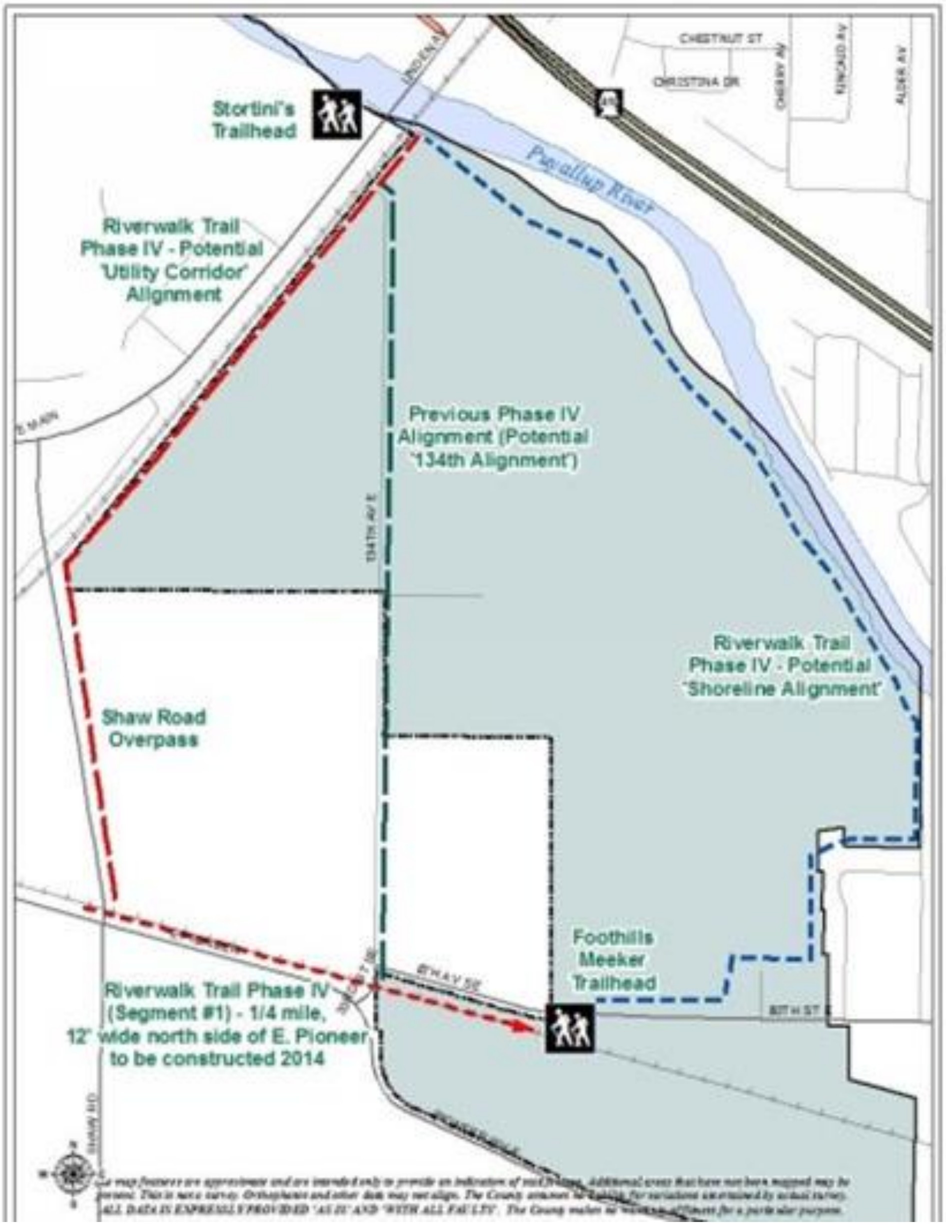


Figure 4-56. Excerpt of Figure 10-9 of the City of Puyallup Comprehensive Plan Showing the Riverwalk Trail Phase IV Alignment Option

These recreation sites or opportunities are used primarily by both residents and visitors from neighboring communities in the region. Figure 4-57 shows the existing recreation sites or opportunities in the Project site.

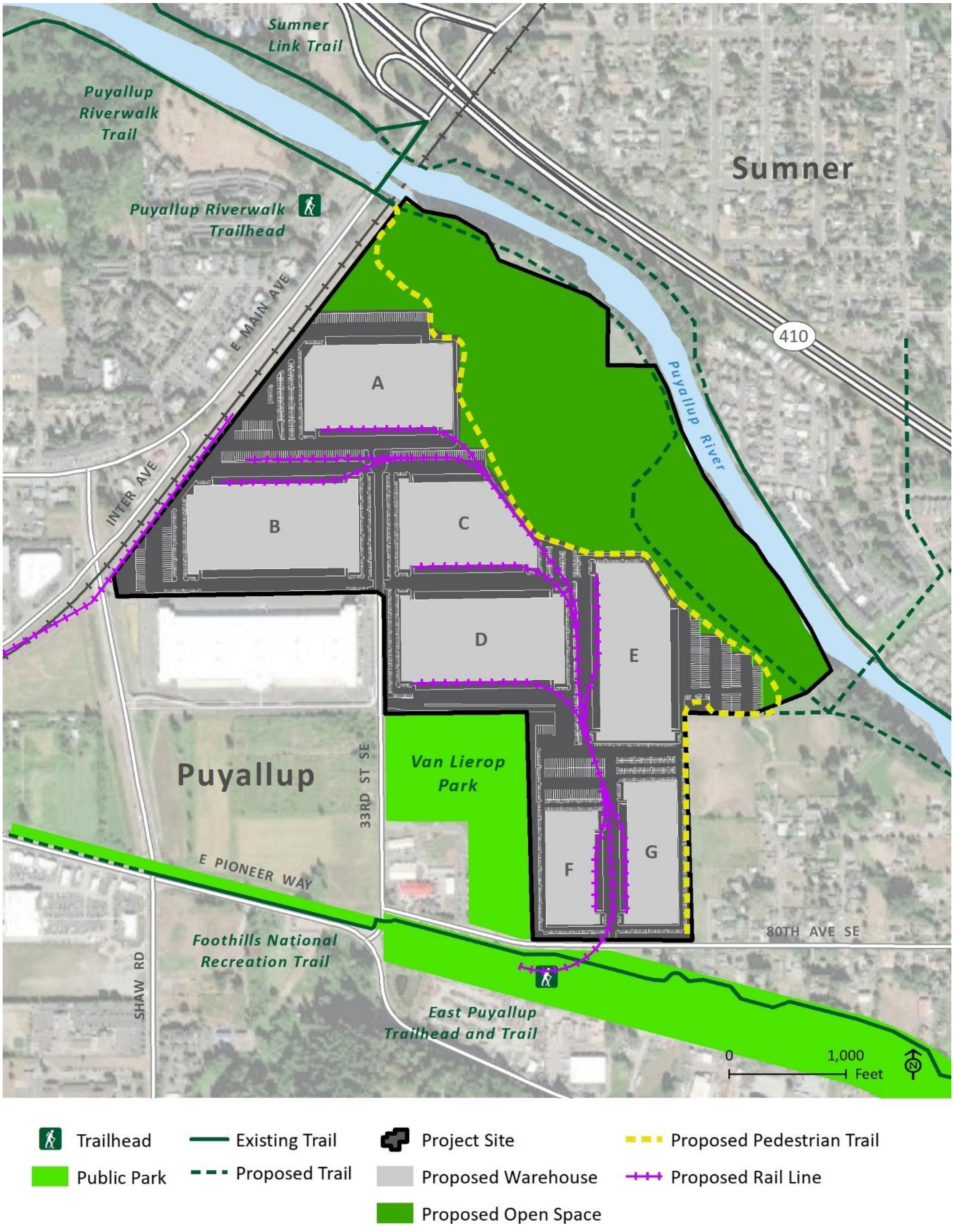


Figure 4-57. Recreation Sites or Opportunities in the Study Area

Along the southern bank of the Puyallup River, within the Project site boundary, the City PROS Plan (2020) includes a potential extension of the Puyallup Riverwalk Trail, an off-road, 10-foot-wide, paved multiuse trail providing connections to Van Lierop Park, Sumner, and the Foothills Trail that allows additional connections to the Sumner Link Trail and Puyallup Loop Trail. There is no existing public access to the Puyallup River from the Project site (City of Puyallup 2023; Pierce County 2008b). The Project site proposal includes a proposed trail extension, presumed to be a multipurpose off-road trail that the Applicant would build and dedicate to Pierce County Parks. This extension would continue the existing multipurpose trail network along a contoured edge of the Project Site's development envelope.

The City's PROS Plan also shows a proposed on-road multipurpose trail connecting to Van Lierop Park and then linking with the Foothills Trail; that on road connection runs along East Pioneer Avenue from Shaw Road to 33rd Street, and is currently built. The City's PROS Plan (2020) identifies a potential waterfront access location on the northern tip of the Project site to provide fishing and hand-carry craft access to the Puyallup River. The Puyallup Shoreline Public Access Plan Map (City of Puyallup 2014b) identifies a potential shoreline alignment, known as Phase IV of the Riverwalk Trail, on the eastern boundary of the Project site closest to the Puyallup River. The Pierce County PROS Plan (2020) identifies the Riverwalk Trail Connection as a regional trail.

4.7.4 Impacts

This section describes the potential for environmental impacts related to recreation as a result of Project implementation. It describes the thresholds used to determine whether an impact would be significant, as well as measures to mitigate potentially significant impacts, where appropriate.

Methodology

The recreation analysis is based on consistency with plans and policies and includes general compatibility considerations by evaluating the Project's potential to result in temporary or permanent loss of use of a recreation use/facility or a substantive change in overall user enjoyment or recreational experience. To determine impacts, the Project is evaluated based on the extent of interference or modifications to existing recreation sites or planned opportunities.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, the potential for trail connections or extensions associated with the Project would not occur until either Pierce County or the City of Puyallup Parks Department(s) built the trail extensions, as planned. No new infrastructure would be placed adjacent to the existing recreation sites until future development is proposed. Potential future development could either preserve existing recreation or lead to recreation opportunities including those potentially implemented in locations closer to the shoreline.

Proposed Project

Construction Impacts

Mitigated Significant Impact. During construction, construction equipment and activity could interfere with the existing uses of surrounding recreation sites and opportunities, including Sumner Link Trail, the

Foothills Trail Trailhead, and Van Lierop Park's view corridor of Mount Rainier. Construction of the Project would create a change to the natural environment, the built environment, and the recreational use and quality within and adjacent to those environments in the Project site during the anticipated 5 years of construction. Impacts would be minimized with the implementation of mitigation measures REC-1, REC-2, and REC-3:

- ***REC-1: Eliminate Van Lierop Park Prime View Corridor Obstructions.*** During building permit review and prior to design approval, the Applicant should modify the proposed site plan to remove proposed structures from the view corridor and place a restriction on the title that prohibits blocking or in any way obscure, produce glare, or visually impact the view corridor created in Van Lierop Park as shown in Key Observation Point (KOP) 5. The Applicant should show (using visually aided representations of the vertical massing and height of buildings using architectural modeling software) that changes to the site plan have been fully made to avoid and mitigate impacts on the natural environment, the built environment, and the visual quality of these environments and the intent of Van Lierop Park Mount Rainier prime view corridor. Building F, as well as potentially portions of Building G (pending final visual analysis), would need to be eliminated, shifted, relocated, redesigned, and/or reduced in size to not create impacts. Additionally, no parking lot(s) or landscaping of trees should occur in the view corridor as those improvements would also create visual interference, glare, screening, and other visual blockage of the public view corridor of Mount Rainier from Van Lierop Park. The park view corridor area should remain as open space to prevent visual obstruction from a major community park. The Applicant and permitting agency (Pierce County) should consult with and receive concurrence from the city of Puyallup Development and Permitting Services and Parks Departments on the visual assessment during permit review by Pierce County. This mitigation measure is consistent with Pierce County Comprehensive Plan Policy LU-47.8 and Pierce County Comprehensive Plan and PROS Plan Policies PR 1.3 and PR 5.6, as well as City of Puyallup Comprehensive Plan Policy CC-1.3, Policy CC-2.2, and Goal CC-3.
- ***REC-2: Identify and address recreation closures.*** During building permit review and prior to design approval, the Applicant should identify temporary park and trail closures, durations of closures, and extent during the 5-year construction period in order to identify the limit on recreation users in the community. The Applicant should ensure that recreation opportunities are not closed for the entire duration of construction and stockpiling or staging of construction equipment does not interfere with the intended uses of the trails and recreation opportunities.
- ***REC-3: Implement Visual Screening.*** To minimize visual impacts from construction activity on the residential and recreation viewers in the Project site, the Contractor should ensure that material and equipment storage areas, including storage sites for excavated materials, that are visible from nearby roads, residences, and recreational areas are visually screened per Title 18J.15.220(C)(6)-(7) PCC.

Operations Impacts

Mitigated Significant Impact. During operation, the Project would introduce structures and associated truck activity that would interfere with the intended uses of surrounding recreation opportunities in the area.

As provided in Table 4-22, the Project is generally inconsistent with each relevant recreation plan—the Pierce County PROS Plan and the City of Puyallup PROS Plan. Policy 2.4 of the City's PROS Plan and the County's PROS Exhibit 6-3 identify the Project site as a potential location for the missing linkage of the Riverwalk and Foothills Trail. Policy 2.4 of the City's PROS Plan is for a visual connection to the Puyallup River through the Riverwalk Trail and provide for opportunities for fishing and general access through the trail system. The County PROS Policy PR-19 is to provide public waterfront access, including increasing the shoreline and water access in concern with increased demand from growth and development (PR-19.3), and PR-2.4 states that the County should work toward an interconnected system of parks and trails in the urban area that safely connects to schools, civic facilities, shopping, and recreational facilities. The Project would also be inconsistent with Policies 2(V), 2.1(a), 2.1(c), and 3.1(g) of the City of Puyallup SMP.

Buildings F and G would interfere with the intended use of Van Lierop Park's site plan design, which contemplated connections to the regional trail network to-and-from the park. Buildings F and G would also block Mount Rainier, a central part of the design of Van Lierop Park.

The proposed site plan includes an on-site pedestrian trail near Buildings A, E, and G. The location of the proposed pedestrian trail, as shown on the Project Site Plan, would not provide an east-west connection to Van Lierop Park and places development in a manner that would interfere substantially with a community-wide park resource. The Project is an intensive industrial development that would subject the users to an unappealing and conflicting environment. This would likely result in impacts on the recreational enjoyment of park users and reduced pedestrian usage, more than would be expected had the Project not occurred. Additionally, the proposed trail does not follow the Puyallup riverbank in areas where access could be provided with a design that would place the trail closer to the river itself, which is preferred by both the Puyallup Comprehensive Plan and SMP. The proposed trail also is shown to be routed through Wetland D; a new trail that would require fill of a wetland in order to construct it would be inconsistent with PCC critical area code protections related to wetlands.

Proposed Buildings F and G would interfere with the intended purpose and use of Van Lierop Park's site plan design, which contemplated connections to the regional trail network to and from the park. Buildings F and G would block the view of Mount Rainier, a central part of the design of Van Lierop Park. Implementation of mitigation measure REC-1 would minimize these recreation impacts associated with the operation of the proposed Project to the extent feasible (see potential modifications illustrated in Figure 4-58 and Figure 4-59).

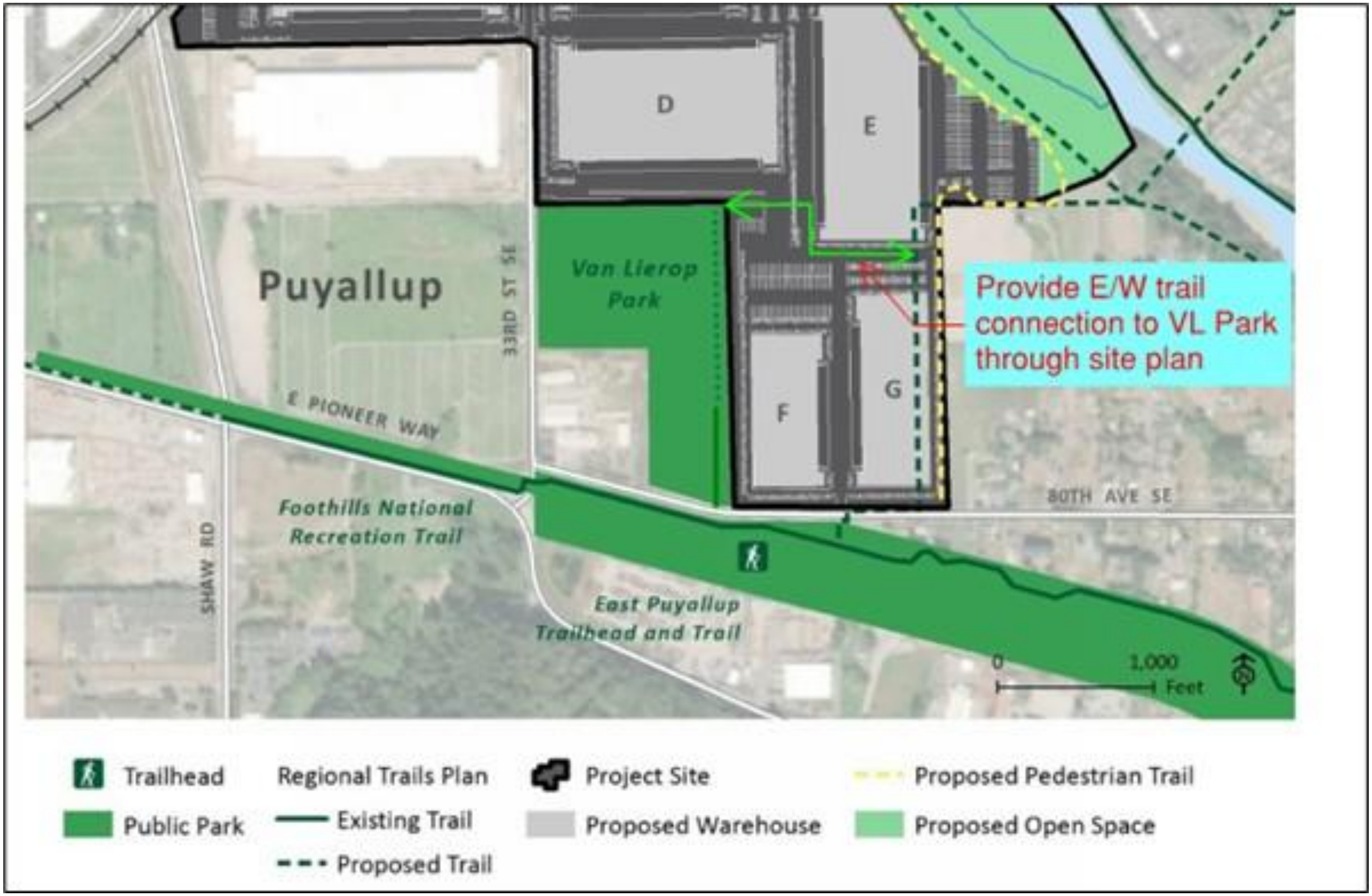


Figure 4-58. Proposed East/West Trail Connection through the Site Plan for Trail Connectivity

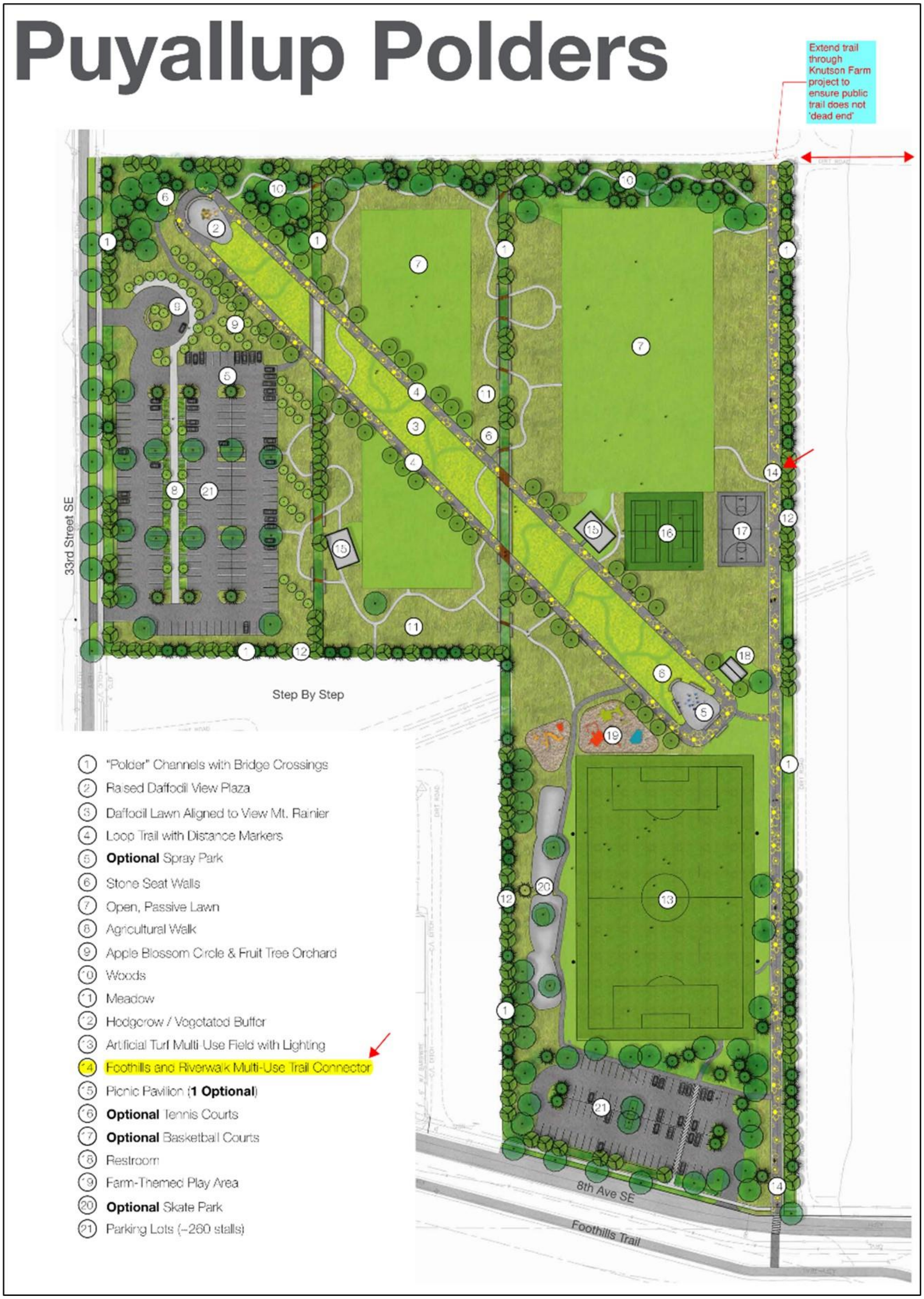


Figure 4-59. Excerpt from City's PROS Plan Showing Van Lierop Park Layout

The proposed pedestrian trail route would be visually and physically separate from the Puyallup River and from trails intended to connect large community park space to the regional trail network. Implementation of mitigation measures REC-1, REC-4, and REC-5 would reduce impacts to the extent feasible.

- ***REC-4: Modify the Site Plan to Provide a New Trail Location.*** The Applicant should modify the site plan to provide a new multipurpose trail location, one that runs along the southern bank of the Puyallup River consistent with the location identified in the 2020 Puyallup PROS Plan, as an extension of the existing Foothills/Riverwalk Trail, in keeping with the intended user experience of the Riverwalk Trail to provide the public with a visual connection and/or shoreline access to the Puyallup River. This should include conducting a Trail Routing Feasibility Analysis. The Trail Routing Feasibility Analysis should determine where the least impactful location would be to relocate the proposed trail along the shoreline of the Puyallup River; the Applicant should identify a trail route that will be in conformance with the County and City SMPs and PROS Plans, as well as minimize impacts on floodplain, CMZ(s) and critical areas, and mitigate for any impacts. Special designs—such as elevated boardwalks—should be considered to bridge wetlands, and maintain flood storage capacity and sensitive areas and buffers. Pierce County Parks, City of Puyallup Parks, and user advocate groups (Foothills Trail coalition, Friends of the Riverwalk Trail) should review the overall dimensions and cross section of the trail corridor. The trail design throughout the site planning should utilize significant landscape buffering to separate physically and visually the trail from the industrial park to protect the trail user experience from impacts from the Project operations while implementing Crime Prevention Through Environmental Design (CPTED) principles and incorporating visual public access to the shoreline environment.

Pierce County Comprehensive Plan policies (included as part of the County PROS) supporting this mitigation measure include ENV-1-2, ENV-1.5, ENV-2.2, PR-19, PR-21, and PR-19.3. City 2020 PROS Plan Policy P-2.4 supports this measure. Additionally, pg. A-109 of the Pierce County Alderton-McMillin Community Plan says, "*New links to the [Foothills] trail system should strive to connect to public river access areas*."

- ***REC-5: Provide a Trail Connection to Van Lierop Park.*** Consistent with County and City policies calling for trail connectivity with other recreation facilities and community activity centers, the Applicant should provide a trail connection to Van Lierop Park (Pierce County Comprehensive Plan Policies PR-10 and PR-17.1, City PROS Plan Policy 2.3). This could be an east/west trail connection through the site plan to allow trail connectivity from the northwest corner of the park to the trail corridor as shown on the proposed site plan, though it is possible a different alignment may be preferred, for instance, if the site plan changes as called for in other mitigation measures in this EIS. One concept could be to modify the portion of the site containing Buildings F and G by creating a trail corridor break in the site plan to separate the complex into two separate sites with no vehicular access between them. This would create a protected corridor to allow for an east-west connection from Van Lierop Park to the proposed trail on the Project site. The trail corridor could also potentially be placed in the Williams

Pipeline corridor, pending approval from Williams through an encroachment agreement. Any connection through the site should contain appropriate landscape buffering, raised crossings, limited/consolidated driveway/parking lot crossings of the trail, and other features to protect trail users, such as way-finding signage indicating "public trail connection" that allow for safe access to the trail. The Project Applicant and Pierce County should seek input from the City of Puyallup Parks Department and Development and Permitting Services Department as the site plan is revised to meet this mitigation measure.

Alternative 1 – Rail Transport

Construction Impacts

Mitigated Significant Impact. The construction impacts associated with Alternative 1 would be the same as those described for the proposed Project and would require implementation of mitigation measures REC-1, REC-2, and REC-3 to minimize impacts. Alternative 1 would also include rail construction across 80th Street, close to the Foothills Trailhead parking. This would impact the experience of the Foothills Trail users, as the aesthetic quality of their use of the trail would be interrupted. Further, trail users could potentially experience temporary trail closures as a result of the interference of construction activity and construction equipment. The Alternative 1 rail line on the Project site, especially outside of Warehouse C, would conflict with the proposed pedestrian trail. Construction could cause noise and dust exposure to users of nearby recreation facilities. For more information on air and noise impacts associated with construction of Alternative 1, see Sections 4.8 Air Quality and Greenhouse Gases and 4.13 Noise. These recreation disruptions associated with the construction of Alternative 1 could last during the anticipated 5 years of construction. To mitigate for the potential impacts, mitigation measure REC-6 would be required:

- ***REC-6: Modify Alternative 1 Site Plan to Avoid Trail Impacts.*** During building permit review and prior to design approval, the Applicant should provide a site plan that locates the rail line so it does not block or close any trails/trail heads in the vicinity. This includes mitigation meant to limit exposing recreationalists to unsafe environments, dust, and noise that can be associated with rail activity. Any construction over the existing trail or trail connections need to provide a re-route to preserve public access during construction. The Applicant and permitting agency (Pierce County) should consult with and receive concurrence from the city of Puyallup Development and Permitting Services and Parks Departments on the assessment during permit review by Pierce County. This mitigation measure is consistent with Pierce County Comprehensive Plan Policy LU-47.8 and Pierce County Comprehensive Plan and PROS Plan Policies PR 1.3 and PR 5.6, as well as City of Puyallup Comprehensive Plan Policy CC-1.3, Policy CC-2.2, and Goal CC-3.

Operations Impacts

Mitigated Significant Impact. The recreation impacts associated with Alternative 1 would be the same as those described for the proposed Project. Alternative 1 would introduce structures and associated truck activity that would interfere with the intended uses of surrounding recreation opportunities in the area. Implementation of mitigation measures REC-1, REC-2, and REC-3 would be required to minimize impacts.

Alternative 1 would add to the recreation impacts by introducing rail activity. The experience of existing recreation users would likely include increased noise from train engines both running and idling and whistles at at-grade crossings. Additionally, recreation users might experience a less safe environment, as the proposed rail would cross within direct proximity of the East Puyallup Trailhead and Trail, the Foothills Trail, and the proposed trail extension from the East Puyallup Trailhead and Trail across 80th Avenue SE. The proposed rail line on the Project site, especially outside of Warehouse C, would conflict with the proposed pedestrian trail. To mitigate for the potential impacts, mitigation measure REC-6 would be required, as outlined under Construction Impacts above.

Alternative 2 – Reduced Intensity Alternative

Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility (AES-2, LU-1, REC-1, and SW-4) as outlined in this Draft EIS for the proposed Project) were adopted by the Applicant. Alternative 2 would implement mitigation identified to remove portions of Building F, and potentially Building G, from the park view corridor, provide east-west connectivity to the proposed trail on the Project site, establishes that the alternative alignment for the proposed trail along the shoreline would be implemented and provides for a consolidated north-south trail on the Van Lierop Park site. Alternative 2 would still require Project implementation mitigation measures to reduce recreation impacts.

Construction Impacts

Mitigated Significant Impact. The recreation-related construction impacts associated with Alternative 2 would be similar to those described for the proposed Project but would have a reduced footprint, so construction would be at a smaller scale. However, construction equipment could still interfere with the existing uses of surrounding recreation sites and opportunities, including Puyallup Riverwalk Trail, the Foothills Trail Trailhead, and Van Lierop Park’s view corridor of Mount Rainier. Construction of the Project would create a change to the natural environment, the built environment, and the recreational use and quality within those environments in the Project site. To mitigate for the potential impacts, mitigation measures REC-2 and REC-3 would be required.

Operations Impacts

Mitigated Significant Impact. During operations, Alternative 2 would still interfere with the intended uses of surrounding recreation, including the Puyallup Riverwalk Trail or the Foothills Trail Trailhead, as operations would bring increased truck and other vehicular traffic to the area and compromise the user’s experience (Pierce County Comprehensive Plan, Goal PR-21 and Policy CC-1.3). The reduced building footprints of Buildings A, C, and E and the addition of trail and building buffers would allow the trail location to be visually screened from the industrial uses under scenario 2, but the recreational use would still conflict with the character of the industrial warehouse development. However, under Scenario 2, the proposed on-site trail would shift to a shoreline alignment (starting east of Building E, due north), lessening impacts to future recreationalists and separating incompatible uses. Scenario 2 would also reduce building footprints of Buildings F and G by removing the portions of each building blockage of Mount Rainier from Van Lierop Park in accordance with REC-1, thereby lessening impacts to the park and recreational resources. The location of the proposed trail as shown on the proposed Project site plan would not connect to Van Lierop Park and would place the proposed development in a manner that would have substantial impacts on a community-wide park resource. Under Scenario 2, the trail would be moved from the proposed location parallel to Building G (east of Building G) and consolidated with built and future planned extension of the trail on the eastern side of Van Lierop Park. Scenario 2 would also require that the site plan be separated by the east-west trail corridor so no vehicular crossing of the trail would occur. Additional pedestrian improvement to facilitate safe access across 80th Street/8th Avenue Southeast would also need to occur under Scenario 2.

Impacts would be minimized with the implementation of mitigation measures REC-2 and REC-3.

4.8 Air Quality and Greenhouse Gases

This section describes the existing air quality in the study area. It also describes impacts on air quality that could result under the No Action Alternative or as a result of the construction and routine operation of the proposed Project. Finally, this section presents any measures identified to mitigate impacts of the proposed Project for potential significant adverse impacts.

4.8.1 Study Area

The study area for evaluating impacts on air quality is within and near the Project site that could be affected by construction and operation activities in the Project site. The Project site is in the UGA of the City of Puyallup approximately 2 miles east-northeast of the center of the City and within Pierce County. The Puyallup River borders the Project site along the northeast portion of the property. The City of Sumner is located within one-half mile across the Puyallup River to the north-northeast of the Project site. For the evaluation of climate and greenhouse gases, the study area is discussed in terms of regional air quality, as changes in climate are realized more broadly. The immediate area surrounding the Project site is composed mainly of residential and commercial use with some light industrial property. There are two schools located approximately 0.6 mile to the east-northeast and another school located approximately 0.8 mile southwest of the Project site. Van Lierop Park and Foothills Trail are located near the Project site.

4.8.2 Relevant Plans, Policies, and Regulations

This section summarizes federal, state, and local regulations related to air quality that are applicable to the Project. The relevant federal, state, and local laws, regulations, plans, and policies that establish the regulatory framework regarding air quality and greenhouse gases (GHGs) are provided in Table 4-25. Air quality and GHGs are defined further below after Table 4-25 and in Section 4.8.3, Affected Environment.

Table 4-25. Relevant Air Quality and GHG Laws, Regulations, Plans, and Policies

Laws, Regulations and Plans	Description
Federal	
Clean Air Act and Amendments	Enacted in 1970, as amended in 1977 and 1990, requires the USEPA to develop and enforce regulations to protect the public from air pollutants and their health impacts.
National Ambient Air Quality Standards (NAAQS)	Established by USEPA. Specifies the maximum acceptable ambient air concentrations for seven criteria air pollutants: carbon monoxide (CO), ozone, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead, and particulate matter ($PM_{2.5}$ and PM_{10}). Primary NAAQS set limits to protect public health, and secondary NAAQS set limits to protect public welfare. Geographic areas where concentrations of a given criteria pollutant violate the NAAQS are classified as nonattainment areas for that pollutant; maintenance areas have reduced pollution to achieve standards but have long-term requirements to ensure that they maintain attainment.

Laws, Regulations and Plans	Description
GHG Reporting Program Rule (40 Code of Federal Regulations [CFR] 98)	The GHG Reporting Program requires reporting of GHG data and other relevant information from large GHG stationary emission sources, fuel and industrial gas suppliers, and CO_2 injection sites in the United States. The numeric reporting threshold is 25,000 metric tons per year of GHG in terms of CO_2 equivalent emissions.
GHG Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles (numerous parts under 40 CFR and 49 CFR)	The USEPA and the Department of Transportation's National Highway Traffic Safety Administration jointly finalized standards for medium- and heavy-duty vehicles that would improve fuel efficiency and cut carbon pollution to reduce the impacts of climate change.
State	
Washington State General Regulations for Air Pollution Sources (WAC 173-400); Washington State Clean Air Act (RCW 70.94)	Establishes the rules and procedures to control or prevent the emissions of air pollutants; provides the regulatory authority to control emissions from stationary sources, reporting requirements, emissions standards, permitting programs, and the control of air toxic emissions.
Washington State Ambient Air Quality Standards (WAC 173-476)	Establishes maximum acceptable levels in the ambient air for particulate matter, lead, SO_2, NO_2, ozone, and CO; Washington adopts current federal NAAQS in state regulations.
Washington State Greenhouse Gas Reporting Regulation (WAC 173-441)	Requires some facilities and transportation fuel suppliers to annually report their greenhouse gas emissions; 10,000 metric tons per year is the numeric threshold.
Washington State Controls for New Sources of Toxic Air Pollutants (WAC 173-460)	Establishes controls for new and modified sources of toxic air pollutants.
Limiting Greenhouse Gas Emissions (RCW 70.235)	Requires state to reduce overall GHG emissions as compared to a 1990 baseline and to report emissions to the governor biannually.
Reporting of Green House Gas Emissions (WAC 173-441)	Requires facilities that emit at least 10,000 metric tons of carbon pollution yearly from stationary sources to report their greenhouse gas emissions.
Local	
Puget Sound Clean Air Agency Regulations (Regulations I through III, activated by RCW 70.94)	Regulate stationary sources of air pollution in Pierce, King, Snohomish, and Kitsap counties. Include emissions standards and permitting, evaluating toxic air contaminant impacts, and SEPA requirements.
Pierce County Comprehensive Plan	The Pierce County Comprehensive Plan (Pierce County 2021d) outlines strategies for improving air quality in order to reduce adverse health impacts and improve visibility for scenic views. For this Project, the relevant policies include: • ENV-3.1. Continue to work to meet federal and state air quality requirements.

Laws, Regulations and Plans	Description
	• ENV-3.4. Develop land use practices which improve air quality, including infill development and concentrating high density land uses which reduce vehicle trips. • ENV-3.5. Recognize the relationship between reducing vehicle trips and reducing carbon emissions. • ENV-3.6. Encourage development and implementation of transportation-based strategies that reduce pollutants, smog, and diesel air-toxins. • ENV-3.7. Pursue the use of alternative cleaner-burning fuels. • ENV-4.1. Coordinate with local agencies and jurisdictions to develop transportation control measures and similar mobile source emission reduction programs that may be warranted to attain or maintain air quality health standards. • ENV-4. 2. Coordinate with agencies to provide information on air quality problems and measures to improve air quality.
City of Puyallup Comprehensive Plan	The City of Puyallup Comprehensive Plan (City of Puyallup 2015a) outlines strategies for protecting clean air and the climate for present and future generations through reduction of greenhouse gas emissions and promotion of efficient and effective solutions for transportation, clean industries, and development. For this Project, the relevant policies include: • NE 11.1. Promote compliance with federal and state air pollution control laws and improvements to regional air quality in cooperation with the Puget Sound Air Pollution Control Agency and the Puget Sound Regional Council. • NE 11.2. Achieve criteria air pollutant reductions in both municipal operations and the community at large, with attention given to social equity. • NE 11.3. Maintain high air quality through land use and transportation planning and management. • NE 11.4. Implement commute trip reduction programs as a means to limit or reduce vehicle trips as a key strategy for reducing vehicle-related air pollution. • NE 11.5. Reduce the amount of airborne particulates through a street sweeping program, dust abatement on construction sites, street trees, covered loads of hauled materials, and other methods to reduce the dust sources. • NE 11.6. Address Puyallup's contribution to climate change by, at a minimum, committing to comply with state initiatives and directives regarding climate change and the reduction of GHG. • NE 11.7. Include analysis of climate change impacts when conducting environmental review under SEPA.

Laws, Regulations and Plans	Description
	• NE 11.8. Promote the reduction of GHG by encouraging conservation and the use of alternative energy sources and reducing vehicles miles traveled by increasing alternatives to driving alone. Consider the implementation of a complete streets ordinance to ensure that City capital projects will integrate and promote multimodal transportation options to the extent feasible. • T-6.2. Meet or exceed federal and state air quality requirements by working with state, regional, and local agencies and jurisdictions to develop transportation control measures and/or similar mobile source emission reduction programs to attain or maintain air quality requirements: a. Conform to federal and state Clean Air Acts by following the guidance of the Puget Sound Regional Council's Transportation 2040 Plan. b. Encourage walking, bicycling, and riding public transit in order to reduce energy consumption and air pollution. c. Require air quality impact analysis of major new developments which might adversely impact air quality levels in their vicinity. d. Encourage and promote the use of electric vehicles; provide a broad range of opportunities for vehicle recharge.

Source: Ecology 2020

Federal, State, and Local Standards

The 1970 Federal Clean Air Act and subsequent amendments required the USEPA to establish regulations for controlling the nations' air quality. These regulations set criteria for the National Ambient Air Quality Standards (NAAQS). The primary NAAQS are protective of public health. The secondary NAAQS are protective of public welfare and the environment. Both primary and secondary standards specify ambient air concentration limits, with a safety margin, for pollutants to avoid adverse health and environmental effects. These standards are designed to protect the most susceptible public populations such as those with respiratory illnesses, the very young, the elderly, and those engaging in strenuous work or exercise.

The USEPA identified eight pervasive criteria air pollutants and established health-based ambient air quality standards for them. Ozone (O_3), carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb) were the initial criteria pollutants followed by PM_{10} (particulate matter less than or equal to 10 microns in diameter) and $PM_{2.5}$ (particulate matter less than or equal to 2.5 microns in diameter), which are subsets of particulate matter and more commonly regulated. Ozone is a pollutant that is not typically directly emitted, but it forms in the lower atmosphere from direct emissions of NOx and volatile organic compounds (VOC) and their photochemical reactions with sunlight.

Geographic areas of the United States that do not meet the NAAQS for any one or more of the criteria pollutants are designated by the USEPA as nonattainment areas. Areas that were once designated nonattainment but are now achieving the NAAQS are termed maintenance areas. Areas that have pollutant levels below the NAAQS are termed attainment areas. In nonattainment areas, states must develop plans to reduce emissions and bring the area back into attainment with NAAQS. Maintenance areas have requirements that last for at least 20 years to ensure that they stay in attainment. The Knutson Farms proposed Project is in Pierce County, Washington, which is classified as in attainment with the NAAQS for all criteria pollutants but is also classified as a maintenance area for $PM_{2.5}$ (USEPA 2021a). As of May 14, 2021, Pierce County went from maintenance status to attainment status for PM_{10} as the 20-year maintenance period lapsed on that date.

One of the ambient air monitors located in Pierce County and considered representative of air quality at the Knutson Farms site is located at 1802 S. 36th Street, Tacoma, Washington. The $PM_{2.5}$ values from this monitoring station for the period of 2018 through 2020 have shown the ambient annual mean $PM_{2.5}$ concentrations in this location have been between 7.2 micrograms per cubic meter ($\mu g/m^3$) and 9.3 $\mu g/m^3$ compared to the standard of 12 $\mu g/m^3$, approximately 60 to 78 percent of the standard. The 24-hour $PM_{2.5}$ 98th percentile concentrations from this station for the period of 2018 through 2020 have ranged from 18 $\mu g/m^3$ to 41 $\mu g/m^3$ with a 3-year average of 29 $\mu g/m^3$. approximately 83 percent of the ambient standard. The NO_2 values from this monitoring station for the period of 2018 through 2020 have shown the ambient annual mean NO_2 concentrations in this location have been between 12.5 parts per billion (ppb) and 16 ppb compared to the standard of 53 ppb; approximately 23 to 30 percent of the standard. The 1-hour NO_2 98th percentile concentrations from this monitoring station for the period of 2018 through 2020 have ranged from 40 ppb to 47 ppb with a 3-year average of 44.3 ppb, 44.3 percent of the standard (USEPA 2020).

Table 4-26 identifies the primary and secondary NAAQS for the criteria pollutants under federal and Washington State law. Washington has adopted the federal primary and secondary standards.

Table 4-26. Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	Primary Standard	Secondary Standards	Form
Ozone	8 hours	0.070 ppm[a]	0.070 ppm	Annual 4th-highest daily max. 8-hour concentration, averaged over 3 years
Carbon monoxide (CO)	1 hour	35 ppm	No applicable standard	Not to be exceeded more than once/year
	8 hours	9 ppm	No applicable standard	
Nitrogen dioxide (NO_2)	1 hour	0.100 ppm (100 ppb)	No applicable standard	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Annually	0.053 ppm (53 ppb)	0.053 ppm (53 ppb)	Annual mean
Sulfur dioxide (SO_2)	1 hour	0.075 ppm	No applicable standard	99th percentile of 1-hour daily maximum

Pollutant	Averaging Time	Primary Standard	Secondary Standards	Form
				concentrations, averaged over 3 years
	3 hours	0.5 ppm for state, no applicable standard for federal	0.5 ppm	Not to be exceeded more than once/year
	Annually	0.02 ppm for state, no applicable standard for federal	No applicable standard	Not to be exceeded
	24 hours	0.14 ppm for state, no applicable standard for federal[b]	No applicable standard	Not to be exceeded more than once/year
Particulate matter (PM_{10})	24 hours	150 µg/m^3 [c]	150 µg/m^3	Not to be exceeded more than once/year on average over 3 years
Fine particulate matter ($PM_{2.5}$)	24 hours	35 µg/m^3 [d]	35 µg/m^3	98th percentile, averaged over 3 years
	Annually	12 µg/m^3	15 µg/m^3	Annual mean, averaged over 3 years
Lead	Rolling 3-month average	0.15 µg/m^3	0.15 µg/m^3	Not to be exceeded

Sources: USEPA 2021b; WAC Chapter 173-476

[a] This 2015 NAAQS is the most stringent NAAQS still in effect for ozone. A 2008 8-hour ozone standard of 0.075 ppm also remains in effect. The 2015 8-hour ozone standard is attained when the 3-year average of the fourth highest daily concentration is 0.070 ppm or less.

[b] The 24-hour average concentration for sulfur oxides in the ambient air must not exceed 0.14 ppm by volume more than once per calendar year (WAC 173-476-130).

[c] The 24-hour PM10 standard is attained when the 3-year average of the 99th percentile of monitored concentrations is less than the standard.

[d] The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of the 98th percentile is less than the standard.

Note: ppm: parts per million; µg/m^3: micrograms per cubic meter.

The USEPA General Conformity Rule (40 Code of Federal Regulations [CFR] 51 and 93) applies to federal actions or federally funded actions (non-transportation agency actions) occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. The emissions thresholds that trigger requirements for a conformity analysis are called *de minimis* levels. *De minimis* levels (in tons per year [tpy]) vary by pollutant and depend on the severity of the nonattainment status for the air quality management area in question. These *de minimis* levels represent the quantity of emissions above which the need for a conformity assessment with the State Implementation Plan (SIP) is required. The SIP is the state's plan for meeting and maintaining the NAAQS, which must be approved by the USEPA, including revisions. Although the USEPA General Conformity rule does not apply to the Knutson Farms proposed Project, the *de minimis* levels that would apply to an applicable federal action in Pierce County were used as a surrogate to assess the potential significance of Project-related criteria air pollutant emissions. The only *de minimis* levels for Pierce County that is applicable is 100 tpy of $PM_{2.5}$ due to its maintenance status. The precursors to $PM_{2.5}$ include SO_2, NOx, and potentially VOC; therefore, 100 tpy has also been used as a surrogate for potential air quality significance indication for these criteria pollutants as well. The Prevention of Significant Deterioration (PSD) major source threshold of 250 tpy is being used as a surrogate for potential air quality significance indication for CO and PM_{10} because they are attainment pollutants and are not a precursor to other criteria pollutants.

The Clean Air Act identifies 187 compounds that are known to cause cancer or serious health effects. This group of compounds is called air toxics or hazardous air pollutants (HAPs). The USEPA has identified 21 HAPs emitted from mobile sources, referred to as mobile source air toxics (MSAT), within a few final rules: Control of Emissions of Hazardous Air Pollutants from Mobile Sources (40 CFR 80, 85, 86). These rules mainly regulate fuel and vehicle manufacturers. The USEPA designated seven priority MSAT due to their potential for causing cancer and serious health effects when exposures are long enough and at sufficient concentrations: acrolein, benzene, formaldehyde, diesel particulate matter (DPM)/diesel exhaust organic gases, naphthalene, polycyclic organic matter, and 1,3-butadiene. These priority MSAT are analyzed in this EIS regarding operational emissions from truck hauling to and from the Warehouse Complex Facility.

Ecology provides protection of public health and the environment by establishing and enforcing rules to prevent and reduce air pollution and approve emissions with limitations. Enforcement of most of the Clean Air Act requirements has been delegated by the USEPA to Ecology and seven clean air agencies with local authority in the state. Ecology works to improve air quality throughout the state by overseeing the development and conformity of the SIP. Ecology oversees the statewide air monitoring network and ensures that the monitoring data meets the federal requirements of 40 CFR 58. Ecology also requires facilities that have applicable emissions source categories (e.g., stationary fuel combustion, electricity generation, specific types of manufacturers, petroleum industry sources) and emit at least 10,000 metric tons of CO_2 equivalents annually to report their greenhouse gas emissions annually (WAC Chapter 173-441).

The Puget Sound Clean Air Agency (PSCAA) regulates air quality within the counties of Pierce, King, Snohomish, and Kitsap. PSCAA has local authority for setting regulations and permitting of stationary emissions sources and construction emissions.

4.8.3 Affected Environment

Ambient “air quality” refers to the condition of the outdoor air within our environment. Good ambient air quality pertains to the degree to which the air is clean, clear, and free from pollutants such as smoke, dust, and gaseous impurities in the air. Air quality is determined by the concentration of various pollutants in the atmosphere. The main pollutants of concern are called criteria pollutants and toxic air pollutants. The criteria pollutants that are regulated nationwide via NAAQS consist of CO, O_3, NO_2, SO_2, Pb, and particulate matter including PM_{10} and $PM_{2.5}$. The regulated toxic pollutants are from a list of 187 chemical compounds designated by the USEPA and over 400 toxic pollutants designated by the state and local air quality agency as posing cancer or other human health risks.

Air quality in and around the study area is generally good for roughly 75 percent of the year, with some moderate air quality for 20 percent of the year and typically only a few days per year with unhealthy air for sensitive groups (PSCAA 2019). Air quality in this area is regulated and enforced by the USEPA, Ecology, and the PSCAA.

Climate and Greenhouse Gases

"Climate" is the average weather conditions over time for a particular region, usually taken over a period of 30 years or more. While the topic of climate can be global in nature, changes in climate for this EIS are discussed with respect to potential impacts on regional air quality in Washington for the proposed Project. Atmospheric warming associated with climate change has the potential to increase ground-level ozone in many regions, which may present challenges for compliance with the ozone standards in the future. The impact of climate change on other air pollutants, such as particulate matter, is less certain, but research is underway to address these uncertainties.

The region around the Project site experiences a maritime climate with winters that are cool and very wet with high temperatures averaging in the mid- to upper 40s Fahrenheit and lows near freezing. Snow is not very common, with occurrences typically only on a few days each year. Spring has less rain and milder temperatures, with highs regularly in the mid-50s to around 60°F. Summers are warm and dry with highs in the 70s on most days, with some days reaching the 80s and occasionally the 90s. Summer thunderstorms occur occasionally but are mostly isolated and rarely severe. These storms typically originate from the Cascade Mountains and are from warm moist air from monsoonal flow in the southwest U.S. By fall, temperatures start to drop and precipitation increases. The average rainfall in the months of October to March is 4 to 7 inches per month, with the lowest rainfall between May and September averaging between 1 and 2 inches per month (Best Places 2021; Wikipedia 2021). The wind direction is most often from the west between May and mid-September and most often from the south between mid-September through April. The average of the mean hourly wind speed does not vary significantly throughout the year and varies between 3 to 5.3 mph (Weather Spark 2021).

Gases that trap heat in the atmosphere are referred to as GHGs because they capture heat radiated from the earth that would otherwise be lost to space. While the physical mechanism of this heat capture is different than for a greenhouse, it has the same effect of keeping surface temperatures warmer, and so these gases are referred to as GHGs. The accumulation of GHGs contributes to temperature increases and global climate change. Regulated GHGs include CO_2, methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). Carbon dioxide, methane, and nitrous oxide are commonly emitted from sources of fuel combustion (e.g., stationary boilers, heaters, engines, and mobile sources such as construction equipment and on-road vehicles). Methane is also commonly emitted from agricultural practices such as livestock and crop farming. PFCs and HFCs can be found contained within industrial processes, electrical equipment, and building cooling systems as coolants/refrigerants, although sometimes these systems leak into the atmosphere. GHGs have long atmospheric lifetimes that vary from 1 year to thousands of years and have significantly varying potentials to trap heat that are described as their global warming potential. On a 100-year time horizon, CH_4 is estimated to be 25 times as potent as CO_2 at trapping heat, while SF_6 is 22,800 times more potent than CO_2. GHG emissions are typically reported as CO_2 equivalents (CO_2-e), which convert the quantities of non-CO_2 emissions into an equivalent amount of CO_2 to report emissions as a single quantity, usually in metric tons.[16]

In 2018, the state of Washington produced approximately 100 million gross metric tons of CO_2-e. The transportation industry is the largest source, at 44.9 percent of the state's GHG emissions, followed by residential, commercial, and industrial energy use at 23.4 percent, and electricity consumption (both in state and out of state) at 16.3 percent. The sources of the remaining 15.4 percent of emissions are agriculture, waste management, and industrial processes (Ecology 2018b).

Some of the effects of climate change over the last 50 to 100+ years in Washington State include the following, as presented in a special report issued by the Intergovernmental Panel on Climate Change (PSI 2021):

- Average snowpack has declined by approximately 30 percent from 1955 to 2016.
- The total area occupied by glaciers in the North Cascades has declined by more than 56 percent since 1900.
- Sea level has risen in northern Puget Sound by as much as 4 inches, with other increases elsewhere.
- Peak stream flow is occurring earlier in the year by as much as 20 days when comparing 1948 data to 2002 data for the most snow-covered areas near Puget Sound.
- Coastal waters have warmed between 0.9°F and 1.8°F between 1990 and 2012, with the Pacific Ocean and Puget Sound shifting to slightly less alkaline conditions.

4.8.4 Impacts

Methodology

The evaluation of potential impacts on air quality and GHG impacts consists of conducting the following tasks:

- Develop a qualitative assessment of the levels of direct and indirect criteria pollutants, DPM, and GHG emissions from construction activities (e.g., earthmoving/land-clearing equipment and fossil-fueled construction vehicles/equipment, asphalt paving, construction worker commuter vehicle emissions, material hauling vehicle emissions) for the Project and operational activities (e.g., space-heating emissions sources, emergency power generating sources, worker vehicle commuting). This emissions assessment is based on similar Project historical data, typical energy use data based on the region in the United States, and type of building and/or use of air quality screening models. Criteria pollutant emissions are compared to General Conformity *de minimus* threshold levels and PSD major source thresholds as a measure of Project emissions significance. Stationary source emissions that would require an air quality permit from PSCAA or Ecology would not count toward threshold comparisons, as they would comply with the SIP by obtaining a permit and following permit conditions. DPM emissions are compared to state-level thresholds

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[16] Criteria pollutants and toxic pollutants are typically reported in units of short tons (English units).

and distances to sensitive receptors for assessing impacts and are assessed under MSAT pollutants below.

- Quantify MSAT pollutants from operational truck traffic emissions for the local air quality study area, defined as from the exit point(s) of the freeway system to the proposed Project. These emissions are estimated using the latest version of the USEPA's MOVES emissions model, MOVES3, together with vehicle miles travelled and vehicle speed data provided by the Project traffic analysts. The MOVES model is executed for Pierce County in a national default mode to generate emission factors for the heavy-duty trucks being analyzed for local emissions.

Characterization of Air Quality Impacts

An adverse air quality impact would be any level of expected/estimated annual criteria pollutant emissions increase in direct or indirect emissions from Project construction activities or operational activities that would exceed the General Conformity *de minimus* or major thresholds discussed above. Decreases in direct or indirect emissions would be considered beneficial impacts. A significant air quality impact during construction or operations would be an annual emission increase of criteria pollutants, after applicable and appropriate mitigation measures, that would be expected to exceed the General Conformity *de minimus* threshold levels (or PSD major source threshold for CO and PM_{10}) and would be expected to result in exceedance of an ambient air quality standard. An exceedance of an ambient air quality standard would be based on applying a percent increase in county-level emissions from the proposed Project to the current ambient monitored values nearest to the proposed Project and comparison to the ambient air quality standards.

Characterization of MSAT Impacts

The adverse impacts from operations-related emissions of mobile source criteria pollutants and air toxics pollutants would be any level of expected/estimated emissions increases in these pollutant emissions. A significant adverse impact during the proposed Project operation period would be annual emissions of MSATs, after applicable and appropriate mitigation measures, that would be greater than 25 tpy for all MSATs combined.

Characterization of GHG Impacts

An adverse GHG impact would be any level of expected/estimated annual GHG emissions increase in direct or indirect emissions from Project construction activities or operational activities. Decreases in direct or indirect emissions would be considered beneficial impacts. A significant adverse impact during construction or operations would be annual emissions of GHG, after applicable and appropriate mitigation measures, that would exceed the PSD Best Available Control Technology (BACT) threshold of 75,000 tons (short tons) per year. Exceeding the Ecology 10,000 metric tpy direct stationary emissions threshold from specific types of emission sources would require annual reporting. Although not currently required, facilities that exceed the Ecology 10,000 metric tpy threshold could be required in the future to reduce GHG emissions to contribute to meeting Washington State GHG limits from 2030 to 2050. It is anticipated that those reductions would be phased in over time, but the nature, extent, and details of these future requirements are not known.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, the construction and operation of the proposed Project would not occur. Existing conditions in the study area related to air quality would continue under the No Action Alternative.

Proposed Project

Construction Impacts

Less than Significant. Construction activities generating air pollutant emissions include fuel combustion within the internal combustion engines of non-road construction equipment. This could include graders, bulldozers, backhoes, loaders, skid steers, excavators, rollers, cranes, high lifts, dump trucks, concrete trucks, paving equipment, street sweepers, and water trucks. In addition, particulate fugitive dust emissions would be generated from land clearing disturbances and soil excavations and movements, and passenger and truck delivery traffic on unpaved and paved roads. It is estimated that 400,000 to 450,000 CY of on-site excavation and fill, approximately 120,000 CY of imported fill, and 80,000 to 110,000 CY of stripping material would be moved over the course of the construction period. Most of the stripping material is planned to remain on site and be used in landscaping areas for berms. Some quantity of stripping material would be exported from the site to an approved receiving site. Asphalt paving of roads and parking areas and surface coating of building surfaces would generate VOC emissions.

The construction workers commuting in vehicles would also generate combustion emissions. The Project developer estimated that the total number of construction employees present at the job site at any single period is expected to be about 150 employees.

Based on similar sized and type of construction projects, the construction emissions from the proposed Project are not expected to cause a significant air quality impact and are not expected to cause an exceedance of the NAAQS. The construction emissions would be intermittent in nature, temporary and spatially dispersed, and are not expected to represent a significant adverse impact. A similar size and type hypothetical construction Project was entered into the U.S. Air Force Air Conformity Applicability Model (screening model) for a project in Pierce County, Washington (Department of the Air Force 2019). The resulting estimated emissions were well below the General Conformity *de minimus* thresholds of 100 tpy for CO, NOx, SO_2, VOC, PM_{10}, and $PM_{2.5}$ (Pb emissions are considered insignificant for these types of construction projects). The highest criteria pollutant was PM_{10} at just under 12 tpy, CO and NOx were less than 4.3 tpy, and all other criteria pollutants were less than 1 tpy. The emissions of CO_2 equivalent emissions were less than 1,200 tpy (1,088 metric tons per year [mtpy]), which is well below the 75,000 tpy PSD BACT threshold and the 10,000 mtpy Ecology GHG reporting threshold. While these thresholds do not apply to construction emissions, this comparison provides a sense of the minimal magnitude of the Project construction emissions in comparison to *de minimis* and insignificant thresholds for regulatory permitting or reporting.

Construction activities will operate in compliance with PSCAA Regulation I, Section 9.15 – Fugitive Dust Control Measures, which include minimizing fugitive dust through control methods such as wet or chemical suppression techniques, reducing vehicle speeds, cleaning vehicle undercarriages or wheels, and covering or wetting truckloads of soils or loose materials. The construction activities will also comply with PSCAA Regulation I, Section 9.03 – Emission of Air Contaminant: Visual Standard, which includes a 20 percent opacity standard.

The following BMPs would be implemented during construction to minimize potential for air quality impacts during construction in accordance with Perce County Comprehensive Plan Goals ENV-3 and ENV-4.2, City of Puyallup Comprehensive Plan Goal NE-11.5, and Puget Sound Clean Air Agency Regulation 1, Section 9.15:

- Apply dust suppression materials on exposed soil areas and construction paths/roadways and/or water during dust-generating construction activities to limit fugitive dust emissions.
- Require mobile construction equipment and any stationary engines be powered by USEPA-certified engines that meet applicable USEPA emission standards.
- Implement and enforce a 10- to 15-mile-per-hour speed limit for construction vehicles while moving on site.
- Provide a wheel washing and/or vehicle undercarriage cleaning system for trucks leaving the Project construction site.
- Implement commute trip reduction options for alternatives to single-occupancy vehicle commuting including offering bus passes, priority carpool parking, and shuttle buses; providing bicycle paths; and promoting bicycle commuting.
- Require all loose material truck loads to have covers and/or use wetting agents to minimize escape of dust.

Operations Impacts

Less than significant. Operational activities generating air emissions under the proposed Project include the following:

- Combustion of fuels for space heating of the 2.6-million-SF facility.
- Emergency generator fuel combustion (if necessary).
- Light industrial activities generating emissions (e.g., fuel combustion, volatile organic chemical use).
- Daily transport trucks hauling materials/products to and from the proposed facility, including idling of trucks.
- Daily worker commuting in vehicles.

The estimated total number of employees occupying the seven proposed buildings is anticipated to be up to 1,500 employees over three shifts per day. Maintenance activities including landscaping/lawn care and building maintenance would generate minimal emissions from fuel combustion and evaporation of volatile organic compounds. Any future industrial-related point source emissions from the development area are speculative and would be subject to future PSCAA or Ecology air permitting as described above.

This would also include space-heating combustion sources using distillate fuel oil, natural gas, propane, or biodiesel and greater than 10 million British Thermal Units per hour in heat input capacity, and emergency generators operating greater than 500 hours per year or operating under a demand response program contract. Therefore, these sources subject to permitting would be subject to review and compliance with the SIP and ambient air quality standards through obtaining and complying with a local or state air permit. These permitted emission sources also would not count toward comparing to General Conformity emissions thresholds. Space heating and emergency generators that fall below the air permitting thresholds would generate minor levels of pollutants that are expected to fall below General Conformity emissions thresholds and the PSD major source threshold. The General Conformity thresholds for Pierce County are 100 tpy for NOx, SO_2, VOC, and $PM_{2.5}$, and the PSD major source threshold is 250 tpy for CO and PM_{10}.

The CO_2-e emissions from future operational stationary sources at the facility were estimated to be 17,153 tons/year CO_2-e, including an emergency generator and building heating sources using natural gas. The emissions of CO_2-e emissions from future operational mobile sources (i.e., vehicle/truck traffic) were estimated to be 8,409 tons/year and are discussed in more detail below. The total CO_2-e operational emissions are expected to be below the 75,000 tpy PSD BACT threshold. Stationary source emissions would be above the 10,000-mtpy Ecology GHG reporting threshold at 15,561 mtpy. This is currently only a reporting requirement. There could be a future requirement to reduce GHG emissions for facilities that require reporting, but the nature and extent of those reductions are not known and not required at this time. Additionally, the level of estimated CO_2-e emissions is not nearly as significant as those at other types of facilities requiring reporting GHG emissions, such as industrial facilities and power plants, where there are expected to be more stringent future reduction requirements. Therefore, GHG emissions from the proposed Project would be less than significant.

A quantitative assessment was conducted of operational criteria pollutant and air toxics emissions from transport trucks hauling materials to and from the warehouses/industrial park and employee commuting once operations begin on the site. Emissions were calculated using the number of heavy-duty and light-duty vehicle trips and employee commuter data generated by a separate traffic analysis. The total daily trips for heavy-duty vehicles, light-duty vehicles, and passenger cars (includes vans/pickups) are estimated as 147 trips, 1,335 trips, and 7,242 trips, respectively (total of 8,724 trips under the project Proposal). The average speed and vehicle type data were input into the USEPA MOVES mobile source emissions model to generate emission factors for the vehicles. The emission factors were multiplied by the annual vehicle miles traveled resulting in the estimated level of annual emissions provided in Table 4-27. Additionally, truck idling emissions were calculated within MOVES and included in the emissions summary, assuming 15 minutes of idle time per truck trip. As indicated in Table 4-27, all pollutants were estimated to be below all significance indicator levels. Therefore, criteria pollutant and MSAT impacts due to operational emissions from transport trucks and employee commuting would be adverse, but less than significant. Appendix D provides the traffic analysis VMT and speed data, MOVES emission factors, and MOVES output file.

Table 4-27. Proposed Project – Operational Truck and Passenger Vehicle Annual Emissions

Vehicle Class	VMT	Emissions (tons/year)						
		CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	VOC	MSAT
Passenger Car	6,999,801	13.70	0.42	0.01	0.25	0.04	0.11	0.01
Passenger Truck	6,999,801	15.67	0.85	0.02	0.27	0.05	0.16	0.02
Single Unit Truck	2,580,704	15.13	0.52	0.02	0.21	0.05	0.28	0.03
Combination Truck	284,167	6.54	0.59	0.00	0.08	0.02	0.17	0.02
Idling Truck	123,062	5.49	7.95	0.00	0.07	0.06	0.46	0.06
TOTALS		**56.54**	**10.33**	**0.05**	**0.87**	**0.23**	**1.19**	**0.13**
General Conformity Significance Indicator Levels		NA	100	100	NA	100	100	NA
PSD Major Source Significance Indicator Levels		250	NA	NA	250	NA	NA	NA
MSAT Significance Indicator Levels		NA	NA	NA	NA	NA	NA	25

Notes: NA = Not Applicable

The following BMPs would be implemented during operations to minimize potential for localized air quality impacts during construction in accordance with Perce County Comprehensive Plan Goals ENV-3.5 to 3.7, 3.10, and 4.1; City of Puyallup Comprehensive Plan Goal T-6.2; Title 10.50 PCC; and Chapter 21.16 PMC.

- Implement and enforce a no-idling policy for vehicles within the Project construction areas and for employees and truck transport vehicles during facility operations.
- Install electric and/or fossil fuel-powered equipment and control systems using the latest energy efficiency technology.
- Install solar water heater systems, where feasible.
- Install electric space heater systems.
- Implement commute trip reduction options for alternatives to single-occupancy vehicle commuting including bus passes, priority carpool parking, and shuttle buses; provide bicycle paths; and promote bicycle commuting.

Alternative 1 – Rail Transport

Construction Impacts

Less than Significant. The air quality construction impacts associated with Alternative 1 would be similar to those described for the proposed Project but would include construction of the new rail line and track extensions from BNSF mainline/Meeker Southern interchange. Construction would generate combustion emissions from equipment used for clearing, grading, and other construction activities. In addition, fugitive dust emissions would be generated from the disturbance of soils and movement of vehicles over unpaved areas. When compared to the proposed Project, these additional emissions associated with the construction of the rail line would be offset by the reduction in other construction activities that would no longer occur. Overall, the construction emissions from Alternative 1 are anticipated to still be well below the General Conformity thresholds of 100 tpy for each criteria pollutant. Therefore, construction air quality impacts would be less than significant. The same BMPs identified under the proposed Project would be implemented during construction to minimize potential for localized air quality impacts.

Operations Impacts

Less than Significant. The operational air quality impacts associated with Alternative 1 would be similar to those described for the proposed Project but would include emissions from operation of the rail line. Operational emissions from rail transport of materials to or from the warehouse complex would be based on a rate of two trains per day, each with up to 55 cars per train. This was estimated to reduce the number of heavy truck transport trips by up to 330 trucks per day. Alternative 1 emissions, to be consistent with the truck traffic analysis, are from combustion of diesel fuel over the approximate 1.25-mile-long rail line from the main line to the proposed facility and travel back to the main line but without any load. The emissions calculations utilize a national rail average tons-miles/gallon of diesel fuel and a conversion factor from a brake horsepower-hours per gallon of diesel fuel for switching hauling to grams emissions per gallon of diesel fuel. Additionally, emissions from idling of trains are included in Alternative 1 emissions based on the assumption of 30 minutes of idle time per train. The resulting rail alternative operational emissions from operations under Alternative 1, accounting for the addition of trains and the reduction in truck trips, are provided in Table 4-28. As indicated in the table, all pollutants were estimated to be below all significance indicator levels and slightly less than emissions under the proposed Project. Therefore, criteria pollutant and MSAT impacts due to operational emissions from the rail alternative with reduced transport trucks and the same employee commuting would be long-term and adverse but less than significant. Appendix D also provides the rail emissions calculations and reduced truck traffic VMT for the rail alternative. The MOVES emission factors and MOVES output file are the same as for the proposed Project.

The emissions of CO_2-e emissions from future operational mobile sources (i.e., vehicle/truck traffic) were estimated to be 7,758 tons/year and are discussed in more detail below. The total CO_2-e operational emissions are expected to be below the 75,000 tpy PSD BACT threshold. The operational stationary source emissions from an emergency generator and heating of buildings would be the same as under the proposed Project, including for GHG emissions. Therefore, as stated previously, GHG emissions reporting would be required, but GHG emissions from Alternative 1 would be less than significant.

The same BMPs identified under the proposed Project would be implemented during operations to minimize potential for localized air quality impacts.

Table 4-28. Alternative 1 – Operational Rail Alternative with Reduced Heavy-Duty Trucks plus Light-Duty Truck and Passenger Vehicle Annual Emissions

Vehicle Class	VMT	Emissions (tons/year)						
		CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	VOC	MSAT
Passenger Car	6,999,801	13.70	0.42	0.01	0.25	0.04	0.11	0.01
Passenger Truck	6,999,801	15.67	0.85	0.02	0.27	0.05	0.16	0.02
Single Unit Truck	2,103,226	12.33	0.42	0.01	0.17	0.04	0.22	0.02
Combination Truck	230,041	5.29	0.48	0.00	0.06	0.02	0.14	0.01
Idling Truck	100,226	4.47	6.47	0.00	0.06	0.05	0.38	0.05
Rail	5,758 ton-miles/ train round trip	0.50	2.20	0.03	0.05	0.05	0.24	0.00
TOTALS		**51.97**	**10.84**	**0.08**	**0.86**	**0.25**	**1.26**	**0.11**
General Conformity Significance Indicator Levels		NA	100	100	NA	100	100	NA
PSD Major Source Significance Indicator Levels		250	NA	NA	250	NA	NA	NA
MSAT Significance Indicator Levels		NA	NA	NA	NA	NA	NA	25

Notes: NA = Not Applicable

Alternative 2 – Reduced Intensity Alternative

Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility (AES-2, LU-1, REC-1, and SW-4) as outlined in this Draft EIS for the proposed Project) were adopted by the Applicant. As noted below, Alternative 2 would still require BMPs to reduce air quality impacts.

Construction Impacts

Less than Significant. The air quality construction impacts associated with Alternative 2 would be similar to but less than those described for the proposed Project due to the reduced size of building construction. Construction would generate combustion emissions from equipment used for clearing, grading, and other construction activities. In addition, fugitive dust emissions would be generated from the disturbance of soils and movement of vehicles over unpaved areas. Overall, the construction emissions from Alternative 2 are anticipated to be well below the General Conformity thresholds of 100 tpy for each criteria pollutant. Therefore, construction air quality impacts would be less than significant. The same BMPs identified under the proposed Project would be implemented during construction to minimize potential for localized air quality impacts.

Operations Impacts

Less than Significant. The operational air quality impacts associated with Alternative 2 would be similar to but less than those described for the proposed Project because of the smaller operational footprint of the buildings. There would be less vehicle traffic than under the proposed Project at 98 heavy-duty truck trips per day, 890 light duty truck trips per days, and 4,828 passenger car (includes vans/pickups) trips per day. The resulting operational emissions from operations under Alternative 2 are provided in Table

4-29. As indicated in the table, all pollutants were estimated to be below all significance indicator levels. Therefore, criteria pollutant and MSAT impacts due to operational emissions from the proposed Project with reduced building footprint and reduced vehicle traffic would be long-term and adverse but less than significant. Appendix D also provides the emissions calculations for Alternative 2. The MOVES emission factors and MOVES output file are the same as for the proposed Project.

The emissions of CO_2-e emissions from future operational mobile sources (i.e., vehicle/truck traffic) were estimated to be 5,606 tons/year and are discussed in more detail further below. The total CO_2-e operational emissions are expected to be below the 75,000 tpy PSD BACT threshold. The operational stationary source GHG emissions from an emergency generator and heating of buildings would be less than under the proposed Project due to a smaller total building footprint; they are estimated at 10,180 mtpy CO_2-e, which is below the 75,000 tpy (68,039 mtpy) PSD BACT threshold. Therefore, GHG emissions reporting would be required, but GHG emissions from Alternative 2 would be less than significant.

Table 4-29. Alternative 2 - Operational Truck and Passenger Vehicle Annual Emissions

Vehicle Class	**VMT**	**Emissions (tons/year)**						
		CO	**NOx**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**MSAT**
Passenger Car	4,666,534	9.14	0.28	0.01	0.17	0.03	0.07	0.01
Passenger Truck	4,666,534	10.45	0.57	0.01	0.18	0.03	0.11	0.01
Single Unit Truck	1,720,473	10.08	0.34	0.01	0.14	0.03	0.18	0.02
Combination Truck	189,447	4.36	0.39	0.00	0.05	0.02	0.11	0.01
Idling Truck	82,041	3.66	5.30	0.00	0.05	0.04	0.31	0.04
TOTALS		**37.69**	**6.88**	**0.03**	**0.58**	**0.15**	**0.79**	**0.09**
General Conformity Significance Indicator Levels		NA	100	100	NA	100	100	
PSD Major Source Significance Indicator Levels		250	NA	NA	250	NA	NA	
MSAT Significance Indicator Levels		NA	NA	NA	NA	NA	NA	

Notes: NA = Not Applicable

The same BMPs identified under the proposed Project would be implemented during operations to minimize potential for air quality impacts.

4.9 Transportation

This section provides an analysis of potential impacts on the vehicle transportation network.

4.9.1 Study Area

The study area for vehicle traffic and transportation encompasses the roadways, intersections, and at-grade railroad crossings that could be affected by construction and operations (Figure 4-60). For construction impacts, the study area consists of the roads and intersections that construction vehicles would use to access the proposed Project site. For operations impacts, the study area consists of the roads and intersections that vehicles moving to and from the proposed facility would use to access the proposed Project site.

Relevant Plans Policies and Regulations

Relevant policies and regulations related to transportation are summarized in Table 4-1.

Table 4-30. Regulations and Policies for Transportation

Laws and Regulations	Description
Federal	
Highway Safety Act and the Federal Railroad Safety Act	Gives the Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) regulatory jurisdiction over safety at federal highway/rail grade crossings.
Manual on Uniform Traffic Control Devices (23 U.S.C. 109(d))	Provides standards and guidelines for traffic control devices.
State	
Transportation System Policy Goals (RCW 47.04.280)	Establishes the following goals for the transportation system in Washington State: economic vitality, preservation, safety, mobility, environment, and stewardship.
Motor Vehicles – Rules of the Road (RCW 46.61)	Establishes rules of the road for vehicle and rail crossings.
City Streets as Part of State Highways (RCW 47.24)	Regulates the maintenance and jurisdictional control for city streets that are part of state highways.
Local	
Traffic Regulations (PMC Title 10 and SMC Title 10)	Establishes regulations for vehicle traffic and emergency services in the City of Puyallup and City of Sumner.

4.7.1.3 Affected Environment

The affected environment includes 35 counted intersections and three safety study corridors. These are listed below and are shown in Table 4-31 and Figure 4-60.

Table 4-31. Intersections and Safety Study Corridors Evaluated

1. Traffic Avenue & Cannery Way
2. Traffic Avenue & State Street
3. Traffic Avenue & State Route (SR) 410 westbound (WB) ramps

17. E Pioneer Avenue & 25th Street SE
18. East Pioneer Avenue & 21st Street SE
19. E Pioneer Avenue & Shaw Road E
20. E Pioneer Avenue & 33rd Street SE

4. E Main Avenue & SR 410 eastbound (EB) ramps
5. E Main Avenue & 5th Avenue northeast (NE)
6. E Main Avenue & Shaw Road E
7. E Main Avenue & 15th Street SE
8. E Main Avenue & 5th Street NE
9. E Main Avenue & 2nd Street NE
10. North (N) Meridian Avenue & SR 167 northbound (NB)
11. N Meridian Avenue & SR 167 southbound (SB)
12. N Meridian Avenue & Valley Avenue NE
13. E Pioneer Avenue & SR 512 SB ramps
14. E Pioneer Avenue & SR 512 NB ramps
15. E Pioneer Avenue & 13th Street SE
16. E Pioneer Avenue & 15th Street SE
21. 8th Avenue SE & 33rd Street SE
22. Shaw Road E & Highlands Boulevard
23. Shaw Road E & 16th Avenue SE
24. Shaw Road E & 23rd Avenue SE
25. Shaw Road E & Forest Green Boulevard
26. Shaw Road E & Manorwood Drive
27. Shaw Road E & 39th Avenue SE
28. Shaw Road E & 5th Avenue SE
29. 33rd Street SE & 5th Avenue SE
30. Shaw Road E & Safeway driveway
31. 80th Street E & warehouse driveway
32. SR 162 & E Pioneer Avenue
33. SR 162 & 80th Street E
34. SR 162 & SR 410 EB ramps
35. SR 162 & SR 410 WB ramps

A. E Pioneer – between SR 512 and Shaw Road E
B. Shaw Road E – between E Pioneer and E Main Avenue
C. E Main Avenue – between Shaw Road E and White River

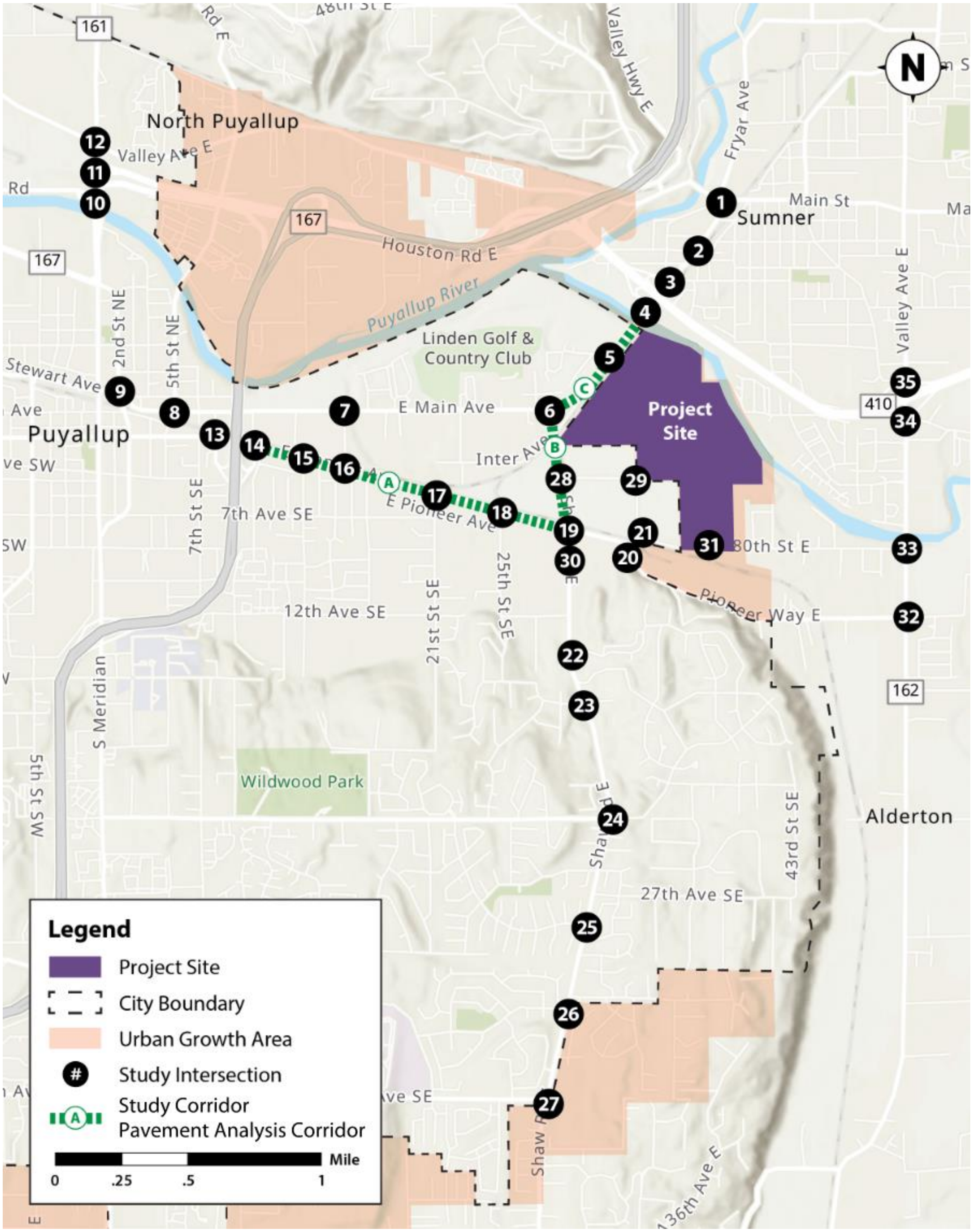

Figure 4-60. Intersections and Safety Study Corridors Evaluated

4.9.2 Scenarios Analyzed

The five build scenarios shown in Table 4-32 and a No Action scenario were considered and analyzed for the expected Project completion and operation year 2026.

Table 4-32. Build Scenarios Analyzed

Build Scenario	Total SF (in millions)	Total Daily Trips (vpd)	Total Heavy Vehicle Trips (vpd)	Total PM Peak Hour Trips (vph)	Total Peak Hour Heavy Vehicle Trips (vph)
A – Proposed Project	2.6	8,724	1,482	880	104
B – Rail scenario	2.6	8, 487	1,207	729	86
C – Proposed Project, with mitigation	2.6	8,724	1,482	880	104
D – Reduced land use scenario	1.73	5,844	998	590	70
E – Reduced land use scenario, with mitigation	1.73	5,844	998	590	70

Note: vpd = vehicles per day; vph = vehicles per hour

No Action Scenario

The No Action Scenario was included for equal evaluation in this study to facilitate the identification of impacts of other scenarios. Under the No Action Scenario, none of the facilities proposed to assist with Project traffic access would be constructed.

Scenario A: Proposed Project

The proposed Project is consistent with Institute of Transportation Engineers (ITE) Land Use Code 130. These facilities typically provide for storage and processing of shipped materials and/or goods that are reconstituted and packaged, and then shipped elsewhere. The development, as proposed by the applicant, would have 1,730 parking spaces for cars and 473 parking spaces for freight trailers.

In addition to these general definitions, a restrictive covenant has been agreed upon for Knutson Farms that will "… strictly prohibit 'High-Cube Fulfillment Center Warehouse – Sort,' ITE Land Use Code 155, and 'High Cube Parcel Hub Warehouse,' ITE Land Use Code 156, uses under the definitions established in the ITE Trip Generation Manual 11th Edition." The covenant also limits trips to a level consistent with Industrial Park use.

Scenario B: EIS Alternative 1, Rail Delivery

Scenario B was developed to analyze the potential to mitigate traffic impacts by shifting some Project-related truck traffic onto trains. Overall, Scenario B was meant to test the relative impact of the use of trains to bring as much freight onto the site as reasonably possible to lessen overall traffic impacts. The analysis assumed the increase in rail traffic may result in a train being present during the peak hour, which is not a typical occurrence today.

Scenario C: EIS Proposed Project with Traffic Mitigation

Scenario C was developed by making changes to the assumptions about transportation infrastructure based on the analysis results of Scenario A. These changes generally take the form of intersection capacity upgrades and other operational modifications that help the intersections process peak hour traffic more efficiently. Intersection mitigations were developed only for individual intersections at which traffic generated by the proposed Project would result in a degradation in LOS below the responsible agency's standard for LOS. More information about this measure is included in the next section.

Scenario D: EIS Alternative 2, Reduced Site Intensity

Scenario D represents a modification of Scenario A. Specifically, initial findings related to non-transportation resource impacts and associated mitigation resulted in the need to consider a scenario that would use less of the Knutson Farms site and therefore would accommodate a lower level of land use. To assess transportation effects for Scenario D, the amount of land use programmed was reduced by one-third from that assumed in Scenario A.

Scenario E: EIS Alternative 2 with Traffic Mitigation

The results of Scenario D analysis directly informed the mitigation needs that defined Scenario E. Because Knutson Farms land use is lower for Scenarios D and E, its traffic generation is also lower. As such, there are fewer locations indicating that traffic mitigation would be needed in Scenario E than in Scenario C.

4.9.3 Methods and Assumptions

The quantitative analysis of traffic operations for the Project was conducted using VISSIM traffic modeling software (microscopic simulation). This software was used to build the traffic models of the roadway network within the Project area. An existing year model was developed to determine a baseline calibrated model. The microsimulation models utilized input data from various sources including existing roadway configuration, traffic volume inputs, vehicle speed distributions, relevant recent traffic impact analyses, and vehicle static routing to develop the existing year model, No Action model, and the five scenario models.

Traffic Counts

Traffic counts were collected at intersections 1 through 27 on August 3, 2021. A need for additional traffic counts was identified to improve model calibration. Traffic counts for intersections 28 through 35 were collected on June 23, 2022. The field counts were adjusted for this analysis in two ways. First, an adjustment derived from Washington State Department of Transportation (WSDOT) data to reflect lower-than-typical traffic overall as a result of the Covid-19 pandemic. Second, because summertime counts can be higher than normal within this area, a seasonal adjustment factor was applied to produce volumes that reflect an annual average condition for each peak hour. The peak hours observed during the count period were 7:15–8:15 a.m. and 3:45–4:45 p.m. Site generated traffic volumes peak during traditional AM and PM peak periods and therefore midday traffic counts that coincide with school release were not collected.

Volumes from the East Town Crossing Traffic Impact Study, which used traffic counts collected between 4:00 and 5:00 p.m. on May 4, 2022, were used to validate the adjusted volumes described above. Comparing the adjusted volumes with the collected counts from the East Town Crossing Traffic Impact Study resulted in increased traffic volumes at the following intersections and inclusion of those higher volumes in the baseline model for the study:

- Shaw Road E and 23rd Avenue SE (7 percent increase)
- E Pioneer Avenue and Shaw Road E (11 percent increase)
- E Main Avenue and Shaw Road E (2 percent increase)

Simulation Model Calibration

Calibration is an iterative process that involves adjusting model parameters until the simulation reasonably replicates driver behavior, traffic flow patterns, and field-measured data. A synopsis of the calibration process follows, with emphasis placed on identifying the key decisions and assumptions made in the refinement process to achieve the calibration targets outlined in the technical traffic report (TTR). Documentation on the calibration parameters and results are provided in the Technical Traffic Report, see Appendix E.

Measures of Effectiveness for Scenario Comparisons

The VISSIM simulation model measures vehicle travel characteristics that are consistent with the way people determine how effectively the transportation system is working. The differences between the traffic measures of effectiveness (MOEs) from the “No Action” simulation and those from the simulations of Project action scenarios form the basis for determining the scenarios’ traffic impacts. The MOEs employed for this analysis were vehicle delay, LOS, 50th percentile and 95th percentile queue lengths, travel time, and volume-to-capacity (v/c) ratio. Note that LOS is assigned directly from vehicle delay.

Intersection Delay and LOS

After the simulation and the post-processing, the average of the delays experienced by all vehicles at each intersection (due to red light, stop sign, or other control feature) is determined, and each of these average delays is assigned a letter grade referred to as LOS, ranging from LOS A (best) to LOS F (worst). The grading scale for LOS is based on the guidelines from the HCM (Transportation Research Board (TRB) 2016). Table 4-33 shows the HCM peak hour delay performance indicators for signalized and unsignalized intersections.

Table 4-33. Delay Performance Indicators for Intersection LOS

LOS	Description	Average Delay Range (seconds/vehicle)	
		Signalized	Unsignalized
A	No congestion; nearly all drivers experience little to no delay	0 to 10.0	0 to 10.0
B	No congestion; most drivers experience little to no delay	10.1 to 20.0	10.1 to 15.0
C	Light congestion; most drivers experience minor delay	20.1 to 35.0	15.1 to 25.0
D	Moderate congestion; individual movements with high delay	35.1 to 55.0	25.1 to 35.0
E	Heavy congestion, with high delays on multiple movements	55.1 to 80.0	35.1 to 50.0
F	Extensive delays due to cycle failures at signals or sparse opportunities to make desired movements at unsignalized intersections	80.1 or more	50.1 or more

Source: TRB 2016.

The HCM delay performance indicators are used to assign LOS to the VISSIM delay results, but it should be noted that the method of measuring intersection vehicle delays in VISSIM is slightly different from the HCM method. With the HCM method, intersection delays are calculated based on traffic volume and the effects of traffic control devices (e.g., signals, stop signs; TRB 2016), whereas VISSIM directly measures the simulated total delay, which consists of control delay, delay due specifically to the presence of other vehicles, and other delay incurred in the vicinity of the traffic control device. In most cases, the differences between total delay and control delay are considered negligible. While the TRB does not endorse any specific software model to estimate intersection delay, the same LOS performance indicators are commonly applied in both cases.

Generally, LOS D is considered the worst acceptable condition for peak hour intersection traffic operations. LOS E is often characterized by unstable flow and high delays for lower-volume movements and can result in individual drivers choosing to change their travel patterns to avoid congested intersections. At LOS F, congestion is severe enough that the calculation of intersection delay using the HCM methodology breaks down, and very high delay results are not necessarily considered valid. For example, a delay estimate or measurement of 450 seconds for one intersection and 500 seconds for another might not lead to a reliable conclusion that the former intersection can be expected to perform "better" than the latter. For this reason, intersection delay estimates over 300 seconds per vehicle are truncated to "300+" for this study.

The City of Puyallup Comprehensive Plan contains the following policies regarding LOS:

> *"The City's existing level of service policy sets the following standards for its roadways:*
>
> - *Volume to capacity (V/C) ratio of 0.85 for arterial and collector segments in the PM peak hour (page 7.21 and map figure 7-7, City of Puyallup Transportation Element, 2015).*
>
> *T- 3.2 Develop a transportation system that achieves the following levels of service metrics:*

- *Vehicular LOS: Maintain standards that promote growth where appropriate while preserving and maintaining the existing transportation system. Set LOS D as the standard for PM peak hour intersection performance, with the exception of the Meridian, Shaw Road, and 9th Street SW corridors, where LOS E operations will be considered acceptable during PM period in recognition of the need to balance driver experience with other considerations, such as cost, right of way, and other modes.*
- *Pedestrian LOS: Provision of sidewalks, trails, and/or separated paths will be prioritized within pedestrian priority areas, as defined in Puyallup Moves.*
- *Bicycle LOS: Provision of bike lanes, separated paths, protected facilities, and bicycle boulevards, as defined in Puyallup Moves.*
- *Transit LOS: Partner with Pierce Transit, Sound Transit, and other transit operators to provide transit stop amenities and safe access to transit at major transit stops and park and ride facilities.*

T- 3.3 Improve the transportation system concurrently with increasing demands due to growth.

a. *Track transportation concurrency to ensure that infrastructure can accommodate growth and maintain level of service standards.*
b. *Require developers to perform a transportation impact analysis, at the discretion of the City Engineer, to demonstrate the effect of significant additional travel demand from their projects on the transportation network. In the event the analysis shows that the project would impact the level of service in the affected area, new development is responsible for improvements to the transportation system. If the existing vehicle level of service is below the standard, the developer shall mitigate impacts to the pre-developed level of service condition plus an allowable increase in delay of up to 15%.*

As indicated by City policy (see page 7.21 and map figure 7-7, City of Puyallup Transportation Element, 2015 for v/c), the standard of acceptability for v/c on arterial and collector PM peak hour corridor segments is 0.85, and intersection LOS (D or better) is applied for PM peak hour conditions. Three corridors are subject to a lower standard (LOS E or better), and one of those, Shaw Road, is within the Knutson Farms study area. The analysis documented here applies that standard to AM peak hour operations as well. The SR 410 ramp terminal intersections in this study are under WSDOT jurisdiction and were subject to a LOS D standard for both peak hours.

Queue Lengths at Intersections

Queue estimates from VISSIM's node evaluation function were compiled for all turning movements modeled at the study area intersections. This function was used to tabulate the queue extent during each time step during the peak hour, and the calculated 50th and 95th percentile values for the hour were reported.

Travel Time

Travel time measurements over multiple roadway segments were coded in VISSIM and times were measured during each simulation run to capture overall vehicle performance at the corridor level. The travel time segments originally used during calibration were expanded somewhat for reporting purposes. Travel times are reported here for each scenario for the following three segments:

1. E Pioneer Avenue from 7th Street SE to 33rd Street SE
2. From E Main Avenue and 2nd Street NE to Traffic Avenue and State Street
3. Shaw Road E from E Main Avenue to 39th Street SE

Because the *2015 Puyallup Comprehensive Plan* (City of Puyallup 2015) does not provide policy on travel time measurements or standards, these results are presented as an optional way of interpreting traffic congestion information. No impact definitions are included for travel time.

Volume-to-Capacity (v/c) Ratio

The v/c ratio along certain segments within the Project area were used to compare the No Action Scenario with the build scenarios and the mitigated build scenarios. The v/c ratio identifies the capacity constraints along the corridor and how the traffic generated by the proposed Project would further impact the corridor capacity within the Project area. The capacity of the corridors was calculated by the City and used to determine the v/c ratios. The v/c ratio performance indicator for the City is 0.85 (page 7.21 and map figure 7-7, City of Puyallup Transportation Element, 2015). The proportional difference between the No Action Scenario and Scenarios A and D will be used to determine additional proportional mitigation required to address the reduction in corridor capacity caused by the traffic generated by the applicant.

Background Traffic Growth

Overall traffic volumes were grown from the existing counts collected in 2021 to the scenario comparison year of 2026 using an annual average growth rate. The traffic analysis team arrived at a consensus growth rate by considering similar traffic impact studies conducted in the area since 2017, in addition to the growth rate assumed for the SR 410/Traffic Avenue Interchange Improvements project.

The average of the annual growth rates quantified in the TTR is 1.94 percent. As a result of this comparison, an annual background traffic growth rate of 2 percent has been applied for this study. In addition to this annual growth, trips generated by the following specific large projects were added to background traffic at the City’s direction:

- East Town Crossing
- Prologis Park Edgewood
- Puyallup Corporate Center
- Fitness Quest (previously known as the “Regional Wrestling Center”)
- Shaw Heights
- ST Sumner Parking Garage

4.7.3.5 Project Trip Generation and Distribution

Project trip generation estimates were derived using the assumptions documented for the proposed warehousing land use as represented by ITE Land Use Code 130, Industrial Park, and land use that would be displaced by the Project, Land Use Code 210, Single Family Residential. The ITE Land Use Code 130 and Land Use Code 210 were used as inputs in the ITE Trip Generation tool. The relevant assumptions and calculation results are provided in the TTR.

Project trips were distributed to the immediate surrounding street network differently depending on whether they were heavy truck trips or passenger car/light-truck trips. Heavy trucks are not allowed to use the central site access (33rd Street SE, south of 5th Avenue E). The general distributions for these two types of trips are shown side-by-side in Figure 4-61 and Figure 4-62 for Scenario A/C and Scenario D/E, respectively.

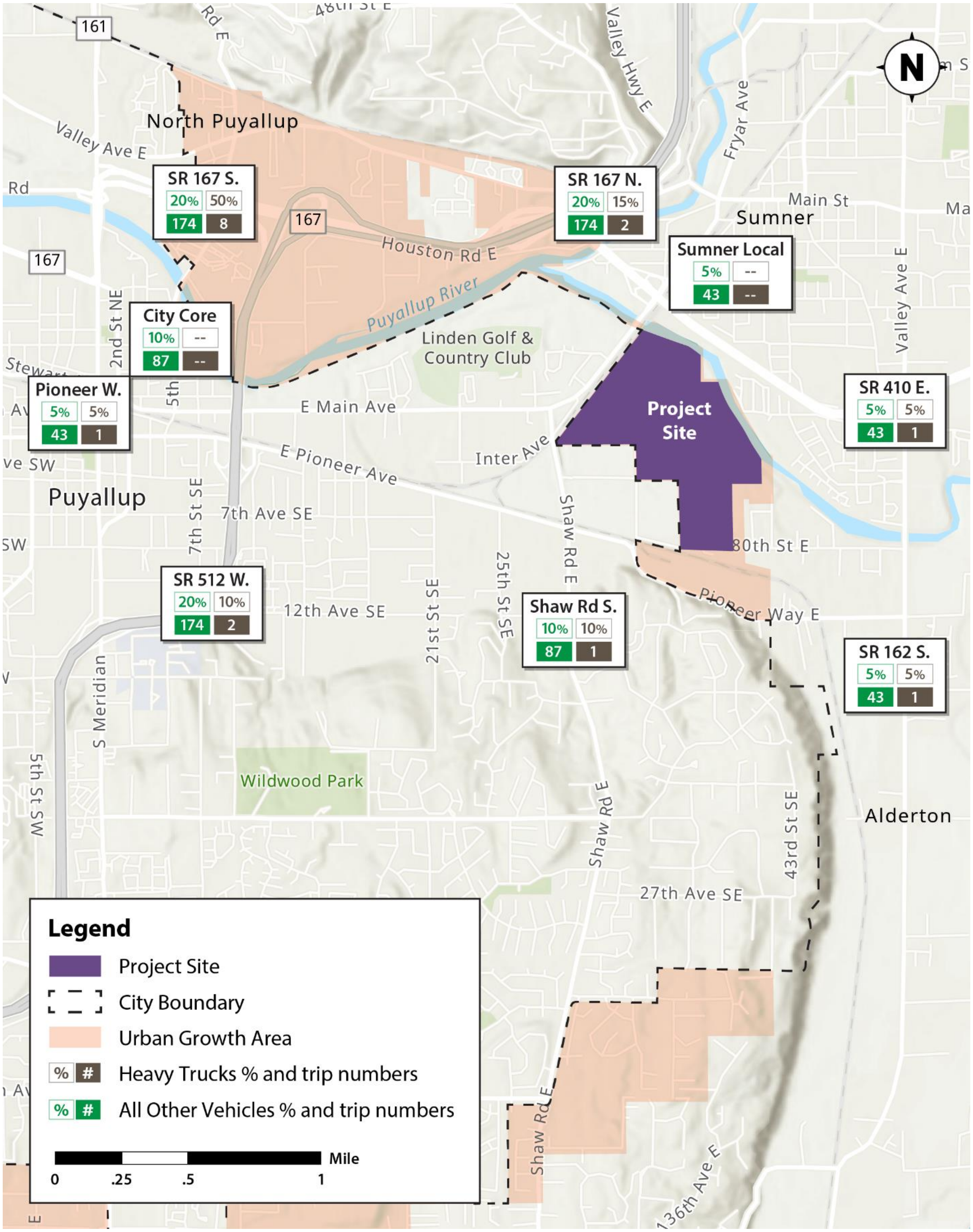

Figure 4-61. Scenarios A and C, PM Peak Distribution of Site-Generated Trips

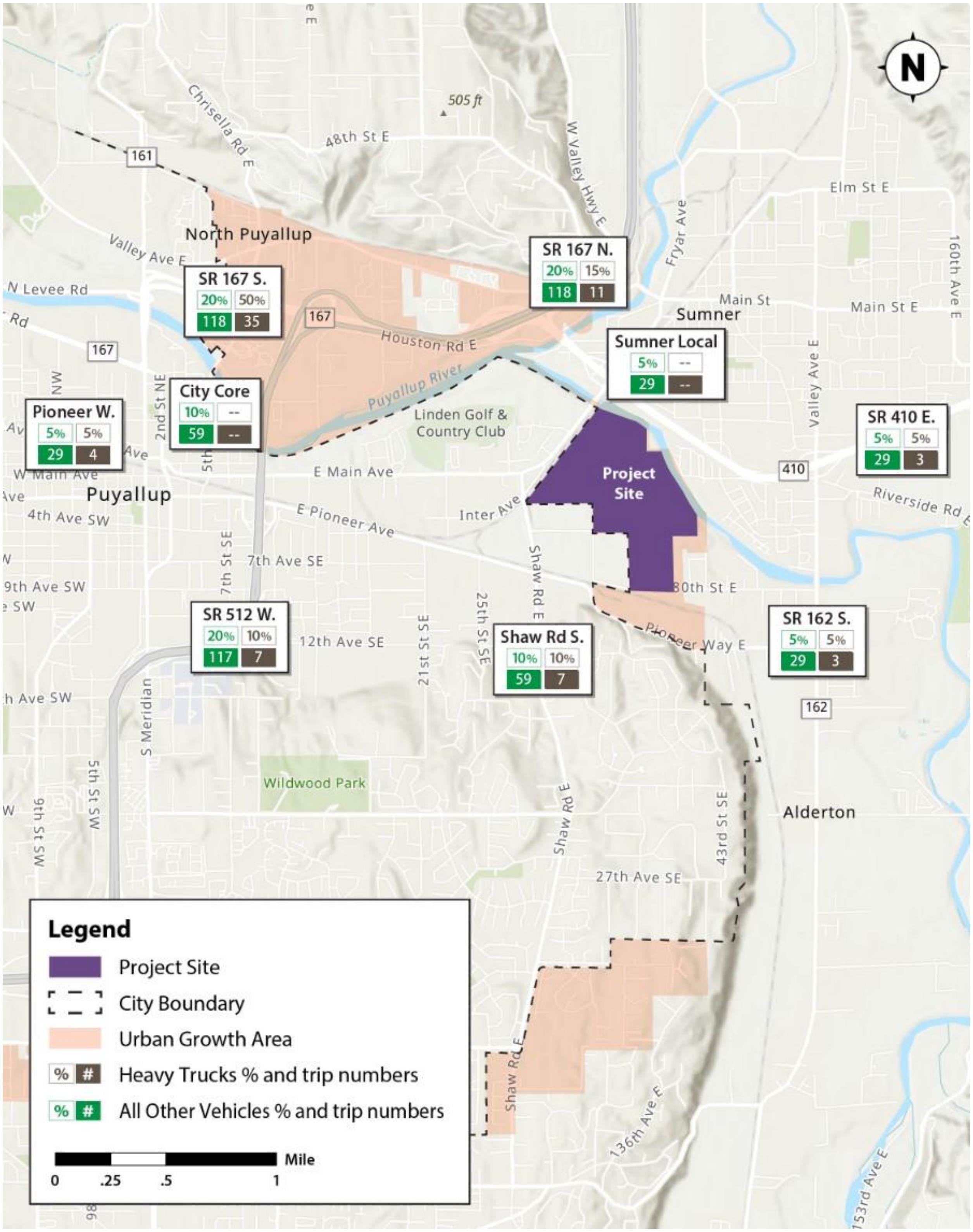

Figure 4-62. Scenarios D and E, PM Peak Distribution of Site-Generated Trips

Crash Analysis

Crash data for 31 out of the 35 study intersections and three study corridors indicated in the introduction to this report were collected for the 7 complete years 2015 through 2021 (WSDOT 2023). Those not included (#28 through #31) were all private driveway intersections: three that would carry Knutson Farms traffic almost exclusively and one a more lightly used shopping center ("Safeway Plaza") driveway.

WSDOT crash data were examined with respect to type, severity, and year, both in terms of raw crash counts and, in the case of intersections, the volume-weighted crash rate. WSDOT crash data includes police-reported vehicle crashes. Rates were not examined for the corridor crashes because crashes that occur within the influence area of an intersection are not counted in the "corridor" total. Corridor crashes occur between the study intersections. Note that the three corridors were selected for their relevance to the proposed Project, not as a sampling to represent the City of Puyallup.

Pavement Analysis

The Project would increase truck traffic on public streets near the site which is anticipated to have impacts to existing pavement. Pavement was analyzed to determine the potential impact of trucks on remaining pavement service life. Specifically, HWA GeoSciences Inc. (HWA) performed an investigation of the existing pavement on the designated truck routes within the Project vicinity: E Main Avenue, Shaw Road E, and E Pioneer Avenue. The investigation included drilling and retrieving pavement cores and falling weight deflectometer (FWD) testing. Pavement cores were performed at 28 locations along the three subject roadways. Existing asphaltic concrete (AC) pavement cores were retrieved, and the depth of crushed (aggregate) base was measured at each location. The FWD is a nondestructive test that is used to evaluate pavement component layer stiffness of existing pavement as well as condition and resilience of the subgrade material. The test simulates pavement loading by applying an impulse load to the pavement surface and measuring the pavement response by a series of sensors spaced linearly away from the loading plate. HWA used the FWD results to estimate the subgrade resilient modulus and the existing structural number using two different software programs.

In order to estimate the traffic loading on the existing pavement, the traffic volumes were converted into Equivalent Single-Axle Loads (ESALs). An ESAL is defined as equivalent to a single axle with dual wheels and a load of 18 kips (one kip, or kilopound, is equal to 1,000 pounds). The FHWA official Vehicle Classification set (FHWA 2014) is used in calculating ESALs for pavement design and is shown in Figure 4-63**.**

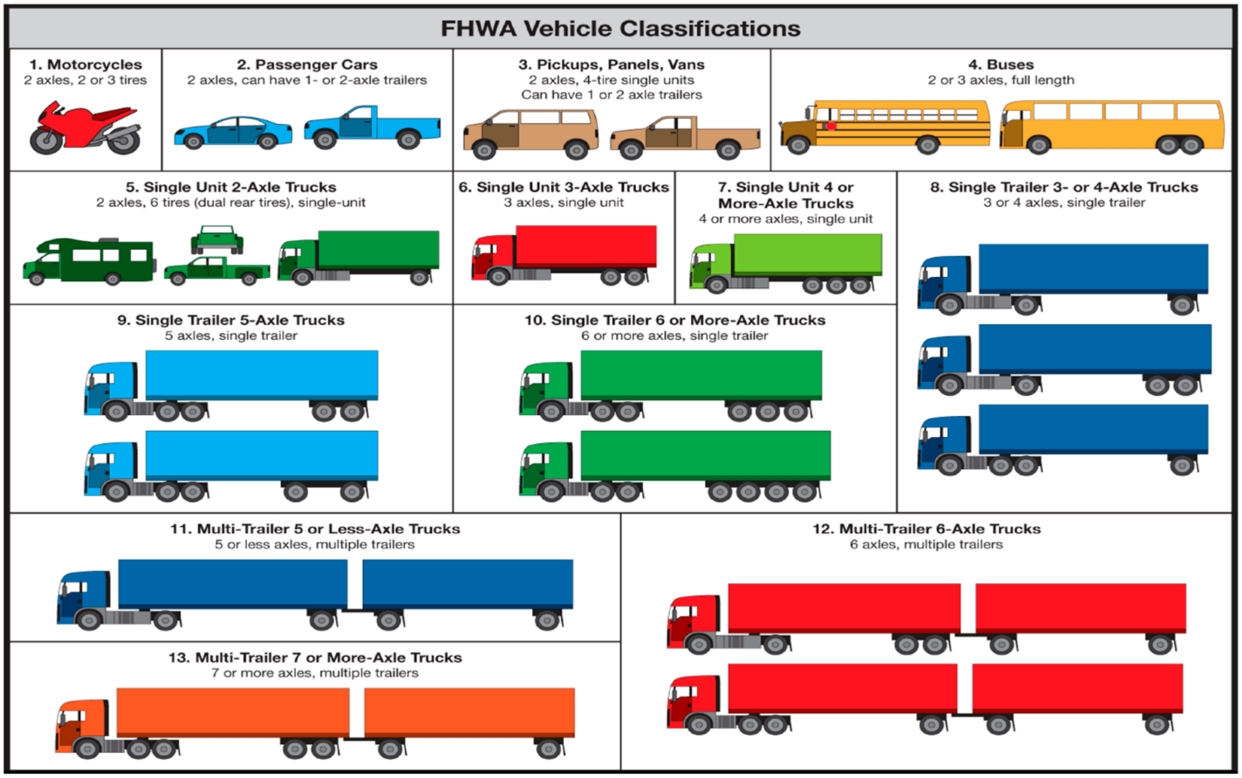

Figure 4-63. FHWA Vehicle Classifications

The traffic was grouped by IDAX Data Solutions into four vehicle groups (Class 1 through Class 4) that reflect groupings of the 13 FHWA Vehicle Classifications (FHWA 2014) as follows:

Class 1 (motorcycle, car, van, pickup) = Classifications 1 through 3
Class 2 (single-unit truck) = Classifications 4 through 7
Class 3 (double-unit truck) = Classifications 8 through 10
Class 4 (triple-unit truck) = Classifications 11 through 13

The use of truck data and conversion factors is important because comprehensive research has indicated that pavement damage from trucks is exponentially greater than damage from passenger cars.

Traffic volumes at the three locations were grown, and factors were applied for ESAL estimates. The change in ESAL from Scenario A was then evaluated for the potential to change the expected lifespan of the roadway (i.e., remaining service life).

4.9.4 Traffic Simulation Results

The traffic simulation results across all scenarios are tabulated together in this section. The measures of effectiveness include LOS, delay, queue lengths, travel times, and v/c ratio.

LOS is based on the HCM and uses average delay in seconds at an intersection. For signalized intersections, the average delay of all approaches is used to determine LOS. For unsignalized intersections, the greatest average delay of the stop-controlled movements is used to determine LOS. The LOS performance indicators are dependent on intersection control type, ranging between LOS A and

LOS F. The LOS performance indicators for signalized and unsignalized intersections were shown previously in Table 4-33.

Jurisdictional ownership of intersections varies between WSDOT, Pierce County, Sumner, and Puyallup in the Project study area; most of the affected intersections in the study area are City of Puyallup owned and managed. Jurisdictional owners may have different LOS standards. For this Project, the City of Puyallup LOS standard is LOS E or better at intersections on the Meridian Avenue and Shaw Road corridors and LOS D or better at all others. A standard of LOS D or better was applied for intersections outside Puyallup's jurisdiction. LOS and average delay results for each scenario are provided in the subsections below, and intersections that exceed the LOS standard are indicated with red text.

Queue length indicates operational issues such as lane blockage. The 95th percentile queue, which represents the measured queue length that is not exceeded during 95 percent of the signal cycles, is typically the storage length turn lanes are designed to provide. The 50th percentile queue represents the average queue length during the peak hour. When queue lengths become extensive and spillback to an adjacent intersection, the capacity impacts are no longer localized to a single intersection and congestion will extend along a corridor or throughout the network.

Travel time is used to understand how future congestion will impact certain origin-destination pairs. Travel time provides a good indication of whether a transportation network is over capacity, where congestion cripples the ability to progress traffic through the corridor.

A v/c ratio of 0.85 or less is the City's performance target. A v/c ratio of 1.0 is representative of a corridor at capacity. A v/c ratio that exceeds 1.0 is operating over capacity and usually corresponds with a degradation of MOEs described above. The v/c ratio will be used to estimate the proportion of corridor wide mitigation improvements, such as widening of Shaw Road E, triggered by the volume generated by the applicant. The proportional ratio is calculated by taking the difference in v/c ratio between the No Action Scenario and Scenario A and dividing it by the No Action Scenario v/c ratio. A second proportional ratio will be calculated for Scenario D.

Although each MOE is a useful metric independently, it is important to consider them together to gain a thorough understanding of how the transportation system is functioning. Results for each scenario are provided below along with a comparison of each MOE for all the scenarios.

Existing Conditions

LOS and Delay

For both the AM and PM peak periods, all intersections provide acceptable LOS and meet the LOS standards in the existing condition.

Queue Lengths

Excessive queueing was not reported during the AM or PM peak period, with a majority of the 95th percentile queue lengths ranging between 100 and 250 feet. Due to the large number of turning movements for which queue results were compiled, the tables showing the results of AM and PM peak hour queue extents across simulation scenarios have been placed in Attachment C.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, see Figure 4-64. Table 4-34 shown below provides existing travel times.

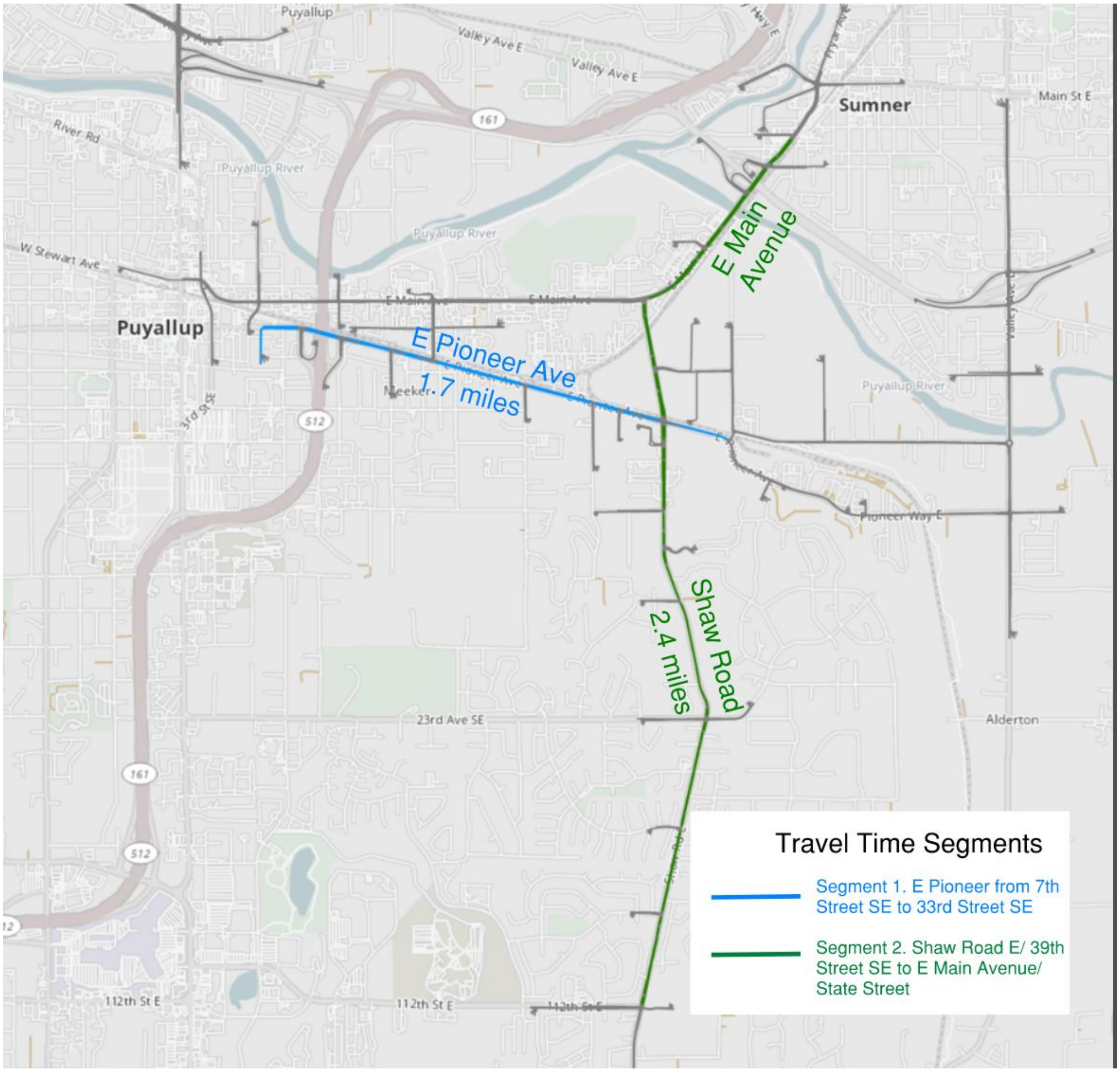

Figure 4-64. Reported Travel Time Segments

Table 4-34. AM and PM Peak Hour Travel Time

Segment	Travel Direction	Distance (miles)	2021 AM Peak Travel Time (min)	2022 PM Peak Travel Time (min)
E Pioneer Ave: 7th Ave to 33rd Ave	Eastbound	1.7	4.17	5.00
E Pioneer Ave: 33rd Ave to 7th Ave	Westbound	1.7	4.20	5.07
Shaw Road: 39th Ave to E Main Ave	Northbound	2.5	4.33	6.02
Shaw Road: 39th Ave to E Main Ave	Southbound	2.5	4.26	7.92

Note: min = minutes.

v/c Ratio

The v/c ratio was calculated using HCM methodology for key roadway segments within the Project area. Results are shown in Table 4-35 below. The v/c ratios shown in red exceed the 0.85 v/c ratio standard. During the PM peak period, the v/c ratio exceeds 1.0 for a majority of the segments studied.

Table 4-35. AM and PM Peak Hour Segmental v/c Ratio – Existing 2021 AM and 2022 PM

Roadway Segment	Travel Direction	Calculated Directional Maximum Capacity	Volume (vehicles)		v/c Ratio	
			2021 AM	2022 PM	2021 AM	2022 PM
1. E Main Avenue – Shaw Road E to 5th Avenue NE	Westbound	1,445	472	1,620	0.33	1.12
	Eastbound	1445	1,001	843	0.69	0.58
2. E Main Avenue – 5th Avenue NE to SR 410	Westbound	1,445	503	1,614	0.35	1.12
	Eastbound	760	991	856	1.30	1.13
3. E Main Avenue – 23rd St to Shaw Road E	Westbound	1,615	372	803	0.23	0.50
	Eastbound	1,615	313	518	0.19	0.32
4. Shaw Road E – E Main Avenue to 5th Avenue SE	Northbound	1,445	893	658	0.62	0.46
	Southbound	1,445	305	1,151	0.21	0.80
5. E Pioneer – 21st Street SE to 25th Street SE	Westbound	1,445	454	626	0.31	0.43
	Eastbound	1,445	382	765	0.26	0.53
6. E Pioneer – Shaw Road E to SR 162	Westbound	560	356	324	0.64	0.58
	Eastbound	560	210	342	0.38	0.61
7. SR 162 – 143rd Avenue E to 80th Street E	Northbound	800	694	600	0.87	0.75
	Southbound	800	373	1,136	0.47	1.42
8. SR 162 – SR 410 to 143rd Avenue E	Northbound	840	694	600	0.83	0.71
	Southbound	840	373	1136	0.44	1.35
9. Shaw Road E - 12th Avenue SE to 16th Avenue SE	Northbound	560	848	597	1.51	1.07
	Southbound	560	277	1,170	0.49	2.09
10. Shaw Road E - 16th Avenue SE to 23rd Avenue SE	Northbound	560	796	560	1.42	1.00
	Southbound	560	270	1040	0.48	1.86
11. Shaw Road E – 23rd Avenue SE to 39th Avenue SE	Northbound	560	715	523	1.28	0.93
	Southbound	560	275	957	0.49	1.71

No Action Scenario

LOS and Delay

Without development activity at Knutson Farms, the changes affecting intersection LOS after 5 years follow normal trend lines for growth based on regional models. Other surrounding developments and standard expected traffic growth rates that are captured in the regional travel demand model used to develop future volumes would impact traffic flow and LOS without the proposed Project. Refer to the TTR for LOS and delay for the No Action Scenario AM and PM peak hours. Based on the future projected volumes, the following intersections are expected to exceed the LOS standard performance indicator during the 2026 PM peak period:

- Traffic Avenue/Fryar Avenue and Main Street/Cannery Way (Sumner city limits)
- E Main Avenue and SR 410 Westbound /Thompson Street (Sumner city limits)
- N Meridian Avenue and Valley Avenue NE (Puyallup city limits, WSDOT intersection)

Queue Lengths

Excessive queueing was reported during the AM and PM peak period. During the AM and PM peak periods, the intersections shown in Table 4-36 reported a 95th percentile queue length exceeding 1,000 feet.

Table 4-36. 2026 AM and PM Peak Hour Excessive Queue Length – No Action Scenario

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	AM	Northbound	Left	180	705	1,157
1. Traffic Ave & Cannery Wy	AM	Northbound	Thru	320	782	1,163
11. N Meridian Ave & SR 167 SB	AM	Westbound	Right	470	410	1,346
1. Traffic Ave & Cannery Wy	PM	Eastbound	Thru	600	1,162	1,604
1. Traffic Ave & Cannery Wy	PM	Eastbound	Right	190	1,158	1,624
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Thru	1,640	1,636	1,682
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	500	1,147	1,633
27. Shaw Rd E & 39th Ave SE	PM	Northbound	Left	330	989	1,529

Notes: Ave = Avenue; ft = feet; Rd = Road; St = Street; Wy = Way

Excessive queueing as shown in Table 4-36 is detrimental to overall system performance. Although only three intersections reported LOS exceeding standard performance indicators, the congestion created by the excessive queueing meters traffic downstream into adjacent signals. Excessive queueing can also indicate inefficient signal timing and insufficient green time provided at signalized intersections.

Due to the large number of turning movements for which queue results were compiled, the tables showing the results of AM and PM peak hour queue extents across simulation scenarios have been placed in Attachment C.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, shown below in Table 4-37.

Table 4-37. 2026 AM and PM Peak Hour Travel Time – No Action Scenario

Segment	Travel Direction	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer Ave: 7th Ave to 33rd Ave	Eastbound	1.68	4.52	5.34
E Pioneer Ave: 33rd Ave to 7th Ave	Westbound	1.68	4.26	4.68
Shaw Road E: 39th Ave SE to E Main Ave	Northbound	2.38	6.13	6.54
Shaw Road E: 39th Ave SE to E Main Ave	Southbound	2.38	5.96	9.00

v/c Ratio

Under the No Action Scenario, a majority of the specified segments exceed the 0.85 v/c ratio standard, with some segments exceeding 2.0. Table 4-38 shows the volumes and calculated v/c ratios for the No Action Scenario. The v/c ratios shown in red exceed the 0.85 v/c ratio standard.

Table 4-38. AM and PM Peak Hour Segmental v/c Ratio – No Action Scenario

Roadway Segment	Travel Direction	Calculated Directional Maximum Capacity	Volume (Vehicles)		v/c Ratio	
			AM	PM	AM	PM
E Main Ave – Shaw Road E to 5th Ave NE	Westbound	1,445	531	1885	0.37	1.31
	Eastbound	1,445	1,205	1,004	0.83	0.69
E Main Ave – 5th Avenue NE to SR 410	Westbound	1,445	566	1875	0.39	1.30
	Eastbound	760	1,191	1,018	1.57	1.34
E Main Ave – 23rd St SE to Shaw Road E	Westbound	1,615	439	919	0.27	0.57
	Eastbound	1,615	375	615	0.23	0.38
Shaw Road E – E Main Ave to 5th Ave SE	Northbound	1,445	1,079	786	0.75	0.54
	Southbound	1,445	341	1,363	0.24	0.94
E Pioneer Ave – 21st St SE to 25th St SE	Westbound	1,445	532	740	0.37	0.51
	Eastbound	1,445	460	869	0.32	0.60
E Pioneer Ave – Shaw Road E to SR 162	Westbound	560	386	361	0.69	0.64
	Eastbound	560	252	564	0.45	1.01
SR 162 – 143rd Ave E to 80th St E	Northbound	800	771	657	0.96	0.82
	Southbound	800	403	1,260	0.50	1.58
SR 162 – SR 410 to 143rd Ave E	Northbound	840	771	657	0.92	0.78
	Southbound	840	403	1,260	0.48	1.50
Shaw Road E – 12th Ave SE to 16th Ave SE	Northbound	560	948	707	1.69	1.26
	Southbound	560	346	1,350	0.62	2.41
Shaw Road E – 16th Ave SE to 23rd Ave SE	Northbound	560	931	666	1.66	1.19
	Southbound	560	337	1,201	0.60	2.14
Shaw Road E – 16th Ave SE to 23rd Ave SE	Northbound	560	816	592	1.46	1.06
	Southbound	560	348	1,042	0.62	1.86

Scenario A: EIS Proposed Project

LOS and Delay

In addition to the projected growth in traffic volumes developed for the No Action Scenario, Scenario A includes traffic generated from the proposed Project. Due to the traffic generated by the proposed Project, five intersections exceed the LOS standard performance indicators during the PM peak period, refer to the TTR, including:

- Traffic Ave/Fryar Avenue & Main Street/Cannery Way E Main Avenue & SR 410 Westbound /Thompson Street
- E Main Avenue & SR 410 Eastbound
- N Meridian Avenue & Valley Avenue NE
- SR 162 & 80th Street E

Comparing the No Action Scenario delay with Scenario A delay, a majority of the intersections within the study area are impacted by an increase in average delay. However, several intersections show a reduction in delay, which is counterintuitive to an increase in demand traffic. Congestion that develops at a failing intersection can meter traffic into downstream intersections. This can result in traffic arriving less frequently, reducing average delay.

Queue Lengths

Excessive queueing was reported during the AM and PM peak period. During the AM and PM peak hours, several intersection movements exhibited simulated 95th percentile queue length estimates exceeding 1,000 feet, as indicated in Table 4-39.

Table 4-39. 2026 AM and PM Peak Hour Excessive Queue Lengths – Scenario A

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	AM	Northbound	Left	180	910	1,132
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	AM	Northbound	Thru	320	1,035	1,160
11. N Meridian Ave & SR 167 SB	AM	Westbound	Right	470	591	1,007
1. Traffic Ave & Cannery Way	PM	Eastbound	Thru	600	1,051	1,612
1. Traffic Ave & Cannery Way	PM	Eastbound	Right	190	993	1,570
4. E Main Ave & SR 410 EB	PM	Eastbound	Left	300	758	1,083
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	1,640	1,645	1,681
12. N Meridian Ave & Valley Ave NE	PM	Westbound	Left	500	1,066	1,572

Notes: Ave = Avenue; ft = feet; St = Street; Wy = Way

Excessive queueing as shown in the table above is detrimental to the overall system performance. Although only three intersections reported LOS exceeding standard performance indicators, the congestion created by the excessive queueing meters traffic downstream into adjacent signals. Excessive queueing is also indicative of inefficient signal timing and insufficient green time provided at the signalized intersections.

The traffic impacts of Scenario A (proposed Project) require mitigation to meet the LOS standard performance indicators of the City and other affected agencies. The Mitigation Scenarios subsection describes what mitigation is required and provides the results of implementing the mitigation.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, shown below in Table 4-40.

Table 4-40. 2026 Scenario A – AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer, From 7th St to 33rd St SE	Eastbound	1.68	4.72	5.50
E Pioneer, 33rd St SE to 7th St	Westbound	1.68	4.40	4.84
Shaw Road/39th Ave to E Main Ave/State Street	Northbound	2.38	7.44	7.71
Shaw Road/39th Ave to E Main Ave/State Street	Southbound	2.38	6.72	9.59

v/c Ratio

Under Scenario A, and similar to the No Action Scenario, a majority of the specified segments exceed the 0.85 v/c target ratio, with some segments exceeding 2.0. The v/c ratios shown in red exceed the 0.85 v/c ratio standard.

The below table provides the volumes and calculated v/c ratios for the No Action Scenario and Scenario A and the percent difference in v/c ratio for each segment. The v/c ratios shown in red exceed the 0.85 v/c ratio standard.

Table 4-41. 2026 Peak Hour Segmental v/c Ratio Comparison – No Action Scenario and Scenario A

Roadway Segment	Segment Length (ft)	Direction of Travel	v/c Ratio					
			AM			PM		
			No Action Scenario	Scenario A	Percent Increase	No Action Scenario	Scenario A	Percent Increase
1. E Main Ave – Shaw Rd E to 5th Ave NE	1,600	Westbound	0.37	0.52	41%	1.31	1.43	9
		Eastbound	0.83	0.90	8%	0.69	1.00	45
2. E Main Avee – 5th Ave NE to SR 410	3,000	Westbound	0.39	0.54	38%	1.30	1.43	10
		Eastbound	1.57	1.69	8%	1.34	1.92	43
3. E Main Ave – 23rd St to Shaw Rd E	1,800	Westbound	0.27	0.30	11%	0.57	0.72	26
		Eastbound	0.23	0.31	35%	0.38	0.44	16
4. Shaw Rd E – E Main Ave to 5th Ave SE	1,400	Northbound	0.75	0.85	13%	0.54	1.02	89
		Southbound	0.24	0.47	96%	0.94	1.15	22
5. E Pioneer – 21st St SE to 25th St SE	1,350	Westbound	0.37	0.41	11%	0.51	0.73	43
		Eastbound	0.32	0.43	34%	0.60	0.70	17
6. E Pioneer – Shaw Rd E to SR 162	7,300	Westbound	0.69	0.71	3%	0.64	1.01	58
		Eastbound	0.45	0.50	11%	1.01	1.28	27
7. SR 162 – 143rd Ave E to 80th St E	1,350	Northbound	0.96	0.98	2%	0.82	0.90	10
		Southbound	0.50	0.54	8%	1.58	1.61	2
8. SR 162 – SR 410 to 143rd Avee E	2,000	Northbound	0.92	0.93	1%	0.78	0.85	9
		Southbound	0.48	0.52	8%	1.50	1.53	2
9. Shaw Rd E - 12th Ave SE to 16th Ave SE	1,800	Northbound	1.69	1.93	14%	1.26	1.29	2
		Southbound	0.62	0.66	6%	2.41	2.46	2
10. Shaw Rd E - 16th Ave SE to 23rd Ave SE	2,300	Northbound	1.66	1.75	5%	1.19	1.27	7
		Southbound	0.60	0.64	7%	2.14	2.32	8
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	7,550	Northbound	1.46	1.55	6%	1.06	1.09	3
		Southbound	0.62	0.64	3%	1.86	2.02	9

Notes: Ave = Avenue; ft = feet; Rd = Road; sec = second; St = Street; Wy = Way

The weighted average of the percent increase for each roadway was calculated to be used as a proportional factor for corridor wide improvements necessary to increase the capacity to be within the targeted 0.85 v/c ratio. The percent increase was weighted based on segment length and provides the proportional factor for each roadway corridor.

Table 4-42. Scenario A – Roadway Proportional Factor

Roadway Segment	Proportional Factor
E Main Avenue	0.324
Shaw Road	0.170
E Pioneer	0.122
SR 162	0.117

The proportional factor is to be applied to long-range estimates (LRE) for corridor-wide improvements including roadway widening, stormwater improvements, lighting, and typical infrastructure costs during construction such as mobilization, erosion control, and maintenance of traffic. LREs should also include soft project costs such as design management and engineering, construction management, and permitting and inspection. Below is an example of how the proportional factor would be applied. Costs shown are applied as an example and are not indicative of an actual LRE for the project mitigation.

Example: If the LRE for Shaw Road widening within the study area is determined to be $12 million (M) in construction costs, $2M in design and management costs, and $6M in construction management, permitting, and inspection, totaling $20M, the 0.17 proportional factor would be applied to the total construction cost of $20m. This would result in a $3.4M fee in lieu cost to the applicant.

Scenario B: EIS Alternative 1, Rail Delivery

LOS and Delay

Due to its nearly identical trip generation and street network assumptions, Scenario B would exhibit functionally identical LOS results as long as no train serving Knutson Farms is present. The traffic model demonstrated that at-grade rail crossings blocking these streets would cause significant additional delays beyond the at-grade crossings themselves. Other intersections around the site would not improve substantially as a result of the reduction (approximately 18.5 percent) in heavy truck trip generation from Knutson Farms because heavy trucks only form 16.9-percent of overall site traffic. Delays at some of the most congested intersections would be higher on days when a train blockage occurs than with Scenario A. Scenario B also results in intersections exceeding LOS standards during the AM peak period, which does not occur under the No Action Scenario or Scenario A. Seven intersections during the AM peak period and 13 intersections during the PM peak period exceed the LOS standard performance indicators (refer to the TTR). The intersections exceeding the LOS standard include:

AM Peak Period:

- E Main Avenue & SR 410 EB
- E Main Avenue & 5th Avenue NE
- N Meridian Avenue & SR 167 EB
- Shaw Road E & Highlands Boulevard
- Shaw Road E & 16th Avenue SE
- Shaw Road E & 5th Avenue SE
- Shaw Road E & Safeway Driveway

PM Peak Period:

- Traffic Avenue & Cannery Way
- Traffic Avenue & State Street
- E Main Avenue & SR 410 WB Ramps
- E Main Avenue & SR 410 EB Ramps
- E Main Avenue & NE 5th Avenue
- E Main Avenue & Shaw Road E
- N Meridian Avenue & Valley Avenue NE
- E Pioneer & Shaw Road E
- E Pioneer & 33rd Street SE
- 33rd Street SE & 8th Avenue SE
- Shaw Road E & Highlands Boulevard
- Shaw Road E & 23rd Avenue SE/Crystal Ridge Drive SE

Comparing the No Action Scenario delay with Scenario B delay, the majority of the intersections within the study area are impacted by a significant increase in average delay, mainly along the Shaw Road E corridor during the PM peak period.

Queue Lengths

Excessive queueing was reported during the AM and PM peak periods. During the AM and PM peak hours, several intersection movements simulated exhibited 95th percentile queue length estimates exceeding 1,000 feet, refer to the TTR and Table 4-43.

Table 4-43. 2026 AM and PM Peak Hour Excessive Queue Lengths – Scenario B

Intersection	Peak Hour	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave & Cannery Way	AM	Northbound	Left	180	475	1,189
1.Traffic Ave & Cannery Way	AM	Northbound	Thru	320	552	1,194
3. E Main Ave & SR 410 EB Ramps	AM	Eastbound	Left	300	180	1,027
10. N Meridian Ave & SR 167 NB	AM	Westbound	Left	1,100	203	1,337
11. N Meridian Ave & SR 167 SB	AM	Westbound	Right	470	687	3,098
24. Shaw Rd E & 23rd Ave SE	AM	Northbound	Thru	190	255	1,464
34. SR 162 & SR 410 EB Ramps	AM	Northbound	Thru	450	149	1,206
1. Traffic Ave & Cannery Way	PM	Eastbound	Thru	600	971	1,657
1. Traffic Ave & Cannery Way	PM	Eastbound	Right	190	879	1,674
2. Traffic Ave & State St	PM	Southbound	Thru	1,020	629	1,209
3. Traffic Ave & State St	PM	Southbound	Right	1,020	599	1,168
4. E Main Ave & SR 410 EB Ramps	PM	Eastbound	Left	300	1,154	1,473
4. E Main Ave & SR 410 EB Ramps	PM	Northbound	Thru	750	978	1,388

Intersection	Peak Hour	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
5. E Main Ave & 5th Ave NE	PM	Northbound	Thru	1,000	630	1,406
5. E Main Ave & 5th Ave NE	PM	Southbound	Thru	1,000	354	1,225
5. E Main Ave & 5th Ave NE	PM	Southbound	Right	1,000	354	1,225
6. E Main Ave & Shaw Rd E	PM	Westbound	Left	460	800	1,621
6. E Main Ave & Shaw Rd E	PM	Northbound	Left	210	317	1,066
6. E Main Ave & Shaw Rd E	PM	Northbound	Right	210	247	1,034
SR 167 EB on/WB Left	PM	Northbound	Thru	230	248	1,661
10. N Meridian Ave & SR 167 NB	PM	Eastbound	Right	1,640	1,339	1,697
10. N Meridian Ave & SR 167 NB	PM	Westbound	Left	500	810	1,657
19. E Pioneer Ave & Shaw Rd E	PM	Eastbound	Left	340	618	1,422
19. E Pioneer Ave & Shaw Rd E	PM	Eastbound	Thru	750	739	1,434
19. E Pioneer Ave & Shaw Rd E	PM	Eastbound	Right	750	198	1,224
19. E Pioneer Ave & Shaw Rd E	PM	Westbound	Left	300	614	1,264
19. E Pioneer Ave & Shaw Rd E	PM	Westbound	Thru	300	495	1,270
19. E Pioneer Ave & Shaw Rd E	PM	Westbound	Right	300	506	1,300
21. E Pioneer Ave & 33rd St SE	PM	Westbound	Thru	1,000	398	1,481
21. E Pioneer Ave & 33rd St SE	PM	Westbound	Right	1,000	380	1,461
22. Shaw Rd E & Highlands Blvd	PM	Southbound	Thru	650	1,421	1,685
23. Shaw Rd E & 16th Ave SE	PM	Southbound	Thru	1,000	739	1,109
23. Shaw Rd E & 16th Ave SE	PM	Southbound	Right	1,000	739	1,109
24. Shaw Rd E & 23rd Ave SE	PM	Southbound	Thru	650	1,321	1,669
27. Shaw Rd E & 39th Ave SE	PM	Northbound	Left	330	672	1,619
28. Shaw Rd E & 5th Ave SE	PM	Westbound	Left	250	689	1,507
28. Shaw Rd E & 5th Ave SE	PM	Westbound	Right	250	248	1,340
28. Shaw Rd E & 5th Ave SE	PM	Southbound	Left	210	473	1,315
28. Shaw Rd E & 5th Ave SE	PM	Southbound	Thru	1,020	760	1,419
29. 33rd St & 5th Ave SE	PM	Southbound	Thru	550	1,035	1,693
29. 33rd St & 5th Ave SE	PM	Southbound	Right	550	1,044	1,689

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; ft = feet; Rd = Road; St = Street

Excessive queueing as shown in the table above is detrimental to the overall system performance. Although only three intersections reported LOS exceeding standard performance indicators, the congestion created by the excessive queueing meters traffic downstream into adjacent signals. Excessive queueing is also indicative of insufficient green time provided at the signalized intersections.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, shown below in Table 4-44. During the PM peak period, the impact of a train trip is significant along the Shaw Road E corridor, more than doubling the travel time compared to the No Action Scenario.

Table 4-44. 2026 Scenario B – AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer, 7th St to 33rd St SE	Eastbound	1.68	4.57	7.49
E Pioneer, 33rd St SE to 7th St	Westbound	1.68	4.35	6.50
Shaw Rd/39th Ave to E Main Ave/State Street	Northbound	2.38	7.07	13.47
Shaw Rd/39th Ave to E Main Ave/State Street	Southbound	2.38	6.80	19.66

Under Scenario B and similar to the No Action Scenario, a majority of the specified segments exceed the 0.85 v/c target ratio, with some segments exceeding 2.0. Table 4-45 below provides the volumes and calculated v/c ratios for Scenario B. Segments exceeding the 0.85 standard performance v/c are shown in red.

Table 4-45. AM and PM Peak Hour Segmental v/c Ratio – Scenario B

Roadway Segment	Direction of Travel	Calculated Directional Maximum Capacity	Volume (vehicles)		v/c ratio	
			AM	PM	AM	PM
E Main Ave – Shaw Road E to 5th Ave NE	Westbound	1,445	748	1,929	0.52	1.34
	Eastbound	1,445	1,297	1,097	0.90	0.76
E Main Ave – 5th Ave NE to SR 410	Westbound	1,445	783	1,922	0.54	1.33
	Eastbound	760	1,284	1,109	1.69	1.46
E Main Ave – 23rd St to Shaw Road E	Westbound	1,615	491	979	0.30	0.61
	Eastbound	1,615	495	628	0.31	0.39
Shaw Road E – E Main Ave to 5th Ave SE	Northbound	1,445	1,224	991	0.85	0.69
	Southbound	1,445	677	1,472	0.47	1.02
E Pioneer Ave – 21st St SE to 25th St SE	Westbound	1,445	597	894	0.41	0.62
	Eastbound	1,445	614	705	0.42	0.49
E Pioneer Ave – Shaw Road E to SR 162	Westbound	560	399	547	0.71	0.98
	Eastbound	560	282	552	0.50	0.99
SR 162 – 143rd Ave E to 80th St E	Northbound	800	785	687	0.98	0.86
	Southbound	800	434	1,270	0.54	1.59
SR 162 – SR 410 to 143rd Ave E	Northbound	840	785	687	0.93	0.82
	Southbound	840	434	1,270	0.52	1.51
Shaw Road E – 12th Ave SE to 16th Ave SE	Northbound	560	1,107	690	1.98	1.23
	Southbound	560	400	1070	0.71	1.91
Shaw Road E – 16th Ave SE to 23rd Avenue SE	Northbound	560	981	678	1.75	1.21
	Southbound	560	359	1,001	0.64	1.79
Shaw Road E – 16th Ave SE to 23rd Ave SE	Northbound	560	869	602	1.55	1.08
	Southbound	560	340	842	0.61	1.50

This finding indicates that rail crossing delay impacts outweigh the potential benefits of removing a small number of trucks from the Knutson Farms Industrial Park site's delivery traffic stream.

Scenario C: Proposed Project with Traffic Mitigation

Scenario C mitigates the traffic impacts reported in Scenario A. Several mitigation strategies were implemented to address the delay, extensive queueing, and LOS exceeding City standard performance indicators. Some of the strategies are global, meaning they are applied throughout the network to improve the overall system performance. Other strategies are localized at the intersections exceeding City standard performance indicators previously described. The main strategies include:

- Global - Increase signal cycle length and coordinate signals
    - To improve signal progression and increase vehicular throughput at signalized intersections
- Localized - Increase left turn and/or right-turn-lane storage
    - Reduce the occurrence of queue spillback leading to blocking through-lanes
- Localized - Convert unsignalized intersection at SR 162 and 80th Street E to a roundabout
    - Improve minor approach access onto main approach
- Localized - Modify lane configuration at signalized intersections
    - Eliminate split-phase signal timing
    - Improve lane utilization, thus reducing queue lengths
- Proportionate Localized – Upgrade to roadways that do not meet current City standards
    - Roadway typical section improvements including widening, stormwater treatment, and lighting.
    - Pedestrian improvements to bring pedestrian facilities within Americans with Disabilities Act (ADA) standards
    - Improvements to transit stops along corridors identified for improvement using the proportional factor within the Project area including Stop #1301 on Shaw Road E

Proportionate localized mitigation compares the increase of v/c ratio between the No Action Scenario and Scenario C. Using the v/c ratios allows for a proportional factor to be developed accounting for the reduction of capacity attributed by the traffic generated by the applicant. The proportional factor is intended to be applied to the total infrastructure costs of bringing the No Action Scenario within City targets for LOS, delay, and queue lengths.

Table 4-46 describes the extent of mitigation at each location.

Table 4-46. 2026 Scenario C – Traffic Impact Mitigation Applied

Intersection Location	Reason for Mitigation	Mitigation Applied	Does Mitigation Fully Address Impact?
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	LOS and delay exceed City's performance indicators	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
2. Traffic Ave & State St	LOS and delay exceed City's performance indicators	Retime and coordinate signal; this intersection requires retiming even though it meets LOS thresholds due to proximity to SR 410	Yes, traffic analysis shows acceptable LOS and delay performance indicators
3. E Main Ave & SR 410 WB	LOS and delay exceed City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection, and allowing EB and WB left turns to run concurrently	Yes, traffic analysis shows acceptable LOS and delay performance indicators
4. E Main Ave & SR 410 EB	LOS and delay exceed City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
12. N Meridian Ave & Valley Ave NE	LOS and delay exceed City's performance indicators; queuing spillbacks to adjacent intersections	No mitigation applied, see below for discussion	No mitigation applied, see below for discussion
28. Shaw Rd E & 5th Ave SE	LOS and delay exceed City's performance indicators	Widen 5th Avenue and convert unsignalized intersection to a signal with dedicated WB left- and right-turn lanes; widen 5th Ave to a three-lane roadway section; retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
33. SR 162 & 80th St	Traffic generated by Scenario A increases left turning volumes onto SR 162	Convert to roundabout	Yes, traffic analysis shows acceptable LOS and delay performance indicators

Notes: Ave = Avenue; Rd = Road; St = Street; Wy = Way

Below is a description of the mitigation treatments required at specific intersections. Figure 4-65 below also depicts the locations of the intersections needing mitigation.

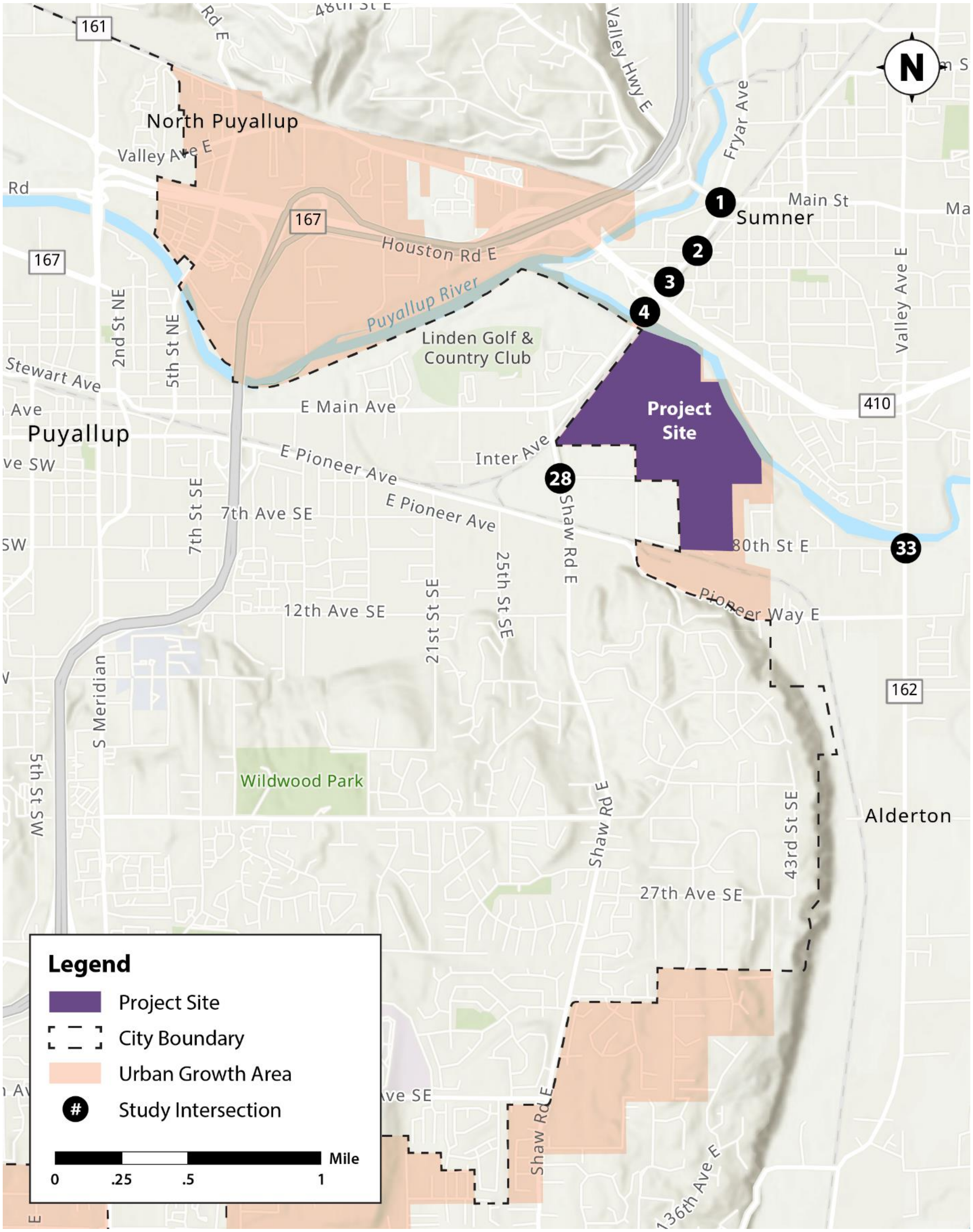

Figure 4-65. Intersection Mitigation Vicinity Map

Location #1 and Location #2. Traffic Avenue & Cannery Way, Traffic Avenue & State Street
Retiming these two signalized intersections to run coordinated with SR 410 improves vehicular throughput, reduces queue lengths, and reduces delay. It is recommended to retime the signal to 120-second cycle lengths and update the offset to align the green band with the SR 410 interchange.

Location #3 and Location #4. E Main Ave & SR 410 WB and E Main Avenue & SR 410 EB
E Main Avenue & SR 410 is a critical bottleneck along the corridor due to the existing width of the bridge over SR 410. Increasing the capacity to meet the demand volume would require a full reconstruction of the interchange. Because WSDOT has jurisdictional control of the interchange and the recent improvements to the existing bridge over SR 410, the localized improvements at each ramp terminal considered only low-impact mitigation strategies. This includes retiming both signals to 120-second cycle lengths and adjusting offsets to improve vehicular throughput and reduce queue lengths. Modifications at E Main Avenue & SR 410 WB (see Figure 4-66) to eliminate the split-phase signal operations are required, including:

- Modify stop bar locations and restripe intersection to eliminate split-phase signalization and to eliminate path overlap of left-turn vehicles. Update signal phasing to operate with protected signal phasing.

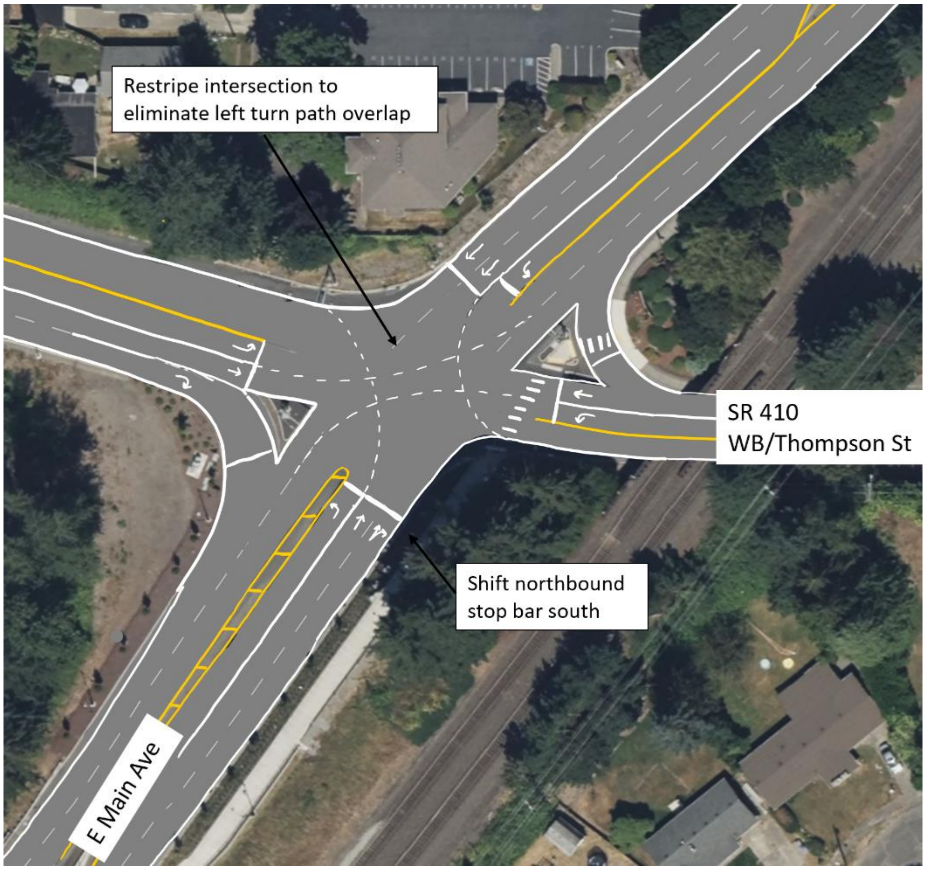

Figure 4-66. Mitigation Improvement at Location #3, E Main Avenue & SR 410 Westbound/Thompson Street

Location #12. N Meridian Avenue & NE Valley Avenue

Although this intersection exceeds mitigation performance indicators with the Project impacts, it already fails in the No Action Scenario. The operational results are tied to the SR 167 interchange, which falls under WSDOT jurisdictional control. Mitigation of traffic impacts at this intersection are not feasible without a full reconstruction of the SR 167 interchange.

Location #28. Shaw Road E & 5th Avenue SE

Widening 5th Avenue SE to provide dedicated westbound left- and right-turn lanes and converting the unsignalized intersection into a signalized intersection will reduce significant delay 5th Avenue SE approach (see Figure 4-67). The signal will also facilitate improved southbound left access onto 5th Avenue SE. Coordinating the signal to the adjacent signals will also improve vehicular flow along Shaw Road E. This will reduce queue lengths and improve travel time. Roadway modifications are also required, including providing a westbound right-turn lane. Due to topography, widening 5th Avenue SE will likely occur to the south, impacting approximately 6,400 feet of right-of-way and a driveway access point. To provide acceptable roadway geometry and the recommended lane configuration at the signal, 5th Avenue SE requires widening to three lanes between Shaw Road E and 33rd Street SE.

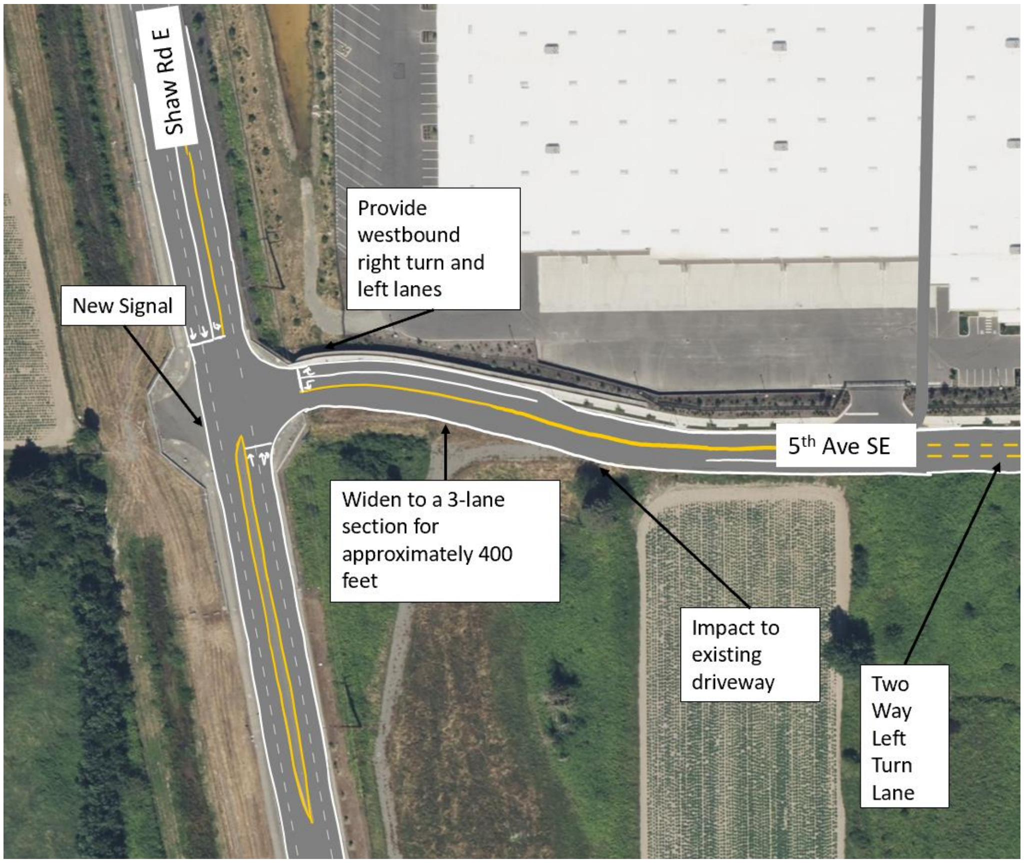

Figure 4-67. Mitigation Improvement at Location #28, Shaw Road E & 5th Avenue SE

Location #33 SR 162 & 80th Street E

Converting SR 162 and 80th Street E to a roundabout will provide a greater opportunity for the left-turning volume from 80th to complete their movement. Due to the increased traffic generated along SR 162, the left-turning vehicles from 80th experience significant delay waiting for a gap simultaneously in both directions. Providing a roundabout at SR 162 and 80th Street E will have significant right-of-way impacts on all adjacent parcels. There is also a utility pole that would need to be relocated (see Figure 4-68).

Figure 4-68. Mitigation Improvement at Location #33 SR 162 & 80th Street E

LOS and Delay

The mitigation strategies significantly improved the system performance; however, N Meridian Avenue and Valley Avenue NE still exceed LOS performance indicators, refer to the TTR. The following intersection still exceeds the LOS performance indicator:

- N Meridian Avenue & Valley Avenue NE (WSDOT)

The N Meridian Avenue intersection requires significant interchange reconstruction under WSDOT jurisdictional control. The mitigation strategies, however, did reduce overall delay and improve operations at these intersections compared to Scenario A.

Although the proposed roundabout at SR 162 and 80th Street approaches LOS F, a reduction in delay was realized. Other intersection control options were considered including a traditional signal and a continuous green-t intersection. The continuous green-t intersection was dismissed due to site specific constraints including adjacent bridges. Although a traditional signal may provide similar operations compared to the roundabout, it would not provide the same safety benefit of a roundabout. Similar to how LOS is determined at unsignalized intersections, a roundabout's minor approach delay is used to determine LOS. Due to the heavy southbound demand during the design year, delay along 80th Street E is still anticipated. The roundabout does reduce the delay and improve safety along the corridor by reducing the conflict points at the intersection and reducing the potential for severe and fatal crashes. Converting a two-way, stop-controlled intersection to a single-lane roundabout has a crash modification factor (CMF) of 0.22 for serious, minor injury, and possible injury crashes.[17] A 0.22 CMF suggest a 78 percent crash reduction.

Queue Lengths

The mitigation strategies implemented did not eliminate excessive 95th percentile queueing, which represents the queue length that is exceeded only 5 percent of the time. In fact, by improving traffic flow at the critical bottlenecks within the Project area, traffic platoons and congestion spread throughout the network, increasing the number of locations where 1,000-foot queues develop. Rather than compare 95th percentile queues with Scenario A, a more meaningful metric that shows an improvement to traffic flow is comparing the 50th percentile queue lengths. The majority of 50th percentile queue lengths are less than the available storage length provided. Refer to the TTR for all excessive queue lengths reported.

Mitigating the excessive queue lengths requires adding capacity to each corridor. Considering that both the existing condition model and No Action Scenario have corridors that exceed the City's performance indicator of 0.85 v/c ratio, the proportional factors provided in Table 4-42 in Section 4.3.4 should be used to develop the mitigation cost required due to the proposed Project.

Travel Time

Average travel time was collected during the AM and PM peak period for specific routes within the Project area, shown in Table 4-47.

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[17] CMF Clearinghouse, CMF ID: 234

Table 4-47. Scenario C – 2026 AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer, 7th St to 33rd St SE	Eastbound	1.68	4.44	5.23
E Pioneer, 33rd St SE to 7th St	Westbound	1.68	4.37	4.41
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	6.78	6.09
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	6.37	9.62

v/c Ratio

The v/c ratio for Scenario C would be equivalent to that for Scenario A since both scenarios have the same demand volume.

Scenario D: EIS Alternative 2, Reduced Site Intensity

Scenario D does not generate as much Knutson Farms traffic due to a decrease in the site footprint. Compared to Scenario A, Scenario D generates 33 percent less site demand volume.

LOS and Delay

Although less site traffic volume is generated, Scenario D still has intersections that exceed the City's standard LOS performance indicator. Due to the traffic generated by the proposed Project, three intersections exceed the LOS standard performance indicators during the PM peak period, including:

- Traffic Avenue & Cannery Way
- E Main Avenue & SR 410 Westbound
- N Meridian Avenue & Valley Avenue NE

Queue Lengths

Excessive queueing was reported during the AM and PM peak periods. During the AM and PM peak periods, the several intersections reported a 95th percentile queue length exceeding 1,000 feet, as shown in Table 4-48.

Table 4-48. AM and PM Peak Hour Excessive Queue Lengths – Scenario D

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave & Cannery Way	AM	Northbound	Left	180	935	1,096
1. Traffic Ave & Cannery Way	AM	Northbound	Thru	320	1,004	1,137
1. Traffic Ave & Cannery Way	PM	Eastbound	Thru	600	1,183	1,598
4. E Main Ave & SR 410 EB	PM	Eastbound	Left	300	170	1,270
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	1,640	1,645	1,681
12. N Meridian Ave & Valley Ave NE	PM	Westbound	Left	500	1,066	1,572
24. Shaw Rd E & 23rd Ave SE	PM	Southbound	Thru	650	1,038	1,383
27. Shaw Rd E & 39th Ave SE	PM	Northbound	Left	330	1,074	1,656
27. Shaw Rd E & 39th Ave SE	PM	Southbound	Thru	530	1,043	1,217

Notes: Ave = Avenue; ft = feet; Rd = Road

The excessive queuing shown in the table above and the intersections performing outside City's standard LOS performance indicator require mitigation.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, shown in Table 4-49.

Table 4-49. Scenario D - 2026 AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer, 7th St to 33rd St SE	Eastbound	1.68	4.43	5.29
E Pioneer, 33rd St SE to 7th St	Westbound	1.68	4.32	4.78
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	6.61	6.49
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	6.40	8.98

v/c Ratio

Although Scenario D generates less site volume than Scenario A, Scenario D does increase the v/c ratios along each segment compared to the No Action Scenario. Table 4-50 below compares the v/c ratios of the No Action Scenario and Scenario D showing the percent increase of v/c for each segment. The v/c ratios shown in red exceed the 0.85 v/c ratio standard.

Table 4-50. 2026 Peak Hour Segmental v/c Ratio Comparison – No Action Scenario and Scenario D

Roadway Segment	Segment Length (ft)	Direction of Travel	v/c Ratio					
			AM			PM		
			No Action	Scenario D	Percent Increase	No Action	Scenario D	Percent Increase
1. E Main Ave – Shaw Rd E to 5th Ave NE	1,600	Westbound	0.37	0.47	27%	1.31	1.39	7
		Eastbound	0.83	0.88	5%	0.69	0.89	28
2. E Main Ave – 5th Ave NE to SR 410	3,000	Westbound	0.39	0.49	26%	1.30	1.38	7
		Eastbound	1.57	1.65	5%	1.34	1.71	28
3. E Main Ave – 23rd St to Shaw Rd E	1,800	Westbound	0.27	0.29	8%	0.57	0.66	16
		Eastbound	0.23	0.28	21%	0.38	0.42	11
4. Shaw Rd E – E Main Ave to 5th Ave SE	1,400	Northbound	0.75	0.81	9%	0.54	0.85	56
		Southbound	0.24	0.39	66%	0.94	1.08	15
5. E Pioneer – 21st St SE to 25th St SE	1,350	Westbound	0.37	0.40	8%	0.51	0.65	27
		Eastbound	0.32	0.39	22%	0.60	0.67	12
6. E Pioneer – Shaw Rd E to SR 162	7,300	Westbound	0.69	0.70	2%	0.64	0.63	-3
		Eastbound	0.45	0.49	8%	1.01	0.97	-4
7. SR 162 – 143rd Ave E to 80th St E	1,350	Northbound	0.96	0.98	1%	0.82	0.87	6
		Southbound	0.50	0.53	5%	1.58	1.59	1
8. SR 162 – SR 410 to 143rd Ave E	2,000	Northbound	0.92	0.93	1%	0.78	0.83	6
		Southbound	0.48	0.50	5%	1.50	1.51	1

Roadway Segment	Segment Length (ft)	Direction of Travel	v/c Ratio					
			AM			PM		
			No Action	Scenario D	Percent Increase	No Action	Scenario D	Percent Increase
9. Shaw Rd E - 12th Ave SE to 16th Ave SE	1,800	Northbound	1.69	1.89	11%	1.26	1.37	8
		Southbound	0.62	0.65	5%	2.41	2.54	5
10. Shaw Rd E - 16th Ave SE to 23rd Ave SE	2,300	Northbound	1.66	1.72	4%	1.19	1.27	7
		Southbound	0.60	0.63	4%	2.14	2.25	5
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	7,550	Northbound	1.46	1.53	5%	1.06	1.14	7
		Southbound	0.62	0.60	-4%	1.86	2.02	9

Notes: Ave = Avenue; ft = feet; Rd = Road; St = Street

The weighted average of the percent increase for each roadway was calculated to be used as a proportional factor for corridor-wide improvements necessary to increase the capacity to be within the targeted 0.85 v/c ratio. The percent increase was weighted based on segment length. Table 4-51 provides the proportional factor for each roadway corridor.

Table 4-51. Scenario D – Roadway Proportional Factor

Roadway Segment	Proportional Factor
E Main Avenue	0.211
Shaw Road	0.083
E Pioneer	0.067
SR 162	0.065

Scenario E: EIS Alternative 2 with Traffic Mitigation

Scenario E mitigates the traffic impacts reported in Scenario D. Many of the same mitigation strategies implemented under Scenario C were deployed, including:

- Global - Increase signal cycle length and coordinate signals:
  - Improve signal progression and increase vehicular throughput at signalized intersections.
- Localized - Increase left-turn and/or right-turn lane storage:
  - Reduce the occurrence of queue spillback leading to blocking through-lanes.
- Localized - Convert an unsignalized intersection at SR 162 and 80th Street E to a roundabout:
  - Improve minor approach access onto main approach.
- Localized - Modify lane configuration at signalized intersections:
  - Eliminate split-phase signal timing.
  - Improve lane utilization, thus reducing queue lengths.

For the localized mitigation strategies, Table 4-52 describes the extent of mitigation at each location.

Table 4-52. 2026 Scenario E Traffic Impact Mitigation Applied

Intersection Location	Reason for Mitigation	Mitigation Applied	Does Mitigation Fully Address Impact?
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	LOS and delay exceed City's performance indicators	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
2. Traffic Ave & State St	LOS and delay exceed City's performance indicators	Retime and coordinate signal; this intersection requires retiming even though it meets LOS thresholds due to proximity to SR 410	Yes, traffic analysis shows acceptable LOS and delay performance indicators
3. E Main Ave & SR 410 WB	LOS and delay exceed City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection and allowing EB and WB left turns to run concurrently	Yes, traffic analysis shows acceptable LOS and delay performance indicators
4. E Main Ave & SR 410 EB	LOS and delay exceed City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
28. Shaw Rd E & 5th Ave SE	LOS and delay exceed City's performance indicators	Widen 5th Ave and convert unsignalized intersection to a signal with dedicated WB left- and right-turn lanes; widen 5th Avenue to a three-lane roadway section; retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
33. SR 162 & 80th St	Traffic generated by Scenario D increases left turning volumes onto SR 162	Convert to roundabout	Yes, traffic analysis shows acceptable LOS and delay performance indicators

LOS and Delay

Similar to Scenario C, which mitigated the Scenario A traffic impacts, only the N Meridian Avenue and Valley Avenue NE intersection still exceeds the LOS performance indicators, refer to the TTR. Comparing the intersection delay between Scenario D and Scenario E, a majority of intersections saw a decrease in delay. Several intersections did see an increase in delay, mainly at unsignalized intersections. Due to the improved vehicular throughput along main corridors, fewer available gaps occur for the minor approach to complete their movement. Although the delay increases at some locations, the overall network performance is improved, as represented by the reduction in average delay at a majority of the intersections within the study area and overall reduction in queue lengths described below.

Queue Lengths

Similar to Scenario C, the mitigation strategies implemented did not eliminate excessive 95th percentile queueing. In fact, by improving traffic flow at the critical bottlenecks within the Project area, traffic platoons and congestion spreads throughout the network, increasing the number of locations where 1,000-foot queues develop. Rather than comparing 95th percentile queues with Scenario A, a more meaningful metric that shows an improvement to traffic flow is comparing the 50th percentile queue lengths. A majority of the 50th percentile queue lengths are less than the available storage length provided. Refer to the TTR for all excessive queue lengths reported.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, as shown Table 4-53.

Table 4-53. Scenario E – 2026 AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer, 7th St to 33rd St SE	Eastbound	1.68	4.39	5.38
E Pioneer, 33rd St SE to 7th St	Westbound	1.68	4.16	4.68
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	6.13	5.93
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	5.91	8.53

v/c Ratio

The v/c ratio for Scenario E would be equivalent to the ratio for Scenario D because both scenarios have the same demand volume.

Travel Time Comparison

Travel time results from the simulations of all scenarios are provided for comparison in Table 4-54.

Table 4-54. Travel Time Comparison

Segment and Direction	Length (miles)	Travel Time (minutes)						
		Existing	No Action Scenario	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
AM Peak Hour								
Pioneer, 7th to 33rd, EB	1.68	4.17	4.52	4.72 (4%)	4.57 (1%)	4.44 (-2%)	4.43 (-2%)	4.39 (-3%)
Pioneer, 33rd to 7th, WB	1.68	4.20	4.26	4.40 (3%)	4.35 (2%)	4.37 (3%)	4.32 (1%)	4.15 (-3%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	4.33	6.13	7.44 (21%)	7.07 (15%)	6.78 (11%)	6.61 (8%)	6.13 (0%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	4.26	5.96	6.72 (13%)	6.80 (14%)	6.37 (7%)	6.40 (7%)	5.91 (-1%)

PM Peak Hour								
Pioneer, 7th to 33rd, EB	1.68	5.0	5.34	5.50 (3%)	7.49 (40%)	5.23 (-2%)	5.29 (-1%)	5.38 (1%)
Pioneer, 33rd to 7th, WB	1.68	5.07	4.68	4.84 (3%)	6.50 (39%)	4.41 (-6%)	4.78 (2%)	4.68 (0%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	6.02	6.55	7.71 (18%)	13.47 (106%)	6.09 (-7%)	6.49 (-1%)	5.93 (-9%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	7.92	9.00	9.59 (7%)	19.66 (118%)	9.62 (7%)	8.98 (0%)	8.53 (-5%)

Note: Percentages represent increase over the No Action Scenario.

Scenario A sees a significant increase in travel time during the PM peak period compared to the No Action Scenario. The main reason for the increase in travel time is due to the failing signalized intersections and extensive queue lengths described previously in this section. Main Street, Shaw Road, and Pioneer Avenue are projected to be nearing capacity under the No Action Scenario. The increase in traffic generated by the Knutson Farms proposal pushes these corridors further over capacity, resulting in extensive queuing, congestion, and significant increase in travel times.

Scenario B results in network wide system breakdown during the PM peak period. This results in excessive increases in travel time along all corridors. The grid lock is due to the train call which results in excessive queue lengths.

Scenario C results in a decrease in travel time for some corridors and a slight increase in travel time for other corridors during the PM peak period compared to the No Action Scenario. Scenario C travel times indicate that the mitigation strategies implemented reduce the travel times through the transportation network when compared to Scenario A.

Scenario D results in a decrease in travel time for some corridors and a slight increase in travel time for other corridors during the PM peak period compared to the No Action Scenario. Although not as significant as the traffic increase in Scenario A, the increase in traffic generated by Knutson Farms is anticipated to increase travel times along the corridors by less than 1-minute during the AM peak period and are relatively equivalent during the PM peak period.

Scenario E results in a decrease in travel time for some corridors and a slight increase in travel time for other corridors during the PM peak period compared to the No Action Scenario. Scenario E travel times indicate that the mitigation strategies implemented reduce the travel times through the transportation network when compared to Scenario D.

Additional Mitigation

As previously described, due to the roadway corridors exceeding capacity under the No Action Scenario, not all intersection LOS, v/c ratios, and queue lengths are able to be mitigated within target values. Large corridor-wide improvements would be needed, such as widening from a two-lane roadway section to a four or five-lane section. Weighting the added impact created by the volume generated by the proposed Project allows for proportionate mitigation costs to be incurred. Improvements that would be included in those costs include:

- Corridor widening improvements along Shaw Road E, E Main Avenue, SR 162, and E Pioneer Avenue
- Upgrading roadways within the Project area to City standards
- Upgrading pedestrian facilities to meet ADA standards
- Improvements to transit stops within the Project area, including Stop #1301

4.9.5 Crash Analysis Results

Crash History

A total of 836 crashes were reported at the study intersections (Intersections 1 through 27 and 31 through 35) and the corridor segments in the 7-year period between January 1, 2015, and December 31, 2021 (WSDOT 2023). The study intersections accounted for 757 of these. Refer to the TTR for a summary of intersection and segment crashes by type, severity, and year.

The majority of both intersection and corridor segment crashes were either angle or rear-end crashes. Angle crashes are those in which two vehicles approaching the intersection on intersecting streets collide. Such crashes, by definition, involve at least one of the two drivers failing to yield the right-of-way. Rear-end crashes tend to predominate on congested intersections and are almost always caused by inattention on the part of the second driver.

There were no fatal crashes during the study period at any of the intersections or corridor segments studied. “Unknown” severity is a simple lack of reporting and can indicate that a driver, passenger, cyclist, or pedestrian involved in a crash left the scene of the crash without the reporting officer being able to assess injury status or that the officer may have neglected to complete that part of the crash report. A total of only 10 crashes with suspected serious injuries were reported in 836 total reported crashes, which represents an uncommonly low degree of severity. Refer to the TTR for crash history type.

Crashes per year generally declined from 2015 to 2020 and then bounced back in 2021. The year 2020 could be considered something of an aberration, as the global pandemic reduced vehicle miles traveled for most of the year. Crash rates were generally lower on Shaw Road East between East Pioneer Avenue and 39th Street than at other intersections. No crash rates higher than 1.0 were observed for any study intersection. To illustrate relative crash intensity for study area intersections, a color-coded map is provided in Figure 4-69.

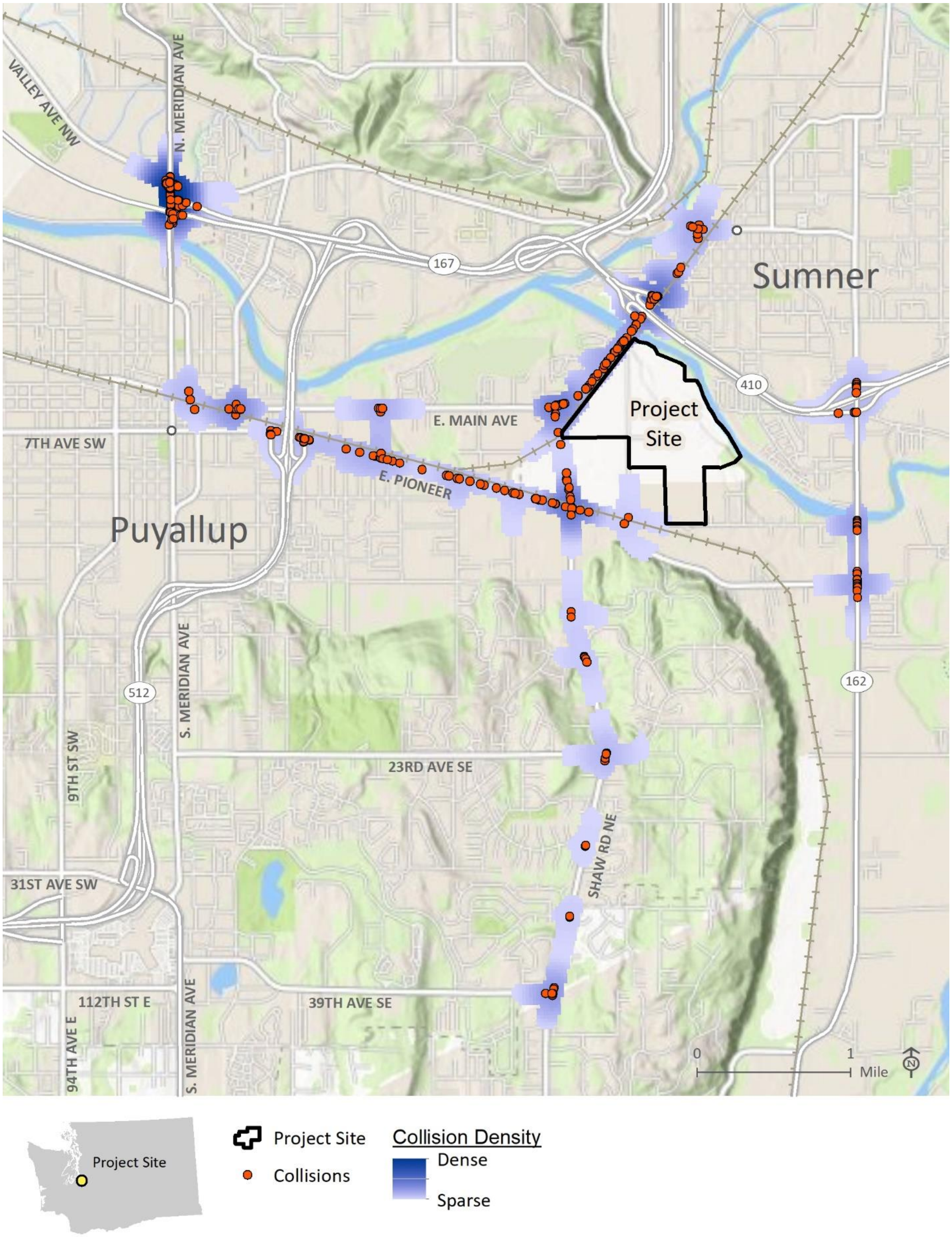


Figure 4-69. Relative Crash Intensity for Study Intersections

Traffic Safety Performance Impacts of Future Scenarios

Intersection crash rates (crashes per million entering vehicles) can reasonably be expected to remain similar in the Project year of opening (2026) unless one or more of the following occurrences influences them:

- Abnormal weather results in more hazardous conditions than have been observed in the study area in the recent past
- Industrywide improvements in vehicle technology associated with crash avoidance are implemented in enough of the vehicle fleet that overall crashes are reduced; and/or
- Project improvements are made at specific intersections that reduce crash risk, such as improvements to lighting, sight distance, or intersection geometry.

Comparisons here are based on an assumption that such factors would either not be substantive or would effectively cancel each other out.

No Action Scenario

The No Action Scenario would experience more crashes per year than the 6-year average from 2015–2020, but type and severity patterns would not be expected to change. No significant safety impacts are expected to result from the No Action Scenario.

Scenario A: Proposed Project

Scenario A would result in significant increases in traffic volume at study intersections and along study segments. With the assumption that relationship of crashes to volume remains the same, the Project would come with an anticipated corresponding increase in crashes and impacts to overall public safety. As shown earlier, Scenario A would, for the most part, also result in more peak hour congestion, which could reasonably be expected to affect crash likelihood.

Additional traffic congestion could affect safety performance both positively and negatively. On the positive side, lower speeds could give drivers more time to react to other road users. Shaw Road has documented high speeds as shown in City plans, such as the Safe Routes to Schools Plan. However, drivers could also become frustrated by delays and attempt to make more aggressive movements to compensate, such as changing lanes more often or accepting smaller gaps when entering or crossing conflicting traffic.

During congested or lower-speed conditions, crash type distribution could be different from when drivers are freer to choose their desired speeds. More congestion is likely to correspond to more sideswipe and rear-end crashes due to increased lane-changing or other aggressive/impatient driving. Both lower speeds and more of these types of crashes are often associated with lower severity (fewer injuries) than the head-on, angle, and fixed-object crashes that typically occur when there is little or no congestion. No significant safety impacts are expected to result from Scenario A.

Scenario B: Rail Delivery

With similar levels of congestion relative to Scenario A, Scenario B would be expected to have safety impacts similar to those outlined for Scenario A. While the very low speeds of proposed trains on crossings near the site for Scenario B indicate that new safety impacts due to rail crossing activity would not be significant, additional active rail crossings would not make Scenario B safer than the No Action Scenario or Scenario A. No significant safety impacts are expected to result from Scenario B.

Scenario D: Reduced Land Use

The characteristics of the safety impacts under Scenario D are similar to those under Scenario A. However, the magnitude of the impacts is expected to be lower, since the traffic volumes associated with Scenario D are lower than those associated with Scenario A.

4.9.6 Pavement Analysis Results

Existing Condition

As presented in Attachment B, the pavement analysis determined average remaining life of the existing pavement on the subject roadways. It was determined E Main Avenue has 9 percent remaining life, Shaw Road E has 38 percent remaining life, and E Pioneer Avenue has 38 percent remaining life. See Table 4-55 for the estimated remaining life at current condition.

No Action Scenario

Under the No Action Scenario, pavement would continue to deteriorate at its current rate, with slight potential acceleration due to increasing traffic.

Scenarios A and D

Due to the increase in truck volumes and the ESALs (see Section Pavement Analysis) under Scenarios A and D, the subject roadways would reach their end of life faster than under the No Action Scenario. Table 4-55 shows the percent increase in ESALs from the No Action Scenario to Scenario A and Scenario D. These percent increases indicate how much sooner the roadways would reach their end of life. For example, on East Main Avenue, pavement condition under Scenario A would reach end of its life 9.4 percent sooner than under the No Action Scenario. A pavement analysis for Scenario B was not conducted due to the operational impacts and lack of viability of that scenario.

Typical mitigation measures for pavements include a full repave and a grind-and-inlay. Within reasonable range, it is recommended for applicant to share 5 to 10 percent of the cost of the mitigation.

Table 4-55. Pavement Remaining Life and Percent Increase in ESAL

Roadway	**Estimated Remaining Life at Current Condition**	**Scenario A % Increase in ESAL**	**Scenario D % Increase in ESAL**
East Main Avenue	0 to 23% (9% Average)	9.4	6.5
Shaw Road East	18 to 68% (38% average)	5.3	3.6
East Pioneer Avenue	8 to 63% (32% average)	6.8	4.7

Other mitigation to incorporate:

- Transit stop pavement improvements on E Main Avenue (bus shelter for closest stop location 2728 E Main Avenue)

- Roadway pavement improvements on 33rd Street (between 5th Avenue and 8th Avenue, full street improvements)
- Pedestrian safety for trail crossings – 80th Street (from Meeker trailhead to the new on-site trail – rapid flashing beacons), intersection crossing at 33rd Street/Pioneer Avenue (improved safety of crossing, such as rapid flashing beacons)

4.9.7 Mitigation Measures

As outlined in the City of Puyallup Comprehensive Plan, developers are required to mitigate for impacts to LOS in the affected area through improvements to the transportation system. For the significant impacts identified in this analysis where LOS has degraded to below LOS D, or below LOS E along Shaw Road, Meridian, or the 9th Street Corridors as a result of the Project, the applicant would be required to identify effective mitigation measures, see Figure 4-56. If the LOS without the Project is not meeting the City standard, the developer shall be required to mitigate impacts to the pre-developed level of service condition plus an allowable increase in delay of up to 15 percent.

The City’s Comprehensive Plan policies on intersection LOS only address mitigations for PM peak hour impacts because both (a) trip generation for most land uses and (b) overall background traffic is higher than in the AM peak hour. As such, only PM model runs were used to test the effectiveness of mitigation measures even though there would be AM peak hour benefits as well. In other words, the significant impacts identified for AM peak hour conditions are expected to be addressed by the same mitigation measures.

The proposed Project, either Scenario A or the reduced footprint Scenario D, will result in operational degradation of the transportation system within the Project area. Several intersections within the Project area exceed LOS performance indicator, triggering the need for mitigation at specific intersections including restriping, roadway widening and new signals, and construction of a roundabout.

Table 4-56. Required Mitigation Summary

Intersection/Corridor	**Required Mitigation By Scenario**	
	Scenario A	**Scenario D**
1. Traffic Ave/Fryar Ave & Main St/Cannery Wy	Retime and coordinate signal	Retime and coordinate signal
2. Traffic Ave & State St	Retime and coordinate signal; this intersection requires retiming even though it meets LOS performance indicators due to proximity to SR 410	Retime and coordinate signal; this intersection requires retiming even though it meets LOS performance indicators due to proximity to SR 410
3. E Main Ave & SR 410 WB	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection and allowing eastbound and westbound left turns to run concurrently	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection and allowing eastbound and westbound left turns to run concurrently
4. E Main Ave & SR 410 EB	Retime and coordinate signal	Retime and coordinate signal
12. N Meridian Ave & Valley Ave NE	No mitigation applied, see below for discussion	No mitigation applied, see below for discussion
28. Shaw Rd E & 5th Ave SE	Widen 5th Avenue and convert unsignalized intersection to a signal with dedicated westbound left and right turn lanes. Widen 5th Avenue to a 3-lane roadway section	Widen 5th Avenue and convert unsignalized intersection to a signal with dedicated westbound left and right turn lanes. Widen 5th Avenue to a 3-lane roadway section
33. SR 162 & 80th St	Convert to roundabout	Convert to roundabout
Proportional Factor		
E Main Avenue	0.324	0.211
Shaw Road E	0.170	0.083
E Pioneer	0.122	0.067
SR 162	0.117	0.065

In addition to global mitigation strategies, a proportional factor was developed for each major corridor within the Project area. The proposed Project would reduce the available capacity any proposed corridor-wide capacity improvement would provide. In order to determine a fee-in-lieu cost, the weighted factor is developed to quantify the total fee-in-lieu cost that is equivalent to the reduction in available capacity due to the proposed Project. The proportional factor is to be applied to corridor-wide capacity improvements long-range estimates to determine the appropriate capacity usage fee.

The proposed Project would require unavoidable upgrades to the transportation network within the Project area. These improvements include:

- Improve existing roadways to meet ADA requirements. Areas impacted by associated mitigation would need to provide associated upgrades to street right-of-way facilities to meet all current ADA regulations, best practices, and guidelines. This would apply globally under each mitigation scenario.
- Improve existing transit stations. The Project would generate substantial employment on site that would necessitate transit stop improvements meant to serve the site employees. In

consultation with Pierce Transit, the EIS team and City have identified one current bus stop (stop #1301, at the NE corner of Shaw Road and East Main Avenue) that would require full improvement with a bus stop shelter. This would apply globally under each mitigation scenario.

- Widen existing roadways to meet current City and County standards. Due to the substandard nature of the immediate public roadways serving the development site and the total daily vehicle trips documented on those roads, upgrades to the following roadways would be required:
  - 5th Avenue SE. Completing cross section improvements from Shaw to 33rd Street in accordance with City standards. This mitigation is needed to address the increased demand from impacts generated by the site development. This would apply globally under each mitigation scenario.
  - 33rd Street SE. Complete full street cross section improvements to 33rd Street SE from 5th Avenue SE to East Pioneer Avenue, including intersection improvements at 8th Avenue SE/33rd Street SE and 33rd Street SE/E Pioneer Avenue. The existing 33rd Street SE, from 5th Avenue to E Pioneer Avenue, is substandard; the majority of the roadway is 15 to 17 feet in width paved, with no pedestrian facilities. This roadway is designated in the City's Comprehensive Plan as a future arterial. A major community park facility (Van Lierop Park) and a large non-profit (Step by Step) serving at risk mothers and youth exist on this road, and both plan major improvement in the future. The road would need to be improved to serve the demand and impacts generated by site development. Without this mitigation, the impacts to the City transportation network safety would be significant. Per the City Comprehensive Plan (policy T-3.3 (b.)), development that causes impacts to the City transportation network are required to make improvements. This would apply globally under each mitigation scenario.
  - 80th Street E/8th Avenue SE. Complete full street cross section improvements to 80th Street E (Pierce County) and 8th Avenue SE (City) from the eastern-most portion of the Project site frontage to the 8th Avenue SE/33rd Street SE intersection. Similar to the above analysis regarding street impacts and substandard nature of these local roads, improvements to serve the demand and impacts generated by site development are required. Without this mitigation, the impacts to the City and County transportation network safety would be significant. Per the City Comprehensive Plan (policy T-3.3 (b.)), development that causes impacts to the City transportation network are required to make improvements. This would apply globally under each mitigation scenario.

Construction-Related Impacts

Traffic and Traffic Safety

To mitigate for potential impacts related to traffic and traffic safety due to an increase in vehicle traffic on local roads and a minor traffic safety risk associated with construction traffic, the applicant would be required to develop and implement a traffic management plan for all construction traffic.

Pavement Conditions

Vehicle trips associated with construction would contribute to deterioration of local roads; however, the applicant would be required to repair any damage and restore roadways to a condition similar to or better than that prior to construction.

Operations-Related Impacts

Traffic

Several intersections would see peak hour LOS exceed the City standards with implementation of the proposed Project. Most of these cases would represent significant impacts resulting from implementation of the proposed Project. Several mitigation strategies were proposed and tested in the traffic simulation models to address these impacts. The mitigation strategies are outlined in Section 4.9.4 (Scenario C and Scenario E).

4.10 Health and Safety

This section describes the potential environmental health and safety hazards that may result from construction and operation of the proposed Project and alternatives. Risks to environmental health and safety could occur during construction and operation of the Project. The risks may include job site hazards for construction workers, operational risks and hazards for future workers and site occupants, inadvertent release of hazardous materials to the natural and built environment, and exposure to existing hazardous materials sites and utilities. Potential mitigation measures are also identified.

4.10.1 Study Area

The study area for the environmental health and safety analysis is a 0.5-mile radius from the proposed Project site (see Figure 4-70). A 0.5-mile search radius was utilized to match the ASTM-defined search radius for state-listed contaminated sites.

4.10.2 Relevant Plans, Policies, and Regulations

This section summarizes federal, state, and local regulations related to health and safety that are applicable to the Project. Relevant policies and regulations related to health and safety are summarized in Table 4-57.

Table 4-57. Applicable Policies and Regulations for Health and Safety

Policies and Regulations	Description
Federal	
Comprehensive Environmental Response, Compensation and Liability Act (CERLCA; 40 CFR 300–302)	Establishes authority for governmental response to hazardous substance releases to the environment and liability for responsible parties for response actions and damage to natural resources.
Superfund Amendment and Reauthorization Act (40 CFR 302)	Amended CERCLA and requires reporting for emergency response, emergency release, and hazardous and toxic chemical releases.
Federal Resource Conservation and Recovery Act (42 USC 6901 et seq.)	Governs the generation, storage, and transportation of hazardous waste and waste management activities for hazardous waste treatment, storage, and disposal facilities. This is delegated to Washington State for administration under the Washington Hazardous Waste Management Act.
Occupational Safety and Health Administration (OSHA) Regulations (29 CFR 1910)	Federal occupational hazard regulations.
State	
Washington Industrial Safety and Health Act (WISHA) (RCW 49.17)	Requires employers to provide safe and healthful workplaces for all employees; enforced by Washington Department of Labor and Industries.
Pollution Prevention Plan Requirements (WAC 173-307)	Requirements for Pollution Prevention Plans associated with hazardous substance users and waste generators.
Washington Industrial Health and Safety Act (RCW 49.17)	Regulates emergency planning and response, including air-contaminant exposure limits for workers.
Washington Safety and Health (WAC 296-800)	Requires employers to provide a safety and healthy workplace free from recognized hazards and requires the establishment, supervision, and enforcement of an accident prevention program.

Policies and Regulations	**Description**
Model Toxics Control Act and its implementing regulations (RCW 70.105D and WAC 173-340)	Require potentially liable persons to assume responsibility for cleaning up contaminated sites. Require reporting hazardous substance releases if they constitute a threat to human health or the environment.
Washington Hazardous Waste Management Act (RCW 70.105 and WAC 173–303)	State equivalent of Resource Conservation and Recovery Act; requires designation of dangerous and extremely hazardous waste, and proper handling, storage, transport, and disposal of such wastes. Governs and establishes regulations for hazardous waste treatment, storage, and disposal facilities.
Washington Administrative Code, Site Discovery and Reporting (WAC 173-340-300)	Requires reporting hazardous substance releases if they constitute a threat to human health or the environment.
General Occupational Health Standards (WAC 296–62)	Protect the health of employees and help create a healthy workplace by establishing requirements to control health hazards, including chemical hazard communication and exposure programs.
Gas Companies – Safety (WAC 480-93)	WAC 480-93-020, Proximity Considerations, requires gas pipeline companies to receive Washington Utilities and Transportation Commission approval for construction or building activities near natural gas pipelines.
Local	
Pierce County Code Title 17C	Pierce County's construction and infrastructure regulations, including building and fire codes.
Pierce County Code Title 18E	Pierce County's Critical Areas Ordinance, including regulations related hazardous materials usage within critical areas.
Pierce County Comprehensive Emergency Management Plan	Pierce County's Comprehensive Emergency Management Plan describes the responsibilities and capabilities of the agencies and organizations in Pierce County working to prevent, protect against, mitigate, respond to, and recover from emergencies and major disasters impacting our communities.
City of Puyallup Municipal Code 17.04	City of Puyallup's building and construction municipal code.

4.10.3 Affected Environment

The Project is in the UGA of the City of Puyallup in unincorporated Pierce County. The 188-acre Project site is situated east of Shaw Road East and East Main Avenue, north of East Pioneer and 88th Street East, and west of the Puyallup River within Sections 25 and 26, Township 20N, Range 4E in the Willamette Meridian baseline.

The affected environment includes the existing physical environment (property, facilities, and infrastructure) and the natural environments (plants, animals, and their habitat) on the Project site and within the Project vicinity as a precursor to hazards and hazardous materials. See Section 4.4 Plants and Animals and Section 4.5 Land and Shoreline Use for a description of the affected environment for these subject areas.

Known hazardous materials sites and hazardous materials cleanup sites within 0.5 mile of the Project site, but not north of the Puyallup River due to hydrological separation, are identified and discussed. A brief description of other potential sources of hazards within the Project site, such as the natural gas pipeline, is also included. Natural hazards, such as flooding (Section 4.1 Earth Resources), volcanic eruptions/lahars (Section 4.1 Earth Resources), and groundwater contamination (Section 4.3 Ground Water) are addressed in their respective resource chapters.

Hazardous Materials and Sites

Hazardous materials are materials that, because of their chemical, physical or biological properties, pose a potential risk to life, health, the environment, or property when not properly contained.

Hazardous materials can include materials that are explosive, flammable, combustible, corrosive, reactive, poisonous, biological, or radioactive. They can be in a solid, liquid, or gaseous state (Pierce County DEM 2015).

The Project site has historically been used for agricultural purposes, which may have included the application of arsenical or organochlorine pesticides. In addition, adjacent properties southeast of the Project site have been used since at least the 1940s for agricultural purposes including berry farming.

The rail line located immediately west of the Project site has been adjacent to the Project site since at least 1897 (USGS 2021). Contaminants of concern associated with the rail line may include polynuclear aromatic hydrocarbons (PAHs) and metals due to rail operations. Rail ties were treated historically with creosote and arsenic. Hydraulic drippings from train braking systems may contain polychlorinated biphenyls (PCBs) or PAHs. Due to the proximity of the rail line to the Project site, contaminants may have migrated into the Project site and surrounding area.

A **hazardous materials release** is the release of the material from its container into the local environment (Pierce County DEM 2015).

A survey of known contaminated sites within the study area was conducted using Ecology's online system (Ecology 2021). No existing contaminated sites of concern were identified within the Project site. For the purposes of this analysis, sites located north of the Puyallup River were considered hydraulically separated from the Project site and are not included in the known contaminated sites below. The following three known contaminated sites were identified within the study area for health and safety (0.5-mile radius from the Project site).

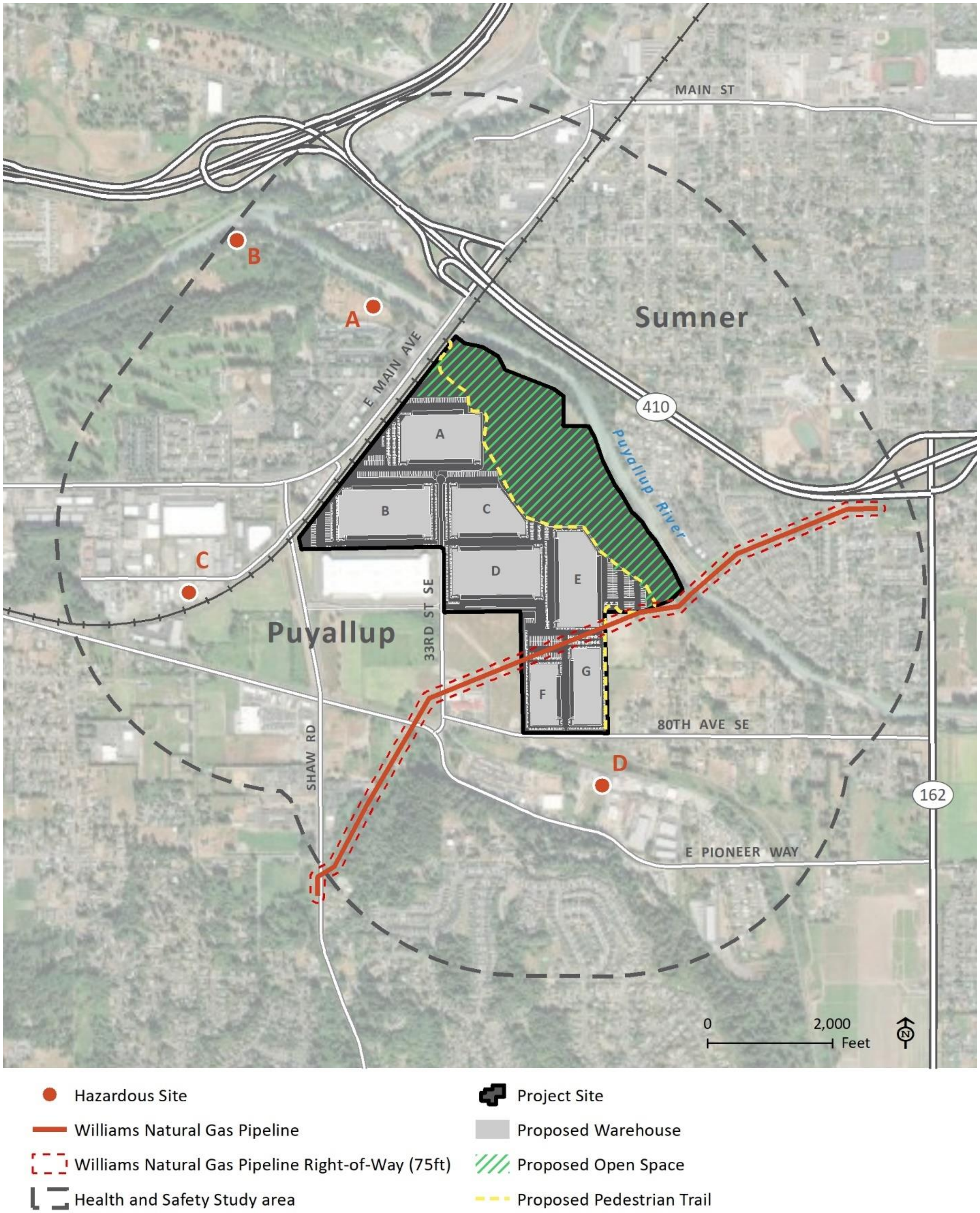
- **Puyallup Landfill A and B** (Sites A and B on Figure 4-70): The Puyallup Landfill A and B sites are located approximately 0.21 and 0.47 mile west of the Project site, respectively. These sites were used as municipal landfills from 1948 to 1976 and received many types of wastes. Another nearby landfill (Puyallup Landfill D, outside of the study area) is listed in the Ecology's Confirmed and Suspected Contaminated Sites List (CSCSL). Because of their similar times of operations, similar uses, and proximity to Puyallup Landfill D, Ecology has also listed the Puyallup Landfill A and B sites on the CSCSL. Contaminants of concern at these sites include methane, dieldrin, monuron, non-carcinogenic polycyclic aromatic hydrocarbons, 4,4 Dichlorodiphenyldichloroethane, PCBs, lead, arsenic, iron, manganese, gasoline, diesel, and various volatile organic compounds. The Puyallup Landfill A and B sites are awaiting cleanup.
- **Best Parking Lot Cleaning Trust** (Site C on Figure 4-70)**:** This site is located approximately 0.23 mile southwest of the Project site. A leaking underground storage tank (LUST) was reported on

the site in 1998. Petroleum-gasoline contamination was confirmed above cleanup levels in soil. Metals and petroleum contamination was suspected in groundwater. The site was remediated and received a No Further Action from Ecology in 2007.

- **Pasquier Panel Products** (Site D on Figure 4-70)**:** This site is located approximately 0.08 mile southeast of the Project site. A LUST was reported in 1994. The LUST was removed along with approximately 20 cubic yards of contaminated soils. Additional soil and groundwater sampling occurred at the site in 2020. All sample constituents were below their respective Model Toxics Control Act cleanup limits.

Natural Gas Pipeline

A natural gas high-pressure transmission pipeline (the Williams Northwest Pipeline) is mapped in the southwestern corner of the Project site (NPMS 2021) (Figure 4-70). Williams Northwest Pipeline LLC owns and operates a 75-foot-wide high-pressure natural gas transmission ROW through the southeast portion of the Project site. Williams Northwest Pipeline LLC is a primary conveyer of natural gas to the Pacific Northwest. Natural gas is listed as a hazardous material due to its flammability under 49 CFR 172. Existing hazards are associated mainly with the natural gas transmission pipeline and the potential for contaminated sites located within the study area. The proposed Project contains hardscape and other improvements over the pipeline and associated easement; in addition, three of the proposed warehouses within the pipeline easement Williams Northwest Pipeline require prior approval for any development activities or structures located within its easements or ROW. The placement of trees, buildings, structures, sheds, fences, decks, patios, swimming pools, roads, driveways, utilities, sprinkler systems, power or telephone poles is not allowed on Williams' easements without Williams' consent.



Source: WA Dept of Ecology, 2021

Figure 4-70. Contaminated and Hazardous Materials Sites of Concern within the Study Area

4.10.4 Impacts

Methodology

Potential impacts on environmental health and safety were evaluated based on the applicable federal, state, and local regulatory frameworks, as well as health and safety related to construction and operation of the Project. Since warehouse tenants of the Project site have not yet been determined, the operational impact analysis presented here addresses the range of supported uses allowed within the applicable land use code for the Project site, which includes manufacturing facilities and chemical storage. A significant impact would occur if the Project would cause long-term or irreversible disruptions to community and worker health and safety.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, the proposed Project would not be constructed, and existing health and safety hazards would remain in the study area. If other future development occurred, the development would need to comply with the relevant plans, policies, and regulations listed in Section 4.7.2.

Proposed Project

Construction Hazards

Mitigated Significant Impact. Various site preparation activities are proposed, including, but not limited to, clearing and grading; installation and construction of stormwater facilities; and extension of existing services and utilities including electricity, sanitary sewer, and potable water. During construction of the proposed Project, construction workers could experience construction hazards similar to those of a large-scale project. These include trips, slips, and falls; electrical or mechanical hazards; overhead hazards from cranes or excavators; and risk of blunt force trauma from accidents with machinery.

Construction workers could also be exposed to inadvertent release of hazardous materials. Hazardous materials likely to be present during construction would include materials typical of construction projects, which are generally handled and used in relatively small quantities. Types of hazardous materials that could be present include fuels and lubricant oils for construction vehicles and equipment. Diesel fuel is the primary potentially hazardous substance that could be used in a significant quantity during construction. Contractors would be required develop a Project Health and Safety Plan (HASP) prior to construction for all phases of the Project, which would mitigate risks to construction workers. The HASP would be implemented to manage and control safety risks, as well as to guide responses in the case of emergency situations during construction, including evacuation plans in the event of a lahar or volcanic eruption.

Construction of the proposed Project could expose hazardous materials in the Project site that could pose risks to human health and the environment through contact with contaminated soil, contaminated groundwater, and inhalation of toxic vapors.

Existing single-family residential structures located on the Project site would be vacated and demolished during construction. Based on the age of the structures, hazardous materials such as lead-based paint and asbestos-containing materials may be present. Releases of these materials could migrate to the air, soil, surface water, or groundwater and affect the health and safety of construction personnel and others including users of the neighboring parks and trails and surrounding residential development.

Based on these considerations, public and occupational health and safety risks during construction of the Project include the potential exposure to electrical and mechanical hazards for construction workers, inadvertent release of hazardous materials, and exposure to existing hazardous materials sites. A mitigated significant impact is anticipated. Mitigation measures HS-1 through HS-6 are required to avoid, minimize, or reduce impacts to the extent feasible:

- ***HS-1: Prepare a Project Health and Safety Plan.*** In accordance with RCW 49.17, in order to ensure worker safety on site during construction, the selected Contractor should be required develop a HASP prior to construction for all phases of the Project. The HASP would be implemented to manage and control safety risks as well as to guide responses in the case of emergency situations during construction. The HASP should be provided to the permitting agency prior to permit issuance.
- ***HS-2: Prepare Emergency Response Plan.*** The selected Contractor should be required to provide an emergency response plan and practice proper hazardous material storage, handling, and emergency procedures including spill notification and response requirements in accordance with RCW 49.17 and WAC 173-303. The emergency response plan should be provided to the permitting agency prior to permit issuance. BMPs would be in place to minimize impacts on environmental health. Implementation of appropriate spill prevention and control measures would ensure that the risk of an accidental release of hazardous materials remains low throughout construction of the Project.
- ***HS-3: Survey for Lead Based Paint and Asbestos.*** A lead-based-paint and asbestos-containing-materials survey should be conducted on structures before demolition activities begin. Abatement and management should then be conducted prior to demolition, renovation, and/or repair for lead and asbestos as required by the Washington Hazardous Waste Management Act and Washington Dangerous Waste Regulations (RCW 70.105 and WAC 173-303). The Applicant would be responsible for conducting the survey, conducting any required abatement, and providing the permitting agency with the results of the survey and abatement activities.
- ***HS-4: Comply with Model Toxics Control Act Regulations for Unexpected Encounter with Hazardous Materials***. The permitting agency would be required to inform the Applicant and contractors that they are instructed to immediately stop subsurface activities if potentially hazardous materials are encountered or significantly stained soil is found during construction. Contractors would be instructed to follow applicable regulations including the Model Toxics Control Act and its implementing regulations (RCW 70.105D and WAC 173-340) regarding discovery and response for hazardous materials encountered during the construction process.
- ***HS-5: Comply with WISHA Rules.*** The permitting agency would be required to inform the Applicant and contractors that they are required to comply with WISHA rules that protect

workers from hazardous job conditions. WISHA regulates an array of occupational hazards in WAC 296 (Safety Standards for Construction Work) such as safety standards for construction work (WAC 296-155), general safety and health standards (WAC 296-24), and general occupational health standards (WAC 296-62).

- ***HS-6: Comply with Pierce County Public Works Inspection and Enforcement.*** Building codes are developed and enforced to protect individuals from safety risks such as structural failures, fire hazards caused by electrical systems, and electrical shock. The Project would be subject to building inspection and enforcement by the Pierce County Planning and Public Works Department during construction.

Natural Gas Pipeline Safety

As currently designed, the proposed Project is sited above the Williams Natural Gas Pipeline and associated 75-foot-wide easement. The pipeline is located below the parking area between Warehouses E, F, and G, and these warehouses are proposed within the pipeline ROW. Any Project development activity within the 75-foot easement requires approval by Williams Northwest Pipeline LLC. Construction of the Project would require excavation, grading, utility installation, and warehouse construction above or near the Williams Natura Gas Pipeline. Although a release or incident involving the pipeline is unlikely, unintentional force or excavation could cause releases from the pipeline, placing construction workers and the public at risk. Depending on environmental factors such as wind, proximity of vegetation or other fuels, and dryness of the environment, a fire could spread to other nearby structures or wooded natural environments; the extent of damage would depend on various unpredictable elements. To minimize the potential for an incident to occur and resulting significant impacts, mitigation measures HS-7 and HS-8 would be required:

- ***HS-7: Obtain and Comply with Williams Northwest Pipeline Encroachment Agreement.*** Prior to construction, the County will need to notify and seek comment from pipeline operators concerning land use development applications and take comments received under advisement as Williams has approval authority over the improvements planned and proposed in the pipeline easement.

  The Applicant should avoid any development over the Williams Pipeline corridor on site and should separate out the site plan into two separate warehouse complexes to avoid conflicts with and public exposure to risks associated with construction over the pipeline.

  For natural gas pipelines, the Applicant should site critical facilities and high-occupancy facilities within the regulations of WAC 480-93-020, and 480-93-030.

  The Applicant is required to consult with Williams Northwest Pipeline LLC to obtain an encroachment agreement and approval.

  The Applicant will obtain and provide accurate “as-built” pipeline maps as a condition of approval for any County development permit. In addition to scaled plan maps, which will be accurate to the parcel level, pipeline information (e.g., pipe size, allowable pressure, fuel type, average or approximate ROW width) will also be provided.

  The Applicant should coordinate with Williams and comply with any encroachment agreement to mitigate for construction impacts to the pipeline.

The Applicant is required to apply for an encroachment agreement from Williams Northwest Pipeline LLC in accordance with the Williams Developers' Handbook (Williams 2018) and may be required to modify the site plan as needed to comply with the terms of the agreement to mitigate safety risks. Upon receipt of an encroachment agreement between the Applicant and Williams Northwest Pipeline LLC, a pipeline risk assessment to determine if the Project would change the risk of potential damage to the pipeline will be conducted. A copy of the approved encroachment agreement should be provided to the County and City prior to approval of any County development permit (including but not limited to shoreline, site plan, conditional use, design review, clearing and grading, and major development).

The County should flag all information from Williams approvals on County databases for permit applications. Through the permitting process, flag or control excavation activity in areas adjacent to or within 50 feet of the pipeline, placing a higher level of scrutiny on construction in such areas.

A pipeline vicinity (within 660 feet of a pipeline) disclosure statement should be recorded with/on property deeds in the County Auditor's Office and will be treated in the same manner as critical areas notes.

A statement identifying that a significant natural gas or hazardous liquid pipeline is within the vicinity and the auditor's file number for it will be on the final plat or short plat map under surveyor's notes prior to final approval by the County.

- ***HS-8: Comply with PHSMA's Minimum Design Requirements.*** During design, the Applicant should comply with the minimum design requirements specified by PHSMA for protection of the pipeline. This would be required to meet federal standards expected of Williams Pipeline. Williams Pipeline, as the pipeline operator, is responsible for the safety of its pipeline in compliance with federal safety requirements. Compliance measures to be used would be determined by Williams and should be in coordination with the Applicant and based on a review of final design, site-specific conditions, and field measurements.

Operations Impacts

Chemical Use and Storage

Mitigated Significant Impact. The Project site is zoned EC under the Alderton-McMillen Urban Zone Classification. Due to the Project Site's location within a Volcanic Hazard Area Case I & II Lahar zone, "Hazardous Facilities" are not allowed within the Project site. Although post-construction tenants have not been identified, this zoning can support the following uses: basic manufacturing, contractor yards, food and related products, industrial services and repair, intermediate manufacturing and intermediate/final assembly, recycling collection and processing facilities, and salvage yards/vehicle storage and warehousing, distribution, and freight movement. Potential hazardous materials associated with future tenants may include solvents, petroleum products, and metals. For example, anhydrous ammonia is listed on the Extremely Hazardous Substances (EHS) list and is a refrigerant that could be used in cold storage facilities, one of the possible uses on the Project site. In addition to holding and using hazardous materials, hazardous wastes could be generated on site.

PCC 18.25.030 Definitions

"Hazardous facilities" means those occupancies or structures housing or supporting toxic or explosive chemicals or substances and any non-building structures housing, supporting or containing quantities of toxic or explosive substances that, if contained within a building, would cause that building to be defined as a hazardous facility. Hazardous facilities include any elements contained in the definition for hazardous waste treatment, storage, and recycling facility. Hazardous facilities may be classified as a group "H" occupancy in the International Building Code.

Under the Hazard Communication Standard (HCS) of the U.S. Occupational Safety and Health Administration (OSHA), any chemical that presents a physical hazard or a health hazard is considered a hazardous material. Chemical warehousing, including the storage of hazardous materials, is a highly regulated undertaking with a substantial investment in both the physical storage environment and rigorous adherence to associated protocols, practices and paperwork required to ensure safety and compliance. Each chemical class is like an industry unto itself, with specific rules and regulations for safe storage and handling. Within each class, each specific chemical also has its own requirements; labels and Safety Data Sheets (SDS) are required of chemical manufacturers and importers to convey hazard information to eventual handlers of the chemical. In general, best practices related to a given chemical can be maintained by following the guidelines outlined in the SDS sheet for handling, storage, and transportation (Lilja 2017).

Additionally, OSHA has set permissible exposure limits for chemicals and other materials to protect employees in the workplace from exposure. Workers are not to be exposed to levels of chemical greater than these permissible exposure limits (Lilja 2017). During operations, businesses that store hazardous materials would be required to adhere to the storage requirements outlined in OSHA 29 CFR 1910, Subpart H, for hazardous materials storage (Table 4-58). Businesses that generate hazardous wastes would be required to follow Ecology's Dangerous Waste Regulations (WAC 173-303) for proper storage and disposal.

Table 4-58. OSHA Chemical Class Handling Requirements

Chemical Class	Requirements
Explosives	Heat, shock, friction, or even static electricity can initiate explosions of these chemicals. All rooms in the distribution center should be "no-spark"' environments to eliminate the potential for sparks or equipment backfires. That means using non-spark forklift trucks and EE- and EEE-rated machinery.
Flammable Liquids and Solids	All flammable products are required to be stored in one classified room, away from any potential ignition sources. Flammable liquids and gases require rack stack storage and a rack firehouse pump system (sprinklers). Regular preventive maintenance is required to ensure that all systems are well maintained and up to code.
Gases	Great care must be taken in storing and handling compressed gases since dropping or knocking over a cylinder can cause the energy in the cylinder to be rapidly released, even propelling the cylinder like a rocket. Specific storage requirements will depend on the type of gas. If the gas is flammable, it is stored in a classified flammable room. Some gases could be a mix of toxics and corrosives, so they might be stored in the toxics room.
Oxidizers	Oxidizers require their own room and are not to be mixed with other product, especially flammable or combustible materials. Oxidizers should be kept in a cool, dry place, well ventilated, and away from sunlight. Oxidizer rooms have no windows to keep out sunlight and are ventilated to reduce smell and allow airflow.
Poisons	Poisons require their own classified room. This room needs to have ventilation and be segregated from combustibles. Typically, air vents suck out the odors, and the air travels to charcoal bins above the warehouse. Poisons should be labeled, processed, and palletized in a poison-coded room. Poisonous products should never be in any other part of the warehouse except their specified room.

The Project could introduce the use, generation, and storage of hazardous materials on the Project site, which could expose employees to hazardous materials. Chemicals and other hazardous materials in the warehouse operations setting are highly regulated by OSHA. As such, the potential for employee exposure to chemicals and other hazardous materials is low; however, the impacts could be severe if exposure did occur.

Inadvertent Release of Hazardous Materials

The Project could expose people or structures to hazardous materials through the inadvertent release of chemicals used during operation. In Pierce County, spills of small quantities of hazardous materials occur on an annual basis and can range from cleanup of sites that present a public health risk to a diesel spill on the highway. Spills in large quantities are unlikely to occur on the Project site since the Project's location within a Case II inundation zone prohibits the siting of hazardous facilities (see Section 4.1 Earth Resources for discussion of geological hazards).

A hazardous materials incident may be caused by or during another emergency such as flooding, volcanic eruption/lahar, a major fire or earthquake, or a terrorist attack. Damage to transportation infrastructure and to fire facilities may impact the ability of fire services to respond to the emergency or disaster. Hazardous materials could possibly enter water or sewer systems and necessitate the shutdown of those systems (Pierce County 2020b).

The severity of exposure would depend on the hazardous material(s) involved and the quantity, proximity of exposures, and current environmental factors during the time of the incident. However, due to the proposed location within a lahar zone, storage of hazardous materials in large quantities would not be allowed. The consequence to persons, property, infrastructure, and facilities in the affected area would range. Response to release of hazardous materials may require a multi-disciplinary approach and require support from responders from fire services, law enforcement, environmental containment and cleanup specialists, utilities, local public works, fish and wildlife experts, private and public emergency medical services, environmental public health, and other agencies (Pierce County 2020b).

Hazardous facilities are defined in the PCC as "*those occupancies or structures housing or supporting toxic or explosive chemicals or substances and any non-building structures housing, supporting or containing quantities of toxic or explosive substances that, if contained within a building, would cause that building to be defined as a hazardous facility, including hazardous waste treatment and storage facilities*" (Title 18E.60.040 PCC). As such, the storage of *large quantities* of toxic or explosive materials or hazardous waste treatment and storage facilities in the Project site would not be allowed. The Project could introduce the use and storage of *small quantities* hazardous materials on the Project site. Facility occupants would be required to follow established regulations for the proper storage and handling of these chemicals (WAC 296-24). An inadvertent release of stored chemicals is unlikely; however, if it were to occur, the potential damage from such an incident could be high. A hazardous chemical release could lead to a chemical fire or spill that could impact the immediate surrounding community. This could lead to direct mortality of workers and the public, destroy buildings and infrastructure, and directly impact nearby parks and trails through closures or impacts to infrastructure.

The Project could result in an inadvertent release of hazardous materials during operation. In the event of an inadvertent hazardous materials release, both the physical and natural environments as well as their occupants and inhabitants could be affected; the scope and magnitude of such effects are wide-ranging and dependent on the types and quantities of the chemicals being stored, as well as proximity to receptors. the risk of inadvertent release of hazard materials is low; however, if there was a release, the impacts could be significant.

Mitigation measures HS-9 and HS-10 would be required to reduce the probability of a release of stored chemicals and exposure to hazardous materials to the extent feasible:

- ***HS-9: Designate and carry out duties of a Facility Emergency Coordinator.*** Facilities storing EHS must identify the locations of such substances and designate a Facility Emergency Coordinator to act as the contact for facility and hazardous materials information. The owner or operator of a facility would be required to designate a facility representative who would participate in the local emergency planning process as a facility emergency response coordinator (40 CFR 355.30 and 40 CFR 355.30(c)). Reporting requirements would depend on the type and quantity of the stored chemical. Reporting forms, called Tier II forms, are sent to Ecology, the Local Emergency Planning Committee of Pierce County located at the Department of Emergency Management (DEM), and the local fire department or district (Pierce County DEM 2015).

- ***HS-10: Comply with HCS of the U.S. OSHA Standards.*** During operation, the Applicant and/or facility tenants should comply with permissible exposure limits for chemicals and other materials and the storage requirements outlined in OSHA 29 CFR 1910, Subpart H, for hazardous materials storage, and should follow Ecology's Dangerous Waste Regulations (WAC 173-303) for proper storage and disposal of waste.

Natural Gas Pipeline Safety

As currently designed, the proposed facility site is sited above the Williams Natural Gas Pipeline. The pipeline is below the parking area between Warehouses E, F, and G. Any disturbance, equipment crossings, utility crossings, pavement, or any changes in land use within the Williams Northwest Pipeline easement would require an encroachment agreement between the Applicant and Williams Northwest Pipeline. If the encroachment agreement is received, the Project could still pose a significant health and safety risk. Significant impacts could result from a gas-line explosion. A gas-line rupture could cause a disturbance of above the break. Structures located over or adjacent to the rupture could be damaged or destroyed. If the gas ignites, it might set structures or small quantities of stored chemicals located near the rupture on fire. Depending on environmental factors such as wind, proximity of vegetation or other fuels, and dryness of the environment, a fire could spread to other nearby structures or wooded natural environments. Although unlikely, impacts from the proximity to the Williams Northwest Pipeline would be considered significant.

Nationally, the Office of Pipeline Safety recorded 1,202 incidents involving natural gas pipelines between 1986 and 2000. These incidents resulted in 56 fatalities and 214 injuries. Between 1985 and 1999, Washington State had 47 natural gas pipeline accidents reported. These accidents resulted in 5 fatalities and 16 injuries (Whatcom County 2001). Between 1997 and 2017, there were 14 incidents involving natural gas transmission lines, none of which resulted in death or injury (WA UTC 2018). If a leak or rupture occurred, Williams Northwest Pipeline LLC would immediately shut off the flow of gas in the pipeline. The remaining gas in the line would then dissipate. If the gas ignited, shutting off the flow of gas would allow the fire to burn itself out (Pierce County 2019c).

Williams Northwest Pipeline LLC provided a comment during the scoping period indicating that they have not been consulted by the Applicant regarding the proposal to encroach on their pipeline ROW. They further indicated that no approvals to encroach on the ROW will be granted until an encroachment agreement is in place. The Williams Developers' Handbook (Williams 2018) notes that they seek to minimize encroachment and excavation within the limits of the pipeline ROW. As such, they generally seek to have projects remain outside of the pipeline ROW. Further, the handbook notes that improvements that will encroach into the ROW/easement should be designed to ensure continued safe operation and maintenance of the pipeline.

As the pipeline operator, Williams is responsible for operating and maintaining its pipelines in accordance with or to exceed the Pipeline and Hazardous Materials Safety Administration (PHSMA) Minimum Federal Safety Standards in 49 CFR Part 195 (and Washington State UTC's adopted and enhanced regulations contained in WAC 480). The regulations are intended to ensure adequate protection for the public and to prevent pipeline accidents and failures. The likelihood of a pipeline rupture and release remains low; the potential damage from such an incident would be high.

In order to minimize the potential risk associated with the presence of the Williams Pipeline, mitigation measures HS-7 and HS-8 should be required.

Alternative 1 – Rail Transport

Construction Impacts

Mitigated Significant Impact. The impacts from construction of Alternative 1 would be similar to those described for the proposed Project in that the potential exposure to electrical and mechanical hazards for construction workers, inadvertent release of hazardous materials, and exposure to existing hazardous materials sites would still occur. Construction over the Williams Pipeline ROW would risk unintentional force or excavation that could cause releases from the pipeline, placing construction workers and the public at risk. Under Alternative 1, construction of the rail line would occur almost entirely within the same Project footprint, except for a 300-foot portion between the existing Meeker Southern rail line and 80th Street East and the extension of the BNSF mainline/Meeker Southern interchanges. Additional considerations for Alternative 1 Construction include exposure to air pollution and particulates from construction of infrastructure for and operation of diesel-powered locomotives. A mitigated significant impact is anticipated. Mitigation measures HS-1 through HS-8 are identified to avoid, minimize, or reduce impacts to the extent feasible.

Operations Impacts

Mitigated Significant Impact. The impacts from operation of Alternative 1 would be similar to those described for the proposed Project in that Alternative 1 could also result in an inadvertent release of hazardous materials during operation. Under Alternative 1, the addition of rail activity during operations would allow for the transportation by rail of hazardous materials. Under Alternative 1, the proposed facility and rail line are sited above the Williams Natural Gas Pipeline. The pipeline is below the parking area between Warehouses E, F, and G and crosses below the proposed rail line. Similar to the proposed Project, there is a potential risk associated with operation of the facility above the Williams Pipeline. Based on these considerations, a mitigated significant impact is anticipated. Mitigation measures HS-7 and HS-8 are identified to avoid, minimize, or reduce operation of Alternative 1 Williams Pipeline impacts to the extent feasible. Mitigation measures HS-9 and HS-10 would further reduce the probability of a release of stored chemicals and exposure to hazardous materials to the extent feasible.

Alternative 2 – Reduced Intensity Alternative

Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility (AES-2, LU-1, REC-1, and SW-4) as outlined in this Draft EIS for the proposed Project) were adopted by the Applicant. As noted below, Alternative 2 would still require Project implementation mitigation measures to reduce health and safety impacts.

Construction Impacts

Mitigated Significant Impact. Compared to the proposed Project, Alternative 2 would have reduced footprint and construction could be expected to be at a smaller scale. However, the same construction-related environmental impacts analogous to the proposed Project could still occur. A mitigated significant impact is anticipated. Mitigation measures HS-1 through HS-8 are identified to avoid, minimize, or reduce impacts to the extent feasible.

Operations Impacts

Mitigated Significant Impact. Compared to the proposed Project, Alternative 2 would be a reduced footprint and operation could be expected to be at a smaller scale. However, the same operation-related environmental impacts analogous to the proposed Project could still occur. Based on these considerations, a mitigated significant impact is anticipated. Mitigation measures HS-7 and HS-8 are identified to avoid, minimize, or reduce operation of Alternative 2 impacts to the extent feasible. Mitigation measures HS-9 and HS-10 would further reduce the probability of a release of stored chemicals and exposure to hazardous materials to the extent feasible.

4.11 Public Services and Utilities

This section describes the potential impacts to public services (fire and police services) and utilities (water, sewer, and stormwater; natural gas; electrical facilities; and solid waste services) that may result from construction and operation of the proposed Project and alternatives. Potential mitigation measures are also identified in this section.

4.11.1 Study Area

The study area for the public services and utilities analysis is the service areas of the public service agencies and utility providers in relation to the Project site and parcels directly adjacent to the site.

4.11.2 Relevant Plans, Policies, and Regulations

This section summarizes state and local regulations related to public services and utilities that are applicable to the Project. There are no federal regulations applicable to the Project. Relevant policies and regulations related to public services and utilities are summarized in Table 4-59.

Table 4-59. Applicable Policies and Regulations for Public Services and Utilities

Policies and Regulations	Description
State	
Washington Administrative Code	The WAC includes water quality standards that are implemented at the local municipality level. Relevant standards that guide stormwater management and site development manuals, include: • Chapter 173-200 of the Washington Administrative Code (WAC), Water Quality Standards for Groundwaters of the State of Washington • Chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington • Chapter 173-204 WAC, Sediment Management Standards.
Washington State Growth Management Act **(GMA)**	Under the GMA (RCW 36.70A), certain counties and cities must create and regularly update comprehensive plans to identify where growth will occur and to plan for housing, transportation, water, sewer, natural gas, electrical lines, and other necessary facilities. Jurisdictions under the GMA are required to have a capital facilities' plan element within their comprehensive plans. The capital facilities element requires a forecast of future needs, expansions or new facilities, locations, and capacities of expanded or new facilities and a 6-year plan for financing. The land use element, capital facilities element, and financing plan must all be coordinated and consistent.
Washington Department of Ecology Stormwater Water Quality Regulations	Ecology has the authority to issue stormwater permits guided by both the federal water pollution permit program, known as the NPDES, and also state water quality laws. Stormwater permits vary from water quality general for releasing treated stormwater or wastewater discharge to either surface or groundwater; Construction Stormwater General Permit (CSWGP) to control and reduce water pollution during construction; and Industrial Stormwater General Permit (ISGP), which helps industrial facilities comply with federal regulations that reduce pollution. Most industrial sites in Washington to monitor, measure, and reduce stormwater pollution leaving their site.
Local	

Pierce County Comprehensive Plan, Capital Facilities and Utilities Element	The Pierce County Comprehensive Plan includes chapters that identify goals and policies for capital facilities and utilities. These goals and policies are intended to guide the Pierce County Capital Facilities Plan (Pierce County 2020c) and the provision of utility services in the County. The Pierce County Comprehensive Plan has goals and policies in the Utilities Element and the Capital Facilities Element that address public services and utilities, including: • Policy CF-6.2: Condition development projects in a manner that guarantees public facilities will be in place or that adequate mitigation will be provided as the impacts of the development occur. • Goal U-2. Provide urban level facilities and services only within the designated UGAs prior to or concurrent with development. • Goal U-22. Preserve the high quality and supply of groundwater resources.
Pierce County Code	The Pierce County Code, Chapter 11.05, Illicit Stormwater Discharges and 17A.10, Construction and Infrastructure Regulations – Site Development and Stormwater Drainage, 17A.40, Stormwater Drainage includes minimum requirements and regulations to protect Pierce County's surface and ground water quality by providing minimum requirements for reducing and controlling the discharge of pollutants to stormwater conveyance systems owned and maintained by Pierce County.
Pierce County Stormwater Management Program Plan (SWMPP)	Pierce County's SWMPP (Pierce County 2022) is intended to comply with requirements of Pierce County's NPDES Municipal Phase I Stormwater Permit (MS4, Permit No WAR044002). As the local land use authority in unincorporated portions of the county, Pierce County is required to have appropriate codes, regulations, enforcement, and education capacity to reduce water-polluting practices and promote practices that protect water quality.
Pierce County Stormwater Management and Site Development Manual (PCSWDM)	The PCSWDM (2021) and codified in Chapter 17A.10 of the Pierce County Code, establishes design and analysis criteria for development activity by managing stormwater to minimize contact with contaminants, mitigating the impacts of increased runoff as a result of urbanization, and managing runoff from developed property and property that is being developed under WAC 173-200, 173-201A, and 173-204 water quality standards. Developments in Pierce County must be consistent with the County's Stormwater Management and Site Development Manual.
Pierce County Sheriff's Department (PCSD) Law Enforcement Staffing Study and Strategic Planning Overview	The PCSD Law Enforcement Staffing Study and Strategic Planning Overview (2018) provides a review of staffing and law enforcement operations. It also provides recommendations for future deployment and efficiencies in the context of policing. The Project is within the Foothills Detachment service area of the PCSD, an estimated 15-minute drive time from the nearest station.
Pierce County Solid Waste Management Plan	The Pierce County Solid Waste Management Plan (2020) provides a framework for effective and efficient strategies to increase the uniformity and ease of recyclable waste practices, as well as reducing overall non-recyclable waste production. This strategy is divided into four main goals: system, culture, decisions, and measurement that focus on addressing solid waste related issues. The Pierce County Solid Waste Management Plan also identifies solid waste collection requirements and programs in Pierce County.

City of Puyallup Comprehensive Plan, Utilities Element and Capital Facilities Element	The City of Puyallup Comprehensive Plan includes chapters that identify goals and policies for capital facilities and utilities in order to provide long-term planning for services and facilities and to ensure that new developments can grow concurrently. This includes long-term planning for services and facilities is integrated with other elements of the Comprehensive Plan and addresses services such as fire and emergency medical response, parks and recreation facilities, educational facilities, sewer and stormwater facilities, and transportation facilities. Relevant goals or policies from the Utilities and Capital Facilities Elements include: • Goal U-2. Ensure that adequate water quantity and quality provided by either City or private water purveyors is available to all existing future customers in the City and UGA in a manner that supports the planned growth and development of the community. • Policy U-4.3. Use established minimum standards for the requirement of sanitary sewer service based upon land use intensities and densities. • Goal U-5. Control the quantity and quality of stormwater produced by new development and redevelopment such that they comply with water quality standards and contribute to the protection of beneficial uses of the receiving waters. • Goal U-7. Promote reliable and cost-effective solid waste management services. • Goal U-8. Promote solid waste practices that minimize environmental degradation. • Goal U-9. Ensure that adequate electric, natural gas and telecommunications service, provided by privately-owned utilities companies, is available to all existing and future customers in a manner that supports the planned growth of the community by coordinating and working with private utility providers. • Goal CF-1. Provide continuous, reliable, and cost-effective capital facilities and public services in the city and its UGA in a phased, efficient manner, reflecting the sequence of development as described in other elements of the Comprehensive Plan. • Goal CF-5. Adequate public facilities shall be provided by constructing needed capital improvements that (1) repair or replace obsolete or worn-out facilities, (2) eliminate existing deficiencies, and (3) meet the needs of future development and redevelopment caused by previously issued and new development permits. The City's ability to provide needed improvements will be demonstrated by maintaining a financially feasible schedule of capital improvements in this Capital Facilities Plan. • Goal CF-5.1. Provide, or arrange for others to provide, the capital improvements listed in the schedule of capital improvements in the Capital Facilities Plan, which may be updated and modified.
City of Puyallup Municipal Code	The City of Puyallup Municipal Code, Chapter 14.06.021 Prohibited Discharge Standards and Chapter 12.10.050 Stormwater management requires developers to comply with the Stormwater Manual, identifies discharge pollutants that are prohibited and requires developers to employ BMPs to control stormwater flows, provide treatment, and alleviate erosion and sedimentation.
City of Puyallup Comprehensive Storm Drainage Plan	The City of Puyallup Comprehensive Storm Drainage Plan (City of Puyallup 2012) is intended to guide the City’s storm and surface water utility in regard to future activities and improvements for the stormwater drainage system.

	The plan includes a review of background information about the storm and surface water utility, examines relevant City policies and goals, analyzes identified problems and development of alternatives to reduce or eliminate those problems, and provides an implementation plan and a schedule to address that plan. The City's land use goals and policies are supported by the City's Comprehensive Storm Drainage Plan.
City of Puyallup Water Comprehensive Plan	The City of Puyallup completes Water System Planning in accordance with the Washington State Department of Health guidelines to help with identification of both current and future system needs. The most recent Water System Plan was completed in 2011. The Water System Plan provides detail and analysis regarding the water system's infrastructure, current and anticipated future water demand, current and future needs and a review of the Water Utility's financial status.
City of Puyallup Comprehensive Sewer Plan	The City of Puyallup Comprehensive Sewer Plan (City of Puyallup 2016b) reviews the City's current sewage capacities and assesses the impact of projected growth on the City's sewage collection and conveyance system. The Comprehensive Sewer Plan identifies future facilities needed to accommodate both existing and future wastewater collection, conveyance, and treatment needs, and includes possible policies that the City currently has or could adopt relating to operation of the sanitary sewer system. The City of Puyallup's (City) Comprehensive Sewer Plan (the Plan) reviews the City's current sewage capacities and assesses the impact of projected growth on the City's sewage collection and conveyance system. The Plan identifies future facilities required to accommodate both existing and future wastewater collection, conveyance and treatment needs as the City's population grows within the service area limits for the years 2020, 2034, and build out conditions.
Valley Water District Water System Plan	The Valley Water District completes Water System Planning in accordance with the Washington State Department of Health guidelines to help with identification of both current and future system needs (Washington State Department of Health 2021). The last version of the water system plan was issued in 2012. A draft water system plan was developed in 2021 (Valley Water District 2021a). The Water System Plan provides detail and analysis regarding the water system's infrastructure, current and anticipated future water demand, current and future needs and a review of financial status.

4.11.3 Affected Environment

This section describes the affected environment for public services and utilities, which are summarized in Table 4-60.

Table 4-60. Utility Services and Providers within the Project Site

Service	Provider
Police/Sheriff	Pierce County Sheriff's Department
Fire	East Pierce Fire and Rescue
Domestic Water	City of Puyallup Public Works Department Valley Water District
Sanitary Sewer	City of Puyallup Public Works Department

Service	Provider
Stormwater	Pierce County Planning & Public Works Surface Water Management Division*
Natural Gas	Puget Sound Energy
Electrical Facilities	Puget Sound Energy
Solid Waste	Murrey's Disposal and D.M. Disposal

*A note about storm water management: Management of private side of exiting outfall pipe that will connect to the site development will be the responsibility of Pierce County. Other stormwater impacts occurring in City of Puyallup or other agency ROW (coming as a result of traffic mitigation, for example) may be managed separately

Police and Sheriff Services

Jurisdictions that service the Project site rely on the PCSD for public safety services. The County Sheriff's Department serves unincorporated areas, while local municipal police departments typically serve incorporated cities and towns. Many local fire and police agencies have mutual response agreements, which allow public safety responsibilities to be shared across jurisdictional boundaries; in this case, the City and the Sheriff's Department do not share a mutual response agreement.

The City of Puyallup provides informal enforcement support for the general vicinity and would mutually respond to the Project site in the event of a large-scale interagency response. The City would also provide traffic control for roads servicing the Project site in the event of road closures or emergencies.

The Puyallup Police Department nearest to the Project site is approximately 2 miles west of the Project site. The PCSD closest to the Project site is approximately 7 miles southeast of the Project site, located in Bonney Lake. See Figure 4-71 for police stations near the Project site.

Fire Services

The Project site and surrounding region are served by East Pierce Fire and Rescue for fire suppression and emergency medical services; their facilities consist of eight staffed fire stations, two volunteer fire stations, and one facility on Lake Tapps for Marine Rescue. East Pierce Fire and Rescue covers a 153-square-mile area and serves approximately 97,000 citizens in the communities of Bonney Lake, Sumner, Lake Tapps, the Ridge Communities, South Prairie, Tehaleh, Edgewood, and Milton (East Pierce Fire and Rescue 2021b). The closest fire stations are Station 113, located approximately 0.4 mile north of the Project site, and Station 110, located approximately 3 miles east of the Project site (see Figure 4-71).

Domestic Water

The water supply for the Project site and surrounding area is provided by a combination of the City of Puyallup's Public Works Department, which includes 6,700 acres of water service area, 193 miles of water mains, and 150 miles of water services lines, and the Valley Water District. Valley Water serves the majority of the site and is anticipated to provide the majority of domestic water to the Project.

The City receives the majority of its water from two sources: Salmon Springs and Maplewood Springs. The remainder of the water supply comes from five operational wells and an intertie with the City of Tacoma (City of Puyallup 2019b).

Valley Water District is a municipal water utility operating principally in Pierce County. It consists of eight non-contiguous water supply systems, including the Valley Water System, which provides water to the Project site. The Valley Water System consists of one 1,000-gallon-per-minute-capacity well in the Puyallup Valley and an emergency intertie into the Tacoma Water System for supplemental water during high demand, power outages, or fire flow conditions (Valley Water District 2020a).

Sanitary Sewer

The City's Public Works Department provides sanitary sewer services to the Project site and surrounding parcels within its service area boundaries. The City's wastewater collection system currently consists of 3,200 manholes, 225 miles of gravity sewer lines, and 20 pump stations and 8 miles of force mains. Wastewater flows are treated at the City's Water Pollution Control Plant (WPCP). The WPCP's current capacity is 27.4 million gallons per day. Per the 2016 Sewer Comprehensive Plan, no capital improvement projects are planned in the Project site (City of Puyallup 2016b), and the Project site is not currently served by City sewer; the Project would install all needed infrastructure to serve the proposed structures and uses.

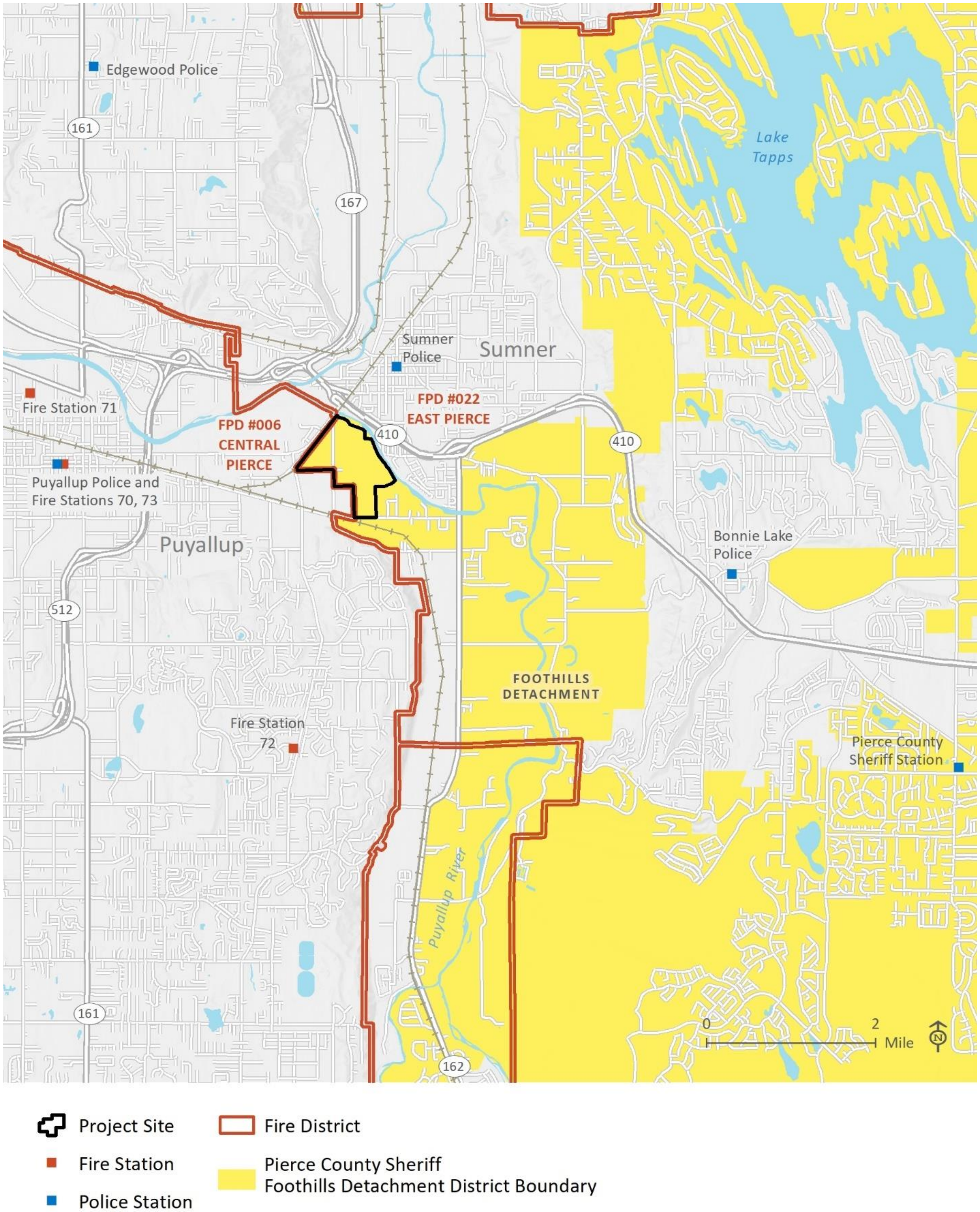


Figure 4-71. Fire and Police Stations in Proximity to the Project site

Stormwater

Stormwater within and adjacent to the Project Site is managed by the Pierce County Planning and Public Works Department, specifically the Surface Water Management Division (Figure 4-72). The Viking outfall currently discharges stormwater from a single warehouse facility into the Puyallup River. The Project is proposing to use the same outfall structure to receive runoff. See the surface water chapter for additional detail.

Natural Gas

Puget Sound Energy (PSE), a regional utility provider, provides natural gas service to the Project site and surrounding parcels through two regulator stations east of the downtown area boundary. PSE has both high-pressure and intermediate-pressure gas pipelines that border the development, as well as a District Regulator that can be used to adjust the flow of natural gas as needed. Natural gas is provided from gas wells in the Rocky Mountains and Canada and is transported through interstate pipelines by Williams Northwest Pipeline to PSE’s gate stations. Supply mains then transport gas from the gate stations to district regulators, which feed to distribution mains. Individual residential, commercial, and industrial service lines are fed by the distribution mains (City of Puyallup 2015a, Chapter 8, Utilities Element). The Williams Northwest Pipeline intersects the southern portion of the Project site (see Figure 4-72). The Williams Northwest Pipeline consists of 3,900 miles of high-pressure natural gas transmission pipeline and has a system peak design capacity of 3.8-million dekatherms per day, with 14-million dekatherms of capacity for seasonal storage.

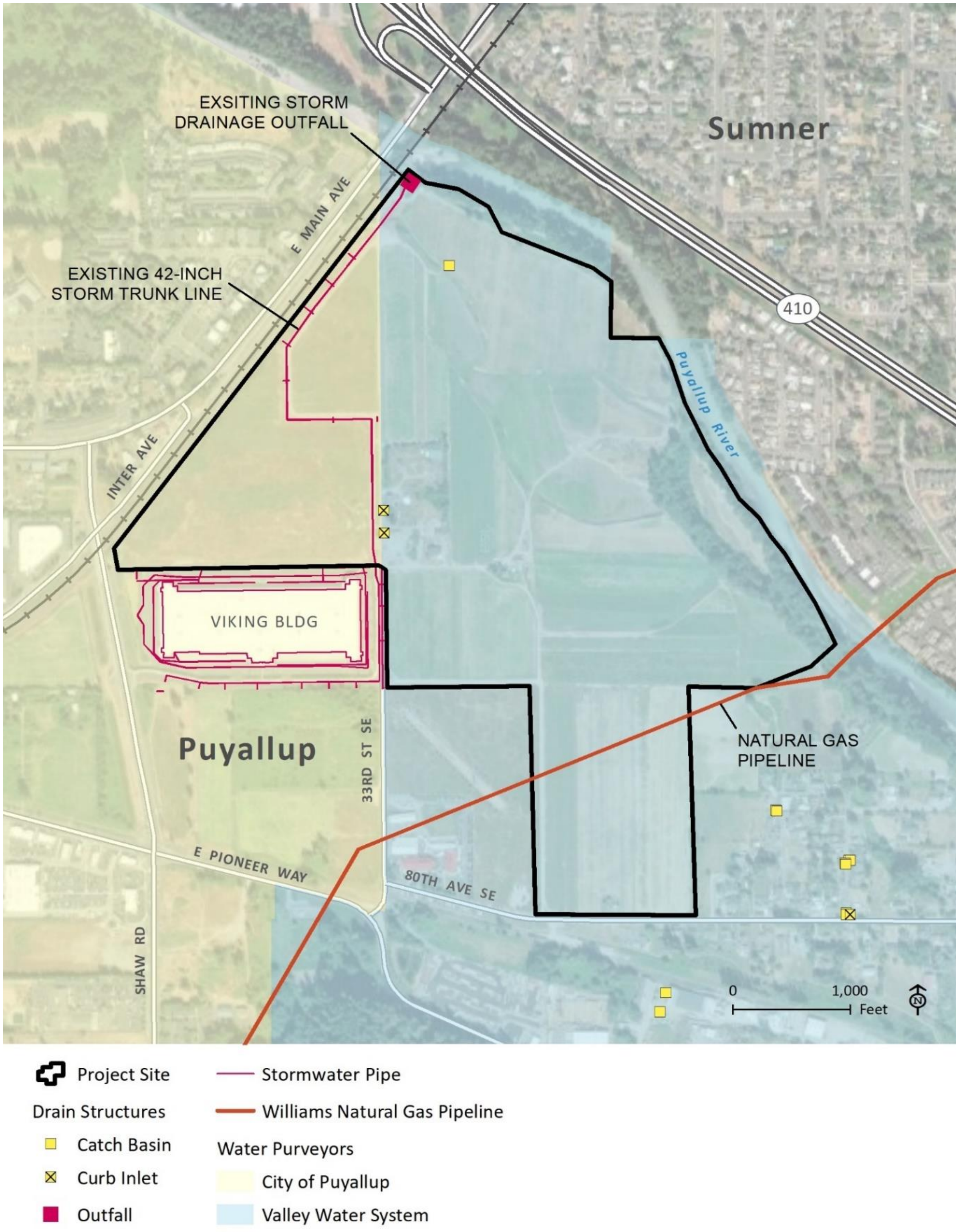


Figure 4-72. Water Purveyors, Stormwater Infrastructure, and Natural Gas Pipeline Utilities in the Project Site

Electricity

PSE provides electricity to the Project site and surrounding parcels. Two main access points exist for receiving power in Pierce County: the White River 230/115-kilovolt Transmission Station and PSE's Frederickson Generation Station. Pierce County is interconnected with multiple transmission lines to systems in King and Thurston Counties. A PSE transmission line is located adjacent to the proposed Project site, running parallel along E Main Avenue.

PSE's demand forecasts come largely from monitoring development applications made to the jurisdictions that they serve in combination with actual applications for new customer services. In order to build new facilities or reinforce existing facilities, PSE needs to have sufficient demand information that can be used to justify facility expenditures to meet new levels of demand. As a fully regulated utility, PSE is precluded from expending resources based on speculative demand—service applications for new or upgraded services are the most reliable means for projecting actual load requirements (PSE 2021).

Solid Waste Services

The Project site would be served by an MSW contracted waste hauler. MSW is a subset of solid waste which includes garbage discarded from residential, commercial, institutional, and industrial sources. The Project site and surrounding parcels receive solid waste collection service under contract with Murrey's Disposal and D.M. Disposal, which offers curbside garbage, recycling, and yard waste collection in Pierce County. Commercial refuse collection occurs weekly at a level commensurate with the amount of solid waste produced by the establishment. All MSW requiring final disposal is currently transported to the LRI Landfill (Pierce County 2020). For the purposes of projecting long-term capacity needs for MSW services, Pierce County maintains a 20-year forecast for the entire County's waste management systems. In 2020, Pierce County issued the *Tacoma-Pierce County Solid and Hazardous Waste Management Plan: 2021-2040* (Pierce County 2020). Under current population and tonnage projections, the LRI Landfill is projected to fill by 2030; however, with long-haul and diversion tactics, the lifespan could be extended to 2032 to 2036.

4.11.4 Impacts

This section describes the potential environmental impacts related to public services and utilities as a result of Project implementation. It describes the thresholds used to determine whether an impact would be significant, as well as measures to mitigate potentially significant impacts, where appropriate.

Methodology

The public services and utilities analysis evaluates the Project's potential to result in conflicts and/or plan inconsistencies that would result in significant impacts on public services and utilities. The chapter was written by reviewing publicly available plan information from the affected public service and utility providers, as well as direct outreach to service and utility providers. The Project EIS team sent service and utility capacity and information requests to each affected agency and utility during the analysis phase of this section of the EIS. This analysis was performed at the local level to facilitate an evaluation of the Project's consistency with service standards, plans for serving the Project site at the projected levels, current rates of development in the area, and concurrent service demands. Different levels of information were available for different service providers. Due to the Applicant's proposal not identifying a final end user, this chapter relied on most intensive impacts scenario analysis on the affected service or utility under review.

This section also evaluates the Project's potential to introduce facilities or components that could result in localized public service and utility conflicts or plan inconsistencies. If the Project is determined to be inconsistent with the provision of public services or utilities, or inconsistent with plans for serving the area as future development occurs, an impact would occur. A significant impact would occur if the Project would result in irreversible interruptions to public services and utilities in the area that cannot be addressed via mitigation or would be inconsistent with local growth and demand for services that cannot be addressed via mitigation.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, the proposed Project would not be constructed at the Project site. No changes to existing public services or utilities would occur as a result of Project activities. Development at the Project site and in adjacent areas would continue according to current planning goals and service demands outlined within the UGA.

Proposed Project

Construction Impacts

Police and Sheriff Services

Less than Significant. During construction, police services would be provided by the PCSD. City of Puyallup Police Department may provide traffic control services for City ROW if during construction utility installation or roadway construction in City ROW would necessitate city police traffic control services by a uniformed officer(s).

Construction activities would result in increased traffic to and from the Project site and an increased presence of physical property. Grading and filling activities would result in up to 320 truck trips per day over the course of 6 weeks, and warehouse construction would result in up to 60 truck trips per day over the course of 40 weeks. Installation of on-site utilities would require approximately 100 truck trips over approximately 27 weeks, resulting in approximately four truck trips per day. Increased traffic has the potential to adversely impact police/sheriff protection response times in the area due to congestion. It is possible that construction that requires traffic control would result in the need for police or sheriff traffic control services.

The addition of construction activity and construction equipment could require the need for increased security on site, which could lead to service calls for property crimes such as theft (PCSD 2021). The PCSD currently observes traffic issues, abandoned vehicles, suspicious vehicles, alarms, and property crime at warehouse properties. In the Project site, the PCSD received approximately 82 calls over the last 5 years (PCSD 2021). Calls for service in all of PPD included a total of 59,883 in 2019, of which 127 (0.27 percent) were related to theft from a building (Puyallup Police Department 2020).

Impacts from increased traffic, construction activities, and traffic control would be intermittent and temporary, occurring over a 5-year construction period, which could create a need for services from police and sheriff services during that time. However, the increased need would not be at a level that would permanently interfere with or cause a decreased level of service for either PPD or PCSD services; impacts would be less than significant.

Fire Services

Less than Significant. East Pierce Fire and Rescue, Station 113 Sumner, would provide fire services to the Project site during construction. East Pierce Fire and Rescue does not have a service goal or a forecasting tool for warehouse developments (East Pierce County Fire and Rescue 2021). Overall, Station 113 Sumner received 2,594 9-1-1 calls in 2020 (East Pierce County Fire and Rescue 2020).

The increased presence of construction equipment, physical property, and vehicles may result in inadvertent traffic delays that may affect emergency service and fire protection response times. Increased traffic from construction could also result in a higher potential for motor vehicle collisions, which could also require emergency services. Further, emergencies related to construction of new buildings on the Project site could lead to the need for fire and emergency services, such as medical emergencies, construction accidents, fires, and emergencies related to natural disasters that could occur in and affect the Project site. For example, fire and rescue services could be involved in the event of a seismic, volcanic, and/or flood event.

Impacts from increased traffic, construction activities, and traffic control would be intermittent and temporary, occurring over a 5-year construction period, which could create a need for emergency and fire services during that time. However, the increased need would not be at a level that would permanently interfere with or cause a decreased level of service for East Pierce Fire and Rescue; impacts would be less than significant.

Domestic Water

Less than Significant. Project construction would require the use of locally available water supplies that are distributed by the City of Puyallup and Valley Water District. During construction, water would be required for various activities, such as controlling dust, compacting soil, and mixing concrete. The Project’s construction water demand would be short-term and temporary.

Construction of the Project would be constrained to the Project site and long-term interruption of water services to adjacent parcels is not anticipated. It is possible that short-term interruptions could occur with the need to install new connections or temporary shutoffs. Adjacent parcels could also experience interruptions if an unanticipated large-scale main break were to occur. Water service interruptions would be intermittent and temporary; impacts would be less than significant.

Sanitary Sewer

Less than Significant. Wastewater produced during construction would be minimal and would be discharged to the municipal sewer system or hauled off site and the waste disposed of at an appropriate facility in accordance with appropriate regulations. As such, construction of the Project would not impact the City of Puyallup Public Works water or sewer capacity outside of normal impacts expected during and after temporary construction projects. Construction activities would also include placement of new sewer and water conveyance lines.

Construction of the Project would be constrained to the Project site, and long-term interruption of sewer services to adjacent parcels is not anticipated. It is possible that short-term interruptions could occur with the need to install new connections or temporary shutoffs. Adjacent parcels could also experience interruptions if an unanticipated large-scale main break were to occur. However, since a main break is unlikely, sewer service interruptions would be intermittent and temporary; impacts would be less than significant.

Stormwater

Less than Significant. Construction would result in ground-disturbing activities that could change drainage patterns on site and in the immediate vicinity of the Project. Prior to construction, the Applicant would be required to comply with Ecology Stormwater Quality Regulations, obtain coverage under the NPDES through a Construction Stormwater General Permit to help control runoff, and reduce water pollution from the construction site. Prior to construction, the Applicant would be required to develop a SWPPP in conformance with requirements in the PCSWDM, implement sediment erosion and pollution prevention control measures, and receive an approved permit under the NPDES program. Further, the Applicant is required to maintain existing operation and maintenance of stormwater facilities in the condition they were at the time of the site development permit approval (Title 17A.40.020 PCC). Therefore, the construction or expansion of storm drainage facilities would not be anticipated.

Additionally, Pierce County requires that development projects be conditioned to guarantee public facilities or mitigation in place if the development would cause impacts (Pierce County Comprehensive Plan, CF 6.2). Therefore, with the required measures (NPDES, SWPPP, PCC Title 17A), stormwater construction impacts related to ground-disturbing activities during construction would be less than significant.

Electricity and Natural Gas

Less than Significant. The Project is located in a developed, semi-rural area of unincorporated Pierce County in the UGA/PAA of the City of Puyallup, which has existing infrastructure for electric power and natural gas provided by PSE. PSE has both high-pressure and intermediate-pressure gas pipelines that border the development, as well as a District Regulator that can be used to adjust the flow of natural gas as needed. The District Regulator is close to the proposed development (PSE 2021). Construction related activities of the Project would result in fuel consumption from the use of construction tools and equipment, as well as transport of workers and materials to or from the construction site. Electricity and natural gas are not expected to be consumed in large quantities during construction-related activities, as construction equipment is expected to be fueled with diesel, gasoline, or electricity.

Construction of the Project would be constrained to the Project site and would not impact or interrupt natural gas service on adjacent parcels. The Project would not include the placement of new natural gas conveyance or alteration of existing natural gas conveyance but may tie into the existing natural gas pipeline. The Applicant would coordinate with the owners of the Williams Northwest Pipeline prior to construction on an encroachment agreement, as discussed in this section. No impacts are anticipated, as construction would not proceed until the pipeline owners have granted approval of an encroachment agreement, ensuring that impacts to the Williams Northwest Pipeline are less than significant.

Solid Waste Services

Less than Significant. Construction of the Project would be limited to the Project site and would not impact or interrupt solid waste services to adjacent parcels. Construction activities would result in an increase in solid waste services in the Project site during construction; however, no interruptions to service are anticipated.

Operations Impacts

Police/Sheriff Services

Less than Significant. The Project EIS team consulted with the PCSD regarding the Project and anticipated impacts. According to the PCSD, Operation activities would result in increased traffic from employees and warehouse operations, as well as an increase of physical property. The Project is anticipated to employ up to approximately 1,500 individuals and would result in approximately 500 employees in the Project site at any time. Warehouse operations are estimated to result in up to 8,724 vehicles entering and exiting the site each day. The increased traffic has the potential to adversely impact police/sheriff protection response times in the area due to congestion; additional vehicle traffic may also adversely impact services due to responses to local automotive crashes in roadways.

The presence of warehouses and workers would result in an increase in service calls, including for property crimes, traffic issues, abandoned vehicles, suspicious vehicles, and alarms. However, the number of these types of calls is currently low City/County-wide, and the addition of the Project is unlikely to result in many increased calls.

Impacts from increased traffic and crime related to warehouse structures would be less than significant, as the increase in need would not be at a level that would be permanently interfere with or cause a decreased level of service for either the PPD or PCSD services.

Fire Services

Less than Significant. East Pierce Fire and Rescue, Station 113 Sumner, would provide fire services to the Project site during operations. The Project EIS team consulted with East Pierce Fire and Rescue regarding the Project and anticipated impacts. According to East Pierce Fire and Rescue staff, they do not have a service goal or a forecasting tool for warehouse developments (East Pierce County Fire and Rescue 2021). Station 113 Sumner received 2,594 calls to 9-1-1 in 2020 (East Pierce County Fire and Rescue 2020). Currently, types of calls for service to warehouses are related to sick or injured individuals (East Pierce County Fire and Rescue 2021).

The increased presence of vehicles may result in inadvertent traffic delays that may affect emergency service and fire protection response times. Increased traffic could also result in a higher potential for motor vehicle collisions, which could also require emergency services.

Emergencies related to warehouse operations, such as chemical or hazardous waste storage exposure or release, and potential medical aid response for employees, could lead to the need for fire and emergency services. Warehouse operations that carry chemical or hazardous wastes would be required to notify the State Emergency Response Commission and Local Emergency Planning Committee and local fire department. Additionally, employers with more than 10 employees are required under 29 CFR 1910.38 and 1910.30 (OSHA 2020), OSHA, to have Emergency Action Plans and Fire Prevention Plans, the creation and communication of which can minimize property damage and prevent injury. Prevention planning and compliance with state and local laws would lessen the need for emergency services as a result of warehouse operations accidents.

The need for additional fire or emergency medical services due to increased traffic, employee medical needs, warehouse operations, and traffic control would be intermittent; impacts would be less than significant.

Domestic Water

Less than Significant. During operations, the Project would increase demand for water when compared to existing conditions. Since the end use of the Project is not known, the EIS Project team utilized the most intensive end-user scenario analysis, as taken from Hickey (2008). Based on the typical water usage levels presented in Table 4-61, the highest estimated water use during Project operations for 60 acres of heavy-industrial warehouse would be approximately 136,200 gallons per day (or 49,713,000 gallons annually). This type of land use could include power plants, large building construction, and airports. The City of Puyallup Comprehensive Plan considers industrial use to mainly support the development of business and industrial parks, clean light industry, and warehousing. Water consumption in these land use types may include use for industrial and/or manufacturing processes, domestic water for employees, and fire flow for sprinkler systems and hydrants.

Table 4-61. Industrial Land Uses Water Usage

Land Use	Water Usage (gallons/day/acre)		
	Low	Average	High
Light – Industrial	200	4,700	1,620
Heavy – Industrial	200	3,100	2,270

Source: Hickey 2008

The water sourced for the Project would come from the City of Puyallup Public Works Division and the Valley Water District. As the Project site is covered by both utilities' service areas, it is possible that both utilities could ultimately provide water to the site. However, for the purposes of analyzing the potential impact on water supply, this analysis makes the conservative assumption that all water would be supplied from one or the other utility.

The City of Puyallup Public Works Division has capacity to produce more than 13.7 million gallons of water per day. Assuming that the City of Puyallup was serving the whole Project, the Project would require approximately 1 percent of the total capacity of the system per day. Additionally, all water system extensions to serve the site would be designed to provide flow and capacity for this specific Project. The City therefore anticipates having water capacity to serve the Project within the city's service area of the site; however, a final determination including any appropriate utility permit conditions or system development charges will be made following publication of the EIS. City of Puyallup Code Chapter 14.02 sets forth water system development charges that may be required once an end user and final water usage projections are known. As such, implementation of mitigation measure PS-1 is required to avoid a significant impact to the City of Puyallup water system:

- ***PS-1: Comply with Title 14.02 PCC for Water Usage.*** The Applicant will be required to pay any system development charges in accordance with Chapter 14.02.040.

In 2018, the Valley Water System produced about 95 million gallons of water, with daily consumption of about 230,000 gallons (Valley Water District 2021a). Assuming that the Valley Water District serves the entire Project, the Project would represent a 59 percent increase over current consumption levels. Although this is a large increase over current consumption levels, Valley Water District indicated (during consultation with their manager) that they have the capacity to serve the proposed Project (Valley Water District 2021b). Valley Water's service area is smaller than the entire site area, so the demand on their system is not expected to equal the entire Project area unless an alternative agreement on the service area was established with the Puyallup Water Department. The Applicant would be required to apply for a Water Availability Letter prior to construction to determine if the water availability is sufficient for development.

Sanitary Sewer

Mitigated Significant Impact. Operation of the Project would require connection to the City of Puyallup's existing wastewater facilities. The level of service for sanitary sewer is a level that allows collection of peak wastewater discharge plus infiltration and inflow (City of Puyallup 2015a). The City of Puyallup Comprehensive Sewer Plan describes estimates for growth and development in local populations and populations receiving sewer service. The proposed Project is located in mini-basin PUY 32 under the Comprehensive Sewer Plan (City of Puyallup 2016b). In 2016, the baseline sewered employment population estimate in PUY-32 was 0 and with full employment buildout is projected to be 1,564 (City of Puyallup 2016b). Table 4-62 outlines employment population baselines and projections in Puyallup mini-basin 32.

Table 4-62. Puyallup Mini-Basin 32 Employment Population Estimates and Projections

	Baseline Employment		2020 Employment Projection		2034 Employment Projection		Buildout Employment Projection	
Mini-Basin	**Total**	**Sewered**	**Total**	**Sewered**	**Total**	**Sewered**	**Total**	**Sewered**
Puyallup 32	78	0	269	190	545	466	1,564	1,564

The Project would introduce up to 1,500 new employees, with up to 500 on site at a time. A total of 500 new employees would be within the employment projections of Puyallup mini-basin 32; however, a review of sanitary sewer impacts at the time of utility permit application, and once Project uses were more defined, would enable the City to determine whether capacity improvements were needed ahead of planned timeframes and whether any would need to be completed prior to Project operations.

During the preparation of the utility permit application, the City of Puyallup may require physical capacity improvements to correct any failures in the downstream system resulting from the Project occupancy (final user(s)) build-out. If there are potential failures, the following mitigation measure would be required to avoid, minimize, or reduce impacts to the extent feasible:

- ***PS-2: Conduct a Sanitary Sewer Assessment.*** The Applicant will provide a site and user specific modeling report to determine if the Project would lead to downstream failures of the sanitary sewer system to ensure that unmitigated impacts do not occur and to determine if any system improvements need to be made prior to Project occupancy. The Applicant should pay any mitigation costs associated with the Project consistent with City of Puyallup Code Chapter 14.10 in order to mitigate this potential impact. This is consistent with CPCP policies U-4.3, CF-1, CF-5, and CF-5.1 and the LOS standard for sewer in Table 9-1 of the CPCP. It is also consistent with Pierce County Comprehensive Plan policies CF-6.2 and U-2.

Stormwater

Mitigated Significant Impact. The Project would result in substantial increases in the impervious surface of the Project site and, thus, the rate and amount of surface runoff is expected to increase with Project implementation. The Applicant would be required to obtain and maintain an Industrial Stormwater General Permit to reduce pollution associated with industrial facilities and maintain water quality requirements of Pierce County's NPDES Municipal Phase I Stormwater Permit (MS4, Permit No WAR044002).

The Project would include two separate stormwater systems to manage runoff from proposed impervious surfaces. The first consists of trench drains, catch basins, a storm drain network, and water quality vaults to collect, convey, and treat stormwater runoff from pavement areas and roof runoff from Warehouses B, F, and G. Approximately 70 acres of impervious surfaces would drain to this system. Following water quality treatment, the runoff would be directed to a new 42-inch-diameter storm trunk line, which would discharge to the Puyallup River at the northeast corner of the Project site at a recently constructed engineered outfall (see Figure 4-73). The engineered outfall is a large armored and vegetated energy dissipator located above the OHWM of the Puyallup River. The outfall is currently receiving flow from a 42-inch-diameter trunk line and would receive additional flow from this Project. The outfall is currently in poor condition and may need improvements to function as intended. More information on the potential water quality impacts associated with the outfall can be found in Section 4.2 Surface Water . The following mitigation measure would be required to avoid, minimize, or reduce impacts to the extent feasible:

- ***PS-3. Comply with Stormwater Quality Requirements.*** The Project is required to comply with Minimum Requirements 1 through 10 of the PCSWDM (Pierce County 2021b) in order to control the quantity and quality of stormwater produced by the site to meet water quality standards and beneficial uses of the receiving waters.

The 42-inch-diameter trunk line is sized to convey a 100-year storm event. The Puyallup River is a flow-control-exempt receiving water due to its size; therefore, no effect is anticipated from the additional runoff from the Project on channel morphology. Few details are known about the proposed water quality vaults, although, while effective, they tend to be expensive up front and prone to frequent and expensive maintenance. In the event they are not properly maintained, untreated runoff may discharge to the Puyallup River.

There have been issues with the stormwater system at the Viking Warehouse on the property adjacent to the Project site. Groundwater was encountered that was nearer the surface than expected during design, which has necessitated the installation of dewatering trenches to manage post-construction groundwater intrusion coming through the surface through pavement and foundations on the adjacent Viking Warehouse site. Given the proximity of the Viking Warehouse to the Project site, it is likely that similar issues would be encountered with the stormwater system for the proposed Project. Therefore, the following mitigation measure would be required to avoid, minimize, or reduce impacts to the extent feasible:

- ***PS-4. Conduct Groundwater Monitoring.*** The Applicant will need to provide additional monitoring of groundwater though at least two more wet seasons (wet season as defined by the SMMWW [Ecology 2019]) in order ensure that the Applicant has obtained enough data to adequately design their facilities.

The second stormwater system would convey rooftop runoff from Warehouses A, C, D, and E to one of three infiltration/dispersion systems along the northeast bench of the site (see Figure 4-73). The function of these systems is to reduce surface water runoff rates from the Project site and maintain the hydrology of the adjacent wetlands and riparian areas in compliance with “Minimum Requirement 8: Wetlands Protection” of the PCSWDM (Pierce County 2021b). Approximately 38 acres of impervious surfaces would drain to these facilities. Design of the infiltration/dispersion systems appears feasible based on the preliminary geotechnical information provided; however, it is unclear where flows above the Minimum Requirement will be directed. The new 42-inch-diameter storm trunk line may not have capacity for the entire Project site runoff. Additionally, the location of the infiltration trenches may not be properly located relative to the minimum setback requirements from the topographical bench/steep slope and may not be appropriately located as to convey hydrology to the wetlands (generally located southeast of some of the trenches). Therefore, the following mitigation measure would be required to avoid, minimize, or reduce impacts to the extent feasible:

- ***PS-5. Comply with Infiltration and Dispersion Trench Design Requirements.*** Infiltration and dispersion trenches must be designed to take into account all requirements of the SMMWW (Ecology 2019), including:
  - Trenches cannot be located within any of the critical area buffers but can have flow paths that reach into the buffers.
  - As currently proposed, the infiltration/dispersion trenches appear to be shown too close to the steep slope. Per the stormwater manual, infiltration trenches should not be built on slopes steeper than 25 percent (4:1). A geotechnical analysis and report may be required on slopes over 15 percent or if located within 200 feet of the top of slope steeper than 40 percent or in a landslide hazard area. If solely designed as infiltration facilities, a mounding analysis must be performed to show that the trenches will infiltrate as designed. To

determine infiltration rates, pilot infiltration tests are required to be performed per the manual.

- If these will be used as a dispersion or infiltration/dispersion trenches, per the stormwater manual, a vegetated flowpath of at least 25 feet in length must be maintained between the outlet of the trench and any property line, structure, stream, wetland, or impervious surface. A vegetated flowpath of at least 50 feet in length must be maintained between the outlet of the trench and any slope steeper than 15 percent. Sensitive area buffers may count towards flowpath lengths.
- If being used as dispersion trenches, these facilities must have some sort of grade board and be located in such a way to ensure sheet flow out of the facilities and through the runout zone so that no erosion issues are created.

A significant impact may result from inappropriate or poorly functioning permanent stormwater facilities. The facilities may require excessive maintenance or need to be retrofitted. Complete failure of a permanent stormwater facility would result in significant impacts.

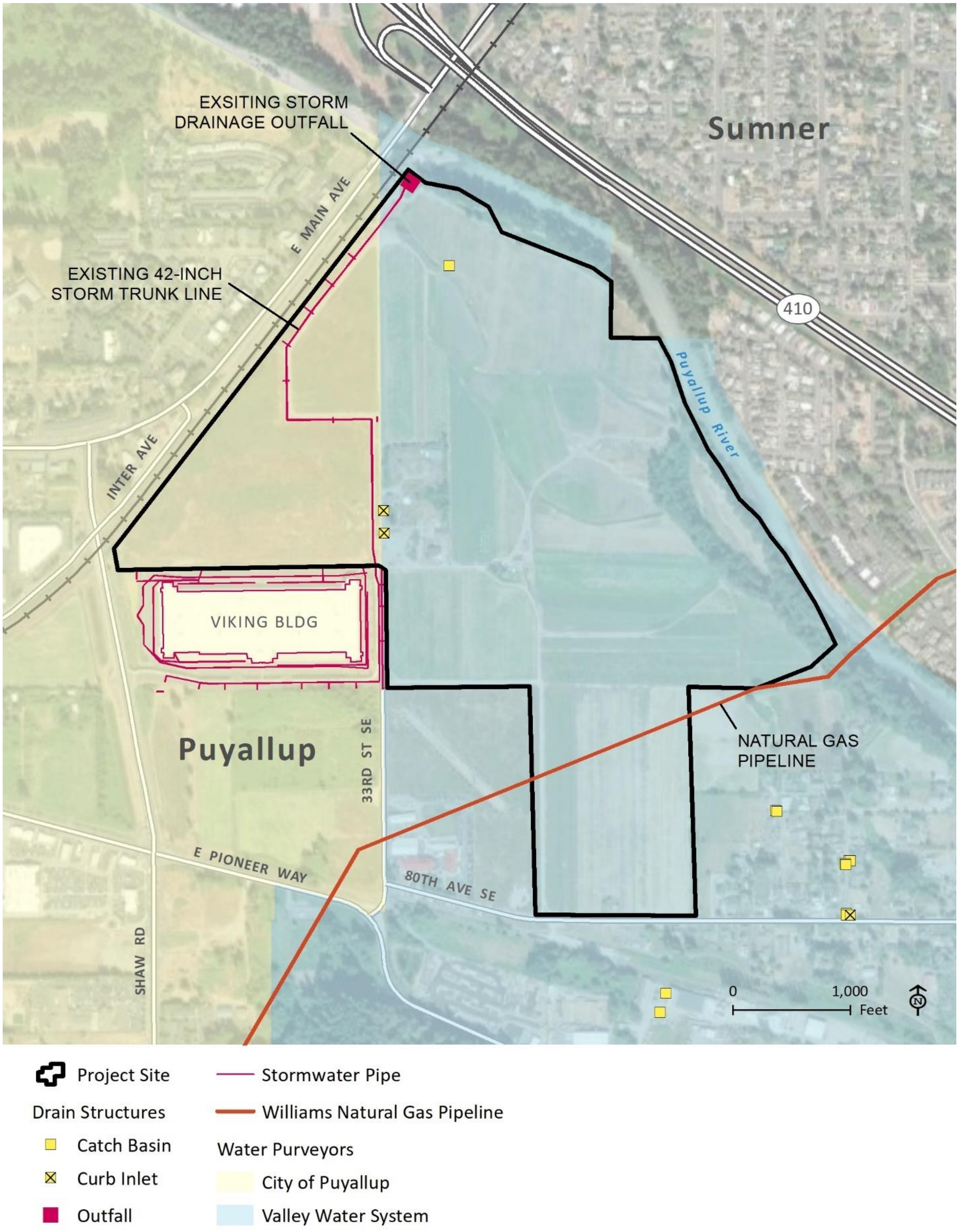


Figure 4-73. Proposed Stormwater System

Electricity and Natural Gas

Less than Significant. During operation, the Project would increase electrical power or natural gas demand as a result of power needs for lighting, security, heating and cooling, and systems operations. Coordination with PSE would be needed for electrical needs at signal houses, platforms, the underpass, and the pump station. These improvements would facilitate proposed Project actions that include water and sanitary sewer extensions, stormwater facility construction, and franchise utility improvements to support warehouse operational activities.

Additional electrical utilities would be used at the warehouse sites but would not result in an overall strain on existing area infrastructure. Operations at the warehouses would not impact existing electrical infrastructure or service to the area and adjacent parcels, and electrical usage would be consistent with current growth and development of the area. The net increase in electrical consumption following implementation of the Project would be met with PSE’s 9 megawatts of available peak capacity to service the Project, which is estimated to be adequate for the most likely uses of the Project (PSE 2021). It is possible that certain reinforcement of PSE facilities could be required depending on the actual load requirements of the development. PSE has both high-pressure and intermediate-pressure gas pipelines that border the development, as well as a District Regulator that can be used to adjust the flow of natural gas as needed. The District Regulator is close to the development; PSE is confident in their ability to provide sufficient supply to meet the needs of the most likely uses of natural gas at this location (PSE 2021). Further, the Applicant would be required to submit service applications to PSE to ensure adequate supply for both electrical and natural gas services availability; impacts would be less than significant.

Solid Waste Services

Less than Significant. Regardless of the final end user, operations at the warehouses would increase the need for solid waste disposal in the County. Once an end user has been determined for the site, the user would be responsible for negotiating their solid waste disposal requirements with the service provider. As noted above, the LRI Landfill, which is the landfill servicing Pierce County and the Project site, is projected to be full as soon as 2030 based on projected County population growth. As noted in the Tacoma-Pierce County Solid Waste Management Plan, the County is considering negotiating a new solid waste disposal contract once the LRI Landfill is full. As such, while this Project would contribute to the solid wastes disposed of at the landfill, it is not anticipated to hasten the filling of the landfill, as the projections in the solid waste management plan are based on reasonable population growth.

Alternative 1 – Rail Transport

Construction Impacts

Less than Significant. The impacts from construction of Alternative 1 would be similar to those described for the proposed Project but would include construction of the proposed rail line and track extensions from BNSF mainline/Meeker Southern interchange. Construction would not require additional police/sheriff or fire services beyond those that were already identified under the proposed Project. Construction of the rail line would require use of domestic water, stormwater, natural gas, electrical facilities, and solid waste services. However, when compared to the proposed Project, the additional utility requirements would be very similar. Therefore, impacts on public services and utilities from construction of Alternative 1 would be less than significant.

Operations Impacts

Mitigated Significant Impact. The public services and utilities impacts associated with operation of Alternative 1 would be similar to those described for the proposed Project. Public services and utilities requirements for rail transport of materials to or from the warehouse complex would require use of police/sheriff or fire services, domestic water, and natural gas, but would not require, sanitary sewer, stormwater, electrical facilities, or solid waste services to operate. The use of police/sheriff or fire services, domestic water, and natural gas would be similar to those described for the proposed Project. The stormwater and sanitary sewer issues identified under the proposed Project would also occur under Alternative 1. Implementation of mitigation measures PS-1, PS-2, PS-3, PS-4, and PS-5 would be required to minimize potential impacts to domestic water, stormwater, and sanitary sewer services. Therefore, public services and utilities impacts would be less than significant.

Alternative 2 – Reduced Intensity Alternative

Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility (AES-2, LU-1, REC-1, and SW-4) as outlined in this EIS for the proposed Project) were adopted by the Applicant. As noted below, Alternative 2 would still require Project implementation mitigation measures to reduce public services and utilities impacts.

Construction Impacts

Less than Significant. The impacts from construction of Alternative 2 would be similar to, but less than, those described for the proposed Project. Construction would not require additional police/sheriff or fire services beyond those that were already identified under the proposed Project. Construction would require use of domestic water, stormwater, natural gas, electrical facilities, and solid waste services. However, when compared to the proposed Project, the additional utility requirements would be lessened due to the decreased size of the facility. Therefore, impacts on public services and utilities from construction of Alternative 2 would be less than significant.

Operations Impacts

Mitigated Significant Impact. The public services and utilities impacts associated with operation of Alternative 2 would be similar to, but less than those described for the proposed Project. The reduced size of the facility would result in a reduction in the demand for public services and utilities and would lessen the potential impact on those resources. The stormwater and sanitary sewer issues identified under the proposed Project would also occur under Alternative 1. Implementation of mitigation measures PS-1, PS-2, PS-3, PS-4, and PS-5 would be required to minimize potential impacts to domestic water, stormwater, and sanitary sewer services. With implementation of these mitigation measures, public services and utilities impacts would be less than significant.

4.12 Cultural Resources

The cultural resources analysis included conducting background research, two phases of archaeological survey, and a reconnaissance-level architectural history survey of previously undocumented buildings, structures, and objects 45 years old or older in the Project site Area of Impacts (AI). While National Register of Historic Places (NRHP) eligibility is generally limited to resources 50 years old or older, this analysis uses a 45-year cutoff to cover resources that will reach the age of 50 years by the time the Project is constructed. The archaeological survey was completed within the footprint of disturbance, and the architectural history survey was completed within four parcels that contained built-environment resources. No archaeological resources were identified during the survey. Four historic built environment resources were documented, one of which is recommended eligible for listing in the NRHP, Washington Heritage Register (WHR), and Pierce County Register of Historic Places (PCRHP), and the remaining three resources are recommended not eligible for local, state, or national registers of historic places. The full results of the cultural resources field survey are presented in Appendix F.

4.12.1 Study Area

The AI is defined as the areas in which Project activities have the potential to impact cultural resources, should any be present. The AI includes the combined footprint of the Project and all locations where ground disturbance would occur (Figure 3-2). The study area of the proposed Project encompasses the AI, which includes the proposed seven warehouse buildings with associated grading, paved parking, and related infrastructure that would impact a total of 126 acres of a 188-acre property. Ground disturbance would include leveling and clearing, installation of utilities, and construction of the seven buildings and associated landscaping. Prior to this review, no cultural resources were recorded within the AI. Four cultural resources surveys have been conducted within the AI parcels and found no cultural resources (Gill and Berger 2007; McClintock et al. 2013, 2014; Flenniken and Trautman 2015; Durkin et al. 2021).

4.12.2 Relevant Plans, Policies, and Regulations

The Project requires compliance with SEPA, which is a process to understand the impacts on the environment, including cultural resources, that result from decisions made by Washington State (RCW Ch. 197-11). Compliance with RCW 27.44 (Indian Grave and Records) and RCW 27.53 (Archaeological Sites and Resources) is required. Additionally, compliance is also required with Title 18S.30.020 PCC (Archaeological, Cultural and Historic Resources) and the Pierce County Comprehensive Plan (Table 4-63).

Table 4-63. Pierce County Comprehensive Plan Policies for Cultural Resources

Select goals and policies from the Pierce County Comprehensive Plan related to cultural resources are listed below.

Cultural Resources Element
Identification
Goal CR-1. Identify, protect, and enhance historic properties and cultural landscapes throughout unincorporated Pierce County.

- Policy CR-1.1. Use current professional standards for cultural resource management of historic properties

Protection

Goal CR-2. Recognize the importance of resources that reflect the uniqueness and diversity of Pierce County in surveys, inventories, and local, state, and national registration programs.

Goal CR-3. Protect cultural resources through land use actions.

- Policy CR-3.1. Consider cultural resources as part of initial Project planning, review, and development.
- Policy CR-3.2. Develop and enforce protections for cultural resources.
- Policy CR-3.3. Protect sacred sites to preserve people's cultural roots and connections to the past.

While the City of Puyallup is serving as the lead agency on this EIS review, the Project site is located in unincorporated Pierce County, within the City's UGA and adjacent to Puyallup's corporate limits.

National Register of Historic Places Criteria for Evaluation

The criteria for listing a property in the NRHP require that, in addition to a site, building, structure, object, or district being more than 50 years of age and possessing integrity, it must meet at least one of the following criteria (NPS 1997), outlined in 36 CFR 60.4:

- Property is associated with events that have made a significant contribution to the broad patterns of our history; or
- Property is associated with the lives of persons significant in our past; or
- Property embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction; or
- Property has yielded, or is likely to yield, information important in prehistory or history.

In addition to possessing significance under at least one of the criteria listed above, a property must retain integrity, which is a measure of how a property conveys its significance. To retain integrity, a property must retain several, if not all, of the following seven aspects:

- **Location**: the place where the property was constructed or the place where the historic event occurred.
- **Design**: the combination of elements that create the form, plan, space, structure, and style of a property.
- **Setting**: the physical environment of a historic property.
- **Materials**: the physical elements that were combined or deposited during a particular period of time, and in a particular pattern or configuration, to form a historic property.
- **Workmanship**: the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
- **Feeling**: a property's expression of the aesthetic or historic sense of a particular period of time.
- **Association**: the direct link between an important historic event or person and a historic property.

Washington Heritage Register Criteria for Evaluation

Sites that are listed in the NRHP are automatically added to the WHR (WAC 25-12); as such, a separate nomination is not needed. Additionally, to be independently eligible for listing in the WHR, a building, site, structure, or object must meet the following criteria (DAHP 2021):

- The resource must be at least 50 years old. If newer, the resource should have documented exceptional significance.
- The resource should have a high to medium level of integrity (i.e., it should retain important character-defining features from its historic period of construction).
- The resource should have documented historical significance at the local, state, or federal level.
- ACHP review and listing require the consent of the owner (DAHP 2021).

Pierce County Register of Historic Places Criteria for Evaluation

A property must be at least 50 years of age, although exceptions may be allowed for special resources, and possess the quality of significance in American history, architecture, archaeology, and culture and have integrity of location, design, setting, materials, workmanship, feeling, and association. The property must meet one or more of the following criteria:

1. It is associated with events that have made a significant contribution to the broad patterns of our history; or
2. It is associated with the lives of persons significant in Pierce County's past; or
3. It embodies the distinctive characteristics of a type, period, or method of construction or represents the distinguishable entity whose components may lack individual distinction; or
4. It has yielded or may be likely to yield information important in prehistory or history (Pierce County 2021c).

Puyallup Register of Historic Places

The City Puyallup’s Municipal Code Chapter 21.22.025 Puyallup Register of Historic Places (PRHP) outlines the process for determining designation on the Register. Any building, structure, site, object, or district may be designated for inclusion in the PRHP if it meets the requirements provided for as noted below:

> (a) It is significantly associated with the history, architecture, archaeology, engineering, or cultural heritage of the community;
>
> (b) It has integrity;
>
> (c) It is at least 50 years old or is of lesser age and has exceptional importance; and
>
> (d) It falls in at least one of the following categories:
>
> (i) Is associated with events that have made a significant contribution to the broad patterns of national, state, or local history;

(ii) Embodies the distinctive architectural characteristics of a type, period, style, or method of design or construction, or represents a significant and distinguishable entity whose components may lack individual distinction;

(iii) Is an outstanding work of a designer, builder, or architect who has made a substantial contribution to the art;

(iv) Exemplifies or reflects special elements of the city’s cultural, social, economic, political, aesthetic, engineering, or architectural history;

(v) Is associated with the lives of persons significant in national, state, or local history;

(vi) Has yielded or may be likely to yield important archaeological information related to history or prehistory;

(vii) Is a building or structure removed from its original location but which is significant primarily for architectural value, or which is the only surviving structure significantly associated with a historic person or event;

(viii) Is a birthplace or grave of a historical figure of outstanding importance and is the only surviving structure or site associated with that person;

(ix) Is a cemetery which derives its primary significance from age, from distinctive design features, or from association with historic events, or cultural patterns;

(x) Is a reconstructed building that has been executed in a historically accurate manner on the original site; or

(xi) Is a creative and unique example of folk architecture and design created by persons not formally trained in the architectural or design professions, and which does not fit into formal architectural or historical categories.

4.12.3 Affected Environment

Background Research

Four cultural resource surveys have been conducted within the AI parcels and found no cultural resources (Gill and Berger 2007; McClintock et al. 2013, 2014; Flenniken and Trautman 2015; Durkin et al. 2021). Other cultural resources studies conducted within 0.5 mile of the AI were associated with developing recreational trails (Cole 2002; Shong and Miss 2003; Hartmann 2010), a wastewater treatment plant expansion (Piper 2014; Shong and Piper 2014), building construction, and transportation projects (Baldwin and Chambers 2014; Arthur 2016; Mueller 2016; Stipe 2016; Baldwin 2018; Elliot and Mayer 2019). No cultural resources were found. Finally, a sewer system upgrade in the city of Sumner identified historic-period archaeological site 45PI01415 (Baldwin 2017).

Two previously recorded archaeological sites are located within 0.5 mile of the AI. Site 45PI01360, a 1.5-mile segment of the Cascade Junction Wilkeson Branch of the North Pacific & Cascade Railroad that was abandoned in 1984, is approximately 0.4 mile south of the AI. Site 45PI01415 is located approximately 0.3 mile northeast of the AI. The site is a large historic-period domestic dump comprising artifacts manufactured between 1900 and 1970 (Paton and Hanson 2016; Baldwin 2017). Neither site has been evaluated for eligibility for listing in the NRHP.

There are no historic buildings, structures, or objects listed in the NRHP or WHR within 0.5 mile of the AI. Additionally, there are no resources listed on the Pierce County or Puyallup registers of historic places within 0.5 mile of the AI. Finally, there are no documented cemeteries within 0.5 mile of the AI (Durkin et al. 2021).

The DAHP predictive model for archaeological sites categorizes the location of the AI as an area with Very High Risk to High Risk for archaeological resources. In general, the southern and eastern portions of the AI are classified as Very High Risk, while the High-Risk areas are in the north and east portions of the AI.

Environmental Context

Topography and Geology

Recurring episodes of glaciation have changed the topography of the Puget Sound region during the Pleistocene epoch, between 18,000 and 15,000 years ago. The Puget Lobe of the Cordilleran icecap scoured and covered the region, making several advances and retreats (Porter and Swanson 1998; Pielou 2008). The last phase of this glaciation was the Vashon Stade (Franklin and Dyrness 1973; Orr and Orr 2002).

The AI is in the Puget Trough Physiographic region, which runs from the border of Canada to the Willamette Valley of Oregon (Franklin and Dyrness 1973; Pojar and Mackinnon 2004). Today the Puget Trough is characterized by rolling hills with rivers, lakes, and inlets, an area approximately 2,000 square miles in size. The Puget Trough was carved out and shaped by thousands of years of glacial, sedimentary, and volcanic activity. Subduction of tectonic plates and processes of coastal uplift provided a back-and-forth effect that raised the Coastal Range, which includes the Olympic Mountains, and lowered the interior areas, forming the Puget Lowland or Puget Trough. Glacial activity and the resulting floods when the glaciers melted caused the area to be scoured and carved (Orr and Orr 2002). This resulted in the formation of north-south trending ridges interspersed with drainages in the Puget Sound area (Porter and Swanson 1998). Glacial outwash materials accumulated in thick layers atop older bedrock. Human occupation could have occurred in the Project site after the retreat of the glaciers, by approximately 14,000 years ago.

The surface geology in the AI is described as a Holocene Alluvium described as loose, stratified to massively bedded fluvial silt, sand, and gravel (Schuster et al. 2015). A 2015 geotechnical engineering study conducted for the Project described the soils within the AI as a thin layer of topsoil transitioning to alluvial sand and silt deposits, with many of the pits containing wood fragments and small organic materials (Riegel and Campbell 2015). The majority of the soil within the AI is part of the Briscot soil series. A typical soil profile of this series is a dark grayish-brown silty loam from 0 to 22 centimeters below the surface (cmbs), then a grayish-brown silt loam with large prominent redox concentrations from 22 to 43 cmbs, and then a grayish-brown finely stratified silt loam, fine sand, and fine sandy loam with large prominent redox concentrations from 43 to 150 cmbs. The Briscot series forms in recent alluvium on floodplains (NRCS 2020). Other soils series present in small sections of the AI include Sultan silt loam in the northwest corner of the AI, Pilchuck fine sand along the banks of the Puyallup River, and Puyallup fine sandy loam along the eastern boundary of the AI (NRCS 2020).

Climate and Vegetation

Between 12,000 and 7,000 years ago, major climate changes occurred throughout western Washington, resulting in a warmer, drier climate than today's climate (Whitlock 1992). Shifts occurred between 6,000 and 5,000 years ago, causing a cooler, moister climate and altered the vegetation across the landscape. Mosaic-forest parkland shifted to a closed-canopy forest, much like that of today. Typically, the current Pacific Northwest climate is one of cool summers and wet, mild winters (Suttles 1990).

Today, western Washington is part of the *Tsuga heterophylla* (western hemlock) vegetation zone. This vegetation zone has a wet, mild maritime climate. Latitude, elevation, and relative location to the mountain ranges can affect climatic variations within this zone (Franklin and Dyrness 1973). Lying in the rainshadow of the Olympic Mountains, the area typically has a current precipitation range from 80 to 90 centimeters annually (Franklin and Dyrness 1973).

Dominant tree species in this vegetation zone include Douglas-fir (*Pseudotsuga menziesii*), western hemlock, and western red cedar (Pojar and Mackinnon 2004). Grand fir (*Abies grandis*), Sitka spruce (*Picea sitchensis*), and western white pine (*Pinus monticola*) are less common, but still present (Franklin and Dyrness 1973; Barnosky et al. 1987; Brubaker 1991; Whitlock 1992). Secondary species include red alder and big-leaf maple (Franklin and Dyrness 1973). Historic-period and modern use of the AI has likely allowed vegetation that thrives in disturbed soils (i.e., blackberry and Scotch broom) to flourish.

Fauna

During prehistoric and ethnographic times, fauna were plentiful and diverse, depending on microenvironments in the vicinity of the AI. Large mammals would have included deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), black bear (*Ursus americanus*), mountain lion (i.e., cougar, *Felis concolor*), and coyote (*Canis latrans*). Medium and small mammals consisted of red fox (*Vulpes vulpes*), snowshoe hare (*Lepus americanus*), porcupine (*Erethizon dorsatum*), raccoon (*Procyon lotor*), and weasel (*Mustela frenata*) (Larrison 1967; Kruckeberg 1991).

Riverine and lacustrine species in the lower Puget Sound and Puyallup River would have consisted of all five species of salmon, freshwater fish (e.g., trout [*Oncorhynchus* sp.], whitefish [*Coregonus* sp.], and eels [*Anguillidae* sp.]), otter (*Lutra candensis*), muskrat (*Ondatra zibethica*), beaver (*Castor canadensis*), and waterfowl (*Aix* and *Anas* sp.) (Larrison 1967; Suttles and Lane 1990; Kruckeberg 1991). Important shellfish species included butter clam (*Saxidomus giganteus*), littleneck clam (*Protothaca staminea*), horse clam (*Schizotherus nuttalli, S. capax*), geoduck (*Panopea generosa*), thin-shelled clam (*Protothaca tenerrima*), razor clam (*Siliqua patula*), and bay mussel (*Mytilus edulis*) (Suttles 1990).

Cultural Context

Precontact Context

The Project is located within the Southwestern Coast Salish region of the Northwest Coast culture area (Ames and Maschner 1999). Several cultural chronologies have been formulated for this region, each based on a different set of archaeological sites depending on the scale of the analysis and the availability of data at the time.

In general, people in western Washington are thought to have used an increasing number and diversity of plant and animal resources during the Archaic Period (12,500–6,400 years before present [BP]). Archaeological data indicate that this period is characterized by broad-spectrum foraging economies emphasizing terrestrial resources associated with the oak woodland and savanna. Lithic tools include dart points that were hafted for use with an atlatl or throwing-stick. The Bear Creek Site (45KI839) in Redmond dates to between 8,000 and 12,000 years old. This early Holocene stratum contained evidence of salmon harvesting as well as large mammal hunting (Kopperl et al. 2016). Toward the end of the Archaic period, hunting and gathering shifted to more extensive use of riverine resources, as these resources were enhanced by changes in the environment that stabilized river gradients and flows, leading to the cultural changes of the Pacific Period (6,400–200 BP) (Ames and Maschner 1999).

Early Pacific Period (6,400–3,700 BP) technological adaptations reflect a shift from subsistence emphasis on terrestrial mammals to marine mammals, fish, and shellfish indicated by a diversity of bone and antler tools, including barbed points for harpoons. Woodworking tools include groundstone celts and mauls (Ames and Maschner 1999). Shell middens have been found dating to this period, including the DuPont Southwest Site (45PI72) overlooking the Nisqually Reach that dates to at least 5,200 years ago (Wessen 1989), and the West Point Site Complex (Sites 45KI429 and 45KI429) in Seattle that dates to at least 4,250 years ago (Larson and Lewarch 1995).

The Middle Pacific Period (3,700–2,400 BP) is marked by the introduction of plank houses and plank-house villages, evidence for the accumulation of wealth and social inequality that continued into the historic period. Storage pit features at some sites indicate that food storage was important (Ames and Maschner 1999). Villages tended to be located in coastal areas and near the mouths of major rivers such as the Duwamish No. 1 Site (45KI23) in Seattle and the Tualdad Altu Site (45KI59) in Renton (Campbell 1981; Chatters et al. 1990).

Archaeological data suggest that Late Pacific Period (2,400–200 BP) cultures were similar to those observed in early historic times. Changes within the Late Pacific Period include increasingly specialized subsistence patterns focused on seasonally abundant food resources (especially camas and salmon) and technologies for preserving and storing these foods for use in winter. Changes in the lithic technology include the introduction of small, notched projectile points, indicating the adoption of bow and arrow technology (Ames and Maschner 1999).

Ethnohistoric Context

The AI is in the traditional territory of the Puyallup Indian Tribe, a subgroup of the Southern Coast Salish (Smith 1940; Carpenter 2002). The Southern Coast Salish comprised two language groups, the Twana and the Lushootseed (further subdivided into Northern and Southern groups). The Puyallup were part of the Southern Lushootseed dialect group (Suttles and Lane 1990). These groups followed the general Southern Coast Salish subsistence and settlement pattern.

The ethnographically recorded lifeways centered around making seasonal rounds based on resource availability. Winter villages would have been semi-permanent to permanent locations with large cedar plank dwellings, spacious enough for several families to share, typically 100–200 feet long. The houses were built from cedar planks split from tree trunks by the use of elk horn wedges and the boards were smoothed with adzes (Carpenter 1986). The Lower Coast Salish groups placed wall boards horizontally within the longhouses and used twisted cedar twigs to tie them to the vertical pole framework (Haeberlin and Gunther 1930). Small partition walls of mats were incorporated into the winter village longhouses to give each family privacy (Haeberlin and Gunther 1930). Seasonal campsites were used during the spring, summer, and autumn, when groups traveled to hunting, fishing, and berry picking grounds. Seasonal campsite dwellings had pole frames covered with mats (Carpenter 1986; Suttles and Lane 1990). The typical Puyallup summer dwelling was either tipi-shaped or square. A frame of poles was lashed together at the top and covered with mats, which were tied with dried cattail rushes (Haeberlin and Gunther 1930).

Subsistence strategies were also based on seasonal rounds, where small task groups would travel to specific resource locations to hunt, fish, and gather plants and other materials, such as stone for lithic tools. Blacktailed deer and elk were the most important terrestrial animals. All five species of salmon, along with other fish, were caught using seines, gill nets, weirs, and traps (Suttles and Lane 1990). Winter fishing was often done in the Puyallup River, and this territory was shared with the Nisqually (Haeberlin and Gunther 1930). Waterfowl and shellfish were important resources as well (Belcher 1985; Suttles and Lane 1990). A variety of plants was commonly used by the Southern Coast Salish groups (e.g., roots, bulbs, sprouts, nuts). Acorn processing was common for the Puyallup (Haeberlin and Gunther 1930). A diverse array of berries was also noted by Gunther (1945), including blackberry, elderberry, salmonberry, thimbleberry, blackcap, salal berry, huckleberry, and blueberry. The Puyallup shared berry picking grounds with the Nisqually (Haeberlin and Gunther 1930). Camas and other roots were important staples that were dug on the Nisqually prairie (Haeberlin and Gunther 1930; Carpenter 1986).

The nearest ethnographically recorded village is st¢Á, which translates to “something pulled” located along the White River north of Sumner, approximately 0.75 mile north of the AI (Hilbert et al. 2001). When the river, then known as the Stuck River, changed course, the village was moved south to the confluence of the White and Puyallup rivers (approximately 0.7 mile northwest of the AI) (Smith 1940). The confluence of the White and Puyallup rivers is known as st¢Áucid, which translates to “pulled mouth; pulled opening; pulled river mouth” (Hilbert et al. 2001). The town of Sumner is ¨i¨istalb, which translates to “sandy,” and the town of Puyallup is sïil¢çac, which translates to “strawberry plant” (Hilbert et al. 2001). To the north of the AI, a depression on the top of the plateau likely used to snare deer was known as ⍰a€abid, which translates to “dig something” (Hilbert et al. 2001). Other ethnographically recorded place names have been recorded along the Puyallup River, to the east of the AI. A place along the Puyallup River at the town of McMillian, approximately 4 miles south of the AI, is known as ñùay€ac, which translates to “where dog salmon grow.” Another place along the river, north of Orting, approximately 8 miles south of the AI, is known as ¨¢¿¨¢¿i⍰, which translates to “horse tail roots” (Hilbert et al. 2001).

Historic-Period Context

In 1833, Dr. William F. Tolmie visited the Puyallup Valley as part of his work with the Hudson's Bay Company trappers. He is believed to be the first Euroamerican visitor to the region. By 1846, the Oregon Treaty between England and United States ceded the Northwest to the Americans, and in 1850, with the federal Donation Land Act, Euroamerican settlement increased. In 1853, a wagon train on its way to the Puget Sound came northwest of the Oregon Trail and over Naches Pass to the Puyallup Valley (Becker 2006; Chesley 2008). The first American settlers were impressed with the valley's rich soil and began to build their homes on the ancestral lands of the Puyallup Tribe (Price and Anderson 2002).

While the Puyallup peoples and the first Euroamerican settlers formed cooperative relationships, this early peace was soon broken. In 1854, Washington Territory's first territorial governor, Isaac I. Stevens, convinced 62 leaders of Northwest Native American tribes to sign the Medicine Creek Treaty, ceding their rights to approximately 2.24 million acres of land. In exchange, the Puyallup Tribe received guaranteed hunting and fishing rights along with 1,280 acres for the Puyallup Reservation and cash stipends over ten years (Chesley 2008). The reservation lands proved woefully insufficient, and the resulting Indian Wars of 1855–1856 stalled Euroamerican settlement in the region, but only briefly (Becker 2006; Douglas 2016).

In the 1860s, the rich river valley quickly attracted farmers who recognized the region's agricultural potential, including Ezra Meeker, who arrived with his family in 1862. In 1865, when Charles Wood first brought hops to the region, the Meeker family was quick to acquire some of the roots for planting. Hops, integral to brewing, thrived in the Puyallup River Valley, and the Meekers were excellent salespeople, quickly marketing their crops overseas. As a successful hop grower, Ezra Meeker carved 20 acres from his farm in 1877 and platted the new town of Puyallup. At the same time, the Northern Pacific Railway was constructing a new railroad southwest of the Puyallup River, connecting Tacoma and Wilkeson as part of its transcontinental route. The new railroad faced financial difficulties but would eventually open up the Puget Sound to the nation's East Coast, providing shipping for local products and spurring the growth of commercial centers such as Tacoma (Robertson 1995).

The earliest created maps that included the AI were cadastral surveys. These surveys were conducted under the Land Ordinance of 1785 to divide the land in the United States and establish plots to be sold. The surveyors, working for the General Land Office (GLO), produced plats that document the landscape and some cultural features that were present at the time of each survey. The first of these surveys done in Pierce County took place in 1864. At that time, only two homesteads were recorded in the vicinity of the AI. R.S. More's property overlaps with the AI, and I. Woolery's property was to the east, in the vicinity of the current Sumner Cemetery (U.S. Surveyor General [USSG] 1864).

In 1889, Frederick G. Plummer published a Pierce County atlas. His map showed multiple residents around the area most likely farming. Two railroads were built between 1874 and 1889. One aligned northeast-southwest, less than 0.1 mile west of the AI, and the other east-west, less than 0.1 mile south of the AI. Both of these railroads are still present and operational today. Additionally, a new road system was built through the area. J.G. Williams and F.A. Clark obtained previously empty plots in the AI (Plummer 1889).

By 1891, the *New York Times* reported that hops farming in the Puyallup River Valley was responsible for bringing $20 million into the state and employing 15,000 people. The next year, the crop was crushed. Hop lice invaded Puyallup farms and decimated crops throughout the region, including Meeker's. Farmers unable to recover their hops fortunes turned instead to blackberries, raspberries, strawberries, and loganberries, which were developed in the region. The valley and the region also became known for its profusion of flower bulbs, including daffodil. Poultry and dairy farms added to the agricultural growth of the valley (BOLA 2007; Chesley 2008).

In 1900, Puyallup hosted its first "Valley Fair" to show off its local produce. This annual event would later grow into the Washington State Fair. By 1912, the Puyallup and Sumner Fruitgrowers' Association would claim a total of 1,300 members. The association's cannery had by then preserved almost 3 million pounds of produce (Price and Anderson 2002; Becker 2006).

While the Puyallup River Valley was home to fertile farmland, it was also subject to regular flooding. Pierce and King counties regularly partnered on flood control measures beginning in the early twentieth century. They began constructing levies and diversion dams and re-channelized the valley's many tributaries. In the 1930s, the USACE constructed the Mud Mountain Retarding Dam on the upper reaches of the White River to further control flooding and then went on to re-channel more than 2 miles of the Puyallup River (BOLA 2007; Pierce County Public Works Department 2013; Ott 2016).

While the valley was subject to flooding, the region's damp valley climate also proved perfect for cultivating daffodils. In 1926, Charles Orton, brother of E.C. Orton, invited local civic leaders from towns throughout western Washington to visit his estate and view the daffodils in bloom. By 1927, the valley, home to the Puyallup Valley Bulb Exchange, was producing 23 million bulbs. Just 2 years later, the total was 60 million, and local residents would go on to use bulbs as currency during the Great Depression. Since 1934, the region has been celebrating the daffodil harvest with a series of events, including the Daffodil Parade, which has since grown into the Daffodil Festival (Chesley 2007).

The Puyallup Valley, like many agricultural areas, had boosted crop production for World War I, but saw a slow and painful decline during the Great Depression. Not until World War II would farmers ramp up production again. In the 1940s, as industry boomed throughout the Puget Sound, the Puyallup Valley contributed to the war effort, as did other local industries. The Boeing Company alone required 7,500 additional staff just to meet government contracts (Price and Anderson 2002). While the Puget Sound region ramped up local production, it also suffered profound effects from the forced incarceration of Japanese Americans.

In 1942, following President Franklin D. Roosevelt's Executive Order 9066, the West Coast's Japanese Americans were forced into assembly areas, including the Puyallup Assembly Center, hastily erected in the Puyallup fairgrounds. From the Puyallup Assembly Center, also known as Camp Harmony, 7,500 Japanese Americans were sent to inland prison camps for the duration of the war. Incarceration disrupted lives, businesses, and educational trajectories, and split friends and family. It permanently altered the demographics of the region, as not all families, many of whom were successful farmers in Pierce and King Counties, chose to return to the West after the war (Price and Anderson 2002; Fiset 2008).

In the late 1940s, the Puget Sound region, including the Puyallup Valley, received returning servicemen anxious to start families and return to civilian jobs. The post-war years saw new construction, improvements to local roadways, and continued narrowing and straightening of the Puyallup River. The rail line through Puyallup that linked Tacoma and Seattle fell out of favor in the 1940s as trucking grew in popularity (Price and Anderson 2002).

By 1951, the closest cities to the AI, Meeker and Sumner, were highly developed. The road systems in the valley became more complex, and residential plots became smaller (Metsker 1951). Within the AI, the well-known farmer E.C. Orton owned a large plot on which he was famous for producing tulip bulbs. Portions of Orton's property were sold or given away by the 1960s; however, he remained a farmer in the area (Metsker 1960, 1965; Collins 1982). The city of Meeker became a neighborhood within the city of Puyallup by 1960. Interstate 410 was established to the north of the AI on the other side of the Puyallup River (Metsker 1960).

Tacoma and Puyallup continued to grow along with the greater Puget Sound region in the mid-century as projects, including the completion of Interstate 5 from California to Canada, improved access between regional hubs. While growth took place throughout the Puget Sound region, it had a particularly profound effect on once-agricultural communities in the Puyallup Valley, as more and more farmland was lost to development. As early as 1985, Pierce County asked voters to approve a $15-million plan to purchase development rights and preserve farmland. It was voted down. The expansion of freeways; the construction of new residential, commercial, and industrial developments on former farmland; and the increasing competition from bulb growers in other Washington counties and outside the United States has permanently altered the Puyallup Valley's character. According to the *Seattle Times*, by 1992, there were only 2 of the original 40 farms left in the Puyallup Valley producing daffodils: the Van Lierop Bulb Farm and Knutson Farms, Inc., the former E.C. Orton farm (*Seattle Times* 1992). The Van Lierop Farm, once bordering the Knutson Farm to the west, has since been acquired by the City of Puyallup and transformed into a community park (City of Puyallup 2021).

Development of the area continued. In 1990, the state's High-Capacity Transportation Act allowed King, Pierce, and Snohomish counties to cooperate on a high-capacity transit system. A three-county committee began meeting in 1992 and put forward a tri-county plan for light rail, commuter trains, and regional bus service. Sound Transit's Sounder commuter trains began carrying passengers between Seattle and Tacoma with service along the BNSF rails in Puyallup in 2000, making the Puyallup Valley even more attractive to developers (Cohen 2017).

4.12.4 Impacts

Methodology

Background Research Methods

Background research for the Project consisted of searching the DAHP online database (Washington Information System for Architectural and Archaeological Records Database [WISAARD]) for previous cultural resources studies, archaeological site records, cemetery records, and historic properties listed in the NRHP or the WHR within a 0.5-mile research radius of the AI. The statewide predictive model layer on WISAARD was reviewed for probability estimates for archaeological resources within the AI, and HRA's in-house library produced information on the environmental, archaeological, ethnohistorical, and historical context of the AI and vicinity. The applicable historic-period plats from the USSG's GLO were examined for the presence of structures and features that might be extant within the AI. The GLOs and other online historic-period map archives were also consulted for indicators of potential archaeological sites and past land-use patterns.

For the purposes of architectural review, a number of these same sources were reviewed, as well as Pierce County assessor records and additional online sources, including the Puyallup Register of Historic Places, the PCRHP, local histories, newspaper archives, and historical maps and aerials. In preparation for field survey, HRA identified architectural resources within the AI constructed in 1976 or earlier (i.e., resources 45 years old or older) per SEPA guidelines, and because these resources might reach the 50-year age threshold for NRHP eligibility before the Project is completed.

Archaeological Survey Methods

HRA prepared a two-phase methodology for conducting archaeological survey of the AI and assisted the City in discussing the plan with DAHP and the Puyallup Tribe's Tribal Historic Preservation Officer (THPO). Following archaeological pedestrian survey of the parcels identified for development, two phases of subsurface probing occurred. The Project landform is shown as Very High Risk in DAHP's predictive model, and prior geotechnical sampling indicated that the property exhibits extensive flood sediments, requiring an intensive level of subsurface examination to the full depth of proposed construction disturbances through excavation of test probes using 8-inch bucket augers. The Phase 1 survey included a low-resolution sample of probes placed tactically in different areas of differing depths of impact based on the Project design. These probes sought evidence of buried surfaces and archaeological deposits.

All excavated sediments were screened through ¼-inch mesh to identify any small cultural items that may be present. All probe locations were plotted onto a Project map using a Global Positioning Satellite instrument.

HRA designed Phase 2 of the archaeological survey based on the results of Phase 1. An HRA geoarchaeologist reviewed the Phase 1 field data and identified four augers that contained potential buried surfaces that had the potential to contain cultural materials. Phase 2 of the archaeological survey focused on the area around those four auger probes. As before, the methods used for the Phase 2 survey were discussed with DAHP and the Puyallup THPO in advance of initiation of the fieldwork. Phase 2 involved 12 deep auger probes excavated in the cardinal and ordinal directions around the four Phase 1 probes with potential buried surfaces. Each probe reached the maximum depth of construction impacts in its location.

Architectural Survey Methods

An HRA architectural historian conducted field research for the Project, taking digital photographs and field notes documenting materials, style, and the history of use and alteration of each resource observed in the AI. Survey data was used to evaluate architectural resources against criteria for listing in the NRHP. The results are documented in the technical report for the Project (Durkin et al. 2021) and in historic property inventory forms created in Washington's WISAARD database.

Survey Results

Archaeological Results

HRA observed no precontact or historic-period cultural materials during the pedestrian survey or the auger probe subsurface survey. In Phase 1, HRA archaeologists excavated 59 auger probes within the AI (Figure 4-74). The desired depths of the auger probes varied from 1.52 meters (5 feet) to 3.65 meters (12 feet). The majority of the probes reached the proposed depth of ground disturbance, but 24 were terminated early due to water inundation or impenetrable gravels. Although terminated early, these probes were able to reach a depth typically within 20 centimeters of the maximum depth of proposed ground disturbance, or a nearby probe reached the desired depth, which provided for an adequate subsurface sample.

Within auger probes A-4, CB-9, D-5, and E-4, an organic-rich stratigraphic layer was observed. The presence of an organic-rich deposit creates the potential for a stable surface that could have allowed human occupation and the creation of an archaeological deposit. These stratigraphic layers became the focus of the Phase 2 survey, which consisted of 48 deep auger probes, 12 at each of the four locations where buried surfaces were present (Figure 4-75). All probes reached the maximum proposed depth of ground disturbance in the four areas surveyed. The Phase 2 archaeological survey confirmed that the four buried surfaces observed within the auger probes excavated during Phase 1 of the archaeological survey were stable enough to accumulate organic materials but did not contain any precontact or historic-period cultural materials.

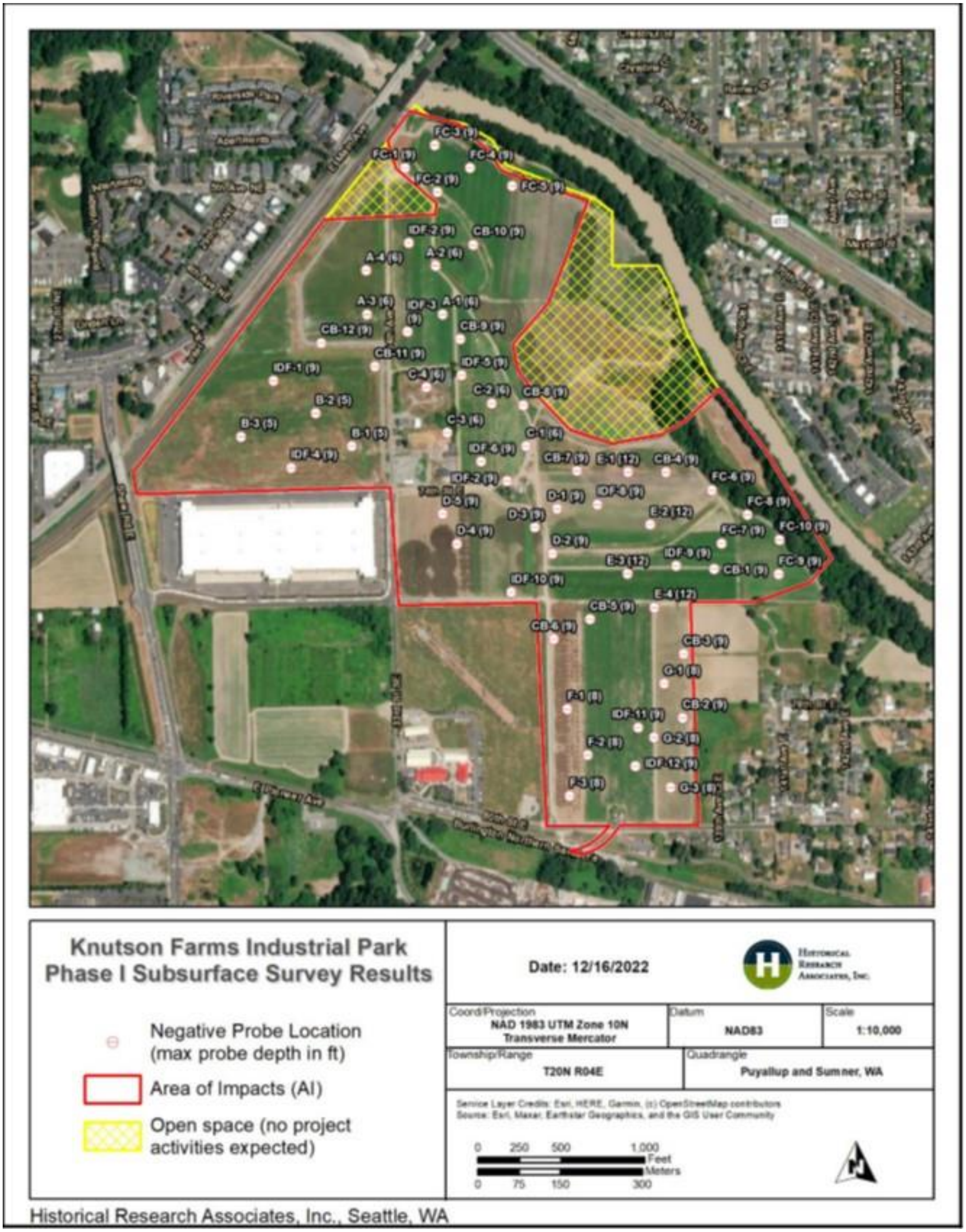
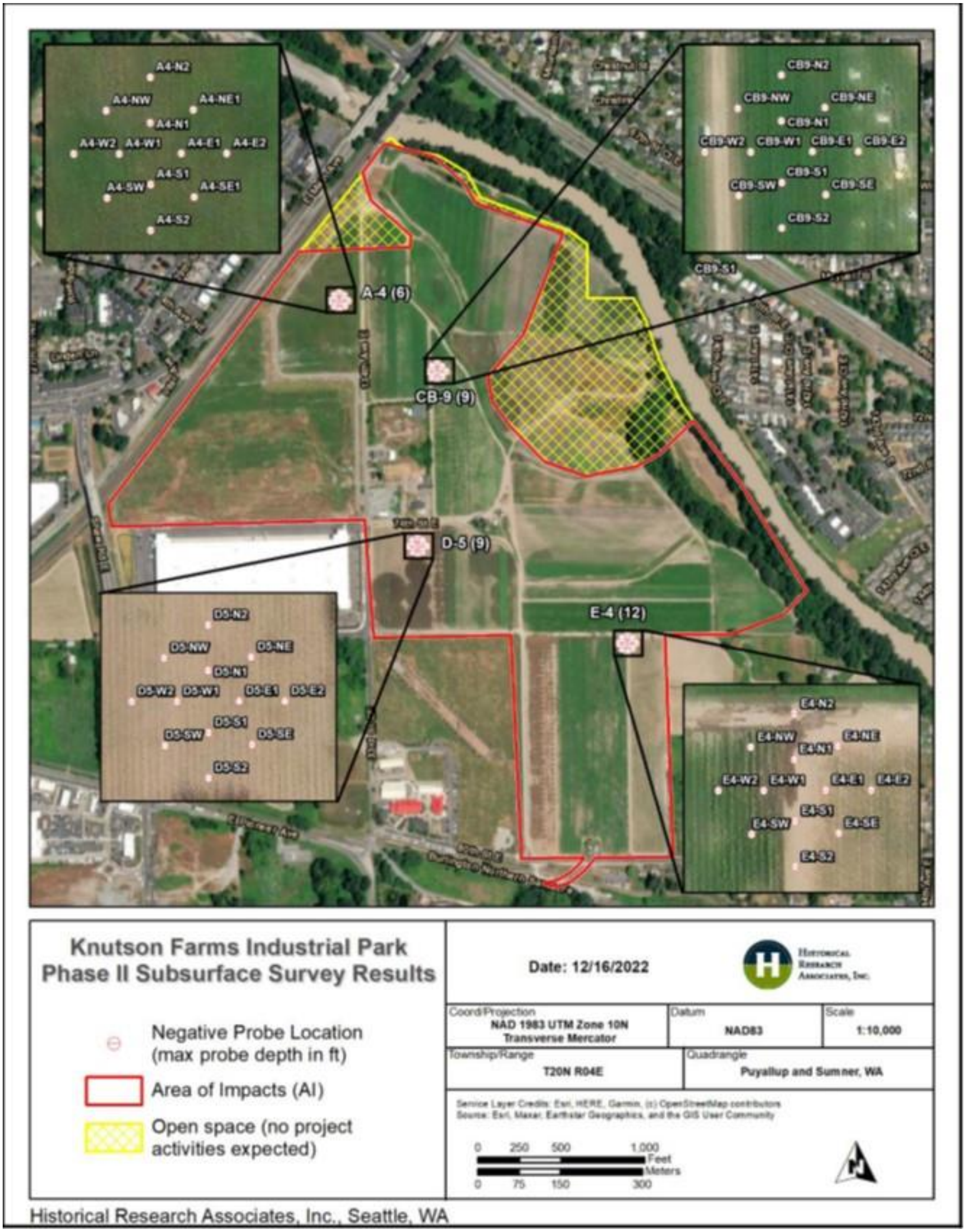


Figure 4-74. Phase 1 Auger Probe Locations



Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 4-75. Phase 2 Auger Probe Locations and Results

Architectural Survey Results

HRA's architectural historian surveyed four parcels with built-environment resources that are 45 years in age or older within the AI. Buildings on three of the four parcels lack integrity due to alterations and additions. These resources are recommended not eligible for the NRHP, WHR, or PCRHP:

- 13719 80th Street E, a small, one-story, rectangular bungalow constructed in 1930 (DAHP Property ID #725699);
- 7301 134th Avenue E, a two-story single-family residence constructed circa (ca.) 1955 (DAHP Property ID #725701); and
- 7215 134th Avenue E, a single-story residence constructed in 1940, with a barn/garage constructed ca. 1955 (DAHP Property ID #725702).

The fourth parcel (7525 134th Avenue E) includes a residence constructed in 1920 (Figure 4-76) and two functionally related structures: a garage/chicken coop (ca. 1970) and a storage shed/barn (ca. 1920) (DAHP Property ID #725700).

Figure 4-76. 7525 134th Avenue E, Residence, View Southeast

The residence, storage shed/barn, and garage/chicken coop are significant under NRHP Criterion A. While some integrity has been lost, the residence and functionally related units continue to convey their significance. HRA recommends the residence, storage shed/barn, and garage/chicken coop as eligible for listing in the NRHP at the local level under Criterion A. The eligible resource, the primary building and functionally related units, is bound by the present and historic tax parcel boundaries, which include the associated farmland. The period of significance for the building and its functionally related units dates to its construction in 1920 and continues through 1970. Additionally, the residence and functionally related units are eligible for listing in the WHR at the local level, and/or the PCRHP under Criterion 1, and/or the PRHP under Criterion D(i).

This resource is recommended eligible for listing in the NRHP, WHR, PCRHP, and/or the PRHP. Formal determination of NRHP and WHR eligibility from DAHP is pending. Nomination by the Pierce County Landmarks and Historic Preservation Commission for listing in the PCRHP and/or nomination by the Puyallup Design Review and Historic Preservation Board for the PRHP is pending.

Impacts Analysis

One historic built environment resource, the residence and functionally related units at 7525 134th Avenue E (DAHP Property ID #725700) is recommended eligible for listing in the NRHP, WHR, and PCRHP. This resource should be avoided until it has been formally determined eligible by DAHP and Pierce County. Three historic built environment resources (DAHP Property ID #s 725699, 725701, and 725702) are recommended not eligible for listing in the NRHP, WHR, or PCRHP, and as such, are not considered for Project impacts. No additional cultural resources have been identified within the AI.

No Action Alternative

Under the No Action Alternative, the Project would not be built and the recommended NRHP, WHR, and PCRHP-eligible historic built environment resource would remain in its current state and not be impacted.

Proposed Project

Construction Impacts

Significant Impact. No impacts on precontact or historic-period cultural materials are anticipated, as none were observed during the pedestrian survey or the auger probe subsurface survey. The Applicant would be required to prepare an unanticipated discovery plan should any cultural materials be encountered during construction.

The recommended-eligible historic built environment resource is located within the ROW of 74th Street E and the northeast corner of the proposed footprint of Building D. As such, the residence and its functionally related units would be demolished and the associated farmland would be converted to new uses, which would be a significant impact because the resource is recommended as eligible for listing in local, state, and national registers of historic places. To date, DAHP has not provided concurrence on the recommended eligible historic built environment resource and no mitigation is proposed.

Operations Impacts

No impacts. No operational impacts to archaeology resources or the recommended-eligible historic built environment resource are anticipated since it would have been demolished prior to construction.

Alternative 1 – Rail Transport

Construction Impacts

Significant Impact. The construction impacts associated with Alternative 1 would be similar to those described for the proposed Project but would include construction of a rail line that would primarily be within the same Project footprint as the proposed Project. The recommended-eligible historic built environment resource is located within the ROW of 74th Street E and the northeast corner of the proposed footprint of Building D. As such, the residence and its functionally related units would be demolished and the associated farmland would be converted to new uses, which would be a significant impact because the resource is recommended as eligible for listing in local, state, and national registers of historic places.

The AI under Alternative 1 would be slightly larger to include the proposed rail line connection between the Project site and the Meeker Southern rail line and track extensions from BNSF mainline/Meeker Southern interchange. Although these areas were not surveyed for cultural resources, it is not anticipated that any cultural resources would be impacted during construction. The surveys conducted for the nearby Project site under the proposed Project did not find any cultural resources. The depth of excavation required for the rail line would be up to 3 feet and, in this area, this depth has been heavily disturbed by agriculture and other development. Therefore, it is unlikely that any unknown cultural resources would be encountered during construction. However, the Applicant would be required to prepare an unanticipated discovery plan should any cultural materials be encountered during construction.

Operations Impacts

No Impacts. The operational impacts associated with Alternative 1 would be the same as those described for the proposed Project but would include operation of trains along the proposed rail line. Operation of trains under Alternative 1 is not anticipated to impact cultural resources.

Alternative 2 – Reduced Intensity Alternative

Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility (AES-2, LU-1, REC-1, and SW-4) as outlined in this Draft EIS for the proposed Project) were adopted by the Applicant. As noted below, Alternative 2 would still require Project implementation mitigation measures to reduce cultural resource impacts.

Construction Impacts

Significant Impact. No impacts on precontact or historic-period cultural materials are anticipated, as none were observed during the pedestrian survey or the auger probe subsurface survey. The Applicant would be required to prepare an unanticipated discovery plan should any cultural materials be encountered during construction.

The recommended-eligible historic built environment resource is located within the ROW of 74th Street E and the northeast corner of the proposed footprint of Building D. As such, the residence and its functionally related units would be demolished and the associated farmland would be converted to new uses, which would be a significant impact because the resource is recommended as eligible for listing in local, state, and national registers of historic places.

Operations Impacts

No impacts. No operational impacts to archaeology resources or the recommended-eligible historic built environment resource are anticipated since it would have been demolished prior to construction.

4.13 Noise

Noise is defined as sound that is perceived by humans as unpleasant or excessively loud. Noise of sufficient strength might pose health concerns such as hearing loss or sleep disturbances. Noise impacts are somewhat variable and often depend on receiving land uses. For example, areas where people sleep tend to be more sensitive to noise compared with places where people congregate during the day, such as parks and schools. This section describes basic acoustical concepts; how noise is regulated at the local and state levels; and existing noise levels in the Project site. This section also includes estimates of noise associated with the proposed Project alternatives and a discussion of appropriate mitigation to reduce noise impacts.

Sound is made up of tiny fluctuations in air pressure and is characterized by its amplitude (how loud it is), frequency (or pitch), and duration. a logarithmic scale, known as the decibel (dB) scale, is used to quantify sound intensity and to compress the scale to a more manageable range.

Noise is defined simply as unwanted sound; the terms noise and sound are often used interchangeably.

Within the range of human hearing, sound can vary in amplitude by more than 1 million units. The human ear does not hear all frequencies equally. In fact, the human hearing organs of the inner ear de-emphasize low and very high frequencies. The A-weighting scale is the most common weighting scale used to reflect this selective sensitivity of human hearing. It puts more emphasis or “weight” on the frequencies we hear well and less weight on frequencies we do not hear very well. A-weighted decibels are noted using the abbreviation dBA.

The range of human hearing extends from approximately 3 dBA to approximately 140 dBA (all sound pressure levels discussed herein are relative to 20 micropascals). Table 4-64 lists noise levels for typical sources.

Table 4-64. Typical Source Noise Levels

Sound Pressure Level, dBA	Typical Sources
90	Motorcycle at 25-foot distance Gas lawn mower at 3-foot distance
84	Tractor at 50-foot distance
80	Garbage disposal
70	City street corner Vacuum cleaner at 10-foot distance
60	Conversational speech
50	Typical office
40	Residential living room (without television)
30	Quiet bedroom at night
20	Approximate threshold of hearing

Sources: Rau and Wooten 1980; FHWA 2006; HDR Engineering, Inc.

Most sounds are made up of a wide range of frequencies and are termed broadband sounds. Sounds that are focused in a particular frequency range are tonal sounds. Sound sources can be constant or time-varying. Environmental sound levels are often expressed over periods of time, thereby allowing time-varying signals to be represented by sound levels averaged over intervals (for example, a 1-hour period). One metric used to describe environmental sound is the equivalent average sound level (Leq), which represents a constant sound that, over the specified time period, has the same acoustic energy as the time-varying signal. It is a mean average noise level over a 1-hour period.

4.13.1 Study Area

The study area for construction noise is an area around each warehouse footprint and parking lots extending approximately 500 feet beyond the outer limits of building and parking lot footprints. The study area for noise generated during operations includes typical stationary and mobile noise sources. Stationary sources include rooftop-mounted heating, ventilation, and air conditioning (HVAC) equipment and potentially emergency diesel generators. Mobile noise sources include trucks, cars, and material-handling equipment such as forklifts. It is anticipated that much of the activity that makes noise would occur indoors. Noise associated with these types of activities typically impacts areas within 500 feet of the source; therefore, this study area is utilized for the analysis.

4.13.2 Relevant Plans, Policies, and Regulations

This section summarizes state and local regulations related to noise that are applicable to the Project. There are no federal regulations related to noise that are applicable to the Project. Construction noise is addressed in the City of Puyallup and Pierce County noise ordinances and in the Washington Administrative Code. Table 4-65 outlines applicable state and local laws, policies, and codes related to noise. Major laws, policies, and codes are described in the sub-sections below.

Table 4-65. State and Local Laws, Plans, and Policies

Regulatory Program or Policies	Lead Agency	Description
State		
WAC 173-60 Maximum Environmental Noise Levels WAC 173-60-050 Exemptions	Washington State	Construction noise from temporary construction sites is exempt from the maximum allowable noise level limits in WAC 173-60-040, except when construction noise reaches Class A EDNAs (residences) between 10 p.m. and 7 a.m.
WAC 173-60 Maximum Environmental Noise Levels WAC 173-60-040 WAC 173-60-050 Exemptions	Washington State	Lands where overnight sleep occurs and park lands are both in Class A EDNA. The limit for noise from a Class A to a receiver in Class A is 55 dBA. There are other qualifiers; however, noise from electrical substations and existing stationary equipment used in the conveyance of water is exempt from regulation. (Construction of new sites is dealt with separately.)
Local		
Title 8.76 PCC, Noise Pollution Control	Pierce County	Pierce County adopts the WAC 173-60 definitions, land use categories, and noise limits.

Regulatory Program or Policies	Lead Agency	Description
Title 8.76 PCC, Noise Pollution Control Title 8.76.070 PCC, Exemptions	Pierce County	Construction noise from temporary construction sites is exempt from the maximum allowable noise level limits in Title 8.76.060 PCC, except when construction noise reaches Class A EDNAs (residences) between 10 p.m. and 7 a.m.
Comprehensive Plan, Chapter 7, Environment Element	Pierce County	Goal ENV-13. Reduce, mitigate, and where possible eliminate noise problems. Policy ENV-13.2. Reduce, mitigate, and where possible eliminate problems associated with noise generating land uses. Policy ENV-13.3. Promote cooperation between Joint Base Lewis-McCord and Pierce County to address the reduction or mitigation of noise generating uses. Policy ENV-13.3.1. Establish a disclosure process advising property owners of possible noise impacts to property around Joint Base Lewis-McChord
Chapter 6.16 PMC Noise Control	City of Puyallup	City of Puyallup adopts the WAC 173-60 definitions, land use categories, and noise limits.
Comprehensive Plan, Chapter 5, Community Character Element	City of Puyallup	Noise is a community concern, and reducing citizen's exposure to noise is a goal. Policy CC – 2.3. Buffer the visual and noise impact on residential areas of commercial, office, industrial, and institutional development. Policy CC – 6.6. Utilize landscaping buffers between different uses to provide for natural transition, noise reduction, and delineation of space while maintaining visual connection to the public amenity. Goal CC – 11. Citizens receive minimal exposure to the harmful physiological and psychological effects of excessive noise. Policy CC – 11.1. Enforce regulations to control excessive, repetitive, or continuous noises within its practical and legal abilities. Policy CC – 11.2. Mitigate the impacts of pre-existing generators of noise upon new development within the community, such as along major transportation corridors (e.g., frontages of highways and railroad tracks) or near other major noise generators; residential and commercial development may be required to mitigate the impacts of noise on new development through design and siting. Policy CC – 11.3. Foster a collaborative relationship with BNSF Railway to explore options for increasing the use of wayside

Regulatory Program or Policies	Lead Agency	Description
		horns, particularly where crossings are in proximity to residential neighborhoods
Comprehensive Plan, Chapter 2 Natural Environment Element	City of Puyallup	Goal NE-12. Identify and regulate sources of noise pollution through enforcement, abatement, and advanced planning measures that will avoid point sources impacts. Policy NE – 12.1. Maintain noise regulations to limit noise to levels that protect the public health and that allow residential, commercial, and manufacturing areas to be used for their intended purposes. Provide flexibility in the regulations to allow construction at night when necessary to protect worker safety while maintaining the tranquility of the city. Policy NE – 12.2. Provide noise reduction and mitigation measures to reduce the noise and visual impacts of freeways and arterials on residential areas. Ensure the Washington State Department of Transportation (WSDOT) provides appropriate levels of noise suppression when expanding or improving state highways. Work with WSDOT to maintain and enhance roadside vegetation that will buffer and limit noise intrusions from state highway facilities into Puyallup's neighborhoods. Policy NE – 12.3. Require buffering or other noise reduction and mitigation measures to reduce noise impacts from Commercial and Industrial zones on residential areas. Policy NE – 12.4. Ensure that mixed-use developments are designed and operated to minimize noise impacts. Measures may include provisions controlling uses, design and construction measures, and timing. requirements
Chapter 6.16.060 PMC, Noises Exempt – Completely or Partially	City of Puyallup	Construction noise is exempt from regulation under this chapter if it occurs between 7:00 a.m. and 10:00 p.m. on weekdays. The public works director may prohibit or allow construction noise during nighttime hours (10:00 p.m. to 7:00 a.m.). Noise from traffic on local roadways is also exempt except when such sounds are received in residential zones of the city. Noise from safety devices (i.e., backup beepers) is exempt. Noise from emergency or standby equipment (i.e., generators) is exempt. Noise from stationary equipment used in the conveyance of water (i.e., pump stations) and substations is exempt.
Chapter 6.16.080 PMC, Enforcement – Complaints	City of Puyallup	Complaint-Only Basis. Only after a complaint has been received from an identified person who owns, rents, or leases property that is affected by a noise source may a civil infraction be issued; provided that the section of this chapter relating to motor vehicles and noise emanating therefrom shall be subject to enforcement proceedings regardless of whether a complaint has been received; provided further, that with the exception of

Regulatory Program or Policies	Lead Agency	Description
		motor vehicle noise, noise created by industrial areas is to be enforced by the State of Washington.

EDNA = environmental designation for noise abatement.

Washington Administrative Code - Chapter 173-60

Maximum Environmental Noise Levels

The State of Washington has a robust environmental noise control program. It regulates maximum allowable noise levels using different limits for receiving lands of differing noise sensitivity. Construction noise is specifically addressed and is exempt from regulation unless it occurs during nighttime hours (10:00 p.m. to 7:00 a.m.), when it is subject to the numeric limits. If construction occurs during nighttime hours, it is subject to the maximum permissible noise levels in WAC 173-60-040, shown below. This section of the WAC establishes different noise limits, depending upon the environmental designation for noise abatement (EDNA) or area or zone (environment) within which maximum permissible noise levels are established.

Class A EDNA represents lands where people reside and sleep. Typically, Class A EDNA includes residential, multiple-family living accommodations, recreational and entertainment (e.g., camps, parks, camping facilities, and resorts), and community service (e.g., orphanages, homes for the aged, hospitals, health and correctional facilities).

Class B EDNA represents lands with uses requiring protection against noise interference with speech. Typically Class B EDNA includes commercial living accommodations; commercial dining establishments; motor vehicle services; retail services; banks and office buildings; miscellaneous commercial services; property not used for human habitation, recreation, and entertainment; property not used for human habitation (such as theaters, stadiums, fairgrounds, and amusement parks); and community services property not used for human habitation (e.g., educational, religious, governmental, cultural, and recreational facilities).

Class C EDNA represents lands with economic activities of such a nature that the normally anticipated noise levels are higher than those experienced in other areas. People working in these areas are typically covered by noise control regulations of the Washington Department of Labor and Industries. Uses typical of Class A EDNA are generally not permitted within such areas. Typically, Class C EDNA includes storage, warehouse, and distribution facilities; industrial property used for the production and fabrication of durable and nondurable man-made goods; and agricultural and silvicultural property used to produce crops, wood products, or livestock.

Under the Washington Administrative Code, no person may cause or permit noise that exceeds the maximum permissible noise levels listed in Table 4-66 to intrude into the property of another person. Between 10:00 p.m. and 7:00 a.m., the noise limitations presented in Table 4-66. Washington Administrative Code Noise Limits are reduced by 10 dBA for receiving property within Class A EDNAs. At any hour of the day or night, those noise limitations may be exceeded for any receiving property by no more than:

- 5 dBA for a total of 15 minutes in any 1-hour period; or
- 10 dBA for a total of 5 minutes in any 1-hour period; or
- 15 dBA for a total of 1.5 minutes in any 1-hour period.

Table 4-66. Washington Administrative Code Noise Limits

EDNA of Noise Source	**EDNA of Receiving Property**		
	Class A	**Class B**	**Class C**
Class A	55 dBA	57 dBA	60 dBA
Class B	57 dBA	60 dBA	65 dBA
Class C	60 dBA	65 dBA	70 dBA

Source: WAC 173-60-040

The assessment of noise impacts as a result of the potential Project considers the Project site to be a park-like land use (Class A EDNA) adjacent to a residential neighborhood (Class A EDNA). Therefore, the maximum allowable nighttime construction noise level at residences surrounding the Project site is 45 dBA (55 dBA reduced by 10 dB for nighttime hours, as explained in the preceding paragraph). That limit can be exceeded for brief durations as explained above.

Pierce County Code – Title 8 Health and Welfare

Title 8.72 PCC regulates construction noise. Construction noise is exempt from regulations, except when it reaches residential parcels during nighttime hours (10:00 p.m. to 7:00 a.m.), when it is subject to the maximum permissible noise limits listed in Title 8.76.060 PCC, Maximum Permissible Environmental Noise Levels. These are the same numeric noise limits and land use classification scheme as shown in Table 4-66.

Title 8.76 PCC adopts the definitions, land use categories, and noise limits in WAC 173-60, making considerations for any special conditions that exist within Pierce County.

Noise emissions from operation of the proposed Project would be subject to regulation under Title 8 PCC.

City of Puyallup Municipal Code – Chapter 6.16 Noise Control

The City of Puyallup regulates environmental noise by adopting the State rules in WAC Chapters 70.107 (since recoded as 70A.20.010), 173-58, 173-60, and 173-62 (essentially adopting the EDNA system) (Chapter 6.16.20 PMC). Daytime construction noise, noise associated with stationary equipment used in the conveyance of water (pump stations), and substation noise are exempt. The City Public Works director has the authority to approve or prohibit nighttime construction activities. In most cases, complaints must be filed for the ordinance to be enforced. The State of Washington regulates noise created by industrial areas (under the WAC) (Chapter 6.16 PMC). Noise from the site would be regulated by PMC as locations surrounding the site that would be impacted by construction or operations on the Project site would be in the city limits.

4.13.3 Affected Environment

The Project site is a series of parcels characterized by open agricultural fields. The dominant features of the soundscape are noises from transportation corridors close to the site. The Puyallup River borders the site on the eastern and northeastern sides. Beyond the river is State Route 410, a four-lane divided highway. The western and northwestern property lines are adjacent to a railroad corridor and East Main Avenue. Shaw Road East forms the western boundary of the Project site. The southern border of the Project site is adjacent to East Pioneer, 8th Avenue Southeast, and the Meeker Southern rail line. There are residential neighborhoods to the east and southeast of the Project site and a strip of light industrial parcels to the south. Land use to the west of the site is a mixture of commercial and residential and Van Lierop Park. Overall, the density of development in the surrounding area is moderate.

Based on current uses in the area, the existing noise levels appear compatible for overnight sleep in the residential land uses that are as close as 300 feet from the site. Table 4-67 shows typical A-weighted noise levels for residential land uses. For purposes of analysis, these noise levels are utilized as the baseline noise estimates for the existing conditions in the study area.

Table 4-67. Typical Residential Noise Levels

Residential Land Use Category	Daytime Sound Pressure Level, dBA	Nighttime Sound Pressure Level, dBA
Very noisy urban	66	58
Noisy urban	61	54
Urban and noisy suburban	55	49
Quiet urban and normal suburban	50	44
Quiet suburban	45	39
Very quiet suburban and rural	40	34

Source: ANSI/ASA 2013

Sensitive receptors for noise include land uses such as hospitals, nursing homes, senior citizen centers, schools, churches, libraries, recording studios, concert halls, and residences (FTA 2006). The sensitive receptors for noise nearest to the Project site are residential in nature and Van Lierop Park.

4.13.4 Impacts

Methodology

Noise impacts are defined as exceedances of regulatory thresholds set by WAC 173-60 and adopted by both the County and City as identified in Section 4.13.2. This assessment assumes that adverse noise impacts would occur if noise levels were anticipated to *exceed* regulatory thresholds; noise levels *under* regulatory thresholds would be less than significant. A significant adverse noise impact would be an exceedance of a regulatory limit by 10 dBA or more (a 10 dBA increase is generally perceived as a doubling of sound levels).

Noise from daytime construction activities is exempt and not subject to limitation under local and state environmental noise ordinances and requirements (WAC 173-60). Noise from nighttime construction activities (10 p.m. to 7 a.m.) is subject to the limits in WAC 173-60 (i.e., the noise limits presented in

Table 4-66 minus 10 dBA). To estimate the potential the magnitude of potential daytime construction noise levels, the Project team performed a desktop construction noise assessment using methods in the *Highway Construction Noise Handbook* (FHWA 2006). Generic construction phasing and equipment information from comparable prior projects was used for this assessment to illustrate what construction noise sources and noise levels could be expected.

The *Highway Construction Noise Handbook* (FHWA 2006) is an industry standard reference for construction noise assessment. The methodology consists of identifying the types and numbers of the loudest pieces of construction equipment likely to be used in each phase of construction. Next, the hours of use per day and percent of use during those hours are estimated. Using measured noise levels for that equipment, analysts calculate resulting noise levels at increasing distance from the source. Noise levels from the loudest two pieces of equipment were averaged and are presented in this assessment. That process was repeated for each major phase of the construction process.

The operational noise analysis focuses on the most likely sources of operational noise, potential mitigation to address those activities, and identification of potential end users that could require additional mitigation.

Impacts Analysis

No Action Alternative

Under the No Action Alternative, Project construction activities would not occur. Because no construction or operation would take place under this alternative, there would be no noise impacts. Existing sources of noise in the study area would continue and could evolve over time due to changes in land uses or the regional economy.

Proposed Project

Construction Impacts

Mitigated Significant Impact. Construction equipment proposed for this Project that will generate noise include dozers, dump trucks, and excavators, rollers, dozers, excavators, and haul trucks. Some of these include noise-creating internal combustion engines, which can be an annoyance when used near noise-sensitive areas (such as residential parcels and parks).

Construction activities would occur between 7:00 a.m. and 10:00 p.m. and not during nighttime hours (defined as 10:00 p.m. to 7:00 a.m.). Daytime construction noise is exempt from regulation, and nighttime construction noise is subject to the limits in WAC 173-60. Although daytime construction noise is exempt, the exemption is not intended to preclude requirements for installation of BMPs to abate noise.

Direct effects of daytime construction noise could include speech interference (i.e., making it difficult to hear someone talking) when close to loud equipment or generating noise that is an annoyance to residents and users of Van Lierop Park. Table 4-68 presents estimates of noise from daytime construction activities. Table 4-68 lists the phases of construction activity and identifies equipment likely to be used during each phase. Table 4-68. Estimates of Construction Noise Under Action Alternatives also notes the estimated quantity of each piece of equipment, how many hours per day that equipment is assumed to be used, and what percentage of each hour that equipment is assumed to be in use. Next, Table 4-68 presents a maximum noise level (L_{max}) at 50 feet distance from each piece of equipment taken from the *Highway Construction Noise Handbook* (FHWA 2006). Finally, Table 4-68 also shows the combined noise level from the two loudest pieces of equipment in each construction phase, propagated to distances of 100, 200, and 500 feet from the equipment.

Table 4-68. Estimates of Construction Noise Under Action Alternatives

Equipment and Phase of Construction	**Qty.**	**Hours Use/Day**	**Utilization (%)**	**Maximum Noise Level (L_{max}) at 50 feet (dBA)**	**Sound Pressure Level (dBA) at Distance (feet)**		
					100	**200**	**500**
Clearing							
Dozer	2	8	40	85	78	72	64
Off-road dump truck	3	8	40	84	81	75	67
Excavators	2	8	40	85	80	74	66
Combined Levels of Two Noisiest Pieces of Equipment					*84*	*78*	*70*
Utility Relocation							
Excavators	2	8	40	85	80	74	66
Dump truck	2	8	40	84	80	74	66
Combined Level of Two Noisiest Pieces of Equipment					*83*	*77*	*69*
Excavation							
Excavators	3	8	40	85	81	75	67
Off-highway trucks	6	8	40	84	84	78	70
Combined Level of Two Noisiest Pieces of Equipment					*86*	*80*	*72*
Foundation and Building Construction							
Roller	1	8	20	85	72	66	58
Dozer	2	8	40	85	78	72	64
Excavator	2	8	40	85	80	74	66
Combined Level of Two Noisiest Pieces of Equipment					*82*	*76*	*68*
Access Road							
Roller	1	8	20	85	72	66	58
Dozer	1	8	40	85	75	69	61
Combined Level of Two Noisiest Pieces of Equipment					*77*	*71*	*63*
Park Grading and Fill							
Roller	2	8	20	85	75	69	61
Dozer	2	8	40	85	78	72	64
Combined level of two noisiest pieces of equipment					*80*	*74*	*66*

Source: HDR Engineering, Inc., 2023

Daytime construction would temporarily increase noise levels in the study area. The two noisiest pieces of equipment are estimated to be 84 dBA at the nearest distance (100 feet). The nearest residential land use is 300 feet from the nearest site boundary. Direct effects of daytime construction noise could include speech interference (i.e., making it difficult to hear someone talking) when close to loud equipment. Other effects considered are annoyance to residential land uses. When used near residences and other areas where people gather, noise from construction equipment can interfere with outdoor verbal conversations.

Although daytime construction noise is exempt from regulation, the exemption is not intended to preclude requirements for implementation of BMPs to abate noise (WAC 173-60-050[6]). The Applicant and its construction contractors are required to ensure that noise from construction equipment and activities complies with applicable noise rules and minimizes the potential for annoyance/disturbance. As such, mitigation measures N-1 and N-2 would be required:

- **N-1. Develop Construction Noise Control Plan.** Consistent with the goals and policies of the Community Character Elements of the Puyallup Comprehensive Plan (CC-2.3, CC-6.6, CC-11, and CC-11.1), a construction noise control plan should be developed during construction that would include BMPs and administrative controls to demonstrate and achieve compliance with applicable construction noise limits. BMPs could include using original equipment manufacturer (or equivalent) mufflers on equipment with internal combustion engines; ensuring that the equipment is maintained in a state of good repair; and scheduling activities that occur closest to noise-sensitive parcels for mid-day rather than early in the morning or past 8:00 p.m.
- **N-2. Prioritize Construction of Noise Restricting Project Elements.** In accordance with the community character elements of the Puyallup Comprehensive Plan (CC-2.3, CC-6.6, CC-11, and CC-11.1), the Applicant should construct all required perimeter landscaping and berming, install required fencing, and plant required landscaping prior to beginning site work and building construction on site for all areas abutting Van Lierop park and where residential land uses are adjacent to or abutting the Project site. Additionally, consider a grading plan that would store and stockpile earth in manner and location that would deflect and attenuate noise from the Project site away from residential and public parkland uses throughout all phases of construction.

Nighttime construction activities are not proposed as part of the Project. If the Applicant proposes any nighttime construction work, including work in County or City of ROW, or if utility work is required at night, the Applicant will be required to manage noise emissions in accordance with local requirements. Pierce County Code 6.16.060(2)(c) indicates that “the public works director, or his or her designee, shall have the authority to prohibit, or to allow with or without mitigating conditions, noise that emanates from construction or related activity during evening or nighttime hours.” As such, the Applicant would be required to apply for a noise variance that should include appropriate noise minimization measures and notification of the City of Puyallup and neighboring property owners by U.S. mail no less than 5 days in advance of the proposed construction activities.

Operations Impacts

Mitigated Significant Impact. Noise emissions from operation of the proposed Project would be subject to regulation under WAC 173-60. This could include noise from outdoor activities, outdoor equipment, indoor noise-generating activities, or rooftop-mounted HVAC equipment.

Operational noise can generally be characterized as indoor and outdoor noise associated with future use of the site. Although the end user of the proposed Project has not been determined by the Applicant, operations of the facility would likely result in noise generation from outdoor noise-generating activities, including rooftop-mounted HVAC units, refrigeration units, emergency backup generators, movement and idling of vehicles, backup beepers, and material-handling activities at loading docks (e.g., forklifts). Indoor noise generation would be highly dependent on the final end uses and the specific equipment installed in the warehouses; however, some uses may be more likely to generate noise. These potential noisier activities include manufacturing and recycling collection and processing facilities that could impact surrounding Class A EDNA land uses.

Other anticipated operation-related noise sources from the proposed Project includes transportation, HVAC and refrigeration, backup generator, and interior noise as discussed in detail below.

Transportation Noise

Transportation activities are the most likely known Project action that would generate noise during operations. All of the potential allowable end uses would incorporate incoming and outgoing shipments of materials, products, traffic associated with vendors and employees, and other similar transportation-related activities. Material handling at loading docks is also anticipated, which would involve equipment such as forklift trucks and pallet movers, which are typically not loud vehicles, but may have repetitive noises such as backup audible warning noise.

WAC 173-60-040 identifies the maximum permissible environmental noise levels (dBA) at receiving locations as presented in Table 4-69. Under WAC 173-60-050 (4)(l), sounds created by motor vehicles are subject to the maximum permissible environmental noise levels when those sounds are received in EDNA Class A Environments (i.e., parks or residential areas). The proposed Project would result in the daily movement of up to 1,482 heavy-duty vehicles and 7,242 passenger/light-duty vehicles in and out of the Project site. Adjacent to the property are multiple Class A environments, including Van Lierop Park and residential zones. These vehicle movements would be subject to the maximum permissible noise levels under WAC 173-60-040. Table 4-69 presents the results from the desktop analysis of noise generation associated with vehicle traffic. It indicates that individual Project-related heavy trucks cannot be closer than 50 feet to a Class A EDNA parcel during daytime hours and 200 feet during nighttime hours for more than 1.5 minutes. Individual Project-related passenger/light duty vehicles cannot be closer than 25 feet to a Class A EDNA parcel during daytime or nighttime hours for more than 1.5 minutes. Without mitigation, this vehicle activity on the site would constitute a significant impact on these Class A environments as vehicle activity would exceed the maximum allowable noise levels.

Table 4-69. Distance from Operating Vehicles Maximum Allowable Noise Levels

	Nighttime				**Daytime**			
Maximum Allowable Noise Limit (dBA)	50	55	60	65	60	65	70	75
Allowed Exposure per hour (minutes)	NA	15	5	1.5	NA	15	5	1.5
Passenger/Light Duty Vehicles (feet)	NA	50	25	25	NA	25	25	25
Heavy Duty Vehicles (feet)	2,000	950	450	200	450	450	100	50

Source: HDR 2022
Note: NA = not applicable

In order for trucks to operate within the facility site within the distances noted without generated noise above the maximum permissible environmental noise levels, the following mitigation would be required:

- **N-3: Construct Noise Walls.** Noise walls would be required to mitigate noise generated from vehicle traffic on site. Twelve-foot-high noise walls would be required along all shared property boundaries with Van Lierop Park and along the Project boundary to the east of Warehouses E and G between the Project and the adjacent residential zones. The 12-foot-high wall was the shortest wall that would lower noise levels to below the maximum permissible noise levels as outlined in WAC 173-60-040 (HDR 2022).

See Section 4.6 for impacts of the noise wall on aesthetic resources.

Under WAC 173-60-050 (4)(d), sounds created by warning devices not operating continuously for more than 5 minutes, or bells, chimes, and carillons, are exempt from the maximum permissible environmental noise levels outlined in WAC 173-60-040. Any end user would be required to adhere to these requirements and would be subject to daily violations in accordance with WAC 173-60-090 if the requirements are not followed.

HVAC and Refrigeration Noise

HVAC equipment and refrigeration units would generate noise during operations. The noise generated would likely result in adverse impacts at Van Lierop Park and nearby residential areas. HVAC equipment and refrigeration units would not be exempt from the requirements of WAC 173-60 or Chapter 16 PMC; therefore, any installed equipment would be required to adhere to the maximum permissible environmental noise levels. The noise generated by HVAC and refrigeration units would be required to be analyzed during permitting, and additional mitigation measures would be identified by the permitting agency. The Applicant would be required to submit a written narrative to the permitting agency describing the noise generation from the proposed uses and compliance with all applicable laws regulating sensitive surrounding land uses such as residential and public parks.

Backup Generators

If utilized in an emergency, backup generators would generate temporary noise during operations. The noise generated during operations could be experienced at Van Lierop Park or in nearby residential areas. However, because backup generators would be only used in an emergency, they would be exempt from maximum permissible environmental noise levels in accordance with Chapter 6.16.060 (1)(c) PMC and WAC 173-60-050 (4)(l).

Indoor Noise-Generating Activities

Details of the specific noise-generating indoor equipment that would be required would be determined during the permitting phase of the Project; however, activities such as manufacturing and recycling collection and processing facilities are potential sources of indoor noise that could impact surrounding Class A EDNA land uses. The noise generated by indoor activities would be required to be analyzed during permitting, and additional mitigation measures would be identified by the permitting agency. The Applicant would be required to submit a written narrative to the permitting agency describing the noise generation from the proposed uses and compliance with all applicable laws regulating sensitive surrounding land uses, such as residential and public parks.

The wide range of potential end uses outlined in Table 3-3 precludes identification of all potential operation-related noise impacts. As such, once a final end-user has been identified for the proposed facility, the specific noise levels would be required to be measured and analyzed during permitting and appropriate mitigation measures would be identified by the permitting agency. The potential end use categories allowed under PCC 18A.33.280(A)-(I) and described in Chapter 3, Project Description, involve vehicles of one or more types.

Warehousing, Distribution, Freight: The more transportation-intensive uses (e.g., warehousing, distribution, and freight movements) and uses such as contractor yards, salvage yards, and storage areas will generate more noise from outdoor activities both on site and off site. In general, noise emissions from outdoor activities associated with any of these use categories are a greater concern than noise inside buildings.

Fulfillment Center Warehouses: Activities inside fulfillment center warehouses are dominated by material handling (e.g., conveyors, racks) of small packages and products. General warehousing also includes material-handling equipment that is scaled up for larger packages (i.e., pallets). Forklift trucks, pallet movers, and similar machines are common material-handling equipment inside warehouses. General manufacturing is a very broad category of land use and activities that would likely include some form of material-handling systems and equipment but would also include machines and processes that make finished products. It is reasonable to assume that building envelopes would be constructed such that noise created inside the buildings would not reach nuisance levels off site or reach levels that exceed applicable noise limits outside the buildings.

Alternative 1 – Rail Transport

Construction Impacts

Mitigated Significant Impact. The construction Impacts associated with Alternative 1 would be similar to those described for the proposed Project but would include construction of a rail line that would primarily be within the same Project footprint as the proposed Project. As described for the proposed Project, construction would be limited to allowable daytime hours. Some of the techniques and equipment used to construct freight rail turnouts and sidings is specific to the rail industry. However, the internal combustion engines on larger pieces of equipment used on rail projects are comparable in size to the internal combustion engines on typical large equipment commonly used on construction projects. Both types of construction activities require use of large and small equipment with powerful engines capable of moving heavy materials or performing specific functions. On that basis, construction noise associated with Alternative 1 is anticipated to be comparable to noise associated with the proposed Project.

Although daytime construction noise is exempt from regulation, the exemption is not intended to preclude requirements for implementation of BMPs to abate noise (WAC 173-60-050[6]). The Applicant and its construction contractors are required to ensure that noise from construction equipment and activities complies with applicable noise rules and minimizes the potential for annoyance/disturbance.

As such, mitigation measures N-1 and N-2 would be required to minimize the potential for noise disturbance during construction activities.

Nighttime construction activities are not proposed as part of the proposed Project. If the Applicant proposes any nighttime construction work or if utility work is required at night, the Applicant will be required to manage noise emissions in accordance with local requirements. Title 6.16.060(2)(c) PCC indicates that "*the public works director, or his or her designee, shall have the authority to prohibit, or to allow with or without mitigating conditions, noise that emanates from construction or related activity during evening or nighttime hours.*" As such, the Applicant would be required to apply for a noise variance that should include appropriate noise minimization measures and notification of the City of Puyallup and neighboring property owners by U.S. mail no less than 5 days in advance of the proposed construction activities.

Operations Impacts

Mitigated Significant Impact. The operational noise impacts associated with Alternative 1 would be similar to those described for the proposed Project but would include noise generated from operation of the rail line. Residences near the proposed rail line are currently exposed to noise and vibration from trains on the existing mainline (Figure 3-3). Train noise and vibration decrease with increasing distance away from the rail line. Residents in that area would experience additional train noise from up to two additional trains/day on the proposed rail line. Those trains would be traveling at a low rate of speed, and slower trains are generally quieter than faster trains, although they produce longer periods of exposure to train noise than faster trains. When the locomotive and railcar wheels cross over the gap in the rail at the proposed industrial turnout, they would create a repetitive impact noise and also generate some ground-borne vibration. The residence nearest the proposed turnout is approximately 700 feet away from the turnout. The ground-borne vibration is unlikely to be noticeable beyond a few hundred feet from the turnout. Empty railcars crossing over the turnout would create more noise than loaded rail cars. The magnitude of noise and vibration levels associated with trains on the proposed turnout is expected to be less than noise and vibration from trains on the mainline because trains on the mainline travel faster than trains on the proposed siding. As trains travel through the Project site, the buildings would provide acoustical shielding (act like noise walls), reducing train noise levels at residential areas off-site.

The trains could potentially remove up to 330 trucks from the roadway network. Overall maximum noise levels from semi-trucks on local roadways is comparable to maximum noise levels from slow-moving freight trains. A key difference is the duration of the pass-by event, the number of the pass-by events, and when those events occur. Other important distinctions include the duration of the pass-by, the number of the pass-by events, and when those pass-bys occur.

Eliminating up to 330 heavy truck pass-bys throughout the day and night would reduce noise levels on noise-sensitive lands throughout the roadway network. Adding two new trains per day would increase noise at noise-sensitive lands near the proposed industrial turnout during two train pass-bys per day. The net effect would be a reduction in the areal extent of transportation-related noise and a reduction in the amount of time the noise events occur, thus reducing the overall Project-related noise exposure.

However, as discussed under the proposed Project, truck traffic on site would still be anticipated to generate noise levels that exceed maximum permissible noise levels at Class A noise environments (i.e., Van Lierop Park and nearby residential zones); therefore, implementation of N-3 would be required.

Alternative 2 – Reduced Intensity Alternative

Alternative 2 considers the potential impacts that would result if the mitigation measures that reduce the site footprint of the facility (AES-2, LU-1, REC-1, and SW-4) as outlined in this EIS for the proposed Project) were adopted by the Applicant. As noted below, Alternative 2 would still require Project implementation mitigation measures to reduce noise impacts.

Construction Impacts

Mitigated Significant Impact. The size and scale of the proposed development is smaller under Alternative 2; therefore, construction noise impacts associated with Alternative 2 are expected to be less than those discussed for the proposed Project. The nature of the construction noise would be similar to that of the proposed Project, but the duration of construction would be lessened.

Although daytime construction noise is exempt from regulation, the exemption is not intended to preclude requirements for implementation of BMPs to abate noise (WAC 173-60-050[6]). The Applicant and its construction contractors are required to ensure that noise from construction equipment and activities complies with applicable noise rules and minimizes the potential for annoyance/disturbance. As such, mitigation measures N-1 and N-2 would be required to minimize the potential for noise disturbance during construction activities.

Nighttime construction activities are not proposed as part of the proposed Project. If the Applicant proposes any nighttime construction work or if utility work is required at night, the Applicant will be required to manage noise emissions in accordance with local requirements. Title 6.16.060(2)(c) PCC indicates that “the public works director, or his or her designee, shall have the authority to prohibit, or to allow with or without mitigating conditions, noise that emanates from construction or related activity during evening or nighttime hours.” As such, the Applicant would be required to apply for a noise variance that should include appropriate noise minimization measures and notification of the City of Puyallup and neighboring property owners by U.S. mail no less than 5 days in advance of the proposed construction activities.

Operations Impacts

Mitigated Significant Impact. Operations impacts associated with Alternative 2 are expected to generally be similar to those discussed for proposed Project, although the number of truck movements in and out of the site under Alternative 2 would be lessened. Even with the decrease in the overall number of trucks, truck traffic on site would still be anticipated to generate noise levels that exceed maximum permissible noise levels at Class A noise environments (i.e., Van Lierop Park and nearby residential zones); therefore, implementation of N-3 would be required.

5. CUMULATIVE IMPACTS

5.1 Introduction

Cumulative impacts are effects that would result from the incremental addition of the proposed Project with other impacts from past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions that occur over time. The purpose of the cumulative impacts analysis is to ensure that decision-makers consider the full range of consequences for the proposed Project, including the Proposed Action's incremental contribution to cumulative impacts on the environment.

This section describes the scope of the cumulative impacts analysis, including the regulatory setting and analysis methods and how the effects of the proposed Project may contribute to the environmental effects of other past, present, and reasonably foreseeable future actions. Potential cumulative impacts are summarized for each resource area with the potential to be adversely affected by the proposed Project as determined in this EIS.

5.2 Regulatory Context

This cumulative impact analysis has been prepared in accordance with SEPA (RCW 43.21C), the SEPA Rules (WAC 197-11-060), and the State Environmental Policy Act Handbook (Ecology 2018a). SEPA requires cumulative impacts to be evaluated as part of environmental review per WAC 197-11-060 and 197-11-792.

5.3 Methodology

The following guidelines were used to evaluate the cumulative impacts from construction and operation of the proposed Project:

- Identify the resources with the potential to be adversely affected by the proposed Project
- Consider other actions in relation to the geographic scope of the proposed Project (i.e., those actions that would have effects in the same area as the proposed Project)
- Consider other actions in relation to the temporal period of the proposed Project (i.e., those actions that would have effects during the same time as the proposed Project)
- Rely on the best available data at the time of analysis

This cumulative impact analysis extends to the year 2030 in considering reasonably foreseeable future actions to account for future actions that can reasonably be expected to be operational in the future.

5.3.1 Study Area

The cumulative impacts study area is specific to each resource that would be adversely affected by construction and operation of the proposed Project. The study area for cumulative impacts may extend beyond the study areas for direct and indirect impacts, if necessary, to assess the incremental contribution to impacts on each resource.

5.3.2 Past and Present Actions

Since its incorporation in 1890, the City of Puyallup has experienced steady growth. In 1900, the U.S. Census indicated that Puyallup had a population of 1,884. One hundred years later, the 2000 Census showed that Puyallup had grown to 33,011 (City of Puyallup 2015a). Currently, the City has grown to include a population of 43,040. This growth has been due to both infill development within the existing City limits and annexations of the UGA. The area immediately surrounding the Project site and the surrounding community have seen recent growth. Table 5-1 presents a sample of some of the notable projects that have been constructed and are representative of the type of growth that has been occurring (Figure 5-1).

Table 5-1. Recently Completed Past Actions

Project No.	Project	Project Description
#1	Viking Warehouse Development	440,000-SF warehouse constructed on a 23-acre site to the southeast and immediately adjacent to the proposed Project.
#2	Pioneer Crossing Development	Commercial development including a grocery store and 30,000 SF of additional retail, restaurant, and service spaces at the intersection of East Pioneer Avenue and Shaw Road.
#3	Van Lierop Park	Phase 1 of Van Lierop Park opened in 2019 on the south side of the Project site along 8th Avenue Southeast.
#4	Puyallup Corporate Park (Red Dot)	Puyallup Corporate Park is a recently completed 200,000-SF warehouse located along the south side of East Main Avenue and west of 23rd Street East in Puyallup.
#5	Valley Water District New Reservoir	Valley Water District constructed a new 747,000-gallon water reservoir and booster pump station, infrastructure, and associated utility improvements including a combination wetpond/detention facility on a 1.93-acre site. The site is located at 1200 St. Andrews Court in Puyallup.
#6	Vision Quest	1.6-acre commercial use building along with the associated grading activities, paved parking, stormwater facility, water and sanitary sewer extensions, landscaping, roadway improvements, and franchise utility extensions.

5.3.3 Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions were considered in this cumulative impact analysis if they met at least one of the following criteria:

- Projects are currently within the planning stage and have funding secured for the action.
- Projects are currently undergoing SEPA review.
- Projects have completed the SEPA process and review is in another permitting phase.

Table 5-2 presents the reasonably foreseeable future actions found in the study area (Figure 5-1).

Table 5-2. Reasonably Foreseeable Future Actions

Project No.	Project	Opening Year	Project Description
#1	East Town Crossing	2024-2025	The proposed multi-family development project (Parcels 0420264021, 0420264053, 0420264054, 0420351066, 0420351030, 0420351029, and 0420351026) is located at the southeast corner of Shaw Road and East Pioneer Avenue in Puyallup, WA 98372. It would include 193 multi-family residential units.
#2	Prologis Park Edgewood	2026	Prologis purchased a 45-acre property at 8819 Valley Avenue East in March 2021. The proposed development would feature four warehouses with about 885,000 total square feet of space.
#3	Shaw Heights Housing Development	2024	Proposed development of a 7.6-acre site at the corner 122nd Street East and Shaw Road East. Development would consist of 20 single-family detached lots and 100 townhome lots.
#4	Sound Transit Sumner Parking Garage	2024	Construction of a parking garage for the Sound Transit Sumner Station with up to 627 stalls at the corner of Narrow Street and Harrison Street in Sumner, Washington.
#5	Normandy Heights Subdivision	2024	Proposal is a new single-family residential subdivision at Crystal Ridge/23rd Avenue and Shaw Road. Preliminary plat proposing 20 lots on approximately 7.35 acres.
#6	Pierce College STEM Building	2024	54,000-SF college campus STEM education building at Pierce College Puyallup.

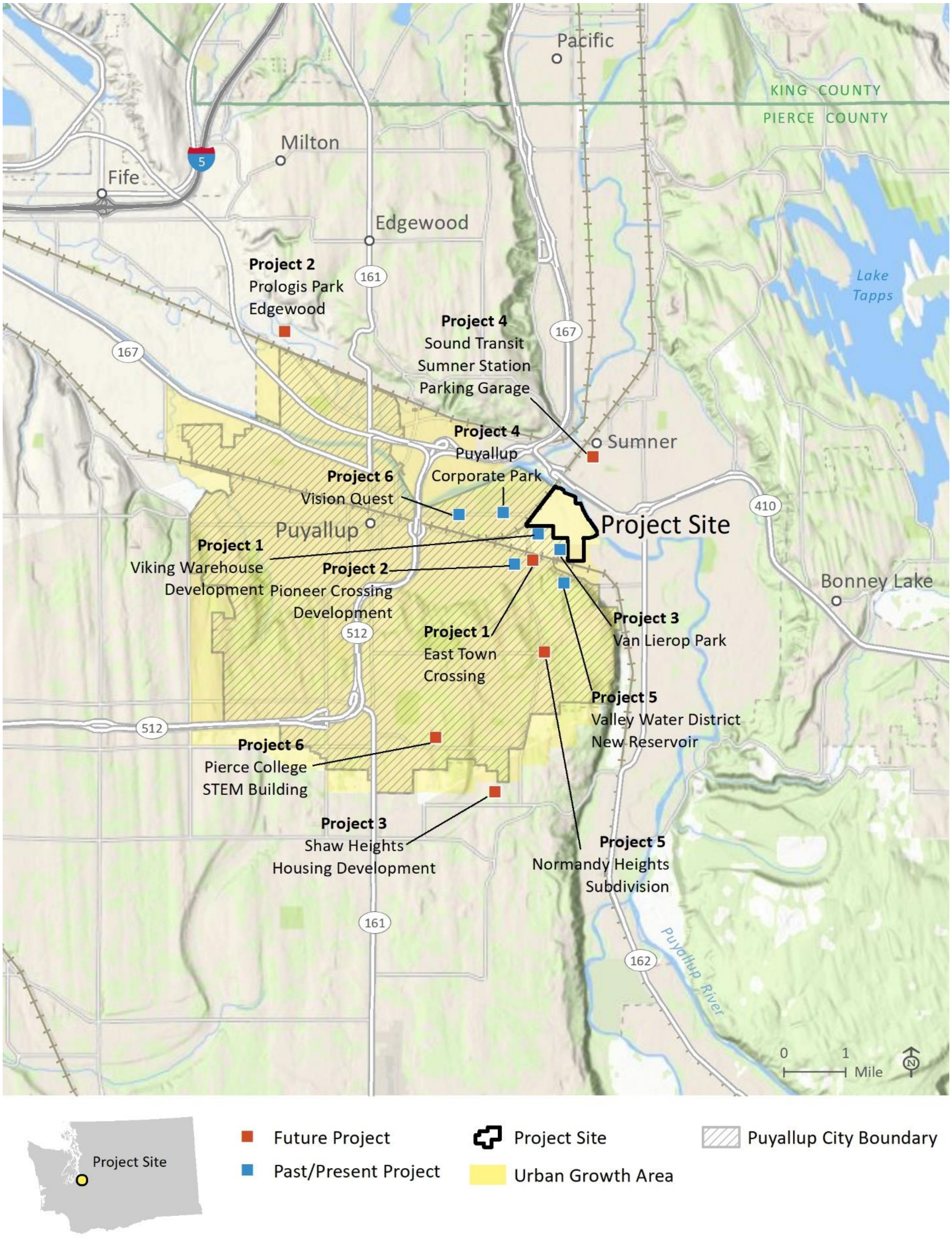


Figure 5-1. Representative Past and Present Projects and Reasonably Foreseeable Future Projects

5.4 Cumulative Impacts Analysis

This section includes a description of the following for each resource with the potential to have cumulative impacts:

- Review of probable adverse impacts on the resource from the proposed Project
- The impacts from reasonably foreseeable future actions that may contribute to cumulative impacts
- Any cumulative impacts resulting when the adverse impacts from the reasonably foreseeable future actions are considered with the impacts from the Proposed Project

Table 5-3 identifies the resource areas studied in EIS and whether the Proposed Project would result in adverse impacts on the resource area and potentially contribute to cumulative effects. Assessments of cumulative impacts for these resources were conducted qualitatively. If the Proposed Project would not result in adverse impacts on a resource area, then it would not have the potential to contribute to cumulative impacts in that resource area, and no cumulative analysis for the resource area is warranted.

Table 5-3. Cumulative Impacts Analysis

Section Number	Resource	Summary of Impacts from Proposed Project or Alternatives	Impacts from Past, Present, and Reasonably Foreseeable Future Actions	Potential Cumulative Impacts
4.1	Earth Resources	Construction would impact surface geology, topography, and soils within the Project site. A long-term loss of soil productivity and quality would occur in association with permanent Project facilities and infrastructure. Geologic hazards in the Project site, including earthquakes, erosion hazards, and volcanic hazards could disrupt construction and operations activities, damage equipment, existing utilities and expose construction workers, established infrastructure and employees to outcomes of those risks.	Past and present actions in the study area have contributed to a loss of soil productivity, soil quality, and prime farmland in the study area. Construction of the reasonably foreseeable future actions would also likely contribute to loss of soil productivity, soil quality, and prime farmland soils in association with ground disturbance and placement of permanent infrastructure and facilities. Reasonably foreseeable future actions in the Project site could experience geologic hazards, including earthquakes, erosion hazards, and volcanic hazards could disrupt construction and operations activities, damage equipment, existing utilities and expose construction workers, established infrastructure and employees to outcomes of those risks.	Geography and soil conditions vary, but future projects would also be required to adhere to the Washington state and local building codes, reducing the potential for loss of soil and erosion, and risks of the outcome of geologic hazards on people and facilities. Likewise, adherence to federal, state and local programs, requirements and policies pertaining to emergency and safety would limit the potential for injury or damage from geologic hazards. Therefore, the Proposed Project or alternatives, when considered with the potential impacts from past, present, and reasonably foreseeable future actions, would not result in cumulatively significant impacts related to soils or geologic hazards.
4.2	Surface Water	Construction and long-term operations of the Project would impact surface water systems within the Project site. A long-term reduction in water quality in the Puyallup River would occur in association with increased inputs of 6PPD-laden stormwater runoff as well as from ongoing riverbank erosion near the outfall structure.	Past and present actions in the study area have contributed to erosion at the Puyallup river bank, and ongoing impacts on water quality in the river. Ongoing farming actions have impacted wetlands and their buffers in the floodplain as well as on-site portions of Wetland D and its buffer by clearing, grading, and farming in these areas. Construction and long-term operations of the Project as currently proposed	Over time, increased erosion at the riverbank as well as increased volumes of 6PPD to the river from new stormwater inputs would result in increased impacts to surface water quality in the river. In addition, the reduction in on-site wetland hydrology volumes due to redirection of surface flows to the river is expected to result in reduction or complete loss over time of on-site wetland acreage. Therefore, the Proposed Project or alternatives, when considered with the

Section Number	Resource	Summary of Impacts from Proposed Project or Alternatives	Impacts from Past, Present, and Reasonably Foreseeable Future Actions	Potential Cumulative Impacts
		Loss of wetland acreage on site is expected over time as a result of redirecting surface water runoff to the river rather than infiltrating to groundwater (primary wetland hydrology source), and due to the proposal to fill part of Wetland D.	would increase erosion at the river bank, and would result in reduction of wetland acreage on site due to redirection of surface water to the river rather than infiltrating the majority to groundwater, as occurs under current conditions.	potential impacts from past, present, and reasonably foreseeable future actions, would result in cumulatively significant impacts related to surface water.
4.3	Groundwater	Construction and long-term operations of the Project warehouse Project would impact groundwater within the Project site. A long-term reduction in groundwater volumes below the site and in the directly adjacent floodplain would occur as a result of redirection of surface water to the stormwater outfall at the River. Because groundwater is the primary hydrology source for the on-site floodplain wetlands as well as Wetand D, loss of wetland acreage on site is expected over time as groundwater volumes are reduced.	Past and present actions from farming on the study area appear to have contributed to loss of groundwater volumes on site over time, due to surface compaction and reduction in surface infiltration potential as well as installation of surface and subsurface drainage systems. Based on historical wetland mapping, these actions may have reduced wetland acreage in the on-site floodplain over time. Three small toe slope wetlands in the floodplain and a small depressional wetland on the upper terrace have persisted to date. Construction and long-term operations of the Project as currently proposed would further decrease groundwater volumes and result in reduction of wetland acreage on site due to redirection of more surface water to the river rather than infiltrating the majority to groundwater, as occurs under current conditions. Reasonably foreseeable future impacts to warehouses and parking areas located near the proposed edge of terrace infiltration facilities could result	Over time, reduction in groundwater volumes would result in loss of wetland acreage in the floodplain as well as on the upper terrace at Wetland D. Therefore, the Proposed Project or alternatives, when considered with the potential impacts from past, present, and reasonably foreseeable future actions, would result in cumulatively significant impacts to groundwater-supported wetland system acreages, in conflict with no-net-loss policies and regulations. Changes to groundwater volume concentrations over time in relation to proposed infiltration trenches at the edge of the upper terrace may result in destabilization of the adjacent sandy steep slopes from excessive periodic hydraulic loading during winter months, with potential cumulative impacts to adjacent warehouses and parking lots.

Section Number	Resource	Summary of Impacts from Proposed Project or Alternatives	Impacts from Past, Present, and Reasonably Foreseeable Future Actions	Potential Cumulative Impacts
			from slope failure and undermining due to concentrated groundwater hydraulic loading failures in the sandy side slopes.	
4.4	Plants and Animals	Construction and long-term operations of the Project warehouse Project would impact plants and animals within and directly adjacent to the Project site. Currently, several sensitive or listed salmon species are documented as using the directly adjacent Puyallup River for various life stages habitat. Reduced water quality in the Puyallup River would result from increased inputs of 6PPD-laden stormwater runoff and from ongoing riverbank erosion near the outfall structure. These impacts would affect listed fish species in the river adjacent to the Project site. Reduction of wetland and buffer habitat acreage on site is expected over time as a result of reduced groundwater hydrology volumes (described above) and due to proposed filling of on-site portions of Wetland D and its buffer.	Past and present actions in the study area from farming (clearing, grading, planting) and loss of riverine buffer habitat from clearing and construction at the existing stormwater outfall have contributed to overall reduction of wildlife habitat on the upper terrace and lower floodplain, and have resulted in eroded sediment impacts on fish habitat and water quality at the Puyallup River bank. Ongoing farming actions have also severely impacted habitat functions of on-site portions of Wetland D and its buffer. Construction and long-term operations of the Project as currently proposed would decrease on-site wetland habitat, and increase 6PPD inputs to the river, resulting in increased salmon mortality. Ongoing erosion at the river bank would also result in negative impacts on fish habitat near and downstream from the outfall.	Over time, new additions to 6PPD in the river from new stormwater inputs would result in a cumulative increase in salmon mortality, which is precluded by federal and state law. Ongoing erosion at the river bank would also negatively impact fish habitat in the river over time. A reduction in on-site wetland and buffer habitat acreage is expected over time. Therefore, the Proposed Project or alternatives, when considered with the potential impacts from past, present, and reasonably foreseeable future actions, would result in cumulatively significant impacts on fish species in the Puyallup River, and other cumulative impacts to on-site wetland and buffer-related habitat systems.
4.5	Land and Shoreline Use	The Proposed Project or alternatives would conflict with land use plans, policies, or regulations pertaining to non-conformance of future land use	It is assumed that, due to the process of approvals and compliance with comprehensive plans and community plans, no land use inconsistencies would be present for previously developed	Land uses are anticipated to change over time because of growth. The Project, in concert with other past, present or future projects could cause unintended land use impacts such as reducing available open

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		designations. Additionally, soils classified as prime farmland would no longer be available for agricultural uses.	projects. Future actions would be required to be consistent with comprehensive plans and community plans to decrease the potential for adverse impacts.	space or contributing to development of intense land uses. As analyzed, the Project would conflict with applicable land use plans, policies and regulations adopted for the purpose of avoiding or mitigation an environmental effect. The Project and related past, present, and reasonably foreseeable future actions would be subject to the goals and policies of the General Plans, zoning codes and other planning documents of the jurisdiction at the time of permit submittals and prior to construction. Consistency with General Plans, zoning codes and other planning documents would ensure compliance and orderly development of the Project and other related cumulative projects. Like the Project, final site plans of all related cumulative projects are subject to review and approval by the governing jurisdiction at the time of permit submittal and intake approval. Therefore, the Proposed Project or alternatives, when considered with the potential impacts from past, present, and reasonably foreseeable future actions, would not result in cumulatively significant impacts related to land and shoreline use.
4.6	Recreation	The Proposed Project or alternatives would create a change to the natural environment, the built environment, and the recreational use and quality within those environments in the Project site. The Project would introduce	It is assumed that, due to the process of approvals and compliance required before construction, no shared impacts would occur to regional trails from the past or present actions. Future actions could alter of affect recreation sites include those actions	The Project could potentially cause cumulative impacts to recreation if the same recreation sites are affected; if the construction period overlaps or if future actions create an increase in use of existing recreation resources. During construction, projects that occur

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		structures and associated truck activity that would interfere with the intended uses of surrounding recreation opportunities in the area. The Project is generally inconsistent with each relevant recreation plan. the proposed pedestrian trail route being visually and physically separate from the shoreline and from trails intended to connect large community park space to the regional trail network. Additionally, the rail associated with Alternative 1 would impact the experience of the Foothills Trail users. The experience of existing recreation users would likely encounter noise from train engines both running and idling and whistles at at-grade crossings. Recreation users might experience a less safe environment as the proposed rail would cross with the East Puyallup Trailhead and Trail, the Foothills Trail, the proposed trail extension from the East Puyallup Trailhead and Trail across 80th Ave Southeast. The proposed rail line on the Project site, especially outside of Warehouse C, would conflict with the proposed pedestrian trail.	nearby that would put pressure on recreation areas from development and increased use and potential degradation of existing recreation resources.	during the same time as the Project should coordinate to work together to avoid or minimize cumulative impacts to recreation areas by limiting the duration of construction in areas that would result in the closure of recreation areas or disruption of access. The Project and other future actions would be required to reduce potential cumulative impacts through facility design, siting, and compliance with applicable permitting requirements. Therefore, the Proposed Project or alternatives, when considered with the potential impacts from past, present, and reasonably foreseeable future actions, would not result in cumulatively significant impacts related to recreation use.

Section Number	Resource	Summary of Impacts from Proposed Project or Alternatives	Impacts from Past, Present, and Reasonably Foreseeable Future Actions	Potential Cumulative Impacts
4.7	Aesthetics	The Proposed Project or Alternatives would contribute to the changing visual character of the area with increased activity and the presence of construction equipment during construction and facilities during operation; a disruption and displacement of the community's sense of place, visibility of viewer groups, including recreationists and users of Van Lierop Park, nearby residents, and the travelling public. The rail line and cars associated with Alternative 1 would introduce a more intense level of contrast in the aesthetic environment, causing the aesthetic value of the environment to change.	The Viking Warehouse Development, a past action, created a permanent change to the aesthetics resources in the study area by introducing a 440,000-square-foot warehouse in an area characterized by semi-rural/urban transition/agricultural development. Future actions that could alter or affect the aesthetic environment include those actions nearby that would create a visual change or impair aesthetic resources.	Generally, as development occurs there is an increased likelihood that the aesthetic environment can be adversely impacted. The Project, as proposed, would contribute to blocking, obscuring, and changing views in the Project site, most notably the contrast from the existing semi-rural/urban transition/agricultural environment to intense industrial. However, the Project and other future actions would be required to conform to applicable community plans, policies, and regulations regarding aesthetics and the visual character of the built environment. Therefore, the Proposed Project or alternatives, when considered with the potential impacts from past, present, and reasonably foreseeable future actions, would not likely result in cumulatively significant impacts related to aesthetics.
4.8	Air Quality and Greenhouse Gases	The Proposed Project or alternatives would generate less-than-significant impacts from construction and operations air emissions.	The air quality analysis for the Proposed Project and Alternatives accounts for existing emissions sources from past and present actions. The future actions considered in this analysis are not anticipated to result in significant air quality impacts.	Because the air quality analysis for the Proposed Project and alternatives accounts for existing conditions of past and present actions and the future actions are not anticipated to result in significant air quality impacts, it is not anticipated that a cumulative significant impact to air quality would result.
4.9	Transportation	The Proposed Project or alternatives would increase traffic demand volumes for the transportation system, resulting in an increase in congestion and a	The traffic analysis utilized the regional travel demand model and existing traffic counts to account for regional traffic demand growth. The projected future traffic demand volumes would have an	The cumulative impact of past, present, and reasonably foreseeable future actions and the Proposed Project or alternatives would result in exceeding the capacity of the major arterials within the study area. This would

Section Number	Resource	Summary of Impacts from Proposed Project or Alternatives	Impacts from Past, Present, and Reasonably Foreseeable Future Actions	Potential Cumulative Impacts
		degradation of the transportation system performance. An increase in traffic demand volumes would degrade intersection performance, exceeding acceptable delay and LOS thresholds. The increase in demand volume would also exceed the existing segmental volume-to-capacity along East Main Avenue, Shaw Road East, East Pioneer Avenue, and SR 162.	impact on the segmental volume-to-capacity and intersection performance within the study area.	result in an increase in congestion, queue lengths, and travel times.
4.10	Health and Safety	Public and occupational health and safety risks during construction of the Project or alternatives include the potential exposure to electrical and mechanical hazards for construction workers; inadvertent release of hazardous materials; and exposure to existing hazardous materials sites. The Project could result in an inadvertent release of hazardous materials during operation. In the event of an inadvertent hazardous materials release, both the physical and natural environments as well as their occupants and inhabitants could be affected; the scope and magnitude of such effects are wide-ranging and dependent on the types and quantities of the chemicals being stored, as well as proximity to receptors. As such, the risk of inadvertent release of	There are no known existing conditions in the study area that would pose a significant concern for employee or public health and safety. Construction of the reasonably foreseeable future actions in the study area would pose similar issues to health and safety as the Proposed Project and Alternatives. Except for the Prologis Park Edgewood, operation of the reasonably foreseeable future projects is not expected to generate significant health and safety impacts. As a warehouse development project, the health and safety impacts associated with Prologis Park Edgewood would be dependent on the end uses, which are unknown at this time.	The Proposed Project or alternatives, when considered with the impacts from past, present, and reasonably foreseeable future actions, is not anticipated to contribute to a cumulative impact on health and safety. While the Proposed Project or Alternatives have potential health and safety risks associated with hazardous materials storage and risks associated with the Williams Pipeline, these risks would be isolated and not additive in nature to past, present, or future projects in the study area. Similar to the proposed Project, cumulative projects would be required to analyze specific impacts related to hazards and hazardous materials as well as remediate any hazardous conditions that could occur. Additionally, they would be required to adhere to federal, state, and local laws, such as those listed in Table 4-57. Therefore, the Proposed Project or alternatives, when considered with the potential impacts from past, present, and

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		hazard materials is low; however, if there was a release, the impacts could be significant.		reasonably foreseeable future actions, would not result in cumulatively significant impacts related to health and safety.
4.11	Public Services and Utilities	Construction and operations would increase the demand on public services and utilities in the Project site, but not to a level that would permanently interfere with, or cause decreased, LOS. The Applicant would coordinate with the owners of the Williams Northwest Pipeline prior to construction on an encroachment agreement. The Project could exceed the wastewater contribution assumed in the comprehensive plan and contribute to the need for capacity improvement projects. For stormwater, the existing outfall along the Puyallup River would require further evaluation to determine if it can handle the additional flows from the Project. A significant impact may result from inappropriate or poorly functioning permanent stormwater facilities.	The public services and utilities analysis for the Proposed Project and alternatives accounts for the existing conditions for public services and utilities as it relates to past and present actions in the study area. Construction and operation of the reasonably foreseeable future actions in the study area would generate demands on public services. These future actions would be required to meet the capacity requirements of public services and utilities prior to implementation.	The Proposed Project or alternatives, when considered with the impacts from past, present, and reasonably foreseeable future actions, could contribute to a cumulative impact on sanitary sewer or stormwater services near the Project site. To the extent that the reasonably foreseeable future actions would tie into the same stormwater or sanitary sewer infrastructure, the Proposed Project or alternatives could contribute to further exceedances of the capacities of those systems. However, the impacts from the Proposed Project or alternatives would be mitigated per the mitigation measures outlined in Section 4.11. Therefore, the Proposed Project or alternatives, when considered with the potential impacts from past, present, and reasonably foreseeable future actions, are unlikely to result in cumulatively significant impacts related to public services and utilities.
4.12	Cultural Resources	No impacts on precontact or historic-period cultural materials are anticipated, as none were observed during the pedestrian survey or the auger probe subsurface survey. The Applicant	Future development has the potential for ground disturbance, which could impact cultural or archaeological. Future development could also impact additional historic resources with demolition or alterations to resources or	The Proposed Project or alternatives, when considered with the impacts from past, present, and reasonably foreseeable future actions, could contribute to a cumulative impact on cultural resources. However, the impacts from the Proposed Project or

Section Number	Resource	Summary of Impacts from Proposed Project or Alternatives	Impacts from Past, Present, and Reasonably Foreseeable Future Actions	Potential Cumulative Impacts
		would be required to prepare an unanticipated discovery plan should any cultural materials be encountered during construction. The recommended-eligible historic built environment resource is located within the ROW of 74th Street East and the northeast corner of the proposed footprint of Building D. As such, the residence and its functionally related units would be demolished and the associated farmland would be converted to new uses, which would be a significant impact. No operational impacts to archaeology resources or the recommended-eligible historic built environment resource are anticipated since it would have been demolished prior to construction.	their setting. Reasonably foreseeable future actions could contribute to cumulative impacts on historic and cultural resources. However, it is anticipated that potential impacts on these resources would be mitigated through consultation with DAHP, and affected tribes, as applicable to the type of impacted resource and as required by federal and state law.	Alternative 1 would be mitigated per the mitigation measures outlined in Section 4.11 and mitigation would be developed through consultation with DAHP, affected tribes, and local governments for impacts associated with the reasonably foreseeable future actions.
4.13	Noise	Day-time construction of the Proposed Project or alternatives would temporarily increase noise levels in the study area. Although daytime construction noise is exempt from regulation, the exemption is not intended to preclude requirements for implementation of BMPs to abate noise (WAC 173-60-050[6]). Nighttime construction activities	The noise analysis for the Proposed Project or alternatives accounts for existing emissions sources from past and present actions. Cumulative noise impacts could occur as a result of excess temporary construction and/or long-term operational noise from the combination of cumulative project noise sources. Construction noise at the reasonably foreseeable future action project sites	Cumulative projects could result in significant noise impacts related to construction and/or operations. However, these projects would be required to comply with the same regulations pertaining to noise levels and exposure to noise as the Project. Additionally, it is unlikely that all cumulative projects would result in significant operational noise impacts. Therefore, the Proposed Project or alternatives, when considered with the potential impacts from past, present, and

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		are not proposed as part of the action. Vehicle activity on the site would constitute to a significant impact on these Class A environments that would require mitigation before implementation.	would be expected to be similar to the Proposed Project or alternatives. Operational noise emissions from the reasonably foreseeable future actions would vary. The residential and commercial projects would generate some noise from vehicle traffic but are not inherently noisy land uses. Prologis Park Edgewood would likely generate similar noise emissions as the Proposed Project, related to vehicle traffic if the end use of those projects is as a distribution center.	reasonably foreseeable future actions, are not expected to result in significant cumulative noise impacts.

6. REFERENCES

AboutAmazon.com. 2021. Our Facilities. Available online: https://www.aboutamazon.com/workplace/facilities. Accessed October 5, 2021.

Ames, Kenneth M., and Herbert D.G. Maschner. 1999. *Peoples of the Northwest Coast, Their Archaeology and Prehistory*. Thames and Hudson Limited, London, England.

ANSI/ASA (American National Standards Institute/Acoustical Society of America). 2013. S12.9-2013, Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-term Measurements with an Observer Present.

Arthur, Ed. 2016. *Historic Properties Evaluation For The Proposed Pioneer Crossing Project, 2614 E. Pioneer Avenue, Puyallup, Washington*. Caldera Archaeology, Bellingham, Washington. Prepared for Mead and Hunt, Issaquah, Washington.

Baldwin, Garth, and Jennifer Chambers. 2014. *Cultural Resources Assessment for the Bridge Street Bridge Replacement Project, Sumner, Pierce County, Washington*. Drayton Archaeology, Bellingham, Washington. Prepared for Widener and Associates, Everett, Washington.

Baldwin, Garth. 2017. *A Cultural Resource Monitoring Report for the City of Sumner, Sewer System Upgrades Project, Pierce County, Washington*. Drayton Archaeology, Bellingham, Washington. Prepared for Widener and Associates, Everett, Washington.

Baldwin, Garth. 2018. *Cultural Resources Review for the SR 410 Traffic Avenue Interchange, City of Sumner, Pierce County, Washington*. Drayton Archaeology, Bellingham, Washington. Prepared for Widener and Associates, Everett, Washington.

Barbulescu, Alina, 2020, Assessing Groundwater Vulnerability: DRASTIC and DRASTIC-Like Methods: A Review, Water 2020, 12, 1356; doi:10.3390/w12051356. Available at: https://www.mdpi.com/journal/water

Barghausen Engineering Conceptual Grading and Storm Drainage Plan, stamped 03/26/2021.

Barghausen Engineering Project site survey map, stamped 03/23/2021.

Barnosky, Cathy W., Patricia M. Anderson, and Patrick J. Bartlein. 1987. The Northwestern U.S. During Deglaciation: Vegetation History and Paleoclimatic Implication. In *North America and Adjacent Oceans During the Last Deglaciation*, Vol. K-3, edited by W. F. Ruddiman and H. E. Wright, Jr., pp. 289–321. Geological Society of America, Boulder, Colorado.

Beason, Scott, Taylor Kenyon, and Robert P. Jost. 2022. 23-9 A Vanishing Landscape. Current Trends for the Glaciers of Mount Rainier National Park, Washington, USA, Geological Society of America Abstracts with Programs. Vol 54, No. 5, 2022 doi: 10.1130/abs/2022AM-381984

Becker, Paula. 2006. Pierce County — Thumbnail History. HistoryLink.org Essay 8001. Electronic document. Available at: http://www.historylink.org/File/8001. Accessed August 19, 2021.

Belcher, William R. 1985. Shellfish Utilization Among the Puget Sound Salish. *Northwest Anthropological Research Notes* 19(1):83–92. Moscow, Idaho.

Best Places. 2021. Best Places. *Puyallup, Washington Climate*. Available at: https://www.bestplaces.net/climate/city/washington/puyallup. Accessed April 9, 2021.

Blair, S.I., C.H. Barlow, and J.K. McIntyre. 2021. *Acute cerebrovascular effects in juvenile coho salmon exposed to roadway runoff.* Canadian Journal of Fisheries and Aquatic Sciences, 78(2), 103-109.

BOLA (BOLA Architecture and Planning). 2007. Puyallup Historic Survey Report for The City of Puyallup, Pierce County, and the Washington State Department of Archaeology and Historic Preservation. On file with the City of Puyallup.

Brinkmann et al. 2022. Acute Toxicity of the Tire Rubber-Derived Chemical 6PPD-quinone to Four Fishes of Commercial, Cultural, and Ecological Importance, *Environmental Science & Technology Letters* 2022 *9* (4), 333-338

Brubaker, Linda B. 1991. Climate Change and the Origin of Old-Growth Douglas-Fir Forests in the Puget Sound Lowland. In *Wildlife and Vegetation of Unmanaged Douglas-Fir Forests*, edited by Leonard F. Ruggiero, Keith B. Aubry, Andrew B. Carey, and Mark F. Huff, pp. 17–24. U. S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report PNW- GTR-286. Portland, Oregon.

Campbell, Sarah K. 1981. *The Duwamish No. 1 Site: A Lower Puget Sound Shell Midden*. Research Report 1, Office of Public Archaeology, Seattle, Washington.

Capolupo M, Sorensen L, Jayasena KDR, Booth AM, Fabbri E (2020) Chemical composition and ecotoxicity of plastic and car tire rubber leachates to aquatic organisms. Water Research, Vol. 169, February 2020, 115270 169:115270. https://doi.org/10.1016/j.watres.2019.115270

Carpenter, Cecelia Svinth. 1986. *Fort Nisqually: A Documented History of Indian and British Interaction*. Tahoma Research Publication, Tacoma, Washington.

Carpenter, Cecelia Svinth. 2002. The Nisqually, My People. *Tahoma Research Publication*, Tacoma, Washington.

Chatters, Jim, David Rhode, and Karin Hoover. 1990. Tauldad Altu (45KI59): A Prehistoric Riverine Village in Southern Puget Sound. *Archaeology in Washington* II:23–48.

Chesley, Frank. 2007. First Puyallup Daffodil Parage Chugs Out on March 17, 1934. HistoryLink.org Essay 8365. Available at: https://www.historylink.org/File/8365. Accessed August 25, 2021.

Chesley, Frank. 2008 Puyallup—Thumbnail History. HistoryLink.org Essay 8447. Available at: https://www.historylink.org/File/8447. Accessed August 19, 2021.

Chow M.I., J.I. Lundin, C.J. Mitchell, J.W. Davis, G. Young, N.L. Scholz, and J.K. McIntyre. 2019. *An urban stormwater runoff mortality syndrome in juvenile coho salmon.* Aquatic Toxicology. 2019 Sep; 214:105231. doi: 10.1016/j.aquatox.2019.105231. Epub 2019 Jun 20. PMID: 31295703.

City of Puyallup. 2012. City of Puyallup Comprehensive Storm Drainage Plan. Available at: https://www.cityofpuyallup.org/DocumentCenter/View/1246/Storm-Drainage-Plan-March-2012-PDF?bidId=

City of Puyallup. 2014a. Parks, Recreation and Open Space Plan. Available at: https://www.cityofpuyallup.org/DocumentCenter/View/1376/Parks-Recreation-and-Open-Space-Plan-Element-?bidId=

City of Puyallup. 2014b. Puyallup Shoreline Access Plan Map. Available at: https://www.cityofpuyallup.org/DocumentCenter/View/13767/Ex-12-Shoreline-Public-Access-Plan-Map

City of Puyallup. 2015. City of Puyallup Comprehensive Plan. Available at: https://www.cityofpuyallup.org/438/Comprehensive-Plan

City of Puyallup. 2023. Shoreline Master Program. Available at: https://www.cityofpuyallup.org/1407/Shoreline-Master-Program-SMP

City of Puyallup. 2016b. City of Puyallup Comprehensive Sewer Plan. Available at: https://www.cityofpuyallup.org/888/2016-Sewer-Comprehensive-Plan

City of Puyallup. 2019a. Comprehensive Plan Land Use. Available at: https://www.cityofpuyallup.org/DocumentCenter/View/2687/future_landuse_2019?bidId=

City of Puyallup. 2019b. Water Quality Report 2019. Available at: https://www.cityofpuyallup.org/DocumentCenter/View/12066/2019-Water-Quality-Report

City of Puyallup. 2020a. Municipal Code. Title 20, Zoning Code. Available at: https://www.codepublishing.com/WA/Puyallup/html/Puyallup20/Puyallup20.html

City of Puyallup. 2020b. Parks, Recreation and Open Space (PROS) Plan. March 4, 2020. Available at: https://www.cityofpuyallup.org/DocumentCenter/View/11921/Puyallup-PROS-Plan---30-March-2020

City of Puyallup. 2020c. Municipal Code. Title 14, Water and Sewers. Available at: https://www.codepublishing.com/WA/Puyallup/#!/Puyallup14/Puyallup14.html

City of Puyallup. 2021. Van Lierop Park. Available at: https://www.cityofpuyallup.org/1278/Van-Lierop-Park. Accessed August 25, 2021.

City of Tacoma. 2003. Storm Water Management Manual, Appendix I-B Water Quality Treatment Design Storm, Volume, and Flow Rate https://cms.cityoftacoma.org/enviro/Surfacewater_1/SWMM2003/V1-AppB.pdf

Cohen, Josh. 2017. Sound Transit (King, Pierce, and Snohomish counties). HistoryLink Essay No. 8002. Available at: https://www.historylink.org/File/8002. Accessed August 19, 2021.

Cole, Stephen. 2002. *Cultural Resources Investigations for the Foothills Linear ParkiTrail, McMillan to Meeker (CSM 6169)*. Northwest Archaeological Associates, Inc., Seattle, Washington. Prepared for Pierce County Public Works and Utilities, Tacoma, Washington and Entranco, Seattle, Washington.

Confluence Environmental. 2023. Viking/Puyallup stormwater outfall, mitigation action HPA – Findings and recommendations, August 14, 2023 related to fish impacts and fish habitat.

Collins, William. 1982. National Register of Historic Places Inventory-Nomination Form for the Charles W. Orton Residence. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

Cornell Lab of Ornithology. 2021. *EBird*. Available at: https://ebird.org/hotspot/L7781014. Accessed June 2021.

Crandell, D. R. 1963. Surficial geology and geomorphology of the Lake Tapps quadrangle, Washington: U.S. Geological Survey Professional Paper 388-A, 84 p., 2 plates.

DAHP (Department of Archaeology and Historic Preservation). 2021. Washington Information System for Architectural and Archaeological Records Data. Available at: www.dahp.wa.gov. Accessed August 26, 2021.

Department of the Air Force. 2019. Department of the Air Force, Headquarters Air Combat Command. Air Conformity Applicability Model, Version 5.0.17b. Available at: https://aqhelp.com/acam.html (hosted by Solutio Environmental, Inc.). Accessed May 4, 2021.

Douglas, Miguel. 2016. Puyallup Land Claims Settlement (1990). HistoryLink.org Essay 20157. Available at: http://www.historylink.org/File/20157. Accessed August 19, 2021.

Durkin, Brian, Chrisanne Beckner, and Celena McPeak. 2021. Draft—Cultural Resources Inventory Technical Report for the City of Puyallup's Knutson Farms Industrial Park Project, Puyallup, Pierce County, Washington. Prepared for HDR Engineering, Inc., Seattle, Washington.

Earthjustice. 2023. August 1, 2023, Citizen Petition under TSCA Section 21 to Prohibit 6PPD in tires. https://earthjustice.org/wp-content/uploads/2023/08/tsca-section-21-petition-to-epa-re-6ppd-in-tires.pdf

Earth Solutions NW, LLC. 2015. Preliminary Geotechnical Engineering Study Knutson Property Warehouse Distribution Development. November 2015.

Earth Solutions NW, LLC. 2018. Preliminary Infiltration Evaluation letter report, May 22, 2018.

East Pierce County Fire and Rescue. 2020. Annual Report. Available at: http://www.eastpiercefire.org/page.php?id=209

East Pierce County Fire and Rescue. 2021. Personal Communication from Chuck King. September 20, 2021.

Ecology (Washington State Department of Ecology). 2009. Selecting Wetland Mitigation Sites Using a Watershed Approach (Western Washington), Hruby, T.m K. Harper and S. Stanley, Publication #09-06-032, December 2009.

Ecology. 2016. Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State, Paul S. Anderson, Susan Meyer, Dr. Patricia Olson, Erik Stockdale, Washington State Department of Ecology Olympia, Washington March 2010, updated October 2016 Publication 16-06-029.

Ecology. 2018a. State Environmental Policy Act Handbook. 2018 Updates. Available at: https://ecology.wa.gov/DOE/files/4c/4c9fec2b-5e6f-44b5-bf13-b253e72a4ea1.pdf.

Ecology. 2018b. *2018 Washington State Greenhouse Gas Data*. Accessed at: https://ecology.wa.gov/Air-Climate/Climate-change/Greenhouse-gases/2018-Data, 29 March 2021.

Ecology. 2019. Stormwater Management Manual for Western Washington. Available at: https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMWW/2019SWMMWW.htm

Ecology. 2020. *Proposed Chehalis River Basin Flood Damage Reduction Project, SEPA Draft Environmental Impact Statement. Appendix A, Air Quality and Greenhouse Gas Discipline Report.* February 2020.

Ecology. 2021. What's in My Neighborhood? Available at: https://apps.ecology.wa.gov/neighborhood/ Accessed March 30, 2021.

Ecology. 2021a. Well Construction and Licensing database and mapping. Available at: https://appswr.ecology.wa.gov/wellconstruction/map/WCLSWebMap/WellConstructionMapSearch.aspx. Accessed May 2021.

Ecology. 2021b. "What's in My Neighborhood" hazardous waste cleanup sites mapping system. Available at: https://apps.ecology.wa.gov/neighborhood/. Accessed May 2021.

Ecology. 2021c. Source Water Assessment Program (SWAP) Mapping Application. Available at: https://fortress.wa.gov/doh/swap/index.html. Accessed May 2021.

Elliot, Patrick, and James Mayer. 2019. *Cultural Resources Assessment, 2401 Inter Avenue SE, Puyallup, Washington*. Jacobs, Bellevue, Washington. Prepared for 2401 Inter LLC.

Federal Register, Volume 63, Number 11482. March 9, 1998. Endangered and Threatened Species: Proposed Endangered Status for Two Chinook Salmon ESUs and Proposed Threatened Status for Five Chinook Salmon ESUs; Proposed Redefinition, Threatened Status, and Revision of Critical Habitat for One Chinook Salmon ESU; Proposed Designation of Chinook Salmon Critical Habitat in California, Oregon, Washington, Idaho.

Federal Register, Volume 64, Number 210. November 1, 1999. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for Bull Trout in the Coterminous United States; Final Rule. Notice of Intent to Prepare a Proposed Special Rule Pursuant to Section 4(d) of the Endangered Species Act for the Bull Trout; Proposed Rule.

Federal Register, Volume 64, Number 57. March 25, 1999. Endangered and Threatened Species: Threatened Status for Two ESUs of Steelhead in Washington and Oregon.

Federal Register, Volume 65, Number 7764. March 03, 2000. Critical habitat designation for 19 evolutionary significant units of salmon and steelhead in Washington, Oregon, Idaho, and California; Final Rule.

Federal Register, Volume 70, Number 170. September 2, 2005. Endangered and Threatened Species; Designation of Critical Habitat for 12 Evolutionarily Significant Units of west Coast salmon and Steelhead in Washington, Oregon, and Idaho: Final Rule.

Federal Register, Volume 70, Number 185. September 26, 2005. Endangered and Threatened wildlife and Plants: Designation of Critical Habitat for the Bull Trout; Final Rule.

Federal Register, Volume 81, Number 9251. March 25, 2016. Endangered and Threatened Species; Designation of Critical Habitat for Lower Columbia River Coho Salmon and Puget Sound Steelhead; Final Rule.

Federal Register, Volume 72, Number 91. Friday, May 11, 2007. Endangered and Threatened Species: Final Listing Determination for Puget Sound Steelhead

Feist, B.E., E.R. Buhle, P. Arnold, J.W. Davis, and N.L. Scholz. 2011. Landscape Ecotoxicology of Coho Salmon Spawner Mortality in Urban Streams. *PLoS ONE* 6(8): e23424. doi:10.1371/journal.pone.0023424

Feist, B.E., E.R. Buhle, D.H. Baldwin, J.A. Spromberg, S.E. Damm, J.W. David, and N.L. Scholz. 2017. Roads to ruin: conservation threats to a sentinel species across an urban gradient. *Ecological Applications* 27(8), 2017, pp.2382–2396.

FEMA (Federal Emergency Management Agency). Undated. Map Service Center. Available at: https://msc.fema.gov/portal/search?AddressQuery=Puyallup%2C%20WA#searchresultsanchor. Accessed 05/2021.

FEMA. 2012. Floodplain Management and the Endangered Species Act A Model Ordinance January 2012 Region 10 Available at: https://www.fema.gov/pdf/about/regions/regionx/nfip_esa_faq/nfip_esa_model_ordinance_final.pdf

FHWA (Federal Highway Administration). 2006. Construction Noise Handbook, FHWA-HEP-06-015. Available at: https://www.fhwa.dot.gov/Environment/noise/construction_noise/handbook/

FHWA (Federal Highway Administration). 2014. *Traffic Monitoring Guide*. Appendix C, Vehicle Types. Policy and Governmental Affairs, Office of Highway Policy Information. Available at: https://www.fhwa.dot.gov/policyinformation/tmguide/tmg_2013/vehicle-types.cfm.

Fiset, Louis. 2008. Camp Harmony (Puyallup Assembly Center), 1942. HistoryLink.org Essay 8748. Available at: https://www.historylink.org/File/8748. Accessed August 19, 2021.

Flenniken, Jeffery, and Pam Trautman. 2015. *Cultural Resource Survey, Puget Sound Energy, Alderton to White River, Pierce 230kV Expansion, Transmission Project Pierce County, Washington*. Lithic Analysts, Silverthorne, Washington. Prepared GeoEngineers, Inc., Tacoma and Puget Sound Energy, Tacoma, Washington.

Franklin, J.F., and C.T. Dyrness. 1973. Natural Vegetation of Oregon and Washington. USDA Forest Service, General Technical Report PNW-8, Washington, DC.

Geoengineers. 2003. Geomorphic Evaluation and Channel Migration Zone Analysis Puyallup, Carbon and White Rivers for Pierce County Public Works and Utilities Environmental Services, Water Programs Division June 19, 2003, Geoengineers File No. 2998-006-00\061903.

Gill, Matthew, and Margaret Berger. 2007. *Cultural Resources Survey for the Shaw Road Extension Project. Pierce County, Washington*. Cultural Resources Consultants, Inc., Bainbridge Island, Washington. Prepared for Parametrix, Inc., Puyallup, Washington.

Gunther, Erna. 1945. Ethnobotany of Western Washington. *University of Washington Publications in Anthropology* 10(1):1–62. Seattle.

Haeberlin, Herman K., and Erna Gunther. 1930. *The Indians of Puget Sound*. University of Washington Press, Seattle.

Hartmann, Glenn. 2010. *Letter to Charles "Ted" Hill RE: Cultural Resources Assessment for the White River Trail (Confluence to Bridge St) Project, Sumner, Pierce Country, WA*. Cultural Resources Consultants, Inc., Bainbridge Island, Washington. Prepared for City of Sumner.

HDR. 2021. City of Puyallup Knutson Farms Environmental Impact Statement, Rail Mitigation Analysis – Rail Concepts Memo, V2; October 25, 2021.

HDR. 2022. *Project-related vehicle noise analysis.* HDR Engineering.Hilbert, Vi, Jay Miller, and Zalmai Zahir. 2001. *Puget Sound Geography: Original Manuscript from T. T. Waterman*. Edited with additional material from Vi Hilbert, Jay Miller, and Zalmai Zahir. Lushootseed Press, Seattle, Washington.

Hilbert, Vi, Jay Miller, and Zalmai Zahir. 2001. *Puget Sound Geography: Original Manuscript from T. T. Waterman*. Edited with additional material from Vi Hilbert, Jay Miller, and Zalmai Zahir. Lushootseed Press, Seattle, Washington.

ITE (Institute of Transportation Engineers). 2021. *Trip General Manual, 11th edition*. Available at: https://www.ite.org/pub/?id=FB8FA48B-9560-D85F-56A4-5A6F8CD1A9CF.

Johannessen, C., P. Helm, B. Lashuk, *et al.* 2022. The Tire Wear Compounds 6PPD-Quinone and 1,3-Diphenylguanidine in an Urban Watershed. *Archives of Environmental Contamination and Toxicology, Vol.* 82, pp. 171–179. https://doi.org/10.1007/s00244-021-00878-4

Jorgensen J.C., C. Nicol, C. Fogel, and T.J. Beechie. 2021. Identifying the potential of anadromous salmonid habitat restoration with life cycle models. PLoS ONE 16(9): e0256792. https://doi.org/10.1371/journal.pone.0256792

Kahn, Farhan R., Louise Lynn Halle, and Annemette Palmqvist. 2019. Acute and long-term toxicity of micronized car tire wear particles to Hyalella Azteca. Journal of Aquatic Toxicology, Vol. 213, August 2019, 105216. https://doi.org/10.1016/j.aquatox.2019.05.018

Kopperl, Robert, Charles Hodges, Christian Miss, Johonna Shea, and Alecia Spooner. 2016. *Archaeology of King County, Washington: A Context Statement for Native American Archaeological Resources*. SWCA Environmental Consultants, Seattle, Washington. Prepared for the King County Historic Preservation Program, Seattle, Washington.

Kruckeberg, Arthur R. 1991. *The Natural History of Puget Sound Country*. University of Washington Press, Seattle.

Larrison, Earl J. 1967. *Mammals of the Northwest: Washington, Oregon, Idaho, and British Columbia*. Seattle Audubon Society, Seattle, Washington.

Larson, Lynn L., and Dennis E. Lewarch (editors). 1995. *The Archaeology of West Point, Seattle, Washington: 4,000 Years of Hunter-Fisher-Gatherer Land Use in Southern Puget Sound Volume 1, Parts 1 and 2*. Larson Anthropological Archaeological Services, Ltd., Seattle, Washington. Prepared for King County Department of Metropolitan Services, Seattle, Washington. Submitted to CH2M Hill, Bellevue, Washington. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

Lilja, Bob. 2017. Hazardous Material Storage: Frequently Asked Questions. Available at: https://www.weberlogistics.com/blog/california-logistics-blog/hazardous-material-storage-faq. Accessed September 1, 2021.

Livingood-Schott, T, and J.P. Losee. 2016. *Research and Monitoring of Adult Oncorhynchus mykiss in the Puyallup and White rivers.* Washington Department of Fish and Wildlife. Olympia, WA.

McClintock, Robin, Aaron Fergusson, and Julie Witt. 2013. *Northwest Pipeline GP Washington Expansion Project Cultural Resources Overview and Survey Report*. CH2MHILL, Bellevue, Washington. Prepared for Williams Northwest Pipeline GP.

McClintock, Robin, Julie Wilt, Jennifer Gilpin, Carol Schultze, Jenny Dellert, and Jordan Pickrell. 2014. *Northwest Pipeline LLC Washington Expansion Project - Addendum to Cultural Resources Overview and Survey Report: Survey of Highway 410 Reroute and Temporary Extra Workspace Areas and Easements*. CH2MHILL, Bellevue, Washington and HRA, Inc., Seattle, Washington. Prepared for Williams Northwest Pipeline GP.

McIntyre, J. 2021. Salmon Safe Webinar: Car Tires & Salmon Health: Exploring New Research on Stormwater Impacts. Frasier Basin Council. Available at: https://www.youtube.com/watch?v=_xk3-Luiiw . Accessed May 2021.

McIntyre, Dr. J. 2020. Personal communication related to effective treatments that can be used to remove or reduce 6PPD in stormwater, 2020.

McIntyre, J., and E. Kolodjiez. 2021. Technical Q+A on Stormwater and Tire Chemical Toxicity to Aquatic Organisms. Puyallup, WA: Washington Stormwater Center.

McIntyre, Jenifer. 2021. Salmon Safe Webinar: Car Tires & Salmon Health: Exploring New Research on Stormwater Impacts. Frasier Basin Council. Accessed 05/2021. https://www.youtube.com/watch?v=_xk3-Luiimw

Metsker (Metsker, Chas. F.). 1951. Page 028 - Township 20 N., Range 4 E., Puyallup, Sumner, Firwood, Milton, Alderton, Arden, McAleer. Metsker Maps, Seattle, Washington. Available at: http://www.historicmapworks.com, accessed August 25, 2021.

Metsker. 1960. Page 079 - Sumner, alderton, Puyallup, No. Puyallup, Puyallup River. Metsker Maps, Seattle, Washington. Available at: http://www.historicmapworks.com, accessed August 25, 2021.

Metsker. 1965. Township 20 North - Range 4 East., Edgewood, Stuck River - Page 080. Electronic document. Available at: http://www.historicmapworks.com. Accessed August 25, 2021.

Mueller, Andrew. 2016. *River Grove Levee Cultural Survey, PUY-04-16*. U.S. Army Corps of Engineers, Seattle District.

NETROnline. 2021. Historic Aerials: Puyallup, Washington. Electronic document. Available at: https://www.historicaerials.com/viewer. Accessed August 25, 2021.

NHC. 2023. Memorandum: Viking Warehouse Facility Stormwater Outfall HPA Mitigation Action Assessment, by Jeremy Payne, Hydraulic Engineer and Vaughn Collins, P.E., Principal Hydraulic Engineer, June 28, 2023.

NHC and SCJ. 2023., Viking Warehouse Facility Stormwater Outfall Deficiencies Report. Prepared for the City of Puyallup, February 2023.

NMFS (National Marine Fisheries Service). 1995. Status Review of Coho Salmon from Washington, Oregon, and California.

NMFS. 1998. Factors contributing to the decline of Chinook salmon: an addendum to the 1996 west coast steelhead factors for decline report. Protect Resources Division, Portland, OR.

NMFS. 1999. Endangered and threatened species; threatened status for three Chinook salmon evolutionarily significant units (ESUs) in Washington and Oregon, and endangered status for one Chinook salmon ESU in Washington. Final Rule. March 24, 1999. *Federal Register* 64(56):14308-14328.

NMFS. 2019. ESA Recovery Plan for the Puget Sound Steelhead Distinct Population Segment (Oncorhynchus mykiss). National Marine Fisheries Service. Seattle, WA.

NMFS (National Marine Fisheries Service), NOAA (National Oceanic and Atmospheric Administration), Commerce. 2008. Final Rule to Implement Essential Fish Habitat (EFH), Fisheries Off West Coast States; West Coast Salmon Fisheries; Amendment 14; Federal Register 11/14/2008, Document 73 FR 60987, pages 60987-60994.

NOAA (National Oceanic and Atmospheric Administration). 1995. Endangered and Threatened Species; Proposed Threatened Status for Three Contiguous ESUs of Coho Salmon Ranging from Oregon Through Central California. 38011-38031.

NOAA. 2021. Protected Resources App. Available at: https://www.fisheries.noaa.gov/resource/map/protected-resources-app. Accessed April 2021.

NOAA. 2021a. *Critical Habitat - Salmon and Steelhead (all West Coast) Maps and GIS data*. Accessed 04/2021. https://www.fisheries.noaa.gov/resource/map/critical-habitat-salmon-and-steelhead-all-west-coast

NOAA. 2021b. *Essential Fish Habitat Mapper.* Accessed 04/2021. https://www.habitat.noaa.gov/apps/efhmapper/

NPMS (U.S. Department of Transportation National Pipeline Mapping System). 2021. Public Viewer. Available at: https://pvnpms.phmsa.dot.gov/PublicViewer/. Accessed March 29, 2021.

NPS (National Park Service). 1997. *National Register Bulletin: How to Apply the National Register Criteria for Evaluation*. Available at: http://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_2.htm. Accessed August 27, 2021.

NRCS (Natural Resources Conservation Service). 2020. Web Soil Survey Map. Available at: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed August 24, 2021.

NRCS, AgACIS (Pierce County). 2021. – WETS Station: TACOMA NO. 1, WA, Requested years: 1971 – 2021. Available at: https://www.wcc.nrcs.usda.gov/climate/navigate_wets.htm?state=wa -- http://agacis.rcc-acis.org/?fips=53053

Orr, William N., and Elizabeth L. Orr. 2002. *Geology of the Pacific Northwest.* Second Edition. Waveland Press, Incorporated, Long Grove, Illinois.

OSHA (Occupational Safety and Health Administration). 2020. 1910.38 - Emergency action plans. Available at: https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.38

Ott, Jennifer. 2016. King and Pierce County Commissioners Form the Inter-County River Improvement Commission on January 19, 1914. HistoryLink.org Essay 20233. Available at: http://www.historylink.org/File/20233. Accessed August 19, 2021.

Paton, Courtney, and Marsha Hanson. 2016. State of Washington Archaeological Site Inventory Form for 45PI1415. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

PCSD (Pierce County Sheriff's Department). 2021. Personal Communication from Micah Lundborg. September 17, 2021.

PFMC (Pacific Fishery Management Council). 2020. *Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery.* Portland, OR. Available at: https://www.pcouncil.org/documents/2016/08/pacific-coast-groundfish-fishery-management-plan.pdf/.

Pielou, Evelyn C. 2008. *After the Ice Age: The Return of Life to Glaciated North America*. University of Chicago Press, Chicago, Illinois.

Pierce County (Puyallup and Chambers Watersheds Salmon Recovery Lead Entity). 2018. *Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.* Available at: https://www.piercecountywa.gov/ArchiveCenter/ViewFile/Item/6075.

Pierce County. Undated. Aquifer Recharge Areas mapping. Available at: https://gisdata-piercecowa.opendata.arcgis.com/datasets/aquifer-recharge-areas?selectedAttribute=NAME. Accessed May 2021.

Pierce County DEM (Department of Emergency Management). 2015. *Pierce County Hazard Identification and Risk Assessment*. Available at:

https://www.piercecountywa.gov/DocumentCenter/View/7032/HIRA?bidId=. Accessed September 1, 2021.

Pierce County Public Works Department. 2013. Pierce County Rivers Flood Hazard Management Plan. Available at: https://www.piercecountywa.org/ArchiveCenter/ViewFile/Item/375. Accessed August 19, 2021.

Pierce County. 2007. Alderton-McMillin Community Plan. Available at: https://wa-piercecounty2.civicplus.com/DocumentCenter/View/38494/ADOPTED-Alderton-McMillin-Community-Plan?bidId=

Pierce County. 2008a. Mount Rainier Volcanic Hazards Plan. Available online: https://volcanoes.usgs.gov/vsc/file_mngr/file-130/Mt%20Rainier%20Volcanic%20Hazards%20Plan%2010-2008_201208170931311140.pdf

Pierce County. 2008b. Pierce County Parks, Recreation and Open Space Plan. Available at: https://www.co.pierce.wa.us/DocumentCenter/View/4992/final_pros_122909?bidId=

Pierce County. 2013. Rivers Flood Hazard Management Plan, Volume II – Appendices, Adopted February 19, 2013 Ordinance 2012-53s. Available at: https://www.piercecountywa.gov/ArchiveCenter/ViewFile/Item/374

Pierce County. 2013. Rivers Flood Hazard Management Plan, Volume I, Adopted February 19, 2013 Ordinance 2012-53s. Available at: https://www.piercecountywa.gov/ArchiveCenter/ViewFile/Item/375

Pierce County. 2014. Puyallup Watershed Assessment (Draft) 2014, prepared by the Puyallup River Watershed Council. Available at: https://www.piercecountywa.gov/DocumentCenter/View/70562/Puyallup-Watershed-Assessment-Oct-2014

Pierce County. 2016. 2016 Supplement to the 2000 Tacoma-Pierce County Solid Waste Management Plan. Available at: https://www.piercecountywa.gov/DocumentCenter/View/61988/2016-Supplement_and-Appendices?bidId=

Pierce County (Puyallup and Chambers Watersheds Salmon Recovery Lead Entity). 2018. *Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.* https://www.piercecountywa.gov/ArchiveCenter/ViewFile/Item/6075

Pierce County. 2018a. Rivers Flood Hazard Management Plan Vol. 1. 2018 Update. Available at: https://www.piercecountywa.org/ArchiveCenter/ViewFile/Item/5950. Accessed March 29, 2021.

Pierce County. 2018b. Shoreline Master Program. Pierce County Code Title 18S. Available at: https://www.codepublishing.com/WA/PierceCounty/#!/html/PierceCounty18S/PierceCounty18S.html

Pierce County. 2019a. Pierce County Land Use Map. Available at: https://www.co.pierce.wa.us/DocumentCenter/View/66137/Comprehensive-Plan-Land-Use-Designations

Pierce County. 2019b. Pierce County Zoning Map. Available at: https://www.co.pierce.wa.us/DocumentCenter/View/66134/County-Zoning

Pierce County. 2019c. Pierce County Hazard Identification and Risk Assessment. Pipeline Hazards.

Pierce County. 2020. Hazard Mitigation Plan. Available online at: https://www.piercecountywa.gov/6310/Hazard-Mitigation-Plan.

Pierce County. 2022. Stormwater Management Plan, 2020. Available at: 2022-SWMP (piercecountywa.gov)

Pierce County. 2020b. Comprehensive Emergency Management Plan. 2020 Edition. Available at: https://www.piercecountywa.gov/DocumentCenter/View/89989/Basic-Plan. Accessed September 1, 2021.

Pierce County. 2020c. Pierce County Capital Facilities Plan. Available at: https://www.piercecountywa.gov/DocumentCenter/View/45110/Capital-Facilities-Plan-2020-2025-Final?bidId=

Pierce County. 2021a. Pierce County Zoning Code, Title 18, Development Regulations. Available at: https://www.codepublishing.com/WA/PierceCounty/#!/html/PierceCounty18/PierceCounty18.html

Pierce County. 2021b. Stormwater Management and Site Development Manual. Available at: https://www.piercecountywa.gov/2969/Stormwater-Site-Development-Manual

Pierce County. 2021c. Pierce County Register of Historic Places. Available at: https://www.piercecountywa.gov/5938/Landmarks-and-Historic-Preservation. Accessed September 7, 2021.

Pierce County. 2021d. Pierce County Comprehensive Plan. Available at: https://www.piercecountywa.gov/DocumentCenter/View/38259/ADOPTED-Comprehensive-Plan-with-Community-Plans-Effective-10-1-2021

Pierce County. 2022. Landslide Hazard Areas. Pierce County WA Open Spatial Data Portal (v2.1). Updated August 4, 2022.

Pierce County. Undated. Foothills Trail. Available: https://www.piercecountywa.org/1384/Foothills-Trail

Pierce County. Undated. Water Service Purveyors map system Available at: https://gisdata-piercecowa.opendata.arcgis.com/datasets/4fd38edddf2449abab6dc86a2c76c61d_0

Pierce County. Undated. Aquifer Recharge Areas mapping (https://gisdata-piercecowa.opendata.arcgis.com/datasets/aquifer-recharge-areas/api) Accessed 03/2023.

Pierce County Office of the Hearing Examiner, July 11, 2018, The Puyallup Tribe of Indians vs. Director, Pierce Co. Public Works and Knutsen Farms, Inc., Running Bear development Partners LLC, and Barghausen Consulting Engineers, Inc. Joint Stipulated Motion to Dismiss the Puyallup Tribe's Appeal (case no. 863309).

Pierce County Office of the Hearing Examiner, November 21, 2018, Administrative Appeal of the Knutson Preliminary Short Plat, Application Number: 863849.

Pierce County Office of the Hearing Examiner, November 21, 2018, Environmental Appeal of the Knutson Farms Industrial Project, Application Numbers: 863849 (City of Puyallup) and 863309 (Puyallup Tribe of Indians).

Pierce County Office of the Hearing Examiner, November 21, 2018, Shoreline Substantial Development Permit SD36-14, Application number 792213.

Pierce County Staff Report, Shoreline Substantial Development Permit: SD36-14 Knutson Application Number: 792213, November 2018.

Plummer, Frederick. 1889. Township 20 North Range 4 East. Pierce County 1889. Frederick G. Plummer. Available at: www.historicmapworks.com. Accessed August 25, 2021.

PNSN (Pacific Northwest Seismic Network). 2021. Cascadia Subduction Zone. Available at: https://pnsn.org/outreach/earthquakesources/csz. Accessed March 29, 2021.

Pojar, Jim, and Andy Mackinnon. 2004. *Revised Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, and Alaska*. B.C. Ministry of Forests and Lone Pine Publishing, Vancouver, British Columbia, Canada.

Porter, Stephen C., and Terry W. Swanson. 1998. Radiocarbon Age Constraints on Rates of Advance and Retreat of the Puget Lobe of the Cordilleran Ice Sheet during the Last Glaciation. *Quaternary Research* 50:205–213.

Price, Lori, and Ruth Anderson. 2002. *Puyallup, A Pioneer Paradise*. Arcadia Publishing, Charleston, South Carolina.

PRWC (Puyallup River Watershed Council). 2014. *Puyallup River Watershed Assessment (Draft).*

PSCAA (Puget Sound Clean Air Agency). 2019. *Puget Sound Clean Air Agency, Air Quality Data Summary for 2019*. Accessed at: https://pscleanair.gov/629/2019-Data-Summary, 26 March 2021.

PSE (Puget Sound Energy). 2021. Personal Communication from Jeff Payne. September 16, 2021.

PSI (Puget Sound Institute). 2021. Puget Sound Institute, University of Washington, Tacoma. *New Report Describes Anticipated Climate-Change Effects in Washington State.* Available at: https://www.pugetsoundinstitute.org/2020/02/new-report-describes-anticipated-climate-change-effects-in-washington-state/. Accessed April 9, 2021.

Puget Soundkeepers. 2022. Blog, June 2022, Puget Sound Municipalities Fail to Address 6PPD-quinone, Putting Salmon At Risk, https://pugetsoundkeeper.org/2022/06/16/6ppd-mukilteo-burien-seatac-normandy-park-seattle/

Puyallup Tribe of Indians. 2016. *Climate Change Impact Assessment and Adaptation Options*. Prepared by Cascadia Consulting Group.

Rau, J.G., and D.C. Wooten. 1980. Environmental Impact Analysis Handbook. McGraw-Hill: New York, NY.

Richardson, R., and M.A. Reinhart, Mary Ann (Geoengineers). 2008. Levee Setback Feasibility Analysis, Puyallup River Watershed, Pierce County, Washington June 19, 2008 for Pierce County Public Works & Utilities, Geoengineers File No. 2998-012-00.

Riegel, Scott, and Kyle Campbell. 2015. *Preliminary Geotechnical Engineering Study Knutson Property Warehouse Distribution Development Pierce County, Washington*. Earth Solutions NW, LLC, Bellevue, Washington. Prepared for Michelson Commercial Realty and Development.

Robertson, Donald R. 1995. *Encyclopedia of Western Railroad History*, Volume III: Oregon and Washington. Caxton Printers, Ltd., Caldwell, Idaho.

Rodrick, E. and R. Milner, eds. 1991. *Management Recommendations for Washington's Priority Habitats and Species.* Washington Department of Wildlife, Olympia, WA.

Schuster, J.E., A.A. Cabibbo, J.F. Schilter, and I.J. Hubert. 2015. Geologic map of the Tacoma 1:100,000-scale quadrangle, Washington, Washington Division of Geology and Earth Resources, Map Series 2015-03, 1:100,000

SCJ Alliance. 2021. Knutsen Farms Industrial Park Wetland D Report, prepared in support of City of Puyallup EIS.

Seattle Times. 1992. Bloom is Off Daffodil Farming—Puyallup's Proud Festival Symbol Being Plowed Under By Growth. April 3.

Shong, Michael, and Christian Miss. 2003. *Heritage Resources Investigations for the City Of Puyallup Riverfront Trail Project-Phase 2 (Sr 512 To East Main) Pierce County, Washington*. Northwest Archaeological Associates, Inc., Seattle, Washington. Prepared for Perteet Engineering, Lakewood, Washington.

Smith, Marion W. 1940. *The Puyallup-Nisqually.* Columbia University Press, New York.

Soundview Consultants. 2016. Critical Areas Assessment Report, Knutsen Farms Industrial Park, prepared for Running Bear Development Partners, LLC, December 2016.

Soundview Consultants. 2017. Letter addressed to Russ Ladley, Puyallup Tribal Fisheries regarding Knutson Farms Industrial Park-- Puyallup Tribe Water Quality and Habitat Concerns, November 29, 2017.

Soundview Consultants. 2018. Letter addressed to Dennis Hanberg, Director of Planning, Pierce Co, regarding rebuttal of Peter Eglick November 2016 letter; Puyallup Tribal Appeal; and Muckleshoot Tribal appeal, February 2, 2018.

Soundview Consultants. 2020. Technical Memorandum As-Built Report and Post-Construction Baseline, File number 1412.0001-B, October 21, 2020.

Soundview Consultants. 2022. Year 1 and 2 Monitoring Report, Viking JV, LLC Outfall, December 2022.

Soundview Consultants. 2023. Technical Memorandum re: Viking Outfall Spring Maintenance Actions, File # 1412.0001, addressed to Scott Sissons, Pierce County, May 5, 2023.

Sprecher, S.W., and A. G. Warne. 2000. Accessing and using meteorological data to evaluate wetland hydrology. U.S. Army Corps of Engineers, Engineer Research and Development Center, Vicksburg, MS, USA. ERDC/EL TR-WRAP-00-01.

StreamNet. 2021. *StreamNet Mapper.* Produced by The Pacific States Marine Fisheries Commission. Available at: https://www.streamnet.org/data/interactive-maps-and-gis-data/. Accessed April 2021.

Suttles, Wayne, and Barbara Lane. 1990. Southern Coast Salish. In *Northwest Coast*, edited by Wayne Suttles, pp. 485–502. Handbook of North American Indians, Vol. 7, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.

Suttles, Wayne. 1990. Environment. In *Northwest Coast*, edited by Wayne Suttles, pp. 16–29. Handbook of North American Indians, Vol. 7, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.

SVC (Soundview Consultants LLC). 2016. Critical Areas Assessment Report – Knutson Farms Industrial Park. Gig Harbor, WA.

SVC. 2020a. 2020 Mitigation Monitoring Technical Memo.

SVC. 2020b. Technical Memorandum As-Built Report and Post-Construction Baseline, File number 1412.0001-B.

Talasea Consultants, Inc. 2017. *Biological Evaluation – Van Lierop Property Stormwater Outfall Project.* Woodinville, WA.

Talasea Consultants, Inc. 2018. Detailed Mitigation Plan, Puyallup River Outfall, Pierce County, Washington, prepared for Mr. Todd Franceschina.

TENW (Transportation Engineering NorthWest). 2017. *Revised Transportation Impact Analysis – Knutsen Industrial*. Bellevue, WA.

Tian, Z., Peter, K. T., C. Wu, B. Du, B. Leonard, J. McIntyre, and E.P. Kolodziej. 2019. Performance Evaluation of Compost-Amended Biofiltration Swales for Highway Runoff Treatment in Field and Laboratory. Washington State Department of Transportation.

Tian, Z., H. Zhao, Haoqi, K.T. Peter, M. Gonzalez, J. Wetzel, C. Wu, . . . and E.P. Kolodziej. 2021. *A ubiquitous tire rubber-derived chemical induces acute mortality in coho salmon.* Science (American Association for the Advancement of Science), 371(6525), 185-189.

Tian, Z., M. Gonzalez, C. Rideout, H. Zhao, X. Hu, J. Wetzel, …and E. P. Kolodziej. 2022. 6PPDQuinone: Revised Toxicity Assessment and Quantification with a Commercial Standard. *Environmental Science and Technology* 9(2), 140-146. doi:10.1021/acs.estlett.1c00910

TRB (Transportation Research Board). 2016. *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis.*

U.S. Bureau of Labor Statistics. 2020. Occupational Employment and Wages, May 2020; Packing and Filling Machine Operators and Tenders. Available at: https://www.bls.gov/oes/current/oes519111.htm. Accessed August 30, 2021.

U.S. Census Bureau. 2020. “Poverty Thresholds.” Available at: https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html. Accessed August 25, 2021.

USACE (U.S. Army Corps of Engineers). 2016. Puyallup River Basin, Flood Risk Management General Investigation Draft Integrated Feasibility Report/ EIS, March 2016 (https://www.nws.usace.army.mil/Portals/27/docs/civilworks/projects/puyallup/Puyallup%20River%20Basin%20GI-Draft%20FR-EIS-Main-Report-18MAR2016.pdf)

USDA (U.S. Department of Agriculture). 2021. USDA Soil Survey Web Map. Available at: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed March 25, 2021.

USDA. 2021. Web Soil Survey, Pierce County, WA. Available at: (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx) 2021.

USDOT (United States Department of Transportation). Undated. America’s Byways – Washington. Available at: https://www.fhwa.dot.gov/byways/states/WA

USDOT (U.S. Department of Transportation). 2020. *Comprehensive Truck Size and Weight Study*. Available at: https://www.fhwa.dot.gov/policy/otps/truck/finalreport.cfm.

USEPA. 2020. USEPA Outdoor Air Quality Data, Monitored Values Reports. Available at: https://www.epa.gov/outdoor-air-quality-data/monitor-values-report. Accessed May 5, 2021.

USEPA. 2021a. USEPA Greenbook. *Washington Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants.* Available at: https://www3.epa.gov/airquality/greenbook/anayo_wa.html. Accessed December 11, 2020.

USEPA. 2021b. USEPA NAAQS Table. Available at: https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed December 11, 2020.

USFWS (U.S. Fish and Wildlife Service). 1998. Endangered and threatened wildlife and plants; proposal to list the Coastal Puget Sound, Jarbridge River, and St. Mary-Belly River population segment of bull trout as threatened species. Proposed rule June 10, 1998. *Federal Register* 63(111):31693-31710.

USFWS. 2015. Recovery plan for the coterminous United States population of bull trout (*Salvelinus confluentus*). Portland, OR.

USFWS. 2020. Endangered Species. Available at: https://www.fws.gov/endangered/species/index.html. Access May 2021.

USFWS. 2021. USFWS Critical Habitat Portal. Available at: https://ecos.fws.gov/ecp/report/table/critical-habitat.html/.

USGS (U.S. Geological Survey). 1998. Volcanic Hazards from Mount Rainier, Washington. Revised 1998. Available online: https://pubs.er.usgs.gov/publication/ofr98428. Accessed March 25, 2021.

USGS. 2010. Channel-Conveyance Capacity, Channel Change, and Sediment Transport in the Lower Puyallup, White, and Carbon Rivers, Western Washington, Scientific Investigations Report 2010–5240, by Jonathan A. Czuba, Christiana R. Czuba, Christopher S. Magirl, and Frank D. Voss.

USGS. 2015. National Geologic Map Database, Schuster, J.E., Cabibbo, A.A., Schilter, J.F., and Hubert, I.J., 2015, Geologic map of the Tacoma 1:100,000-scale quadrangle, Washington, Map Series 2015-03. (https://ngmdb.usgs.gov/Prodesc/proddesc_103595.htm), accessed May 2021.

USGS. 2021. Historical Topographic Maps – Preserving the Past. Available at: https://ngmdb.usgs.gov/topoview/viewer/#14/47.1910/-122.2486. Accessed April 5, 2021.

USGS. Undated. National Water Information System, USGS 12101500 Puyallup River at Puyallup, WA – parameters Discharge, Gage height and Turbidity, (https://nwis.waterdata.usgs.gov/usa/nwis/uv/?cb_00060=on&cb_00065=on&cb_63680=on&format=gif_stats&site_no=12101500&period=&begin_date=2010-04-01&end_date=2021-04-27), accessed June 2021

USSG (U.S. Surveyor General). 1864. Department of the Interior, General Land Office, Cadastral Survey of Township 20 North, Range 4 East. U.S. Department of Interior, Washington, DC.

Valley Water District. 2020a. 2020 Annual Water Use Efficiency Performance Report. Available at: https://www.valleywaterdistrict.com/forms/000180.pdf

Valley Water District. 2021a. Draft Valley Water District Water System Plan.

Valley Water District. 2021b. Personal Communication from Sean Vance. September 13, 2021.

WA DLI (Washington Department of Labor and Industries). 2022. FY23-127 2023 Minimum Wage Announcement. Available at: https://www.lni.wa.gov/workers-rights/_docs/FY23-127-2023MinimumWageAnnouncementEnglish.pdf.

WA UTC (Washington Utilities and Transportation Commission). 2018. Pipeline Safety in Washington State 2018. Available at: https://www.utc.wa.gov/sites/default/files/2021-04/Pipeline%20Safety%20in%20Washington%20State%2C%202018.pdf

Washington State Department of Health. 2021. Water Facilities Inventory Form. Available at: https://fortress.wa.gov/doh/eh/portal/odw/si/SingleSystemViews/RptViewSingleSys.aspx?rptName=WFI&orgnum=01250

WDFW (Washington State Department of Fish and Wildlife). 2008, Revised 2021. *Priority Habitats and Species List*. Olympia, WA.

WDFW. 2015. Washington's State Wildlife Action Plan: 2015 Update. Washington Department of Fish and Wildlife, Olympia, Washington, USA.

WDFW. 2021a. *Priority Habitats and Species Map.* Available at: http://wdfw.wa.gov/mapping/phs/. Accessed April 2021.

WDFW. 2021b. *SalmonScape.* Available at: http://apps.wdfw.wa.gov/salmonscape/map.html. Accessed April 2021.

WDFW. 2022. HPA Correction Request, dated 11/15/2022, regarding HPA #11998 at the Van Lierop Puyallup River Outfall, for Permittee: Tim Berry, Michelson Puyallup Partners, Inc.

WDNR (Washington Department of Natural Resources). 2021a. Geologic Provinces of Washington – Puget Lowlands. Available at: https://www.dnr.wa.gov/programs-and-services/geology/explore-popular-geology/geologic-provinces-washington/puget-lowland. Accessed March 25, 2021.

WDNR. 2021b. Geologic Informational Portal. Available at: https://geologyportal.dnr.wa.gov/2d-view#natural_hazards?-14056695,-12882622,5737586,6310558

WDNR. 2021c. *Washington Natural Heritage Program Element Occurrences – Current.* Available at: https://data-wadnr.opendata.arcgis.com/datasets/. Accessed May 2021.

Weather Spark. 2021. Weather Spark. *Average Weather in Puyallup Washington, United States.* Available at: https://weatherspark.com/y/904/Average-Weather-in-Puyallup-Washington-United-States-Year-Round#:~:text=The. Accessed April 9, 2021.

Welch, W.B., K.H. Johnson, M.E. Savoca, R.C. Lane, E.T. Fasser, A.S. Gendaszek, C. Marshall, B.G. Clothier, and E.N. Knoedler. 2015. Hydrogeologic framework, groundwater movement, and water budget in the Puyallup River Watershed and vicinity, Pierce and King Counties, Washington: U.S. Geological Survey Scientific Investigations Report 2015–5068, 54 p., 4 pls. (http://dx.doi.org/10.3133/sir20155068).

West Consultants Inc. 2021. Knutsen Farm Scour Analysis model of the Puyallup River near the BNSF Trestle Bridge, prepared for Viking LLC and Running Bear development Partners, LLC.

Whatcom County. 2001. Natural Gas and Hazardous Liquid Pipelines Background Report. Available at: https://mrsc.org/getmedia/C7FE4020-25E2-4E51-B5BE-AEB1B5550102/W47pipelinerpt.aspx

Wikipedia. 2021. Wikipedia. *Puyallup, Washington.* Available at: https://en.wikipedia.org/wiki/Puyallup,_Washington#Climate. Accessed April 9, 2021.

Williams. 2018. Williams Developers' Handbook. Available at: https://co.williams.com/wp-content/uploads/2018/07/2018-developers-handbook-final.pdf. Accessed August 30, 2021.

Winck, B., and D. Reuter. May 5, 2021. Amazon is establishing a new minimum wage in America. Available at: https://www.businessinsider.com/new-minumum-wage-amazon-salaries-worker-pay-labor-market-shortage-2021-5. Accessed August 30, 2021.

WSDOT (Washington State Department of Transportation). 2021. WA State Crash Data Portal. Available at: https://remoteapps.wsdot.wa.gov/highwaysafety/collision/data/portal/public/.

Knutson Farms Industrial Park Project Environmental Impact Statement

Scoping Summary Report

January 2021

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Acronyms and Abbreviations

DAHP	Department of Archaeology and Historic Preservation
DS	Determination of Significance
Ecology	Washington Department of Ecology
EIS	Environmental Impact Statement
FSID	Facility Site ID
SEPA	State Environmental Policy Act
SR	State Route

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INTRODUCTION

1.1 How to Use this Report

The City of Puyallup (City) is the lead agency overseeing the preparation of an environmental impact statement (EIS) under the State Environmental Policy Act (SEPA) for the proposed Knutson Farms Industrial Park project. An EIS provides an impartial discussion of probable adverse environmental impacts, reasonable alternatives, and mitigation measures that would avoid or minimize adverse impacts.

The purpose of scoping is to identify the issues to be analyzed in the EIS. The purpose of this scoping report is to summarize the priority issues identified by individuals, tribes, organizations, and agencies during the scoping comment period for the Knutson Farms Industrial Park project EIS. This report distills all comments received into key themes, giving equal weight to each issue and concept; it does not contain all comments received verbatim nor does it quantify comments by topic.

All comments received during the scoping comment period are available as Appendix A or on the project website: https://knutsonfarmseis.org/.

Scoping comments will be used by the City to help determine the issues and extent of the analysis to be included in the EIS, as well as options for reasonable alternatives to the proposed project and mitigation measures that could be considered. The City will have the opportunity to review comments as they develop the Draft EIS.

1.2 Proposal Overview

Knutson Farms, Inc. (applicant), seeks to develop a Level 8 Warehousing, Distribution, and Freight Movement facility of up to 2.6 million square feet of building area on the approximate 162-acre Knutson Farm property located within unincorporated Pierce County. The project would include construction of seven warehouse buildings. Site work activities would include grading, paved parking and truck maneuvering areas, landscaping, water and sanitary sewer extensions, storm water facility, franchise utility improvements, and roadway improvements including establishment of new access to and use of City roads.

1.3 Purpose of Scoping

The first step in the development of an EIS is called “scoping.” During scoping, agencies, tribes, local communities, organizations, and the public are provided opportunities to comment on factors that should be analyzed and considered in the EIS. Specifically, the scoping process is intended to collect input on the following topics:

1. Reasonable range of alternatives
2. Potentially impacted resources and extent of analysis for those resources
3. Potential measures to avoid, minimize, and mitigate impacts of the proposed project

This report allows the City to review and consider all comments when developing the scope of the EIS. In accordance with SEPA requirements for scoping, the City does not respond to all individual comments.

2.0 SCOPING PROCESS

2.1 Notification of Scoping

2.1.1 Determination of Significance and Second Notice

The City of Puyallup issued a Determination of Significance (DS) on the proposed development on May 10, 2017. Proceeding with preparation of an EIS was delayed due to appeals (now withdrawn) of the DS by Pierce County and the applicant, as well as litigation (now resolved) concerning the City's authority to issue a DS.

Recognizing that significant time had passed since the initial scoping notice, the City issued a second notice on November 17, 2020, to invite the public, tribal governments, and agencies to renew and/or update comments on the scope of the EIS. The original DS and second notice are provided in Appendix B. An extended 30-day scoping comment period was issued for this project to give the public additional time to provide comments.

2.1.2 Public Notification

The City notified key stakeholders, interested parties, agencies, and the general public of the DS, the scoping comment period, and the ways in which they could provide comments using a variety of communication tools. Notifications are provided in Appendix C and included:

1. Tacoma News Tribune Legal Notice (November 18, 2020)
2. Email Listserv (November 17, 2020)
3. Mailed notice to property owners within 500' of the project site (November 23, 2020)
4. City website (https://www.cityofpuyallup.org/1115/Puyallup-Valley-Warehouse-Development)
5. Project website (online open house; knutsonfarmseis.org) launched on November 17, 2020
6. Social media posts (Facebook; November 17, 23; December 8, 15, 2020)

2.1.3 Opportunities to Provide Comment

During the scoping period, the public was invited to submit comments in the four ways described below. No in-person scoping meetings were held due to Washington State COVID-19 safety guidelines.

Online Open House (knutsonfarmseis.org)

The City hosted an online open house that provided an opportunity for visitors to learn more about the proposed project, submit their scoping comments online, and sign up for project notifications. The site accepted comments throughout the scoping comment period (November 17 to December 17, 2020). The online open house received more than 2,000 visits from approximately 1,700 users during the scoping comment period.

The online open house included a Google Translate function that allowed visitors to translate the site into various languages.

Voicemail

A toll-free number was available for people to call and leave verbal comments.

Email

Stakeholders could submit comments via email to comment@knutsomfarmseis.org or directly to City staff.

Written Comments via Mail

Those who wished to provide written comments could mail them directly to the City. A printable comment form was available on the online open house website.

2.1.4 Comments Received

The City invited comments through a variety of methods. Table 1 provides a count for the number of comments submitted during the scoping comment period and the methods by which comments were received. A list of the tribes and governmental agencies that submitted comments is provided in Appendix D.

Table 1. Tally of Comments Received during Scoping

Comment Options	Number of Comments Submitted
Online open house comment form	268
Voicemail	0
Email	29
Written (letters or printable comment form)	4
TOTAL	**302**

2.2 Comment Analysis Process

The extended scoping period began on November 17, 2020, for 30 days and closed on December 17, 2020. During this time, a total of 302 scoping comments were received through the various methods described in Table 1. All submissions were reviewed and analyzed in the preparation of this report. A copy of all scoping comment submissions can be found on the project website: https://knutsonfarmseis.org/.

2.2.1 Processing Communications

The full text of all comment submissions was reviewed and entered into a single database for analysis. Analysts recorded the name and contact information of each commenter, the source of the submission, and date received.

Once the commenters' names and their submissions were entered into the database, analysts read each submission to identify and code unique comments. Many submissions contained multiple comments. Comments were defined as unique concepts or ideas within a submission. Each unique comment was assigned one or more unique categories.

Each unique submission was reviewed at least twice—once by the primary coding analyst, and again by a second analyst for quality assurance and control and/or during the preparation of this scoping summary. This process allowed for resolution of discrepancies or inconsistencies.

2.2.2 Analysis Methodology

To create this report, analysts queried the database to generate lists of comments organized by comment categories. Comments within each category were then summarized to capture the unique issues and concerns expressed by commenters.

For the purpose of this summary, every comment has value, whether it is stated only once or multiple times. The analysis represented in this report did not seek to tally the number of comments received on any given topic or whether a comment ultimately supported or opposed the proposed project. Scoping is designed to help identify issues that should be addressed and analyzed in the EIS and is not intended to function as a “voting” process.

3.0 PUBLIC COMMENTS SUMMARIZED BY ISSUES OF CONCERN

This section reflects the issues and concerns mentioned during the scoping period. The issues and concerns are summarized and paraphrased, and do not capture every comment for each category; they are not quantified. Please also note that comments often mix statements of fact with statements of opinion, and, as a result, this report may include inaccurate or incomplete information in the form it was provided by commenters.

3.1 Comments Summarized by Topic

Key comment topics included the project objective; project description; alternatives; geology/soils; surface water; groundwater; plants and animals; land use; recreation and aesthetics; air quality and greenhouse gases; transportation; health and safety; public services and utilities; cultural resources; noise; social elements; mitigation; and permitting. Comments received during the scoping period are summarized and paraphrased by topic below.

3.1.1 Project Objective

Commenters questioned why there was a need for more warehouses when there are so many that sit empty in the area.

3.1.2 Project Description

One commenter noted that the developer estimates that 700–900 people would work at the completed project; however, the developer’s plan is to sell or rent the property to a separate party business, so there is no guarantee as to the number of workers who would conduct business at the property.

3.1.3 Alternatives

Commenters noted several alternatives to the proposal, including:

- Developing the land for mixed-use developments, affordable housing, residential use, community centers, retail businesses, outdoor recreation (including parks, dog parks, and walking paths), or event centers.
- Selecting an alternative location that is closer to Interstate 5 or in Graham.

- Redeveloping vacant buildings in the industrial areas of Tacoma.
- Redeveloping vacant commercial space in the city.
- Reducing the size of the facility by reducing the number of warehouses (many noted that Warehouses F and G could be removed from the proposal) and leaving the remaining space as open space or parkland, or for other purposes such as housing.

3.1.4 Geology/Soils

Many commenters noted that the project would destroy fertile farmland that cannot be restored.

Commenters asked if the project would lead to further erosion of the hill above Pioneer Way and expressed concerns about increased risk of mudslides.

Commenters noted concern that the project would cause soil pollution from truck traffic.

3.1.5 Surface Water

The Muckleshoot Indian Tribe Fisheries Division requested that the EIS include an assessment of riparian impacts potentially arising from the project. They suggested that the assessment include a complete delineation of the Channel Migration Zone and the 100-year flood plain, and consideration of whether the project would directly or indirectly influence these areas or their associated protection measures afforded by applicable code.

Commenters noted that the area floods and that constructing the warehouses within a wetland, adjacent to the Puyallup River, and within the 100-year floodplain would cause adverse impacts.

Many commenters were concerned about increased impervious surfaces and water run-off, especially into the Puyallup River.

One commenter questioned if the project has been considered in regard to the 2023 Comprehensive Flood Hazard Management Plan.

3.1.6 Groundwater

One commenter was concerned about groundwater being impacted by the proposal.

One commenter noted that Knutson Farms currently has a water right to withdraw water from the Puyallup River for irrigation. The commenter felt that this right should be vacated upon development of this site, which would increase low-flow quantities for endangered salmon.

3.1.7 Plants and Animals

Many commenters expressed concern about animals being displaced and about degraded or destroyed habitat.

One commenter noted that Chinook salmon and bull trout are known to be in the Puyallup River and should be addressed in the EIS. Commenters expressed concern about the chemical in tire rubber that can impact coho salmon and that the impact would be exacerbated by additional truck traffic.

One commenter noted that the effects of the industrial development would have a negative impact on Southern Resident Orca, which rely on the salmon from the Puyallup-White watershed—one of the few in Puget Sound with spring-run Chinook—for the entirety of their diet.

One commenter noted that the erosion would negatively impact the Puyallup River and its floodway, as well as animal and plant life in and along the river/floodway. The location of planned construction is just upstream of where the Puyallup River and White River converge. This spot is important for the conservation of many fish species and is a seasonally popular/important spot for fishing. There is concern that the 3- to 5-year construction process, as well as the planned permanent proximity of the warehouses to the river, would negatively impact conservation and fishing practices.

Commenters were concerned about pollution runoff into creeks and rivers from the warehouse and the possible damage to salmon and other wildlife habitat.

One commenter noted that the project would disrupt the Pacific Flyway for Migratory Birds and would endanger the habitat of salmon, steelhead, trout, and other species of fish in the Puyallup River. One commenter noted that there are 108 different bird species that have been observed at the project site, and that impacts to these bird species and other wildlife should be considered.

One commenter noted that wild lupine grow on this property. According to the U.S. Forest Service, certain species of lupine are listed as endangered.

One commenter noted that beaver have been found on nearby streams, and it is highly likely that deer, eagles, and herons have also been in the area. The commenter felt that an appropriate inventory of animals utilizing the site and methods to mitigate the development’s impacts to these animals must be studied.

3.1.8 Land Use, Recreation and Aesthetics

Many commenters noted concerns regarding land use and zoning of the project and compatibility of the surrounding land uses—particularly, the expansive residential and multifamily development that was approved and built farther south along the Shaw/Military Road and meridian corridor. Commenters requested that the City’s land use plan be followed. One commenter noted that the project is not consistent with Puyallup's land use plan that calls for limited warehouses, a business park, and protection of farmland and open space; others noted that the land was initially supposed to be made into parks, that it is not a commercial or industrial area, and that large warehouse developments should be located outside residential communities.

Commenters noted concern with the warehouses keeping with the character of the community—specifically the density and size of buildings; the scale of the project would be in contrast with existing surroundings, and going from farmland to warehouses is not in keeping with the character of the community.

One commenter noted growth in the downtown area and that industrial buildings are not needed.

Commenters noted that the presence of warehouses and semi-truck traffic would result in negative aesthetics impacts for the community, including disruption of views and impacts on views from nearby parks.

Many commenters shared that they thought the project would not be aesthetically pleasing and that there are enough ugly warehouses in Pierce County. Commenters noted that the project would tarnish the view of Mount Rainier and the Cascades and that the rural feel of the area would be lost forever. One commenter noted that past city projects were ugly.

One commenter noted that windblown debris and clutter from these types of facilities result in negative aesthetic impacts.

Commenters noted general concerns about negative light pollution impacts from headlights and taillights from trucks entering and existing the proposed facility at night.

One commenter noted that Farm 12, as an event center, relies on an aesthetically pleasing atmosphere and surroundings (currently in place).

Many commenters expressed concern that the development would interfere with existing recreation experience and access in the area, including the positive experience that children can currently have at the Van Lierop park and the nearby Foothills Trail.

Commenters suggested an increase in the amount of open space to the northeast along the Puyallup River and development of the areas along the banks of the Puyallup River as an extension of existing bike and walking trails, including connecting the foothills bike path to the Puyallup River trails.

One commenter questioned whether quality public space would be provided by the developer.

3.1.9 Air Quality and Greenhouse Gases

Many commenters noted that air quality would be negatively impacted by the increase of truck traffic.

Commenters noted that the air quality for Shaw Road Elementary and the private school next to it would be degraded for students.

3.1.10 Transportation

Many commenters expressed concern about the traffic impacts of the proposal. Many expressed concern that the warehouses are not suitable with current traffic patterns. They noted that Shaw Road is a major arterial connecting hundreds to thousands of daily commuters to Washington State Route (SR) 410/167/Sounder transportation networks and that additional high-volume commercial traffic, semis, and employees would significantly degrade the current situation for Puyallup residents and negatively impact the quality of life.

Many commenters were concerned that the project would increase traffic in nearby neighborhoods, that the trucks would use Shaw Road to circumvent Meridian, and that an increasing number of commuters would cut through the residential neighborhoods to find a faster route around the gridlock.

Many commenters noted that the local infrastructure, including roads and bridges, is not equipped to handle the additional traffic. Commenters noted that they do not think the new entrance to SR 410 on Main Street would be able to handle semi-truck traffic and suggested re-routing to use the SR 512 ramp on Pioneer instead. One commenter noted that the current highway and road infrastructure does not support additional industrial traffic and the addition of more lanes to the highway and a direct industrial route would be acceptable.

One commenter suggested that once the Milwaukee Bridge is completed, a large number of trucks will route down Meridian and Valley Avenue and over the bridge, and will back up traffic all up and down 5th Street NE. One commenter noted that traffic during the State Fair would create major traffic delays. One commenter noted that the heavy traffic is usually in the morning and evening hours or when an accident has occurred, that these routes are used to bypass it, and that it would be beneficial if 5th Street could tie into 80th Street E in some way.

One commenter noted that the developer’s plans mainly concern internal-to-the-property roads, do not describe who is to pay for the improvements to City roads, and do not seem to acknowledge the impact of the intersection at 80th Street E and WA-162, or the use of Inter Avenue.

Commenters noted that the project needs better documentation on the volume of traffic, trucks, and other traffic that would be generated and better documentation on the impact on the Shaw Road overpass and other corridors.

One commenter requested that traffic lights be installed at any entry or exit points to the facility and other points along Main Street and Shaw Road.

One commenter noted that the on/off ramp already constructed for the current warehouse that stems from the Shaw Road E bridge cannot accommodate semi-trucks, which would be the primary vehicles for the completed warehouse project.

One commenter questioned how it would be possible to reroute all the trucks from Shaw Road.

One commenter noted that the Shaw Road southbound left-turn lane onto 5th Avenue SE is too short to handle more than two trucks. They felt that a study needs to be conducted to determine the optimum length of this turn lane and construction required by the project. The commenter questioned that the ability for a semi-truck to take this angle during a turn was not adequately considered.

Commenters noted that the project would make getting to the Sumner Sound Transit station more difficult because of increased traffic.

One commenter noted that the amount of direct traffic to be shifted away from property for construction would make traffic congestion even higher on existing (external to the property) roadways.

One commenter noted that previously published estimates of the truck traffic generated by the project are underestimates and that the existing conditions need to be updated to account for current traffic levels. They also noted that the project needs to account for proposed nearby projects, including a new Safeway shopping center and a proposed mixed-used development.

One commenter requested that Knutson and other developers be required to build and pay for their own access roads. One commenter questioned if this complex would be mandated its own exit/entrance, off SR-410.

One commenter suggested adding access and egress from Shaw Road and all points of entry/exit to the warehouses.

One commenter noted that traffic on Shaw Road travels well over the 35 mph posted speed limit.

Commenters noted that Pioneer and Main Street are heavily used by pedestrians and that Pioneer is narrow and does not have sidewalks.

Commenters noted that the rate of traffic accidents would increase due to the additional trucks and that the trucks would be traveling on roads that have three elementary schools nearby.

Commenters expressed a desire for a bike lane and a speed reduction from the foothills trail to downtown.

One commenter noted that the construction project as proposed includes plans for approximately 2,202 parking spaces. The estimated number of workers and the planned number of parking spaces do not logically align. One commenter noted that there is no parking for the trail, the new park, or Farm 12.

3.1.11 Health and Safety

One commenter noted that the warehouse industry could lead to an increase in homeless camps in public areas, which poses a safety concern for people in nearby parks.

Commenters noted that residents would be exposed to the negative health effects of pollution from the warehouses.

Commenters noted that semi-trucks in the current traffic situations and on residential roads would be dangerous.

The Washington Department of Ecology (Ecology) noted that the property is within a quarter mile of two contaminated sites. The sites are Puyallup Landfill A, Facility Site ID (FSID) 49172; and Highway 410 at Traffic Avenue Overpass, FSID 58749. If contamination is suspected, discovered, or occurs during the proposed construction of the warehouse, distribution, and freight movement facility, testing of the potentially contaminated media must be conducted. If contamination of soil or groundwater is readily apparent, or is revealed by sampling, Ecology must be notified.

3.1.12 Public Services and Utilities

Many commenters expressed concerned about stormwater drainage into the Puyallup River. One commenter noted that drainage from the property onto adjacent properties needs to be accounted for and mitigated, including through installation of storm and sewer drains. One commenter noted that the risk of contaminated runoff from industrial sites, inadvertent disposal, and illicit discharge should be considered carefully, considering that all discharges flow directly to the Puyallup River, which is used by endangered species. Possible mitigations include secondary containment, enhanced water quality treatment, and other measures.

Many commenters expressed concerns about who was going to pay for the increased costs of public services, including fire and police, and utilities, including water and sewer. Commenters noted concern that crime would spike and there would be an increased need for fire and police protection. One commenter noted concern over the expense of flooding as well as the cleanup and protection of public and private property. One commenter was concerned that the project would create more waste/garbage by the people who would work there.

One commenter noted that the use of natural gas is a contributing factor to carbon pollution and should be excluded from the development or that mitigation of its carbon effects be provided.

Ecology noted that all grading and filling of land must utilize only clean fill. All other materials may be considered solid waste, and permit approval may be required from the local jurisdictional health department prior to filling. All removed debris resulting from this project must be disposed of at an approved site.

Williams-Northwest Pipeline commented that there is a 75-foot-wide high-pressure natural gas transmission right-of-way through the project area. They noted that they have been consulted regarding development and encroachment standards and have not granted approval for any disturbance, equipment crossings, utility crossings, pavement, or any changes in land use, whatsoever. Until an encroachment agreement is in place between the owner and Williams, no approvals will be granted.

3.1.13 Cultural Resources

The Washington Department of Archaeology and Historic Preservation (DAHP) commented that they are pleased that the EIS scoping is including cultural resources as an element of analysis. DAHP is interested in this project and recommends that an archaeological survey of the project area be completed during the EIS process. Having the initial cultural resources work completed during the EIS will help the DAHP make more informed recommendations for project alternatives during the EIS review period.

The Nisqually Indian Tribe, Squaxin Island Tribe, and Puyallup Tribe requested a thorough sub-surface archaeological survey and cultural resource investigation of the entire project area using comprehensive background research into the long history of the Puyallup Valley as a guide. They also request that an archaeological monitor be present once groundwork on the project begins.

Commenters noted that the EIS needs to identify any cultural sites and impacted tribal lands.

3.1.14 Noise

Commenters noted that diesel engine noise generated by the project would cause uninterrupted noise throughout the project area and that the existing noise level is already loud from trains and existing traffic.

Commenters noted that noise from construction, which is expected to last 3–5 years (as previously stated in the document), would negatively impact business operations of surrounding businesses—especially Farm 12, which is a restaurant and event center largely enjoyed by the community.

3.1.15 Social Elements

Commenters noted economic concerns with the proposed development, including that the warehouse would not promote local business and economic growth, would not create that many jobs, and would adversely impact adjacent property values.

One commenter noted that the project would be an opportunity to bring jobs to Puyallup.

Commenters noted that the environmental costs would outweigh the economic benefits of the project.

Commenters noted that the farmland needs to be preserved and the City should encourage future farmers. One commenter noted that Pierce Conservation District has identified Pierce County farmlands as a significantly declining resource. This project is proposing to eliminate 161.55 acres of scarce farmland without mitigation.

One commenter noted that affordable housing is a huge need in all communities, and this project proposes elimination of three affordable housing units with no mitigation proposed. A project of this magnitude needs to mitigate this loss.

3.1.16 Mitigation

To mitigate traffic impacts, commenters provided several suggestions, including:

- The applicant should be required to upgrade all roads to four lanes, including East Pioneer, 80th Street E, and the Orting Highway over the Puyallup River to Highway 410 to account for traffic impacts.
- The project should be required to help pay for costs to build SR 167 to Tacoma.
- Commercial routes should be segregated from residential routes and pre-developed.
- The project should include access to E Main from 134th Avenue E.
- Truck traffic should be prohibited from entering or exiting the development during weekday rush hours (5:30 am to 8:00 am and 3:30 pm to 6:30 pm).
- The City of Puyallup should be required to complete to complete the four-lane widening project where E Main meets the new Hwy 410 bridge/Traffic Avenue no later than December 15, 2020, or the bridge project was a waste of taxpayer money and will result in worsening traffic problems that will be created by this project.
- Truck traffic should be limited to a certain time of day.
- Shaw Road should be improved to be a four-lane road or at least add a turn lane in the middle.
- Trucks must be required to enter/exit directly to Hwy 410.
- The project should utilize rail instead of trucks for transporting goods.

To mitigate transit impacts, one commenter requested that the developer be required to upgrade both adjacent bus stops with concrete pads and transit shelter packages due to the increase of expected bus riders. Additionally, because the transit stops are located across the train tracks from the project, the commenter requested that a pedestrian pathway be installed between the project site and Main Street to provide safe and efficient access to the bus stops. One commenter suggested that a light rail link in the community that ties into the Sounder could be developed using the Meeker line.

To offset traffic impacts, one commenter suggested that the City of Puyallup have at least 10 plans for things like parks and trails and gardens; spaces for cultural events and breweries and wine tasting rooms; a state-of-the-art swimming facility; and grocery stores like Trader Joe's or Whole Foods.

To mitigate greenhouse gas emissions, one commenter suggested that all warehouses must be required to have solar panels and/or vegetation (native plants or agricultural crops) covering the entirety of otherwise empty roof space.

To mitigate impacts for the loss of agricultural lands, one commenter suggested that property developers must buy and restore an equal number of unused agricultural lands in the Puyallup River-Orting Valley for a community farming project, offering use at $1/acre/applicant.

To mitigate noise and fumes, one commenter suggested that the entrance/exit of the project should be moved to farther down on Main Street near the freeway to keep noise and fumes away from homes and schools.

To mitigate water quality issues, one commenter suggested an excellent filtration system and annual water quality monitoring.

One commenter suggested an analysis of economic impact to see if the project would be at least beneficial economically.

Commenters noted that the new Van Lierop Park, the new Step by Step facility, and a future Foothills Trails connection must be protected with mitigation that preserves their character. Warehouses must be screened to protect the visual impact at these facilities.

One commenter suggested that the height of the buildings be limited and that landscaping and architectural features be added to improve the appearance and minimize impacts to views.

One commenter noted that the property should be used to build a city park, add more works of art, and connect the River Walk to the Foothills Trail on the Knutson Farms property, which will add far more economic and environmental value to the town.

One commenter requested that the large California cedar tree on the property be preserved, as well as any other large trees on the property.

Commenters suggested that a full environmental restoration corridor be created along the Puyallup River, with a 300-foot buffer from the river’s edge.

One commenter suggested that the applicant should extend the Puyallup Riverwalk through the area from the East Main Street bridge, to the Foothills Trail-East Puyallup Trailhead, with a skyway pedestrian/bicycle bridge built over 80th Street SE.

One commenter noted that all lighting should be shielded and Dark Sky Association-approved to mitigate nighttime light impacts.

One commenter noted that the mitigation where the developer has proposed to accommodate for this recreation area is not ideal for any sort of high-traffic path (which includes skateboarders, roller skaters/bladers, dog walkers, joggers, bike riders, etc.).

Ecology noted that erosion control measures must be in place prior to any clearing, grading, or construction. These control measures must be effective to prevent stormwater runoff from carrying soil and other pollutants into surface water or storm drains that lead to waters of the state. Sand, silt, clay particles, and soil will damage aquatic habitat and are considered to be pollutants. Ecology noted that if there are known soil/ground water contaminants present on-site, additional information (including, but not limited to, temporary erosion and sediment control plans; stormwater pollution prevention plan; list of known contaminants with concentrations and depths found; a site map depicting the sample location[s]; and additional studies/reports regarding contaminant[s]) will be required to be submitted.

3.1.17 Permitting

The Tacoma-Pierce County Health Department noted that all wells that would not be included in the public water system for this project must be properly decommissioned per Washington Administrative Code 173-160 prior to final application approval. The Tacoma-Pierce County Health Department must be contacted 48 hours prior to any decommissioning activity at the site. They further noted that when an existing on-site sewage disposal system is abandoned, the Tacoma-Pierce County Health Department requires that all tanks be pumped by a certified septage hauler, all tanks filled with soil, and a Decommissioning Application be completed, pursuant to Environmental Health Code, Chapter 2, On-Site Sewage.

Ecology noted that the following construction activities require coverage under the Construction Stormwater General Permit:

1. Clearing, grading and/or excavation that results in the disturbance of one or more acres and discharges stormwater to surface waters of the State; and
2. Clearing, grading and/or excavation on sites smaller than one acre that are part of a larger common plan of development or sale, if the common plan of development or sale will ultimately disturb one acre or more and discharge stormwater to surface waters of the State.
    a) This includes forest practices (including, but not limited to, class IV conversions) that are part of a construction activity that will result in the disturbance of one or more acres, and discharge to surface waters of the State; and
3. Any size construction activity discharging stormwater to waters of the State that Ecology:
    a) Determines to be a significant contributor of pollutants to waters of the State of Washington.
    b) Reasonably expects to cause a violation of any water quality standard.

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Appendix A – Comments Received During Scoping

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Appendix B – Determination of Significance and Second Notice for Scoping Comments

CITY OF PUYALLUP
Development Services Department

DETERMINATION OF SIGNIFICANCE AND REQUEST FOR COMMENTS ON SCOPE OF EIS

Description of proposal:

‟The Applicant seeks to develop a Level 8 Warehousing, Distribution and Freight Movement facility of up to 2.6 million square feet of building area on the approximate 161.55-acre Knutson Farm property located within unincorporated Pierce County. The site is zoned EC (Employment Center) and is within the Alderton-McMillin Community Plan area and within the Urban Service area of the City of Puyallup. The development will apply for Administrative Design Review with a parking reduction request, a public road deviation request, a proposed trail amenity and a 7-Lot Commercial Short Plat.”
See 9/14/2016 Revised SEPA Environmental Checklist
https://palsonline.co.pierce.wa.us/pals/public/documentView?docSysId=671084 .

“The project will include construction of 7 warehouse buildings along with site work activities to include grading, paved parking and truck maneuvering areas, landscaping, water and sanitary sewer extensions, storm water facility, franchise utility improvements and roadway improvements.”
See 9/19/2016 Master Application
https://palsonline.co.pierce.wa.us/pals/public/documentView?docSysId=671078.

‟Grading of approximately 140 acres will occur for the construction of buildings and parking lots on the site. Approximately [sic] 450,000 cubic yards of on-site material will be excavated and filled to prepare the building pads, paved areas and open space areas for development. It is estimated that approximately 120,000 cubic yards of import fill will be used and approximately 110,000 cubic yards of stripping will be exported from the site. The applicant states that no portion of the floodplain or floodway will be filled. The area of the floodplain and floodway associated with the Puyallup River will be kept in a protective Tract as part of the proposed 7-Lot Commercial Short Plat.”
See 9/14/2016 Revised SEPA Environmental Checklist
https://palsonline.co.pierce.wa.us/pals/public/documentView?docSysId=671084 .

Proponent: Knutson Farms, Inc.

Location of proposal: 6719 134th Avenue East, Puyallup, WA, within Sections 25 and 26, T20N, R4E, W.M. in County Council District No. 2; also City of Puyallup streets, including, but not limited to, Shaw Road, East Maine Avenue and East Pioneer

Lead agency: City of Puyallup, Tom Utterback (SEPA Responsible Official)

EIS Required: The City of Puyallup has assumed SEPA lead agency status on this proposal and has determined this proposal is likely to have a significant adverse impact on the environment. An environmental impact statement (EIS) is required under RCW 43.21C.030(2)(c) and will be prepared. A SEPA Environmental Checklist and other materials indicating likely environmental impacts can be reviewed at the City of Puyallup Permit Counter (2nd Floor, City Hall, 333 S. Meridian), as well as on the Pierce County Planning & Land Service site for the application: https://palsonline.co.pierce.wa.us/palsonline/#/permitSearch/permit/relatedPermits?applPermitId=792206.

The City has initially identified the following areas for discussion in the EIS:

- Transportation, particularly transportation systems and traffic
- Public Services and Utilities, including stormwater, sanitary sewer and fire flow
- Water, Plants and Animals
- Land and Shoreline Use, including aesthetics, recreation, agricultural crops, and the project's relationship to existing land use plans
- Alternatives
- Mitigation measures

Scoping: Agencies, affected tribes, and members of the public are invited to comment on the scope of the EIS within 21 days of this DS issuance, or by 5:00 PM on Wednesday, May 31, 2017. You may comment, among other matters, on alternatives, mitigation measures, probable significant adverse impacts, and licenses or other approvals that may be required.

Comments must be submitted in writing to the City's Responsible Official, Tom Utterback, at the address below or via email at sepaofficial@ci.puyallup.wa.us.

Any agency or person may appeal, pursuant to Puyallup Municipal Code Sec. 21.04.205, the City's Determination of Significance by filing a written appeal within 14 days of this determination, by 5:00 PM on Monday, May 24, 2017.

Responsible official:

Tom Utterback
Development Services Director
City of Puyallup
333 S. Meridian
Puyallup, WA 98371
(253) 841-5502
tomu@ci.puyallup.wa.us

Date: May 10, 2017   Signature _

CITY OF PUYALLUP
Development and Permitting Services
333 S Meridian, Puyallup, WA 98371
(253) 864-4165 Fax (253) 840-6678

SECOND NOTICE*:

REQUEST FOR FURTHER COMMENTS ON SCOPE OF ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR A PREVIOUSLY ISSUED DETERMINATION OF SIGNIFICANCE (DS)

***The City of Puyallup issued a Determination of Significance (DS) on the project on May 10, 2017. Proceeding with preparation of an EIS was delayed due to appeals (now withdrawn) of the DS by Pierce County and the Applicant as well as litigation (now resolved) concerning the City's authority to issue a DS. This second notice, although not required, is being issued due to the passage of time to invite the public, tribal governments and agencies to renew and/or update comments on the scope of the EIS.**

Project Name: Knutson Farms Industrial Park

Proponent: Knutson Farms, Inc.

Lead Agency: City of Puyallup

Project Location: The project is located in the Urban Growth Area of the City of Puyallup in unincorporated Pierce County. The 162-acre development site is located east of Shaw Road E. and East Main Avenue, north of East Pioneer and 88th Ave S.E., and west of the Puyallup River within Sections 25 and 26, Township 20N, Range 4E in the Willamette Meridian baseline.

Description of the Proposal: The Proponent seeks to develop a Level 8 Warehousing, Distribution and Freight Movement facility of up to 2.6 million square feet of building area on the approximate 162-acre Knutson Farm property located within unincorporated Pierce County. The project would include construction of seven warehouse buildings. Site work activities would include: grading, paved parking and truck maneuvering areas, landscaping, water and sanitary sewer extensions, storm water facility, franchise utility improvements and roadway improvements including establishment of new access to and use of City roads.

EIS Required: The City of Puyallup has assumed SEPA lead agency status on this proposal and has determined this proposal is likely to have a significant adverse impact on the environment. An environmental impact statement (EIS) is required under RCW 43.21C.030(2)(c) and will be prepared.

Elements of the Environment: The lead agency has preliminarily identified the following elements for analysis in the EIS based on application materials as well as information and circumstances that have come to the City's attention since May, 2017.

- Transportation, particularly transportation systems and traffic
- Public Services and Utilities, including stormwater, sanitary sewer and fire flow and fire protection services
- Water, Plants and Animals
- Cultural resources
- Noise
- Air quality, including green house gases
- Land and Shoreline Use, including aesthetics, recreation, agricultural crops, and the project's relationship to existing land use plans
- Alternatives
- Mitigation measures

Alternatives: The lead agency has preliminarily identified that the Proposed Action and No Action Alternative will be analyzed in the EIS.

Scoping: Agencies, affected tribes, and members of the public are invited to comment on the scope of the EIS within 30 days of this second notice request for further comments on a previously issued DS. Comments are due no later than 5:00 PM on December 17, 2020 using one of the methods below.

More project information may be found online at:
https://www.cityofpuyallup.org/1115/Puyallup-Valley-Warehouse-Development

You may comment, among other matters, on alternatives, mitigation measures, probable significant adverse impacts, topic areas for the EIS, and licenses, permits or other approvals that may be required.

Methods for presenting your comments are described below:

- Via Email to: Chris Beale, Senior Planner, EIS project manager - cbeale@puyallupwa.gov
- In writing to: Puyallup City Hall ATTN: Michelle Ochs, DPS Administrative Assistant, 333 S. Meridian, Puyallup, WA 98371
- Phone: (253) 841.5418 (written comments are preferred)

Date: 11/17/2020 SEPA Responsible Official: ____________________
Jeffrey S. Wilson, AICP

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Appendix C – Public Notifications

2.3.1 EIS Scoping Process

The first step in the development of an EIS is called scoping. During the scoping process, agencies, tribes, local communities, organizations, and the public are invited to comment on factors that should be analyzed and considered in the EIS. Specifically, the process is intended to collect input on a reasonable range of alternatives; potentially affected resources and extent of analysis to determine impacts; measures to avoid, minimize, and mitigate impacts of the proposal; and cumulative impacts.

The City of Puyallup issued a DS on the proposed development on May 10, 2017. Preparation of an EIS was delayed due to appeals (subsequently withdrawn) of the DS by Pierce County and the Applicant, as well as litigation (now resolved) concerning the City's authority to issue a DS. Recognizing that significant time had passed since the initial scoping notice, the City issued a second notice of the 2017 DS on November 17, 2020, to invite the public, tribal governments, and agencies to renew and/or update comments on the scope of the EIS. An extended 30-day scoping comment period was issued for this Project to give the public additional time to provide comments. The scoping process was documented in the Knutson Farms Industrial Park Environmental Impact Statement Scoping Summary Report (Appendix A).

The City notified key stakeholders, interested parties, agencies, and the general public of the DS, the scoping comment period, and the ways in which they could provide comments using a variety of communication tools. Notifications included:

- Tacoma News Tribune Legal Notice (November 18, 2020)
- Email Listserv (November 17, 2020)
- Mailed notice to property owners within 500 feet of the Project site (November 23, 2020)
- City website (https://www.cityofpuyallup.org/1115/Puyallup-Valley-Warehouse-Development)
- Project website (online open house; https://www.knutsonfarmseis.org) launched on November 17, 2020
- Social media posts (Facebook; November 17 and 23; December 8 and 15, 2020)

The key issues identified during scoping and a summary of the scoping process are documented in the Knutson Farms Industrial Park Environmental Impact Statement Scoping Summary Report (Appendix A). Key comment topics received during scoping included the Project objective; Project description; alternatives; geology/soils; surface water; groundwater; plants and animals; land use; recreation and aesthetics; air quality and greenhouse gases; transportation; health and safety; public services and utilities; cultural resources; noise; social elements; mitigation; and permitting. The comments received were used in developing the scope of the analysis of this EIS.

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Appendix D: Tribes and Governments

The following is a list of Tribes and government organizations who submitted comments during the scoping period.

Tribes

Muckleshoot Indian Tribe Fisheries Division

Puyallup Tribe - Historic Preservation Department

Squaxin Island Tribe - Cultural Resource Department

Nisqually Indian Tribe – Tribal Historic Preservation Officers Department

Federal

None

State

Washington Department of Archaeology and Historic Preservation

Washington Department of Ecology

Local

Pierce County - Planning and Public Works

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Knutson Farms Industrial Park Project

Draft EIS – Appendix B – Draft EIS Distribution List

CITY OF PUYALLUP
STATE OF WASHINGTON

December 2023

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Table B-1. Draft EIS Distribution List

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Knutsen Farms Industrial Park Wetland D Report

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October 6, 2021

SCJ ALLIANCE
CONSULTING SERVICES

Knutsen Farms Industrial Park
Wetland D Report

Project Information

Project:	Shaw-Pioneer On-Call Critical Areas
Prepared for:	City of Puyallup 333 South Meridian Puyallup, WA 98371

Reviewing Agency

Jurisdiction:	Pierce County

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Disclaimer

SCJ Alliance has prepared this Wetland Report for the City of Puyallup. The information contained herein is, to our knowledge, correct and accurate. It should be recognized that the establishment of stream and wetland boundaries is an inexact science. Streams are subject to weather patterns, in addition to upstream and downstream activities. Wetlands are, by definition, transitional areas, and wetland boundaries often change with time. The presence of wetland indicators may also vary depending on the time of year. Additionally, individual professionals may disagree on the precise location of wetland boundaries or the functions and values of a wetland. All stream and wetland boundaries, classifications, and buffer widths should be considered subject to change until reviewed and approved by the appropriate regulatory agencies with jurisdiction. We recommend obtaining jurisdictional approval before completing final site plans and/or beginning construction activities. We are not responsible for the accuracy of information provided by others.

Within the limitations of schedule, budget, and scope-of-work, we warrant that this study was conducted in accordance with generally accepted environmental science practices, including the technical guidelines and criteria in effect at the time of this study. The results and conclusions of this report represent the authors' best professional judgment based upon information provided by the project proponent and information obtained during this study. No other warranty, expressed or implied, is made.

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1 Introduction

The Knutsen Farms Industrial Park (KFIP) property is located in Pierce County northeast of Puyallup, in the City of Puyallup Urban Growth Area (UGA). This report describes results of a wetland delineation project carried out in an area near the southeast corner of the KFIP Project site (Figure 1). Wetland conditions were evaluated and documented during site visits on March 18, 2019, March 4, 2021 and August 27, 2021. This work is carried out for the City of Puyallup in support of an EIS which is assessing and documenting potential KFIP project impacts.

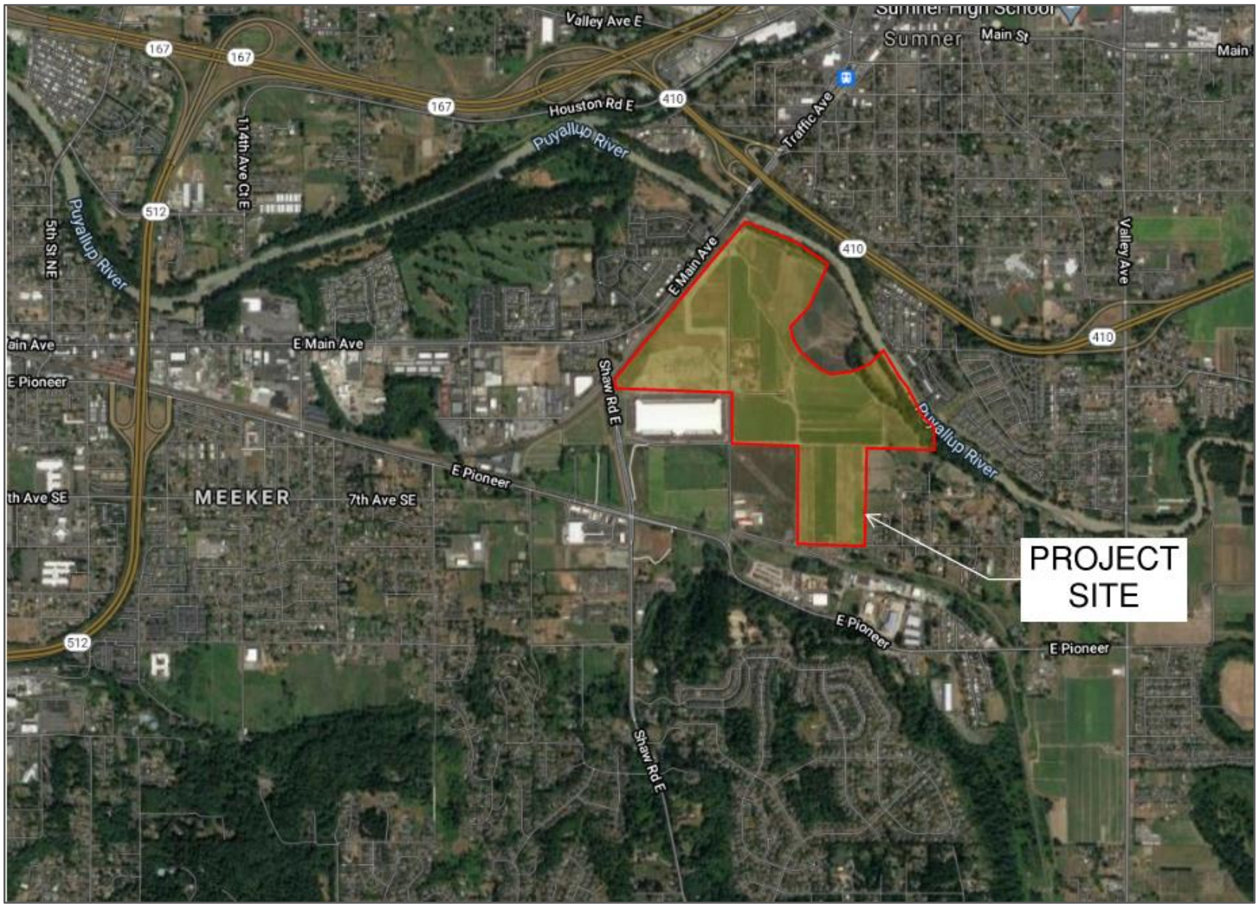


Figure 1. Industrial Park Site (red outline) vicinity map with Wetland D location indicated.

Critical areas on the KFIP Project site were initially delineated and described in a Critical Areas Assessment Report prepared by Soundview Consultants (SVC) in 2016 (Appendix D). SVC delineated and described four wetlands onsite, Wetlands A, B, C and D. A field site visit during a public hearing process in March 2019 determined that the delineation at Wetland D was incorrect, and that the wetland was larger than previously described. The wetland boundary was subsequently re-delineated by SCJ Alliance (a member of the EIS research team) using data collected during the March 2019 site visit, in addition to field work in March and August of 2021. Results of this work are described below.

2 Methods and Materials

2.1 Desktop Review

Prior to visiting the project area, SCJ Alliance staff reviewed available reports and conducted a desktop review of readily available mapping resources and other pertinent information including but not limited to:

- City of Puyallup Wetlands Inventory Mapping (https://gis-portal-puyallup.opendata.arcgis.com/datasets/puyallup::wetlands/explore?location=47.185547%2C-122.260287%2C14.02)
- Pierce County GIS Mapping System, wetlands, floodplain and shorelines mapping (https://matterhornwab.co.pierce.wa.us/publicgis/)
- Google Earth Pro (https://www.google.com/earth/) This source provided recent and past aerial photographs of the project area.
- LiDAR topography of the Project site (developed in-house at SCJ Alliance, using WADNR LiDAR databases) https://lidarportal.dnr.wa.gov/#47.18472:-122.25586:13
- US Fish and Wildlife Service National Wetlands Inventory Wetlands Mapper (https://www.fws.gov/wetlands/data/mapper.html). This mapping source depicts some but not all wetlands and streams throughout the United States.
- US Department of Agriculture Natural Resources Conservation Service Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx). This source depicts mapped soils including hydric soils throughout the United States.
- WDFW Priority Habitats and Species mapping (https://geodataservices.wdfw.wa.gov/hp/phs/)
- WDFW SalmonScape Hydrography and Fish Distribution mapping (http://apps.wdfw.wa.gov/salmonscape/map.html)
- Soundview Consultants Knutson Farms Industrial Park Critical Areas Assessment Report, December 2016
- Project Site professional topographic survey, engineer stamped 03/26/2021

2.2 State & Federal Regulations

2.2.1 Federal

Wetlands are regulated as “waters of the United States” under Section 404 and Section 401 of the Clean Water Act. Section 404 regulations are related to wetland fill, and are administered by the US Army Corps of Engineers (USACE). Rivers, streams, creeks, and estuaries are also considered “waters of the United States” and subject to Federal laws. Section 401 regulations are related to water quality, and are reviewed and administered through the Washington State Department of Ecology under an MOU with EPA.

Wetlands for this project were defined according to methods outlined in the U.S. Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0). This federal protocol is the standard adopted by Washington state, and thus is applied in local Critical Areas Protection Ordinances. Using this protocol, data documenting vegetation, soils, and hydrology were collected and used to describe wetland and upland conditions at the site.

Under federal law, wetland fill is regulated, and any wetland crossing is also reviewed for permit compliance, even if no fill is placed in the wetland for the crossing. Minimal impact projects can generally be permitted under a Nationwide Permit (NWP) process, a simpler and less time intensive review. As a general rule and dependent on the specific NWP permit, total fill must be less than 0.5 acre to avoid being reviewed under an individual 404/401 permit process.

2.2.2 State

Wetlands are regulated by Washington Department of Ecology (Ecology) under the Water Pollution Control Act and the Shoreline Management Act. The State Environmental Policy Act (SEPA) process is also used to identify potential wetland-related concerns early in the permitting process. Any proposed impacts to wetlands are reviewed and approved or denied by Ecology applying state law and federal Section 401 regulations listed above.

Under the Washington Administrative Code (WAC) section 173-22-035, the Washington State Department of Ecology (Ecology) requires wetland identification and delineation be completed following the approved federal wetland delineation manual and applicable regional supplements, including but not limited to the 1987 Corps of Engineers Wetland Delineation Manual and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (U.S. Army Corps of Engineers 2010). Thus, the same wetland definitions apply in both state and federal law.

2.3 Local Regulations

Wetlands, streams and other surface water systems are regulated by Pierce County according to Pierce County (PCC) Title 18E – Development Regulations -- Critical Areas ordinance (CAO). Pierce County code defines wetland and stream protection standards, which includes requirements for rating the wetland and making buffer width determinations based on rating score results.

2.4 Preceding Rainfall Assessment Protocol

Preceding weather conditions must be taken into account when delineating wetlands to inform the field practitioner as to whether the work is being carried out during wetter versus dryer than normal conditions. Rainfall conditions preceding the site visits in March of 2019, 2021 and August 2021 were evaluated to determine if they were normal, applying standard procedures described in the 2010 Regional WMVC Supplement (Sprecher and Warne, 2000).

3 Results & Discussion

3.1 Project Overview

This report describes results of a wetland delineation project carried out on the Knutsen Farms Industrial Park (KFIP) property located northeast of Puyallup, in Pierce County, and in the City of Puyallup Urban Growth Area (UGA). The industrial park is proposed by Running Bear Development.

Critical areas onsite were initially delineated and reported in a Critical Areas Assessment Report prepared by Soundview Consultants (SVC) in 2016 (Appendix D). SVC delineated and described four wetlands onsite, Wetlands A, B, C and D. Wetlands A, B and C were mapped in the floodplain east of the warehouse complex, and Wetland D was mapped as being a small wetland, 4,253 sqft, located just offsite on the upper terrace to the southeast (Figure 2). Wetland D was described as being too small to be regulated per PCC 18E.20.030K (CAO 2016). The CAO has been updated since 2016, and that code reference, which defines a minimum size for a regulated wetland in Pierce County is now per PCC 18E.20.035C. An isolated Category IV wetland smaller than 10,000 sqft is not buffered under Pierce County code.

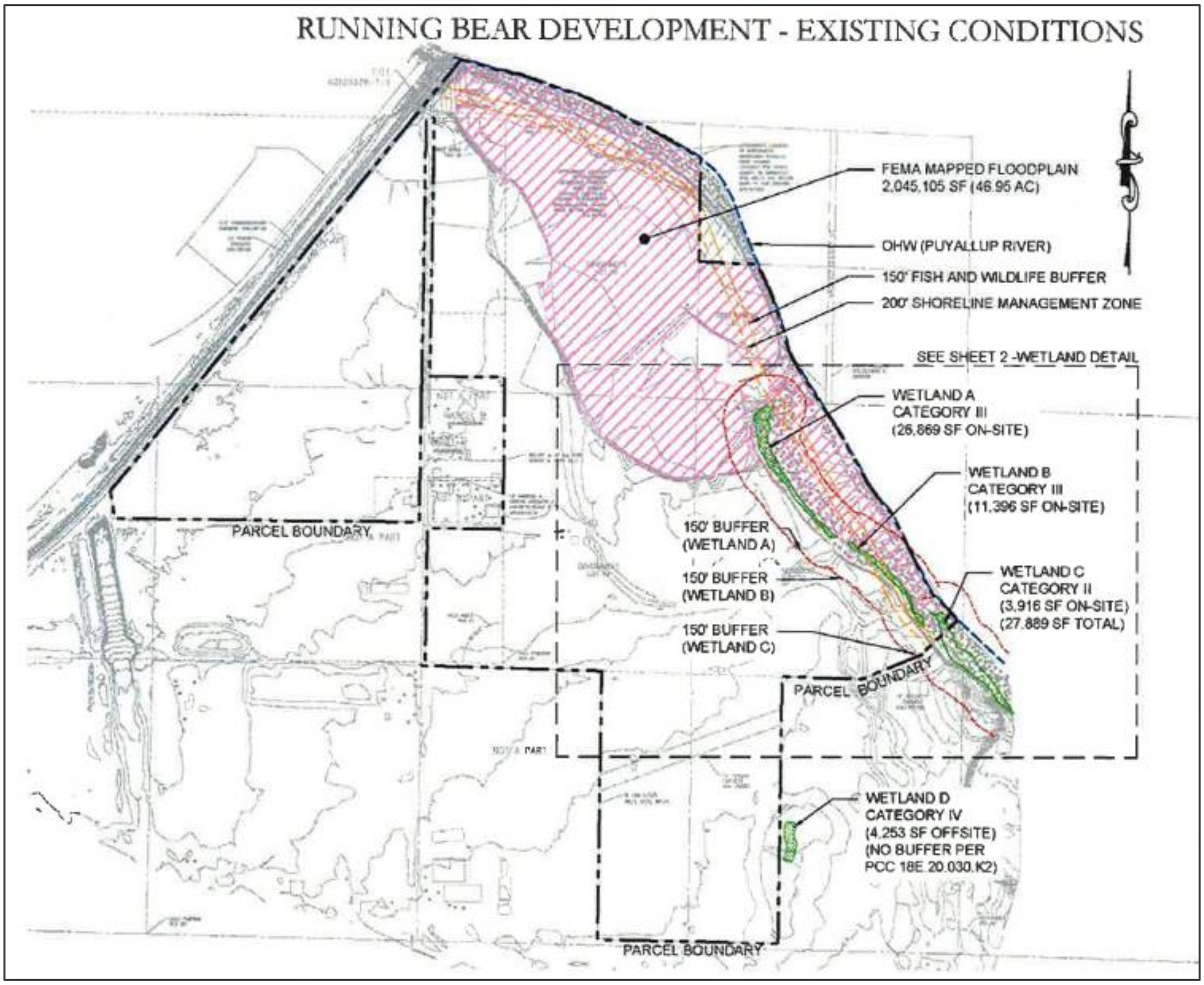


Figure 2. Site wetlands as delineated by SVC in 2016 (figure from Page 39 of SVC 2016 report).

Aerial photo analysis and review of onsite photo records by the City of Puyallup wetland consultant (Lisa Palazzi, PWS, CPSS, SCJ Alliance LLC) during a 2019 public hearing process about the proposed development indicated that the delineation at Wetland D was potentially incorrect. To determine whether Wetland D required additional assessment and to review other key site features in question at the Public Hearing, a March 18, 2019 onsite reconnaissance meeting was organized. Participants included the Pierce County Hearing Examiner, Pierce County staff, City of Puyallup Staff, the KFIP project developer, the project engineer, and others involved in the public hearing process at that time. Site hydrology and hydric soil conditions at Wetland D were photo-documented with brief field notes, but no more detailed wetland analysis or data collection was carried out at that time. The intent of the site visit at Wetland D was primarily to determine whether Wetland D was large enough to be regulated under Pierce County regulations, and whether it extended on to the Project site. Results indicated that Wetland D was larger than depicted in the SVC report and large enough to be regulated by Pierce County. Results also photo-documented that Wetland D overlapped the eastern project property line, extending 20-30 feet onto the Project site for a few hundred feet along the fence line, and thus some wetland and wetland buffer would be directly impacted by the proposed project.

No further work at Wetland D has been carried out by Running Bear Development to date, but a professional determination of the Wetland D boundary is needed in support of the EIS KFIP review process. Therefore, the EIS Team was tasked with delineating Wetland D and preparing a wetland report to document the wetland characteristics and potential impacts from the KFIP proposal.

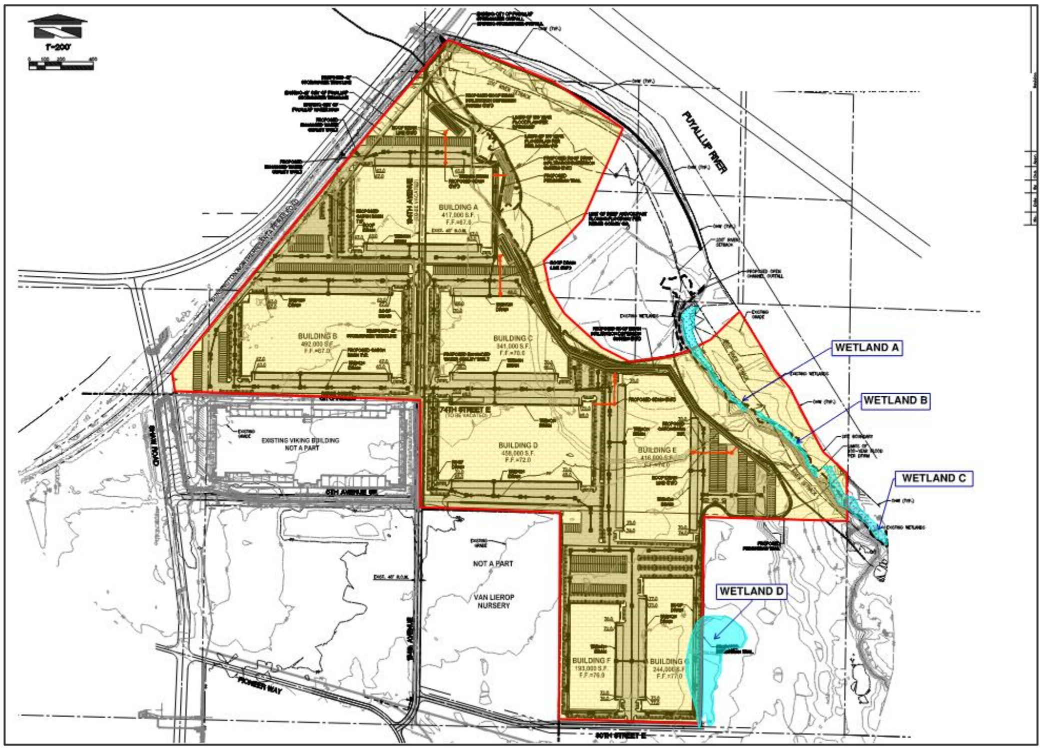


Figure 3. Proposed Warehouse Project layout with associated wetlands, and the corrected delineation of Wetland D (adapted from 03/26/2021 Conceptual Grading and Storm Drainage Plan).

3.2 Results of 2019 and 2021 Wetland D Site Assessment Work

During the March 2019 site visit at Wetland D, surface water in the Wetland D depression was documented in photos and brief field notes on both sides of the Project site boundary in the vicinity of what is proposed as Warehouse G. Figure 3 shows the revised outline of Wetland D in relation to the proposed project warehouses and parking lots in the southeast portion of the site. Approximately one acre of wetland and 0.89 acres of wetland buffer overlay the eastern edge of Warehouse G.

The wetland water surface included areas onsite and offsite to the east at the same elevation. During the March 2019 site visit, the western side of the wetland overlaid the farm field west of the property line fence, in an area that had already been plowed in preparation for summer planting. The plowing had overturned the surface soils and had exposed soil substrate peds (dirt clods). Soil colors in the interior of exposed soil peds in and near the edge of the ponded area were assessed and found to have depleted soil matrix characteristics – i.e., an indicator of hydric (wetland) soil conditions. Aside from documenting the long-duration water edge occurring during the growing season, and presence hydric soil conditions, no more detailed delineation or wetland assessment work was carried during the March 2019 site visit. The purpose of the 2019 site visit and related hydrology and soils assessment work was only to determine whether the wetland was large enough to be regulated under Pierce County code, and if any part of Wetland D was within the KFIP Project site boundary. Both of these conditions were verified.

No further analysis of the Wetland D area was carried out until 2021. As part of the KFIP EIS preparation, the Wetland D boundary conditions were documented and delineated during field work carried out by SCJ Alliance staff (Lisa Palazzi, CPSS, PWS and Erika Whitney, environmental scientist) on March 4, 2021 and August 27, 2021. This work was necessary to determine how much of the Project site may be encumbered by critical area and buffers, and to assess potential impacts from the KFIP project. Results of the 2021 wetland delineation and assessment work are described in more detail below.

3.3 Preceding Rainfall Assessment

To inform the field scientists about current field wetland conditions while carrying out onsite assessment and delineation work, a preceding rainfall analysis (Sprecher and Warne, 2000) was carried out to determine whether the observed hydrology conditions are a result of wetter than normal, normal, or drier than normal preceding rainfall patterns. The standard preceding rainfall analysis is based on rainfall records for the three months prior to field work. Tables 1 and 2 below show this data prior to the March 2019 and March 2021 field visits, as early spring (during the growing season) is a critical time period for determining whether the subject area meets wetland hydrology definition requirements. Results of preceding rainfall analysis indicated that **Normal** precipitation conditions were present prior to both March 2019 and March 2021 field visits (Tables 1 and 2).

Table 1. March 18, 2019: Preceding monthly precipitation data for Tacoma 1 NRCS weather station.

Month	30% <	Avg	30% >	PPT (in.)	Rank	Rank Value	Weight Value	Product
Feb.	2.54	3.92	4.72	5.1	W	3	3	9
Jan.	4.28	6.01	7.11	3.72	D	1	2	2
Dec.	4.28	5.76	6.74	6.76	W	3	1	3
			SUM	**15.58**			**SUM:**	**14**
							Conclusion:	**Normal**
Growing Season: 2/6 to 12/1: 298 days 50% chance of 28F or higher								
Source: AgACIS for Tacoma #1, WA								

Rank and Value:
Dry (D) = 1
Normal (N) = 2
Wet (W) = 3

Result Assessment:
6-9: Drier than normal
10-14: normal
15-18: wetter than normal

Table 2. March 4, 2021: Preceding monthly precipitation data for Tacoma 1 NRCS weather station.

Month	30% <	Avg	30% >	PPT (in.)	Rank	Rank Value	Weight Value	Product
Feb.	2.54	3.92	4.72	3.91	N	2	3	6
Jan.	4.28	6.01	7.11	8.79	W	3	2	6
Dec.	4.28	5.76	6.74	5.64	N	2	1	2
			SUM	**18.34**			**SUM:**	**14**
							Conclusion:	**Normal**
Growing Season: 2/6 to 12/1: 298 days 50% chance of 28F or higher								
Source: AgACIS for Tacoma #1, WA								

Rank and Value:
Dry (D) = 1
Normal (N) = 2
Wet (W) = 3

Result Assessment:
6-9: Drier than normal
10-14: normal
15-18: wetter than normal

3.4 Wetland D Assessment Results

3.4.1

To properly determine how much of the Project site may be encumbered by critical area and buffers, Wetland D has been re-delineated. Vegetation, soils, and hydrology were assessed following methods described in the U.S. Army Corps of Engineers (2010) Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).

Wetland D is an internally draining, natural depression with surface inflows from the south, and groundwater inflows from surrounding uplands, both onsite and offsite. The natural depression may have formed originally as a shallow glacial kettle on the post-glacial floodplain. Kettle depressions often contain wetlands or lakes, particularly when they are in a position to receive surface runoff. The onsite portion of Wetland D is plowed in the late spring and planted in summer after the early season hydrology has infiltrated, evaporated or is lost to transpiration from spring and early summer plant growth. Offsite areas to the east are managed as a pasture for livestock. The lowest central area of the wetland has scant vegetation even in mid to late summer, due to long-duration inundation in the Spring, which limits early season plant growth. The wetland is dominated by emergent vegetation, but includes enough shrubby areas around the perimeter and along the Project site fence line to meet requirements for a Palustrine Scrub-Shrub Cowardin vegetation class. Thus, Wetland D is classified as a Palustrine Emergent and Palustrine Scrub-Shrub (PEM/PSS) system.

The one-acre onsite portion of Wetland D is in an actively farmed field. Therefore, no field staking or wetland flags were placed at the wetland boundary, as the flags would have been lost during cultivation,

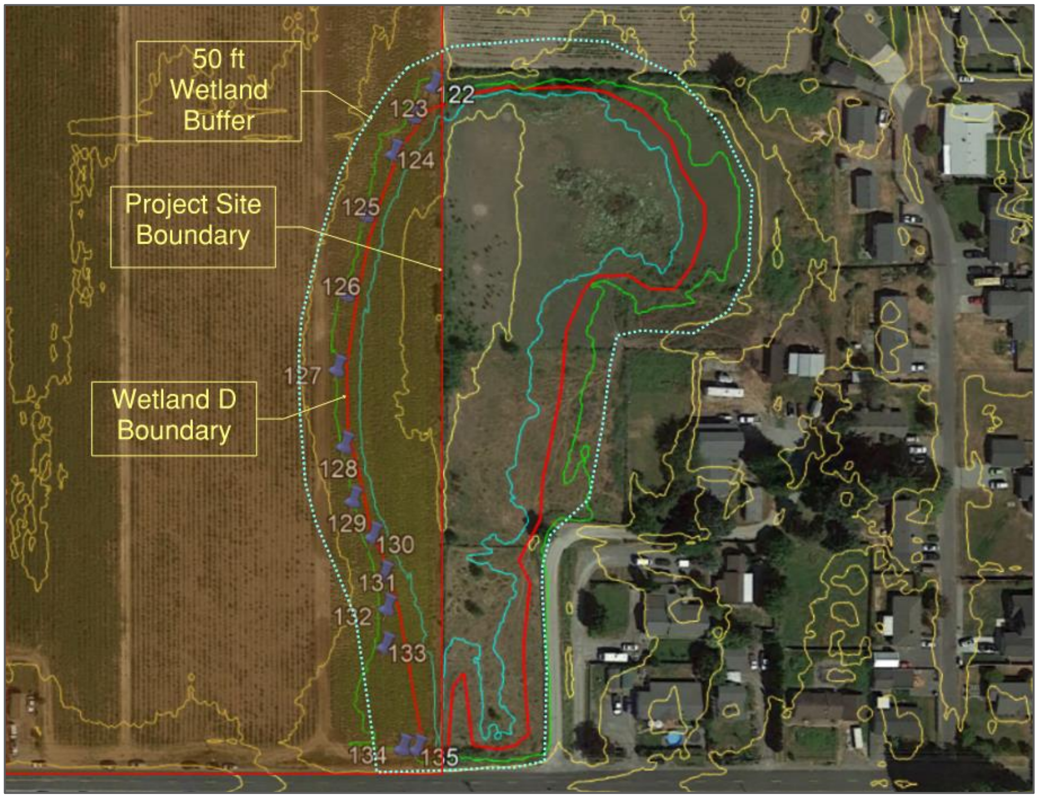


Figure 4. Wetland D boundary (red line), as indicated by GPS Waypoints and topography.

and stakes or pin flags could potentially have damaged equipment during farming operations. The onsite section of the wetland edge was instead marked with Waypoints using a hand-held GPS unit, which had a reported error of less than 3 to 5 feet during the field work, due to clear skies and optimal satellite coverage (Figure 4). The map of the entire wetland, including the 2 acres of offsite wetland pasture areas to the east, was created by overlaying the waypoint mapping from onsite areas on a LiDAR topography base map, then following the same elevation line (midway between 1ft contour lines) to define the approximate wetland edge in offsite areas. Figure 4 shows the three-acre Wetland D boundary outlined in red.

Hydrology

During the March 18, 2019 and March 4, 2021 field visits, extensive ponded surface water was photo-documented in the Wetland D depression on both sides of the Project site fence line in the vicinity of proposed Warehouse G (Figure 5). During the August 2021 field visit, onsite portions were being farmed, and offsite portions were being used as pasture. There was no surface hydrology on either side of the fence. Wetland D is a seasonally wet system, so this lack of hydrology in mid to late summer is expected.

Figure 5. Water surface at Wetland D in March 2021

Wetland hydrology indicators in August were obscured by cultivation. However, onsite and offsite wetland hydrology indicators during the dry season included: Water marks (B1), Drift deposits (B3), Inundation visible on aerial imagery (B7); Sparsely vegetated concave surface (B8); Recent Iron reduction in tilled soils (C6); stunted or stressed plants (D1); and Geomorphic position (D2).

Figure 6. Hydric soils at the edge of Wetland D.

Soils

Soils in the area in and surrounding Wetland D are mapped as Briscot loam and Sultan silt loam. The Briscot is considered hydric, unless artificially drained. The Sultan is mapped as having a shallow, seasonal water table within a foot or two of the surface, and can include wetland areas in depressions and swales.

Hydric soil indicators were present. In areas where recent plowing had not mixed the surface, the upper soil layers (0-6 inches) were dark grayish brown (10YR4/2) sandy loams and loam fine sands, with no redox concentrations. Below 6 inches to deeper than 12 inches, the subsoils were dark grayish brown (10YR4/2) with about 30% distinct redox concentrations, yellowish brown (10YR5/6). This meets requirements of Indicator F3, Depleted Matrix. (Figure 6).

Vegetation

The plant community in the plowed farm field was non-existent in March 2021. However, the plant community at the fence line and offsite to the east was documented in both March and in August 2021.

More than 80% of the wetland plants were Facultative or Facultative Wet species (Table 3). The two Facultative Upland species, oxeye daisy and red clover, were mostly on a small berm along the fence line. These plants grow later in the summer, and thus were not growing when the soils were saturated.

The upland vegetation community associated with Wetland D was mostly offsite in the pasture, as the onsite upland was all plowed farmland. However, the most obvious difference in the buffer plant community along the northern fenceline was increased presence of Himalayan blackberry in the buffer.

Figure 7. Wetland shrubs and herbs along fence line

Table 3. Wetland species list

	Indicator Status
Shrubs	
Black cottonwood (*Populus balsamifera*)	FAC
Pacific willow (*Salix lasiandra*)	FAC
Sitka/ Hooker willow (Salix spp)	FACU
Ferns, Herbs & Vines	
Reed canarygrass (*Phalaris arundinacea*)	FACW
Soft rush (*Juncus effusus*)	FACW
Canada thistle (*Cirsium arvense*)	FAC
Lady’s thumb (*Persicaria maculosa)*	FACW
Tall fescue (*Schedonorus arundinaceus*)	FAC
Field horsetail (*Equisetum arvense*)	FAC
Purslane (*Portulaca oleracea)*	FAC
Beggars tick (*Bidens frondose)*	FACW
Hairy willowherb (*Epilobium hirsutum*)	FACW
Miners lettuce (*Claytonia siberica*)	FAC
Oxeye daisy (*Leucanthemum vulgare)*	FACU
Red clover (*Trifolium pratense)*	FACU
Field bindweed (*Convolvulus arvensis)*	NI
Smooth pigweed (*Amaranthus hybridus)*	NI
Field pumpkin (*Cucurbita pepo)*	NI

3.5 Wetland D Rating Result

The wetland was rated applying the current Western Washington Wetland Rating System. The wetland scored 6 points for Improving Water Quality, primarily due to being an internally draining depression. It scored 6 points for Hydrologic or Water Quantity controls, for the same reason – it ponds water. It scored very low for Habitat Potential and Value – 3 points.

Applying these results to the Pierce County CAO guidance indicates a standard buffer of 50 ft.

3.6 Summary

Wetland D is a Depressional, Palustrine Emergent/ Palustrine Scrub-Shrub system. It encompasses 3-acres total, with one acre onsite and two acres offsite to the east. It is a Category IV wetland with Moderate Water Quality and Hydrologic rating scores, but a low Habitat rating score, and has a standard buffer of 50 feet.

The Project proposes to fill the onsite portions of Wetland D, and its buffer. This action will require federal permit review from the USACE (Section 404 – fill impacts) and Ecology (Section 401 – water quality impacts), as well as Critical Area review and permitting from Pierce County. Any impacts to wetlands or their buffers will require mitigation.

Appendix A

Wetland Rating Figures and Forms

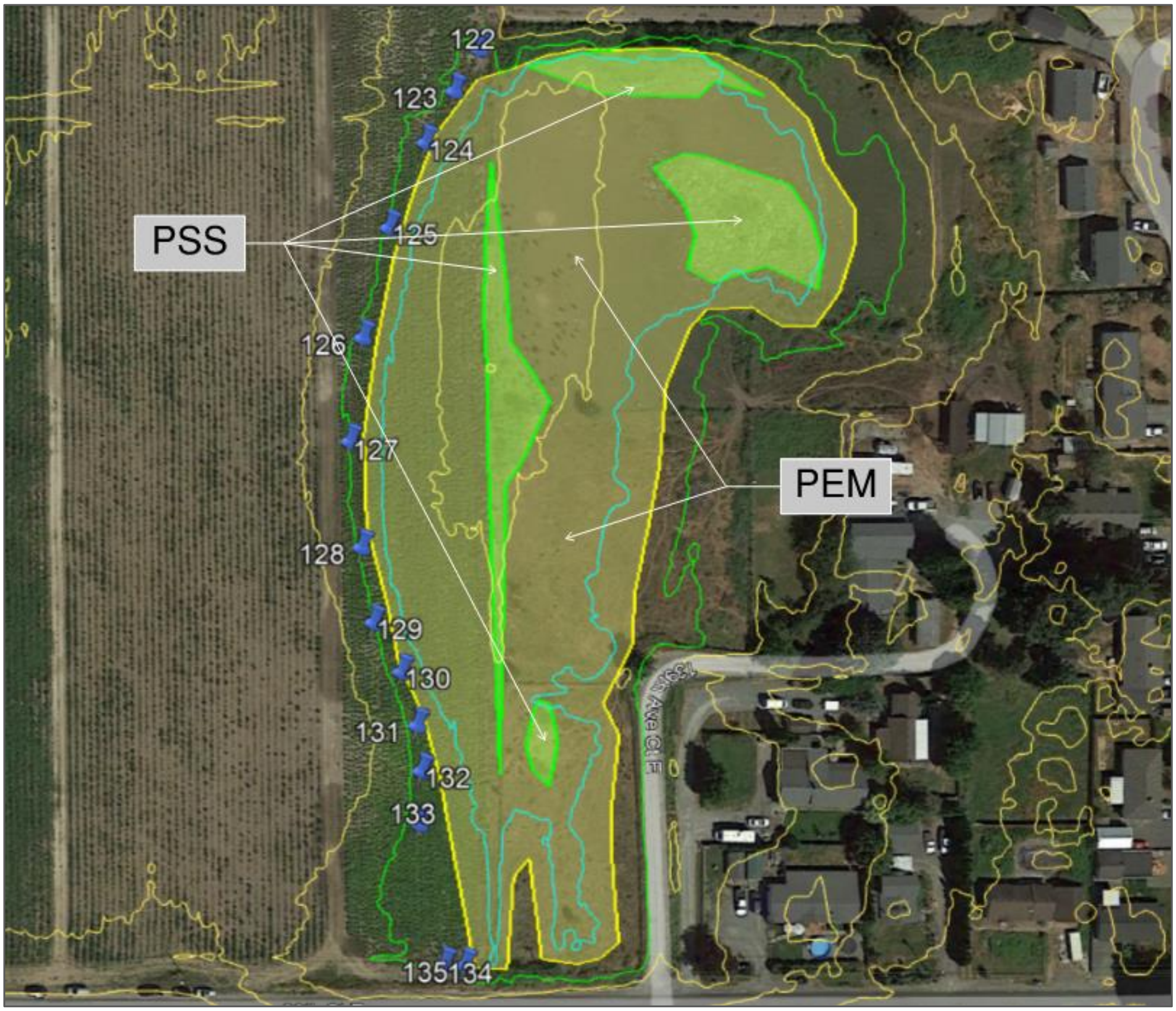


Figure 8. Wetland D Cowardin Classes

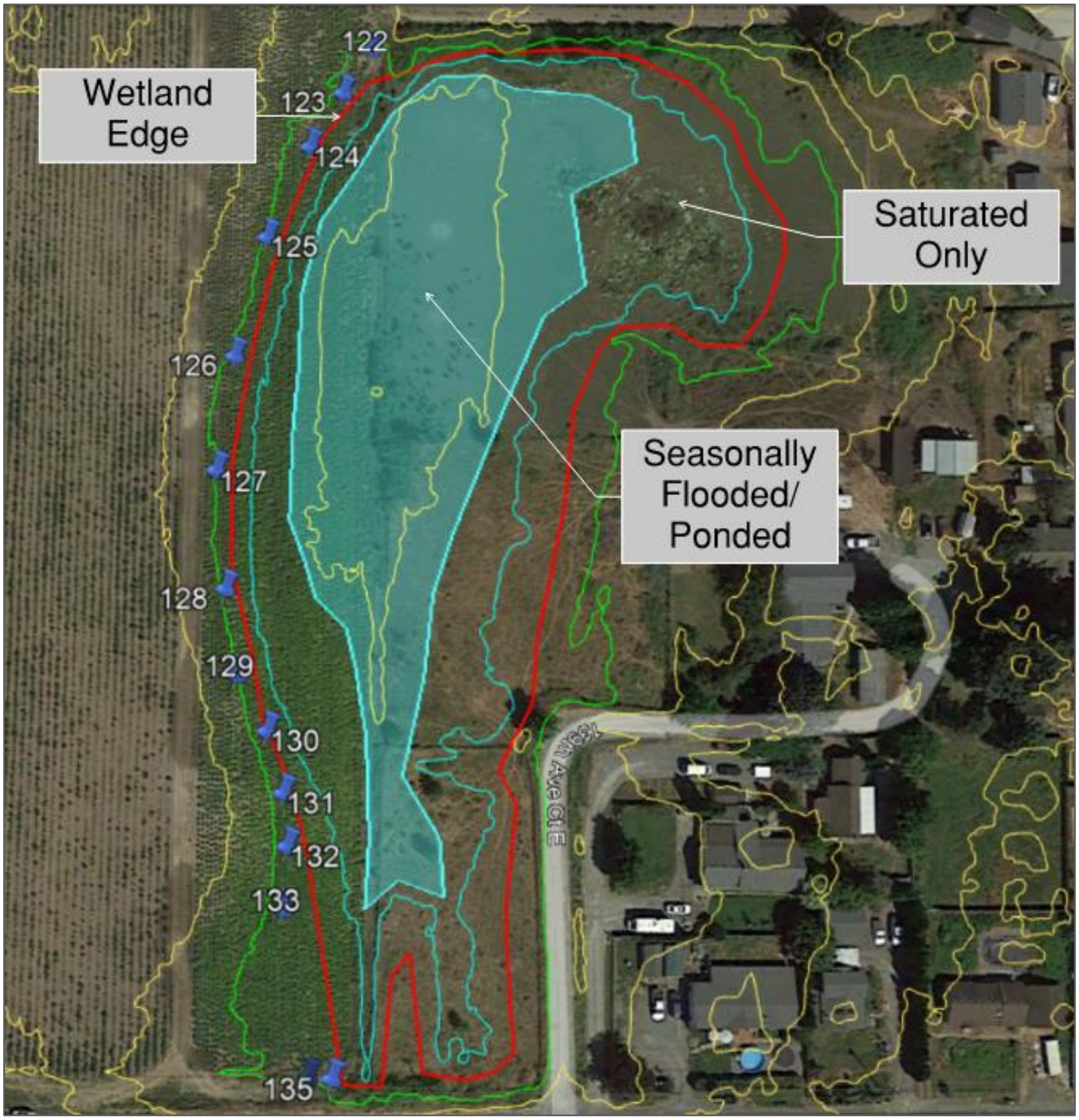


Figure 9. Hydroperiods – No Surface Outlet

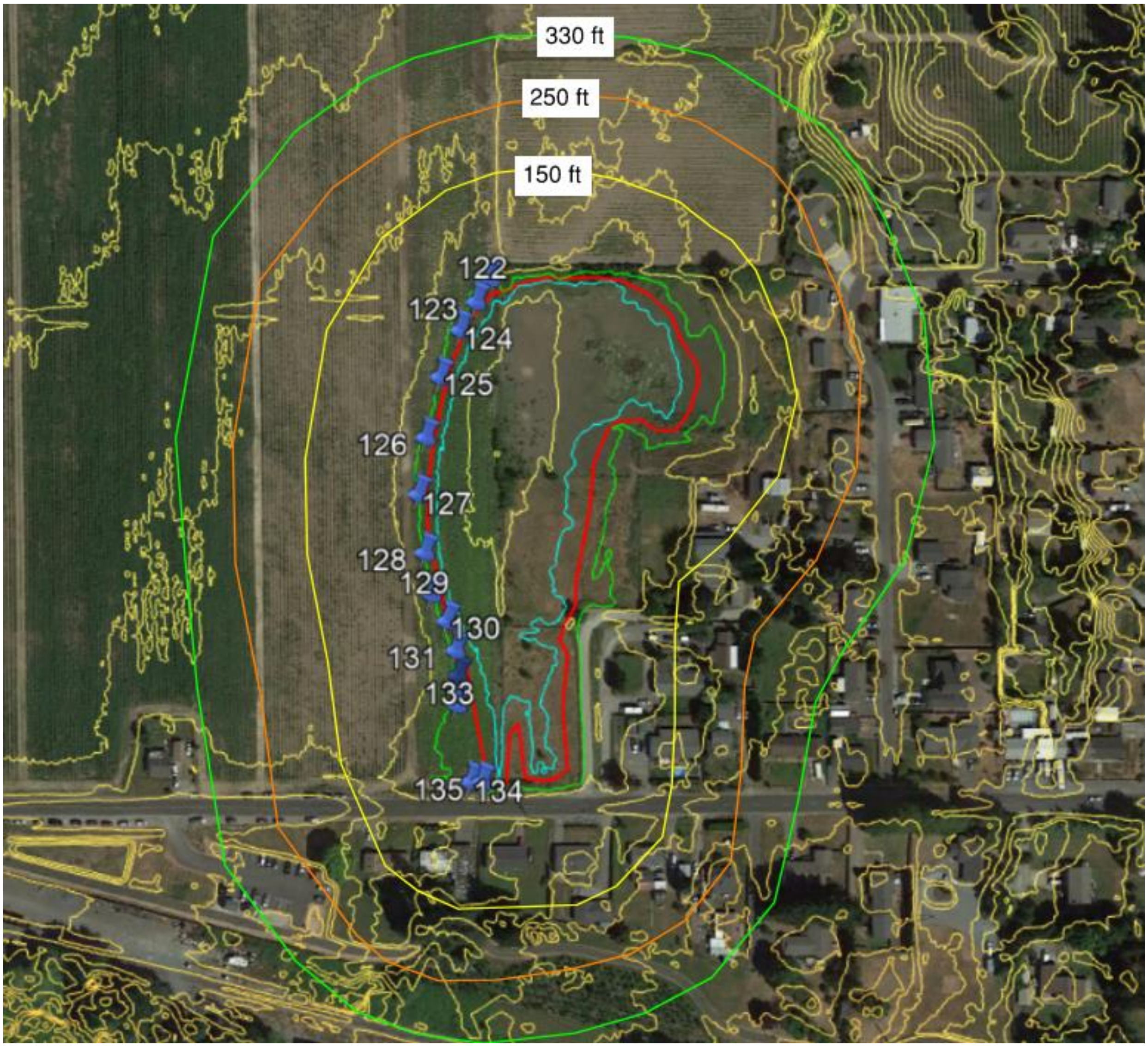


Figure 10. 150’. 250’ and 330’ setbacks

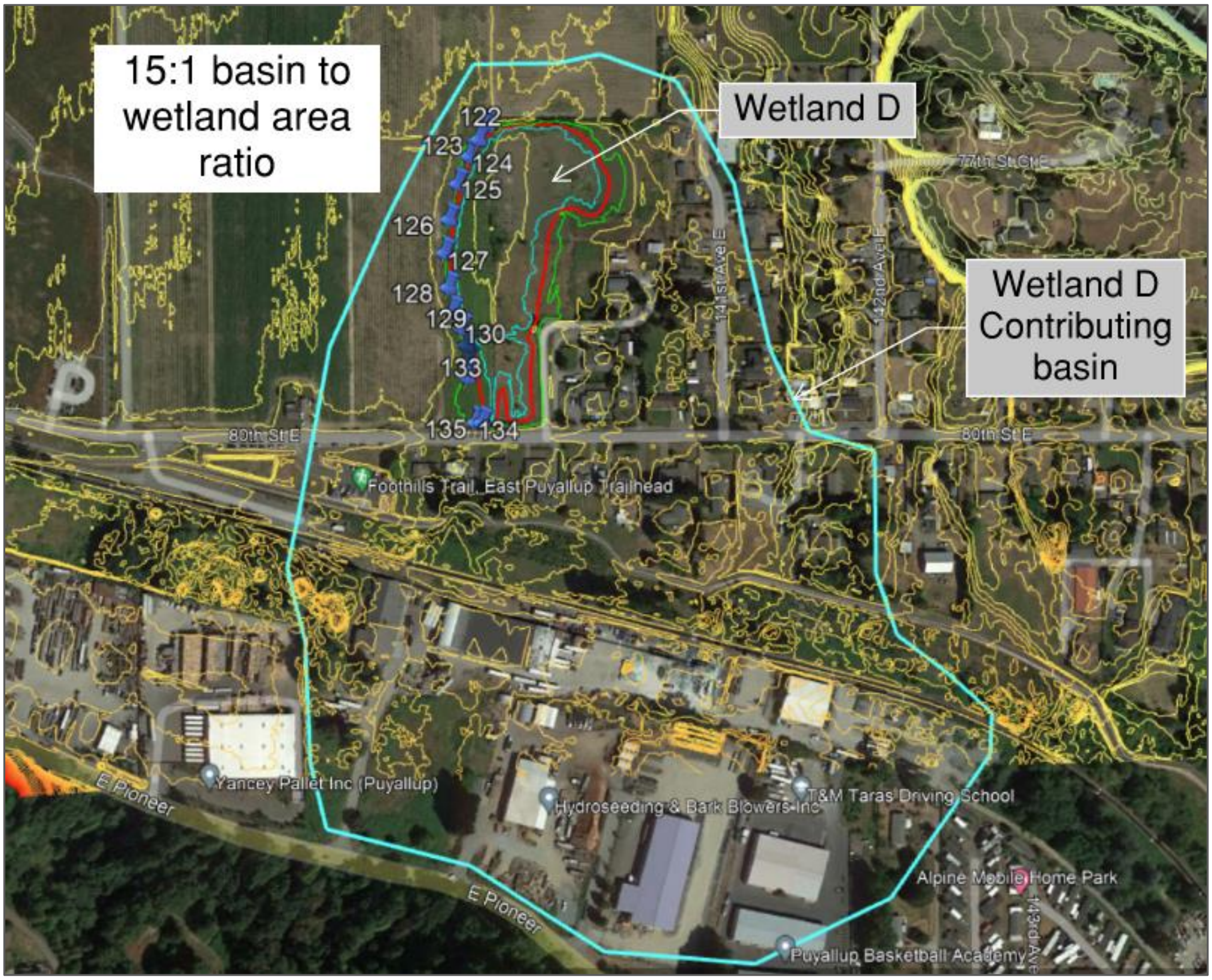
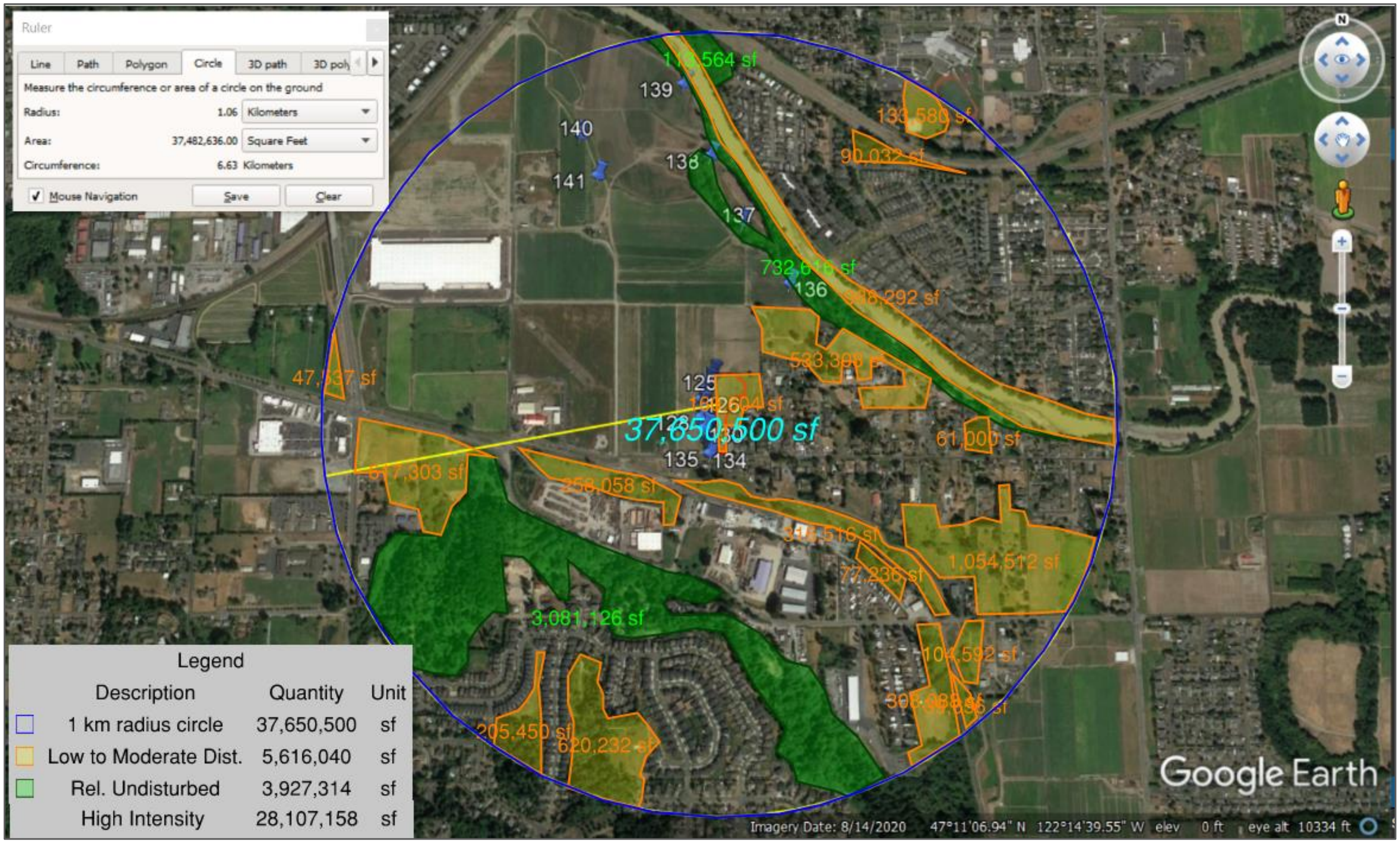


Figure 11. Wetland D Contributing Basin


Ruler

Measure the circumference or area of a circle on the ground

Radius: 1.06 Kilometers

Area: 37,482,636.00 Square Feet

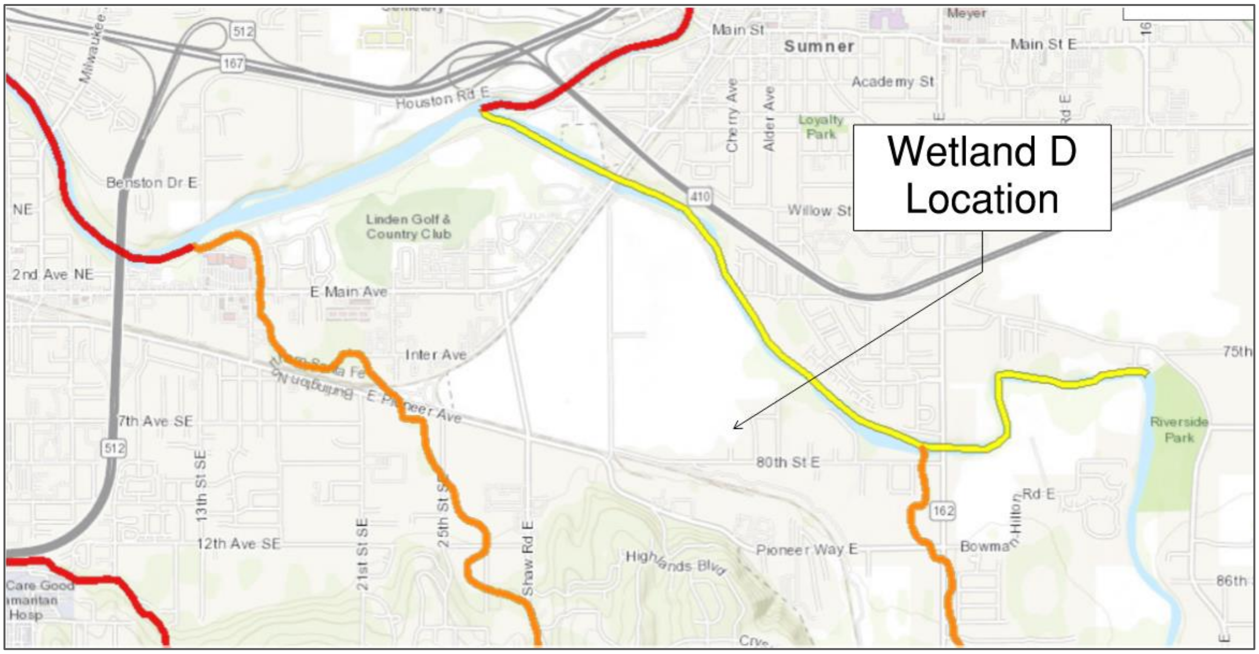
Circumference: 6.63 Kilometers

☑ Mouse Navigation

Legend

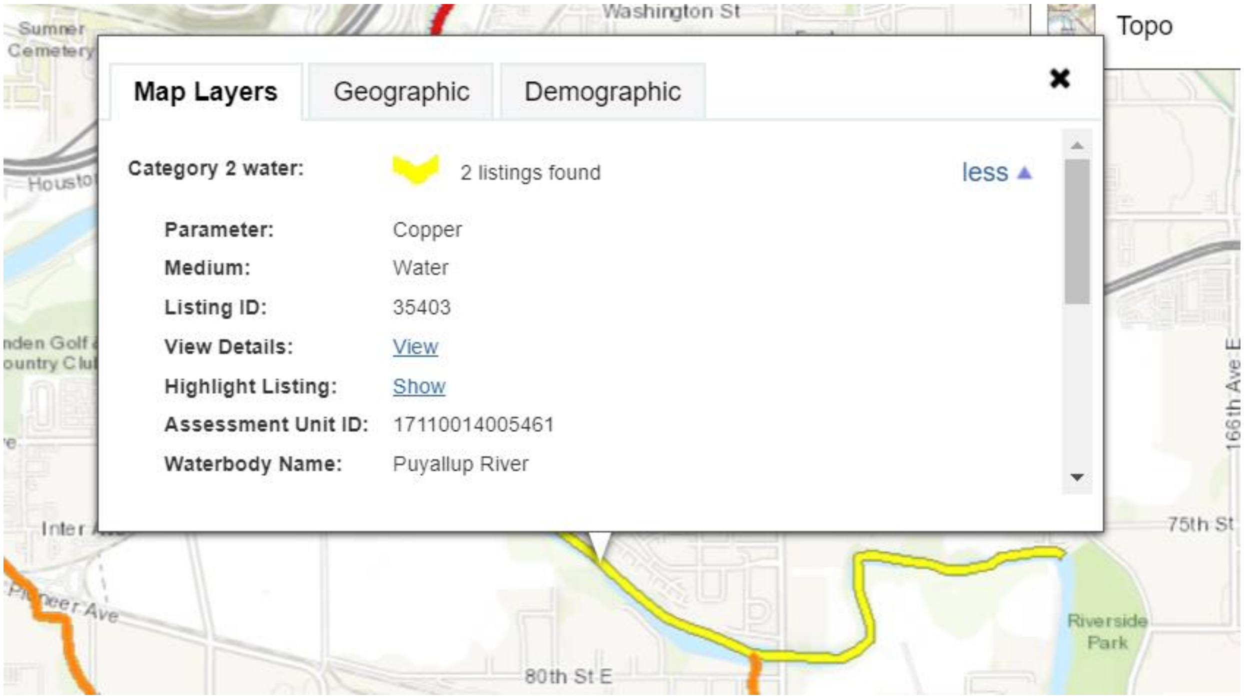
	Description	Quantity	Unit
🟦	1 km radius circle	37,650,500	sf
🟨	Low to Moderate Dist.	5,616,040	sf
🟩	Rel. Undisturbed	3,927,314	sf
	High Intensity	28,107,158	sf

Figure 12. Habitat Cover



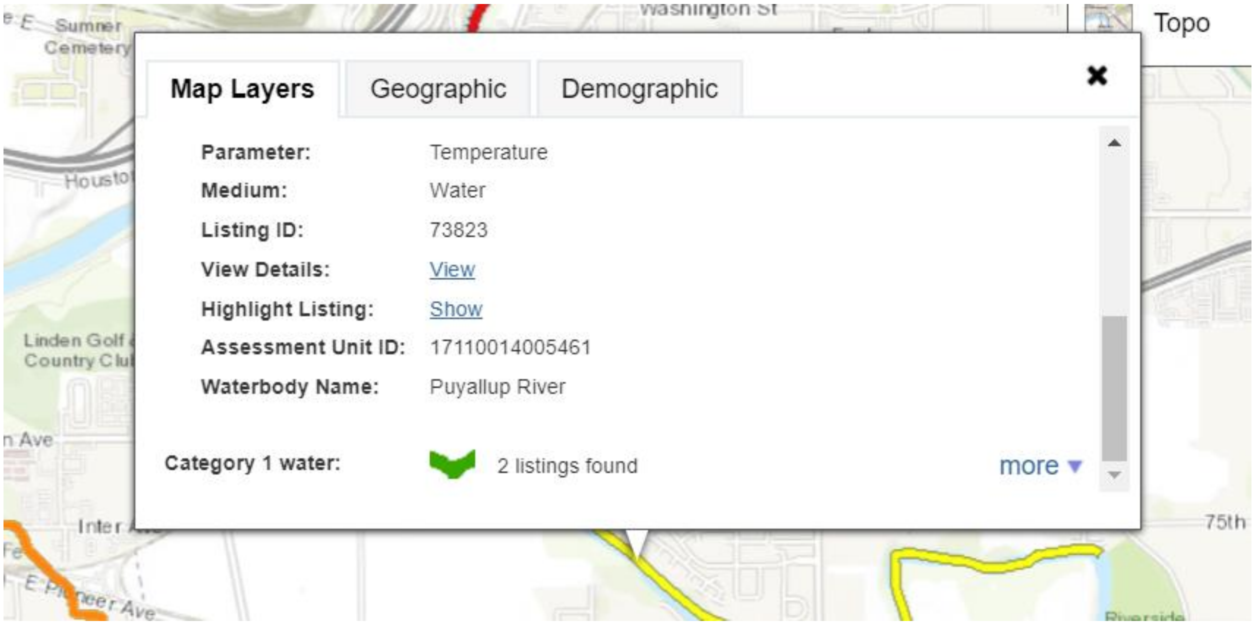
Wetland D Location

Figure 13. 303D mapping and TMDL projects nearby (see details below)



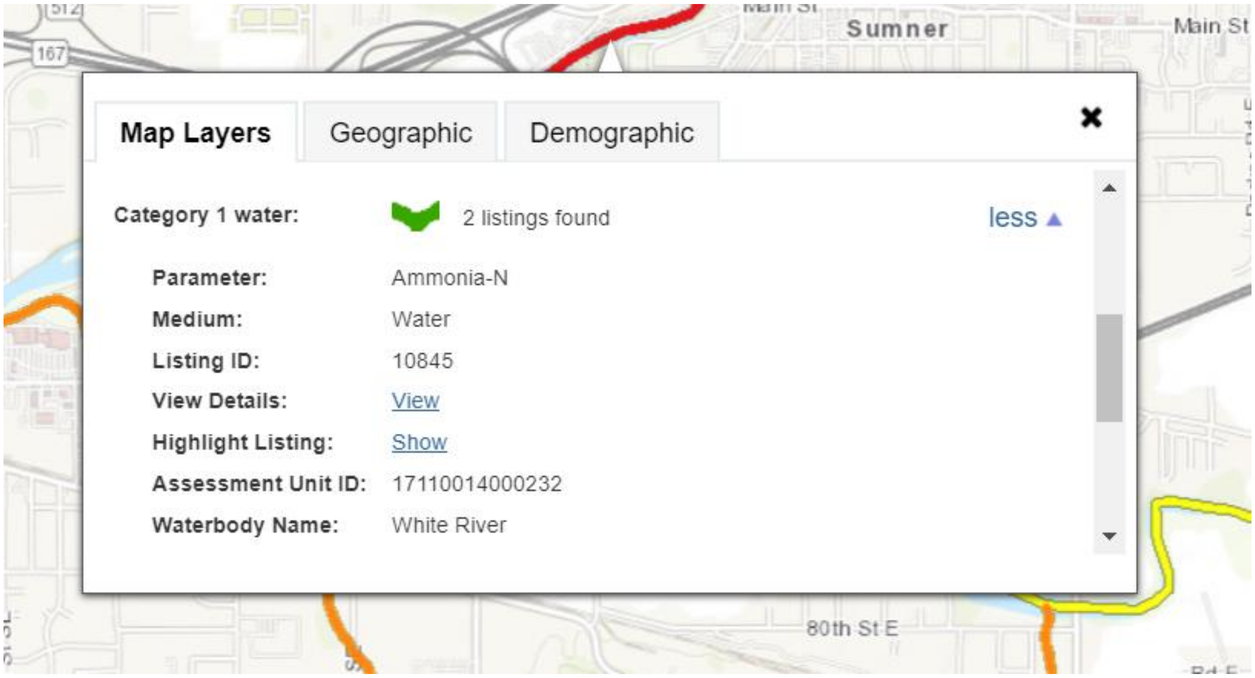
Category 2 water: 2 listings found

Parameter: Copper
Medium: Water
Listing ID: 35403
View Details: View
Highlight Listing: Show
Assessment Unit ID: 17110014005461
Waterbody Name: Puyallup River



Parameter: Temperature
Medium: Water
Listing ID: 73823
View Details: View
Highlight Listing: Show
Assessment Unit ID: 17110014005461
Waterbody Name: Puyallup River

Category 1 water: ✓ 2 listings found



Category 1 water: ✓ 2 listings found

Parameter: Ammonia-N
Medium: Water
Listing ID: 10845
View Details: View
Highlight Listing: Show
Assessment Unit ID: 17110014000232
Waterbody Name: White River

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Shaw Road WL D Date of site visit: 3/4/2021 and 8//19/2021

Rated by Lisa Palazzi Trained by Ecology? ☑ Yes ☐ No Date of training 2021

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☐ Y ☑ N

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.

Source of base aerial photo/map GoogleEarth and Pierce County GIS

OVERALL WETLAND CATEGORY II (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

____ **Category I** – Total score = 23 - 27

____ **Category II** – Total score = 20 - 22

____ **Category III** – Total score = 16 - 19

XX **Category IV** – Total score = 9 - 15

FUNCTION	**Improving Water Quality**	**Hydrologic**	**Habitat**	
			Circle the appropriate ratings	
Site Potential	H☐ M☑ L☐	H☐ M☑ L☐	H☐ M☐ L☑	
Landscape Potential	H☑ M☐ L☐	H☑ M☐ L☐	H☐ M☐ L☑	
Value	H☐ M☐ L☑	H☐ M☐ L☑	H☐ M☐ L☑	**TOTAL**
Score Based on Ratings	6	6	3	15

Score for each function based on three ratings
(order of ratings is not important)

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	**CATEGORY**
Estuarine	I II
Wetland of High Conservation Value	I
Bog	I
Mature Forest	I
Old Growth Forest	I
Coastal Lagoon	I II
Interdunal	I II III IV
None of the above	xx

Wetland name or number Shaw Road WL D

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	8
Hydroperiods	D 1.4, H 1.2	9
Location of outlet *(can be added to map of hydroperiods)*	D 1.1, D 4.1	9
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	10
Map of the contributing basin	D 4.3, D 5.3	11
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	12
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	13
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	13

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number Shaw Road WL D

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

☑ NO – go to 2 ☐ **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☑ **NO – Saltwater Tidal Fringe (Estuarine)** ☐ **YES – Freshwater Tidal Fringe**
*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☑ NO – go to 3 ☐ **YES** – The wetland class is **Flats**
*If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
☐ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
☐ At least 30% of the open water area is deeper than 6.6 ft (2 m).

☑ NO – go to 4 ☐ **YES** – The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
☐ The wetland is on a slope (*slope can be very gradual*),
☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
☐ The water leaves the wetland **without being impounded**.

☑ NO – go to 5 ☐ **YES** – The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
☐ The overbank flooding occurs at least once every 2 years.

Wetland name or number Shaw Road WL D

☑ NO – go to 6 ☐ **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO – go to 7 ☑ **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☑ NO – go to 8 ☐ **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions)*. Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^{1}/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^{1}/_{10}$ of area points = 0	1
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	4
Total for D 1 Add the points in the boxes above	8

Rating of Site Potential If score is: ☐ **12-16 = H** ☑ **6-11 = M** ☐ **0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? ☑ Yes = 1 No = 0 ☐	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? ☑ Yes = 1 No = 0 ☐	1
D 2.3. Are there septic systems within 250 ft of the wetland? ☑ Yes = 1 No = 0 ☐	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source Agrichemicals from farming ☑ Yes = 1 No = 0 ☐	1
Total for D 2 Add the points in the boxes above	4

Rating of Landscape Potential If score is: ☑ **3 or 4 = H** ☐ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? ☐ Yes = 1 No = 0 ☑	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? ☐ Yes = 1 No = 0 ☑	0
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? ☐ Yes = 2 No = 0 ☑	0
Total for D 3 Add the points in the boxes above	0

Rating of Value If score is: ☐ **2-4 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

Wetland name or number Shaw Road WL D

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet points = 2 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	3
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	0
Total for D 4 Add the points in the boxes above	7

Rating of Site Potential If score is: ☐ **12-16 = H** ☑ **6-11 = M** ☐ **0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? ☑ Yes = 1 No = 0 ☐	1
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? ☑ Yes = 1 No = 0 ☐	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? ☑ Yes = 1 No = 0 ☐	1
Total for D 5 Add the points in the boxes above	3

Rating of Landscape Potential If score is: ☑ **3 = H** ☐ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately down-gradient of unit. points = 2 ☐ • Surface flooding problems are in a sub-basin farther down-gradient. points = 1 ☐ Flooding from groundwater is an issue in the sub-basin. points = 1 ☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* ____ points = 0 ☐ There are no problems with flooding downstream of the wetland. points = 0 ☑	0
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? ☐ Yes = 2 No = 0 ☑	0
Total for D 6 Add the points in the boxes above	0

Rating of Value If score is: ☐ **2-4 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

Wetland name or number Shaw Road WL D

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.*

☐ Aquatic bed	4 structures or more: points = 4
☑ Emergent	3 structures: points = 2
☑ Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points = 1
☐ Forested (areas where trees have > 30% cover)	1 structure: points = 0

If the unit has a Forested class, check if:

☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

1

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

☐ Permanently flooded or inundated	4 or more types present: points = 3
☑ Seasonally flooded or inundated	3 types present: points = 2
☐ Occasionally flooded or inundated	2 types present: points = 1
☑ Saturated only	1 type present: points = 0
☐ Permanently flowing stream or river in, or adjacent to, the wetland	
☐ Seasonally flowing stream in, or adjacent to, the wetland	
☐ **Lake Fringe wetland**	**2 points**
☐ **Freshwater tidal wetland**	**2 points**

1

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

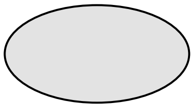
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

If you counted: > 19 species	☐	points = 2
5 - 19 species	☑	points = 1
< 5 species	☐	points = 0

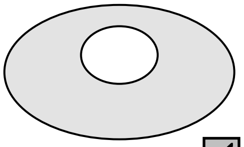
1

H 1.4. Interspersion of habitats

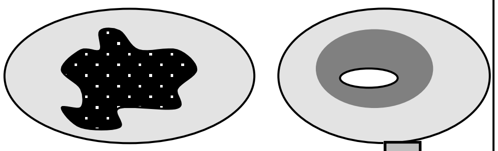
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*



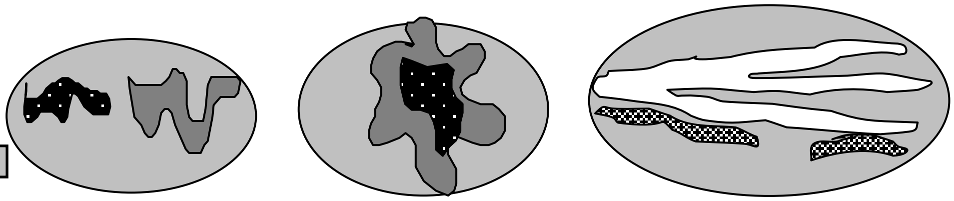
None = 0 points ☐



Low = 1 point ☑



Moderate = 2 points ☐



All three diagrams in this row are **HIGH** = 3points ☐

1

H 1.5. Special habitat features:

Check the habitat features that are present in the wetland. *The number of checks is the number of points.*

☐ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long).
☐ Standing snags (dbh > 4 in) within the wetland
☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m)
☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)*
☐ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)*
☐ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)

0

Total for H 1 — Add the points in the boxes above — 4

Rating of Site Potential If score is: ☐ **15-18 = H** ☐ **7-14 = M** ☑ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?

H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*).

Calculate: % undisturbed habitat 0 [(% moderate and low intensity land uses)/2] 0.21 _ 0.21 %

If total accessible habitat is:

> $^{1}/_{3}$ (33.3%) of 1 km Polygon	points = 3	0
20-33% of 1 km Polygon	points = 2	
10-19% of 1 km Polygon	points = 1	
< 10% of 1 km Polygon	points = 0	

H 2.2. Undisturbed habitat in 1 km Polygon around the wetland.

Calculate: % undisturbed habitat 10.4 [(% moderate and low intensity land uses)/2] 7.5 _ 17.9 %

Undisturbed habitat > 50% of Polygon	points = 3	
Undisturbed habitat 10-50% and in 1-3 patches	points = 2	
Undisturbed habitat 10-50% and > 3 patches	points = 1	1
Undisturbed habitat < 10% of 1 km Polygon	points = 0	

H 2.3. Land use intensity in 1 km Polygon: If

> 50% of 1 km Polygon is high intensity land use	points = (- 2)	-2
≤ 50% of 1 km Polygon is high intensity	points = 0	

Total for H 2 — Add the points in the boxes above — -1

Rating of Landscape Potential If score is: ☐ **4-6 = H** ☐ **1-3 = M** ☑ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?

H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.*

Site meets ANY of the following criteria: points = 2

☐ It has 3 or more priority habitats within 100 m (see next page)
☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists)
☐ It is mapped as a location for an individual WDFW priority species
☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources
☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan

☐ Site has 1 or 2 priority habitats (listed on next page) within 100 m points = 1

☑ Site does not meet any of the criteria above points = 0

2

Rating of Value If score is: ☐ **2 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

Wetland name or number Shaw Road WL D

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

☐ **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

☐ **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

☐ **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

☐ **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

☐ **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

☐ **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

☐ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

☐ **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

☐ **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

☐ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

Wetland name or number Shaw Road WL D

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt Yes –Go to **SC 1.1** No= **Not an estuarine wetland**	NA
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ Yes = **Category I** ☑ No - Go to **SC 1.2**	**Cat. I** ☐
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐ Yes = **Category I** ☐ No = **Category II**	**Cat. I** ☐ **Cat. II** ☐
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes **–** Go to **SC 2.2** ☑ No **–** Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes **= Category I** ☑ No **= Not a WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes **– Contact WNHP/WDNR and go to SC 2.4** ☑ No **= Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes **= Category I** ☑ No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐ Yes – Go to **SC 3.3** ☑ No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐ Yes – Go to **SC 3.3** ☑ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐ Yes = **Is a Category I bog** ☑ No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? ☐ Yes = **Is a Category I bog** ☑ No = **Is not a bog**	**Cat. I** ☐

Wetland name or number Shaw Road WL D

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.

☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

☐ Yes = **Category I** ☑ No **= Not a forested wetland for this section**

☐ **Cat. I**

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks

☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)*

Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).

☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.

☐ The wetland is larger than $^1/_{10}$ ac (4350 ft^2)

☐ Yes = **Category I** ☐ No = **Category II**

☐ **Cat. I**

☐ **Cat. II**

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

☐ Long Beach Peninsula: Lands west of SR 103

☐ Grayland-Westport: Lands west of SR 105

☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109

☐ Yes – Go to **SC 6.1** ☑ No = **not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? ☐ Yes = **Category I** ☐ No – Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?

☐ Yes = **Category II** ☐ No – Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?

☐ Yes = **Category III** ☐ No = **Category IV**

☐ **Cat I**

☐ **Cat. II**

☐ **Cat. III**

☐ **Cat. IV**

Category of wetland based on Special Characteristics

If you answered No for all types, enter "Not Applicable" on Summary Form

Appendix B

Wetland Field Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Grass Lake WL-D City/County: Pierce Sampling Date: 3/4/2021
Applicant/Owner: Running Bear Development State: WA Sampling Point: Wpt. 131 (WL)
Investigator(s): Lisa Palazzi, CPSS, PWS Section, Township, Range: S25 T20 R04E
Landform (hillslope, terrace, etc.): Depressional Swale Local relief (concave, convex, none): Concave Slope (%): 0-3%
Subregion (LRR): WMVC Lat: 47.185836 Long: -122.243531 Datum: ______
Soil Map Unit Name: Sultan silt loam and Briscot loam NWI classification: PEM/PSS
Are climatic / hydrologic conditions on the site typical for this time of year? Yes XX No ______ (If no, explain in Remarks.)
Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes XX No ______
Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes XX No ______	**Is the Sampled Area within a Wetland?** **Yes** XX **No** ______
Hydric Soil Present?	Yes XX No ______	
Wetland Hydrology Present?	Yes XX No ______	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 30ft)			
1. Sitka willow (Salix sitchensis)	30	Y	FACW
2. Black cottonwood (Populus balsamifera)	50	Y	FAC
3. Pacific Willow (Salix lasiandra)	40	Y	FAC
4.			
5.			
= Total Cover	120		
Herb Stratum (Plot size: 10ft)			
1. Reed canarygrass (Phalaris arundinacea)	40	Y	FACW
2. Soft rush (Juncus effusus)	40	Y	FACW
3. Lady's thumb (Persicaria maculosa)	25	N	FACW
4. Beggars tick (Bidens frondose)	25	N	FACW
5. Field horsetail (Equisetum arvense)	30	N	FAC
6. Tall fescue (Schedonorus arundinaceus)	60	Y	FAC
7. Oxeye daisy (Leucanthemum vulgare)	30	N	FACU
8. Red clover (Trifolium pratense)	30	N	FACU
9.			
10.			
11.			
= Total Cover	190		
Woody Vine Stratum (Plot size: 10ft)			
1.			
2.			
= Total Cover	%		
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)
Total Number of Dominant Species Across All Strata: 6 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	165	x 2 =	330
FAC species	180	x 3 =	540
FACU species	60	x 4 =	240
UPL species		x 5 =	
Column Totals:	405 (A)		1110 (B)

Prevalence Index = B/A = 2.74

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** XX **No** ______

Remarks:

SOIL

Sampling Point: Wpt. 131 (WL)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-6	10YR4/2	100					SL/LFS	mixed from plowing
6-12	10YR4/2	70	10YR5/6	30	C	M	SL/LFS	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

☐ Histosol (A1)
☐ Histic Epipedon (A2)
☐ Black Histic (A3)
☐ Hydrogen Sulfide (A4)
☐ Depleted Below Dark Surface (A11)
☐ Thick Dark Surface (A12)
☐ Sandy Mucky Mineral (S1)
☐ Sandy Gleyed Matrix (S4)
☐ Sandy Redox (S5)
☐ Stripped Matrix (S6)
☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
☐ Loamy Gleyed Matrix (F2)
☑ Depleted Matrix (F3)
☐ Redox Dark Surface (F6)
☐ Depleted Dark Surface (F7)
☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

☐ 2 cm Muck (A10)
☐ Red Parent Material (TF2)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** XX **No** ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

☑ Surface Water (A1)
☑ High Water Table (A2)
☑ Saturation (A3)
☑ Water Marks (B1)
☐ Sediment Deposits (B2)
☑ Drift Deposits (B3)
☐ Algal Mat or Crust (B4)
☐ Iron Deposits (B5)
☑ Surface Soil Cracks (B6)
☑ Inundation Visible on Aerial Imagery (B7)
☑ Sparsely Vegetated Concave Surface (B8)
☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
☐ Salt Crust (B11)
☐ Aquatic Invertebrates (B13)
☐ Hydrogen Sulfide Odor (C1)
☐ Oxidized Rhizospheres along Living Roots (C3)
☐ Presence of Reduced Iron (C4)
☑ Recent Iron Reduction in Tilled Soils (C6)
☑ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
☐ Drainage Patterns (B10)
☐ Dry-Season Water Table (C2)
☐ Saturation Visible on Aerial Imagery (C9)
☑ Geomorphic Position (D2)
☐ Shallow Aquitard (D3)
☐ FAC-Neutral Test (D5)
☐ Raised Ant Mounds (D6) (**LRR A**)
☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes XX No ______ Depth (inches): +12" mid WL
Water Table Present? Yes XX No ______ Depth (inches): Surface
Saturation Present? (includes capillary fringe) Yes XX No ______ Depth (inches): Surface

Wetland Hydrology Present? **Yes** XX **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Grass Lake WL-D City/County: Pierce Sampling Date: 3/4/2021
Applicant/Owner: Running Bear Development State: WA Sampling Point: Wpt. 131 (WL)
Investigator(s): Lisa Palazzi, CPSS, PWS Section, Township, Range: S25 T20 R04E
Landform (hillslope, terrace, etc.): Depressional Swale Local relief (concave, convex, none): Concave Slope (%): 0-3%
Subregion (LRR): WMVC Lat: 47.185836 Long: -122.243531 Datum: ______
Soil Map Unit Name: Sultan silt loam and Briscot loam NWI classification: PEM/PSS
Are climatic / hydrologic conditions on the site typical for this time of year? Yes XX No ______ (If no, explain in Remarks.)
Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes XX No ______
Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes XX No ______
Hydric Soil Present? Yes ______ No XX
Wetland Hydrology Present? Yes ______ No XX

Is the Sampled Area within a Wetland? **Yes** ______ **No** XX

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30ft)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 30ft)			
1. Black cottonwood (Populus balsamifera)	30	Y	FACW
2.			
3.			
4.			
5.			
= Total Cover	30		
Herb Stratum (Plot size: 10ft)			
1. Reed canarygrass (Phalaris arundinacea)	35	N	FACW
2. Soft rush (Juncus effusus)	20	N	FACW
3. Oxeye daisy (Leucanthemum vulgare)	35	N	FACU
4. Red clover (Trifolium pratense)	40	Y	FACU
5. Field horsetail (Equisetum arvense)	15	N	FAC
6. Tall fescue (Schedonorus arundinaceus)	40	Y	FAC
7.			
8.			
9.			
10.			
11.			
= Total Cover	185		
Woody Vine Stratum (Plot size: 10ft)			
1.			
2.			
= Total Cover	%		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	85	x 2 =	170
FAC species	55	x 3 =	165
FACU species	75	x 4 =	300
UPL species		x 5 =	
Column Totals:	225 (A)		635 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** XX **No** ______

Remarks:

SOIL

Sampling Point: Wpt 131 UL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR4/3	100					SL/LFS	mixed from plowing

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes XX **No** ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No XX Depth (inches): ____________

Water Table Present? Yes ______ No XX Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes ______ No XX Depth (inches): ____________

Wetland Hydrology Present? Yes ______ **No** XX

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C

SVC Critical Areas Report (2016)

CRITICAL AREAS ASSESSMENT REPORT

KNUTSON FARMS INDUSTRIAL PARK
3200 EAST MAIN AVENUE

SEPTEMBER 2016
REVISED DECEMBER 2016

Pierce County

Reviewed for Planning and Land Services Resource Management/Biologist

By Scott R. Sissons EB3

#834238 & #83

Date of Approval 12/23/2016

Soundview Consultants
Environmental Assessment
Planning + Land Use Solutions

CRITICAL AREAS ASSESSMENT REPORT

KNUTSON FARMS INDUSTRIAL PARK
3200 EAST MAIN AVENUE

SEPTEMBER 15, 2016
REVISED DECEMBER 12, 2016

PROJECT LOCATION

3200 EAST MAIN AVENUE
PUYALLUP, WASHINGTON 98372

PREPARED FOR

RUNNING BEAR DEVELOPMENT PARTNERS, LLC
7701 FORSYTH, SUITE 900
CLAYTON, MISSOURI 63105

PREPARED BY

SOUNDVIEW CONSULTANTS LLC
2907 HARBORVIEW DRIVE
GIG HARBOR, WASHINGTON 98335
(253) 514-8952

Soundview Consultants
Environmental Assessment
Planning + Land Use Solutions

Executive Summary

Soundview Consultants LLC has been contracted by Running Bear Development Partners, LLC (Applicant) to conduct a critical areas assessment for a proposed commercial development located at 3200 East Main Avenue in the Puyallup area of unincorporated Pierce County, Washington. This assessment considers wetland, shoreline, and fish and wildlife habitat for local critical area and shoreline management review. The subject property is situated in Sections 25 and 26, Township 20, Range 04 W.M. and includes seventeen mostly-undeveloped parcels comprising 165.88 acres (Pierce County Tax Parcel Numbers 0420252002, -2003, -2012, -2700, -3702, -3703, -3704, -3705, -3007, -3036, -3057, -3063, 3064, -0420261012, -4014, -4033).

The proposed project includes construction of seven commercial/industrial buildings (Buildings A-G), parking, utilities, stormwater facilities, and associated infrastructure. The project will be broken up into two phases, Phase I will include construction of 2,124,000 square feet consisting of Buildings A-E and associated parking areas. Phase II will include construction of 437,000 square feet consisting of Buildings F and G and associated parking areas

The subject property was investigated for the presence of potentially-regulated wetlands, waterbodies, fish and wildlife habitat, and/or priority species in the spring and summer of 2015. The site investigation identified three onsite wetlands (Wetlands A, B, and C) and one river (Puyallup River). In general, the wetlands were identified as Palustrine Emergent/Scrub-shrub, Seasonally Flooded/Saturated wetlands. Wetlands A and B are Category III depressional wetlands, and Wetland C is a Category II depressional wetland. The Puyallup River borders the northeastern boundary of the subject property and is considered a Shoreline of the State. The identified wetlands and river may contain sensitive fish or wildlife species. In addition, an off-site wetland was identified near the southeastern boundary of the property. The off-site wetland (Wetland D) was identified adjacent to the stormwater pond on the neighboring property. At the time of the site visit, a recently-excavated temporary stormwater pond associated with agricultural management uses was also identified on-site and has since been filled. As access was not granted to the off-site property, the off-site wetland boundary was estimated using hydrologic and vegetation patterns visible on aerial photography. Due to the small size and isolation of the wetland, Wetland D is exempt from the provisions of Title 18E, Development Regulations--Critical Areas, per PCC 18E.20.030K and no buffers will extend onto the project site from this off-site wetland. Direct impacts to wetlands, wetland buffers, and the Puyallup River are avoided.

The subject property also contains 46.95 acres of land located within the 100-year floodplain of the Puyallup River. All development is outside of this 100-year floodplain.

Feature Name	Size Onsite	Class	Category /Type	Regulated Under Pierce County Code Title 18E	Regulated Under RCW 90.48	Regulated Under Clean Water Act
Wetland A	26,869 sf	Depressional	III	Yes	Yes	Yes
Wetland B	11,396 sf	Depressional	III	Yes	Yes	Yes
Wetland C	3,916 sf	Depressional	II	Yes	Yes	Yes
Wetland D	Off-site	Depressional	IV	No	Yes	Not Likely
Puyallup River	3,908 lf	N/A	Type S	Yes	Yes	Yes

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Figures

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Appendices

Chapter 1. Introduction

Soundview Consultants LLC has been contracted by Running Bear Development Partners, LLC (Applicant) to conduct a critical areas assessment for a proposed commercial development located at 3200 East Main Avenue in the Puyallup area of unincorporated Pierce County, Washington. This assessment considers wetland, shoreline, and fish and wildlife habitat for local critical area and shoreline management review. The subject property is situated in Sections 25 and 26, Township 20, Range 04 W.M. and includes eight mostly-undeveloped parcels comprising 165.88 acres (Pierce County Tax Parcel Numbers 0420252002, -2003, -2012, -2700, -3702, -3703, -3704, -3705, -3007, -3036, -3057, -3063, 3064, -0420261012, -4014, -4033).

The purpose of this critical areas assessment report is to identify the presence of potentially regulated wetlands and fish and wildlife species and habitat conservation areas on or near the subject property; assess potential impacts to any critical areas and/or species associated with the property; and provide impact avoidance and management recommendations.

This report is being used to satisfy the following review processes:

- Pierce County SEPA review
- Pierce County Critical Areas review
- Pierce County Shoreline Management Review

This report provides conclusions and recommendations regarding:

- Site description and area of assessment;
- Background research and identification of potentially regulated critical areas and shorelines in the vicinity of the subject property;
- Identification, delineation, and assessment of potentially regulated wetlands and waterbodies;
- Identification and assessment of potentially regulated species and habitat conservation areas on or near the subject property;
- Standard buffer recommendations, building setbacks, and development limitations;
- Existing site map detailing identified critical areas and standard buffers;
- Documentation of impact avoidance, minimization, and mitigation measures;
- Proposed site plan with proposed building sites, road alignments, and infrastructure;
- Supplemental information necessary for Federal, State, and Local regulatory review.

Chapter 2. Project Location

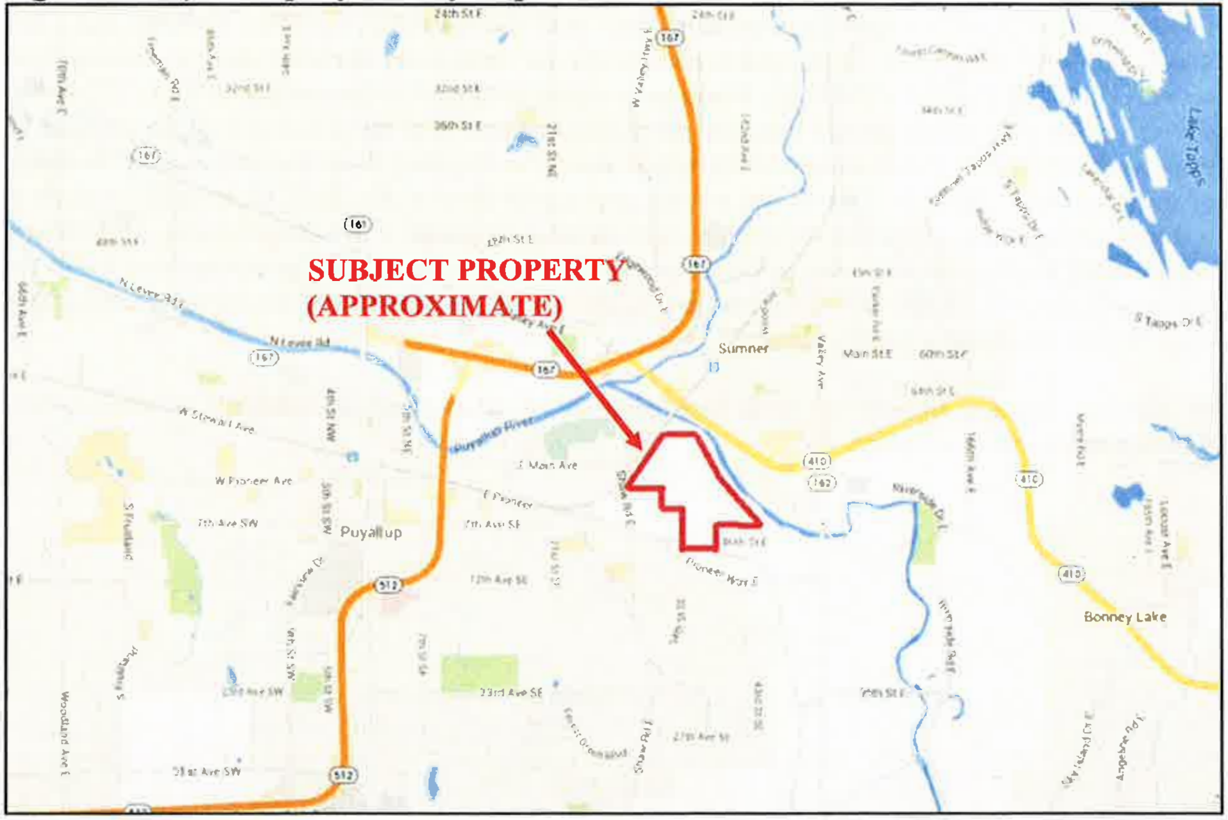
The project location, directions to the project site, purpose and need of the project, and a description of work that is being proposed are detailed below.

2.1 Location

The subject property is located at 3200 East Main Avenue in the Puyallup area of unincorporated Pierce County, Washington (Figure 1). The subject property is situated in Sections 25 and 26, Township 20, Range 04 W.M. (Pierce County Tax Parcel Numbers 0420252002, -2003, -2012, -2700, -3702, -3703, -3704, -3705, -3007, -3036, -3057, -3063, 3064, -0420261012, -4014, -4033).

To access the site from the Tacoma area via Interstate 5 North, take Exit 135 to merge onto Washington-167 North/East 28th Street toward Puyallup. Turn left onto 66th Avenue East and then turn right onto North Levee Road East and proceed approximately 2.3 miles. Turn right onto North Levee Road and proceed approximately 0.2 mile. Continue onto Washington-167 North and take the Washington-410 East exit toward Sumner/Yakima. Then take the exit toward East Main Traffic Avenue and turn right onto Inter Avenue East/Linden Avenue/East Main Avenue. The destination will be on the left in 0.4 mile.

Figure 1. Subject Property Vicinity Map



Source: Google Maps

2.2 Purpose and Need

The purpose of the proposed project is to establish additional industrial space and associated infrastructure near the southern extent of State-Route 167 and improve nearby arterial traffic corridors to meet the growing economic demands for such services in the Sumner/Puyallup valley. With the economic recovery of the region, large-scale industrial facilities that provide increased manufacturing warehousing and shipping capacity are in high demand. To meet this demand and provide the services and jobs associated with it, additional industrial facilities are needed.

2.3 Project Description

To meet the purpose and need of the project, the proposed site development actions include demolition of existing structures and agricultural facilities, removal of scrap and debris associated with the previous land use, clearing and grading for construction of seven commercial buildings (Buildings A-G), and construction of parking, utilities, and associated infrastructure along with floodplain and habitat restoration actions.

The project will be broken up into two phases, Phase I will include construction of 2,124,000 square feet consisting of Buildings A-E and Phase II will include construction of 437,000 square feet consisting of Buildings F and G (Appendix C).

While no in-water work is proposed and no direct discharges of construction stormwater will go into the Puyallup River, site grading could cause a temporarily increased level of turbidity entering the Puyallup River if stormwater management and best management practices (BMPs) fail. The Washington Administrative Code makes allowances for temporary turbidity due to construction activities in WAC 173-201A-200(1)(e). Temporary mixing is subject to constraints of WAC 173-201A-400(4) and (6). For waters greater than 100 cfs during construction, the point of compliance shall be three hundred (300) feet downstream of the action area. The Puyallup River has a mean daily discharge of approximately 3,300 cfs. Due to the volume and rate of flow of the river, measurable impacts to turbidity from construction stormwater are expected to be minimal if not discountable. In addition, any turbidity impacts are expected to be temporary due to the conservation measures and BMPs for the project; therefore a 300-foot downstream mixing zone will be considered in case any unanticipated construction stormwater release occurs.

In addition, the new impervious areas may have an effect on local hydrologic and water quality function within the watershed.

Chapter 3. Methods

The methods used to successfully comply with Federal, State, and local assessment requirements are detailed below. Please see Appendix A for further details of methods used in this report.

Wetlands, rivers, and other potentially regulated fish and wildlife habitat on or within 315 feet of the subject property boundaries were delineated and assessed by a qualified wetland specialist on May 22nd, 26th and August 8th, 2015. All wetland and ordinary high water (OHW) determinations were made using observable vegetation, hydrology, and soils in conjunction with data from the National Wetland Inventory, Pierce County Geographic Information Services, maps of the U.S. Fish and Wildlife Service, the Soil Survey of Pierce County (Zulauf, 1979), and various aerial photographs. See Appendix B for maps detailing background data such as soils, topography, and resource inventories.

Wetland boundaries were determined using the routine approach described in the U.S. Army Corps of Engineers' Wetlands Delineation Manual (Environmental Laboratory, 1987) and modified according to the guidelines established in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region, Version 2.0 (USACE, 2010). The OHW was determined using Washington State Department of Ecology's (Ecology) method as detailed in Determining the Ordinary High Water Mark on Streams in Washington State (Olson, 2008) and definitions provided in RCW 77.55.011 (11) and WAC 220.110.020 (69).

All wetland boundaries and associated drainages were inspected, delineated and surveyed over several dates between May and August of 2015. To mark the boundary between wetlands and uplands, orange surveyor's flagging was alpha-numerically labeled and tied to vegetation or wood lath along the wetland boundary. To mark the points where data was collected, pink surveyor's flagging was alpha-numerically labeled and tied at each sampling location. To mark the centerline or banks of the regulated streams, blue surveyor's flagging was alpha-numerically labeled and tied to vegetation. The locations and features of the critical areas are described in Chapter 4 and are shown on site plan sheets in Appendix C.

Wetlands were classified using both the hydrogeomorphic (Brinson, 1993) and Cowardin (Cowardin, 1979) classification systems, and assessed using the Wetland Functions Characterization Tool for Linear Projects (WSDOT, 2000). Following classification and assessment, all wetlands were rated and categorized using both the Washington State Wetland Rating System for Western Washington: 2014 Update (Hruby, 2014) and the definitions established in the Pierce County Code Title 18E. Streams and surface water features were classified using the Washington Department of Natural Resources Water Typing System as outlined in described in the Washington Administrative Code (WAC) Section 222-16 and the guidelines established in the Pierce County Code Title 18E.

The fish and wildlife habitat assessment was conducted by a qualified biologist during the same site visits. Publicly available background data was queried for documented wildlife observations and/or the presence of potentially regulated fish and wildlife habitat on or near the site. In addition, high-resolution aerial photography of the surrounding area was carefully examined. Visual observations using stationary and walking survey methods were utilized for both aquatic and upland habitats. Any special habitat features or signs of wildlife activity were noted, and these areas were thoroughly re-inspected as necessary.

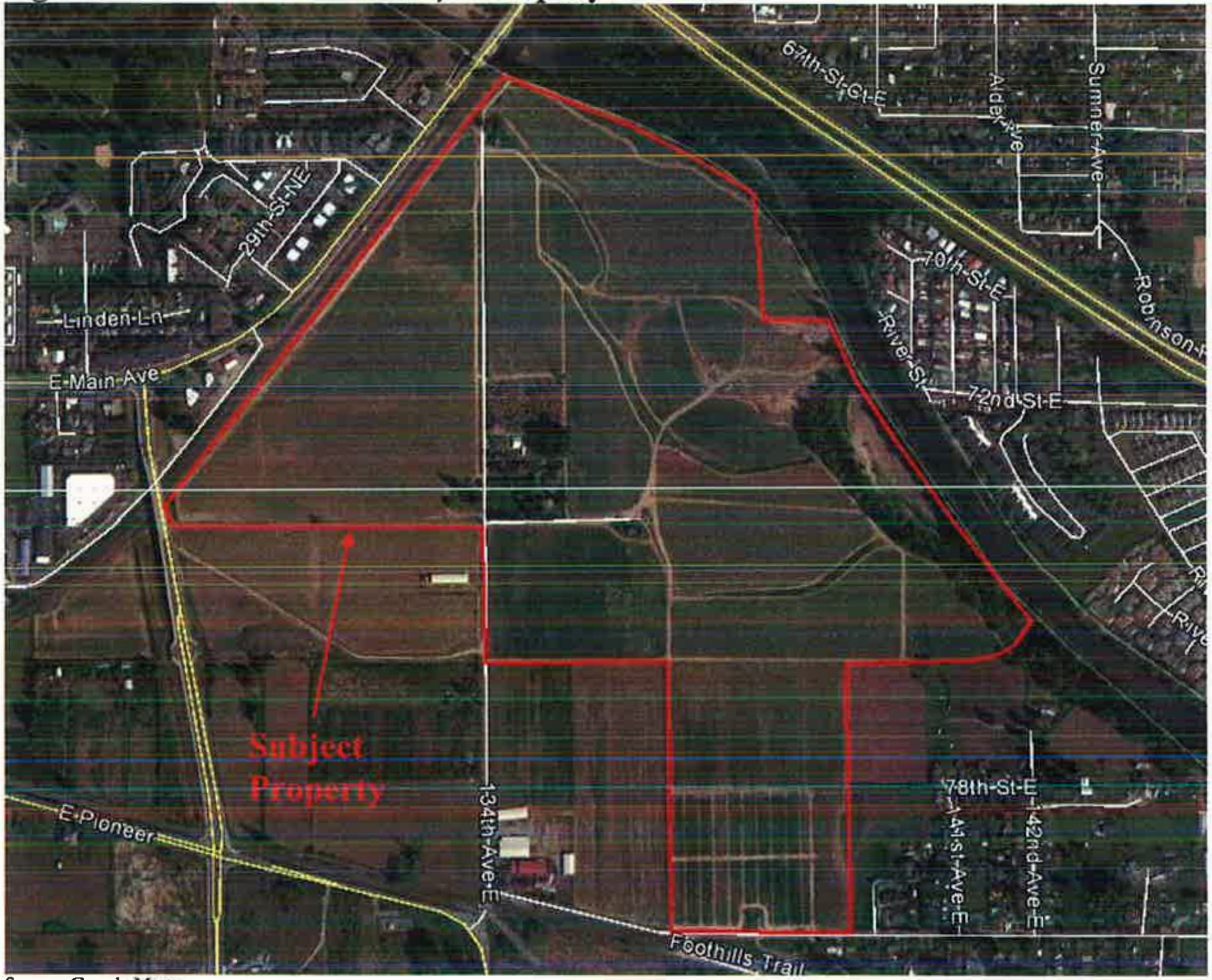
Chapter 4. Existing Conditions

The landscape setting, existing conditions of the wetlands and streams within or near the project setting, and watershed conditions are detailed below.

4.1 Landscape Setting

With the exception of wetland areas, the subject property is entirely under active agricultural management surrounding one single-family residence and yard area in the middle of the site (Figure 2). Surrounding areas contain a mixture of residential, commercial, and agricultural lands with similar pending development. The subject property is bounded on the northeast by the Puyallup River. The vegetation on the subject property is primarily limited to agricultural crops, such as rhubarb and bulbs. The property is generally flat with terracing down to the Puyallup River. Since 1990, the site has remained similar to how it is used today and is currently subject to agricultural uses and other ongoing anthropogenic disturbances.

Figure 2. Aerial Photo of the Subject Property



Source: Google Maps

4.2 Wetlands

4.2.1 Overview

The site investigation identified a total of three potentially regulated wetlands on the subject property, Wetlands A, B, and C, with Wetland C extending easterly and offsite (Appendix C). One additional wetland, Wetland D, was identified off-site to the southwest of the property. The wetlands identified contained indicators of wetland hydrology, hydric soils, and a predominance of hydrophytic vegetation which satisfied the jurisdictional criteria set forth in Chapter 3 (Appendix A). Table 2 summarizes the wetlands identified on the subject property.

Table 2. Wetland Summary

Wetland	**Predominant Wetland Classification / Rating**			**Wetland Size (square feet)**	**Buffer Width (feet)**
	Cowardin	**HGM**	**Rating**		
A	PSS/EME	Depressional	Category III	26,869 onsite	150
B	PSS/EME	Depressional	Category III	11,396 onsite	150
C	PSS/EMB/H	Depressional	Category II	3,916 onsite	150
D	PEME	Depressional	Category IV	8,800 off-site	N/A[A]

[A]Per PCC 18E.20.030.K.2

Wetland A is approximately 26,869 square feet (0.62 acre) in area, and is located near the mid-eastern property boundary and near the Puyallup River (Appendix C). The wetland appears to have been created from an old oxbow that is upslope of the current bed of the Puyallup River. Vegetation within Wetland A is dominated by pacific willow, reed canary grass, and mannagrass. Hydric soils were confirmed by the presence of redox dark surface. Wetland hydrology primarily comes from upslope seeps, surface water runoff, and direct precipitation. Wetland hydrology indicators observed within the wetland included oxidized rhizospheres along living roots in the upper 12 inches. Wetland A is a Palustrine Scrub-Shrub/Emergent, Seasonally Flooded/Saturated wetland (PSS/EME). Wetland A is a Category III depressional wetland scoring 19 total function points with 5 habitat function points. Table 3 provides a detailed summary of Wetland A.

Wetland B is approximately 11,396 square feet (0.26 acre) in area, and is located near the mid-eastern property boundary, near the Puyallup River, and east of Wetland A (Appendix C). The wetland appears to have been created from an old oxbow that is upslope of the current bed of the Puyallup River. Vegetation within Wetland B is dominated by red-osier dogwood, mannagrass, reed canary grass, and American vetch. Hydric soils were confirmed by the presence of a redox dark surface. Wetland hydrology primarily comes from upslope seeps, surface water runoff, and direct precipitation. Wetland hydrology indicators observed within the wetland included saturation to a depth of 11 inches. Wetland B is connected to Wetland C via a small drainage located at the eastern end of Wetland B. Wetland B is a Palustrine Scrub-Shrub/Emergent, Seasonally Flooded/Saturated wetland (PSS/EME). Wetland B is a Category III depressional wetland scoring 19 total function points and 5 habitat function points. Table 4 provides a detailed summary of Wetland B.

Wetland C extends offsite with approximately 3,916 square feet (0.090 acre) in area onsite, and is located near the southeastern property corner and near the Puyallup River (Appendix C). The wetland appears to have been created from an old oxbow that is upslope of the current bed of the Puyallup River. Wetland C is dominated by open water with isolated areas of skunk cabbage and reed canary grass and salmonberry along the perimeter. Hydric soils were confirmed by the presence of redox dark surface and hydrogen sulfide. Wetland hydrology primarily comes from high water from the Puyallup River, a seasonally high water table, surface water runoff, and direct precipitation. Wetland hydrology indicators observed within the wetland included a high water table, saturation within 10 inches, and hydrogen sulfide odor. Wetland C is connected to Wetland B via a small drainage, which is located at the western end of Wetland C. Wetland C is a Palustrine Scrub-Shrub/Emergent, Seasonally Saturated/Permanently Flooded wetland (PSS/EMB/H). Wetland C is a Category II depressional wetland scoring 20 total function points with 6 Habitat Function points. Table 5 provides a detailed summary of Wetland C.

Wetland D is located offsite near the southeastern property corner (Appendix C). The wetland appears to be associated with a low portion of the adjacent and actively grazed pasture/paddock and possibly an artifact of years of active livestock use. Use of the pasture appears to have compacted the soils sufficiently that infiltration is slower than surrounding areas. Vegetation within Wetland D is dominated by various pasture grasses with Himalayan blackberry growing along the fence line. A shallow farm pond was excavated onsite and adjacent to Wetland D to hold water being allowed to drain prior to relocating the irrigation system to another field. Wetland D is a Palustrine Emergent, Seasonally Flooded/Saturated wetland (PEME). Wetland D is a Category IV depressional wetland scoring 15 total function points with 3 Habitat Function points. Table 6 provides a detailed summary of Wetland D.

Table 3. Wetland A Summary.

<table>
<tr><th colspan="3">WETLAND A – INFORMATION SUMMARY</th></tr>
<tr><td>Location:</td><td colspan="2">Located near the mid-eastern property boundary adjacent to the Puyallup River</td></tr>
<tr><td rowspan="11">
</td><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>WRIA</td><td>10</td></tr>
<tr><td>Ecology Rating[A]</td><td>III</td></tr>
<tr><td>Pierce County Rating[B]</td><td>III</td></tr>
<tr><td>Pierce County Buffer Width[C]</td><td>150 feet</td></tr>
<tr><td>Estimated Wetland Size</td><td>26,869 square feet</td></tr>
<tr><td>Cowardin Classification[D]</td><td>PSS/EME</td></tr>
<tr><td>HGM Classification[E]</td><td>Depressional</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>DP-2</td></tr>
<tr><td>Upland Data Sheet (s)</td><td>DP-1</td></tr>
<tr><td>Boundary Flag color</td><td>Orange</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Wetland A is dominated by pacific willow and mannagrass.</td></tr>
<tr><td>Soils</td><td colspan="2">Soils are identified by NRCS as were identified as a Pilchuck fine sand. Field data shows the soils to be a sandy silt with a matrix color of 10YR 3/2 and 7 percent 10YR 3/3 redox features</td></tr>
<tr><td>Hydrology</td><td colspan="2">Observed wetland hydrology indicators included oxidized rhizospheres along living roots. Wetland hydrology primarily comes from seasonally high water table, surface water runoff, and direct precipitation.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">Upland areas were determined by a predominance of upland plant species, and a transition from hydric soils to non-hydric soils.</td></tr>
<tr><td>Rationale for Local Rating</td><td colspan="2">Local rating is based upon Ecology's current rating system in accordance with Pierce County Code.</td></tr>
<tr><td colspan="3">Wetland Functions Summary</td></tr>
<tr><td>Water Quality</td><td colspan="2">Wetland A has a high potential to retain sediments and pollutants from surface runoff of undeveloped and farmed upslope areas due to its location, relative size, and depressional geomorphology.</td></tr>
<tr><td>Hydrologic</td><td colspan="2">Wetland has moderate potential to reduce flooding and improve water quality through water retention and filtration of surface runoff associated with adjacent land use because of its location adjacent to the Puyallup River.</td></tr>
<tr><td>Habitat</td><td colspan="2">Wildlife habitat functions provided by the wetland may include small mammal forage and cover, and small bird forage and nesting.</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">The buffer surrounding Wetland A is primarily cleared and in agricultural production. Uncleared areas are dominated by willow, cottonwood, red alder, colonial bentgrass, mannagrass and Japanese knotweed.</td></tr>
</table>

A. Ecology rating according to Washington State wetland rating system for Western Washington – Revised Hruby (2014).
B. Pierce County Code Chapter 18E.30
C. Recommended wetland buffer width according to Pierce County Code Chapter 18E.30.060
D. Cowardin et al. (1979) or National Wetland Inventory (NWI) Class based on vegetation: PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forested; Modifiers (-C, -E, -H, -x, et cetera) = Water Regime or Special Situations
E. Brinson, M. M. (1993).

Table 4. Wetland B Summary.

<table>
<tr><th colspan="3">WETLAND B – INFORMATION SUMMARY</th></tr>
<tr><td>Location:</td><td colspan="2">Located near the mid-eastern property boundary adjacent to the Puyallup River</td></tr>
<tr><td rowspan="11">
</td><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>WRIA</td><td>10</td></tr>
<tr><td>Ecology Rating[A]</td><td>III</td></tr>
<tr><td>Pierce County Rating[B]</td><td>III</td></tr>
<tr><td>Pierce County Buffer Width[C]</td><td>150 feet</td></tr>
<tr><td>Estimated Wetland Size</td><td>11,396 square feet</td></tr>
<tr><td>Cowardin Classification[D]</td><td>PSS/EME</td></tr>
<tr><td>HGM Classification[E]</td><td>Depressional</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>DP-3</td></tr>
<tr><td>Upland Data Sheet (s)</td><td>DP-4</td></tr>
<tr><td>Boundary Flag color</td><td>Orange</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Wetland B is dominated by red-osier dogwood, snowberry, mannagrass, and vetch.</td></tr>
<tr><td>Soils</td><td colspan="2">Soils are identified by NRCS as were identified as a Pilchuck fine sand. Field data shows the soils to be a sandy silt with a matrix color of 10YR 3/2 to 4 inches and 2.5Y 2.5/1 with 5 percent 10YR 3/4 redox features.</td></tr>
<tr><td>Hydrology</td><td colspan="2">Observed wetland hydrology indicators included saturation to a depth of 11 inches. Wetland hydrology primarily comes from seasonally high water table, surface water runoff, and direct precipitation.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">Upland areas were determined by a predominance of upland plant species, and a transition from hydric soils to non-hydric soils.</td></tr>
<tr><td>Rationale for Local Rating</td><td colspan="2">Local rating is based upon Ecology's current rating system in accordance with Pierce County Code.</td></tr>
<tr><th colspan="3">Wetland Functions Summary</th></tr>
<tr><td>Water Quality</td><td colspan="2">Wetland B has a high potential to retain sediments and pollutants from surface runoff of undeveloped and farmed upslope areas due to its location, relative size, and depressional geomorphology.</td></tr>
<tr><td>Hydrologic</td><td colspan="2">Wetland has moderate potential to reduce flooding and improve water quality through water retention and filtration of surface runoff associated with adjacent land use because of its location adjacent to the Puyallup River.</td></tr>
<tr><td>Habitat</td><td colspan="2">Wildlife habitat functions provided by the wetland may include small mammal forage and cover, and small bird forage and nesting.</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">The buffer surrounding Wetland B is primarily cleared and in agricultural production. Uncleared areas are dominated by red alder, Scouler's willow, cottonwood, oak sapling, Himalayan blackberry, salmonberry, trailing blackberry, reed canary grass, and horsetail.</td></tr>
</table>

A. Ecology rating according to Washington State wetland rating system for Western Washington – Revised Hruby (2014).
B. Pierce County Code Chapter 18E.30
C. Recommended wetland buffer width according to Pierce County Code Chapter 18E.30.060
D. Cowardin et al. (1979) or National Wetland Inventory (NWI) Class based on vegetation: PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forested; Modifiers (-C, -E, -H, -x, et cetera) = Water Regime or Special Situations
E. Brinson, M. M. (1993).

Table 5. Wetland C Summary.

WETLAND C – INFORMATION SUMMARY		
Location:	Located near the southeastern property corner	
	**Local Jurisdiction**	Pierce County
	WRIA	10
	Ecology Rating^{A}	II
	Pierce County Rating^{B}	II
	Pierce County Buffer Width^{C}	150 feet
	Estimated Wetland Size	3,916 square feet (onsite)
	Cowardin Classification^{D}	PSS/EMB/H
	HGM Classification^{E}	Depressional
	Wetland Data Sheet(s)	DP 5
	Upland Data Sheet (s)	DP 4
	Boundary Flag color	Orange
Dominant Vegetation	Wetland A is dominated by reed canary grass, willow, and open water.	
Soils	Soils are identified by NRCS as were identified as a Pilchuck fine sand. Field data shows the soils to be a sandy silt with a matrix color of 10YR 3/2 to 4 inches and 2.5Y 2.5/1 with 5 percent 10YR 3/4 redox features.	
Hydrology	Observed wetland hydrology indicators included high water table, saturation, hydrogen sulfide, and water stained leaves. Wetland hydrology primarily comes from seasonally high water table, surface water runoff, and direct precipitation.	
Rationale for Delineation	Upland areas were determined by a predominance of upland plant species, and a transition from hydric soils to non-hydric soils.	
Rationale for Local Rating	Local rating is based upon Ecology's current rating system in accordance with Pierce County Code.	
Wetland Functions Summary		
Water Quality	Wetland C has a high potential to retain sediments and pollutants from surface runoff of undeveloped and farmed upslope areas due to its location, relative size, and depressional geomorphology.	
Hydrologic	Wetland has moderate potential to reduce flooding and improve water quality through water retention and filtration of surface runoff associated with adjacent land use because of its location adjacent to the Puyallup River.	
Habitat	Wildlife habitat functions provided by the wetland may include water fowl feeding and breeding, amphibian habitat, small mammal forage and cover, and small bird forage and nesting.	
Buffer Condition	The buffer surrounding Wetland C is primarily cleared and in agricultural production. Uncleared areas are dominated by red alder, Scouler's willow, cottonwood, oak sapling, Himalayan blackberry, salmonberry, trailing blackberry, reed canary grass, and horsetail.	

A. Ecology rating according to Washington State wetland rating system for Western Washington – Revised Hruby (2014).
B. Pierce County Code Chapter 18E.30
C. Recommended wetland buffer width according to Pierce County Code Chapter 18E.30.060
D. Cowardin et al. (1979) or National Wetland Inventory (NWI) Class based on vegetation: PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forested; Modifiers (-C, -E, -H, -x, et cetera) = Water Regime or Special Situations
E. Brinson, M. M. (1993).

Table 6. Off-Site Wetland D Summary.

WETLAND D – INFORMATION SUMMARY		
Location:	Located near the southeastern property corner and north of 80th Street East	
	**Local Jurisdiction**	Pierce County
	WRIA	10
	Ecology Rating[A]	IV
	Pierce County Rating[B]	IV
	Pierce County Buffer Width[C]	N/A
	Estimated Wetland Size[D]	Approx. 8,800 sf
	Cowardin Classification[E]	PEME
	HGM Classification[F]	Depressional
	Wetland Data Sheet(s)	N/A (Off-site)
	Upland Data Sheet (s)	N/A (Off-site)
	Boundary Flag color	Orange
Dominant Vegetation	Wetland is dominated by various pasture grasses.	
Soils	Soils are identified by NRCS as were identified as non-hydric Sultan silt loam. Feature is offsite so no soil data was collected.	
Hydrology	Aerial photographic interpretation indicates the area is ponded for periods of time following rain events and after draining of irrigation systems.	
Rationale for Delineation	Boundary was estimated using historic precipitation data and aerial photographic interpretation.	
Rationale for Local Rating	Local rating is based upon Ecology's current rating system in accordance with Pierce County Code.	
Wetland Functions Summary		
Water Quality	Wetland D has a limited potential to retain sediments and pollutants from surface runoff of undeveloped and farmed upslope areas due to its location, relative size, vegetative cover and absence of drainage feature.	
Hydrologic	Wetland has low potential to reduce flooding and improve water quality through water retention and filtration of surface runoff because of its small size and adjacent land use as actively grazed pasture.	
Habitat	Wildlife habitat functions for Wetland D is limited due to the absence of cover and year-round grazing.	
Buffer Condition	The buffer surrounding Wetland D is dominated by actively grazed pasture grasses, Himalayan blackberry, agricultural crops, and farm roads.	

A. Ecology rating according to Washington State wetland rating system for Western Washington – Revised Hruby (2014).
B. Pierce County Code Chapter 18E.30
C. Recommended wetland buffer width according to Pierce County Code Chapter 18E.30.060
D. Cowardin et al. (1979) or National Wetland Inventory (NWI) Class based on vegetation: PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forested; Modifiers (-C, -E, -H, -x, et cetera) = Water Regime or Special Situations
E. Brinson, M. M. (1993).

4.2.2 Soils

The Natural Resources Conservation Service (NRCS) Soil Survey of Pierce County (Zulauf, 1979) identified five soil series on the subject property, Briscot loam, Pilchuck fine sand, Puyallup fine sandy loam, Riverwash, and Sultan silt loam (Appendix B).

Briscot loam (6A)
According to the survey, Briscot loam is a nearly level soil that is somewhat poorly drained. In a typical profile, the surface layer (0 to 11 inches) is dark brown loam. The subsoil (11 to 29 inches) is mottled, dark grayish brown fine sandy loam and silt loam. The lower part of the substratum (29 to more than 60 inches) is mottled, very dark grayish brown sand and gray silty clay loam. Briscot loam is listed as hydric on the Pierce County Hydric Soils List (NRCS, 2001).

Pilchuck fine sand (29A)
According to the survey, Pilchuck fine sand is excessively drained soil formed in major river valleys in mixed alluvium under hardwoods and conifers. In a typical profile, the surface layer is very dark brown fine sand about 7 inches thick. The underlying material to a depth of 36 inches is very dark brown fine sand, and it is very dark brown very gravelly sand to a depth of 60 inches or more. Pilchuck fine sand is considered non-hydric on the Pierce County Hydric Soils List (NRCS, 2010).

Puyallup fine sandy loam (31A)
Puyallup fine sandy loam (31A) soil series has 0-3 percent slopes and are well drained soils formed in recent alluvium on the natural levees in the Puyallup Rivers. Puyallup soils are usually found on floodplains and low-lying areas. In a typical profile, the surface layer is a very dark brown (10YR 2/2) fine sandy loam about 13 inches thick. The underlying material to a depth of 50 inches is a very dark grayish brown (10YR 4/2) loamy fine sand and fine sand. Between depths of 50 and more than 68 inches, it is dark grayish brown fine sandy loam and fine sand. The Puyallup soil series is considered non-hydric with hydric inclusions of Briscot soils found in depressional areas.

Riverwash (34A)
According to the survey, riverwash consists of recent coarse sand and gravelly alluvium. It is in areas adjacent to streams and is flooded by runoff from melting snow and heavy rains. These areas have sparse vegetation cover and are limited to as use as wildlife habitat. Riverwash soils are considered a hydric soil series on the Pierce County Hydric Soils List (NRCS, 2010).

Sultan silt loam (42A)
Sultan silt loam (42A) soil series are moderately well drained soils formed in recent alluvium on floodplains at the sea level to 120 feet, under deciduous and coniferous trees. This soil is on the bottom lands along the Puyallup and White Rivers at elevations ranging from near sea level to 100 feet. Slopes are less than 2 percent, and the surface is smooth. In a typical profile, the surface layer is a dark grayish brown (10YR 3/2) silt loam about 14 inches thick. The underlying material to a depth of 34 inches is a mottled, brown silt loam and dark yellowish brown (10YR 5/4) very fine sandy loam. To a depth of more than 60 inches, it is a mottled, dark gray fine sandy loam, gray silty clay loam, very dark grayish brown fine sand, and dark yellowish brown silt loam. The Sultan soil series is considered non-hydric with hydric inclusions of Briscot and Puget soils.

4.2.3 Vegetation

All three wetlands are dominated by scrub-shrub and emergent vegetation strata, though dominant species vary by wetland. Wetland A is dominated by reed canary grass, willow, and open water. Wetland B is dominated by red-osier dogwood, snowberry, mannagrass, and vetch. Wetland C is dominated by pacific willow and mannagrass.

4.2.4 Hydrology

The shape and location of the wetlands suggests they naturally developed from old oxbows of the Puyallup River with a short drainage that connected Wetland C to Wetland B. Aside from the Puyallup River, no other waterbodies were identified on-site or within 315 feet of the subject property and south of the Puyallup River. Wetland hydrology appears to be elevated above the river and thus is likely to come primarily from surface water runoff and direct precipitation.

Precipitation data was obtained from the National Oceanic and Atmospheric Administration (NOAA) weather station at SeaTac Airport for precipitation in the days and weeks, and month leading up to the site visits (August, 2014). A summary of data collected is provided in Table 7.

Table 7. Precipitation Summary.

Date	Day of	Day Before	1 Week Prior	2 Weeks Prior	Month[1]	Water Year[2]	% of Normal[3]
5/22/15	0.00	0.00	0.00	0.34	0.58	32.39	100
5/26/15	0.00	0.00	0.00	0.17	0.58	32.39	99
8/10/15	T	0.00	0.00	0.00	T	32.71	92

[1] Month to date precipitation.
[2] Water Year is precipitation from October 1, 2014.
[3] Percent of normal is shown as for the water year.

The Precipitation data shows that 0.00 inches rain fell in the week prior to the site visits and precipitation was nearly normal for the water year. The lack of rain fall data suggests that precipitation levels would be considered normal at the time of the May site assessments and low at the time of the August site assessment. The precipitation levels were taken into account when determining wetland hydrology criteria.

4.2.5 Wetland Buffers

The site is mostly under active agricultural use, and buffer conditions onsite consist of predominately agricultural crops or plowed fields with a narrow vegetated buffer adjacent to the wetlands.

4.2.6 Wetland Functions

Table 8 provides a summary of existing functions and values associated with each wetland.

Table 8. Functions and Values of Existing Wetlands.

Function / Value[A]	Wetland		
	A	B	C
Water Quality Functions			
Sediment Removal	+	+	+
Nutrient and Toxicant Removal	+	+	+
Hydrologic Functions			
Flood Flow Alteration	+	+	+
Erosion Control & Shoreline Stabilization	-	-	-
Habitat Functions			
Production & Export of Organic Matter	x	x	x
General Habitat Suitability	x	x	x
Habitat for Aquatic Invertebrates	-	x	+
Habitat for Amphibians	x	x	+
Habitat for Wetland-Associated Mammals	x	x	+
Habitat for Wetland-Associated Birds	x	x	x
General Fish Habitat	-	-	-
Native Plant Richness	x	x	x
Special Characteristics			
Educational or Scientific Value	-	-	-
Uniqueness and Heritage	-	-	-

[A] "-" means that the function is not present; "x" means that the function is present is of lower quality; and "+" means the function is present an is of higher quality.

Due to their location downslope of active agricultural fields and upslope of the Puyallup River, the wetlands provide high water quality functions by removing sediment, nutrients, and toxins from runoff flowing in the Puyallup River. The wetlands provide moderate hydrologic function with high to moderate flood flow alteration potential due to their depressional morphology and location in relation to the Puyallup River. Habitat functions are also moderate as the wetlands provide potential small bird foraging and nesting, some fish-free amphibian breeding sites, and wildlife migration corridors.

4.3 Puyallup River

The site investigation identified one waterbody, the Puyallup River, which borders the northeastern boundary of the subject property. The project is located within Water Resources Inventory Area (WRIA) 10 for the Puyallup-White watershed. The Puyallup River is approximately 45 miles long. The river is formed from glacial runoff on the west side of Mount Rainier and flows into Puget Sound at the Port of Tacoma. The Puyallup River is considered to be a Shoreline of the State per the Shoreline Management Act of 1971 and the Pierce County Shoreline Management Use Regulations. The shoreline of the Puyallup River adjacent to the site is designated as Conservancy Environment. The Puyallup River is also regulated under the Pierce County Critical Areas Ordinance as a Regulated Fish and Wildlife Habitat Conservation Area and is classified as a Type F1 (salmonid-bearing) waterbody per PCC. Table 9 provides a detailed summary of the Puyallup River.

Table 9. Puyallup River Summary

<table>
<tr><th colspan="3">PUYALLUP RIVER INFORMATION SUMMARY</th></tr>
<tr><td rowspan="8"></td><td>Feature Name</td><td>Puyallup River</td></tr>
<tr><td>WRIA</td><td>10</td></tr>
<tr><td>WA Stream Catalog #</td><td>0021</td></tr>
<tr><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>DNR Stream Type</td><td>Type S</td></tr>
<tr><td>Local Stream Rating</td><td>Type F1</td></tr>
<tr><td>Buffer Width</td><td>150 feet from OHW</td></tr>
<tr><td>Documented Fish Use</td><td>Yes</td></tr>
<tr><td>Location of Feature</td><td colspan="2">The river is located along the eastern property boundary</td></tr>
<tr><td>Connectivity (where water flows from/to)</td><td colspan="2">The Puyallup River originates at the Puyallup and Tahoma Glaciers on Mount Rainier and flows westerly into the Puget Sound. One of two major tributaries, the White River, flows into the Puyallup River just downstream of the property.</td></tr>
<tr><td>Documented Fish Species</td><td colspan="2">The portion of the Puyallup River adjacent to the property is documented to contain Chinook salmon, chum salmon, steelhead trout, pink odd year salmon, bull trout, and coho salmon.</td></tr>
<tr><td>Riparian/Buffer Condition</td><td colspan="2">The buffer is dominated by cottonwood, big-leaf maple, and Himalayan blackberry.</td></tr>
</table>

4.3.1 Puyallup River Buffer

As a Type F1 waterbody, the Puyallup River requires a buffer width of 150 feet. Buffer areas directly adjacent to the river are vegetated with cottonwood, big-leaf maple, and Himalayan blackberry. Beyond the shrub/tree line, buffers are actively under agricultural use with farm roads and agricultural fields located in the outer areas of the buffer.

4.4 Sensitive Plant, Fish and Wildlife

The WDFW PHS maps and data identify palustrine intertidal habitat, cutthroat, bull trout, chinook, chum, and pink odd year. WDFW SalmonScape maps identify Chinook salmon, chum salmon, steelhead trout, pink salmon, bull trout, and coho salmon (Appendix B).

Chapter 5. Regulatory Considerations

The proposed project is located in the Puyallup area of unincorporated Pierce County. The site investigation identified three potentially regulated wetlands and one regulated river on the property. One potentially non-regulated wetland was also identified off-site to the southeast. The project will not impact wetlands and their buffers, the Puyallup River or Puyallup River floodplain. The only action within these critical areas will be the installation of a stormwater outfall to the Puyallup River. Local, State, and Federal regulatory implications are addressed below:

5.1 Local Requirements

The Puyallup River is classified as a Type F1 waterbody under PCC 18E.40. According to PCC 18E.40.060 and WAC 222-16-031, Type F1 waterbodies require 150-foot buffers. The project is also regulated as a Shoreline of the State under PCC Title 20. Regulation under PCC Title 20 establishes a special management zone that extends 200 feet from OHWM of the river, plus associated wetlands. The shoreline is designated as Conservancy Environment. Preferred uses in Conservancy Environments include recreation activities, commercial timber harvesting, and passive agriculture. Per PCC 20.30.030.A, Commercial and light industrial development allowances within Conservancy Environments is limited to "Neighborhood Commercial," i.e. retail establishments scaled from 8,000 to 15,000 square feet servicing a localized population, and may only be permitted with a Conditional Use permit. Other than stormwater outfalls, the closest point of the proposed development to the Puyallup River is 301 feet and all activities are away from wetlands; therefore, the project will not require a conditional use permit or need to meet "Neighborhood Commercial" specifications.

Pierce County's Regional Trail Plan proposes connection between the Puyallup Riverwalk Trail and the Foothills Trail along the northeastern property boundary parallel to the Puyallup River. Hiking trails/bicycle paths such as these are considered to be Water Related Uses under PCC 20.60.010.B. Per PCC 20.60.030.A.1, water related recreational activities and facilities are allowed in the Conservancy Environment. The proposed Knutson Farms Industrial Park will include a 12 ft. wide pedestrian trail; it will be sited immediately outside of the floodplain and outside of regulated wetland buffers.

Wetlands A, B, and C were identified west of the Puyallup River. Wetlands A and B are Category III wetlands, and Wetland C is a Category II wetland. Under PCC 18E.30.060, Category III wetlands are subject to a 50-foot base buffer widths and Category II wetlands are subject to 100 foot base buffer widths. However, as the proposed commercial development meets the criteria of a "high impact" land use, PCC 18E.30.070 Appendix F requires the wetland buffers be increased to 150 feet for all wetlands A, B, and C. The project does not propose any direct impacts to the onsite wetlands nor to their buffers.

More than 28 percent of the site is encumbered by floodplain, shoreline, wetlands, and buffers. The project avoids all direct wetland impacts and development within the shoreline management zone.

Off-site Wetland D is not likely subject to development standards outlined in PCC 18E.30 due to its small size and lack of connection to other systems. Wetland D is not contiguous with any ditches, stream, or other fresh water systems. Per PCC 18E.20.030.K.2, Category IV wetlands smaller than 10,000 square feet in size, which are not contiguous with a freshwater or estuarine system, may be exempt from regulation under PCC Title 18E. As Wetland D is less than 10,000 square feet in size and is not connected to other wetland systems, it meets exemption criteria under Pierce County critical areas regulations; therefore, no buffer from Wetland D extends onto the subject property

5.2 Federal and State Regulatory Considerations

The results of the site investigation identified three wetlands and one waterbody onsite. The Puyallup River is a Navigable Water of the U.S. known to be regulated under Section 10 of the Rivers and Harbors Act (RHA) downstream and Section 404 of the Clean Water Act (CWA) in its entirety. In a December 2, 2008 memorandum from the Environmental Protection Agency (EPA) and USACE, joint guidance is provided that describes waters that are to be regulated under section 404 of the CWA (USACE, 2008). This memorandum was amended on February 2, 2012 where the EPA and USACE issued a final guidance letter on waters protected by the CWA.

The 2012 guidance describes the following waters where jurisdiction would be asserted: 1) traditional navigable waters, 2) interstate waters, 3) wetlands adjacent to traditional navigable waters, 4) non-navigable tributaries of traditional navigable waters that are relatively permanent meaning they contain water at least seasonally (e.g. typically three months and does not include ephemeral waters), and 5) wetlands that directly abut permanent waters. The regulated waters are those associated with naturally occurring waters and water courses and not artificial waters (i.e. stormwater pond outfalls). The Puyallup River is considered to be a Traditional Navigable Water by the USACE. As Wetlands A-C are adjacent to the Puyallup River, these wetlands are likely subject to regulation under Section 404 of the CWA. Any placement of fill within or dredging of these wetlands or the Puyallup River would require additional Federal permitting.

As Wetland D is located off-site and as no fill or dredge actions are proposed with the onsite wetlands or below OHW of the Puyallup River, this project will not likely trigger Federal jurisdiction under Section 10 or Section 404 of the CWA. As such, a Section 401 Water Quality Certification will also not be necessary. Similarly, as no substantial development is proposed within the shoreline, nor are any variances needed. State regulation will be limited to SEPA comments and stormwater regulation.

Chapter 6. Mitigation of Critical Area Impacts

6.1 Description of Impacts

The proposed development includes construction of approximately 2,561,000 square feet of buildings (Buildings A-G). The project will be divided into two phases, Phase I and Phase II. Approximately 46.95 acres (28 percent) of the subject property is encumbered by wetland buffers, stream buffers, and floodplain. Impacts to all critical areas, buffers, and floodplain areas will be avoided.

6.2 Mitigation Sequencing

The first step in the mitigation sequence is avoidance. Impacts to all critical areas, buffers, and floodplain areas will be avoided so no compensatory mitigation or non-compensatory mitigation is required.

6.3 Best Management Practices

Temporary erosion and sediment control (TESC) measures will be implemented that consists of high-visibility fencing (HVF) installed around existing native vegetation within the floodplain, silt fencing between the graded areas and Puyallup River, plastic sheeting on stockpiled materials, and seeding of disturbed soils. A TESC plan will be prepared by the Project Engineer prior to construction. Additional erosion and sediment control measures may include hydro-mulching or seeding bare ground as soon as possible to minimize intrusion of invasive species, use of straw weirs and/or coir logs as necessary. These TESC measures should be installed prior to the start of development or enhancement actions and actively managed for the duration of the project. All TESC features will be removed after grading and planting have been completed and dense herbaceous cover is established.

Equipment used for project actions will be typical for small excavation and grading activities and will be kept in good working order free of leaks. All equipment staging and materials stockpiles will be kept out of wetlands, streams, and buffers and the area will be kept free of spills and/or hazardous materials. Any fill material will be sourced from upland areas onsite or from approved suppliers, and will be free of pollutants and hazardous materials, and all concrete wash water will be contained onsite.

Chapter 7. Closure

The findings and conclusions documented in this report have been prepared for specific application to this project. They have been developed in a manner consistent with that level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area. Our work was also performed in accordance with the terms and conditions set forth in our proposal. The conclusions and recommendations presented in this report are professional opinions based on an interpretation of information currently available to us and are made within the operation scope, budget, and schedule of this project. No warranty, expressed or implied, is made. In addition, changes in government codes, regulations, or laws may occur. Due to such changes, our observations and conclusions applicable to this site may need to be revised wholly or in part.

Wetland and OHW boundaries identified by Soundview Consultants LLC are based on conditions present at the time of the site visit and considered preliminary until the flagged wetland boundaries are validated by the jurisdictional agencies. Validation of the wetland and OHW boundaries by the regulating agency provides a certification, usually written, that the wetland and OHW boundaries verified are the boundaries that will be regulated by the agencies until a specific date or until the regulations are modified. Only the regulating agencies can provide this certification.

As wetlands and waterbodies are dynamic communities affected by both natural and human activities, changes in boundaries may be expected; therefore, delineations cannot remain valid for an indefinite period of time. Local agencies typically recognize the validity of wetland delineations for a period of 5 years after completion of a delineation report. Development activities on a site 5 years after the completion of this delineation report may require revision of the wetland delineation. In addition, changes in government codes, regulations, or laws may occur. Due to such changes, our observations and conclusions applicable to this site may need to be revised wholly or in part.

Chapter 8. Report Summary

All initial field inspections, wetland boundary delineations, OHWM determinations, habitat assessments, and supporting documentation, including this ***Critical Areas Assessment*** prepared for ***Running Bear Development Partners, LLC*** were prepared by, or under the direction of, Jeremy Downs, Jim Carsner, and Hannah Blackstock of Soundview Consultants LLC. Jeremy Downs is a Pierce County approved Wetlands Specialist and Environmental Planner, Jim Carsner is a certified Professional Wetland Scientist, and Hannah Blackstock is a Pierce County approved Fisheries Biologist. Updates and modifications and field verification of wetlands were undertaken by Ann Boeholt (Professional Wetland Scientist) and Alex Callender, of Soundview Consultants LLC. Any deviations and/or alterations of the proposed project and/or habitat management recommendations provided in this document must be approved by the aforementioned parties at Soundview Consultants LLC. Please see Appendix F for a description of professional qualifications.

Sincerely,

Jeremy Downs

12/12/2016
Date

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Chapter 9. References

Brinson, M. M. 1993. *A Hydrogeomorphic Classification for Wetlands, Technical Report WRP-DE-4*. U.S. Army Engineer Waterways Experiment Station. Vicksburg, MS.

Cooke, S.S. 1997. *Wetland Plants of Western Washington*. Seattle Audubon Society. Seattle, Washington

Cowardin, L.M. V. Carter, F. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish & Wildlife Service. Washington D.C.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual.* Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Hitchcock, C.L. and A. Cronquist. 1973. *Flora of the Pacific Northwest.* University of Washington Press. Seattle, Washington.

Hruby, T. (2014). *Washington State Wetland Rating System for Western Washington: 2014 Update.* (Publication #14-06-029). Olympia, WA: Washington Department of Ecology.

Pierce County Code. Title 18E, Development Regulations – Critical Areas.

Pierce County Code. Title 20, Shoreline Management Use Regulations.

Lichvar, R.W., M. Butterwick, N.C. Melvin, and W.N. Kirchner. 2014. The National Wetland Plant List: 2014 Update of Wetland Ratings. Phytoneuron 2014-41: 1-42.

Munsell® Color. 2000. Munsell® soil color charts. New Windsor, New York.

Natural Resources Conservation Service. 2001. *Hydric Soils List: Pierce County, Washington.* U.S. Department of Agriculture. Washington D.C.

Olson, P. and E. Stockdale. 2008. *Determining the Ordinary High Water Mark on Streams in Washington State.* Washington State Department of Ecology, Shorelands & Environmental Assistance Program, Lacey, WA. Ecology Publication # 08-06-001.

Rodrick, E. & R. Milner, eds. 1991. *Management Recommendations for Washington's Priority Habitats and Species. Washington Department of Wildlife.* Wildlife Management, Fish Management, and Habitat Management Divisions. Olympia, Washington.

U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*, ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-3. Vicksburg, MS: U.S. Army Engineer Research and Development

Washington State Department of Ecology, U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. (Ecology) 2006a. *Wetland Mitigation in Washington State – Part 1: Agency Policies and Guidance (Version 1).* Washington State Department of Ecology. Publication #06-06-011a. Olympia, WA.

Washington State Department of Ecology, U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. (Ecology) 2006b. *Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1).* Washington State Department of Ecology. Publication #06-06-011b. Olympia, WA.

Washington State Department of Fish and Wildlife. 2011. Priority Habitats and Species Map for the 7.5-Minute Quadrangle: Bremerton West (Quadcode 4712256), produced February 7, 2011. Washington Department of Fish and Wildlife. Olympia, Washington.

Zulauf, Allen S., Miles L. Raver, Alfonso DeBose, and Jonathan F. Edwards. 1979. *Soil Survey of Pierce County Area, Washington.* Soil Conservation Service United States Department of Agriculture, Soil Conservation Service, in cooperation with the Washington Agricultural Experiment Station. Natural Resource Conservation Service.

Appendix A — Methods and Tools

Parameter	Method or Tool	Website	Reference
Wetland Delineation	USACE 1987 Wetland Delineation Manual	http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf	**Environmental Laboratory.** 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.
	Western Mountains, Valleys, and Coast Region Interim Regional Supplement	http://www.usace.army.mil/CECW/Documents/cecwo/reg/west_mt_finalsupp.pdf	**U.S. Army Corps of Engineers.** 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-3. Vicksburg, MS: U.S. Army Engineer Research and Development Center.
Wetland Classification	USFWS / Cowardin Classification System	http://www.fws.gov/nwi/Pubs_Reports/Class_Manual/class_titlepg.htm	**Cowardin,** L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. Government Printing Office, Washington, D.C.
	Hydrogeomorphic Classification (HGM) System	http://el.erdc.usace.army.mil/wetlands/pdfs/wrpde4.pdf	**Brinson,** M. M. (1993). "A hydrogeomorphic classification for wetlands," Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
Wetland Rating	Washington State Wetland Rating System	https://fortress.wa.gov/ecy/publications/documents/1406029.pdf	**Hruby,** T. (2014). *Washington State Wetland Rating System for Western Washington: 2014 Update.* (Publication #14-06-029). Olympia, WA: Washington Department of Ecology.
	Pierce County Code	http://www.codepublishing.com/wa/piercecounty/	Uses State Rating System under Pierce County Code Title 18E
Wetland Indicator Status	2013 National Wetland Plant List	http://wetland_plants.usace.army.mil/	**Lichvar,** R.W., M. Butterwick, N.C. Melvin, and W.N. Kirchner. 2014. The National Wetland Plant List: 2014 Update of Wetland Ratings. Phytoneuron 2014-41: 1-42.
Plant Names	USDA Plant Database	http://plants.usda.gov/	Website (see Appendix A)
Soils Data	NRCS Soil Survey	http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx	Website GIS data based upon: Zulauf, Allen S., Miles L. Raver, Alfonso DeBose, and Jonathan F. Edwards. 1979. *Soil Survey of Pierce County Area, Washington.* Soil Conservation Service United States Department of Agriculture, Soil Conservation Service, in cooperation with the Washington Agricultural Experiment Station. Natural Resource Conservation Service
Hydric Soils Data	Pierce County Hydric Soils List	http://soils.usda.gov/use/hydric/	**Natural Resources Conservation Service.** 2001. Hydric Soils List: Pierce County, Washington. U.S. Department of Agriculture. Washington D.C.
Threatened and Endangered Species	Washington Natural Heritage Program	http://www.dnr.wa.gov/nhp/ and http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf	**Washington Natural Heritage Program** (Data published 10/15/08). Endangered, threatened, and sensitive plants of Washington. Washington State Department of Natural Resources, Washington Natural Heritage Program, Olympia, WA
	Washington Priority Habitats and Species	http://wdfw.wa.gov/hab/phspage.htm	**Priority Habitats and Species (PHS) Program** Washington Department of Fish and Wildlife (WDFW).
	NOAA fisheries species list and maps	http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Index.cfm and http://www.nmfs.noaa.gov/pr/species/	Website
	USFWS species lists by County	http://www.fws.gov/westwafwo/se/SE_List/endangered_Species.asp	Website

Parameter	Method or Tool	Website	Reference
Stream Delineation	Federal Ordinary High Water Mark Definition	http://www.usace.army.mil/inet/functions/cw/cecwo/reg/33cfr328.htm	Congressional Federal Register 33 Part 328 Definition of Waters of the United States.
	Draft State Ordinary High Water Mark Protocol	http://www.ecy.wa.gov/pubs/0806001.pdf	Olson, P. and E. Stockdale. 2008. Determining the Ordinary High Water Mark on Streams in Washington State. Washington State Department of Ecology, Shorelands & Environmental Assistance Program, Lacey, WA. Ecology Publication # 08-06-001.
Stream Classification	Department of Natural Resources (DNR) Water Typing System	**Forest Practices Water Typing:** http://www.stage.dnr.wa.gov/forestpractices/watertyping/ **WAC 222-16-030:** http://apps.leg.wa.gov/WAC/default.aspx?cite=222-16-030 **Water Type Mapping:** http://www3.wadnr.gov/dnrapp5/website/fpars/viewer.htm	Washington Administrative Code (WAC) 222-16-030. DNR Water typing system.
	Pierce County Code	http://www.codepublishing.com/wa/piercecounty/	Uses State Water Typing System under Pierce County Code Title 18E
Species of Local Importance	WDFW GIS Data	http://wdfw.wa.gov/mapping/salmonscape/	Website
Report Preparation	Pierce County Code	http://www.codepublishing.com/wa/piercecounty/	Pierce County Code Title 18E

Appendix B — Background Information

This Appendix includes a USFWS National Wetland Inventory map (B1), a Pierce County Critical Areas Map (B2), an NRCS Soil Survey map (B3), a WDFW Priority Habitats and Species map (B4), and a WDFW SalmonScape map (B5).

Appendix B1. USFWS National Wetland Inventory Map

U.S. Fish and Wildlife Service

National Wetlands Inventory

Apr 2, 2015

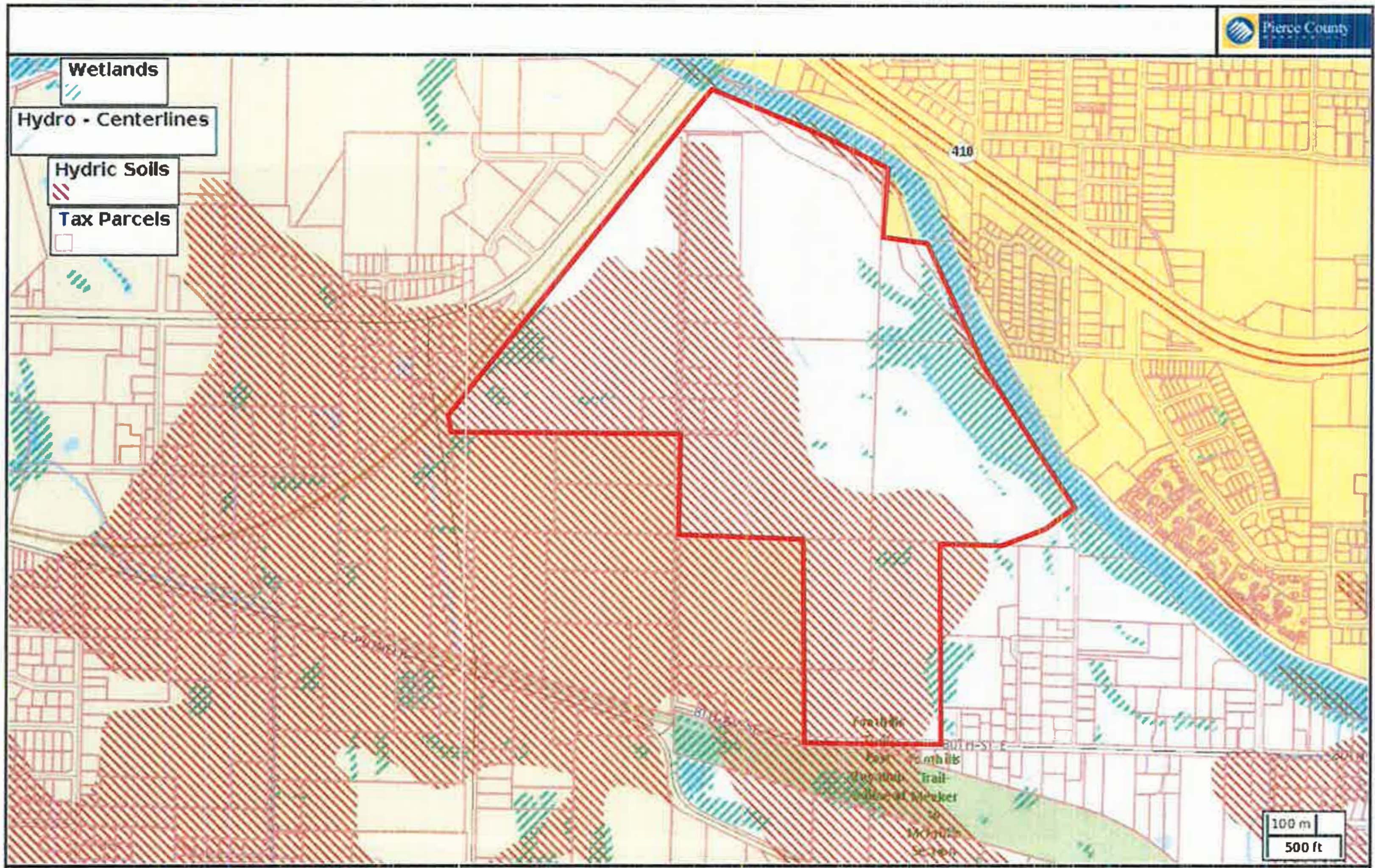
Wetlands

🟩	Freshwater Emergent
🟩	Freshwater Forested/Shrub
🟦	Estuarine and Marine Deepwater
🟦	Estuarine and Marine
🟦	Freshwater Pond
🟦	Lake
🟦	Riverine
🟫	Other

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

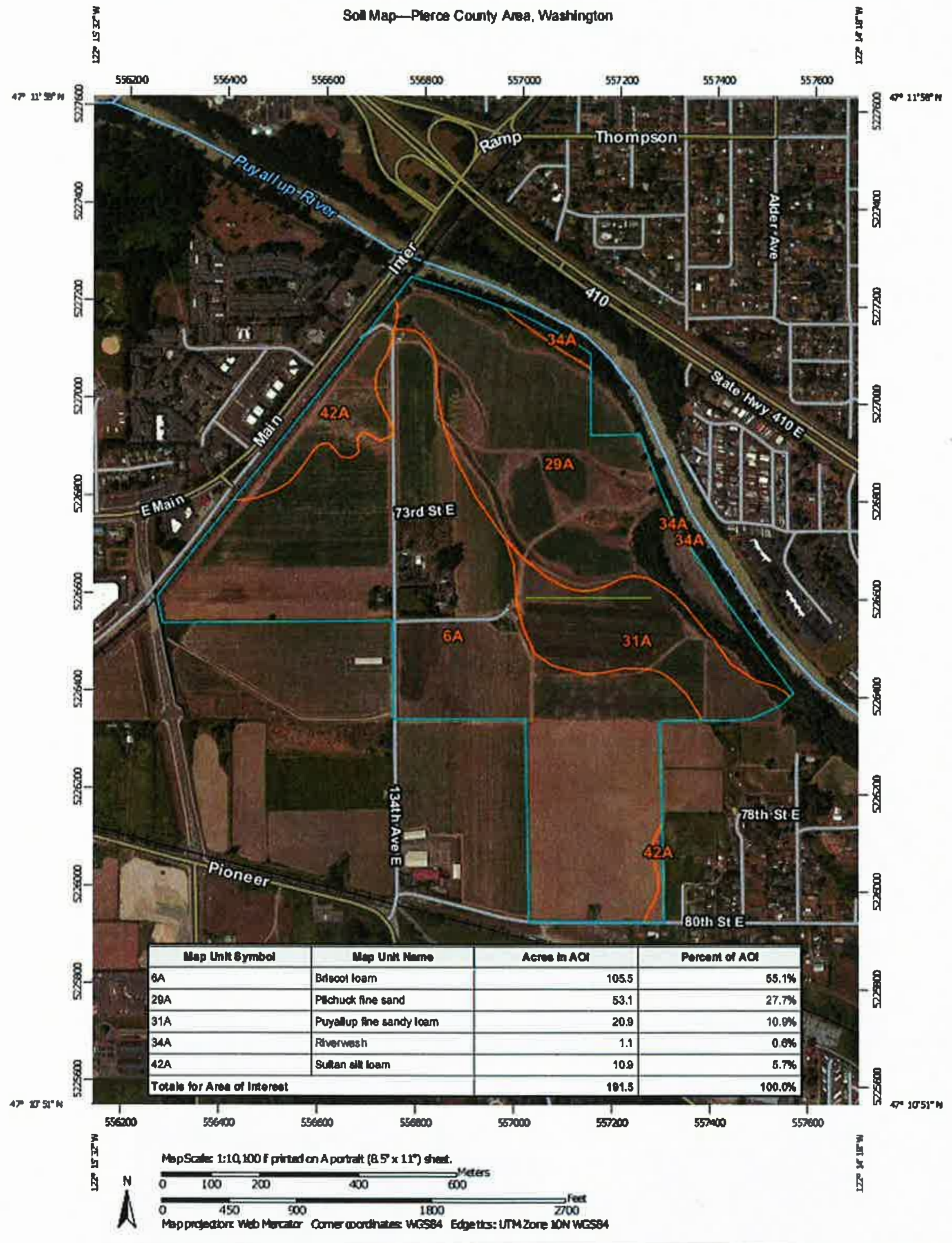
Appendix B2. Pierce County Critical Areas Map



Disclaimer: The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. The County assumes no liability for variations ascertained by actual survey. **ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'**. The County makes no warranty of fitness for a particular purpose. 2015/12/15

Appendix B3. NRCS Soil Survey Map

Soil Map—Pierce County Area, Washington

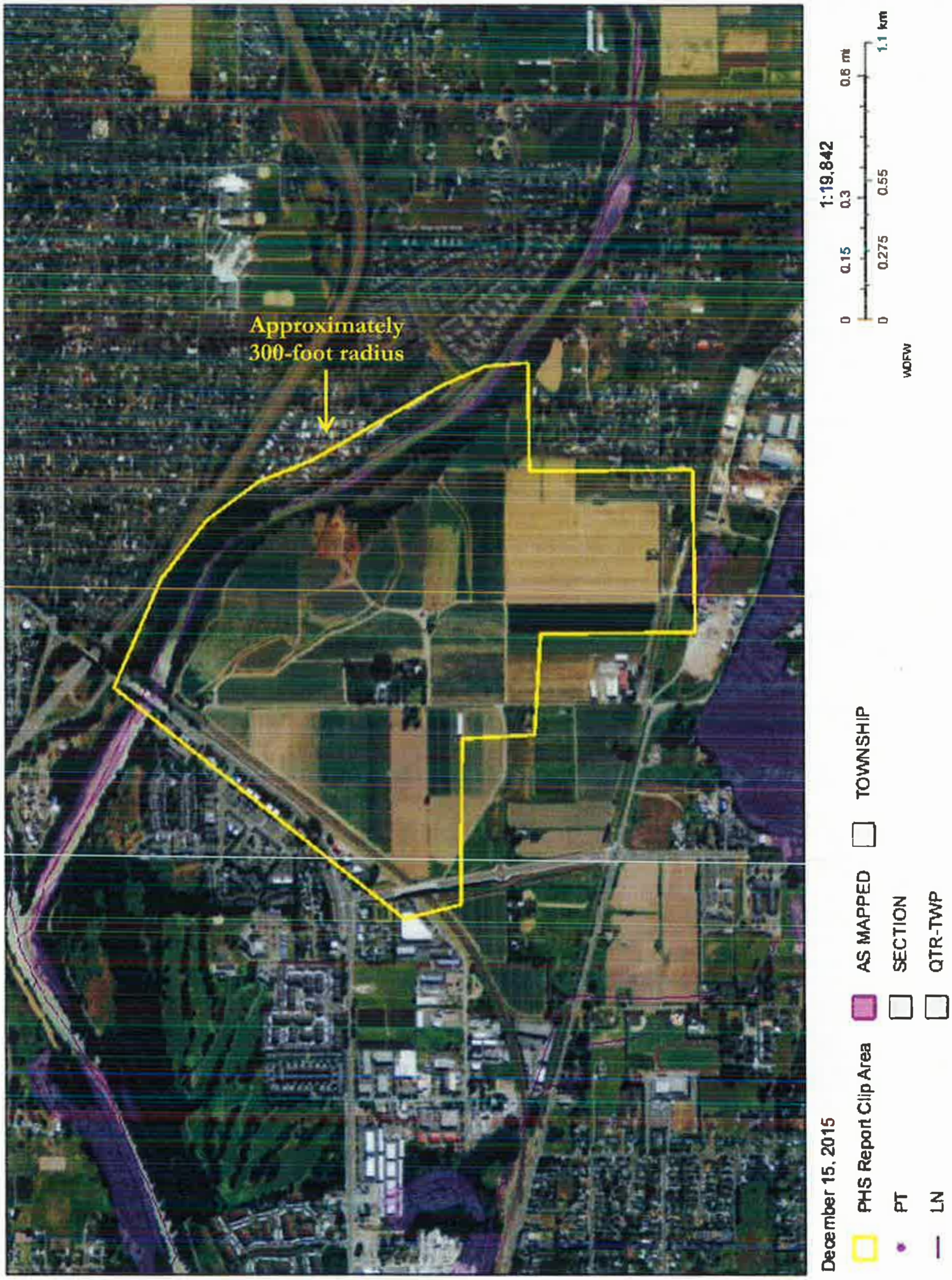


Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Briscot loam	105.5	55.1%
29A	Pilchuck fine sand	53.1	27.7%
31A	Puyallup fine sandy loam	20.9	10.9%
34A	Riverwash	1.1	0.6%
42A	Sultan silt loam	10.9	5.7%
Totals for Area of Interest		191.5	100.0%

Map Scale: 1:10,100 if printed on A portrait (8.5" x 11") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Appendix B4. WDFW Priority Habitat and Species Map



WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
PRIORITY HABITATS AND SPECIES REPORT

SOURCE DATASET: PHSPlusPublic
REPORT DATE: 12/15/2015 2.25

Query ID: P151215142512

Common Name Scientific Name Notes	Site Name Source Dataset Source Record Source Date	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Bull Trout Salvelinus malma	Puyallup River SASI 8144	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Bull Trout Salvelinus malma	Puyallup River SASI 8168	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Chinook Oncorhynchus tshawytscha	Puyallup River SASI 1176	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Chum Oncorhynchus keta	Puyallup River SASI 2176	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Chum Oncorhynchus keta	Puyallup River SASI 2187	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Coho Oncorhynchus kisutch	Puyallup River SWIFD 45600	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Coho Oncorhynchus kisutch	Puyallup River SASI 3160	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Candidate N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Cutthroat Oncorhynchus clarki	Puyallup River SASI 7400	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Dolly Varden/ Bull Trout Salvelinus malma	Puyallup River SWIFD 45603	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Fall Chinook Oncorhynchus tshawytscha	Puyallup River SWIFD 45590	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Fall Chum Oncorhynchus keta	Puyallup River SWIFD 45593	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Freshwater Forested/Shrub	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Forested/Shrub	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Forested/Shrub	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Pink Oncorhynchus gorbuscha	Puyallup River SASI 4520	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines

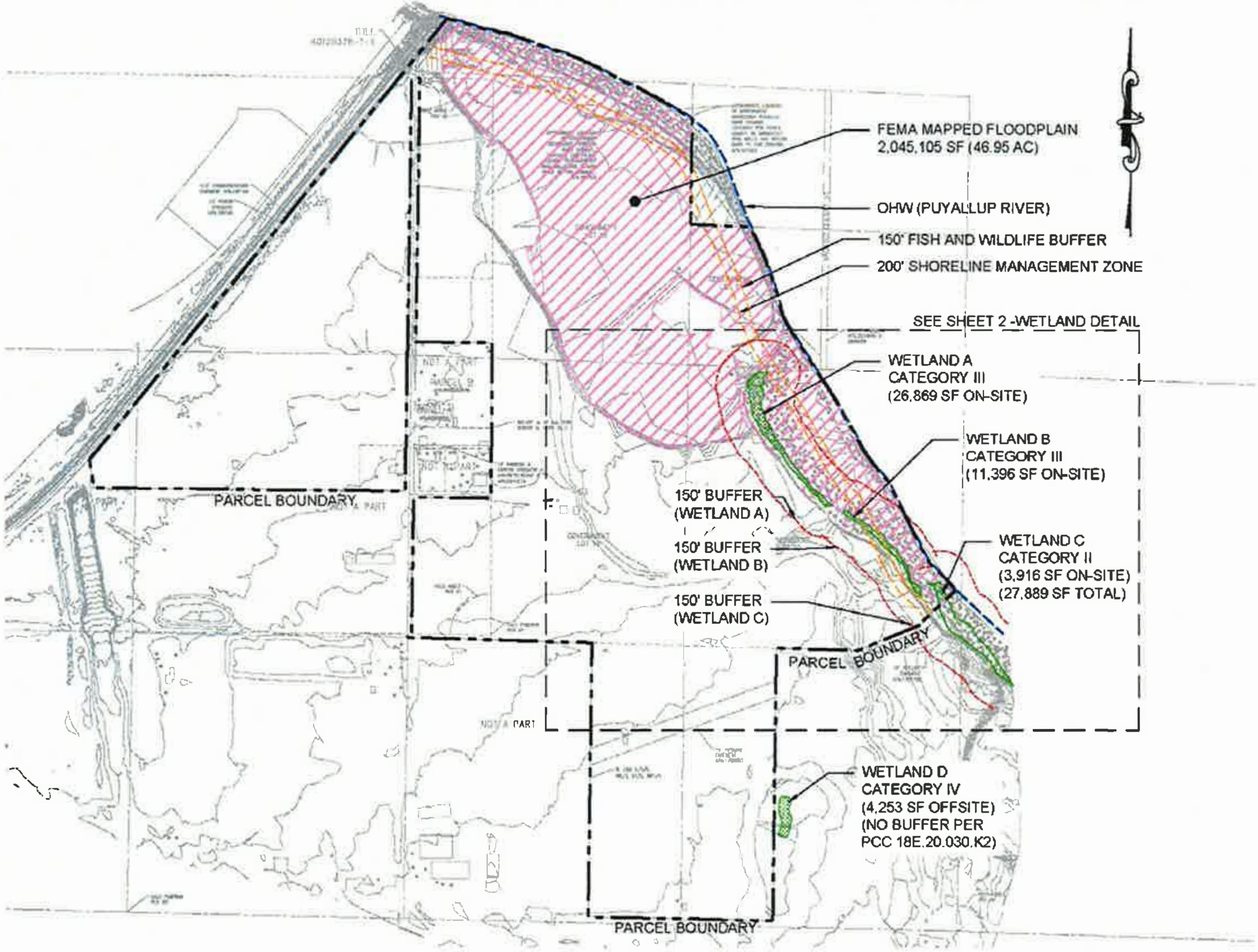
Common Name Scientific Name Notes	Site Name Source Dataset Source Record Source Date	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Pink Salmon Odd Year Oncorhynchus gorbuscha	Puyallup River SWIFD 45605	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Resident Coastal Cutthroat Oncorhynchus clarki	Puyallup River SWIFD 45588	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Riverine	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Riverine	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Steelhead Oncorhynchus mykiss	Puyallup River SASI 6182	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Steelhead Oncorhynchus mykiss	Puyallup River SASI 6196	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Wetlands	LOWER PUYALLUP RIVER PHSREGION 902559	Aquatic Habitat N/A http://www.ecy.wa.	1/4 mile (Quarter	N/A N/A PHS LISTED	N AS MAPPED	WA Dept. of Fish and Wildlife Polygons
Winter Steelhead Oncorhynchus mykiss	Puyallup River SWIFD 45611	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines

Appendix B5. WDFW SalmonScape Map

Appendix C — Plan Sheets

This Appendix includes the map of the subject property showing the locations of existing physical features of the site including the delineated wetland boundaries, ordinary high water of the shoreline, and protective buffers.

RUNNING BEAR DEVELOPMENT - EXISTING CONDITIONS



Appendix D — Data Sheets

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Knutson Property City/County: Puyallup / Pierce Sampling Date: 8.10.2015
Applicant/Owner: Running Bear Development Partners LLC State: WA Sampling Point: DP-1
Investigator(s): Jim Carsner - Bronte Hopkins Section, Township, Range: 04, T20N, R25E
Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): ≤1
Subregion (LRR): A2 Lat: 47.191667 Long: -122.243889 Datum: WGS 84
Soil Map Unit Name: Pilchuck fine sand NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒
Hydric Soil Present?	Yes ☐ No ☒	
Wetland Hydrology Present?	Yes ☐ No ☒	

Remarks: Precipitation was 92% of normal for the water year and 97% of normal for the yeat-to-date. Not all three wetland criteria observed.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Alnus rubra	90	Yes	FAC
2.			
3.			
4.			
	90	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Salix lucida	10	Yes	FACW
2.			
3.			
4.			
5.			
	10	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Agrostis capillaris	30	Yes	FAC
2. Glyceria elata	30	Yes	OBL
3. Polygonum cupidatum	20	Yes	FACU
4. Rubus ursinus	5	No	FACU
5. Urtica dioica	5	No	FAC
6.			
7.			
8.			
9.			
10.			
11.			
	90	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	
% Bare Ground in Herb Stratum 10			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ______	x 1 = ______
FACW species ______	x 2 = ______
FAC species ______	x 3 = ______
FACU species ______	x 4 = ______
UPL species ______	x 5 = ______
Column Totals: ______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks: Dominance test criteria met.

SOIL

Sampling Point: DP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20	10YR 5/2	98	10YR 3/3	2	C	M	SaL	Sandy loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☐ No ☒

Remarks: Redox features considered faint and soil does not meet hydric soil criteria.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☐ No ☒ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches):

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Precipitation was 92% of normal for the water year and 97% of normal for the yeat-to-date. No wetland hydrology indicators observed.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Knutson Property City/County: Puyallup / Pierce Sampling Date: 8.10.2015
Applicant/Owner: Running Bear Development Partners LLC State: WA Sampling Point: DP-2
Investigator(s): Jim Carsner - Bronte Hopkins Section, Township, Range: 04, T20N, R25E
Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): <1
Subregion (LRR): A2 Lat: 47.19194 Long: -122.24250 Datum: WGS 84
Soil Map Unit Name: Pilchuck fine sand NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐
Hydric Soil Present? Yes ☒ No ☐
Wetland Hydrology Present? Yes ☒ No ☐

Is the Sampled Area within a Wetland? Yes ☒ No ☐

Remarks: Precipitation was 92% of normal for the water year and 97% of normal for the yeat-to-date. All three wetland criteria observed.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix lucida	90	Yes	FACW
2. Alnus rubra	10	No	FAC
3.			
4.			
	100	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Glyceria elata	40	Yes	OBL
2. Epilobium ciliatum	10	No	FACW
3. Solanum dulcamara	10	No	FAC
4. Vicia americana	5	No	FAC
5. Iris pseudacorus	2	No	OBL
6.			
7.			
8.			
9.			
10.			
11.			
	67	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 33

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

☐ Rapid Test for Hydrophytic Vegetation
☒ Dominance Test is >50%
☐ Prevalence Index is ≤3.0[1]
☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
☐ Wetland Non-Vascular Plants[1]
☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks: Dominant test criteria met.

SOIL

Sampling Point: DP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-16	10YR 5/1	93	10YR 3/3	7	C	M	SaSi	Sandy silt

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

☐ Histosol (A1)
☐ Histic Epipedon (A2)
☐ Black Histic (A3)
☐ Hydrogen Sulfide (A4)
☐ Depleted Below Dark Surface (A11)
☐ Thick Dark Surface (A12)
☐ Sandy Mucky Mineral (S1)
☐ Sandy Gleyed Matrix (S4)
☐ Sandy Redox (S5)
☐ Stripped Matrix (S6)
☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
☐ Loamy Gleyed Matrix (F2)
☒ Depleted Matrix (F3)
☐ Redox Dark Surface (F6)
☐ Depleted Dark Surface (F7)
☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

☐ 2 cm Muck (A10)
☐ Red Parent Material (TF2)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes ☒ No ☐

Remarks: Hydric soil indicator F3 observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

☐ Surface Water (A1)
☐ High Water Table (A2)
☐ Saturation (A3)
☐ Water Marks (B1)
☐ Sediment Deposits (B2)
☐ Drift Deposits (B3)
☐ Algal Mat or Crust (B4)
☐ Iron Deposits (B5)
☐ Surface Soil Cracks (B6)
☐ Inundation Visible on Aerial Imagery (B7)
☐ Sparsely Vegetated Concave Surface (B8)
☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
☐ Salt Crust (B11)
☐ Aquatic Invertebrates (B13)
☐ Hydrogen Sulfide Odor (C1)
☒ Oxidized Rhizospheres along Living Roots (C3)
☐ Presence of Reduced Iron (C4)
☐ Recent Iron Reduction in Tilled Soils (C6)
☐ Stunted or Stressed Plants (D1) **(LRR A)**
☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
☐ Drainage Patterns (B10)
☐ Dry-Season Water Table (C2)
☐ Saturation Visible on Aerial Imagery (C9)
☐ Geomorphic Position (D2)
☐ Shallow Aquitard (D3)
☐ FAC-Neutral Test (D5)
☐ Raised Ant Mounds (D6) **(LRR A)**
☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):
Water Table Present? Yes ☐ No ☒ Depth (inches):
Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches):

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Precipitation was 92% of normal for the water year and 97% of normal for the yeat-to-dat. No water table or saturation observed; however, primary wetland hydrology indicator C3 observed.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Knutson Property City/County: Puyallup / Pierce Sampling Date: 8.10.2015

Applicant/Owner: Running Bear Development Partners LLC State: WA Sampling Point: DP-3

Investigator(s): Jim Carsner - Bronte Hopkins Section, Township, Range: 04, T20N, R25E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): ≤1

Subregion (LRR): A2 Lat: 47.19144 Long: -122.24250 Datum: WGS 84

Soil Map Unit Name: Pilchuck fine sand NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Hydric Soil Present? Yes ☒ No ☐

Wetland Hydrology Present? Yes ☒ No ☐

Is the Sampled Area within a Wetland? Yes ☒ No ☐

Remarks: Precipitation was 92% of normal for the water year and 97% of normal for the yeat-to-date. All three wetland criteria observed.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Symphoricarpos albus	15	Yes	FACU
2. Cornus sericea	5	Yes	FACW
3.			
4.			
5.			
	20	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Glyceria elata	30	Yes	OBL
2. Vicia americana	20	Yes	FAC
3. Equisetum sp.	5	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	65	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

☐ Rapid Test for Hydrophytic Vegetation

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Wetland Non-Vascular Plants[1]

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks: Dominance test criteria met.

SOIL

Sampling Point: DP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	–	–	–	–	–	Si	Silt
4-20	2.5Y 2.5/1	95	10YR 3/4	5	C	M	Sa	fine Sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☒ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☒ No ☐

Remarks: Hydric soil indicators A11 and F6 observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☒ No ☐ Depth (inches): 13

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 11

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Precipitation was 92% of normal for the water year and 97% of normal for the yeat-to-date. Primary wetland hydrology indicators A2 and A3 observed.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Knutson Property City/County: Puyallup / Pierce Sampling Date: 8.10.2015
Applicant/Owner: Running Bear Development Partners LLC State: WA Sampling Point: DP-4
Investigator(s): Jim Carsner - Bronte Hopkins Section, Township, Range: 04, T20N, R25E
Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): ≤1
Subregion (LRR): A2 Lat: 47.188889 Long: -122.240833 Datum: WGS 84
Soil Map Unit Name: Pilchuck fine sand NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐
Hydric Soil Present? Yes ☐ No ☒
Wetland Hydrology Present? Yes ☐ No ☒

Is the Sampled Area within a Wetland? Yes ☐ No ☒

Remarks: Precipitation was 92% of normal for the water year and 97% of normal for the yeat-to-date. Not all three wetland criteria observed.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Alnus rubra	30	Yes	FAC
2. Populus balsamifera	15	Yes	FAC
3.			
4.			
	45	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Acer macrophyllum (sapling)	30	Yes	FACU
2. Salix scouleriana	15	Yes	FAC
3. Rubus armeniacus	10	No	FACU
4.			
5.			
	55	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Equisetum sp.	70	Yes	FAC
2. Glyceria elata	10	No	OBL
3. Urtica dioica	5	No	FAC
4. Ranunculus repens	1	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	86	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 14

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks: Dominance test criteria met

SOIL

Sampling Point: DP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type¹	Loc²	Texture	Remarks
0-16	5YR 3/2	100	--	--	--	--	Sa	Sand

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ________

Depth (inches): ________

Hydric Soil Present? **Yes** ☐ **No** ☒

Remarks: No hydric soil indicators observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): ________

Water Table Present? Yes ☐ No ☒ Depth (inches): ________

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): ________

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Precipitation was 92% of normal for the water year and 97% of normal for the yeat-to-date. No primary or secondary wetland hydrology indicators observed.

Appendix E — Rating Forms

RATING SUMMARY – Western Washington

Name of wetland (or ID #): A Date of site visit: 7/27/2016

Rated by AB and AC Trained by Ecology?☑ Yes☐ No Date of training May-07

HGM Class used for rating Depressional & Flats Wetland has multiple HGM classes?☐ Yes ☑ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

____ **Category I** - Total score = 23 - 27
____ **Category II** - Total score = 20 - 22
X **Category III** - Total score = 16 - 19
____ **Category IV** - Total score = 9 - 15

FUNCTION	**Improving Water Quality**	**Hydrologic**	**Habitat**	
	List appropriate rating (H, M, L)			
Site Potential	M	M	L	
Landscape Potential	M	M	L	
Value	H	H	H	**Total**
Score Based on Ratings	7	7	5	19

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	**Category**
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	X

Maps and Figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	1
Hydroperiods	D 1.4, H 1.2	1
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	1
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	1
Map of the contributing basin	D 4.3, D 5.3	5
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	5
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	6
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	7

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream (*can be added to another figure*)	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to another figure*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number A

HGM Classification of Wetland in Western Washington

For questions 1 -7, the criteria described must apply to the entire unit being rated.
If hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

☑ NO - go to 2 ☐ **YES** - the wetland class is **Tidal Fringe** - go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☐ **NO - Saltwater Tidal Fringe (Estuarine)** ☐ **YES - Freshwater Tidal Fringe**
If your wetland can be classified as a Freshwater Tidal Fringe use the forms for ***Riverine*** *wetlands. If it is Saltwater Tidal Fringe it is an* ***Estuarine*** *wetland and is not scored. This method* ***cannot*** *be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Flats**
If your wetland can be classified as a Flats wetland, use the form for ***Depressional*** *wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
☐ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
☐ At least 30% of the open water area is deeper than 6.6 ft (2 m).

☑ NO - go to 4 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
☑ The wetland is on a slope (*slope can be very gradual*),
☑ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
☐ The water leaves the wetland **without being impounded.**

☑ NO - go to 5 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
☑ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
☐ The overbank flooding occurs at least once every 2 years.

☑ NO - go to 6 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding.

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 7 ☑ **YES** - The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☑ NO - go to 8 ☐ **YES** - The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:
Wetland A is a depressional wetland upslope of the OHW mark of the Puyallup River east of Puyallup, WA. The wetland area appears to be a historic remnant of an old river meander before the river was channelized.

Wetland name or number A

Wetland name or number __A____

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	2
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions*). Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^1/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^1/_{10}$ of area points = 0	1
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	4
Total for D 1 Add the points in the boxes above	7

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3? Source Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	1

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number A

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet points = 2 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	2
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 ☐ Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 ☐ The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	3
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* ☐ The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 ☐ Entire wetland is in the Flats class points = 5	3
Total for D 4 Add the points in the boxes above	**8**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic function of the site?	
D 5.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	1
Total for D 5 Add the points in the boxes above	**2**

Rating of Landscape Potential If score is: ☐ **3 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately down-gradient of unit. points = 2 ☐ • Surface flooding problems are in a sub-basin farther down-gradient. points = 1 ☐ Flooding from groundwater is an issue in the sub-basin. points = 1 ☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. Explain why points = 0 ☐ There are no problems with flooding downstream of the wetland. points = 0	2
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	2

Total for D 6	Add the points in the boxes above	4

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number A

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.*

☐ Aquatic bed	4 structures or more: points = 4	1
☑ Emergent	3 structures: points = 2	
☑ Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points - 1	
☐ Forested (areas where trees have > 30% cover)	1 structure: points = 0	

If the unit has a Forested class, check if:

☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

☐ Permanently flooded or inundated	4 or more types present: points = 3	
☑ Seasonally flooded or inundated	3 types present: points = 2	1
☐ Occasionally flooded or inundated	2 types present: points = 1	
☑ Saturated only	1 types present: points = 0	
☐ Permanently flowing stream or river in, or adjacent to, the wetland		
☐ Seasonally flowing stream or in, or adjacent to, the wetland		
☐ **Lake Fringe wetland**	**2 points**	
☐ **Freshwater tidal wetland**	**2 points**	

H 1.3. Richness of plant species

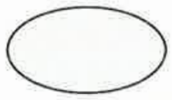
Count the number of plant species in the wetland that cover at least 10 ft^2.
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

1

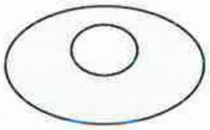
If you counted:	> 19 species	points = 2	
	5 - 19 species	points = 1	
	< 5 species	points = 0	

H 1.4. Interspersion of habitats

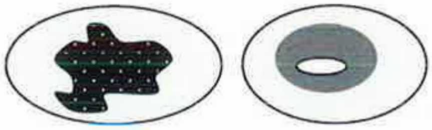
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*



None = 0 points



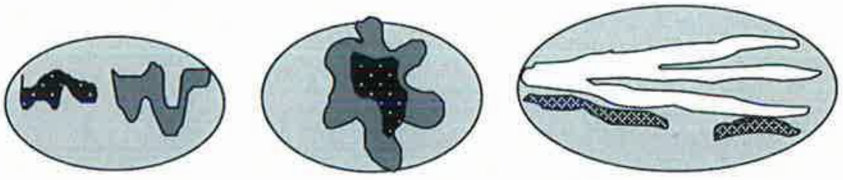
Low = 1 point



Moderate = 2 points

1

All three diagrams in this row are **HIGH** = 3 points



H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ☑ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long) ☐ Standing snags (dbh > 4 in) within the wetland ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☐ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☑ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	2
Total for H 1 Add the points in the boxes above	6

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☐ **7 - 14 = M** ☑ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat function of the site?	
H 2.1 Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* 0 % undisturbed habitat + (0 % moderate & low intensity land uses / 2) = 0% If total accessible habitat is: > $^1/_3$ (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* 1.2 % undisturbed habitat + (0 % moderate & low intensity land uses / 2) = 1.2% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	0
H 2.3 Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (-2) ≤ 50% of 1km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	-2

Rating of Landscape Potential If Score is: ☐ **4 - 6 = H** ☐ **1 - 3 = M** ☑ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 ☑ It has 3 or more priority habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) with in 100m points = 1 Site does not meet any of the criteria above points = 0	2

Wetland name or number A

Rating of Value If Score is: ☑ **2 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE****: This question is independent of the land use between the wetland unit and the priority habitat.*

☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

☐ **Herbaceous Balds**: Variable size patches of grass and forbs on shallow soils over bedrock.

☐ **Old-growth/Mature forests**: Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

☑ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

☐ **Westside Prairies**: Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

☑ **Instream**: The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page*).

☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are

addressed elsewhere.

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine Wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt ☐ Yes - Go to **SC 1.1** ☑ No = **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ Yes = **Category I** ☐ No - Go to **SC 1.2**	
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐ Yes = **Category I** ☐ No = **Category II**	
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes - Go to **SC 2.2** ☑ No - Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☐ No = **Not WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 2.4** ☑ No = **Not WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☐ No = **Not WHCV**	
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐ Yes - Go to **SC 3.3** ☑ No - Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐ Yes - Go to **SC 3.3** ☑ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐ Yes = **Is a Category I bog** ☑ No - Go to **SC 3.4** **NOTE**: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species)	

listed in Table 4 provide more than 30% of the cover under the canopy? ☐ Yes = **Is a Category I bog** ☑ No = **Is not a bog**	

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.

☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80-200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

☐ Yes = **Category I** ☑ No = **Not a forested wetland for this section**

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks

☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon (*needs to be measured near the bottom*)

☐ Yes - Go to **SC 5.1** ☑ No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).

☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.

☐ The wetland is larger than $^1/_{10}$ ac (4350 ft^2)

☐ Yes = **Category I** ☐ No = **Category II**

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

☐ Long Beach Peninsula: Lands west of SR 103

☐ Grayland-Westport: Lands west of SR 105

☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109

☐ Yes - Go to **SC 6.1** ☑ No = **Not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)?

☐ Yes = **Category I** ☐ No - Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?

☐ Yes = **Category II** ☐ No - Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?

☐ Yes = **Category III** ☐ No = **Category IV**

Category of wetland based on Special Characteristics

If you answered No for all types, enter "Not Applicable" on Summary Form

RATING SUMMARY – Western Washington

Name of wetland (or ID #): B Date of site visit: 7/27/2016

Rated by AB & AC Trained by Ecology? ☑ Yes ☐ No Date of training May-07

HGM Class used for rating Depressional & Flats Wetland has multiple HGM classes? ☐ Yes ☑ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

____ **Category I** - Total score = 23 - 27
____ **Category II** - Total score = 20 - 22
X **Category III** - Total score = 16 - 19
____ **Category IV** - Total score = 9 - 15

FUNCTION	**Improving Water Quality**	**Hydrologic**	**Habitat**	
	List appropriate rating (H, M, L)			
Site Potential	M	M	L	
Landscape Potential	M	M	L	
Value	H	H	H	**Total**
Score Based on Ratings	7	7	5	**19**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	**Category**
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	**X**

Wetland name or number B

Maps and Figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	2
Hydroperiods	D 1.4, H 1.2	2
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	2
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	2
Map of the contributing basin	D 4.3, D 5.3	5
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	5
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	6
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	7

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream (*can be added to another figure*)	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to another figure*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

HGM Classification of Wetland in Western Washington

For questions 1 -7, the criteria described must apply to the entire unit being rated.
If hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

☑ NO - go to 2 ☐ **YES** - the wetland class is **Tidal Fringe** - go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☐ **NO - Saltwater Tidal Fringe (Estuarine)** ☐ **YES - Freshwater Tidal Fringe**
If your wetland can be classified as a Freshwater Tidal Fringe use the forms for ***Riverine*** *wetlands. If it is Saltwater Tidal Fringe it is an* ***Estuarine*** *wetland and is not scored. This method* ***cannot*** *be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Flats**
If your wetland can be classified as a Flats wetland, use the form for ***Depressional*** *wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
☐ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
☐ At least 30% of the open water area is deeper than 6.6 ft (2 m).

☑ NO - go to 4 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
☑ The wetland is on a slope (*slope can be very gradual*),
☑ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
☐ The water leaves the wetland **without being impounded.**

☑ NO - go to 5 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
☑ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
☐ The overbank flooding occurs at least once every 2 years.

☑ NO - go to 6 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding.

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 7 ☑ **YES** - The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☑ NO - go to 8 ☐ **YES** - The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:
Wetland A is a depressional wetland upslope of the OHW mark of the Puyallup River east of Puyallup, WA. The wetland area appears to be a historic remnant of an old river meander before the river was channelized.

Wetland name or number B

Wetland name or number B

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	2
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions*). Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^{1}/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^{1}/_{10}$ of area points = 0	1
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	4
Total for D 1 Add the points in the boxes above	7

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3? Source Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	1

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number B

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet points = 2 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	2
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 ☐ Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 ☐ The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	3
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* ☐ The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 ☐ Entire wetland is in the Flats class points = 5	3
Total for D 4 Add the points in the boxes above	**8**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic function of the site?	
D 5.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	1
Total for D 5 Add the points in the boxes above	**2**

Rating of Landscape Potential If score is: ☐ **3 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately down-gradient of unit. points = 2 ☐ • Surface flooding problems are in a sub-basin farther down-gradient. points = 1 ☐ Flooding from groundwater is an issue in the sub-basin. points = 1 ☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. Explain why points = 0 ☐ There are no problems with flooding downstream of the wetland. points = 0	2
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	2

Total for D 6	Add the points in the boxes above	4

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.*

☐ Aquatic bed	4 structures or more: points = 4
☑ Emergent	3 structures: points = 2
☑ Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points - 1
☐ Forested (areas where trees have > 30% cover)	1 structure: points = 0

If the unit has a Forested class, check if:

☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

1

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

☐ Permanently flooded or inundated	4 or more types present: points = 3
☑ Seasonally flooded or inundated	3 types present: points = 2
☐ Occasionally flooded or inundated	2 types present: points = 1
☑ Saturated only	1 types present: points = 0
☐ Permanently flowing stream or river in, or adjacent to, the wetland	
☐ Seasonally flowing stream or in, or adjacent to, the wetland	
☐ **Lake Fringe wetland**	**2 points**
☐ **Freshwater tidal wetland**	**2 points**

1

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

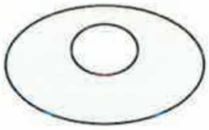
If you counted:	> 19 species	points = 2
	5 - 19 species	points = 1
	< 5 species	points = 0

1

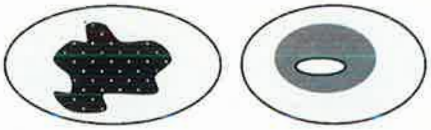
H 1.4. Interspersion of habitats

Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*

None = 0 points



Low = 1 point



Moderate = 2 points

1

All three diagrams in this row are **HIGH** = 3 points

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ☑ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long) ☐ Standing snags (dbh > 4 in) within the wetland ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☐ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☑ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	2
Total for H 1 Add the points in the boxes above	**6**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☐ **7 - 14 = M** ☑ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat function of the site?	
H 2.1 Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* 0 % undisturbed habitat + (0 % moderate & low intensity land uses / 2) = 0% If total accessible habitat is: > $^{1}/_{3}$ (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* 3.1 % undisturbed habitat + (0 % moderate & low intensity land uses / 2) = 3.1% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	0
H 2.3 Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (-2) ≤ 50% of 1km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	**-2**

Rating of Landscape Potential If Score is: ☐ **4 - 6 = H** ☐ **1 - 3 = M** ☑ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 ☑ It has 3 or more priority habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) with in 100m points = 1 Site does not meet any of the criteria above points = 0	2

Wetland name or number B

Rating of Value If Score is: ☑ **2 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE**: This question is independent of the land use between the wetland unit and the priority habitat.*

☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

☐ **Herbaceous Balds**: Variable size patches of grass and forbs on shallow soils over bedrock.

☐ **Old-growth/Mature forests**: Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

☑ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

☐ **Westside Prairies**: Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

☑ **Instream**: The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page*).

☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are

Wetland name or number B

addressed elsewhere.

Wetland name or number B

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine Wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt ☐ Yes - Go to **SC 1.1** ☑ No = **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ Yes = **Category I** ☐ No - Go to **SC 1.2**	
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐ Yes = **Category I** ☐ No = **Category II**	
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes - Go to **SC 2.2** ☑ No - Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☐ No = **Not WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 2.4** ☑ No = **Not WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☐ No = **Not WHCV**	
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐ Yes - Go to **SC 3.3** ☑ No - Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐ Yes - Go to **SC 3.3** ☑ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐ Yes = **Is a Category I bog** ☐ No - Go to **SC 3.4** **NOTE**: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species)	

listed in Table 4 provide more than 30% of the cover under the canopy? ☐ Yes = **Is a Category I bog** ☑ No = **Is not a bog**

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.

☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80-200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

☐ Yes = **Category I** ☑ No = **Not a forested wetland for this section**

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks

☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon (*needs to be measured near the bottom*)

☐ Yes - Go to **SC 5.1** ☑ No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).

☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.

☐ The wetland is larger than $^1/_{10}$ ac (4350 ft^2)

☐ Yes = **Category I** ☐ No = **Category II**

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

☐ Long Beach Peninsula: Lands west of SR 103

☐ Grayland-Westport: Lands west of SR 105

☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109

☐ Yes - Go to **SC 6.1** ☑ No = **Not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)?

☐ Yes = **Category I** ☐ No - Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?

☐ Yes = **Category II** ☐ No - Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?

☐ Yes = **Category III** ☐ No = **Category IV**

Category of wetland based on Special Characteristics

If you answered No for all types, enter "Not Applicable" on Summary Form

RATING SUMMARY – Western Washington

Name of wetland (or ID #): C

Date of site visit: 7/27/2016

Rated by AB & AC

Trained by Ecology? ☑ Yes ☐ No

Date of training May-07

HGM Class used for rating Depressional & Flats

Wetland has multiple HGM classes? ☐ Yes ☑ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).

Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY II (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

	Category I - Total score = 23 - 27
X	**Category II** - Total score = 20 - 22
	Category III - Total score = 16 - 19
	Category IV - Total score = 9 - 15

FUNCTION	**Improving Water Quality**	**Hydrologic**	**Habitat**	
	List appropriate rating (H, M, L)			
Site Potential	M	M	M	
Landscape Potential	M	M	L	
Value	H	H	H	**Total**
Score Based on Ratings	7	7	6	**20**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	**Category**
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	

Maps and Figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	3
Hydroperiods	D 1.4, H 1.2	3
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	3
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	3
Map of the contributing basin	D 4.3, D 5.3	5
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	5
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	6
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	7

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream (*can be added to another figure*)	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to another figure*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

HGM Classification of Wetland in Western Washington

For questions 1 -7, the criteria described must apply to the entire unit being rated.
If hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

☑ NO - go to 2 ☐ **YES** - the wetland class is **Tidal Fringe** - go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☐ **NO - Saltwater Tidal Fringe (Estuarine)** ☐ **YES - Freshwater Tidal Fringe**
If your wetland can be classified as a Freshwater Tidal Fringe use the forms for ***Riverine*** *wetlands. If it is Saltwater Tidal Fringe it is an* ***Estuarine*** *wetland and is not scored. This method* ***cannot*** *be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Flats**
If your wetland can be classified as a Flats wetland, use the form for ***Depressional*** *wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
☐ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
☐ At least 30% of the open water area is deeper than 6.6 ft (2 m).

☑ NO - go to 4 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
☑ The wetland is on a slope (*slope can be very gradual*),
☑ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
☐ The water leaves the wetland **without being impounded.**

☑ NO - go to 5 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
☑ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
☐ The overbank flooding occurs at least once every 2 years.

☑ NO - go to 6 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding.

Wetland name or number C

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 7 ☑ **YES** - The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☑ NO - go to 8 ☐ **YES** - The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:
Wetland A is a depressional wetland upslope of the OHW mark of the Puyallup River east of Puyallup, WA. The wetland area appears to receive water from the Puyallup River up-stream of the subject property duirng high tide or flow events.

Wetland name or number C

Wetland name or number C

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	2
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions*). Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^1/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^1/_{10}$ of area points = 0	1
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	4
Total for D 1 Add the points in the boxes above	**7**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3? Source Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	**2**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	**3**

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?		
D 4.1. Characteristics of surface water outflows from the wetland:		2
Wetland is a depression or flat depression with no surface water leaving it (no outlet)	points = 4	
Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet	points = 2	
Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch	points = 1	
Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing	points = 0	
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.*		3
Marks of ponding are 3 ft or more above the surface or bottom of outlet	points = 7	
Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet	points = 5	
☑ Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet	points = 3	
☐ The wetland is a "headwater" wetland	points = 3	
Wetland is flat but has small depressions on the surface that trap water	points = 1	
Marks of ponding less than 0.5 ft (6 in)	points = 0	
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.*		3
☐ The area of the basin is less than 10 times the area of the unit	points = 5	
The area of the basin is 10 to 100 times the area of the unit	points = 3	
The area of the basin is more than 100 times the area of the unit	points = 0	
☐ Entire wetland is in the Flats class	points = 5	
Total for D 4	Add the points in the boxes above	8

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic function of the site?		
D 5.1. Does the wetland unit receive stormwater discharges?	Yes = 1 No = 0	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate excess runoff?	Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)?	Yes = 1 No = 0	1
Total for D 5	Add the points in the boxes above	2

Rating of Landscape Potential If score is: ☐ **3 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?		
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.*		2
The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds):		
• Flooding occurs in a sub-basin that is immediately down-gradient of unit.	points = 2	
☐ • Surface flooding problems are in a sub-basin farther down-gradient.	points = 1	
☐ Flooding from groundwater is an issue in the sub-basin.	points = 1	
☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. Explain why	points = 0	
☐ There are no problems with flooding downstream of the wetland.	points = 0	
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 No = 0	2

Wetland name or number C

Total for D 6	Add the points in the boxes above	4

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number C

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.*

☐ Aquatic bed	4 structures or more: points = 4
☑ Emergent	3 structures: points = 2
☑ Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points - 1
☐ Forested (areas where trees have > 30% cover)	1 structure: points = 0

If the unit has a Forested class, check if:

☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

1

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

☑ Permanently flooded or inundated	4 or more types present: points = 3
☐ Seasonally flooded or inundated	3 types present: points = 2
☐ Occasionally flooded or inundated	2 types present: points = 1
☑ Saturated only	1 types present: points = 0
☐ Permanently flowing stream or river in, or adjacent to, the wetland	
☐ Seasonally flowing stream or in, or adjacent to, the wetland	
☐ **Lake Fringe wetland**	**2 points**
☐ **Freshwater tidal wetland**	**2 points**

1

H 1.3. Richness of plant species

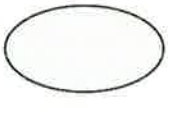
Count the number of plant species in the wetland that cover at least 10 ft^2.
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

If you counted:	> 19 species	points = 2
	5 - 19 species	points = 1
	< 5 species	points = 0

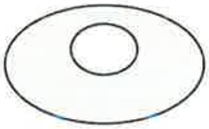
1

H 1.4. Interspersion of habitats

Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*



None = 0 points



Low = 1 point

Moderate = 2 points

All three diagrams in this row are **HIGH** = 3 points

1

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ☑ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long) ☐ Standing snags (dbh > 4 in) within the wetland ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☑ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☐ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☑ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	3
Total for H 1 — Add the points in the boxes above	**7**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☑ **7 - 14 = M** ☐ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat function of the site?	
H 2.1 Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* 0 % undisturbed habitat + (0 % moderate & low intensity land uses / 2) = 0% If total accessible habitat is: > $^{1}/_{3}$ (33.3%) of 1 km Polygon — points = 3 20 - 33% of 1 km Polygon — points = 2 10 - 19% of 1 km Polygon — points = 1 < 10 % of 1 km Polygon — points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* 3.8 % undisturbed habitat + (0 % moderate & low intensity land uses / 2) = 3.8% Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of 1 km Polygon — points = 0	0
H 2.3 Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use — points = (-2) ≤ 50% of 1km Polygon is high intensity — points = 0	-2
Total for H 2 — Add the points in the boxes above	**-2**

Rating of Landscape Potential If Score is: ☐ **4 - 6 = H** ☐ **1 - 3 = M** ☑ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated*. Site meets ANY of the following criteria: — points = 2 ☑ It has 3 or more priority habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) with in 100m — points = 1 Site does not meet any of the criteria above — points = 0	2

Wetland name or number C

Rating of Value If Score is: ☑ **2 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE**: This question is independent of the land use between the wetland unit and the priority habitat.*

☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

☐ **Herbaceous Balds**: Variable size patches of grass and forbs on shallow soils over bedrock.

☐ **Old-growth/Mature forests**: Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

☐ **Westside Prairies**: Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

☐ **Instream**: The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page*).

☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are

addressed elsewhere.

Wetland name or number C

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine Wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt ☐ Yes - Go to **SC 1.1** ☑ No = **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ Yes = **Category I** ☐ No - Go to **SC 1.2**	
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐ Yes = **Category I** ☐ No = **Category II**	
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes - Go to **SC 2.2** ☑ No - Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☐ No = **Not WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 2.4** ☑ No = **Not WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☐ No = **Not WHCV**	
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐ Yes - Go to **SC 3.3** ☑ No - Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐ Yes - Go to **SC 3.3** ☑ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐ Yes = **Is a Category I bog** ☑ No - Go to **SC 3.4** **NOTE**: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species)	

listed in Table 4 provide more than 30% of the cover under the canopy? ☐ Yes = **Is a Category I bog** ☑ No = **Is not a bog**

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.*** ☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more. ☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80-200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm). ☐ Yes = **Category I** ☑ No = **Not a forested wetland for this section**	
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? ☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks ☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon (*needs to be measured near the bottom*) ☐ Yes - Go to **SC 5.1** ☑ No = **Not a wetland in a coastal lagoon** SC 5.1. Does the wetland meet all of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100). ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland is larger than $^1/_{10}$ ac (4350 ft^2) ☐ Yes = **Category I** ☐ No = **Category II**	
SC 6.0. Interdunal Wetlands Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.*** In practical terms that means the following geographic areas: ☐ Long Beach Peninsula: Lands west of SR 103 ☐ Grayland-Westport: Lands west of SR 105 ☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109 ☐ Yes - Go to **SC 6.1** ☑ No = **Not an interdunal wetland for rating** SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? ☐ Yes = **Category I** ☐ No - Go to **SC 6.2** SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? ☐ Yes = **Category II** ☐ No - Go to **SC 6.3** SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? ☐ Yes = **Category III** ☐ No = **Category IV**	
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	

RATING SUMMARY – Western Washington

Name of wetland (or ID #): D - offsite Date of site visit: 7/27/2016

Rated by AB & AC Trained by Ecology? ☑ Yes ☐ No Date of training May-07

HGM Class used for rating Depressional & Flats Wetland has multiple HGM classes? ☐ Yes ☑ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map ____________________

OVERALL WETLAND CATEGORY IV (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

____ **Category I** - Total score = 23 - 27
____ **Category II** - Total score = 20 - 22
____ **Category III** - Total score = 16 - 19
X **Category IV** - Total score = 9 - 15

FUNCTION	**Improving Water Quality**	**Hydrologic**	**Habitat**	
List appropriate rating (H, M, L)				
Site Potential	L	L	L	
Landscape Potential	M	M	L	
Value	H	H	L	**Total**
Score Based on Ratings	6	6	3	15

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	**Category**
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	X

Maps and Figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	4
Hydroperiods	D 1.4, H 1.2	4
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	4
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	4
Map of the contributing basin	D 4.3, D 5.3	5
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	5
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	6
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	7

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream (*can be added to another figure*)	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to another figure*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

HGM Classification of Wetland in Western Washington

For questions 1 -7, the criteria described must apply to the entire unit being rated.
If hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

☑ NO - go to 2 ☐ **YES** - the wetland class is **Tidal Fringe** - go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☐ **NO - Saltwater Tidal Fringe (Estuarine)** ☐ **YES - Freshwater Tidal Fringe**
If your wetland can be classified as a Freshwater Tidal Fringe use the forms for ***Riverine*** *wetlands. If it is Saltwater Tidal Fringe it is an* ***Estuarine*** *wetland and is not scored. This method* ***cannot*** *be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it.
Groundwater and surface water runoff are NOT sources of water to the unit.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Flats**
If your wetland can be classified as a Flats wetland, use the form for ***Depressional*** *wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
☐ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
☐ At least 30% of the open water area is deeper than 6.6 ft (2 m).

☑ NO - go to 4 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
☐ The wetland is on a slope (*slope can be very gradual*),
☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
☐ The water leaves the wetland **without being impounded.**

☑ NO - go to 5 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
☐ The overbank flooding occurs at least once every 2 years.

☑ NO - go to 6 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding.

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 7 ☑ **YES** - The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☑ NO - go to 8 ☐ **YES** - The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:

Wetland name or number D - offsite

Wetland name or number D - offsite

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	2
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions*). Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^{1}/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^{1}/_{10}$ of area points = 0	0
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	0
Total for D 1 Add the points in the boxes above	**2**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☐ **6 - 11 = M** ☑ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3? Source Agricultural runoff Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	**1**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☑ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	**3**

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number D - offsite

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet points = 2 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	2
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 ☐ Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 ☐ The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	3
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* ☐ The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 ☐ Entire wetland is in the Flats class points = 5	0
Total for D 4 Add the points in the boxes above	5

Rating of Site Potential If score is: ☐**12 - 16 = H** ☐**6 - 11 = M** ☑**0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic function of the site?	
D 5.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	1
Total for D 5 Add the points in the boxes above	2

Rating of Landscape Potential If score is: ☐**3 = H** ☑**1 or 2 = M** ☐**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): ● Flooding occurs in a sub-basin that is immediately down-gradient of unit. points = 2 ☐ ● Surface flooding problems are in a sub-basin farther down-gradient. points = 1 ☐ Flooding from groundwater is an issue in the sub-basin. points = 1 ☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. Explain why points = 0 ☐ There are no problems with flooding downstream of the wetland. points = 0	2
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	2

Wetland name or number D - offsite

Total for D 6	Add the points in the boxes above	**4**

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number D - offsite

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.*

☐ Aquatic bed	4 structures or more: points = 4
☑ Emergent	3 structures: points = 2
☐ Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points - 1
☐ Forested (areas where trees have > 30% cover)	1 structure: points = 0

If the unit has a Forested class, check if:

☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

0

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

☐ Permanently flooded or inundated	4 or more types present: points = 3
☑ Seasonally flooded or inundated	3 types present: points = 2
☐ Occasionally flooded or inundated	2 types present: points = 1
☐ Saturated only	1 types present: points = 0
☐ Permanently flowing stream or river in, or adjacent to, the wetland	
☐ Seasonally flowing stream in, or adjacent to, the wetland	
☐ **Lake Fringe wetland**	**2 points**
☐ **Freshwater tidal wetland**	**2 points**

0

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

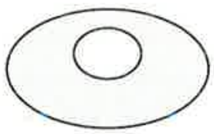
If you counted:		
	> 19 species	points = 2
	5 - 19 species	points = 1
	< 5 species	points = 0

1

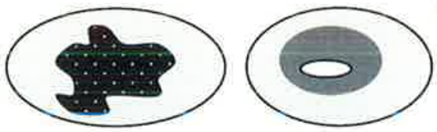
H 1.4. Interspersion of habitats

Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*

None = 0 points

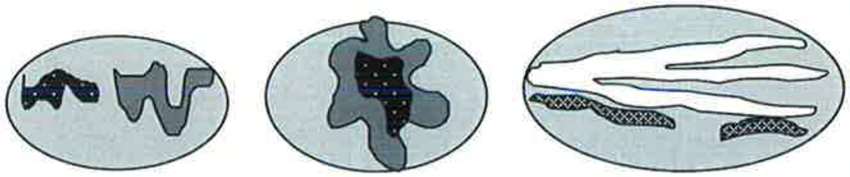


Low = 1 point



Moderate = 2 points

All three diagrams in this row are **HIGH** = 3 points



0

Wetland name or number D - offsite

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ☐ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long) ☐ Standing snags (dbh > 4 in) within the wetland ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☐ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☑ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	1
Total for H 1 Add the points in the boxes above	**2**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☐ **7 - 14 = M** ☑ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat function of the site?	
H 2.1 Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* 0 % undisturbed habitat + (0 % moderate & low intensity land uses / 2) = 0% If total accessible habitat is: > $^1/_3$ (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* 8.5 % undisturbed habitat + (0 % moderate & low intensity land uses / 2) = 8.5% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	0
H 2.3 Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (-2) ≤ 50% of 1km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	**-2**

Rating of Landscape Potential If Score is: ☐ **4 - 6 = H** ☐ **1 - 3 = M** ☑ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated*. Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) with in 100m points = 1 Site does not meet any of the criteria above points = 0	0

Wetland name or number D - offsite

Rating of Value If Score is: ☐ **2 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

Wetland name or number D - offsite

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE**: This question is independent of the land use between the wetland unit and the priority habitat.*

☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

☐ **Herbaceous Balds**: Variable size patches of grass and forbs on shallow soils over bedrock.

☐ **Old-growth/Mature forests**: Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

☑ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

☐ **Westside Prairies**: Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

☑ **Instream**: The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page*).

☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

☐ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are

addressed elsewhere.

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine Wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt ☐ Yes - Go to **SC 1.1** ☑ No = **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ Yes = **Category I** ☐ No - Go to **SC 1.2**	
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐ Yes = **Category I** ☐ No = **Category II**	
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes - Go to **SC 2.2** ☑ No - Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☐ No = **Not WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 2.4** ☑ No = **Not WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☐ No = **Not WHCV**	
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐ Yes - Go to **SC 3.3** ☑ No - Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐ Yes - Go to **SC 3.3** ☑ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐ Yes = **Is a Category I bog** ☐ No - Go to **SC 3.4** **NOTE**: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed	

in Table 4 provide more than 30% of the cover under the canopy?

☐ Yes = **Is a Category I bog** ☐ No = **Is not a bog**

Wetland name or number D - offsite

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.

☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80-200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

☐ Yes = **Category I** ☑ No = **Not a forested wetland for this section**

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks

☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon (*needs to be measured near the bottom*)

☐ Yes - Go to **SC 5.1** ☑ No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).

☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.

☐ The wetland is larger than $^1/_{10}$ ac (4350 ft^2)

☐ Yes = **Category I** ☐ No = **Category II**

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

☐ Long Beach Peninsula: Lands west of SR 103

☐ Grayland-Westport: Lands west of SR 105

☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109

☐ Yes - Go to **SC 6.1** ☑ No = **Not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)?

☐ Yes = **Category I** ☐ No - Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?

☐ Yes = **Category II** ☐ No - Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?

☐ Yes = **Category III** ☐ No = **Category IV**

Category of wetland based on Special Characteristics

If you answered No for all types, enter "Not Applicable" on Summary Form

Appendix F — Biologist Qualifications

Jeremy Downs, Principal Scientist and Environmental Planner

Jeremy Downs is the Principal Scientist and Environmental Planner for the project with professional training and extensive experience in land use, site planning and design, project coordination, permitting and management, marine and wetland ecology, habitat restoration, wetland, stream, and benthic delineations and assessments, stream assessments, underwater and terrestrial monitoring programs, and mitigation planning and design since 1987. Jeremy earned a Bachelor's of Science degree in Biology from the University of California, Davis. In addition, he studied under the Environmental Risk and Recovery program at the Australian Institute of Marine Science. He also holds graduate-level professional certifications in various advanced wetland science and management programs from both Portland State University and San Francisco State University, and he has received professional training in Salmonid Biology from the University of California Extension.

Jeremy is a certified wetlands delineator under US Army Corps of Engineers guidelines. He has been formally trained in the use of the Washington State Wetland Rating System, Determination of Ordinary High Water Mark, Designing Compensatory Mitigation and Restoration Projects, and Reviewing Wetland Mitigation and Monitoring Plans from the US Army Corps of Engineers and Washington State Department of Ecology, and in conducting Biological Assessments from the Washington Department of Transportation. He is also a Pierce County Qualified Wetland Specialist and Fisheries Biologist, and he holds similar qualifications from other jurisdictions.

Ann Boeholt

Ann Boeholt is a Senior Environmental Planner and a Certified Professional Wetland Scientist with 28 years of experience in aquatic resources management in western Washington. She has worked within all levels of government. Ann began her career working two part-time positions--with a local government (Mason County) and the US Fish and Wildlife Service. This transitioned to a full-time position as a Wetland Biologist with the USFWS, then 14 years as a regional Wetland Specialist at the Washington State Department of Ecology where she had a hand in developing many of the wetland tools in use to this day within the State of Washington. Also, during that time, Ann served an 8 month appointment as a Marine Habitat Biologist with the State Department of Fish and Wildlife and attended graduate school. She then served 12 years at Pierce County Surface Water Management as a Wetland Biologist and Project Manager. She joined SVC in July 2016. Ann has extensive experience in wetlands delineation and rating, native plant selection and care, restoration design, maintenance, monitoring, and mitigation banking and In-Lieu Fee Programs.

Ann earned a Bachelor of Science degree from The Evergreen State College, in Olympia Washington and completed coursework and a thesis towards a Master of Science at the University of Washington's School of Fisheries and Aquatic Sciences. On the job education and training has included training in wetland delineation, the use of the Washington State Wetland Rating System and Credit/Debit Assessment, Determination of Ordinary High Water Mark, Designing Compensatory Mitigation and Restoration Projects, Construction Management, and more.

James H. Carsner, Senior Scientist and Wetland Scientist

Jim Carsner, a certified Professional Wetland Scientist (#1461) with professional training and extensive experience in planning and design, project coordination, permitting and management, aquatic and wetland ecology, habitat restoration, wetland, stream, and benthic delineations and assessments, stream assessments, and mitigation planning and monitoring since 1979. Jim earned a Bachelor's of Science degree from the University of Washington, College of Fisheries and undertook post-graduate studies in wetland ecology at Portland State University. He has served on the Board of Directors of the Washington State Weed Association and instructed courses on pesticide laws, regulations, and uses.

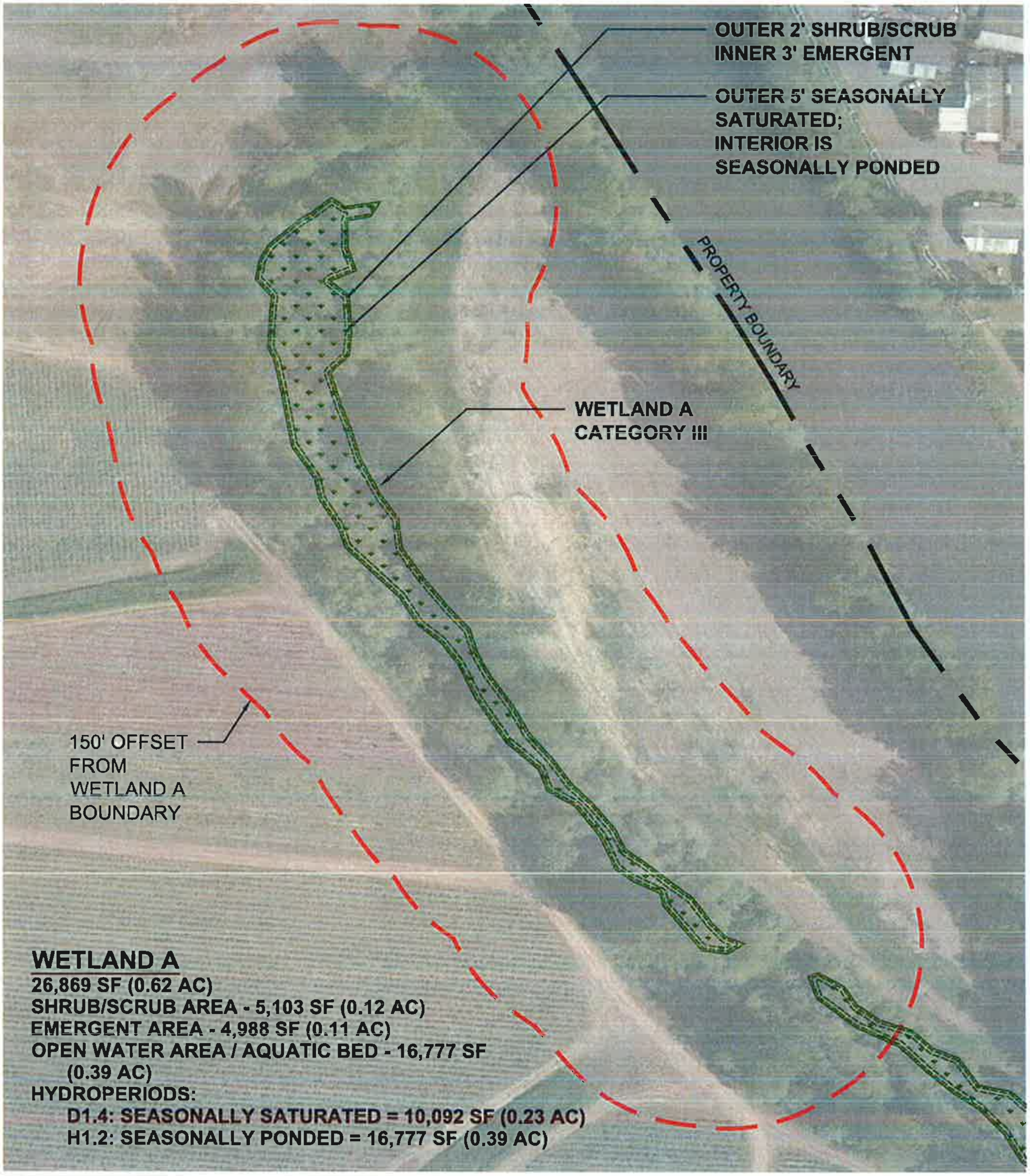
Jim has been formally trained in the use of the Washington State Wetland Rating System, Determination of Ordinary High Water Mark, Designing Compensatory Mitigation and Restoration Projects, and Reviewing

Wetland Mitigation and Monitoring Plans from the US Army Corps of Engineers and Washington State Department of Ecology. He is also a Pierce County Qualified Wetland Specialist and Fisheries Biologist, and he holds similar qualifications from other jurisdictions.

Hannah Blackstock, Staff Scientist and Project Manager

Hannah Blackstock is a Staff Scientist with a background in both forest and wetland ecology and fisheries biology and experience with various Federal agencies. Hannah earned a Bachelor's of Science with a double major in Environmental Science and Resource Management as well as Aquatic and Fisheries Sciences at the University of Washington. Hannah has an extensive knowledge of restoration ecology, ranging in topics such as soils, plant familiarity, hydrology, and wetland ecology. Furthermore, she has been certified by the Washington Department of Ecology in the use of the Washington State Wetland Rating System and Selecting Wetland Mitigation Sites Using a Watershed Approach and has received training from the PNW Invasive Plant Council on the identification of newly emerging invasive plant species. She is also a Pierce County Qualified Fisheries Biologist.

RUNNING BEAR DEVELOPMENT - WETLAND "A" - 150' OFFSET



WETLAND A
26,869 SF (0.62 AC)
SHRUB/SCRUB AREA - 5,103 SF (0.12 AC)
EMERGENT AREA - 4,988 SF (0.11 AC)
OPEN WATER AREA / AQUATIC BED - 16,777 SF (0.39 AC)
HYDROPERIODS:
D1.4: SEASONALLY SATURATED = 10,092 SF (0.23 AC)
H1.2: SEASONALLY PONDED = 16,777 SF (0.39 AC)

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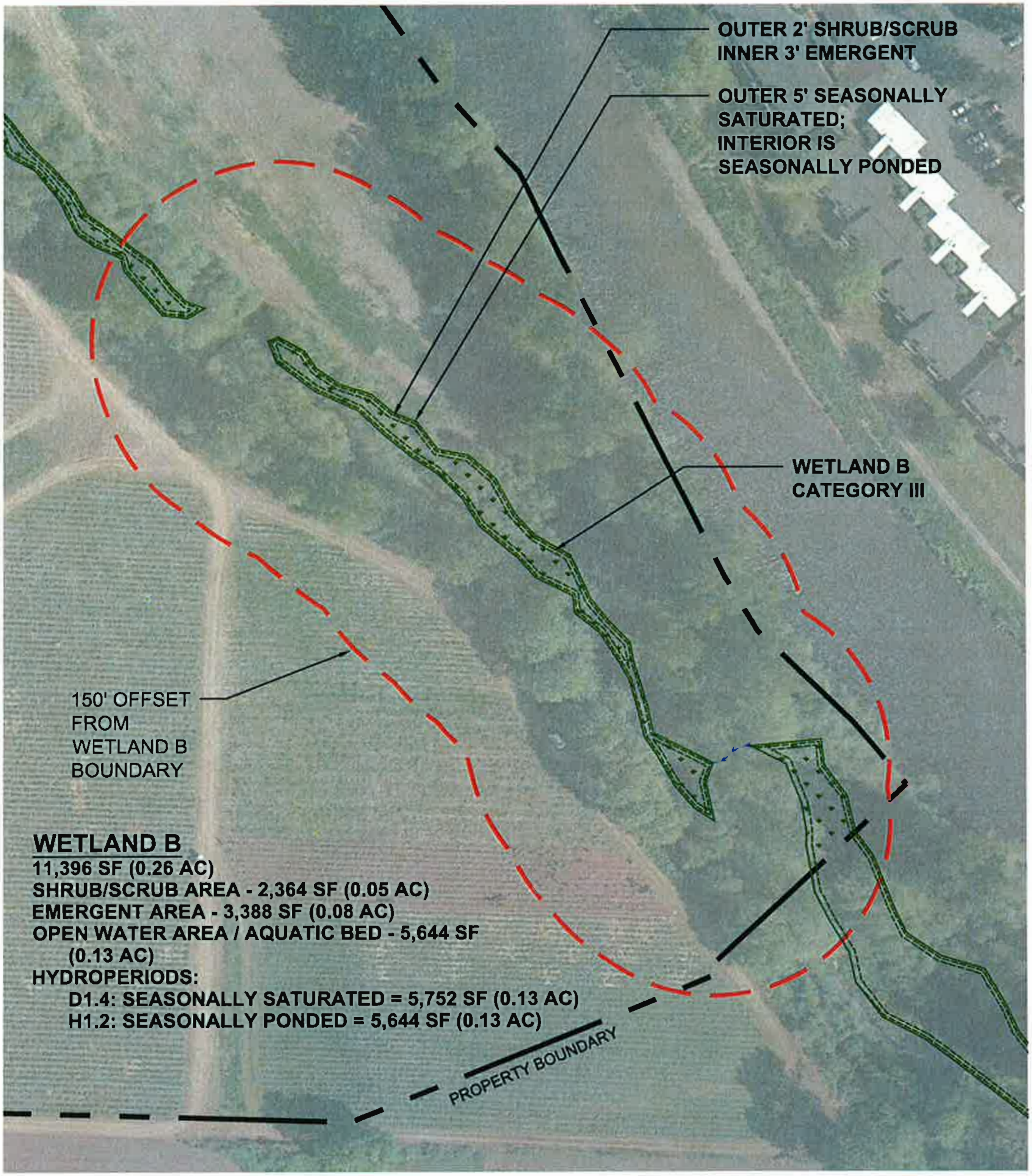
RUNNING BEAR DEVELOPMENT
PUYALLUP, WASHINGTON 98329

A PORTION OF Q23 OF SECTION 25,
TOWNSHIP 20N, RANGE O4E, W.M.

DATE:	12/09/2016
JOB:	1412.0001
BY:	DS
SCALE:	1" = 120'
FIGURE NO.	1

RUNNING BEAR DEVELOPMENT - WETLAND "B" - 150' OFFSET



WETLAND B

11,396 SF (0.26 AC)
SHRUB/SCRUB AREA - 2,364 SF (0.05 AC)
EMERGENT AREA - 3,388 SF (0.08 AC)
OPEN WATER AREA / AQUATIC BED - 5,644 SF (0.13 AC)
HYDROPERIODS:
D1.4: SEASONALLY SATURATED = 5,752 SF (0.13 AC)
H1.2: SEASONALLY PONDED = 5,644 SF (0.13 AC)

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PUYALLUP, WASHINGTON 98329

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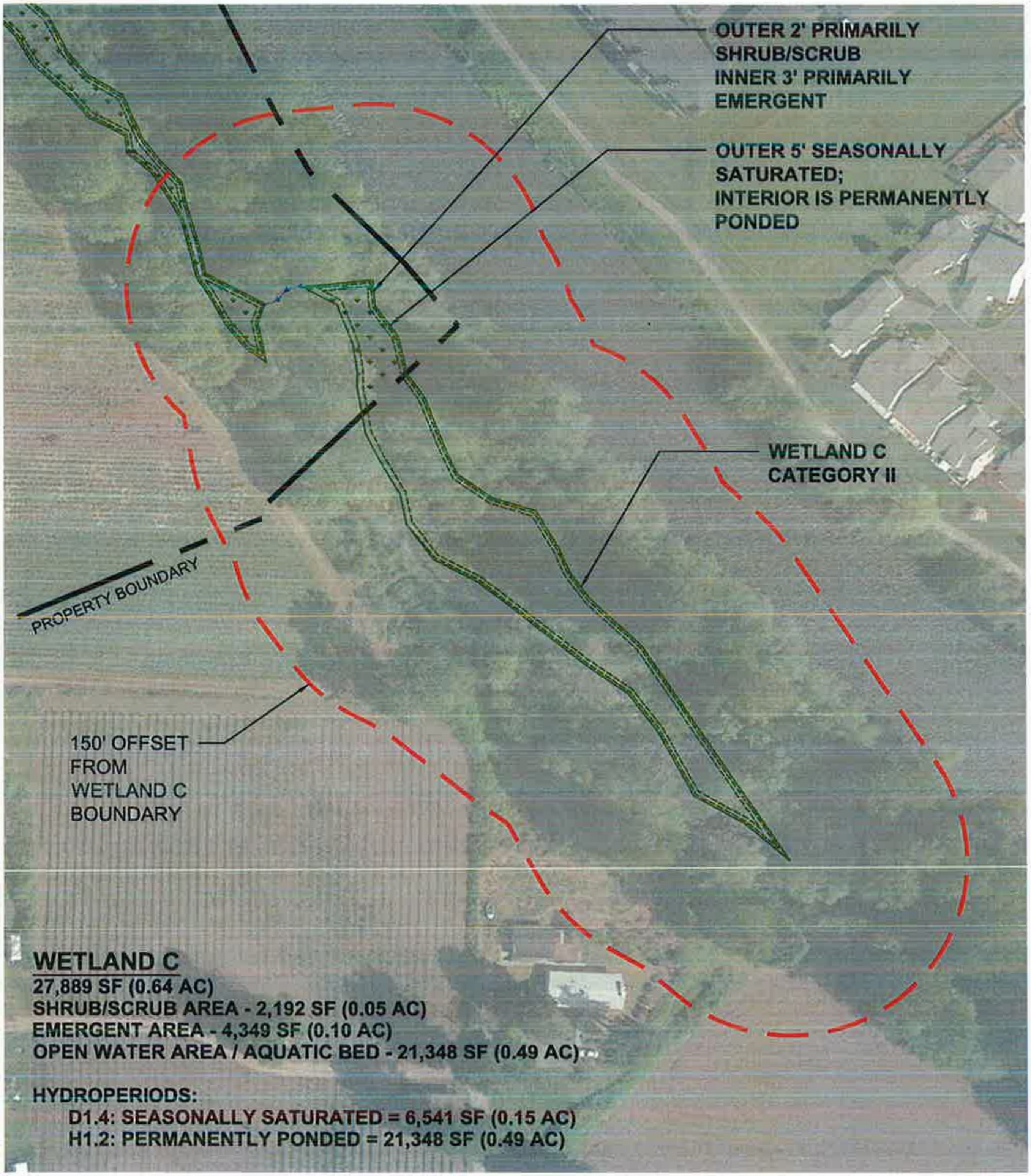
TOWNSHIP 20N, RANGE O4E, W.M.

DATE:	12/09/2016
JOB:	1412.0001
BY:	DS
SCALE:	1" = 120'
FIGURE NO.	2

RUNNING BEAR DEVELOPMENT - WETLAND "C" - 150' OFFSET



WETLAND C

27,889 SF (0.64 AC)
SHRUB/SCRUB AREA - 2,192 SF (0.05 AC)
EMERGENT AREA - 4,349 SF (0.10 AC)
OPEN WATER AREA / AQUATIC BED - 21,348 SF (0.49 AC)

HYDROPERIODS:
D1.4: SEASONALLY SATURATED = 6,541 SF (0.15 AC)
H1.2: PERMANENTLY PONDED = 21,348 SF (0.49 AC)

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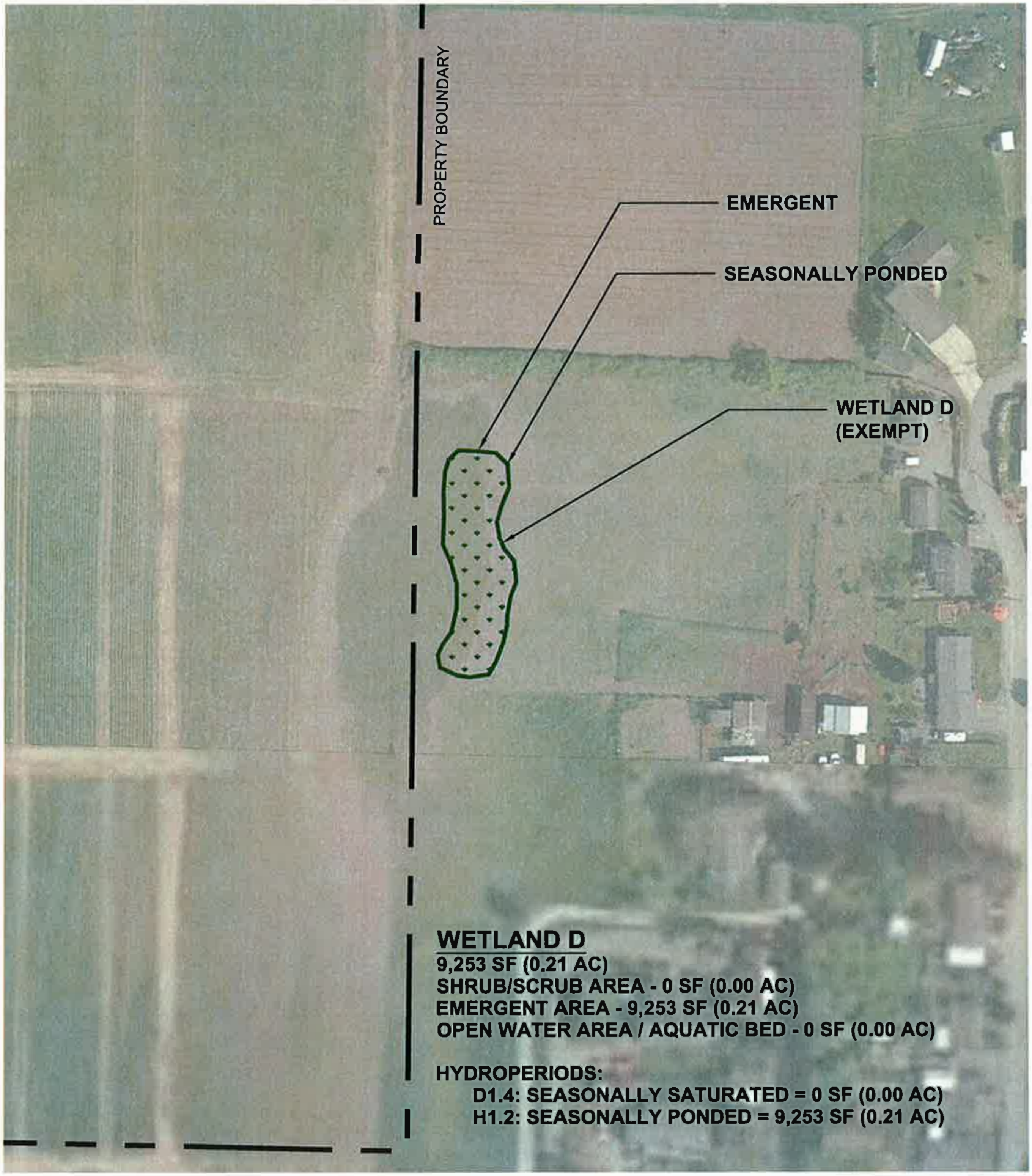
DATE:	12/09/2016
JOB:	1412.0001
BY:	DS
SCALE:	1" = 120'
FIGURE NO.	3

RUNNING BEAR DEVELOPMENT - WETLAND "D" - EXEMPT



WETLAND D
9,253 SF (0.21 AC)
SHRUB/SCRUB AREA - 0 SF (0.00 AC)
EMERGENT AREA - 9,253 SF (0.21 AC)
OPEN WATER AREA / AQUATIC BED - 0 SF (0.00 AC)

HYDROPERIODS:
D1.4: SEASONALLY SATURATED = 0 SF (0.00 AC)
H1.2: SEASONALLY PONDED = 9,253 SF (0.21 AC)

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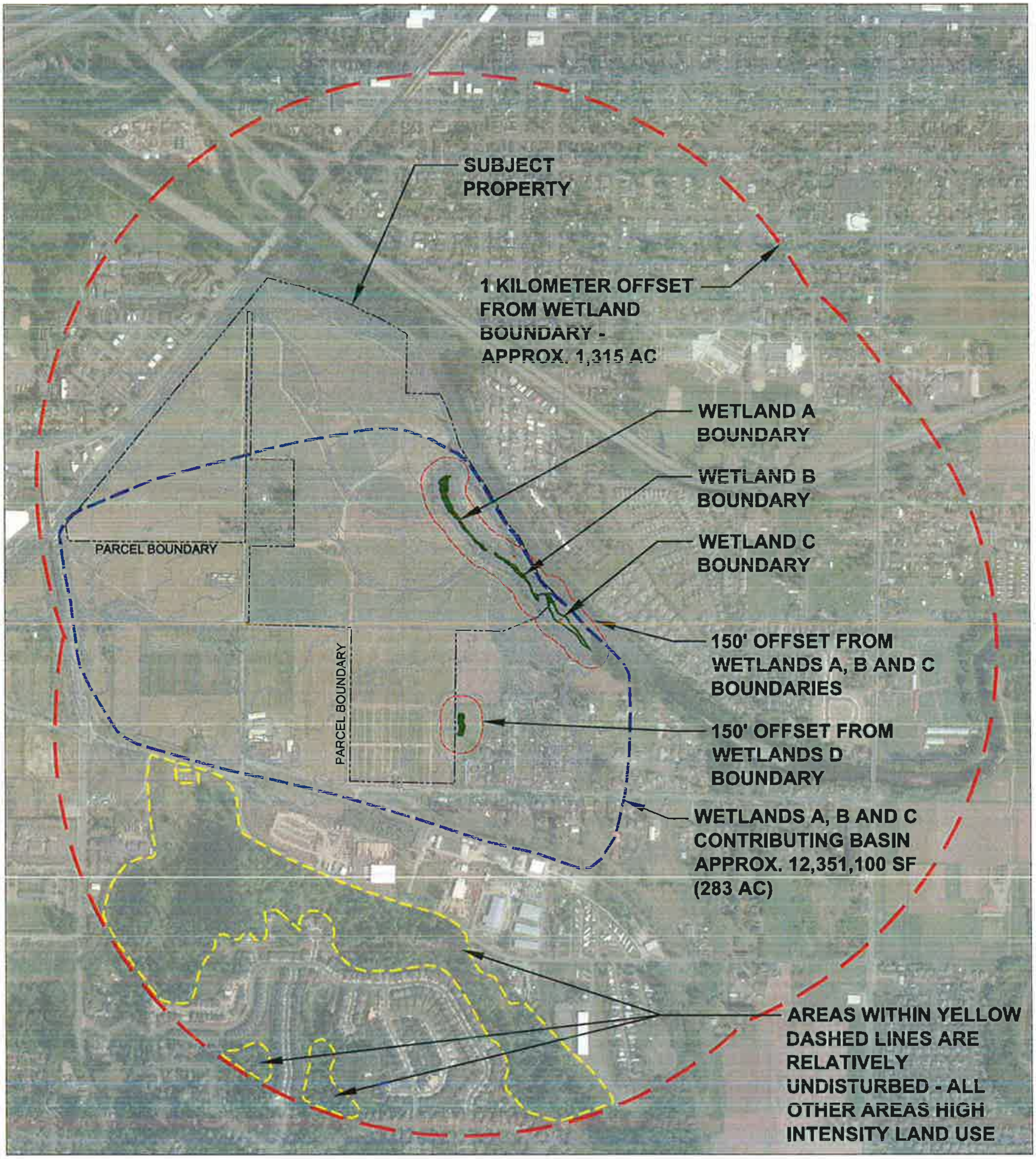
PUYALLUP, WASHINGTON 98329

A PORTION OF Q23 OF SECTION 25,
TOWNSHIP 20N, RANGE O4E, W.M.

DATE: 12/09/2016
JOB: 1412.0001
BY: DS
SCALE: 1" = 120'
FIGURE NO. 4

RUNNING BEAR DEVELOPMENT - WETLANDS - 1 KM OFFSET



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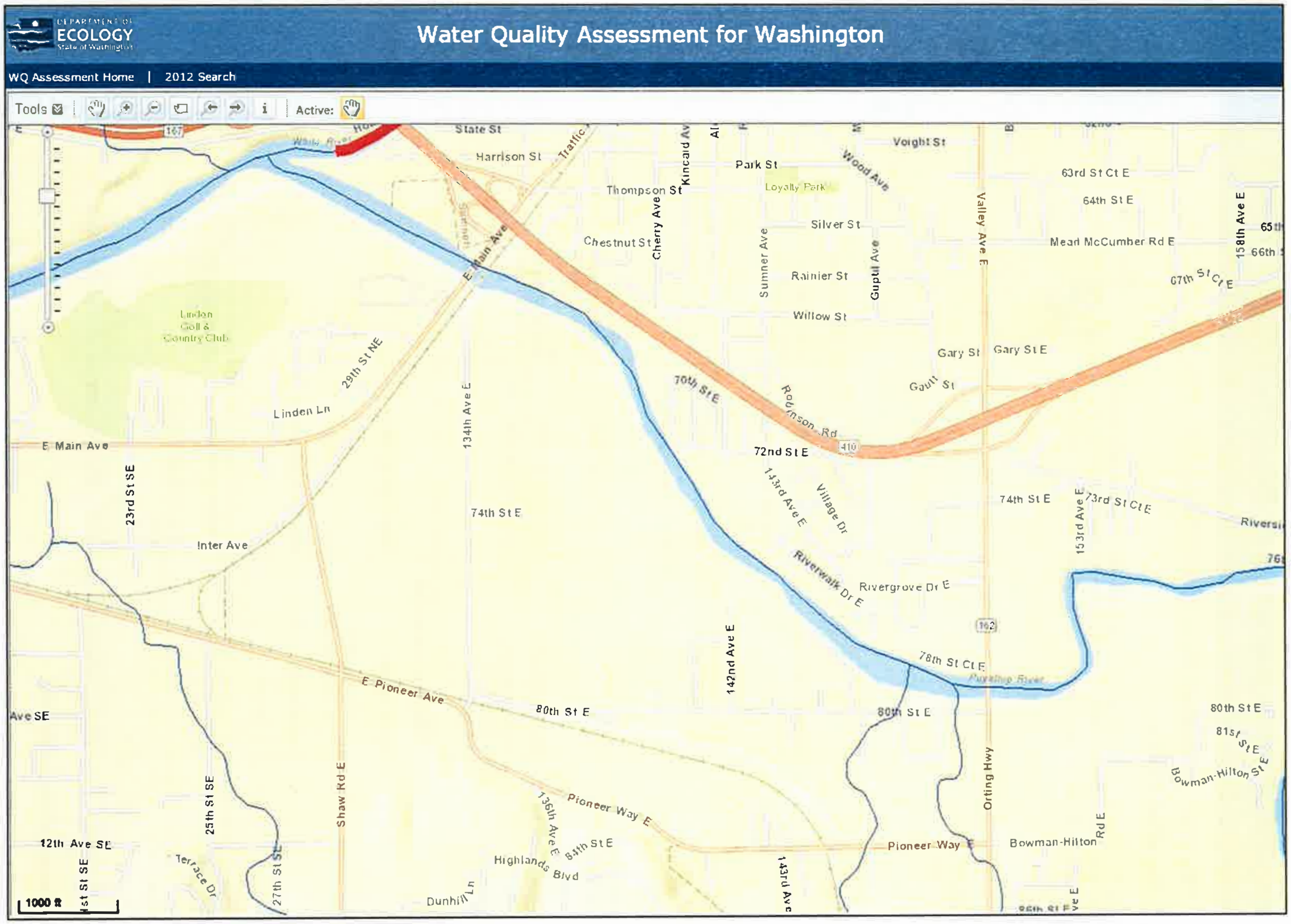
RUNNING BEAR DEVELOPMENT
PUYALLUP, WASHINGTON 98329

A PORTION OF Q23 OF SECTION 25,
TOWNSHIP 20N, RANGE 04E, W.M.

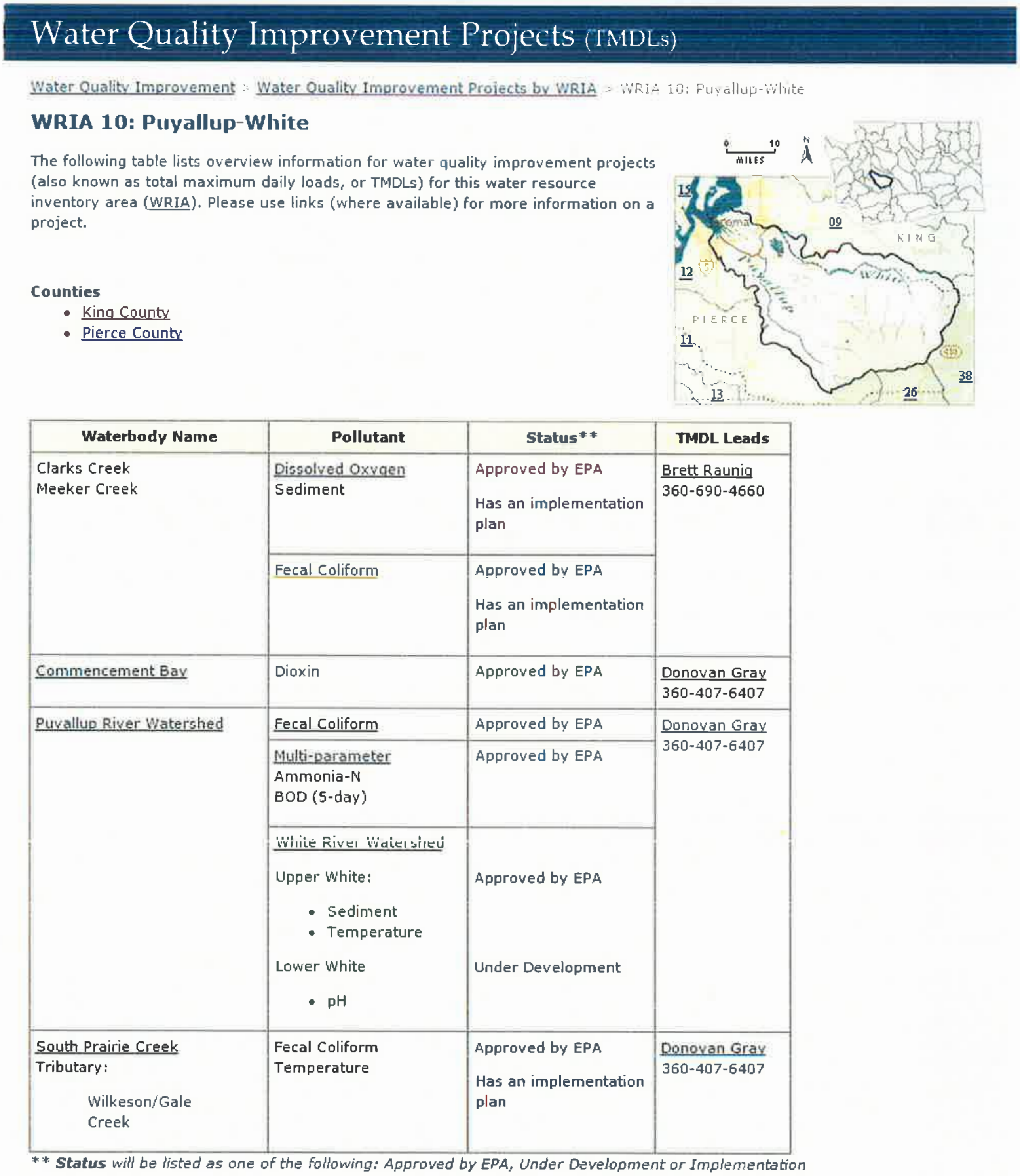
DATE: 12/09/2016
JOB: 1412.0001
BY: DS
SCALE: 1" = 1,200'
FIGURE NO. 5

Figure 6: Map of 303(d) Listed Waters in Basin



SOURCE: Department of Ecology

Figure 7: TMDLs for WRIA



Water Quality Improvement Projects (TMDLs)

Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 10: Puyallup-White

WRIA 10: Puyallup-White

The following table lists overview information for water quality improvement projects (also known as total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Counties

- King County
- Pierce County

Waterbody Name	Pollutant	Status**	TMDL Leads
Clarks Creek Meeker Creek	Dissolved Oxygen Sediment	Approved by EPA Has an implementation plan	Brett Raunig 360-690-4660
	Fecal Coliform	Approved by EPA Has an implementation plan	
Commencement Bay	Dioxin	Approved by EPA	Donovan Gray 360-407-6407
Puyallup River Watershed	Fecal Coliform	Approved by EPA	Donovan Gray 360-407-6407
	Multi-parameter Ammonia-N BOD (5-day)	Approved by EPA	
	White River Watershed Upper White: • Sediment • Temperature	Approved by EPA	
	Lower White • pH	Under Development	
South Prairie Creek Tributary: Wilkeson/Gale Creek	Fecal Coliform Temperature	Approved by EPA Has an implementation plan	Donovan Gray 360-407-6407

** ***Status*** *will be listed as one of the following: Approved by EPA, Under Development or Implementation*

SOURCE: DEPARTMENT OF ECOLOGY WEBSITE

Air Quality Emissions Calculations

Vehicle Class	Proposed Action - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O	CO_2e	MSAT
Passenger Car	1,449,835	2.84	0.09	0.00	0.05	0.01	0.02	386.04	0.01	0.00	386.78	0.00
Passenger Truck	1,449,835	3.25	0.18	0.00	0.06	0.01	0.03	512.84	0.01	0.00	513.92	0.00
Single Unit Truck	15,447,508	90.55	3.09	0.10	1.27	0.31	1.65	15,200.46	0.28	0.07	15,228.84	0.16
Combination Truck	1,490,432	34.30	3.10	0.02	0.39	0.12	0.90	2,733.47	0.15	0.02	2,743.43	0.09
Idling Truck	727,575	32.47	46.98	0.02	0.40	0.37	2.75	5,858.13	0.60	0.00	5,873.16	0.34
	Total Emissions	163.41	53.43	0.14	2.17	0.82	5.35	24,690.93	1.05	0.10	24,746.12	0.60

Vehicle Class or Rail	Alternative 1 - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O	CO_2e	MSAT
Passenger Car	1,449,835	2.84	0.09	0.00	0.05	0.01	0.02	386.04	0.01	0.00	386.78	0.00
Passenger Truck	1,449,835	3.25	0.18	0.00	0.06	0.01	0.03	512.84	0.01	0.00	513.92	0.00
Single Unit Truck	15,447,508	90.55	3.09	0.10	1.27	0.31	1.65	15,200.46	0.28	0.07	15,228.84	0.16
Combination Truck	852,502	19.62	1.77	0.01	0.23	0.07	0.52	1,563.50	0.09	0.01	1,569.19	0.05
Idling Truck	700,172	31.25	45.21	0.02	0.38	0.35	2.64	5,637.49	0.58	0.00	5,651.96	0.33
Rail (1)	5,758 ton-miles/train round trip	0.50	2.20	0.03	0.05	0.05	0.24	102.46	0.01	0.00	103.74	0.00
	Total Emissions	148.00	52.53	0.17	2.04	0.80	5.10	23,402.79	0.98	0.09	23,454.43	0.55

(1) Includes rail idling emissions; assumed 30 minutes per train.

Vehicle Class	Alternative 2 - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O	CO_2e	MSAT
Passenger Car	966,557	1.89	0.06	0.00	0.03	0.01	0.02	257.36	0.01	0.00	257.85	0.00
Passenger Truck	966,557	2.16	0.12	0.00	0.04	0.01	0.02	341.89	0.01	0.00	342.61	0.00
Single Unit Truck	10,349,886	60.67	2.07	0.07	0.85	0.21	1.10	10,184.36	0.19	0.05	10,203.38	0.11
Combination Truck	999,422	23.00	2.08	0.01	0.26	0.08	0.60	1,832.95	0.10	0.01	1,839.63	0.06
Idling Truck	487,513	21.76	31.48	0.01	0.27	0.25	1.84	3,925.25	0.40	0.00	3,935.32	0.23
	Total Emissions	109.48	35.80	0.10	1.45	0.55	3.58	16,541.82	0.71	0.06	16,578.80	0.40

Assume 15 minutes idling for all trucks entering the site for proposed action and both alternatives.

Class 1	Motocycles, Car, Van, Pickup
Class 2	Single-Unit Truck
Class 3	Double Unit Truck
Class 4	Triple Unit Truck

	Scenario A - Proposal (covenant)	**Scenario B (Proposal, with rail)**	**Scenario D (Mitigated site plan)**
Bldg sq ft	2.6m	2.6m	1.7m
Peak hour trips	884	856	579
Heavy Truck	771	441	517
Light Truck	7,991	7,991	5,354
Employee	1500 total (500 each shift)	1500 total (500 each shift)	1000 total (333 each shift)

Conversion from Daily to Yearly Traffic, based on R112 PTR

Year	2019
Annual Average Daily Traffic	45109
Tue/Wed/Thu Average Daily Traffic	49608
AADT/T-Th Factor	0.91

Site	Description
A	Shaw north of E Pioneer
C	E Pioneer east of 13th St SE
D	E Main Ave north of 5th Ave NE

Daily and Yearly Traffic from Site

	Scenario A		Scenario B		Scenario D	
Vehicle Class	Daily	Yearly	Daily	Yearly	Daily	Yearly
Passenger Car	1,500	498,225	1,500	498,225	1,000	332,150
Single-Unit Truck	7,991	2,654,211	7,991	2,654,211	5,354	1,778,331
Double & Triple Unit Truck	771	256,088	441	146,478	517	171,722

Roundtrip Distance from Freeway to Site (miles)

To/From SR 512	3.53
To/From SR 410	2.29
Total	5.82

Average Vehicle Speed from Tube Counts (mph)

Site	EB	WB	NB	SB
A			40.8	35.7
C	36.1	36.6		
D			39.8	39
Average for All				38

Scenario A Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMT	Avg Speed
Passenger Car, Van, Pickup	2,899,670	38
Single-Unit Truck	15,447,508	
Double & Triple Unit Truck	1,490,432	

320	1,022.81
1477	25,149.88
1477	2,426.55
	28,599.24

MOVES Vehicle Type	VMT	Avg Speed
21	1449835	38
31	1449835	38
52	15447508	38
61	1490432	38

Scenario B Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMT	Avg Speed
Passenger Car, Van, Pickup	2,899,670	38
Single-Unit Truck	15,447,508	
Double & Triple Unit Truck	852,502	

MOVES Vehicle Type	VMT	Avg Speed
21	1449835	38
31	1449835	38
52	15447508	38
61	852502	38

Scenario D Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMT	Avg Speed
Passenger Car, Van, Pickup	1,933,113	38
Single-Unit Truck	10,349,886	
Double & Triple Unit Truck	999,422	

MOVES Vehicle Type	VMT	Avg Speed
21	966557	38
31	966557	38
52	10349886	38
61	999422	38

MOVES Speed Bin = 9

37.5 mph <= Speed <42.5 mph

Kuntson Farms EIS - Rail Alternative - Locomotive Throughput Data and Criteria Pollutant and CO_2 Emissions

400	tons-miles/gal diesel (EPA document; Technical Highlights - Emission Factors for Locomotives, EPA-420-F-09-025, April 2009)
15.2	bhp-hr/gal (conversion factor, switching haul, EPA-420-F-09-025)
67	tons/rail car [national avg. (1991-2001) from https://www.bts.gov/archive/publications/transportation_statistics_annual_report/2003/chapter_02/railcar_weights]
1.25	miles for the rail spur
55	rail cars/train
2	trains/day
5,758	tons-miles/train round trip (assumes train weight after unloading for return trip is 25% of full load)
14.4	gal diesel per train round trip
3.94	gal/hour/train of diesel fuel for idling (estimated average locomotive fuel use on idle setting: https://www.railserveleaf.biz/pdf/rsi-white-paper-fuel-emissions.pdf)
0.5	hours, Assumed idle time per train (30 minutes)
32.7	gal/day diesel fuel, including for idling
11,936	gal/yr train diesel fuel
15.2	bhp-hr/gal (EPA-420-F-09-025)

Switch Locomotive Average Emission Factors (grams/horsepower-per hour), CH_4 and N_2O Emisson Factors (grams/gallon diesel fuel)

	NO_x	**VOC**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**
Locomotive	**11.00**	**1.20**	**2.50**	**0.16**	**0.26**	**0.25**	**512.38**	**0.8**	**0.26**

Notes:

Emission factors are based on the Switch Locomotives - Exhaust Emission Standards (40 CFR 1033.101)

Emission factors are conservatively based on Tier 1 locomotive.

Emission factor for PM2.5 is 97% of PM10

Emission Factors for CH4 asnd N2O from EPA's Emission Factors for Greenhouse Gas Inventories, April 2022.

bhp = brake horsepower
gal = gallons
hr = hour
yr = year

Locomotive Emissions (tons/yr)

NO_x	**VOC**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**
2.2	**0.24**	**0.5**	**0.03**	**0.05**	**0.05**	**102.46**	**0.01**	**0.003**

Idle fuel use (gal/hr) per locomotive type

Idle fuel use (gal/hr) per locomotive type	
3	
3.1	
3.3	
3.8	
3.8	
3.8	
3.8	
3.5	
3.5	
4.6	
4.6	
5.5	
5.2	
3.5	
5	
4	
2.9	
5.5	
6	
3	
3	
3.4	
3.4	
3.4	
94.6	Total
3.941667	Average (gal/hr)

Kuntson Farms EIS - Rail Alternative - Locomotive Mobile Source Air Toxics Emissions Estimates

MSAT	Emission Factor (a)	Units	Diesel Fuel Use	Units	Diesel Heating Value (b)	Units	Emissions	Units
Benzene	7.76E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.34E-04	tons/year
Toluene	2.81E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	2.30E-04	tons/year
Xylene	1.93E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	1.58E-04	tons/year
Formaldehyde	7.89E-05	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.45E-05	tons/year
Acrolein	7.88E-06	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.44E-06	tons/year
Acetaldehyde	2.52E-05	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	2.06E-05	tons/year
Total Polycyclic Aromtaic Hydrocarbons	2.12E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	1.73E-04	tons/year
						TOTAL	**1.29E-03**	tons/year

(a) MSAT emission factors obtained from EPA AP-42 document; large stationary diesel engine emission factors in Tables 3.4-3 and 3.4-4 as surrogates.

(b) Diesel heating value obtained from AP-42, Appendix A - Miscellaneous Data and Conversion Factors

Vehicle Class	Proposed Action - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O	CO_2e	MSAT
Passenger Car	6,999,801	13.70	0.42	0.01	0.25	0.04	0.11	1,863.80	0.04	0.01	1,867.36	0.01
Passenger Truck	6,999,801	15.67	0.85	0.02	0.27	0.05	0.16	2,476.00	0.06	0.01	2,481.19	0.02
Single Unit Truck	2,580,704	15.13	0.52	0.02	0.21	0.05	0.28	2,539.43	0.05	0.01	2,544.17	0.03
Combination Truck	284,167	6.54	0.59	0.00	0.08	0.02	0.17	521.17	0.03	0.00	523.06	0.02
Idling Truck	123,062	5.49	7.95	0.00	0.07	0.06	0.46	990.84	0.10	0.00	993.38	0.06
Total Emissions		56.54	10.33	0.05	0.87	0.23	1.19	8,391.23	0.28	0.04	8,409.17	0.13

Vehicle Class or Rail	Alternative 1 - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O	CO_2e	MSAT
Passenger Car	6,999,801	13.70	0.42	0.01	0.25	0.04	0.11	1,863.80	0.04	0.01	1,867.36	0.01
Passenger Truck	6,999,801	15.67	0.85	0.02	0.27	0.05	0.16	2,476.00	0.06	0.01	2,481.19	0.02
Single Unit Truck	2,103,226	12.33	0.42	0.01	0.17	0.04	0.22	2,069.59	0.04	0.01	2,073.45	0.02
Combination Truck	230,041	5.29	0.48	0.00	0.06	0.02	0.14	421.90	0.02	0.00	423.44	0.01
Idling Truck	100,226	4.47	6.47	0.00	0.06	0.05	0.38	806.98	0.08	0.00	809.05	0.05
Rail (1)	5,758 ton-miles/train round trip	0.50	2.20	0.03	0.05	0.05	0.24	102.46	0.01	0.00	103.74	0.00
Total Emissions		51.97	10.84	0.08	0.86	0.25	1.26	7,740.72	0.25	0.04	7,758.23	0.11

(1) Includes rail idling emissions; assumed 30 minutes per train.

Vehicle Class	Alternative 2 - VMT/yr and Idling Time (hr/yr)	Emissions (tons/year)										
		CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O	CO_2e	MSAT
Passenger Car	4,666,534	9.14	0.28	0.01	0.17	0.03	0.07	1,242.53	0.03	0.01	1,244.91	0.01
Passenger Truck	4,666,534	10.45	0.57	0.01	0.18	0.03	0.11	1,650.67	0.04	0.01	1,654.13	0.01
Single Unit Truck	1,720,473	10.08	0.34	0.01	0.14	0.03	0.18	1,692.96	0.03	0.01	1,696.12	0.02
Combination Truck	189,447	4.36	0.39	0.00	0.05	0.02	0.11	347.45	0.02	0.00	348.71	0.01
Idling Truck	82,041	3.66	5.30	0.00	0.05	0.04	0.31	660.56	0.07	0.00	662.26	0.04
Total Emissions		37.69	6.88	0.03	0.58	0.15	0.79	5,594.16	0.18	0.02	5,606.12	0.09

Assume 15 minutes idling for all trucks entering the site for proposed action and both alternatives.

Emission Calc

	Pollutant	Pollutant ID	January Emission Factor				July Emission Factor				Average Emission Factor (ton/mi)				Scenario A VMT/yr or idle hr				Scenario A Emissions (ton/yr)				Scenario B VMT/yr or idle hr				Scenario B Emissions (ton/yr)				Scenario D VMT/yr or idle hr				Scenario D Emissions (ton/yr)			
Emission Type			21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61	21	31	52	61
MSAT	Benzene	20	7.0E-10	9.8E-10	5.0E-09	2.9E-08	7.4E-10	1.0E-09	5.3E-09	3.1E-08	7.2E-10	1.0E-09	5.1E-09	3.0E-08	6999801.3	6999801.3	2580704.4	284167.32	5.04E-03	7.09E-03	1.33E-02	8.48E-03	6999801.3	6999801.3	2103225.78	230041.32	5.04E-03	7.09E-03	1.08E-02	6.86E-03	4666534.2	4666534.2	1720473.48	189446.82	3.36E-03	4.73E-03	8.85E-03	5.65E-03
MSAT	Formaldehyde	25	2.5E-10	3.5E-10	1.8E-09	1.0E-08	2.6E-10	3.7E-10	1.9E-09	1.1E-08	2.5E-10	3.6E-10	1.8E-09	1.1E-08	6999801.3	6999801.3	2580704.4	284167.32	1.78E-03	2.50E-03	4.72E-03	3.02E-03	6999801.3	6999801.3	2103225.78	230041.32	1.78E-03	2.50E-03	3.85E-03	2.45E-03	4666534.2	4666534.2	1720473.48	189446.82	1.19E-03	1.66E-03	3.15E-03	2.01E-03
MSAT	Butadiene	24	3.3E-11	5.8E-11	6.5E-11	7.4E-11	3.3E-11	5.8E-11	6.4E-11	7.4E-11	3.3E-11	5.8E-11	6.5E-11	7.4E-11	6999801.3	6999801.3	2580704.4	284167.32	2.30E-04	4.08E-04	1.66E-04	2.10E-05	6999801.3	6999801.3	2103225.78	230041.32	2.30E-04	4.08E-04	1.36E-04	1.70E-05	4666534.2	4666534.2	1720473.48	189446.82	1.53E-04	2.72E-04	1.11E-04	1.40E-05
MSAT	Naphthalene Particle	23	7.5E-14	1.1E-13	8.1E-13	4.3E-12	7.5E-14	1.1E-13	8.1E-13	4.3E-12	7.5E-14	1.1E-13	8.1E-13	4.3E-12	6999801.3	6999801.3	2580704.4	284167.32	5.23E-07	7.80E-07	2.08E-06	1.22E-06	6999801.3	6999801.3	2103225.78	230041.32	5.23E-07	7.80E-07	1.70E-06	9.88E-07	4666534.2	4666534.2	1720473.48	189446.82	3.49E-07	5.20E-07	1.39E-06	8.14E-07
MSAT	Naphthalene Gas	185	3.2E-11	4.7E-11	2.1E-10	1.2E-09	3.4E-11	4.9E-11	2.3E-10	1.3E-09	3.3E-11	4.8E-11	2.2E-10	1.3E-09	6999801.3	6999801.3	2580704.4	284167.32	2.32E-04	3.34E-04	5.69E-04	3.55E-04	6999801.3	6999801.3	2103225.78	230041.32	2.32E-04	3.34E-04	4.64E-04	2.88E-04	4666534.2	4666534.2	1720473.48	189446.82	1.55E-04	2.23E-04	3.80E-04	2.37E-04
MSAT	Acrolein	27	1.1E-11	1.6E-11	7.8E-11	4.5E-10	1.2E-11	1.7E-11	8.2E-11	4.8E-10	1.1E-11	1.6E-11	8.0E-11	4.6E-10	6999801.3	6999801.3	2580704.4	284167.32	8.02E-05	1.14E-04	2.07E-04	1.31E-04	6999801.3	6999801.3	2103225.78	230041.32	8.02E-05	1.14E-04	1.68E-04	1.06E-04	4666534.2	4666534.2	1720473.48	189446.82	5.35E-05	7.57E-05	1.38E-04	8.73E-05
MSAT	Acetaldehyde	26	1.5E-10	2.2E-10	8.8E-10	4.8E-09	1.5E-10	2.3E-10	9.0E-10	4.9E-09	1.5E-10	2.3E-10	8.9E-10	4.8E-09	6999801.3	6999801.3	2580704.4	284167.32	1.06E-03	1.58E-03	2.29E-03	1.37E-03	6999801.3	6999801.3	2103225.78	230041.32	1.06E-03	1.58E-03	1.87E-03	1.11E-03	4666534.2	4666534.2	1720473.48	189446.82	7.04E-04	1.05E-03	1.53E-03	9.12E-04
MSAT	Ethylbenzene	41	2.8E-10	4.1E-10	1.8E-09	1.1E-08	2.9E-10	4.2E-10	1.9E-09	1.2E-08	2.8E-10	4.2E-10	1.8E-09	1.1E-08	6999801.3	6999801.3	2580704.4	284167.32	1.98E-03	2.91E-03	4.68E-03	3.25E-03	6999801.3	6999801.3	2103225.78	230041.32	1.98E-03	2.91E-03	3.81E-03	2.63E-03	4666534.2	4666534.2	1720473.48	189446.82	1.32E-03	1.94E-03	3.12E-03	2.17E-03
MSAT	*Acenaphthene gas*	170	6.3E-13	9.0E-13	4.1E-12	2.3E-11	6.5E-13	9.4E-13	4.4E-12	2.5E-11	6.4E-13	9.2E-13	4.3E-12	2.4E-11	6999801.3	6999801.3	2580704.4	284167.32	4.48E-06	6.45E-06	1.10E-05	6.85E-06	6999801.3	6999801.3	2103225.78	230041.32	4.48E-06	6.45E-06	8.95E-06	5.54E-06	4666534.2	4666534.2	1720473.48	189446.82	2.98E-06	4.30E-06	7.32E-06	4.57E-06
MSAT	*Acenaphthene particle*	70	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6999801.3	6999801.3	2580704.4	284167.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6999801.3	6999801.3	2103225.78	230041.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4666534.2	4666534.2	1720473.48	189446.82	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MSAT	*Acenaphthylene gas*	171	2.8E-12	4.1E-12	1.9E-11	1.1E-10	3.0E-12	4.3E-12	2.0E-11	1.1E-10	2.9E-12	4.2E-12	1.9E-11	1.1E-10	6999801.3	6999801.3	2580704.4	284167.32	2.03E-05	2.93E-05	4.98E-05	3.11E-05	6999801.3	6999801.3	2103225.78	230041.32	2.03E-05	2.93E-05	4.06E-05	2.52E-05	4666534.2	4666534.2	1720473.48	189446.82	1.35E-05	1.95E-05	3.32E-05	2.07E-05
MSAT	*Acenaphthylene particle*	71	2.2E-14	3.3E-14	2.4E-13	1.3E-12	2.2E-14	3.3E-14	2.4E-13	1.3E-12	2.2E-14	3.3E-14	2.4E-13	1.3E-12	6999801.3	6999801.3	2580704.4	284167.32	1.56E-07	2.32E-07	6.20E-07	3.63E-07	6999801.3	6999801.3	2103225.78	230041.32	1.56E-07	2.32E-07	5.05E-07	2.94E-07	4666534.2	4666534.2	1720473.48	189446.82	1.04E-07	1.55E-07	4.13E-07	2.42E-07
MSAT	*Anthracene gas*	172	5.3E-13	7.6E-13	3.5E-12	2.0E-11	5.5E-13	7.9E-13	3.7E-12	2.1E-11	5.4E-13	7.7E-13	3.6E-12	2.0E-11	6999801.3	6999801.3	2580704.4	284167.32	3.75E-06	5.41E-06	9.21E-06	5.75E-06	6999801.3	6999801.3	2103225.78	230041.32	3.75E-06	5.41E-06	7.51E-06	4.65E-06	4666534.2	4666534.2	1720473.48	189446.82	2.50E-06	3.61E-06	6.14E-06	3.83E-06
MSAT	*Anthracene particle*	72	2.3E-14	3.4E-14	2.5E-13	1.3E-12	2.3E-14	3.4E-14	2.5E-13	1.3E-12	2.3E-14	3.4E-14	2.5E-13	1.3E-12	6999801.3	6999801.3	2580704.4	284167.32	1.61E-07	2.41E-07	6.42E-07	3.77E-07	6999801.3	6999801.3	2103225.78	230041.32	1.61E-07	2.41E-07	5.24E-07	3.05E-07	4666534.2	4666534.2	1720473.48	189446.82	1.08E-07	1.60E-07	4.28E-07	2.51E-07
MSAT	*Benz(a)anthracene gas*	173	8.5E-14	1.2E-13	5.6E-13	3.2E-12	8.8E-14	1.3E-13	5.9E-13	3.4E-12	8.7E-14	1.2E-13	5.8E-13	3.3E-12	6999801.3	6999801.3	2580704.4	284167.32	6.06E-07	8.74E-07	1.49E-06	9.28E-07	6999801.3	6999801.3	2103225.78	230041.32	6.06E-07	8.74E-07	1.21E-06	7.51E-07	4666534.2	4666534.2	1720473.48	189446.82	4.04E-07	5.82E-07	9.92E-07	6.19E-07
MSAT	*Benz(a)anthracene particle*	73	2.1E-13	3.2E-13	2.3E-12	1.2E-11	2.1E-13	3.2E-13	2.3E-12	1.2E-11	2.1E-13	3.2E-13	2.3E-12	1.2E-11	6999801.3	6999801.3	2580704.4	284167.32	1.48E-06	2.21E-06	5.90E-06	3.46E-06	6999801.3	6999801.3	2103225.78	230041.32	1.48E-06	2.21E-06	4.81E-06	2.80E-06	4666534.2	4666534.2	1720473.48	189446.82	9.87E-07	1.47E-06	3.93E-06	2.31E-06
MSAT	*Benzo(a)pyrene gas*	174	4.6E-15	6.7E-15	3.0E-14	1.7E-13	4.8E-15	6.9E-15	3.2E-14	1.8E-13	4.7E-15	6.8E-15	3.1E-14	1.8E-13	6999801.3	6999801.3	2580704.4	284167.32	3.30E-08	4.75E-08	8.09E-08	5.05E-08	6999801.3	6999801.3	2103225.78	230041.32	3.30E-08	4.75E-08	6.59E-08	4.09E-08	4666534.2	4666534.2	1720473.48	189446.82	2.20E-08	3.17E-08	5.39E-08	3.37E-08
MSAT	*Benzo(a)pyrene particle*	74	5.3E-13	7.9E-13	5.7E-12	3.0E-11	5.3E-13	7.9E-13	5.7E-12	3.1E-11	5.3E-13	7.9E-13	5.7E-12	3.0E-11	6999801.3	6999801.3	2580704.4	284167.32	3.71E-06	5.54E-06	1.48E-05	8.66E-06	6999801.3	6999801.3	2103225.78	230041.32	3.71E-06	5.54E-06	1.20E-05	7.01E-06	4666534.2	4666534.2	1720473.48	189446.82	2.47E-06	3.69E-06	9.85E-06	5.78E-06
MSAT	*Benzo(b)fluoranthene gas*	175	6.3E-14	9.1E-14	4.2E-13	2.3E-12	6.6E-14	9.4E-14	4.4E-13	2.5E-12	6.4E-14	9.3E-14	4.3E-13	2.4E-12	6999801.3	6999801.3	2580704.4	284167.32	4.50E-07	6.48E-07	1.10E-06	6.88E-07	6999801.3	6999801.3	2103225.78	230041.32	4.50E-07	6.48E-07	8.99E-07	5.57E-07	4666534.2	4666534.2	1720473.48	189446.82	3.00E-07	4.32E-07	7.35E-07	4.59E-07
MSAT	*Benzo(b)fluoranthene particle*	75	2.6E-13	3.8E-13	2.8E-12	1.5E-11	2.6E-13	3.9E-13	2.8E-12	1.5E-11	2.6E-13	3.9E-13	2.8E-12	1.5E-11	6999801.3	6999801.3	2580704.4	284167.32	1.81E-06	2.70E-06	7.20E-06	4.22E-06	6999801.3	6999801.3	2103225.78	230041.32	1.81E-06	2.70E-06	5.87E-06	3.42E-06	4666534.2	4666534.2	1720473.48	189446.82	1.21E-06	1.80E-06	4.80E-06	2.81E-06
MSAT	*Benzo(g,h,i)perylene gas*	176	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6999801.3	6999801.3	2580704.4	284167.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6999801.3	6999801.3	2103225.78	230041.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4666534.2	4666534.2	1720473.48	189446.82	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MSAT	*Benzo(g,h,i)perylene particle*	76	1.4E-12	2.1E-12	1.5E-11	8.2E-11	1.4E-12	2.1E-12	1.6E-11	8.3E-11	1.4E-12	2.1E-12	1.5E-11	8.3E-11	6999801.3	6999801.3	2580704.4	284167.32	1.00E-05	1.50E-05	4.00E-05	2.34E-05	6999801.3	6999801.3	2103225.78	230041.32	1.00E-05	1.50E-05	3.26E-05	1.90E-05	4666534.2	4666534.2	1720473.48	189446.82	6.70E-06	9.99E-06	2.67E-05	1.56E-05
MSAT	*Benzo(k)fluoranthene gas*	177	6.3E-14	9.1E-14	4.2E-13	2.3E-12	6.6E-14	9.4E-14	4.4E-13	2.5E-12	6.4E-14	9.3E-14	4.3E-13	2.4E-12	6999801.3	6999801.3	2580704.4	284167.32	4.50E-07	6.48E-07	1.10E-06	6.88E-07	6999801.3	6999801.3	2103225.78	230041.32	4.50E-07	6.48E-07	8.99E-07	5.57E-07	4666534.2	4666534.2	1720473.48	189446.82	3.00E-07	4.32E-07	7.35E-07	4.59E-07
MSAT	*Benzo(k)fluoranthene particle*	77	2.6E-13	3.8E-13	2.8E-12	1.5E-11	2.6E-13	3.9E-13	2.8E-12	1.5E-11	2.6E-13	3.9E-13	2.8E-12	1.5E-11	6999801.3	6999801.3	2580704.4	284167.32	1.81E-06	2.70E-06	7.20E-06	4.22E-06	6999801.3	6999801.3	2103225.78	230041.32	1.81E-06	2.70E-06	5.87E-06	3.42E-06	4666534.2	4666534.2	1720473.48	189446.82	1.21E-06	1.80E-06	4.80E-06	2.81E-06
MSAT	*Chrysene gas*	178	9.5E-14	1.4E-13	6.3E-13	3.5E-12	9.9E-14	1.4E-13	6.6E-13	3.8E-12	9.7E-14	1.4E-13	6.4E-13	3.7E-12	6999801.3	6999801.3	2580704.4	284167.32	6.78E-07	9.77E-07	1.66E-06	1.04E-06	6999801.3	6999801.3	2103225.78	230041.32	6.78E-07	9.77E-07	1.36E-06	8.40E-07	4666534.2	4666534.2	1720473.48	189446.82	4.52E-07	6.52E-07	1.11E-06	6.92E-07
MSAT	*Chrysene particle*	78	1.8E-13	2.7E-13	1.9E-12	1.0E-11	1.8E-13	2.7E-13	1.9E-12	1.0E-11	1.8E-13	2.7E-13	1.9E-12	1.0E-11	6999801.3	6999801.3	2580704.4	284167.32	1.25E-06	1.87E-06	4.98E-06	2.92E-06	6999801.3	6999801.3	2103225.78	230041.32	1.25E-06	1.87E-06	4.06E-06	2.37E-06	4666534.2	4666534.2	1720473.48	189446.82	8.35E-07	1.25E-06	3.32E-06	1.95E-06
MSAT	*Dibenzo(a,h)anthracene gas*	168	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6999801.3	6999801.3	2580704.4	284167.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6999801.3	6999801.3	2103225.78	230041.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4666534.2	4666534.2	1720473.48	189446.82	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MSAT	*Dibenzo(a,h)anthracene particle*	68	1.2E-14	1.8E-14	1.3E-13	7.1E-13	1.2E-14	1.8E-14	1.3E-13	7.1E-13	1.2E-14	1.8E-14	1.3E-13	7.1E-13	6999801.3	6999801.3	2580704.4	284167.32	8.66E-08	1.29E-07	3.45E-07	2.02E-07	6999801.3	6999801.3	2103225.78	230041.32	8.66E-08	1.29E-07	2.81E-07	1.64E-07	4666534.2	4666534.2	1720473.48	189446.82	5.77E-08	8.61E-08	2.30E-07	1.35E-07
MSAT	*Fluoranthene gas*	169	8.8E-13	1.3E-12	5.8E-12	3.3E-11	9.2E-13	1.3E-12	6.1E-12	3.5E-11	9.0E-13	1.3E-12	6.0E-12	3.4E-11	6999801.3	6999801.3	2580704.4	284167.32	6.28E-06	9.05E-06	1.54E-05	9.61E-06	6999801.3	6999801.3	2103225.78	230041.32	6.28E-06	9.05E-06	1.26E-05	7.78E-06	4666534.2	4666534.2	1720473.48	189446.82	4.19E-06	6.03E-06	1.03E-05	6.41E-06
MSAT	*Fluoranthene particle*	69	8.1E-14	1.2E-13	8.8E-13	4.7E-12	8.2E-14	1.2E-13	8.8E-13	4.7E-12	8.2E-14	1.2E-13	8.8E-13	4.7E-12	6999801.3	6999801.3	2580704.4	284167.32	5.71E-07	8.51E-07	2.27E-06	1.33E-06	6999801.3	6999801.3	2103225.78	230041.32	5.71E-07	8.51E-07	1.85E-06	1.08E-06	4666534.2	4666534.2	1720473.48	189446.82	3.80E-07	5.68E-07	1.51E-06	8.88E-07
MSAT	*Fluorene gas*	181	1.3E-12	1.8E-12	8.4E-12	4.7E-11	1.3E-12	1.9E-12	8.9E-12	5.0E-11	1.3E-12	1.9E-12	8.6E-12	4.9E-11	6999801.3	6999801.3	2580704.4	284167.32	9.07E-06	1.31E-05	2.22E-05	1.39E-05	6999801.3	6999801.3	2103225.78	230041.32	9.07E-06	1.31E-05	1.81E-05	1.12E-05	4666534.2	4666534.2	1720473.48	189446.82	6.04E-06	8.71E-06	1.48E-05	9.25E-06
MSAT	*Fluorene particle*	81	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6999801.3	6999801.3	2580704.4	284167.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6999801.3	6999801.3	2103225.78	230041.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4666534.2	4666534.2	1720473.48	189446.82	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MSAT	*Indeno(1,2,3,c,d)pyrene gas*	182	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6999801.3	6999801.3	2580704.4	284167.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6999801.3	6999801.3	2103225.78	230041.32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4666534.2	4666534.2	1720473.48	189446.82	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MSAT	*Indeno(1,2,3,c,d)pyrene particle*	82	5.4E-13	8.0E-13	5.8E-12	3.1E-11	5.4E-13	8.1E-13	5.8E-12	3.1E-11	5.4E-13	8.0E-13	5.8E-12	3.1E-11	6999801.3	6999801.3	2580704.4	284167.32	3.77E-06	5.63E-06	1.50E-05	8.81E-06	6999801.3	6999801.3	2103225.78	230041.32	3.77E-06	5.63E-06	1.22E-05	7.13E-06	4666534.2	4666534.2	1720473.48	189446.82	2.52E-06	3.75E-06	1.00E-05	5.87E-06
MSAT	*Naphthalene gas*	185	3.2E-11	4.7E-11	2.1E-10	1.2E-09	3.4E-11	4.9E-11	2.3E-10	1.3E-09	3.3E-11	4.8E-11	2.2E-10	1.3E-09	6999801.3	6999801.3	2580704.4	284167.32	2.32E-04	3.34E-04	5.69E-04	3.55E-04	6999801.3	6999801.3	2103225.78	230041.32	2.32E-04	3.34E-04	4.64E-04	2.88E-04	4666534.2	4666534.2	1720473.48	189446.82	1.55E-04	2.23E-04	3.80E-04	2.37E-04
MSAT	*Naphthalene particle*	23	7.5E-14	1.1E-13	8.1E-13	4.3E-12	7.5E-14	1.1E-13	8.1E-13	4.3E-12	7.5E-14	1.1E-13	8.1E-13	4.3E-12	6999801.3	6999801.3	2580704.4	284167.32	5.23E-07	7.80E-07	2.08E-06	1.22E-06	6999801.3	6999801.3	2103225.78	230041.32	5.23E-07	7.80E-07	1.70E-06	9.88E-07	4666534.2	4666534.2	1720473.48	189446.82	3.49E-07	5.20E-07	1.39E-06	8.14E-07
MSAT	*Phenanthrene gas*	183	3.4E-12	4.9E-12	2.2E-11	1.3E-10	3.5E-12	5.0E-12	2.4E-11	1.3E-10	3.4E-12	5.0E-12	2.3E-11	1.3E-10	6999801.3	6999801.3	2580704.4	284167.32	2.41E-05	3.47E-05	5.90E-05	3.68E-05	6999801.3	6999801.3	2103225.78	230041.32	2.41E-05	3.47E-05	4.81E-05	2.98E-05	4666534.2	4666534.2	1720473.48	189446.82	1.60E-05	2.31E-05	3.93E-05	2.45E-05
MSAT	*Phenanthrene particle*	83	8.0E-14	1.2E-13	8.7E-13	4.6E-12	8.1E-14	1.2E-13	8.7E-13	4.6E-12	8.1E-14	1.2E-13	8.7E-13	4.6E-12	6999801.3	6999801.3	2580704.4	284167.32	5.64E-07	8.41E-07	2.25E-06	1.32E-06	6999801.3	6999801.3	2103225.78	230041.32	5.64E-07	8.41E-07	1.83E-06	1.07E-06	4666534.2	4666534.2	1720473.48	189446.82	3.76E-07	5.61E-07	1.50E-06	8.78E-07
MSAT	*Pyrene gas*	184	1.0E-12	1.4E-12	6.6E-12	3.7E-11	1.0E-12	1.5E-12	7.0E-12	4.0E-11	1.0E-12	1.5E-12	6.8E-12	3.9E-11	6999801.3	6999801.3	2580704.4	284167.32	7.18E-06	1.03E-05	1.76E-05	1.10E-05	6999801.3	6999801.3	2103225.78	230041.32	7.18E-06	1.03E-05	1.44E-05	8.89E-06	4666534.2	4666534.2	1720473.48	189446.82	4.79E-06	6.90E-06	1.17E-05	7.32E-06
MSAT	*Pyrene particle*	84	8.8E-14	1.3E-13	9.5E-13	5.1E-12	8.8E-14	1.3E-13	9.5E-13	5.1E-12	8.8E-14	1.3E-13	9.5E-13	5.1E-12	6999801.3	6999801.3	2580704.4	284167.32	6.17E-07	9.21E-07	2.46E-06	1.44E-06	6999801.3	6999801.3	2103225.78	230041.32	6.17E-07	9.21E-07	2.00E-06	1.17E-06	4666534.2	4666534.2	1720473.48	189446.82	4.12E-07	6.14E-07	1.64E-06	9.61E-07
CO	CO	2	2.0E-06	2.3E-06	5.9E-06	2.3E-05	1.9E-06	2.2E-06	5.8E-06	2.3E-05	2.0E-06	2.2E-06	5.9E-06	2.3E-05	6999801.3	6999801.3	2580704.4	284167.32	1.37E+01	1.57E+01	1.51E+01	6.54E+00	6999801.3	6999801.3	2103225.78	230041.32	1.37E+01	1.57E+01	1.23E+01	5.29E+00	4666534.2	4666534.2	1720473.48	189446.82	9.14E+00	1.04E+01	1.01E+01	4.36E+00
NOx	NOx	3	6.3E-08	1.3E-07	2.1E-07	2.2E-06	5.8E-08	1.2E-07	1.9E-07	2.0E-06	6.1E-08	1.2E-07	2.0E-07	2.1E-06	6999801.3	6999801.3	2580704.4	284167.32	4.24E-01	8.50E-01	5.16E-01	5.91E-01	6999801.3	6999801.3	2103225.78	230041.32	4.24E-01	8.50E-01	4.20E-01	4.78E-01	4666534.2	4666534.2	1720473.48	189446.82	2.83E-01	5.66E-01	3.44E-01	3.94E-01
SO2	SO2	31	1.8E-09	2.3E-09	6.5E-09	1.2E-08	1.8E-09	2.3E-09	6.5E-09	1.2E-08	1.8E-09	2.3E-09	6.5E-09	1.2E-08	6999801.3	6999801.3	2580704.4	284167.32	1.24E-02	1.64E-02	1.69E-02	3.46E-03	6999801.3	6999801.3	2103225.78	230041.32	1.24E-02	1.64E-02	1.37E-02	2.80E-03	4666534.2	4666534.2	1720473.48	189446.82	8.25E-03	1.10E-02	1.12E-02	2.31E-03
PM10	PM10-Primary Exhaust	*100*	1.6E-09	2.2E-09	1.2E-08	6.4E-08	1.6E-09	2.2E-09	1.2E-08	6.5E-08	1.6E-09	2.2E-09	1.2E-08	6.5E-08	6999801.3	6999801.3	2580704.4	284167.32	1.14E-02	1.53E-02	3.13E-02	1.83E-02	6999801.3	6999801.3	2103225.78	230041.32	1.14E-02	1.53E-02	2.55E-02	1.48E-02	4666534.2	4666534.2	1720473.48	189446.82	7.63E-03	1.02E-02	2.08E-02	1.22E-02
PM10	PM10-Brakewear	*106*	2.4E-08	2.5E-08	5.4E-08	1.6E-07	2.4E-08	2.5E-08	5.4E-08	1.6E-07	2.4E-08	2.5E-08	5.4E-08	1.6E-07	6999801.3	6999801.3	2580704.4	284167.32	1.65E-01	1.78E-01	1.39E-01	4.58E-02	6999801.3	6999801.3	2103225.78	230041.32	1.65E-01	1.78E-01	1.13E-01	3.71E-02	4666534.2	4666534.2	1720473.48	189446.82	1.10E-01	1.19E-01	9.24E-02	3.05E-02
PM10	PM10-Tirewear	*107*	1.0E-08	1.1E-08	1.6E-08	3.9E-08	1.0E-08	1.1E-08	1.6E-08	3.9E-08	1.0E-08	1.1E-08	1.6E-08	3.9E-08	6999801.3	6999801.3	2580704.4	284167.32	7.34E-02	7.37E-02	4.20E-02	1.11E-02	6999801.3	6999801.3	2103225.78	230041.32	7.34E-02	7.37E-02	3.42E-02	8.98E-03	4666534.2	4666534.2	1720473.48	189446.82	4.89E-02	4.91E-02	2.80E-02	7.40E-03
PM2.5	PM2.5-Primary Exhaust	*110*	1.4E-09	1.9E-09	1.1E-08	5.7E-08	1.4E-09	1.9E-09	1.1E-08	5.7E-08	1.4E-09	1.9E-09	1.1E-08	5.7E-08	6999801.3	6999801.3	2580704.4	284167.32	1.01E-02	1.35E-02	2.77E-02	1.62E-02	6999801.3	6999801.3	2103225.78	230041.32	1.01E-02	1.35E-02	2.25E-02	1.31E-02	4666534.2	4666534.2	1720473.48	189446.82	6.75E-03	9.00E-03	1.84E-02	1.08E-02
PM2.5	PM2.5-Brakewear	*116*	2.9E-09	3.2E-09	6.7E-09	2.0E-08	2.9E-09	3.2E-09	6.7E-09	2.0E-08	2.9E-09	3.2E-09	6.7E-09	2.0E-08	6999801.3	6999801.3	2580704.4	284167.32	2.06E-02	2.23E-02	1.73E-02	5.72E-03	6999801.3	6999801.3	2103225.78	230041.32	2.06E-02	2.23E-02	1.41E-02	4.63E-03	4666534.2	4666534.2	1720473.48	189446.82	1.37E-02	1.49E-02	1.16E-02	3.81E-03
PM2.5	PM2.5-Tirewear	*117*	1.6E-09	1.6E-09	2.4E-09	5.9E-09	1.6E-09	1.6E-09	2.4E-09	5.9E-09	1.6E-09	1.6E-09	2.4E-09	5.9E-09	6999801.3	6999801.3	2580704.4	284167.32	1.10E-02	1.11E-02	6.30E-03	1.66E-03	6999801.3	6999801.3	2103225.78	230041.32	1.10E-02	1.11E-02	5.13E-03	1.35E-03	4666534.2	4666534.2	1720473.48	189446.82	7.34E-03	7.37E-03	4.20E-03	1.11E-03
VOC	VOC	*87*	1.6E-08	2.3E-08	1.0E-07	5.9E-07	1.6E-08	2.4E-08	1.1E-07	6.2E-07	1.6E-08	2.3E-08	1.1E-07	6.0E-07	6999801.3	6999801.3	2580704.4	284167.32	1.12E-01	1.62E-01	2.75E-01	1.72E-01	6999801.3	6999801.3	2103225.78	230041.32	1.12E-01	1.62E-01	2.24E-01	1.39E-01	4666534.2	4666534.2	1720473.48	189446.82	7.48E-02	1.08E-01	1.83E-01	1.14E-01
CO2	Carbob Dioxide	*90*	2.7E-04	3.5E-04	9.8E-04	1.8E-03	2.7E-04	3.5E-04	9.8E-04	1.8E-03	2.7E-04	3.5E-04	9.8E-04	1.8E-03	6999801.3	6999801.3	2580704.4	284167.32	1.86E+03	2.48E+03	2.54E+03	5.21E+02	6999801.3	6999801.3	2103225.78	230041.32	1.86E+03	2.48E+03	2.07E+03	4.22E+02	4666534.2	4666534.2	1720473.48	189446.82	1.24E+03	1.65E+03	1.69E+03	3.47E+02
CH4	Methane	*5*	6.1E-09	7.7E-09	1.8E-08	9.9E-08	6.4E-09	8.1E-09	1.9E-08	1.1E-07	6.3E-09	7.9E-09	1.8E-08	1.0E-07	6999801.3	6999801.3	2580704.4	284167.32	4.39E-02	5.51E-02	4.67E-02	2.91E-02	6999801.3	6999801.3	2103225.78	230041.32	4.39E-02	5.51E-02	3.80E-02	2.36E-02	4666534.2	4666534.2	1720473.48	189446.82	2.93E-02	3.67E-02	3.11E-02	1.94E-02
N2O	Nitrous Oxide	*6*	1.2E-09	1.8E-09	4.6E-09	1.4E-08	1.2E-09	1.8E-09	4.6E-09	1.4E-08	1.2E-09	1.8E-09	4.6E-09	1.4E-08	6999801.3	6999801.3	2580704.4	284167.32	8.28E-03	1.28E-02	1.20E-02	3.93E-03	6999801.3	6999801.3	2103225.78	230041.32	8.28E-03	1.28E-02	9.78E-03	3.18E-03	4666534.2	4666534.2	1720473.48	189446.82	5.52E-03	8.54E-03	8.00E-03	2.62E-03
CO2e	CO2 equivalent		2.7E-04	3.5E-04	9.9E-04	1.8E-03	2.7E-04	3.5E-04	9.9E-04	1.8E-03	2.7E-04	3.5E-04	9.9E-04	1.8E-03	6999801.3	6999801.3	2580704.4	284167.32	1.87E+03	2.48E+03	2.54E+03	5.23E+02	6999801.3	6999801.3	2103225.78	230041.32	1.87E+03	2.48E+03	2.07E+03	4.23E+02	4666534.2	4666534.2	1720473.48	189446.82	1.24E+03	1.65E+03	1.70E+03	3.49E+02
idle-CO	CO	2				4.5E-05								4.5E-05				123062				5.49E+00				100226				4.47E+00				82041				3.66E+00
idle-NOx	NOx	3				6.5E-05								6.5E-05				123062				7.95E+00				100226				6.47E+00				82041				5.30E+00
idle-SO2	SO2	31				2.7E-08								2.7E-08				123062				3.32E-03				100226				2.70E-03				82041				2.21E-03
idle-PM10	PM10-Primary Exhaust	*100*				5.5E-07								5.5E-07				123062				6.76E-02				100226				5.50E-02				82041				4.51E-02
idle-PM2.5	PM2.5-Primary Exhaust	*110*				5.1E-07								5.1E-07				123062				6.22E-02				100226				5.06E-02				82041				4.15E-02
idle-VOC	VOC	*87*				3.8E-06								3.8E-06				123062				4.64E-01				100226				3.78E-01				82041				3.10E-01
idle-CO2	Carbob Dioxide	*90*				8.1E-03								8.1E-03				123062				9.91E+02				100226				8.07E+02				82041				6.61E+02
idle-CH4	Methane	*5*				8.3E-07								8.3E-07				123062				1.02E-01				100226				8.28E-02				82041				6.78E-02
idle-N2O	Nitrous Oxide	*6*				0.0E+00								0.0E+00				123062				0.00E+00				100226				0.00E+00				82041				0.00E+00
idle-CO2e	CO2 equivalent					8.1E-03								8.1E-03				123062				9.93E+02				100226				8.09E+02				82041				6.62E+02
idle-MSAT	Benzene	20				1.4E-08								1.4E-08				123062				1.72E-03				100226				1.40E-03				82041				1.15E-03
idle-MSAT	Formaldehyde	25				2.1E-07								2.1E-07				123062				2.61E-02				100226				2.12E-02				82041				1.74E-02
idle-MSAT	Butadiene	24				4.5E-09								4.5E-09				123062				5.52E-04				100226				4.50E-04				82041				3.68E-04
idle-MSAT	Naphthalene Particle	23				5.0E-13								5.0E-13				123062				6.11E-08				100226				4.98E-08				82041				4.08E-08
idle-MSAT	Naphthalene Gas	185				1.8E-08								1.8E-08				123062				2.17E-03				100226				1.77E-03				82041				1.45E-03
idle-MSAT	Acrolein	27				1.9E-08								1.9E-08				123062				2.37E-03				100226				1.93E-03				82041				1.58E-03
idle-MSAT	Acetaldehyde	26				1.5E-07								1.5E-07				123062				1.89E-02				100226				1.54E-02				82041				1.26E-02
idle-MSAT	Ethylbenzene	41				2.9E-08								2.9E-08				123062				3.53E-03				100226				2.87E-03				82041				2.35E-03
idle-MSAT	*Acenaphthene gas*	170				4.9E-10								4.9E-10				123062				5.97E-05				100226				4.86E-05				82041				3.98E-05
idle-MSAT	*Acenaphthene particle*	70				0.0E+00								0.0E+00				123062				0.00E+00				100226				0.00E+00				82041				0.00E+00
idle-MSAT	*Acenaphthylene gas*	171				7.9E-10								7.9E-10				123062				9.74E-05				100226				7.94E-05				82041				6.50E-05
idle-MSAT	*Acenaphthylene particle*	71				4.7E-14								4.7E-14				123062				5.84E-09				100226				4.76E-09				82041				3.89E-09
idle-MSAT	*Anthracene gas*	172				3.7E-10								3.7E-10				123062				4.54E-05				100226				3.69E-05				82041				3.02E-05
idle-MSAT	*Anthracene particle*	72				2.1E-11								2.1E-11				123062				2.58E-06				100226				2.10E-06				82041				1.72E-06
idle-MSAT	*Benz(a)anthracene gas*	173				6.6E-11								6.6E-11				123062				8.16E-06				100226				6.65E-06				82041				5.44E-06
idle-MSAT	*Benz(a)anthracene particle*	73				4.2E-11								4.2E-11				123062				5.16E-06				100226				4.20E-06				82041				3.44E-06
idle-MSAT	*Benzo(a)pyrene gas*	174				0.0E+00								0.0E+00				123062				0.00E+00				100226				0.00E+00				82041				0.00E+00
idle-MSAT	*Benzo(a)pyrene particle*	74				1.5E-11								1.5E-11				123062				1.90E-06				100226				1.55E-06				82041				1.27E-06
idle-MSAT	*Benzo(b)fluoranthene gas*	175				0.0E+00								0.0E+00				123062				0.00E+00				100226				0.00E+00				82041				0.00E+00
idle-MSAT	*Benzo(b)fluoranthene particle*	75				4.6E-12								4.6E-12				123062				5.70E-07				100226				4.64E-07				82041				3.80E-07
idle-MSAT	*Benzo(g,h,i)perylene gas*	176				1.3E-12								1.3E-12				123062				1.56E-07				100226				1.27E-07				82041				1.04E-07

idle-MSAT	*Benzo(g,h,i)perylene particle*	76	7.0E-13	7.0E-13	123062	8.63E-08	100226	7.03E-08	82041	5.75E-08
idle-MSAT	*Benzo(k)fluoranthene gas*	177	0.0E+00	0.0E+00	123062	0.00E+00	100226	0.00E+00	82041	0.00E+00
idle-MSAT	*Benzo(k)fluoranthene particle*	77	7.1E-13	7.1E-13	123062	8.68E-08	100226	7.07E-08	82041	5.78E-08
idle-MSAT	*Chrysene gas*	178	2.6E-11	2.6E-11	123062	3.18E-06	100226	2.59E-06	82041	2.12E-06
idle-MSAT	*Chrysene particle*	78	2.6E-11	2.6E-11	123062	3.23E-06	100226	2.63E-06	82041	2.16E-06
idle-MSAT	*Dibenzo(a,h)anthracene gas*	168	0.0E+00	0.0E+00	123062	0.00E+00	100226	0.00E+00	82041	0.00E+00
idle-MSAT	*Dibenzo(a,h)anthracene particle*	68	5.6E-13	5.6E-13	123062	6.94E-08	100226	5.65E-08	82041	4.62E-08
idle-MSAT	*Fluoranthene gas*	169	5.5E-10	5.5E-10	123062	6.77E-05	100226	5.52E-05	82041	4.52E-05
idle-MSAT	*Fluoranthene particle*	69	8.0E-11	8.0E-11	123062	9.85E-06	100226	8.02E-06	82041	6.56E-06
idle-MSAT	*Fluorene gas*	181	8.3E-10	8.3E-10	123062	1.02E-04	100226	8.29E-05	82041	6.79E-05
idle-MSAT	*Fluorene particle*	81	3.6E-11	3.6E-11	123062	4.40E-06	100226	3.58E-06	82041	2.93E-06
idle-MSAT	*Indeno(1,2,3,c,d)pyrene gas*	182	0.0E+00	0.0E+00	123062	0.00E+00	100226	0.00E+00	82041	0.00E+00
idle-MSAT	*Indeno(1,2,3,c,d)pyrene particle*	82	1.1E-12	1.1E-12	123062	1.38E-07	100226	1.13E-07	82041	9.21E-08
idle-MSAT	*Naphthalene gas*	185	1.8E-08	1.8E-08	123062	2.17E-03	100226	1.77E-03	82041	1.45E-03
idle-MSAT	*Naphthalene particle*	23	5.0E-13	5.0E-13	123062	6.11E-08	100226	4.98E-08	82041	4.08E-08
idle-MSAT	*Phenanthrene gas*	183	1.4E-09	1.4E-09	123062	1.74E-04	100226	1.41E-04	82041	1.16E-04
idle-MSAT	*Phenanthrene particle*	83	8.4E-11	8.4E-11	123062	1.04E-05	100226	8.46E-06	82041	6.93E-06
idle-MSAT	*Pyrene gas*	184	6.5E-10	6.5E-10	123062	8.03E-05	100226	6.54E-05	82041	5.35E-05
idle-MSAT	*Pyrene particle*	84	1.2E-10	1.2E-10	123062	1.42E-05	100226	1.16E-05	82041	9.47E-06

CO2 equivalent based on global warming potential (GWP) of 1 for CO2, 25 for CH4, and 298 for N2O, per 40 CFR 98.

VMT and Speed

Class 1	Motocycles, Car, Van, Pickup
Class 2	Single-Unit Truck
Class 3	Double Unit Truck
Class 4	Triple Unit Truck

Conversion from Daily to Yearly Traffic, based on R112 PTR

Year	2019
Annual Average Daily Traffic	45109
Tue/Wed/Thu Average Daily Traffic	49608
AADT/T-Th Factor	0.91

Site	Description
A	Shaw north of E Pioneer
C	E Pioneer east of 13th St SE
D	E Main Ave north of 5th Ave NE

Daily and Yearly Traffic from Site	Scenario A		Scenario B		Scenario D	
Vehicle Class	Daily	Yearly	Daily	Yearly	Daily	Yearly
Passenger Car	7,242	2,405,430	7,242	2,405,430	4,828	1,603,620
Single-Unit Truck	1,335	443,420	1,088	361,379	890	295,614
Double & Triple Unit Truck	147	48,826	119	39,526	98	32,551

Roundtrip Distance from Freeway to Site (miles)

To/From SR 512	3.53
To/From SR 410	2.29
Total	5.82

Average Vehicle Speed from Tube Counts (mph)

Site	EB	WB	NB	SB
A			40.8	35.7
C	36.1	36.6		
D			39.8	39
Average for All				38

Scenario A Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMT	Avg Speed
Passenger Car, Van, Pickup	13,999,603	38
Single-Unit Truck	2,580,704	
Double & Triple Unit Truck	284,167	

320	4,938.13
1477	4,201.61
1477	462.65
	9,602.39

MOVES Vehicle Type	VMT	Avg Speed
21	6999801	38
31	6999801	38
52	2580704	38
61	284167	38

Scenario B Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMT	Avg Speed
Passenger Car, Van, Pickup	13,999,603	38
Single-Unit Truck	2,103,226	
Double & Triple Unit Truck	230,041	

MOVES Vehicle Type	VMT	Avg Speed
21	6999801	38
31	6999801	38
52	2103226	38
61	230041	38

Scenario D Total Vehicle Miles Traveled (Yearly) and Average Speed

Vehicle Class	VMT	Avg Speed
Passenger Car, Van, Pickup	9,333,068	38
Single-Unit Truck	1,720,473	
Double & Triple Unit Truck	189,447	

MOVES Vehicle Type	VMT	Avg Speed
21	4666534	38
31	4666534	38
52	1720473	38
61	189447	38

MOVES Speed Bin = 9
37.5 mph <= Speed <42.5 mph

MOVES Output

yearID	MonthID	SourceTyp	PollutantI	avgSpeedBinID	rateperdistance	Lookup Code
2026	1	21	2	9	1.96686E-06	1-21-2
2026	1	21	3	9	6.34829E-08	1-21-3
2026	1	21	5	9	6.10624E-09	1-21-5
2026	1	21	6	9	1.18238E-09	1-21-6
2026	1	21	20	9	6.98018E-10	1-21-20
2026	1	21	23	9	7.45986E-14	1-21-23
2026	1	21	24	9	3.29328E-11	1-21-24
2026	1	21	25	9	2.48231E-10	1-21-25
2026	1	21	26	9	1.50216E-10	1-21-26
2026	1	21	27	9	1.11972E-11	1-21-27
2026	1	21	31	9	1.76881E-09	1-21-31
2026	1	21	41	9	2.77598E-10	1-21-41
2026	1	21	68	9	1.23475E-14	1-21-68
2026	1	21	69	9	8.13868E-14	1-21-69
2026	1	21	70	9	0	1-21-70
2026	1	21	71	9	2.22025E-14	1-21-71
2026	1	21	72	9	2.30141E-14	1-21-72
2026	1	21	73	9	2.11273E-13	1-21-73
2026	1	21	74	9	5.29407E-13	1-21-74
2026	1	21	75	9	2.57913E-13	1-21-75
2026	1	21	76	9	1.4325E-12	1-21-76
2026	1	21	77	9	2.57913E-13	1-21-77
2026	1	21	78	9	1.78579E-13	1-21-78
2026	1	21	81	9	0	1-21-81
2026	1	21	82	9	5.38208E-13	1-21-82
2026	1	21	83	9	8.04344E-14	1-21-83
2026	1	21	84	9	8.80731E-14	1-21-84
2026	1	21	87	9	1.56886E-08	1-21-87
2026	1	21	90	9	0.000266264	1-21-90
2026	1	21	98	9	3.5235E-07	1-21-98
2026	1	21	100	9	1.63127E-09	1-21-100
2026	1	21	106	9	2.354E-08	1-21-106
2026	1	21	107	9	1.04867E-08	1-21-107
2026	1	21	110	9	1.44305E-09	1-21-110
2026	1	21	116	9	2.9425E-09	1-21-116
2026	1	21	117	9	1.573E-09	1-21-117
2026	1	21	168	9	0	1-21-168
2026	1	21	169	9	8.77914E-13	1-21-169
2026	1	21	170	9	6.25817E-13	1-21-170
2026	1	21	171	9	2.84041E-12	1-21-171
2026	1	21	172	9	5.25035E-13	1-21-172
2026	1	21	173	9	8.47815E-14	1-21-173
2026	1	21	174	9	4.61247E-15	1-21-174
2026	1	21	175	9	6.28582E-14	1-21-175
2026	1	21	176	9	0	1-21-176
2026	1	21	177	9	6.28582E-14	1-21-177

2026	1	21	178	9	9.48489E-14	1-21-178
2026	1	21	181	9	1.26765E-12	1-21-181
2026	1	21	182	9	0	1-21-182
2026	1	21	183	9	3.36376E-12	1-21-183
2026	1	21	184	9	1.00377E-12	1-21-184
2026	1	21	185	9	3.24616E-11	1-21-185
2026	1	31	2	9	2.25111E-06	1-31-2
2026	1	31	3	9	1.27212E-07	1-31-3
2026	1	31	5	9	7.67085E-09	1-31-5
2026	1	31	6	9	1.83029E-09	1-31-6
2026	1	31	20	9	9.8318E-10	1-31-20
2026	1	31	23	9	1.11274E-13	1-31-23
2026	1	31	24	9	5.83639E-11	1-31-24
2026	1	31	25	9	3.48129E-10	1-31-25
2026	1	31	26	9	2.24846E-10	1-31-26
2026	1	31	27	9	1.59028E-11	1-31-27
2026	1	31	31	9	2.34981E-09	1-31-31
2026	1	31	41	9	4.08138E-10	1-31-41
2026	1	31	68	9	1.84181E-14	1-31-68
2026	1	31	69	9	1.214E-13	1-31-69
2026	1	31	70	9	0	1-31-70
2026	1	31	71	9	3.31181E-14	1-31-71
2026	1	31	72	9	3.43286E-14	1-31-72
2026	1	31	73	9	3.15143E-13	1-31-73
2026	1	31	74	9	7.89684E-13	1-31-74
2026	1	31	75	9	3.84713E-13	1-31-75
2026	1	31	76	9	2.13678E-12	1-31-76
2026	1	31	77	9	3.84713E-13	1-31-77
2026	1	31	78	9	2.66376E-13	1-31-78
2026	1	31	81	9	0	1-31-81
2026	1	31	82	9	8.02811E-13	1-31-82
2026	1	31	83	9	1.19979E-13	1-31-83
2026	1	31	84	9	1.31373E-13	1-31-84
2026	1	31	87	9	2.26593E-08	1-31-87
2026	1	31	90	9	0.000353724	1-31-90
2026	1	31	98	9	5.45427E-07	1-31-98
2026	1	31	100	9	2.17565E-09	1-31-100
2026	1	31	106	9	2.54846E-08	1-31-106
2026	1	31	107	9	1.05323E-08	1-31-107
2026	1	31	110	9	1.92462E-09	1-31-110
2026	1	31	116	9	3.18557E-09	1-31-116
2026	1	31	117	9	1.57983E-09	1-31-117
2026	1	31	168	9	0	1-31-168
2026	1	31	169	9	1.26799E-12	1-31-169
2026	1	31	170	9	9.03879E-13	1-31-170
2026	1	31	171	9	4.10246E-12	1-31-171
2026	1	31	172	9	7.58316E-13	1-31-172

2026	1	31	173	9	1.22451E-13	1-31-173
2026	1	31	174	9	6.66186E-15	1-31-174
2026	1	31	175	9	9.07871E-14	1-31-175
2026	1	31	176	9	0	1-31-176
2026	1	31	177	9	9.07871E-14	1-31-177
2026	1	31	178	9	1.36992E-13	1-31-178
2026	1	31	181	9	1.83089E-12	1-31-181
2026	1	31	182	9	0	1-31-182
2026	1	31	183	9	4.85833E-12	1-31-183
2026	1	31	184	9	1.44977E-12	1-31-184
2026	1	31	185	9	4.68849E-11	1-31-185
2026	1	52	2	9	5.88343E-06	1-52-2
2026	1	52	3	9	2.08858E-07	1-52-3
2026	1	52	5	9	1.75723E-08	1-52-5
2026	1	52	6	9	4.64923E-09	1-52-6
2026	1	52	20	9	4.96331E-09	1-52-20
2026	1	52	23	9	8.05236E-13	1-52-23
2026	1	52	24	9	6.46305E-11	1-52-24
2026	1	52	25	9	1.78646E-09	1-52-25
2026	1	52	26	9	8.80393E-10	1-52-26
2026	1	52	27	9	7.77605E-11	1-52-27
2026	1	52	31	9	6.53682E-09	1-52-31
2026	1	52	41	9	1.76141E-09	1-52-41
2026	1	52	68	9	1.33283E-13	1-52-68
2026	1	52	69	9	8.78511E-13	1-52-69
2026	1	52	70	9	0	1-52-70
2026	1	52	71	9	2.39659E-13	1-52-71
2026	1	52	72	9	2.4842E-13	1-52-72
2026	1	52	73	9	2.28054E-12	1-52-73
2026	1	52	74	9	5.71456E-12	1-52-74
2026	1	52	75	9	2.78399E-12	1-52-75
2026	1	52	76	9	1.54628E-11	1-52-76
2026	1	52	77	9	2.78399E-12	1-52-77
2026	1	52	78	9	1.92763E-12	1-52-78
2026	1	52	81	9	0	1-52-81
2026	1	52	82	9	5.80957E-12	1-52-82
2026	1	52	83	9	8.6823E-13	1-52-83
2026	1	52	84	9	9.50684E-13	1-52-84
2026	1	52	87	9	1.03608E-07	1-52-87
2026	1	52	90	9	0.000984007	1-52-90
2026	1	52	98	9	1.38547E-06	1-52-98
2026	1	52	100	9	1.20924E-08	1-52-100
2026	1	52	106	9	5.37095E-08	1-52-106
2026	1	52	107	9	1.62635E-08	1-52-107
2026	1	52	110	9	1.06971E-08	1-52-110
2026	1	52	116	9	6.71368E-09	1-52-116
2026	1	52	117	9	2.43951E-09	1-52-117

2026	1	52	168	9	0	1-52-168
2026	1	52	169	9	5.79776E-12	1-52-169
2026	1	52	170	9	4.13292E-12	1-52-170
2026	1	52	171	9	1.87583E-11	1-52-171
2026	1	52	172	9	3.46734E-12	1-52-172
2026	1	52	173	9	5.59899E-13	1-52-173
2026	1	52	174	9	3.04608E-14	1-52-174
2026	1	52	175	9	4.15117E-13	1-52-175
2026	1	52	176	9	0	1-52-176
2026	1	52	177	9	4.15117E-13	1-52-177
2026	1	52	178	9	6.26385E-13	1-52-178
2026	1	52	181	9	8.37161E-12	1-52-181
2026	1	52	182	9	0	1-52-182
2026	1	52	183	9	2.22143E-11	1-52-183
2026	1	52	184	9	6.62894E-12	1-52-184
2026	1	52	185	9	2.14377E-10	1-52-185
2026	1	61	2	9	2.30836E-05	1-61-2
2026	1	61	3	9	2.16822E-06	1-61-3
2026	1	61	5	9	9.93154E-08	1-61-5
2026	1	61	6	9	1.38307E-08	1-61-6
2026	1	61	20	9	2.87255E-08	1-61-20
2026	1	61	23	9	4.28648E-12	1-61-23
2026	1	61	24	9	7.39804E-11	1-61-24
2026	1	61	25	9	1.03772E-08	1-61-25
2026	1	61	26	9	4.76306E-09	1-61-26
2026	1	61	27	9	4.46756E-10	1-61-27
2026	1	61	31	9	1.21835E-08	1-61-31
2026	1	61	41	9	1.10802E-08	1-61-41
2026	1	61	68	9	7.095E-13	1-61-68
2026	1	61	69	9	4.67654E-12	1-61-69
2026	1	61	70	9	0	1-61-70
2026	1	61	71	9	1.27577E-12	1-61-71
2026	1	61	72	9	1.3224E-12	1-61-72
2026	1	61	73	9	1.214E-11	1-61-73
2026	1	61	74	9	3.042E-11	1-61-74
2026	1	61	75	9	1.48199E-11	1-61-75
2026	1	61	76	9	8.23124E-11	1-61-76
2026	1	61	77	9	1.48199E-11	1-61-77
2026	1	61	78	9	1.02613E-11	1-61-78
2026	1	61	81	9	0	1-61-81
2026	1	61	82	9	3.09258E-11	1-61-82
2026	1	61	83	9	4.62181E-12	1-61-83
2026	1	61	84	9	5.06073E-12	1-61-84
2026	1	61	87	9	5.85574E-07	1-61-87
2026	1	61	90	9	0.00183401	1-61-90
2026	1	61	98	9	4.12154E-06	1-61-98
2026	1	61	100	9	6.43859E-08	1-61-100

2026	1	61	106	9	1.61075E-07	1-61-106
2026	1	61	107	9	3.90367E-08	1-61-107
2026	1	61	110	9	5.6957E-08	1-61-110
2026	1	61	116	9	2.01344E-08	1-61-116
2026	1	61	117	9	5.85548E-09	1-61-117
2026	1	61	168	9	0	1-61-168
2026	1	61	169	9	3.27679E-11	1-61-169
2026	1	61	170	9	2.33584E-11	1-61-170
2026	1	61	171	9	1.06018E-10	1-61-171
2026	1	61	172	9	1.95968E-11	1-61-172
2026	1	61	173	9	3.16445E-12	1-61-173
2026	1	61	174	9	1.72159E-13	1-61-174
2026	1	61	175	9	2.34616E-12	1-61-175
2026	1	61	176	9	0	1-61-176
2026	1	61	177	9	2.34616E-12	1-61-177
2026	1	61	178	9	3.5402E-12	1-61-178
2026	1	61	181	9	4.73147E-11	1-61-181
2026	1	61	182	9	0	1-61-182
2026	1	61	183	9	1.25551E-10	1-61-183
2026	1	61	184	9	3.74655E-11	1-61-184
2026	1	61	185	9	1.21162E-09	1-61-185
2026	7	21	2	9	1.94882E-06	7-21-2
2026	7	21	3	9	5.77367E-08	7-21-3
2026	7	21	5	9	6.44602E-09	7-21-5
2026	7	21	6	9	1.18238E-09	7-21-6
2026	7	21	20	9	7.42781E-10	7-21-20
2026	7	21	23	9	7.4838E-14	7-21-23
2026	7	21	24	9	3.28035E-11	7-21-24
2026	7	21	25	9	2.60416E-10	7-21-25
2026	7	21	26	9	1.51512E-10	7-21-26
2026	7	21	27	9	1.17114E-11	7-21-27
2026	7	21	31	9	1.76881E-09	7-21-31
2026	7	21	41	9	2.89065E-10	7-21-41
2026	7	21	68	9	1.23872E-14	7-21-68
2026	7	21	69	9	8.16481E-14	7-21-69
2026	7	21	70	9	0	7-21-70
2026	7	21	71	9	2.22737E-14	7-21-71
2026	7	21	72	9	2.30879E-14	7-21-72
2026	7	21	73	9	2.11951E-13	7-21-73
2026	7	21	74	9	5.31107E-13	7-21-74
2026	7	21	75	9	2.58741E-13	7-21-75
2026	7	21	76	9	1.43709E-12	7-21-76
2026	7	21	77	9	2.58741E-13	7-21-77
2026	7	21	78	9	1.79152E-13	7-21-78
2026	7	21	81	9	0	7-21-81
2026	7	21	82	9	5.39935E-13	7-21-82
2026	7	21	83	9	8.06926E-14	7-21-83

2026	7	21	84	9	8.83558E-14	7-21-84
2026	7	21	87	9	1.63681E-08	7-21-87
2026	7	21	90	9	0.000266264	7-21-90
2026	7	21	98	9	3.5235E-07	7-21-98
2026	7	21	100	9	1.63703E-09	7-21-100
2026	7	21	106	9	2.354E-08	7-21-106
2026	7	21	107	9	1.04867E-08	7-21-107
2026	7	21	110	9	1.44815E-09	7-21-110
2026	7	21	116	9	2.9425E-09	7-21-116
2026	7	21	117	9	1.573E-09	7-21-117
2026	7	21	168	9	0	7-21-168
2026	7	21	169	9	9.15938E-13	7-21-169
2026	7	21	170	9	6.52922E-13	7-21-170
2026	7	21	171	9	2.96344E-12	7-21-171
2026	7	21	172	9	5.47775E-13	7-21-172
2026	7	21	173	9	8.84535E-14	7-21-173
2026	7	21	174	9	4.81224E-15	7-21-174
2026	7	21	175	9	6.55807E-14	7-21-175
2026	7	21	176	9	0	7-21-176
2026	7	21	177	9	6.55807E-14	7-21-177
2026	7	21	178	9	9.8957E-14	7-21-178
2026	7	21	181	9	1.32255E-12	7-21-181
2026	7	21	182	9	0	7-21-182
2026	7	21	183	9	3.50945E-12	7-21-183
2026	7	21	184	9	1.04725E-12	7-21-184
2026	7	21	185	9	3.38676E-11	7-21-185
2026	7	31	2	9	2.22686E-06	7-31-2
2026	7	31	3	9	1.15561E-07	7-31-3
2026	7	31	5	9	8.06767E-09	7-31-5
2026	7	31	6	9	1.83029E-09	7-31-6
2026	7	31	20	9	1.04282E-09	7-31-20
2026	7	31	23	9	1.11663E-13	7-31-23
2026	7	31	24	9	5.81347E-11	7-31-24
2026	7	31	25	9	3.65273E-10	7-31-25
2026	7	31	26	9	2.26234E-10	7-31-26
2026	7	31	27	9	1.65572E-11	7-31-27
2026	7	31	31	9	2.34981E-09	7-31-31
2026	7	31	41	9	4.22995E-10	7-31-41
2026	7	31	68	9	1.84826E-14	7-31-68
2026	7	31	69	9	1.21824E-13	7-31-69
2026	7	31	70	9	0	7-31-70
2026	7	31	71	9	3.32339E-14	7-31-71
2026	7	31	72	9	3.44487E-14	7-31-72
2026	7	31	73	9	3.16245E-13	7-31-73
2026	7	31	74	9	7.92446E-13	7-31-74
2026	7	31	75	9	3.86059E-13	7-31-75
2026	7	31	76	9	2.14425E-12	7-31-76

2026	7	31	77	9	3.86059E-13	7-31-77
2026	7	31	78	9	2.67307E-13	7-31-78
2026	7	31	81	9	0	7-31-81
2026	7	31	82	9	8.0562E-13	7-31-82
2026	7	31	83	9	1.20399E-13	7-31-83
2026	7	31	84	9	1.31833E-13	7-31-84
2026	7	31	87	9	2.35284E-08	7-31-87
2026	7	31	90	9	0.000353724	7-31-90
2026	7	31	98	9	5.45426E-07	7-31-98
2026	7	31	100	9	2.18352E-09	7-31-100
2026	7	31	106	9	2.54846E-08	7-31-106
2026	7	31	107	9	1.05323E-08	7-31-107
2026	7	31	110	9	1.93158E-09	7-31-110
2026	7	31	116	9	3.18557E-09	7-31-116
2026	7	31	117	9	1.57983E-09	7-31-117
2026	7	31	168	9	0	7-31-168
2026	7	31	169	9	1.31661E-12	7-31-169
2026	7	31	170	9	9.38541E-13	7-31-170
2026	7	31	171	9	4.25979E-12	7-31-171
2026	7	31	172	9	7.87397E-13	7-31-172
2026	7	31	173	9	1.27147E-13	7-31-173
2026	7	31	174	9	6.91733E-15	7-31-174
2026	7	31	175	9	9.42687E-14	7-31-175
2026	7	31	176	9	0	7-31-176
2026	7	31	177	9	9.42687E-14	7-31-177
2026	7	31	178	9	1.42246E-13	7-31-178
2026	7	31	181	9	1.9011E-12	7-31-181
2026	7	31	182	9	0	7-31-182
2026	7	31	183	9	5.04464E-12	7-31-183
2026	7	31	184	9	1.50536E-12	7-31-184
2026	7	31	185	9	4.86829E-11	7-31-185
2026	7	52	2	9	5.83978E-06	7-52-2
2026	7	52	3	9	1.9087E-07	7-52-3
2026	7	52	5	9	1.86034E-08	7-52-5
2026	7	52	6	9	4.64923E-09	7-52-6
2026	7	52	20	9	5.32988E-09	7-52-20
2026	7	52	23	9	8.08562E-13	7-52-23
2026	7	52	24	9	6.43771E-11	7-52-24
2026	7	52	25	9	1.87336E-09	7-52-25
2026	7	52	26	9	8.95788E-10	7-52-26
2026	7	52	27	9	8.24049E-11	7-52-27
2026	7	52	31	9	6.53682E-09	7-52-31
2026	7	52	41	9	1.86319E-09	7-52-41
2026	7	52	68	9	1.33834E-13	7-52-68
2026	7	52	69	9	8.82138E-13	7-52-69
2026	7	52	70	9	0	7-52-70
2026	7	52	71	9	2.40649E-13	7-52-71

2026	7	52	72	9	2.49445E-13	7-52-72
2026	7	52	73	9	2.28996E-12	7-52-73
2026	7	52	74	9	5.73816E-12	7-52-74
2026	7	52	75	9	2.79548E-12	7-52-75
2026	7	52	76	9	1.55266E-11	7-52-76
2026	7	52	77	9	2.79548E-12	7-52-77
2026	7	52	78	9	1.93559E-12	7-52-78
2026	7	52	81	9	0	7-52-81
2026	7	52	82	9	5.83355E-12	7-52-82
2026	7	52	83	9	8.71815E-13	7-52-83
2026	7	52	84	9	9.54609E-13	7-52-84
2026	7	52	87	9	1.09687E-07	7-52-87
2026	7	52	90	9	0.000984007	7-52-90
2026	7	52	98	9	1.38547E-06	7-52-98
2026	7	52	100	9	1.2141E-08	7-52-100
2026	7	52	106	9	5.37095E-08	7-52-106
2026	7	52	107	9	1.62635E-08	7-52-107
2026	7	52	110	9	1.07401E-08	7-52-110
2026	7	52	116	9	6.71368E-09	7-52-116
2026	7	52	117	9	2.43951E-09	7-52-117
2026	7	52	168	9	0	7-52-168
2026	7	52	169	9	6.13793E-12	7-52-169
2026	7	52	170	9	4.3754E-12	7-52-170
2026	7	52	171	9	1.98588E-11	7-52-171
2026	7	52	172	9	3.67078E-12	7-52-172
2026	7	52	173	9	5.9275E-13	7-52-173
2026	7	52	174	9	3.2248E-14	7-52-174
2026	7	52	175	9	4.39473E-13	7-52-175
2026	7	52	176	9	0	7-52-176
2026	7	52	177	9	4.39473E-13	7-52-177
2026	7	52	178	9	6.63136E-13	7-52-178
2026	7	52	181	9	8.86279E-12	7-52-181
2026	7	52	182	9	0	7-52-182
2026	7	52	183	9	2.35177E-11	7-52-183
2026	7	52	184	9	7.01788E-12	7-52-184
2026	7	52	185	9	2.26956E-10	7-52-185
2026	7	61	2	9	2.29495E-05	7-61-2
2026	7	61	3	9	1.98831E-06	7-61-3
2026	7	61	5	9	1.05657E-07	7-61-5
2026	7	61	6	9	1.38307E-08	7-61-6
2026	7	61	20	9	3.09325E-08	7-61-20
2026	7	61	23	9	4.30619E-12	7-61-23
2026	7	61	24	9	7.36901E-11	7-61-24
2026	7	61	25	9	1.08805E-08	7-61-25
2026	7	61	26	9	4.8631E-09	7-61-26
2026	7	61	27	9	4.75385E-10	7-61-27
2026	7	61	31	9	1.21835E-08	7-61-31

2026	7	61	41	9	1.17875E-08	7-61-41
2026	7	61	68	9	7.12762E-13	7-61-68
2026	7	61	69	9	4.69804E-12	7-61-69
2026	7	61	70	9	0	7-61-70
2026	7	61	71	9	1.28164E-12	7-61-71
2026	7	61	72	9	1.32848E-12	7-61-72
2026	7	61	73	9	1.21958E-11	7-61-73
2026	7	61	74	9	3.05599E-11	7-61-74
2026	7	61	75	9	1.4888E-11	7-61-75
2026	7	61	76	9	8.26909E-11	7-61-76
2026	7	61	77	9	1.4888E-11	7-61-77
2026	7	61	78	9	1.03085E-11	7-61-78
2026	7	61	81	9	0	7-61-81
2026	7	61	82	9	3.1068E-11	7-61-82
2026	7	61	83	9	4.64307E-12	7-61-83
2026	7	61	84	9	5.084E-12	7-61-84
2026	7	61	87	9	6.22963E-07	7-61-87
2026	7	61	90	9	0.00183401	7-61-90
2026	7	61	98	9	4.12154E-06	7-61-98
2026	7	61	100	9	6.46741E-08	7-61-100
2026	7	61	106	9	1.61075E-07	7-61-106
2026	7	61	107	9	3.90367E-08	7-61-107
2026	7	61	110	9	5.72119E-08	7-61-110
2026	7	61	116	9	2.01344E-08	7-61-116
2026	7	61	117	9	5.85548E-09	7-61-117
2026	7	61	168	9	0	7-61-168
2026	7	61	169	9	3.48602E-11	7-61-169
2026	7	61	170	9	2.485E-11	7-61-170
2026	7	61	171	9	1.12787E-10	7-61-171
2026	7	61	172	9	2.0848E-11	7-61-172
2026	7	61	173	9	3.3665E-12	7-61-173
2026	7	61	174	9	1.83151E-13	7-61-174
2026	7	61	175	9	2.49596E-12	7-61-175
2026	7	61	176	9	0	7-61-176
2026	7	61	177	9	2.49596E-12	7-61-177
2026	7	61	178	9	3.76626E-12	7-61-178
2026	7	61	181	9	5.03358E-11	7-61-181
2026	7	61	182	9	0	7-61-182
2026	7	61	183	9	1.33568E-10	7-61-183
2026	7	61	184	9	3.98577E-11	7-61-184
2026	7	61	185	9	1.28899E-09	7-61-185

Rate per Hour

MOVESScenarioID	MOVESRunID	yearID	monthID	dayID	hourID	linkID	pollutantID	processID	sourceTypeID	regClassID	SCC	fuelTypeID	modelYearID	roadTypeID	temperature	relHumidity	ratePerHour
Knutson_2022_run	1	2026	1	5	1	530530100	1	90	62	0		2	0	1	38.1	87.6	4.26545E-06
Knutson_2022_run	1	2026	1	5	1	530530100	2	90	62	0		2	0	1	38.1	87.6	4.46289E-05
Knutson_2022_run	1	2026	1	5	1	530530100	3	90	62	0		2	0	1	38.1	87.6	6.45659E-05
Knutson_2022_run	1	2026	1	5	1	530530100	5	90	62	0		2	0	1	38.1	87.6	8.26258E-07
Knutson_2022_run	1	2026	1	5	1	530530100	20	90	62	0		2	0	1	38.1	87.6	1.39991E-08
Knutson_2022_run	1	2026	1	5	1	530530100	23	90	62	0		2	0	1	38.1	87.6	4.96762E-13
Knutson_2022_run	1	2026	1	5	1	530530100	24	90	62	0		2	0	1	38.1	87.6	4.48502E-09
Knutson_2022_run	1	2026	1	5	1	530530100	25	90	62	0		2	0	1	38.1	87.6	2.11833E-07
Knutson_2022_run	1	2026	1	5	1	530530100	26	90	62	0		2	0	1	38.1	87.6	1.53215E-07
Knutson_2022_run	1	2026	1	5	1	530530100	27	90	62	0		2	0	1	38.1	87.6	1.92402E-08
Knutson_2022_run	1	2026	1	5	1	530530100	31	90	62	0		2	0	1	38.1	87.6	2.69701E-08
Knutson_2022_run	1	2026	1	5	1	530530100	33	90	62	0		2	0	1	38.1	87.6	2.22262E-05
Knutson_2022_run	1	2026	1	5	1	530530100	41	90	62	0		2	0	1	38.1	87.6	2.86563E-08
Knutson_2022_run	1	2026	1	5	1	530530100	68	90	62	0		2	0	1	38.1	87.6	5.63705E-13
Knutson_2022_run	1	2026	1	5	1	530530100	69	90	62	0		2	0	1	38.1	87.6	8.00013E-11
Knutson_2022_run	1	2026	1	5	1	530530100	70	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	71	90	62	0		2	0	1	38.1	87.6	4.74684E-14
Knutson_2022_run	1	2026	1	5	1	530530100	72	90	62	0		2	0	1	38.1	87.6	2.09417E-11
Knutson_2022_run	1	2026	1	5	1	530530100	73	90	62	0		2	0	1	38.1	87.6	4.19205E-11
Knutson_2022_run	1	2026	1	5	1	530530100	74	90	62	0		2	0	1	38.1	87.6	1.54265E-11
Knutson_2022_run	1	2026	1	5	1	530530100	75	90	62	0		2	0	1	38.1	87.6	4.62922E-12
Knutson_2022_run	1	2026	1	5	1	530530100	76	90	62	0		2	0	1	38.1	87.6	7.0136E-13
Knutson_2022_run	1	2026	1	5	1	530530100	77	90	62	0		2	0	1	38.1	87.6	7.05098E-13
Knutson_2022_run	1	2026	1	5	1	530530100	78	90	62	0		2	0	1	38.1	87.6	2.62709E-11
Knutson_2022_run	1	2026	1	5	1	530530100	79	90	62	0		2	0	1	38.1	87.6	3.43919E-06
Knutson_2022_run	1	2026	1	5	1	530530100	81	90	62	0		2	0	1	38.1	87.6	3.57649E-11
Knutson_2022_run	1	2026	1	5	1	530530100	82	90	62	0		2	0	1	38.1	87.6	1.12274E-12
Knutson_2022_run	1	2026	1	5	1	530530100	83	90	62	0		2	0	1	38.1	87.6	8.44212E-11
Knutson_2022_run	1	2026	1	5	1	530530100	84	90	62	0		2	0	1	38.1	87.6	1.15378E-10
Knutson_2022_run	1	2026	1	5	1	530530100	87	90	62	0		2	0	1	38.1	87.6	3.7729E-06
Knutson_2022_run	1	2026	1	5	1	530530100	90	90	62	0		2	0	1	38.1	87.6	0.00805158
Knutson_2022_run	1	2026	1	5	1	530530100	91	90	62	0		2	0	1	38.1	87.6	0.0939859
Knutson_2022_run	1	2026	1	5	1	530530100	98	90	62	0		2	0	1	38.1	87.6	0.00807224
Knutson_2022_run	1	2026	1	5	1	530530100	100	90	62	0		2	0	1	38.1	87.6	5.49193E-07
Knutson_2022_run	1	2026	1	5	1	530530100	110	90	62	0		2	0	1	38.1	87.6	5.05256E-07
Knutson_2022_run	1	2026	1	5	1	530530100	111	90	62	0		2	0	1	38.1	87.6	1.7764E-07
Knutson_2022_run	1	2026	1	5	1	530530100	112	90	62	0		2	0	1	38.1	87.6	1.40649E-07
Knutson_2022_run	1	2026	1	5	1	530530100	115	90	62	0		2	0	1	38.1	87.6	1.19057E-07
Knutson_2022_run	1	2026	1	5	1	530530100	118	90	62	0		2	0	1	38.1	87.6	3.64607E-07
Knutson_2022_run	1	2026	1	5	1	530530100	119	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	168	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	169	90	62	0		2	0	1	38.1	87.6	5.50334E-10
Knutson_2022_run	1	2026	1	5	1	530530100	170	90	62	0		2	0	1	38.1	87.6	4.85305E-10
Knutson_2022_run	1	2026	1	5	1	530530100	171	90	62	0		2	0	1	38.1	87.6	7.91781E-10
Knutson_2022_run	1	2026	1	5	1	530530100	172	90	62	0		2	0	1	38.1	87.6	3.68651E-10
Knutson_2022_run	1	2026	1	5	1	530530100	173	90	62	0		2	0	1	38.1	87.6	6.63084E-11
Knutson_2022_run	1	2026	1	5	1	530530100	174	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	175	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	176	90	62	0		2	0	1	38.1	87.6	1.26932E-12
Knutson_2022_run	1	2026	1	5	1	530530100	177	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	178	90	62	0		2	0	1	38.1	87.6	2.58716E-11
Knutson_2022_run	1	2026	1	5	1	530530100	181	90	62	0		2	0	1	38.1	87.6	8.27355E-10
Knutson_2022_run	1	2026	1	5	1	530530100	182	90	62	0		2	0	1	38.1	87.6	0
Knutson_2022_run	1	2026	1	5	1	530530100	183	90	62	0		2	0	1	38.1	87.6	1.41064E-09
Knutson_2022_run	1	2026	1	5	1	530530100	184	90	62	0		2	0	1	38.1	87.6	6.52329E-10
Knutson_2022_run	1	2026	1	5	1	530530100	185	90	62	0		2	0	1	38.1	87.6	1.76515E-08

Kuntson Farms EIS - Rail Alternative - Locomotive Throughput Data and Criteria Pollutant and CO_2 Emissions

400	tons-miles/gal diesel (EPA document; Technical Highlights - Emission Factors for Locomotives, EPA-420-F-09-025, April 2009)
15.2	bhp-hr/gal (conversion factor, switching haul, EPA-420-F-09-025)
67	tons/rail car [national avg. (1991-2001) from https://www.bts.gov/archive/publications/transportation_statistics_annual_report/2003/chapter_02/railcar_weights]
1.25	miles for the rail spur
55	rail cars/train
2	trains/day
5,758	tons-miles/train round trip (assumes train weight after unloading for return trip is 25% of full load)
14.4	gal diesel per train round trip
3.94	gal/hour/train of diesel fuel for idling (estimated average locomotive fuel use on idle setting: https://www.railserveleaf.biz/pdf/rsi-white-paper-fuel-emissions.pdf)
0.5	hours, Assumed idle time per train (30 minutes)
32.7	gal/day diesel fuel, including for idling
11,936	gal/yr train diesel fuel
15.2	bhp-hr/gal (EPA-420-F-09-025)

Switch Locomotive Average Emission Factors (grams/horsepower-per hour), CH_4 and N_2O Emisson Factors (grams/gallon diesel fuel)

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Locomotive	**11.00**	**1.20**	**2.50**	**0.16**	**0.26**	**0.25**	**512.38**	**0.8**	**0.26**

Locomotive Emissions (tons/yr)

NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
2.2	**0.24**	**0.5**	**0.03**	**0.05**	**0.05**	**102.46**	**0.01**	**0.003**

Notes:

Emission factors are based on the Switch Locomotives - Exhaust Emission Standards (40 CFR 1033.101)

Emission factors are conservatively based on Tier 1 locomotive.

Emission factor for PM2.5 is 97% of PM10

Emission Factors for CH4 asnd N2O from EPA's Emission Factors for Greenhouse Gas Inventories, April 2022.

bhp = brake horsepower

gal = gallons

hr = hour

yr = year

Idle fuel use (gal/hr) per locomotive type

3
3.1
3.3
3.8
3.8
3.8
3.8
3.5
3.5
4.6
4.6
5.5
5.2
3.5
5
4
2.9
5.5
6
3
3
3.4
3.4
3.4

94.6 Total
3.941667 Average (gal/hr)

Kuntson Farms EIS - Rail Alternative - Locomotive Mobile Source Air Toxics Emissions Estimates

MSAT	Emission Factor [a]	Units	Diesel Fuel Use	Units	Diesel Heating Value [b]	Units	Emissions	Units
Benzene	7.76E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.34E-04	tons/year
Toluene	2.81E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	2.30E-04	tons/year
Xylene	1.93E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	1.58E-04	tons/year
Formaldehyde	7.89E-05	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.45E-05	tons/year
Acrolein	7.88E-06	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	6.44E-06	tons/year
Acetaldehyde	2.52E-05	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	2.06E-05	tons/year
Total Polycyclic Aromtaic Hydrocarbons	2.12E-04	lb/MMBtu fuel	11,935.50	gallons/year	137,000	Btu/gal.	1.73E-04	tons/year
						TOTAL	**1.29E-03**	tons/year

[a] MSAT emission factors obtained from EPA AP-42 document; large stationary diesel engine emission factors in Tables 3.4-3 and 3.4-4 as surrogates.

[b] Diesel heating value obtained from AP-42, Appendix A - Miscellaneous Data and Conversion Factors

Knutson Farms Industrial Park Project

Traffic Analysis Report (Final)

CITY OF PUYALLUP
STATE OF WASHINGTON

Prepared by HDR

December 2023

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Acronyms and Abbreviations

AC	asphaltic concrete
ADA	Americans with Disabilities Act
Ave	Avenue
Blvd	Boulevard
BNSF	BNSF Railway
CMF	crash modification factor
Dr	Drive
E	east
EB	eastbound
EIS	Environmental Impact Statement
ESAL	Equivalent Single Axle Load
FHWA	Federal Highway Administration
ft	feet
FWD	falling weight deflectometer
HCM	Highway Capacity Manual
HGV	heavy goods vehicle
HWA	HWA Geosciences Inc.
ITE	Institute of Transportation Engineers
KFIP	Knutson Farms Industrial Park
LOS	level of service
LRE	long-range estimates
M	million
min	minute
MOE	measure of effectiveness
N	north
NB	northbound
NE	northeast
OD	Origin-Destination [matrix]
Ped	Pedestrian
PTV	PTV America
Rd	Road
SB	southbound
SE	southeast
sec	second
SEPA	Washington State Environmental Policy Act
SF	square feet
SR	State Route
St	Street
TRB	Transportation Research Board
v/c	volume-to-capacity

vpd	vehicles per day
vph	vehicles per hour
WB	westbound
Wy	Way
WSDOT	Washington State Department of Transportation

1.0 INTRODUCTION

This traffic analysis report is prepared as a supporting technical document for the Knutson Farms Environmental Impact Statement (EIS). The Transportation Impact section of the Draft EIS is based on the findings presented in this report.

1.1 Project Description

Knutson Farms, Inc., has applied to develop a warehouse project (Project) of up to 2.6 million square feet (SF) of building area on the approximately 188-acre Knutson Farms property located within unincorporated Pierce County, Washington. The proposed Knutson Farms Industrial Park (KFIP) Project is located east of Shaw Road between East (E) Main Avenue and E Pioneer Avenue. The Project site is just outside the Puyallup city limits, but it is within the Puyallup Urban Growth Area as identified in the 2015 Puyallup Comprehensive Plan. The large-scale map of the Project location is shown in Figure 1, and the Project location is shown in a more local context with the intersections studied in Figure 2.

The site currently consists of four single-family homes that would be removed. As of this writing, the expected completion and operation of the Project would occur in 2026. Vehicular access between the arterial street network and the site would be provided via 33rd Street Southeast (SE), 80th Street E, and 5th Avenue SE. Most site traffic would pass through the 5th Avenue SE/33rd Street SE intersection, and the 5th Avenue SE/Shaw Road intersection would be signalized in conjunction with the Project. The 5th Avenue SE/33rd Street SE intersection would be two-way-stop controlled with the eastern and western legs controlled. The western leg (eastbound direction) would have a dedicated left-turn lane and a shared through-right-turn lane. The current expectation is for trucks to be prohibited from using 33rd Street SE between 5th Avenue SE and 8th Avenue SE. The Project site plan drawing is shown in Figure 3.

1.1.1 State Environmental Policy Act Substantive Authority, Permits Needed

The Washington State Environmental Policy Act (SEPA) is generally described as having two aspects, one procedural and the other substantive. The procedural aspect of SEPA is what underlies the process of SEPA Checklist review; threshold determination; and, in some instances such as this one, preparation of an EIS.

The substantive component of SEPA established in Revised Code of Washington 43.21C.060 and Washington Administrative Code 197-11-660 authorizes application of SEPA to condition or deny a proposal even when it may comply with the immediately applicable development regulations. The statute and regulations set out prerequisites for jurisdictions' use of this substantive SEPA authority. One aspect of substantive SEPA authority that differs from application of zoning regulations is that an application's vesting date does not govern what plans and policies may be applied through substantive SEPA authority. Instead, per the SEPA statute and regulations, plans, and policies in effect when the Draft EIS is issued may be applied.

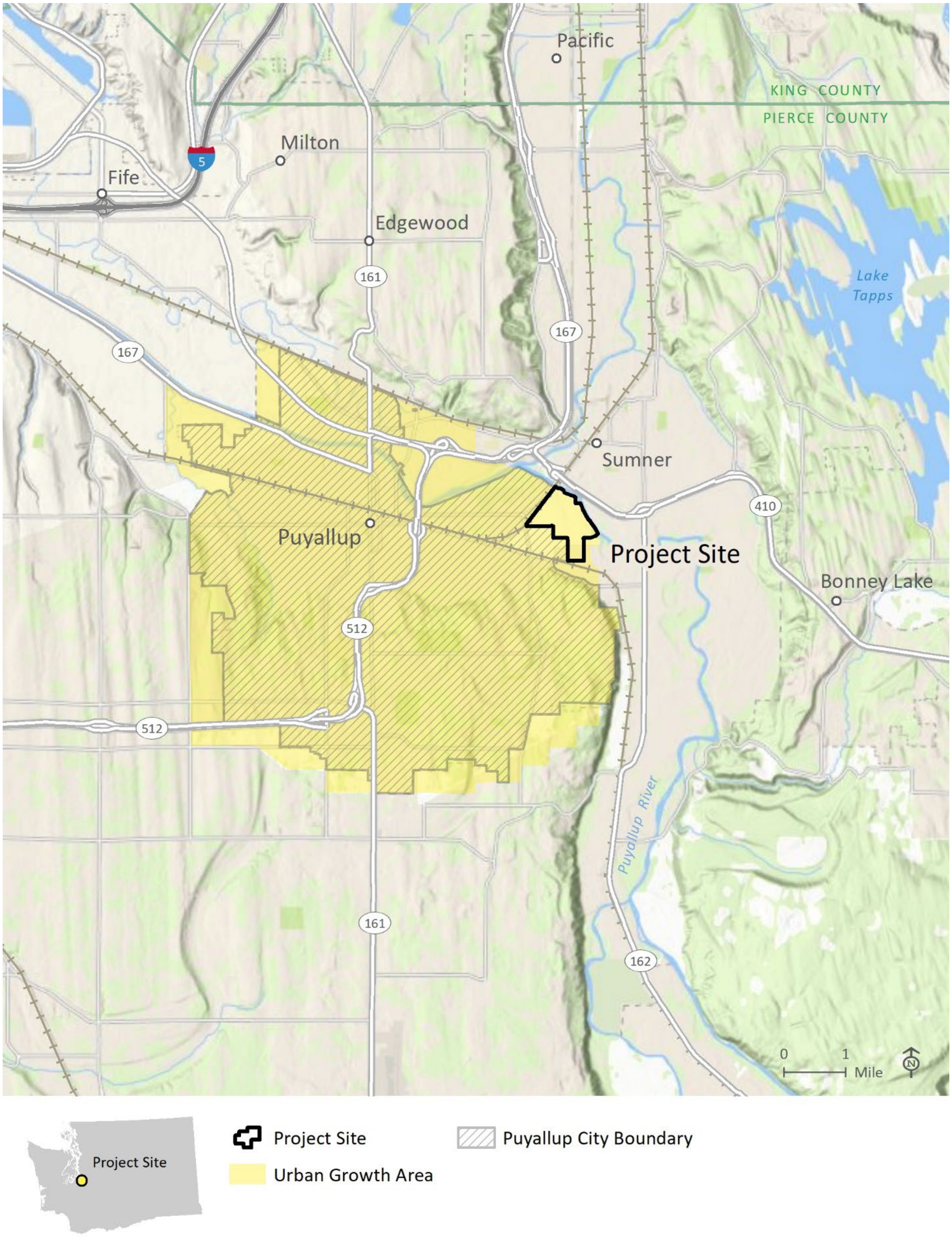


Figure 1. Large-Scale Project Location/Vicinity Map

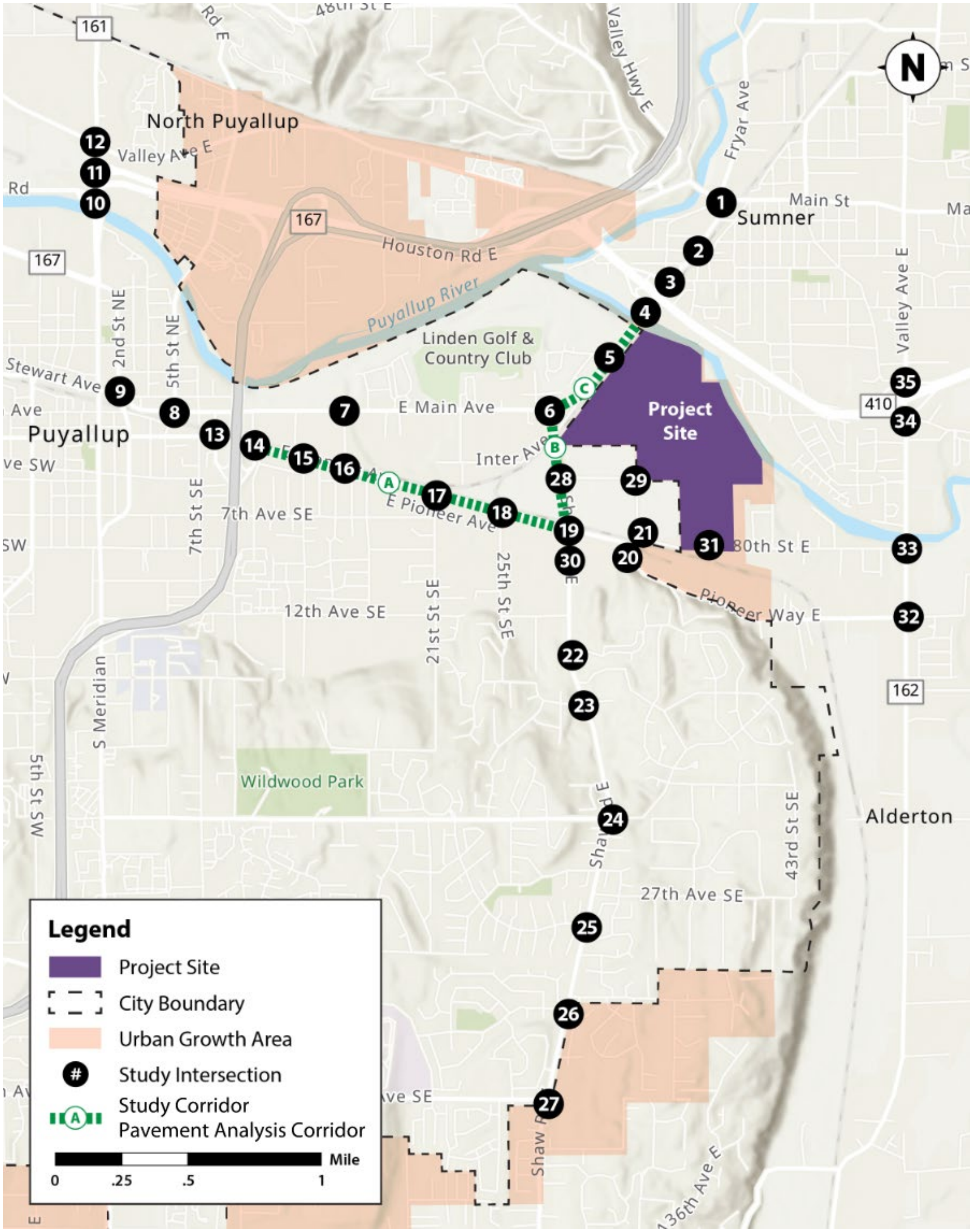


Figure 2. Local Project Vicinity Map with Study Intersections/Corridors

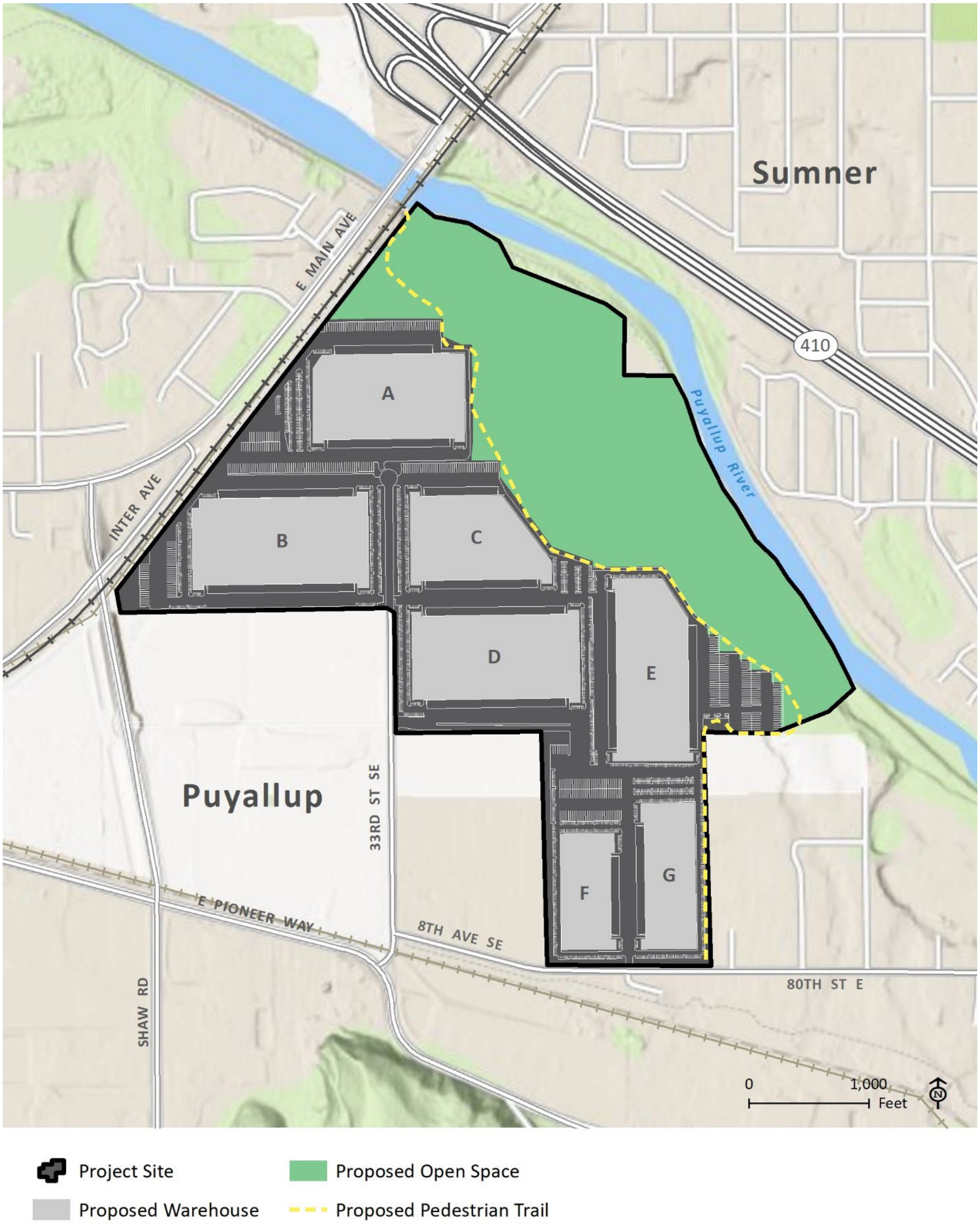


Figure 3. Site Plan

Consistent with the prerequisites, Pierce County has adopted Pierce County Code 18D.40.060 (https://pierce.county.codes/PCC/18D.40.060 and incorporated by reference here), which specifies when the County may exercise its SEPA substantive authority and the regulations, plans, and codes that Pierce County may rely upon in doing so. Pierce County may use this authority in connection with permits and approvals for KFIP, which is located within the County. Among the specified plans is Title 19A, Pierce County Comprehensive Plan.

The City of Puyallup, in Puyallup Municipal Code 21.04.210 (https://www.codepublishing.com/WA/Puyallup/html/Puyallup21/Puyallup2104.html#21.04.210), incorporated here by reference, has similarly provided in its Code for use of substantive SEPA authority per the SEPA statute. Therefore, the City of Puyallup may also use substantive SEPA authority in connection with its jurisdiction over approvals needed, for example, for KFIP access to City streets.

To facilitate the Project proposal, the applicant, Knutson Farms, would need civil (street right-of-way) permits for street right-of-way improvements to City of Puyallup public rights-of-way. Based on the proposed site plan under the proposed action, the City notes that right-of-way permits would be required to connect the Project access to 33rd Street SE. In order to mitigate Project impacts on City of Puyallup public right-of-way, the City of Puyallup would require other civil (street right-of-way) permits. Those mitigation measures are outlined in this chapter and would be based on the scenario under which the ultimate build-out of the Project is constructed.

1.2 Study Intersections/Corridors

The list of study intersections and corridors was identified with the City's concurrence during the scoping process. The 35 counted intersections and three safety study corridors are listed below and shown in Figure 2.

1. Traffic Avenue & Cannery Way
2. Traffic Avenue & State Street
3. Traffic Avenue & State Route (SR) 410 westbound (WB) ramps
4. E Main Avenue & SR 410 eastbound (EB) ramps
5. E Main Avenue & 5th Avenue northeast (NE)
6. E Main Avenue & Shaw Road E
7. E Main Avenue & 15th Street SE
8. E Main Avenue & 5th Street NE
9. E Main Avenue & 2nd Street NE
10. North (N) Meridian Avenue & SR 167 northbound (NB)
11. N Meridian Avenue & SR 167 southbound (SB)
12. N Meridian Avenue & Valley Avenue NE
13. E Pioneer Avenue & SR 512 SB ramps
14. E Pioneer Avenue & SR 512 NB ramps
15. E Pioneer Avenue & 13th Street SE
17. E Pioneer Avenue & 25th Street SE
18. East Pioneer Avenue & 21st Street SE
19. E Pioneer Avenue & Shaw Road E
20. E Pioneer Avenue & 33rd Street SE
21. 8th Avenue SE & 33rd Street SE
22. Shaw Road E & Highlands Boulevard
23. Shaw Road E & 16th Avenue SE
24. Shaw Road E & 23rd Avenue SE
25. Shaw Road E & Forest Green Boulevard
26. Shaw Road E & Manorwood Drive
27. Shaw Road E & 39th Avenue SE
28. Shaw Road E & 5th Avenue SE
29. 33rd Street SE & 5th Avenue SE
30. Shaw Road E & Safeway driveway
31. 80th Street E & warehouse driveway
32. SR 162 & E Pioneer Avenue
33. SR 162 & 80th Street E
34. SR 162 & SR 410 EB ramps

16. E Pioneer Avenue & 15th Street SE
35. SR 162 & SR 410 WB ramps

A. E Pioneer Avenue – between SR 512 and Shaw Road E
B. Shaw Road E – between E Pioneer and E Main Avenue
C. E Main Avenue – between Shaw Road E and White River

1.3 Traffic Counts

Traffic counts were collected at intersections 1 through 27 on August 3, 2021. A need for additional traffic counts was identified to improve model calibration. Traffic counts for intersections 28 through 35 were collected on June 23, 2022. The field counts were adjusted for this analysis in two ways. First, an adjustment derived from Washington State Department of Transportation (WSDOT) data to reflect lower-than-typical traffic overall as a result of the Covid-19 pandemic. Second, because summertime counts can be higher than normal within this area, a seasonal adjustment factor was applied to produce volumes that reflect an annual average condition for each peak hour. The peak hours observed during the count period were 7:15–8:15 a.m. and 3:45–4:45 p.m. Site generated traffic volumes peak during traditional AM and PM peak periods and therefore midday traffic counts that coincide with school release were not collected.

Volumes from the East Town Crossing Traffic Impact Study, which used traffic counts collected between 4:00 and 5:00 p.m. on May 4, 2022, were used to validate the adjusted volumes described above. Comparing the adjusted volumes with the collected counts from the East Town Crossing Traffic Impact Study resulted in increased traffic volumes at the following intersections and inclusion of those higher volumes in the baseline model for the study:

- Shaw Road E and 23rd Avenue SE (7 percent increase)
- E Pioneer Avenue and Shaw Road E (11 percent increase)
- E Main Avenue and Shaw Road E (2 percent increase)

Refer to Attachment A for the Existing Traffic Counts

2.0 SCENARIOS ANALYZED

The six scenarios shown in Table 1 were considered and analyzed for the expected Project completion and operation year 2026.

Table 1. Build Scenarios Size and Generated Traffic Volumes

Build Scenario	Total SF (in millions)	Total Daily Trips (vpd)	Total Heavy Vehicle Trips (vpd)	Total PM Peak Hour Trips (vph)	Total Peak Hour Heavy Vehicle Trips (vph)
A – Proposed Action	2.6	8,724	1,482	880	104
B – Rail scenario	2.6	8, 487	1,207	729	86
C – Proposed Action, with mitigation	2.6	8,724	1482	880	104
D – Reduced land use scenario	1.73	5,844	998	590	70
E – Reduced land use scenario, with mitigation	1.73	5,844	998	590	70

Note: vpd = vehicles per day; vph = vehicles per hour

2.1 No Action Scenario

The No Action Scenario was included for equal evaluation in this study to facilitate the identification of impacts of other scenarios. Under the No Action Scenario, none of the facilities proposed to assist with Project traffic access would be constructed.

2.2 Scenario A: Proposed Action

As indicated in the Project description, a warehouse complex is proposed for the Knutson Farms property. The applicant seeks to build seven warehouses, each varying in size from approximately 190,000 to 490,000 SF, for a total of 2.6 million SF of Industrial Park use consistent with the Institute of Transportation Engineers (ITE) Land Use Code 130. These facilities typically provide for storage and processing of shipped materials and/or goods that are reconstituted and packaged, then shipped elsewhere. The development, as proposed by the applicant, would have 1,730 parking spaces for cars and 473 parking spaces for freight trailers.

In addition to these general definitions, a restrictive covenant has been agreed upon for Knutson Farms that would:

> *… strictly prohibit “High-Cube Fulfillment Center Warehouse – Sort,” ITE Land Use Code 155, and “High Cube Parcel Hub Warehouse,” ITE Land Use Code 156, uses under the definitions under the definitions established in the ITE Trip Generation Manual 11th Edition.*

The covenant also limits trips to a level consistent with Industrial Park use. The ITE manual defines Industrial Park as:

> *An industrial park contains several individual industrial or related facilities. It is characterized by a mix of manufacturing, service, and warehouse facilities with a*

> *wide variation in the proportion of each type of use from one location to another. Many industrial parks contain highly diversified facilities. Some parks in the database have a large number of small businesses and others have one or two dominant industries.*

More information about the assumptions associated with Scenario A is provided in Section 3.0.

Scenario A was analyzed by combining the traffic in the No Action Scenario with new traffic generated by the proposed Knutson Farms development. The intersection lane arrangements and signal timing assumptions associated with the No Action Scenario were preserved for Scenario A, with the exception of certain intersections at or near Knutson Farms access points.

2.3 Scenario B: Rail Delivery

The Scenario B was developed to analyze the potential to mitigate traffic impacts by shifting some Project-related truck traffic onto trains. Overall, Scenario B was meant to test the relative impact of the use of trains to bring as much freight onto the site as reasonably possible to lessen overall traffic impacts. The conceptual rail layout for the site is shown in Figure 4. The alignment and design of the rail spur and on-site rail lines were formulated by a rail engineer on the EIS Project team with consultation from the rail operators.

In terms of traffic, Scenario B differs from Scenario A in two ways. First, trains serving the Knutson Farms site would use BNSF Railway (BNSF) and Meeker Southern lines, which cross Shaw Road and several other study area streets at grade. Second, while the amount of proposed warehouse square footage is the same as with Scenario A, the number of heavy truck trips generated by Scenario B would be slightly lower than with Scenario A.

Through brief coordination with the BNSF and analysis of the infrastructure available, preliminary spatial and operational evaluation of potential rail capacity for the Knutson Farms site indicated that two trains per day, each a maximum 55 standard railcars in length, could serve the site. The freight capacity of this level of train activity was estimated to be equivalent to between 275 and 320 truck trips. The possibility of the site accommodating two trains per day was predicated on tight control and maximum capacity operations. To take a more conservative approach and to avoid over-estimating the potential benefit, the low end of that estimate of daily truck trips (275), representing a truck trip reduction of approximately 18.5 percent, was used for traffic analysis. Non-truck trip generation would be unchanged from Scenario A. More information about the assumptions associated with Scenario B is provided in Section 3.0. The alternative development and feasibility was documented in a Rail Mitigation Analysis technical memorandum (City of Puyallup 2021).

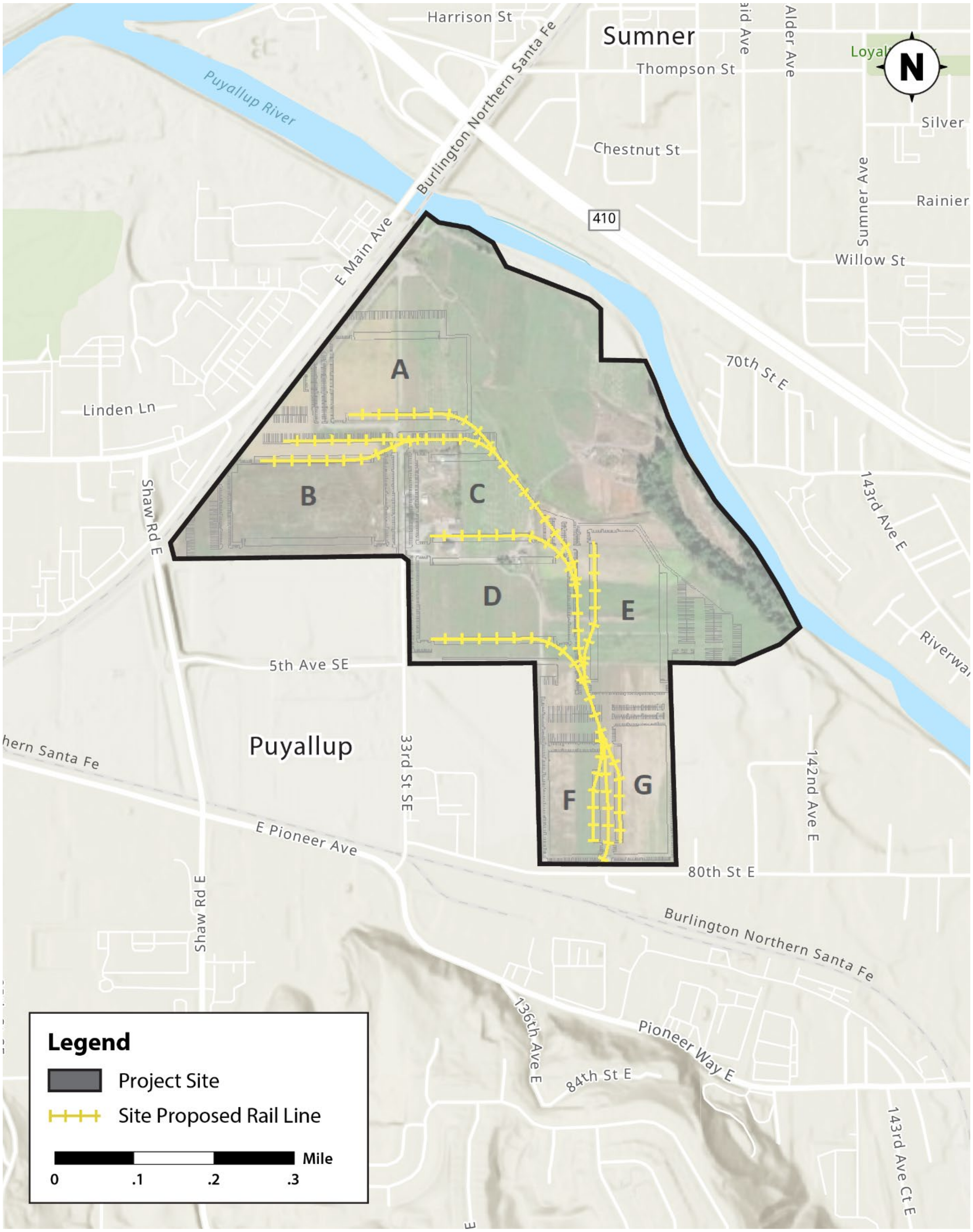


Figure 4. Rail Access

2.4 Scenario C: Proposed Action with Mitigation

Scenario C was formed by making changes to the assumptions about transportation infrastructure based on the analysis results of Scenario A. These changes generally take the form of intersection capacity upgrades and other operational modifications that help the intersections process peak hour traffic more efficiently. Intersection mitigations were developed only for individual intersections at which traffic generated by the proposed Project Scenario A would result in a degradation in level of service (LOS) below the responsible agency's LOS standard LOS, so Scenario C was developed to address LOS deficiencies and other impacts. More information about this measure is included in the next section.

2.5 Scenario D: Reduced Footprint Alternative

Scenario D represents a modification of Scenario A. Specifically, initial findings related to non-transportation resource impacts and associated mitigation resulted in the need to consider a scenario that would use less of the Knutson Farms site and therefore accommodate a lower level of land use. To assess transportation effects for Scenario D, the amount of land use programmed was reduced by one-third from that assumed in Scenario A.

2.6 Scenario E: Reduced Footprint Alternative with Mitigation

In a similar fashion to formation of Scenario C, the results of the Scenario D analysis directly informed the mitigation needs that defined Scenario E. Because Knutson Farms land use is lower for Scenarios D and E, its traffic generation is also lower. As such, fewer locations indicate that mitigation would be needed in Scenario E than in Scenario C.

2.7 Project Trip Generation and Distribution

Project trip generation estimates were derived using the assumptions documented for the proposed warehousing land use as represented by ITE land use 130 – Industrial Park, and land use that would be displaced by the Project, land use 210 – Single Family Residential. Table 2 shows the relevant assumptions and calculation results.

Project trips were distributed to the immediate surrounding street network differently depending upon whether they were heavy truck trips or passenger car/light-truck trips. Heavy trucks are not allowed to use the central site access (33rd Street SE, south of 5th Avenue E). Figure 5 and Figure 6 show the general distributions for these two types of trips side-by-side.

Table 2. Project Trip Generation Data

Land Use	**Quantity (Unit)**	**Trip Rate or Equation**[a]	**Directional Split**	**Site-Generated Trips**		
				Heavy Trucks	**All Others**	**Total**
Daily						
Proposed: 130 – Industrial Park (16.9% daily heavy trucks)	2,600 (1,000 SF)	3.37 per day	50% In 50% Out **Total**	741 741 **1,482**	3,640 3,640 **7,280**	4,381 4,381 **8,762**
Displaced: 210 – Single Family Residential	4 (DU)	9.43 per day	50% In 50% Out **Total**	0 0 **0**	(19) (19) **(38)**	(19) (19) **(38)**
Net New Daily Trips:			In Out **Total**	741 741 **1,482**	3,621 3,621 **7,242**	4,362 4,362 **8,724**
AM Peak Hour						
Proposed: 130 – Industrial Park (11.8% AM heavy trucks)	2,600 (1,000 SF)	0.34 per hour	81% In 19% Out **Total**	84 20 **104**	632 148 **780**	716 168 **884**
Displaced: 210 – Single Family Residential	4 (DU)	0.7 per hour	25% In 75% Out **Total**	0 0 **0**	(1) (2) **(3)**	(1) (2) **(3)**
Net New AM Peak Hour Trips:			In Out **Total**	84 20 **104**	631 146 **777**	715 166 **881**
PM Peak Hour						
Proposed: 130 – Industrial Park (11.8% PM heavy trucks)	2,600 (1,000 SF)	0.34 per hour	22% In 78% Out **Total**	23 81 **104**	171 609 **780**	194 690 **884**
Displaced: 210 – Single Family Residential	4 (DU)	0.94 per hour	63% In 37% Out **Total**	0 0 **0**	(3) (1) **(4)**	(3) (1) **(4)**
Net New PM Peak Hour Trips:			In Out **Total**	23 81 **104**	168 608 **776**	191 689 **880**

[a] Rates and equations are from the ITE Trip Generation manual, 11th edition (ITE 2021).

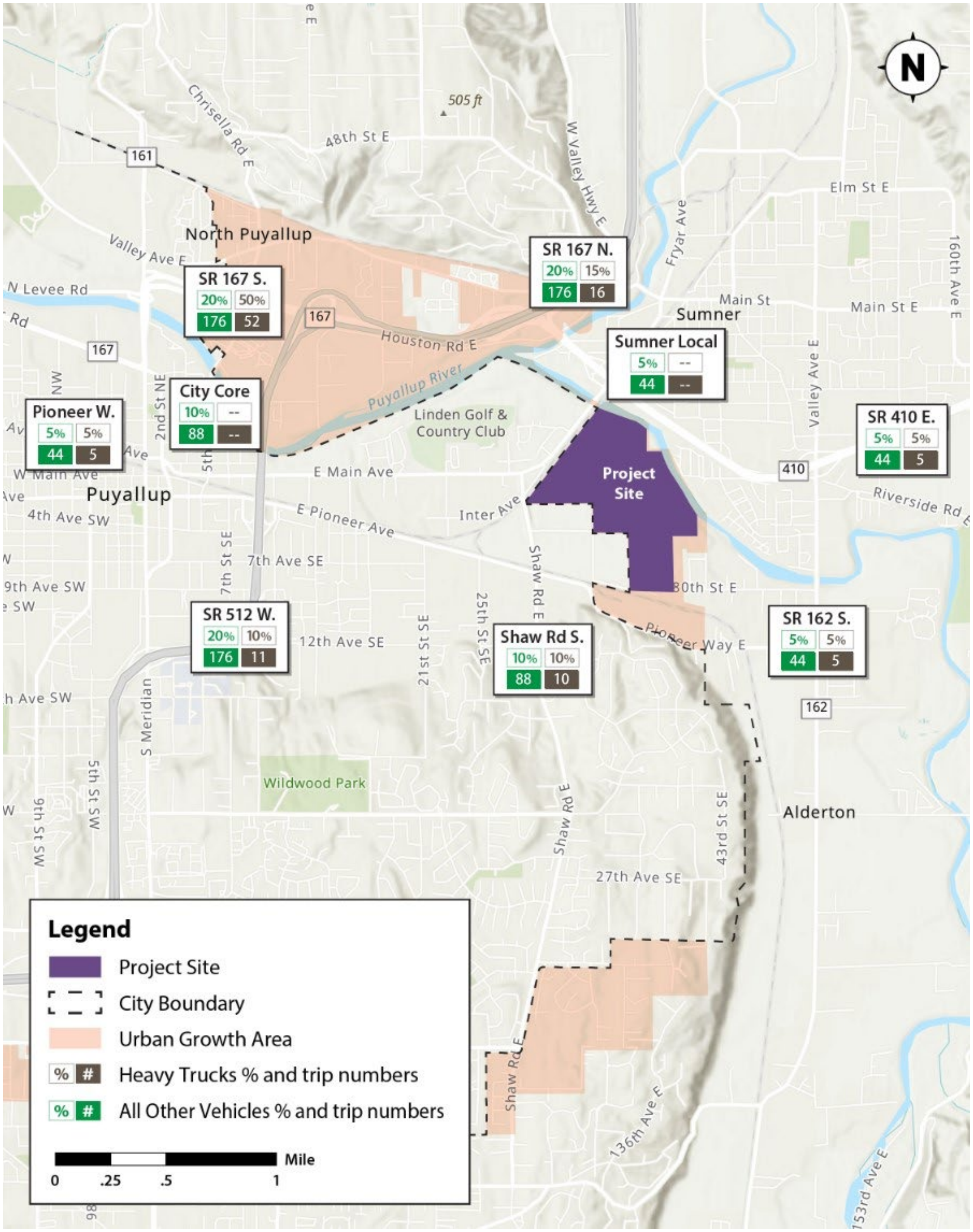


Figure 5. Scenarios A and C, PM Peak Distribution of Site-Generated Trips

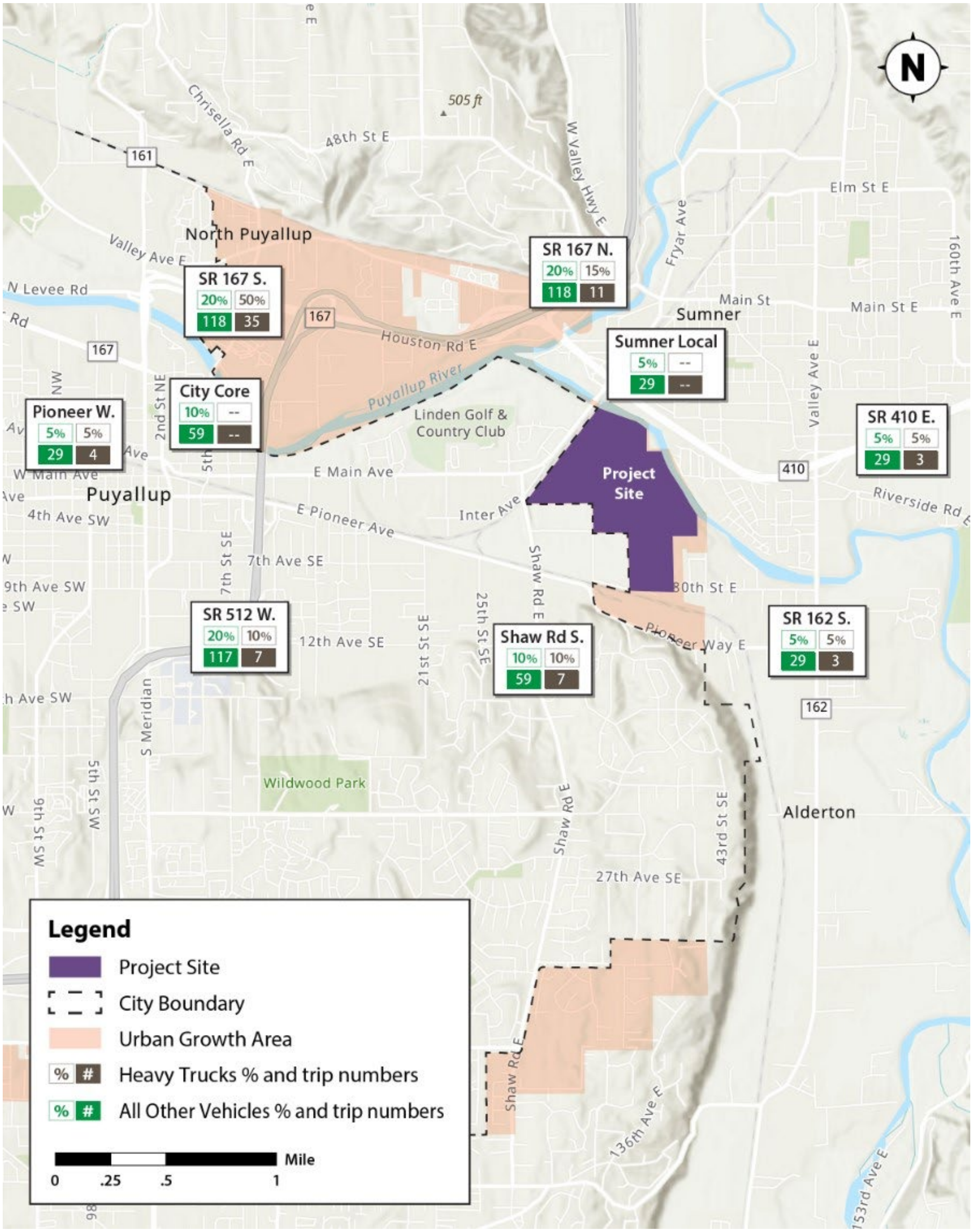


Figure 6. Scenarios D and E, PM Peak Distribution of Site-Generated Trips

3.0 METHODS AND ASSUMPTIONS

The quantitative analysis of traffic operations for this Project was conducted using VISSIM traffic modeling software (microscopic simulation). This software was used to build the traffic models of the roadway network within the Project area.

3.1 Simulation Model Inputs and Assumptions

The existing conditions simulation models for the study area were developed using VISSIM version 2020, a widely used, behavior-based, multi-purpose, traffic microsimulation program developed by PTV America (PTV). Stochastic models, or those that incorporate variability such as VISSIM, track individual vehicle movements and interactions. This feature leads to more robust analysis than deterministic methods such as those documented in the *Highway Capacity Manual* (HCM; TRB 2016) as implemented by common analysis software programs such as Synchro or Highway Capacity Software. Stochastic microsimulation is particularly useful when evaluating traffic conditions, when demand is at or above capacity. Some parts of the street network around Knutson Farms exhibit such capacity challenges that make the stochastic simulation approach better able to account for the effects of extensive peak-hour queues. VISSIM as a micro-simulation model more accurately assesses existing conditions and anticipated impacts when freeways and ramps are nearby, closely spaced intersections, and oversaturated conditions, all of which exist here. Additionally, the size of the Project, the number of trips it would generate, the variability in truck types, and similar variables further support use of VISSIM instead of Synchro.

3.1.1 Input Data

Multiple data sources were used to develop the data inputs and calibration targets used in the VISSIM models for the Knutson Farms EIS Project. The basic VISSIM model data inputs, sources, and uses are shown in Table 3.

Table 3. Project Data Types

Type	Source	Purpose
Street network layout and geometry	Aerial imagery and Project team field review	Study
Peak period intersection traffic volumes	Third-party data vendor	Study and calibration
Traffic signal timings	Cities, WSDOT	Study
Vehicle travel times	Third-party data vendor	Study and calibration
Field queue lengths	Observations by Project staff	Calibration
Future traffic volumes/Project trips	Calculations by Project staff based on ITE Land Use 130, per applicant covenant	Study
Rail crossing blockage durations	Calculations by Project staff	Study

3.1.2 Model Geometrics

Scaled aerial photography was used to develop the base VISSIM network and establish intersection lane configurations, stop-bar locations, vehicle travel paths, and turn-pocket lengths. Where necessary, the information collected from online aerial photography was verified during field observations. Model entry links were extended to provide sufficient distance for lane changes as vehicles enter the simulation network.

3.1.3 Volume Inputs

Peak hour traffic volumes were summarized in 15-minute intervals to represent the traffic fluctuations during simulated peak hours, which allowed the VISSIM models to represent more closely the traffic arrival patterns and queuing at the study intersections. The VISSIM models used a 30-minute seeding period (using 80 percent of peak hour flow rate) prior to the start of the peak hour. The seeding period allows for traffic to be loaded into the network before simulation results are recorded. Heavy vehicle percentages for each model input were derived from existing count data for the analysis of existing conditions and the No Build Scenario.

New trips (for both trucks and non-truck traffic) generated for the proposed Project were estimated using the ITE Trip Generation manual, 11th edition (ITE 2021), which was the current industry standard at the onset of this study. As discussed in the previous section, Project trips for the scenarios were estimated using the ITE land use category 130 – Industrial Park to represent the proposed warehouse complex. The independent variable used for trip calculations is 1,000 SF of gross floor area. With no specific end user prescribed for the Knutson Farms site, this land use designation assumption was selected because it represents a covenant-restricted estimate of potential trip generation for the potential allowable uses under Pierce County zoning. The ITE 130 land use category has a relatively robust data background and includes both trip generation rates and heavy vehicle percentages. More information about trip generation is provided in Section 2.7 of this report.

3.1.4 Vehicle Models and Distribution in the Traffic Stream

Car and heavy vehicle distributions were based on the VISSIM North American default vehicle fleet developed by PTV in January 2010. The model distribution for cars is based on a PTV estimate of the more popular models on the road that year and is shown in Table 4. The model distribution for trucks is based on a Federal Highway Administration (FHWA) truck size and weight study (USDOT 2020), and is shown in Table 5. Note that the model's term for a truck is a "heavy goods vehicle" (HGV).

Table 4. Car Performance Models, Frequencies, and VISSIM 3D Model Files

#	Make/Model	Type	Percentage	3D Vehicle Model
1	Ford F-150	Light Truck	19.2	LtTruck_Ford_F150_2009.v3d
2	Chevrolet Silverado	Light Truck	15.1	LtTruck_Chevrolet_Silverado_2008.v3d
3	Toyota Camry	Car	13.5	Car_Toyota_Camry_2006.v3d
4	Ford Explorer	SUV	10.6	SUV_Ford_Explorer_2008.v3d
5	Honda Accord	Car	12.9	Car_Honda_Accord_2003.v3d
6	Plymouth Voyager	Light Truck	5.5	Van_Plymouth_Voyager_1999.v3d
7	Jeep Grand Cherokee	SUV	5.8	SUV_Jeep_Grand_Cherokee_2002.v3d
8	Nissan Quest	Car	6.4	Van_Nissan_Quest_1995.v3d
9	GMC Yukon	SUV	5.0	SUV_GMC_Yukon_XL_2008.v3d
10	Nissan Altima	Car	6.0	Car_Nissan_Altima_2005.v3d

Source: PTV 2021.

Note: SUV = sport utility vehicle. Car performance models are not listed in descending order by frequency.

Table 5. Truck Performance Models, Frequencies, and VISSIM 3D Model Files

#	Description	Percentage	3D Vehicle Model	
			Tractor	Trailer
1	5-Axle Tractor Semi-trailer	47.8	HGV_wb50_tractor.v3d	HGV_wb50_trailer.v3d
2	3-Axle Single-Unit Truck	27.7	truck.v3d	N/A
3	4-Axle Tractor Semi-trailer	10.6	HGV_wb40_tractor.v3d	HGV_wb40_trailer.v3d
4	4-Axle or more Single-Unit Truck	4.9	HGV_flatbed_truck_v3d	N/A
5	3-Axle Tractor Semi-trailer	4.7	HGV_wb67d_tractor.v3d	HGV_wb67d_trailer.v3d
6	6-Axle Tractor Semi-trailer	4.4	HGV_wb65_tractor.v3d	HGV_wb65_trailer.v3d

Source: PTV 2021; USDOT 2020.
Notes: N/A = not applicable

3.1.5 Vehicle Routing

Traffic patterns in VISSIM were modeled using static routes and routing decisions. Vehicle routing through the study area, where multiple intersections exist, was achieved through the development of an Origin-Destination (OD) matrix. The OD matrix was estimated by evaluating permitted/prohibited movements and calculating the ratios of individual turn movements at each intersection. When using an OD matrix, a vehicle is assigned one complete route upon entering the model that continues until the vehicle leaves the network. Routings followed the traffic distributions indicated in Section 3.5.

3.1.6 Speed Distributions

Speed distributions were used based on the speed limit within the network. Speed decisions were used in the models to generate desired vehicle speeds at various roadway segments, and reduced speed areas were placed in locations where drivers need to reduce their speed due to roadway alignment or for turning movements at intersections.

3.1.7 Lane-Change Distance and Emergency Stop Distance

The look-back or lane-change distance defines the distance at which vehicles attempt to change lanes. The longer the distance, the farther back the driver prepares for their next turning movement before making the movement, thus resulting in better lane utilization. Lane-change distances were initially set to a default value of 1,500 feet and adjusted, where necessary, to match field conditions and calibrate congestion levels. Known decision-making patterns and engineering judgment were also used to assess the assumptions and modifications that were made, where applicable.

Emergency stop is the last possible position where a vehicle can change lanes. The default value for emergency stops is 16.4 feet, and was increased to 50 feet at intersections and where diverges occurred in the model to allow enough space for drivers to make decisions prior to being too close to an intersection or diverge location, especially at higher speeds.

3.1.8 Signal Operations and Stop Control

The City of Puyallup, for local intersections, and WSDOT, at the intersections of SRs, provided signal timing and phasing used in the AM and PM peak hour models. Field investigations were conducted to verify signal phasing, protected/permissive movements, right-turn-on-red behaviors, and overlap phasing. Stop control was also coded in the model for unsignalized intersections. For future scenarios, signal phasing was retained, but timings were modified slightly at some intersections to optimize progression.

3.1.9 Rail Crossings

A railroad (Meeker Southern) runs mostly east/west along E Pioneer Avenue near the southern edge of the Project site. For the scenarios that do not involve rail freight delivery, it is assumed that no trains use it during peak street traffic hours; therefore, no rail crossing activity was analyzed. For Scenario B, the Rail Delivery scenario, one train movement was assumed to block key intersections during each peak hour. Rail parameters (train length, crossing speed, crossing width) specific to this Project were developed to help estimate the traffic impact of these crossings. Most importantly, a train was programmed to enter 30 minutes into the peak hour measurement period. Based on those rail parameters, a train serving Knutson Farms was estimated to block Shaw Road for just under 7 minutes.

3.1.10 Multiple Model Runs and Simulation Output Processing

VISSIM is a stochastic model, which means that it incorporates randomness. Due to the varying nature of the simulations between runs with different random seed numbers, VISSIM results can differ significantly from one run to the next. By contrast, a deterministic model would produce the same results each time it is conducted. An accurate VISSIM modeling effort requires multiple simulations, and the results are calculated using an average of these runs. Ten simulation runs were performed, each with a different random number seed, to determine results for existing conditions and each future scenario, with the results of the ten runs then averaged for reporting here.

3.2 Simulation Model Calibration

Calibration is an iterative process that involves adjusting model parameters until the simulation reasonably replicates driver behavior, traffic flow patterns, and field-measured data. A synopsis of the calibration process follows, with emphasis placed on identifying the key decisions and assumptions made in the refinement process to achieve the calibration targets outlined in Section 3.2.2.

3.2.1 Visual Checking and Error Correction

The visual checking and error correction process focused on addressing coding errors before the calibration process began. This process involved reviewing data inputs, VISSIM error reports, and model animations. Although performed primarily during model development, visual checking and error correction is still an important process that should be performed during calibration. When making changes to driver behavior or other model parameters, this step helps ensure unintended consequences in the model are minimized.

Data inputs included network geometry, traffic volumes, signal timing, and route choices, and were reviewed by the model developer as well as a quality control reviewer. VISSIM produces an error file after each simulation run. This can include vehicle removal, signal issues, end-of-link errors, and various others. Critical errors in the model were accounted for and corrected during this step. Visual checking of the animation was performed to check for abnormal driving behavior or irregular queuing within the network and to identify coding parameters subject to additional refinement.

3.2.2 Calibration Targets

The following model calibration targets were defined for this study:

- Hourly Volumes (model versus observed):
  - Simulated and measured turning movement volumes for more than 85 percent of links should be:
    - Within 100 vehicles per hour (vph) for volumes under 700 vph
    - Within 15 percent for volumes between 700 and 2,700 vph
    - Within 400 vph for volumes over 2,700 vph
  - Simulated and measured turning movement volumes for more than 85 percent of links to have a GEH statistic (explained in Section 3.2.3) value of less than 5.0
  - Sum of turning movement volumes within the calibration area to be within 5 percent
  - Sum of turning movement volumes to have a GEH statistic value of 5 or lower
- Visual Audits:
  - Check consistency with field conditions for the following:
    - Weaving maneuvers
    - Patterns and extent of queues at intersections and on congested links
    - Lane utilization/choice
    - Locations of bottlenecks
    - Modifications to look-back distances (which were made to specific links to better represent lane utilization/choice, or how vehicles behave approaching intersections or congested links)
- Vehicle Travel Times:
  - Simulated and measured travel times within 15 percent or 1 minute, whichever is greater

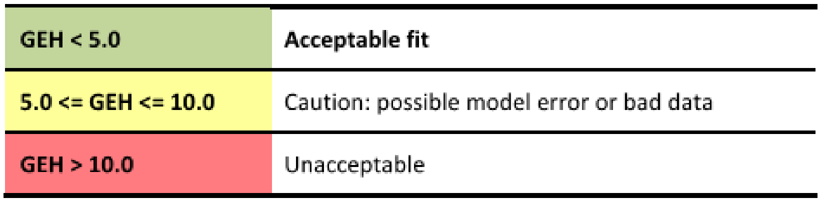
3.2.3 Volume Validation

The GEH statistic, named for the scientist who developed it (Geoffrey E. Havers) in London in the 1970s, is used in traffic model calibration by comparing expected or measured traffic volume with output from a model and is calculated using the following formula:

$$GEH = \sqrt{\frac{2(m-c)^2}{m+c}}$$

Notes:
m = output traffic volume from the simulation model (vph)
c = input traffic volume (vph)

The adequacy of GEH performance is scored using the following scale:



GEH < 5.0	**Acceptable fit**
5.0 <= GEH <= 10.0	Caution: possible model error or bad data
GEH > 10.0	Unacceptable

Using GEH instead of difference percentages allows for more consistent testing over a wider range of volumes. GEH is not linear and places less importance on links with low expected volumes while allowing for variation at high-volume locations where simulation models can be more difficult to calibrate. As indicated, GEH values of 5 to 10 could indicate that additional investigation and adjustment are warranted, and values over 10 indicate that the model is not sufficiently calibrated.

3.2.4 Calibration Parameters

Calibration parameters are based on the default "Urban Motorized" driver behavior built into the VISSIM software, with a few modifications based on suggestions from PTV and the simulation team's engineering judgment to better replicate existing conditions. The Knutson Farms EIS team updated a previous VISSIM model (confidential document, CH2M 2017) for the analysis documented in this report. The default speed distribution parameters in the model were adjusted in the previous study. Based on observations and calibration results, it was determined to maintain the previously adjusted speed distribution parameters.

In addition to the "Urban Motorized" car-following behavior described above, the lane-change parameter "waiting time before diffusion" was adjusted. The waiting time before diffusion was increased from 60 to 140 seconds. This was done to ensure that a vehicle waiting to make a lane change on a congested multi-lane link is not removed from the model due to the naturally longer waiting times inherent when longer signal cycle lengths are used.

Some of the intersections in the study area used adaptive signal timing. At these intersections, average splits and cycle lengths were provided to estimate the timing experience in the field. This was adjusted where necessary to account for the nature of adaptive signal timing to meet calibration targets.

These changes resulted in traffic conditions that were generally consistent with field-observed conditions.

3.2.5 Calibration Results

The results of the VISSIM calibration process were used to determine the simulation model's ability to replicate observed queue lengths, traffic volumes, and travel times. Calibration results are presented separately for each of these three measures.

Queue Length

Queue lengths can be a valuable calibration parameter if it is possible that the vehicle mix or driver behavior affects the average amount of space each vehicle takes up when it is stopped in queue at an intersection. For example, longer vehicles or more conservative driving behavior, in the form of leaving more empty space in front of one's own vehicle in this situation, could lead to turning lanes holding fewer vehicles and worse intersection performance than might otherwise be predicted by the simulation model.

Peak hour queue lengths at three specific locations were compared visually between (1) field conditions observed by Project team staff in person while existing count data were being collected for this Project and (2) a simulation model run from each peak hour. This comparison provides additional information regarding the accuracy of the simulation model at replicating field conditions. These locations were:

1. NB at E Main Avenue and SR 410 WB ramps
2. WB and NB at E Main Avenue and Shaw Road E
3. NB and SB at E Pioneer Avenue and Shaw Road E

Table 6 shows these field-observed queue extents on a lane-specific basis. Field observed queue lengths are equivalent to 95th percentile queue lengths. All queue extents indicated in the simulation examined for these areas were generally consistent with observations of existing field conditions.

Table 6. Field Observed (Simulated) Queue Extents (in feet) at Selected Locations

Int. #3	E Main Avenue & SR 410 WB Ramps						
	Northbound						
Peak	**Left**	**Thru**	**Right**				
AM	257 (302)	139 (251)	257 (251)				
PM	199 (227)	96 (184)	171 (184)				
Int. #6	**E Main Avenue & Shaw Road E**						
	Westbound			**Northbound**			
Peak	**Left**	**Left**	**Thru**	**Left**	**Right**	**Right**	
AM	64 (77)	119 (77)	110 (66)	105 (85)	108 (160)	92 (160)	
PM	234 (249)	180 (249)	248 (240)	132 (97)	78 (86)	47 (86)	
Int. #19	**E Pioneer Avenue & Shaw Road E**						
	Southbound			**Northbound**			
Peak	**Left**	**Left**	**Thru/Right**	**Left**	**Left**	**Thru**	**Thru/Right**
AM	90 (41)	32 (41)	116 (107)	64 (79)	84 (79)	390 (236)	195 (282)
PM	47 (94)	244 (392)	223 (392)	64 (79)	72 (79)	154 (125)	180 (271)

Source: IDAX Data Solutions, field observed August 3, 2021

Traffic Volume

Table 7 and Table 8 provide a comparison of the AM and PM peak hour modeled traffic volumes and balanced existing volumes for all movements at each intersection. Model volumes were examined for all intersection turn movements using VISSIM's "node evaluation" feature. As shown below, the AM and PM peak hour traffic volumes, as measured in the VISSIM simulation models, correlate well with the balanced volumes obtained in the field, with a calculated GEH of less than 2.5 for all movements. These GEH results are all well within the acceptable range of 0 to 5. These results indicate that the volumes in the VISSIM models are a good representation of the existing traffic counts, and the VISSIM models are calibrated for volume.

Table 7. Volume Calibration Summary, AM Peak Hour

Intersection	**Volume**		**GEH**	**Difference**		**Acceptable Volume Difference**	**Calibrated?**	
	Observed	**Simulated**		**vph**	**%**		**vph**	**GEH**
Traffic Ave/Fryar Ave & Main St/Cannery Wy	1,669	1,646	0.6	-23	-1.4	+/- 15%	Yes	Yes
Traffic Ave & State St	1,347	1,319	0.8	-28	-2.1	+/- 15%	Yes	Yes
E Main Ave & SR 410 WB/ Thompson St	1,983	1,955	0.6	-28	-1.4	+/- 15%	Yes	Yes
E Main Ave & SR 410 EB	1,949	1,910	0.9	-39	-2.0	+/- 15%	Yes	Yes
E Main Ave & 5th Ave NE	1,575	1,523	1.3	-52	-3.3	+/- 15%	Yes	Yes
E Main Ave & Shaw Rd E	1,740	1,671	1.7	-69	-4.0	+/- 15%	Yes	Yes
E Main Ave & 15th St SE	873	825	1.6	-48	-5.5	+/- 15%	Yes	Yes
E Main Ave & 5th St SE	787	757	1.1	-30	-3.8	+/- 15%	Yes	Yes
E Main Ave/W Stewart Ave & 2nd St NE	1,316	1,294	0.6	-22	-1.7	+/- 15%	Yes	Yes
N Meridian Ave & SR 167 EB	3,097	3,053	0.8	-44	-1.4	+/- 400 vph	Yes	Yes
N Meridian Ave & SR 167 WB	2,679	2,670	0.2	-9	-0.3	+/- 15%	Yes	Yes
N Meridian Ave & Valley Ave NE	3,088	3,073	0.3	-15	-0.5	+/- 400 vph	Yes	Yes
E Pioneer Ave & SR 512 WB ramps	959	934	0.8	-25	-2.6	+/- 15%	Yes	Yes
E Pioneer Ave & SR 512 EB ramps	1,107	1072	1.1	-35	-3.2	+/- 15%	Yes	Yes
E Pioneer Ave & 13th St SE	1,013	977	1.1	-36	-3.6	+/- 15%	Yes	Yes
E Pioneer Ave & 15th St SE	1,078	1,037	1.3	-41	-3.8	+/- 15%	Yes	Yes
E Pioneer Ave & 21st St SE	915	873	1.4	-42	-4.6	+/- 15%	Yes	Yes
E Pioneer Ave & 25th St SE	831	841	0.3	10	1.2	+/- 15%	Yes	Yes
E Pioneer Ave & Shaw Rd E	1,941	1,854	2.0	-87	-4.5	+/- 15%	Yes	Yes
E Pioneer Ave & 33rd St SE	592	568	1.0	-24	-4.1	+/- 100 vph	Yes	Yes
33rd St SE & 8th Ave SE	119	105	1.3	-14	-11.8	+/- 100 vph	Yes	Yes
Shaw Rd E & Highlands Blvd	1,193	1,136	1.7	-57	-4.8	+/- 15%	Yes	Yes
Shaw Rd E & 16th Ave SE	1,119	1,064	1.7	-55	-4.9	+/- 15%	Yes	Yes
Shaw Rd E & 23rd Ave SE/Crystal Ridge Dr SE	1,217	1,170	1.4	-47	-3.9	+/- 15%	Yes	Yes

Intersection	Volume		GEH	Difference		Acceptable Volume Difference	Calibrated?	
	Observed	Simulated		vph	%		vph	GEH
Shaw Rd E & Forest Green Blvd	1,059	1,026	1.0	-33	-3.1	+/- 15%	Yes	Yes
Shaw Rd E & Manorwood Dr	1,052	1,023	0.9	-29	-2.8	+/- 15%	Yes	Yes
Shaw Rd E & 39th Ave SE	1,497	1,479	0.5	-18	-1.2	+/- 15%	Yes	Yes
Shaw Rd E & 5th Ave SE	1,257	1,201	1.6	-56	-4.5	+/- 15%	Yes	Yes
33rd St SE & 5th Ave SE	19	16	0.7	-3	-15.8	+/- 100 vph	Yes	Yes
Shaw Rd E & Safeway Driveway	1,428	1,366	1.7	-62	-4.3	+/- 15%	Yes	Yes
80th St & Warehouse Driveway	102	90	1.2	-12	-11.8	+/- 100 vph	Yes	Yes
E Pioneer & SR 162	1,231	1,203	0.8	-28	-2.3	+/- 15%	Yes	Yes
80th St & SR 162	955	935	0.7	-20	-2.1	+/- 15%	Yes	Yes
SR 162 & SR 410 EB	1,260	1,232	0.8	-28	-2.2	+/- 15%	Yes	Yes
SR 162 & SR 410 WB	1,242	1,217	0.7	-25	-2.0	+/- 15%	Yes	Yes

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; St = Street; Wy = Way

Table 8. Volume Calibration Summary, PM Peak Hour

Intersection	Volume			Difference		Acceptable	Calibrated?	
	Observed	Simulated	GEH	vph	%	Volume Difference	vph	GEH
Traffic Ave/Fryar Ave & Main St/Cannery Wy	2,283	2,237	1.0	-46	-2.0	+/- 15%	Yes	Yes
Traffic Ave & State St	1,566	1,537	0.7	-29	-1.9	+/- 15%	Yes	Yes
E Main Ave & SR 410 WB/ Thompson St	2,666	2,583	1.6	-83	-3.1	+/- 15%	Yes	Yes
E Main Ave & SR 410 EB	2,849	2,764	1.6	-85	-3.0	+/- 400 vph	Yes	Yes
E Main Ave & 5th Ave NE	2,572	2,485	1.7	-87	-3.4	+/- 15%	Yes	Yes
E Main Ave & Shaw Rd E	2,815	2,714	1.9	-101	-3.6	+/- 400 vph	Yes	Yes
E Main Ave & 15th St SE	1,578	1,521	1.4	-57	-3.6	+/- 15%	Yes	Yes
E Main Ave & 5th St SE	1,322	1,286	1.0	-36	-2.7	+/- 15%	Yes	Yes
E Main Ave/W Stewart Ave & 2nd St NE	1,609	1,576	0.8	-33	-2.1	+/- 15%	Yes	Yes
N Meridian Ave & SR 167 EB	4,157	4,299	2.2	142	3.4	+/- 400 vph	Yes	Yes
N Meridian Ave & SR 167 WB	2,841	2,974	2.5	133	4.7	+/- 400 vph	Yes	Yes
N Meridian Ave & Valley Ave NE	3,360	3,565	3.5	205	6.1	+/- 400 vph	Yes	Yes
E Pioneer Ave & SR 512 WB ramps	1,482	1,433	1.3	-49	-3.3	+/- 15%	Yes	Yes
E Pioneer Ave & SR 512 EB ramps	1,660	1,600	1.5	-60	-3.6	+/- 15%	Yes	Yes

Intersection	Volume			Difference		Acceptable	Calibrated?	
	Observed	Simulated	GEH	vph	%	Volume Difference	vph	GEH
E Pioneer Ave & 13th St SE	1,612	1,550	1.6	-62	-3.8	+/- 15%	Yes	Yes
E Pioneer Ave & 15th St SE	1,752	1,698	1.3	-54	-3.1	+/- 15%	Yes	Yes
E Pioneer Ave & 21st St SE	1,449	1,400	1.3	-49	-3.4	+/- 15%	Yes	Yes
E Pioneer Ave & 25th St SE	1,408	1,368	1.1	-40	-2.8	+/- 15%	Yes	Yes
E Pioneer Ave & Shaw Rd E	3,245	3,065	3.2	-180	-5.5	+/- 400 vph	Yes	Yes
E Pioneer Ave & 33rd St SE	1,035	994	1.3	-41	-4.0	+/- 15%	Yes	Yes
33rd St SE & 8th Ave SE	260	248	0.8	-12	-4.6	+/- 100 vph	Yes	Yes
Shaw Rd E & Highlands Blvd	1,779	1,721	1.4	-58	-3.3	+/- 15%	Yes	Yes
Shaw Rd E & 16th Ave SE	1,670	1,606	1.6	-64	-3.8	+/- 15%	Yes	Yes
Shaw Rd E & 23rd Ave SE/ Crystal Ridge Dr SE	1,844	1,768	1.8	-76	-4.1	+/- 15%	Yes	Yes
Shaw Rd E & Forest Green Blvd	1,536	1,476	1.5	-60	-3.9	+/- 15%	Yes	Yes
Shaw Rd E & Manorwood Dr	1,501	1,443	1.5	-58	-3.9	+/- 15%	Yes	Yes
Shaw Rd E & 39th Ave SE	2,185	2,125	1.3	-60	-2.7	+/- 15%	Yes	Yes

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; St = Street; Wy = Way

All peak hour intersection volumes indicated in the simulation were consistent with field-counted volumes.

Travel Time

Travel times for two corridors were provided by the traffic data collection vendor. These corridors were:

1. East Pioneer from 7th Street SE to 33rd Street SE
2. From Traffic Avenue and State Street to Shaw Road and 39th Street

Note that these are not the same as the safety and pavement analysis corridors indicated previously. Travel time measurements were recorded from the VISSIM model runs and compared to travel times experienced in the field. Table 9 shows the results of this comparison.

Table 9. Travel Time Calibration

Travel Time Segment and Direction	Travel Time		Difference		Acceptable Difference	Calibrated?
	Observed	VISSIM	Minutes	%		
AM Peak Hour						
E Pioneer Ave, 7th St to 33rd St EB	3.80	4.17	0.37	9.8	± 15% or 1 min	Yes
E Pioneer Ave, 33rd St to 7th St WB	4.47	4.20	-0.27	5.9	± 15% or 1 min	Yes
Shaw Rd/39th Ave to Main Ave/State St NB	4.13	4.33	0.20	4.9	± 15% or 1 min	Yes
Traffic Ave/State St to Shaw Rd/39th Ave SB	4.85	4.26	-0.59	12.2	± 15% or 1 min	Yes

Travel Time Segment and Direction	Travel Time		Difference		Acceptable Difference	Calibrated?
	Observed	VISSIM	Minutes	%		
PM Peak Hour						
E Pioneer Ave, 7th St to 33rd St EB	5.00	5.00	0.00	0.0	± 15% or 1 min	Yes
E Pioneer Ave, 33rd St to 7th St WB	5.75	5.07	-0.68	11.7	± 15% or 1 min	Yes
Shaw Rd/39th Ave to Main Ave/State St NB	5.97	6.02	0.05	0.8	± 15% or 1 min	Yes
Traffic Ave/State St to Shaw Rd/39th Ave SB	9.30	7.92	-1.38	14.9	± 15% or 1 min	Yes

Notes: Ave = Avenue; Rd = Road; St = Street

All travel times indicated in the simulation were consistent with measurements of existing field travel times.

3.3 Measures of Effectiveness for Scenario Comparisons

The VISSIM simulation model measures vehicle travel characteristics that are consistent with the way people determine how effectively the transportation system is working. The differences between the traffic measures of effectiveness (MOEs) from the “No Action” simulation, and those from the simulations of Project action scenarios form the basis for determining the scenarios’ traffic impacts. The MOEs employed for this analysis were vehicle delay, LOS, 50th- and 95th-percentile queue length, travel time, and volume-to-capacity (v/c) ratio. Note that LOS is assigned directly from vehicle delay.

3.3.1 Intersection Delay and LOS

After the simulation and post-processing, the average of the delays experienced by all vehicles at each intersection (due to red light, stop sign, or other control feature) is determined, and each of these average delays is assigned a letter grade referred to as LOS, ranging from LOS A (best) to LOS F (worst). The grading scale for LOS is based on the guidelines from the HCM, published by the Transportation Research Board (TRB; 2016). Table 10 shows the HCM peak hour delay thresholds for signalized and unsignalized intersections.

Table 10. Delay Thresholds for Intersection LOS

LOS	Description	Average Delay Range (seconds/vehicle)	
		Signalized	Unsignalized
A	No congestion; nearly all drivers experience little to no delay	0 to 10.0	0 to 10.0
B	No congestion; most drivers experience little to no delay	10.1 to 20.0	10.1 to 15.0
C	Light congestion; most drivers experience minor delay	20.1 to 35.0	15.1 to 25.0
D	Moderate congestion; individual movements with high delay	35.1 to 55.0	25.1 to 35.0
E	Heavy congestion, with high delays on multiple movements	55.1 to 80.0	35.1 to 50.0
F	Extensive delays due to cycle failures at signals or sparse opportunities to make desired movements at unsignalized intersections	80.1 or more	50.1 or more

Source: TRB 2016

The HCM delay thresholds are used to assign LOS to the VISSIM delay results, but it should be noted that the method of measuring intersection vehicle delays in VISSIM is slightly different from the HCM method. With the HCM method, intersection delays are calculated based on traffic volume and the effects of traffic control devices (e.g., signals, stop signs; TRB 2016), whereas VISSIM directly measures the simulated total delay, which consists of control delay, delay due specifically to the presence of other vehicles, and other delay incurred in the vicinity of the traffic control device. In most cases, the differences between total delay and control delay are often considered negligible. While the TRB does not endorse any specific software model to estimate intersection delay, the same LOS thresholds are commonly applied in both cases.

In most communities, LOS D is considered the worst acceptable condition for peak hour intersection traffic operations. LOS E is often characterized by unstable flow and high delays for lower-volume movements, and can result in individual drivers choosing to change their travel patterns to avoid congested intersections. At LOS F, congestion is severe enough that the calculation of intersection delay using the HCM methodology breaks down, and very high delay results are not necessarily considered valid. For example, a delay estimate or measurement of 450 seconds for one scenario and 500 seconds for another might not lead to a reliable conclusion that the former intersection can be expected to perform “better” than the latter. For this reason, intersection delay estimates over 300 seconds per vehicle are truncated to “300+” for this study.

The City of Puyallup Comprehensive Plan contains the following policies regarding LOS:

> *“The City’s existing level of service policy sets the following standards for its roadways:*
>
> - *Volume to capacity (V/C) ratio of 0.85 for arterial and collector segments in the PM peak hour (page 7.21 and map figure 7-7, City of Puyallup Transportation Element, 2015).*
>
> *T- 3.2 Develop a transportation system that achieves the following levels of service metrics:*
>
> - *Vehicular LOS: Maintain standards that promote growth where appropriate while preserving and maintaining the existing transportation system. Set LOS D as the standard for PM peak hour intersection performance, with the exception of the Meridian, Shaw Road, and 9th Street SW corridors, where LOS E operations will be considered acceptable during PM period in recognition of the need to balance driver experience with other considerations, such as cost, right of way, and other modes.*
> - *Pedestrian LOS: Provision of sidewalks, trails, and/or separated paths will be prioritized within pedestrian priority areas, as defined in Puyallup Moves.*
> - *Bicycle LOS: Provision of bike lanes, separated paths, protected facilities, and bicycle boulevards, as defined in Puyallup Moves.*
> - *Transit LOS: Partner with Pierce Transit, Sound Transit, and other transit operators to provide transit stop amenities and safe access to transit at major transit stops and park and ride facilities.*

> *T- 3.3 Improve the transportation system concurrently with increasing demands due to growth.*
>
> a. *Track transportation concurrency to ensure that infrastructure can accommodate growth and maintain level of service standards.*
> b. *Require developers to perform a transportation impact analysis, at the discretion of the City Engineer, to demonstrate the effect of significant additional travel demand from their projects on the transportation network. In the event the analysis shows that the project would impact the level of service in the affected area, new development is responsible for improvements to the transportation system. If the existing vehicle level of service is below the standard, the developer shall mitigate impacts to the pre-developed level of service condition plus an allowable increase in delay of up to 15%.*

As indicated by City policy, the standard of acceptability for v/c on arterial and collector PM peak hour corridor segments is 0.85, and intersection LOS (D or better) is applied for PM peak hour conditions. Three corridors are subject to a lower standard (LOS E or better), and one of those, Shaw Road, is within the Knutson Farms study area. The analysis documented here applies that standard to AM peak hour operations as well. The SR 410 ramp terminal intersections in this study are under WSDOT jurisdiction and were subject to a LOS D standard for both peak hours.

3.3.2 Queue Lengths at Intersections

Queue estimates from VISSIM's node evaluation function were compiled for all turning movements modeled at the study area intersections. This function was used to tabulate the queue extent during each time step during the peak hour, and the calculated 95th-percentile value for the hour was reported.

3.3.3 Travel Time

Travel time measurements over multiple roadway segments were coded in VISSIM, and times were measured during each simulation run to capture overall vehicle performance at the corridor level. The travel time segments originally used during calibration were expanded somewhat for reporting purposes. As shown in Figure 7, travel times are reported for each scenario for the following segments:

1. E Pioneer Avenue from 7th Street SE to 33rd Street SE
2. Shaw Road E from 39th Street SE to E Main Avenue
3. E Main Avenue from Shaw Road to Cannery Way (Sumner)

Because the City's Comprehensive Plan does not mention travel time measurements or standards, these results are presented here only as an additional method of interpreting and assessing the impacts of traffic congestion as a result of the Project impacts.

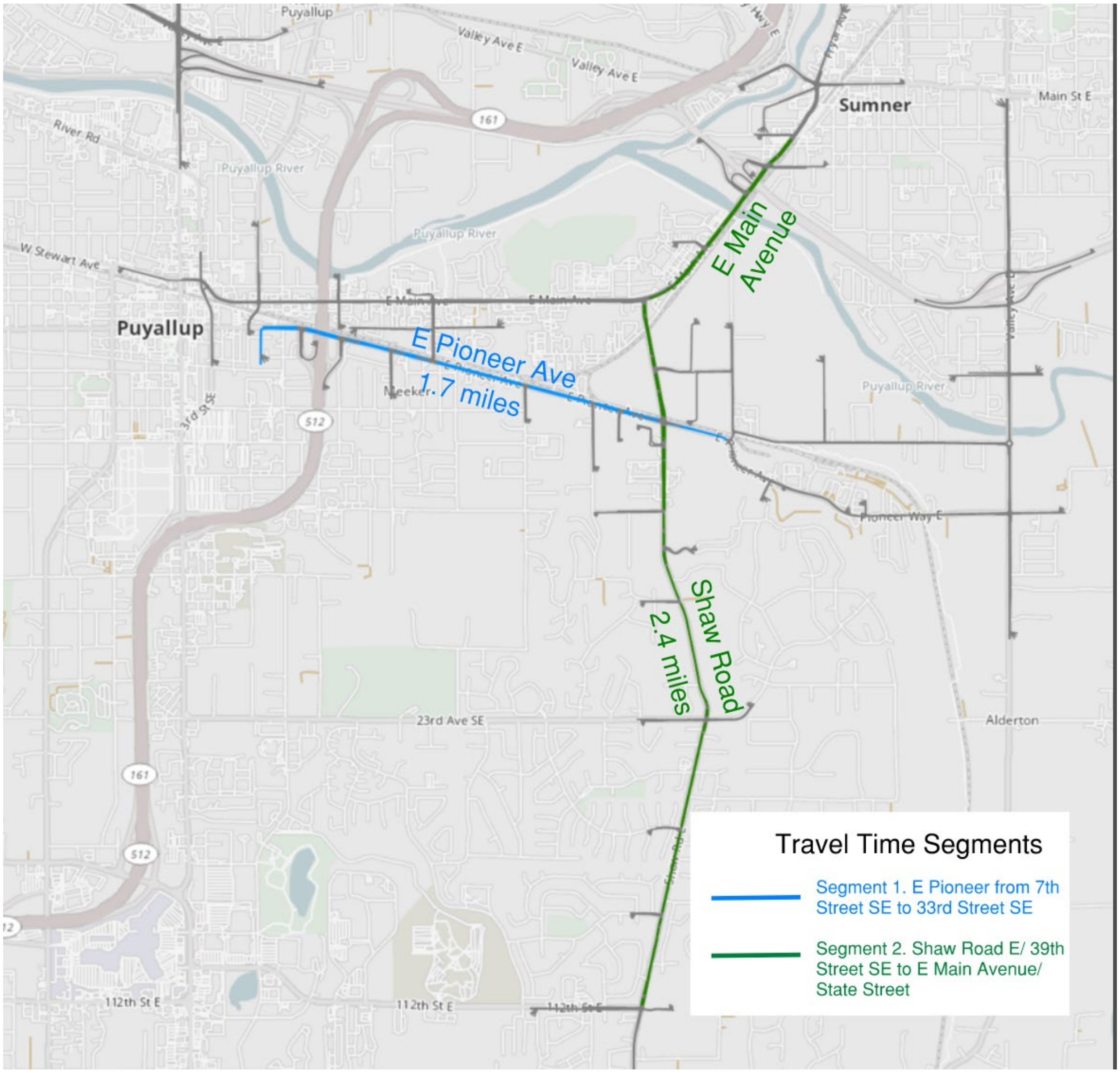


Figure 7. Reported Travel Time Segments

3.3.4 Segmental v/c Ratio

The v/c ratio LOS standard for the City is 0.85 (City of Puyallup Transportation Element 2015: page 7.21 and map figure 7-7). While not typically applied at the development project scale, v/c is applied to the Project given its far-reaching study area of impact and extensive impacts to the City’s transportation network. The v/c ratio along segments within the Project area are used to compare the No Action Scenario with the build scenarios and the mitigated build scenarios. The v/c ratio identifies the capacity constraints along the corridor and how the traffic generated by the Proposed Action further impacts the corridor capacity within the Project area. The proportional difference between the No Action Scenario and Scenarios A and D would be used to determine additional proportional mitigation required to address the reduction in corridor capacity caused by the traffic generated by the applicant. Section 4.1.4

provides existing capacity and v/c ratio for each segment below. Figure 8 show segments with reported v/c ratios, including:

1. E Main Avenue – Shaw Road E to 5th Avenue NE
2. E Main Avenue – 5th Avenue NE to SR 410
3. E Main Avenue – 23rd St to Shaw Road E
4. Shaw Road E – E Main Avenue to 5th Avenue SE
5. E Pioneer – 21st Street SE to 25th Street SE
6. E Pioneer – Shaw Road E to SR 162
7. SR 162 – 143rd Avenue E to 80th Street E
8. SR 162 – SR 410 to 143rd Avenue E
9. Shaw Road E – 12th Avenue SE to 16th Avenue SE
10. Shaw Road E – 16th Avenue SE to 23rd Avenue SE
11. Shaw Road E – 23rd Avenue SE to 39th Avenue SE

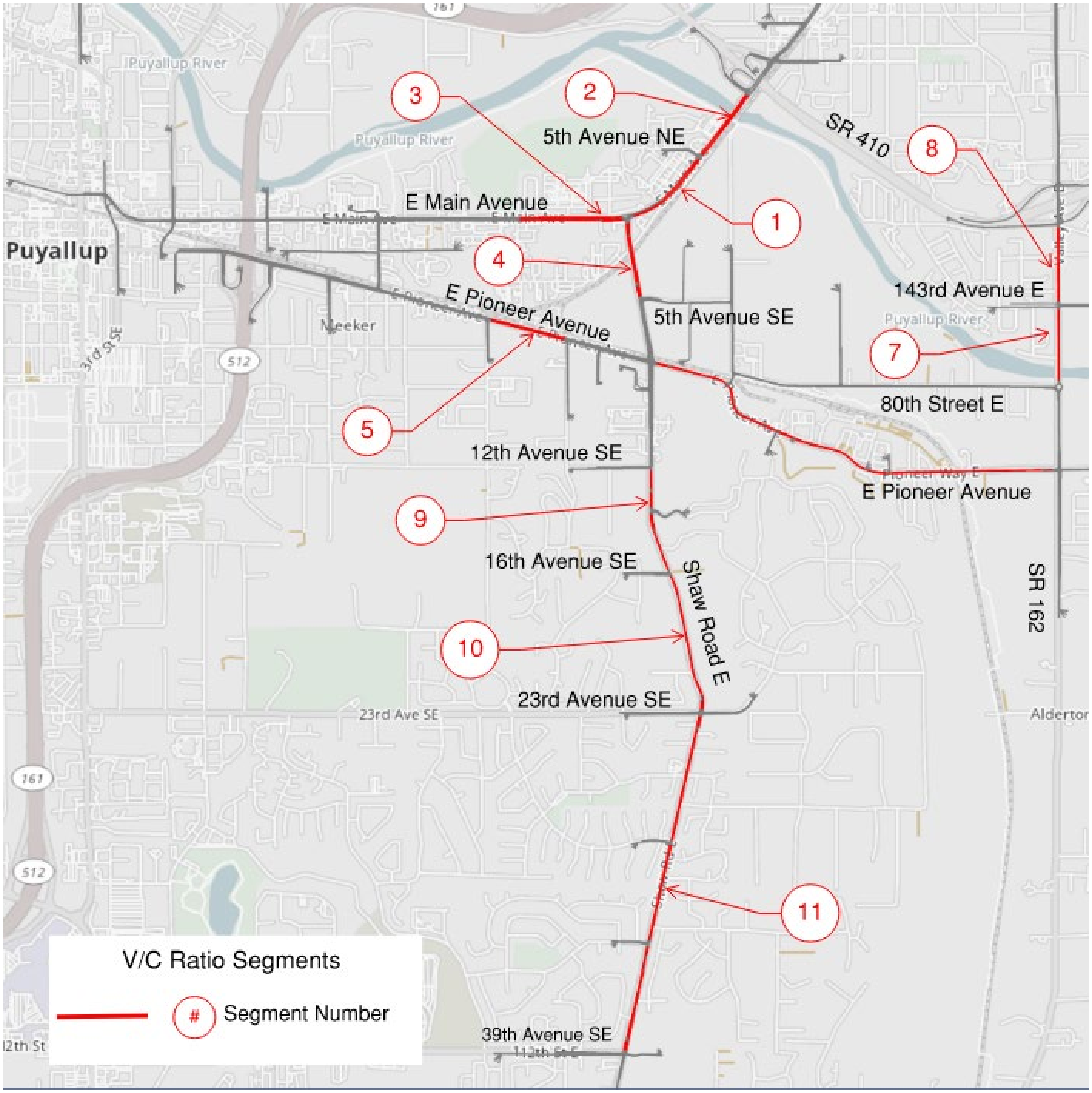


Figure 8. Reported v/c Ratio Segments

3.4 Background Traffic Growth

Overall traffic volumes were grown from the existing counts collected in 2021 for the AM peak period and the 2022 traffic counts from the East Town Crossing traffic impact study (see Section 1.3) to the scenario comparison year of 2026 using an annual average growth rate. The traffic analysis team arrived at a consensus growth rate by considering similar traffic impact studies conducted within the area since 2017, in addition to the growth rate assumed for the SR 410/Traffic Avenue Interchange improvement project. Table 11 shows the previous studies and their growth rates that were used to derive the applied average growth rate used in the analysis documented in this report.

Table 11. Background Traffic Growth in Previous Studies

Date	Project	Annual Growth Rate (%)
February 2017	Viking Warehouse	3
March 2017	SR 410/Traffic Avenue Interchange Improvements	1.6[a]
March 2017	Pioneer Crossing	3
December 2017	Van Lierop Park	1
June 2018	Shaw Road Subarea	1
February 2020	Puyallup Corporate Center	3
December 2020	East Town Crossing [not approved]	1

[a] WSDOT used different annual growth rates for the AM (1.73%) and PM (1.46%) peak hours. The rate shown here is the average of those rates.

The average of the annual growth rates shown in Table 11 is 1.94 percent. As a result of this comparison, an annual background traffic growth rate of 2 percent per year linearly has been applied for this study. In addition to this annual growth, trips generated by the following specific large projects were added to background traffic:

1. East Town Crossing
2. Prologis Park Edgewood
3. Puyallup Corporate Center
4. Fitness Quest (previously known as the “Regional Wrestling Center”)
5. Shaw Heights
6. ST Sumner Parking Garage

3.5 Crash Analysis

Crash data for 31 of the 35 study intersections (those that existed since 2015) and three study corridors indicated in the introduction to this report were collected for the 7 complete years 2015 through 2021. WSDOT crash data includes police-reported vehicle crashes. These data were examined with respect to type, severity, and year, both in terms of raw crash counts and, in the case of intersections, the volume-weighted crash rate. Rates were not examined for the corridor crashes because crashes that occur within the influence area of an intersection are not counted in the “corridor” total. Crashes in the “corridor” totals are those that occur between the study intersections. Note that the three corridors were selected for their relevance to the proposed Project, not as a sampling to represent the City of Puyallup.

3.6 Pavement Analysis

Because the Project would increase truck traffic on public streets near the site which is anticipated to have impacts to existing pavement. Pavement was analyzed to determine the potential impact of trucks on remaining pavement service life. Specifically, HWA GeoSciences Inc. (HWA) performed an investigation of the existing pavement on the designated truck routes within the project vicinity: E Main Avenue, Shaw Road E, and E Pioneer Avenue. The investigation included drilling and retrieving pavement cores as well as falling weight deflectometer (FWD) testing. Pavement cores were performed at 28 locations along the three subject roadways. Existing asphaltic concrete (AC) pavement cores were retrieved, and the depth of crushed (aggregate) base was measured at each location. The FWD is a nondestructive test that is used to evaluate pavement component layer stiffness of existing pavement as well as condition and resilience of the subgrade material. The test simulates pavement loading by applying an impulse load to the pavement surface and measuring the pavement response by a series of sensors linearly spaced away from the loading plate. HWA used the FWD results to estimate the subgrade resilient modulus and the existing structural number using two different software programs.

In order to estimate the traffic loading on the existing pavement, the traffic volumes were converted into Equivalent Single-Axle Loads (ESALs). An ESAL is defined as equivalent to a single axle with dual wheels and a load of 18 kips (one kip, or kilopound, is equal to 1,000 pounds). The FHWA official Vehicle Classification set (FHWA 2014) is used in calculating ESALs for pavement design and is shown in Figure 9.

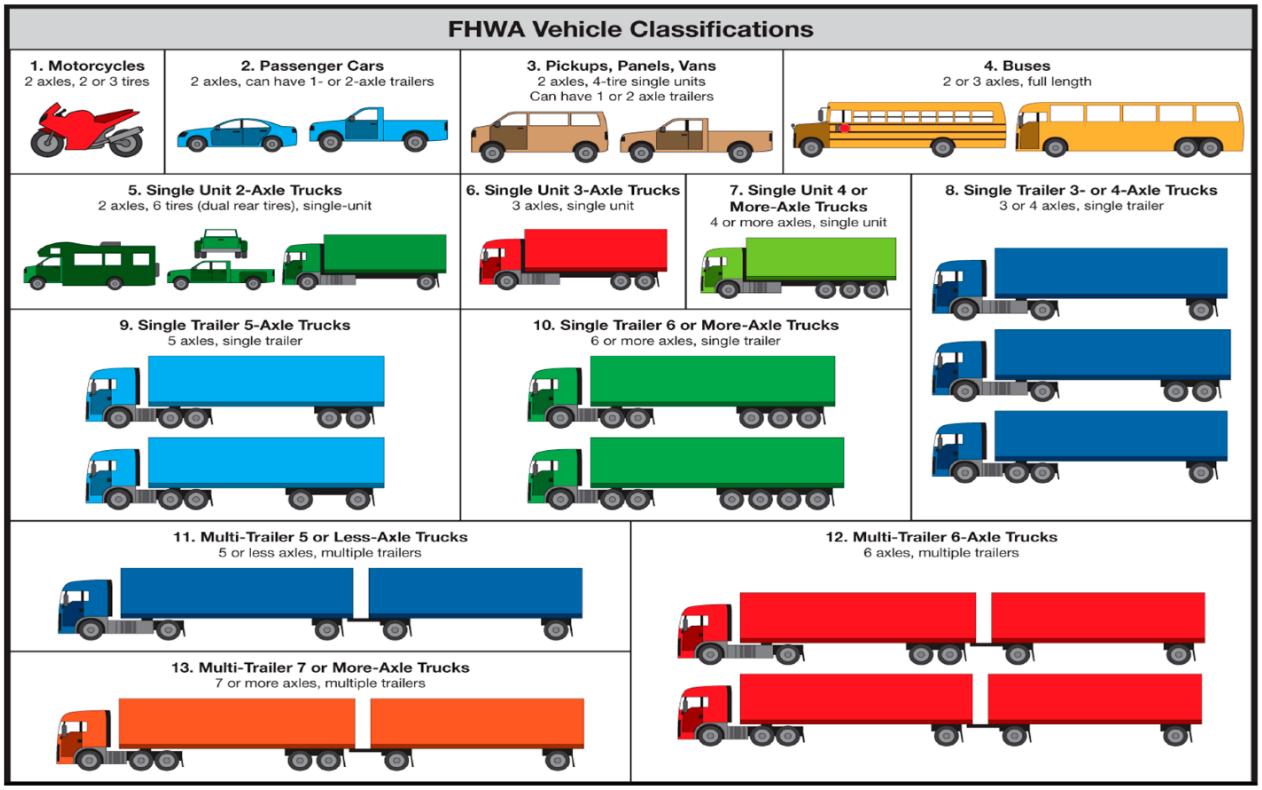


Figure 9. FHWA Vehicle Classifications

The traffic was grouped by IDAX into four vehicle groups (Class 1 through Class 4) that reflect groupings of the 13 FHWA Vehicle Classifications as follows:

- Class 1 (motorcycle, car, van, pickup) = FHWA Vehicle Classifications 1 through 3
- Class 2 (single-unit truck) = FHWA Vehicle Classifications 4 through 7
- Class 3 (double-unit truck) = FHWA Vehicle Classifications 8 through 10
- Class 4 (triple-unit truck) = FHWA Vehicle Classifications 11 through 13

The existing average daily traffic was estimated for each of the three pavement assessment sites as shown in Table 12.

Table 12. Existing Average Daily Traffic by Class

Location	Class				
	1	2	3	4	Total
Shaw Road E, north of E Pioneer Avenue	19,209	2,252	207	65	21,733
E Pioneer Avenue, east of 13th Street SE	15,373	1,200	164	58	16,795
E Main Avenue, north of 5th Avenue NE	24,175	3,237	289	67	27,768

The use of truck data and these conversion factors is important because comprehensive research has indicated that pavement damage from trucks is exponentially greater than from passenger cars. The ESALs for each class of traffic were estimated using the WSDOT simplified load factors shown in Table 13.

Table 13. WSDOT Pavement Load Factors by Class

Class	FHWA Vehicle Classifications	Pavement Load Factor
1	1, 2, and 3	0.0008
2	4, 5, 6, and 7	0.40
3	8, 9, and 10	1.00
4	11, 12, and 13	1.75

Traffic volumes at the three locations were grown and factors were applied for ESAL estimates. The change in ESAL from Scenario A was then evaluated for the potential to change the expected lifespan of the roadway (i.e., remaining service life). The results of this analysis are shown in Section 6.0. See Attachment B for the complete Pavement Analysis.

4.0 TRAFFIC SIMULATION RESULTS

The traffic simulation results across all scenarios are tabulated together in this section. The measures of effectiveness include LOS, delay, queue lengths, travel times, and v/c ratio.

LOS is based on the HCM and uses average delay in seconds at an intersection. For signalized intersections, the average delay of all approaches is used to determine LOS. For unsignalized intersections, the greatest average delay of the stop-controlled movements is used to determine LOS. The LOS thresholds are dependent on intersection control type, ranging between LOS A and LOS F. The LOS thresholds for signalized and unsignalized intersections were shown previously in Table 10.

Jurisdictional ownership of intersections varies between WSDOT, Pierce County, Sumner, and Puyallup within the Project study area; most of the affected intersections within the study area are City of Puyallup owned and managed. Jurisdictional owners may have different LOS standards. For this Project, the City of Puyallup LOS standard is LOS E or better at intersections on the Meridian Avenue and Shaw Road corridors, and LOS D or better at all others. A standard of LOS D or better was applied for intersections outside Puyallup’s jurisdiction. LOS and average delay results for each scenario are provided in the subsections below, and intersections that exceed the LOS standard are indicated with red text.

Queue length indicates operational issues such as lane blockage. The 95th percentile queue, which represents the measured queue length that is not exceeded during 95 percent of the signal cycles, which is typically the storage length that turn lanes are designed to provide. The 50th percentile queue represents the average queue length during the peak hour. When queue lengths become extensive and spillback to an adjacent intersection, the capacity impacts are no longer localized to a single intersection and congestion will extend along a corridor or throughout the network.

Travel time is used to understand how future congestion would affect certain origin-destination pairs. Travel time provides a good indication of whether a transportation network is over capacity where congestion cripples the ability to progress traffic through the corridor.

A v/c ratio less than 0.85 is Puyallup’s performance indicator. A v/c ratio of 1.0 is representative of a corridor at capacity. A v/c ratio that exceeds 1.0 is operating over capacity and would result in a degradation of MOEs described above. The v/c ratio would be used to estimate the proportion of corridor-wide mitigation improvements, such as widening of Shaw Road E, triggered by the volume generated by the applicant. The proportional ratio is calculated by taking the difference in v/c between the No Action Scenario and Scenario A, and dividing it by the No Action v/c. A second proportional ratio would be calculated for Scenario D.

Although each MOE is a useful metric independently, it is important to consider them together to gain a thorough understanding of how the transportation system is functioning. Results for each scenario are provided below along with a comparison of each MOE for all the scenarios.

4.1 Existing

4.1.1 LOS and Delay

For both the AM and PM peak periods, all intersections provide acceptable LOS and meet the LOS standards for the existing condition (see Table 14 and Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; sec = second; St = Street

Table 15).

Table 14. AM Peak Hour Intersection LOS and Delay – Existing 2021

Intersection Location	**Jurisdiction Control**	**Intersection Control**	**LOS Standard**	**Existing**	
				Delay (sec)	**LOS**
1. Traffic Ave & Cannery Way	Sumner	Signal	D	45.7	D
2. Traffic Ave & State St	Sumner	Signal	D	16.2	B
3. E Main Ave & SR 410 WB	WSDOT	Signal	D	19.9	B
4. E Main Ave & SR 410 EB	WSDOT	Signal	D	23.9	C
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	D	7.3	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	E	14.6	B
7. E Main Ave & 15th St SE	Puyallup	Signal	D	8.3	A
8. E Main Ave & 5th St SE	Puyallup	Signal	D	10.7	B
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	D	15.0	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	D	31.4	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	D	21.4	C
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	E	26.6	C
13. E Pioneer Ave & SR 512 WB ramps	WSDOT	Signal	D	20.5	C
14. E Pioneer Ave & SR 512 EB ramps	WSDOT	Signal	D	11.4	B
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	D	10.0	B
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	D	5.8	A
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	D	7.4	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	D	15.0	C
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	E	42.9	D
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	D	8.9	A
21. 33rd St SE & 8th Ave SE	Puyallup	Unsignalized	D	9.3	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	E	27.1	D
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	E	26.0	D
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	E	21.5	C
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	E	12.7	B
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	E	11.7	B
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	E	16.0	B
28. Shaw Rd E & 5th Ave SE	Puyallup	Unsignalized	E	15.0	B
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	D	0.7	A
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	E	13.4	B
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	D	5.9	A

Intersection Location	Jurisdiction Control	Intersection Control	LOS Standard	Existing	
				Delay (sec)	LOS
32. SR 162 & W Pioneer Ave	WSDOT	Signal	D	24.0	C
33. SR 162 & 80th St	WSDOT	Unsignalized	D	12.3	B
34. SR 162 & SR 410 EB	WSDOT	Signal	D	21.3	C
35. SR 162 & SR 410 WB	WSDOT	Signal	D	18.0	B

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; sec = second; St = Street

Table 15. PM Peak Hour Intersection LOS and Delay – Existing 2022

Intersection Location	Jurisdiction Control	Intersection Control	LOS Standard	Existing	
				Delay (sec)	LOS
1. Traffic Ave & Cannery Way	Sumner	Signal	D	37.7	D
2. Traffic Ave & State St	Sumner	Signal	D	2.9	A
3. E Main Ave & SR 410 WB	WSDOT	Signal	D	28.6	C
4. E Main Ave & SR 410 EB	WSDOT	Signal	D	17.3	B
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	D	7.3	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	E	16.6	B
7. E Main Ave & 15th St SE	Puyallup	Signal	D	9.3	A
8. E Main Ave & 5th St SE	Puyallup	Signal	D	13.9	B
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	D	9.8	A
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	D	24.3	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	D	9.7	A
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	E	49.0	D
13. E Pioneer Ave & SR 512 WB ramps	WSDOT	Signal	D	23.7	C
14. E Pioneer Ave & SR 512 EB ramps	WSDOT	Signal	D	8.9	A
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	D	10.3	B
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	D	10.7	B
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	D	9.3	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	D	16.2	C
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	E	38.9	D
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	D	9.2	A
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	D	7.4	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	E	19.9	C
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	E	25.7	D
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	E	24.5	C
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	E	15.4	C
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	E	15.4	C
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	E	32.6	C
28. Shaw Rd E & 5th Ave SE	Puyallup	Unsignalized	E	1.1	A
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	D	0.1	A
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	E	11.4	B
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	D	1.3	A

Intersection Location	Jurisdiction Control	Intersection Control	LOS Standard	Existing	
				Delay (sec)	LOS
32. SR 162 & W Pioneer Ave	WSDOT	Signal	D	20.7	C
33. SR 162 & 80th St	WSDOT	Unsignalized	D	20.7	C
34. SR 162 & SR 410 EB	WSDOT	Signal	D	12.8	B
35. SR 162 & SR 410 WB	WSDOT	Signal	D	15.4	B

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; sec = second; St = Street

4.1.2 Queue Lengths

Excessive queueing (queue lengths exceeding 1,000 feet) was not reported during the AM or PM peak period, with a majority of the 95th percentile queue lengths ranging between 100 and 500 feet. The 95th percentile queue represents the queue length that only has a 5 percent likelihood of being exceeded. Queue lengths reported from VISSIM are limited to the segment length between signalized intersections. However, since the queue lengths reported do not exceed any distance between signalized intersections, the queue lengths shown do not underestimate the 95th percentile queue. Due to the large number of turning movements for which queue results were compiled, the tables showing the results of AM and PM peak hour queue extents across simulation scenarios have been placed in Attachment C.

4.1.3 Travel Time

Average travel times were collected during the AM and PM peak periods for specific routes within the Project area, shown below in Table 16.

Table 16. AM and PM Peak Hour Travel Times

Segment	Direction of Travel	Distance (miles)	2021 AM Peak Travel Time (min)	2022 PM Peak Travel Time (min)
E Pioneer Ave, 7th St to 33rd St SE	Eastbound	1.7	4.17	5.00
E Pioneer Ave, 33rd St SE to 7th St	Westbound	1.7	4.20	5.07
Shaw Rd/39th Ave to E Main Ave	Northbound	2.5	4.33	6.02
Shaw Rd/39th Ave to E Main Ave	Southbound	2.5	4.26	7.92

Notes: Ave = Avenue; min = minute; Rd = Road; St = Street

4.1.4 v/c Ratio

The v/c ratio was calculated using HCM methodology along corridor segments within the Project area. Results are shown in Table 17. The v/c ratios shown in red text exceed the 0.85 v/c performance indicator. During the PM peak period, a majority of the segments exceed a 1.0 v/c ratio. Capacity along each corridor was determined using Florida Department of Transportation methodology.

Table 17. Peak Hour Segmental v/c Ratio – Existing 2021 AM and 2022 PM

Roadway Segment	**Direction of Travel**	**Calculated Directional Maximum Capacity**	**Demand Volume (vehicles)**		**v/c Ratio**	
			2021 AM	**2022 PM**	**2021 AM**	**2022 PM**
1. E Main Ave – Shaw Rd E to 5th Ave NE	Westbound	1,445	472	1,620	0.33	1.12
	Eastbound	1445	1,001	843	0.69	0.58
2. E Main Ave – 5th Ave NE to SR 410	Westbound	1,445	503	1,614	0.35	1.12
	Eastbound	760	991	856	1.30	1.13
3. E Main Ave – 23rd St to Shaw Rd E	Westbound	1,615	372	803	0.23	0.50
	Eastbound	1,615	313	518	0.19	0.32
4. Shaw Rd E – E Main Ave to 5th Ave SE	Northbound	1,445	893	658	0.62	0.46
	Southbound	1,445	305	1,151	0.21	0.80
5. E Pioneer Ave – 21st St SE to 25th St SE	Westbound	1,445	454	626	0.31	0.43
	Eastbound	1,445	382	765	0.26	0.53
6. E Pioneer Ave – Shaw Rd E to SR 162	Westbound	560	356	324	0.64	0.58
	Eastbound	560	210	342	0.38	0.61
7. SR 162 – 143rd Ave E to 80th St E	Northbound	800	694	600	0.87	0.75
	Southbound	800	373	1,136	0.47	1.42
8. SR 162 – SR 410 to 143rd Ave E	Northbound	840	694	600	0.83	0.71
	Southbound	840	373	1136	0.44	1.35
9. Shaw Rd E – 12th Ave SE to 16th Ave SE	Northbound	560	848	597	1.51	1.07
	Southbound	560	277	1,170	0.49	2.09
10. Shaw Rd E – 16th Ave SE to 23rd Ave SE	Northbound	560	796	560	1.42	1.00
	Southbound	560	270	1040	0.48	1.86
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	Northbound	560	715	523	1.28	0.93
	Southbound	560	275	957	0.49	1.71

Notes: Ave = Avenue; Rd = Road; St = Street

4.2 No Action Scenario

4.2.1 LOS and Delay

Without development activity at Knutson Farms, the changes affecting intersection LOS after 5 years follow normal trend lines for growth based on regional models. Other surrounding developments and standard expected traffic growth rates that are captured in the regional travel demand model used to develop future volumes would impact traffic flow and LOS without the Proposed Action. All intersections meet performance indicators during the AM peak period (see Table 18). Based on the future projected volumes, the following intersections are expected to exceed the LOS standard threshold during the 2026 PM peak period (see Table 19):

- Traffic Avenue/Fryar Avenue & Main Street/Cannery Way (within Sumner city limits)
- E Main Avenue & SR 410 WB/Thompson Street (within Sumner city limits)
- N Meridian Avenue & Valley Avenue NE (Puyallup city limits, WSDOT intersection)

Table 18. AM Peak Hour Intersection LOS and Delay – No Action Scenario

Intersection Location	Jurisdiction Control	Intersection Control	LOS Standard	No Action Scenario	
				Delay (sec)	**LOS**
1. Traffic Ave/Fryar Ave & Main St/Cannery Wy	Sumner	Signal	D	42.9	D
2. Traffic Ave & State St	Sumner	Signal	D	14.4	B
3. E Main Ave & SR 410 WB/Thompson St	WSDOT	Signal	D	20.6	C
4. E Main Ave & SR 410 EB	WSDOT	Signal	D	16.6	B
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	D	7.1	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	E	12.4	B
7. E Main Ave & 15th St SE	Puyallup	Signal	D	7.4	A
8. E Main Ave & 5th St SE	Puyallup	Signal	D	10.0	A
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	D	12.3	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	D	31.4	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	D	21.4	C
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	E	26.6	C
13. E Pioneer Ave & SR 512 WB ramps	WSDOT	Signal	D	18.6	B
14. E Pioneer Ave & SR 512 EB ramps	WSDOT (maintained by Puyallup)	Signal	D	10.3	B
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	D	8.9	A
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	D	5.5	A
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	D	6.9	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	D	11.6	B
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	E	33.0	C
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	D	9.4	A
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	D	7.7	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	E	23.2	C
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	E	17.7	C
24. Shaw Rd E & 23rd Ave SE/Crystal Ridge Dr SE	Puyallup	Signal	E	18.9	B
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	E	12.7	B
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	E	11.1	B
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	E	14.4	B
28. Shaw Rd E and 5th Ave SE	Puyallup	Unsignalized	E	0.8	A
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	D	0.7	A
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	E	8.3	A
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	D	0.9	A
32. SR 162 and W Pioneer Ave	WSDOT	Signal	D	24.0	C
33. SR 162 & 80th St	WSDOT	Unsignalized	D	13.1	B
34. SR 162 & SR 410 EB	WSDOT	Signal	D	17.7	B
35. SR 162 & SR 410 WB	WSDOT	Signal	D	16.8	B

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; sec = second; St = Street; Wy = Way

Table 19. PM Peak Hour Intersection LOS and Delay – No Action Scenario

Intersection Location	Jurisdiction Control	Intersection Control	LOS Standard	No Action Scenario	
				Delay (sec)	LOS
1. Traffic Ave/Fryar Ave & Main St/Cannery Wy	Sumner	Signal	D	***63.7***	***E***
2. Traffic Ave & State St	Sumner	Signal	D	44.8	D
3. E Main Ave & SR 410 WB/Thompson St	WSDOT	Signal	D	***60.1***	***E***
4. E Main Ave & SR 410 EB	WSDOT	Signal	D	35.7	D
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	D	7.4	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	E	21.1	C
7. E Main Ave & 15th St SE	Puyallup	Signal	D	10.2	B
8. E Main Ave & 5th St SE	Puyallup	Signal	D	15.2	B
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	D	10.6	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	D	30.0	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	D	12.8	B
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	E	***138.4***	***F***
13. E Pioneer Ave & SR 512 WB ramps	WSDOT	Signal	D	34.4	C
14. E Pioneer Ave & SR 512 EB ramps	WSDOT	Signal	D	15.2	B
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	D	11.2	B
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	D	11.6	B
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	D	9.6	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	D	17.5	C
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	E	49.2	D
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	D	13.8	B
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	D	8.1	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	E	36.3	E
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	E	33.1	D
24. Shaw Rd E & 23rd Ave SE/Crystal Ridge Dr SE	Puyallup	Signal	E	41.1	D
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	E	22.3	C
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	E	26.2	D
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	E	75.7	E
28. Shaw Rd E and 5th Ave SE	Puyallup	Unsignalized	E	1.3	A
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	D	0.5	A
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	E	13.5	B
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	D	1.2	A
32. SR 162 and W Pioneer Ave	WSDOT	Signal	D	24.3	C
33. SR 162 & 80th St	WSDOT	Unsignalized	D	28.3	D
34. SR 162 & SR 410 EB	WSDOT	Signal	D	15.9	B
35. SR 162 & SR 410 WB	WSDOT	Signal	D	20.4	C

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; sec = second; St = Street; Wy = Way

4.2.2 Queue Lengths

Excessive queueing was reported during the AM and PM peak periods. During the AM and PM peak periods, the following intersections reported a 95th percentile queue length exceeding 1,000 feet (see Table 20).

Table 20. AM and PM Peak Hour Excessive Queue Lengths – No Action Scenario

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
Traffic Ave/Fryar Ave & Main St/ Cannery Wy	AM	Northbound	Left	180	705	1,157
Traffic Ave & Cannery Wy	AM	Northbound	Thru	320	782	1,163
N Meridian Ave & SR 167 SB	AM	Westbound	Right	470	410	1,346
Traffic Ave & Cannery Wy	PM	Eastbound	Thru	600	1,162	1,604
Traffic Ave & Cannery Wy	PM	Eastbound	Right	190	1,158	1,624
N Meridian Ave & Valley Ave NE	PM	Eastbound	Thru	1,640	1,636	1,682
N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	500	1,147	1,633
Shaw Rd E & 39th Ave SE	PM	Northbound	Left	330	989	1,529

Notes: Ave = Avenue; ft = feet; Rd = Road; St = Street; Wy = Way

Excessive queueing, as shown in Table 20, is detrimental to the overall system performance. Although only three intersections reported LOS exceeding standard thresholds, the congestion created by the excessive queueing meters traffic downstream into adjacent signals. Excessive queueing is also indicative of inefficient signal timing and insufficient green time provided at the signalized intersections.

Due to the large number of turning movements for which queue results were compiled, the tables showing the results of AM and PM peak hour queue extents across simulation scenarios have been placed in Attachment C.

4.2.3 Travel Time

Table 21 shows the average travel time was collected during the AM and PM peak periods for specific routes within the Project area.

Table 21. No Action Scenario AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer Ave, 7th St to 33rd St SE	Eastbound	1.68	4.52	5.34
E Pioneer Ave, 33rd St SE to 7th St	Westbound	1.68	4.26	4.68
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	6.13	6.54
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	5.96	9.00

Notes: Ave = Avenue; min = minute; Rd = Road; St = Street

4.2.4 v/c Ratio

Under the No Action Scenario, a majority of the specified segments exceed the 0.85 v/c performance indicator ratio, and some segments exceed 2.0. Table 22 provides the volumes and calculated v/c ratios for the No Action Scenario.

Table 22. Peak Hour Segmental v/c Ratio – No Action Scenario AM and PM

Roadway Segment	Direction of Travel	Calculated Directional Maximum Capacity	Demand Volume (vehicles)		v/c Ratio	
			AM	PM	AM	PM
1. E Main Ave – Shaw Rd E to 5th Ave NE	Westbound	1,445	531	1,885	0.37	1.31
	Eastbound	1445	1,205	1,004	0.83	0.69
2. E Main Ave – 5th Ave NE to SR 410	Westbound	1,445	566	1,875	0.39	1.30
	Eastbound	760	1,191	1,018	1.57	1.34
3. E Main Ave – 23rd St to Shaw Rd E	Westbound	1,615	439	919	0.27	0.57
	Eastbound	1,615	375	615	0.23	0.38
4. Shaw Rd E – E Main Ave to 5th Ave SE	Northbound	1,445	1,079	786	0.75	0.54
	Southbound	1,445	341	1,363	0.24	0.94
5. E Pioneer Ave – 21st St SE to 25th St SE	Westbound	1,445	532	740	0.37	0.51
	Eastbound	1,445	460	869	0.32	0.60
6. E Pioneer Ave – Shaw Rd E to SR 162	Westbound	560	386	361	0.69	0.64
	Eastbound	560	252	564	0.45	1.01
7. SR 162 – 143rd Ave E to 80th St E	Northbound	800	771	657	0.96	0.82
	Southbound	800	403	1,260	0.50	1.58
8. SR 162 – SR 410 to 143rd Ave E	Northbound	840	771	657	0.92	0.78
	Southbound	840	403	1,260	0.48	1.50
9. Shaw Rd E - 12th Ave SE to 16th Ave SE	Northbound	560	948	707	1.69	1.26
	Southbound	560	346	1,350	0.62	2.41
10. Shaw Rd E - 16th Ave SE to 23rd Ave SE	Northbound	560	931	666	1.66	1.19
	Southbound	560	337	1,201	0.60	2.14
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	Northbound	560	816	592	1.46	1.06
	Southbound	560	348	1,042	0.62	1.86

Notes: Ave = Avenue; Rd = Road; St = Street

4.3 Scenario A

4.3.1 LOS and Delay

In addition to the projected growth in traffic volumes developed for the No Action Scenario, Scenario A includes traffic generated from the Knutson Farms Proposed Action. All intersections meet performance indicators during the AM peak period (see Table 23). Due to the traffic generated by the Proposed Action, five intersections exceed the LOS standard thresholds during the PM peak period (see Table 24), including:

- Traffic Avenue/Fryar Avenue & Main Street/Cannery Way
- E Main Avenue & SR 410 WB/ Thompson Street
- E Main Avenue & SR 410 EB
- N Meridian Avenue & Valley Avenue NE
- SR 162 & 80th Street E

Table 23. AM Peak Hour Intersection LOS and Delay – Scenario A

Intersection Location	Jurisdiction Control	Intersection Control	LOS Standard	No Action Scenario		Scenario A	
				Delay (sec)	LOS	Delay (sec)	LOS
1. Traffic Ave/Fryar Ave & Main St/Cannery Wy	Sumner	Signal	D	42.9	D	46.1	D
2. Traffic Ave & State St	Sumner	Signal	D	14.4	B	16.9	B
3. E Main Ave & SR 410 WB	WSDOT	Signal	D	20.6	C	19.2	B
4. E Main Ave & SR 410 EB	WSDOT	Signal	D	16.6	B	23.1	C
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	D	7.1	A	7.1	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	E	12.4	B	14.9	B
7. E Main Ave & 15th St SE	Puyallup	Signal	D	7.4	A	8.2	A
8. E Main Ave & 5th St SE	Puyallup	Signal	D	10.0	A	10.4	B
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	D	12.3	B	15.0	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	D	31.4	C	31.4	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	D	21.4	C	21.4	C
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	E	26.6	C	26.6	C
13. E Pioneer Ave & SR 512 WB ramps	WSDOT	Signal	D	18.6	B	20.4	C
14. E Pioneer Ave & SR 512 EB ramps	WSDOT	Signal	D	10.3	B	11.3	B
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	D	8.9	A	10.4	B
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	D	5.5	A	5.7	A
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	D	6.9	A	7.6	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	D	11.6	B	15.3	C
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	E	33.0	C	43.6	D
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	D	9.4	A	7.3	A
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	D	7.7	A	7.9	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	E	23.2	C	27.1	D
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	E	17.7	C	24.1	C
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	E	18.9	B	21.3	C
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	E	12.7	B	13.4	B

Intersection Location	**Jurisdiction Control**	**Intersection Control**	**LOS Standard**	**No Action Scenario**		**Scenario A**	
				Delay (sec)	**LOS**	**Delay (sec)**	**LOS**
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	E	11.1	B	11.3	B
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	E	14.4	B	15.7	B
28. Shaw Rd E & 5th Ave SE	Puyallup	Signal[a]	E	0.8	A	15.3	B
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	D	0.7	A	19.8	C
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	E	8.3	A	13.9	B
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	D	0.9	A	6.1	A
32. SR 162 & W Pioneer Ave	WSDOT	Signal	D	24.0	C	24.0	C
33. SR 162 & 80th St	WSDOT	Unsignalized	D	13.1	B	12.1	B
34. SR 162 & SR 410 EB	WSDOT	Signal	D	17.7	B	21.4	C
35. SR 162 & SR 410 WB	WSDOT	Signal	D	16.8	B	18.1	B

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; sec = second; St = Street; Wy = Way

[a] The Shaw Road E and 5th Avenue SE was modeled as a signal to allow traffic into the models. This was documented as a mitigation need.

Table 24. PM Peak Hour Intersection LOS and Delay – Scenario A

Intersection Location	**Jurisdiction Control**	**Intersection Control**	**LOS Standard**	**No Action Scenario**		**Scenario A**	
				Delay (sec)	**LOS**	**Delay (sec)**	**LOS**
1. Traffic Ave/Fryar Ave & Main St/Cannery Wy	Sumner	Signal	D	63.7	E	60.1	E
2. Traffic Ave & State St	Sumner	Signal	D	44.8	D	21.9	C
3. E Main Ave & SR 410 WB	WSDOT	Signal	D	60.1	E	76.4	E
4. E Main Ave & SR 410 EB	WSDOT	Signal	D	35.7	D	64.1	E
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	D	7.4	A	8.2	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	E	21.1	C	23.7	C
7. E Main Ave & 15th St SE	Puyallup	Signal	D	10.2	B	9.9	A
8. E Main Ave & 5th St SE	Puyallup	Signal	D	15.2	B	15.0	B
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	D	10.6	B	10.8	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	D	30.0	C	29.9	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	D	12.8	B	12.4	B
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	E	138.4	F	140.9	F
13. E Pioneer Ave & SR 512 WB ramps	WSDOT	Signal	D	34.4	C	18.3	B
14. E Pioneer Ave & SR 512 EB ramps	WSDOT	Signal	D	15.2	B	9.9	A
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	D	11.2	B	12.7	B

Intersection Location	Jurisdiction Control	Intersection Control	LOS Standard	No Action Scenario		Scenario A	
				Delay (sec)	LOS	Delay (sec)	LOS
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	D	11.6	B	12.0	B
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	D	9.6	A	9.6	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	D	17.5	C	22.9	C
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	E	49.2	D	60.9	E
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	D	13.8	B	14.0	B
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	D	8.1	A	8.2	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	E	36.3	E	39.8	E
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	E	33.1	D	38.0	E
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	E	41.1	D	38.1	D
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	E	22.3	C	22.9	C
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	E	26.2	D	24.8	C
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	E	75.7	E	70.9	E
28. Shaw Rd E and 5th Ave SE	Puyallup	Signal[a]	E	1.3	A	25.6	C
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	D	0.5	A	13.8	B
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	E	13.5	B	14.5	B
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	D	1.2	A	6.9	A
32. SR 162 and W Pioneer Ave	WSDOT	Signal	D	24.3	C	25.1	C
33. SR 162 & 80th St	WSDOT	Unsignalized	D	28.3	D	33.8	D
34. SR 162 & SR 410 EB	WSDOT	Signal	D	15.9	B	16.6	B
35. SR 162 & SR 410 WB	WSDOT	Signal	D	20.4	C	21.0	C

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; sec = second; St = Street; Wy = Way

[a] The Shaw Road E and 5th Avenue SE was modeled as a signal to allow traffic into the network in the models. This was documented as a mitigation need.

Comparing the No Action Scenario delay with Scenario A delay, a majority of the intersections within the study area are impacted by an increase in average delay. However, several intersections show a reduction in delay, which is counter intuitive to an increase in demand traffic. Congestion that develops at a failing intersection can meter traffic into downstream intersections. This can result in traffic arriving less frequently reducing average delay.

4.3.2 Queue Lengths

Excessive queueing was reported during the AM and PM peak periods. During the AM and PM peak periods, the following intersections reported a 95th percentile queue length exceeding approximately 1,000 feet (see Table 25).

Table 25. AM and PM Peak Hour Excessive Queue Lengths – Scenario A

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	AM	Northbound	Left	180	910	1,132
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	AM	Northbound	Thru	320	1,035	1,160
11. N Meridian Ave & SR 167 SB	AM	Westbound	Right	470	591	1,007
1. Traffic Ave & Cannery Way	PM	Eastbound	Thru	600	1,051	1,612
1. Traffic Ave & Cannery Way	PM	Eastbound	Right	190	993	1,570
4. E Main Ave & SR 410 EB	PM	Eastbound	Left	300	758	1,083
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	1,640	1,645	1,681
12. N Meridian Ave & Valley Ave NE	PM	Westbound	Left	500	1,066	1,572

Notes: Ave = Avenue; ft = feet; St = Street; Wy = Way

Excessive queueing, as shown in Table 25, is detrimental to the overall system performance. Although only three intersections reported LOS exceeding standard thresholds, the congestion created by the excessive queueing meters traffic downstream into adjacent signals. Excessive queueing is also indicative of inefficient signal timing and insufficient green time provided at the signalized intersections.

The traffic impacts of Proposed Action Scenario A require mitigation to meet the City of Puyallup (and other affected agencies) LOS standard thresholds. The Mitigation Scenarios subsection describes what mitigation is required and provides the results of implementing the mitigations.

Due to the large number of turning movements for which queue results were compiled, the tables showing the results of AM and PM peak hour queue extents across simulation scenarios have been placed in Attachment C.

4.3.3 Travel Time

Table 26 shows the average travel time was collected during the AM and PM peak periods for specific routes within the Project area.

Table 26. Scenario A – AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer Ave, 7th St to 33rd St SE	Eastbound	1.68	4.72	5.50
E Pioneer Ave, 33rd St SE to 7th St	Westbound	1.68	4.40	4.84
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	7.44	7.71
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	6.72	9.59

Notes: Ave = Avenue; min = minute; Rd = Road; St = Street

4.3.4 v/c Ratio

Under Scenario A and similar to the No Action Scenario, a majority of the specified segments exceed the 0.85 v/c performance indicator ratio with some segments exceeding 2.0. Table 27 provide the volumes and calculated v/c ratios for Scenario A and the No Action scenario.

Table 27. Peak Hour Segmental v/c Ratio – Scenario A AM and PM

Roadway Segment	**Direction of Travel**	**Calculated Directional Maximum Capacity**	**Demand Volume (vehicles)**		**v/c Ratio**	
			AM	**PM**	**AM**	**PM**
1. E Main Ave – Shaw Rd E to 5th Ave NE	Westbound	1,445	752	2,072	0.52	1.43
	Eastbound	1445	1,300	1,444	0.90	1.00
2. E Main Ave – 5th Ave NE to SR 410	Westbound	1,445	787	2,062	0.54	1.43
	Eastbound	760	1,285	1,458	1.69	1.92
3. E Main Ave – 23rd St to Shaw Rd E	Westbound	1,615	491	1,160	0.30	0.72
	Eastbound	1,615	495	717	0.31	0.44
4. Shaw Rd E – E Main Ave to 5th Ave SE	Northbound	1,445	1,225	1,471	0.85	1.02
	Southbound	1,445	681	1,655	0.47	1.15
5. E Pioneer Ave – 21st St SE to 25th St SE	Westbound	1,445	598	1,050	0.41	0.73
	Eastbound	1,445	615	1,008	0.43	0.70
6. E Pioneer Ave – Shaw Rd E to SR 162	Westbound	560	399	564	0.71	1.01
	Eastbound	560	282	715	0.50	1.28
7. SR 162 – 143rd Ave E to 80th St E	Northbound	800	785	717	0.98	0.90
	Southbound	800	434	1,285	0.54	1.61
8. SR 162 – SR 410 to 143rd Ave E	Northbound	840	785	717	0.93	0.85
	Southbound	840	434	1,285	0.52	1.53
9. Shaw Rd E - 12th Ave SE to 16th Ave SE	Northbound	560	1,078	721	1.93	1.29
	Southbound	560	372	1,375	0.66	2.46
10. Shaw Rd E - 16th Ave SE to 23rd Ave SE	Northbound	560	982	711	1.75	1.27
	Southbound	560	358	1,301	0.64	2.32
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	Northbound	560	870	612	1.55	1.09
	Southbound	560	358	1,084	0.64	1.94

Notes: Ave = Avenue; Rd = Road; St = Street

Table 28. Peak Hour Segmental v/c Ratio Comparison – No Action Scenario and Scenario A

Roadway Segment	Segment Length (ft)	Direction of Travel	v/c Ratio					
			AM			PM		
			No Action Scenario	Scenario A	Percent Increase	No Action Scenario	Scenario A	Percent Increase
1. E Main Ave – Shaw Rd E to 5th Ave NE	1,600	Westbound	0.37	0.52	41	1.31	1.43	9
		Eastbound	0.83	0.90	8	0.69	1.00	45
2. E Main Ave – 5th Ave NE to SR 410	3,000	Westbound	0.39	0.54	38	1.30	1.43	10
		Eastbound	1.57	1.69	8	1.34	1.92	43
3. E Main Ave – 23rd St to Shaw Rd E	1,800	Westbound	0.27	0.30	11	0.57	0.72	26
		Eastbound	0.23	0.31	35	0.38	0.44	16
4. Shaw Rd E – E Main Ave to 5th Ave SE	1,400	Northbound	0.75	0.85	13	0.54	1.02	89
		Southbound	0.24	0.47	96	0.94	1.15	22
5. E Pioneer Ave – 21st St SE to 25th St SE	1,350	Westbound	0.37	0.41	11	0.51	0.73	43
		Eastbound	0.32	0.43	34	0.60	0.70	17
6. E Pioneer Ave– Shaw Rd E to SR 162	7,300	Westbound	0.69	0.71	3	0.64	1.01	58
		Eastbound	0.45	0.50	11	1.01	1.28	27
7. SR 162 – 143rd Ave E to 80th St E	1,350	Northbound	0.96	0.98	2	0.82	0.90	10
		Southbound	0.50	0.54	8	1.58	1.61	2
8. SR 162 – SR 410 to 143rd Ave E	2,000	Northbound	0.92	0.93	1	0.78	0.85	9
		Southbound	0.48	0.52	8	1.50	1.53	2
9. Shaw Rd E – 12th Ave SE to 16th Ave SE	1,800	Northbound	1.69	1.93	14	1.26	1.29	2
		Southbound	0.62	0.66	6	2.41	2.46	2
10. Shaw Rd E – 16th Ave SE to 23rd Ave SE	2,300	Northbound	1.66	1.75	5	1.19	1.27	7
		Southbound	0.60	0.64	7	2.14	2.32	8
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	7,550	Northbound	1.46	1.55	6	1.06	1.09	3
		Southbound	0.62	0.64	3	1.86	2.02	9

Notes: Ave = Avenue; ft = feet; Rd = Road; sec = second; St = Street; Wy = Way

The weighted average of the percent increase for each roadway was calculated to be used as a proportional factor for corridor wide improvements necessary to increase the capacity to be within the performance indicator 0.85 v/c ratio. The percent increase was weighted based on segment length. Table 29 provides the proportional factor for each roadway corridor.

Table 29. Scenario A – Roadway Proportional Factor

Roadway Segment	Proportional Factor
E Main Avenue	0.324
Shaw Road	0.170
E Pioneer Avenue	0.122
SR 162	0.117

The proportional factor is to be applied to long-range estimates (LRE) for corridor-wide improvements, including roadway widening, stormwater improvements, lighting, and typical infrastructure costs during construction such as mobilization, erosion control, and maintenance of traffic. LREs should also include soft project costs such as design management and engineering, construction management, and permitting and inspection. Below is an example of how the proportional factor would be applied. Costs shown are applied as an example and are not indicative of an actual LRE.

If the LRE for Shaw Road widening within the study area is determined to be $12 million (M) in construction costs; $2M in design and management costs; and $6M in construction management, permitting, and inspection, totaling $20M, the 0.17 proportional factor would be applied to the total construction cost. This would result in a $3.4M fee in lieu cost to the applicant.

4.4 Scenario B

4.4.1 LOS and Delay

Due to its nearly identical trip generation and street network assumptions, Scenario B would exhibit functionally identical LOS results as long as no train serving Knutson Farms is present. The traffic model demonstrated that at-grade rail crossings blocking these streets during peak hours would cause significant additional delays beyond the at-grade crossings themselves, even though other intersections around the study would not improve substantially as a result of slightly reduced truck trip generation (about 18.5 percent) from Knutson Farms. Delays at some of the most congested intersections would be higher on days when a train blockage occurs than with Scenario A. Scenario B also results in intersections exceeding LOS standards during the AM peak period, which does not occur under the No Action Scenario or Scenario A. Seven intersections during the AM peak period and 13 intersections during the PM peak period exceed the LOS standard thresholds (see Table 30 and Table 31). These are:

- AM Peak Period:
  - E Main Avenue & SR 410 EB
  - E Main Avenue & 5th Avenue NE
  - N Meridian Avenue & SR 167 EB
  - Shaw Road E & Highlands Boulevard
  - Shaw Road E & 16th Avenue SE
  - Shaw Road E & 5th Avenue SE
  - Shaw Road E & Safeway Driveway
- PM Peak Period:
  - Traffic Avenue & Cannery Way
  - Traffic Avenue & State Street
  - E Main Avenue & SR 410 WB ramps
  - E Main Avenue & SR 410 EB ramps
  - E Main Avenue & NE 5th Avenue
  - E Main Avenue & Shaw Road E
  - N Meridian Avenue & Valley Avenue NE
  - E Pioneer & Shaw Road E

- E Pioneer & 33rd Street SE
- 33rd Street SE & 8th Avenue SE
- Shaw Road E & Highlands Boulevard
- Shaw Road E & 23rd Avenue SE/Crystal Ridge Drive SE
- Shaw Road E & 5th Avenue SE

Table 30. AM Peak Hour Intersection LOS and Delay – Scenario B

Intersection	Jurisdiction Control	Intersection Control	LOS Standard	No Action Scenario		Scenario B	
				Delay (sec)	LOS	Delay (sec)	LOS
1. Traffic Ave & Cannery Way	Sumner	Signal	D	42.9	D	43.3	D
2. Traffic Ave & State St	Sumner	Signal	D	14.4	B	15.5	B
3. E Main Ave & SR 410 WB Ramps	WSDOT	Signal	D	20.6	C	19.7	B
4. E Main Ave & SR 410 EB Ramps	WSDOT	Signal	D	16.6	B	23.5	C
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	D	7.1	A	7.2	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	E	12.4	B	14.2	B
7. E Main Ave & 15th St SE	Puyallup	Signal	D	7.4	A	7.6	A
8. E Main Ave & 5th St NE	Puyallup	Signal	D	10.0	A	10.0	B
9. E Main Ave & 2nd St NE	Puyallup	Signal	D	12.3	B	15.2	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	D	31.4	C	32.1	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	D	21.4	C	25.3	C
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	E	26.6	C	26.8	C
13. E Pioneer Ave & SR 512 WB ramps	WSDOT	Signal	D	18.6	B	20.6	C
14. E Pioneer Ave & SR 512 EB ramps	WSDOT	Signal	D	10.3	B	11.4	B
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	D	8.9	A	10.0	A
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	D	5.5	A	6.5	A
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	D	6.9	A	7.3	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	D	11.6	B	15.3	B
19. E Pioneer Ave & Shaw Road E	Puyallup	Signal	E	33.0	C	47.2	D
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	D	9.4	A	7.9	A
21. 33rd St SE & 8th Ave SE	Puyallup	Unsignalized	D	7.7	A	10.2	B
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	E	23.2	C	26.9	C
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	E	17.7	C	19.8	B
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	E	18.9	B	32.0	C
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	E	12.7	B	12.8	B
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	E	11.1	B	11.4	B
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	E	14.4	B	14.4	B
28. Shaw Rd E & 5th Ave SE	Puyallup	Signal[a]	E	0.8	A	15.0	B
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	D	0.7	A	15.8	B
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	E	8.3	A	18.4	B
31. 80th St E & Warehouse Driveway	Puyallup	Unsignalized	D	0.9	A	5.9	A

Intersection	Jurisdiction Control	Intersection Control	LOS Standard	No Action Scenario		Scenario B	
				Delay (sec)	LOS	Delay (sec)	LOS
32. SR 162 & E Pioneer Ave	WSDOT	Signal	D	24.0	C	24.1	C
33. SR 162 & 80th St E	WSDOT	Unsignalized	D	13.1	B	12.6	B
34. SR 162 & SR 410 EB Ramps	WSDOT	Signal	D	17.7	B	21.2	C
35. SR 162 & SR 410 WB Ramps	WSDOT	Signal	D	16.8	B	18.9	B

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; sec = second; St = Street

[a] The Shaw Road E & 5th Avenue SE intersection was modeled as a signal to allow all site traffic into the model network. Signalization was documented as a mitigation need.

Table 31. PM Peak Hour Intersection LOS and Delay – Scenario B

Intersection	Jurisdiction Control	Intersection Control	LOS Standard	No Action Scenario		Scenario B	
				Delay (sec)	LOS	Delay (sec)	LOS
1. Traffic Ave & Cannery Way	Sumner	Signal	D	63.7	E	75.9	E
2. Traffic Ave & State St	Sumner	Signal	D	44.8	D	78.5	E
3. E Main Ave & SR 410 WB Ramps	WSDOT	Signal	D	60.1	E	109.6	F
4. E Main Ave & SR 410 EB Ramps	WSDOT	Signal	D	35.7	D	157.5	F
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	D	7.4	A	115.8	F
6. E Main Ave & Shaw Rd E	Puyallup	Signal	E	21.1	C	76.0	E
7. E Main Ave & 15th St SE	Puyallup	Signal	D	10.2	B	9.8	A
8. E Main Ave & 5th St NE	Puyallup	Signal	D	15.2	B	14.8	B
9. E Main Ave & 2nd St NE	Puyallup	Signal	D	10.6	B	10.9	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	D	30.0	C	29.9	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	D	12.8	B	12.4	B
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	E	138.4	F	140.9	F
13. E Pioneer Ave & SR 512 WB Ramps	WSDOT	Signal	D	34.4	C	19.8	B
14. E Pioneer Ave & SR 512 EB Ramps	WSDOT	Signal	D	15.2	B	10.8	B
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	D	11.2	B	13.4	B
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	D	11.6	B	12.6	B
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	D	9.6	A	12.7	B
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	D	17.5	C	153.1	F
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	E	49.2	D	124.6	F
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	D	13.8	B	93.3	F
21. 33rd St SE & 8th Ave SE	Puyallup	Unsignalized	D	8.1	A	21.8	C
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	E	36.3	E	188.8	F
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	E	33.1	D	67.0	F
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	E	41.1	D	99.8	F
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	E	22.3	C	17.8	B
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	E	26.2	D	15.4	B
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	E	75.7	E	52.6	D

Intersection	Jurisdiction Control	Intersection Control	LOS Standard	No Action Scenario		Scenario B	
				Delay (sec)	LOS	Delay (sec)	LOS
28. Shaw Rd E & 5th Ave SE	Puyallup	Signal[a]	E	1.3	A	106.0	F
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	D	0.5	A	170.3	F
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	E	13.5	B	64.5	E
31. 80th St E & Warehouse Driveway	Puyallup	Unsignalized	D	1.2	A	5.9	A
32. SR 162 & E Pioneer Ave	WSDOT	Signal	D	24.3	C	25.3	C
33. SR 162 & 80th St E	WSDOT	Unsignalized	D	28.3	D	12.6	B
34. SR 162 & SR 410 EB Ramps	WSDOT	Signal	D	15.9	B	17.1	B
35. SR 162 & SR 410 WB Ramps	WSDOT	Signal	D	20.4	C	21.4	C

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; sec = second; St = Street

[a] The Shaw Road E & 5th Avenue SE intersection was modeled as a signal to allow all site traffic into the model network. Signalization was documented as a mitigation need.

Comparing the No Action Scenario delay with the Scenario B delay, the majority of the intersections within the study area are impacted by a significant increase in average delay, mainly along the Shaw Road E corridor during the PM peak period.

4.4.2 Queue Lengths

Excessive queueing was reported during the AM and PM peak periods. During the AM and PM peak hours, several intersection movements simulated exhibited 95th percentile queue length estimates exceeding 1,000 feet, as indicated in Table 32.

Table 32. AM and PM Peak Hour Excessive Queue Lengths – Scenario B

Intersection	Peak Hour	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave & Cannery Way	AM	Northbound	Left	180	475	1,189
1.Traffic Ave & Cannery Way	AM	Northbound	Thru	320	552	1,194
3. E Main Ave & SR 410 EB Ramps	AM	Eastbound	Left	300	180	1,027
10. N Meridian Ave & SR 167 NB	AM	Westbound	Left	1,100	203	1,337
11. N Meridian Ave & SR 167 SB	AM	Westbound	Right	470	687	3,098
24. Shaw Rd E & 23rd Ave SE	AM	Northbound	Thru	190	255	1,464
34. SR 162 & SR 410 EB Ramps	AM	Northbound	Thru	450	149	1,206
1. Traffic Ave & Cannery Way	PM	Eastbound	Thru	600	971	1,657
1. Traffic Ave & Cannery Way	PM	Eastbound	Right	190	879	1,674
2. Traffic Ave & State St	PM	Southbound	Thru	1,020	629	1,209
3. Traffic Ave & State St	PM	Southbound	Right	1,020	599	1,168
4. E Main Ave & SR 410 EB Ramps	PM	Eastbound	Left	300	1,154	1,473
4. E Main Ave & SR 410 EB Ramps	PM	Northbound	Thru	750	978	1,388
5. E Main Ave & 5th Ave NE	PM	Northbound	Thru	1,000	630	1,406
5. E Main Ave & 5th Ave NE	PM	Southbound	Thru	1,000	354	1,225
5. E Main Ave & 5th Ave NE	PM	Southbound	Right	1,000	354	1,225

Intersection	Peak Hour	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
6. E Main Ave & Shaw Rd E	PM	Westbound	Left	460	800	1,621
6. E Main Ave & Shaw Rd E	PM	Northbound	Left	210	317	1,066
6. E Main Ave & Shaw Rd E	PM	Northbound	Right	210	247	1,034
SR 167 EB on/WB Left	PM	Northbound	Thru	230	248	1,661
10. N Meridian Ave & SR 167 NB	PM	Eastbound	Right	1,640	1,339	1,697
10. N Meridian Ave & SR 167 NB	PM	Westbound	Left	500	810	1,657
19. E Pioneer Ave & Shaw Rd E	PM	Eastbound	Left	340	618	1,422
19. E Pioneer Ave & Shaw Rd E	PM	Eastbound	Thru	750	739	1,434
19. E Pioneer Ave & Shaw Rd E	PM	Eastbound	Right	750	198	1,224
19. E Pioneer Ave & Shaw Rd E	PM	Westbound	Left	300	614	1,264
19. E Pioneer Ave & Shaw Rd E	PM	Westbound	Thru	300	495	1,270
19. E Pioneer Ave & Shaw Rd E	PM	Westbound	Right	300	506	1,300
21. E Pioneer Ave & 33rd St SE	PM	Westbound	Thru	1,000	398	1,481
21. E Pioneer Ave & 33rd St SE	PM	Westbound	Right	1,000	380	1,461
22. Shaw Rd E & Highlands Blvd	PM	Southbound	Thru	650	1,421	1,685
23. Shaw Rd E & 16th Ave SE	PM	Southbound	Thru	1,000	739	1,109
23. Shaw Rd E & 16th Ave SE	PM	Southbound	Right	1,000	739	1,109
24. Shaw Rd E & 23rd Ave SE	PM	Southbound	Thru	650	1,321	1,669
27. Shaw Rd E & 39th Ave SE	PM	Northbound	Left	330	672	1,619
28. Shaw Rd E & 5th Ave SE	PM	Westbound	Left	250	689	1,507
28. Shaw Rd E & 5th Ave SE	PM	Westbound	Right	250	248	1,340
28. Shaw Rd E & 5th Ave SE	PM	Southbound	Left	210	473	1,315
28. Shaw Rd E & 5th Ave SE	PM	Southbound	Thru	1,020	760	1,419
29. 33rd St & 5th Ave SE	PM	Southbound	Thru	550	1,035	1,693
29. 33rd St & 5th Ave SE	PM	Southbound	Right	550	1,044	1,689
34. SR 162 & SR 410 EB Ramps	PM	Northbound	Thru	450	149	1,206

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; ft = feet; Rd = Road; St = Street

Excessive queueing, as shown in Table 32, is detrimental to the overall system performance. Although only three intersections reported LOS exceeding standard thresholds, the congestion created by the excessive queueing meters traffic downstream into adjacent signals. Excessive queueing is also indicative of insufficient green time provided at the signalized intersections.

4.4.3 Travel Time

Table 33 shows the average travel time was collected during the AM and PM peak periods for specific routes within the Project area. During the PM peak period, the impact of a train trip is significant along the Shaw Road E corridor, more than doubling the travel time compared to the No Action Scenario.

Table 33. Scenario B – AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer Ave, 7th St to 33rd St SE	Eastbound	1.68	4.57	7.49
E Pioneer Ave, 33rd St SE to 7th St	Westbound	1.68	4.35	6.50
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	7.07	13.47
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	6.80	19.66

Notes: Ave = Avenue; min = minute; Rd = Road; sec = second; St = Street; Wy = Way

4.4.4 v/c Ratio

Under Scenario B and similar to the No Action Scenario, a majority of the specified segments exceed the 0.85 v/c performance indicator ratio with some segments exceeding 2.0. Table 34 below provides the volumes and calculated v/c ratios for Scenario B. Segments exceeding the 0.85 performance indicator v/c are shown in red.

Table 34. Peak Hour Segmental v/c Ratio – Scenario B AM and PM

Roadway Segment	Direction of Travel	Calculated Directional Maximum Capacity	Demand Volume (vehicles)		v/c Ratio	
			AM	PM	AM	PM
1. E Main Ave – Shaw Rd E to 5th Ave NE	Westbound	1,445	748	1,929	0.52	1.34
	Eastbound	1,445	1,297	1,097	0.90	0.76
2. E Main Ave – 5th Ave NE to SR 410	Westbound	1,445	783	1,922	0.54	1.33
	Eastbound	760	1,284	1,109	1.69	1.46
3. E Main Ave – 23rd St to Shaw Rd E	Westbound	1,615	491	979	0.30	0.61
	Eastbound	1,615	495	628	0.31	0.39
4. Shaw Rd E – E Main Ave to 5th Ave SE	Northbound	1,445	1,224	991	0.85	0.69
	Southbound	1,445	677	1,472	0.47	1.02
5. E Pioneer Ave – 21st St SE to 25th St SE	Westbound	1,445	597	894	0.41	0.62
	Eastbound	1,445	614	705	0.42	0.49
6. E Pioneer Ave – Shaw Rd E to SR 162	Westbound	560	399	547	0.71	0.98
	Eastbound	560	282	552	0.50	0.99
7. SR 162 – 143rd Ave E to 80th St E	Northbound	800	785	687	0.98	0.86
	Southbound	800	434	1,270	0.54	1.59
8. SR 162 – SR 410 to 143rd Ave E	Northbound	840	785	687	0.93	0.82
	Southbound	840	434	1,270	0.52	1.51
9. Shaw Rd E – 12th Ave SE to 16th Ave SE	Northbound	560	1,107	690	1.98	1.23
	Southbound	560	400	1,070	0.71	1.91
10. Shaw Rd E – 16th Ave SE to 23rd Ave SE	Northbound	560	981	678	1.75	1.21
	Southbound	560	359	1,001	0.64	1.79
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	Northbound	560	869	602	1.55	1.08
	Southbound	560	340	842	0.61	1.50

Notes: Ave = Avenue; Rd = Road; St = Street

This finding indicates that rail crossing delay impacts outweigh the potential benefits of removing a small number of trucks from the KFIP site's delivery traffic stream.

4.5 Scenario C – Mitigation of Scenario A Traffic Impacts

Scenario C mitigates the traffic impacts reported in Scenario A. Several mitigation strategies were implemented to address the delay, extensive queueing, and LOS exceeding City standard thresholds. Some of the strategies are global, meaning they are applied throughout the network to improve the overall system performance. Other strategies are localized at the intersections exceeding City standard thresholds previously described. The main strategies include:

- Global – increase signal cycle length and coordinate signals
  - To improve signal progression and increase vehicular throughput at signalized intersections
- Localized – increase left- and/or right-turn-lane storage
  - Reduce the occurrence of queue spillback leading to blocking through-lanes
- Localized – convert unsignalized intersection to a roundabout
  - Improve minor approach access onto main approach
- Localized – modify lane configuration at signalized intersections
  - Eliminate split-phase signal timing
  - Improve lane utilization, thus reducing queue lengths
- Proportionate Localized – upgrade to roadways that do not meet current City standards
  - Roadway typical section improvements, including widening, stormwater treatment, and lighting
  - Pedestrian improvements to bring pedestrian facilities within Americans with Disabilities Act (ADA) standards
  - Improvements to transit stops along corridors identified for improvement using the proportional factor within the Project area, including Stop #1301 on Shaw Road E

Proportionate localized mitigation compares the increase of v/c ratio between the No Action Scenario and Scenario C. Using the v/c ratios allows for a proportional factor to be developed accounting for the reduction of capacity attributed by the traffic generated by the applicant. The proportional factor is intended to be applied to the total infrastructure costs of bringing the No Action Scenario within City performance indicators for LOS, delay, and queue lengths.

Table 35 describes the extent of mitigation at each location.

Table 35. Scenario C – Traffic Impact Mitigation Applied

Intersection Location	Reason for Mitigation	Mitigation Applied	Does Mitigation Fully Address Impact?
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	LOS and delay exceeds City's performance indicators	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
2. Traffic Ave & State St	LOS and delay exceeds City's performance indicators	Retime and coordinate signal; this intersection requires retiming even though it meets LOS thresholds due to proximity to SR 410	Yes, traffic analysis shows acceptable LOS and delay performance indicators
3. E Main Ave & SR 410 WB	LOS and delay exceeds City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection, and allowing EB and WB left turns to run concurrently	Yes, traffic analysis shows acceptable LOS and delay performance indicators
4. E Main Ave & SR 410 EB	LOS and delay exceeds City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
12. N Meridian Ave & Valley Ave NE	LOS and delay exceeds City's performance indicators; queuing spillbacks to adjacent intersections	No mitigation applied, see below for discussion	No mitigation applied, see below for discussion
28. Shaw Rd E & 5th Ave SE	LOS and delay exceeds City's performance indicators	Widen 5th Avenue and convert unsignalized intersection to a signal with dedicated WB left- and right-turn lanes; widen 5th Ave to a three-lane roadway section; retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
33. SR 162 & 80th St	Traffic generated by Scenario A increases left turning volumes onto SR 162	Convert to roundabout	Yes, traffic analysis shows acceptable LOS and delay performance indicators

Notes: Ave = Avenue; Rd = Road; St = Street; Wy = Way

Mitigation for the unsignalized intersections identified above is not presently defined due to the nature of failure at these intersections. The manner in which these unsignalized intersections fail is a symptom of the Shaw Road E and E Pioneer Avenue corridors being over capacity, and not the unsignalized intersections themselves. Based on the demand volume of the minor approach at the unsignalized intersections, the intersections would not meet signal warrants. Additionally, if corridor-wide improvements along Shaw Road E and E Pioneer Avenue were implemented, the delay and LOS at these intersections would improve to well within the City’s LOS performance indicator.

The SR 162 and 80th Street intersection is an exception to the unsignalized failure described in the previous paragraph. Based on the minor approach demand volume, this intersection would continue to exceed LOS performance indicators if larger corridor improvements were implemented. Therefore, a roundabout is recommended as the mitigation at this intersection.

To reduce delay throughout the network, including at unsignalized intersections, a global mitigation strategy of retiming the corridors was applied to better serve the increase in demand volume. Retiming the signals along Shaw Road E, E Pioneer Avenue, E Main Avenue, and at SR 410 would increase the effective green time throughout the network and increase the overall efficiency of the transportation network. The new signal at Shaw Road E and 5th Avenue SE should be coordinated with the signal at Shaw Road E and E Main Avenue. By improving the overall system performance and reducing congestion, vehicles turning from the minor unsignalized approaches are provided more gaps, thus reducing delay and mitigating the traffic impact. SR 162 and 80th Street has sufficient minor approach volumes where a roundabout is recommended to improve the intersection operations. Retiming signals would require signal hardware upgrades, new conduit and wiring, and communications enhancements. A long-range estimate to improve signal operations is required to determine the cost implications of this mitigation strategy.

Below is a description of the mitigation treatments required at specific intersections. Figure 10 also depicts the locations of the intersections needing mitigation.

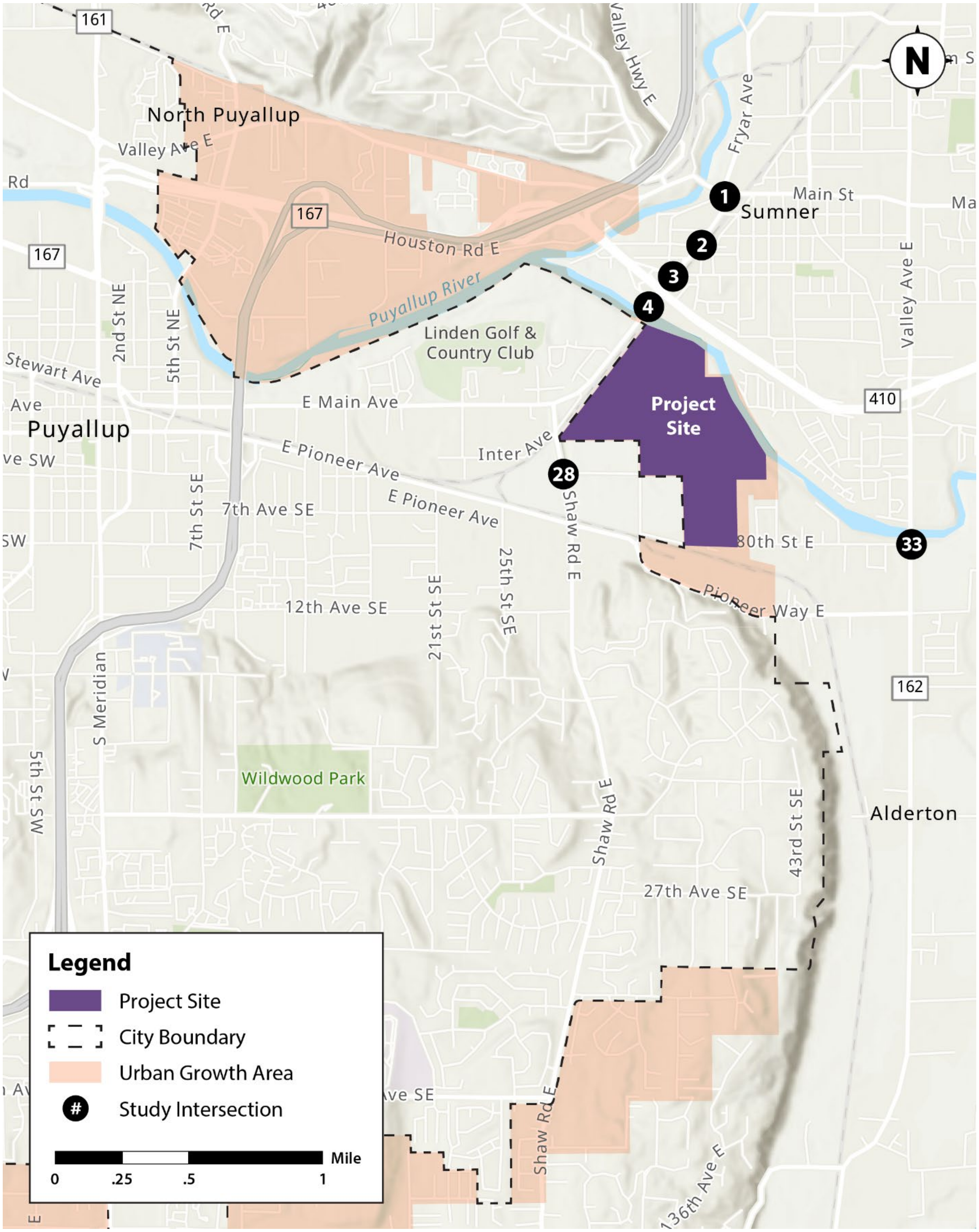


Figure 10. Intersection Mitigation (Scenario C) Vicinity Map

Location #1 and Location #2: Traffic Avenue & Cannery Way, Traffic Avenue & State Street

Retiming these two signalized intersections to run coordinated with SR 410 improves vehicular throughput, reduces queue lengths, and reduces delay. It is recommended to retime the signal to 120-second cycle lengths and update the offset to align the green band with the SR 410 interchange.

Location #3 and Location #4: E Main Avenue & SR 410 WB and E Main Avenue & SR 410 EB

E Main Avenue & SR 410 is a critical bottleneck along the corridor due to the existing width of the bridge over SR 410. Increasing the capacity to meet the demand volume would require a full reconstruction of the interchange. Because WSDOT has jurisdictional control of the interchange and due to the recent improvements to the existing bridge over SR 410, the localized improvements at each ramp terminal considered only low-impact mitigation strategies. This includes retiming both signals to 120-second cycle lengths, and adjusting offsets to improve vehicular throughput and reduce queue lengths. Modifications at E Main Avenue and SR 410 WB (see Figure 11) to eliminate the split-phase signal operations are required, including:

- Modify stop bar locations and restripe the intersection to eliminate split-phase signalization and eliminate path overlap of left-turn vehicles. Update signal phasing to operate with protected signal phasing.

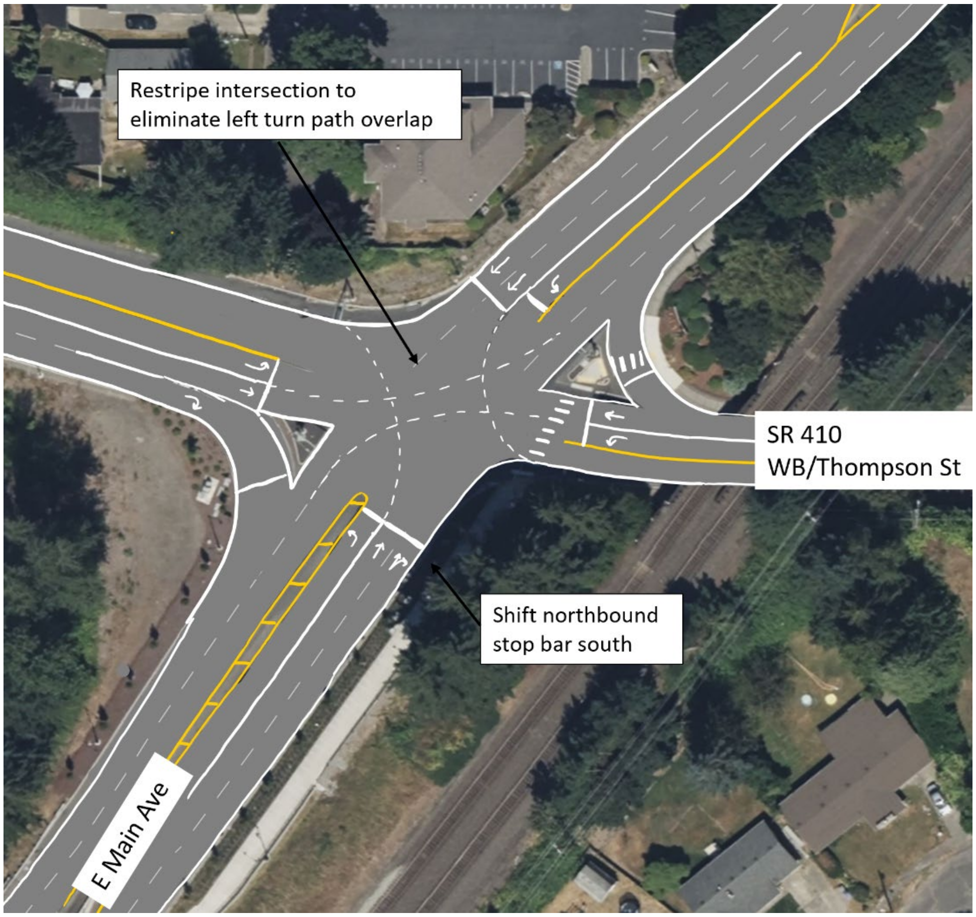


Figure 11. Mitigation Improvement at Location #3, E Main Avenue & SR 410 Westbound/Thompson Street

Location #12: N Meridian Avenue & NE Valley Avenue

Although this intersection exceeds mitigation thresholds with the Project impacts, it already fails in the No Action Scenario. The operational results are tied to the SR 167 interchange, which falls under WSDOT jurisdictional control. Mitigation of traffic impacts at this intersection is not feasible without a full reconstruction of the SR 167 interchange.

Location #28: Shaw Road E & 5th Avenue SE

Widening 5th Avenue SE to provide dedicated WB left- and right-turn lanes, and converting the unsignalized intersection into a signalized intersection would reduce significant delay onto the 5th Avenue SE approach (see Figure 12). The signal would also facilitate improved SB left access onto 5th Avenue SE. Coordinating the signal to the adjacent signals would also improve vehicular flow along Shaw Road E. This would reduce queue lengths and improve travel time. Roadway modifications are also required, including providing a WB right-turn lane. Due to topography, widening 5th Avenue SE would likely occur to the south, affecting approximately 6,400 square feet of right-of-way and a driveway access point. To provide acceptable roadway geometry and the recommended lane configuration at the signal, 5th Avenue SE requires widending to three lanes between Shaw Road E and 33rd Street SE.

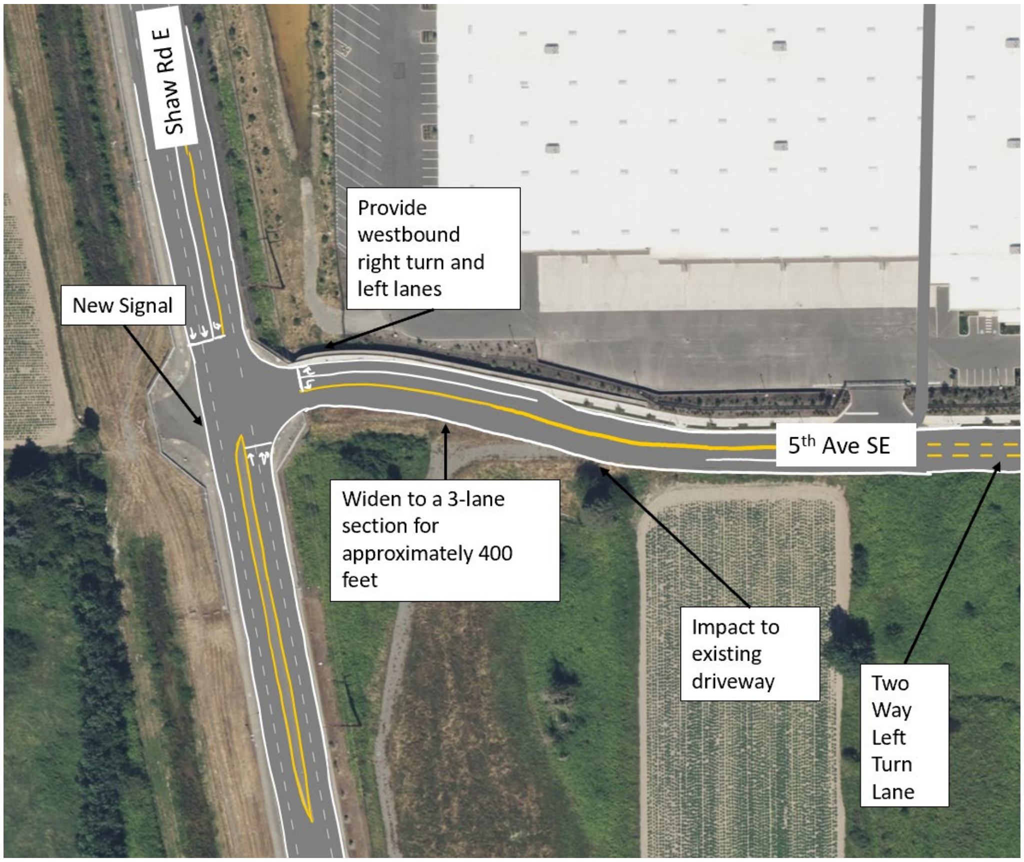


Figure 12. Mitigation Improvement at Location #28, Shaw Road E & 5th Avenue SE

Location #33 SR 162 & 80th Street E

Converting SR 162 and 80th Street E to a roundabout would provide a greater opportunity for the left-turning volume from 80th Street E to complete its movement. Due to the increased traffic generated along SR 162, the left-turning vehicles from 80th Street E experience significant delay waiting for a gap simultaneously in both directions. Providing a roundabout at SR 162 and 80th Street E would have significant right-of-way impacts on all adjacent parcels. A utility pole would also need to be relocated (see Figure 13).

Figure 13. Mitigation Improvement at Location #33 SR 162 & 80th Street E

4.5.1 LOS and Delay

The mitigation strategies significantly improved the system performance; however, several intersections still exceed LOS thresholds (see Table 36 and Table 37). As previously described, several of these are under WSDOT jurisdictional control, and the mitigation implemented looked to prevent these locations from creating operational issues to the adjacent signalized and unsignalized intersections. Although the unsignalized intersection at Shaw Road and Highlands Boulevard fails, the minor approach volume is less than 10 vehicles during the peak hour. The intersection would neither meet warrants to convert to a traffic signal nor provide the minor approach volume to justify converting it to a roundabout.

Table 36. AM Peak Hour Intersection LOS and Delay – Scenario C

Intersection Location	Jurisdiction Control	Intersection Control	Scenario A		Scenario C	
			Delay (sec)	LOS	Delay (sec)	LOS
1. Traffic Ave/Fryar Ave & Main St/Cannery Wy	Sumner	Signal	46.1	D	43.7	D
2. Traffic Ave & State St	Sumner	Signal	16.9	B	15.8	B
3. E Main Ave & SR 410 WB	WSDOT	Signal	19.2	B	15.7	B
4. E Main Ave & SR 410 EB	WSDOT	Signal	23.1	C	24.1	C
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	7.1	A	7.3	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	14.9	B	14.8	B
7. E Main Ave & 15th St SE	Puyallup	Signal	8.2	A	7.8	A
8. E Main Ave & 5th St SE	Puyallup	Signal	10.4	B	10.0	A
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	15.0	B	15.1	B
10. N Meridian Ave & SR 167 EB	WSDOT	Signal	31.4	C	32.1	C
11. N Meridian Ave & SR 167 WB	WSDOT	Signal	21.4	C	25.3	C
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	26.6	C	26.8	C
13. E Pioneer Ave & SR 512 WB Ramps	WSDOT	Signal	20.4	C	20.3	C
14. E Pioneer Ave & SR 512 EB Ramps	WSDOT	Signal	11.3	B	11.5	B
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	10.4	B	10.0	A
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	5.7	A	5.7	A
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	7.6	A	7.3	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	15.3	C	15.4	C
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	43.6	D	43.4	D
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	7.3	A	9.7	A
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	7.9	A	9.6	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	27.1	D	27.5	D
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	24.1	C	25.6	D
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	21.3	C	21.3	C
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	13.4	B	13.1	B
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	11.3	B	11.1	B
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	15.7	B	14.6	B
28. Shaw Rd E & 5th Ave SE	Puyallup	Signal[a]	15.3	B	14.0	B
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	19.8	C	19.8	C
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	13.9	B	13.6	B
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	6.1	A	5.9	A
32. SR 162 & E Pioneer Ave	WSDOT	Signal	24.0	C	24.1	C
33. SR 162 & 80th St E	WSDOT	Roundabout	12.1	B	5.0	A
34. SR 162 & SR 410 EB	WSDOT	Signal	21.4	C	20.8	C
35. SR 162 & SR 410 WB	WSDOT	Signal	18.1	B	18.5	B

Notes: Ave = Avenue; Blvd = Boulevard; Rd = Road; sec = second; St = Street; Wy = Way

[a] The Shaw Road E and 5th Avenue SE intersection was modeled as a signal to allow traffic into the models. This was documented as a mitigation need.

Table 37. PM Peak Hour Intersection LOS and Delay – Scenario C

Intersection Location	**Jurisdiction Control**	**Intersection Control**	**Scenario A**		**Scenario C**	
			Delay (sec)	**LOS**	**Delay (sec)**	**LOS**
1. Traffic Ave/Fryar Ave & Main St/Cannery Wy	Sumner	Signal	60.1	E	33.4	C
2. Traffic Ave & State St	Sumner	Signal	21.9	C	10.8	B
3. E Main Ave & SR 410 WB	WSDOT	Signal	76.4	E	51.9	D
4. E Main Ave & SR 410 EB	WSDOT	Signal	64.1	E	32.4	C
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	8.2	A	7.4	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	23.7	C	30.0	C
7. E Main Ave & 15th St SE	Puyallup	Signal	9.9	A	10.6	B
8. E Main Ave & 5th St SE	Puyallup	Signal	15.0	B	15.8	B
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	10.8	B	11.0	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	29.9	C	29.9	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	12.4	B	12.4	B
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	140.9	F	140.9	F
13. E Pioneer Ave & SR 512 WB Ramps	WSDOT	Signal	18.3	B	23.1	C
14. E Pioneer Ave & SR 512 EB Ramps	WSDOT	Signal	9.9	A	10.8	B
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	12.7	B	10.6	B
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	12.0	B	14.9	B
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	9.6	A	8.7	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	22.9	C	21.3	C
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	60.9	E	57.8	E
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	14.0	B	15.5	C
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	8.2	A	8.4	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	39.8	E	37.7	E
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	38.0	E	49.2	E
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	38.1	D	43.4	D
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	22.9	C	26.0	D
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	24.8	C	32.7	D
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	70.9	E	51.3	D
28. Shaw Rd E & 5th Ave SE[b]	Puyallup	Signal[b]	25.6	C	25.3	C
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	13.8	B	13.9	B
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	14.5	B	11.1	B
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	6.9	A	6.6	A
32. SR 162 & E Pioneer Ave	WSDOT	Signal	25.1	C	26.5	C
33. SR 162 & 80th St E	WSDOT	Roundabout	33.8	D	28.7	C
34. SR 162 & SR 410 EB	WSDOT	Signal	16.6	B	20.7	C
35. SR 162 & SR 410 WB	WSDOT	Signal	21.0	C	20.9	C

Notes: Ave = Avenue; Blvd = Boulevard; Rd = Road; sec = second; St = Street; Wy = Way

[a] No mitigation was implemented at N. Meridian Avenue & Valley Avenue NE because this intersection fails under existing conditions and requires improvements at the SR 167 interchange.

[b] The Shaw Road E and 5th Avenue SE intersection was modeled as a signal to allow traffic into the models. This was documented as a mitigation need.

The following intersections still exceed the LOS threshold:

- E Main Avenue & SR 410 WB (WSDOT)
- E Main Avenue & SR 410 EB (WSDOT)
- N Meridian Avenue & Valley Avenue NE (WSDOT)
- Shaw Road & Highlands Boulevard (Puyallup)
- SR 162 & 80th Street E (WSDOT)

The SR 410 ramp terminals and N Meridian Avenue intersection, as previously described, require significant interchange reconstruction under WSDOT jurisdictional control. The mitigation strategies, however, would reduce overall delay and improve operations at these intersections compared to Scenario A.

The proposed roundabout at SR 162 and 80th Street E would meet the WSDOT LOS performance indicators. The roundabout would also improve safety along the corridor by reducing the conflict points at the intersection and reducing the potential for severe and fatal crashes. Converting a two-way, stop-controlled intersection to a single-lane roundabout has a crash modification factor (CMF) of 0.22 for serious, minor injury, and possible injury crashes.[1] A 0.22 CMF suggest a 78 percent crash reduction. The roundabout would provide better traffic performance than a stop controlled 80th Street E. A continuous green-t intersection was considered and dismissed because the NB-required NB acceleration lane would impact the bridge to the north.

4.5.2 Queue Lengths

The mitigation strategies implemented did not eliminate excessive 95th percentile queueing, which represents the queue length that is exceeded only 5 percent of the time. In fact, by improving traffic flow at the critical bottlenecks within the Project area, traffic platoons and congestion spread throughout the network, increasing the number of locations where 1,000-foot queues develop. Rather than compare 95th percentile queues with Scenario A, a more meaningful metric that shows an improvement to traffic flow is comparing the 50th percentile queue lengths. The 50th percentile queue length represents the queue length that is exceeded 50 percent of the time. Table 38 shows the Scenario A and C intersections where excessive queue lengths were reported. The 50th percentile queue lengths at these intersections are provided for Scenarios A and C.

Due to the large number of turning movements for which queue results were compiled, the tables showing the results of AM and PM peak hour queue extents across simulation scenarios have been placed in Attachment C.

Mitigating the excessive queue lengths requires adding capacity to each corridor. Considering that both the existing condition model and No Action scenario have corridors that exceed the City's performance indicator of 0.85 v/c ratio, the proportional factors provided in Table 27 in Section 4.3.4 should be used to develop the mitigation cost required due to the Proposed Action.

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[1] CMF Clearinghouse, CMF ID: 234

Table 38. AM and PM Peak Hour Excessive Queue Lengths – Scenario C

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	50th Percentile Queue Length (ft)		95th Percentile Queue Length (ft)	
					Scenario A	Scenario C	Scenario A	Scenario C
1. Traffic Ave & Cannery Way	AM	Northbound	Left	180	910	847	1,132	1,103
1. Traffic Ave & Cannery Way	AM	Northbound	Thru	320	1,035	956	1,160	1,163
11. N Meridian Ave & SR 167 SB	AM	Westbound	Right	470	591	722	1,007	1,115
1. Traffic Ave & Cannery Way	PM	Eastbound	Thru	600	1,051	239	1,612	492
1. Traffic Ave & Cannery Way	PM	Eastbound	Right	190	1,014	144	1,650	775
4. E Main Ave & SR 410 EB	PM	Eastbound	Left	300	758	249	1,083	296
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	1,640	1,645	1,645	1,681	1,681
12. N Meridian Ave & Valley Ave NE	PM	Westbound	Left	500	1,066	1,066	1,572	1,572

Notes: Ave = Avenue; ft = feet

4.5.3 Travel Time

Average travel time was collected during the AM and PM peak period for specific routes within the project area, shown in Table 39.

Table 39. Scenario C – AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer Ave, 7th St to 33rd St SE	Eastbound	1.68	4.44	5.23
E Pioneer Ave, 33rd St SE to 7th St	Westbound	1.68	4.37	4.41
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	6.78	6.09
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	6.37	9.62

Notes: Ave = Avenue; min = minute; St = Street

4.5.4 Segmental v/c Ratio

The v/c ratio for Scenario C would be equivalent to the v/c ratio for Scenario A since both scenarios have the same demand volume. The proportional factor for Scenario C is also equivalent to Scenario A.

4.6 Scenario D – Reduced Footprint of Scenario A

Scenario D does not generate as much Knutson Farms traffic due to a decrease in the site footprint. Compared to Scenario A, Scenario D generates 33 percent less site demand volume.

4.6.1 LOS and Delay

Although less site traffic volume is generated, Scenario D still has intersections that exceed the City's standard LOS threshold (see Table 40 and Table 41). Due to the traffic generated by the Proposed Action, 11 intersections exceed the LOS standard thresholds during the PM peak period, including:

- Traffic Avenue & Cannery Way
- E Main Avenue & SR 410 WB
- N Meridian Avenue & Valley Avenue NE

Table 40. AM Peak Hour Intersection LOS and Delay – Scenario D

Intersection Location	Jurisdiction Control	Intersection Control	No Action Scenario		Scenario D	
			Delay (sec)	LOS	Delay (sec)	LOS
1. Traffic Ave & Cannery Way	Sumner	Signal	42.9	D	46.8	D
2. Traffic Ave & State St	Sumner	Signal	14.4	B	17.2	B
3. E Main Ave & SR 410 WB	WSDOT	Signal	20.6	C	19.0	B
4. E Main Ave & SR 410 EB	WSDOT	Signal	16.6	B	22.2	C
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	7.1	A	7.2	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	12.4	B	14.1	B
7. E Main Ave & 15th St SE	Puyallup	Signal	7.4	A	7.7	A
8. E Main Ave & 5th St SE	Puyallup	Signal	10.0	A	10.4	B
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	12.3	B	14.1	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	31.4	C	31.9	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	21.4	C	21.8	C
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	26.6	C	26.7	C
13. E Pioneer Ave & SR 512 WB Ramps	WSDOT	Signal	18.6	B	20.1	C
14. E Pioneer Ave & SR 512 EB Ramps	WSDOT	Signal	10.3	B	10.9	B
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	8.9	A	9.2	A
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	5.5	A	5.6	A
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	6.9	A	7.6	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	11.6	B	14.9	B
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	33.0	C	42.2	D
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	9.4	A	8.5	A
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	7.7	A	7.5	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	23.2	C	19.5	C
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	17.7	C	16.4	C
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	18.9	B	19.2	B
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	12.7	B	12.0	B
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	11.1	B	10.5	B

Intersection Location	Jurisdiction Control	Intersection Control	No Action Scenario		Scenario D	
			Delay (sec)	LOS	Delay (sec)	LOS
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	14.4	B	15.2	B
28. Shaw Rd E and 5th Ave SE[a]	Puyallup	Signal[a]	0.8	A	8.7	A
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	0.7	A	13.0	B
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	8.3	A	11.6	B
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	0.9	A	5.6	A
32. SR 162 & W Pioneer Ave	WSDOT	Signal	24.0	C	24.2	C
33. SR 162 & 80th St	WSDOT	Unsignalized	13.1	B	12.7	B
34. SR 162 & SR 410 EB	WSDOT	Signal	17.7	B	20.9	C
35. SR 162 & SR 410 WB	WSDOT	Signal	16.8	B	18.1	B

Notes: Ave = Avenue; Blvd = Boulevard; Rd = Road; sec = second; St = Street

[a] The Shaw Road E and 5th Avenue SE intersection was modeled as a signal to allow traffic into the models. This was documented as a mitigation need.

Table 41. PM Peak Hour Intersection LOS and Delay – Scenario D

Intersection Location	Jurisdiction Control	Intersection Control	No Action Scenario		Scenario D	
			Delay (sec)	LOS	Delay (sec)	LOS
1. Traffic Ave & Cannery Way	Sumner	Signal	63.7	E	61.4	E
2. Traffic Ave & State St	Sumner	Signal	44.8	D	8.1	A
3. E Main Ave & SR 410 WB	WSDOT	Signal	60.1	E	58.9	E
4. E Main Ave & SR 410 EB	WSDOT	Signal	35.7	D	28.9	C
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	7.4	A	7.4	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	21.1	C	23.0	C
7. E Main Ave & 15th St SE	Puyallup	Signal	10.2	B	9.9	A
8. E Main Ave & 5th St SE	Puyallup	Signal	15.2	B	14.8	B
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	10.6	B	10.8	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	30.0	C	29.9	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	12.8	B	12.4	B
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	138.4	F	140.9	F
13. E Pioneer Ave & SR 512 WB ramps	WSDOT	Signal	34.4	C	17.8	B
14. E Pioneer Ave & SR 512 EB ramps	WSDOT	Signal	15.2	B	9.6	A
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	11.2	B	12.7	B
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	11.6	B	11.8	B
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	9.6	A	9.6	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	17.5	C	15.3	C
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	49.2	D	55.5	E
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	13.8	B	13.3	B
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	8.1	A	8.1	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	36.3	E	38.4	E
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	33.1	D	37.4	E

Intersection Location	Jurisdiction Control	Intersection Control	No Action Scenario		Scenario D	
			Delay (sec)	LOS	Delay (sec)	LOS
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	41.1	D	36.6	D
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	22.3	C	21.8	C
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	26.2	D	20.3	C
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	75.7	E	68.1	E
28. Shaw Rd E & 5th Ave SE	Puyallup	Signal[1]	1.3	A	26.6	C
29. 33rd St SE & 5th Ave SE[a]	Puyallup	Unsignalized	0.5	A	10.2	B
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	13.5	B	12.0	B
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	1.2	A	6.1	A
32. SR 162 & W Pioneer Ave	WSDOT	Signal	24.3	C	24.8	C
33. SR 162 & 80th St	WSDOT	Unsignalized	28.3	D	35.0	C
34. SR 162 & SR 410 EB	WSDOT	Signal	15.9	B	16.5	B
35. SR 162 & SR 410 WB	WSDOT	Signal	20.4	C	20.5	C

Notes: Ave = Avenue; Blvd = Boulevard; Rd = Road; sec = second; St = Street

[a] The Shaw Road E and 5th Avenue SE intersection was modeled as a signal to allow traffic into the models. This was documented as a mitigation need.

4.6.2 Queue Lengths

Excessive queueing was reported during the AM and PM peak periods. During the AM and PM peak periods, the following intersections reported a 95th percentile queue length exceeding 1,000 feet (see Table 42).

Table 42. AM & PM Peak Hour Excessive Queue Lengths – Scenario D

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave & Cannery Way	AM	Northbound	Left	180	935	1,096
1. Traffic Ave & Cannery Way	AM	Northbound	Thru	320	1,004	1,137
1. Traffic Ave & Cannery Way	PM	Eastbound	Thru	600	1,183	1,598
4. E Main Ave & SR 410 EB	PM	Eastbound	Left	300	170	1,270
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	1,640	1,645	1,681
12. N Meridian Ave & Valley Ave NE	PM	Westbound	Left	500	1,066	1,572
24. Shaw Rd E & 23rd Ave SE	PM	Southbound	Thru	650	1,038	1,383
27. Shaw Rd E & 39th Ave SE	PM	Northbound	Left	330	1,074	1,656
27. Shaw Rd E & 39th Ave SE	PM	Southbound	Thru	530	1,043	1,217

Notes: Ave = Avenue; ft = feet; Rd = Road

The excessive queuing shown in Table 42 and the intersections performing outside City's standard LOS threshold require mitigation.

Again, due to the large number of turning movements for which queue results were compiled, the tables showing the results of AM and PM peak hour queue extents across simulation scenarios have been placed in Attachment C.

4.6.3 Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the project area, shown in Table 43.

Table 43. Scenario D – AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer Ave, 7th St to 33rd St SE	Eastbound	1.68	4.43	5.29
E Pioneer Ave, 33rd St SE to 7th St	Westbound	1.68	4.32	4.78
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	6.61	6.49
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	6.40	8.98

Notes: Ave = Avenue; min = minute; Rd = Road; St = Street

4.6.4 v/c Ratio

Although Scenario D generates less site volume compared to Scenario A, Scenario D does increase the v/c ratios along each segment compared to the No Action Scenario. Table 44 provides the volumes and calculated v/c ratios for Scenario D.

Table 44. Peak Hour Segmental v/c Ratio – Scenario D AM and PM

Roadway Segment	Direction of Travel	Calculated Directional Maximum Capacity	Volume (vehicles)		v/c Ratio	
			AM	PM	AM	PM
1. E Main Ave – Shaw Rd E to 5th Ave NE	Westbound	1,445	676	2,009	0.47	1.39
	Eastbound	1,445	1,266	1,286	0.88	0.89
2. E Main Ave – 5th Ave NE to SR 410	Westbound	1,445	711	2,000	0.49	1.38
	Eastbound	760	1,252	1,300	1.65	1.71
3. E Main Ave – 23rd St to Shaw Rd E	Westbound	1,615	472	1,065	0.29	0.66
	Eastbound	1,615	454	684	0.28	0.42
4. Shaw Rd E – E Main Ave to 5th Ave SE	Northbound	1,445	1,173	1,224	0.81	0.85
	Southbound	1,445	565	1,566	0.39	1.08
5. E Pioneer Ave – 21st St SE to 25th St SE	Westbound	1,445	575	940	0.40	0.65
	Eastbound	1,445	560	971	0.39	0.67
6. E Pioneer Ave – Shaw Rd E to SR 162	Westbound	560	394	350	0.70	0.63
	Eastbound	560	272	544	0.49	0.97
7. SR 162 – 143rd Ave E to 80th St E	Northbound	800	780	694	0.98	0.87
	Southbound	800	423	1,270	0.53	1.59
8. SR 162 – SR 410 to 143rd Ave E	Northbound	840	780	694	0.93	0.83
	Southbound	840	423	1,270	0.50	1.51
9. Shaw Rd E – 12th Ave SE to 16th Ave SE	Northbound	560	1,056	766	1.89	1.37
	Southbound	560	363	1,420	0.65	2.54
10. Shaw Rd E – 16th Ave SE to 23rd Ave SE	Northbound	560	964	710	1.72	1.27
	Southbound	560	351	1,258	0.63	2.25

Roadway Segment	Direction of Travel	Calculated Directional Maximum Capacity	Volume (vehicles)		v/c Ratio	
			AM	PM	AM	PM
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	Northbound	560	858	636	1.53	1.14
	Southbound	560	335	1,132	0.60	2.02

Notes: Ave = Avenue; Rd = Road; St = Street

Table 45 below compares the v/c ratios of the No Action Scenario and Scenario D showing the percent increase of v/c for each segment.

Table 45. Peak Hour Intersection v/c Ratio Comparison – No Action Scenario and Scenario D

Roadway Segment	Segment Length (ft)	Direction of Travel	v/c Ratio					
			AM	PM				
			No Action	Scenario D	Percent Increase	No Action	Scenario D	Percent Increase
1. E Main Ave – Shaw Rd E to 5th Ave NE	1,600	Westbound	0.37	0.47	27	1.31	1.39	7
		Eastbound	0.83	0.88	5	0.69	0.89	28
2. E Main Ave – 5th Ave NE to SR 410	3,000	Westbound	0.39	0.49	26	1.30	1.38	7
		Eastbound	1.57	1.65	5	1.34	1.71	28
3. E Main Ave – 23rd St to Shaw Rd E	1,800	Westbound	0.27	0.29	8	0.57	0.66	16
		Eastbound	0.23	0.28	21	0.38	0.42	11
4. Shaw Rd E – E Main Ave to 5th Ave SE	1,400	Northbound	0.75	0.81	9	0.54	0.85	56
		Southbound	0.24	0.39	66	0.94	1.08	15
5. E Pioneer – 21st St SE to 25th St SE	1,350	Westbound	0.37	0.40	8	0.51	0.65	27
		Eastbound	0.32	0.39	22	0.60	0.67	12
6. E Pioneer – Shaw Rd E to SR 162	7,300	Westbound	0.69	0.70	2	0.64	0.63	-3
		Eastbound	0.45	0.49	8	1.01	0.97	-4
7. SR 162 – 143rd Ave E to 80th St E	1,350	Northbound	0.96	0.98	1	0.82	0.87	6
		Southbound	0.50	0.53	5	1.58	1.59	1
8. SR 162 – SR 410 to 143rd Ave E	2,000	Northbound	0.92	0.93	1	0.78	0.83	6
		Southbound	0.48	0.50	5	1.50	1.51	1
9. Shaw Rd E – 12th Ave SE to 16th Ave SE	1,800	Northbound	1.69	1.89	11	1.26	1.37	8
		Southbound	0.62	0.65	5	2.41	2.54	5
10. Shaw Rd E – 16th Ave SE to 23rd Ave SE	2,300	Northbound	1.66	1.72	4	1.19	1.27	7
		Southbound	0.60	0.63	4	2.14	2.25	5
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	7,550	Northbound	1.46	1.53	5	1.06	1.14	7
		Southbound	0.62	0.60	-4	1.86	2.02	9

Notes: Ave = Avenue; ft = feet; Rd = Road; St = Street

The weighted average of the percent increase for each roadway was calculated to be used as a proportional factor for corridor-wide improvements necessary to increase the capacity to be within the performance indicator 0.85 v/c ratio. The percent increase was weighted based on segment length. Table 46 provides the proportional factor for each roadway corridor.

Table 46. Scenario D – Roadway Proportional Factor

Roadway Segment	Proportional Factor
E Main Avenue	0.211
Shaw Road	0.083
E Pioneer Avenue	0.067
SR 162	0.065

4.7 Scenario E – Traffic Mitigation of Scenario D

Scenario E mitigates the traffic impacts reported in Scenario D. Many of the same mitigation strategies implemented under Scenario C were deployed, including:

- Global – increase signal cycle length and coordinate signals:
  - Improve signal progression and increase vehicular throughput at signalized intersections
- Localized – increase left- and/or right-turn lane storage:
  - Reduce the occurrence of queue spillback leading to blocking through-lanes
- Localized – convert an unsignalized intersection at SR 162 and 80th Street E to a roundabout:
  - Improve minor approach access onto the main approach
- Localized – modify lane configuration at signalized intersections:
  - Eliminate split-phase signal timing
  - Improve lane utilization, thus reducing queue lengths

For the localized mitigation strategies, Table 47 describes the extent of mitigation at each location.

Table 47. Scenario E Traffic Impact Mitigation Applied

Intersection Location	Reason for Mitigation	Mitigation Applied	Does Mitigation Fully Address Impact?
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	LOS and delay exceeds City's performance indicators	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
2. Traffic Ave & State St	LOS and delay exceeds City's performance indicators	Retime and coordinate signal; this intersection requires retiming even though it meets LOS thresholds due to proximity to SR 410	Yes, traffic analysis shows acceptable LOS and delay performance indicators
3. E Main Ave & SR 410 WB	LOS and delay exceeds City's performance indicators; queuing	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection	Yes, traffic analysis shows acceptable LOS and delay performance indicators

Intersection Location	Reason for Mitigation	Mitigation Applied	Does Mitigation Fully Address Impact?
	spillbacks to adjacent intersections	and allowing EB and WB left turns to run concurrently	
4. E Main Ave & SR 410 EB	LOS and delay exceeds City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
28. Shaw Rd E & 5th Ave SE	LOS and delay exceeds City's performance indicators	Widen 5th Ave and convert unsignalized intersection to a signal with dedicated WB left- and right-turn lanes; widen 5th Avenue to a three-lane roadway section; retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
33. SR 162 & 80th St	Traffic generated by Scenario D increases left turning volumes onto SR 162	Convert to roundabout	Yes, traffic analysis shows acceptable LOS and delay performance indicators

Notes: Ave = Avenue; St = Street; Wy = Way

4.7.1 LOS and Delay

Similar to Scenario C, which mitigated the Scenario A traffic impacts, several intersections still exceed the LOS thresholds (see Table 48 and Table 49), including:

- Traffic Avenue/Fryar Avenue and E Main Avenue
- E Main Avenue & SR 410 WB
- N Meridian Avenue & Valley Avenue NE

Table 48. AM Peak Hour Intersection LOS and Delay – Scenario E

Intersection Location	Jurisdiction Control	Intersection Control	Scenario D		Scenario E	
			Delay (sec)	LOS	Delay (sec)	LOS
1. Traffic Ave & Cannery Way	Sumner	Signal	46.8	D	42.1	D
2. Traffic Ave & State St	Sumner	Signal	17.2	B	13.9	B
3. E Main Ave & SR 410 WB	WSDOT	Signal	19.0	B	8.0	A
4. E Main Ave & SR 410 EB	WSDOT	Signal	22.2	C	22.2	C
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	7.2	A	7.3	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	14.1	B	13.6	B
7. E Main Ave & 15th St SE	Puyallup	Signal	7.7	A	7.3	A
8. E Main Ave & 5th St SE	Puyallup	Signal	10.4	B	9.7	A
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	14.1	B	14.2	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	31.9	C	31.7	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	21.8	C	23.9	C
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	26.7	C	26.7	C
13. E Pioneer Ave & SR 512 WB Ramps	WSDOT	Signal	20.1	C	20.2	C
14. E Pioneer Ave & SR 512 EB Ramps	WSDOT	Signal	10.9	B	10.7	B

Intersection Location	Jurisdiction Control	Intersection Control	Scenario D		Scenario E	
			Delay (sec)	LOS	Delay (sec)	LOS
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	9.2	A	9.2	A
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	5.6	A	5.6	A
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	7.6	A	7.1	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	14.9	B	12.3	B
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	42.2	D	30.7	C
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	8.5	A	7.4	A
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	7.5	A	7.6	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	19.5	C	25.8	D
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	16.4	C	18.8	C
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	19.2	B	19.1	B
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	12.0	B	11.5	B
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	10.5	B	11.4	B
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	15.2	B	14.1	B
28. Shaw Rd E and 5th Ave SE	Puyallup	Signalized	8.7	A	8.1	A
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	13.0	B	12.4	B
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	11.6	B	8.9	A
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	5.6	A	5.3	A
32. SR 162 and W Pioneer Ave	WSDOT	Signal	24.2	C	24.4	C
33. SR 162 & 80th St	WSDOT	Unsignalized	12.7	B	4.3	A
34. SR 162 & SR 410 EB	WSDOT	Signal	20.9	C	21.7	C
35. SR 162 & SR 410 WB	WSDOT	Signal	18.1	B	18.2	B

Notes: Ave = Avenue; Blvd = Boulevard; Rd = Road; sec = second; St = Streety

Table 49. PM Peak Hour Intersection LOS and Delay – Scenario E

Intersection Location	Jurisdiction Control	Intersection Control	Scenario D		Scenario E	
			Delay (sec)	LOS	Delay (sec)	LOS
1. Traffic Ave & Cannery Way	Sumner	Signal	61.4	E	33.5	C
2. Traffic Ave & State St	Sumner	Signal	8.1	A	10.1	B
3. E Main Ave & SR 410 WB	WSDOT	Signal	58.9	E	48.5	D
4. E Main Ave & SR 410 EB	WSDOT	Signal	28.9	C	31.7	C
5. E Main Ave & 5th Ave NE	Puyallup	Unsignalized	7.4	A	7.3	A
6. E Main Ave & Shaw Rd E	Puyallup	Signal	23.0	C	28.7	C
7. E Main Ave & 15th St SE	Puyallup	Signal	9.9	A	9.9	A
8. E Main Ave & 5th St SE	Puyallup	Signal	14.8	B	15.1	B
9. E Main Ave/W Stewart Ave & 2nd St NE	Puyallup	Signal	10.8	B	11.0	B
10. N Meridian Ave & SR 167 NB	WSDOT	Signal	29.9	C	29.9	C
11. N Meridian Ave & SR 167 SB	WSDOT	Signal	12.4	B	12.4	B
12. N Meridian Ave & Valley Ave NE	WSDOT	Signal	140.9	F	140.9	F
13. E Pioneer Ave & SR 512 WB ramps	WSDOT	Signal	17.8	B	22.7	C
14. E Pioneer Ave & SR 512 EB ramps	WSDOT	Signal	9.6	A	10.4	B

Intersection Location	Jurisdiction Control	Intersection Control	Scenario D		Scenario E	
			Delay (sec)	LOS	Delay (sec)	LOS
15. E Pioneer Ave & 13th St SE	Puyallup	Unsignalized	12.7	B	10.7	B
16. E Pioneer Ave & 15th St SE	Puyallup	Signal	11.8	B	14.9	B
17. E Pioneer Ave & 21st St SE	Puyallup	Signal	9.6	A	8.3	A
18. E Pioneer Ave & 25th St SE	Puyallup	Unsignalized	15.3	C	19.6	C
19. E Pioneer Ave & Shaw Rd E	Puyallup	Signal	55.5	E	49.7	D
20. E Pioneer Ave & 33rd St SE	Puyallup	Unsignalized	13.3	B	14.9	B
21. 33rd St SE & 80th Ave SE	Puyallup	Unsignalized	8.1	A	8.1	A
22. Shaw Rd E & Highlands Blvd	Puyallup	Unsignalized	38.4	E	42.4	E
23. Shaw Rd E & 16th Ave SE	Puyallup	Unsignalized	37.4	E	43.5	E
24. Shaw Rd E & 23rd Ave SE	Puyallup	Signal	36.6	D	39.2	D
25. Shaw Rd E & Forest Green Blvd	Puyallup	Unsignalized	21.8	C	25.0	D
26. Shaw Rd E & Manorwood Dr	Puyallup	Unsignalized	20.3	C	28.8	D
27. Shaw Rd E & 39th Ave SE	Puyallup	Signal	68.1	E	50.1	D
28. Shaw Rd E & 5th Ave SE	Puyallup	Signalized	26.6	C	6.4	A
29. 33rd St SE & 5th Ave SE	Puyallup	Unsignalized	10.2	B	10.4	B
30. Shaw Rd E & Safeway Driveway	Puyallup	Signal	12.0	B	7.7	A
31. 80th St & Warehouse Driveway	Puyallup	Unsignalized	6.1	A	6.1	A
32. SR 162 & E Pioneer Ave	WSDOT	Signal	24.8	C	27.1	C
33. SR 162 & 80th St E	WSDOT	Unsignalized	35.0	C	27.0	C
34. SR 162 & SR 410 EB	WSDOT	Signal	16.5	B	21.4	C
35. SR 162 & SR 410 WB	WSDOT	Signal	20.5	C	20.9	C

Notes: Ave = Avenue; Blvd = Boulevard; Rd = Road; sec = second; St = Street

Comparing the intersection delay between Scenarios D and E, a majority of intersections saw a decrease in delay. Several intersections did see an increase in delay, mainly at unsignalized intersections. Due to the improved vehicular throughput along main corridors, fewer available gaps occur for the minor approach to complete their movement. Although the delay increases at some locations, the overall network performance is improved, as represented by the reduction in average delay at a majority of the intersections within the study area and overall reduction in queue lengths described below.

4.7.2 Queue Lengths

Similar to Scenario C, the mitigation strategies implemented did not eliminate excessive 95th percentile queueing. In fact, by improving traffic flow at the critical bottlenecks within the Project area, traffic platoons and congestion spreads throughout the network, increasing the number of locations where 1,000-foot queues develop. Rather than comparing 95th percentile queues with Scenario A, a more meaningful metric that shows an improvement to traffic flow is comparing the 50th percentile queue lengths. A majority of the 50th percentile queue lengths are less than the available storage length provided. Table 50 below shows the Scenario A intersections where excessive queue lengths were reported. The 50th percentile queue lengths at these intersections are provided for Scenarios D and E.

Table 50. AM and PM Peak Hour Excessive Queue Lengths – Scenarios D and E

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	50th Percentile Queue Length (ft)		95th Percentile Queue Length (ft)	
					Scenario D	Scenario E	Scenario D	Scenario E
1. Traffic Ave & Cannery Wy	AM	Northbound	Left	180	935	789	1,096	1,099
1. Traffic Ave & Cannery Wy	AM	Northbound	Thru	320	1,004	920	1,137	1,156
1. Traffic Ave & Cannery Wy	PM	Eastbound	Thru	600	1,183	247	1,598	456
10. N Meridian Ave & SR 167 NB	PM	Westbound	Left	1,100	170	112	1,270	747
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	1,640	1,645	1,645	1,681	1,681
12. N Meridian Ave & Valley Ave NE	PM	Westbound	Left	500	1,066	1,066	1,572	1,572
24. Shaw Rd E & 23rd Ave SE	PM	Southbound	Thru	650	1,038	566	1,383	1,151
27. Shaw Rd E & 39th Ave SE	PM	Northbound	Left	330	1,074	411	1,564	555
27. Shaw Rd E & 39th Ave SE	PM	Southbound	Thru	530	1,043	1,297	1,217	1,600

Notes: Ave = Avenue; ft = feet; Rd = Road; St = Street; Wy = Way

Due to the large number of turning movements for which queue results were compiled, the tables showing the results of AM and PM peak hour queue extents across simulation scenarios have been placed in Attachment C.

4.7.3 Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, as shown in Table 51.

Table 51. Scenario E – AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer Ave, 7th St to 33rd St SE	Eastbound	1.68	4.39	5.38
E Pioneer Ave, 33rd St SE to 7th St	Westbound	1.68	4.16	4.68
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	6.13	5.93
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	5.91	8.53

Notes: Ave = Avenue; min = minute; Rd = Road; St = Street

4.7.4 v/c Ratio

The v/c ratio for Scenario E would be equivalent to the v/c ratio for Scenario D since both scenarios have the same demand volume. The proportional factor for Scenario E is also equivalent to Scenario D.

4.8 Travel Time

Table 52 provides travel time results from the simulations of all scenarios for comparison.

Table 52. Travel Time Comparison

Segment and Direction	Length (miles)	Travel Time (minutes)						
		Existing	No Action Scenario	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
AM Peak Hour								
Pioneer Ave, 7th St to 33rd St, EB	1.68	4.17	4.52	4.72 (4%)	4.57 (1%)	4.44 (-2%)	4.43 (-2%)	4.39 (-3%)
Pioneer Ave, 33rd St to 7th St, WB	1.68	4.20	4.26	4.40 (3%)	4.35 (2%)	4.37 (3%)	4.32 (1%)	4.15 (-3%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	4.33	6.13	7.44 (21%)	7.07 (15%)	6.78 (11%)	6.61 (8%)	6.13 (0%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	4.26	5.96	6.72 (13%)	6.80 (14%)	6.37 (7%)	6.40 (7%)	5.91 (-1%)
PM Peak Hour								
Pioneer Ave, 7th St to 33rd St, EB	1.68	5.0	5.34	5.50 (3%)	7.49 (40%)	5.23 (-2%)	5.29 (-1%)	5.38 (1%)
Pioneer Ave, 33rd St to 7th St, WB	1.68	5.07	4.68	4.84 (3%)	6.50 (39%)	4.41 (-6%)	4.78 (2%)	4.68 (0%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	6.02	6.55	7.71 (18%)	13.47 (106%)	6.09 (-7%)	6.49 (-1%)	5.93 (-9%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	7.92	9.00	9.59 (7%)	19.66 (118%)	9.62 (7%)	8.98 (0%)	8.53 (-5%)

Notes: Ave = Avenue; Rd = Road; St = Street. Percentages represent increase over the No Action Scenario.

Scenario A sees a significant increase in travel time during the PM peak period compared to the No Action Scenario. The main reason for the increase in travel time is due to the failing signalized intersections and extensive queue lengths described previously in this section. Main Street, Shaw Road, and Pioneer Avenue are projected to be nearing capacity under the No Action Scenario. The increase in traffic generated by the Knutson Farms proposal pushes these corridors further over capacity, resulting in extensive queuing, congestion, and significant increase in travel times.

Scenario B results in grid lock during the PM peak period. This results in a excessive increases in travel time along all corridors. The grid lock is due to the train call which results in excessive queue lengths.

Scenario C results in a decrease in travel time for some corridors and a slight increase in travel time for other corridors during the PM peak period compared to the No Action Scenario. Scenario C travel times indicate that the mitigation strategies implemented reduce the travel times through the transportation network when compared to Scenario A.

Scenario D results in a decrease in travel time for some corridors and a slight increase in travel time for other corridors during the PM peak period compared to the No Action Scenario. Although not as significant as the traffic increase in Scenario A, the increase in traffic generated by Knutson Farms is anticipated to increase travel times along the corridors by less than 1-minute during the AM peak period and are relatively equivalent during the PM peak period.

Scenario E results in a decrease in travel time for some corridors and a slight increase in travel time for other corridors during the PM peak period compared to the No Action Scenario. Scenario E travel times indicate that the mitigation strategies implemented reduce the travel times through the transportation network when compared to Scenario D.

5.0 CRASH ANALYSIS RESULTS

5.1 Crash History

A total of 836 crashes were reported at the study intersections (#1 through #27 and #31 through #35) and the segments in the 7-year period between January 1, 2015, and December 31, 2021 (WSDOT 2023). The study intersections where existing conditions were reported accounted for 757 of these. The summary of intersection and segment crashes is shown in Table 53 by type, in Table 54 by severity, and in Table 55 by year.

Approximately 71 percent of both intersection and segment crashes were either angle or rear-end crashes. Angle crashes are those where two vehicles approaching the intersection on intersecting streets collide. Such crashes, by definition, involve at least one of the two drivers failing to yield the right-of-way. Rear-end crashes tend to predominate on congested intersections and are almost always caused by inattention on the part of the second driver.

No fatal crashes occurred during the study period at any of the intersections or segments studied. “Unknown” severity is a simple lack of reporting and can indicate that a driver, passenger, cyclist, or pedestrian involved in a crash left the scene of the crash without the reporting officer being able to assess injury status, or that the officer may have neglected to complete that part of the crash report. A total of only ten crashes with suspected serious injuries in 836 total reported crashes represent a low degree of severity.

Crashes per year generally declined from 2015 to 2020 and then bounced back in 2021. The year 2020 could be considered something of an aberration, as the global pandemic reduced vehicle miles traveled for most of the year. Crash rates were generally lower on Shaw Road E between E Pioneer Avenue and 39th Street than at other intersections. No crash rates higher than 1.0 were observed for any study intersection. To illustrate relative crash intensity for study area intersections, Figure 14 provides a color-coded map.

Table 53. Crash History by Type

Intersection/Segment	**Angle**	**Fixed Object**	**Head On**	**Over-turn**	**Ped/ Cyclist**	**Rear End**	**Side-swipe**	**Other**	**Total**
1. Traffic Ave & Cannery Way	7	1	1			8	8		25
2. Traffic Ave & State St	3	3				4	1		11
3. E Main Ave & SR 410 WB	30	4	2		1	24	4		65
4. E Main Ave & SR 410 EB	11	2			1	5	1		20
5. W Main Ave & 5th Ave NE	5					2	2		9
6. E Main Ave & Shaw Rd E	11	2		1		23	9		46
7. E Main Ave & 15th St SE	12	3				5	2		22
8. E Main Ave & 5th Ave SE	20	4			2	13	2		41
9. E Main Ave & 2nd St SE	5	1			3	3	5		17
10. N Meridian Ave & SR 167 SB	7			2	1	26	25	2	63
11. N Meridian Ave & SR 167 NB	3	2			1	18	7	1	32
12. N Meridian Ave & Valley Ave NE	26	2				39	41		108

Intersection/Segment	Angle	Fixed Object	Head On	Over-turn	Ped/ Cyclist	Rear End	Side-swipe	Other	Total
13. E Pioneer Ave & SR 512 WB		2				3	1		6
14. E Pioneer Ave & SR 512 EB	1	3			2	7	3		16
15. E Pioneer Ave & 13th St SE	10	1			3		1		15
16. E Pioneer Ave & 15th St SE	4	2				4	1	1	12
17. E Pioneer Ave & 21st St	8					3	2		13
18. E Pioneer Ave & 25th St SE	1	1				1			3
19. E Pioneer Ave & Shaw Rd E	16	2				33	8		59
20. E Pioneer Ave & 33rd St SE	1					5			6
21. 80th St E & 33rd St SE	1								1
22. Shaw Rd E & Highlands Blvd	1	2				3	1		7
23. Shaw Rd E & 16th Ave SE	2					5		1	8
24. Shaw Rd E & 23rd Ave SE	6	1				10			17
25. Shaw Rd E & Forest Green Blvd	1	1				1			3
26. Shaw Rd E & Manorwood Dr	3	2				2			7
27. Shaw Rd E & 39th Ave SE	20	4				12			36
32. SR 162 & E Pioneer Ave	6	2				13	8		29
33. SR 162 & 80th St E	18	3	1			13	1	1	37
34. SR 162 & SR 410 EB	1	1				8			10
35. SR 162 & SR 410 WB	4					9			13
Total Intersection Crashes	**244**	**51**	**4**	**3**	**14**	**302**	**133**	**6**	**757**
A. E Pioneer Ave, SR 512 to Shaw Rd E	12	2				8	4	2	28
B. Shaw Rd E, Pioneer Ave to E Main Ave	2					4	3	1	10
C. E Main Ave, Shaw Rd E to Puyallup River	11				1	13	15	1	41
Total Study Segment Crashes	**25**	**2**	**0**	**0**	**1**	**25**	**22**	**4**	**79**

Source: WSDOT 2023

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Ped = Pedestrian; Rd = Road; St = Street

Table 54. Crash History by Severity

Intersection/Segment	No Injury Apparent	Possible Injury	Suspected Minor Injury	Suspected Serious Injury	Unknown	Total
1. Traffic Ave & Cannery Way	19	5	1			25
2. Traffic Ave & State St	8	2	1			11
3. E Main Ave & SR 410 WB	40	16	6	1	2	65
4. E Main Ave & SR 410 EB	14	4		1	1	20
5. W Main Ave & 5th Ave NE	7	2				9
6. E Main Ave & Shaw Rd E	33	9	2		2	46
7. E Main Ave & 15th St SE	13	6		1	2	22
8. E Main Ave & 5th Ave SE	29	10	2			41
9. E Main Ave & 2nd St SE	11	3	2		1	17
10. N Meridian Ave & SR 167 NB	48	11	2	2		63

Intersection/Segment	No Injury Apparent	Possible Injury	Suspected Minor Injury	Suspected Serious Injury	Unknown	Total
11. N Meridian Ave & SR 167 SB	22	7	2		1	32
12. N Meridian Ave & Valley Ave	94	10	2		2	108
13. E Pioneer Ave & SR 512 WB	6					6
14. E Pioneer Ave & SR 512 EB	11	3	1		1	16
15. E Pioneer Ave & 13th St SE	7	7	1			15
16. E Pioneer Ave & 15th St SE	7	1	3		1	12
17. E Pioneer Ave & 21st St	8	4	1			13
18. E Pioneer Ave & 25th St SE	1	2				3
19. E Pioneer Ave & Shaw Rd E	39	16	3	1		59
20. E Pioneer Ave & 33rd St SE	4	2				6
21. 80th St E & 33rd St SE		1				1
22. Shaw Rd E & Highlands Blvd	5	1		1		7
23. Shaw Rd E & 16th Ave SE	7	1				8
24. Shaw Rd E & 23rd Ave SE	11	5	1			17
25. Shaw Rd E & Forest Green Blvd	1	2				3
26. Shaw Rd E & Manorwood Dr	6		1			7
27. Shaw Rd E & 39th Ave SE	26	7	1		2	36
32. SR 162 & E Pioneer Ave	20	8	1			29
33. SR 162 & 80th St E	20	16	1			37
34. SR 162 & SR 410 EB	9	1				10
35. SR 162 & SR 410 WB	6	7				13
Total Intersection Crashes	**532**	**169**	**34**	**7**	**15**	**757**
A. E Pioneer Ave, SR 512 to Shaw Rd E	19	5	3		1	28
B. Shaw Rd E, Pioneer Ave to E Main Ave	7	1	1	1		10
C. E Main Ave, Shaw Rd E to Puyallup River	30	7	1	2	1	41
Total Study Segment Crashes	**56**	**13**	**5**	**3**	**2**	**79**

Source: WSDOT 2023

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; St = Street

Table 55. Crash History by Year, with Estimated Crash Rate

Intersection/Segment	2015	2016	2017	2018	2019	2020	2021	Total	Rate[a]
1. Traffic Ave & SW 6th Ave	3	3	6	3	4	3	3	25	0.36
2. Traffic Ave & State St	2		1	2	1	2	3	11	0.24
3. E Main Ave & SR 410 WB	14	8	11	8	9	7	8	65	0.81
4. E Main Ave & SR 410 EB	1	4	6	2	1	5	1	20	0.23
5. W Main Ave & 5th Ave NE	1	1	2	1	3		1	9	0.12
6. E Main Ave & Shaw Rd E	6	10	7	5	6	4	8	46	0.48
7. E Main Ave & 15th St SE	4	5	2	1	3	1	6	22	0.44
8. E Main Ave & 5th Ave SE	10	7	8	3	6	4	3	41	0.96
9. E Main Ave & 2nd St SE	2	3	3	3	4	2	0	17	0.30
10. N Meridian Ave & SR 167 NB	9	13	5	14	10	3	9	63	0.41

Intersection/Segment	2015	2016	2017	2018	2019	2020	2021	Total	Rate[a]
11. N Meridian Ave & SR 167 SB	1	4		4	2	1	20	32	0.31
12. N Meridian Ave & Valley Ave	19	16	10	17	16	11	19	108	0.87
13. E Pioneer Ave & SR 512 WB	2	1	1		1	1	0	6	0.15
14. E Pioneer Ave & SR 512 EB	2	1	2	2	4	3	2	16	0.38
15. E Pioneer Ave & 13th St SE	3	4	2	2	1	1	2	15	0.37
16. E Pioneer Ave & 15th St SE	2	4	1	1	1	2	1	12	0.28
17. E Pioneer Ave & 21st St	2	1	2	1	1	1	5	13	0.39
18. E Pioneer Ave & 25th St SE	1			1			1	3	0.09
19. E Pioneer Ave & Shaw Rd E	14	11	6	4	5	4	15	59	0.61
20. E Pioneer Ave & 33rd St SE		1	1	1	1		2	6	0.19
21. 80th St E & 33rd St SE				1			0	1	0.12
22. Shaw Rd E & Highlands Blvd	2	2					3	7	0.11
23. Shaw Rd E & 16th Ave SE	2		1	2			3	8	0.14
24. Shaw Rd E & 23rd Ave SE	2	4	1	2	4	2	2	17	0.28
25. Shaw Rd E & Forest Green Blvd	1	1			1		0	3	0.06
26. Shaw Rd E & Manorwood Dr	2	1	2			1	1	7	0.15
27. Shaw Rd E & 39th Ave SE	7	12	10	4	3		0	36	0.51
32. SR 162 & E Pioneer Ave	3	6	6	5	4	1	4	29	0.46
33. SR 162 & 80th St E	6	3	10	6	5	6	1	37	0.72
34. SR 162 & SR 410 EB	2	1	1	0	1	2	3	10	0.13
35. SR 162 & SR 410 WB	1	0	4	1	2	3	2	13	0.20
Total Intersection Crashes	**126**	**127**	**111**	**96**	**99**	**70**	**128**	**757**	**-**
A. E Pioneer Ave, SR 512 to Shaw Rd E	5	4	5	4	3	2	5	28	
B. Shaw Rd E, Pioneer Ave to E Main Ave	1	2	4			3	0	10	
C. E Main Ave, Shaw Rd E to Puyallup River	4	9	8	4	12	4	0	41	
Total Study Segment Crashes	**10**	**15**	**17**	**8**	**15**	**9**	**5**	**79**	**-**

Source: WSDOT 2023

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; Rd = Road; St = Street

[a] Intersection crash rate is an estimate of crashes per million entering vehicles. Segment crash rate is an estimate of crashes per 100M vehicle miles traveled.

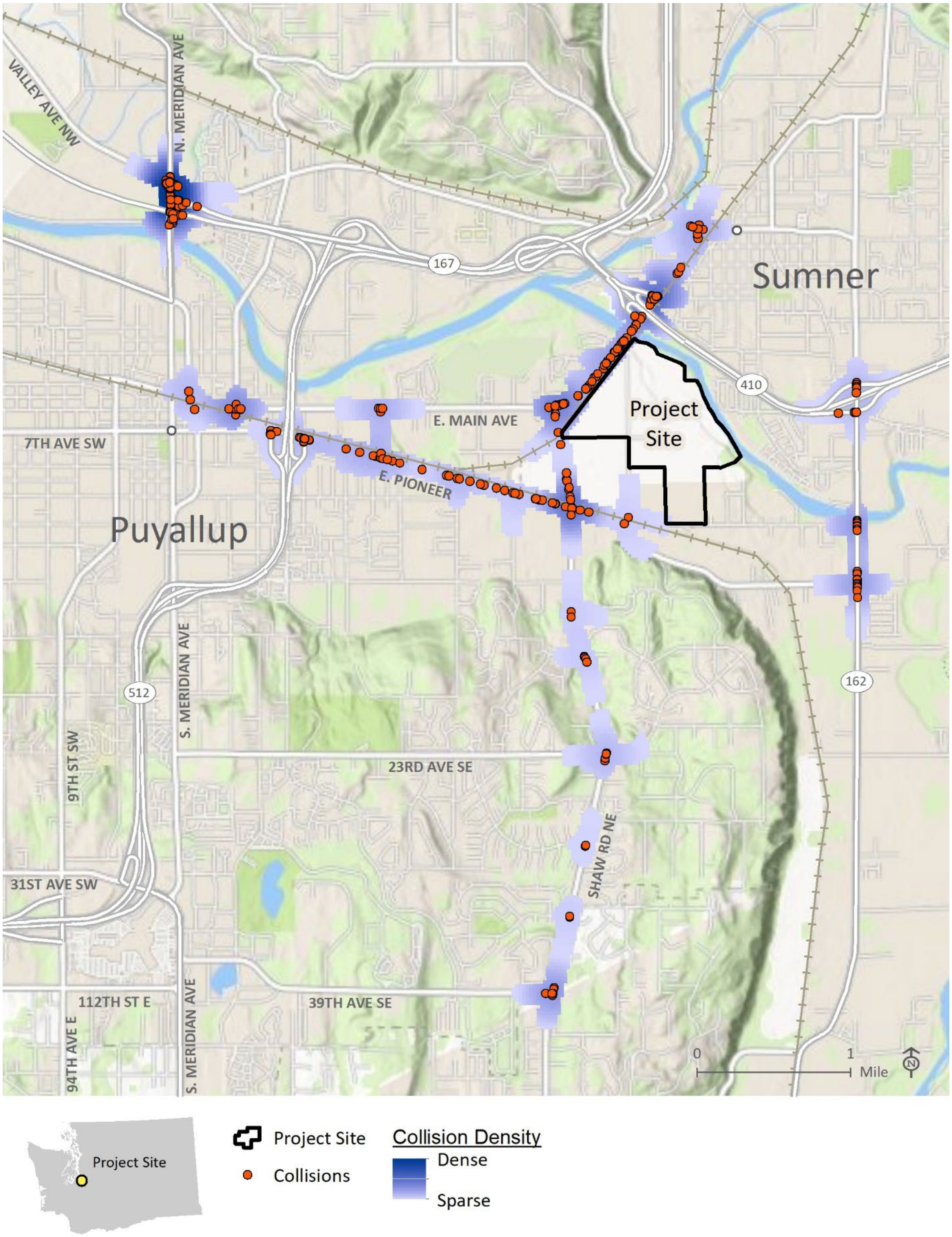

Figure 14. Relative Crash Intensity for Study Intersections

5.2 Traffic Safety Performance Impacts of Future Scenarios

Intersection crash rates (crashes per million entering vehicles) can reasonably be expected to remain similar in the Project year of opening (2026) unless one or more of the following influences them:

- Abnormal weather results in more hazardous conditions than have been observed within the study area in the recent past;
- Industrywide improvements in vehicle technology associated with crash avoidance are implemented in enough of the vehicle fleet that overall crashes are reduced; and/or
- Project improvements are made at specific intersections that reduce crash risk, such as improvements to lighting, sight distance, or intersection geometry.

Comparisons here are based on an assumption that such factors would neither be substantive nor effectively cancel each other out.

5.2.1 No Action Scenario

The No Action Scenario would experience more crashes per year than the 6-year average from 2015 to 2020, but type and severity patterns would not be expected to change. No significant safety impacts are expected to result from the No Action Scenario.

5.2.2 Scenario A: Proposed Action

Scenario A would result in significant increases in traffic volume at study intersections and along study segments. With the assumption that relationship of crashes to volume remains the same, the Project would come with an anticipated corresponding increase in crashes and impacts to overall public safety. As shown earlier, Scenario A would, for the most part, also result in more peak hour congestion, which could reasonably be expected to affect crash likelihood.

Additional traffic congestion could affect safety performance both positively and negatively. On the positive side, lower speeds could give drivers more time to react to other road users. Shaw Road has documented high speeds as shown in City plans, such as the Safe Routes to Schools Plan. However, drivers could also become frustrated by delays and attempt to make more aggressive movements to compensate, such as changing lanes more often or accepting smaller gaps when entering or crossing conflicting traffic.

During congested or lower-speed conditions, crash type distribution could be different from when drivers are freer to choose their desired speed. More congestion is likely to correspond to more sideswipe and rear-end crashes due to increased lane-changing or other aggressive/impatient driving. Both lower speeds and more of these types of crashes are often associated with lower severity (fewer injuries) than the head-on, angle, and fixed-object crashes that typically occur when there is little or no congestion. No significant safety impacts are expected to result from Scenario A.

5.2.3 Scenario B: Rail Delivery

With similar levels of congestion relative to Scenario A, Scenario B would be expected to have similar safety impacts to those outlined for Scenario A. While the very low speeds of proposed trains on crossings near the site for Scenario B indicate that new safety impacts due to rail crossing activity would not be significant, additional active rail crossings would not make Scenario B safer than the No Action Scenario or Scenario A. No significant safety impacts are expected to result from Scenario B.

5.2.4 Scenario D: Reduced Footprint Alternative

The characteristics of the safety impacts under Scenario D are similar to those under Scenario A. However, the magnitude of the impacts is expected to be lower, since the anticipated traffic volumes associated with Scenario D are lower than those associated with Scenario A.

6.0 PAVEMENT ANALYSIS RESULTS

6.1 Current Condition

As presented in Attachment B, the pavement analysis determined average remaining life of the existing pavement on the subject roadways. It was determined E Main Avenue has 9 percent remaining life, Shaw Road E has 38 percent remaining life, and E Pioneer Avenue has 38 percent remaining life. See Table 56 for the estimated remaining life at current condition.

Table 56. Pavement Remaining Life and Percent Increase in ESAL

Roadway	Estimated Remaining Life at Current Condition	Scenario A Percent Increase in ESAL	Scenario D Percent Increase in ESAL
East Main Avenue	0 to 23% (9% Average)	9.4	6.5
Shaw Road East	18 to 68% (38% average)	5.3	3.6
East Pioneer Avenue	8 to 63% (32% average)	6.8	4.7

6.2 No Action Scenario

Under the No Action Scenario, pavement would continue to deteriorate at its current rate, with slight potential acceleration due to increasing traffic.

6.3 Scenarios A and D

Due to the increase in truck volumes and the ESALs (refer to Section 3.6) under Scenarios A and D, the subject roadways would reach their end of life faster than under No Action Scenario. Table 56 shows the percent increase in ESALs from the No Action Scenario to Scenarios A and D. These percent increases indicate how much sooner the pavements would reach their end of life. For example, on E Main Avenue, pavement condition under Scenario A would reach the end of its life 9.4 percent sooner than under the No Action Scenario. A pavement analysis for Scenario B was not conducted due to the operational impacts and lack of viability of that scenario.

Typical mitigation measures for pavements include a full repave and a grind-and-overlay. Within reasonable range, it is recommended for the applicant to share 5 to 10 percent of the cost of the mitigation.

7.0 MITIGATION SUMMARY

The Proposed Action, either Scenario A or the reduced intensity alternative, Scenario D, would result in operational degradation of the transportation system within the Project area. Several intersections within the Project area would exceed LOS thresholds, triggering the need for mitigation at specific intersections, including restriping, roadway widening and new signals, and construction of a roundabout. Table 57 summarizes required mitigation for Scenarios A and D.

Table 57. Required Mitigation Summary

Intersection/Corridor	**Required Mitigation By Scenario**	
	Scenario A	**Scenario D**
1. Traffic Ave/Fryar Ave & Main St/Cannery Wy	Retime and coordinate signal	Retime and coordinate signal
2. Traffic Ave & State St	Retime and coordinate signal; this intersection requires retiming even though it meets LOS thresholds due to proximity to SR 410	Retime and coordinate signal; this intersection requires retiming even though it meets LOS thresholds due to proximity to SR 410
3. E Main Ave & SR 410 WB	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection and allowing EB and WB left turns to run concurrently	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection and allowing EB and WB left turns to run concurrently
4. E Main Ave & SR 410 EB	Retime and coordinate signal	Retime and coordinate signal
12. N Meridian Ave & Valley Ave NE	No mitigation applied, see below for discussion	No mitigation applied, see below for discussion
28. Shaw Rd E & 5th Ave SE	Widen 5th Ave and convert unsignalized intersection to a signal with dedicated WB left- and right-turn lanes; widen 5th Ave to a three-lane roadway section between Shaw Rd E and 33rd St SE	Widen 5th Ave and convert unsignalized intersection to a signal with dedicated WB left- and right-turn lanes; widen 5th Ave to a three-lane roadway section between Shaw Rd E and 33rd St SE
33. SR 162 & 80th St	Convert to roundabout	Convert to roundabout
Proportional Factor		
E Main Ave	0.324	0.211
Shaw Rd E	0.170	0.083
E Pioneer Ave	0.122	0.067
SR 162	0.117	0.065

Notes: Ave = Avenue; Rd = Road; St = Street; Wy = Way

The Proposed Action further exacerbates the roadway corridors that are projected to have a v/c ratio greater than 0.85 under the no-build condition. This is evident of the excessive queueing that is projected to occur along Shaw Road E, Pioneer Avenue, and SR 162. Global mitigation strategies, such as retiming existing signals, are proposed to alleviate the excessive queue lengths.

In addition to global mitigation strategies, a proportional factor was developed for each major corridor within the Project area. The Proposed Action would reduce the available capacity any proposed corridor-wide capacity improvement would provide. In order to determine a fee-in-lieu cost, the weighted factor is developed to quantify the total fee-in-lieu cost that is equivalent to the reduction in available capacity due to the Proposed Action. The proportional factor is to be applied to corridor-wide capacity improvements long-range estimates to determine the appropriate capacity usage fee.

The Proposed Action would require unavoidable upgrades to the transportation network within the Project area. These improvements include:

- Improve existing roadways to meet ADA requirements. Areas impacted by associated mitigation would need to provide associated upgrades to street right-of-way facilities to meet all current ADA regulations, best practices, and guidelines. This would apply globally under each mitigation scenario.
- Improve existing transit stations. The Project would generate substantial employment on site that would necessitate transit stop improvements meant to serve the site employees. In consultation with Pierce Transit, the EIS team and City have identified one current bus stop (stop #1301, at the NE corner of Shaw Road and East Main Avenue) that would require full improvement with a bus stop shelter. This would apply globally under each mitigation scenario.
- Widen existing roadways to meet current City and County standards. Due to the substandard nature of the immediate public roadways serving the development site and the total daily vehicle trips documented on those roads, upgrades to the following roadways would be required:
    - 5th Avenue SE. Completing cross section improvements from Shaw to 33rd Street in accordance with City standards. This mitigation is needed to address the increased demand from impacts generated by the site development. This would apply globally under each mitigation scenario.
    - 33rd Street SE. Complete full street cross section improvements to 33rd Street SE from 5th Avenue SE to East Pioneer Avenue, including intersection improvements at 8th Avenue SE/33rd Street SE and 33rd Street SE/E Pioneer Avenue. The existing 33rd Street SE, from 5th Avenue to E Pioneer Avenue, is substandard; the majority of the roadway is 15 to 17 feet in width paved, with no pedestrian facilities. This roadway is designated in the City’s Comprehensive Plan as a future arterial. A major community park facility (Van Lierop Park) and a large non-profit (Step by Step) serving at risk mothers and youth exist on this road, and both plan major improvement in the future. The road would need to be improved to serve the demand and impacts generated by site development. Without this mitigation, the impacts to the City transportation network safety would be significant. Per the City Comprehensive Plan (policy T-3.3 (b.)), development that causes impacts to the City transportation network are required to make improvements. This would apply globally under each mitigation scenario.
    - 80th Street E/8th Avenue SE. Complete full street cross section improvements to 80th Street E (Pierce County) and 8th Avenue SE (City) from the eastern-most portion of the Project site frontage to the 8th Avenue SE/33rd Street SE intersection. Similar to the above analysis regarding street impacts and substandard nature of these local roads, improvements to serve the demand and impacts generated by site development are required. Without this mitigation, the impacts to the City and County transportation network safety would be significant. Per the City Comprehensive Plan (policy T-3.3 (b.)), development that causes impacts to the City transportation network are required to make improvements. This would apply globally under each mitigation scenario.

8.0 REFERENCES

City of Puyallup. 2021. Knutson Farms Environmental Impact Statement, Rail Mitigation Analysis – Rail Concepts MemoV2. October 25, 2021.

City of Puyallup. Transportation Element 2015

FHWA (Federal Highway Administration). 2014. *Traffic Monitoring Guide*. Appendix C, Vehicle Types. Policy and Governmental Affairs, Office of Highway Policy Information. Available at: https://www.fhwa.dot.gov/policyinformation/tmguide/tmg_2013/vehicle-types.cfm.

ITE (Institute of Transportation Engineers). 2021. *Trip General Manual, 11th Edition*. Available at: https://www.ite.org/pub/?id=FB8FA48B-9560-D85F-56A4-5A6F8CD1A9CF.

PTV. 2021. User Manual, North America Vehicle Fleet.

TRB (Transportation Research Board). 2016. *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis.*

USDOT (U.S. Department of Transportation). 2020. *Comprehensive Truck Size and Weight Study*. Available at: https://www.fhwa.dot.gov/policy/otps/truck/finalreport.cfm.

WSDOT (Washington State Department of Transportation). 2023. WA State Crash Data Portal. Available at: https://remoteapps.wsdot.wa.gov/highwaysafety/collision/data/portal/public/.

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Attachment A – Existing Traffic Counts

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Attachment B – Pavement Analysis

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Attachment C – Queuing Results

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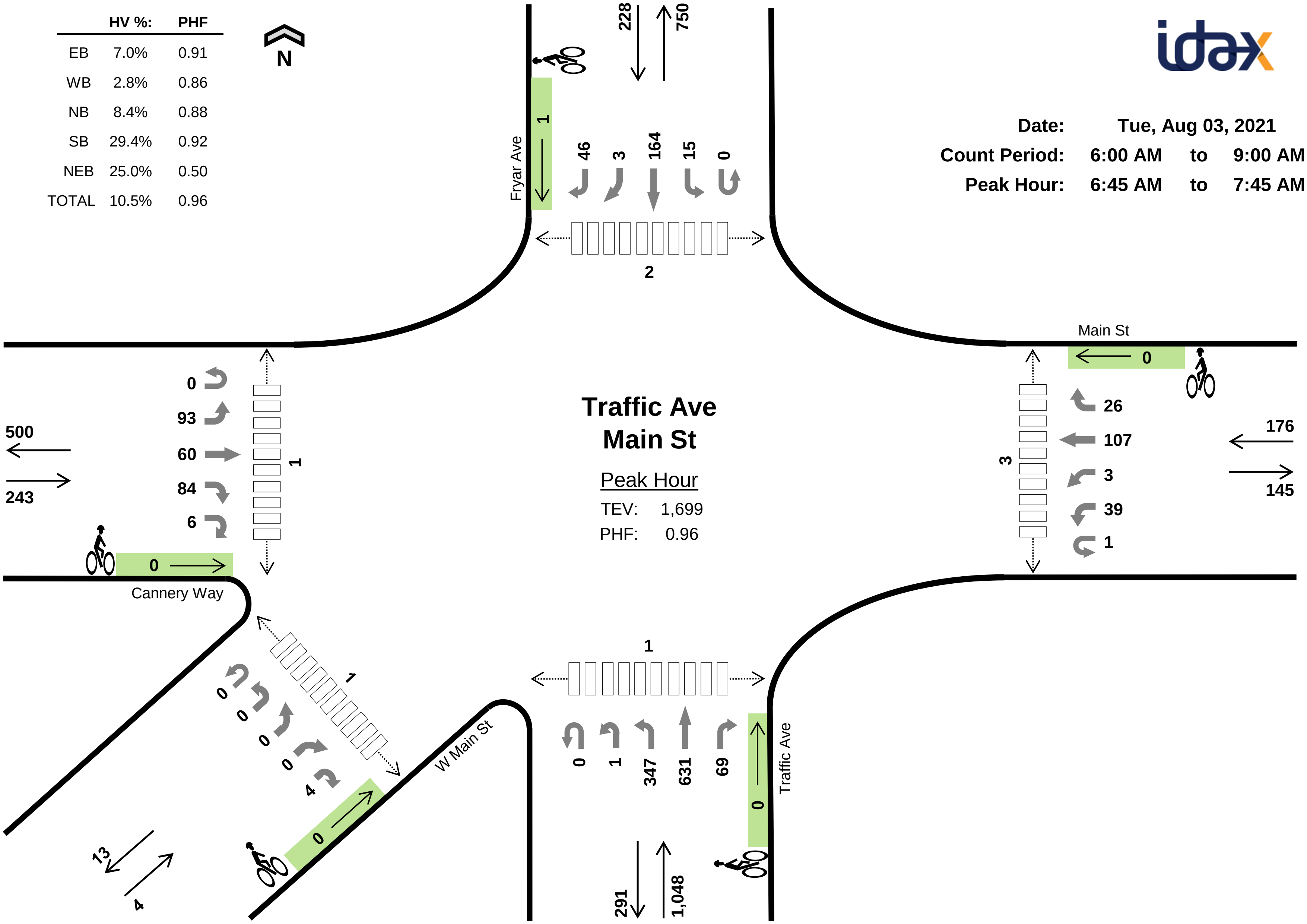
	HV %:	PHF
EB	7.0%	0.91
WB	2.8%	0.86
NB	8.4%	0.88
SB	29.4%	0.92
NEB	25.0%	0.50
TOTAL	10.5%	0.96

Date:	**Tue, Aug 03, 2021**			
Count Period:	**6:00 AM**	**to**	**9:00 AM**	
Peak Hour:	**6:45 AM**	**to**	**7:45 AM**	



Three-Hour Count Summaries

Interval Start	Cannery Way					Main St					Traffic Ave					Fryar Ave					W Main St					15-min Total	Rolling One Hour
	Eastbound					Westbound					Northbound					Southbound					Northeastbound						
	UT	LT	TH	RT	HR	UT	LT	BL	TH	RT	UT	HL	LT	TH	RT	UT	LT	TH	BR	RT	UT	HL	BL	BR	HR		
6:00 AM	0	16	7	8	1	0	6	0	16	9	0	0	57	137	10	0	2	44	1	7	0	0	0	0	0	321	0
6:15 AM	0	28	9	13	0	0	9	0	14	3	0	1	80	144	5	0	1	26	0	7	0	0	0	0	0	340	0
6:30 AM	0	25	8	18	1	0	12	0	21	7	0	0	67	149	11	0	3	35	1	10	0	0	0	0	0	368	0
6:45 AM	**0**	**28**	**13**	**12**	**3**	**1**	**8**	**1**	**25**	**5**	**0**	**0**	**95**	**193**	**10**	**0**	**6**	**36**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**443**	1,472
7:00 AM	**0**	**23**	**13**	**23**	**0**	**0**	**9**	**1**	**22**	**5**	**0**	**0**	**81**	**123**	**13**	**0**	**6**	**45**	**0**	**11**	**0**	**0**	**0**	**0**	**2**	**377**	1,528
7:15 AM	**0**	**18**	**17**	**30**	**2**	**0**	**11**	**0**	**34**	**6**	**0**	**1**	**91**	**152**	**21**	**0**	**2**	**43**	**2**	**9**	**0**	**0**	**0**	**0**	**1**	**440**	1,628
7:30 AM	**0**	**24**	**17**	**19**	**1**	**0**	**11**	**1**	**26**	**10**	**0**	**0**	**80**	**163**	**25**	**0**	**1**	**40**	**1**	**19**	**0**	**0**	**0**	**0**	**1**	**439**	**1,699**
7:45 AM	0	24	19	26	3	0	12	2	21	7	0	0	87	141	23	0	4	40	1	19	0	0	0	0	3	432	1,688
8:00 AM	0	15	23	35	2	0	19	0	24	8	0	0	44	114	20	0	9	55	0	12	0	0	0	0	6	386	1,697
8:15 AM	0	22	25	30	2	0	13	6	26	11	0	1	37	103	19	0	3	50	0	19	0	0	0	0	2	369	1,626
8:30 AM	0	23	21	25	0	0	18	0	18	11	0	2	45	102	24	0	11	64	1	12	0	0	0	0	2	379	1,566
8:45 AM	0	21	28	32	0	0	15	0	17	17	0	0	36	94	26	0	9	56	1	18	0	0	0	0	2	372	1,506
Count Total	0	267	200	271	15	1	143	11	264	99	0	5	800	1,615	207	0	57	534	8	150	0	0	0	0	19	4,666	0
Peak Hour All	**0**	**93**	**60**	**84**	**6**	**1**	**39**	**3**	**107**	**26**	**0**	**1**	**347**	**631**	**69**	**0**	**15**	**164**	**3**	**46**	**0**	**0**	**0**	**0**	**4**	**1,699**	**0**
HV	**0**	**11**	**2**	**4**	**0**	**0**	**3**	**0**	**1**	**1**	**0**	**0**	**12**	**76**	**0**	**0**	**2**	**59**	**0**	**6**	**0**	**0**	**0**	**0**	**1**	**178**	**0**
HV%	**-**	**12%**	**3%**	**5%**	**0%**	**0%**	**8%**	**0%**	**1%**	**4%**	**-**	**0%**	**3%**	**12%**	**0%**	**-**	**13%**	**36%**	**0%**	**13%**	**-**	**-**	**-**	**-**	**25%**	**10%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals						Bicycles						Pedestrians (Crossing Leg)					
	EB	WB	NB	SB	NEB	Total	EB	WB	NB	SB	NEB	Total	East	West	North	South	Southwest	Total
6:00 AM	3	1	15	17	0	*36*	1	0	0	0	0	*1*	1	0	2	1	0	*4*
6:15 AM	4	0	7	14	0	*25*	0	0	0	0	0	*0*	2	0	1	0	0	*3*
6:30 AM	2	1	13	22	0	*38*	0	0	0	0	0	*0*	1	0	0	0	0	*1*
6:45 AM	**6**	**0**	**12**	**19**	**0**	***37***	**0**	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	**0**	***1***
7:00 AM	**5**	**3**	**28**	**17**	**1**	***54***	**0**	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**1**	**0**	**1**	***3***
7:15 AM	**2**	**1**	**30**	**16**	**0**	***49***	**0**	**0**	**0**	**1**	**0**	***1***	**2**	**1**	**0**	**1**	**0**	***4***
7:30 AM	**4**	**1**	**18**	**15**	**0**	***38***	**0**	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	**0**	***0***
7:45 AM	4	1	28	25	0	*58*	0	0	0	0	0	*0*	2	0	0	4	3	*9*
8:00 AM	7	3	18	20	0	*48*	0	1	0	0	0	*1*	1	1	0	0	0	*2*
8:15 AM	6	2	22	24	0	*54*	0	0	0	0	0	*0*	0	0	0	0	0	*0*
8:30 AM	6	6	21	27	0	*60*	0	0	0	0	0	*0*	2	0	0	1	3	*6*
8:45 AM	2	2	16	21	0	*41*	0	0	0	1	0	*1*	0	0	0	0	0	*0*
Count Total	51	21	228	237	1	*538*	1	1	0	2	0	*4*	12	2	5	7	7	*33*
Peak Hr	**17**	**5**	**88**	**67**	**1**	***178***	**0**	**0**	**0**	**1**	**0**	***1***	**3**	**1**	**2**	**1**	**1**	*8*

Three-Hour Count Summaries - Heavy Vehicles

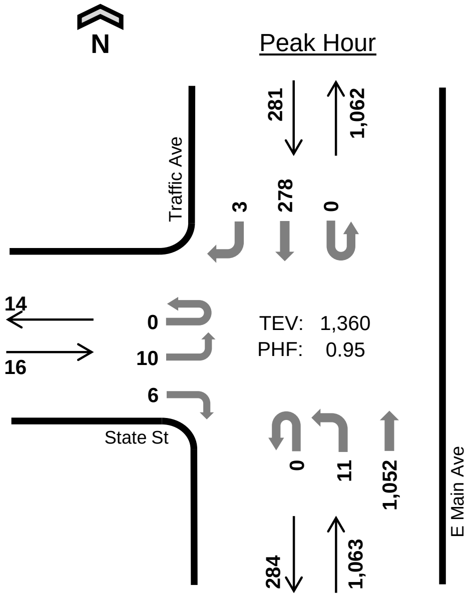
Interval Start	Cannery Way					Main St					Traffic Ave					Fryar Ave					W Main St					15-min Total	Rolling One Hour
	Eastbound					Westbound					Northbound					Southbound					Northeastbound						
	UT	LT	TH	RT	HR	UT	LT	BL	TH	RT	UT	HL	LT	TH	RT	UT	LT	TH	BR	RT	UT	HL	BL	BR	HR		
6:00 AM	0	3	0	0	0	0	0	0	0	1	0	0	2	12	1	0	0	16	0	1	0	0	0	0	0	36	0
6:15 AM	0	3	0	1	0	0	0	0	0	0	0	0	1	6	0	0	0	12	0	2	0	0	0	0	0	25	0
6:30 AM	0	1	0	1	0	0	1	0	0	0	0	0	2	11	0	0	1	19	0	2	0	0	0	0	0	38	0
6:45 AM	**0**	**4**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**10**	**0**	**0**	**1**	**16**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**37**	136
7:00 AM	**0**	**3**	**0**	**2**	**0**	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**4**	**24**	**0**	**0**	**1**	**15**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**54**	154
7:15 AM	**0**	**0**	**0**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**5**	**25**	**0**	**0**	**0**	**15**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**49**	178
7:30 AM	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**17**	**0**	**0**	**0**	**13**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**38**	**178**
7:45 AM	0	2	0	2	0	0	1	0	0	0	0	0	5	22	1	0	1	19	1	4	0	0	0	0	0	58	199
8:00 AM	0	2	1	4	0	0	2	0	1	0	0	0	2	16	0	0	0	18	0	2	0	0	0	0	0	48	193
8:15 AM	0	1	2	3	0	0	1	0	0	1	0	0	0	21	1	0	0	18	0	6	0	0	0	0	0	54	198
8:30 AM	0	4	1	1	0	0	3	0	1	2	0	0	1	17	3	0	0	25	0	2	0	0	0	0	0	60	220
8:45 AM	0	1	0	1	0	0	1	0	0	1	0	0	0	15	1	0	0	19	0	2	0	0	0	0	0	41	203
Count Total	0	28	6	17	0	0	12	0	3	6	0	0	25	196	7	0	4	205	1	27	0	0	0	0	1	538	0
Peak Hour	**0**	**11**	**2**	**4**	**0**	**0**	**3**	**0**	**1**	**1**	**0**	**0**	**12**	**76**	**0**	**0**	**2**	**59**	**0**	**6**	**0**	**0**	**0**	**0**	**1**	178	**0**

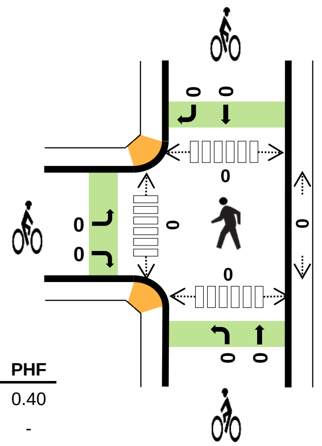
Three-Hour Count Summaries - Bikes

Interval Start	Cannery Way					Main St					Traffic Ave					Fryar Ave					W Main St					15-min Total	Rolling One Hour
	Eastbound					Westbound					Northbound					Southbound					Northeastbound						
	UT	LT	TH	RT	HR	UT	LT	BL	TH	RT	UT	HL	LT	TH	RT	UT	LT	TH	BR	RT	UT	HL	BL	BR	HR		
6:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	1
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	2
Count Total	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	4	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1	**0**

E Main Ave
State St

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 6:45 AM to 7:45 AM





	HV %:	PHF
EB	0.0%	0.40
WB	-	-
NB	8.3%	0.91
SB	24.6%	0.88
TOTAL	11.5%	0.95

Three-Hour Count Summaries

Interval Start		State St				0				E Main Ave				Traffic Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:45 AM		0	1	0	0	0	0	0	0	0	3	290	0	0	0	56	0	350	0
7:00 AM		0	0	0	3	0	0	0	0	0	4	227	0	0	0	73	1	308	0
7:15 AM		0	1	0	1	0	0	0	0	0	2	261	0	0	0	79	1	345	0
7:30 AM		0	8	0	2	0	0	0	0	0	2	274	0	0	0	70	1	357	1,360
Peak Hour	All	0	10	0	6	0	0	0	0	0	11	1,052	0	0	0	278	3	1,360	0
	HV	0	0	0	0	0	0	0	0	0	0	88	0	0	0	69	0	157	0
	HV%	-	0%	-	0%	-	-	-	-	-	0%	8%	-	-	-	25%	0%	12%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:45 AM	0	0	11	16	*27*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	0	0	29	19	*48*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	0	0	25	18	*43*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	0	0	23	16	*39*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	0	0	88	69	*157*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	**State St**				**0**				**E Main Ave**				**Traffic Ave**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	1	0	0	0	0	0	0	0	1	204	0	0	0	57	0	263	0
6:15 AM	0	2	0	1	0	0	0	0	0	0	224	0	0	0	45	1	273	0
6:30 AM	0	1	0	1	0	0	0	0	0	2	249	0	0	0	65	0	318	0
6:45 AM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**290**	**0**	**0**	**0**	**56**	**0**	**350**	1,204
7:00 AM	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**4**	**227**	**0**	**0**	**0**	**73**	**1**	**308**	1,249
7:15 AM	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**261**	**0**	**0**	**0**	**79**	**1**	**345**	1,321
7:30 AM	**0**	**8**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**274**	**0**	**0**	**0**	**70**	**1**	**357**	**1,360**
7:45 AM	0	2	0	1	0	0	0	0	0	2	249	0	0	0	77	0	331	1,341
8:00 AM	0	5	0	1	0	0	0	0	0	4	180	0	0	0	103	6	299	1,332
8:15 AM	0	6	0	3	0	0	0	0	0	1	160	0	0	0	92	1	263	1,250
8:30 AM	0	3	0	4	0	0	0	0	0	2	165	0	0	0	102	1	277	1,170
8:45 AM	0	7	0	2	0	0	0	0	0	2	161	0	0	0	108	3	283	1,122
Count Total	0	37	0	19	0	0	0	0	0	25	2,644	0	0	0	927	15	3,667	0
Peak Hour **All**	**0**	**10**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**11**	**1,052**	**0**	**0**	**0**	**278**	**3**	**1,360**	**0**
HV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**88**	**0**	**0**	**0**	**69**	**0**	**157**	**0**
HV%	**-**	**0%**	**-**	**0%**	**-**	**-**	**-**	**-**	**-**	**0%**	**8%**	**-**	**-**	**-**	**25%**	**0%**	**12%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	**Heavy Vehicle Totals**					**Bicycles**					**Pedestrians (Crossing Leg)**				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	0	0	13	15	*28*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	0	0	5	12	*17*	0	0	1	1	*2*	0	0	0	0	*0*
6:30 AM	0	0	18	23	*41*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	**0**	**0**	**11**	**16**	***27***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:00 AM	**0**	**0**	**29**	**19**	***48***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:15 AM	**0**	**0**	**25**	**18**	***43***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**0**	**0**	**23**	**16**	***39***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
7:45 AM	0	0	27	20	*47*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	0	0	18	24	*42*	0	0	0	0	*0*	0	0	2	0	*2*
8:15 AM	0	0	23	22	*45*	0	0	0	1	*1*	0	0	1	0	*1*
8:30 AM	0	0	20	25	*45*	0	0	0	0	*0*	0	0	4	0	*4*
8:45 AM	1	0	16	25	*42*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	1	0	228	235	*464*	0	0	1	2	*3*	0	0	7	0	*7*
Peak Hr	**0**	**0**	**88**	**69**	***157***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	**State St**				**0**				**E Main Ave**				**Traffic Ave**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	13	0	0	0	15	0	28	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	12	0	17	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	18	0	0	0	23	0	41	0
6:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**0**	**0**	**0**	**16**	**0**	**27**	113
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**29**	**0**	**0**	**0**	**19**	**0**	**48**	133
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**25**	**0**	**0**	**0**	**18**	**0**	**43**	159
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**23**	**0**	**0**	**0**	**16**	**0**	**39**	**157**
7:45 AM	0	0	0	0	0	0	0	0	0	0	27	0	0	0	20	0	47	177
8:00 AM	0	0	0	0	0	0	0	0	0	0	18	0	0	0	24	0	42	171
8:15 AM	0	0	0	0	0	0	0	0	0	0	23	0	0	0	22	0	45	173
8:30 AM	0	0	0	0	0	0	0	0	0	1	19	0	0	0	25	0	45	179
8:45 AM	0	1	0	0	0	0	0	0	0	0	16	0	0	0	25	0	42	174
Count Total	0	1	0	0	0	0	0	0	0	1	227	0	0	0	235	0	464	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**88**	**0**	**0**	**0**	**69**	**0**	**157**	**0**

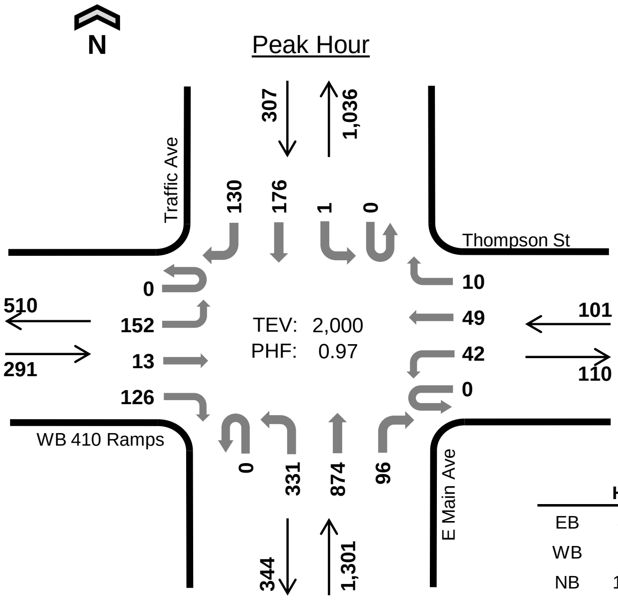
Three-Hour Count Summaries - Bikes

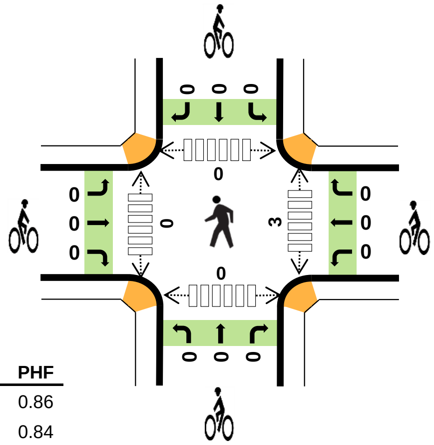
Interval Start	**State St**			**0**			**E Main Ave**			**Traffic Ave**			**15-min Total**	**Rolling One Hour**
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	1	0	0	1	0	2	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	0	0	0	0	0	1	0	0	1	1	3	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

E Main Ave
WB 410 Ramps

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM





	HV %:	PHF
EB	4.1%	0.86
WB	5.0%	0.84
NB	10.0%	0.97
SB	23.8%	0.89
TOTAL	11.0%	0.97

Three-Hour Count Summaries

Interval Start		WB 410 Ramps				Thompson St				E Main Ave				Traffic Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	20	5	25	0	11	11	2	0	82	209	25	0	1	36	37	464	0
7:15 AM		0	52	2	20	0	11	13	3	0	92	209	25	0	0	54	32	513	0
7:30 AM		0	43	2	37	0	8	10	2	0	78	234	23	0	0	42	31	510	0
7:45 AM		0	37	4	44	0	12	15	3	0	79	222	23	0	0	44	30	513	2,000
Peak Hour	All	0	152	13	126	0	42	49	10	0	331	874	96	0	1	176	130	2,000	0
	HV	0	8	2	2	0	3	2	0	0	30	96	4	0	0	29	44	220	0
	HV%	-	5%	15%	2%	-	7%	4%	0%	-	9%	11%	4%	-	0%	16%	34%	11%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	2	3	41	18	*64*	0	0	0	0	*0*	1	0	0	0	*1*
7:15 AM	1	0	32	17	*50*	0	0	0	0	*0*	1	0	0	0	*1*
7:30 AM	4	0	30	18	*52*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	5	2	27	20	*54*	0	0	0	0	*0*	1	0	0	0	*1*
Peak Hour	12	5	130	73	*220*	0	0	0	0	*0*	3	0	0	0	*3*

Three-Hour Count Summaries

Interval Start		WB 410 Ramps				Thompson St				E Main Ave				Traffic Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM		0	23	7	14	0	2	4	3	0	71	176	18	0	0	19	38	375	0
6:15 AM		0	21	5	17	0	6	11	4	0	114	201	17	0	0	19	29	444	0
6:30 AM		0	31	6	32	0	9	9	3	0	85	224	22	0	0	26	42	489	0
6:45 AM		0	40	6	25	0	4	9	3	0	90	249	27	0	0	26	27	506	1,814
7:00 AM		**0**	**20**	**5**	**25**	**0**	**11**	**11**	**2**	**0**	**82**	**209**	**25**	**0**	**1**	**36**	**37**	**464**	1,903
7:15 AM		**0**	**52**	**2**	**20**	**0**	**11**	**13**	**3**	**0**	**92**	**209**	**25**	**0**	**0**	**54**	**32**	**513**	1,972
7:30 AM		**0**	**43**	**2**	**37**	**0**	**8**	**10**	**2**	**0**	**78**	**234**	**23**	**0**	**0**	**42**	**31**	**510**	1,993
7:45 AM		**0**	**37**	**4**	**44**	**0**	**12**	**15**	**3**	**0**	**79**	**222**	**23**	**0**	**0**	**44**	**30**	**513**	**2,000**
8:00 AM		0	26	3	21	0	11	6	4	0	90	156	31	0	2	60	43	453	1,989
8:15 AM		0	25	0	31	0	10	9	2	0	69	137	24	0	0	58	40	405	1,881
8:30 AM		0	23	1	28	0	7	11	3	0	80	142	25	0	1	59	43	423	1,794
8:45 AM		0	34	2	28	0	15	16	1	0	77	134	26	0	1	66	44	444	1,725
Count Total		0	375	43	322	0	106	124	33	0	1,007	2,293	286	0	5	509	436	5,539	0
Peak Hour	**All**	**0**	**152**	**13**	**126**	**0**	**42**	**49**	**10**	**0**	**331**	**874**	**96**	**0**	**1**	**176**	**130**	**2,000**	**0**
	HV	**0**	**8**	**2**	**2**	**0**	**3**	**2**	**0**	**0**	**30**	**96**	**4**	**0**	**0**	**29**	**44**	**220**	**0**
	HV%	**-**	**5%**	**15%**	**2%**	**-**	**7%**	**4%**	**0%**	**-**	**9%**	**11%**	**4%**	**-**	**0%**	**16%**	**34%**	**11%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	2	2	21	13	*38*	0	0	0	0	*0*	2	0	0	0	*2*
6:15 AM	2	0	18	13	*33*	0	0	0	0	*0*	2	0	0	0	*2*
6:30 AM	3	1	16	24	*44*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	2	1	12	16	*31*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	**2**	**3**	**41**	**18**	***64***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	*1*
7:15 AM	**1**	**0**	**32**	**17**	***50***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	*1*
7:30 AM	**4**	**0**	**30**	**18**	***52***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**5**	**2**	**27**	**20**	***54***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	*1*
8:00 AM	2	2	23	23	*50*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	3	0	19	23	*45*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	6	2	25	27	*60*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	3	2	22	23	*50*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	35	15	286	235	*571*	0	0	0	0	*0*	7	0	0	0	*7*
Peak Hour	**12**	**5**	**130**	**73**	***220***	**0**	**0**	**0**	**0**	***0***	**3**	**0**	**0**	**0**	***3***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	WB 410 Ramps				Thompson St				E Main Ave				Traffic Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	1	1	0	0	2	0	0	0	8	13	0	0	0	2	11	38	0
6:15 AM	0	1	1	0	0	0	0	0	0	10	8	0	0	0	1	12	33	0
6:30 AM	0	3	0	0	0	1	0	0	0	6	10	0	0	0	1	23	44	0
6:45 AM	0	0	1	1	0	0	1	0	0	1	11	0	0	0	5	11	31	146
7:00 AM	**0**	**0**	**1**	**1**	**0**	**2**	**1**	**0**	**0**	**10**	**29**	**2**	**0**	**0**	**3**	**15**	**64**	172
7:15 AM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**25**	**0**	**0**	**0**	**5**	**12**	**50**	189
7:30 AM	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**20**	**1**	**0**	**0**	**10**	**8**	**52**	197
7:45 AM	**0**	**3**	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**4**	**22**	**1**	**0**	**0**	**11**	**9**	**54**	**220**
8:00 AM	0	2	0	0	0	1	1	0	0	2	20	1	0	0	13	10	50	206
8:15 AM	0	3	0	0	0	0	0	0	0	3	16	0	0	0	10	13	45	201
8:30 AM	0	4	0	2	0	1	1	0	0	7	16	2	0	0	12	15	60	209
8:45 AM	0	2	0	1	0	1	1	0	0	7	14	1	0	0	10	13	50	205
Count Total	0	24	5	6	0	9	6	0	0	74	204	8	0	0	83	152	571	0
Peak Hour	**0**	**8**	**2**	**2**	**0**	**3**	**2**	**0**	**0**	**30**	**96**	**4**	**0**	**0**	**29**	**44**	**220**	**0**

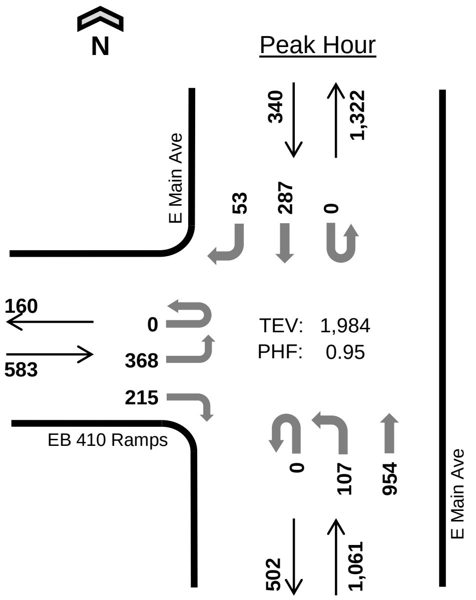
Three-Hour Count Summaries - Bikes

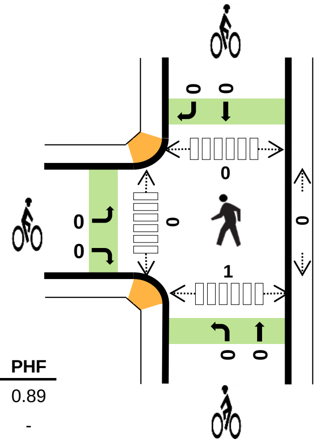
Interval Start	WB 410 Ramps			Thompson St			E Main Ave			Traffic Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

E Main Ave
EB 410 Ramps

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM





	HV %:	PHF
EB	13.9%	0.89
WB	-	-
NB	7.0%	0.93
SB	10.0%	0.88
TOTAL	9.5%	0.95

Three-Hour Count Summaries

Interval Start		EB 410 Ramps				0				E Main Ave				E Main Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	87	0	48	0	0	0	0	0	19	236	0	0	0	60	10	460	0
7:15 AM		0	87	0	46	0	0	0	0	0	30	256	0	0	0	73	14	506	0
7:30 AM		0	90	0	62	0	0	0	0	0	29	256	0	0	0	74	12	523	0
7:45 AM		0	104	0	59	0	0	0	0	0	29	206	0	0	0	80	17	495	1,984
Peak Hour	**All**	0	368	0	215	0	0	0	0	0	107	954	0	0	0	287	53	1,984	0
	HV	0	67	0	14	0	0	0	0	0	11	63	0	0	0	20	14	189	0
	HV%	-	18%	-	7%	-	-	-	-	-	10%	7%	-	-	-	7%	26%	10%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	27	0	18	7	*52*	0	0	0	0	*0*	0	0	0	1	*1*
7:15 AM	22	0	23	6	*51*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	15	0	16	8	*39*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	17	0	17	13	*47*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	81	0	74	34	*189*	0	0	0	0	*0*	0	0	0	1	*1*

Three-Hour Count Summaries

Interval Start	EB 410 Ramps				0				E Main Ave				E Main Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	72	0	16	0	0	0	0	0	17	213	0	0	0	30	6	354	0
6:15 AM	0	80	0	42	0	0	0	0	0	20	247	0	0	0	36	6	431	0
6:30 AM	0	75	0	56	0	0	0	0	0	18	262	0	0	0	57	11	479	0
6:45 AM	0	73	0	54	0	0	0	0	0	19	266	0	0	0	44	11	467	1,731
7:00 AM	**0**	**87**	**0**	**48**	**0**	**0**	**0**	**0**	**0**	**19**	**236**	**0**	**0**	**0**	**60**	**10**	**460**	1,837
7:15 AM	**0**	**87**	**0**	**46**	**0**	**0**	**0**	**0**	**0**	**30**	**256**	**0**	**0**	**0**	**73**	**14**	**506**	1,912
7:30 AM	**0**	**90**	**0**	**62**	**0**	**0**	**0**	**0**	**0**	**29**	**256**	**0**	**0**	**0**	**74**	**12**	**523**	1,956
7:45 AM	**0**	**104**	**0**	**59**	**0**	**0**	**0**	**0**	**0**	**29**	**206**	**0**	**0**	**0**	**80**	**17**	**495**	**1,984**
8:00 AM	0	79	0	55	0	0	0	0	0	19	191	0	0	0	76	18	438	1,962
8:15 AM	0	78	0	62	0	0	0	0	0	26	151	0	0	0	83	17	417	1,873
8:30 AM	0	61	0	60	0	0	0	0	0	34	175	0	0	0	69	24	423	1,773
8:45 AM	0	82	0	54	0	0	0	0	0	35	157	0	1	0	86	22	437	1,715
Count Total	0	968	0	614	0	0	0	0	0	295	2,616	0	1	0	768	168	5,430	0
Peak Hour All	**0**	**368**	**0**	**215**	**0**	**0**	**0**	**0**	**0**	**107**	**954**	**0**	**0**	**0**	**287**	**53**	**1,984**	**0**
HV	**0**	**67**	**0**	**14**	**0**	**0**	**0**	**0**	**0**	**11**	**63**	**0**	**0**	**0**	**20**	**14**	**189**	**0**
HV%	**-**	**18%**	**-**	**7%**	**-**	**-**	**-**	**-**	**-**	**10%**	**7%**	**-**	**-**	**-**	**7%**	**26%**	**10%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	9	0	12	4	*25*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	15	0	13	3	*31*	0	0	0	0	*0*	0	0	0	1	*1*
6:30 AM	13	0	14	2	*29*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	9	0	10	4	*23*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	**27**	**0**	**18**	**7**	***52***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	*1*
7:15 AM	**22**	**0**	**23**	**6**	***51***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**15**	**0**	**16**	**8**	***39***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**17**	**0**	**17**	**13**	***47***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:00 AM	13	0	9	11	*33*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	20	0	12	10	*42*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	23	0	12	16	*51*	0	0	0	0	*0*	0	0	0	1	*1*
8:45 AM	17	0	12	14	*43*	0	0	1	0	*1*	0	0	0	0	*0*
Count Total	200	0	168	98	*466*	0	0	1	0	*1*	0	0	0	3	*3*
Peak Hr	**81**	**0**	**74**	**34**	***189***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	**EB 410 Ramps**				**0**				**E Main Ave**				**E Main Ave**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	7	0	2	0	0	0	0	0	1	11	0	0	0	2	2	25	0
6:15 AM	0	8	0	7	0	0	0	0	0	4	9	0	0	0	2	1	31	0
6:30 AM	0	9	0	4	0	0	0	0	0	3	11	0	0	0	1	1	29	0
6:45 AM	0	6	0	3	0	0	0	0	0	4	6	0	0	0	1	3	23	108
7:00 AM	**0**	**22**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**3**	**15**	**0**	**0**	**0**	**3**	**4**	**52**	135
7:15 AM	**0**	**17**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**2**	**21**	**0**	**0**	**0**	**6**	**0**	**51**	155
7:30 AM	**0**	**11**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**2**	**14**	**0**	**0**	**0**	**3**	**5**	**39**	165
7:45 AM	**0**	**17**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**13**	**0**	**0**	**0**	**8**	**5**	**47**	**189**
8:00 AM	0	8	0	5	0	0	0	0	0	2	7	0	0	0	6	5	33	170
8:15 AM	0	16	0	4	0	0	0	0	0	3	9	0	0	0	8	2	42	161
8:30 AM	0	15	0	8	0	0	0	0	0	1	11	0	0	0	9	7	51	173
8:45 AM	0	13	0	4	0	0	0	0	0	2	10	0	0	0	8	6	43	169
Count Total	0	149	0	51	0	0	0	0	0	31	137	0	0	0	57	41	466	0
Peak Hour	**0**	**67**	**0**	**14**	**0**	**0**	**0**	**0**	**0**	**11**	**63**	**0**	**0**	**0**	**20**	**14**	**189**	**0**

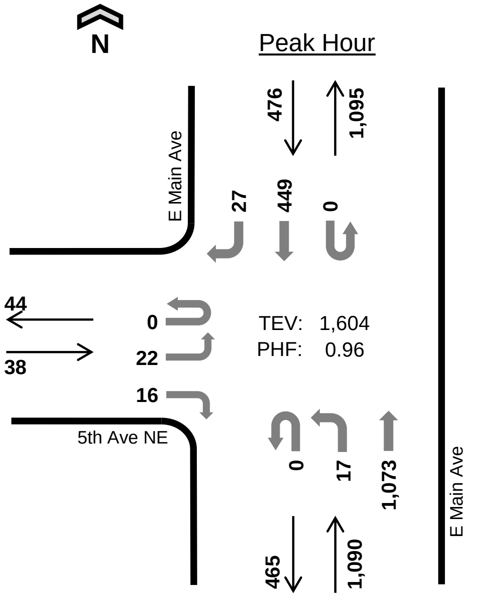
Three-Hour Count Summaries - Bikes

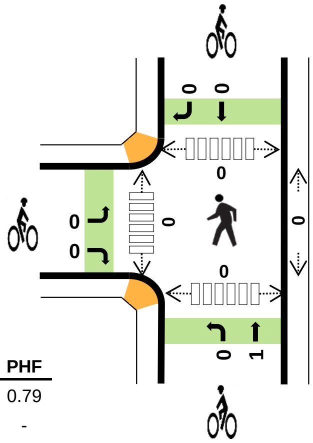
Interval Start	**EB 410 Ramps**			**0**			**E Main Ave**			**E Main Ave**			**15-min Total**	**Rolling One Hour**
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Count Total	0	0	0	0	0	0	0	1	0	0	0	0	1	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

E Main Ave
5th Ave NE

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 6:45 AM to 7:45 AM





	HV %:	PHF
EB	2.6%	0.79
WB	-	-
NB	7.0%	0.95
SB	6.3%	0.88
TOTAL	6.7%	0.96

Three-Hour Count Summaries

Interval Start		5th Ave NE				0				E Main Ave				E Main Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:45 AM		0	6	0	4	0	0	0	0	0	2	285	0	0	0	103	3	403	0
7:00 AM		0	6	0	6	0	0	0	0	0	3	251	0	0	0	103	8	377	0
7:15 AM		0	6	0	2	0	0	0	0	0	6	270	0	0	0	116	7	407	0
7:30 AM		0	4	0	4	0	0	0	0	0	6	267	0	0	0	127	9	417	1,604
Peak Hour	All	0	22	0	16	0	0	0	0	0	17	1,073	0	0	0	449	27	1,604	0
	HV	0	1	0	0	0	0	0	0	0	1	75	0	0	0	30	0	107	0
	HV%	-	5%	-	0%	-	-	-	-	-	6%	7%	-	-	-	7%	0%	7%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:45 AM	0	0	15	4	*19*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	0	0	23	7	*30*	0	0	1	0	*1*	0	0	0	0	*0*
7:15 AM	1	0	26	11	*38*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	0	0	12	8	*20*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	1	0	76	30	*107*	0	0	1	0	*1*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	5th Ave NE				0				E Main Ave				E Main Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	4	0	5	0	0	0	0	0	1	239	0	0	0	43	2	294	0
6:15 AM	0	4	0	1	0	0	0	0	0	0	253	0	0	0	75	1	334	0
6:30 AM	0	6	0	4	0	0	0	0	0	0	268	0	0	0	103	6	387	0
6:45 AM	**0**	**6**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**2**	**285**	**0**	**0**	**0**	**103**	**3**	**403**	1,418
7:00 AM	**0**	**6**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**3**	**251**	**0**	**0**	**0**	**103**	**8**	**377**	1,501
7:15 AM	**0**	**6**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**6**	**270**	**0**	**0**	**0**	**116**	**7**	**407**	1,574
7:30 AM	**0**	**4**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**6**	**267**	**0**	**0**	**0**	**127**	**9**	**417**	**1,604**
7:45 AM	0	4	0	0	0	0	0	0	0	13	244	0	0	0	128	11	400	1,601
8:00 AM	0	5	0	6	0	0	0	0	0	8	194	0	0	0	117	14	344	1,568
8:15 AM	0	4	0	5	0	0	0	0	1	1	177	0	0	0	125	18	331	1,492
8:30 AM	0	2	0	5	0	0	0	0	0	8	199	0	0	0	120	7	341	1,416
8:45 AM	0	9	0	6	0	0	0	0	0	5	184	0	0	0	135	10	349	1,365
Count Total	0	60	0	48	0	0	0	0	1	53	2,831	0	0	0	1,295	96	4,384	0
Peak Hour All	**0**	**22**	**0**	**16**	**0**	**0**	**0**	**0**	**0**	**17**	**1,073**	**0**	**0**	**0**	**449**	**27**	**1,604**	**0**
HV	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**75**	**0**	**0**	**0**	**30**	**0**	**107**	**0**
HV%	**-**	**5%**	**-**	**0%**	**-**	**-**	**-**	**-**	**-**	**6%**	**7%**	**-**	**-**	**-**	**7%**	**0%**	**7%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	0	0	13	3	*16*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	0	0	10	7	*17*	0	0	0	1	*1*	0	0	0	0	*0*
6:30 AM	0	0	11	8	*19*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	**0**	**0**	**15**	**4**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:00 AM	**0**	**0**	**23**	**7**	***30***	**0**	**0**	**1**	**0**	***1***	**0**	**0**	**0**	**0**	*0*
7:15 AM	**1**	**0**	**26**	**11**	***38***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**0**	**0**	**12**	**8**	***20***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
7:45 AM	0	0	13	8	*21*	0	0	1	0	*1*	0	0	0	0	*0*
8:00 AM	0	0	12	13	*25*	0	0	0	0	*0*	0	1	0	0	*1*
8:15 AM	0	0	11	16	*27*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	0	0	10	11	*21*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	0	0	14	12	*26*	0	0	2	0	*2*	0	0	0	0	*0*
Count Total	1	0	170	108	*279*	0	0	4	1	*5*	0	1	0	0	*1*
Peak Hr	**1**	**0**	**76**	**30**	***107***	**0**	**0**	**1**	**0**	***1***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	5th Ave NE				0				E Main Ave				E Main Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	13	0	0	0	3	0	16	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	10	0	0	0	7	0	17	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	11	0	0	0	8	0	19	0
6:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**4**	**0**	**19**	71
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**22**	**0**	**0**	**0**	**7**	**0**	**30**	85
7:15 AM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**26**	**0**	**0**	**0**	**11**	**0**	**38**	106
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**0**	**0**	**8**	**0**	**20**	**107**
7:45 AM	0	0	0	0	0	0	0	0	0	0	13	0	0	0	8	0	21	109
8:00 AM	0	0	0	0	0	0	0	0	0	2	10	0	0	0	13	0	25	104
8:15 AM	0	0	0	0	0	0	0	0	0	0	11	0	0	0	16	0	27	93
8:30 AM	0	0	0	0	0	0	0	0	0	0	10	0	0	0	11	0	21	94
8:45 AM	0	0	0	0	0	0	0	0	0	0	14	0	0	0	12	0	26	99
Count Total	0	1	0	0	0	0	0	0	0	3	167	0	0	0	108	0	279	0
Peak Hour	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**75**	**0**	**0**	**0**	**30**	**0**	**107**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	5th Ave NE			0			E Main Ave			E Main Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	2
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
7:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	2
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	1	1	0	0	0	0	2	2
Count Total	0	0	0	0	0	0	1	3	0	0	1	0	5	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**

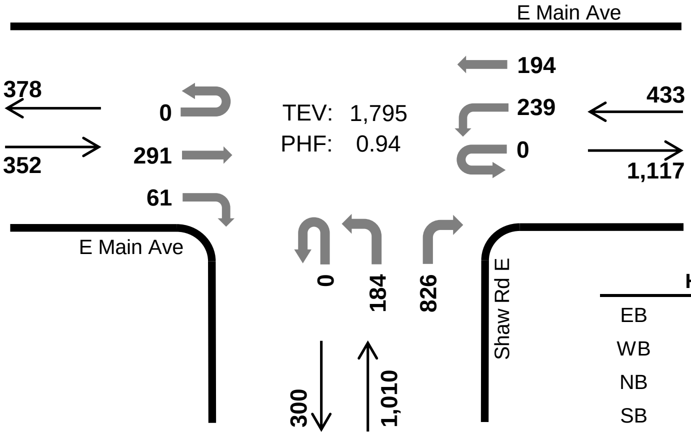
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd E
E Main Ave

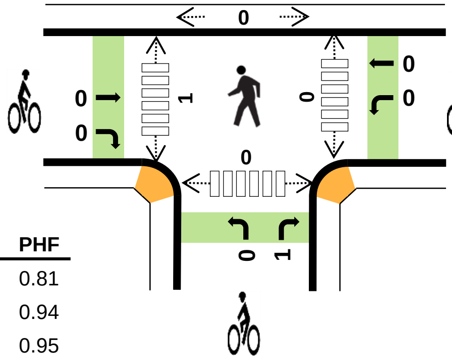
N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM



	HV %:	PHF
EB	7.1%	0.81
WB	7.6%	0.94
NB	5.8%	0.95
SB	-	-
TOTAL	6.5%	0.94



Three-Hour Count Summaries

Interval Start		E Main Ave				E Main Ave				Shaw Rd E				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	0	59	13	0	65	41	0	0	50	0	194	0	0	0	0	422	0
7:15 AM		0	0	70	12	0	57	52	0	0	45	0	209	0	0	0	0	445	0
7:30 AM		0	0	75	15	0	63	52	0	0	36	0	211	0	0	0	0	452	0
7:45 AM		0	0	87	21	0	54	49	0	0	53	0	212	0	0	0	0	476	1,795
Peak Hour	All	0	0	291	61	0	239	194	0	0	184	0	826	0	0	0	0	1,795	0
	HV	0	0	20	5	0	15	18	0	0	4	0	55	0	0	0	0	117	0
	HV%	-	-	7%	8%	-	6%	9%	-	-	2%	-	7%	-	-	-	-	7%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	5	9	15	0	*29*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	4	8	15	0	*27*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	8	10	16	0	*34*	0	0	0	0	*0*	0	1	0	0	*1*
7:45 AM	8	6	13	0	*27*	0	0	1	0	*1*	0	0	0	0	*0*
Peak Hour	25	33	59	0	*117*	0	0	1	0	*1*	0	1	0	0	*1*

Three-Hour Count Summaries

Interval Start	E Main Ave				E Main Ave				Shaw Rd E				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	54	7	0	15	20	0	0	26	0	199	0	0	0	0	321	0
6:15 AM	0	0	58	4	0	19	28	0	0	30	0	196	0	0	0	0	335	0
6:30 AM	0	0	67	13	0	63	34	0	0	39	0	217	0	0	0	0	433	0
6:45 AM	0	0	64	7	0	42	51	0	0	43	0	259	0	0	0	0	466	1,555
7:00 AM	**0**	**0**	**59**	**13**	**0**	**65**	**41**	**0**	**0**	**50**	**0**	**194**	**0**	**0**	**0**	**0**	**422**	1,656
7:15 AM	**0**	**0**	**70**	**12**	**0**	**57**	**52**	**0**	**0**	**45**	**0**	**209**	**0**	**0**	**0**	**0**	**445**	1,766
7:30 AM	**0**	**0**	**75**	**15**	**0**	**63**	**52**	**0**	**0**	**36**	**0**	**211**	**0**	**0**	**0**	**0**	**452**	1,785
7:45 AM	**0**	**0**	**87**	**21**	**0**	**54**	**49**	**0**	**0**	**53**	**0**	**212**	**0**	**0**	**0**	**0**	**476**	**1,795**
8:00 AM	0	0	59	13	0	78	49	0	0	32	0	183	0	0	0	0	414	1,787
8:15 AM	0	0	48	16	0	78	52	0	0	37	0	147	0	0	0	0	378	1,720
8:30 AM	0	0	55	14	0	67	56	0	0	53	0	161	0	0	0	0	406	1,674
8:45 AM	0	0	54	19	0	80	62	0	0	33	0	138	0	0	0	0	386	1,584
Count Total	0	0	750	154	0	681	546	0	0	477	0	2,326	0	0	0	0	4,934	0
Peak Hour All	**0**	**0**	**291**	**61**	**0**	**239**	**194**	**0**	**0**	**184**	**0**	**826**	**0**	**0**	**0**	**0**	**1,795**	**0**
HV	**0**	**0**	**20**	**5**	**0**	**15**	**18**	**0**	**0**	**4**	**0**	**55**	**0**	**0**	**0**	**0**	**117**	**0**
HV%	**-**	**-**	**7%**	**8%**	**-**	**6%**	**9%**	**-**	**-**	**2%**	**-**	**7%**	**-**	**-**	**-**	**-**	**7%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	4	3	7	0	*14*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	3	5	10	0	*18*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	5	6	12	0	*23*	0	0	1	0	*1*	0	0	0	0	*0*
6:45 AM	3	7	10	0	*20*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	**5**	**9**	**15**	**0**	***29***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:15 AM	**4**	**8**	**15**	**0**	***27***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**8**	**10**	**16**	**0**	***34***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	*1*
7:45 AM	**8**	**6**	**13**	**0**	***27***	**0**	**0**	**1**	**0**	***1***	**0**	**0**	**0**	**0**	***0***
8:00 AM	5	17	10	0	*32*	0	0	0	0	*0*	0	1	0	1	*2*
8:15 AM	5	13	7	0	*25*	0	0	0	0	*0*	0	1	0	1	*2*
8:30 AM	5	8	11	0	*24*	1	0	0	0	*1*	0	0	0	0	*0*
8:45 AM	6	14	10	0	*30*	1	1	0	0	*2*	0	0	0	2	*2*
Count Total	61	106	136	0	*303*	2	1	2	0	*5*	0	3	0	4	*7*
Peak Hr	**25**	**33**	**59**	**0**	***117***	**0**	**0**	**1**	**0**	***1***	**0**	**1**	**0**	**0**	***1***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Main Ave				E Main Ave				Shaw Rd E				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	4	0	0	1	2	0	0	0	0	7	0	0	0	0	14	0
6:15 AM	0	0	3	0	0	2	3	0	0	1	0	9	0	0	0	0	18	0
6:30 AM	0	0	5	0	0	3	3	0	0	1	0	11	0	0	0	0	23	0
6:45 AM	0	0	3	0	0	2	5	0	0	2	0	8	0	0	0	0	20	75
7:00 AM	**0**	**0**	**4**	**1**	**0**	**5**	**4**	**0**	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**29**	90
7:15 AM	**0**	**0**	**3**	**1**	**0**	**2**	**6**	**0**	**0**	**2**	**0**	**13**	**0**	**0**	**0**	**0**	**27**	99
7:30 AM	**0**	**0**	**6**	**2**	**0**	**5**	**5**	**0**	**0**	**2**	**0**	**14**	**0**	**0**	**0**	**0**	**34**	110
7:45 AM	**0**	**0**	**7**	**1**	**0**	**3**	**3**	**0**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**27**	**117**
8:00 AM	0	0	4	1	0	9	8	0	0	2	0	8	0	0	0	0	32	120
8:15 AM	0	0	3	2	0	6	7	0	0	1	0	6	0	0	0	0	25	118
8:30 AM	0	0	4	1	0	4	4	0	0	3	0	8	0	0	0	0	24	108
8:45 AM	0	0	5	1	0	11	3	0	0	0	0	10	0	0	0	0	30	111
Count Total	0	0	51	10	0	53	53	0	0	14	0	122	0	0	0	0	303	0
Peak Hour	**0**	**0**	**20**	**5**	**0**	**15**	**18**	**0**	**0**	**4**	**0**	**55**	**0**	**0**	**0**	**0**	**117**	**0**

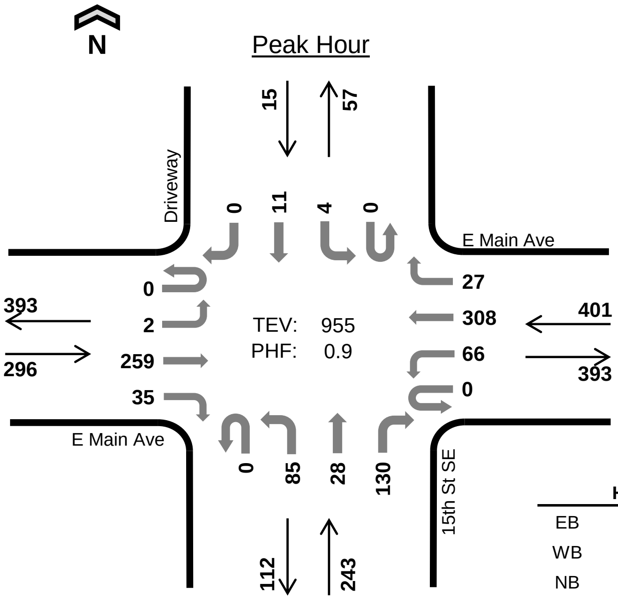
Three-Hour Count Summaries - Bikes

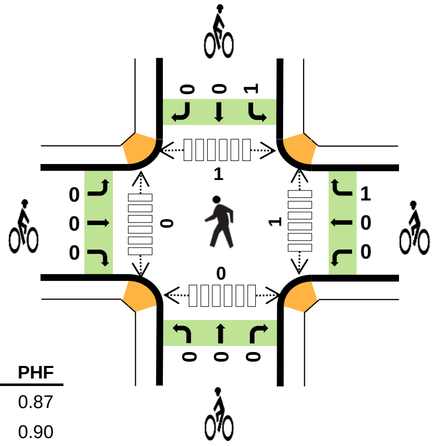
Interval Start	E Main Ave			E Main Ave			Shaw Rd E			0			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**1**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:30 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	2
8:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	2	3
Count Total	0	2	0	0	1	0	1	0	1	0	0	0	5	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

15th St SE
E Main Ave

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:15 AM to 8:15 AM





	HV %:	PHF
EB	7.8%	0.87
WB	6.7%	0.90
NB	6.2%	0.83
SB	20.0%	0.75
TOTAL	7.1%	0.90

Three-Hour Count Summaries

Interval Start		E Main Ave				E Main Ave				15th St SE				Driveway				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:15 AM		0	1	73	11	0	18	86	7	0	26	4	29	0	1	3	0	259	0
7:30 AM		0	1	64	6	0	14	74	6	0	12	7	27	0	1	1	0	213	0
7:45 AM		0	0	71	9	0	14	86	7	0	17	12	44	0	2	2	0	264	0
8:00 AM		0	0	51	9	0	20	62	7	0	30	5	30	0	0	5	0	219	955
Peak Hour	All	0	2	259	35	0	66	308	27	0	85	28	130	0	4	11	0	955	0
	HV	0	0	19	4	0	10	16	1	0	4	2	9	0	0	3	0	68	0
	HV%	-	0%	7%	11%	-	15%	5%	4%	-	5%	7%	7%	-	0%	27%	-	7%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:15 AM	3	9	2	1	*15*	0	0	0	1	*1*	1	0	0	0	*1*
7:30 AM	4	6	3	0	*13*	0	1	0	0	*1*	0	0	1	0	*1*
7:45 AM	12	4	5	1	*22*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	4	8	5	1	*18*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	23	27	15	3	*68*	0	1	0	1	*2*	1	0	1	0	*2*

Three-Hour Count Summaries

Interval Start	E Main Ave				E Main Ave				15th St SE				Driveway				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	41	4	0	11	43	2	0	7	0	28	0	0	0	0	136	0
6:15 AM	0	0	38	0	0	15	57	6	0	11	5	34	0	1	0	1	168	0
6:30 AM	0	0	59	1	0	15	62	4	0	17	4	37	0	1	0	0	200	0
6:45 AM	0	0	51	7	0	15	58	6	0	13	8	25	0	2	0	0	185	689
7:00 AM	0	2	56	3	0	16	72	7	0	15	7	30	0	1	0	0	209	762
7:15 AM	**0**	**1**	**73**	**11**	**0**	**18**	**86**	**7**	**0**	**26**	**4**	**29**	**0**	**1**	**3**	**0**	**259**	853
7:30 AM	**0**	**1**	**64**	**6**	**0**	**14**	**74**	**6**	**0**	**12**	**7**	**27**	**0**	**1**	**1**	**0**	**213**	866
7:45 AM	**0**	**0**	**71**	**9**	**0**	**14**	**86**	**7**	**0**	**17**	**12**	**44**	**0**	**2**	**2**	**0**	**264**	945
8:00 AM	**0**	**0**	**51**	**9**	**0**	**20**	**62**	**7**	**0**	**30**	**5**	**30**	**0**	**0**	**5**	**0**	**219**	955
8:15 AM	0	0	52	11	0	20	76	6	0	17	6	14	0	5	2	1	210	906
8:30 AM	0	1	51	15	0	21	87	9	0	21	9	31	0	5	4	0	254	947
8:45 AM	0	1	52	8	0	15	74	7	0	21	7	22	0	3	3	1	214	897
Count Total	0	6	659	84	0	194	837	74	0	207	74	351	0	22	20	3	2,531	0
Peak Hour All	**0**	**2**	**259**	**35**	**0**	**66**	**308**	**27**	**0**	**85**	**28**	**130**	**0**	**4**	**11**	**0**	**955**	**0**
HV	**0**	**0**	**19**	**4**	**0**	**10**	**16**	**1**	**0**	**4**	**2**	**9**	**0**	**0**	**3**	**0**	**68**	**0**
HV%	**-**	**0%**	**7%**	**11%**	**-**	**15%**	**5%**	**4%**	**-**	**5%**	**7%**	**7%**	**-**	**0%**	**27%**	**-**	**7%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	5	6	0	0	*11*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	2	4	1	0	*7*	0	1	0	0	*1*	0	0	1	0	*1*
6:30 AM	6	3	2	0	*11*	0	1	0	0	*1*	0	0	0	0	*0*
6:45 AM	1	4	2	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	5	4	1	0	*10*	0	1	0	0	*1*	0	0	0	0	*0*
7:15 AM	**3**	**9**	**2**	**1**	***15***	**0**	**0**	**0**	**1**	***1***	**1**	**0**	**0**	**0**	*1*
7:30 AM	**4**	**6**	**3**	**0**	***13***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**1**	**0**	*1*
7:45 AM	**12**	**4**	**5**	**1**	***22***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**4**	**8**	**5**	**1**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:15 AM	3	6	3	0	*12*	0	0	0	0	*0*	1	0	2	0	*3*
8:30 AM	6	9	2	3	*20*	0	0	0	0	*0*	1	0	1	0	*2*
8:45 AM	3	6	3	0	*12*	0	0	0	0	*0*	0	0	1	0	*1*
Count Total	54	69	29	6	*158*	0	4	0	1	*5*	3	0	6	0	*9*
Peak Hour	**23**	**27**	**15**	**3**	***68***	**0**	**1**	**0**	**1**	***2***	**1**	**0**	**1**	**0**	***2***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Main Ave				E Main Ave				15th St SE				Driveway				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	4	1	0	2	4	0	0	0	0	0	0	0	0	0	11	0
6:15 AM	0	0	2	0	0	2	2	0	0	0	0	1	0	0	0	0	7	0
6:30 AM	0	0	5	1	0	0	3	0	0	1	0	1	0	0	0	0	11	0
6:45 AM	0	0	1	0	0	1	3	0	0	0	0	2	0	0	0	0	7	36
7:00 AM	0	0	4	1	0	1	3	0	0	0	0	1	0	0	0	0	10	35
7:15 AM	**0**	**0**	**2**	**1**	**0**	**5**	**4**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**1**	**0**	**15**	43
7:30 AM	**0**	**0**	**4**	**0**	**0**	**3**	**2**	**1**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**13**	45
7:45 AM	**0**	**0**	**9**	**3**	**0**	**0**	**4**	**0**	**0**	**2**	**2**	**1**	**0**	**0**	**1**	**0**	**22**	60
8:00 AM	**0**	**0**	**4**	**0**	**0**	**2**	**6**	**0**	**0**	**2**	**0**	**3**	**0**	**0**	**1**	**0**	**18**	**68**
8:15 AM	0	0	3	0	0	1	5	0	0	2	0	1	0	0	0	0	12	65
8:30 AM	0	0	4	2	0	2	7	0	0	0	1	1	0	3	0	0	20	72
8:45 AM	0	0	2	1	0	2	3	1	0	1	1	1	0	0	0	0	12	62
Count Total	0	0	44	10	0	21	46	2	0	8	4	17	0	3	3	0	158	0
Peak Hour	**0**	**0**	**19**	**4**	**0**	**10**	**16**	**1**	**0**	**4**	**2**	**9**	**0**	**0**	**3**	**0**	**68**	**0**

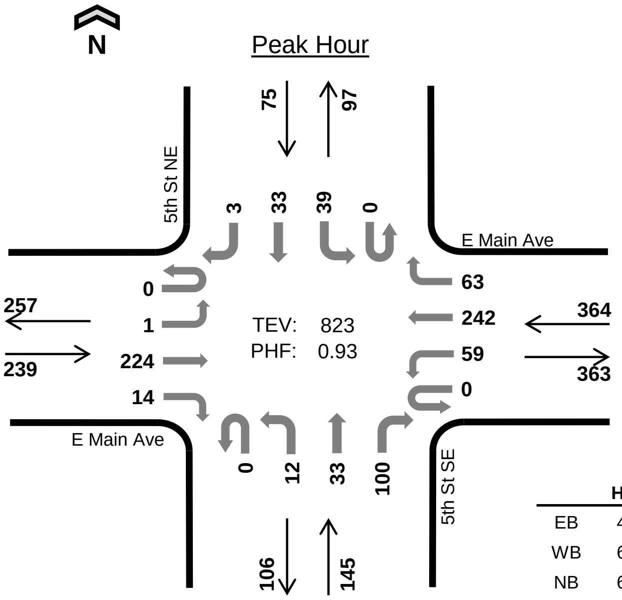
Three-Hour Count Summaries - Bikes

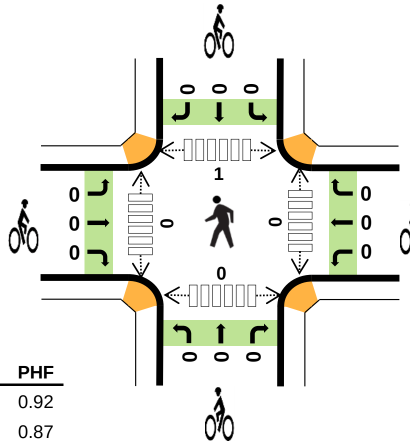
Interval Start	E Main Ave			E Main Ave			15th St SE			Driveway			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	0
6:30 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
7:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	1	3
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	3
7:30 AM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	3
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	3
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	2	2	0	0	0	1	0	0	5	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**2**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

5th St SE
E Main Ave

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 8:00 AM to 9:00 AM





	HV %:	PHF
EB	4.6%	0.92
WB	6.9%	0.87
NB	6.9%	0.81
SB	4.0%	0.89
TOTAL	6.0%	0.93

Three-Hour Count Summaries

Interval Start		E Main Ave				E Main Ave				5th St SE				5th St NE				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
8:00 AM		0	0	52	1	0	8	62	25	0	5	8	32	0	6	10	0	209	0
8:15 AM		0	0	58	2	0	12	51	8	0	3	7	20	0	8	8	1	178	0
8:30 AM		0	1	56	8	0	23	70	12	0	2	8	20	0	11	9	1	221	0
8:45 AM		0	0	58	3	0	16	59	18	0	2	10	28	0	14	6	1	215	823
Peak Hour	All	0	1	224	14	0	59	242	63	0	12	33	100	0	39	33	3	823	0
	HV	0	0	11	0	0	4	18	3	0	2	3	5	0	2	1	0	49	0
	HV%	-	0%	5%	0%	-	7%	7%	5%	-	17%	9%	5%	-	5%	3%	0%	6%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
8:00 AM	3	5	3	1	*12*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	3	6	3	1	*13*	0	0	0	0	*0*	0	0	1	0	*1*
8:30 AM	3	7	2	0	*12*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	2	7	2	1	*12*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	11	25	10	3	*49*	0	0	0	0	*0*	0	0	1	0	*1*

Three-Hour Count Summaries

Interval Start		E Main Ave				E Main Ave				5th St SE				5th St NE				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM		0	0	29	3	0	4	34	17	0	0	3	23	0	2	3	0	118	0
6:15 AM		0	0	22	3	0	5	33	15	0	3	5	27	0	5	2	0	120	0
6:30 AM		0	0	49	1	0	5	36	19	0	1	6	27	0	4	4	0	152	0
6:45 AM		0	0	45	2	0	7	35	13	0	2	9	35	0	9	3	0	160	550
7:00 AM		0	0	43	2	0	9	52	16	0	1	4	30	0	7	3	1	168	600
7:15 AM		0	0	65	1	0	7	66	28	0	0	3	36	0	11	5	1	223	703
7:30 AM		0	0	44	3	0	8	53	15	0	1	6	27	0	12	4	1	174	725
7:45 AM		0	0	56	1	0	13	54	17	0	5	5	27	0	16	4	1	199	764
8:00 AM		**0**	**0**	**52**	**1**	**0**	**8**	**62**	**25**	**0**	**5**	**8**	**32**	**0**	**6**	**10**	**0**	**209**	805
8:15 AM		**0**	**0**	**58**	**2**	**0**	**12**	**51**	**8**	**0**	**3**	**7**	**20**	**0**	**8**	**8**	**1**	**178**	760
8:30 AM		**0**	**1**	**56**	**8**	**0**	**23**	**70**	**12**	**0**	**2**	**8**	**20**	**0**	**11**	**9**	**1**	**221**	807
8:45 AM		**0**	**0**	**58**	**3**	**0**	**16**	**59**	**18**	**0**	**2**	**10**	**28**	**0**	**14**	**6**	**1**	**215**	**823**
Count Total		0	1	577	30	0	117	605	203	0	25	74	332	0	105	61	7	2,137	0
Peak Hour	**All**	**0**	**1**	**224**	**14**	**0**	**59**	**242**	**63**	**0**	**12**	**33**	**100**	**0**	**39**	**33**	**3**	**823**	**0**
	HV	**0**	**0**	**11**	**0**	**0**	**4**	**18**	**3**	**0**	**2**	**3**	**5**	**0**	**2**	**1**	**0**	**49**	**0**
	HV%	**-**	**0%**	**5%**	**0%**	**-**	**7%**	**7%**	**5%**	**-**	**17%**	**9%**	**5%**	**-**	**5%**	**3%**	**0%**	**6%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	1	4	2	0	*7*	0	0	0	0	*0*	0	1	0	0	*1*
6:15 AM	0	3	3	0	*6*	0	0	0	0	*0*	0	0	0	1	*1*
6:30 AM	7	3	1	0	*11*	0	0	0	0	*0*	0	0	1	0	*1*
6:45 AM	1	2	1	0	*4*	0	0	0	1	*1*	0	0	0	1	*1*
7:00 AM	5	2	1	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	4	4	2	0	*10*	0	0	0	0	*0*	1	0	0	0	*1*
7:30 AM	5	3	1	0	*9*	0	1	1	0	*2*	0	0	0	0	*0*
7:45 AM	8	5	1	0	*14*	0	0	0	0	*0*	0	1	1	1	*3*
8:00 AM	**3**	**5**	**3**	**1**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:15 AM	**3**	**6**	**3**	**1**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	*1*
8:30 AM	**3**	**7**	**2**	**0**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:45 AM	**2**	**7**	**2**	**1**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	42	51	22	3	*118*	0	1	1	1	*3*	1	2	3	3	*9*
Peak Hour	**11**	**25**	**10**	**3**	***49***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	***1***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Main Ave				E Main Ave				5th St SE				5th St NE				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	1	0	0	0	2	2	0	0	0	2	0	0	0	0	7	0
6:15 AM	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	6	0
6:30 AM	0	0	7	0	0	0	2	1	0	0	0	1	0	0	0	0	11	0
6:45 AM	0	0	1	0	0	0	2	0	0	0	0	1	0	0	0	0	4	28
7:00 AM	0	0	4	1	0	1	1	0	0	0	0	1	0	0	0	0	8	29
7:15 AM	0	0	4	0	0	0	3	1	0	0	0	2	0	0	0	0	10	33
7:30 AM	0	0	5	0	0	1	2	0	0	0	0	1	0	0	0	0	9	31
7:45 AM	0	0	8	0	0	1	2	2	0	0	0	1	0	0	0	0	14	41
8:00 AM	**0**	**0**	**3**	**0**	**0**	**1**	**4**	**0**	**0**	**2**	**0**	**1**	**0**	**1**	**0**	**0**	**12**	45
8:15 AM	**0**	**0**	**3**	**0**	**0**	**1**	**4**	**1**	**0**	**0**	**1**	**2**	**0**	**0**	**1**	**0**	**13**	48
8:30 AM	**0**	**0**	**3**	**0**	**0**	**2**	**5**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**12**	51
8:45 AM	**0**	**0**	**2**	**0**	**0**	**0**	**5**	**2**	**0**	**0**	**1**	**1**	**0**	**1**	**0**	**0**	**12**	**49**
Count Total	0	0	41	1	0	7	35	9	0	2	3	17	0	2	1	0	118	0
Peak Hour	**0**	**0**	**11**	**0**	**0**	**4**	**18**	**3**	**0**	**2**	**3**	**5**	**0**	**2**	**1**	**0**	**49**	**0**

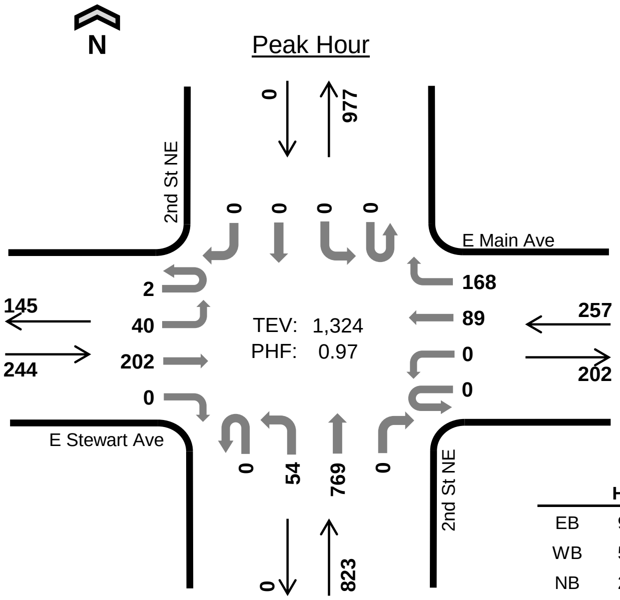
Three-Hour Count Summaries - Bikes

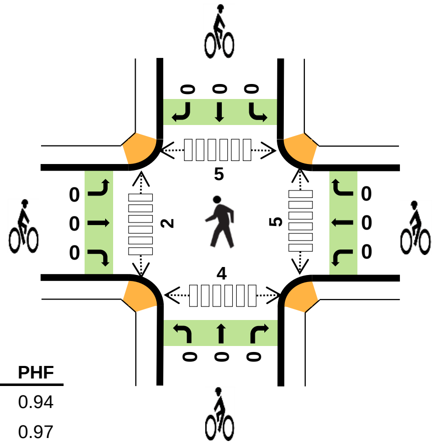
Interval Start	E Main Ave			E Main Ave			5th St SE			5th St NE			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	1
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	0	1	0	0	0	0	1	0	0	0	2	3
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Count Total	0	0	0	1	0	0	0	0	1	0	1	0	3	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

2nd St NE
E Stewart Ave

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:15 AM to 8:15 AM





	HV %:	PHF
EB	9.4%	0.94
WB	5.4%	0.97
NB	2.4%	0.94
SB	-	-
TOTAL	4.3%	0.97

Three-Hour Count Summaries

Interval Start		E Stewart Ave				E Main Ave				2nd St NE				2nd St NE				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:15 AM		0	5	60	0	0	0	15	48	0	8	204	0	0	0	0	0	340	0
7:30 AM		2	11	45	0	0	0	25	40	0	16	199	0	0	0	0	0	338	0
7:45 AM		0	11	51	0	0	0	24	39	0	15	203	0	0	0	0	0	343	0
8:00 AM		0	13	46	0	0	0	25	41	0	15	163	0	0	0	0	0	303	1,324
Peak Hour	All	2	40	202	0	0	0	89	168	0	54	769	0	0	0	0	0	1,324	0
	HV	0	3	20	0	0	0	6	8	0	2	18	0	0	0	0	0	57	0
	HV%	0%	8%	10%	-	-	-	7%	5%	-	4%	2%	-	-	-	-	-	4%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:15 AM	8	3	4	0	*15*	0	0	0	0	*0*	2	0	2	2	*6*
7:30 AM	6	2	4	0	*12*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	6	2	7	0	*15*	0	0	0	0	*0*	2	0	2	1	*5*
8:00 AM	3	7	5	0	*15*	0	0	0	0	*0*	1	2	1	1	*5*
Peak Hour	23	14	20	0	*57*	0	0	0	0	*0*	5	2	5	4	*16*

Three-Hour Count Summaries

Interval Start		E Stewart Ave				E Main Ave				2nd St NE				2nd St NE				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM		0	13	28	0	0	0	15	22	0	9	115	0	0	0	0	0	202	0
6:15 AM		0	6	20	0	0	0	9	27	0	4	135	0	0	0	0	0	201	0
6:30 AM		0	11	44	0	0	0	6	36	0	4	153	0	0	0	0	0	254	0
6:45 AM		0	3	44	0	0	0	12	26	0	10	165	0	0	0	0	0	260	917
7:00 AM		0	6	37	0	0	0	22	37	0	8	152	0	0	0	0	0	262	977
7:15 AM		**0**	**5**	**60**	**0**	**0**	**0**	**15**	**48**	**0**	**8**	**204**	**0**	**0**	**0**	**0**	**0**	**340**	1,116
7:30 AM		**2**	**11**	**45**	**0**	**0**	**0**	**25**	**40**	**0**	**16**	**199**	**0**	**0**	**0**	**0**	**0**	**338**	1,200
7:45 AM		**0**	**11**	**51**	**0**	**0**	**0**	**24**	**39**	**0**	**15**	**203**	**0**	**0**	**0**	**0**	**0**	**343**	1,283
8:00 AM		**0**	**13**	**46**	**0**	**0**	**0**	**25**	**41**	**0**	**15**	**163**	**0**	**0**	**0**	**0**	**0**	**303**	**1,324**
8:15 AM		0	24	55	0	0	0	24	38	0	17	135	0	0	0	0	0	293	1,277
8:30 AM		0	14	52	0	0	0	25	55	0	20	162	1	0	0	0	0	329	1,268
8:45 AM		0	14	54	0	0	0	38	38	0	22	143	0	0	0	0	0	309	1,234
Count Total		2	131	536	0	0	0	240	447	0	148	1,929	1	0	0	0	0	3,434	0
Peak Hour	**All**	**2**	**40**	**202**	**0**	**0**	**0**	**89**	**168**	**0**	**54**	**769**	**0**	**0**	**0**	**0**	**0**	**1,324**	**0**
	HV	**0**	**3**	**20**	**0**	**0**	**0**	**6**	**8**	**0**	**2**	**18**	**0**	**0**	**0**	**0**	**0**	**57**	**0**
	HV%	**0%**	**8%**	**10%**	**-**	**-**	**-**	**7%**	**5%**	**-**	**4%**	**2%**	**-**	**-**	**-**	**-**	**-**	**4%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	3	3	1	0	*7*	0	0	1	0	*1*	0	0	0	1	*1*
6:15 AM	1	1	3	0	*5*	0	0	0	0	*0*	0	1	0	0	*1*
6:30 AM	5	1	2	0	*8*	0	0	0	0	*0*	1	1	0	0	*2*
6:45 AM	4	4	3	0	*11*	0	0	0	0	*0*	1	0	1	0	*2*
7:00 AM	4	1	4	0	*9*	0	0	0	0	*0*	0	0	1	0	*1*
7:15 AM	**8**	**3**	**4**	**0**	***15***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**2**	**2**	*6*
7:30 AM	**6**	**2**	**4**	**0**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**6**	**2**	**7**	**0**	***15***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**2**	**1**	*5*
8:00 AM	**3**	**7**	**5**	**0**	***15***	**0**	**0**	**0**	**0**	***0***	**1**	**2**	**1**	**1**	***5***
8:15 AM	5	5	2	0	*12*	0	0	0	0	*0*	0	3	3	0	*6*
8:30 AM	3	5	5	0	*13*	0	0	0	0	*0*	0	0	1	1	*2*
8:45 AM	4	4	2	0	*10*	0	0	0	0	*0*	0	2	2	0	*4*
Count Total	52	38	42	0	*132*	0	0	1	0	*1*	7	9	13	6	*35*
Peak Hour	**23**	**14**	**20**	**0**	***57***	**0**	**0**	**0**	**0**	***0***	**5**	**2**	**5**	**4**	***16***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Stewart Ave				E Main Ave				2nd St NE				2nd St NE				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	2	1	0	0	0	2	1	0	0	1	0	0	0	0	0	7	0
6:15 AM	0	0	1	0	0	0	0	1	0	0	3	0	0	0	0	0	5	0
6:30 AM	0	1	4	0	0	0	0	1	0	1	1	0	0	0	0	0	8	0
6:45 AM	0	1	3	0	0	0	1	3	0	1	2	0	0	0	0	0	11	31
7:00 AM	0	0	4	0	0	0	1	0	0	0	4	0	0	0	0	0	9	33
7:15 AM	**0**	**1**	**7**	**0**	**0**	**0**	**2**	**1**	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**15**	43
7:30 AM	**0**	**1**	**5**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**12**	47
7:45 AM	**0**	**0**	**6**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**15**	51
8:00 AM	**0**	**1**	**2**	**0**	**0**	**0**	**2**	**5**	**0**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**15**	**57**
8:15 AM	0	2	3	0	0	0	4	1	0	1	1	0	0	0	0	0	12	54
8:30 AM	0	0	3	0	0	0	2	3	0	1	4	0	0	0	0	0	13	55
8:45 AM	0	2	2	0	0	0	4	0	0	0	2	0	0	0	0	0	10	50
Count Total	0	11	41	0	0	0	20	18	0	6	36	0	0	0	0	0	132	0
Peak Hour	**0**	**3**	**20**	**0**	**0**	**0**	**6**	**8**	**0**	**2**	**18**	**0**	**0**	**0**	**0**	**0**	**57**	**0**

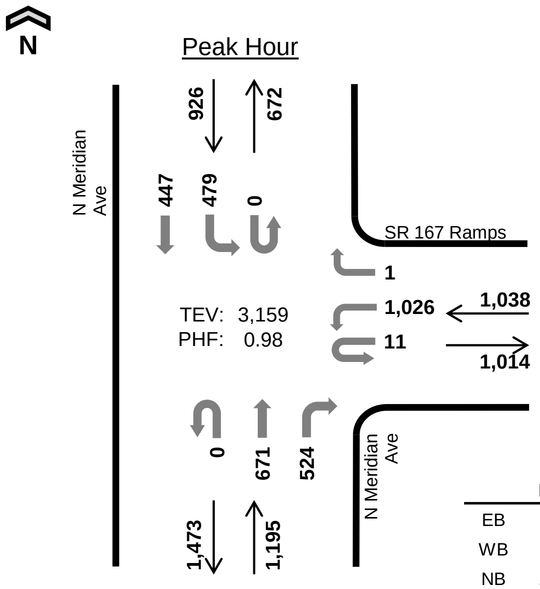
Three-Hour Count Summaries - Bikes

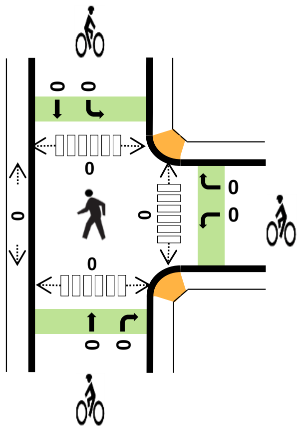
Interval Start	E Stewart Ave			E Main Ave			2nd St NE			2nd St NE			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

N Meridian Ave
SR 167 Ramps

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:15 AM to 8:15 AM





	HV %:	PHF
EB	-	-
WB	8.8%	0.92
NB	10.2%	0.97
SB	17.6%	0.93
TOTAL	11.9%	0.98

Three-Hour Count Summaries

Interval Start		0				SR 167 Ramps				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:15 AM		0	0	0	0	4	276	0	1	0	0	188	121	0	115	103	0	808	0
7:30 AM		0	0	0	0	2	262	0	0	0	0	166	135	0	123	105	0	793	0
7:45 AM		0	0	0	0	5	255	0	0	0	0	161	133	0	109	123	0	786	0
8:00 AM		0	0	0	0	0	233	0	0	0	0	156	135	0	132	116	0	772	3,159
Peak Hour	All	0	0	0	0	11	1,026	0	1	0	0	671	524	0	479	447	0	3,159	0
	HV	0	0	0	0	1	90	0	0	0	0	47	75	0	117	46	0	376	0
	HV%	-	-	-	-	9%	9%	-	0%	-	-	7%	14%	-	24%	10%	-	12%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:15 AM	0	19	18	48	*85*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	0	16	24	42	*82*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	0	27	38	26	*91*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	0	29	42	47	*118*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	0	91	122	163	*376*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	0				SR 167 Ramps				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	170	0	0	0	0	153	90	0	77	48	0	538	0
6:15 AM	0	0	0	0	2	223	0	0	0	0	175	123	0	89	49	0	661	0
6:30 AM	0	0	0	0	3	252	0	0	0	0	162	106	0	105	67	0	695	0
6:45 AM	0	0	0	0	3	248	0	0	0	0	188	156	0	92	63	0	750	2,644
7:00 AM	0	0	0	0	3	186	0	0	0	0	179	127	0	105	87	0	687	2,793
7:15 AM	**0**	**0**	**0**	**0**	**4**	**276**	**0**	**1**	**0**	**0**	**188**	**121**	**0**	**115**	**103**	**0**	**808**	2,940
7:30 AM	**0**	**0**	**0**	**0**	**2**	**262**	**0**	**0**	**0**	**0**	**166**	**135**	**0**	**123**	**105**	**0**	**793**	3,038
7:45 AM	**0**	**0**	**0**	**0**	**5**	**255**	**0**	**0**	**0**	**0**	**161**	**133**	**0**	**109**	**123**	**0**	**786**	3,074
8:00 AM	**0**	**0**	**0**	**0**	**0**	**233**	**0**	**0**	**0**	**0**	**156**	**135**	**0**	**132**	**116**	**0**	**772**	**3,159**
8:15 AM	0	0	0	0	1	212	0	0	0	0	149	130	0	123	109	0	724	3,075
8:30 AM	0	0	0	0	1	203	0	0	0	0	131	135	0	145	135	0	750	3,032
8:45 AM	0	0	0	0	2	208	0	0	0	0	140	137	0	128	119	0	734	2,980
Count Total	0	0	0	0	26	2,728	0	1	0	0	1,948	1,528	0	1,343	1,124	0	8,698	0
Peak Hour All	**0**	**0**	**0**	**0**	**11**	**1,026**	**0**	**1**	**0**	**0**	**671**	**524**	**0**	**479**	**447**	**0**	**3,159**	**0**
HV	**0**	**0**	**0**	**0**	**1**	**90**	**0**	**0**	**0**	**0**	**47**	**75**	**0**	**117**	**46**	**0**	**376**	**0**
HV%	**-**	**-**	**-**	**-**	**9%**	**9%**	**-**	**0%**	**-**	**-**	**7%**	**14%**	**-**	**24%**	**10%**	**-**	**12%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	0	13	26	21	*60*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	0	14	26	27	*67*	0	0	2	0	*2*	0	0	0	0	*0*
6:30 AM	0	22	20	33	*75*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	0	23	30	35	*88*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	0	17	27	42	*86*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	**0**	**19**	**18**	**48**	***85***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**0**	**16**	**24**	**42**	***82***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**0**	**27**	**38**	**26**	***91***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**0**	**29**	**42**	**47**	***118***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:15 AM	0	26	32	42	*100*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	0	25	25	46	*96*	0	0	0	1	*1*	0	0	0	0	*0*
8:45 AM	0	23	26	39	*88*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	0	254	334	448	*1,036*	0	0	2	1	*3*	0	0	0	0	*0*
Peak Hr	**0**	**91**	**122**	**163**	***376***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	0				SR 167 Ramps				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	13	0	0	0	0	9	17	0	14	7	0	60	0
6:15 AM	0	0	0	0	0	14	0	0	0	0	7	19	0	23	4	0	67	0
6:30 AM	0	0	0	0	0	22	0	0	0	0	9	11	0	23	10	0	75	0
6:45 AM	0	0	0	0	0	23	0	0	0	0	11	19	0	27	8	0	88	290
7:00 AM	0	0	0	0	0	17	0	0	0	0	10	17	0	29	13	0	86	316
7:15 AM	**0**	**0**	**0**	**0**	**1**	**18**	**0**	**0**	**0**	**0**	**3**	**15**	**0**	**30**	**18**	**0**	**85**	334
7:30 AM	**0**	**0**	**0**	**0**	**0**	**16**	**0**	**0**	**0**	**0**	**9**	**15**	**0**	**34**	**8**	**0**	**82**	341
7:45 AM	**0**	**0**	**0**	**0**	**0**	**27**	**0**	**0**	**0**	**0**	**18**	**20**	**0**	**21**	**5**	**0**	**91**	344
8:00 AM	**0**	**0**	**0**	**0**	**0**	**29**	**0**	**0**	**0**	**0**	**17**	**25**	**0**	**32**	**15**	**0**	**118**	**376**
8:15 AM	0	0	0	0	0	26	0	0	0	0	9	23	0	35	7	0	100	391
8:30 AM	0	0	0	0	0	25	0	0	0	0	5	20	0	31	15	0	96	405
8:45 AM	0	0	0	0	0	23	0	0	0	0	6	20	0	32	7	0	88	402
Count Total	0	0	0	0	1	253	0	0	0	0	113	221	0	331	117	0	1,036	0
Peak Hour	**0**	**0**	**0**	**0**	**1**	**90**	**0**	**0**	**0**	**0**	**47**	**75**	**0**	**117**	**46**	**0**	**376**	**0**

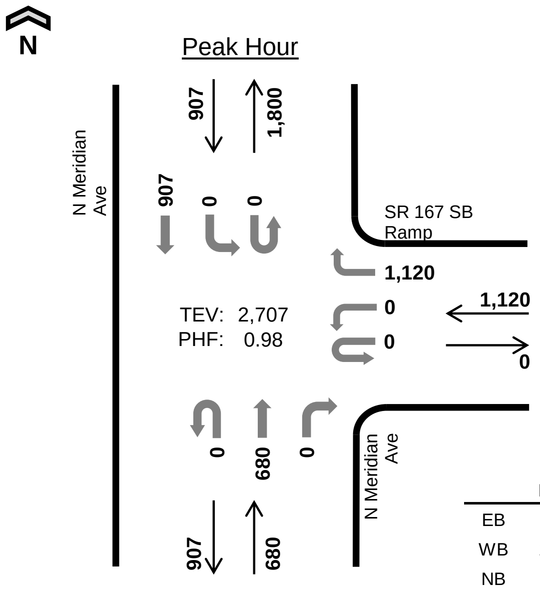
Three-Hour Count Summaries - Bikes

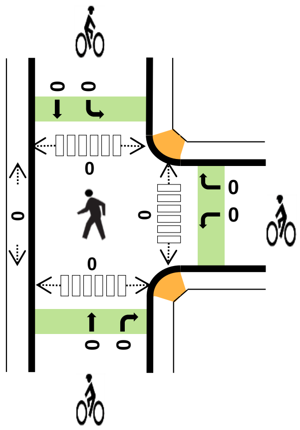
Interval Start	0			SR 167 Ramps			N Meridian Ave			N Meridian Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	2	0	0	0	0	2	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	0	0	0	0	0	2	0	0	1	0	3	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

N Meridian Ave
SR 167 SB Ramp

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:15 AM to 8:15 AM





	HV %:	PHF
EB	-	-
WB	10.4%	0.94
NB	6.2%	0.94
SB	18.1%	0.95
TOTAL	11.9%	0.98

Three-Hour Count Summaries

Interval Start		0				SR 167 SB Ramp				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:15 AM		0	0	0	0	0	0	0	272	0	0	181	0	0	0	213	0	666	0
7:30 AM		0	0	0	0	0	0	0	297	0	0	166	0	0	0	228	0	691	0
7:45 AM		0	0	0	0	0	0	0	266	0	0	171	0	0	0	239	0	676	0
8:00 AM		0	0	0	0	0	0	0	285	0	0	162	0	0	0	227	0	674	2,707
Peak Hour	All	0	0	0	0	0	0	0	1,120	0	0	680	0	0	0	907	0	2,707	0
	HV	0	0	0	0	0	0	0	117	0	0	42	0	0	0	164	0	323	0
	HV%	-	-	-	-	-	-	-	10%	-	-	6%	-	-	-	18%	-	12%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:15 AM	0	25	7	40	*72*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	0	29	11	44	*84*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	0	24	15	34	*73*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	0	39	9	46	*94*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	0	117	42	164	*323*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	0				SR 167 SB Ramp				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	256	0	0	152	0	0	0	123	0	531	0
6:15 AM	0	0	0	0	0	0	0	269	0	0	184	0	0	0	140	0	593	0
6:30 AM	0	0	0	0	0	0	0	267	0	0	158	0	0	0	162	0	587	0
6:45 AM	0	0	0	0	0	0	0	264	0	0	186	0	0	0	161	0	611	2,322
7:00 AM	0	0	0	0	0	0	0	250	0	0	178	0	0	0	191	0	619	2,410
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**272**	**0**	**0**	**181**	**0**	**0**	**0**	**213**	**0**	**666**	2,483
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**297**	**0**	**0**	**166**	**0**	**0**	**0**	**228**	**0**	**691**	2,587
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**266**	**0**	**0**	**171**	**0**	**0**	**0**	**239**	**0**	**676**	2,652
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**285**	**0**	**0**	**162**	**0**	**0**	**0**	**227**	**0**	**674**	**2,707**
8:15 AM	0	0	0	0	0	0	0	227	0	0	152	0	0	0	239	0	618	2,659
8:30 AM	0	0	0	0	0	1	0	269	0	0	118	0	0	0	274	0	662	2,630
8:45 AM	0	0	0	0	0	0	0	219	0	0	143	0	0	0	269	0	631	2,585
Count Total	0	0	0	0	0	1	0	3,141	0	0	1,951	0	0	0	2,466	0	7,559	0
Peak Hour All	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,120**	**0**	**0**	**680**	**0**	**0**	**0**	**907**	**0**	**2,707**	**0**
HV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**117**	**0**	**0**	**42**	**0**	**0**	**0**	**164**	**0**	**323**	**0**
HV%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**10%**	**-**	**-**	**6%**	**-**	**-**	**-**	**18%**	**-**	**12%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	0	23	9	22	*54*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	0	29	8	29	*66*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	0	30	11	30	*71*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	0	29	8	35	*72*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	0	30	7	40	*77*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	**0**	**25**	**7**	**40**	***72***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**0**	**29**	**11**	**44**	***84***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**0**	**24**	**15**	**34**	***73***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**0**	**39**	**9**	**46**	***94***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:15 AM	0	29	9	44	*82*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	0	30	10	41	*81*	0	0	0	1	*1*	1	0	0	0	*1*
8:45 AM	0	30	9	42	*81*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	0	347	113	447	*907*	0	0	0	1	*1*	1	0	0	0	*1*
Peak Hr	**0**	**117**	**42**	**164**	***323***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	**0**				**SR 167 SB Ramp**				**N Meridian Ave**				**N Meridian Ave**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	23	0	0	9	0	0	0	22	0	54	0
6:15 AM	0	0	0	0	0	0	0	29	0	0	8	0	0	0	29	0	66	0
6:30 AM	0	0	0	0	0	0	0	30	0	0	11	0	0	0	30	0	71	0
6:45 AM	0	0	0	0	0	0	0	29	0	0	8	0	0	0	35	0	72	263
7:00 AM	0	0	0	0	0	0	0	30	0	0	7	0	0	0	40	0	77	286
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**25**	**0**	**0**	**7**	**0**	**0**	**0**	**40**	**0**	**72**	292
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**29**	**0**	**0**	**11**	**0**	**0**	**0**	**44**	**0**	**84**	305
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**24**	**0**	**0**	**15**	**0**	**0**	**0**	**34**	**0**	**73**	306
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**39**	**0**	**0**	**9**	**0**	**0**	**0**	**46**	**0**	**94**	**323**
8:15 AM	0	0	0	0	0	0	0	29	0	0	9	0	0	0	44	0	82	333
8:30 AM	0	0	0	0	0	1	0	29	0	0	10	0	0	0	41	0	81	330
8:45 AM	0	0	0	0	0	0	0	30	0	0	9	0	0	0	42	0	81	338
Count Total	0	0	0	0	0	1	0	346	0	0	113	0	0	0	447	0	907	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**117**	**0**	**0**	**42**	**0**	**0**	**0**	**164**	**0**	**323**	**0**

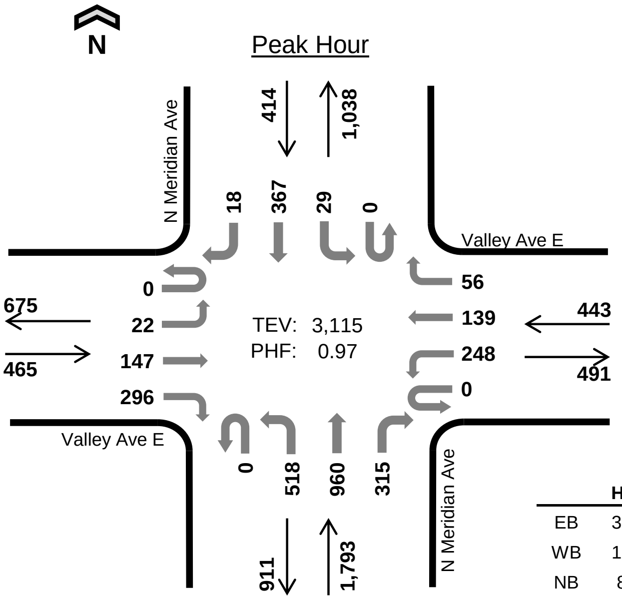
Three-Hour Count Summaries - Bikes

Interval Start	**0**			**SR 167 SB Ramp**			**N Meridian Ave**			**N Meridian Ave**			**15-min Total**	**Rolling One Hour**
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

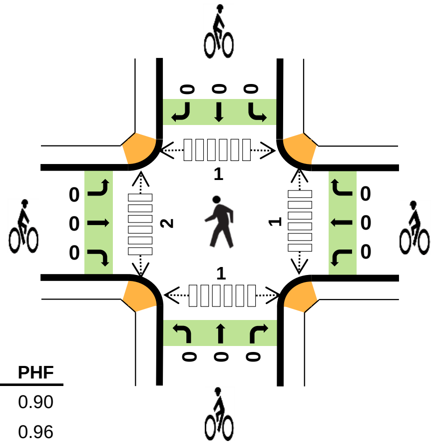
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

N Meridian Ave
Valley Ave E

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:15 AM to 8:15 AM



	HV %:	PHF
EB	35.3%	0.90
WB	18.3%	0.96
NB	8.8%	0.96
SB	5.6%	0.85
TOTAL	13.6%	0.97



Three-Hour Count Summaries

Interval Start		Valley Ave E				Valley Ave E				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:15 AM		0	7	32	74	0	65	27	17	0	130	248	77	0	10	83	2	772	0
7:30 AM		0	3	44	77	0	57	39	17	0	123	259	85	0	6	90	4	804	0
7:45 AM		0	4	53	72	0	64	33	9	0	118	235	71	0	8	108	6	781	0
8:00 AM		0	8	18	73	0	62	40	13	0	147	218	82	0	5	86	6	758	3,115
Peak Hour	All	0	22	147	296	0	248	139	56	0	518	960	315	0	29	367	18	3,115	0
	HV	0	3	57	104	0	33	37	11	0	82	34	41	0	1	20	2	425	0
	HV%	-	14%	39%	35%	-	13%	27%	20%	-	16%	4%	13%	-	3%	5%	11%	14%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:15 AM	43	25	26	3	*97*	0	0	0	0	*0*	0	1	0	1	*2*
7:30 AM	43	20	42	5	*110*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	44	21	41	8	*114*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	34	15	48	7	*104*	0	0	0	0	*0*	1	1	1	0	*3*
Peak Hour	164	81	157	23	*425*	0	0	0	0	*0*	1	2	1	1	*5*

Three-Hour Count Summaries

Interval Start	Valley Ave E				Valley Ave E				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	2	16	48	0	35	27	6	0	127	233	73	0	1	39	9	616	0
6:15 AM	0	4	22	55	0	39	31	8	0	110	239	77	0	6	44	0	635	0
6:30 AM	0	9	49	61	0	42	40	12	0	132	225	72	0	6	53	2	703	0
6:45 AM	0	7	34	47	0	51	29	9	0	139	232	83	0	4	71	10	716	2,670
7:00 AM	0	8	41	57	0	59	34	19	0	121	229	80	0	5	75	4	732	2,786
7:15 AM	**0**	**7**	**32**	**74**	**0**	**65**	**27**	**17**	**0**	**130**	**248**	**77**	**0**	**10**	**83**	**2**	**772**	2,923
7:30 AM	**0**	**3**	**44**	**77**	**0**	**57**	**39**	**17**	**0**	**123**	**259**	**85**	**0**	**6**	**90**	**4**	**804**	3,024
7:45 AM	**0**	**4**	**53**	**72**	**0**	**64**	**33**	**9**	**0**	**118**	**235**	**71**	**0**	**8**	**108**	**6**	**781**	3,089
8:00 AM	**0**	**8**	**18**	**73**	**0**	**62**	**40**	**13**	**0**	**147**	**218**	**82**	**0**	**5**	**86**	**6**	**758**	**3,115**
8:15 AM	0	1	42	74	0	68	20	8	0	114	215	59	0	4	106	5	716	3,059
8:30 AM	0	5	34	89	0	65	25	17	0	117	199	60	0	5	117	1	734	2,989
8:45 AM	0	3	38	100	0	63	31	16	0	108	191	64	0	6	98	2	720	2,928
Count Total	0	61	423	827	0	670	376	151	0	1,486	2,723	883	0	66	970	51	8,687	0
Peak Hour All	**0**	**22**	**147**	**296**	**0**	**248**	**139**	**56**	**0**	**518**	**960**	**315**	**0**	**29**	**367**	**18**	**3,115**	**0**
HV	**0**	**3**	**57**	**104**	**0**	**33**	**37**	**11**	**0**	**82**	**34**	**41**	**0**	**1**	**20**	**2**	**425**	**0**
HV%	**-**	**14%**	**39%**	**35%**	**-**	**13%**	**27%**	**20%**	**-**	**16%**	**4%**	**13%**	**-**	**3%**	**5%**	**11%**	**14%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	23	6	35	2	*66*	0	0	0	0	*0*	0	2	1	1	*4*
6:15 AM	30	19	35	0	*84*	0	0	0	0	*0*	0	1	0	0	*1*
6:30 AM	42	25	38	3	*108*	0	0	0	0	*0*	0	0	1	0	*1*
6:45 AM	38	27	39	2	*106*	0	0	0	0	*0*	0	1	0	1	*2*
7:00 AM	40	24	39	5	*108*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	**43**	**25**	**26**	**3**	***97***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**1**	*2*
7:30 AM	**43**	**20**	**42**	**5**	***110***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**44**	**21**	**41**	**8**	***114***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**34**	**15**	**48**	**7**	***104***	**0**	**0**	**0**	**0**	***0***	**1**	**1**	**1**	**0**	*3*
8:15 AM	42	17	41	9	*109*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	41	21	33	11	*106*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	40	14	42	8	*104*	0	0	0	0	*0*	1	1	0	0	*2*
Count Total	460	234	459	63	*1,216*	0	0	0	0	*0*	2	7	3	3	*15*
Peak Hour	**164**	**81**	**157**	**23**	***425***	**0**	**0**	**0**	**0**	***0***	**1**	**2**	**1**	**1**	***5***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	**Valley Ave E**				**Valley Ave E**				**N Meridian Ave**				**N Meridian Ave**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	2	3	18	0	2	4	0	0	19	11	5	0	0	1	1	66	0
6:15 AM	0	0	8	22	0	7	12	0	0	22	6	7	0	0	0	0	84	0
6:30 AM	0	2	19	21	0	10	13	2	0	28	7	3	0	2	1	0	108	0
6:45 AM	0	1	16	21	0	12	12	3	0	18	16	5	0	0	1	1	106	364
7:00 AM	0	5	12	23	0	10	8	6	0	27	8	4	0	0	5	0	108	406
7:15 AM	**0**	**0**	**11**	**32**	**0**	**8**	**13**	**4**	**0**	**18**	**5**	**3**	**0**	**0**	**3**	**0**	**97**	419
7:30 AM	**0**	**1**	**18**	**24**	**0**	**11**	**6**	**3**	**0**	**20**	**8**	**14**	**0**	**0**	**5**	**0**	**110**	421
7:45 AM	**0**	**1**	**21**	**22**	**0**	**9**	**9**	**3**	**0**	**21**	**9**	**11**	**0**	**1**	**6**	**1**	**114**	429
8:00 AM	**0**	**1**	**7**	**26**	**0**	**5**	**9**	**1**	**0**	**23**	**12**	**13**	**0**	**0**	**6**	**1**	**104**	**425**
8:15 AM	0	0	16	26	0	11	5	1	0	20	13	8	0	1	8	0	109	437
8:30 AM	0	1	9	31	0	9	11	1	0	19	11	3	0	1	10	0	106	433
8:45 AM	0	0	13	27	0	6	6	2	0	27	12	3	0	0	8	0	104	423
Count Total	0	14	153	293	0	100	108	26	0	262	118	79	0	5	54	4	1,216	0
Peak Hour	**0**	**3**	**57**	**104**	**0**	**33**	**37**	**11**	**0**	**82**	**34**	**41**	**0**	**1**	**20**	**2**	**425**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	**Valley Ave E**			**Valley Ave E**			**N Meridian Ave**			**N Meridian Ave**			**15-min Total**	**Rolling One Hour**
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

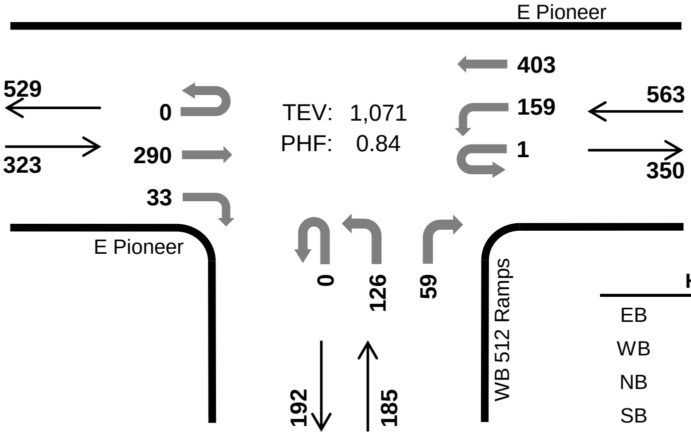
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

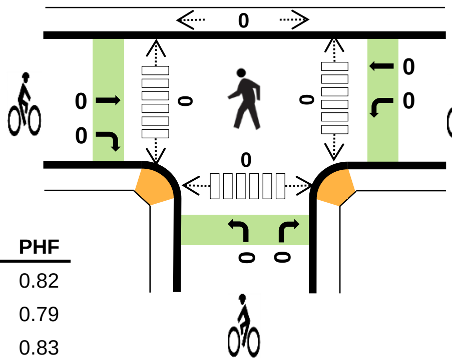
WB 512 Ramps
E Pioneer

N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 8:00 AM to 9:00 AM





	HV %:	PHF
EB	5.9%	0.82
WB	5.9%	0.79
NB	6.5%	0.83
SB	-	-
TOTAL	6.0%	0.84

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				WB 512 Ramps				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
8:00 AM		0	0	58	8	0	35	89	0	0	41	0	13	0	0	0	0	244	0
8:15 AM		0	0	95	3	0	36	77	0	0	22	0	11	0	0	0	0	244	0
8:30 AM		0	0	73	10	0	42	137	0	0	34	0	22	0	0	0	0	318	0
8:45 AM		0	0	64	12	1	46	100	0	0	29	0	13	0	0	0	0	265	1,071
Peak Hour	All	0	0	290	33	1	159	403	0	0	126	0	59	0	0	0	0	1,071	0
	HV	0	0	15	4	0	17	16	0	0	6	0	6	0	0	0	0	64	0
	HV%	-	-	5%	12%	0%	11%	4%	-	-	5%	-	10%	-	-	-	-	6%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
8:00 AM	7	6	2	0	*15*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	5	7	2	0	*14*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	3	11	5	0	*19*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	4	9	3	0	*16*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	19	33	12	0	*64*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				WB 512 Ramps				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM		0	0	55	9	0	19	33	0	0	7	0	7	0	0	0	0	130	0
6:15 AM		0	0	88	5	0	29	53	0	0	10	0	12	0	0	0	0	197	0
6:30 AM		0	0	85	10	0	31	45	0	0	20	0	9	0	0	0	0	200	0
6:45 AM		0	0	82	11	0	33	53	0	0	26	0	9	0	0	0	0	214	741
7:00 AM		0	0	88	7	0	36	48	0	0	15	0	6	0	0	0	0	200	811
7:15 AM		0	0	97	9	0	36	77	0	0	18	0	11	0	0	0	0	248	862
7:30 AM		0	0	74	6	0	40	65	0	0	30	0	16	0	0	0	0	231	893
7:45 AM		0	0	66	9	0	39	82	0	0	32	0	14	0	0	0	0	242	921
8:00 AM		**0**	**0**	**58**	**8**	**0**	**35**	**89**	**0**	**0**	**41**	**0**	**13**	**0**	**0**	**0**	**0**	**244**	965
8:15 AM		**0**	**0**	**95**	**3**	**0**	**36**	**77**	**0**	**0**	**22**	**0**	**11**	**0**	**0**	**0**	**0**	**244**	961
8:30 AM		**0**	**0**	**73**	**10**	**0**	**42**	**137**	**0**	**0**	**34**	**0**	**22**	**0**	**0**	**0**	**0**	**318**	1,048
8:45 AM		**0**	**0**	**64**	**12**	**1**	**46**	**100**	**0**	**0**	**29**	**0**	**13**	**0**	**0**	**0**	**0**	**265**	**1,071**
Count Total		0	0	925	99	1	422	859	0	0	284	0	143	0	0	0	0	2,733	0
Peak Hour	**All**	**0**	**0**	**290**	**33**	**1**	**159**	**403**	**0**	**0**	**126**	**0**	**59**	**0**	**0**	**0**	**0**	**1,071**	**0**
	HV	**0**	**0**	**15**	**4**	**0**	**17**	**16**	**0**	**0**	**6**	**0**	**6**	**0**	**0**	**0**	**0**	**64**	**0**
	HV%	**-**	**-**	**5%**	**12%**	**0%**	**11%**	**4%**	**-**	**-**	**5%**	**-**	**10%**	**-**	**-**	**-**	**-**	**6%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	1	3	1	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	5	3	2	0	*10*	0	0	0	0	*0*	0	0	0	1	*1*
6:30 AM	6	1	4	0	*11*	0	0	0	0	*0*	0	0	0	1	*1*
6:45 AM	5	4	4	0	*13*	0	0	0	0	*0*	0	0	0	2	*2*
7:00 AM	7	5	2	0	*14*	1	0	0	0	*1*	0	0	0	0	*0*
7:15 AM	6	8	3	0	*17*	0	0	0	0	*0*	0	0	0	1	*1*
7:30 AM	3	10	7	0	*20*	0	1	0	0	*1*	0	0	0	0	*0*
7:45 AM	1	9	2	0	*12*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	**7**	**6**	**2**	**0**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:15 AM	**5**	**7**	**2**	**0**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:30 AM	**3**	**11**	**5**	**0**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:45 AM	**4**	**9**	**3**	**0**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	53	76	37	0	*166*	1	1	0	0	*2*	0	0	0	5	*5*
Peak Hr	**19**	**33**	**12**	**0**	***64***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				WB 512 Ramps				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	1	0	0	2	1	0	0	1	0	0	0	0	0	0	5	0
6:15 AM	0	0	4	1	0	3	0	0	0	0	0	2	0	0	0	0	10	0
6:30 AM	0	0	6	0	0	1	0	0	0	1	0	3	0	0	0	0	11	0
6:45 AM	0	0	5	0	0	3	1	0	0	1	0	3	0	0	0	0	13	39
7:00 AM	0	0	7	0	0	1	4	0	0	0	0	2	0	0	0	0	14	48
7:15 AM	0	0	6	0	0	5	3	0	0	0	0	3	0	0	0	0	17	55
7:30 AM	0	0	3	0	0	8	2	0	0	3	0	4	0	0	0	0	20	64
7:45 AM	0	0	0	1	0	4	5	0	0	0	0	2	0	0	0	0	12	63
8:00 AM	**0**	**0**	**4**	**3**	**0**	**3**	**3**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**15**	64
8:15 AM	**0**	**0**	**5**	**0**	**0**	**3**	**4**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	61
8:30 AM	**0**	**0**	**2**	**1**	**0**	**4**	**7**	**0**	**0**	**2**	**0**	**3**	**0**	**0**	**0**	**0**	**19**	60
8:45 AM	**0**	**0**	**4**	**0**	**0**	**7**	**2**	**0**	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**16**	**64**
Count Total	0	0	47	6	0	44	32	0	0	12	0	25	0	0	0	0	166	0
Peak Hour	**0**	**0**	**15**	**4**	**0**	**17**	**16**	**0**	**0**	**6**	**0**	**6**	**0**	**0**	**0**	**0**	**64**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	E Pioneer			E Pioneer			WB 512 Ramps			0			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Count Total	0	1	0	0	1	0	0	0	0	0	0	0	2	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

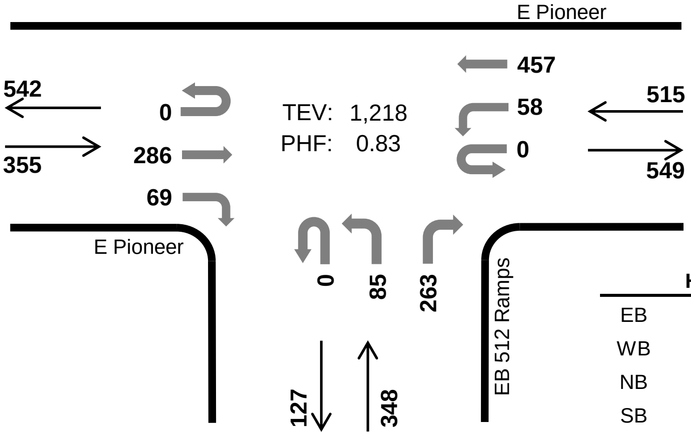
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

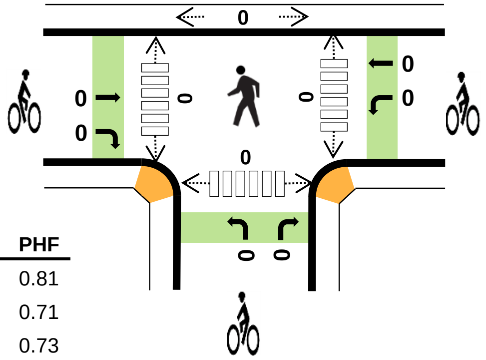
EB 512 Ramps
E Pioneer

N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:45 AM to 8:45 AM





	HV %:	PHF
EB	5.6%	0.81
WB	7.6%	0.71
NB	6.6%	0.73
SB	-	-
TOTAL	6.7%	0.83

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				EB 512 Ramps				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:45 AM		0	0	58	14	0	14	103	0	0	19	0	100	0	0	0	0	308	0
8:00 AM		0	0	67	12	0	11	102	0	0	21	0	47	0	0	0	0	260	0
8:15 AM		0	0	86	23	0	13	91	0	0	21	0	48	0	0	0	0	282	0
8:30 AM		0	0	75	20	0	20	161	0	0	24	0	68	0	0	0	0	368	1,218
Peak Hour	All	0	0	286	69	0	58	457	0	0	85	0	263	0	0	0	0	1,218	0
	HV	0	0	18	2	0	11	28	0	0	4	0	19	0	0	0	0	82	0
	HV%	-	-	6%	3%	-	19%	6%	-	-	5%	-	7%	-	-	-	-	7%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:45 AM	4	10	6	0	*20*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	7	8	5	0	*20*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	4	9	5	0	*18*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	5	12	7	0	*24*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	20	39	23	0	*82*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				EB 512 Ramps				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	34	29	0	14	54	0	0	2	0	38	0	0	0	0	171	0
6:15 AM	0	0	55	40	0	21	73	0	0	6	0	41	0	0	0	0	236	0
6:30 AM	0	0	55	38	0	18	68	0	0	7	0	40	0	0	0	0	226	0
6:45 AM	0	0	49	40	0	15	80	0	0	6	0	57	0	0	0	0	247	880
7:00 AM	0	0	52	45	0	8	79	0	0	5	0	50	0	0	0	0	239	948
7:15 AM	0	0	58	49	0	14	108	0	0	9	0	55	0	0	0	0	293	1,005
7:30 AM	0	0	61	29	0	10	94	0	0	11	0	51	0	0	0	0	256	1,035
7:45 AM	**0**	**0**	**58**	**14**	**0**	**14**	**103**	**0**	**0**	**19**	**0**	**100**	**0**	**0**	**0**	**0**	**308**	1,096
8:00 AM	**0**	**0**	**67**	**12**	**0**	**11**	**102**	**0**	**0**	**21**	**0**	**47**	**0**	**0**	**0**	**0**	**260**	1,117
8:15 AM	**0**	**0**	**86**	**23**	**0**	**13**	**91**	**0**	**0**	**21**	**0**	**48**	**0**	**0**	**0**	**0**	**282**	1,106
8:30 AM	**0**	**0**	**75**	**20**	**0**	**20**	**161**	**0**	**0**	**24**	**0**	**68**	**0**	**0**	**0**	**0**	**368**	**1,218**
8:45 AM	0	0	62	18	0	16	112	0	0	26	0	42	0	0	0	0	276	1,186
Count Total	0	0	712	357	0	174	1,125	0	0	157	0	637	0	0	0	0	3,162	0
Peak Hour All	**0**	**0**	**286**	**69**	**0**	**58**	**457**	**0**	**0**	**85**	**0**	**263**	**0**	**0**	**0**	**0**	**1,218**	**0**
HV	**0**	**0**	**18**	**2**	**0**	**11**	**28**	**0**	**0**	**4**	**0**	**19**	**0**	**0**	**0**	**0**	**82**	**0**
HV%	**-**	**-**	**6%**	**3%**	**-**	**19%**	**6%**	**-**	**-**	**5%**	**-**	**7%**	**-**	**-**	**-**	**-**	**7%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	1	5	1	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	7	3	2	0	*12*	0	0	0	0	*0*	0	0	0	1	*1*
6:30 AM	8	2	1	0	*11*	0	0	0	0	*0*	0	0	0	1	*1*
6:45 AM	8	5	4	0	*17*	0	0	0	0	*0*	0	0	0	3	*3*
7:00 AM	7	5	4	0	*16*	1	0	0	0	*1*	0	0	0	0	*0*
7:15 AM	9	9	4	0	*22*	0	0	0	0	*0*	0	0	0	1	*1*
7:30 AM	7	10	5	0	*22*	0	1	0	0	*1*	0	0	0	0	*0*
7:45 AM	**4**	**10**	**6**	**0**	***20***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**7**	**8**	**5**	**0**	***20***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:15 AM	**4**	**9**	**5**	**0**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:30 AM	**5**	**12**	**7**	**0**	***24***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:45 AM	5	10	5	0	*20*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	72	88	49	0	*209*	1	1	0	0	*2*	0	0	0	7	*7*
Peak Hr	**20**	**39**	**23**	**0**	***82***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	**E Pioneer**				**E Pioneer**				**EB 512 Ramps**				**0**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	1	0	2	3	0	0	0	0	1	0	0	0	0	7	0
6:15 AM	0	0	6	1	0	0	3	0	0	0	0	2	0	0	0	0	12	0
6:30 AM	0	0	7	1	0	1	1	0	0	0	0	1	0	0	0	0	11	0
6:45 AM	0	0	6	2	0	2	3	0	0	1	0	3	0	0	0	0	17	47
7:00 AM	0	0	6	1	0	1	4	0	0	1	0	3	0	0	0	0	16	56
7:15 AM	0	0	6	3	0	0	9	0	0	0	0	4	0	0	0	0	22	66
7:30 AM	0	0	4	3	0	0	10	0	0	0	0	5	0	0	0	0	22	77
7:45 AM	**0**	**0**	**4**	**0**	**0**	**3**	**7**	**0**	**0**	**1**	**0**	**5**	**0**	**0**	**0**	**0**	**20**	80
8:00 AM	**0**	**0**	**5**	**2**	**0**	**2**	**6**	**0**	**0**	**1**	**0**	**4**	**0**	**0**	**0**	**0**	**20**	84
8:15 AM	**0**	**0**	**4**	**0**	**0**	**2**	**7**	**0**	**0**	**1**	**0**	**4**	**0**	**0**	**0**	**0**	**18**	80
8:30 AM	**0**	**0**	**5**	**0**	**0**	**4**	**8**	**0**	**0**	**1**	**0**	**6**	**0**	**0**	**0**	**0**	**24**	**82**
8:45 AM	0	0	4	1	0	2	8	0	0	1	0	4	0	0	0	0	20	82
Count Total	0	0	57	15	0	19	69	0	0	7	0	42	0	0	0	0	209	0
Peak Hour	**0**	**0**	**18**	**2**	**0**	**11**	**28**	**0**	**0**	**4**	**0**	**19**	**0**	**0**	**0**	**0**	**82**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	**E Pioneer**			**E Pioneer**			**EB 512 Ramps**			**0**			**15-min Total**	**Rolling One Hour**
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	1	0	0	1	0	0	0	0	0	0	0	2	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

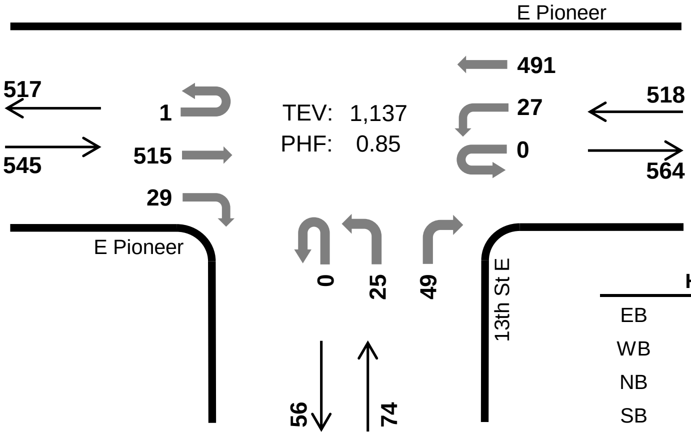
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

13th St E
E Pioneer

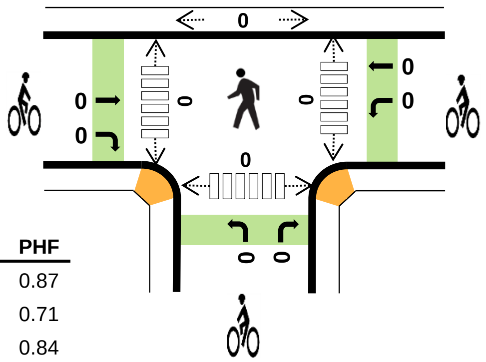
N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:45 AM to 8:45 AM



	HV %:	PHF
EB	6.8%	0.87
WB	7.1%	0.71
NB	2.7%	0.84
SB	-	-
TOTAL	6.7%	0.85



Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				13th St E				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:45 AM		0	0	151	5	0	6	112	0	0	6	0	16	0	0	0	0	296	0
8:00 AM		1	0	108	7	0	5	103	0	0	7	0	14	0	0	0	0	245	0
8:15 AM		0	0	128	6	0	10	100	0	0	5	0	13	0	0	0	0	262	0
8:30 AM		0	0	128	11	0	6	176	0	0	7	0	6	0	0	0	0	334	1,137
Peak Hour	All	1	0	515	29	0	27	491	0	0	25	0	49	0	0	0	0	1,137	0
	HV	0	0	36	1	0	0	37	0	0	1	0	1	0	0	0	0	76	0
	HV%	0%	-	7%	3%	-	0%	8%	-	-	4%	-	2%	-	-	-	-	7%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:45 AM	10	9	2	0	*21*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	9	8	0	0	*17*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	9	7	0	0	*16*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	9	13	0	0	*22*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	37	37	2	0	*76*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				13th St E				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	68	2	0	3	58	0	0	12	0	5	0	0	0	0	148	0
6:15 AM	0	0	93	4	0	2	75	0	0	19	0	6	0	0	0	0	199	0
6:30 AM	0	0	93	3	0	5	80	0	0	11	0	14	0	0	0	0	206	0
6:45 AM	0	0	97	7	0	2	87	0	0	7	0	9	0	0	0	0	209	762
7:00 AM	0	0	102	1	0	0	83	0	0	7	0	7	0	0	0	0	200	814
7:15 AM	0	0	112	1	0	3	119	0	0	5	0	7	0	0	0	0	247	862
7:30 AM	0	0	110	3	0	7	96	0	0	8	0	11	0	0	0	0	235	891
7:45 AM	**0**	**0**	**151**	**5**	**0**	**6**	**112**	**0**	**0**	**6**	**0**	**16**	**0**	**0**	**0**	**0**	**296**	978
8:00 AM	**1**	**0**	**108**	**7**	**0**	**5**	**103**	**0**	**0**	**7**	**0**	**14**	**0**	**0**	**0**	**0**	**245**	1,023
8:15 AM	**0**	**0**	**128**	**6**	**0**	**10**	**100**	**0**	**0**	**5**	**0**	**13**	**0**	**0**	**0**	**0**	**262**	1,038
8:30 AM	**0**	**0**	**128**	**11**	**0**	**6**	**176**	**0**	**0**	**7**	**0**	**6**	**0**	**0**	**0**	**0**	**334**	**1,137**
8:45 AM	0	0	102	3	0	8	105	0	0	14	0	6	0	0	0	0	238	1,079
Count Total	1	0	1,292	53	0	57	1,194	0	0	108	0	114	0	0	0	0	2,819	0
Peak Hour All	**1**	**0**	**515**	**29**	**0**	**27**	**491**	**0**	**0**	**25**	**0**	**49**	**0**	**0**	**0**	**0**	**1,137**	**0**
HV	**0**	**0**	**36**	**1**	**0**	**0**	**37**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**76**	**0**
HV%	**0%**	**-**	**7%**	**3%**	**-**	**0%**	**8%**	**-**	**-**	**4%**	**-**	**2%**	**-**	**-**	**-**	**-**	**7%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	1	6	0	0	*7*	0	0	0	0	*0*	0	0	0	1	*1*
6:15 AM	7	4	0	0	*11*	0	0	0	0	*0*	0	0	0	1	*1*
6:30 AM	9	6	1	0	*16*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	9	3	0	0	*12*	0	0	0	0	*0*	0	0	0	1	*1*
7:00 AM	9	4	1	0	*14*	1	0	0	0	*1*	0	0	0	1	*1*
7:15 AM	9	10	0	0	*19*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	9	11	0	0	*20*	0	1	0	0	*1*	0	0	0	0	*0*
7:45 AM	**10**	**9**	**2**	**0**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**9**	**8**	**0**	**0**	***17***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:15 AM	**9**	**7**	**0**	**0**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:30 AM	**9**	**13**	**0**	**0**	***22***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:45 AM	9	11	0	0	*20*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	99	92	4	0	*195*	1	1	0	0	*2*	0	0	0	5	*5*
Peak Hr	**37**	**37**	**2**	**0**	***76***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				13th St E				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	1	0	0	1	5	0	0	0	0	0	0	0	0	0	7	0
6:15 AM	0	0	7	0	0	1	3	0	0	0	0	0	0	0	0	0	11	0
6:30 AM	0	0	9	0	0	2	4	0	0	1	0	0	0	0	0	0	16	0
6:45 AM	0	0	9	0	0	1	2	0	0	0	0	0	0	0	0	0	12	46
7:00 AM	0	0	9	0	0	0	4	0	0	0	0	1	0	0	0	0	14	53
7:15 AM	0	0	9	0	0	0	10	0	0	0	0	0	0	0	0	0	19	61
7:30 AM	0	0	9	0	0	1	10	0	0	0	0	0	0	0	0	0	20	65
7:45 AM	**0**	**0**	**10**	**0**	**0**	**0**	**9**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**21**	74
8:00 AM	**0**	**0**	**8**	**1**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**17**	77
8:15 AM	**0**	**0**	**9**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**16**	74
8:30 AM	**0**	**0**	**9**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**22**	**76**
8:45 AM	0	0	9	0	0	0	11	0	0	0	0	0	0	0	0	0	20	75
Count Total	0	0	98	1	0	6	86	0	0	2	0	2	0	0	0	0	195	0
Peak Hour	**0**	**0**	**36**	**1**	**0**	**0**	**37**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**76**	**0**

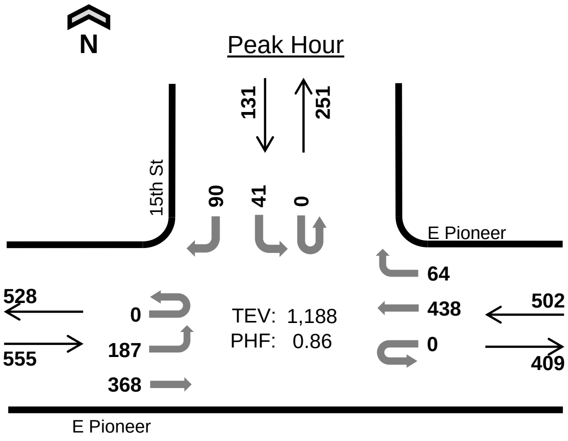
Three-Hour Count Summaries - Bikes

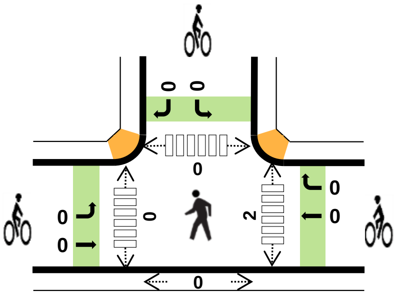
Interval Start	E Pioneer			E Pioneer			13th St E			0			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	1	0	0	1	0	0	0	0	0	0	0	2	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

15th St
E Pioneer

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:45 AM to 8:45 AM





	HV %:	PHF
EB	6.7%	0.84
WB	5.6%	0.69
NB	-	-
SB	7.6%	0.84
TOTAL	6.3%	0.86

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				0				15th St				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:45 AM		0	71	95	0	0	0	105	11	0	0	0	0	0	7	0	14	303	0
8:00 AM		0	48	78	0	0	0	85	28	0	0	0	0	0	12	0	21	272	0
8:15 AM		0	28	109	0	0	0	86	6	0	0	0	0	0	12	0	26	267	0
8:30 AM		0	40	86	0	0	0	162	19	0	0	0	0	0	10	0	29	346	1,188
Peak Hour	All	0	187	368	0	0	0	438	64	0	0	0	0	0	41	0	90	1,188	0
	HV	0	12	25	0	0	0	28	0	0	0	0	0	0	3	0	7	75	0
	HV%	-	6%	7%	-	-	-	6%	0%	-	-	-	-	-	7%	-	8%	6%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:45 AM	11	7	0	3	*21*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	10	6	0	5	*21*	0	0	0	0	*0*	1	0	0	0	*1*
8:15 AM	7	8	0	1	*16*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	9	7	0	1	*17*	0	0	0	0	*0*	1	0	0	0	*1*
Peak Hour	37	28	0	10	*75*	0	0	0	0	*0*	2	0	0	0	*2*

Three-Hour Count Summaries

Interval Start	**E Pioneer**				**E Pioneer**				**0**				**15th St**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	29	40	0	0	0	51	7	0	0	0	0	0	2	0	11	140	0
6:15 AM	0	51	53	0	0	0	63	9	0	0	0	0	0	0	0	13	189	0
6:30 AM	0	46	60	0	0	0	62	14	0	0	0	0	0	1	0	16	199	0
6:45 AM	0	51	60	0	0	0	73	7	0	0	0	0	0	5	0	12	208	736
7:00 AM	0	36	65	0	0	0	70	15	0	0	0	0	0	4	0	11	201	797
7:15 AM	0	46	79	0	0	0	105	20	0	0	0	0	0	8	0	16	274	882
7:30 AM	0	36	87	0	0	0	76	12	0	0	0	0	0	10	0	18	239	922
7:45 AM	**0**	**71**	**95**	**0**	**0**	**0**	**105**	**11**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**14**	**303**	1,017
8:00 AM	**0**	**48**	**78**	**0**	**0**	**0**	**85**	**28**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**21**	**272**	1,088
8:15 AM	**0**	**28**	**109**	**0**	**0**	**0**	**86**	**6**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**26**	**267**	1,081
8:30 AM	**0**	**40**	**86**	**0**	**0**	**0**	**162**	**19**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**29**	**346**	**1,188**
8:45 AM	0	41	68	0	0	0	90	11	0	0	0	0	0	8	0	19	237	1,122
Count Total	0	523	880	0	0	0	1,028	159	0	0	0	0	0	79	0	206	2,875	0
Peak Hour **All**	**0**	**187**	**368**	**0**	**0**	**0**	**438**	**64**	**0**	**0**	**0**	**0**	**0**	**41**	**0**	**90**	**1,188**	**0**
HV	**0**	**12**	**25**	**0**	**0**	**0**	**28**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**7**	**75**	**0**
HV%	**-**	**6%**	**7%**	**-**	**-**	**-**	**6%**	**0%**	**-**	**-**	**-**	**-**	**-**	**7%**	**-**	**8%**	**6%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	**Heavy Vehicle Totals**					**Bicycles**					**Pedestrians (Crossing Leg)**				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	4	3	0	2	*9*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	7	2	0	1	*10*	0	0	0	0	*0*	0	1	0	0	*1*
6:30 AM	7	4	0	3	*14*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	8	4	0	1	*13*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	8	2	0	3	*13*	1	0	0	0	*1*	0	0	0	0	*0*
7:15 AM	7	6	0	4	*17*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	13	8	0	6	*27*	0	0	0	0	*0*	0	0	1	0	*1*
7:45 AM	**11**	**7**	**0**	**3**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**10**	**6**	**0**	**5**	***21***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	*1*
8:15 AM	**7**	**8**	**0**	**1**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:30 AM	**9**	**7**	**0**	**1**	***17***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
8:45 AM	9	8	0	4	*21*	0	0	0	0	*0*	0	0	2	0	*2*
Count Total	100	65	0	34	*199*	1	0	0	0	*1*	2	1	3	0	*6*
Peak Hr	**37**	**28**	**0**	**10**	***75***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**0**	***2***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				0				15th St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	1	3	0	0	0	3	0	0	0	0	0	0	0	0	2	9	0
6:15 AM	0	1	6	0	0	0	2	0	0	0	0	0	0	0	0	1	10	0
6:30 AM	0	1	6	0	0	0	3	1	0	0	0	0	0	0	0	3	14	0
6:45 AM	0	2	6	0	0	0	4	0	0	0	0	0	0	0	0	1	13	46
7:00 AM	0	1	7	0	0	0	2	0	0	0	0	0	0	1	0	2	13	50
7:15 AM	0	1	6	0	0	0	6	0	0	0	0	0	0	1	0	3	17	57
7:30 AM	0	4	9	0	0	0	7	1	0	0	0	0	0	0	0	6	27	70
7:45 AM	**0**	**4**	**7**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**21**	78
8:00 AM	**0**	**3**	**7**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**4**	**21**	86
8:15 AM	**0**	**2**	**5**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**16**	85
8:30 AM	**0**	**3**	**6**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**17**	**75**
8:45 AM	0	5	4	0	0	0	8	0	0	0	0	0	0	0	0	4	21	75
Count Total	0	28	72	0	0	0	63	2	0	0	0	0	0	5	0	29	199	0
Peak Hour	**0**	**12**	**25**	**0**	**0**	**0**	**28**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**7**	**75**	**0**

Three-Hour Count Summaries - Bikes

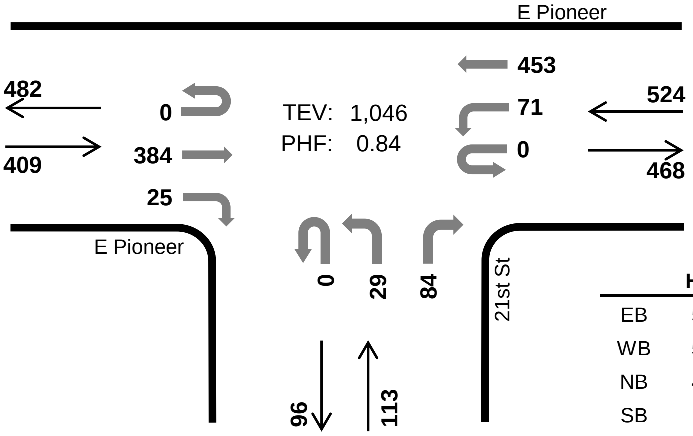
Interval Start	E Pioneer			E Pioneer			0			15th St			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

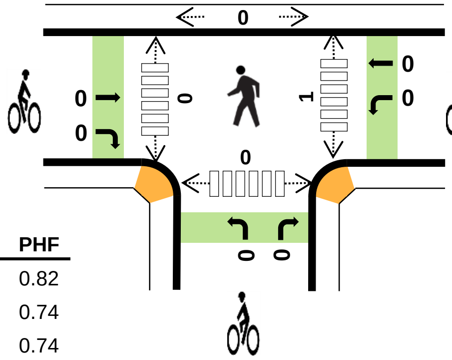
21st St
E Pioneer

Peak Hour

Date:	**Tue, Aug 03, 2021**
Count Period:	**6:00 AM to 9:00 AM**
Peak Hour:	**7:45 AM to 8:45 AM**



	HV %:	PHF
EB	5.6%	0.82
WB	5.9%	0.74
NB	4.4%	0.74
SB	-	-
TOTAL	5.6%	0.84



Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				21st St				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:45 AM		0	0	92	2	0	13	113	0	0	6	0	16	0	0	0	0	242	0
8:00 AM		0	0	90	4	0	20	91	0	0	5	0	12	0	0	0	0	222	0
8:15 AM		0	0	111	13	0	20	90	0	0	6	0	30	0	0	0	0	270	0
8:30 AM		0	0	91	6	0	18	159	0	0	12	0	26	0	0	0	0	312	1,046
Peak Hour	All	0	0	384	25	0	71	453	0	0	29	0	84	0	0	0	0	1,046	0
	HV	0	0	20	3	0	1	30	0	0	3	0	2	0	0	0	0	59	0
	HV%	-	-	5%	12%	-	1%	7%	-	-	10%	-	2%	-	-	-	-	6%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:45 AM	3	9	0	0	*12*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	6	6	0	0	*12*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	8	5	2	0	*15*	0	0	0	0	*0*	1	0	0	0	*1*
8:30 AM	6	11	3	0	*20*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	23	31	5	0	*59*	0	0	0	0	*0*	1	0	0	0	*1*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				21st St				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	39	1	0	2	51	0	0	3	0	10	0	0	0	0	106	0
6:15 AM	0	0	49	1	0	11	59	0	0	8	0	6	0	0	0	0	134	0
6:30 AM	0	0	56	0	0	3	63	0	0	7	0	10	0	0	0	0	139	0
6:45 AM	0	0	62	2	0	5	76	0	0	5	0	11	0	0	0	0	161	540
7:00 AM	0	0	67	1	0	4	80	0	0	6	0	8	0	0	0	0	166	600
7:15 AM	0	0	78	6	0	7	119	0	0	7	0	10	0	0	0	0	227	693
7:30 AM	0	0	100	4	0	11	87	0	0	1	0	14	0	0	0	0	217	771
7:45 AM	**0**	**0**	**92**	**2**	**0**	**13**	**113**	**0**	**0**	**6**	**0**	**16**	**0**	**0**	**0**	**0**	**242**	852
8:00 AM	**0**	**0**	**90**	**4**	**0**	**20**	**91**	**0**	**0**	**5**	**0**	**12**	**0**	**0**	**0**	**0**	**222**	908
8:15 AM	**0**	**0**	**111**	**13**	**0**	**20**	**90**	**0**	**0**	**6**	**0**	**30**	**0**	**0**	**0**	**0**	**270**	951
8:30 AM	**0**	**0**	**91**	**6**	**0**	**18**	**159**	**0**	**0**	**12**	**0**	**26**	**0**	**0**	**0**	**0**	**312**	**1,046**
8:45 AM	0	0	67	5	0	15	103	0	0	3	0	14	0	0	0	0	207	1,011
Count Total	0	0	902	45	0	129	1,091	0	0	69	0	167	0	0	0	0	2,403	0
Peak Hour All	**0**	**0**	**384**	**25**	**0**	**71**	**453**	**0**	**0**	**29**	**0**	**84**	**0**	**0**	**0**	**0**	**1,046**	**0**
HV	**0**	**0**	**20**	**3**	**0**	**1**	**30**	**0**	**0**	**3**	**0**	**2**	**0**	**0**	**0**	**0**	**59**	**0**
HV%	**-**	**-**	**5%**	**12%**	**-**	**1%**	**7%**	**-**	**-**	**10%**	**-**	**2%**	**-**	**-**	**-**	**-**	**6%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	4	3	0	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	5	3	0	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	6	3	0	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	6	4	0	0	*10*	0	0	0	0	*0*	1	0	0	0	*1*
7:00 AM	10	3	0	0	*13*	1	0	0	0	*1*	0	0	0	1	*1*
7:15 AM	10	8	0	0	*18*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	10	4	0	0	*14*	0	1	0	0	*1*	0	0	0	0	*0*
7:45 AM	**3**	**9**	**0**	**0**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**6**	**6**	**0**	**0**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:15 AM	**8**	**5**	**2**	**0**	***15***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	*1*
8:30 AM	**6**	**11**	**3**	**0**	***20***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:45 AM	3	5	1	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	77	64	6	0	*147*	1	1	0	0	*2*	2	0	0	1	*3*
Peak Hr	**23**	**31**	**5**	**0**	***59***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				21st St				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	4	0	0	0	3	0	0	0	0	0	0	0	0	0	7	0
6:15 AM	0	0	5	0	0	0	3	0	0	0	0	0	0	0	0	0	8	0
6:30 AM	0	0	6	0	0	0	3	0	0	0	0	0	0	0	0	0	9	0
6:45 AM	0	0	6	0	0	0	4	0	0	0	0	0	0	0	0	0	10	34
7:00 AM	0	0	10	0	0	0	3	0	0	0	0	0	0	0	0	0	13	40
7:15 AM	0	0	10	0	0	0	8	0	0	0	0	0	0	0	0	0	18	50
7:30 AM	0	0	10	0	0	0	4	0	0	0	0	0	0	0	0	0	14	55
7:45 AM	**0**	**0**	**3**	**0**	**0**	**1**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	57
8:00 AM	**0**	**0**	**6**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	56
8:15 AM	**0**	**0**	**6**	**2**	**0**	**0**	**5**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**15**	53
8:30 AM	**0**	**0**	**5**	**1**	**0**	**0**	**11**	**0**	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**20**	**59**
8:45 AM	0	0	2	1	0	1	4	0	0	0	0	1	0	0	0	0	9	56
Count Total	0	0	73	4	0	2	62	0	0	3	0	3	0	0	0	0	147	0
Peak Hour	**0**	**0**	**20**	**3**	**0**	**1**	**30**	**0**	**0**	**3**	**0**	**2**	**0**	**0**	**0**	**0**	**59**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	E Pioneer			E Pioneer			21st St			0			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	1	0	0	1	0	0	0	0	0	0	0	2	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

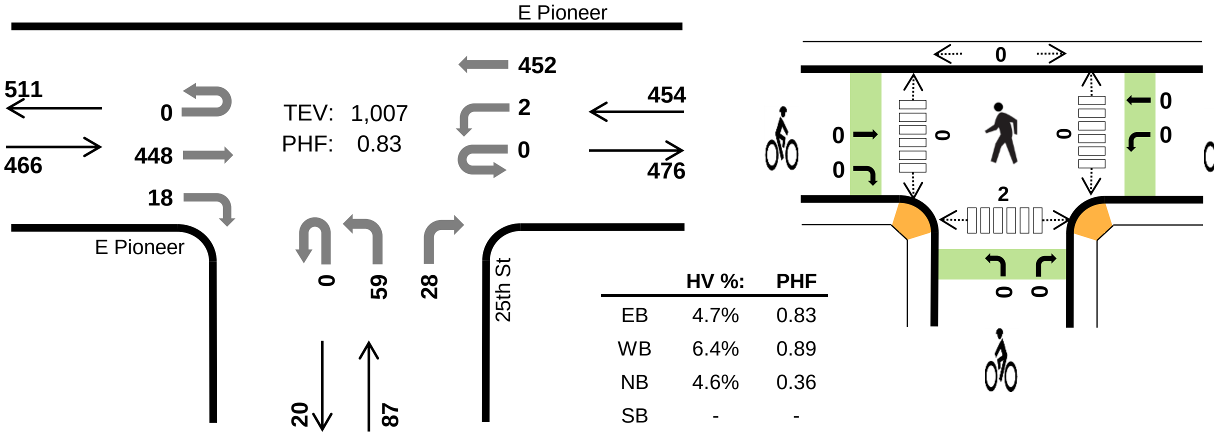
25th St
E Pioneer

idax

N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:45 AM to 8:45 AM



	HV %:	PHF
EB	4.7%	0.83
WB	6.4%	0.89
NB	4.6%	0.36
SB	-	-
TOTAL	5.5%	0.83

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				25th St				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:45 AM		0	0	101	1	0	0	124	0	0	3	0	3	0	0	0	0	232	0
8:00 AM		0	0	104	3	0	1	108	0	0	3	0	1	0	0	0	0	220	0
8:15 AM		0	0	127	13	0	0	94	0	0	12	0	5	0	0	0	0	251	0
8:30 AM		0	0	116	1	0	1	126	0	0	41	0	19	0	0	0	0	304	1,007
Peak Hour	All	0	0	448	18	0	2	452	0	0	59	0	28	0	0	0	0	1,007	0
	HV	0	0	21	1	0	0	29	0	0	2	0	2	0	0	0	0	55	0
	HV%	-	-	5%	6%	-	0%	6%	-	-	3%	-	7%	-	-	-	-	5%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:45 AM	3	9	0	0	*12*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	6	8	0	0	*14*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	7	5	1	0	*13*	0	0	0	0	*0*	0	0	0	1	*1*
8:30 AM	6	7	3	0	*16*	0	0	0	0	*0*	0	0	0	1	*1*
Peak Hour	22	29	4	0	*55*	0	0	0	0	*0*	0	0	0	2	*2*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				25th St				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	50	0	0	0	57	0	0	3	0	0	0	0	0	0	110	0
6:15 AM	0	0	54	2	0	0	64	0	0	4	0	2	0	0	0	0	126	0
6:30 AM	0	0	63	1	0	1	63	0	0	2	0	2	0	0	0	0	132	0
6:45 AM	0	0	66	0	0	0	89	0	0	3	0	0	0	0	0	0	158	526
7:00 AM	0	0	71	2	0	1	71	0	0	4	0	1	0	0	0	0	150	566
7:15 AM	0	0	87	1	0	0	122	0	0	2	0	2	0	0	0	0	214	654
7:30 AM	0	0	106	4	0	0	101	0	0	3	0	2	0	0	0	0	216	738
7:45 AM	**0**	**0**	**101**	**1**	**0**	**0**	**124**	**0**	**0**	**3**	**0**	**3**	**0**	**0**	**0**	**0**	**232**	812
8:00 AM	**0**	**0**	**104**	**3**	**0**	**1**	**108**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**220**	882
8:15 AM	**0**	**0**	**127**	**13**	**0**	**0**	**94**	**0**	**0**	**12**	**0**	**5**	**0**	**0**	**0**	**0**	**251**	919
8:30 AM	**0**	**0**	**116**	**1**	**0**	**1**	**126**	**0**	**0**	**41**	**0**	**19**	**0**	**0**	**0**	**0**	**304**	**1,007**
8:45 AM	0	0	80	1	0	0	114	0	0	7	0	2	0	0	0	0	204	979
Count Total	0	0	1,025	29	0	4	1,133	0	0	87	0	39	0	0	0	0	2,317	0
Peak Hour All	**0**	**0**	**448**	**18**	**0**	**2**	**452**	**0**	**0**	**59**	**0**	**28**	**0**	**0**	**0**	**0**	**1,007**	**0**
HV	**0**	**0**	**21**	**1**	**0**	**0**	**29**	**0**	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**55**	**0**
HV%	**-**	**-**	**5%**	**6%**	**-**	**0%**	**6%**	**-**	**-**	**3%**	**-**	**7%**	**-**	**-**	**-**	**-**	**5%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	3	3	0	0	*6*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	5	2	0	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	7	4	0	0	*11*	0	1	0	0	*1*	0	0	0	1	*1*
6:45 AM	6	4	0	0	*10*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	10	4	0	0	*14*	1	0	0	0	*1*	0	0	0	2	*2*
7:15 AM	10	8	0	0	*18*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	10	3	0	0	*13*	0	1	0	0	*1*	0	0	0	0	*0*
7:45 AM	**3**	**9**	**0**	**0**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**6**	**8**	**0**	**0**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:15 AM	**7**	**5**	**1**	**0**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	*1*
8:30 AM	**6**	**7**	**3**	**0**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	*1*
8:45 AM	3	5	0	0	*8*	0	0	1	0	*1*	0	0	0	0	*0*
Count Total	76	62	4	0	*142*	1	2	1	0	*4*	0	0	0	5	*5*
Peak Hr	**22**	**29**	**4**	**0**	***55***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**2**	***2***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				25th St				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	6	0
6:15 AM	0	0	4	1	0	0	2	0	0	0	0	0	0	0	0	0	7	0
6:30 AM	0	0	6	1	0	0	4	0	0	0	0	0	0	0	0	0	11	0
6:45 AM	0	0	6	0	0	0	4	0	0	0	0	0	0	0	0	0	10	34
7:00 AM	0	0	9	1	0	0	4	0	0	0	0	0	0	0	0	0	14	42
7:15 AM	0	0	10	0	0	0	8	0	0	0	0	0	0	0	0	0	18	53
7:30 AM	0	0	10	0	0	0	3	0	0	0	0	0	0	0	0	0	13	55
7:45 AM	**0**	**0**	**3**	**0**	**0**	**0**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	57
8:00 AM	**0**	**0**	**6**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	57
8:15 AM	**0**	**0**	**6**	**1**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**13**	52
8:30 AM	**0**	**0**	**6**	**0**	**0**	**0**	**7**	**0**	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**16**	**55**
8:45 AM	0	0	3	0	0	0	5	0	0	0	0	0	0	0	0	0	8	51
Count Total	0	0	72	4	0	0	62	0	0	2	0	2	0	0	0	0	142	0
Peak Hour	**0**	**0**	**21**	**1**	**0**	**0**	**29**	**0**	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**55**	**0**

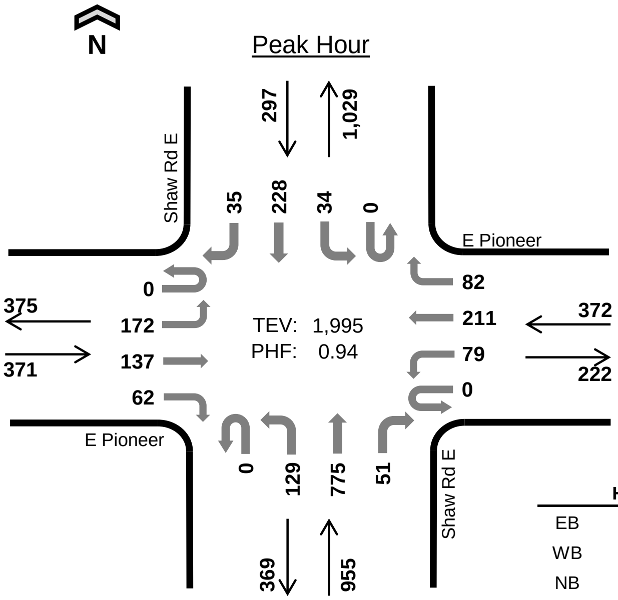
Three-Hour Count Summaries - Bikes

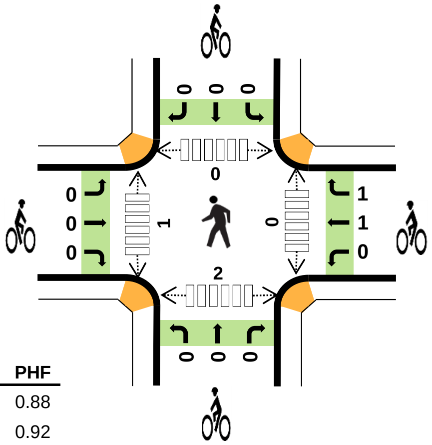
Interval Start	E Pioneer			E Pioneer			25th St			0			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	1	0	0	0	0	0	0	0	0	1	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	2
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
7:30 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	1
Count Total	0	1	0	1	1	0	1	0	0	0	0	0	4	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd E
E Pioneer

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM





	HV %:	PHF
EB	8.6%	0.88
WB	8.6%	0.92
NB	5.4%	0.92
SB	6.7%	0.91
TOTAL	6.8%	0.94

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				Shaw Rd E				Shaw Rd E				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	46	26	8	0	17	42	18	0	18	203	10	0	10	59	6	463	0
7:15 AM		0	39	33	13	0	19	66	16	0	28	206	8	0	9	45	13	495	0
7:30 AM		0	46	37	23	0	26	53	19	0	36	171	15	0	6	69	7	508	0
7:45 AM		0	41	41	18	0	17	50	29	0	47	195	18	0	9	55	9	529	1,995
Peak Hour	All	0	172	137	62	0	79	211	82	0	129	775	51	0	34	228	35	1,995	0
	HV	0	12	15	5	0	13	15	4	0	4	43	5	0	8	8	4	136	0
	HV%	-	7%	11%	8%	-	16%	7%	5%	-	3%	6%	10%	-	24%	4%	11%	7%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	9	3	11	5	*28*	0	1	0	0	*1*	0	1	0	2	*3*
7:15 AM	8	10	14	5	*37*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	6	12	14	6	*38*	0	1	0	0	*1*	0	0	0	0	*0*
7:45 AM	9	7	13	4	*33*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	32	32	52	20	*136*	0	2	0	0	*2*	0	1	0	2	*3*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				Shaw Rd E				Shaw Rd E				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	35	16	5	0	5	28	11	0	19	163	4	0	6	16	6	314	0
6:15 AM	0	31	23	8	0	9	32	10	0	15	191	8	0	4	29	5	365	0
6:30 AM	0	38	32	1	0	9	37	10	0	15	209	11	0	11	57	6	436	0
6:45 AM	0	40	31	9	0	19	57	21	0	18	220	14	0	2	39	6	476	1,591
7:00 AM	**0**	**46**	**26**	**8**	**0**	**17**	**42**	**18**	**0**	**18**	**203**	**10**	**0**	**10**	**59**	**6**	**463**	1,740
7:15 AM	**0**	**39**	**33**	**13**	**0**	**19**	**66**	**16**	**0**	**28**	**206**	**8**	**0**	**9**	**45**	**13**	**495**	1,870
7:30 AM	**0**	**46**	**37**	**23**	**0**	**26**	**53**	**19**	**0**	**36**	**171**	**15**	**0**	**6**	**69**	**7**	**508**	1,942
7:45 AM	**0**	**41**	**41**	**18**	**0**	**17**	**50**	**29**	**0**	**47**	**195**	**18**	**0**	**9**	**55**	**9**	**529**	**1,995**
8:00 AM	0	43	29	26	0	19	41	18	0	43	139	13	0	5	57	19	452	1,984
8:15 AM	0	34	29	67	0	18	45	9	0	28	135	9	0	15	71	8	468	1,957
8:30 AM	0	48	36	38	0	20	54	17	0	47	132	10	0	9	63	8	482	1,931
8:45 AM	0	25	29	25	0	24	52	11	0	32	136	13	0	10	73	19	449	1,851
Count Total	0	466	362	241	0	202	557	189	0	346	2,100	133	0	96	633	112	5,437	0
Peak Hour **All**	**0**	**172**	**137**	**62**	**0**	**79**	**211**	**82**	**0**	**129**	**775**	**51**	**0**	**34**	**228**	**35**	**1,995**	**0**
HV	**0**	**12**	**15**	**5**	**0**	**13**	**15**	**4**	**0**	**4**	**43**	**5**	**0**	**8**	**8**	**4**	**136**	**0**
HV%	**-**	**7%**	**11%**	**8%**	**-**	**16%**	**7%**	**5%**	**-**	**3%**	**6%**	**10%**	**-**	**24%**	**4%**	**11%**	**7%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	1	5	5	1	*12*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	5	3	5	1	*14*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	9	2	7	3	*21*	0	0	0	0	*0*	1	0	1	2	*4*
6:45 AM	5	7	4	3	*19*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	**9**	**3**	**11**	**5**	***28***	**0**	**1**	**0**	**0**	***1***	**0**	**1**	**0**	**2**	*3*
7:15 AM	**8**	**10**	**14**	**5**	***37***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**6**	**12**	**14**	**6**	***38***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**9**	**7**	**13**	**4**	***33***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:00 AM	5	9	6	6	*26*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	6	7	6	13	*32*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	8	11	8	4	*31*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	3	7	8	12	*30*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	74	83	101	63	*321*	0	2	0	0	*2*	1	1	1	5	*8*
Peak Hour	**32**	**32**	**52**	**20**	***136***	**0**	**2**	**0**	**0**	***2***	**0**	**1**	**0**	**2**	***3***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				Shaw Rd E				Shaw Rd E				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	1	0	0	0	0	2	3	0	0	5	0	0	0	0	1	12	0
6:15 AM	0	4	0	1	0	0	2	1	0	0	5	0	0	0	1	0	14	0
6:30 AM	0	6	3	0	0	0	2	0	0	0	6	1	0	2	1	0	21	0
6:45 AM	0	1	2	2	0	0	4	3	0	1	3	0	0	0	3	0	19	66
7:00 AM	**0**	**4**	**3**	**2**	**0**	**0**	**3**	**0**	**0**	**0**	**10**	**1**	**0**	**2**	**3**	**0**	**28**	82
7:15 AM	**0**	**3**	**3**	**2**	**0**	**3**	**6**	**1**	**0**	**0**	**13**	**1**	**0**	**3**	**1**	**1**	**37**	105
7:30 AM	**0**	**1**	**5**	**0**	**0**	**8**	**2**	**2**	**0**	**2**	**10**	**2**	**0**	**1**	**3**	**2**	**38**	122
7:45 AM	**0**	**4**	**4**	**1**	**0**	**2**	**4**	**1**	**0**	**2**	**10**	**1**	**0**	**2**	**1**	**1**	**33**	**136**
8:00 AM	0	1	2	2	0	0	4	5	0	0	5	1	0	2	4	0	26	134
8:15 AM	0	0	3	3	0	2	5	0	0	0	6	0	0	4	7	2	32	129
8:30 AM	0	1	5	2	0	1	5	5	0	2	4	2	0	1	3	0	31	122
8:45 AM	0	2	0	1	0	3	3	1	0	1	7	0	0	2	8	2	30	119
Count Total	0	28	30	16	0	19	42	22	0	8	84	9	0	19	35	9	321	0
Peak Hour	**0**	**12**	**15**	**5**	**0**	**13**	**15**	**4**	**0**	**4**	**43**	**5**	**0**	**8**	**8**	**4**	**136**	**0**

Three-Hour Count Summaries - Bikes

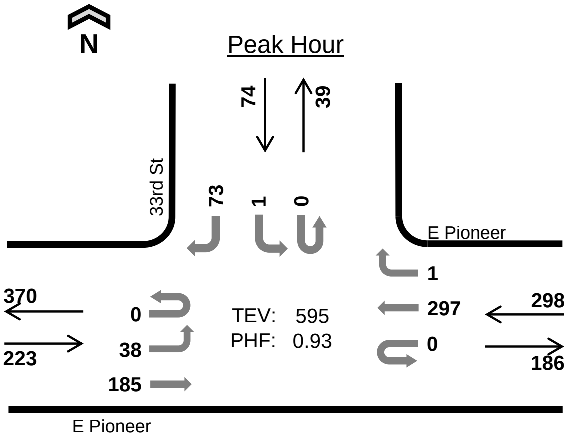
Interval Start	E Pioneer			E Pioneer			Shaw Rd E			Shaw Rd E			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	1
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
7:30 AM	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	2
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	1	1	0	0	0	0	0	0	2	0
Peak Hour	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**

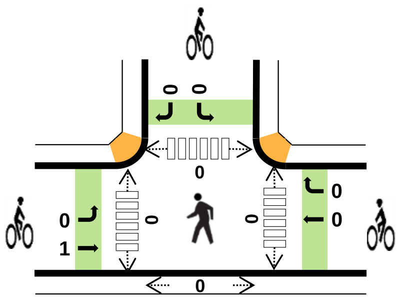
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

33rd St
E Pioneer

Date:	**Tue, Aug 03, 2021**
Count Period:	**6:00 AM to 9:00 AM**
Peak Hour:	**7:00 AM to 8:00 AM**

Peak Hour





	HV %:	PHF
EB	12.6%	0.81
WB	10.1%	0.93
NB	-	-
SB	2.7%	0.80
TOTAL	10.1%	0.93

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				0				33rd St				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	11	33	0	0	0	73	1	0	0	0	0	0	0	0	14	132	0
7:15 AM		0	9	44	0	0	0	80	0	0	0	0	0	0	0	0	18	151	0
7:30 AM		0	10	47	0	0	0	72	0	0	0	0	0	0	1	0	22	152	0
7:45 AM		0	8	61	0	0	0	72	0	0	0	0	0	0	0	0	19	160	595
Peak Hour	All	0	38	185	0	0	0	297	1	0	0	0	0	0	1	0	73	595	0
	HV	0	4	24	0	0	0	30	0	0	0	0	0	0	0	0	2	60	0
	HV%	-	11%	13%	-	-	-	10%	0%	-	-	-	-	-	0%	-	3%	10%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	4	3	0	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	9	9	0	2	*20*	1	0	0	0	*1*	0	0	0	0	*0*
7:30 AM	8	12	0	0	*20*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	7	6	0	0	*13*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	28	30	0	2	*60*	1	0	0	0	*1*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				0				33rd St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	2	26	0	0	0	37	0	0	0	0	0	0	0	0	10	75	0
6:15 AM	0	5	29	0	0	0	37	0	0	0	0	0	0	0	0	11	82	0
6:30 AM	0	14	41	0	0	0	47	1	0	0	0	0	0	0	0	19	122	0
6:45 AM	0	5	39	0	0	0	67	0	0	0	0	0	0	0	0	23	134	413
7:00 AM	**0**	**11**	**33**	**0**	**0**	**0**	**73**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**132**	470
7:15 AM	**0**	**9**	**44**	**0**	**0**	**0**	**80**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**151**	539
7:30 AM	**0**	**10**	**47**	**0**	**0**	**0**	**72**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**22**	**152**	569
7:45 AM	**0**	**8**	**61**	**0**	**0**	**0**	**72**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**160**	**595**
8:00 AM	0	10	37	0	0	0	60	2	0	0	0	0	0	0	0	20	129	592
8:15 AM	0	9	42	0	0	0	51	1	0	0	0	0	0	0	0	22	125	566
8:30 AM	0	12	44	0	0	0	72	0	0	0	0	0	0	0	0	19	147	561
8:45 AM	1	20	34	0	0	0	72	1	0	0	0	0	0	0	0	13	141	542
Count Total	1	115	477	0	0	0	740	6	0	0	0	0	0	1	0	210	1,550	0
Peak Hour All	**0**	**38**	**185**	**0**	**0**	**0**	**297**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**73**	**595**	**0**
HV	**0**	**4**	**24**	**0**	**0**	**0**	**30**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**60**	**0**
HV%	**-**	**11%**	**13%**	**-**	**-**	**-**	**10%**	**0%**	**-**	**-**	**-**	**-**	**-**	**0%**	**-**	**3%**	**10%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	0	3	0	0	*3*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	1	3	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	3	5	0	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	4	6	0	1	*11*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	**4**	**3**	**0**	**0**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:15 AM	**9**	**9**	**0**	**2**	***20***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**8**	**12**	**0**	**0**	***20***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**7**	**6**	**0**	**0**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:00 AM	5	3	0	3	*11*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	7	8	0	1	*16*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	7	10	0	1	*18*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	3	9	0	0	*12*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	58	77	0	8	*143*	1	0	0	0	*1*	0	0	0	0	*0*
Peak Hr	**28**	**30**	**0**	**2**	***60***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				0				33rd St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	0
6:15 AM	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	4	0
6:30 AM	0	1	2	0	0	0	4	1	0	0	0	0	0	0	0	0	8	0
6:45 AM	0	0	4	0	0	0	6	0	0	0	0	0	0	0	0	1	11	26
7:00 AM	**0**	**0**	**4**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	30
7:15 AM	**0**	**1**	**8**	**0**	**0**	**0**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**20**	46
7:30 AM	**0**	**2**	**6**	**0**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**20**	58
7:45 AM	**0**	**1**	**6**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**60**
8:00 AM	0	1	4	0	0	0	3	0	0	0	0	0	0	0	0	3	11	64
8:15 AM	0	1	6	0	0	0	8	0	0	0	0	0	0	0	0	1	16	60
8:30 AM	0	1	6	0	0	0	10	0	0	0	0	0	0	0	0	1	18	58
8:45 AM	0	1	2	0	0	0	8	1	0	0	0	0	0	0	0	0	12	57
Count Total	0	9	49	0	0	0	75	2	0	0	0	0	0	0	0	8	143	0
Peak Hour	**0**	**4**	**24**	**0**	**0**	**0**	**30**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**60**	**0**

Three-Hour Count Summaries - Bikes

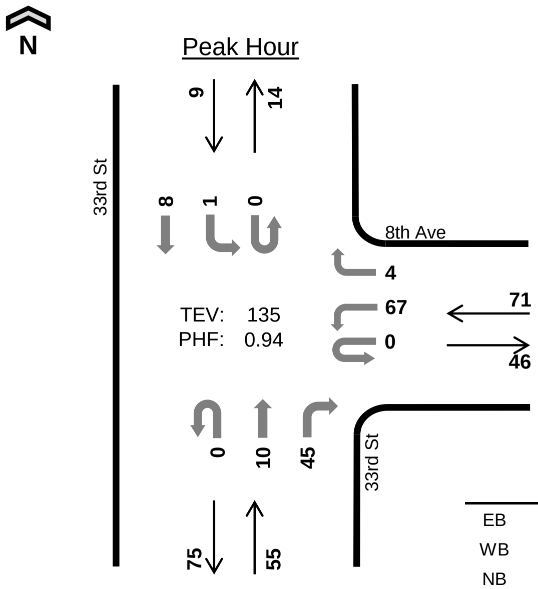
Interval Start	E Pioneer			E Pioneer			0			33rd St			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:15 AM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	1
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Peak Hour	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

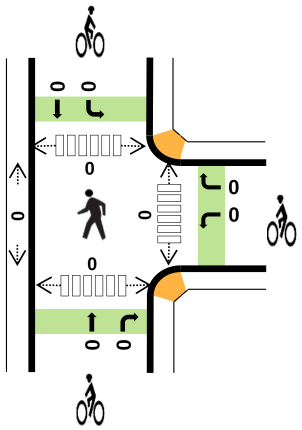
33rd St
8th Ave

Date: **Tue, Aug 03, 2021**
Count Period: **6:00 AM to 9:00 AM**
Peak Hour: **8:00 AM to 9:00 AM**

Peak Hour



TEV: 135
PHF: 0.94



	HV %:	PHF
EB	-	-
WB	2.8%	0.85
NB	9.1%	0.65
SB	44.4%	0.56
TOTAL	8.1%	0.94

Three-Hour Count Summaries

Interval Start		0				8th Ave				33rd St				33rd St				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
8:00 AM		0	0	0	0	0	17	0	0	0	0	3	9	0	0	4	0	33	0
8:15 AM		0	0	0	0	0	19	0	2	0	0	0	10	0	0	2	0	33	0
8:30 AM		0	0	0	0	0	18	0	1	0	0	2	10	0	0	2	0	33	0
8:45 AM		0	0	0	0	0	13	0	1	0	0	5	16	0	1	0	0	36	135
Peak Hour	**All**	0	0	0	0	0	67	0	4	0	0	10	45	0	1	8	0	135	0
	HV	0	0	0	0	0	1	0	1	0	0	2	3	0	0	4	0	11	0
	HV%	-	-	-	-	-	1%	-	25%	-	-	20%	7%	-	0%	50%	-	8%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
8:00 AM	0	1	1	3	*5*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	0	0	1	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	0	1	1	1	*3*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	0	0	2	0	*2*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	0	2	5	4	*11*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	0				8th Ave				33rd St				33rd St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	8	0	0	0	0	0	2	0	0	2	0	12	0
6:15 AM	0	0	0	0	0	13	0	0	0	0	1	4	0	0	0	0	18	0
6:30 AM	0	0	0	0	0	16	0	0	0	0	3	12	0	2	1	0	34	0
6:45 AM	0	0	0	0	0	21	0	1	0	0	3	2	0	3	1	0	31	95
7:00 AM	0	0	0	0	0	15	0	0	0	0	2	10	0	1	0	0	28	111
7:15 AM	0	0	0	0	0	16	0	0	0	0	3	6	0	0	2	0	27	120
7:30 AM	0	0	0	0	0	23	0	0	0	0	2	8	0	0	0	0	33	119
7:45 AM	0	0	0	0	0	18	0	1	0	0	3	5	0	0	0	0	27	115
8:00 AM	**0**	**0**	**0**	**0**	**0**	**17**	**0**	**0**	**0**	**0**	**3**	**9**	**0**	**0**	**4**	**0**	**33**	120
8:15 AM	**0**	**0**	**0**	**0**	**0**	**19**	**0**	**2**	**0**	**0**	**0**	**10**	**0**	**0**	**2**	**0**	**33**	126
8:30 AM	**0**	**0**	**0**	**0**	**0**	**18**	**0**	**1**	**0**	**0**	**2**	**10**	**0**	**0**	**2**	**0**	**33**	126
8:45 AM	**0**	**0**	**0**	**0**	**0**	**13**	**0**	**1**	**0**	**0**	**5**	**16**	**0**	**1**	**0**	**0**	**36**	**135**
Count Total	0	0	0	0	0	197	0	6	0	0	27	94	0	7	14	0	345	0
Peak Hour All	**0**	**0**	**0**	**0**	**0**	**67**	**0**	**4**	**0**	**0**	**10**	**45**	**0**	**1**	**8**	**0**	**135**	**0**
HV	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**2**	**3**	**0**	**0**	**4**	**0**	**11**	**0**
HV%	**-**	**-**	**-**	**-**	**-**	**1%**	**-**	**25%**	**-**	**-**	**20%**	**7%**	**-**	**0%**	**50%**	**-**	**8%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	0	0	2	1	*3*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	0	0	0	1	*1*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	0	2	1	0	*3*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	0	0	2	0	*2*	0	1	0	0	*1*	0	0	0	0	*0*
7:45 AM	0	0	1	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	**0**	**1**	**1**	**3**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:15 AM	**0**	**0**	**1**	**0**	***1***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:30 AM	**0**	**1**	**1**	**1**	***3***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:45 AM	**0**	**0**	**2**	**0**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	0	4	11	6	*21*	0	1	0	0	*1*	0	0	0	0	*0*
Peak Hr	**0**	**2**	**5**	**4**	***11***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	0				8th Ave				33rd St				33rd St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	3	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
7:15 AM	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	3	7
7:30 AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	6
7:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	6
8:00 AM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**3**	**0**	**5**	11
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	9
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**3**	10
8:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**11**
Count Total	0	0	0	0	0	3	0	1	0	0	7	4	0	1	5	0	21	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**2**	**3**	**0**	**0**	**4**	**0**	**11**	**0**

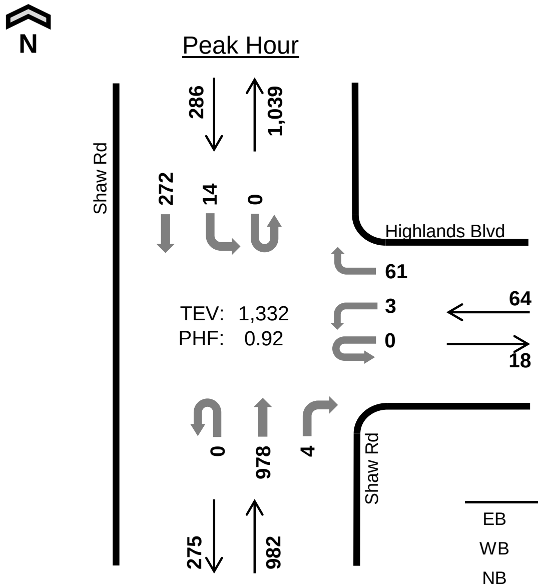
Three-Hour Count Summaries - Bikes

Interval Start	0			8th Ave			33rd St			33rd St			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	1	0	0	0	0	0	0	0	0	1	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Count Total	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

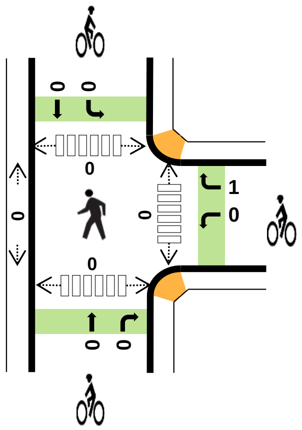
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
Highlands Blvd

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM



	HV %:	PHF
EB	-	-
WB	4.7%	0.76
NB	5.3%	0.95
SB	8.4%	0.83
TOTAL	5.9%	0.92



Three-Hour Count Summaries

Interval Start		0				Highlands Blvd				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	0	0	0	0	0	0	9	0	0	227	2	0	3	66	0	307	0
7:15 AM		0	0	0	0	0	2	0	15	0	0	237	0	0	6	49	0	309	0
7:30 AM		0	0	0	0	0	0	0	17	0	0	258	1	0	2	84	0	362	0
7:45 AM		0	0	0	0	0	1	0	20	0	0	256	1	0	3	73	0	354	1,332
Peak Hour	All	0	0	0	0	0	3	0	61	0	0	978	4	0	14	272	0	1,332	0
	HV	0	0	0	0	0	1	0	2	0	0	52	0	0	2	22	0	79	0
	HV%	-	-	-	-	-	33%	-	3%	-	-	5%	0%	-	14%	8%	-	6%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	10	6	*16*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	0	1	15	7	*23*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	0	1	16	5	*22*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	0	1	11	6	*18*	0	1	0	0	*1*	0	0	0	0	*0*
Peak Hour	0	3	52	24	*79*	0	1	0	0	*1*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	0				Highlands Blvd				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	1	0	0	9	0	0	200	0	0	4	23	0	237	0
6:15 AM	0	0	0	0	0	0	0	13	0	0	229	1	0	0	32	0	275	0
6:30 AM	0	0	0	0	0	2	0	10	0	0	258	1	0	4	49	0	324	0
6:45 AM	0	0	0	0	0	0	0	14	1	0	249	2	0	4	58	0	328	1,164
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**227**	**2**	**0**	**3**	**66**	**0**	**307**	1,234
7:15 AM	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**15**	**0**	**0**	**237**	**0**	**0**	**6**	**49**	**0**	**309**	1,268
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**17**	**0**	**0**	**258**	**1**	**0**	**2**	**84**	**0**	**362**	1,306
7:45 AM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**20**	**0**	**0**	**256**	**1**	**0**	**3**	**73**	**0**	**354**	**1,332**
8:00 AM	0	0	0	0	0	2	0	15	0	0	202	2	0	3	73	0	297	1,322
8:15 AM	0	0	0	0	0	2	0	11	0	0	190	2	0	4	92	0	301	1,314
8:30 AM	0	0	0	0	0	4	0	22	0	0	185	1	0	15	111	0	338	1,290
8:45 AM	0	0	0	0	0	2	0	18	0	0	158	1	0	5	92	0	276	1,212
Count Total	0	0	0	0	1	15	0	173	1	0	2,649	14	0	53	802	0	3,708	0
Peak Hour All	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**61**	**0**	**0**	**978**	**4**	**0**	**14**	**272**	**0**	**1,332**	**0**
HV	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**0**	**52**	**0**	**0**	**2**	**22**	**0**	**79**	**0**
HV%	**-**	**-**	**-**	**-**	**-**	**33%**	**-**	**3%**	**-**	**-**	**5%**	**0%**	**-**	**14%**	**8%**	**-**	**6%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	0	0	5	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	0	0	6	2	*8*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	0	0	7	1	*8*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	0	0	6	4	*10*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	**0**	**0**	**10**	**6**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:15 AM	**0**	**1**	**15**	**7**	***23***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**0**	**1**	**16**	**5**	***22***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**0**	**1**	**11**	**6**	***18***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***
8:00 AM	0	1	6	7	*14*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	0	0	8	7	*15*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	0	1	5	9	*15*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	0	2	9	11	*22*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	0	7	104	65	*176*	0	1	0	0	*1*	0	0	0	0	*0*
Peak Hr	**0**	**3**	**52**	**24**	***79***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	0				Highlands Blvd				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	5	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	6	0	0	0	2	0	8	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	7	0	0	1	0	0	8	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	5	1	0	1	3	0	10	31
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**1**	**5**	**0**	**16**	42
7:15 AM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**15**	**0**	**0**	**1**	**6**	**0**	**23**	57
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**16**	**0**	**0**	**0**	**5**	**0**	**22**	71
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**11**	**0**	**0**	**0**	**6**	**0**	**18**	**79**
8:00 AM	0	0	0	0	0	0	0	1	0	0	6	0	0	1	6	0	14	77
8:15 AM	0	0	0	0	0	0	0	0	0	0	7	1	0	0	7	0	15	69
8:30 AM	0	0	0	0	0	1	0	0	0	0	5	0	0	2	7	0	15	62
8:45 AM	0	0	0	0	0	1	0	1	0	0	9	0	0	0	11	0	22	66
Count Total	0	0	0	0	0	3	0	4	0	0	102	2	0	7	58	0	176	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**0**	**52**	**0**	**0**	**2**	**22**	**0**	**79**	**0**

Three-Hour Count Summaries - Bikes

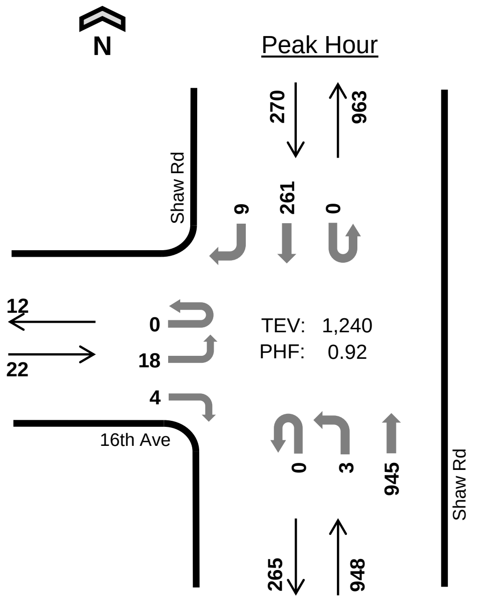
Interval Start	0			Highlands Blvd			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**

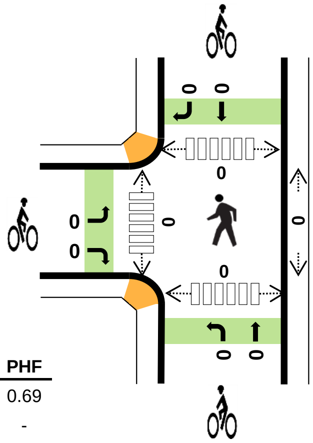
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
16th Ave

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM

Peak Hour





	HV %:	PHF
EB	18.2%	0.69
WB	-	-
NB	5.5%	0.91
SB	8.5%	0.81
TOTAL	6.4%	0.92

Three-Hour Count Summaries

Interval Start		16th Ave				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	6	0	1	0	0	0	0	0	0	209	0	0	0	62	5	283	0
7:15 AM		0	2	0	1	0	0	0	0	0	0	235	0	0	0	48	0	286	0
7:30 AM		0	7	0	1	0	0	0	0	0	2	241	0	0	0	80	3	334	0
7:45 AM		0	3	0	1	0	0	0	0	0	1	260	0	0	0	71	1	337	1,240
Peak Hour	All	0	18	0	4	0	0	0	0	0	3	945	0	0	0	261	9	1,240	0
	HV	0	2	0	2	0	0	0	0	0	2	50	0	0	0	21	2	79	0
	HV%	-	11%	-	50%	-	-	-	-	-	67%	5%	-	-	-	8%	22%	6%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	10	6	*16*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	0	0	13	5	*18*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	1	0	13	7	*21*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	3	0	16	5	*24*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	4	0	52	23	*79*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start		16th Ave				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM		0	5	0	0	0	0	0	0	0	0	206	0	0	0	21	1	233	0
6:15 AM		0	5	0	0	0	0	0	0	0	0	207	0	0	0	28	1	241	0
6:30 AM		0	4	0	1	0	0	0	0	0	1	258	0	0	0	53	0	317	0
6:45 AM		0	3	0	1	0	0	0	0	0	0	243	0	0	0	57	1	305	1,096
7:00 AM		**0**	**6**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**209**	**0**	**0**	**0**	**62**	**5**	**283**	1,146
7:15 AM		**0**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**235**	**0**	**0**	**0**	**48**	**0**	**286**	1,191
7:30 AM		**0**	**7**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**241**	**0**	**0**	**0**	**80**	**3**	**334**	1,208
7:45 AM		**0**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**260**	**0**	**0**	**0**	**71**	**1**	**337**	**1,240**
8:00 AM		0	8	0	1	0	0	0	0	0	0	178	0	0	0	72	1	260	1,217
8:15 AM		0	1	0	0	0	0	0	0	0	0	179	0	0	0	85	1	266	1,197
8:30 AM		0	7	0	0	0	0	0	0	0	0	170	0	0	0	110	7	294	1,157
8:45 AM		0	2	0	0	0	0	0	0	1	1	149	0	0	0	88	3	244	1,064
Count Total		0	53	0	7	0	0	0	0	1	5	2,535	0	0	0	775	24	3,400	0
Peak Hour	**All**	**0**	**18**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**3**	**945**	**0**	**0**	**0**	**261**	**9**	**1,240**	**0**
	HV	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**50**	**0**	**0**	**0**	**21**	**2**	**79**	**0**
	HV%	**-**	**11%**	**-**	**50%**	**-**	**-**	**-**	**-**	**-**	**67%**	**5%**	**-**	**-**	**-**	**8%**	**22%**	**6%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	2	0	5	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	0	0	6	3	*9*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	1	0	6	1	*8*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	0	0	4	1	*5*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	**0**	**0**	**10**	**6**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:15 AM	**0**	**0**	**13**	**5**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**1**	**0**	**13**	**7**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**3**	**0**	**16**	**5**	***24***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:00 AM	1	0	6	7	*14*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	0	0	10	7	*17*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	0	0	8	6	*14*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	0	0	3	13	*16*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	8	0	100	61	*169*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hr	**4**	**0**	**52**	**23**	***79***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	16th Ave				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	2	0	0	0	0	0	0	0	0	5	0	0	0	0	0	7	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	6	0	0	0	2	1	9	0
6:30 AM	0	1	0	0	0	0	0	0	0	0	6	0	0	0	1	0	8	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	1	0	5	29
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**5**	**1**	**16**	38
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**5**	**0**	**18**	47
7:30 AM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**12**	**0**	**0**	**0**	**6**	**1**	**21**	60
7:45 AM	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**15**	**0**	**0**	**0**	**5**	**0**	**24**	**79**
8:00 AM	0	0	0	1	0	0	0	0	0	0	6	0	0	0	7	0	14	77
8:15 AM	0	0	0	0	0	0	0	0	0	0	10	0	0	0	7	0	17	76
8:30 AM	0	0	0	0	0	0	0	0	0	0	8	0	0	0	5	1	14	69
8:45 AM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	12	1	16	61
Count Total	0	5	0	3	0	0	0	0	0	2	98	0	0	0	56	5	169	0
Peak Hour	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**50**	**0**	**0**	**0**	**21**	**2**	**79**	**0**

Three-Hour Count Summaries - Bikes

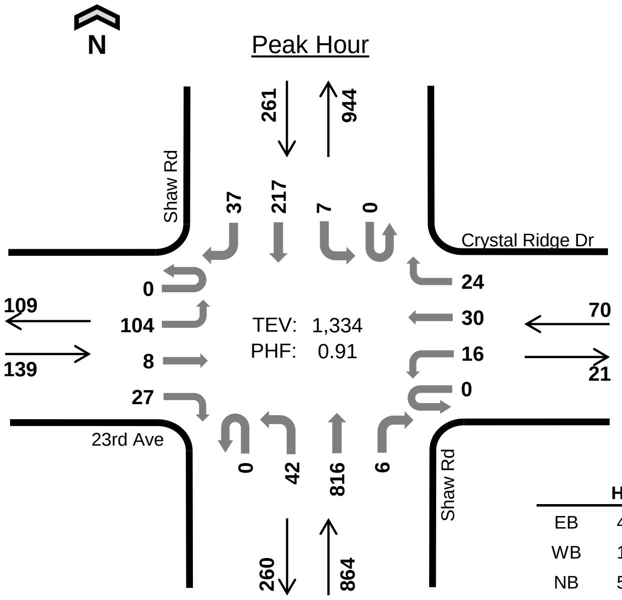
Interval Start	16th Ave			0			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

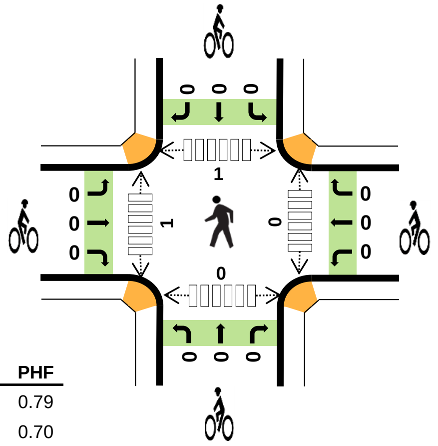
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
23rd Ave

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM

Peak Hour





	HV %:	PHF
EB	4.3%	0.79
WB	1.4%	0.70
NB	5.6%	0.93
SB	8.8%	0.82
TOTAL	5.8%	0.91

Three-Hour Count Summaries

Interval Start		23rd Ave				Crystal Ridge Dr				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	17	0	4	0	4	9	1	0	5	198	1	0	0	49	7	295	0
7:15 AM		0	25	3	4	0	5	5	6	0	14	193	1	0	1	47	9	313	0
7:30 AM		0	36	1	7	0	3	6	6	0	13	205	2	0	4	64	12	359	0
7:45 AM		0	26	4	12	0	4	10	11	0	10	220	2	0	2	57	9	367	1,334
Peak Hour	All	0	104	8	27	0	16	30	24	0	42	816	6	0	7	217	37	1,334	0
	HV	0	3	1	2	0	0	0	1	0	0	48	0	0	1	22	0	78	0
	HV%	-	3%	13%	7%	-	0%	0%	4%	-	0%	6%	0%	-	14%	10%	0%	6%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	0	10	4	*15*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	1	0	14	6	*21*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	4	0	14	8	*26*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	0	1	10	5	*16*	0	0	0	0	*0*	0	1	1	0	*2*
Peak Hour	6	1	48	23	*78*	0	0	0	0	*0*	0	1	1	0	*2*

Three-Hour Count Summaries

Interval Start	23rd Ave				Crystal Ridge Dr				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	19	0	0	0	2	3	4	0	2	194	1	0	0	18	2	245	0
6:15 AM	0	16	2	0	0	0	6	3	0	4	184	4	0	0	22	2	243	0
6:30 AM	0	22	0	3	0	3	4	6	0	8	238	0	0	3	49	7	343	0
6:45 AM	0	25	0	0	0	4	5	3	0	9	208	1	0	0	54	5	314	1,145
7:00 AM	**0**	**17**	**0**	**4**	**0**	**4**	**9**	**1**	**0**	**5**	**198**	**1**	**0**	**0**	**49**	**7**	**295**	1,195
7:15 AM	**0**	**25**	**3**	**4**	**0**	**5**	**5**	**6**	**0**	**14**	**193**	**1**	**0**	**1**	**47**	**9**	**313**	1,265
7:30 AM	**0**	**36**	**1**	**7**	**0**	**3**	**6**	**6**	**0**	**13**	**205**	**2**	**0**	**4**	**64**	**12**	**359**	1,281
7:45 AM	**0**	**26**	**4**	**12**	**0**	**4**	**10**	**11**	**0**	**10**	**220**	**2**	**0**	**2**	**57**	**9**	**367**	**1,334**
8:00 AM	0	9	3	6	0	3	2	3	0	8	152	1	0	2	60	9	258	1,297
8:15 AM	0	20	6	6	0	5	2	6	0	8	152	1	0	2	63	19	290	1,274
8:30 AM	0	18	3	5	0	9	12	8	0	6	146	2	0	4	86	17	316	1,231
8:45 AM	0	11	7	6	0	9	6	8	0	10	130	4	0	5	94	12	302	1,166
Count Total	0	244	29	53	0	51	70	65	0	97	2,220	20	0	23	663	110	3,645	0
Peak Hour All	**0**	**104**	**8**	**27**	**0**	**16**	**30**	**24**	**0**	**42**	**816**	**6**	**0**	**7**	**217**	**37**	**1,334**	**0**
HV	**0**	**3**	**1**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**48**	**0**	**0**	**1**	**22**	**0**	**78**	**0**
HV%	**-**	**3%**	**13%**	**7%**	**-**	**0%**	**0%**	**4%**	**-**	**0%**	**6%**	**0%**	**-**	**14%**	**10%**	**0%**	**6%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	0	0	4	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	1	0	6	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	2	0	3	2	*7*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	1	0	4	2	*7*	0	0	0	0	*0*	1	0	0	0	*1*
7:00 AM	**1**	**0**	**10**	**4**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:15 AM	**1**	**0**	**14**	**6**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**4**	**0**	**14**	**8**	***26***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**0**	**1**	**10**	**5**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**1**	**0**	***2***
8:00 AM	0	0	7	5	*12*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	3	0	8	12	*23*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	0	0	7	5	*12*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	2	0	4	10	*16*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	15	1	91	59	*166*	0	0	0	0	*0*	1	1	1	0	*3*
Peak Hour	**6**	**1**	**48**	**23**	***78***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**1**	**0**	***2***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	23rd Ave				Crystal Ridge Dr				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	0
6:15 AM	0	1	0	0	0	0	0	0	0	0	6	0	0	0	0	0	7	0
6:30 AM	0	2	0	0	0	0	0	0	0	0	3	0	0	0	2	0	7	0
6:45 AM	0	1	0	0	0	0	0	0	0	0	4	0	0	0	2	0	7	25
7:00 AM	0	1	0	0	0	0	0	0	0	0	10	0	0	0	4	0	15	36
7:15 AM	0	0	1	0	0	0	0	0	0	0	14	0	0	0	6	0	21	50
7:30 AM	0	2	0	2	0	0	0	0	0	0	14	0	0	1	7	0	26	69
7:45 AM	0	0	0	0	0	0	0	1	0	0	10	0	0	0	5	0	16	78
8:00 AM	0	0	0	0	0	0	0	0	0	1	6	0	0	0	5	0	12	75
8:15 AM	0	2	1	0	0	0	0	0	0	0	8	0	0	1	9	2	23	77
8:30 AM	0	0	0	0	0	0	0	0	0	0	7	0	0	0	5	0	12	63
8:45 AM	0	0	2	0	0	0	0	0	0	0	4	0	0	2	8	0	16	63
Count Total	0	9	4	2	0	0	0	1	0	1	90	0	0	4	53	2	166	0
Peak Hour	**0**	**3**	**1**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**48**	**0**	**0**	**1**	**22**	**0**	**78**	**0**

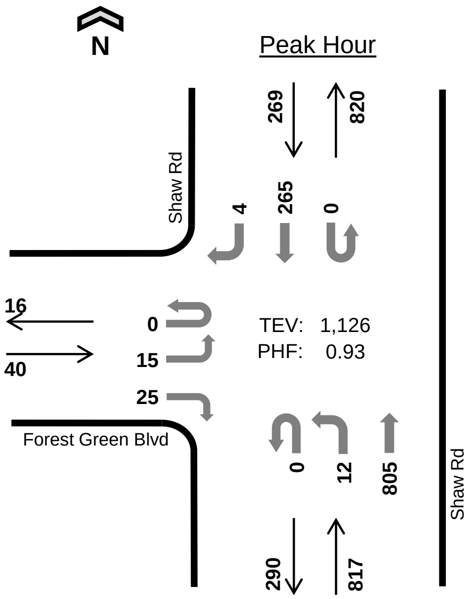
Three-Hour Count Summaries - Bikes

Interval Start	23rd Ave			Crystal Ridge Dr			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

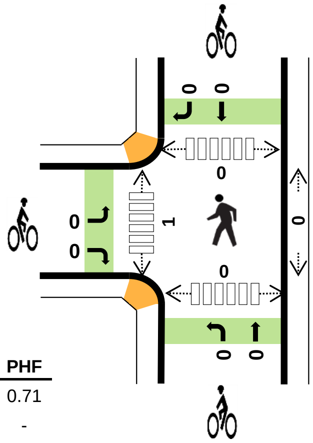
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
Forest Green Blvd

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM



	HV %:	PHF
EB	5.0%	0.71
WB	-	-
NB	5.6%	0.95
SB	8.9%	0.91
TOTAL	6.4%	0.93



Three-Hour Count Summaries

Interval Start		Forest Green Blvd				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	6	0	4	0	0	0	0	0	2	190	0	0	0	59	0	261	0
7:15 AM		0	4	0	4	0	0	0	0	0	5	192	0	0	0	61	2	268	0
7:30 AM		0	2	0	6	0	0	0	0	0	3	210	0	0	0	73	1	295	0
7:45 AM		0	3	0	11	0	0	0	0	0	2	213	0	0	0	72	1	302	1,126
Peak Hour	**All**	0	15	0	25	0	0	0	0	0	12	805	0	0	0	265	4	1,126	0
	HV	0	1	0	1	0	0	0	0	0	0	46	0	0	0	24	0	72	0
	HV%	-	7%	-	4%	-	-	-	-	-	0%	6%	-	-	-	9%	0%	6%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	0	12	6	*19*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	1	0	11	8	*20*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	0	0	12	4	*16*	0	0	0	0	*0*	0	1	0	0	*1*
7:45 AM	0	0	11	6	*17*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	2	0	46	24	*72*	0	0	0	0	*0*	0	1	0	0	*1*

Three-Hour Count Summaries

Interval Start	Forest Green Blvd				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	5	0	1	0	0	0	0	0	0	180	0	0	0	19	0	205	0
6:15 AM	0	2	0	3	0	0	0	0	0	3	188	0	0	0	20	0	216	0
6:30 AM	0	4	0	3	0	0	0	0	0	1	222	0	0	0	56	0	286	0
6:45 AM	0	6	0	3	0	0	0	0	0	2	208	0	0	0	66	0	285	992
7:00 AM	**0**	**6**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**2**	**190**	**0**	**0**	**0**	**59**	**0**	**261**	1,048
7:15 AM	**0**	**4**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**5**	**192**	**0**	**0**	**0**	**61**	**2**	**268**	1,100
7:30 AM	**0**	**2**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**3**	**210**	**0**	**0**	**0**	**73**	**1**	**295**	1,109
7:45 AM	**0**	**3**	**0**	**11**	**0**	**0**	**0**	**0**	**0**	**2**	**213**	**0**	**0**	**0**	**72**	**1**	**302**	**1,126**
8:00 AM	0	3	0	9	0	0	0	0	1	5	156	0	0	0	74	0	248	1,113
8:15 AM	0	4	0	6	0	0	0	0	0	10	135	0	0	0	78	1	234	1,079
8:30 AM	0	3	0	5	0	0	0	0	0	4	145	0	0	0	99	0	256	1,040
8:45 AM	0	1	0	6	0	0	0	0	0	4	144	0	0	0	83	2	240	978
Count Total	0	43	0	61	0	0	0	0	1	41	2,183	0	0	0	760	7	3,096	0
Peak Hour All	**0**	**15**	**0**	**25**	**0**	**0**	**0**	**0**	**0**	**12**	**805**	**0**	**0**	**0**	**265**	**4**	**1,126**	**0**
HV	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**46**	**0**	**0**	**0**	**24**	**0**	**72**	**0**
HV%	**-**	**7%**	**-**	**4%**	**-**	**-**	**-**	**-**	**-**	**0%**	**6%**	**-**	**-**	**-**	**9%**	**0%**	**6%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	1	0	3	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	0	0	5	0	*5*	0	0	0	0	*0*	0	0	0	1	*1*
6:30 AM	0	0	4	2	*6*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	0	0	4	2	*6*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	**1**	**0**	**12**	**6**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:15 AM	**1**	**0**	**11**	**8**	***20***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:30 AM	**0**	**0**	**12**	**4**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	*1*
7:45 AM	**0**	**0**	**11**	**6**	***17***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:00 AM	0	0	8	7	*15*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	0	0	8	4	*12*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	0	0	6	6	*12*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	1	0	5	10	*16*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	4	0	89	55	*148*	0	0	0	0	*0*	0	1	0	1	*2*
Peak Hr	**2**	**0**	**46**	**24**	***72***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	***1***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	Forest Green Blvd				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	4	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	5	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	2	0	6	0
6:45 AM	0	0	0	0	0	0	0	0	0	1	3	0	0	0	2	0	6	21
7:00 AM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**0**	**0**	**6**	**0**	**19**	36
7:15 AM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**0**	**0**	**0**	**8**	**0**	**20**	51
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**0**	**0**	**4**	**0**	**16**	61
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**0**	**0**	**0**	**6**	**0**	**17**	**72**
8:00 AM	0	0	0	0	0	0	0	0	0	2	6	0	0	0	7	0	15	68
8:15 AM	0	0	0	0	0	0	0	0	0	0	8	0	0	0	4	0	12	60
8:30 AM	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	0	12	56
8:45 AM	0	0	0	1	0	0	0	0	0	0	5	0	0	0	10	0	16	55
Count Total	0	2	0	2	0	0	0	0	0	3	86	0	0	0	55	0	148	0
Peak Hour	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**46**	**0**	**0**	**0**	**24**	**0**	**72**	**0**

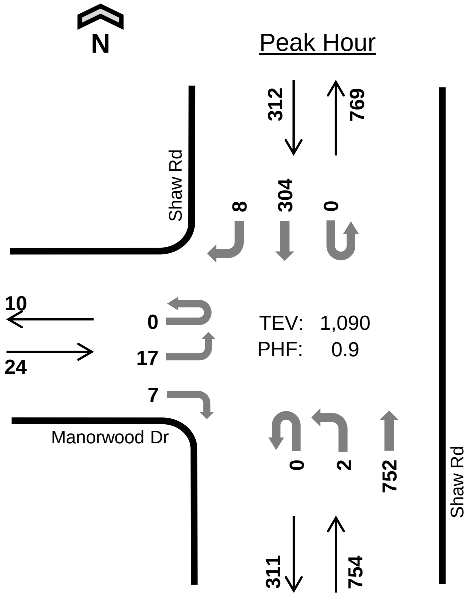
Three-Hour Count Summaries - Bikes

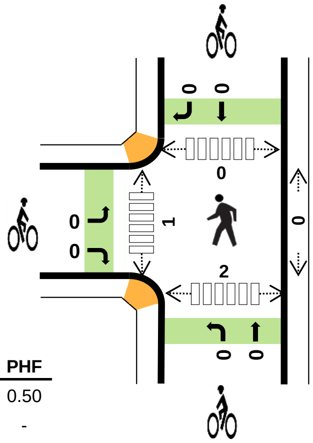
Interval Start	Forest Green Blvd			0			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
Manorwood Dr

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM





	HV %:	PHF
EB	4.2%	0.50
WB	-	-
NB	5.8%	0.92
SB	8.0%	0.91
TOTAL	6.4%	0.90

Three-Hour Count Summaries

Interval Start		Manorwood Dr				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	2	0	0	0	0	0	0	0	1	174	0	0	0	73	0	250	0
7:15 AM		0	5	0	1	0	0	0	0	0	0	178	0	0	0	67	1	252	0
7:30 AM		0	4	0	0	0	0	0	0	0	1	196	0	0	0	81	4	286	0
7:45 AM		0	6	0	6	0	0	0	0	0	0	204	0	0	0	83	3	302	1,090
Peak Hour	**All**	0	17	0	7	0	0	0	0	0	2	752	0	0	0	304	8	1,090	0
	HV	0	1	0	0	0	0	0	0	0	0	44	0	0	0	25	0	70	0
	HV%	-	6%	-	0%	-	-	-	-	-	0%	6%	-	-	-	8%	0%	6%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	10	6	*16*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	1	0	12	10	*23*	0	0	0	0	*0*	0	0	0	1	*1*
7:30 AM	0	0	10	4	*14*	0	0	0	0	*0*	0	1	0	0	*1*
7:45 AM	0	0	12	5	*17*	0	0	0	0	*0*	0	0	0	1	*1*
Peak Hour	1	0	44	25	*70*	0	0	0	0	*0*	0	1	0	2	*3*

Three-Hour Count Summaries

Interval Start		Manorwood Dr				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM		0	4	0	2	0	0	0	0	0	0	167	0	0	0	24	0	197	0
6:15 AM		0	3	0	2	0	0	0	0	0	0	188	0	0	0	27	2	222	0
6:30 AM		0	5	0	0	0	0	0	0	0	0	206	0	0	0	60	0	271	0
6:45 AM		0	5	0	0	0	0	0	0	0	1	198	0	0	0	78	2	284	974
7:00 AM		**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**174**	**0**	**0**	**0**	**73**	**0**	**250**	1,027
7:15 AM		**0**	**5**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**178**	**0**	**0**	**0**	**67**	**1**	**252**	1,057
7:30 AM		**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**196**	**0**	**0**	**0**	**81**	**4**	**286**	1,072
7:45 AM		**0**	**6**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**204**	**0**	**0**	**0**	**83**	**3**	**302**	**1,090**
8:00 AM		0	5	0	1	0	0	0	0	0	0	145	0	0	0	82	2	235	1,075
8:15 AM		0	4	0	1	0	0	0	0	0	0	134	0	0	0	84	3	226	1,049
8:30 AM		0	4	0	6	0	0	0	0	0	2	135	0	0	0	92	1	240	1,003
8:45 AM		0	4	0	6	0	0	0	0	0	1	143	0	0	0	98	2	254	955
Count Total		0	51	0	25	0	0	0	0	0	6	2,068	0	0	0	849	20	3,019	0
Peak Hour	**All**	**0**	**17**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**2**	**752**	**0**	**0**	**0**	**304**	**8**	**1,090**	**0**
	HV	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**44**	**0**	**0**	**0**	**25**	**0**	**70**	**0**
	HV%	**-**	**6%**	**-**	**0%**	**-**	**-**	**-**	**-**	**-**	**0%**	**6%**	**-**	**-**	**-**	**8%**	**0%**	**6%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	1	0	3	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	0	0	6	0	*6*	0	0	0	0	*0*	0	0	0	0	*0*
6:30 AM	0	0	4	2	*6*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	0	0	1	2	*3*	0	0	0	0	*0*	0	0	0	0	*0*
7:00 AM	**0**	**0**	**10**	**6**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:15 AM	**1**	**0**	**12**	**10**	***23***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	*1*
7:30 AM	**0**	**0**	**10**	**4**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	*1*
7:45 AM	**0**	**0**	**12**	**5**	***17***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***
8:00 AM	0	0	8	7	*15*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	0	0	6	7	*13*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	1	0	8	5	*14*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	2	0	4	9	*15*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	5	0	84	57	*146*	0	0	0	0	*0*	0	1	0	2	*3*
Peak Hr	**1**	**0**	**44**	**25**	***70***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**2**	***3***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	Manorwood Dr				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	4	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	6	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	2	0	6	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	3	19
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**6**	**0**	**16**	31
7:15 AM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**0**	**0**	**10**	**0**	**23**	48
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**4**	**0**	**14**	56
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**0**	**0**	**5**	**0**	**17**	**70**
8:00 AM	0	0	0	0	0	0	0	0	0	0	8	0	0	0	7	0	15	69
8:15 AM	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	1	13	59
8:30 AM	0	0	0	1	0	0	0	0	0	0	8	0	0	0	5	0	14	59
8:45 AM	0	0	0	2	0	0	0	0	0	0	4	0	0	0	8	1	15	57
Count Total	0	2	0	3	0	0	0	0	0	0	84	0	0	0	55	2	146	0
Peak Hour	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**44**	**0**	**0**	**0**	**25**	**0**	**70**	**0**

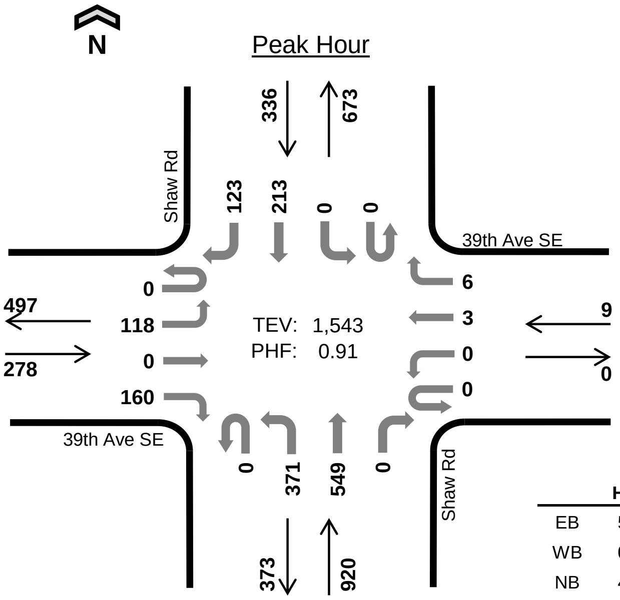
Three-Hour Count Summaries - Bikes

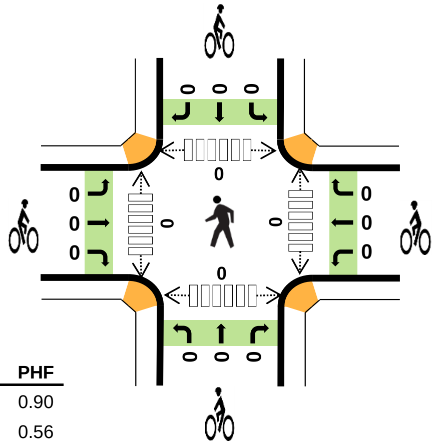
Interval Start	Manorwood Dr			0			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
39th Ave SE

Date: Tue, Aug 03, 2021
Count Period: 6:00 AM to 9:00 AM
Peak Hour: 7:30 AM to 8:30 AM





	HV %:	PHF
EB	5.0%	0.90
WB	0.0%	0.56
NB	4.1%	0.88
SB	8.0%	0.85
TOTAL	5.1%	0.91

Three-Hour Count Summaries

Interval Start		39th Ave SE				39th Ave SE				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:30 AM		0	33	0	31	0	0	0	1	0	78	152	0	0	0	49	26	370	0
7:45 AM		0	28	0	36	0	0	1	1	0	82	179	0	0	0	63	36	426	0
8:00 AM		0	35	0	42	0	0	1	3	0	100	106	0	0	0	49	24	360	0
8:15 AM		0	22	0	51	0	0	1	1	0	111	112	0	0	0	52	37	387	1,543
Peak Hour	All	0	118	0	160	0	0	3	6	0	371	549	0	0	0	213	123	1,543	0
	HV	0	10	0	4	0	0	0	0	0	9	29	0	0	0	24	3	79	0
	HV%	-	8%	-	3%	-	-	0%	0%	-	2%	5%	-	-	-	11%	2%	5%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:30 AM	4	0	10	8	*22*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	3	0	11	5	*19*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	6	0	11	7	*24*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	1	0	6	7	*14*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	14	0	38	27	*79*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	39th Ave SE				39th Ave SE				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	12	0	14	0	0	0	0	0	38	156	0	0	0	15	9	244	0
6:15 AM	0	17	1	22	0	0	1	0	0	45	166	1	0	1	20	11	285	0
6:30 AM	0	28	0	14	0	0	1	0	0	58	185	0	0	0	46	13	345	0
6:45 AM	0	34	0	11	0	0	0	0	0	64	166	0	0	0	53	23	351	1,225
7:00 AM	0	30	0	26	0	0	1	2	0	79	138	0	0	0	50	15	341	1,322
7:15 AM	0	28	0	26	0	0	0	0	0	81	152	0	0	0	36	28	351	1,388
7:30 AM	**0**	**33**	**0**	**31**	**0**	**0**	**0**	**1**	**0**	**78**	**152**	**0**	**0**	**0**	**49**	**26**	**370**	1,413
7:45 AM	**0**	**28**	**0**	**36**	**0**	**0**	**1**	**1**	**0**	**82**	**179**	**0**	**0**	**0**	**63**	**36**	**426**	1,488
8:00 AM	**0**	**35**	**0**	**42**	**0**	**0**	**1**	**3**	**0**	**100**	**106**	**0**	**0**	**0**	**49**	**24**	**360**	1,507
8:15 AM	**0**	**22**	**0**	**51**	**0**	**0**	**1**	**1**	**0**	**111**	**112**	**0**	**0**	**0**	**52**	**37**	**387**	**1,543**
8:30 AM	0	28	0	36	0	0	0	3	0	77	110	0	0	0	62	37	353	1,526
8:45 AM	0	36	2	52	0	0	0	2	0	72	96	0	0	1	70	38	369	1,469
Count Total	0	331	3	361	0	0	6	13	0	885	1,718	1	0	2	565	297	4,182	0
Peak Hour All	**0**	**118**	**0**	**160**	**0**	**0**	**3**	**6**	**0**	**371**	**549**	**0**	**0**	**0**	**213**	**123**	**1,543**	**0**
HV	**0**	**10**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**9**	**29**	**0**	**0**	**0**	**24**	**3**	**79**	**0**
HV%	**-**	**8%**	**-**	**3%**	**-**	**-**	**0%**	**0%**	**-**	**2%**	**5%**	**-**	**-**	**-**	**11%**	**2%**	**5%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
6:00 AM	0	0	3	0	*3*	0	0	0	0	*0*	0	0	0	0	*0*
6:15 AM	2	0	4	0	*6*	0	0	0	0	*0*	1	0	0	0	*1*
6:30 AM	2	0	4	2	*8*	0	0	0	0	*0*	0	0	0	0	*0*
6:45 AM	1	0	5	2	*8*	0	0	0	0	*0*	1	0	0	0	*1*
7:00 AM	1	0	14	6	*21*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	3	0	8	6	*17*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	**4**	**0**	**10**	**8**	***22***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**3**	**0**	**11**	**5**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**6**	**0**	**11**	**7**	***24***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:15 AM	**1**	**0**	**6**	**7**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:30 AM	4	0	7	4	*15*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	6	0	4	11	*21*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	33	0	87	58	*178*	0	0	0	0	*0*	2	0	0	0	*2*
Peak Hour	**14**	**0**	**38**	**27**	***79***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	39th Ave SE				39th Ave SE				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	3	0
6:15 AM	0	1	0	1	0	0	0	0	0	1	3	0	0	0	0	0	6	0
6:30 AM	0	2	0	0	0	0	0	0	0	1	3	0	0	0	2	0	8	0
6:45 AM	0	1	0	0	0	0	0	0	0	3	2	0	0	0	0	2	8	25
7:00 AM	0	0	0	1	0	0	0	0	0	2	12	0	0	0	6	0	21	43
7:15 AM	0	2	0	1	0	0	0	0	0	0	8	0	0	0	5	1	17	54
7:30 AM	**0**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**3**	**7**	**0**	**0**	**0**	**6**	**2**	**22**	68
7:45 AM	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**0**	**0**	**0**	**5**	**0**	**19**	79
8:00 AM	**0**	**4**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**10**	**0**	**0**	**0**	**6**	**1**	**24**	82
8:15 AM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**0**	**0**	**0**	**7**	**0**	**14**	**79**
8:30 AM	0	1	0	3	0	0	0	0	0	3	4	0	0	0	2	2	15	72
8:45 AM	0	1	0	5	0	0	0	0	0	1	3	0	0	0	8	3	21	74
Count Total	0	18	0	15	0	0	0	0	0	21	66	0	0	0	47	11	178	0
Peak Hour	**0**	**10**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**9**	**29**	**0**	**0**	**0**	**24**	**3**	**79**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	39th Ave SE			39th Ave SE			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

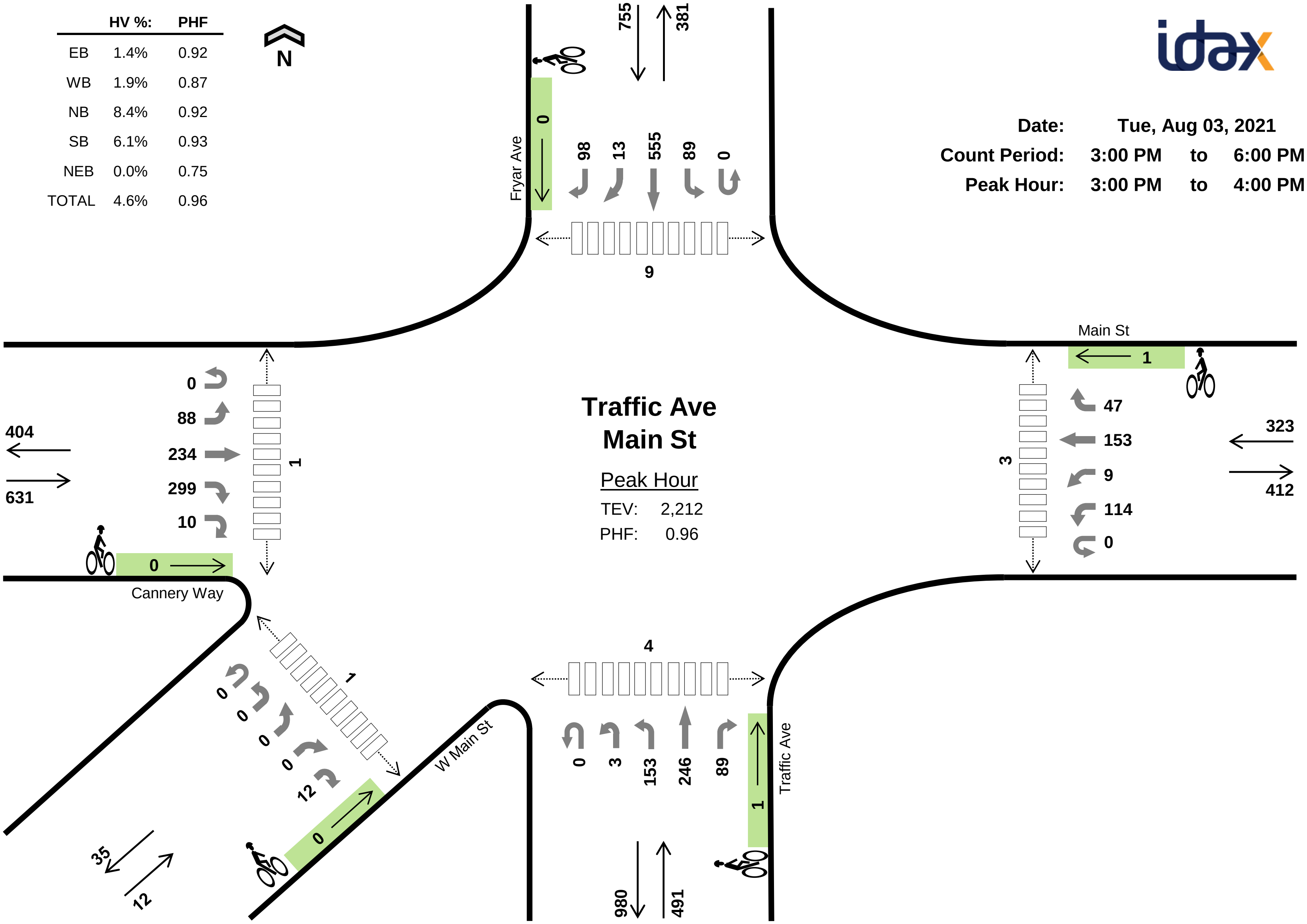
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

	HV %:	PHF
EB	1.4%	0.92
WB	1.9%	0.87
NB	8.4%	0.92
SB	6.1%	0.93
NEB	0.0%	0.75
TOTAL	4.6%	0.96

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:00 PM to 4:00 PM

Traffic Ave
Main St

Peak Hour
TEV: 2,212
PHF: 0.96



Three-Hour Count Summaries

Interval Start	Cannery Way					Main St					Traffic Ave					Fryar Ave					W Main St					15-min Total	Rolling One Hour
	Eastbound					Westbound					Northbound					Southbound					Northeastbound						
	UT	LT	TH	RT	HR	UT	LT	BL	TH	RT	UT	HL	LT	TH	RT	UT	LT	TH	BR	RT	UT	HL	BL	BR	HR		
3:00 PM	**0**	**20**	**61**	**73**	**0**	**0**	**36**	**1**	**38**	**18**	**0**	**0**	**31**	**71**	**21**	**0**	**20**	**156**	**4**	**23**	**0**	**0**	**0**	**0**	**3**	**576**	0
3:15 PM	**0**	**28**	**50**	**63**	**2**	**0**	**25**	**4**	**32**	**13**	**0**	**2**	**40**	**69**	**18**	**0**	**21**	**150**	**1**	**27**	**0**	**0**	**0**	**0**	**3**	**548**	0
3:30 PM	**0**	**21**	**61**	**77**	**4**	**0**	**28**	**3**	**47**	**10**	**0**	**1**	**37**	**36**	**31**	**0**	**24**	**133**	**6**	**23**	**0**	**0**	**0**	**0**	**4**	**546**	0
3:45 PM	**0**	**19**	**62**	**86**	**4**	**0**	**25**	**1**	**36**	**6**	**0**	**0**	**45**	**70**	**19**	**0**	**24**	**116**	**2**	**25**	**0**	**0**	**0**	**0**	**2**	**542**	**2,212**
4:00 PM	0	20	53	88	4	0	26	2	38	16	0	0	43	58	19	0	27	125	6	27	0	0	0	0	5	557	2,193
4:15 PM	0	27	66	71	6	0	20	4	39	7	0	0	45	54	23	0	17	114	1	22	0	0	0	0	3	519	2,164
4:30 PM	0	21	59	93	2	0	25	4	42	15	0	0	49	70	18	0	17	129	3	26	1	0	0	0	1	575	2,193
4:45 PM	0	28	52	96	1	0	23	6	36	9	0	0	35	64	26	0	14	106	3	19	0	0	0	0	2	520	2,171
5:00 PM	0	18	61	106	5	0	21	2	43	13	0	0	33	48	24	0	14	137	1	16	0	0	0	0	3	545	2,159
5:15 PM	0	21	67	101	3	0	23	3	31	7	0	1	33	51	22	0	18	106	6	15	0	0	0	0	3	511	2,151
5:30 PM	0	15	61	86	4	0	24	3	32	11	0	0	38	60	15	0	21	109	3	17	0	0	0	0	6	505	2,081
5:45 PM	0	18	46	85	0	0	16	2	23	5	0	0	30	44	40	0	10	101	3	13	0	0	0	0	2	438	1,999
Count Total	0	256	699	1,025	35	0	292	35	437	130	0	4	459	695	276	0	227	1,482	39	253	1	0	0	0	37	6,382	0
Peak Hour All	**0**	**88**	**234**	**299**	**10**	**0**	**114**	**9**	**153**	**47**	**0**	**3**	**153**	**246**	**89**	**0**	**89**	**555**	**13**	**98**	**0**	**0**	**0**	**0**	**12**	**2,212**	**0**
HV	**0**	**6**	**0**	**3**	**0**	**0**	**3**	**0**	**2**	**1**	**0**	**0**	**8**	**31**	**2**	**0**	**0**	**39**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**102**	**0**
HV%	**-**	**7%**	**0%**	**1%**	**0%**	**-**	**3%**	**0%**	**1%**	**2%**	**-**	**0%**	**5%**	**13%**	**2%**	**-**	**0%**	**7%**	**0%**	**7%**	**-**	**-**	**-**	**-**	**0%**	**5%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals						Bicycles						Pedestrians (Crossing Leg)					
	EB	WB	NB	SB	NEB	Total	EB	WB	NB	SB	NEB	Total	East	West	North	South	Southwest	Total
3:00 PM	**4**	**3**	**11**	**9**	**0**	***27***	**0**	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	**1**	***2***
3:15 PM	**1**	**2**	**10**	**17**	**0**	***30***	**0**	**1**	**1**	**0**	**0**	***2***	**1**	**0**	**5**	**2**	**0**	***8***
3:30 PM	**2**	**1**	**10**	**10**	**0**	***23***	**0**	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**4**	**1**	**0**	***6***
3:45 PM	**2**	**0**	**10**	**10**	**0**	***22***	**0**	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**1**	**0**	***2***
4:00 PM	5	0	10	9	0	*24*	0	0	0	0	0	*0*	2	0	0	0	0	*2*
4:15 PM	2	0	8	12	0	*22*	0	0	0	0	0	*0*	2	0	4	2	2	*10*
4:30 PM	0	3	7	9	0	*19*	0	0	0	0	0	*0*	5	0	2	1	0	*8*
4:45 PM	3	0	8	5	0	*16*	0	0	0	0	0	*0*	3	0	1	5	1	*10*
5:00 PM	2	3	8	7	0	*20*	0	1	0	0	0	*1*	3	5	4	2	0	*14*
5:15 PM	0	1	7	4	0	*12*	0	0	0	0	0	*0*	2	2	0	1	0	*5*
5:30 PM	4	1	9	11	0	*25*	0	0	0	0	0	*0*	0	0	0	2	2	*4*
5:45 PM	1	1	5	9	0	*16*	0	0	0	0	0	*0*	2	0	0	0	2	*4*
Count Total	26	15	103	112	0	*256*	0	2	1	0	0	*3*	22	8	20	17	8	*75*
Peak Hr	**9**	**6**	**41**	**46**	**0**	***102***	**0**	**1**	**1**	**0**	**0**	***2***	**3**	**1**	**9**	**4**	**1**	***18***

Three-Hour Count Summaries - Heavy Vehicles

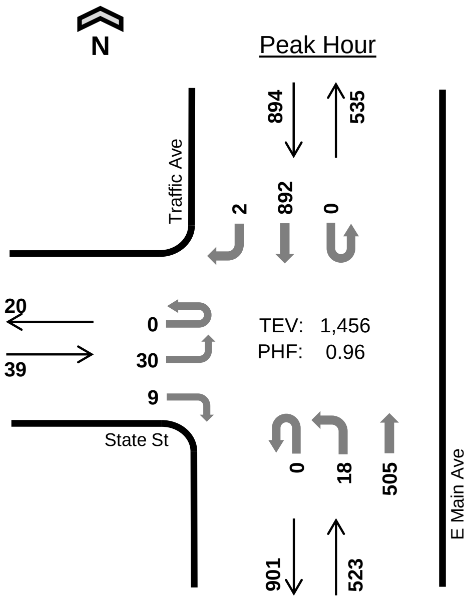
Interval Start	Cannery Way					Main St					Traffic Ave					Fryar Ave					W Main St					15-min Total	Rolling One Hour
	Eastbound					Westbound					Northbound					Southbound					Northeastbound						
	UT	LT	TH	RT	HR	UT	LT	BL	TH	RT	UT	HL	LT	TH	RT	UT	LT	TH	BR	RT	UT	HL	BL	BR	HR		
3:00 PM	0	4	0	0	0	0	2	0	1	0	0	0	1	10	0	0	0	8	0	1	0	0	0	0	0	27	0
3:15 PM	0	0	0	1	0	0	1	0	0	1	0	0	2	8	0	0	0	16	0	1	0	0	0	0	0	30	0
3:30 PM	0	1	0	1	0	0	0	0	1	0	0	0	3	5	2	0	0	6	0	4	0	0	0	0	0	23	0
3:45 PM	0	1	0	1	0	0	0	0	0	0	0	0	2	8	0	0	0	9	0	1	0	0	0	0	0	22	102
4:00 PM	0	1	1	3	0	0	0	0	0	0	0	0	1	9	0	0	0	6	0	3	0	0	0	0	0	24	99
4:15 PM	0	0	0	2	0	0	0	0	0	0	0	0	1	7	0	0	0	12	0	0	0	0	0	0	0	22	91
4:30 PM	0	0	0	0	0	0	1	0	1	1	0	0	0	7	0	0	1	8	0	0	0	0	0	0	0	19	87
4:45 PM	0	1	0	2	0	0	0	0	0	0	0	0	0	8	0	0	0	5	0	0	0	0	0	0	0	16	81
5:00 PM	0	1	0	1	0	0	1	0	2	0	0	0	3	4	1	0	0	7	0	0	0	0	0	0	0	20	77
5:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	6	0	0	0	4	0	0	0	0	0	0	0	12	67
5:30 PM	0	0	2	2	0	0	0	0	1	0	0	0	2	7	0	0	1	9	0	1	0	0	0	0	0	25	73
5:45 PM	0	0	1	0	0	0	0	0	1	0	0	0	1	3	1	0	0	9	0	0	0	0	0	0	0	16	73
Count Total	0	9	4	13	0	0	5	0	8	2	0	0	17	82	4	0	2	99	0	11	0	0	0	0	0	256	0
Peak Hour	**0**	**6**	**0**	**3**	**0**	**0**	**3**	**0**	**2**	**1**	**0**	**0**	**8**	**31**	**2**	**0**	**0**	**39**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	102	**0**

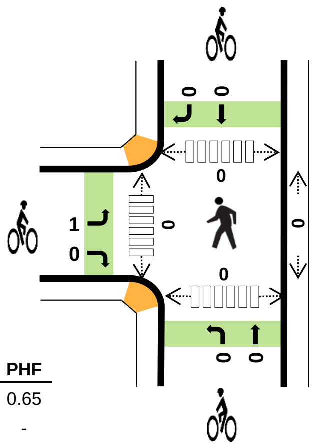
Three-Hour Count Summaries - Bikes

Interval Start	Cannery Way					Main St					Traffic Ave					Fryar Ave					W Main St					15-min Total	Rolling One Hour
	Eastbound					Westbound					Northbound					Southbound					Northeastbound						
	UT	LT	TH	RT	HR	UT	LT	BL	TH	RT	UT	HL	LT	TH	RT	UT	LT	TH	BR	RT	UT	HL	BL	BR	HR		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2	**0**

E Main Ave
State St

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:00 PM to 5:00 PM





	HV %:	PHF
EB	2.6%	0.65
WB	-	-
NB	6.5%	0.95
SB	4.3%	0.96
TOTAL	5.0%	0.96

Three-Hour Count Summaries

Interval Start		State St Eastbound UT	LT	TH	RT	0 Westbound UT	LT	TH	RT	E Main Ave Northbound UT	LT	TH	RT	Traffic Ave Southbound UT	LT	TH	RT	15-min Total	Rolling One Hour
4:00 PM		0	7	0	2	0	0	0	0	0	4	122	0	0	0	219	1	355	0
4:15 PM		0	13	0	2	0	0	0	0	0	3	124	0	0	0	210	0	352	0
4:30 PM		0	3	0	2	0	0	0	0	0	3	129	0	0	0	231	0	368	0
4:45 PM		0	7	0	3	0	0	0	0	0	8	130	0	0	0	232	1	381	1,456
Peak Hour	All	0	30	0	9	0	0	0	0	0	18	505	0	0	0	892	2	1,456	0
	HV	0	1	0	0	0	0	0	0	0	1	33	0	0	0	38	0	73	0
	HV%	-	3%	-	0%	-	-	-	-	-	6%	7%	-	-	-	4%	0%	5%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals EB	WB	NB	SB	Total	Bicycles EB	WB	NB	SB	Total	Pedestrians (Crossing Leg) East	West	North	South	Total
4:00 PM	0	0	10	6	*16*	1	0	0	0	*1*	0	0	0	0	*0*
4:15 PM	1	0	9	16	*26*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	0	0	6	9	*15*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	0	0	9	7	*16*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	1	0	34	38	*73*	1	0	0	0	*1*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	**State St**				**0**				**E Main Ave**				**Traffic Ave**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	7	0	2	0	0	0	0	0	0	113	0	0	0	236	1	359	0
3:15 PM	0	14	0	3	0	0	0	0	0	1	138	0	0	0	229	1	386	0
3:30 PM	0	8	0	3	0	0	0	0	0	7	104	0	0	0	224	1	347	0
3:45 PM	0	3	0	3	0	0	0	0	0	6	130	0	0	0	219	1	362	1,454
4:00 PM	**0**	**7**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**122**	**0**	**0**	**0**	**219**	**1**	**355**	1,450
4:15 PM	**0**	**13**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**3**	**124**	**0**	**0**	**0**	**210**	**0**	**352**	1,416
4:30 PM	**0**	**3**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**3**	**129**	**0**	**0**	**0**	**231**	**0**	**368**	1,437
4:45 PM	**0**	**7**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**8**	**130**	**0**	**0**	**0**	**232**	**1**	**381**	**1,456**
5:00 PM	0	4	0	2	0	0	0	0	0	4	99	0	0	0	225	2	336	1,437
5:15 PM	0	12	0	2	0	0	0	0	0	3	115	0	0	0	214	1	347	1,432
5:30 PM	0	8	0	2	0	0	0	0	0	2	100	0	0	0	209	1	322	1,386
5:45 PM	0	1	0	1	0	0	0	0	0	6	111	0	0	0	217	1	337	1,342
Count Total	0	87	0	27	0	0	0	0	0	47	1,415	0	0	0	2,665	11	4,252	0
Peak Hour **All**	**0**	**30**	**0**	**9**	**0**	**0**	**0**	**0**	**0**	**18**	**505**	**0**	**0**	**0**	**892**	**2**	**1,456**	**0**
HV	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**33**	**0**	**0**	**0**	**38**	**0**	**73**	**0**
HV%	**-**	**3%**	**-**	**0%**	**-**	**-**	**-**	**-**	**-**	**6%**	**7%**	**-**	**-**	**-**	**4%**	**0%**	**5%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	**Heavy Vehicle Totals**					**Bicycles**					**Pedestrians (Crossing Leg)**				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	0	0	7	9	*16*	0	0	1	0	*1*	0	0	1	0	*1*
3:15 PM	2	0	13	16	*31*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	0	0	11	10	*21*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	0	0	10	9	*19*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	**0**	**0**	**10**	**6**	***16***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	*0*
4:15 PM	**1**	**0**	**9**	**16**	***26***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:30 PM	**0**	**0**	**6**	**9**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:45 PM	**0**	**0**	**9**	**7**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
5:00 PM	0	0	8	6	*14*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	9	7	*16*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	0	7	10	*17*	0	0	0	0	*0*	0	0	1	0	*1*
5:45 PM	0	0	5	9	*14*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	3	0	104	114	*221*	1	0	1	0	*2*	0	0	2	0	*2*
Peak Hr	**1**	**0**	**34**	**38**	***73***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	State St				0				E Main Ave				Traffic Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	7	0	0	0	9	0	16	0
3:15 PM	0	1	0	1	0	0	0	0	0	0	13	0	0	0	16	0	31	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	11	0	0	0	10	0	21	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	10	0	0	0	9	0	19	87
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**6**	**0**	**16**	87
4:15 PM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**0**	**16**	**0**	**26**	82
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**5**	**0**	**0**	**0**	**9**	**0**	**15**	76
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**0**	**7**	**0**	**16**	**73**
5:00 PM	0	0	0	0	0	0	0	0	0	0	8	0	0	0	6	0	14	71
5:15 PM	0	0	0	0	0	0	0	0	0	0	9	0	0	0	7	0	16	61
5:30 PM	0	0	0	0	0	0	0	0	0	0	7	0	0	0	9	1	17	63
5:45 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	9	0	14	61
Count Total	0	2	0	1	0	0	0	0	0	1	103	0	0	0	113	1	221	0
Peak Hour	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**33**	**0**	**0**	**0**	**38**	**0**	**73**	**0**

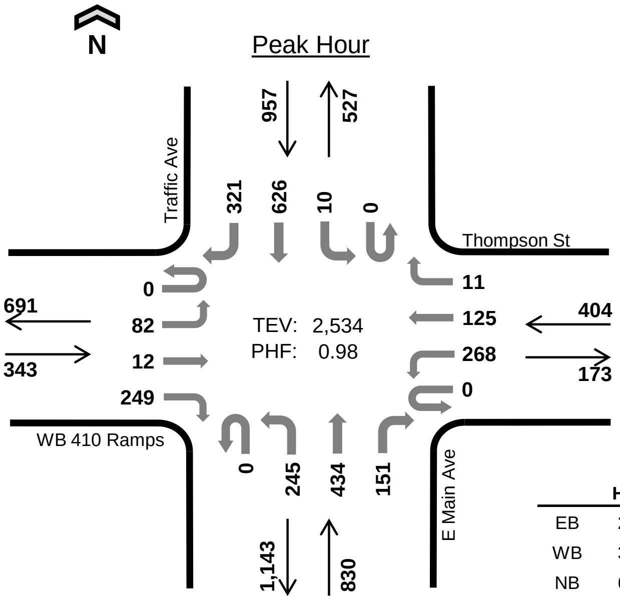
Three-Hour Count Summaries - Bikes

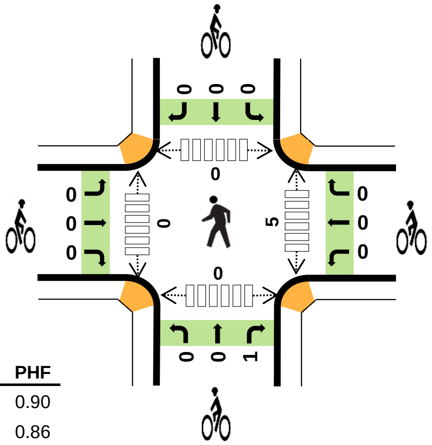
Interval Start	State St			0			E Main Ave			Traffic Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:00 PM	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	1
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	1	0	0	0	0	0	0	1	0	0	0	0	2	0
Peak Hour	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

E Main Ave
WB 410 Ramps

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:00 PM to 5:00 PM





	HV %:	PHF
EB	2.0%	0.90
WB	3.5%	0.86
NB	6.0%	0.94
SB	4.1%	0.95
TOTAL	4.3%	0.98

Three-Hour Count Summaries

Interval Start		WB 410 Ramps				Thompson St				E Main Ave				Traffic Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	23	6	66	0	58	33	3	0	62	100	31	0	4	153	73	612	0
4:15 PM		0	20	2	63	0	85	32	1	0	58	108	43	0	1	143	90	646	0
4:30 PM		0	21	2	56	0	70	34	2	0	72	109	39	0	3	165	73	646	0
4:45 PM		0	18	2	64	0	55	26	5	0	53	117	38	0	2	165	85	630	2,534
Peak Hour	All	0	82	12	249	0	268	125	11	0	245	434	151	0	10	626	321	2,534	0
	HV	0	3	1	3	0	10	4	0	0	11	31	8	0	0	14	25	110	0
	HV%	-	4%	8%	1%	-	4%	3%	0%	-	4%	7%	5%	-	0%	2%	8%	4%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	5	4	15	6	*30*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	0	4	15	19	*38*	0	0	0	0	*0*	2	0	0	0	*2*
4:30 PM	1	3	8	10	*22*	0	0	1	0	*1*	3	0	0	0	*3*
4:45 PM	1	3	12	4	*20*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	7	14	50	39	*110*	0	0	1	0	*1*	5	0	0	0	*5*

Three-Hour Count Summaries

Interval Start	WB 410 Ramps				Thompson St				E Main Ave				Traffic Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	27	5	48	0	59	23	1	0	56	88	25	0	1	155	97	585	0
3:15 PM	0	19	0	40	0	63	22	2	0	47	116	28	0	0	151	88	576	0
3:30 PM	0	27	1	61	0	61	27	3	0	55	82	32	0	2	155	86	592	0
3:45 PM	0	24	2	73	0	49	34	5	0	62	101	28	0	1	154	80	613	2,366
4:00 PM	**0**	**23**	**6**	**66**	**0**	**58**	**33**	**3**	**0**	**62**	**100**	**31**	**0**	**4**	**153**	**73**	**612**	2,393
4:15 PM	**0**	**20**	**2**	**63**	**0**	**85**	**32**	**1**	**0**	**58**	**108**	**43**	**0**	**1**	**143**	**90**	**646**	2,463
4:30 PM	**0**	**21**	**2**	**56**	**0**	**70**	**34**	**2**	**0**	**72**	**109**	**39**	**0**	**3**	**165**	**73**	**646**	2,517
4:45 PM	**0**	**18**	**2**	**64**	**0**	**55**	**26**	**5**	**0**	**53**	**117**	**38**	**0**	**2**	**165**	**85**	**630**	**2,534**
5:00 PM	0	14	5	54	0	55	24	2	0	55	88	33	0	1	168	77	576	2,498
5:15 PM	0	12	5	68	0	67	27	2	0	62	103	36	0	1	152	77	612	2,464
5:30 PM	0	11	5	64	0	78	20	1	0	68	91	41	0	2	154	71	606	2,424
5:45 PM	0	15	1	51	0	40	19	3	0	50	100	30	0	6	158	78	551	2,345
Count Total	0	231	36	708	0	740	321	30	0	700	1,203	404	0	24	1,873	975	7,245	0
Peak Hour All	**0**	**82**	**12**	**249**	**0**	**268**	**125**	**11**	**0**	**245**	**434**	**151**	**0**	**10**	**626**	**321**	**2,534**	**0**
HV	**0**	**3**	**1**	**3**	**0**	**10**	**4**	**0**	**0**	**11**	**31**	**8**	**0**	**0**	**14**	**25**	**110**	**0**
HV%	**-**	**4%**	**8%**	**1%**	**-**	**4%**	**3%**	**0%**	**-**	**4%**	**7%**	**5%**	**-**	**0%**	**2%**	**8%**	**4%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	3	2	9	12	*26*	0	0	0	0	*0*	2	0	0	0	*2*
3:15 PM	3	3	15	14	*35*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	3	2	14	10	*29*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	3	3	13	10	*29*	0	0	0	0	*0*	1	0	0	0	*1*
4:00 PM	**5**	**4**	**15**	**6**	***30***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:15 PM	**0**	**4**	**15**	**19**	***38***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**0**	*2*
4:30 PM	**1**	**3**	**8**	**10**	***22***	**0**	**0**	**1**	**0**	***1***	**3**	**0**	**0**	**0**	*3*
4:45 PM	**1**	**3**	**12**	**4**	***20***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
5:00 PM	2	0	11	9	*22*	0	0	0	0	*0*	2	0	0	0	*2*
5:15 PM	1	2	12	5	*20*	0	0	1	0	*1*	3	0	0	0	*3*
5:30 PM	3	4	9	12	*28*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	3	2	6	6	*17*	0	0	1	0	*1*	1	0	0	0	*1*
Count Total	28	32	139	117	*316*	0	0	3	0	*3*	14	0	0	0	*14*
Peak Hour	**7**	**14**	**50**	**39**	***110***	**0**	**0**	**1**	**0**	***1***	**5**	**0**	**0**	**0**	***5***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	WB 410 Ramps				Thompson St				E Main Ave				Traffic Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	2	0	1	0	1	1	0	0	4	4	1	0	0	5	7	26	0
3:15 PM	0	1	0	2	0	2	1	0	0	3	11	1	0	0	1	13	35	0
3:30 PM	0	2	0	1	0	1	0	1	0	3	10	1	0	0	2	8	29	0
3:45 PM	0	1	0	2	0	2	1	0	0	3	9	1	0	0	3	7	29	119
4:00 PM	**0**	**3**	**0**	**2**	**0**	**2**	**2**	**0**	**0**	**5**	**7**	**3**	**0**	**0**	**2**	**4**	**30**	123
4:15 PM	**0**	**0**	**0**	**0**	**0**	**3**	**1**	**0**	**0**	**3**	**9**	**3**	**0**	**0**	**9**	**10**	**38**	126
4:30 PM	**0**	**0**	**0**	**1**	**0**	**2**	**1**	**0**	**0**	**0**	**7**	**1**	**0**	**0**	**1**	**9**	**22**	119
4:45 PM	**0**	**0**	**1**	**0**	**0**	**3**	**0**	**0**	**0**	**3**	**8**	**1**	**0**	**0**	**2**	**2**	**20**	**110**
5:00 PM	0	1	1	0	0	0	0	0	0	1	9	1	0	0	1	8	22	102
5:15 PM	0	0	1	0	0	1	1	0	0	4	7	1	0	0	2	3	20	84
5:30 PM	0	1	1	1	0	3	1	0	0	2	6	1	0	0	3	9	28	90
5:45 PM	0	1	1	1	0	1	1	0	0	2	4	0	0	0	2	4	17	87
Count Total	0	12	5	11	0	21	10	1	0	33	91	15	0	0	33	84	316	0
Peak Hour	**0**	**3**	**1**	**3**	**0**	**10**	**4**	**0**	**0**	**11**	**31**	**8**	**0**	**0**	**14**	**25**	**110**	**0**

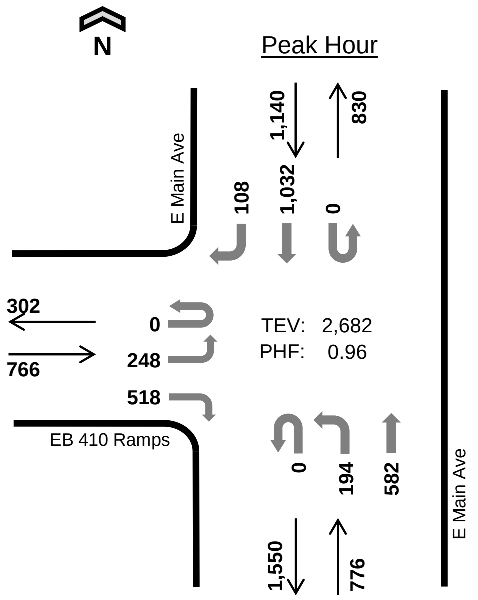
Three-Hour Count Summaries - Bikes

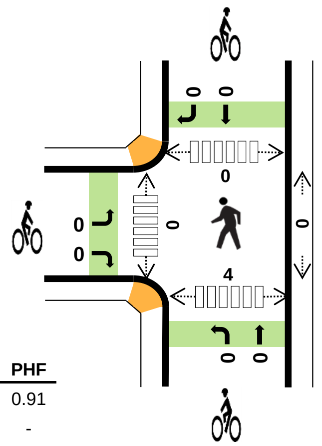
Interval Start	WB 410 Ramps			Thompson St			E Main Ave			Traffic Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	1
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	2
Count Total	0	0	0	0	0	0	0	0	3	0	0	0	3	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

E Main Ave
EB 410 Ramps

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:00 PM to 5:00 PM





	HV %:	PHF
EB	5.7%	0.91
WB	-	-
NB	3.2%	0.91
SB	2.4%	0.93
TOTAL	3.6%	0.96

Three-Hour Count Summaries

Interval Start		EB 410 Ramps				0				E Main Ave				E Main Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	62	0	134	0	0	0	0	0	57	134	0	0	0	238	24	649	0
4:15 PM		0	62	0	148	0	0	0	0	0	44	145	0	0	0	273	27	699	0
4:30 PM		0	57	0	121	0	0	0	0	0	48	166	0	0	0	246	26	664	0
4:45 PM		0	67	0	115	0	0	0	0	0	45	137	0	0	0	275	31	670	2,682
Peak Hour	All	0	248	0	518	0	0	0	0	0	194	582	0	0	0	1,032	108	2,682	0
	HV	0	29	0	15	0	0	0	0	0	4	21	0	0	0	23	4	96	0
	HV%	-	12%	-	3%	-	-	-	-	-	2%	4%	-	-	-	2%	4%	4%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	13	0	7	6	*26*	0	0	0	0	*0*	0	0	0	1	*1*
4:15 PM	15	0	5	11	*31*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	8	0	6	4	*18*	0	0	0	0	*0*	0	0	0	2	*2*
4:45 PM	8	0	7	6	*21*	0	0	0	0	*0*	0	0	0	1	*1*
Peak Hour	44	0	25	27	*96*	0	0	0	0	*0*	0	0	0	4	*4*

Three-Hour Count Summaries

Interval Start	EB 410 Ramps				0				E Main Ave				E Main Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	54	0	142	0	0	0	0	0	46	123	0	0	0	224	37	626	0
3:15 PM	0	41	0	131	0	0	0	0	0	37	140	0	0	0	233	19	601	0
3:30 PM	0	47	0	135	0	0	0	0	0	45	125	0	0	0	239	36	627	0
3:45 PM	0	60	0	142	0	0	0	0	0	41	132	0	0	0	261	23	659	2,513
4:00 PM	**0**	**62**	**0**	**134**	**0**	**0**	**0**	**0**	**0**	**57**	**134**	**0**	**0**	**0**	**238**	**24**	**649**	2,536
4:15 PM	**0**	**62**	**0**	**148**	**0**	**0**	**0**	**0**	**0**	**44**	**145**	**0**	**0**	**0**	**273**	**27**	**699**	2,634
4:30 PM	**0**	**57**	**0**	**121**	**0**	**0**	**0**	**0**	**0**	**48**	**166**	**0**	**0**	**0**	**246**	**26**	**664**	2,671
4:45 PM	**0**	**67**	**0**	**115**	**0**	**0**	**0**	**0**	**0**	**45**	**137**	**0**	**0**	**0**	**275**	**31**	**670**	**2,682**
5:00 PM	0	44	0	116	0	0	0	0	0	49	133	0	0	0	249	28	619	2,652
5:15 PM	0	49	0	125	0	0	0	0	0	38	148	0	0	0	263	23	646	2,599
5:30 PM	0	61	0	125	0	0	0	0	0	45	136	0	0	0	256	34	657	2,592
5:45 PM	0	55	0	138	0	0	0	0	0	27	132	0	0	0	243	13	608	2,530
Count Total	0	659	0	1,572	0	0	0	0	0	522	1,651	0	0	0	3,000	321	7,725	0
Peak Hour **All**	**0**	**248**	**0**	**518**	**0**	**0**	**0**	**0**	**0**	**194**	**582**	**0**	**0**	**0**	**1,032**	**108**	**2,682**	**0**
HV	**0**	**29**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**4**	**21**	**0**	**0**	**0**	**23**	**4**	**96**	**0**
HV%	**-**	**12%**	**-**	**3%**	**-**	**-**	**-**	**-**	**-**	**2%**	**4%**	**-**	**-**	**-**	**2%**	**4%**	**4%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	18	0	10	7	*35*	0	0	0	0	*0*	0	0	0	2	*2*
3:15 PM	11	0	9	4	*24*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	14	0	7	5	*26*	0	0	0	0	*0*	0	0	0	1	*1*
3:45 PM	16	0	8	7	*31*	0	0	0	0	*0*	0	0	0	2	*2*
4:00 PM	**13**	**0**	**7**	**6**	***26***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	*1*
4:15 PM	**15**	**0**	**5**	**11**	***31***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:30 PM	**8**	**0**	**6**	**4**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**2**	*2*
4:45 PM	**8**	**0**	**7**	**6**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	*1*
5:00 PM	9	0	4	1	*14*	0	0	0	0	*0*	0	0	0	1	*1*
5:15 PM	13	0	7	4	*24*	0	0	0	0	*0*	0	0	0	3	*3*
5:30 PM	8	0	5	7	*20*	0	0	0	0	*0*	0	0	0	1	*1*
5:45 PM	6	0	3	3	*12*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	139	0	78	65	*282*	0	0	0	0	*0*	0	0	0	15	*15*
Peak Hr	**44**	**0**	**25**	**27**	***96***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**4**	***4***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	**EB 410 Ramps**				**0**				**E Main Ave**				**E Main Ave**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	6	0	12	0	0	0	0	0	4	6	0	0	0	6	1	35	0
3:15 PM	0	5	0	6	0	0	0	0	0	1	8	0	0	0	4	0	24	0
3:30 PM	0	5	0	9	0	0	0	0	0	1	6	0	0	0	4	1	26	0
3:45 PM	0	8	0	8	0	0	0	0	0	1	7	0	0	0	7	0	31	116
4:00 PM	**0**	**8**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**1**	**6**	**0**	**0**	**0**	**6**	**0**	**26**	107
4:15 PM	**0**	**10**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**0**	**0**	**0**	**10**	**1**	**31**	114
4:30 PM	**0**	**6**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**5**	**0**	**0**	**0**	**3**	**1**	**18**	106
4:45 PM	**0**	**5**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**1**	**6**	**0**	**0**	**0**	**4**	**2**	**21**	**96**
5:00 PM	0	7	0	2	0	0	0	0	0	2	2	0	0	0	1	0	14	84
5:15 PM	0	9	0	4	0	0	0	0	0	2	5	0	0	0	3	1	24	77
5:30 PM	0	5	0	3	0	0	0	0	0	2	3	0	0	0	5	2	20	79
5:45 PM	0	4	0	2	0	0	0	0	0	0	3	0	0	0	3	0	12	70
Count Total	0	78	0	61	0	0	0	0	0	17	61	0	0	0	56	9	282	0
Peak Hour	**0**	**29**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**4**	**21**	**0**	**0**	**0**	**23**	**4**	**96**	**0**

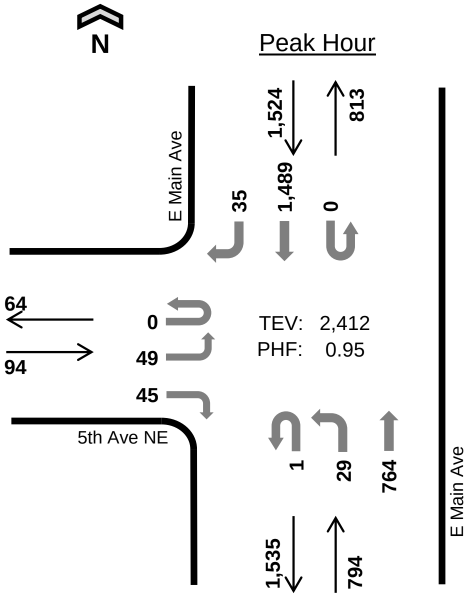
Three-Hour Count Summaries - Bikes

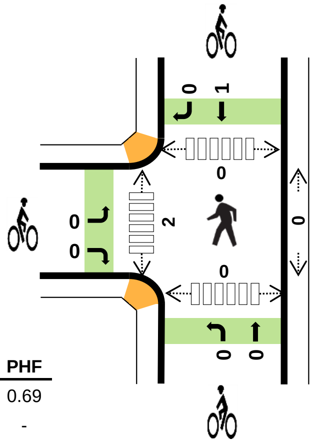
Interval Start	**EB 410 Ramps**			**0**			**E Main Ave**			**E Main Ave**			**15-min Total**	**Rolling One Hour**
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

E Main Ave
5th Ave NE

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:00 PM to 5:00 PM





	HV %:	PHF
EB	2.1%	0.69
WB	-	-
NB	3.4%	0.94
SB	2.4%	0.92
TOTAL	2.7%	0.95

Three-Hour Count Summaries

Interval Start		5th Ave NE				0				E Main Ave				E Main Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	19	0	15	0	0	0	0	0	7	183	0	0	0	358	10	592	0
4:15 PM		0	11	0	6	0	0	0	0	1	8	196	0	0	0	410	6	638	0
4:30 PM		0	10	0	12	0	0	0	0	0	7	205	0	0	0	352	9	595	0
4:45 PM		0	9	0	12	0	0	0	0	0	7	180	0	0	0	369	10	587	2,412
Peak Hour	All	0	49	0	45	0	0	0	0	1	29	764	0	0	0	1,489	35	2,412	0
	HV	0	0	0	2	0	0	0	0	0	1	26	0	0	0	37	0	66	0
	HV%	-	0%	-	4%	-	-	-	-	0%	3%	3%	-	-	-	2%	0%	3%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	1	0	7	10	*18*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	0	0	11	14	*25*	0	0	0	1	*1*	0	1	0	0	*1*
4:30 PM	1	0	4	7	*12*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	0	0	5	6	*11*	0	0	0	0	*0*	0	1	0	0	*1*
Peak Hour	2	0	27	37	*66*	0	0	0	1	*1*	0	2	0	0	*2*

Three-Hour Count Summaries

Interval Start		5th Ave NE				0				E Main Ave				E Main Ave			15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	4	0	9	0	0	0	0	0	3	166	0	0	0	350	6	538	0
3:15 PM	0	10	0	4	0	0	0	0	0	3	163	0	0	0	381	8	569	0
3:30 PM	0	6	0	11	0	0	0	0	0	9	172	0	0	0	348	14	560	0
3:45 PM	0	11	0	13	0	0	0	0	0	9	160	0	0	0	375	16	584	2,251
4:00 PM	**0**	**19**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**7**	**183**	**0**	**0**	**0**	**358**	**10**	**592**	2,305
4:15 PM	**0**	**11**	**0**	**6**	**0**	**0**	**0**	**0**	**1**	**8**	**196**	**0**	**0**	**0**	**410**	**6**	**638**	2,374
4:30 PM	**0**	**10**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**7**	**205**	**0**	**0**	**0**	**352**	**9**	**595**	2,409
4:45 PM	**0**	**9**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**7**	**180**	**0**	**0**	**0**	**369**	**10**	**587**	**2,412**
5:00 PM	0	18	0	24	0	0	0	0	0	7	186	0	0	0	342	10	587	2,407
5:15 PM	0	4	0	13	0	0	0	0	0	4	173	0	0	0	369	9	572	2,341
5:30 PM	0	9	0	8	0	0	0	0	0	2	180	0	0	0	379	11	589	2,335
5:45 PM	0	4	0	10	0	0	0	0	0	9	158	0	0	0	392	15	588	2,336
Count Total	0	115	0	137	0	0	0	0	1	75	2,122	0	0	0	4,425	124	6,999	0
Peak Hour All	**0**	**49**	**0**	**45**	**0**	**0**	**0**	**0**	**1**	**29**	**764**	**0**	**0**	**0**	**1,489**	**35**	**2,412**	**0**
HV	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**26**	**0**	**0**	**0**	**37**	**0**	**66**	**0**
HV%	**-**	**0%**	**-**	**4%**	**-**	**-**	**-**	**-**	**0%**	**3%**	**3%**	**-**	**-**	**-**	**2%**	**0%**	**3%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	0	0	11	12	*23*	0	0	0	0	*0*	0	2	0	0	*2*
3:15 PM	1	0	8	13	*22*	2	0	0	0	*2*	0	0	0	0	*0*
3:30 PM	0	0	8	16	*24*	0	0	0	0	*0*	0	2	0	0	*2*
3:45 PM	1	0	6	15	*22*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	**1**	**0**	**7**	**10**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:15 PM	**0**	**0**	**11**	**14**	***25***	**0**	**0**	**0**	**1**	***1***	**0**	**1**	**0**	**0**	*1*
4:30 PM	**1**	**0**	**4**	**7**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:45 PM	**0**	**0**	**5**	**6**	***11***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	***1***
5:00 PM	1	0	3	4	*8*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	5	5	*10*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	0	5	6	*11*	0	0	0	0	*0*	0	3	0	0	*3*
5:45 PM	0	0	6	8	*14*	0	0	2	0	*2*	0	2	0	0	*2*
Count Total	5	0	79	116	*200*	2	0	2	1	*5*	0	11	0	0	*11*
Peak Hr	**2**	**0**	**27**	**37**	***66***	**0**	**0**	**0**	**1**	***1***	**0**	**2**	**0**	**0**	***2***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	5th Ave NE				0				E Main Ave				E Main Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	11	0	0	0	12	0	23	0
3:15 PM	0	0	0	1	0	0	0	0	0	0	8	0	0	0	13	0	22	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	8	0	0	0	15	1	24	0
3:45 PM	0	1	0	0	0	0	0	0	0	0	6	0	0	0	15	0	22	91
4:00 PM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**10**	**0**	**18**	86
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**10**	**0**	**0**	**0**	**14**	**0**	**25**	89
4:30 PM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**7**	**0**	**12**	77
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**6**	**0**	**11**	**66**
5:00 PM	0	0	0	1	0	0	0	0	0	0	3	0	0	0	4	0	8	56
5:15 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	0	10	41
5:30 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	6	0	11	40
5:45 PM	0	0	0	0	0	0	0	0	0	0	6	0	0	0	8	0	14	43
Count Total	0	1	0	4	0	0	0	0	0	1	78	0	0	0	115	1	200	0
Peak Hour	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**26**	**0**	**0**	**0**	**37**	**0**	**66**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	5th Ave NE			0			E Main Ave			E Main Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	2	0	0	0	0	0	0	0	0	0	0	0	2	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	1
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	2	0	0	0	0	2	2
Count Total	2	0	0	0	0	0	0	2	0	0	1	0	5	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**

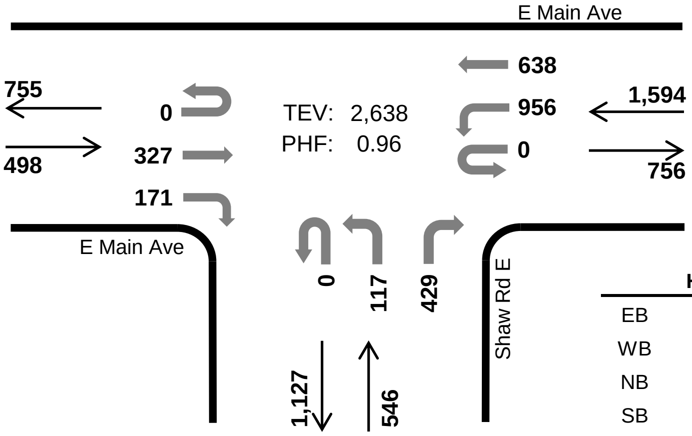
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd E
E Main Ave

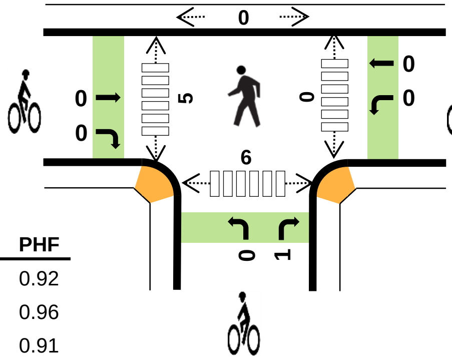
N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:45 PM to 4:45 PM



	HV %:	PHF
EB	3.0%	0.92
WB	3.2%	0.96
NB	4.4%	0.91
SB	-	-
TOTAL	3.4%	0.96



Three-Hour Count Summaries

Interval Start		E Main Ave				E Main Ave				Shaw Rd E				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:45 PM		0	0	77	26	0	249	141	0	0	33	0	105	0	0	0	0	631	0
4:00 PM		0	0	87	46	0	225	174	0	0	29	0	85	0	0	0	0	646	0
4:15 PM		0	0	82	45	0	255	162	0	0	21	0	123	0	0	0	0	688	0
4:30 PM		0	0	81	54	0	227	161	0	0	34	0	116	0	0	0	0	673	2,638
Peak Hour	All	0	0	327	171	0	956	638	0	0	117	0	429	0	0	0	0	2,638	0
	HV	0	0	13	2	0	33	18	0	0	6	0	18	0	0	0	0	90	0
	HV%	-	-	4%	1%	-	3%	3%	-	-	5%	-	4%	-	-	-	-	3%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:45 PM	6	17	7	0	*30*	0	0	0	0	*0*	0	2	0	2	*4*
4:00 PM	1	14	5	0	*20*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	5	14	8	0	*27*	0	0	0	0	*0*	0	1	0	4	*5*
4:30 PM	3	6	4	0	*13*	0	0	1	0	*1*	0	2	0	0	*2*
Peak Hour	15	51	24	0	*90*	0	0	1	0	*1*	0	5	0	6	*11*

Three-Hour Count Summaries

Interval Start	E Main Ave				E Main Ave				Shaw Rd E				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	70	40	0	251	129	0	0	36	0	93	0	0	0	0	619	0
3:15 PM	0	0	63	30	0	238	134	0	0	27	0	109	0	0	0	0	601	0
3:30 PM	0	0	71	45	0	225	137	0	0	31	0	102	0	0	0	0	611	0
3:45 PM	**0**	**0**	**77**	**26**	**0**	**249**	**141**	**0**	**0**	**33**	**0**	**105**	**0**	**0**	**0**	**0**	**631**	2,462
4:00 PM	**0**	**0**	**87**	**46**	**0**	**225**	**174**	**0**	**0**	**29**	**0**	**85**	**0**	**0**	**0**	**0**	**646**	2,489
4:15 PM	**0**	**0**	**82**	**45**	**0**	**255**	**162**	**0**	**0**	**21**	**0**	**123**	**0**	**0**	**0**	**0**	**688**	2,576
4:30 PM	**0**	**0**	**81**	**54**	**0**	**227**	**161**	**0**	**0**	**34**	**0**	**116**	**0**	**0**	**0**	**0**	**673**	**2,638**
4:45 PM	0	0	66	39	0	229	133	0	0	27	0	122	0	0	0	0	616	2,623
5:00 PM	0	0	92	43	0	232	155	0	0	24	0	87	0	0	0	0	633	2,610
5:15 PM	0	0	91	46	0	240	151	0	0	44	0	85	0	0	0	0	657	2,579
5:30 PM	0	0	73	44	0	228	175	0	0	39	0	98	0	0	0	0	657	2,563
5:45 PM	0	0	68	39	0	241	121	0	0	34	0	95	0	0	0	0	598	2,545
Count Total	0	0	921	497	0	2,840	1,773	0	0	379	0	1,220	0	0	0	0	7,630	0
Peak Hour All	**0**	**0**	**327**	**171**	**0**	**956**	**638**	**0**	**0**	**117**	**0**	**429**	**0**	**0**	**0**	**0**	**2,638**	**0**
HV	**0**	**0**	**13**	**2**	**0**	**33**	**18**	**0**	**0**	**6**	**0**	**18**	**0**	**0**	**0**	**0**	**90**	**0**
HV%	**-**	**-**	**4%**	**1%**	**-**	**3%**	**3%**	**-**	**-**	**5%**	**-**	**4%**	**-**	**-**	**-**	**-**	**3%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	4	14	12	0	*30*	1	0	0	0	*1*	0	0	0	0	*0*
3:15 PM	4	12	8	0	*24*	0	0	0	0	*0*	0	0	0	1	*1*
3:30 PM	3	13	8	0	*24*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	**6**	**17**	**7**	**0**	***30***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**2**	*4*
4:00 PM	**1**	**14**	**5**	**0**	***20***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:15 PM	**5**	**14**	**8**	**0**	***27***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**4**	*5*
4:30 PM	**3**	**6**	**4**	**0**	***13***	**0**	**0**	**1**	**0**	***1***	**0**	**2**	**0**	**0**	***2***
4:45 PM	1	6	5	0	*12*	0	0	0	0	*0*	0	0	0	2	*2*
5:00 PM	4	4	5	0	*13*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	3	4	2	0	*9*	0	1	0	0	*1*	0	0	0	0	*0*
5:30 PM	2	5	7	0	*14*	0	0	1	0	*1*	0	0	0	0	*0*
5:45 PM	0	11	2	0	*13*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	36	120	73	0	*229*	1	1	2	0	*4*	0	5	0	9	*14*
Peak Hr	**15**	**51**	**24**	**0**	***90***	**0**	**0**	**1**	**0**	***1***	**0**	**5**	**0**	**6**	***11***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Main Ave				E Main Ave				Shaw Rd E				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	2	2	0	10	4	0	0	5	0	7	0	0	0	0	30	0
3:15 PM	0	0	2	2	0	8	4	0	0	2	0	6	0	0	0	0	24	0
3:30 PM	0	0	2	1	0	9	4	0	0	4	0	4	0	0	0	0	24	0
3:45 PM	0	0	6	0	0	11	6	0	0	3	0	4	0	0	0	0	30	108
4:00 PM	0	0	1	0	0	10	4	0	0	1	0	4	0	0	0	0	20	98
4:15 PM	0	0	5	0	0	9	5	0	0	1	0	7	0	0	0	0	27	101
4:30 PM	0	0	1	2	0	3	3	0	0	1	0	3	0	0	0	0	13	90
4:45 PM	0	0	1	0	0	3	3	0	0	1	0	4	0	0	0	0	12	72
5:00 PM	0	0	3	1	0	2	2	0	0	1	0	4	0	0	0	0	13	65
5:15 PM	0	0	0	3	0	4	0	0	0	0	0	2	0	0	0	0	9	47
5:30 PM	0	0	1	1	0	2	3	0	0	1	0	6	0	0	0	0	14	48
5:45 PM	0	0	0	0	0	5	6	0	0	0	0	2	0	0	0	0	13	49
Count Total	0	0	24	12	0	76	44	0	0	20	0	53	0	0	0	0	229	0
Peak Hour	**0**	**0**	**13**	**2**	**0**	**33**	**18**	**0**	**0**	**6**	**0**	**18**	**0**	**0**	**0**	**0**	**90**	**0**

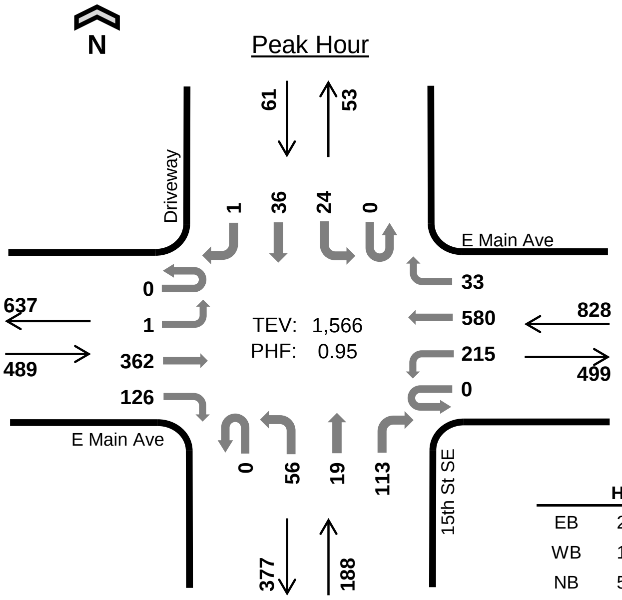
Three-Hour Count Summaries - Bikes

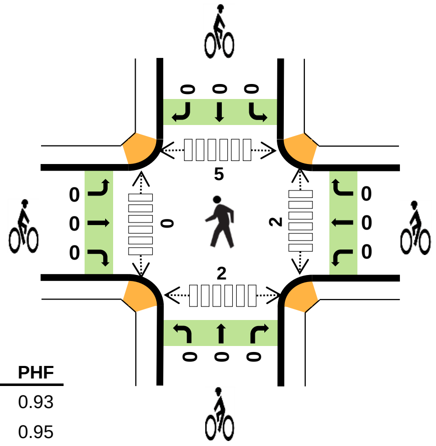
Interval Start	E Main Ave			E Main Ave			Shaw Rd E			0			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	1	2
5:30 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Count Total	0	1	0	1	0	0	0	0	2	0	0	0	4	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

15th St SE
E Main Ave

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:45 PM to 5:45 PM





	HV %:	PHF
EB	2.2%	0.93
WB	1.7%	0.95
NB	5.3%	0.81
SB	0.0%	0.69
TOTAL	2.2%	0.95

Three-Hour Count Summaries

Interval Start		E Main Ave				E Main Ave				15th St SE				Driveway				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:45 PM		0	0	75	28	0	38	132	13	0	9	3	31	0	3	6	0	338	0
5:00 PM		0	1	95	36	0	68	142	8	0	10	6	28	0	10	9	0	413	0
5:15 PM		0	0	95	33	0	53	150	5	0	16	5	22	0	6	15	1	401	0
5:30 PM		0	0	97	29	0	56	156	7	0	21	5	32	0	5	6	0	414	1,566
Peak Hour	All	0	1	362	126	0	215	580	33	0	56	19	113	0	24	36	1	1,566	0
	HV	0	0	8	3	0	1	13	0	0	4	0	6	0	0	0	0	35	0
	HV%	-	0%	2%	2%	-	0%	2%	0%	-	7%	0%	5%	-	0%	0%	0%	2%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:45 PM	2	3	5	0	*10*	0	0	0	0	*0*	1	0	2	1	*4*
5:00 PM	4	3	1	0	*8*	0	0	0	0	*0*	1	0	0	1	*2*
5:15 PM	2	4	2	0	*8*	0	0	0	0	*0*	0	0	1	0	*1*
5:30 PM	3	4	2	0	*9*	0	0	0	0	*0*	0	0	2	0	*2*
Peak Hour	11	14	10	0	*35*	0	0	0	0	*0*	2	0	5	2	*9*

Three-Hour Count Summaries

Interval Start		E Main Ave				E Main Ave				15th St SE				Driveway				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM		0	0	91	31	0	46	119	15	0	14	7	22	0	14	10	3	372	0
3:15 PM		0	3	78	30	0	38	111	11	0	18	11	31	0	9	7	1	348	0
3:30 PM		0	3	57	32	0	52	141	14	0	15	2	22	0	10	7	3	358	0
3:45 PM		0	0	79	31	0	38	103	20	0	15	6	26	0	3	10	4	335	1,413
4:00 PM		0	3	95	23	0	72	161	13	0	23	4	31	0	15	9	0	449	1,490
4:15 PM		0	2	83	19	0	62	115	14	0	14	7	26	0	12	8	1	363	1,505
4:30 PM		0	0	82	27	0	71	131	14	0	20	6	26	0	16	10	1	404	1,551
4:45 PM		**0**	**0**	**75**	**28**	**0**	**38**	**132**	**13**	**0**	**9**	**3**	**31**	**0**	**3**	**6**	**0**	**338**	1,554
5:00 PM		**0**	**1**	**95**	**36**	**0**	**68**	**142**	**8**	**0**	**10**	**6**	**28**	**0**	**10**	**9**	**0**	**413**	1,518
5:15 PM		**0**	**0**	**95**	**33**	**0**	**53**	**150**	**5**	**0**	**16**	**5**	**22**	**0**	**6**	**15**	**1**	**401**	1,556
5:30 PM		**0**	**0**	**97**	**29**	**0**	**56**	**156**	**7**	**0**	**21**	**5**	**32**	**0**	**5**	**6**	**0**	**414**	**1,566**
5:45 PM		0	1	80	28	0	51	103	8	0	12	3	20	0	5	3	1	315	1,543
Count Total		0	13	1,007	347	0	645	1,564	142	0	187	65	317	0	108	100	15	4,510	0
Peak Hour	**All**	**0**	**1**	**362**	**126**	**0**	**215**	**580**	**33**	**0**	**56**	**19**	**113**	**0**	**24**	**36**	**1**	**1,566**	**0**
	HV	**0**	**0**	**8**	**3**	**0**	**1**	**13**	**0**	**0**	**4**	**0**	**6**	**0**	**0**	**0**	**0**	**35**	**0**
	HV%	**-**	**0%**	**2%**	**2%**	**-**	**0%**	**2%**	**0%**	**-**	**7%**	**0%**	**5%**	**-**	**0%**	**0%**	**0%**	**2%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	7	9	1	0	*17*	1	0	0	0	*1*	1	1	1	2	*5*
3:15 PM	6	8	2	0	*16*	0	0	1	0	*1*	5	0	0	1	*6*
3:30 PM	4	10	1	0	*15*	0	0	0	0	*0*	1	0	0	2	*3*
3:45 PM	5	6	2	0	*13*	0	0	0	0	*0*	0	2	2	0	*4*
4:00 PM	1	8	1	0	*10*	0	0	0	0	*0*	0	2	3	0	*5*
4:15 PM	2	5	2	0	*9*	0	0	0	0	*0*	0	0	1	0	*1*
4:30 PM	1	5	2	1	*9*	0	0	0	0	*0*	2	0	1	0	*3*
4:45 PM	**2**	**3**	**5**	**0**	***10***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**2**	**1**	*4*
5:00 PM	**4**	**3**	**1**	**0**	***8***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**1**	*2*
5:15 PM	**2**	**4**	**2**	**0**	***8***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	*1*
5:30 PM	**3**	**4**	**2**	**0**	***9***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**2**	**0**	***2***
5:45 PM	0	3	0	0	*3*	0	0	0	0	*0*	5	0	0	0	*5*
Count Total	37	68	21	1	*127*	1	0	1	0	*2*	16	5	13	7	*41*
Peak Hour	**11**	**14**	**10**	**0**	***35***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**5**	**2**	***9***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Main Ave				E Main Ave				15th St SE				Driveway				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	5	2	0	1	8	0	0	1	0	0	0	0	0	0	17	0
3:15 PM	0	0	5	1	0	1	7	0	0	2	0	0	0	0	0	0	16	0
3:30 PM	0	0	2	2	0	1	9	0	0	1	0	0	0	0	0	0	15	0
3:45 PM	0	0	4	1	0	0	6	0	0	1	0	1	0	0	0	0	13	61
4:00 PM	0	0	1	0	0	1	7	0	0	1	0	0	0	0	0	0	10	54
4:15 PM	0	0	1	1	0	1	4	0	0	0	0	2	0	0	0	0	9	47
4:30 PM	0	0	1	0	0	1	4	0	0	2	0	0	0	0	1	0	9	41
4:45 PM	**0**	**0**	**2**	**0**	**0**	**0**	**3**	**0**	**0**	**2**	**0**	**3**	**0**	**0**	**0**	**0**	**10**	38
5:00 PM	**0**	**0**	**3**	**1**	**0**	**1**	**2**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**8**	36
5:15 PM	**0**	**0**	**1**	**1**	**0**	**0**	**4**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**8**	35
5:30 PM	**0**	**0**	**2**	**1**	**0**	**0**	**4**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**9**	**35**
5:45 PM	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	28
Count Total	0	0	27	10	0	7	61	0	0	12	0	9	0	0	1	0	127	0
Peak Hour	**0**	**0**	**8**	**3**	**0**	**1**	**13**	**0**	**0**	**4**	**0**	**6**	**0**	**0**	**0**	**0**	**35**	**0**

Three-Hour Count Summaries - Bikes

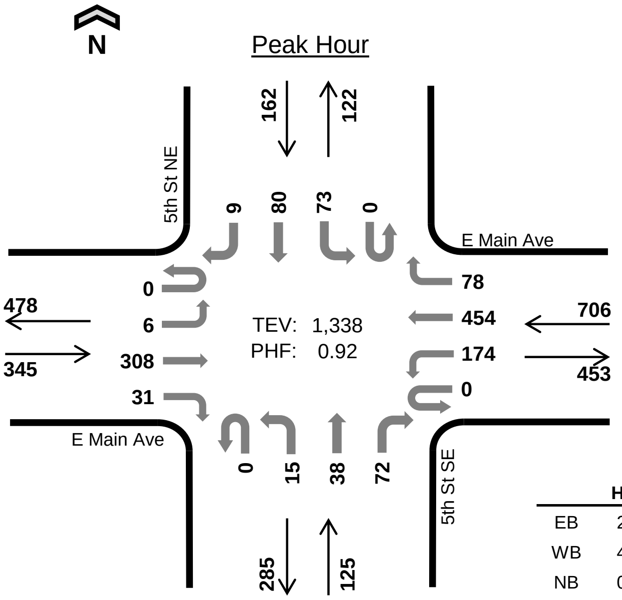
Interval Start	E Main Ave			E Main Ave			15th St SE			Driveway			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	0
3:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
5:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
5:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	1	0	0	0	0	0	1	0	0	0	0	2	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

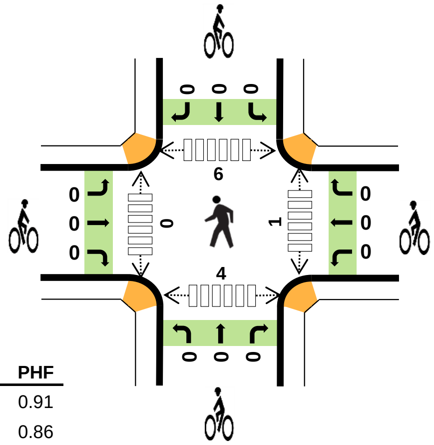
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

5th St SE
E Main Ave

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:45 PM to 4:45 PM

Peak Hour





	HV %:	PHF
EB	2.9%	0.91
WB	4.0%	0.86
NB	0.8%	0.78
SB	0.0%	0.86
TOTAL	2.9%	0.92

Three-Hour Count Summaries

Interval Start		E Main Ave				E Main Ave				5th St SE				5th St NE				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:45 PM		0	4	78	4	0	40	90	21	0	3	5	19	0	18	20	1	303	0
4:00 PM		0	1	89	5	0	40	143	23	0	4	9	19	0	14	15	2	364	0
4:15 PM		0	1	66	11	0	48	109	14	0	6	10	24	0	22	19	4	334	0
4:30 PM		0	0	75	11	0	46	112	20	0	2	14	10	0	19	26	2	337	1,338
Peak Hour	All	0	6	308	31	0	174	454	78	0	15	38	72	0	73	80	9	1,338	0
	HV	0	0	10	0	0	0	25	3	0	0	1	0	0	0	0	0	39	0
	HV%	-	0%	3%	0%	-	0%	6%	4%	-	0%	3%	0%	-	0%	0%	0%	3%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:45 PM	6	8	0	0	*14*	0	0	0	0	*0*	0	0	1	1	*2*
4:00 PM	2	9	0	0	*11*	0	0	0	0	*0*	0	0	2	1	*3*
4:15 PM	1	5	0	0	*6*	0	0	0	0	*0*	0	0	1	1	*2*
4:30 PM	1	6	1	0	*8*	0	0	0	0	*0*	1	0	2	1	*4*
Peak Hour	10	28	1	0	*39*	0	0	0	0	*0*	1	0	6	4	*11*

Three-Hour Count Summaries

Interval Start		E Main Ave				E Main Ave				5th St SE				5th St NE			15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	1	63	4	0	55	96	23	0	5	7	22	0	19	14	1	310	0
3:15 PM	0	1	83	8	0	31	106	21	0	8	6	20	0	17	16	1	318	0
3:30 PM	0	2	59	5	0	38	123	18	0	6	4	20	0	7	9	2	293	0
3:45 PM	**0**	**4**	**78**	**4**	**0**	**40**	**90**	**21**	**0**	**3**	**5**	**19**	**0**	**18**	**20**	**1**	**303**	1,224
4:00 PM	**0**	**1**	**89**	**5**	**0**	**40**	**143**	**23**	**0**	**4**	**9**	**19**	**0**	**14**	**15**	**2**	**364**	1,278
4:15 PM	**0**	**1**	**66**	**11**	**0**	**48**	**109**	**14**	**0**	**6**	**10**	**24**	**0**	**22**	**19**	**4**	**334**	1,294
4:30 PM	**0**	**0**	**75**	**11**	**0**	**46**	**112**	**20**	**0**	**2**	**14**	**10**	**0**	**19**	**26**	**2**	**337**	**1,338**
4:45 PM	1	0	68	9	0	50	97	12	0	2	7	14	0	18	8	0	286	1,321
5:00 PM	0	1	84	11	0	58	116	23	0	7	6	19	0	13	10	1	349	1,306
5:15 PM	0	3	71	10	0	44	109	28	0	2	6	9	0	32	8	1	323	1,295
5:30 PM	0	0	70	8	0	35	129	21	0	5	7	22	0	25	9	0	331	1,289
5:45 PM	0	0	61	7	0	39	99	16	0	0	7	21	0	25	15	2	292	1,295
Count Total	1	14	867	93	0	524	1,329	240	0	50	88	219	0	229	169	17	3,840	0
Peak Hour **All**	**0**	**6**	**308**	**31**	**0**	**174**	**454**	**78**	**0**	**15**	**38**	**72**	**0**	**73**	**80**	**9**	**1,338**	**0**
HV	**0**	**0**	**10**	**0**	**0**	**0**	**25**	**3**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**39**	**0**
HV%	**-**	**0%**	**3%**	**0%**	**-**	**0%**	**6%**	**4%**	**-**	**0%**	**3%**	**0%**	**-**	**0%**	**0%**	**0%**	**3%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	4	12	1	0	*17*	0	0	0	0	*0*	0	1	2	1	*4*
3:15 PM	6	8	1	0	*15*	0	0	0	0	*0*	0	0	0	1	*1*
3:30 PM	1	9	2	1	*13*	0	0	0	0	*0*	0	0	0	1	*1*
3:45 PM	**6**	**8**	**0**	**0**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**1**	*2*
4:00 PM	**2**	**9**	**0**	**0**	***11***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**2**	**1**	*3*
4:15 PM	**1**	**5**	**0**	**0**	***6***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**1**	*2*
4:30 PM	**1**	**6**	**1**	**0**	***8***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**2**	**1**	*4*
4:45 PM	2	5	0	0	*7*	0	0	0	0	*0*	0	1	1	1	*3*
5:00 PM	4	5	0	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	2	3	0	0	*5*	0	0	0	0	*0*	0	0	1	0	*1*
5:30 PM	2	5	0	1	*8*	0	1	0	0	*1*	1	0	0	1	*2*
5:45 PM	0	4	0	0	*4*	0	0	0	0	*0*	1	0	1	1	*3*
Count Total	31	79	5	2	*117*	0	1	0	0	*1*	3	2	11	10	*26*
Peak Hour	**10**	**28**	**1**	**0**	***39***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**6**	**4**	***11***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Main Ave				E Main Ave				5th St SE				5th St NE				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	4	0	0	1	10	1	0	0	0	1	0	0	0	0	17	0
3:15 PM	0	0	6	0	0	0	8	0	0	0	0	1	0	0	0	0	15	0
3:30 PM	0	0	1	0	0	0	7	2	0	0	0	2	0	1	0	0	13	0
3:45 PM	**0**	**0**	**6**	**0**	**0**	**0**	**6**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	59
4:00 PM	**0**	**0**	**2**	**0**	**0**	**0**	**8**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	53
4:15 PM	**0**	**0**	**1**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	44
4:30 PM	**0**	**0**	**1**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**8**	**39**
4:45 PM	0	0	2	0	0	0	4	1	0	0	0	0	0	0	0	0	7	32
5:00 PM	0	0	4	0	0	0	4	1	0	0	0	0	0	0	0	0	9	30
5:15 PM	0	0	1	1	0	0	3	0	0	0	0	0	0	0	0	0	5	29
5:30 PM	0	0	2	0	0	0	4	1	0	0	0	0	0	1	0	0	8	29
5:45 PM	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	4	26
Count Total	0	0	30	1	0	2	68	9	0	0	1	4	0	2	0	0	117	0
Peak Hour	**0**	**0**	**10**	**0**	**0**	**0**	**25**	**3**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**39**	**0**

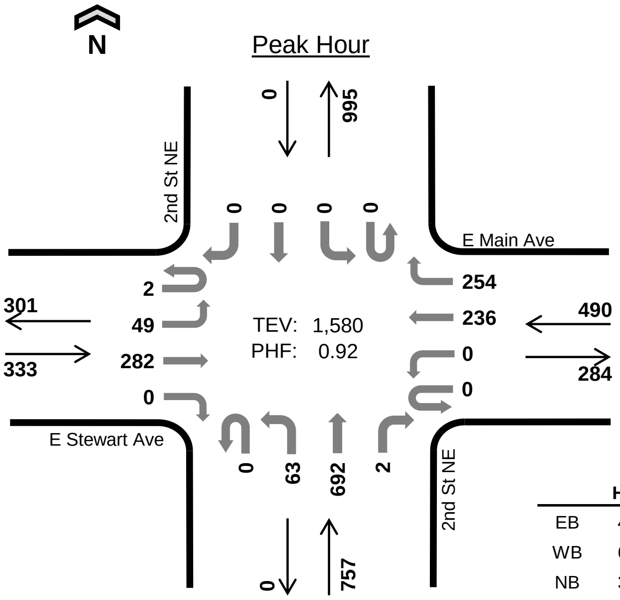
Three-Hour Count Summaries - Bikes

Interval Start	E Main Ave			E Main Ave			5th St SE			5th St NE			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

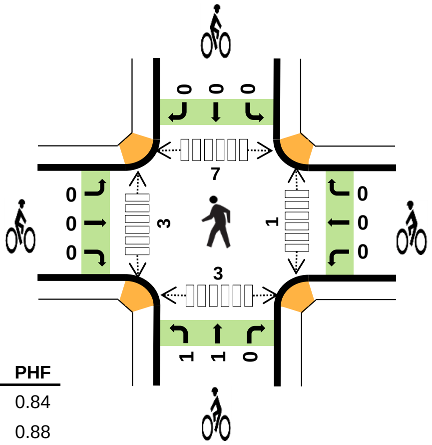
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

2nd St NE
E Stewart Ave

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:15 PM to 4:15 PM



	HV %:	PHF
EB	4.5%	0.84
WB	6.1%	0.88
NB	3.7%	0.86
SB	-	-
TOTAL	4.6%	0.92



Three-Hour Count Summaries

Interval Start		E Stewart Ave				E Main Ave				2nd St NE				2nd St NE				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:15 PM		0	16	74	0	0	0	55	68	0	14	156	0	0	0	0	0	383	0
3:30 PM		1	6	48	0	0	0	51	71	0	18	199	2	0	0	0	0	396	0
3:45 PM		0	14	75	0	0	0	60	46	0	19	158	0	0	0	0	0	372	0
4:00 PM		1	13	85	0	0	0	70	69	0	12	179	0	0	0	0	0	429	1,580
Peak Hour	All	2	49	282	0	0	0	236	254	0	63	692	2	0	0	0	0	1,580	0
	HV	0	4	11	0	0	0	9	21	0	6	22	0	0	0	0	0	73	0
	HV%	0%	8%	4%	-	-	-	4%	8%	-	10%	3%	0%	-	-	-	-	5%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:15 PM	4	9	5	0	*18*	0	0	1	0	*1*	0	0	2	1	*3*
3:30 PM	2	7	12	0	*21*	0	0	0	0	*0*	0	0	1	2	*3*
3:45 PM	6	7	5	0	*18*	0	0	0	0	*0*	0	1	1	0	*2*
4:00 PM	3	7	6	0	*16*	0	0	1	0	*1*	1	2	3	0	*6*
Peak Hour	15	30	28	0	*73*	0	0	2	0	*2*	1	3	7	3	*14*

Three-Hour Count Summaries

Interval Start	E Stewart Ave				E Main Ave				2nd St NE				2nd St NE				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	16	58	0	0	0	52	50	0	18	151	0	0	0	0	0	345	0
3:15 PM	**0**	**16**	**74**	**0**	**0**	**0**	**55**	**68**	**0**	**14**	**156**	**0**	**0**	**0**	**0**	**0**	**383**	0
3:30 PM	**1**	**6**	**48**	**0**	**0**	**0**	**51**	**71**	**0**	**18**	**199**	**2**	**0**	**0**	**0**	**0**	**396**	0
3:45 PM	**0**	**14**	**75**	**0**	**0**	**0**	**60**	**46**	**0**	**19**	**158**	**0**	**0**	**0**	**0**	**0**	**372**	1,496
4:00 PM	**1**	**13**	**85**	**0**	**0**	**0**	**70**	**69**	**0**	**12**	**179**	**0**	**0**	**0**	**0**	**0**	**429**	**1,580**
4:15 PM	0	12	68	0	0	0	68	57	0	22	145	1	0	0	0	0	373	1,570
4:30 PM	0	9	74	0	0	0	63	59	0	15	182	0	0	0	0	0	402	1,576
4:45 PM	0	11	74	0	0	0	63	48	0	22	139	1	0	0	0	0	358	1,562
5:00 PM	0	6	89	0	0	0	76	55	0	12	166	0	0	0	0	0	404	1,537
5:15 PM	0	7	57	0	0	0	57	56	0	19	162	0	0	0	0	0	358	1,522
5:30 PM	0	9	68	0	0	0	66	66	0	28	132	0	0	0	0	0	369	1,489
5:45 PM	0	6	63	0	0	0	52	54	0	26	115	1	0	0	0	0	317	1,448
Count Total	2	125	833	0	0	0	733	699	0	225	1,884	5	0	0	0	0	4,506	0
Peak Hour All	**2**	**49**	**282**	**0**	**0**	**0**	**236**	**254**	**0**	**63**	**692**	**2**	**0**	**0**	**0**	**0**	**1,580**	**0**
HV	**0**	**4**	**11**	**0**	**0**	**0**	**9**	**21**	**0**	**6**	**22**	**0**	**0**	**0**	**0**	**0**	**73**	**0**
HV%	**0%**	**8%**	**4%**	**-**	**-**	**-**	**4%**	**8%**	**-**	**10%**	**3%**	**0%**	**-**	**-**	**-**	**-**	**5%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	7	8	1	0	*16*	0	0	0	0	*0*	0	1	1	0	*2*
3:15 PM	**4**	**9**	**5**	**0**	***18***	**0**	**0**	**1**	**0**	***1***	**0**	**0**	**2**	**1**	*3*
3:30 PM	**2**	**7**	**12**	**0**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**2**	*3*
3:45 PM	**6**	**7**	**5**	**0**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**1**	**0**	*2*
4:00 PM	**3**	**7**	**6**	**0**	***16***	**0**	**0**	**1**	**0**	***1***	**1**	**2**	**3**	**0**	***6***
4:15 PM	1	5	4	0	*10*	0	0	0	0	*0*	2	2	9	2	*15*
4:30 PM	1	6	7	0	*14*	0	0	0	0	*0*	1	0	2	0	*3*
4:45 PM	3	5	6	0	*14*	0	0	0	0	*0*	0	2	1	0	*3*
5:00 PM	3	6	4	0	*13*	0	0	0	0	*0*	0	1	0	0	*1*
5:15 PM	1	1	1	0	*3*	0	0	0	0	*0*	0	0	1	0	*1*
5:30 PM	3	5	3	0	*11*	0	0	1	0	*1*	0	0	3	1	*4*
5:45 PM	1	2	2	0	*5*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	35	68	56	0	*159*	0	0	3	0	*3*	4	9	24	7	*44*
Peak Hour	**15**	**30**	**28**	**0**	***73***	**0**	**0**	**2**	**0**	***2***	**1**	**3**	**7**	**3**	***14***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Stewart Ave				E Main Ave				2nd St NE				2nd St NE				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	1	6	0	0	0	4	4	0	0	1	0	0	0	0	0	16	0
3:15 PM	**0**	**0**	**4**	**0**	**0**	**0**	**4**	**5**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**18**	0
3:30 PM	**0**	**1**	**1**	**0**	**0**	**0**	**1**	**6**	**0**	**3**	**9**	**0**	**0**	**0**	**0**	**0**	**21**	0
3:45 PM	**0**	**1**	**5**	**0**	**0**	**0**	**2**	**5**	**0**	**2**	**3**	**0**	**0**	**0**	**0**	**0**	**18**	73
4:00 PM	**0**	**2**	**1**	**0**	**0**	**0**	**2**	**5**	**0**	**1**	**5**	**0**	**0**	**0**	**0**	**0**	**16**	**73**
4:15 PM	0	0	1	0	0	0	1	4	0	0	4	0	0	0	0	0	10	65
4:30 PM	0	0	1	0	0	0	1	5	0	0	7	0	0	0	0	0	14	58
4:45 PM	0	1	2	0	0	0	1	4	0	2	4	0	0	0	0	0	14	54
5:00 PM	0	0	3	0	0	0	5	1	0	1	3	0	0	0	0	0	13	51
5:15 PM	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	3	44
5:30 PM	0	1	2	0	0	0	3	2	0	1	2	0	0	0	0	0	11	41
5:45 PM	0	0	1	0	0	0	1	1	0	2	0	0	0	0	0	0	5	32
Count Total	0	7	28	0	0	0	25	43	0	12	44	0	0	0	0	0	159	0
Peak Hour	**0**	**4**	**11**	**0**	**0**	**0**	**9**	**21**	**0**	**6**	**22**	**0**	**0**	**0**	**0**	**0**	**73**	**0**

Three-Hour Count Summaries - Bikes

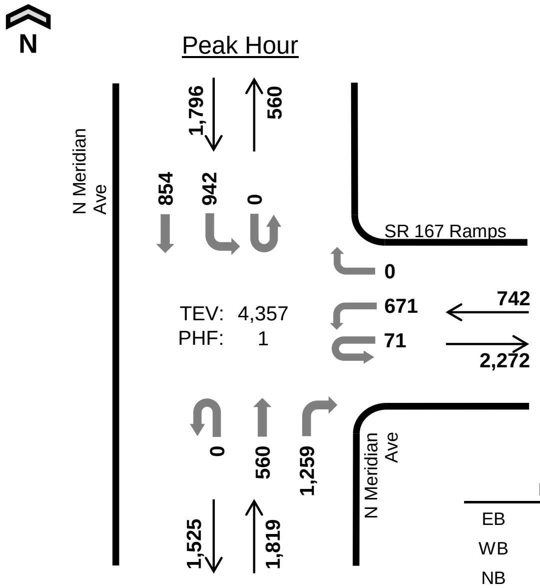
Interval Start	E Stewart Ave			E Main Ave			2nd St NE			2nd St NE			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	0	0	0	0	1	2	0	0	0	0	3	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**

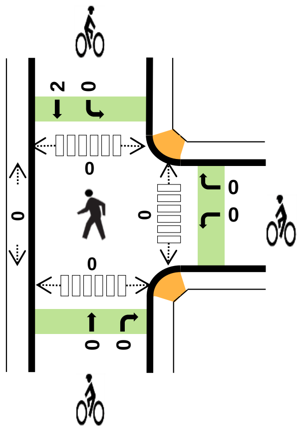
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

N Meridian Ave
SR 167 Ramps

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM

Peak Hour





	HV %:	PHF
EB	-	-
WB	5.9%	0.98
NB	4.5%	0.94
SB	4.0%	0.97
TOTAL	4.5%	1.00

Three-Hour Count Summaries

Interval Start		0				SR 167 Ramps				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:15 PM		0	0	0	0	15	170	0	0	0	0	155	329	0	220	203	0	1,092	0
4:30 PM		0	0	0	0	11	179	0	0	0	0	132	307	0	237	220	0	1,086	0
4:45 PM		0	0	0	0	16	165	0	0	0	0	140	313	0	238	213	0	1,085	0
5:00 PM		0	0	0	0	29	157	0	0	0	0	133	310	0	247	218	0	1,094	4,357
Peak Hour	All	0	0	0	0	71	671	0	0	0	0	560	1,259	0	942	854	0	4,357	0
	HV	0	0	0	0	4	40	0	0	0	0	16	65	0	54	17	0	196	0
	HV%	-	-	-	-	6%	6%	-	-	-	-	3%	5%	-	6%	2%	-	4%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:15 PM	0	13	20	24	*57*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	0	7	24	20	*51*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	0	14	19	14	*47*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	0	10	18	13	*41*	0	0	0	2	*2*	0	0	0	0	*0*
Peak Hour	0	44	81	71	*196*	0	0	0	2	*2*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	0				SR 167 Ramps				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	2	156	0	0	0	0	149	263	0	224	245	0	1,039	0
3:15 PM	0	0	0	0	7	172	0	0	1	0	154	289	0	178	202	0	1,003	0
3:30 PM	0	0	0	0	8	203	0	0	0	0	139	302	0	179	216	0	1,047	0
3:45 PM	0	0	0	0	4	166	0	0	0	0	119	302	0	228	246	0	1,065	4,154
4:00 PM	0	0	0	0	11	165	0	0	0	0	128	263	0	229	185	0	981	4,096
4:15 PM	**0**	**0**	**0**	**0**	**15**	**170**	**0**	**0**	**0**	**0**	**155**	**329**	**0**	**220**	**203**	**0**	**1,092**	4,185
4:30 PM	**0**	**0**	**0**	**0**	**11**	**179**	**0**	**0**	**0**	**0**	**132**	**307**	**0**	**237**	**220**	**0**	**1,086**	4,224
4:45 PM	**0**	**0**	**0**	**0**	**16**	**165**	**0**	**0**	**0**	**0**	**140**	**313**	**0**	**238**	**213**	**0**	**1,085**	4,244
5:00 PM	**0**	**0**	**0**	**0**	**29**	**157**	**0**	**0**	**0**	**0**	**133**	**310**	**0**	**247**	**218**	**0**	**1,094**	**4,357**
5:15 PM	0	0	0	0	9	171	0	0	0	0	135	303	0	236	216	0	1,070	4,335
5:30 PM	0	0	0	0	16	157	0	0	0	0	132	306	0	231	227	0	1,069	4,318
5:45 PM	0	0	0	0	10	188	0	0	0	0	118	318	0	214	222	0	1,070	4,303
Count Total	0	0	0	0	138	2,049	0	0	1	0	1,634	3,605	0	2,661	2,613	0	12,701	0
Peak Hour All	**0**	**0**	**0**	**0**	**71**	**671**	**0**	**0**	**0**	**0**	**560**	**1,259**	**0**	**942**	**854**	**0**	**4,357**	**0**
HV	**0**	**0**	**0**	**0**	**4**	**40**	**0**	**0**	**0**	**0**	**16**	**65**	**0**	**54**	**17**	**0**	**196**	**0**
HV%	**-**	**-**	**-**	**-**	**6%**	**6%**	**-**	**-**	**-**	**-**	**3%**	**5%**	**-**	**6%**	**2%**	**-**	**4%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	0	14	27	30	*71*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	0	16	20	27	*63*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	0	9	14	33	*56*	0	0	0	2	*2*	0	0	0	0	*0*
3:45 PM	0	13	26	22	*61*	0	0	0	1	*1*	0	0	0	0	*0*
4:00 PM	0	14	17	18	*49*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	**0**	**13**	**20**	**24**	***57***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:30 PM	**0**	**7**	**24**	**20**	***51***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:45 PM	**0**	**14**	**19**	**14**	***47***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
5:00 PM	**0**	**10**	**18**	**13**	***41***	**0**	**0**	**0**	**2**	***2***	**0**	**0**	**0**	**0**	***0***
5:15 PM	0	8	16	15	*39*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	8	17	16	*41*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	0	9	9	14	*32*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	0	135	227	246	*608*	0	0	0	5	*5*	0	0	0	0	*0*
Peak Hr	**0**	**44**	**81**	**71**	***196***	**0**	**0**	**0**	**2**	***2***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	0				SR 167 Ramps				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	0	14	0	0	0	0	7	20	0	17	13	0	71	0
3:15 PM	0	0	0	0	1	15	0	0	0	0	3	17	0	22	5	0	63	0
3:30 PM	0	0	0	0	0	9	0	0	0	0	2	12	0	18	15	0	56	0
3:45 PM	0	0	0	0	0	13	0	0	0	0	8	18	0	18	4	0	61	251
4:00 PM	0	0	0	0	0	14	0	0	0	0	5	12	0	15	3	0	49	229
4:15 PM	**0**	**0**	**0**	**0**	**1**	**12**	**0**	**0**	**0**	**0**	**4**	**16**	**0**	**18**	**6**	**0**	**57**	223
4:30 PM	**0**	**0**	**0**	**0**	**1**	**6**	**0**	**0**	**0**	**0**	**6**	**18**	**0**	**13**	**7**	**0**	**51**	218
4:45 PM	**0**	**0**	**0**	**0**	**1**	**13**	**0**	**0**	**0**	**0**	**5**	**14**	**0**	**11**	**3**	**0**	**47**	204
5:00 PM	**0**	**0**	**0**	**0**	**1**	**9**	**0**	**0**	**0**	**0**	**1**	**17**	**0**	**12**	**1**	**0**	**41**	**196**
5:15 PM	0	0	0	0	0	8	0	0	0	0	1	15	0	12	3	0	39	178
5:30 PM	0	0	0	0	0	8	0	0	0	0	5	12	0	13	3	0	41	168
5:45 PM	0	0	0	0	0	9	0	0	0	0	0	9	0	10	4	0	32	153
Count Total	0	0	0	0	5	130	0	0	0	0	47	180	0	179	67	0	608	0
Peak Hour	**0**	**0**	**0**	**0**	**4**	**40**	**0**	**0**	**0**	**0**	**16**	**65**	**0**	**54**	**17**	**0**	**196**	**0**

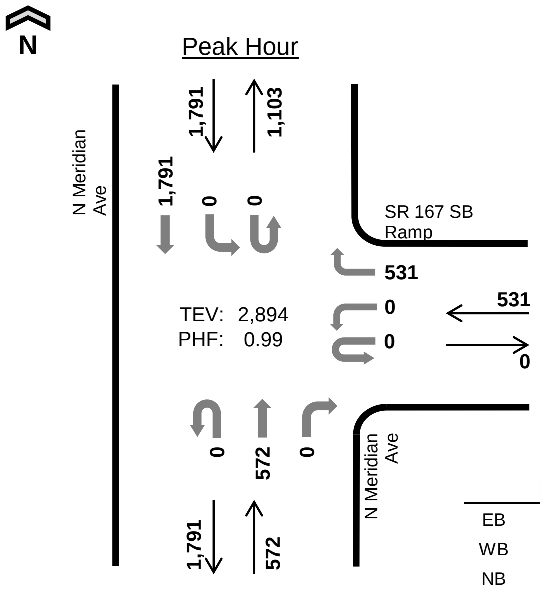
Three-Hour Count Summaries - Bikes

Interval Start	0			SR 167 Ramps			N Meridian Ave			N Meridian Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	2	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	3
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	3
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**2**
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Count Total	0	0	0	0	0	0	0	0	0	0	5	0	5	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**0**

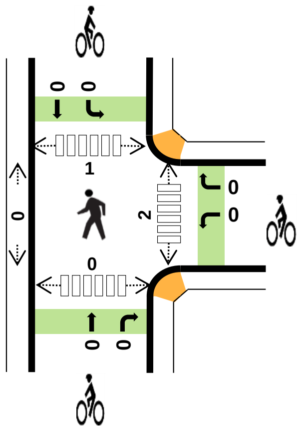
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

N Meridian Ave
SR 167 SB Ramp

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM



	HV %:	PHF
EB	-	-
WB	10.5%	0.90
NB	2.6%	0.93
SB	3.7%	0.97
TOTAL	4.8%	0.99



Three-Hour Count Summaries

Interval Start		0				SR 167 SB Ramp				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:15 PM		0	0	0	0	0	0	0	148	0	0	151	0	0	0	423	0	722	0
4:30 PM		0	0	0	0	0	0	0	132	0	0	134	0	0	0	455	0	721	0
4:45 PM		0	0	0	0	0	0	0	117	0	0	154	0	0	0	451	0	722	0
5:00 PM		0	0	0	0	0	0	0	134	0	0	133	0	0	0	462	0	729	2,894
Peak Hour	All	0	0	0	0	0	0	0	531	0	0	572	0	0	0	1,791	0	2,894	0
	HV	0	0	0	0	0	0	0	56	0	0	15	0	0	0	67	0	138	0
	HV%	-	-	-	-	-	-	-	11%	-	-	3%	-	-	-	4%	-	5%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:15 PM	0	18	5	19	*42*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	0	16	5	19	*40*	0	0	0	0	*0*	1	0	1	0	*2*
4:45 PM	0	8	4	17	*29*	0	0	0	0	*0*	1	0	0	0	*1*
5:00 PM	0	14	1	12	*27*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	0	56	15	67	*138*	0	0	0	0	*0*	2	0	1	0	*3*

Three-Hour Count Summaries

Interval Start	0				SR 167 SB Ramp				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	133	0	0	136	0	0	0	465	0	734	0
3:15 PM	0	0	0	0	0	0	0	125	0	0	154	0	0	0	382	0	661	0
3:30 PM	0	0	0	0	0	0	0	146	0	0	137	0	0	0	396	0	679	0
3:45 PM	0	0	0	0	0	0	0	144	0	0	123	0	0	0	475	0	742	2,816
4:00 PM	0	0	0	0	0	0	0	136	0	0	123	0	0	0	418	0	677	2,759
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**148**	**0**	**0**	**151**	**0**	**0**	**0**	**423**	**0**	**722**	2,820
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**132**	**0**	**0**	**134**	**0**	**0**	**0**	**455**	**0**	**721**	2,862
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**117**	**0**	**0**	**154**	**0**	**0**	**0**	**451**	**0**	**722**	2,842
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**134**	**0**	**0**	**133**	**0**	**0**	**0**	**462**	**0**	**729**	**2,894**
5:15 PM	0	0	0	0	0	0	0	116	0	0	137	0	0	0	449	0	702	2,874
5:30 PM	0	0	0	0	0	0	0	116	0	0	132	0	0	0	460	0	708	2,861
5:45 PM	0	0	0	0	0	0	0	126	0	0	120	0	0	0	443	0	689	2,828
Count Total	0	0	0	0	0	0	0	1,573	0	0	1,634	0	0	0	5,279	0	8,486	0
Peak Hour All	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**531**	**0**	**0**	**572**	**0**	**0**	**0**	**1,791**	**0**	**2,894**	**0**
HV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**56**	**0**	**0**	**15**	**0**	**0**	**0**	**67**	**0**	**138**	**0**
HV%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**11%**	**-**	**-**	**3%**	**-**	**-**	**-**	**4%**	**-**	**5%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	0	16	6	30	*52*	0	0	0	0	*0*	1	0	0	0	*1*
3:15 PM	0	17	6	25	*48*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	0	22	5	34	*61*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	0	22	3	23	*48*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	0	16	6	21	*43*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	**0**	**18**	**5**	**19**	***42***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:30 PM	**0**	**16**	**5**	**19**	***40***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**1**	**0**	*2*
4:45 PM	**0**	**8**	**4**	**17**	***29***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	*1*
5:00 PM	**0**	**14**	**1**	**12**	***27***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
5:15 PM	0	10	0	14	*24*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	23	4	17	*44*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	0	18	2	15	*35*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	0	200	47	246	*493*	0	0	0	0	*0*	3	0	1	0	*4*
Peak Hr	**0**	**56**	**15**	**67**	***138***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**1**	**0**	***3***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	0				SR 167 SB Ramp				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	16	0	0	6	0	0	0	30	0	52	0
3:15 PM	0	0	0	0	0	0	0	17	0	0	6	0	0	0	25	0	48	0
3:30 PM	0	0	0	0	0	0	0	22	0	0	5	0	0	0	34	0	61	0
3:45 PM	0	0	0	0	0	0	0	22	0	0	3	0	0	0	23	0	48	209
4:00 PM	0	0	0	0	0	0	0	16	0	0	6	0	0	0	21	0	43	200
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**0**	**0**	**5**	**0**	**0**	**0**	**19**	**0**	**42**	194
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**16**	**0**	**0**	**5**	**0**	**0**	**0**	**19**	**0**	**40**	173
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**4**	**0**	**0**	**0**	**17**	**0**	**29**	154
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**0**	**1**	**0**	**0**	**0**	**12**	**0**	**27**	**138**
5:15 PM	0	0	0	0	0	0	0	10	0	0	0	0	0	0	14	0	24	120
5:30 PM	0	0	0	0	0	0	0	23	0	0	4	0	0	0	17	0	44	124
5:45 PM	0	0	0	0	0	0	0	18	0	0	2	0	0	0	15	0	35	130
Count Total	0	0	0	0	0	0	0	200	0	0	47	0	0	0	246	0	493	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**56**	**0**	**0**	**15**	**0**	**0**	**0**	**67**	**0**	**138**	**0**

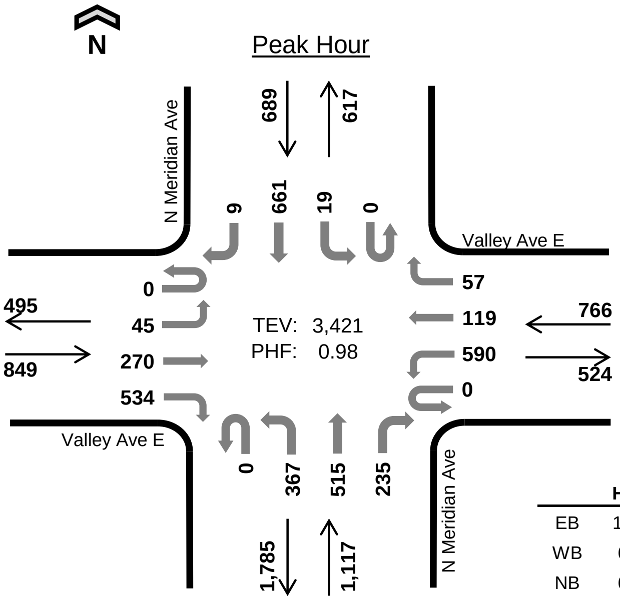
Three-Hour Count Summaries - Bikes

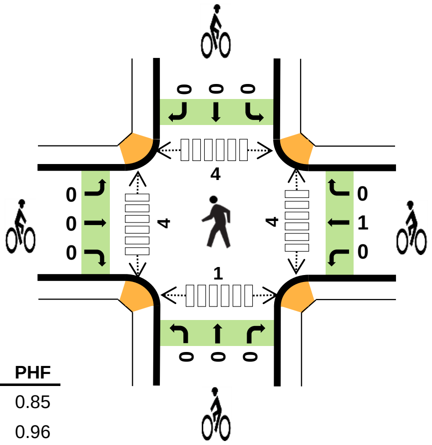
Interval Start	0			SR 167 SB Ramp			N Meridian Ave			N Meridian Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

N Meridian Ave
Valley Ave E

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM





	HV %:	PHF
EB	10.6%	0.85
WB	6.0%	0.96
NB	6.5%	0.89
SB	3.6%	0.91
TOTAL	6.8%	0.98

Three-Hour Count Summaries

Interval Start		Valley Ave E				Valley Ave E				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:15 PM		0	9	63	118	0	158	27	14	0	99	137	78	0	5	146	1	855	0
4:30 PM		0	17	84	149	0	149	35	9	0	82	125	53	0	5	162	3	873	0
4:45 PM		0	9	50	126	0	148	27	22	0	103	121	45	0	6	172	0	829	0
5:00 PM		0	10	73	141	0	135	30	12	0	83	132	59	0	3	181	5	864	3,421
Peak Hour	All	0	45	270	534	0	590	119	57	0	367	515	235	0	19	661	9	3,421	0
	HV	0	4	59	27	0	17	27	2	0	59	7	7	0	0	23	2	234	0
	HV%	-	9%	22%	5%	-	3%	23%	4%	-	16%	1%	3%	-	0%	3%	22%	7%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:15 PM	22	8	24	9	*63*	0	0	0	0	*0*	2	1	1	1	*5*
4:30 PM	28	12	23	7	*70*	0	1	0	0	*1*	0	2	1	0	*3*
4:45 PM	18	15	11	5	*49*	0	0	0	0	*0*	2	1	2	0	*5*
5:00 PM	22	11	15	4	*52*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	90	46	73	25	*234*	0	1	0	0	*1*	4	4	4	1	*13*

Three-Hour Count Summaries

Interval Start	Valley Ave E				Valley Ave E				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	5	73	140	0	112	41	17	0	99	120	66	0	2	210	3	888	0
3:15 PM	0	18	66	88	0	115	37	16	0	76	126	63	0	9	180	2	796	0
3:30 PM	0	11	78	105	0	139	37	17	0	86	114	72	0	3	156	3	821	0
3:45 PM	0	8	53	142	0	138	36	25	0	88	109	67	0	2	197	3	868	3,373
4:00 PM	0	12	70	103	0	150	23	12	0	92	107	65	0	2	164	4	804	3,289
4:15 PM	**0**	**9**	**63**	**118**	**0**	**158**	**27**	**14**	**0**	**99**	**137**	**78**	**0**	**5**	**146**	**1**	**855**	3,348
4:30 PM	**0**	**17**	**84**	**149**	**0**	**149**	**35**	**9**	**0**	**82**	**125**	**53**	**0**	**5**	**162**	**3**	**873**	3,400
4:45 PM	**0**	**9**	**50**	**126**	**0**	**148**	**27**	**22**	**0**	**103**	**121**	**45**	**0**	**6**	**172**	**0**	**829**	3,361
5:00 PM	**0**	**10**	**73**	**141**	**0**	**135**	**30**	**12**	**0**	**83**	**132**	**59**	**0**	**3**	**181**	**5**	**864**	**3,421**
5:15 PM	0	7	73	100	0	152	31	18	1	78	124	62	0	4	195	1	846	3,412
5:30 PM	0	4	58	122	0	151	34	15	0	82	111	51	0	7	189	1	825	3,364
5:45 PM	0	7	46	97	0	153	32	14	0	63	107	61	0	8	195	2	785	3,320
Count Total	0	117	787	1,431	0	1,700	390	191	1	1,031	1,433	742	0	56	2,147	28	10,054	0
Peak Hour All	**0**	**45**	**270**	**534**	**0**	**590**	**119**	**57**	**0**	**367**	**515**	**235**	**0**	**19**	**661**	**9**	**3,421**	**0**
HV	**0**	**4**	**59**	**27**	**0**	**17**	**27**	**2**	**0**	**59**	**7**	**7**	**0**	**0**	**23**	**2**	**234**	**0**
HV%	**-**	**9%**	**22%**	**5%**	**-**	**3%**	**23%**	**4%**	**-**	**16%**	**1%**	**3%**	**-**	**0%**	**3%**	**22%**	**7%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	41	13	26	7	*87*	0	0	0	0	*0*	2	1	0	1	*4*
3:15 PM	38	21	20	12	*91*	0	0	0	0	*0*	0	0	0	2	*2*
3:30 PM	24	18	23	11	*76*	0	0	0	0	*0*	2	0	0	1	*3*
3:45 PM	21	17	28	2	*68*	0	0	0	0	*0*	1	0	1	1	*3*
4:00 PM	23	12	20	9	*64*	0	0	0	0	*0*	1	1	0	1	*3*
4:15 PM	**22**	**8**	**24**	**9**	***63***	**0**	**0**	**0**	**0**	***0***	**2**	**1**	**1**	**1**	*5*
4:30 PM	**28**	**12**	**23**	**7**	***70***	**0**	**1**	**0**	**0**	***1***	**0**	**2**	**1**	**0**	*3*
4:45 PM	**18**	**15**	**11**	**5**	***49***	**0**	**0**	**0**	**0**	***0***	**2**	**1**	**2**	**0**	*5*
5:00 PM	**22**	**11**	**15**	**4**	***52***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
5:15 PM	17	12	16	2	*47*	0	0	0	0	*0*	2	0	0	0	*2*
5:30 PM	22	16	26	0	*64*	0	0	0	0	*0*	2	0	1	1	*4*
5:45 PM	20	18	15	3	*56*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	296	173	247	71	*787*	0	1	0	0	*1*	14	6	6	8	*34*
Peak Hour	**90**	**46**	**73**	**25**	***234***	**0**	**1**	**0**	**0**	***1***	**4**	**4**	**4**	**1**	***13***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	Valley Ave E				Valley Ave E				N Meridian Ave				N Meridian Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	1	20	20	0	3	8	2	0	16	3	7	0	0	7	0	87	0
3:15 PM	0	5	14	19	0	5	15	1	0	14	4	2	0	4	7	1	91	0
3:30 PM	0	1	8	15	0	4	14	0	0	15	5	3	0	1	9	1	76	0
3:45 PM	0	0	9	12	0	9	8	0	0	19	5	4	0	0	2	0	68	322
4:00 PM	0	0	13	10	0	4	8	0	0	17	1	2	0	1	7	1	64	299
4:15 PM	**0**	**2**	**12**	**8**	**0**	**2**	**5**	**1**	**0**	**17**	**4**	**3**	**0**	**0**	**9**	**0**	**63**	271
4:30 PM	**0**	**1**	**21**	**6**	**0**	**6**	**6**	**0**	**0**	**21**	**0**	**2**	**0**	**0**	**7**	**0**	**70**	265
4:45 PM	**0**	**0**	**13**	**5**	**0**	**7**	**8**	**0**	**0**	**8**	**2**	**1**	**0**	**0**	**5**	**0**	**49**	246
5:00 PM	**0**	**1**	**13**	**8**	**0**	**2**	**8**	**1**	**0**	**13**	**1**	**1**	**0**	**0**	**2**	**2**	**52**	**234**
5:15 PM	0	1	8	8	0	4	8	0	0	10	3	3	0	0	2	0	47	218
5:30 PM	0	0	10	12	0	5	11	0	0	18	6	2	0	0	0	0	64	212
5:45 PM	0	1	9	10	0	3	15	0	0	12	3	0	0	0	2	1	56	219
Count Total	0	13	150	133	0	54	114	5	0	180	37	30	0	6	59	6	787	0
Peak Hour	**0**	**4**	**59**	**27**	**0**	**17**	**27**	**2**	**0**	**59**	**7**	**7**	**0**	**0**	**23**	**2**	**234**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	Valley Ave E			Valley Ave E			N Meridian Ave			N Meridian Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:30 PM	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	1
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Peak Hour	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**

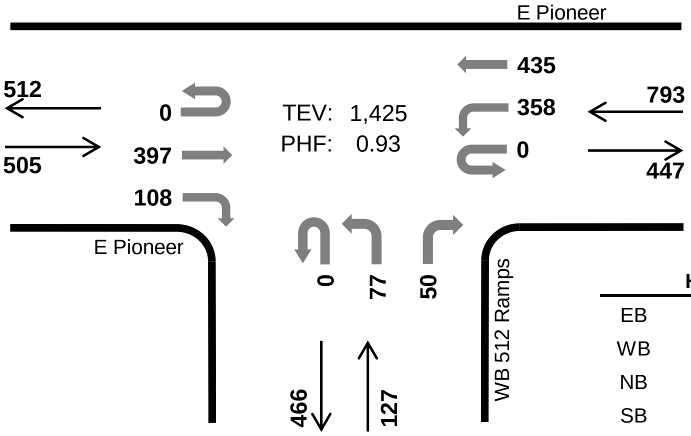
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

WB 512 Ramps
E Pioneer

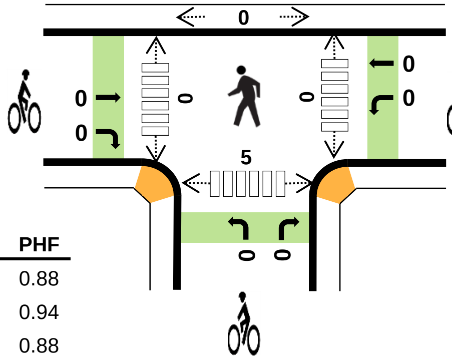
N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM



	HV %:	PHF
EB	0.6%	0.88
WB	1.6%	0.94
NB	3.9%	0.88
SB	-	-
TOTAL	1.5%	0.93



Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				WB 512 Ramps				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:15 PM		0	0	89	19	0	96	104	0	0	24	0	7	0	0	0	0	339	0
4:30 PM		0	0	110	34	0	91	121	0	0	15	0	14	0	0	0	0	385	0
4:45 PM		0	0	81	36	0	89	106	0	0	21	0	10	0	0	0	0	343	0
5:00 PM		0	0	117	19	0	82	104	0	0	17	0	19	0	0	0	0	358	1,425
Peak Hour	All	0	0	397	108	0	358	435	0	0	77	0	50	0	0	0	0	1,425	0
	HV	0	0	3	0	0	7	6	0	0	1	0	4	0	0	0	0	21	0
	HV%	-	-	1%	0%	-	2%	1%	-	-	1%	-	8%	-	-	-	-	1%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:15 PM	1	3	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	0	6	1	0	*7*	0	0	0	0	*0*	0	0	0	5	*5*
4:45 PM	1	3	1	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	1	1	3	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	3	13	5	0	*21*	0	0	0	0	*0*	0	0	0	5	*5*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				WB 512 Ramps				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	84	25	0	66	97	0	0	22	0	13	0	0	0	0	307	0
3:15 PM	0	0	84	17	0	74	98	0	0	27	0	11	0	0	0	0	311	0
3:30 PM	0	0	71	23	0	71	105	0	0	35	0	16	0	0	0	0	321	0
3:45 PM	0	0	79	18	0	67	104	0	1	22	0	7	0	0	0	0	298	1,237
4:00 PM	0	0	78	16	0	111	108	0	0	22	0	20	0	0	0	0	355	1,285
4:15 PM	**0**	**0**	**89**	**19**	**0**	**96**	**104**	**0**	**0**	**24**	**0**	**7**	**0**	**0**	**0**	**0**	**339**	1,313
4:30 PM	**0**	**0**	**110**	**34**	**0**	**91**	**121**	**0**	**0**	**15**	**0**	**14**	**0**	**0**	**0**	**0**	**385**	1,377
4:45 PM	**0**	**0**	**81**	**36**	**0**	**89**	**106**	**0**	**0**	**21**	**0**	**10**	**0**	**0**	**0**	**0**	**343**	1,422
5:00 PM	**0**	**0**	**117**	**19**	**0**	**82**	**104**	**0**	**0**	**17**	**0**	**19**	**0**	**0**	**0**	**0**	**358**	**1,425**
5:15 PM	0	0	79	11	0	89	113	0	0	21	0	12	0	0	0	0	325	1,411
5:30 PM	1	0	89	15	0	68	99	0	0	16	0	16	0	0	0	0	304	1,330
5:45 PM	0	0	65	14	0	74	100	0	0	16	0	14	0	0	0	0	283	1,270
Count Total	1	0	1,026	247	0	978	1,259	0	1	258	0	159	0	0	0	0	3,929	0
Peak Hour All	**0**	**0**	**397**	**108**	**0**	**358**	**435**	**0**	**0**	**77**	**0**	**50**	**0**	**0**	**0**	**0**	**1,425**	**0**
HV	**0**	**0**	**3**	**0**	**0**	**7**	**6**	**0**	**0**	**1**	**0**	**4**	**0**	**0**	**0**	**0**	**21**	**0**
HV%	**-**	**-**	**1%**	**0%**	**-**	**2%**	**1%**	**-**	**-**	**1%**	**-**	**8%**	**-**	**-**	**-**	**-**	**1%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	2	5	0	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	2	6	3	0	*11*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	1	9	2	0	*12*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	3	5	0	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	2	7	2	0	*11*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	**1**	**3**	**0**	**0**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:30 PM	**0**	**6**	**1**	**0**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**5**	*5*
4:45 PM	**1**	**3**	**1**	**0**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
5:00 PM	**1**	**1**	**3**	**0**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
5:15 PM	2	2	0	0	*4*	0	0	0	0	*0*	0	0	0	1	*1*
5:30 PM	5	3	2	0	*10*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	1	0	3	0	*4*	0	0	0	0	*0*	0	0	0	2	*2*
Count Total	21	50	17	0	*88*	0	0	0	0	*0*	0	0	0	8	*8*
Peak Hr	**3**	**13**	**5**	**0**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**5**	***5***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				WB 512 Ramps				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	2	0	2	3	0	0	0	0	0	0	0	0	0	7	0
3:15 PM	0	0	2	0	0	2	4	0	0	1	0	2	0	0	0	0	11	0
3:30 PM	0	0	1	0	0	4	5	0	0	1	0	1	0	0	0	0	12	0
3:45 PM	0	0	2	1	0	4	1	0	0	0	0	0	0	0	0	0	8	38
4:00 PM	0	0	2	0	0	1	6	0	0	1	0	1	0	0	0	0	11	42
4:15 PM	**0**	**0**	**1**	**0**	**0**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	35
4:30 PM	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**7**	30
4:45 PM	**0**	**0**	**1**	**0**	**0**	**1**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	27
5:00 PM	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**5**	**21**
5:15 PM	0	0	2	0	0	1	1	0	0	0	0	0	0	0	0	0	4	21
5:30 PM	0	0	4	1	0	0	3	0	0	2	0	0	0	0	0	0	10	24
5:45 PM	0	0	0	1	0	0	0	0	0	1	0	2	0	0	0	0	4	23
Count Total	0	0	16	5	0	21	29	0	0	7	0	10	0	0	0	0	88	0
Peak Hour	**0**	**0**	**3**	**0**	**0**	**7**	**6**	**0**	**0**	**1**	**0**	**4**	**0**	**0**	**0**	**0**	**21**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	E Pioneer			E Pioneer			WB 512 Ramps			0			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

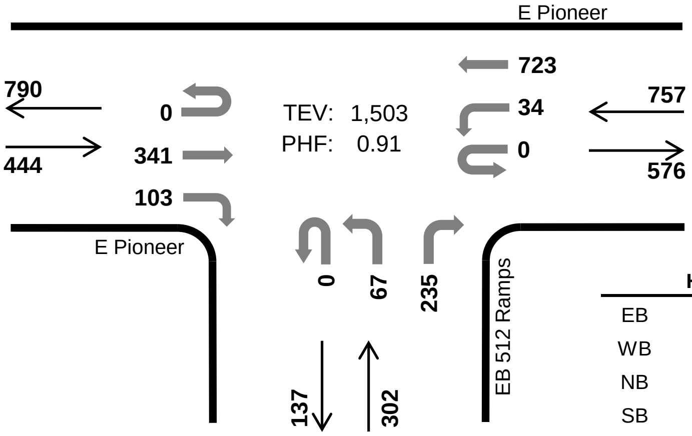
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

EB 512 Ramps
E Pioneer

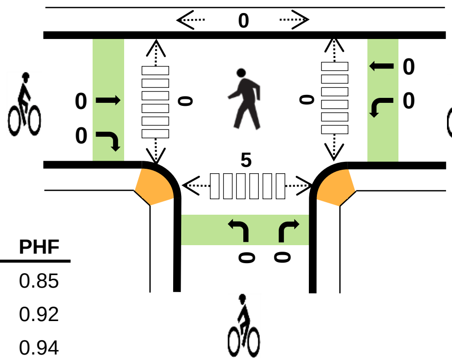
N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM



	HV %:	PHF
EB	1.1%	0.85
WB	1.3%	0.92
NB	4.0%	0.94
SB	-	-
TOTAL	1.8%	0.91



Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				EB 512 Ramps				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:15 PM		0	0	73	20	0	12	189	0	0	13	0	56	0	0	0	0	363	0
4:30 PM		0	0	106	22	0	9	197	0	0	21	0	57	0	0	0	0	412	0
4:45 PM		0	0	60	32	0	6	165	0	0	17	0	63	0	0	0	0	343	0
5:00 PM		0	0	102	29	0	7	172	0	0	16	0	59	0	0	0	0	385	1,503
Peak Hour	All	0	0	341	103	0	34	723	0	0	67	0	235	0	0	0	0	1,503	0
	HV	0	0	4	1	0	0	10	0	0	1	0	11	0	0	0	0	27	0
	HV%	-	-	1%	1%	-	0%	1%	-	-	1%	-	5%	-	-	-	-	2%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:15 PM	1	3	3	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	1	4	1	0	*6*	0	0	0	0	*0*	0	0	0	5	*5*
4:45 PM	1	2	5	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	2	1	3	0	*6*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	5	10	12	0	*27*	0	0	0	0	*0*	0	0	0	5	*5*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				EB 512 Ramps				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	75	18	0	15	150	0	0	15	0	37	0	0	0	0	310	0
3:15 PM	0	0	80	14	0	9	164	0	0	9	0	43	0	0	0	0	319	0
3:30 PM	0	0	75	19	0	15	153	0	0	21	0	41	0	0	0	0	324	0
3:45 PM	0	0	70	15	0	7	160	0	0	18	0	70	0	0	0	0	340	1,293
4:00 PM	0	0	73	27	0	6	192	0	0	16	0	59	0	0	0	0	373	1,356
4:15 PM	**0**	**0**	**73**	**20**	**0**	**12**	**189**	**0**	**0**	**13**	**0**	**56**	**0**	**0**	**0**	**0**	**363**	1,400
4:30 PM	**0**	**0**	**106**	**22**	**0**	**9**	**197**	**0**	**0**	**21**	**0**	**57**	**0**	**0**	**0**	**0**	**412**	1,488
4:45 PM	**0**	**0**	**60**	**32**	**0**	**6**	**165**	**0**	**0**	**17**	**0**	**63**	**0**	**0**	**0**	**0**	**343**	1,491
5:00 PM	**0**	**0**	**102**	**29**	**0**	**7**	**172**	**0**	**0**	**16**	**0**	**59**	**0**	**0**	**0**	**0**	**385**	**1,503**
5:15 PM	0	0	67	26	0	5	187	0	0	15	0	57	0	0	0	0	357	1,497
5:30 PM	0	0	76	27	0	10	142	0	0	22	0	53	0	0	0	0	330	1,415
5:45 PM	0	0	59	20	0	15	165	0	1	18	0	61	0	0	0	0	339	1,411
Count Total	0	0	916	269	0	116	2,036	0	1	201	0	656	0	0	0	0	4,195	0
Peak Hour All	**0**	**0**	**341**	**103**	**0**	**34**	**723**	**0**	**0**	**67**	**0**	**235**	**0**	**0**	**0**	**0**	**1,503**	**0**
HV	**0**	**0**	**4**	**1**	**0**	**0**	**10**	**0**	**0**	**1**	**0**	**11**	**0**	**0**	**0**	**0**	**27**	**0**
HV%	**-**	**-**	**1%**	**1%**	**-**	**0%**	**1%**	**-**	**-**	**1%**	**-**	**5%**	**-**	**-**	**-**	**-**	**2%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	1	5	2	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	3	5	2	0	*10*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	2	9	3	0	*14*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	2	6	3	0	*11*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	3	9	4	0	*16*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	**1**	**3**	**3**	**0**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:30 PM	**1**	**4**	**1**	**0**	***6***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**5**	*5*
4:45 PM	**1**	**2**	**5**	**0**	***8***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
5:00 PM	**2**	**1**	**3**	**0**	***6***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
5:15 PM	2	2	0	0	*4*	0	0	0	0	*0*	0	0	0	1	*1*
5:30 PM	4	3	1	0	*8*	0	0	0	0	*0*	0	0	0	1	*1*
5:45 PM	4	1	2	0	*7*	0	0	0	0	*0*	0	0	0	2	*2*
Count Total	26	50	29	0	*105*	0	0	0	0	*0*	0	0	0	9	*9*
Peak Hr	**5**	**10**	**12**	**0**	***27***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**5**	***5***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				EB 512 Ramps				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	1	0	0	0	5	0	0	0	0	2	0	0	0	0	8	0
3:15 PM	0	0	2	1	0	0	5	0	0	0	0	2	0	0	0	0	10	0
3:30 PM	0	0	2	0	0	0	9	0	0	0	0	3	0	0	0	0	14	0
3:45 PM	0	0	2	0	0	0	6	0	0	0	0	3	0	0	0	0	11	43
4:00 PM	0	0	2	1	0	0	9	0	0	0	0	4	0	0	0	0	16	51
4:15 PM	**0**	**0**	**1**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**7**	48
4:30 PM	**0**	**0**	**1**	**0**	**0**	**0**	**4**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	40
4:45 PM	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**8**	37
5:00 PM	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**6**	**27**
5:15 PM	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	4	24
5:30 PM	0	0	2	2	0	1	2	0	0	0	0	1	0	0	0	0	8	26
5:45 PM	0	0	2	2	0	0	1	0	0	0	0	2	0	0	0	0	7	25
Count Total	0	0	19	7	0	1	49	0	0	1	0	28	0	0	0	0	105	0
Peak Hour	**0**	**0**	**4**	**1**	**0**	**0**	**10**	**0**	**0**	**1**	**0**	**11**	**0**	**0**	**0**	**0**	**27**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	E Pioneer			E Pioneer			EB 512 Ramps			0			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

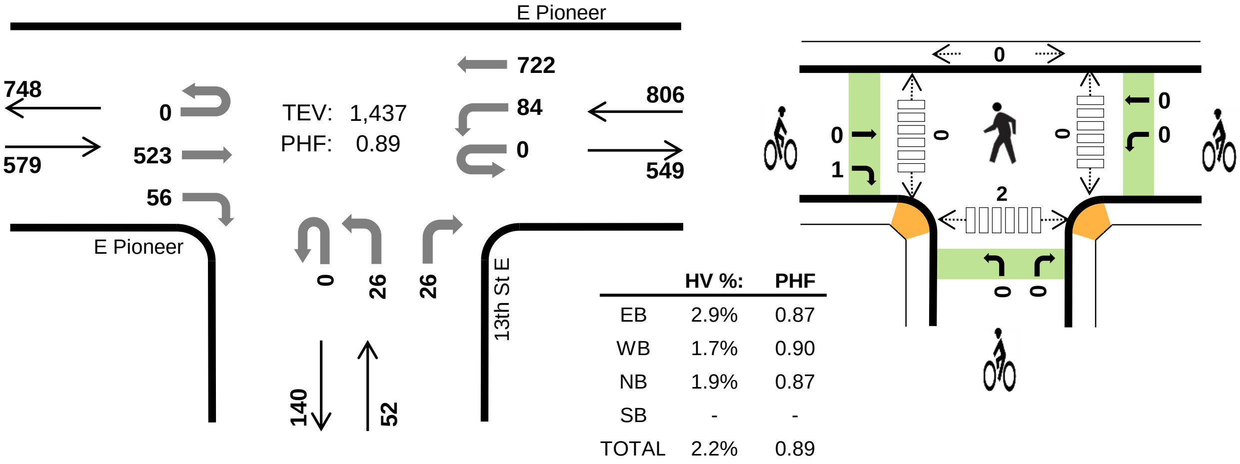
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

13th St E
E Pioneer

N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM



	HV %:	PHF
EB	2.9%	0.87
WB	1.7%	0.90
NB	1.9%	0.87
SB	-	-
TOTAL	2.2%	0.89

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				13th St E				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:15 PM		0	0	119	10	0	16	187	0	0	8	0	7	0	0	0	0	347	0
4:30 PM		0	0	150	16	0	21	203	0	0	6	0	6	0	0	0	0	402	0
4:45 PM		0	0	109	14	0	12	161	0	0	8	0	6	0	0	0	0	310	0
5:00 PM		0	0	145	16	0	35	171	0	0	4	0	7	0	0	0	0	378	1,437
Peak Hour	All	0	0	523	56	0	84	722	0	0	26	0	26	0	0	0	0	1,437	0
	HV	0	0	16	1	0	1	13	0	0	1	0	0	0	0	0	0	32	0
	HV%	-	-	3%	2%	-	1%	2%	-	-	4%	-	0%	-	-	-	-	2%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:15 PM	3	5	0	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	1	6	1	0	*8*	1	0	0	0	*1*	0	0	0	2	*2*
4:45 PM	7	2	0	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	6	1	0	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	17	14	1	0	*32*	1	0	0	0	*1*	0	0	0	2	*2*

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				13th St E				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM		0	0	105	7	0	7	165	0	0	6	0	6	0	0	0	0	296	0
3:15 PM		0	0	119	5	0	7	173	0	0	2	0	14	0	0	0	0	320	0
3:30 PM		0	0	102	12	0	9	153	0	0	6	0	8	0	0	0	0	290	0
3:45 PM		0	0	132	8	0	7	167	0	0	3	0	13	0	0	0	0	330	1,236
4:00 PM		0	0	118	14	0	15	198	0	0	3	0	9	0	0	0	0	357	1,297
4:15 PM		**0**	**0**	**119**	**10**	**0**	**16**	**187**	**0**	**0**	**8**	**0**	**7**	**0**	**0**	**0**	**0**	**347**	1,324
4:30 PM		**0**	**0**	**150**	**16**	**0**	**21**	**203**	**0**	**0**	**6**	**0**	**6**	**0**	**0**	**0**	**0**	**402**	1,436
4:45 PM		**0**	**0**	**109**	**14**	**0**	**12**	**161**	**0**	**0**	**8**	**0**	**6**	**0**	**0**	**0**	**0**	**310**	1,416
5:00 PM		**0**	**0**	**145**	**16**	**0**	**35**	**171**	**0**	**0**	**4**	**0**	**7**	**0**	**0**	**0**	**0**	**378**	**1,437**
5:15 PM		0	0	105	19	0	16	188	0	0	3	0	12	0	0	0	0	343	1,433
5:30 PM		0	0	116	14	0	18	156	0	0	8	0	8	0	0	0	0	320	1,351
5:45 PM		0	0	110	10	0	17	162	0	0	10	0	7	0	0	0	0	316	1,357
Count Total		0	0	1,430	145	0	180	2,084	0	0	67	0	103	0	0	0	0	4,009	0
Peak Hour	**All**	**0**	**0**	**523**	**56**	**0**	**84**	**722**	**0**	**0**	**26**	**0**	**26**	**0**	**0**	**0**	**0**	**1,437**	**0**
	HV	**0**	**0**	**16**	**1**	**0**	**1**	**13**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**32**	**0**
	HV%	**-**	**-**	**3%**	**2%**	**-**	**1%**	**2%**	**-**	**-**	**4%**	**-**	**0%**	**-**	**-**	**-**	**-**	**2%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	4	5	1	0	*10*	0	0	0	0	*0*	0	0	0	1	*1*
3:15 PM	4	6	0	0	*10*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	4	8	0	0	*12*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	5	6	0	0	*11*	0	0	0	0	*0*	0	0	0	1	*1*
4:00 PM	6	5	0	0	*11*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	**3**	**5**	**0**	**0**	***8***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:30 PM	**1**	**6**	**1**	**0**	***8***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**2**	*2*
4:45 PM	**7**	**2**	**0**	**0**	***9***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
5:00 PM	**6**	**1**	**0**	**0**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
5:15 PM	2	4	0	0	*6*	0	0	0	0	*0*	0	0	0	1	*1*
5:30 PM	3	2	1	0	*6*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	2	1	0	0	*3*	0	0	0	0	*0*	0	0	0	3	*3*
Count Total	47	51	3	0	*101*	1	0	0	0	*1*	0	0	0	8	*8*
Peak Hr	**17**	**14**	**1**	**0**	***32***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**2**	***2***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				13th St E				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	4	0	0	0	5	0	0	0	0	1	0	0	0	0	10	0
3:15 PM	0	0	4	0	0	0	6	0	0	0	0	0	0	0	0	0	10	0
3:30 PM	0	0	4	0	0	0	8	0	0	0	0	0	0	0	0	0	12	0
3:45 PM	0	0	5	0	0	0	6	0	0	0	0	0	0	0	0	0	11	43
4:00 PM	0	0	6	0	0	0	5	0	0	0	0	0	0	0	0	0	11	44
4:15 PM	**0**	**0**	**2**	**1**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	42
4:30 PM	**0**	**0**	**1**	**0**	**0**	**1**	**5**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	38
4:45 PM	**0**	**0**	**7**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	36
5:00 PM	**0**	**0**	**6**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**32**
5:15 PM	0	0	2	0	0	2	2	0	0	0	0	0	0	0	0	0	6	30
5:30 PM	0	0	3	0	0	0	2	0	0	1	0	0	0	0	0	0	6	28
5:45 PM	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	3	22
Count Total	0	0	46	1	0	3	48	0	0	2	0	1	0	0	0	0	101	0
Peak Hour	**0**	**0**	**16**	**1**	**0**	**1**	**13**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**32**	**0**

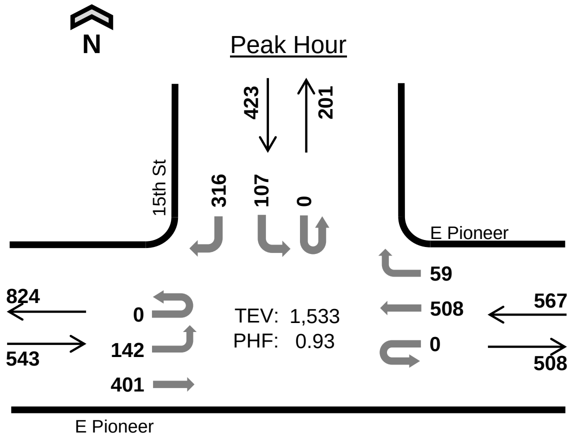
Three-Hour Count Summaries - Bikes

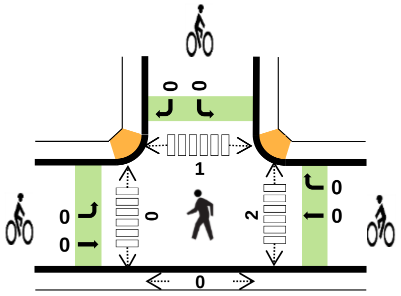
Interval Start	E Pioneer			E Pioneer			13th St E			0			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:30 PM	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	1
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Peak Hour	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

15th St
E Pioneer

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:45 PM to 4:45 PM





	HV %:	PHF
EB	2.8%	0.93
WB	3.0%	0.93
NB	-	-
SB	1.7%	0.85
TOTAL	2.5%	0.93

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				0				15th St				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:45 PM		0	40	97	0	0	0	119	15	0	0	0	0	0	32	0	62	365	0
4:00 PM		0	31	102	0	0	0	128	12	0	0	0	0	0	34	0	85	392	0
4:15 PM		0	30	97	0	0	0	133	19	0	0	0	0	0	12	0	73	364	0
4:30 PM		0	41	105	0	0	0	128	13	0	0	0	0	0	29	0	96	412	1,533
Peak Hour	All	0	142	401	0	0	0	508	59	0	0	0	0	0	107	0	316	1,533	0
	HV	0	7	8	0	0	0	17	0	0	0	0	0	0	3	0	4	39	0
	HV%	-	5%	2%	-	-	-	3%	0%	-	-	-	-	-	3%	-	1%	3%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:45 PM	5	5	0	1	*11*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	4	6	0	2	*12*	0	0	0	0	*0*	1	0	1	0	*2*
4:15 PM	3	2	0	2	*7*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	3	4	0	2	*9*	0	0	0	0	*0*	1	0	0	0	*1*
Peak Hour	15	17	0	7	*39*	0	0	0	0	*0*	2	0	1	0	*3*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				0				15th St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	27	85	0	0	0	120	20	0	0	0	0	0	28	0	57	337	0
3:15 PM	0	45	79	0	0	0	118	17	0	0	0	0	0	26	0	64	349	0
3:30 PM	0	31	85	0	0	0	93	12	0	0	0	0	0	34	0	61	316	0
3:45 PM	**0**	**40**	**97**	**0**	**0**	**0**	**119**	**15**	**0**	**0**	**0**	**0**	**0**	**32**	**0**	**62**	**365**	1,367
4:00 PM	**0**	**31**	**102**	**0**	**0**	**0**	**128**	**12**	**0**	**0**	**0**	**0**	**0**	**34**	**0**	**85**	**392**	1,422
4:15 PM	**0**	**30**	**97**	**0**	**0**	**0**	**133**	**19**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**73**	**364**	1,437
4:30 PM	**0**	**41**	**105**	**0**	**0**	**0**	**128**	**13**	**0**	**0**	**0**	**0**	**0**	**29**	**0**	**96**	**412**	**1,533**
4:45 PM	0	36	82	0	0	0	125	12	0	0	0	0	0	32	0	49	336	1,504
5:00 PM	0	37	116	0	0	0	112	14	0	0	0	0	0	34	0	89	402	1,514
5:15 PM	0	28	77	0	0	0	127	14	0	0	0	0	0	37	0	74	357	1,507
5:30 PM	0	37	98	0	0	0	116	19	0	0	0	0	0	32	0	55	357	1,452
5:45 PM	0	25	90	0	0	0	108	20	0	0	0	0	0	30	0	66	339	1,455
Count Total	0	408	1,113	0	0	0	1,427	187	0	0	0	0	0	360	0	831	4,326	0
Peak Hour All	**0**	**142**	**401**	**0**	**0**	**0**	**508**	**59**	**0**	**0**	**0**	**0**	**0**	**107**	**0**	**316**	**1,533**	**0**
HV	**0**	**7**	**8**	**0**	**0**	**0**	**17**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**4**	**39**	**0**
HV%	**-**	**5%**	**2%**	**-**	**-**	**-**	**3%**	**0%**	**-**	**-**	**-**	**-**	**-**	**3%**	**-**	**1%**	**3%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	4	4	0	4	*12*	0	0	0	0	*0*	1	0	1	0	*2*
3:15 PM	3	6	0	2	*11*	0	0	0	0	*0*	1	0	0	0	*1*
3:30 PM	6	4	0	3	*13*	0	0	0	0	*0*	1	0	0	0	*1*
3:45 PM	**5**	**5**	**0**	**1**	***11***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:00 PM	**4**	**6**	**0**	**2**	***12***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**1**	**0**	*2*
4:15 PM	**3**	**2**	**0**	**2**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:30 PM	**3**	**4**	**0**	**2**	***9***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
4:45 PM	6	2	0	0	*8*	0	0	0	0	*0*	1	0	2	0	*3*
5:00 PM	5	1	0	2	*8*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	2	5	0	2	*9*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	4	1	0	1	*6*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	2	0	0	0	*2*	1	1	0	0	*2*	0	0	0	0	*0*
Count Total	47	40	0	21	*108*	1	1	0	0	*2*	6	0	4	0	*10*
Peak Hr	**15**	**17**	**0**	**7**	***39***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**1**	**0**	***3***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				0				15th St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	1	3	0	0	0	4	0	0	0	0	0	0	2	0	2	12	0
3:15 PM	0	1	2	0	0	0	6	0	0	0	0	0	0	1	0	1	11	0
3:30 PM	0	2	4	0	0	0	4	0	0	0	0	0	0	0	0	3	13	0
3:45 PM	**0**	**2**	**3**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**11**	47
4:00 PM	**0**	**2**	**2**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**12**	47
4:15 PM	**0**	**2**	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**7**	43
4:30 PM	**0**	**1**	**2**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**9**	**39**
4:45 PM	0	5	1	0	0	0	2	0	0	0	0	0	0	0	0	0	8	36
5:00 PM	0	1	4	0	0	0	1	0	0	0	0	0	0	1	0	1	8	32
5:15 PM	0	1	1	0	0	0	4	1	0	0	0	0	0	2	0	0	9	34
5:30 PM	0	2	2	0	0	0	1	0	0	0	0	0	0	0	0	1	6	31
5:45 PM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	25
Count Total	0	20	27	0	0	0	39	1	0	0	0	0	0	9	0	12	108	0
Peak Hour	**0**	**7**	**8**	**0**	**0**	**0**	**17**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**4**	**39**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	E Pioneer			E Pioneer			0			15th St			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	1	0	0	0	1	0	0	0	0	0	0	2	2
Count Total	0	1	0	0	0	1	0	0	0	0	0	0	2	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

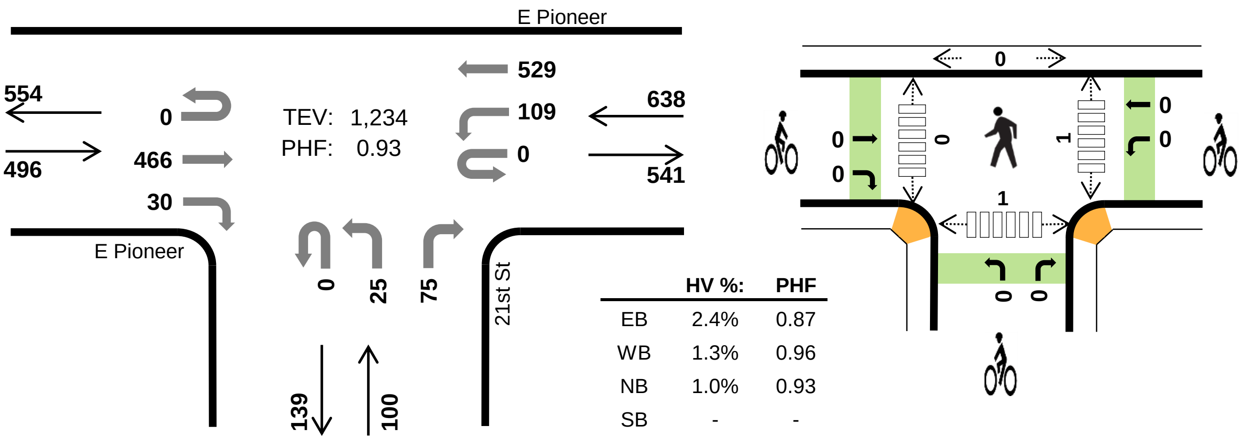
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

21st St
E Pioneer

N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 5:00 PM to 6:00 PM



	HV %:	PHF
EB	2.4%	0.87
WB	1.3%	0.96
NB	1.0%	0.93
SB	-	-
TOTAL	1.7%	0.93

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				21st St				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
5:00 PM		0	0	140	3	0	31	134	0	0	3	0	22	0	0	0	0	333	0
5:15 PM		0	0	107	3	0	24	143	0	0	4	0	23	0	0	0	0	304	0
5:30 PM		0	0	110	19	0	30	123	0	0	13	0	14	0	0	0	0	309	0
5:45 PM		0	0	109	5	0	24	129	0	0	5	0	16	0	0	0	0	288	1,234
Peak Hour	All	0	0	466	30	0	109	529	0	0	25	0	75	0	0	0	0	1,234	0
	HV	0	0	10	2	0	1	7	0	0	0	0	1	0	0	0	0	21	0
	HV%	-	-	2%	7%	-	1%	1%	-	-	0%	-	1%	-	-	-	-	2%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
5:00 PM	6	1	0	0	*7*	0	0	0	0	*0*	0	0	0	1	*1*
5:15 PM	3	5	1	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	1	1	0	0	*2*	0	0	0	0	*0*	1	0	0	0	*1*
5:45 PM	2	1	0	0	*3*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	12	8	1	0	*21*	0	0	0	0	*0*	1	0	0	1	*2*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				21st St				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	114	5	0	20	125	0	0	5	0	20	0	0	0	0	289	0
3:15 PM	0	0	95	7	0	24	122	0	0	15	0	20	0	0	0	0	283	0
3:30 PM	0	0	110	5	0	22	108	0	0	6	0	20	0	0	0	0	271	0
3:45 PM	0	0	114	9	0	31	126	0	0	12	0	18	0	0	0	0	310	1,153
4:00 PM	0	0	119	7	0	18	139	0	0	5	0	15	0	0	0	0	303	1,167
4:15 PM	0	0	94	8	0	17	138	0	0	4	0	17	0	0	0	0	278	1,162
4:30 PM	0	0	116	6	0	16	145	0	0	5	0	10	0	0	0	0	298	1,189
4:45 PM	0	0	96	12	1	15	131	0	0	4	0	15	0	0	0	0	274	1,153
5:00 PM	**0**	**0**	**140**	**3**	**0**	**31**	**134**	**0**	**0**	**3**	**0**	**22**	**0**	**0**	**0**	**0**	**333**	1,183
5:15 PM	**0**	**0**	**107**	**3**	**0**	**24**	**143**	**0**	**0**	**4**	**0**	**23**	**0**	**0**	**0**	**0**	**304**	1,209
5:30 PM	**0**	**0**	**110**	**19**	**0**	**30**	**123**	**0**	**0**	**13**	**0**	**14**	**0**	**0**	**0**	**0**	**309**	1,220
5:45 PM	**0**	**0**	**109**	**5**	**0**	**24**	**129**	**0**	**0**	**5**	**0**	**16**	**0**	**0**	**0**	**0**	**288**	**1,234**
Count Total	0	0	1,324	89	1	272	1,563	0	0	81	0	210	0	0	0	0	3,540	0
Peak Hour All	**0**	**0**	**466**	**30**	**0**	**109**	**529**	**0**	**0**	**25**	**0**	**75**	**0**	**0**	**0**	**0**	**1,234**	**0**
Peak Hour HV	**0**	**0**	**10**	**2**	**0**	**1**	**7**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**21**	**0**
Peak Hour HV%	**-**	**-**	**2%**	**7%**	**-**	**1%**	**1%**	**-**	**-**	**0%**	**-**	**1%**	**-**	**-**	**-**	**-**	**2%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	6	5	1	0	*12*	0	0	0	0	*0*	1	0	0	2	*3*
3:15 PM	3	7	0	0	*10*	0	0	1	0	*1*	1	0	0	0	*1*
3:30 PM	4	5	0	0	*9*	0	0	0	0	*0*	0	0	0	1	*1*
3:45 PM	3	4	1	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	4	5	0	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	2	3	0	0	*5*	0	0	0	0	*0*	2	0	0	1	*3*
4:30 PM	1	3	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	0	3	0	0	*3*	0	1	0	0	*1*	0	0	0	0	*0*
5:00 PM	**6**	**1**	**0**	**0**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	*1*
5:15 PM	**3**	**5**	**1**	**0**	***9***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
5:30 PM	**1**	**1**	**0**	**0**	***2***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	*1*
5:45 PM	**2**	**1**	**0**	**0**	***3***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	35	43	3	0	*81*	0	1	1	0	*2*	5	0	0	5	*10*
Peak Hr	**12**	**8**	**1**	**0**	***21***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**1**	***2***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	**E Pioneer**				**E Pioneer**				**21st St**				**0**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	6	0	0	0	5	0	0	0	0	1	0	0	0	0	12	0
3:15 PM	0	0	3	0	0	1	6	0	0	0	0	0	0	0	0	0	10	0
3:30 PM	0	0	4	0	0	0	5	0	0	0	0	0	0	0	0	0	9	0
3:45 PM	0	0	3	0	0	1	3	0	0	0	0	1	0	0	0	0	8	39
4:00 PM	0	0	4	0	0	0	5	0	0	0	0	0	0	0	0	0	9	36
4:15 PM	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	5	31
4:30 PM	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	4	26
4:45 PM	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	21
5:00 PM	**0**	**0**	**6**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	19
5:15 PM	**0**	**0**	**2**	**1**	**0**	**1**	**4**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**9**	23
5:30 PM	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	21
5:45 PM	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**21**
Count Total	0	0	33	2	0	3	40	0	0	0	0	3	0	0	0	0	81	0
Peak Hour	**0**	**0**	**10**	**2**	**0**	**1**	**7**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**21**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	**E Pioneer**			**E Pioneer**			**21st St**			**0**			**15-min Total**	**Rolling One Hour**
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	1	0	0	0	0	0	0	0	0	1	1
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
5:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
5:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
5:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Count Total	0	0	0	1	0	0	0	0	1	0	0	0	2	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

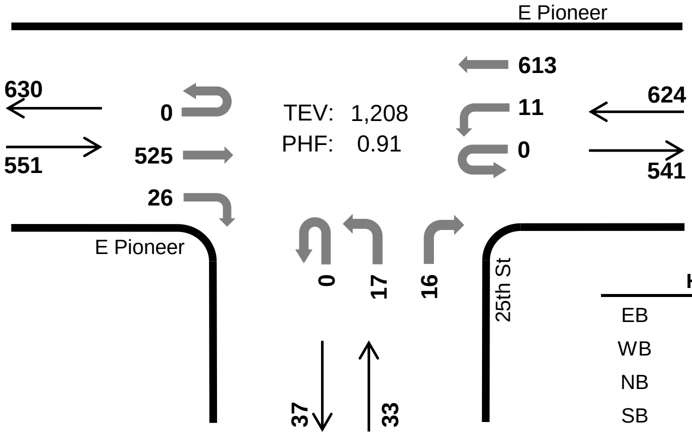
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

25th St
E Pioneer

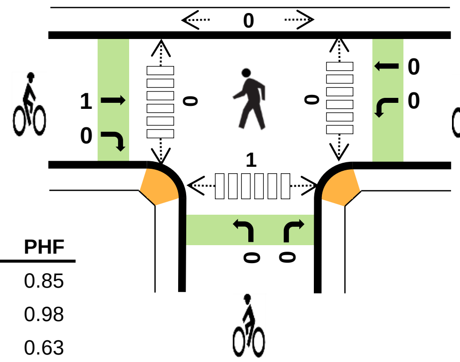
N

Peak Hour

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 5:00 PM to 6:00 PM



	HV %:	PHF
EB	2.0%	0.85
WB	1.3%	0.98
NB	0.0%	0.63
SB	-	-
TOTAL	1.6%	0.91



Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				25th St				0				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
5:00 PM		0	0	159	4	0	1	159	0	0	6	0	4	0	0	0	0	333	0
5:15 PM		0	0	123	8	0	3	148	0	0	3	0	3	0	0	0	0	288	0
5:30 PM		0	0	120	10	0	2	158	0	0	5	0	8	0	0	0	0	303	0
5:45 PM		0	0	123	4	0	5	148	0	0	3	0	1	0	0	0	0	284	1,208
Peak Hour	All	0	0	525	26	0	11	613	0	0	17	0	16	0	0	0	0	1,208	0
	HV	0	0	11	0	0	0	8	0	0	0	0	0	0	0	0	0	19	0
	HV%	-	-	2%	0%	-	0%	1%	-	-	0%	-	0%	-	-	-	-	2%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
5:00 PM	4	0	0	0	*4*	1	0	0	0	*1*	0	0	0	0	*0*
5:15 PM	4	6	0	0	*10*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	2	1	0	0	*3*	0	0	0	0	*0*	0	0	0	1	*1*
5:45 PM	1	1	0	0	*2*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	11	8	0	0	*19*	1	0	0	0	*1*	0	0	0	1	*1*

project.manager.wa@idaxdata.com

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				25th St				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	131	3	0	0	134	0	0	5	0	5	0	0	0	0	278	0
3:15 PM	0	0	115	0	0	0	137	0	0	3	0	0	0	0	0	0	255	0
3:30 PM	0	0	130	2	0	2	126	0	0	3	0	1	0	0	0	0	264	0
3:45 PM	0	0	133	1	0	0	158	0	0	1	0	1	0	0	0	0	294	1,091
4:00 PM	0	0	126	6	0	3	153	0	0	2	0	1	0	0	0	0	291	1,104
4:15 PM	0	0	112	4	0	0	150	0	0	1	0	5	0	0	0	0	272	1,121
4:30 PM	0	0	121	1	0	0	161	0	0	1	0	0	0	0	0	0	284	1,141
4:45 PM	0	0	109	2	0	2	144	0	0	2	0	1	0	0	0	0	260	1,107
5:00 PM	**0**	**0**	**159**	**4**	**0**	**1**	**159**	**0**	**0**	**6**	**0**	**4**	**0**	**0**	**0**	**0**	**333**	1,149
5:15 PM	**0**	**0**	**123**	**8**	**0**	**3**	**148**	**0**	**0**	**3**	**0**	**3**	**0**	**0**	**0**	**0**	**288**	1,165
5:30 PM	**0**	**0**	**120**	**10**	**0**	**2**	**158**	**0**	**0**	**5**	**0**	**8**	**0**	**0**	**0**	**0**	**303**	1,184
5:45 PM	**0**	**0**	**123**	**4**	**0**	**5**	**148**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**284**	**1,208**
Count Total	0	0	1,502	45	0	18	1,776	0	0	35	0	30	0	0	0	0	3,406	0
Peak Hour All	**0**	**0**	**525**	**26**	**0**	**11**	**613**	**0**	**0**	**17**	**0**	**16**	**0**	**0**	**0**	**0**	**1,208**	**0**
HV	**0**	**0**	**11**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**0**
HV%	**-**	**-**	**2%**	**0%**	**-**	**0%**	**1%**	**-**	**-**	**0%**	**-**	**0%**	**-**	**-**	**-**	**-**	**2%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	4	4	0	0	*8*	0	0	0	0	*0*	0	0	0	5	*5*
3:15 PM	6	6	0	0	*12*	1	0	0	0	*1*	0	0	0	2	*2*
3:30 PM	3	5	0	0	*8*	0	0	0	0	*0*	0	0	0	1	*1*
3:45 PM	5	6	0	0	*11*	0	0	0	0	*0*	0	0	0	1	*1*
4:00 PM	2	5	0	0	*7*	0	0	0	0	*0*	0	0	0	2	*2*
4:15 PM	2	3	0	0	*5*	0	0	0	0	*0*	0	0	0	1	*1*
4:30 PM	1	3	0	0	*4*	0	0	0	0	*0*	0	0	0	2	*2*
4:45 PM	2	3	0	0	*5*	0	1	0	0	*1*	0	0	0	0	*0*
5:00 PM	**4**	**0**	**0**	**0**	***4***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	*0*
5:15 PM	**4**	**6**	**0**	**0**	***10***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
5:30 PM	**2**	**1**	**0**	**0**	***3***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	*1*
5:45 PM	**1**	**1**	**0**	**0**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	36	43	0	0	*79*	2	1	0	0	*3*	0	0	0	15	*15*
Peak Hr	**11**	**8**	**0**	**0**	***19***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**1**	***1***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				25th St				0				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	3	1	0	0	4	0	0	0	0	0	0	0	0	0	8	0
3:15 PM	0	0	6	0	0	0	6	0	0	0	0	0	0	0	0	0	12	0
3:30 PM	0	0	3	0	0	0	5	0	0	0	0	0	0	0	0	0	8	0
3:45 PM	0	0	5	0	0	0	6	0	0	0	0	0	0	0	0	0	11	39
4:00 PM	0	0	2	0	0	0	5	0	0	0	0	0	0	0	0	0	7	38
4:15 PM	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	5	31
4:30 PM	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	4	27
4:45 PM	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	5	21
5:00 PM	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	18
5:15 PM	**0**	**0**	**4**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	23
5:30 PM	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	22
5:45 PM	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**19**
Count Total	0	0	35	1	0	0	43	0	0	0	0	0	0	0	0	0	79	0
Peak Hour	**0**	**0**	**11**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**0**

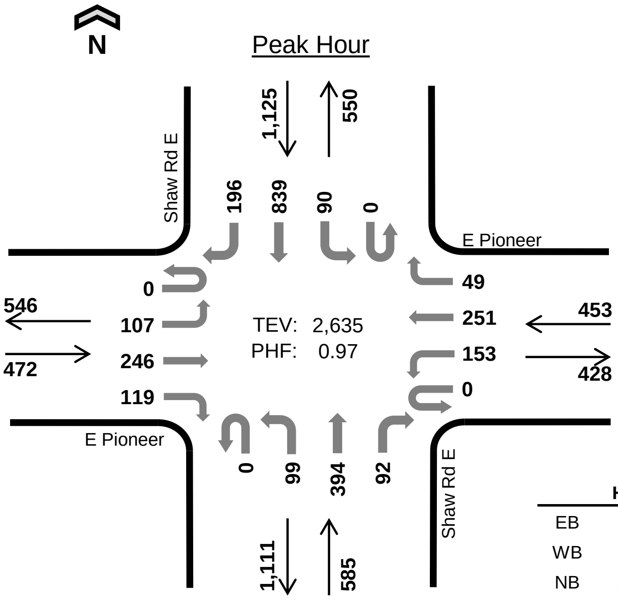
Three-Hour Count Summaries - Bikes

Interval Start	E Pioneer			E Pioneer			25th St			0			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	1
5:00 PM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	2
5:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
5:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2
5:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Count Total	0	2	0	0	1	0	0	0	0	0	0	0	3	0
Peak Hour	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**

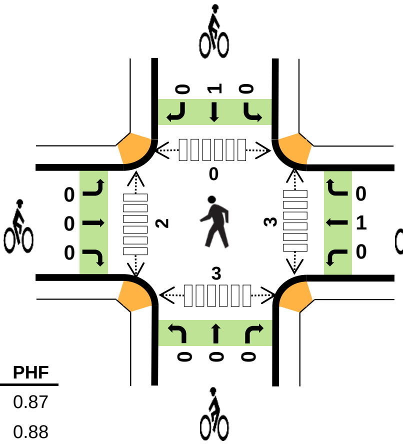
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd E
E Pioneer

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 4:00 PM to 5:00 PM



	HV %:	PHF
EB	1.5%	0.87
WB	1.8%	0.88
NB	4.4%	0.94
SB	2.4%	0.91
TOTAL	2.6%	0.97



Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				Shaw Rd E				Shaw Rd E				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	23	75	34	0	42	72	8	0	26	91	24	0	18	199	42	654	0
4:15 PM		0	25	59	27	0	32	55	14	0	27	101	27	0	25	239	46	677	0
4:30 PM		0	37	65	33	0	46	70	12	0	25	95	17	0	28	177	58	663	0
4:45 PM		0	22	47	25	0	33	54	15	0	21	107	24	0	19	224	50	641	2,635
Peak Hour	All	0	107	246	119	0	153	251	49	0	99	394	92	0	90	839	196	2,635	0
	HV	0	1	6	0	0	2	5	1	0	5	20	1	0	3	21	3	68	0
	HV%	-	1%	2%	0%	-	1%	2%	2%	-	5%	5%	1%	-	3%	3%	2%	3%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	3	1	8	7	*19*	0	0	0	0	*0*	2	0	0	2	*4*
4:15 PM	3	1	6	11	*21*	0	0	0	1	*1*	1	0	0	1	*2*
4:30 PM	1	3	7	6	*17*	0	0	0	0	*0*	0	2	0	0	*2*
4:45 PM	0	3	5	3	*11*	0	1	0	0	*1*	0	0	0	0	*0*
Peak Hour	7	8	26	27	*68*	0	1	0	1	*2*	3	2	0	3	*8*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				Shaw Rd E				Shaw Rd E				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	27	57	28	0	28	52	12	0	24	85	17	0	18	226	42	616	0
3:15 PM	0	31	63	25	0	37	49	11	0	30	79	19	0	15	208	41	608	0
3:30 PM	0	25	59	30	0	39	53	13	0	23	94	23	0	17	231	42	649	0
3:45 PM	0	32	59	28	0	31	51	16	0	39	84	21	0	17	212	47	637	2,510
4:00 PM	**0**	**23**	**75**	**34**	**0**	**42**	**72**	**8**	**0**	**26**	**91**	**24**	**0**	**18**	**199**	**42**	**654**	2,548
4:15 PM	**0**	**25**	**59**	**27**	**0**	**32**	**55**	**14**	**0**	**27**	**101**	**27**	**0**	**25**	**239**	**46**	**677**	2,617
4:30 PM	**0**	**37**	**65**	**33**	**0**	**46**	**70**	**12**	**0**	**25**	**95**	**17**	**0**	**28**	**177**	**58**	**663**	2,631
4:45 PM	**0**	**22**	**47**	**25**	**0**	**33**	**54**	**15**	**0**	**21**	**107**	**24**	**0**	**19**	**224**	**50**	**641**	**2,635**
5:00 PM	0	34	79	47	0	36	61	14	0	22	66	17	0	19	174	60	629	2,610
5:15 PM	0	27	52	28	0	36	56	11	0	29	97	22	0	27	226	51	662	2,595
5:30 PM	0	22	65	31	0	43	49	11	0	33	93	17	0	20	190	47	621	2,553
5:45 PM	0	24	69	29	0	27	54	13	0	28	93	15	0	27	223	48	650	2,562
Count Total	0	329	749	365	0	430	676	150	0	327	1,085	243	0	250	2,529	574	7,707	0
Peak Hour **All**	**0**	**107**	**246**	**119**	**0**	**153**	**251**	**49**	**0**	**99**	**394**	**92**	**0**	**90**	**839**	**196**	**2,635**	**0**
HV	**0**	**1**	**6**	**0**	**0**	**2**	**5**	**1**	**0**	**5**	**20**	**1**	**0**	**3**	**21**	**3**	**68**	**0**
HV%	**-**	**1%**	**2%**	**0%**	**-**	**1%**	**2%**	**2%**	**-**	**5%**	**5%**	**1%**	**-**	**3%**	**3%**	**2%**	**3%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	3	3	9	13	*28*	0	0	0	0	*0*	1	1	0	1	*3*
3:15 PM	5	2	9	11	*27*	0	0	0	0	*0*	1	0	0	1	*2*
3:30 PM	4	6	8	9	*27*	0	0	0	0	*0*	1	0	0	1	*2*
3:45 PM	4	8	7	10	*29*	0	0	0	0	*0*	4	0	0	2	*6*
4:00 PM	**3**	**1**	**8**	**7**	***19***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**2**	*4*
4:15 PM	**3**	**1**	**6**	**11**	***21***	**0**	**0**	**0**	**1**	***1***	**1**	**0**	**0**	**1**	*2*
4:30 PM	**1**	**3**	**7**	**6**	***17***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**0**	*2*
4:45 PM	**0**	**3**	**5**	**3**	***11***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***
5:00 PM	3	0	2	2	*7*	0	0	0	0	*0*	1	2	0	1	*4*
5:15 PM	3	3	4	7	*17*	0	0	0	0	*0*	1	0	0	1	*2*
5:30 PM	3	2	4	4	*13*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	1	2	2	5	*10*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	33	34	71	88	*226*	0	1	0	1	*2*	12	5	0	10	*27*
Peak Hour	**7**	**8**	**26**	**27**	***68***	**0**	**1**	**0**	**1**	***2***	**3**	**2**	**0**	**3**	***8***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				Shaw Rd E				Shaw Rd E				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	1	1	1	0	0	3	0	0	0	8	1	0	4	8	1	28	0
3:15 PM	0	2	3	0	0	1	1	0	0	0	8	1	0	0	10	1	27	0
3:30 PM	0	1	3	0	0	1	4	1	0	1	6	1	0	0	8	1	27	0
3:45 PM	0	2	2	0	0	3	5	0	0	2	5	0	0	1	8	1	29	111
4:00 PM	**0**	**0**	**3**	**0**	**0**	**0**	**1**	**0**	**0**	**3**	**5**	**0**	**0**	**0**	**5**	**2**	**19**	102
4:15 PM	**0**	**1**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**5**	**1**	**0**	**0**	**10**	**1**	**21**	96
4:30 PM	**0**	**0**	**1**	**0**	**0**	**2**	**1**	**0**	**0**	**1**	**6**	**0**	**0**	**3**	**3**	**0**	**17**	86
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**0**	**1**	**4**	**0**	**0**	**0**	**3**	**0**	**11**	**68**
5:00 PM	0	1	2	0	0	0	0	0	0	0	2	0	0	0	2	0	7	56
5:15 PM	0	1	2	0	0	1	2	0	0	0	4	0	0	2	3	2	17	52
5:30 PM	0	1	2	0	0	1	1	0	0	0	4	0	0	1	3	0	13	48
5:45 PM	0	1	0	0	0	1	1	0	0	0	2	0	0	1	4	0	10	47
Count Total	0	11	21	1	0	10	22	2	0	8	59	4	0	12	67	9	226	0
Peak Hour	**0**	**1**	**6**	**0**	**0**	**2**	**5**	**1**	**0**	**5**	**20**	**1**	**0**	**3**	**21**	**3**	**68**	**0**

Three-Hour Count Summaries - Bikes

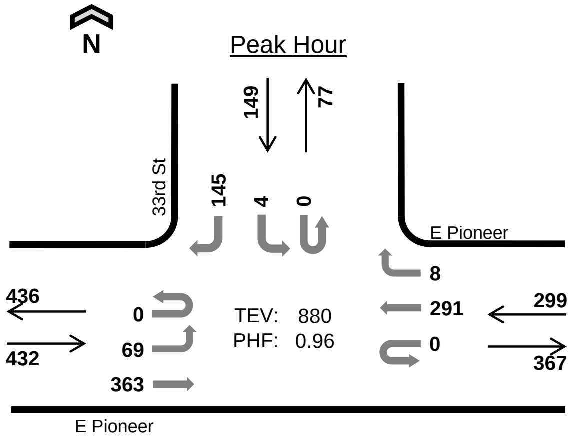
Interval Start	E Pioneer			E Pioneer			Shaw Rd E			Shaw Rd E			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	1
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
4:45 PM	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	1	0	0	0	0	0	1	0	2	0
Peak Hour	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**0**

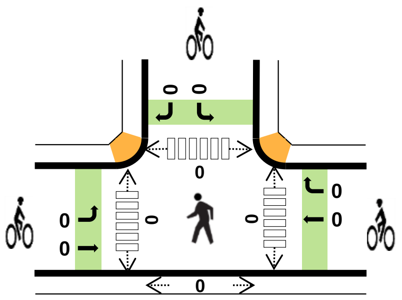
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

33rd St
E Pioneer

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:45 PM to 4:45 PM

Peak Hour





	HV %:	PHF
EB	3.2%	0.93
WB	3.7%	0.88
NB	-	-
SB	2.0%	0.85
TOTAL	3.2%	0.96

Three-Hour Count Summaries

Interval Start		E Pioneer				E Pioneer				0				33rd St				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:45 PM		0	15	86	0	0	0	66	1	0	0	0	0	0	0	0	35	203	0
4:00 PM		0	16	100	0	0	0	64	0	0	0	0	0	0	1	0	43	224	0
4:15 PM		0	18	92	0	0	0	81	4	0	0	0	0	0	0	0	35	230	0
4:30 PM		0	20	85	0	0	0	80	3	0	0	0	0	0	3	0	32	223	880
Peak Hour	All	0	69	363	0	0	0	291	8	0	0	0	0	0	4	0	145	880	0
	HV	0	1	13	0	0	0	10	1	0	0	0	0	0	0	0	3	28	0
	HV%	-	1%	4%	-	-	-	3%	13%	-	-	-	-	-	0%	-	2%	3%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:45 PM	4	6	0	2	*12*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	4	1	0	1	*6*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	3	3	0	0	*6*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	3	1	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	14	11	0	3	*28*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	E Pioneer				E Pioneer				0				33rd St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	12	81	0	0	0	61	2	0	0	0	0	0	0	0	41	197	0
3:15 PM	0	17	72	0	0	0	65	2	0	0	0	0	0	0	0	32	188	0
3:30 PM	0	21	88	0	0	0	50	1	0	0	0	0	0	0	0	58	218	0
3:45 PM	**0**	**15**	**86**	**0**	**0**	**0**	**66**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35**	**203**	806
4:00 PM	**0**	**16**	**100**	**0**	**0**	**0**	**64**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**43**	**224**	833
4:15 PM	**0**	**18**	**92**	**0**	**0**	**0**	**81**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35**	**230**	875
4:30 PM	**0**	**20**	**85**	**0**	**0**	**0**	**80**	**3**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**32**	**223**	**880**
4:45 PM	0	11	83	0	0	0	75	1	0	0	0	0	0	2	0	30	202	879
5:00 PM	0	25	82	0	0	0	62	1	0	0	0	0	0	2	0	43	215	870
5:15 PM	0	20	87	0	0	0	65	2	0	0	0	0	0	1	0	47	222	862
5:30 PM	0	16	85	0	0	0	53	5	0	0	0	0	0	2	0	54	215	854
5:45 PM	0	29	84	0	0	0	61	4	0	0	0	0	0	2	0	27	207	859
Count Total	0	220	1,025	0	0	0	783	26	0	0	0	0	0	13	0	477	2,544	0
Peak Hour **All**	**0**	**69**	**363**	**0**	**0**	**0**	**291**	**8**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**145**	**880**	**0**
HV	**0**	**1**	**13**	**0**	**0**	**0**	**10**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**28**	**0**
HV%	**-**	**1%**	**4%**	**-**	**-**	**-**	**3%**	**13%**	**-**	**-**	**-**	**-**	**-**	**0%**	**-**	**2%**	**3%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	5	3	0	1	*9*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	4	5	0	1	*10*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	4	1	0	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	**4**	**6**	**0**	**2**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:00 PM	**4**	**1**	**0**	**1**	***6***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:15 PM	**3**	**3**	**0**	**0**	***6***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:30 PM	**3**	**1**	**0**	**0**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:45 PM	0	2	0	1	*3*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	3	1	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	2	1	0	1	*4*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	4	1	0	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	1	3	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	37	28	0	7	*72*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hr	**14**	**11**	**0**	**3**	***28***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	E Pioneer				E Pioneer				0				33rd St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	5	0	0	0	3	0	0	0	0	0	0	0	0	1	9	0
3:15 PM	0	0	4	0	0	0	5	0	0	0	0	0	0	0	0	1	10	0
3:30 PM	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	5	0
3:45 PM	0	0	4	0	0	0	6	0	0	0	0	0	0	0	0	2	12	36
4:00 PM	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	1	6	33
4:15 PM	0	1	2	0	0	0	2	1	0	0	0	0	0	0	0	0	6	29
4:30 PM	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	4	28
4:45 PM	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	3	19
5:00 PM	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	4	17
5:15 PM	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	1	4	15
5:30 PM	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	5	16
5:45 PM	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	4	17
Count Total	0	3	34	0	0	0	27	1	0	0	0	0	0	0	0	7	72	0
Peak Hour	**0**	**1**	**13**	**0**	**0**	**0**	**10**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**28**	**0**

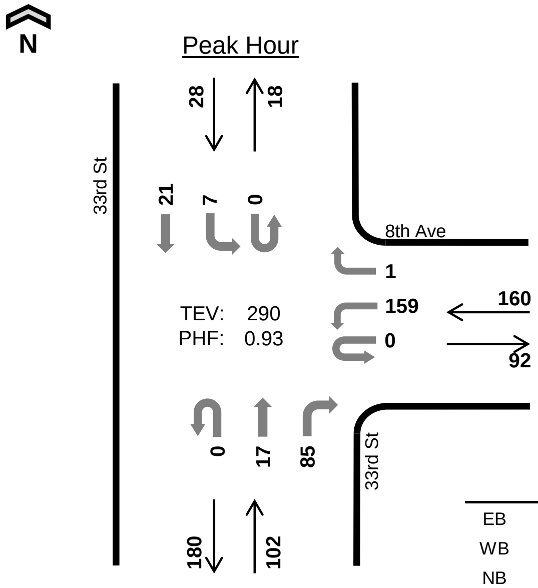
Three-Hour Count Summaries - Bikes

Interval Start	E Pioneer			E Pioneer			0			33rd St			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

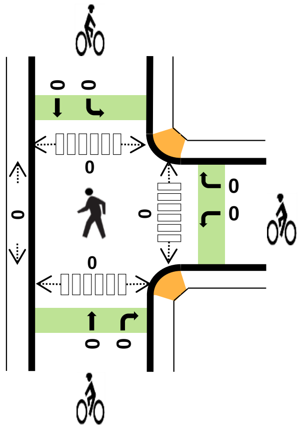
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

33rd St
8th Ave

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 5:00 PM to 6:00 PM



	HV %:	PHF
EB	-	-
WB	0.6%	0.82
NB	2.0%	0.82
SB	0.0%	0.70
TOTAL	1.0%	0.93



Three-Hour Count Summaries

Interval Start		0				8th Ave				33rd St				33rd St				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
5:00 PM		0	0	0	0	0	42	0	1	0	0	4	21	0	3	7	0	78	0
5:15 PM		0	0	0	0	0	42	0	0	0	0	3	19	0	1	3	0	68	0
5:30 PM		0	0	0	0	0	49	0	0	0	0	4	20	0	0	4	0	77	0
5:45 PM		0	0	0	0	0	26	0	0	0	0	6	25	0	3	7	0	67	290
Peak Hour	All	0	0	0	0	0	159	0	1	0	0	17	85	0	7	21	0	290	0
	HV	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	3	0
	HV%	-	-	-	-	-	1%	-	0%	-	-	0%	2%	-	0%	0%	-	1%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
5:00 PM	0	1	1	0	*2*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	0	0	1	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	0	1	2	0	*3*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	0				8th Ave				33rd St				33rd St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	0	39	0	0	0	0	2	12	0	0	1	0	54	0
3:15 PM	0	0	0	0	0	29	0	0	0	0	3	17	0	0	4	0	53	0
3:30 PM	0	0	0	0	0	57	0	0	0	0	2	19	0	0	1	0	79	0
3:45 PM	0	0	0	0	0	36	0	0	0	0	1	15	0	2	1	0	55	241
4:00 PM	0	0	0	0	0	38	0	0	0	0	2	14	0	1	4	0	59	246
4:15 PM	0	0	0	0	0	32	0	1	0	0	2	20	0	1	1	0	57	250
4:30 PM	0	0	0	0	0	29	0	0	0	0	1	21	0	0	6	0	57	228
4:45 PM	0	0	0	0	0	31	0	1	0	0	2	11	0	0	1	0	46	219
5:00 PM	**0**	**0**	**0**	**0**	**0**	**42**	**0**	**1**	**0**	**0**	**4**	**21**	**0**	**3**	**7**	**0**	**78**	238
5:15 PM	**0**	**0**	**0**	**0**	**0**	**42**	**0**	**0**	**0**	**0**	**3**	**19**	**0**	**1**	**3**	**0**	**68**	249
5:30 PM	**0**	**0**	**0**	**0**	**0**	**49**	**0**	**0**	**0**	**0**	**4**	**20**	**0**	**0**	**4**	**0**	**77**	269
5:45 PM	**0**	**0**	**0**	**0**	**0**	**26**	**0**	**0**	**0**	**0**	**6**	**25**	**0**	**3**	**7**	**0**	**67**	**290**
Count Total	0	0	0	0	0	450	0	3	0	0	32	214	0	11	40	0	750	0
Peak Hour All	**0**	**0**	**0**	**0**	**0**	**159**	**0**	**1**	**0**	**0**	**17**	**85**	**0**	**7**	**21**	**0**	**290**	**0**
Peak Hour HV	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**3**	**0**
Peak Hour HV%	**-**	**-**	**-**	**-**	**-**	**1%**	**-**	**0%**	**-**	**-**	**0%**	**2%**	**-**	**0%**	**0%**	**-**	**1%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	0	1	0	0	*1*	0	0	0	1	*1*	0	0	0	0	*0*
3:30 PM	0	1	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	0	2	0	0	*2*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	0	1	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	0	0	2	0	*2*	0	0	2	0	*2*	0	0	0	0	*0*
4:30 PM	0	0	0	0	*0*	0	0	1	0	*1*	0	0	0	0	*0*
4:45 PM	0	1	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	**0**	**1**	**1**	**0**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
5:15 PM	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
5:30 PM	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
5:45 PM	**0**	**0**	**1**	**0**	***1***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	0	7	4	0	*11*	0	0	3	1	*4*	0	0	0	0	*0*
Peak Hr	**0**	**1**	**2**	**0**	**3**	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	0				8th Ave				33rd St				33rd St				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
3:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
3:45 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	4
4:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	5
4:15 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	6
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
4:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	4
5:00 PM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**2**	5
5:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	3
5:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	3
5:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**3**
Count Total	0	0	0	0	0	7	0	0	0	0	1	3	0	0	0	0	11	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**3**	**0**

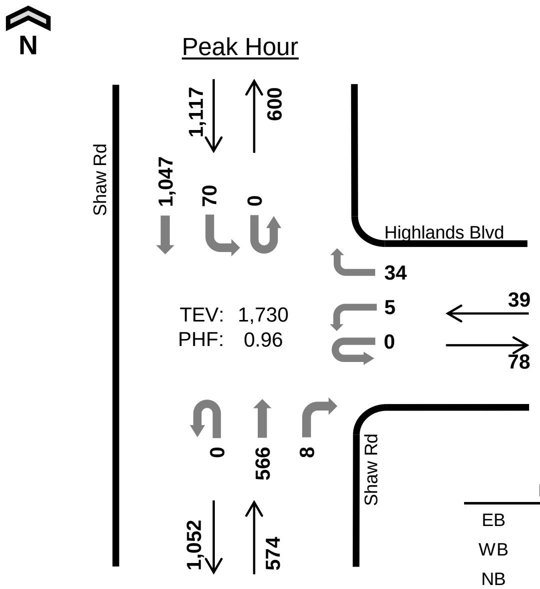
Three-Hour Count Summaries - Bikes

Interval Start	0			8th Ave			33rd St			33rd St			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	2	0	0	0	0	2	2
4:30 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	3
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	3
5:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
5:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
5:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Count Total	0	0	0	0	0	0	0	2	1	0	1	0	4	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

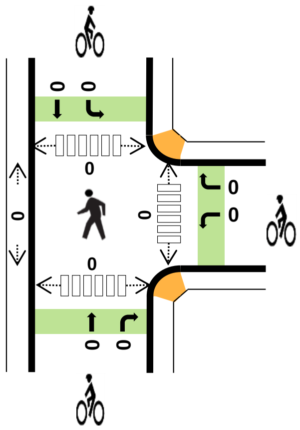
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
Highlands Blvd

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:30 PM to 4:30 PM



	HV %:	PHF
EB	-	-
WB	2.6%	0.81
NB	5.4%	0.94
SB	2.9%	0.96
TOTAL	3.7%	0.96



Three-Hour Count Summaries

Interval Start		0				Highlands Blvd				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:30 PM		0	0	0	0	0	3	0	9	0	0	146	2	0	16	259	0	435	0
3:45 PM		0	0	0	0	0	0	0	10	0	0	119	4	0	20	258	0	411	0
4:00 PM		0	0	0	0	0	0	0	8	0	0	152	1	0	18	255	0	434	0
4:15 PM		0	0	0	0	0	2	0	7	0	0	149	1	0	16	275	0	450	1,730
Peak Hour	All	0	0	0	0	0	5	0	34	0	0	566	8	0	70	1,047	0	1,730	0
	HV	0	0	0	0	0	0	0	1	0	0	31	0	0	0	32	0	64	0
	HV%	-	-	-	-	-	0%	-	3%	-	-	5%	0%	-	0%	3%	-	4%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:30 PM	0	1	10	8	*19*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	0	0	4	11	*15*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	0	0	10	7	*17*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	0	0	7	6	*13*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	0	1	31	32	*64*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	0				Highlands Blvd				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	1	2	0	10	0	0	116	3	0	12	257	0	401	0
3:15 PM	0	0	0	0	0	1	0	11	0	0	130	0	0	18	268	0	428	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**9**	**0**	**0**	**146**	**2**	**0**	**16**	**259**	**0**	**435**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**119**	**4**	**0**	**20**	**258**	**0**	**411**	1,675
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**152**	**1**	**0**	**18**	**255**	**0**	**434**	1,708
4:15 PM	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**7**	**0**	**0**	**149**	**1**	**0**	**16**	**275**	**0**	**450**	**1,730**
4:30 PM	0	0	0	0	0	0	0	14	0	0	129	3	1	23	235	0	405	1,700
4:45 PM	0	0	0	0	0	1	0	9	0	0	151	1	0	23	244	0	429	1,718
5:00 PM	0	0	0	0	0	1	0	13	0	0	114	3	0	23	255	0	409	1,693
5:15 PM	0	0	0	0	0	4	0	14	0	0	133	3	0	26	249	0	429	1,672
5:30 PM	0	0	0	0	0	0	0	8	0	0	146	2	0	32	228	0	416	1,683
5:45 PM	0	0	0	0	0	1	0	17	0	0	126	8	0	27	245	0	424	1,678
Count Total	0	0	0	0	1	15	0	130	0	0	1,611	31	1	254	3,028	0	5,071	0
Peak Hour All	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**34**	**0**	**0**	**566**	**8**	**0**	**70**	**1,047**	**0**	**1,730**	**0**
HV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**31**	**0**	**0**	**0**	**32**	**0**	**64**	**0**
HV%	**-**	**-**	**-**	**-**	**-**	**0%**	**-**	**3%**	**-**	**-**	**5%**	**0%**	**-**	**0%**	**3%**	**-**	**4%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	0	0	5	10	*15*	0	0	0	0	*0*	1	0	0	0	*1*
3:15 PM	0	3	10	11	*24*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	**0**	**1**	**10**	**8**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:45 PM	**0**	**0**	**4**	**11**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:00 PM	**0**	**0**	**10**	**7**	***17***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:15 PM	**0**	**0**	**7**	**6**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:30 PM	0	0	4	4	*8*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	0	1	5	6	*12*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	0	0	4	4	*8*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	2	3	*5*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	0	4	3	*7*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	0	0	3	5	*8*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	0	5	68	78	*151*	0	0	0	0	*0*	1	0	0	0	*1*
Peak Hr	**0**	**1**	**31**	**32**	***64***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	**0**				**Highlands Blvd**				**Shaw Rd**				**Shaw Rd**				**15-min Total**	**Rolling One Hour**
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	10	0	15	0
3:15 PM	0	0	0	0	0	0	0	3	0	0	10	0	0	0	11	0	24	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**10**	**0**	**0**	**0**	**8**	**0**	**19**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**11**	**0**	**15**	73
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**7**	**0**	**17**	75
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**6**	**0**	**13**	**64**
4:30 PM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	8	53
4:45 PM	0	0	0	0	0	0	0	1	0	0	5	0	0	0	6	0	12	50
5:00 PM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	8	41
5:15 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	5	33
5:30 PM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	3	0	7	32
5:45 PM	0	0	0	0	0	0	0	0	0	0	3	0	0	1	4	0	8	28
Count Total	0	0	0	0	0	0	0	5	0	0	68	0	0	1	77	0	151	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**31**	**0**	**0**	**0**	**32**	**0**	**64**	**0**

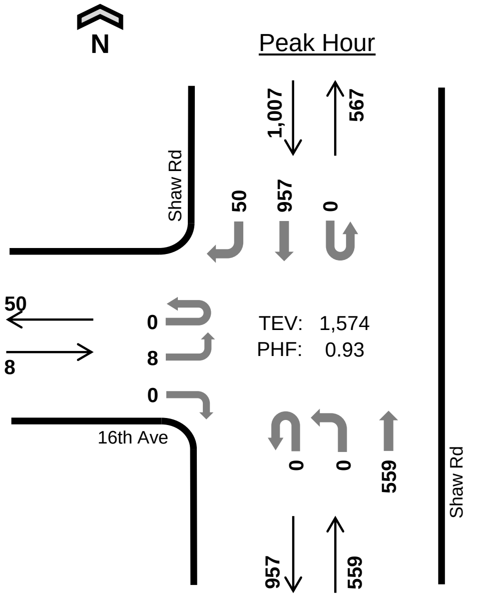
Three-Hour Count Summaries - Bikes

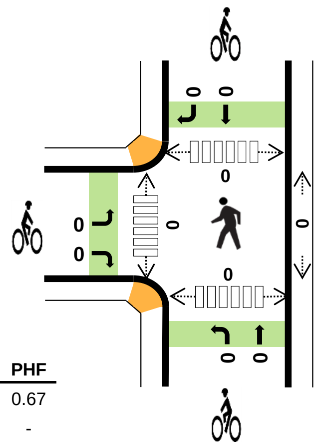
Interval Start	**0**			**Highlands Blvd**			**Shaw Rd**			**Shaw Rd**			**15-min Total**	**Rolling One Hour**
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
16th Ave

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:30 PM to 4:30 PM





	HV %:	PHF
EB	0.0%	0.67
WB	-	-
NB	4.5%	0.88
SB	3.2%	0.95
TOTAL	3.6%	0.93

Three-Hour Count Summaries

Interval Start		16th Ave				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:30 PM		0	1	0	0	0	0	0	0	0	0	149	0	0	0	243	16	409	0
3:45 PM		0	3	0	0	0	0	0	0	0	0	118	0	0	0	230	11	362	0
4:00 PM		0	3	0	0	0	0	0	0	0	0	134	0	0	0	233	9	379	0
4:15 PM		0	1	0	0	0	0	0	0	0	0	158	0	0	0	251	14	424	1,574
Peak Hour	All	0	8	0	0	0	0	0	0	0	0	559	0	0	0	957	50	1,574	0
	HV	0	0	0	0	0	0	0	0	0	0	25	0	0	0	32	0	57	0
	HV%	-	0%	-	-	-	-	-	-	-	-	4%	-	-	-	3%	0%	4%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:30 PM	0	0	6	8	*14*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	0	0	4	11	*15*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	0	0	8	7	*15*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	0	0	7	6	*13*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	0	0	25	32	*57*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	16th Ave				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	3	0	0	0	0	0	0	0	0	109	0	0	0	240	13	365	0
3:15 PM	0	6	0	0	0	0	0	0	0	2	119	0	0	0	238	15	380	0
3:30 PM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**149**	**0**	**0**	**0**	**243**	**16**	**409**	0
3:45 PM	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**118**	**0**	**0**	**0**	**230**	**11**	**362**	1,516
4:00 PM	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**134**	**0**	**0**	**0**	**233**	**9**	**379**	1,530
4:15 PM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**158**	**0**	**0**	**0**	**251**	**14**	**424**	**1,574**
4:30 PM	0	1	0	0	0	0	0	0	0	0	136	0	0	0	198	22	357	1,522
4:45 PM	0	3	0	0	0	0	0	0	0	0	135	0	0	0	212	21	371	1,531
5:00 PM	0	2	0	0	0	0	0	0	0	1	112	0	0	0	222	26	363	1,515
5:15 PM	0	2	0	0	0	0	0	0	0	2	135	0	0	0	213	21	373	1,464
5:30 PM	0	5	0	0	0	0	0	0	0	1	139	0	0	0	200	17	362	1,469
5:45 PM	0	1	0	0	0	0	0	0	0	0	131	0	0	0	229	14	375	1,473
Count Total	0	31	0	0	0	0	0	0	0	6	1,575	0	0	0	2,709	199	4,520	0
Peak Hour **All**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**559**	**0**	**0**	**0**	**957**	**50**	**1,574**	**0**
HV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**25**	**0**	**0**	**0**	**32**	**0**	**57**	**0**
HV%	**-**	**0%**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**4%**	**-**	**-**	**-**	**3%**	**0%**	**4%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	0	0	10	11	*21*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	0	0	10	9	*19*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	**0**	**0**	**6**	**8**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:45 PM	**0**	**0**	**4**	**11**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:00 PM	**0**	**0**	**8**	**7**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:15 PM	**0**	**0**	**7**	**6**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:30 PM	0	0	7	4	*11*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	0	0	4	5	*9*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	0	0	2	2	*4*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	2	4	*6*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	1	0	3	5	*9*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	0	0	5	2	*7*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	1	0	68	74	*143*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hr	**0**	**0**	**25**	**32**	***57***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	16th Ave				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	10	0	0	0	10	1	21	0
3:15 PM	0	0	0	0	0	0	0	0	0	1	9	0	0	0	9	0	19	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**8**	**0**	**14**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**11**	**0**	**15**	69
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**7**	**0**	**15**	63
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**6**	**0**	**13**	**57**
4:30 PM	0	0	0	0	0	0	0	0	0	0	7	0	0	0	4	0	11	54
4:45 PM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	5	0	9	48
5:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	4	37
5:15 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	6	30
5:30 PM	0	1	0	0	0	0	0	0	0	0	3	0	0	0	5	0	9	28
5:45 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	2	0	7	26
Count Total	0	1	0	0	0	0	0	0	0	1	67	0	0	0	73	1	143	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**25**	**0**	**0**	**0**	**32**	**0**	**57**	**0**

Three-Hour Count Summaries - Bikes

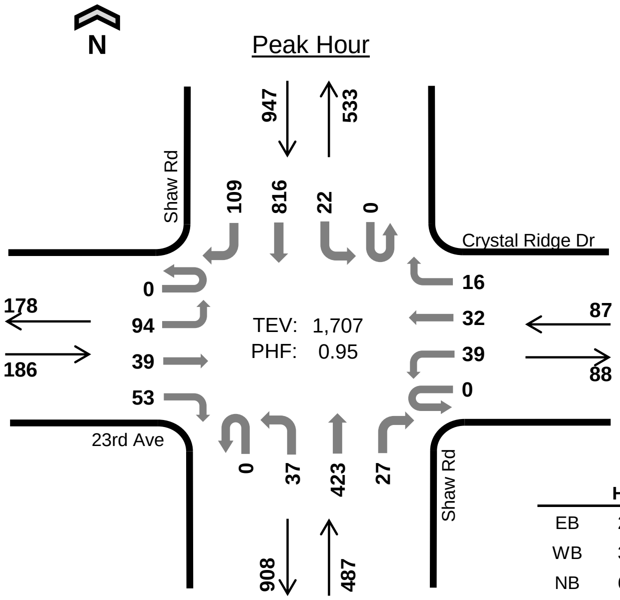
Interval Start	16th Ave			0			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

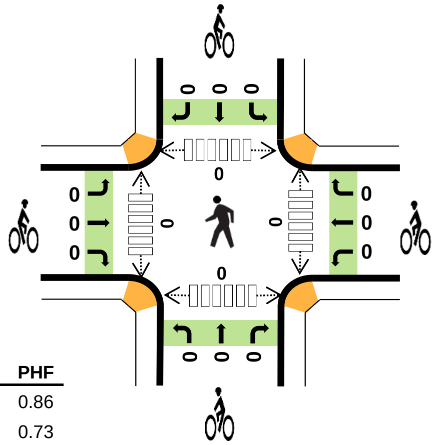
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
23rd Ave

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:15 PM to 4:15 PM

Peak Hour





	HV %:	PHF
EB	2.7%	0.86
WB	3.4%	0.73
NB	6.4%	0.88
SB	3.6%	0.96
TOTAL	4.3%	0.95

Three-Hour Count Summaries

Interval Start		23rd Ave				Crystal Ridge Dr				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:15 PM		0	23	10	15	0	7	7	2	0	11	98	4	0	5	204	27	413	0
3:30 PM		0	32	8	14	0	12	12	6	0	9	117	9	0	3	195	30	447	0
3:45 PM		0	14	13	13	0	12	8	4	0	7	87	7	0	8	204	24	401	0
4:00 PM		0	25	8	11	0	8	5	4	0	10	121	7	0	6	213	28	446	1,707
Peak Hour	All	0	94	39	53	0	39	32	16	0	37	423	27	0	22	816	109	1,707	0
	HV	0	4	0	1	0	1	1	1	0	1	28	2	0	0	31	3	73	0
	HV%	-	4%	0%	2%	-	3%	3%	6%	-	3%	7%	7%	-	0%	4%	3%	4%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:15 PM	2	2	9	7	*20*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	3	0	7	12	*22*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	0	0	5	8	*13*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	0	1	10	7	*18*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	5	3	31	34	*73*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start		23rd Ave				Crystal Ridge Dr				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM		0	25	12	12	0	9	5	5	0	7	74	4	0	8	217	29	407	0
3:15 PM		0	23	10	15	0	7	7	2	0	11	98	4	0	5	204	27	413	0
3:30 PM		0	32	8	14	0	12	12	6	0	9	117	9	0	3	195	30	447	0
3:45 PM		0	14	13	13	0	12	8	4	0	7	87	7	0	8	204	24	401	1,668
4:00 PM		0	25	8	11	0	8	5	4	0	10	121	7	0	6	213	28	446	1,707
4:15 PM		0	20	15	18	0	6	3	6	0	16	111	3	0	6	167	39	410	1,704
4:30 PM		0	35	16	16	0	5	6	4	0	9	107	9	0	2	165	37	411	1,668
4:45 PM		0	19	12	9	0	6	9	5	0	17	122	9	0	3	167	54	432	1,699
5:00 PM		0	25	14	15	0	5	7	5	0	8	96	7	0	2	191	38	413	1,666
5:15 PM		0	23	10	10	0	8	7	4	0	13	101	7	0	4	169	27	383	1,639
5:30 PM		0	25	23	12	0	2	4	7	0	15	105	6	0	3	173	32	407	1,635
5:45 PM		0	26	15	10	0	4	5	3	0	9	90	10	0	3	206	39	420	1,623
Count Total		0	292	156	155	0	84	78	55	0	131	1,229	82	0	53	2,271	404	4,990	0
Peak Hour	All	0	94	39	53	0	39	32	16	0	37	423	27	0	22	816	109	1,707	0
	HV	0	4	0	1	0	1	1	1	0	1	28	2	0	0	31	3	73	0
	HV%	-	4%	0%	2%	-	3%	3%	6%	-	3%	7%	7%	-	0%	4%	3%	4%	0

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	2	1	6	11	*20*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	2	2	9	7	*20*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	3	0	7	12	*22*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	0	0	5	8	*13*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	0	1	10	7	*18*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	0	1	6	6	*13*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	0	1	5	5	*11*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	0	1	3	4	*8*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	1	0	4	2	*7*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	1	3	*4*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	0	4	4	*8*	0	0	0	0	*0*	0	0	1	0	*1*
5:45 PM	1	1	2	4	*8*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	9	8	62	73	*152*	0	0	0	0	*0*	0	0	1	1	*2*
Peak Hour	5	3	31	34	*73*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	23rd Ave				Crystal Ridge Dr				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	1	1	0	0	1	0	0	0	6	0	0	1	10	0	20	0
3:15 PM	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**1**	**8**	**0**	**0**	**0**	**6**	**1**	**20**	0
3:30 PM	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**1**	**0**	**0**	**12**	**0**	**22**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**7**	**1**	**13**	75
4:00 PM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**9**	**1**	**0**	**0**	**6**	**1**	**18**	**73**
4:15 PM	0	0	0	0	0	0	0	1	0	0	6	0	0	1	5	0	13	66
4:30 PM	0	0	0	0	0	0	0	1	0	0	5	0	0	0	3	2	11	55
4:45 PM	0	0	0	0	0	0	0	1	0	0	3	0	0	0	4	0	8	50
5:00 PM	0	1	0	0	0	0	0	0	0	0	4	0	0	0	2	0	7	39
5:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	4	30
5:30 PM	0	0	0	0	0	0	0	0	0	1	3	0	0	0	4	0	8	27
5:45 PM	0	1	0	0	0	0	0	1	0	1	1	0	0	0	4	0	8	27
Count Total	0	6	1	2	0	1	2	5	0	3	57	2	0	2	66	5	152	0
Peak Hour	**0**	**4**	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**28**	**2**	**0**	**0**	**31**	**3**	**73**	**0**

Three-Hour Count Summaries - Bikes

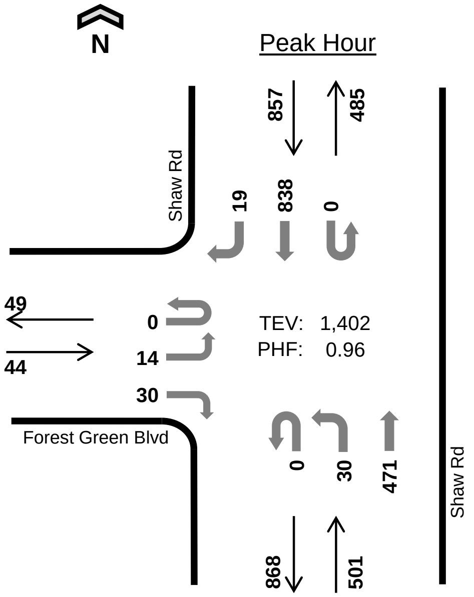
Interval Start	23rd Ave			Crystal Ridge Dr			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

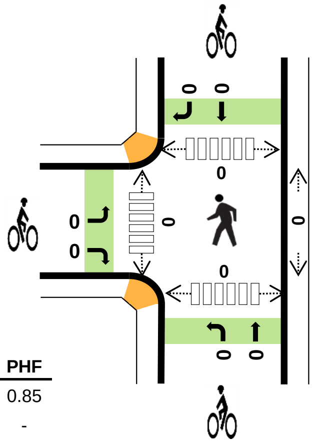
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
Forest Green Blvd

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:15 PM to 4:15 PM

Peak Hour





	HV %:	PHF
EB	4.5%	0.85
WB	-	-
NB	5.8%	0.85
SB	3.7%	0.96
TOTAL	4.5%	0.96

Three-Hour Count Summaries

Interval Start		Forest Green Blvd				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:15 PM		0	2	0	7	0	0	0	0	0	4	112	0	0	0	222	2	349	0
3:30 PM		0	1	0	12	0	0	0	0	0	9	139	0	0	0	201	4	366	0
3:45 PM		0	4	0	5	0	0	0	0	0	10	98	0	0	0	213	7	337	0
4:00 PM		0	7	0	6	0	0	0	0	0	7	122	0	0	0	202	6	350	1,402
Peak Hour	All	0	14	0	30	0	0	0	0	0	30	471	0	0	0	838	19	1,402	0
	HV	0	0	0	2	0	0	0	0	0	0	29	0	0	0	32	0	63	0
	HV%	-	0%	-	7%	-	-	-	-	-	0%	6%	-	-	-	4%	0%	4%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:15 PM	2	0	5	12	*19*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	0	0	9	6	*15*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	0	0	5	8	*13*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	0	0	10	6	*16*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	2	0	29	32	*63*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	Forest Green Blvd				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	1	0	8	0	0	0	0	0	6	88	0	0	0	234	3	340	0
3:15 PM	**0**	**2**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**4**	**112**	**0**	**0**	**0**	**222**	**2**	**349**	0
3:30 PM	**0**	**1**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**9**	**139**	**0**	**0**	**0**	**201**	**4**	**366**	0
3:45 PM	**0**	**4**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**10**	**98**	**0**	**0**	**0**	**213**	**7**	**337**	1,392
4:00 PM	**0**	**7**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**7**	**122**	**0**	**0**	**0**	**202**	**6**	**350**	**1,402**
4:15 PM	0	1	0	12	0	0	0	0	0	4	126	0	0	0	138	3	284	1,337
4:30 PM	0	1	0	5	0	0	0	0	0	6	129	0	0	0	197	10	348	1,319
4:45 PM	0	0	0	1	0	0	0	0	0	6	124	0	1	0	128	7	267	1,249
5:00 PM	0	1	0	4	0	0	0	0	0	8	101	0	0	0	196	1	311	1,210
5:15 PM	0	4	0	7	0	0	0	0	0	11	122	0	0	0	185	5	334	1,260
5:30 PM	0	1	0	6	0	0	0	0	0	7	115	0	0	0	150	7	286	1,198
5:45 PM	0	1	0	5	0	0	0	0	0	7	105	0	0	0	205	8	331	1,262
Count Total	0	24	0	78	0	0	0	0	0	85	1,381	0	1	0	2,271	63	3,903	0
Peak Hour **All**	**0**	**14**	**0**	**30**	**0**	**0**	**0**	**0**	**0**	**30**	**471**	**0**	**0**	**0**	**838**	**19**	**1,402**	**0**
HV	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**29**	**0**	**0**	**0**	**32**	**0**	**63**	**0**
HV%	**-**	**0%**	**-**	**7%**	**-**	**-**	**-**	**-**	**-**	**0%**	**6%**	**-**	**-**	**-**	**4%**	**0%**	**4%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	0	0	10	10	*20*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	**2**	**0**	**5**	**12**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:30 PM	**0**	**0**	**9**	**6**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:45 PM	**0**	**0**	**5**	**8**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:00 PM	**0**	**0**	**10**	**6**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:15 PM	0	0	6	2	*8*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	0	0	4	5	*9*	0	0	0	0	*0*	0	1	0	1	*2*
4:45 PM	0	0	4	4	*8*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	0	0	4	3	*7*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	1	3	*4*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	0	3	4	*7*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	0	0	3	2	*5*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	2	0	64	65	*131*	0	0	0	0	*0*	0	1	0	1	*2*
Peak Hr	**2**	**0**	**29**	**32**	***63***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	Forest Green Blvd				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	2	8	0	0	0	10	0	20	0
3:15 PM	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**12**	**0**	**19**	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**0**	**6**	**0**	**15**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**8**	**0**	**13**	67
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**6**	**0**	**16**	**63**
4:15 PM	0	0	0	0	0	0	0	0	0	0	6	0	0	0	2	0	8	52
4:30 PM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	5	0	9	46
4:45 PM	0	0	0	0	0	0	0	0	0	1	3	0	0	0	4	0	8	41
5:00 PM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	3	0	7	32
5:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	4	28
5:30 PM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	4	0	7	26
5:45 PM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	5	23
Count Total	0	0	0	2	0	0	0	0	0	3	61	0	0	0	65	0	131	0
Peak Hour	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**29**	**0**	**0**	**0**	**32**	**0**	**63**	**0**

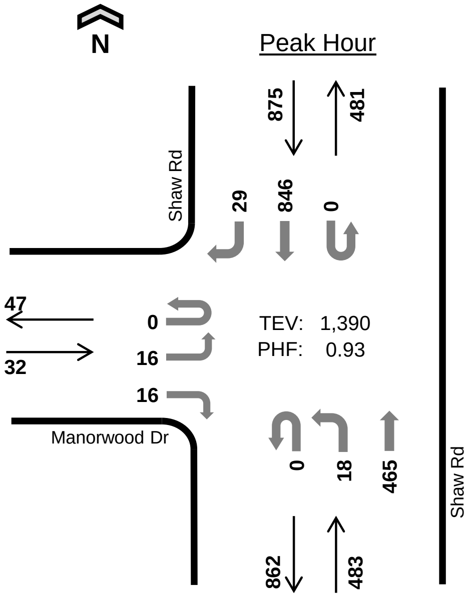
Three-Hour Count Summaries - Bikes

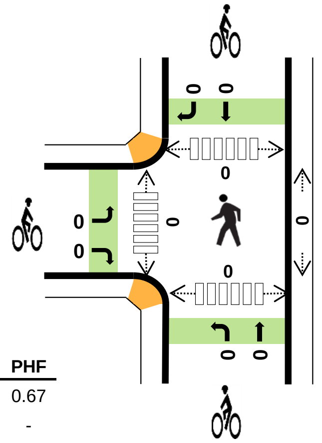
Interval Start	Forest Green Blvd			0			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
Manorwood Dr

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:00 PM to 4:00 PM





	HV %:	PHF
EB	6.3%	0.67
WB	-	-
NB	5.8%	0.82
SB	4.2%	0.91
TOTAL	4.8%	0.93

Three-Hour Count Summaries

Interval Start		Manorwood Dr				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM		0	3	0	3	0	0	0	0	0	6	96	0	0	0	234	7	349	0
3:15 PM		0	3	0	4	0	0	0	0	0	4	122	0	0	0	216	10	359	0
3:30 PM		0	7	0	5	0	0	0	0	0	8	139	0	0	0	207	8	374	0
3:45 PM		0	3	0	4	0	0	0	0	0	0	108	0	0	0	189	4	308	1,390
Peak Hour	All	0	16	0	16	0	0	0	0	0	18	465	0	0	0	846	29	1,390	0
	HV	0	2	0	0	0	0	0	0	0	1	27	0	0	0	35	2	67	0
	HV%	-	13%	-	0%	-	-	-	-	-	6%	6%	-	-	-	4%	7%	5%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	2	0	6	9	*17*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	0	0	8	10	*18*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	0	0	10	9	*19*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	0	0	4	9	*13*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	2	0	28	37	*67*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start	Manorwood Dr				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	**0**	**3**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**6**	**96**	**0**	**0**	**0**	**234**	**7**	**349**	0
3:15 PM	**0**	**3**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**122**	**0**	**0**	**0**	**216**	**10**	**359**	0
3:30 PM	**0**	**7**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**8**	**139**	**0**	**0**	**0**	**207**	**8**	**374**	0
3:45 PM	**0**	**3**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**108**	**0**	**0**	**0**	**189**	**4**	**308**	**1,390**
4:00 PM	0	5	0	3	0	0	0	0	0	2	132	0	0	0	180	9	331	1,372
4:15 PM	0	1	0	4	0	0	0	0	0	6	120	0	0	0	130	12	273	1,286
4:30 PM	0	8	0	2	0	0	0	0	0	3	125	0	0	0	190	10	338	1,250
4:45 PM	0	6	0	2	0	0	0	0	0	1	123	0	0	0	129	13	274	1,216
5:00 PM	0	2	0	2	0	0	0	0	0	2	118	0	0	0	178	9	311	1,196
5:15 PM	0	2	0	3	0	0	0	0	0	3	141	0	0	0	160	15	324	1,247
5:30 PM	0	4	0	3	0	0	0	0	0	4	116	0	0	0	162	9	298	1,207
5:45 PM	0	7	0	3	0	0	0	0	0	2	107	0	0	0	191	14	324	1,257
Count Total	0	51	0	38	0	0	0	0	0	41	1,447	0	0	0	2,166	120	3,863	0
Peak Hour **All**	**0**	**16**	**0**	**16**	**0**	**0**	**0**	**0**	**0**	**18**	**465**	**0**	**0**	**0**	**846**	**29**	**1,390**	**0**
HV	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**27**	**0**	**0**	**0**	**35**	**2**	**67**	**0**
HV%	**-**	**13%**	**-**	**0%**	**-**	**-**	**-**	**-**	**-**	**6%**	**6%**	**-**	**-**	**-**	**4%**	**7%**	**5%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	**2**	**0**	**6**	**9**	***17***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:15 PM	**0**	**0**	**8**	**10**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:30 PM	**0**	**0**	**10**	**9**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:45 PM	**0**	**0**	**4**	**9**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:00 PM	3	0	5	3	*11*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	0	0	5	4	*9*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	0	0	5	4	*9*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	1	0	5	6	*12*	0	0	0	0	*0*	0	0	0	0	*0*
5:00 PM	0	0	3	5	*8*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	2	2	*4*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	0	4	2	*6*	0	0	0	0	*0*	0	1	0	1	*2*
5:45 PM	0	0	2	3	*5*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	6	0	59	66	*131*	0	0	0	0	*0*	0	1	0	1	*2*
Peak Hr	**2**	**0**	**28**	**37**	***67***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	Manorwood Dr				0				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**8**	**1**	**17**	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**10**	**0**	**18**	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**9**	**0**	**0**	**0**	**9**	**0**	**19**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**8**	**1**	**13**	**67**
4:00 PM	0	3	0	0	0	0	0	0	0	0	5	0	0	0	2	1	11	61
4:15 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	4	0	9	52
4:30 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	4	0	9	42
4:45 PM	0	1	0	0	0	0	0	0	0	0	5	0	0	0	6	0	12	41
5:00 PM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	4	1	8	38
5:15 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	4	33
5:30 PM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	2	0	6	30
5:45 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	5	23
Count Total	0	6	0	0	0	0	0	0	0	1	58	0	0	0	62	4	131	0
Peak Hour	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**27**	**0**	**0**	**0**	**35**	**2**	**67**	**0**

Three-Hour Count Summaries - Bikes

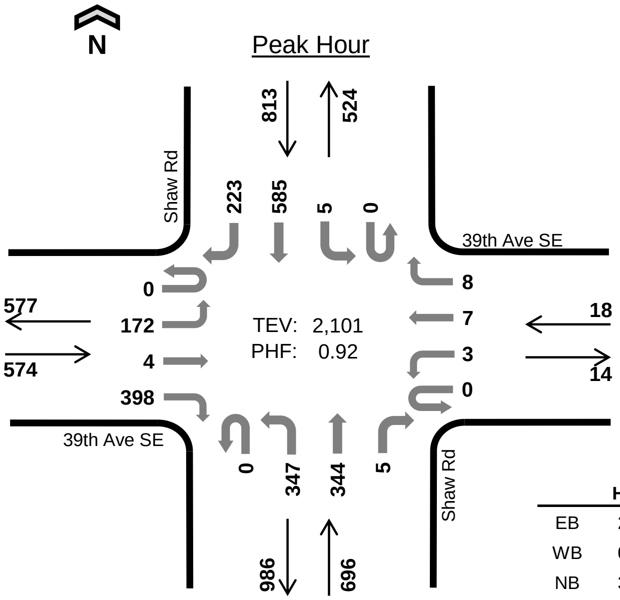
Interval Start	Manorwood Dr			0			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

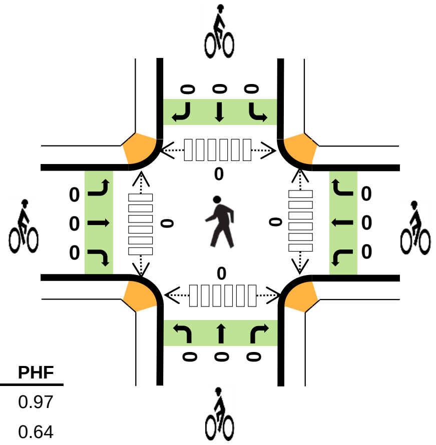
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Shaw Rd
39th Ave SE

Date: Tue, Aug 03, 2021
Count Period: 3:00 PM to 6:00 PM
Peak Hour: 3:15 PM to 4:15 PM

Peak Hour





	HV %:	PHF
EB	2.1%	0.97
WB	0.0%	0.64
NB	3.6%	0.90
SB	3.8%	0.92
TOTAL	3.2%	0.92

Three-Hour Count Summaries

Interval Start		39th Ave SE				39th Ave SE				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:15 PM		0	40	2	99	0	0	2	1	0	89	87	0	0	1	162	56	539	0
3:30 PM		0	44	1	103	0	1	1	5	0	88	102	3	0	3	149	69	569	0
3:45 PM		0	43	1	104	0	1	3	0	0	91	69	1	0	1	128	54	496	0
4:00 PM		0	45	0	92	0	1	1	2	0	79	86	1	0	0	146	44	497	2,101
Peak Hour	All	0	172	4	398	0	3	7	8	0	347	344	5	0	5	585	223	2,101	0
	HV	0	1	0	11	0	0	0	0	0	1	24	0	0	0	25	6	68	0
	HV%	-	1%	0%	3%	-	0%	0%	0%	-	0%	7%	0%	-	0%	4%	3%	3%	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:15 PM	2	0	8	13	*23*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	4	0	6	6	*16*	0	0	0	0	*0*	0	0	0	0	*0*
3:45 PM	4	0	6	8	*18*	0	0	0	0	*0*	0	0	0	0	*0*
4:00 PM	2	0	5	4	*11*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	12	0	25	31	*68*	0	0	0	0	*0*	0	0	0	0	*0*

Three-Hour Count Summaries

Interval Start		39th Ave SE				39th Ave SE				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM		0	33	0	81	0	0	1	1	0	81	67	2	0	0	168	50	484	0
3:15 PM		**0**	**40**	**2**	**99**	**0**	**0**	**2**	**1**	**0**	**89**	**87**	**0**	**0**	**1**	**162**	**56**	**539**	0
3:30 PM		**0**	**44**	**1**	**103**	**0**	**1**	**1**	**5**	**0**	**88**	**102**	**3**	**0**	**3**	**149**	**69**	**569**	0
3:45 PM		**0**	**43**	**1**	**104**	**0**	**1**	**3**	**0**	**0**	**91**	**69**	**1**	**0**	**1**	**128**	**54**	**496**	2,088
4:00 PM		**0**	**45**	**0**	**92**	**0**	**1**	**1**	**2**	**0**	**79**	**86**	**1**	**0**	**0**	**146**	**44**	**497**	**2,101**
4:15 PM		0	39	0	88	0	0	2	3	0	96	79	0	0	0	102	34	443	2,005
4:30 PM		0	41	5	95	0	0	0	3	0	86	86	0	0	1	149	40	506	1,942
4:45 PM		0	35	4	112	0	1	1	5	0	101	79	1	0	0	104	36	479	1,925
5:00 PM		0	52	1	122	0	1	2	0	0	79	75	3	0	0	139	41	515	1,943
5:15 PM		0	46	1	105	0	0	3	1	0	99	100	3	0	2	109	41	510	2,010
5:30 PM		0	45	3	111	0	0	3	6	0	79	73	1	0	6	116	59	502	2,006
5:45 PM		0	33	5	86	0	0	4	2	0	68	73	2	0	0	137	38	448	1,975
Count Total		0	496	23	1,198	0	5	23	29	0	1,036	976	17	0	14	1,609	562	5,988	0
Peak Hour	**All**	**0**	**172**	**4**	**398**	**0**	**3**	**7**	**8**	**0**	**347**	**344**	**5**	**0**	**5**	**585**	**223**	**2,101**	**0**
	HV	**0**	**1**	**0**	**11**	**0**	**0**	**0**	**0**	**0**	**1**	**24**	**0**	**0**	**0**	**25**	**6**	**68**	**0**
	HV%	**-**	**1%**	**0%**	**3%**	**-**	**0%**	**0%**	**0%**	**-**	**0%**	**7%**	**0%**	**-**	**0%**	**4%**	**3%**	**3%**	**0**

Note: Three-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	4	0	7	8	*19*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	**2**	**0**	**8**	**13**	***23***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:30 PM	**4**	**0**	**6**	**6**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:45 PM	**4**	**0**	**6**	**8**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:00 PM	**2**	**0**	**5**	**4**	***11***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:15 PM	2	0	11	7	*20*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	0	0	5	3	*8*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	4	0	3	2	*9*	1	0	0	0	*1*	0	0	0	0	*0*
5:00 PM	0	1	6	1	*8*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	1	0	4	4	*9*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	2	0	4	5	*11*	0	1	0	0	*1*	0	0	0	0	*0*
5:45 PM	2	0	4	1	*7*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	27	1	69	62	*159*	1	1	0	0	*2*	0	0	0	0	*0*
Peak Hour	**12**	**0**	**25**	**31**	***68***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Three-Hour Count Summaries - Heavy Vehicles

Interval Start	39th Ave SE				39th Ave SE				Shaw Rd				Shaw Rd				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	2	0	2	0	0	0	0	0	1	6	0	0	0	7	1	19	0
3:15 PM	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**9**	**4**	**23**	0
3:30 PM	**0**	**1**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**1**	**5**	**0**	**0**	**0**	**6**	**0**	**16**	0
3:45 PM	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**7**	**1**	**18**	76
4:00 PM	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**3**	**1**	**11**	**68**
4:15 PM	0	1	0	1	0	0	0	0	0	4	7	0	0	0	6	1	20	65
4:30 PM	0	0	0	0	0	0	0	0	0	1	4	0	0	0	3	0	8	57
4:45 PM	0	0	0	4	0	0	0	0	0	0	3	0	0	0	2	0	9	48
5:00 PM	0	0	0	0	0	0	1	0	0	2	3	1	0	0	1	0	8	45
5:15 PM	0	0	0	1	0	0	0	0	0	2	2	0	0	0	3	1	9	34
5:30 PM	0	1	0	1	0	0	0	0	0	3	1	0	0	0	3	2	11	37
5:45 PM	0	1	0	1	0	0	0	0	0	1	3	0	0	0	1	0	7	35
Count Total	0	6	0	21	0	0	1	0	0	15	53	1	0	0	51	11	159	0
Peak Hour	**0**	**1**	**0**	**11**	**0**	**0**	**0**	**0**	**0**	**1**	**24**	**0**	**0**	**0**	**25**	**6**	**68**	**0**

Three-Hour Count Summaries - Bikes

Interval Start	39th Ave SE			39th Ave SE			Shaw Rd			Shaw Rd			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	1	0	0	1	0	0	0	0	0	0	0	2	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

E Pioneer & 7th St to E Pioneer & 33rd St SE

Morning 6-9AM

EB	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6	RUN 7	RUN 8	RUN 9	RUN 10	RUN 11	RUN 12	RUN 13	RUN 14
Start Time - ON CLOCK E pioneer & 7th St	6:10:00 AM	6:20:00 AM	6:30:00 AM	6:43:00 AM	6:55:00 AM	7:08:00 AM	7:20:00 AM	7:32:00 AM	7:44:00 AM	7:56:00 AM	8:09:00 AM	8:21:00 AM	8:36:00 AM	8:49:00 AM
SR 161 SB Ramps	0:42	1:20	0:59	0:52	0:57	1:13	0:42	0:58	0:51	0:58	0:45	0:50	0:45	0:48
SR 161 NB Ramps	1:00	1:33	1:17	1:10	1:48	2:01	0:58	1:15	1:06	1:30	1:01	1:53	1:07	1:06
15th St SE	1:37	2:15	1:54	1:48	2:34	2:40	1:46	1:52	2:04	2:05	1:41	2:59	1:40	2:17
21st St SE	2:15	2:50	2:30	2:24	3:10	3:14	2:24	2:29	2:40	3:08	2:15	3:34	2:22	3:00
Shaw Rd	3:27	3:53	4:35	4:05	4:20	4:16	3:16	4:22	4:54	4:34	4:04	5:50	3:58	4:37
33rd St (End)	3:57	4:27	5:06	4:42	4:54	4:58	3:48	4:53	5:26	5:10	4:37	6:25	4:30	5:09

WB	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6	RUN 7	RUN 8	RUN 9	RUN 10	RUN 11	RUN 12	RUN 13	RUN 14	RUN 15
Start Time - ON CLOCK E Pioneer & 33rd St SE	6:00:00 AM	6:14:00 AM	6:25:00 AM	6:34:00 AM	6:49:00 AM	7:01:00 AM	7:13:00 AM	7:25:00 AM	7:39:00 AM	7:51:00 AM	8:03:00 AM	8:15:00 AM	8:29:00 AM	8:42:00 AM	8:55:00 AM
Shaw Rd	2:00	1:48	1:38	2:28	1:53	2:30	3:08	2:32	2:14	1:08	2:15	1:09	2:50	2:34	0:48
21st St SE	2:51	2:50	2:24	3:30	2:58	3:27	3:56	3:18	3:02	1:58	3:04	2:28	3:39	3:24	1:37
15th St SE	3:22	3:45	3:16	4:05	3:$5	4:54	4:49	4:07	3:34	3:25	4:13	3:17	4:59	4:56	2:08
SR 161 NB Ramps	3:55	4:21	3:49	4:39	4:21	5:26	5:26	4:50	4:05	4:02	4:53	4:23	5:36	5:34	2:40
SR 161 Sb Ramps	4:10	5:02	4:05	4:54	4:47	5:47	5:41	5:25	4:45	4:18	5:10	5:10	6:05	5:50	2:55
7th St SE (End)	4:30	5:24	4:23	5:09	5:06	5:59	5:54	5:42	4:57	4:28	5:26	5:29	6:19	6:18	3:18

Shaw Rd & 39th Ave to Traffic Ave & State St

Morning 6-9AM

NB	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6	RUN 7	RUN 8
Start Time - ON CLOCK Shaw Rd & 39th Ave	6:03:00 AM	6:26:00 AM	6:50:00 AM	7:18:00 AM	7:41:00 AM	8:00:00 AM	8:26:00 AM	8:49:00 AM
Crystal Ridge Dr	1:49	1:53	1:58	2:!3	2:32	1:46	1:55	1:54
Safeway Access	3:40	3:28	3:38	4:12	4:16	3:22	3:41	3:46
E Pioneer	3:50	3:46	3:59	5:07	4:24	3:33	5:06	4:42
E Main Ave	4:41	4:38	4:51	6:00	5:18	4:20	5:59	5:37
SR 410 Ramps	5:40	5:44	5:50	6:58	6:37	5:21	7:10	6:47
Thompson St	6:38	6:00	6:48	7:23	7:35	5:40	7:30	7:37
State St (End)	6:59	6:18	7:07	7:44	7:57	6:46	7:50	8:01

SB	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6	RUN 7	RUN 8
Start Time - ON CLOCK Traffic Ave & State St	6:16:00 AM	6:35:00 AM	7:00:00 AM	7:30:00 AM	7:51:00 AM	8:15:00 AM	8:38:00 AM	8:58:00 AM
Thompson St	0:21	0:24	0:22	0:25	0:23	0:19	0:31	0:44
SR 410 Ramps	0:34	1:17	1:01	1:10	0:40	0:37	0:46	0:58
Shaw Rd	1:32	2:14	1:51	2:01	1:45	1:41	1:47	1:52
E Pioneer	2:48	3:39	3:10	2:52	3:47	2:56	3:02	2:53
Safeway Access	3:19	4:42	3:23	3:01	4:01	4:42	3:22	3:14
Crystal Ridge Dr	5:07	6:28	5:04	5:44	5:45	6:27	5:10	5:15
39th Ave (End)	6:59	8:30	7:29	8:17	7:43	8:42	7:28	7:43

E Pioneer & 7th St to E Pioneer & 33rd St SE

Afternoon 3-6PM

EB	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6	RUN 7	RUN 8	RUN 9	RUN 10	RUN 11	RUN 12	RUN 13
Start Time - ON CLOCK E pioneer & 7th St	3:05:00 PM	3:19:00 PM	3:34:00 PM	3:48:00 PM	4:01:00 PM	4:16:00 PM	4:30:00 PM	4:45:00 PM	4:59:00 PM	5:13:00 PM	5:25:00 PM	5:38:00 PM	5:54:00 PM
SR 161 SB Ramps	1:00	0:17	0:50	0:33	0:41	0:33	0:51	1:00	0:41	0:15	0:48	0:35	0:20
SR 161 NB Ramps	1:17	1:12	1:27	0:50	0:59	0:50	1:12	1:28	1:05	0:32	1:06	0:52	0:39
15th St SE	2:08	2:12	2:51	1:27	2:15	1:32	1:51	2:06	2:00	1:12	1:41	1:51	1:32
21st St SE	2:47	2:50	3:36	2:03	2:53	2:11	2:30	2:$2	2:39	1:52	2:21	2:38	2:14
Shaw Rd	5:31	5:16	4:44	4:50	5:28	4:05	4:20	3:30	3:46	3:13	3:28	6:19	4:17
33rd St (End)	6:05	5:53	5:21	5:26	5:59	4:58	4:51	4:08	4:18	3:48	4:03	6:50	4:53

WB	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6	RUN 7	RUN 8	RUN 9	RUN 10	RUN 11	RUN 12	RUN 13
Start Time - ON CLOCK E Pioneer & 33rd St SE	3:00:00 PM	3:13:00 PM	3:27:00 PM	3:41:00 PM	3:55:00 PM	4:09:00 PM	4:23:00 PM	4:37:00 PM	4:52:00 PM	5:05:00 PM	5:19:00 PM	5:31:00 PM	5:47:00 PM
Shaw Rd	1:04	2:06	2:05	1:59	2:02	2:09	2:16	2:18	1:39	1:44	2:02	2:04	1:44
21st St SE	1:52	2:59	2:57	2:51	2:58	3:01	3:12	3:11	2:35	2:35	2:56	2:57	2:38
15th St SE	2:29	3:46	3:38	3:35	3:40	4:27	4:17	4:52	3:49	4:!3	3:34	4:42	3:29
SR 161 NB Ramps	3:04	4:25	4:21	4:!4	4:17	5:05	4:56	5:29	4:53	4:50	4:11	5:18	4:07
SR 161 Sb Ramps	3:20	4:45	4:58	4:31	4:35	5:21	5:12	5:55	5:12	5:07	4:28	5:33	4:24
7th St SE (End)	3:31	4:58	5:11	4:40	4:51	5:32	5:21	6:15	5:25	5:17	4:38	5:51	4:36

Shaw Rd & 39th Ave to Traffic Ave & State St

Afternoon 3-6PM

NB	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
Start Time - ON CLOCK Shaw Rd & 39th Ave	3:02:00 PM	3:27:00 PM	3:53:00 PM	4:27:00 PM	5:06:00 PM	5:47:00 PM
Crystal Ridge Dr	1:57	1:46	2:14	2:27	1:55	1:38
Safeway Access	3:39	3:15	4:13	4:13	3:29	3:19
E Pioneer	3:49	4:00	4:49	4:49	5:11	5:18
E Main Ave	4;33	4:55	5:48	5:38	6:35	6:06
SR 410 Ramps	5:37	5:54	6:47	6:54	8:23	6:59
Thompson St	6:28	6:13	7:28	7:38	9:13	7:37
State St (End)	6:53	6:54	8:35	8:25	9:34	7:56

SB	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5
Start Time - ON CLOCK Traffic Ave & State St	3:12:00 PM	3:36:00 PM	4:03:00 PM	4:39:00 PM	5:22:00 PM
Thompson St	2:14	1:37	1:39	2:30	2:39
SR 410 Ramps	2:43	2:06	3:51	2:48	3:11
Shaw Rd	3:42	3:01	4:55	3:58	4:55
E Pioneer	4:57	4:50	7:09	6:57	6:15
Safeway Access	5:58	5:04	7:20	7:11	6:28
Crystal Ridge Dr	8:04	7:39	9:18	11:54	10:22
39th Ave (End)	11:06	13:16	19:22	22:38	21:03

Vehicle Speed Report Summary

Location: Shaw Rd N-O E Pioneer

Count Direction: Northbound / Southbound

Date Range: 8/3/2021 to 8/5/2021

Site Code: A

	Speed Range (mph)																	Total
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
Study Total																		
Northbound	48	4	12	10	105	2,141	12,489	14,019	3,934	693	138	47	14	10	2	2	10	33,678
Percent	0.1%	0.0%	0.0%	0.0%	0.3%	6.4%	37.1%	41.6%	11.7%	2.1%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Southbound	148	605	1,171	2,056	2,853	4,929	8,599	7,364	2,452	487	96	17	8	2	2	0	0	30,789
Percent	0.5%	2.0%	3.8%	6.7%	9.3%	16.0%	27.9%	23.9%	8.0%	1.6%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Total	196	609	1,183	2,066	2,958	7,070	21,088	21,383	6,386	1,180	234	64	22	12	4	2	10	64,467
Percent	0.3%	0.9%	1.8%	3.2%	4.6%	11.0%	32.7%	33.2%	9.9%	1.8%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Total Study Percentile Speed Summary			Total Study Speed Statistics		
Northbound			**Northbound**		
50th Percentile (Median)	40.6	mph	Mean (Average) Speed	40.8	mph
85th Percentile	44.9	mph	10 mph Pace	35.5 - 45.5	mph
95th Percentile	48.1	mph	Percent in Pace	78.8	%
Southbound			**Southbound**		
50th Percentile (Median)	37.4	mph	Mean (Average) Speed	35.7	mph
85th Percentile	43.5	mph	10 mph Pace	34.0 - 44.0	mph
95th Percentile	47.1	mph	Percent in Pace	52.6	%

Location: Shaw Rd N-O E Pioneer
Date Range: 8/3/2021 to 8/5/2021
Site Code: A

Tuesday, August 3, 2021
Northbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	6	18	21	6	2	1	0	0	0	0	0	0	**54**
1:00 AM	0	0	0	0	0	1	12	11	5	2	0	0	0	0	0	0	0	**31**
2:00 AM	0	0	0	0	0	5	18	14	13	2	0	0	0	0	0	0	0	**52**
3:00 AM	0	0	0	0	1	6	43	64	24	5	1	0	0	0	0	0	0	**144**
4:00 AM	0	0	0	0	1	5	135	274	106	18	7	1	0	0	0	0	0	**547**
5:00 AM	0	0	0	0	0	18	262	331	72	11	3	3	0	1	0	0	0	**701**
6:00 AM	0	0	1	0	1	44	330	410	109	11	3	2	0	0	0	0	0	**911**
7:00 AM	0	0	0	0	1	52	336	437	97	15	4	1	0	0	1	1	0	**945**
8:00 AM	0	0	4	0	2	32	259	337	84	14	2	1	0	0	0	0	0	**735**
9:00 AM	0	0	0	0	4	42	241	244	62	6	2	0	0	0	0	0	0	**601**
10:00 AM	0	0	0	0	2	59	216	226	45	7	3	0	0	0	0	0	0	**558**
11:00 AM	0	0	0	0	7	52	281	234	79	10	0	0	0	0	0	0	0	**663**
12:00 PM	0	0	0	0	1	38	307	231	77	11	0	1	0	0	0	0	0	**666**
1:00 PM	1	0	1	0	1	53	247	237	70	16	1	2	0	1	0	0	0	**630**
2:00 PM	1	0	0	0	3	27	210	224	48	8	1	0	0	0	0	0	0	**522**
3:00 PM	7	0	0	0	4	42	188	196	50	6	0	0	0	0	0	0	0	**493**
4:00 PM	3	0	0	0	1	44	210	207	52	14	2	0	1	0	0	0	0	**534**
5:00 PM	2	0	0	0	4	27	207	210	39	8	2	0	1	0	0	0	0	**500**
6:00 PM	2	0	0	0	1	19	152	210	59	12	4	0	1	0	0	0	0	**460**
7:00 PM	0	0	1	0	1	14	93	135	40	2	1	0	1	1	0	0	0	**289**
8:00 PM	0	0	0	0	2	22	106	106	32	5	0	0	0	0	0	0	0	**273**
9:00 PM	0	0	0	0	0	27	79	85	29	3	1	0	1	0	0	0	0	**225**
10:00 PM	0	0	0	0	1	11	36	48	15	4	1	0	0	0	0	0	0	**116**
11:00 PM	0	0	0	0	0	4	26	25	7	3	0	0	0	0	0	0	0	**65**
Total	**16**	**0**	**7**	**0**	**38**	**650**	**4,012**	**4,517**	**1,220**	**195**	**39**	**11**	**5**	**3**	**1**	**1**	**0**	**10,715**
Percent	**0.1%**	**0.0%**	**0.1%**	**0.0%**	**0.4%**	**6.1%**	**37.4%**	**42.2%**	**11.4%**	**1.8%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary		
50th Percentile (Median)	40.5	mph
85th Percentile	44.7	mph
95th Percentile	47.8	mph

Speed Statistics		
Mean (Average) Speed	40.7	mph
10 mph Pace	35.1 - 45.1	mph
Percent in Pace	79.5	%

Location: **Shaw Rd N-O E Pioneer**
Date Range: **8/3/2021 to 8/5/2021**
Site Code: **A**

IDAX DATA SOLUTIONS

Tuesday, August 3, 2021
Southbound

	Speed Range (mph)																	Total
Time	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
12:00 AM	0	0	0	0	0	9	27	28	10	9	1	0	0	0	0	0	0	**84**
1:00 AM	0	0	0	0	0	3	13	21	11	5	1	0	0	0	0	0	0	**54**
2:00 AM	0	0	0	0	2	3	6	9	10	3	0	0	0	0	0	0	0	**33**
3:00 AM	0	0	0	0	0	0	3	13	3	3	0	0	0	0	0	0	0	**22**
4:00 AM	0	0	0	0	1	2	12	19	4	0	0	0	0	0	0	0	0	**38**
5:00 AM	0	0	0	0	1	6	37	41	18	7	1	0	0	0	0	0	0	**111**
6:00 AM	0	0	0	0	4	11	48	88	28	5	2	0	0	0	0	0	0	**186**
7:00 AM	0	0	0	0	2	18	111	115	38	7	3	0	0	0	0	0	0	**294**
8:00 AM	0	0	2	2	13	40	112	119	47	10	1	0	0	0	0	0	0	**346**
9:00 AM	0	0	0	3	12	45	139	114	41	4	1	0	0	0	0	0	0	**359**
10:00 AM	0	0	0	2	6	62	163	113	46	5	3	0	0	0	0	0	0	**400**
11:00 AM	0	0	1	18	39	105	192	153	43	8	1	0	0	0	0	0	0	**560**
12:00 PM	0	2	5	32	61	143	199	126	43	4	0	0	0	0	0	0	0	**615**
1:00 PM	0	1	3	17	52	128	224	164	48	8	2	0	1	0	0	0	0	**648**
2:00 PM	1	11	36	74	118	184	212	157	56	3	1	1	0	0	0	0	0	**854**
3:00 PM	12	49	71	170	158	156	201	147	49	12	2	0	1	1	0	0	0	**1,029**
4:00 PM	11	45	74	134	173	192	229	122	46	8	0	1	1	0	0	0	0	**1,036**
5:00 PM	13	51	101	126	142	210	212	140	43	10	4	0	0	0	0	0	0	**1,052**
6:00 PM	4	26	29	68	99	150	198	153	47	7	2	0	0	0	0	0	0	**783**
7:00 PM	0	0	0	2	29	65	149	181	71	16	2	1	0	0	0	0	0	**516**
8:00 PM	0	0	0	0	8	45	149	135	52	9	3	0	1	0	0	0	0	**402**
9:00 PM	0	0	0	0	1	22	106	138	39	7	0	1	0	0	0	0	0	**314**
10:00 PM	0	0	0	0	0	8	66	74	26	9	0	0	0	0	0	0	0	**183**
11:00 PM	0	0	0	0	0	5	52	63	31	14	1	1	0	0	0	0	0	**167**
Total	**41**	**185**	**322**	**648**	**921**	**1,612**	**2,860**	**2,433**	**850**	**173**	**31**	**5**	**4**	**1**	**0**	**0**	**0**	**10,086**
Percent	**0.4%**	**1.8%**	**3.2%**	**6.4%**	**9.1%**	**16.0%**	**28.4%**	**24.1%**	**8.4%**	**1.7%**	**0.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	37.5	mph	Mean (Average) Speed	36	mph
85th Percentile	43.7	mph	10 mph Pace	34.1 - 44.1	mph
95th Percentile	47.4	mph	Percent in Pace	52.98	%

Mark Skaggs:425-250-0777
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Location: Shaw Rd N-O E Pioneer
Date Range: 8/3/2021 to 8/5/2021
Site Code: A

Wednesday, August 4, 2021
Northbound

Time	Speed Range (mph)																	Total
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
12:00 AM	0	0	0	0	0	4	20	13	2	3	0	1	0	0	0	0	0	**43**
1:00 AM	0	0	0	0	1	5	11	9	4	0	0	0	0	0	0	0	0	**30**
2:00 AM	0	0	0	0	0	7	11	26	10	3	0	0	0	0	0	0	0	**57**
3:00 AM	0	0	0	0	1	6	42	59	27	5	0	0	0	0	0	0	0	**140**
4:00 AM	0	0	0	0	0	16	114	250	111	27	4	7	0	1	0	0	0	**530**
5:00 AM	0	0	1	0	0	24	269	321	79	14	1	3	1	0	0	0	0	**713**
6:00 AM	0	0	0	0	2	35	345	411	82	16	4	2	0	0	0	0	0	**897**
7:00 AM	0	0	0	0	2	70	333	371	121	19	3	0	1	0	0	0	0	**920**
8:00 AM	0	0	0	0	1	63	301	367	109	20	2	3	0	0	0	0	2	**868**
9:00 AM	0	0	0	0	1	61	284	309	78	20	5	1	0	0	0	0	0	**759**
10:00 AM	0	0	0	0	4	37	217	250	58	11	3	0	0	0	0	0	0	**580**
11:00 AM	0	0	0	0	2	52	281	272	62	7	1	0	0	0	0	0	0	**677**
12:00 PM	0	0	1	0	4	25	241	298	77	14	1	1	1	0	0	0	0	**663**
1:00 PM	0	0	0	0	1	38	241	283	66	11	6	2	0	1	0	0	0	**649**
2:00 PM	0	0	0	1	1	70	212	210	57	14	1	1	0	0	0	0	4	**571**
3:00 PM	1	0	1	0	4	40	191	212	50	12	2	1	1	0	0	0	4	**519**
4:00 PM	2	2	0	0	2	45	271	249	60	8	5	0	0	0	0	0	0	**644**
5:00 PM	0	2	0	0	0	21	219	248	61	10	3	0	0	1	0	0	0	**565**
6:00 PM	6	0	0	0	2	30	180	228	74	13	2	0	0	0	0	0	0	**535**
7:00 PM	0	0	0	0	1	20	125	141	63	11	2	1	0	0	0	0	0	**364**
8:00 PM	0	0	0	0	2	19	92	110	46	13	4	1	0	0	0	0	0	**287**
9:00 PM	0	0	0	0	3	20	105	87	18	5	0	1	0	0	0	0	0	**239**
10:00 PM	0	0	0	1	2	17	59	44	16	1	0	1	1	0	0	0	0	**142**
11:00 PM	0	0	0	1	3	14	20	30	12	3	0	0	0	0	0	0	0	**83**
Total	**9**	**4**	**3**	**3**	**39**	**739**	**4,184**	**4,798**	**1,343**	**260**	**49**	**26**	**5**	**3**	**0**	**0**	**10**	**11,475**
Percent	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.3%**	**6.4%**	**36.5%**	**41.8%**	**11.7%**	**2.3%**	**0.4%**	**0.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.1%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	40.7	mph	Mean (Average) Speed	40.9	mph
85th Percentile	45.0	mph	10 mph Pace	35.7 - 45.7	mph
95th Percentile	48.3	mph	Percent in Pace	78.7	%

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Location: **Shaw Rd N-O E Pioneer**
Date Range: **8/3/2021 to 8/5/2021**
Site Code: **A**

Wednesday, August 4, 2021
Southbound

Time	Speed Range (mph)																	Total
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
12:00 AM	0	0	0	0	1	5	29	36	21	3	0	0	0	0	0	0	0	**95**
1:00 AM	0	0	0	0	0	6	21	16	9	5	0	0	0	0	0	0	0	**57**
2:00 AM	0	1	1	0	0	2	10	10	5	3	0	0	0	0	0	0	0	**32**
3:00 AM	0	0	0	0	0	1	8	13	7	7	0	0	0	0	0	0	0	**36**
4:00 AM	0	0	0	0	0	4	16	16	12	3	0	0	0	0	0	0	0	**51**
5:00 AM	0	0	0	0	1	5	26	40	21	5	1	2	0	0	0	0	0	**101**
6:00 AM	0	0	0	0	1	9	46	79	25	7	1	0	0	0	0	0	0	**168**
7:00 AM	0	0	0	0	4	45	95	113	24	5	2	0	0	0	0	0	0	**288**
8:00 AM	0	0	0	2	5	42	122	107	38	5	1	0	0	0	0	0	0	**322**
9:00 AM	0	0	0	0	10	49	103	145	42	13	1	1	0	0	0	0	0	**364**
10:00 AM	0	0	0	0	6	61	163	131	34	10	1	0	0	0	0	0	0	**406**
11:00 AM	0	2	5	24	47	104	182	130	37	3	0	0	0	0	0	0	0	**534**
12:00 PM	1	3	7	16	43	118	236	160	39	9	1	0	0	0	0	0	0	**633**
1:00 PM	5	6	15	31	75	148	205	157	45	7	1	1	0	0	0	0	0	**696**
2:00 PM	3	27	51	109	116	157	207	143	51	6	5	0	0	0	1	0	0	**876**
3:00 PM	27	49	94	160	163	126	146	111	31	2	1	0	1	0	0	0	0	**911**
4:00 PM	19	66	80	147	169	185	152	116	35	7	1	0	0	0	0	0	0	**977**
5:00 PM	6	27	71	126	147	189	212	125	39	5	1	0	0	0	0	0	0	**948**
6:00 PM	5	11	38	74	109	194	241	173	63	6	1	0	0	0	0	0	0	**915**
7:00 PM	1	4	6	15	30	77	172	207	57	10	2	1	0	0	0	0	0	**582**
8:00 PM	0	0	0	3	7	48	145	177	62	12	2	0	0	0	0	0	0	**456**
9:00 PM	0	0	0	0	4	45	149	130	35	7	2	0	0	0	0	0	0	**372**
10:00 PM	0	0	0	0	2	19	83	107	45	7	2	1	0	0	0	0	0	**266**
11:00 PM	0	0	0	0	0	8	49	73	30	6	5	1	0	0	0	0	0	**172**
Total	**67**	**196**	**368**	**707**	**940**	**1,647**	**2,818**	**2,515**	**807**	**153**	**31**	**7**	**1**	**0**	**1**	**0**	**0**	**10,258**
Percent	**0.7%**	**1.9%**	**3.6%**	**6.9%**	**9.2%**	**16.1%**	**27.5%**	**24.5%**	**7.9%**	**1.5%**	**0.3%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	37.4	mph	Mean (Average) Speed	35.7	mph
85th Percentile	43.5	mph	10 mph Pace	34.0 - 44.0	mph
95th Percentile	47.0	mph	Percent in Pace	52.81	%

Location: Shaw Rd N-O E Pioneer
Date Range: 8/3/2021 to 8/5/2021
Site Code: A

Thursday, August 5, 2021
Northbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	1	1	4	21	13	6	3	0	0	0	0	0	0	0	**49**
1:00 AM	1	0	0	0	1	6	16	16	5	1	0	0	0	0	0	0	0	**46**
2:00 AM	0	0	0	0	0	4	20	14	11	3	0	0	0	1	0	0	0	**53**
3:00 AM	0	0	0	0	2	16	39	57	34	8	0	0	0	0	0	0	0	**156**
4:00 AM	0	0	0	1	3	14	139	223	112	26	3	0	1	0	0	0	0	**522**
5:00 AM	0	0	0	1	0	24	267	360	118	19	4	0	1	1	0	0	0	**795**
6:00 AM	0	0	0	0	2	66	373	372	95	16	9	2	0	0	0	0	0	**935**
7:00 AM	0	0	0	0	0	31	343	411	110	21	2	0	0	0	0	0	0	**918**
8:00 AM	0	0	0	3	6	27	239	291	86	10	3	0	0	0	0	0	0	**665**
9:00 AM	0	0	0	0	1	54	261	224	49	11	1	1	0	0	0	0	0	**602**
10:00 AM	0	0	0	0	1	59	200	252	64	10	2	0	0	0	0	0	0	**588**
11:00 AM	0	0	0	0	1	61	249	288	75	6	3	0	0	0	0	0	0	**683**
12:00 PM	0	0	0	0	0	62	336	312	70	11	2	0	0	0	0	0	0	**793**
1:00 PM	0	0	1	0	1	51	256	247	65	5	0	0	0	1	0	0	0	**627**
2:00 PM	0	0	0	1	2	52	264	254	71	12	3	0	0	0	0	0	0	**659**
3:00 PM	4	0	0	0	0	46	200	219	71	16	1	1	0	0	0	0	0	**558**
4:00 PM	6	0	0	0	1	45	205	220	61	12	3	2	0	0	0	0	0	**555**
5:00 PM	9	0	0	0	1	35	250	274	65	11	5	3	1	0	0	0	0	**654**
6:00 PM	3	0	0	0	1	15	156	198	66	11	2	1	0	0	0	0	0	**453**
7:00 PM	0	0	0	0	1	15	120	168	51	10	4	0	0	1	1	0	0	**371**
8:00 PM	0	0	0	0	0	27	139	106	35	5	0	0	1	0	0	1	0	**314**
9:00 PM	0	0	1	0	3	16	119	88	24	4	0	0	0	0	0	0	0	**255**
10:00 PM	0	0	0	0	0	16	51	65	13	5	3	0	0	0	0	0	0	**153**
11:00 PM	0	0	0	0	0	6	30	32	14	2	0	0	0	0	0	0	0	**84**
Total	**23**	**0**	**2**	**7**	**28**	**752**	**4,293**	**4,704**	**1,371**	**238**	**50**	**10**	**4**	**4**	**1**	**1**	**0**	**11,488**
Percent	**0.2%**	**0.0%**	**0.0%**	**0.1%**	**0.2%**	**6.5%**	**37.4%**	**40.9%**	**11.9%**	**2.1%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			**Speed Statistics**		
50th Percentile (Median)	40.5	mph	Mean (Average) Speed	40.8	mph
85th Percentile	45.0	mph	10 mph Pace	35.3 - 45.3	mph
95th Percentile	48.2	mph	Percent in Pace	78.4	%

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

DATA SOLUTIONS

Location: **Shaw Rd N-O E Pioneer**
Date Range: **8/3/2021 to 8/5/2021**
Site Code: **A**

Thursday, August 5, 2021
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	7	25	49	13	4	1	0	1	0	0	0	0	**100**
1:00 AM	0	0	0	0	0	2	20	33	12	5	0	0	0	0	0	0	0	**72**
2:00 AM	0	0	0	0	1	1	7	11	8	5	0	1	0	0	0	0	0	**34**
3:00 AM	0	0	0	0	0	0	12	13	6	1	0	0	0	0	0	0	0	**32**
4:00 AM	0	0	0	0	0	5	14	19	9	1	0	0	0	0	0	0	0	**48**
5:00 AM	0	0	0	0	1	4	28	41	23	2	1	0	0	0	0	0	0	**100**
6:00 AM	0	0	0	0	1	12	45	72	36	10	2	1	0	0	0	0	0	**179**
7:00 AM	0	0	0	1	3	31	107	108	48	7	2	0	0	1	0	0	0	**308**
8:00 AM	0	0	1	4	10	39	124	134	26	5	3	0	0	0	0	0	0	**346**
9:00 AM	0	0	0	7	25	81	140	108	31	4	2	0	0	0	0	0	0	**398**
10:00 AM	0	0	0	1	12	71	155	144	42	10	0	0	1	0	0	0	0	**436**
11:00 AM	1	12	4	15	50	108	192	129	32	4	2	0	0	0	0	0	0	**549**
12:00 PM	0	0	6	16	60	112	202	133	46	10	2	1	0	0	0	0	0	**588**
1:00 PM	0	5	32	34	70	124	214	160	51	12	0	0	0	0	0	0	0	**702**
2:00 PM	7	29	81	87	132	176	167	137	48	11	1	0	0	0	0	0	0	**876**
3:00 PM	3	48	104	152	181	158	177	113	48	6	0	0	0	0	0	0	0	**990**
4:00 PM	15	66	80	137	145	143	193	166	35	4	1	0	0	0	0	0	0	**985**
5:00 PM	10	47	129	151	155	202	187	88	33	5	0	1	0	0	0	0	0	**1,008**
6:00 PM	4	17	41	69	95	171	209	166	54	13	2	0	0	0	0	0	0	**841**
7:00 PM	0	0	2	22	27	93	221	146	62	7	3	0	0	0	0	0	0	**583**
8:00 PM	0	0	1	4	14	66	171	165	38	9	1	0	1	0	0	0	0	**470**
9:00 PM	0	0	0	1	9	44	145	117	39	6	4	1	0	0	1	0	0	**367**
10:00 PM	0	0	0	0	1	15	110	84	35	10	1	0	0	0	0	0	0	**256**
11:00 PM	0	0	0	0	0	5	56	80	20	10	6	0	0	0	0	0	0	**177**
Total	**40**	**224**	**481**	**701**	**992**	**1,670**	**2,921**	**2,416**	**795**	**161**	**34**	**5**	**3**	**1**	**1**	**0**	**0**	**10,445**
Percent	**0.4%**	**2.1%**	**4.6%**	**6.7%**	**9.5%**	**16.0%**	**28.0%**	**23.1%**	**7.6%**	**1.5%**	**0.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	37.2	mph	Mean (Average) Speed	35.4	mph
85th Percentile	43.4	mph	10 mph Pace	34.0 - 44.0	mph
95th Percentile	47.1	mph	Percent in Pace	52.01	%

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Location: Shaw Rd N-O E Pioneer
Date Range: 8/3/2021 to 8/5/2021
Site Code: A

Total Study Average
Northbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	5	20	16	5	3	0	0	0	0	0	0	0	**49**
1:00 AM	0	0	0	0	1	4	13	12	5	1	0	0	0	0	0	0	0	**36**
2:00 AM	0	0	0	0	0	5	16	18	11	3	0	0	0	0	0	0	0	**53**
3:00 AM	0	0	0	0	1	9	41	60	28	6	0	0	0	0	0	0	0	**145**
4:00 AM	0	0	0	0	1	12	129	249	110	24	5	3	0	0	0	0	0	**533**
5:00 AM	0	0	0	0	0	22	266	337	90	15	3	2	1	1	0	0	0	**737**
6:00 AM	0	0	0	0	2	48	349	398	95	14	5	2	0	0	0	0	0	**913**
7:00 AM	0	0	0	0	1	51	337	406	109	18	3	0	0	0	0	0	0	**925**
8:00 AM	0	0	1	1	3	41	266	332	93	15	2	1	0	0	0	0	1	**756**
9:00 AM	0	0	0	0	2	52	262	259	63	12	3	1	0	0	0	0	0	**654**
10:00 AM	0	0	0	0	2	52	211	243	56	9	3	0	0	0	0	0	0	**576**
11:00 AM	0	0	0	0	3	55	270	265	72	8	1	0	0	0	0	0	0	**674**
12:00 PM	0	0	0	0	2	42	295	280	75	12	1	1	0	0	0	0	0	**708**
1:00 PM	0	0	1	0	1	47	248	256	67	11	2	1	0	1	0	0	0	**635**
2:00 PM	0	0	0	1	2	50	229	229	59	11	2	0	0	0	0	0	1	**584**
3:00 PM	4	0	0	0	3	43	193	209	57	11	1	1	0	0	0	0	1	**523**
4:00 PM	4	1	0	0	1	45	229	225	58	11	3	1	0	0	0	0	0	**578**
5:00 PM	4	1	0	0	2	28	225	244	55	10	3	1	1	0	0	0	0	**574**
6:00 PM	4	0	0	0	1	21	163	212	66	12	3	0	0	0	0	0	0	**482**
7:00 PM	0	0	0	0	1	16	113	148	51	8	2	0	0	1	0	0	0	**340**
8:00 PM	0	0	0	0	1	23	112	107	38	8	1	0	0	0	0	0	0	**290**
9:00 PM	0	0	0	0	2	21	101	87	24	4	0	0	0	0	0	0	0	**239**
10:00 PM	0	0	0	0	1	15	49	52	15	3	1	0	0	0	0	0	0	**136**
11:00 PM	0	0	0	0	1	8	25	29	11	3	0	0	0	0	0	0	0	**77**
Total	**16**	**2**	**2**	**2**	**34**	**715**	**4,162**	**4,673**	**1,313**	**232**	**44**	**14**	**2**	**3**	**0**	**0**	**3**	**11,217**
Percent	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.3%**	**6.4%**	**37.1%**	**41.7%**	**11.7%**	**2.1%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			Total Study Speed Statistics		
50th Percentile (Median)	40.6	mph	Mean (Average) Speed	40.8	mph
85th Percentile	44.9	mph	10 mph Pace	35.5 - 45.5	mph
95th Percentile	48.1	mph	Percent in Pace	78.8	%

Location: **Shaw Rd N-O E Pioneer**
Date Range: **8/3/2021 to 8/5/2021**
Site Code: **A**

Total Study Average
Southbound

Time	Speed Range (mph)																	Total
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
12:00 AM	0	0	0	0	0	7	27	38	15	5	1	0	0	0	0	0	0	**93**
1:00 AM	0	0	0	0	0	4	18	23	11	5	0	0	0	0	0	0	0	**61**
2:00 AM	0	0	0	0	1	2	8	10	8	4	0	0	0	0	0	0	0	**33**
3:00 AM	0	0	0	0	0	0	8	13	5	4	0	0	0	0	0	0	0	**30**
4:00 AM	0	0	0	0	0	4	14	18	8	1	0	0	0	0	0	0	0	**45**
5:00 AM	0	0	0	0	1	5	30	41	21	5	1	1	0	0	0	0	0	**105**
6:00 AM	0	0	0	0	2	11	46	80	30	7	2	0	0	0	0	0	0	**178**
7:00 AM	0	0	0	0	3	31	104	112	37	6	2	0	0	0	0	0	0	**295**
8:00 AM	0	0	1	3	9	40	119	120	37	7	2	0	0	0	0	0	0	**338**
9:00 AM	0	0	0	3	16	58	127	122	38	7	1	0	0	0	0	0	0	**372**
10:00 AM	0	0	0	1	8	65	160	129	41	8	1	0	0	0	0	0	0	**413**
11:00 AM	0	5	3	19	45	106	189	137	37	5	1	0	0	0	0	0	0	**547**
12:00 PM	0	2	6	21	55	124	212	140	43	8	1	0	0	0	0	0	0	**612**
1:00 PM	2	4	17	27	66	133	214	160	48	9	1	0	0	0	0	0	0	**681**
2:00 PM	4	22	56	90	122	172	195	146	52	7	2	0	0	0	0	0	0	**868**
3:00 PM	14	49	90	161	167	147	175	124	43	7	1	0	1	0	0	0	0	**979**
4:00 PM	15	59	78	139	162	173	191	135	39	6	1	0	0	0	0	0	0	**998**
5:00 PM	10	42	100	134	148	200	204	118	38	7	2	0	0	0	0	0	0	**1,003**
6:00 PM	4	18	36	70	101	172	216	164	55	9	2	0	0	0	0	0	0	**847**
7:00 PM	0	1	3	13	29	78	181	178	63	11	2	1	0	0	0	0	0	**560**
8:00 PM	0	0	0	2	10	53	155	159	51	10	2	0	1	0	0	0	0	**443**
9:00 PM	0	0	0	0	5	37	133	128	38	7	2	1	0	0	0	0	0	**351**
10:00 PM	0	0	0	0	1	14	86	88	35	9	1	0	0	0	0	0	0	**234**
11:00 PM	0	0	0	0	0	6	52	72	27	10	4	1	0	0	0	0	0	**172**
Total	**49**	**202**	**390**	**683**	**951**	**1,642**	**2,864**	**2,455**	**820**	**164**	**32**	**4**	**2**	**0**	**0**	**0**	**0**	**10,258**
Percent	**0.5%**	**2.0%**	**3.8%**	**6.7%**	**9.3%**	**16.0%**	**27.9%**	**23.9%**	**8.0%**	**1.6%**	**0.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			Total Study Speed Statistics		
50th Percentile (Median)	37.4	mph	Mean (Average) Speed	35.7	mph
85th Percentile	43.5	mph	10 mph Pace	34.0 - 44.0	mph
95th Percentile	47.1	mph	Percent in Pace	52.6	%

Location: Shaw Rd N-O E Pioneer
Date Range: 8/3/2021 - 8/9/2021
Site Code: A

Time	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average		
	8/3/2021			8/4/2021			8/5/2021			8/6/2021			8/7/2021			8/8/2021			8/9/2021					
	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	54	84	138	43	95	138	49	100	149	-	-	-	-	-	-	-	-	-	-	-	-	49	93	142
1:00 AM	31	54	85	30	57	87	46	72	118	-	-	-	-	-	-	-	-	-	-	-	-	36	61	97
2:00 AM	52	33	85	57	32	89	53	34	87	-	-	-	-	-	-	-	-	-	-	-	-	54	33	87
3:00 AM	144	22	166	140	36	176	156	32	188	-	-	-	-	-	-	-	-	-	-	-	-	147	30	177
4:00 AM	547	38	585	530	51	581	522	48	570	-	-	-	-	-	-	-	-	-	-	-	-	533	46	579
5:00 AM	701	111	812	713	101	814	795	100	895	-	-	-	-	-	-	-	-	-	-	-	-	736	104	840
6:00 AM	911	186	1,097	897	168	1,065	935	179	1,114	-	-	-	-	-	-	-	-	-	-	-	-	914	178	1,092
7:00 AM	945	294	1,239	920	288	1,208	918	308	1,226	-	-	-	-	-	-	-	-	-	-	-	-	928	297	1,224
8:00 AM	735	346	1,081	868	322	1,190	665	346	1,011	-	-	-	-	-	-	-	-	-	-	-	-	756	338	1,094
9:00 AM	601	359	960	759	364	1,123	602	398	1,000	-	-	-	-	-	-	-	-	-	-	-	-	654	374	1,028
10:00 AM	558	400	958	580	406	986	588	436	1,024	-	-	-	-	-	-	-	-	-	-	-	-	575	414	989
11:00 AM	663	560	1,223	677	534	1,211	683	549	1,232	-	-	-	-	-	-	-	-	-	-	-	-	674	548	1,222
12:00 PM	666	615	1,281	663	633	1,296	793	588	1,381	-	-	-	-	-	-	-	-	-	-	-	-	707	612	1,319
1:00 PM	630	648	1,278	649	696	1,345	627	702	1,329	-	-	-	-	-	-	-	-	-	-	-	-	635	682	1,317
2:00 PM	522	854	1,376	571	876	1,447	659	876	1,535	-	-	-	-	-	-	-	-	-	-	-	-	584	869	1,453
3:00 PM	493	1,029	1,522	519	911	1,430	558	990	1,548	-	-	-	-	-	-	-	-	-	-	-	-	523	977	1,500
4:00 PM	534	1,036	1,570	644	977	1,621	555	985	1,540	-	-	-	-	-	-	-	-	-	-	-	-	578	999	1,577
5:00 PM	500	1,052	1,552	565	948	1,513	654	1,008	1,662	-	-	-	-	-	-	-	-	-	-	-	-	573	1,003	1,576
6:00 PM	460	783	1,243	535	915	1,450	453	841	1,294	-	-	-	-	-	-	-	-	-	-	-	-	483	846	1,329
7:00 PM	289	516	805	364	582	946	371	583	954	-	-	-	-	-	-	-	-	-	-	-	-	341	560	902
8:00 PM	273	402	675	287	456	743	314	470	784	-	-	-	-	-	-	-	-	-	-	-	-	291	443	734
9:00 PM	225	314	539	239	372	611	255	367	622	-	-	-	-	-	-	-	-	-	-	-	-	240	351	591
10:00 PM	116	183	299	142	266	408	153	256	409	-	-	-	-	-	-	-	-	-	-	-	-	137	235	372
11:00 PM	65	167	232	83	172	255	84	177	261	-	-	-	-	-	-	-	-	-	-	-	-	77	172	249
Total	**10,715**	**10,086**	**20,801**	**11,475**	**10,258**	**21,733**	**11,488**	**10,445**	**21,933**	-	-	-	-	-	-	-	-	-	-	-	-	**11,226**	**10,263**	**21,489**
Percent	**52%**	**48%**	-	**53%**	**47%**	-	**52%**	**48%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**52%**	**48%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Vehicle Speed Report Summary

Location: Shaw Rd N-O 20th Ave Ct SE

Count Direction: Northbound / Southbound

Date Range: 8/3/2021 to 8/5/2021

Site Code: B

	Speed Range (mph)																	Total
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
									Study Total									
Northbound	22	39	110	331	2,260	10,338	12,838	4,076	635	75	10	1	1	0	0	0	0	30,736
Percent	0.1%	0.1%	0.4%	1.1%	7.4%	33.6%	41.8%	13.3%	2.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Southbound	1,044	1,846	2,322	1,873	2,357	6,228	10,013	4,080	679	129	21	9	6	0	0	0	3	30,610
Percent	3.4%	6.0%	7.6%	6.1%	7.7%	20.3%	32.7%	13.3%	2.2%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Total	1,066	1,885	2,432	2,204	4,617	16,566	22,851	8,156	1,314	204	31	10	7	0	0	0	3	61,346
Percent	1.7%	3.1%	4.0%	3.6%	7.5%	27.0%	37.2%	13.3%	2.1%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Total Study Percentile Speed Summary			Total Study Speed Statistics		
Northbound			**Northbound**		
50th Percentile (Median)	35.7	mph	Mean (Average) Speed	35.7	mph
85th Percentile	40.2	mph	10 mph Pace	31.0 - 41.0	mph
95th Percentile	43.2	mph	Percent in Pace	76.0	%
Southbound			**Southbound**		
50th Percentile (Median)	34.8	mph	Mean (Average) Speed	31.7	mph
85th Percentile	40.3	mph	10 mph Pace	31.9 - 41.9	mph
95th Percentile	43.4	mph	Percent in Pace	55.4	%

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Location: Shaw Rd N-O 20th Ave Ct SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: B

Tuesday, August 3, 2021
Northbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	1	1	0	4	6	5	10	6	2	0	0	0	0	0	0	0	**35**
1:00 AM	0	1	3	3	4	5	6	2	1	0	0	0	0	0	0	0	0	**25**
2:00 AM	1	1	1	3	4	11	9	8	3	1	0	0	0	0	0	0	0	**42**
3:00 AM	0	0	0	0	0	19	50	42	11	1	0	0	0	0	0	0	0	**123**
4:00 AM	0	0	0	4	8	83	200	153	24	1	0	0	0	0	0	0	0	**473**
5:00 AM	0	0	0	0	19	168	331	123	11	1	0	0	0	0	0	0	0	**653**
6:00 AM	0	0	0	6	67	386	362	79	8	0	0	0	0	0	0	0	0	**908**
7:00 AM	0	1	10	24	116	356	338	73	9	1	0	0	0	0	0	0	0	**928**
8:00 AM	0	0	0	0	18	225	307	96	12	1	0	0	0	0	0	0	0	**659**
9:00 AM	0	0	0	10	68	219	242	48	5	0	0	0	0	0	0	0	0	**592**
10:00 AM	4	26	53	67	115	153	113	17	2	0	0	0	0	0	0	0	0	**550**
11:00 AM	0	2	9	18	100	252	190	62	5	0	0	0	0	0	0	0	0	**638**
12:00 PM	0	0	0	2	49	212	253	59	6	1	0	0	0	0	0	0	0	**582**
1:00 PM	0	0	0	0	48	225	247	80	8	4	0	0	0	0	0	0	0	**612**
2:00 PM	0	0	1	3	33	154	218	66	8	1	0	0	0	0	0	0	0	**484**
3:00 PM	0	0	0	5	41	191	170	51	4	0	0	0	0	0	0	0	0	**462**
4:00 PM	2	0	0	15	63	175	177	40	0	1	0	0	0	0	0	0	0	**473**
5:00 PM	0	0	1	4	42	150	149	53	5	0	0	0	0	0	0	0	0	**404**
6:00 PM	0	0	0	0	8	147	159	70	14	1	0	0	0	0	0	0	0	**399**
7:00 PM	0	0	0	1	7	55	151	60	10	2	0	0	0	0	0	0	0	**286**
8:00 PM	2	0	1	2	33	93	114	39	6	0	0	0	0	0	0	0	0	**290**
9:00 PM	0	0	0	2	7	54	98	30	10	1	0	0	0	0	0	0	0	**202**
10:00 PM	0	0	0	0	2	23	40	14	8	2	0	0	0	0	0	0	0	**89**
11:00 PM	0	0	0	2	2	8	16	21	3	1	0	0	0	0	0	0	0	**53**
Total	**9**	**32**	**80**	**171**	**858**	**3,370**	**3,945**	**1,296**	**179**	**22**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9,962**
Percent	**0.1%**	**0.3%**	**0.8%**	**1.7%**	**8.6%**	**33.8%**	**39.6%**	**13.0%**	**1.8%**	**0.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary		
50th Percentile (Median)	35.5	mph
85th Percentile	40.0	mph
95th Percentile	42.9	mph

Speed Statistics		
Mean (Average) Speed	35.3	mph
10 mph Pace	30.5 - 40.5	mph
Percent in Pace	73.8	%

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Location: **Shaw Rd N-O 20th Ave Ct SE**
Date Range: **8/3/2021 to 8/5/2021**
Site Code: **B**

Tuesday, August 3, 2021
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	1	0	0	3	9	33	19	6	3	2	0	0	0	0	0	0	**76**
1:00 AM	0	0	1	0	6	12	18	9	0	0	0	0	0	0	0	0	0	**46**
2:00 AM	0	0	0	2	3	15	5	4	1	1	0	1	0	0	0	0	0	**32**
3:00 AM	0	0	0	0	1	1	9	8	1	2	0	0	0	0	0	0	0	**22**
4:00 AM	0	0	0	0	2	2	12	15	4	0	0	0	0	0	0	0	0	**35**
5:00 AM	0	0	0	0	3	12	30	19	5	1	0	0	0	0	0	0	0	**70**
6:00 AM	0	0	0	5	2	36	67	42	9	1	0	0	0	0	0	0	0	**162**
7:00 AM	0	2	9	2	7	70	112	51	13	3	0	0	0	0	0	0	0	**269**
8:00 AM	3	2	0	13	19	79	151	72	16	4	0	0	0	0	0	0	0	**359**
9:00 AM	0	5	18	15	14	74	178	60	13	0	0	0	0	0	0	0	0	**377**
10:00 AM	0	10	32	39	98	88	130	31	1	0	0	0	0	0	0	0	0	**429**
11:00 AM	18	8	37	19	76	143	227	57	5	0	0	0	0	0	0	0	0	**590**
12:00 PM	7	11	22	46	65	156	259	82	12	2	0	0	0	0	0	0	0	**662**
1:00 PM	0	0	3	19	44	174	287	119	12	1	0	0	0	0	0	0	0	**659**
2:00 PM	16	42	81	82	118	208	233	59	4	0	0	0	0	0	0	0	0	**843**
3:00 PM	31	70	105	123	114	240	226	63	3	1	0	0	0	0	0	0	0	**976**
4:00 PM	126	182	193	99	91	153	73	15	1	0	0	0	0	0	0	0	0	**933**
5:00 PM	189	226	221	137	66	25	41	12	1	1	1	0	0	0	0	0	0	**920**
6:00 PM	2	18	37	57	70	198	304	91	5	2	1	0	0	0	0	0	0	**785**
7:00 PM	0	0	0	4	19	164	271	106	13	5	2	0	0	0	0	0	0	**584**
8:00 PM	0	0	1	0	11	97	218	76	19	5	0	0	0	0	0	0	0	**427**
9:00 PM	0	1	0	1	8	59	156	90	19	0	3	0	0	0	0	0	0	**337**
10:00 PM	0	0	0	0	1	21	84	57	13	4	2	0	2	0	0	0	0	**184**
11:00 PM	0	0	0	0	0	9	57	56	19	5	1	0	1	0	0	0	0	**148**
Total	**392**	**578**	**760**	**663**	**841**	**2,045**	**3,181**	**1,213**	**195**	**41**	**12**	**1**	**3**	**0**	**0**	**0**	**0**	**9,925**
Percent	**3.9%**	**5.8%**	**7.7%**	**6.7%**	**8.5%**	**20.6%**	**32.1%**	**12.2%**	**2.0%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	34.6	mph	Mean (Average) Speed	31.3	mph
85th Percentile	39.9	mph	10 mph Pace	31.9 - 41.9	mph
95th Percentile	43.1	mph	Percent in Pace	54.35	%

Location: Shaw Rd N-O 20th Ave Ct SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: B

Wednesday, August 4, 2021
Northbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	0	0	7	16	9	3	0	0	1	0	0	0	0	0	**36**
1:00 AM	0	0	0	1	0	1	12	9	3	1	0	0	0	0	0	0	0	**27**
2:00 AM	0	0	0	0	0	8	16	11	10	0	0	0	0	0	0	0	0	**45**
3:00 AM	0	0	0	0	1	14	48	45	19	0	0	0	0	0	0	0	0	**127**
4:00 AM	0	0	0	0	0	70	218	148	35	3	0	0	0	0	0	0	0	**474**
5:00 AM	0	0	0	2	10	124	347	134	27	2	0	0	0	0	0	0	0	**646**
6:00 AM	1	1	1	15	35	272	390	114	16	1	0	0	0	0	0	0	0	**846**
7:00 AM	0	0	0	2	116	349	341	84	7	0	0	0	0	0	0	0	0	**899**
8:00 AM	0	0	0	1	52	362	337	64	13	1	1	0	0	0	0	0	0	**831**
9:00 AM	0	0	0	3	40	262	289	55	9	0	0	0	0	0	0	0	0	**658**
10:00 AM	2	0	0	7	46	153	245	69	10	0	0	0	0	0	0	0	0	**532**
11:00 AM	0	0	4	17	56	266	267	53	12	0	0	0	0	0	0	0	0	**675**
12:00 PM	0	0	0	0	22	262	250	60	10	1	0	0	0	0	0	0	0	**605**
1:00 PM	0	0	0	0	52	238	251	55	13	0	0	0	0	0	0	0	0	**609**
2:00 PM	0	0	1	8	65	171	188	59	5	1	0	0	0	0	0	0	0	**498**
3:00 PM	1	0	0	15	64	193	155	21	1	0	0	0	0	0	0	0	0	**450**
4:00 PM	2	0	2	23	79	220	161	43	2	0	0	0	0	0	0	0	0	**532**
5:00 PM	0	0	0	1	33	200	197	57	3	1	0	0	0	0	0	0	0	**492**
6:00 PM	0	0	0	0	5	124	215	65	9	0	0	0	0	0	0	0	0	**418**
7:00 PM	0	0	0	1	9	111	164	52	5	4	1	0	1	0	0	0	0	**348**
8:00 PM	0	2	0	0	7	94	116	44	8	2	2	0	0	0	0	0	0	**275**
9:00 PM	0	0	0	1	8	42	117	38	6	2	0	0	0	0	0	0	0	**214**
10:00 PM	0	0	0	0	4	15	51	21	6	2	0	0	0	0	0	0	0	**99**
11:00 PM	0	0	0	0	4	11	29	15	5	1	1	0	0	0	0	0	0	**66**
Total	**6**	**3**	**8**	**97**	**708**	**3,569**	**4,420**	**1,325**	**237**	**22**	**5**	**1**	**1**	**0**	**0**	**0**	**0**	**10,402**
Percent	**0.1%**	**0.0%**	**0.1%**	**0.9%**	**6.8%**	**34.3%**	**42.5%**	**12.7%**	**2.3%**	**0.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			**Speed Statistics**		
50th Percentile (Median)	35.8	mph	Mean (Average) Speed	35.9	mph
85th Percentile	40.0	mph	10 mph Pace	31.0 - 41.0	mph
95th Percentile	43.3	mph	Percent in Pace	77.3	%

Location: **Shaw Rd N-O 20th Ave Ct SE**
Date Range: **8/3/2021 to 8/5/2021**
Site Code: **B**

Wednesday, August 4, 2021
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	7	30	35	7	4	0	0	0	0	0	0	0	**83**
1:00 AM	0	0	0	0	1	6	17	16	4	2	0	0	1	0	0	0	0	**47**
2:00 AM	0	0	0	0	2	4	6	11	6	3	2	0	0	0	0	0	0	**34**
3:00 AM	0	0	0	0	1	3	6	8	5	4	0	0	0	0	0	0	0	**27**
4:00 AM	0	0	0	0	2	4	16	12	6	2	0	0	0	0	0	0	0	**42**
5:00 AM	0	1	0	0	1	8	27	17	13	2	1	0	0	0	0	0	0	**70**
6:00 AM	1	0	0	3	2	18	54	39	15	0	0	0	0	0	0	0	0	**132**
7:00 AM	0	0	0	0	9	41	119	92	17	1	0	0	0	0	0	0	0	**279**
8:00 AM	0	3	12	1	23	68	147	79	15	1	0	0	0	0	0	0	0	**349**
9:00 AM	4	16	0	8	7	77	136	100	17	2	1	0	0	0	0	0	0	**368**
10:00 AM	0	0	3	10	19	75	206	103	17	2	0	0	0	0	0	0	0	**435**
11:00 AM	0	0	0	15	24	148	224	127	17	1	0	0	0	0	0	0	0	**556**
12:00 PM	2	8	29	28	56	216	248	106	8	0	0	0	0	0	0	0	0	**701**
1:00 PM	8	7	10	19	51	200	328	94	9	4	0	0	0	0	0	0	0	**730**
2:00 PM	42	109	127	141	76	185	197	39	7	2	0	0	0	0	0	0	0	**925**
3:00 PM	163	308	287	110	40	1	0	0	0	0	0	0	0	0	0	0	0	**909**
4:00 PM	124	186	216	164	113	88	41	17	2	2	0	0	0	0	0	0	0	**953**
5:00 PM	73	107	123	92	143	182	169	26	4	1	0	1	0	0	0	0	0	**921**
6:00 PM	10	15	27	55	80	217	345	125	8	0	0	0	0	0	0	0	0	**882**
7:00 PM	0	4	1	4	24	147	335	104	7	1	0	0	0	0	0	0	0	**627**
8:00 PM	0	0	0	10	15	83	243	111	10	0	0	0	0	0	0	0	0	**472**
9:00 PM	0	0	0	1	17	67	218	88	15	1	0	0	0	0	0	0	0	**407**
10:00 PM	0	0	0	0	0	32	107	97	18	5	0	0	0	0	0	0	0	**259**
11:00 PM	0	0	0	1	3	17	54	58	20	2	0	1	0	0	0	0	0	**156**
Total	**427**	**764**	**835**	**662**	**709**	**1,894**	**3,273**	**1,504**	**247**	**42**	**4**	**2**	**1**	**0**	**0**	**0**	**0**	**10,364**
Percent	**4.1%**	**7.4%**	**8.1%**	**6.4%**	**6.8%**	**18.3%**	**31.6%**	**14.5%**	**2.4%**	**0.4%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	34.9	mph	Mean (Average) Speed	31.3	mph
85th Percentile	40.5	mph	10 mph Pace	32.7 - 42.7	mph
95th Percentile	43.5	mph	Percent in Pace	53.33	%

Mark Skaggs:425-250-0777
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Location: Shaw Rd N-O 20th Ave Ct SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: B

Thursday, August 5, 2021
Northbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	3	12	14	4	2	0	0	0	0	0	0	0	**35**
1:00 AM	0	0	0	0	0	4	12	14	3	1	1	0	0	0	0	0	0	**35**
2:00 AM	0	0	0	0	1	4	13	9	8	1	0	0	0	0	0	0	0	**36**
3:00 AM	0	0	0	0	0	14	47	59	19	1	0	0	0	0	0	0	0	**140**
4:00 AM	0	0	0	1	0	38	197	159	36	9	0	0	0	0	0	0	0	**440**
5:00 AM	0	0	0	1	6	131	362	205	31	2	1	0	0	0	0	0	0	**739**
6:00 AM	2	0	0	6	40	290	411	110	11	1	0	0	0	0	0	0	0	**871**
7:00 AM	1	1	5	1	16	279	431	85	9	1	1	0	0	0	0	0	0	**830**
8:00 AM	2	2	8	3	45	205	330	77	2	1	0	0	0	0	0	0	0	**675**
9:00 AM	0	0	0	0	43	208	241	63	4	0	0	0	0	0	0	0	0	**559**
10:00 AM	0	1	4	16	50	165	201	75	7	0	0	0	0	0	0	0	0	**519**
11:00 AM	0	0	0	1	40	216	259	50	3	0	0	0	0	0	0	0	0	**569**
12:00 PM	0	0	0	1	86	248	256	70	5	0	0	0	0	0	0	0	0	**666**
1:00 PM	0	0	0	8	76	247	236	51	7	4	0	0	0	0	0	0	0	**629**
2:00 PM	0	0	2	8	72	272	193	56	9	0	0	0	0	0	0	0	0	**612**
3:00 PM	0	0	0	2	45	206	186	35	6	0	0	0	0	0	0	0	0	**480**
4:00 PM	0	0	0	1	46	239	224	48	7	1	0	0	0	0	0	0	0	**566**
5:00 PM	0	0	1	9	62	208	201	32	3	0	1	0	0	0	0	0	0	**517**
6:00 PM	0	0	0	3	25	134	206	51	11	1	0	0	0	0	0	0	0	**431**
7:00 PM	0	0	1	1	17	89	184	51	6	1	1	0	0	0	0	0	0	**351**
8:00 PM	2	0	0	0	16	99	120	57	5	0	0	0	0	0	0	0	0	**299**
9:00 PM	0	0	0	1	6	70	70	35	13	2	0	0	0	0	0	0	0	**197**
10:00 PM	0	0	1	0	2	18	51	33	5	1	0	0	0	0	0	0	0	**111**
11:00 PM	0	0	0	0	0	12	30	16	5	2	0	0	0	0	0	0	0	**65**
Total	**7**	**4**	**22**	**63**	**694**	**3,399**	**4,473**	**1,455**	**219**	**31**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**10,372**
Percent	**0.1%**	**0.0%**	**0.2%**	**0.6%**	**6.7%**	**32.8%**	**43.1%**	**14.0%**	**2.1%**	**0.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary		
50th Percentile (Median)	35.9	mph
85th Percentile	40.3	mph
95th Percentile	43.3	mph

Speed Statistics		
Mean (Average) Speed	36.0	mph
10 mph Pace	31.1 - 41.1	mph
Percent in Pace	77.2	%

Location: Shaw Rd N-O 20th Ave Ct SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: B

Thursday, August 5, 2021
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	1	9	29	32	9	3	2	1	1	0	0	0	0	**87**
1:00 AM	0	0	0	0	1	14	32	10	8	5	0	1	0	0	0	0	0	**71**
2:00 AM	0	0	0	0	0	4	7	11	8	0	0	1	0	0	0	0	0	**31**
3:00 AM	0	0	0	1	0	5	8	9	3	0	0	0	0	0	0	0	0	**26**
4:00 AM	0	0	0	0	1	7	13	17	5	1	0	0	0	0	0	0	0	**44**
5:00 AM	0	0	0	0	2	8	19	22	8	0	0	0	0	0	0	0	0	**59**
6:00 AM	0	0	0	0	2	20	65	48	4	3	0	0	0	0	0	0	0	**142**
7:00 AM	0	2	7	2	4	59	151	61	10	2	1	0	0	0	0	0	0	**299**
8:00 AM	0	0	0	1	15	71	145	70	15	2	0	0	0	0	0	0	0	**319**
9:00 AM	0	0	4	5	5	85	166	79	8	2	0	0	0	0	0	0	0	**354**
10:00 AM	0	0	3	11	12	74	193	87	15	1	0	0	0	0	0	0	0	**396**
11:00 AM	4	16	12	17	33	168	228	87	10	1	0	0	0	0	0	0	0	**576**
12:00 PM	0	0	5	20	53	191	293	65	11	1	0	0	0	0	0	0	0	**639**
1:00 PM	5	17	23	46	68	180	294	85	10	1	0	0	0	0	0	0	0	**729**
2:00 PM	8	38	82	53	99	293	278	48	4	0	1	0	0	0	0	0	0	**904**
3:00 PM	74	179	197	136	106	135	116	18	1	0	0	0	0	0	0	0	0	**962**
4:00 PM	26	32	77	81	142	256	228	81	8	0	0	1	0	0	0	0	0	**932**
5:00 PM	95	179	239	146	129	64	103	15	1	0	0	0	0	0	0	0	3	**974**
6:00 PM	12	41	78	24	87	236	273	94	11	1	0	0	0	0	0	0	0	**857**
7:00 PM	1	0	0	2	23	186	323	94	11	5	0	1	1	0	0	0	0	**647**
8:00 PM	0	0	0	3	12	126	244	99	14	3	0	0	0	0	0	0	0	**501**
9:00 PM	0	0	0	0	8	56	190	95	24	4	0	0	0	0	0	0	0	**377**
10:00 PM	0	0	0	0	4	36	102	83	17	4	0	0	0	0	0	0	0	**246**
11:00 PM	0	0	0	0	0	6	59	53	22	7	1	1	0	0	0	0	0	**149**
Total	**225**	**504**	**727**	**548**	**807**	**2,289**	**3,559**	**1,363**	**237**	**46**	**5**	**6**	**2**	**0**	**0**	**0**	**3**	**10,321**
Percent	**2.2%**	**4.9%**	**7.0%**	**5.3%**	**7.8%**	**22.2%**	**34.5%**	**13.2%**	**2.3%**	**0.4%**	**0.0%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	35.1	mph	Mean (Average) Speed	32.5	mph
85th Percentile	40.3	mph	10 mph Pace	31.5 - 41.5	mph
95th Percentile	43.4	mph	Percent in Pace	58.97	%

Location: Shaw Rd N-O 20th Ave Ct SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: B

Total Study Average
Northbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	0	1	5	11	11	4	1	0	0	0	0	0	0	0	**33**
1:00 AM	0	0	1	1	1	3	10	8	2	1	0	0	0	0	0	0	0	**27**
2:00 AM	0	0	0	1	2	8	13	9	7	1	0	0	0	0	0	0	0	**41**
3:00 AM	0	0	0	0	0	16	48	49	16	1	0	0	0	0	0	0	0	**130**
4:00 AM	0	0	0	2	3	64	205	153	32	4	0	0	0	0	0	0	0	**463**
5:00 AM	0	0	0	1	12	141	347	154	23	2	0	0	0	0	0	0	0	**680**
6:00 AM	1	0	0	9	47	316	388	101	12	1	0	0	0	0	0	0	0	**875**
7:00 AM	0	1	5	9	83	328	370	81	8	1	0	0	0	0	0	0	0	**886**
8:00 AM	1	1	3	1	38	264	325	79	9	1	0	0	0	0	0	0	0	**722**
9:00 AM	0	0	0	4	50	230	257	55	6	0	0	0	0	0	0	0	0	**602**
10:00 AM	2	9	19	30	70	157	186	54	6	0	0	0	0	0	0	0	0	**533**
11:00 AM	0	1	4	12	65	245	239	55	7	0	0	0	0	0	0	0	0	**628**
12:00 PM	0	0	0	1	52	241	253	63	7	1	0	0	0	0	0	0	0	**618**
1:00 PM	0	0	0	3	59	237	245	62	9	3	0	0	0	0	0	0	0	**618**
2:00 PM	0	0	1	6	57	199	200	60	7	1	0	0	0	0	0	0	0	**531**
3:00 PM	0	0	0	7	50	197	170	36	4	0	0	0	0	0	0	0	0	**464**
4:00 PM	1	0	1	13	63	211	187	44	3	1	0	0	0	0	0	0	0	**524**
5:00 PM	0	0	1	5	46	186	182	47	4	0	0	0	0	0	0	0	0	**471**
6:00 PM	0	0	0	1	13	135	193	62	11	1	0	0	0	0	0	0	0	**416**
7:00 PM	0	0	0	1	11	85	166	54	7	2	1	0	0	0	0	0	0	**327**
8:00 PM	1	1	0	1	19	95	117	47	6	1	1	0	0	0	0	0	0	**289**
9:00 PM	0	0	0	1	7	55	95	34	10	2	0	0	0	0	0	0	0	**204**
10:00 PM	0	0	0	0	3	19	47	23	6	2	0	0	0	0	0	0	0	**100**
11:00 PM	0	0	0	1	2	10	25	17	4	1	0	0	0	0	0	0	0	**60**
Total	**6**	**13**	**35**	**110**	**754**	**3,447**	**4,279**	**1,358**	**210**	**28**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**10,242**
Percent	**0.1%**	**0.1%**	**0.3%**	**1.1%**	**7.4%**	**33.7%**	**41.8%**	**13.3%**	**2.1%**	**0.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			**Total Study Speed Statistics**		
50th Percentile (Median)	35.7	mph	Mean (Average) Speed	35.7	mph
85th Percentile	40.2	mph	10 mph Pace	31.0 - 41.0	mph
95th Percentile	43.2	mph	Percent in Pace	76.0	%

Location: Shaw Rd N-O 20th Ave Ct SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: B

Total Study Average
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	1	8	31	29	7	3	1	0	0	0	0	0	0	**80**
1:00 AM	0	0	0	0	3	11	22	12	4	2	0	0	0	0	0	0	0	**54**
2:00 AM	0	0	0	1	2	8	6	9	5	1	1	1	0	0	0	0	0	**34**
3:00 AM	0	0	0	0	1	3	8	8	3	2	0	0	0	0	0	0	0	**25**
4:00 AM	0	0	0	0	2	4	14	15	5	1	0	0	0	0	0	0	0	**41**
5:00 AM	0	0	0	0	2	9	25	19	9	1	0	0	0	0	0	0	0	**65**
6:00 AM	0	0	0	3	2	25	62	43	9	1	0	0	0	0	0	0	0	**145**
7:00 AM	0	1	5	1	7	57	127	68	13	2	0	0	0	0	0	0	0	**281**
8:00 AM	1	2	4	5	19	73	148	74	15	2	0	0	0	0	0	0	0	**343**
9:00 AM	1	7	7	9	9	79	160	80	13	1	0	0	0	0	0	0	0	**366**
10:00 AM	0	3	13	20	43	79	176	74	11	1	0	0	0	0	0	0	0	**420**
11:00 AM	7	8	16	17	44	153	226	90	11	1	0	0	0	0	0	0	0	**573**
12:00 PM	3	6	19	31	58	188	267	84	10	1	0	0	0	0	0	0	0	**667**
1:00 PM	4	8	12	28	54	185	303	99	10	2	0	0	0	0	0	0	0	**705**
2:00 PM	22	63	97	92	98	229	236	49	5	1	0	0	0	0	0	0	0	**892**
3:00 PM	89	186	196	123	87	125	114	27	1	0	0	0	0	0	0	0	0	**948**
4:00 PM	92	133	162	115	115	166	114	38	4	1	0	0	0	0	0	0	0	**940**
5:00 PM	119	171	194	125	113	90	104	18	2	1	0	0	0	0	0	0	1	**938**
6:00 PM	8	25	47	45	79	217	307	103	8	1	0	0	0	0	0	0	0	**840**
7:00 PM	0	1	0	3	22	166	310	101	10	4	1	0	0	0	0	0	0	**618**
8:00 PM	0	0	0	4	13	102	235	95	14	3	0	0	0	0	0	0	0	**466**
9:00 PM	0	0	0	1	11	61	188	91	19	2	1	0	0	0	0	0	0	**374**
10:00 PM	0	0	0	0	2	30	98	79	16	4	1	0	1	0	0	0	0	**231**
11:00 PM	0	0	0	0	1	11	57	56	20	5	1	1	0	0	0	0	0	**152**
Total	**346**	**614**	**772**	**623**	**788**	**2,079**	**3,338**	**1,361**	**224**	**43**	**6**	**2**	**1**	**0**	**0**	**0**	**1**	**10,198**
Percent	**3.4%**	**6.0%**	**7.6%**	**6.1%**	**7.7%**	**20.4%**	**32.7%**	**13.3%**	**2.2%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			**Total Study Speed Statistics**		
50th Percentile (Median)	34.8	mph	Mean (Average) Speed	31.7	mph
85th Percentile	40.3	mph	10 mph Pace	31.9 - 41.9	mph
95th Percentile	43.4	mph	Percent in Pace	55.4	%

Location: Shaw Rd N-O 20th Ave Ct SE
Date Range: 8/3/2021 - 8/9/2021
Site Code: B

	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday					
	8/3/2021			8/4/2021			8/5/2021			8/6/2021			8/7/2021			8/8/2021			8/9/2021			Mid-Week Average		
Time	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	35	76	111	36	83	119	35	87	122	-	-	-	-	-	-	-	-	-	-	-	-	35	82	117
1:00 AM	25	46	71	27	47	74	35	71	106	-	-	-	-	-	-	-	-	-	-	-	-	29	55	84
2:00 AM	42	32	74	45	34	79	36	31	67	-	-	-	-	-	-	-	-	-	-	-	-	41	32	73
3:00 AM	123	22	145	127	27	154	140	26	166	-	-	-	-	-	-	-	-	-	-	-	-	130	25	155
4:00 AM	473	35	508	474	42	516	440	44	484	-	-	-	-	-	-	-	-	-	-	-	-	462	40	503
5:00 AM	653	70	723	646	70	716	739	59	798	-	-	-	-	-	-	-	-	-	-	-	-	679	66	746
6:00 AM	908	162	1,070	846	132	978	871	142	1,013	-	-	-	-	-	-	-	-	-	-	-	-	875	145	1,020
7:00 AM	928	269	1,197	899	279	1,178	830	299	1,129	-	-	-	-	-	-	-	-	-	-	-	-	886	282	1,168
8:00 AM	659	359	1,018	831	349	1,180	675	319	994	-	-	-	-	-	-	-	-	-	-	-	-	722	342	1,064
9:00 AM	592	377	969	658	368	1,026	559	354	913	-	-	-	-	-	-	-	-	-	-	-	-	603	366	969
10:00 AM	550	429	979	532	435	967	519	396	915	-	-	-	-	-	-	-	-	-	-	-	-	534	420	954
11:00 AM	638	590	1,228	675	556	1,231	569	576	1,145	-	-	-	-	-	-	-	-	-	-	-	-	627	574	1,201
12:00 PM	582	662	1,244	605	701	1,306	666	639	1,305	-	-	-	-	-	-	-	-	-	-	-	-	618	667	1,285
1:00 PM	612	659	1,271	609	730	1,339	629	729	1,358	-	-	-	-	-	-	-	-	-	-	-	-	617	706	1,323
2:00 PM	484	843	1,327	498	925	1,423	612	904	1,516	-	-	-	-	-	-	-	-	-	-	-	-	531	891	1,422
3:00 PM	462	976	1,438	450	909	1,359	480	962	1,442	-	-	-	-	-	-	-	-	-	-	-	-	464	949	1,413
4:00 PM	473	933	1,406	532	953	1,485	566	932	1,498	-	-	-	-	-	-	-	-	-	-	-	-	524	939	1,463
5:00 PM	404	920	1,324	492	921	1,413	517	974	1,491	-	-	-	-	-	-	-	-	-	-	-	-	471	938	1,409
6:00 PM	399	785	1,184	418	882	1,300	431	857	1,288	-	-	-	-	-	-	-	-	-	-	-	-	416	841	1,257
7:00 PM	286	584	870	348	627	975	351	647	998	-	-	-	-	-	-	-	-	-	-	-	-	328	619	948
8:00 PM	290	427	717	275	472	747	299	501	800	-	-	-	-	-	-	-	-	-	-	-	-	288	467	755
9:00 PM	202	337	539	214	407	621	197	377	574	-	-	-	-	-	-	-	-	-	-	-	-	204	374	578
10:00 PM	89	184	273	99	259	358	111	246	357	-	-	-	-	-	-	-	-	-	-	-	-	100	230	329
11:00 PM	53	148	201	66	156	222	65	149	214	-	-	-	-	-	-	-	-	-	-	-	-	61	151	212
Total	**9,962**	**9,925**	**19,887**	**10,402**	**10,364**	**20,766**	**10,372**	**10,321**	**20,693**	-	-	-	-	-	-	-	-	-	-	-	-	**10,245**	**10,203**	**20,449**
Percent	**50%**	**50%**	-	**50%**	**50%**	-	**50%**	**50%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**50%**	**50%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Vehicle Speed Report Summary

Location: E Pioneer E-O 13th St SE

Count Direction: Eastbound / Westbound

Date Range: 8/3/2021 to 8/5/2021

Site Code: C

	Speed Range (mph)																	Total
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
Study Total																		
Eastbound	3	5	58	376	2,306	7,363	9,956	4,035	773	142	38	16	3	5	1	4	2	25,086
Percent	0.0%	0.0%	0.2%	1.5%	9.2%	29.4%	39.7%	16.1%	3.1%	0.6%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Westbound	0	1	28	273	1,455	6,608	10,540	3,992	736	178	31	10	8	5	3	1	2	23,871
Percent	0.0%	0.0%	0.1%	1.1%	6.1%	27.7%	44.2%	16.7%	3.1%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Total	3	6	86	649	3,761	13,971	20,496	8,027	1,509	320	69	26	11	10	4	5	4	48,957
Percent	0.0%	0.0%	0.2%	1.3%	7.7%	28.5%	41.9%	16.4%	3.1%	0.7%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Total Study Percentile Speed Summary			Total Study Speed Statistics		
Eastbound			**Eastbound**		
50th Percentile (Median)	36.1	mph	Mean (Average) Speed	36.1	mph
85th Percentile	40.9	mph	10 mph Pace	31.7 - 41.7	mph
95th Percentile	44.4	mph	Percent in Pace	70.4	%
Westbound			**Westbound**		
50th Percentile (Median)	36.6	mph	Mean (Average) Speed	36.6	mph
85th Percentile	41.0	mph	10 mph Pace	31.4 - 41.4	mph
95th Percentile	44.3	mph	Percent in Pace	74.8	%

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Location: E Pioneer E-O 13th St SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: C

Tuesday, August 3, 2021
Eastbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	1	2	18	17	5	1	0	0	0	0	0	0	0	0	**44**
1:00 AM	0	0	0	1	0	10	14	3	5	3	0	0	0	0	0	0	0	**36**
2:00 AM	0	1	0	1	4	9	13	3	0	0	1	0	0	0	1	0	0	**33**
3:00 AM	0	0	0	0	5	14	28	10	4	1	0	0	0	0	0	0	0	**62**
4:00 AM	0	0	1	1	9	44	100	71	15	1	2	0	0	0	0	1	0	**245**
5:00 AM	0	0	1	5	14	59	112	54	9	0	1	1	0	0	0	0	0	**256**
6:00 AM	0	0	0	4	20	85	161	83	24	0	0	0	0	0	0	0	0	**377**
7:00 AM	0	0	0	7	32	126	229	101	14	2	0	0	0	0	0	0	0	**511**
8:00 AM	0	0	0	8	52	145	195	78	13	3	0	0	0	0	0	0	0	**494**
9:00 AM	0	0	0	4	38	140	139	62	4	4	1	0	0	0	0	0	0	**392**
10:00 AM	0	0	0	8	43	140	153	55	9	1	1	0	0	0	0	0	0	**410**
11:00 AM	0	0	0	10	68	232	178	55	3	2	1	0	0	0	0	0	0	**549**
12:00 PM	0	0	3	6	63	186	205	62	6	0	0	0	0	0	0	0	0	**531**
1:00 PM	0	0	3	14	41	128	197	56	13	2	0	1	0	0	0	0	0	**455**
2:00 PM	0	0	0	4	50	153	190	55	7	4	1	0	0	0	0	0	0	**464**
3:00 PM	0	0	1	7	53	146	174	93	13	3	0	0	0	0	0	0	0	**490**
4:00 PM	0	0	0	7	46	157	200	79	18	5	0	0	0	0	0	0	0	**512**
5:00 PM	0	0	0	5	44	139	208	90	13	0	0	0	0	0	0	0	0	**499**
6:00 PM	0	0	2	7	48	107	150	61	12	0	1	0	0	0	0	0	0	**388**
7:00 PM	0	0	0	8	28	92	126	54	8	1	0	0	0	0	0	0	0	**317**
8:00 PM	0	0	0	6	26	67	114	38	8	0	1	0	0	0	0	0	0	**260**
9:00 PM	0	0	0	1	8	61	88	21	5	2	1	0	0	0	0	0	0	**187**
10:00 PM	0	0	0	1	13	55	49	23	5	1	1	0	0	2	0	0	0	**150**
11:00 PM	0	0	0	1	6	24	31	14	6	0	0	0	0	0	0	0	0	**82**
Total	**0**	**1**	**11**	**117**	**713**	**2,337**	**3,071**	**1,226**	**215**	**35**	**12**	**2**	**0**	**2**	**1**	**1**	**0**	**7,744**
Percent	**0.0%**	**0.0%**	**0.1%**	**1.5%**	**9.2%**	**30.2%**	**39.7%**	**15.8%**	**2.8%**	**0.5%**	**0.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary		
50th Percentile (Median)	36.0	mph
85th Percentile	40.8	mph
95th Percentile	44.1	mph

Speed Statistics		
Mean (Average) Speed	36.0	mph
10 mph Pace	30.9 - 40.9	mph
Percent in Pace	71.0	%

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Location: E Pioneer E-O 13th St SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: C

Tuesday, August 3, 2021
Westbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	2	3	7	10	5	3	0	0	0	0	1	0	0	0	**31**
1:00 AM	0	0	0	1	2	6	8	2	0	0	0	0	1	0	0	0	0	**20**
2:00 AM	0	0	0	0	1	5	8	1	0	1	0	0	0	0	0	0	0	**16**
3:00 AM	0	0	0	1	3	7	7	4	2	0	0	0	0	0	0	0	0	**24**
4:00 AM	0	0	1	2	2	12	27	23	2	0	0	0	0	0	0	0	0	**69**
5:00 AM	0	0	0	1	5	41	71	39	6	1	0	0	0	0	0	0	0	**164**
6:00 AM	0	0	0	4	9	44	131	83	22	4	1	1	0	0	0	0	0	**299**
7:00 AM	0	0	1	3	15	101	186	74	10	1	0	1	0	0	0	0	0	**392**
8:00 AM	0	0	0	8	37	140	230	59	9	4	0	0	0	0	0	1	0	**488**
9:00 AM	0	0	1	9	26	110	178	53	5	0	0	1	0	0	0	0	0	**383**
10:00 AM	0	0	0	9	26	139	181	36	6	0	0	0	0	0	0	0	0	**397**
11:00 AM	0	0	0	4	35	153	219	65	7	4	0	0	0	0	0	0	0	**487**
12:00 PM	0	0	0	5	35	195	187	39	6	5	1	0	0	1	2	0	1	**477**
1:00 PM	0	0	2	5	28	148	207	71	13	1	1	0	0	0	0	0	0	**476**
2:00 PM	0	0	0	2	41	177	258	77	9	1	0	0	0	0	0	0	0	**565**
3:00 PM	0	0	1	2	36	181	311	115	17	4	1	0	1	0	0	0	0	**669**
4:00 PM	0	0	1	3	41	220	355	125	26	5	2	0	0	0	0	0	0	**778**
5:00 PM	0	0	0	11	50	209	338	105	18	8	0	0	0	0	0	0	0	**739**
6:00 PM	0	0	1	2	25	121	196	66	24	8	1	1	1	0	0	0	0	**446**
7:00 PM	0	0	0	3	20	77	126	49	9	1	0	1	0	0	0	0	0	**286**
8:00 PM	0	0	0	4	14	74	99	39	9	2	0	0	0	0	0	0	0	**241**
9:00 PM	0	0	1	3	6	35	70	23	7	3	0	0	0	0	0	0	0	**148**
10:00 PM	0	0	0	5	6	27	34	21	4	0	1	0	0	0	0	0	0	**98**
11:00 PM	0	0	0	3	6	12	12	8	2	0	0	0	0	0	0	0	0	**43**
Total	**0**	**0**	**9**	**92**	**472**	**2,241**	**3,449**	**1,182**	**216**	**53**	**8**	**5**	**3**	**2**	**2**	**1**	**1**	**7,736**
Percent	**0.0%**	**0.0%**	**0.1%**	**1.2%**	**6.1%**	**29.0%**	**44.6%**	**15.3%**	**2.8%**	**0.7%**	**0.1%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			**Speed Statistics**		
50th Percentile (Median)	36.4	mph	Mean (Average) Speed	36.5	mph
85th Percentile	40.8	mph	10 mph Pace	31.4 - 41.4	mph
95th Percentile	44.1	mph	Percent in Pace	75.87	%

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Location: E Pioneer E-O 13th St SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: C

Wednesday, August 4, 2021
Eastbound

	Speed Range (mph)																	Total Volume
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	
12:00 AM	0	0	0	1	6	19	29	9	3	0	1	1	0	0	0	0	0	**69**
1:00 AM	0	0	0	1	3	9	10	3	1	0	0	0	0	0	0	0	0	**27**
2:00 AM	0	0	1	0	5	9	8	10	3	1	0	0	0	0	0	0	0	**37**
3:00 AM	0	0	0	1	4	13	31	13	3	1	0	1	0	0	0	1	0	**68**
4:00 AM	0	0	2	2	11	42	92	49	16	4	3	0	0	0	0	0	0	**221**
5:00 AM	0	0	0	1	22	75	146	66	19	3	0	1	0	0	0	0	0	**333**
6:00 AM	0	0	0	4	22	68	146	102	23	8	2	0	0	0	0	0	1	**376**
7:00 AM	0	0	1	8	32	114	200	115	31	7	0	0	0	0	0	0	0	**508**
8:00 AM	0	0	1	8	41	105	217	97	14	4	0	0	0	0	0	0	0	**487**
9:00 AM	0	0	2	2	30	161	233	73	14	2	1	0	0	0	0	1	0	**519**
10:00 AM	0	1	2	9	55	115	187	65	6	1	0	0	0	0	0	0	0	**441**
11:00 AM	0	0	0	4	68	190	208	83	10	3	0	1	0	0	0	0	0	**567**
12:00 PM	0	0	0	7	52	168	208	84	12	2	0	0	0	0	0	0	0	**533**
1:00 PM	0	0	1	9	44	156	219	71	9	1	0	1	1	0	0	0	0	**512**
2:00 PM	0	1	1	6	59	200	190	69	15	2	0	0	0	0	0	0	0	**543**
3:00 PM	0	0	3	11	34	145	218	74	22	2	0	0	0	0	0	0	0	**509**
4:00 PM	0	2	7	16	45	170	267	90	18	3	1	0	0	0	0	0	0	**619**
5:00 PM	0	0	2	5	73	193	262	98	12	7	0	1	0	0	0	0	0	**653**
6:00 PM	0	0	1	2	39	160	222	97	24	1	0	0	0	0	0	0	0	**546**
7:00 PM	0	0	0	2	14	67	147	81	13	5	2	0	0	0	0	0	0	**331**
8:00 PM	0	0	0	2	42	105	114	52	9	1	0	0	1	0	0	0	0	**326**
9:00 PM	0	0	0	1	23	95	101	29	4	1	0	0	0	0	0	0	0	**254**
10:00 PM	0	0	0	5	9	48	77	25	4	0	0	0	0	0	0	0	0	**168**
11:00 PM	0	0	0	7	9	30	39	14	5	1	1	1	0	0	0	0	0	**107**
Total	**0**	**4**	**24**	**114**	**742**	**2,457**	**3,571**	**1,469**	**290**	**60**	**11**	**7**	**2**	**0**	**0**	**2**	**1**	**8,754**
Percent	**0.0%**	**0.0%**	**0.3%**	**1.3%**	**8.5%**	**28.1%**	**40.8%**	**16.8%**	**3.3%**	**0.7%**	**0.1%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			**Speed Statistics**		
50th Percentile (Median)	36.2	mph	Mean (Average) Speed	36.3	mph
85th Percentile	41.3	mph	10 mph Pace	31.7 - 41.7	mph
95th Percentile	44.5	mph	Percent in Pace	70.7	%

Location: E Pioneer E-O 13th St SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: C

Wednesday, August 4, 2021
Westbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	0	0	10	5	8	2	1	0	0	0	0	0	0	0	**26**
1:00 AM	0	0	0	0	1	6	13	6	0	0	0	0	0	1	0	0	0	**27**
2:00 AM	0	0	0	2	1	7	8	2	1	0	0	0	0	0	0	0	0	**21**
3:00 AM	0	0	1	2	3	5	16	3	1	0	0	0	0	0	0	0	0	**31**
4:00 AM	0	0	0	1	3	18	33	17	4	3	0	0	0	0	0	0	0	**79**
5:00 AM	0	0	2	6	5	44	71	34	7	4	0	0	0	0	0	0	0	**173**
6:00 AM	0	0	0	1	11	44	121	85	14	5	0	0	0	0	0	0	0	**281**
7:00 AM	0	0	0	5	11	64	207	91	17	5	2	0	0	0	0	0	0	**402**
8:00 AM	0	0	0	5	9	115	201	107	25	3	0	0	0	0	0	0	0	**465**
9:00 AM	0	0	0	3	26	104	164	67	13	0	1	0	0	0	0	0	0	**378**
10:00 AM	0	0	1	6	31	133	192	47	6	3	0	0	1	0	0	0	0	**420**
11:00 AM	0	0	4	11	29	153	236	46	15	0	0	0	0	0	0	0	0	**494**
12:00 PM	0	0	0	3	35	136	183	70	11	1	1	0	2	0	0	0	0	**442**
1:00 PM	0	0	0	4	31	139	228	79	8	3	0	0	0	0	0	0	0	**492**
2:00 PM	0	0	0	4	56	153	254	88	20	7	1	0	0	0	0	0	0	**583**
3:00 PM	0	1	0	3	43	182	336	127	18	3	1	0	0	0	0	0	0	**714**
4:00 PM	0	0	1	2	65	223	393	123	18	8	2	2	0	0	0	0	0	**837**
5:00 PM	0	0	0	7	56	206	337	132	22	4	1	0	1	1	0	0	0	**767**
6:00 PM	0	0	0	1	12	94	197	118	44	8	4	0	0	0	0	0	0	**478**
7:00 PM	0	0	1	0	11	58	125	90	20	4	0	0	0	0	0	0	0	**309**
8:00 PM	0	0	1	3	28	56	87	48	5	0	0	0	0	0	0	0	0	**228**
9:00 PM	0	0	2	7	18	59	89	18	4	4	0	0	0	0	0	0	0	**201**
10:00 PM	0	0	1	3	9	43	39	19	3	0	0	0	0	0	0	0	0	**117**
11:00 PM	0	0	1	2	1	20	38	10	4	0	0	0	0	0	0	0	0	**76**
Total	**0**	**1**	**15**	**81**	**495**	**2,072**	**3,573**	**1,435**	**282**	**66**	**13**	**2**	**4**	**2**	**0**	**0**	**0**	**8,041**
Percent	**0.0%**	**0.0%**	**0.2%**	**1.0%**	**6.2%**	**25.8%**	**44.4%**	**17.8%**	**3.5%**	**0.8%**	**0.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			**Speed Statistics**		
50th Percentile (Median)	36.8	mph	Mean (Average) Speed	36.8	mph
85th Percentile	41.4	mph	10 mph Pace	31.7 - 41.7	mph
95th Percentile	44.5	mph	Percent in Pace	73.83	%

Location: E Pioneer E-O 13th St SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: C

Thursday, August 5, 2021
Eastbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	0	2	17	37	5	3	2	0	0	0	0	0	0	0	**66**
1:00 AM	0	0	0	0	1	13	10	5	3	0	0	0	0	0	0	0	0	**32**
2:00 AM	0	0	0	1	3	5	9	2	3	2	0	0	0	0	0	0	0	**25**
3:00 AM	0	0	0	1	10	16	30	27	8	1	0	0	0	0	0	0	0	**93**
4:00 AM	0	0	2	3	12	30	100	65	27	6	2	0	0	0	0	0	0	**247**
5:00 AM	0	0	1	1	15	59	117	60	11	3	0	0	0	0	0	0	0	**267**
6:00 AM	0	0	0	3	28	108	195	86	17	1	0	2	0	0	0	0	0	**440**
7:00 AM	2	0	0	4	39	130	191	87	22	1	0	0	0	0	0	0	0	**476**
8:00 AM	0	0	3	9	67	135	154	71	9	5	1	0	0	0	0	0	0	**454**
9:00 AM	0	0	1	8	31	141	154	49	8	1	0	0	0	0	0	0	0	**393**
10:00 AM	0	0	0	8	49	132	147	45	4	1	1	0	0	0	0	0	0	**387**
11:00 AM	0	0	6	22	89	259	221	63	11	1	0	0	0	0	0	0	0	**672**
12:00 PM	1	0	3	17	100	256	211	94	11	4	2	0	0	0	0	0	0	**699**
1:00 PM	0	0	1	8	56	177	179	74	11	1	1	0	0	0	0	0	1	**509**
2:00 PM	0	0	0	9	39	155	202	75	13	2	0	0	0	0	0	0	0	**495**
3:00 PM	0	0	0	7	39	136	210	85	13	4	1	0	1	1	0	0	0	**497**
4:00 PM	0	0	0	6	58	176	226	80	14	3	0	0	0	0	0	0	0	**563**
5:00 PM	0	0	4	17	85	163	242	84	12	1	1	2	0	0	0	0	0	**611**
6:00 PM	0	0	1	8	34	120	184	83	22	2	0	1	0	0	0	1	0	**456**
7:00 PM	0	0	0	6	17	79	148	79	19	1	3	0	0	0	0	0	0	**352**
8:00 PM	0	0	1	4	34	110	144	42	14	1	2	2	0	0	0	0	0	**354**
9:00 PM	0	0	0	2	24	91	94	40	7	1	0	0	0	1	0	0	0	**260**
10:00 PM	0	0	0	1	13	43	70	27	4	1	0	0	0	1	0	0	0	**160**
11:00 PM	0	0	0	0	6	18	39	12	2	2	1	0	0	0	0	0	0	**80**
Total	**3**	**0**	**23**	**145**	**851**	**2,569**	**3,314**	**1,340**	**268**	**47**	**15**	**7**	**1**	**3**	**0**	**1**	**1**	**8,588**
Percent	**0.0%**	**0.0%**	**0.3%**	**1.7%**	**9.9%**	**29.9%**	**38.6%**	**15.6%**	**3.1%**	**0.5%**	**0.2%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			**Speed Statistics**		
50th Percentile (Median)	35.9	mph	Mean (Average) Speed	36.0	mph
85th Percentile	40.8	mph	10 mph Pace	31.1 - 41.1	mph
95th Percentile	44.4	mph	Percent in Pace	69.9	%

Location: E Pioneer E-O 13th St SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: C

Thursday, August 5, 2021
Westbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	4	10	13	3	0	1	0	0	0	0	0	0	0	**31**
1:00 AM	0	0	0	1	2	4	12	5	0	0	0	0	0	0	0	0	0	**24**
2:00 AM	0	0	0	0	0	1	4	2	0	0	0	0	0	0	0	0	0	**7**
3:00 AM	0	0	0	1	0	7	11	12	4	1	0	0	0	0	0	0	0	**36**
4:00 AM	0	0	0	1	1	8	25	18	1	0	0	0	0	0	0	0	0	**54**
5:00 AM	0	0	1	2	10	40	74	38	4	1	0	0	0	0	0	0	0	**170**
6:00 AM	0	0	0	5	7	47	124	94	16	3	0	0	0	0	0	0	0	**296**
7:00 AM	0	0	0	4	24	91	188	108	12	2	0	0	1	0	0	0	0	**430**
8:00 AM	0	0	0	3	25	110	210	67	8	3	0	0	0	0	0	0	0	**426**
9:00 AM	0	0	0	4	19	135	145	63	8	4	0	0	0	0	0	0	0	**378**
10:00 AM	0	0	0	3	26	125	189	56	9	0	0	0	0	0	0	0	0	**408**
11:00 AM	0	0	0	6	29	145	219	53	13	0	0	0	0	0	0	0	0	**465**
12:00 PM	0	0	0	9	55	165	192	55	5	0	0	0	0	0	0	0	0	**481**
1:00 PM	0	0	0	8	34	172	173	77	15	3	0	0	0	0	0	0	0	**482**
2:00 PM	0	0	0	5	35	156	289	109	15	5	0	1	0	0	0	0	0	**615**
3:00 PM	0	0	0	10	43	230	292	115	27	9	1	0	0	0	0	0	0	**727**
4:00 PM	0	0	0	6	32	215	364	149	26	4	1	1	0	1	1	0	0	**800**
5:00 PM	0	0	0	5	40	246	343	104	20	8	1	1	0	0	0	0	0	**768**
6:00 PM	0	0	0	8	21	119	233	94	15	10	0	0	0	0	0	0	1	**501**
7:00 PM	0	0	1	6	29	84	129	76	16	1	2	0	0	0	0	0	0	**344**
8:00 PM	0	0	2	10	26	86	118	25	8	1	1	0	0	0	0	0	0	**277**
9:00 PM	0	0	0	1	12	55	93	25	6	2	3	0	0	0	0	0	0	**197**
10:00 PM	0	0	0	1	9	30	43	15	8	0	1	0	0	0	0	0	0	**107**
11:00 PM	0	0	0	1	5	14	35	12	2	1	0	0	0	0	0	0	0	**70**
Total	**0**	**0**	**4**	**100**	**488**	**2,295**	**3,518**	**1,375**	**238**	**59**	**10**	**3**	**1**	**1**	**1**	**0**	**1**	**8,094**
Percent	**0.0%**	**0.0%**	**0.0%**	**1.2%**	**6.0%**	**28.4%**	**43.5%**	**17.0%**	**2.9%**	**0.7%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	36.6	mph	Mean (Average) Speed	36.6	mph
85th Percentile	40.9	mph	10 mph Pace	31.4 - 41.4	mph
95th Percentile	44.3	mph	Percent in Pace	74.87	%

Location: **E Pioneer E-O 13th St SE**
Date Range: **8/3/2021 to 8/5/2021**
Site Code: **C**

Total Study Average
Eastbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	1	3	18	28	6	2	1	0	0	0	0	0	0	0	**59**
1:00 AM	0	0	0	1	1	11	11	4	3	1	0	0	0	0	0	0	0	**32**
2:00 AM	0	0	0	1	4	8	10	5	2	1	0	0	0	0	0	0	0	**31**
3:00 AM	0	0	0	1	6	14	30	17	5	1	0	0	0	0	0	0	0	**74**
4:00 AM	0	0	2	2	11	39	97	62	19	4	2	0	0	0	0	0	0	**238**
5:00 AM	0	0	1	2	17	64	125	60	13	2	0	1	0	0	0	0	0	**285**
6:00 AM	0	0	0	4	23	87	167	90	21	3	1	1	0	0	0	0	0	**397**
7:00 AM	1	0	0	6	34	123	207	101	22	3	0	0	0	0	0	0	0	**497**
8:00 AM	0	0	1	8	53	128	189	82	12	4	0	0	0	0	0	0	0	**477**
9:00 AM	0	0	1	5	33	147	175	61	9	2	1	0	0	0	0	0	0	**434**
10:00 AM	0	0	1	8	49	129	162	55	6	1	1	0	0	0	0	0	0	**412**
11:00 AM	0	0	2	12	75	227	202	67	8	2	0	0	0	0	0	0	0	**595**
12:00 PM	0	0	2	10	72	203	208	80	10	2	1	0	0	0	0	0	0	**588**
1:00 PM	0	0	2	10	47	154	198	67	11	1	0	1	0	0	0	0	0	**491**
2:00 PM	0	0	0	6	49	169	194	66	12	3	0	0	0	0	0	0	0	**499**
3:00 PM	0	0	1	8	42	142	201	84	16	3	0	0	0	0	0	0	0	**497**
4:00 PM	0	1	2	10	50	168	231	83	17	4	0	0	0	0	0	0	0	**566**
5:00 PM	0	0	2	9	67	165	237	91	12	3	0	1	0	0	0	0	0	**587**
6:00 PM	0	0	1	6	40	129	185	80	19	1	0	0	0	0	0	0	0	**461**
7:00 PM	0	0	0	5	20	79	140	71	13	2	2	0	0	0	0	0	0	**332**
8:00 PM	0	0	0	4	34	94	124	44	10	1	1	1	0	0	0	0	0	**313**
9:00 PM	0	0	0	1	18	82	94	30	5	1	0	0	0	0	0	0	0	**231**
10:00 PM	0	0	0	2	12	49	65	25	4	1	0	0	0	1	0	0	0	**159**
11:00 PM	0	0	0	3	7	24	36	13	4	1	1	0	0	0	0	0	0	**89**
Total	**1**	**1**	**18**	**125**	**767**	**2,453**	**3,316**	**1,344**	**255**	**48**	**10**	**5**	**0**	**1**	**0**	**0**	**0**	**8,344**
Percent	**0.0%**	**0.0%**	**0.2%**	**1.5%**	**9.2%**	**29.4%**	**39.7%**	**16.1%**	**3.1%**	**0.6%**	**0.1%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			**Total Study Speed Statistics**		
50th Percentile (Median)	36.1	mph	Mean (Average) Speed	36.1	mph
85th Percentile	40.9	mph	10 mph Pace	31.7 - 41.7	mph
95th Percentile	44.4	mph	Percent in Pace	70.4	%

Location: E Pioneer E-O 13th St SE
Date Range: 8/3/2021 to 8/5/2021
Site Code: C

Total Study Average
Westbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	1	2	9	9	5	2	1	0	0	0	0	0	0	0	**29**
1:00 AM	0	0	0	1	2	5	11	4	0	0	0	0	0	0	0	0	0	**23**
2:00 AM	0	0	0	1	1	4	7	2	0	0	0	0	0	0	0	0	0	**15**
3:00 AM	0	0	0	1	2	6	11	6	2	0	0	0	0	0	0	0	0	**28**
4:00 AM	0	0	0	1	2	13	28	19	2	1	0	0	0	0	0	0	0	**66**
5:00 AM	0	0	1	3	7	42	72	37	6	2	0	0	0	0	0	0	0	**170**
6:00 AM	0	0	0	3	9	45	125	87	17	4	0	0	0	0	0	0	0	**290**
7:00 AM	0	0	0	4	17	85	194	91	13	3	1	0	0	0	0	0	0	**408**
8:00 AM	0	0	0	5	24	122	214	78	14	3	0	0	0	0	0	0	0	**460**
9:00 AM	0	0	0	5	24	116	162	61	9	1	0	0	0	0	0	0	0	**378**
10:00 AM	0	0	0	6	28	132	187	46	7	1	0	0	0	0	0	0	0	**407**
11:00 AM	0	0	1	7	31	150	225	55	12	1	0	0	0	0	0	0	0	**482**
12:00 PM	0	0	0	6	42	165	187	55	7	2	1	0	1	0	1	0	0	**467**
1:00 PM	0	0	1	6	31	153	203	76	12	2	0	0	0	0	0	0	0	**484**
2:00 PM	0	0	0	4	44	162	267	91	15	4	0	0	0	0	0	0	0	**587**
3:00 PM	0	0	0	5	41	198	313	119	21	5	1	0	0	0	0	0	0	**703**
4:00 PM	0	0	1	4	46	219	371	132	23	6	2	1	0	0	0	0	0	**805**
5:00 PM	0	0	0	8	49	220	339	114	20	7	1	0	0	0	0	0	0	**758**
6:00 PM	0	0	0	4	19	111	209	93	28	9	2	0	0	0	0	0	0	**475**
7:00 PM	0	0	1	3	20	73	127	72	15	2	1	0	0	0	0	0	0	**314**
8:00 PM	0	0	1	6	23	72	101	37	7	1	0	0	0	0	0	0	0	**248**
9:00 PM	0	0	1	4	12	50	84	22	6	3	1	0	0	0	0	0	0	**183**
10:00 PM	0	0	0	3	8	33	39	18	5	0	1	0	0	0	0	0	0	**107**
11:00 PM	0	0	0	2	4	15	28	10	3	0	0	0	0	0	0	0	0	**62**
Total	**0**	**0**	**7**	**93**	**488**	**2,200**	**3,513**	**1,330**	**246**	**58**	**11**	**1**	**1**	**0**	**1**	**0**	**0**	**7,949**
Percent	**0.0%**	**0.0%**	**0.1%**	**1.2%**	**6.1%**	**27.7%**	**44.2%**	**16.7%**	**3.1%**	**0.7%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			Total Study Speed Statistics		
50th Percentile (Median)	36.6	mph	Mean (Average) Speed	36.6	mph
85th Percentile	41.0	mph	10 mph Pace	31.4 - 41.4	mph
95th Percentile	44.3	mph	Percent in Pace	74.8	%

Location: E Pioneer E-O 13th St SE
Date Range: 8/3/2021 - 8/9/2021
Site Code: C

	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday					
	8/3/2021			8/4/2021			8/5/2021			8/6/2021			8/7/2021			8/8/2021			8/9/2021			Mid-Week Average		
Time	**EB**	**WB**	**Total**	**EB**	**WB**	**Total**	**EB**	**WB**	**Total**	**EB**	**WB**	**Total**	**EB**	**WB**	**Total**	**EB**	**WB**	**Total**	**EB**	**WB**	**Total**	**EB**	**WB**	**Total**
12:00 AM	44	31	75	69	26	95	66	31	97	-	-	-	-	-	-	-	-	-	-	-	-	60	29	89
1:00 AM	36	20	56	27	27	54	32	24	56	-	-	-	-	-	-	-	-	-	-	-	-	32	24	55
2:00 AM	33	16	49	37	21	58	25	7	32	-	-	-	-	-	-	-	-	-	-	-	-	32	15	46
3:00 AM	62	24	86	68	31	99	93	36	129	-	-	-	-	-	-	-	-	-	-	-	-	74	30	105
4:00 AM	245	69	314	221	79	300	247	54	301	-	-	-	-	-	-	-	-	-	-	-	-	238	67	305
5:00 AM	256	164	420	333	173	506	267	170	437	-	-	-	-	-	-	-	-	-	-	-	-	285	169	454
6:00 AM	377	299	676	376	281	657	440	296	736	-	-	-	-	-	-	-	-	-	-	-	-	398	292	690
7:00 AM	511	392	903	508	402	910	476	430	906	-	-	-	-	-	-	-	-	-	-	-	-	498	408	906
8:00 AM	494	488	982	487	465	952	454	426	880	-	-	-	-	-	-	-	-	-	-	-	-	478	460	938
9:00 AM	392	383	775	519	378	897	393	378	771	-	-	-	-	-	-	-	-	-	-	-	-	435	380	814
10:00 AM	410	397	807	441	420	861	387	408	795	-	-	-	-	-	-	-	-	-	-	-	-	413	408	821
11:00 AM	549	487	1,036	567	494	1,061	672	465	1,137	-	-	-	-	-	-	-	-	-	-	-	-	596	482	1,078
12:00 PM	531	477	1,008	533	442	975	699	481	1,180	-	-	-	-	-	-	-	-	-	-	-	-	588	467	1,054
1:00 PM	455	476	931	512	492	1,004	509	482	991	-	-	-	-	-	-	-	-	-	-	-	-	492	483	975
2:00 PM	464	565	1,029	543	583	1,126	495	615	1,110	-	-	-	-	-	-	-	-	-	-	-	-	501	588	1,088
3:00 PM	490	669	1,159	509	714	1,223	497	727	1,224	-	-	-	-	-	-	-	-	-	-	-	-	499	703	1,202
4:00 PM	512	778	1,290	619	837	1,456	563	800	1,363	-	-	-	-	-	-	-	-	-	-	-	-	565	805	1,370
5:00 PM	499	739	1,238	653	767	1,420	611	768	1,379	-	-	-	-	-	-	-	-	-	-	-	-	588	758	1,346
6:00 PM	388	446	834	546	478	1,024	456	501	957	-	-	-	-	-	-	-	-	-	-	-	-	463	475	938
7:00 PM	317	286	603	331	309	640	352	344	696	-	-	-	-	-	-	-	-	-	-	-	-	333	313	646
8:00 PM	260	241	501	326	228	554	354	277	631	-	-	-	-	-	-	-	-	-	-	-	-	313	249	562
9:00 PM	187	148	335	254	201	455	260	197	457	-	-	-	-	-	-	-	-	-	-	-	-	234	182	416
10:00 PM	150	98	248	168	117	285	160	107	267	-	-	-	-	-	-	-	-	-	-	-	-	159	107	267
11:00 PM	82	43	125	107	76	183	80	70	150	-	-	-	-	-	-	-	-	-	-	-	-	90	63	153
Total	**7,744**	**7,736**	**15,480**	**8,754**	**8,041**	**16,795**	**8,588**	**8,094**	**16,682**	-	-	-	-	-	-	-	-	-	-	-	-	**8,362**	**7,957**	**16,319**
Percent	**50%**	**50%**	-	**52%**	**48%**	-	**51%**	**49%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**51%**	**49%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Vehicle Speed Report Summary

Location: E Main Ave N-O 5th Ave NE

Count Direction: Northbound / Southbound

Date Range: 8/3/2021 to 8/5/2021

Site Code: D

	Speed Range (mph)																	Total
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
Study Total																		
Northbound	4	11	80	547	1,120	4,514	14,550	14,015	4,628	994	230	54	24	8	1	0	1	40,781
Percent	0.0%	0.0%	0.2%	1.3%	2.7%	11.1%	35.7%	34.4%	11.3%	2.4%	0.6%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	100%
Southbound	11	17	56	409	1,767	6,047	15,860	12,580	4,040	792	163	37	13	5	1	3	2	41,803
Percent	0.0%	0.0%	0.1%	1.0%	4.2%	14.5%	37.9%	30.1%	9.7%	1.9%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Total	15	28	136	956	2,887	10,561	30,410	26,595	8,668	1,786	393	91	37	13	2	3	3	82,584
Percent	0.0%	0.0%	0.2%	1.2%	3.5%	12.8%	36.8%	32.2%	10.5%	2.2%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Total Study Percentile Speed Summary			Total Study Speed Statistics		
Northbound			**Northbound**		
50th Percentile (Median)	39.9	mph	Mean (Average) Speed	39.8	mph
85th Percentile	44.9	mph	10 mph Pace	35.0 - 45.0	mph
95th Percentile	48.5	mph	Percent in Pace	69.9	%
Southbound			**Southbound**		
50th Percentile (Median)	39.0	mph	Mean (Average) Speed	39.0	mph
85th Percentile	44.2	mph	10 mph Pace	34.3 - 44.3	mph
95th Percentile	47.9	mph	Percent in Pace	68.7	%

Location: E Main Ave N-O 5th Ave NE
Date Range: 8/3/2021 to 8/5/2021
Site Code: D

Tuesday, August 3, 2021
Northbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	1	1	9	22	24	13	4	0	0	0	0	0	0	0	**74**
1:00 AM	0	0	0	3	1	5	25	9	4	6	1	0	0	1	0	0	0	**55**
2:00 AM	0	0	0	4	0	6	23	14	20	4	1	0	0	0	0	0	0	**72**
3:00 AM	0	0	0	6	7	14	59	71	47	4	4	0	0	0	0	0	0	**212**
4:00 AM	0	0	1	5	10	56	194	265	103	22	13	1	0	0	0	0	0	**670**
5:00 AM	0	0	1	6	36	131	312	251	68	17	2	2	0	0	0	0	0	**826**
6:00 AM	0	0	0	6	32	121	426	315	87	22	5	0	2	1	0	0	0	**1,017**
7:00 AM	0	1	0	9	47	141	373	300	97	18	2	0	0	0	0	0	0	**988**
8:00 AM	1	0	0	7	17	74	307	265	61	13	6	0	0	0	0	0	0	**751**
9:00 AM	0	0	1	4	9	75	273	230	76	15	1	0	0	0	0	0	0	**684**
10:00 AM	0	0	0	6	16	98	236	216	74	11	3	0	0	0	0	0	0	**660**
11:00 AM	0	0	0	5	13	99	277	272	69	15	4	2	0	0	0	0	0	**756**
12:00 PM	0	0	1	10	21	95	295	247	94	14	5	3	0	0	0	0	0	**785**
1:00 PM	0	2	1	18	26	104	262	260	94	20	3	1	0	0	0	0	0	**791**
2:00 PM	0	0	2	5	10	55	238	256	91	21	1	0	0	0	0	0	0	**679**
3:00 PM	0	0	2	12	18	51	217	270	72	20	3	1	0	0	0	0	0	**666**
4:00 PM	0	0	0	6	4	79	268	276	92	26	5	3	0	0	0	0	0	**759**
5:00 PM	1	1	2	4	19	62	203	275	95	15	3	1	0	0	0	0	0	**681**
6:00 PM	0	0	1	8	9	29	161	232	80	13	1	0	1	0	0	0	0	**535**
7:00 PM	0	0	0	9	10	30	124	146	47	13	2	1	0	0	0	0	0	**382**
8:00 PM	0	0	0	10	5	30	117	109	42	11	0	0	0	0	0	0	0	**324**
9:00 PM	0	0	0	4	7	24	95	85	30	11	5	0	0	0	0	0	0	**261**
10:00 PM	0	0	1	4	4	12	50	63	21	6	3	1	0	0	0	0	0	**165**
11:00 PM	0	1	0	1	1	6	36	29	26	6	1	0	0	0	0	0	0	**107**
Total	**2**	**5**	**13**	**153**	**323**	**1,406**	**4,593**	**4,480**	**1,503**	**327**	**74**	**16**	**3**	**2**	**0**	**0**	**0**	**12,900**
Percent	**0.0%**	**0.0%**	**0.1%**	**1.2%**	**2.5%**	**10.9%**	**35.6%**	**34.7%**	**11.7%**	**2.5%**	**0.6%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			**Speed Statistics**		
50th Percentile (Median)	39.9	mph	Mean (Average) Speed	39.9	mph
85th Percentile	45.0	mph	10 mph Pace	35.1 - 45.1	mph
95th Percentile	48.5	mph	Percent in Pace	70.2	%

Location: E Main Ave N-O 5th Ave NE
Date Range: 8/3/2021 to 8/5/2021
Site Code: D

Tuesday, August 3, 2021
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	1	7	13	34	24	11	3	0	0	1	0	0	0	0	**94**
1:00 AM	0	0	1	1	4	10	31	18	9	3	0	0	1	0	0	1	0	**79**
2:00 AM	0	0	0	1	4	3	14	8	8	1	1	0	0	0	0	0	0	**40**
3:00 AM	0	0	0	1	4	3	13	7	4	4	1	0	0	0	0	0	0	**37**
4:00 AM	0	0	0	1	2	13	26	13	4	1	0	0	0	0	0	0	0	**60**
5:00 AM	0	0	0	3	4	23	70	65	6	4	0	0	0	0	0	0	0	**175**
6:00 AM	0	0	0	0	7	48	118	107	41	10	2	0	0	0	0	0	0	**333**
7:00 AM	0	0	0	2	21	70	161	165	62	12	4	0	0	0	0	0	0	**497**
8:00 AM	0	0	2	4	21	74	204	140	63	14	4	0	1	0	0	0	0	**527**
9:00 AM	0	0	1	7	19	90	218	160	62	8	0	0	0	0	0	0	0	**565**
10:00 AM	0	0	3	5	34	101	204	167	40	16	3	0	0	0	0	0	0	**573**
11:00 AM	0	0	0	4	32	100	303	206	79	16	2	0	0	0	0	0	0	**742**
12:00 PM	0	0	1	7	27	124	326	217	71	14	0	1	0	0	0	0	0	**788**
1:00 PM	0	1	1	8	44	127	306	304	81	12	2	3	0	0	0	0	0	**889**
2:00 PM	0	0	1	8	42	164	468	327	98	15	3	0	1	0	0	0	0	**1,127**
3:00 PM	0	0	2	16	55	256	511	424	123	20	4	1	1	0	0	1	0	**1,414**
4:00 PM	0	1	0	8	43	193	574	435	128	17	1	1	0	0	0	0	0	**1,401**
5:00 PM	0	1	0	18	57	245	555	421	95	21	7	0	0	1	0	0	0	**1,421**
6:00 PM	0	0	0	13	33	129	409	316	98	16	4	0	1	0	0	0	0	**1,019**
7:00 PM	0	1	0	7	31	51	219	194	75	17	5	0	1	0	1	0	0	**602**
8:00 PM	0	1	1	7	19	52	181	139	55	14	1	1	0	0	0	0	0	**471**
9:00 PM	0	0	0	8	19	36	99	112	51	13	4	1	0	1	0	0	0	**344**
10:00 PM	0	0	0	5	14	33	72	56	26	10	3	0	0	0	0	0	0	**219**
11:00 PM	0	0	0	2	8	19	65	54	27	9	3	0	0	0	0	0	0	**187**
Total	**0**	**5**	**13**	**137**	**551**	**1,977**	**5,181**	**4,079**	**1,317**	**270**	**54**	**8**	**7**	**2**	**1**	**2**	**0**	**13,604**
Percent	**0.0%**	**0.0%**	**0.1%**	**1.0%**	**4.1%**	**14.5%**	**38.1%**	**30.0%**	**9.7%**	**2.0%**	**0.4%**	**0.1%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	39.0	mph	Mean (Average) Speed	39.1	mph
85th Percentile	44.3	mph	10 mph Pace	33.7 - 43.7	mph
95th Percentile	48.0	mph	Percent in Pace	68.84	%

Location: E Main Ave N-O 5th Ave NE
Date Range: 8/3/2021 to 8/5/2021
Site Code: D

Wednesday, August 4, 2021
Northbound

	Speed Range (mph)																	Total
Time	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
12:00 AM	0	0	0	1	1	12	21	23	11	3	1	0	0	0	0	0	0	**73**
1:00 AM	0	0	0	2	2	7	20	11	4	2	1	0	0	0	0	0	0	**49**
2:00 AM	0	0	1	1	0	4	26	29	12	6	0	1	0	0	0	0	0	**80**
3:00 AM	0	0	0	1	5	5	69	68	40	7	1	0	0	0	0	0	0	**196**
4:00 AM	0	0	0	5	15	57	192	223	112	43	4	2	1	0	0	0	0	**654**
5:00 AM	1	0	4	4	30	123	343	278	82	22	4	3	0	0	0	0	0	**894**
6:00 AM	0	2	3	12	23	132	340	344	106	24	3	3	0	0	0	0	0	**992**
7:00 AM	0	1	0	21	49	150	312	328	107	23	1	3	1	0	0	0	0	**996**
8:00 AM	0	0	0	3	40	131	386	278	74	17	2	1	0	1	0	0	1	**934**
9:00 AM	0	0	0	13	20	90	325	300	80	21	3	0	0	0	0	0	0	**852**
10:00 AM	0	0	2	8	26	82	272	244	69	11	0	0	1	1	0	0	0	**716**
11:00 AM	0	0	0	15	32	103	257	257	86	13	5	1	1	0	0	0	0	**770**
12:00 PM	0	0	2	7	35	87	254	299	63	12	2	1	1	0	0	0	0	**763**
1:00 PM	0	0	3	17	19	101	281	273	75	16	2	2	0	1	0	0	0	**790**
2:00 PM	0	0	5	8	32	86	265	227	76	7	3	0	3	0	0	0	0	**712**
3:00 PM	0	0	2	11	11	53	258	260	71	22	3	1	0	0	0	0	0	**692**
4:00 PM	0	0	2	3	16	98	328	317	96	15	4	1	0	0	0	0	0	**880**
5:00 PM	0	1	1	5	6	77	217	316	126	18	7	0	0	0	0	0	0	**774**
6:00 PM	0	0	1	13	8	35	173	240	98	17	4	0	0	0	0	0	0	**589**
7:00 PM	0	0	1	16	12	20	145	165	66	12	3	1	0	1	0	0	0	**442**
8:00 PM	0	0	2	9	10	27	109	139	50	15	2	0	1	0	0	0	0	**364**
9:00 PM	0	1	0	4	6	28	132	123	28	6	0	0	0	0	0	0	0	**328**
10:00 PM	0	0	0	6	5	18	90	68	23	5	3	1	2	1	0	0	0	**222**
11:00 PM	0	0	1	4	1	6	36	35	19	8	0	0	0	0	0	0	0	**110**
Total	**1**	**5**	**30**	**189**	**404**	**1,532**	**4,851**	**4,845**	**1,574**	**345**	**58**	**21**	**11**	**5**	**0**	**0**	**1**	**13,872**
Percent	**0.0%**	**0.0%**	**0.2%**	**1.4%**	**2.9%**	**11.0%**	**35.0%**	**34.9%**	**11.3%**	**2.5%**	**0.4%**	**0.2%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			**Speed Statistics**		
50th Percentile (Median)	39.9	mph	Mean (Average) Speed	39.8	mph
85th Percentile	44.9	mph	10 mph Pace	35.0 - 45.0	mph
95th Percentile	48.7	mph	Percent in Pace	69.8	%

Location: **E Main Ave N-O 5th Ave NE**
Date Range: **8/3/2021 to 8/5/2021**
Site Code: **D**

Wednesday, August 4, 2021
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	1	2	5	11	39	25	19	6	0	0	0	0	0	0	0	**108**
1:00 AM	0	0	0	0	3	8	26	22	10	1	0	0	0	0	0	0	0	**70**
2:00 AM	0	0	0	0	3	7	17	14	8	4	0	1	0	0	0	0	0	**54**
3:00 AM	0	0	0	2	3	5	19	13	4	2	1	0	0	0	0	0	0	**49**
4:00 AM	0	0	0	3	4	9	37	21	9	0	0	0	0	0	0	0	0	**83**
5:00 AM	1	0	3	2	6	16	69	56	18	5	0	0	0	0	0	0	0	**176**
6:00 AM	0	0	0	1	12	27	81	106	46	6	3	0	0	0	0	0	0	**282**
7:00 AM	2	0	0	3	22	77	203	139	41	9	0	0	0	0	0	0	0	**496**
8:00 AM	2	0	0	1	19	86	186	138	49	15	5	0	0	0	0	0	0	**501**
9:00 AM	0	0	1	2	18	80	206	159	46	8	3	1	0	0	0	0	0	**524**
10:00 AM	0	0	3	4	30	84	247	173	50	11	1	0	0	0	0	0	0	**603**
11:00 AM	2	1	2	8	36	86	268	208	67	15	2	1	0	0	0	0	1	**697**
12:00 PM	0	0	0	12	44	125	307	256	73	13	2	0	0	0	0	0	0	**832**
1:00 PM	2	0	1	7	49	119	310	298	87	17	4	1	0	0	0	0	0	**895**
2:00 PM	0	1	1	19	47	184	424	369	97	19	6	2	1	0	0	0	0	**1,170**
3:00 PM	0	0	1	7	51	220	537	404	114	27	4	3	2	0	0	0	0	**1,370**
4:00 PM	0	0	0	16	60	241	581	382	114	14	2	0	0	0	0	0	0	**1,410**
5:00 PM	0	5	2	3	57	241	522	433	122	19	3	1	0	0	0	0	0	**1,408**
6:00 PM	0	0	0	2	31	108	403	365	167	22	5	0	0	0	0	0	0	**1,103**
7:00 PM	0	0	1	3	24	53	219	221	90	18	5	1	0	0	0	1	0	**636**
8:00 PM	0	1	1	7	32	54	187	172	70	10	5	2	0	0	0	0	1	**542**
9:00 PM	0	0	1	9	9	34	145	134	53	10	1	0	0	0	0	0	0	**396**
10:00 PM	0	0	0	3	11	25	111	98	34	6	1	0	0	0	0	0	0	**289**
11:00 PM	0	0	0	2	4	20	83	53	24	13	1	1	1	0	0	0	0	**202**
Total	**9**	**8**	**18**	**118**	**580**	**1,920**	**5,227**	**4,259**	**1,412**	**270**	**54**	**14**	**4**	**0**	**0**	**1**	**2**	**13,896**
Percent	**0.1%**	**0.1%**	**0.1%**	**0.8%**	**4.2%**	**13.8%**	**37.6%**	**30.6%**	**10.2%**	**1.9%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary		
50th Percentile (Median)	39.3	mph
85th Percentile	44.4	mph
95th Percentile	47.9	mph

Speed Statistics		
Mean (Average) Speed	39.2	mph
10 mph Pace	34.3 - 44.3	mph
Percent in Pace	68.39	%

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Location: E Main Ave N-O 5th Ave NE
Date Range: 8/3/2021 to 8/5/2021
Site Code: D

Thursday, August 5, 2021
Northbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	2	2	11	24	39	9	7	2	0	0	0	0	0	0	**96**
1:00 AM	0	0	2	2	1	8	21	16	11	1	2	0	2	0	0	0	0	**66**
2:00 AM	0	0	0	4	1	3	23	23	14	5	2	0	0	0	0	0	0	**75**
3:00 AM	0	0	1	0	3	7	62	85	42	9	5	0	0	0	0	0	0	**214**
4:00 AM	0	0	1	5	6	34	225	248	126	27	7	1	1	0	0	0	0	**681**
5:00 AM	0	0	3	6	19	107	349	335	89	31	7	2	2	0	0	0	0	**950**
6:00 AM	0	0	0	7	54	186	423	273	95	14	5	2	1	0	0	0	0	**1,060**
7:00 AM	0	0	1	10	38	141	343	330	87	18	5	1	0	0	0	0	0	**974**
8:00 AM	0	0	1	11	10	54	271	263	74	7	5	0	0	0	0	0	0	**696**
9:00 AM	0	0	5	5	9	88	314	213	63	13	2	1	0	0	0	0	0	**713**
10:00 AM	0	0	1	9	21	74	259	234	78	15	2	0	0	0	0	0	0	**693**
11:00 AM	0	0	0	5	14	107	314	277	75	14	6	0	0	0	0	0	0	**812**
12:00 PM	0	0	7	34	58	152	422	260	69	21	3	2	0	0	0	0	0	**1,028**
1:00 PM	0	0	2	12	16	92	291	295	94	10	6	0	1	0	0	0	0	**819**
2:00 PM	0	0	1	12	26	92	318	256	83	17	5	0	0	0	0	0	0	**810**
3:00 PM	0	0	2	16	22	84	257	233	77	11	5	0	0	0	0	0	0	**707**
4:00 PM	0	0	0	9	11	76	256	293	71	18	4	1	0	0	0	0	0	**739**
5:00 PM	0	0	0	5	39	121	317	236	88	18	6	0	2	0	0	0	0	**832**
6:00 PM	1	0	1	17	15	36	152	225	79	15	1	2	0	0	0	0	0	**544**
7:00 PM	0	1	1	11	7	18	142	183	64	14	3	1	0	0	0	0	0	**445**
8:00 PM	0	0	2	10	6	23	112	150	64	16	3	1	0	0	0	0	0	**387**
9:00 PM	0	0	3	8	10	30	115	112	36	9	4	0	0	1	1	0	0	**329**
10:00 PM	0	0	1	4	5	17	66	65	34	9	6	2	0	0	0	0	0	**209**
11:00 PM	0	0	2	1	0	15	30	46	29	3	2	1	1	0	0	0	0	**130**
Total	**1**	**1**	**37**	**205**	**393**	**1,576**	**5,106**	**4,690**	**1,551**	**322**	**98**	**17**	**10**	**1**	**1**	**0**	**0**	**14,009**
Percent	**0.0%**	**0.0%**	**0.3%**	**1.5%**	**2.8%**	**11.2%**	**36.4%**	**33.5%**	**11.1%**	**2.3%**	**0.7%**	**0.1%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	39.7	mph	Mean (Average) Speed	39.7	mph
85th Percentile	44.9	mph	10 mph Pace	34.9 - 44.9	mph
95th Percentile	48.3	mph	Percent in Pace	69.9	%

Location: E Main Ave N-O 5th Ave NE
Date Range: 8/3/2021 to 8/5/2021
Site Code: D

Thursday, August 5, 2021
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	1	1	3	10	32	42	17	2	0	0	0	0	0	0	0	**108**
1:00 AM	0	0	1	2	3	12	35	28	10	3	0	1	0	0	0	0	0	**95**
2:00 AM	0	0	0	0	2	8	16	16	1	3	1	0	0	0	0	0	0	**47**
3:00 AM	0	0	0	0	3	5	16	13	7	4	0	0	0	0	0	0	0	**48**
4:00 AM	0	0	1	0	2	13	23	27	5	1	0	0	0	0	0	0	0	**72**
5:00 AM	0	0	0	4	10	24	62	59	20	4	2	0	0	0	0	0	0	**185**
6:00 AM	0	1	1	5	12	48	90	76	31	11	4	0	0	0	0	0	0	**279**
7:00 AM	0	0	2	1	16	68	201	165	58	9	3	1	0	0	0	0	0	**524**
8:00 AM	0	1	3	7	29	81	182	133	50	7	3	1	0	1	0	0	0	**498**
9:00 AM	0	0	2	11	40	90	221	133	41	6	6	0	0	0	0	0	0	**550**
10:00 AM	0	1	3	7	37	103	245	145	52	20	0	0	0	0	0	0	0	**613**
11:00 AM	0	0	0	8	29	107	269	220	59	9	1	0	0	0	0	0	0	**702**
12:00 PM	1	0	4	9	32	146	335	189	68	8	1	1	1	0	0	0	0	**795**
1:00 PM	0	1	1	9	38	140	316	307	94	16	1	0	0	0	0	0	0	**923**
2:00 PM	0	0	0	7	37	175	459	374	108	17	7	0	0	0	0	0	0	**1,184**
3:00 PM	0	0	0	9	62	211	648	420	89	15	3	0	0	0	0	0	0	**1,457**
4:00 PM	0	0	1	12	50	272	643	389	111	24	5	2	0	1	0	0	0	**1,510**
5:00 PM	0	0	2	26	100	292	594	391	95	16	2	1	0	0	0	0	0	**1,519**
6:00 PM	0	0	3	15	44	119	387	403	133	26	6	1	0	0	0	0	0	**1,137**
7:00 PM	0	0	0	10	21	67	201	239	89	16	0	1	1	0	0	0	0	**645**
8:00 PM	0	0	0	2	24	63	219	193	59	7	7	0	0	1	0	0	0	**575**
9:00 PM	1	0	0	5	23	44	111	131	42	12	0	3	0	0	0	0	0	**372**
10:00 PM	0	0	0	3	10	30	86	89	43	11	2	1	0	0	0	0	0	**275**
11:00 PM	0	0	0	1	9	22	61	60	29	5	1	2	0	0	0	0	0	**190**
Total	**2**	**4**	**25**	**154**	**636**	**2,150**	**5,452**	**4,242**	**1,311**	**252**	**55**	**15**	**2**	**3**	**0**	**0**	**0**	**14,303**
Percent	**0.0%**	**0.0%**	**0.2%**	**1.1%**	**4.4%**	**15.0%**	**38.1%**	**29.7%**	**9.2%**	**1.8%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	38.9	mph	Mean (Average) Speed	38.9	mph
85th Percentile	44.1	mph	10 mph Pace	34.3 - 44.3	mph
95th Percentile	47.6	mph	Percent in Pace	68.82	%

Location: E Main Ave N-O 5th Ave NE
Date Range: 8/3/2021 to 8/5/2021
Site Code: D

Total Study Average
Northbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	1	1	11	22	29	11	5	1	0	0	0	0	0	0	**81**
1:00 AM	0	0	1	2	1	7	22	12	6	3	1	0	1	0	0	0	0	**56**
2:00 AM	0	0	0	3	0	4	24	22	15	5	1	0	0	0	0	0	0	**74**
3:00 AM	0	0	0	2	5	9	63	75	43	7	3	0	0	0	0	0	0	**207**
4:00 AM	0	0	1	5	10	49	204	245	114	31	8	1	1	0	0	0	0	**669**
5:00 AM	0	0	3	5	28	120	335	288	80	23	4	2	1	0	0	0	0	**889**
6:00 AM	0	1	1	8	36	146	396	311	96	20	4	2	1	0	0	0	0	**1,022**
7:00 AM	0	1	0	13	45	144	343	319	97	20	3	1	0	0	0	0	0	**986**
8:00 AM	0	0	0	7	22	86	321	269	70	12	4	0	0	0	0	0	0	**791**
9:00 AM	0	0	2	7	13	84	304	248	73	16	2	0	0	0	0	0	0	**749**
10:00 AM	0	0	1	8	21	85	256	231	74	12	2	0	0	0	0	0	0	**690**
11:00 AM	0	0	0	8	20	103	283	269	77	14	5	1	0	0	0	0	0	**780**
12:00 PM	0	0	3	17	38	111	324	269	75	16	3	2	0	0	0	0	0	**858**
1:00 PM	0	1	2	16	20	99	278	276	88	15	4	1	0	0	0	0	0	**800**
2:00 PM	0	0	3	8	23	78	274	246	83	15	3	0	1	0	0	0	0	**734**
3:00 PM	0	0	2	13	17	63	244	254	73	18	4	1	0	0	0	0	0	**689**
4:00 PM	0	0	1	6	10	84	284	295	86	20	4	2	0	0	0	0	0	**792**
5:00 PM	0	1	1	5	21	87	246	276	103	17	5	0	1	0	0	0	0	**763**
6:00 PM	0	0	1	13	11	33	162	232	86	15	2	1	0	0	0	0	0	**556**
7:00 PM	0	0	1	12	10	23	137	165	59	13	3	1	0	0	0	0	0	**424**
8:00 PM	0	0	1	10	7	27	113	133	52	14	2	0	0	0	0	0	0	**359**
9:00 PM	0	0	1	5	8	27	114	107	31	9	3	0	0	0	0	0	0	**305**
10:00 PM	0	0	1	5	5	16	69	65	26	7	4	1	1	0	0	0	0	**200**
11:00 PM	0	0	1	2	1	9	34	37	25	6	1	0	0	0	0	0	0	**116**
Total	**0**	**4**	**27**	**181**	**373**	**1,505**	**4,852**	**4,673**	**1,543**	**333**	**76**	**16**	**7**	**0**	**0**	**0**	**0**	**13,590**
Percent	**0.0%**	**0.0%**	**0.2%**	**1.3%**	**2.7%**	**11.1%**	**35.7%**	**34.4%**	**11.4%**	**2.5%**	**0.6%**	**0.1%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary		
50th Percentile (Median)	39.9	mph
85th Percentile	44.9	mph
95th Percentile	48.5	mph

Total Study Speed Statistics		
Mean (Average) Speed	39.8	mph
10 mph Pace	35.0 - 45.0	mph
Percent in Pace	69.9	%

Location: E Main Ave N-O 5th Ave NE
Date Range: 8/3/2021 to 8/5/2021
Site Code: D

Total Study Average
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	1	1	5	11	35	30	16	4	0	0	0	0	0	0	0	**103**
1:00 AM	0	0	1	1	3	10	31	23	10	2	0	0	0	0	0	0	0	**81**
2:00 AM	0	0	0	0	3	6	16	13	6	3	1	0	0	0	0	0	0	**48**
3:00 AM	0	0	0	1	3	4	16	11	5	3	1	0	0	0	0	0	0	**44**
4:00 AM	0	0	0	1	3	12	29	20	6	1	0	0	0	0	0	0	0	**72**
5:00 AM	0	0	1	3	7	21	67	60	15	4	1	0	0	0	0	0	0	**179**
6:00 AM	0	0	0	2	10	41	96	96	39	9	3	0	0	0	0	0	0	**296**
7:00 AM	1	0	1	2	20	72	188	156	54	10	2	0	0	0	0	0	0	**506**
8:00 AM	1	0	2	4	23	80	191	137	54	12	4	0	0	0	0	0	0	**508**
9:00 AM	0	0	1	7	26	87	215	151	50	7	3	0	0	0	0	0	0	**547**
10:00 AM	0	0	3	5	34	96	232	162	47	16	1	0	0	0	0	0	0	**596**
11:00 AM	1	0	1	7	32	98	280	211	68	13	2	0	0	0	0	0	0	**713**
12:00 PM	0	0	2	9	34	132	323	221	71	12	1	1	0	0	0	0	0	**806**
1:00 PM	1	1	1	8	44	129	311	303	87	15	2	1	0	0	0	0	0	**903**
2:00 PM	0	0	1	11	42	174	450	357	101	17	5	1	1	0	0	0	0	**1,160**
3:00 PM	0	0	1	11	56	229	565	416	109	21	4	1	1	0	0	0	0	**1,414**
4:00 PM	0	0	0	12	51	235	599	402	118	18	3	1	0	0	0	0	0	**1,439**
5:00 PM	0	2	1	16	71	259	557	415	104	19	4	1	0	0	0	0	0	**1,449**
6:00 PM	0	0	1	10	36	119	400	361	133	21	5	0	0	0	0	0	0	**1,086**
7:00 PM	0	0	0	7	25	57	213	218	85	17	3	1	1	0	0	0	0	**627**
8:00 PM	0	1	1	5	25	56	196	168	61	10	4	1	0	0	0	0	0	**528**
9:00 PM	0	0	0	7	17	38	118	126	49	12	2	1	0	0	0	0	0	**370**
10:00 PM	0	0	0	4	12	29	90	81	34	9	2	0	0	0	0	0	0	**261**
11:00 PM	0	0	0	2	7	20	70	56	27	9	2	1	0	0	0	0	0	**194**
Total	**4**	**4**	**19**	**136**	**589**	**2,015**	**5,288**	**4,194**	**1,349**	**264**	**55**	**10**	**3**	**0**	**0**	**0**	**0**	**13,930**
Percent	**0.0%**	**0.0%**	**0.1%**	**1.0%**	**4.2%**	**14.5%**	**38.0%**	**30.1%**	**9.7%**	**1.9%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			Total Study Speed Statistics		
50th Percentile (Median)	39.0	mph	Mean (Average) Speed	39.0	mph
85th Percentile	44.2	mph	10 mph Pace	34.3 - 44.3	mph
95th Percentile	47.9	mph	Percent in Pace	68.7	%

Location: E Main Ave N-O 5th Ave NE
Date Range: 8/3/2021 - 8/9/2021
Site Code: D

Time	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average		
	8/3/2021			8/4/2021			8/5/2021			8/6/2021			8/7/2021			8/8/2021			8/9/2021					
	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	74	94	168	73	108	181	96	108	204	-	-	-	-	-	-	-	-	-	-	-	-	81	103	184
1:00 AM	55	79	134	49	70	119	66	95	161	-	-	-	-	-	-	-	-	-	-	-	-	57	81	138
2:00 AM	72	40	112	80	54	134	75	47	122	-	-	-	-	-	-	-	-	-	-	-	-	76	47	123
3:00 AM	212	37	249	196	49	245	214	48	262	-	-	-	-	-	-	-	-	-	-	-	-	207	45	252
4:00 AM	670	60	730	654	83	737	681	72	753	-	-	-	-	-	-	-	-	-	-	-	-	668	72	740
5:00 AM	826	175	1,001	894	176	1,070	950	185	1,135	-	-	-	-	-	-	-	-	-	-	-	-	890	179	1,069
6:00 AM	1,017	333	1,350	992	282	1,274	1,060	279	1,339	-	-	-	-	-	-	-	-	-	-	-	-	1,023	298	1,321
7:00 AM	988	497	1,485	996	496	1,492	974	524	1,498	-	-	-	-	-	-	-	-	-	-	-	-	986	506	1,492
8:00 AM	751	527	1,278	934	501	1,435	696	498	1,194	-	-	-	-	-	-	-	-	-	-	-	-	794	509	1,302
9:00 AM	684	565	1,249	852	524	1,376	713	550	1,263	-	-	-	-	-	-	-	-	-	-	-	-	750	546	1,296
10:00 AM	660	573	1,233	716	603	1,319	693	613	1,306	-	-	-	-	-	-	-	-	-	-	-	-	690	596	1,286
11:00 AM	756	742	1,498	770	697	1,467	812	702	1,514	-	-	-	-	-	-	-	-	-	-	-	-	779	714	1,493
12:00 PM	785	788	1,573	763	832	1,595	1,028	795	1,823	-	-	-	-	-	-	-	-	-	-	-	-	859	805	1,664
1:00 PM	791	889	1,680	790	895	1,685	819	923	1,742	-	-	-	-	-	-	-	-	-	-	-	-	800	902	1,702
2:00 PM	679	1,127	1,806	712	1,170	1,882	810	1,184	1,994	-	-	-	-	-	-	-	-	-	-	-	-	734	1,160	1,894
3:00 PM	666	1,414	2,080	692	1,370	2,062	707	1,457	2,164	-	-	-	-	-	-	-	-	-	-	-	-	688	1,414	2,102
4:00 PM	759	1,401	2,160	880	1,410	2,290	739	1,510	2,249	-	-	-	-	-	-	-	-	-	-	-	-	793	1,440	2,233
5:00 PM	681	1,421	2,102	774	1,408	2,182	832	1,519	2,351	-	-	-	-	-	-	-	-	-	-	-	-	762	1,449	2,212
6:00 PM	535	1,019	1,554	589	1,103	1,692	544	1,137	1,681	-	-	-	-	-	-	-	-	-	-	-	-	556	1,086	1,642
7:00 PM	382	602	984	442	636	1,078	445	645	1,090	-	-	-	-	-	-	-	-	-	-	-	-	423	628	1,051
8:00 PM	324	471	795	364	542	906	387	575	962	-	-	-	-	-	-	-	-	-	-	-	-	358	529	888
9:00 PM	261	344	605	328	396	724	329	372	701	-	-	-	-	-	-	-	-	-	-	-	-	306	371	677
10:00 PM	165	219	384	222	289	511	209	275	484	-	-	-	-	-	-	-	-	-	-	-	-	199	261	460
11:00 PM	107	187	294	110	202	312	130	190	320	-	-	-	-	-	-	-	-	-	-	-	-	116	193	309
Total	**12,900**	**13,604**	**26,504**	**13,872**	**13,896**	**27,768**	**14,009**	**14,303**	**28,312**	-	-	-	-	-	-	-	-	-	-	-	-	**13,594**	**13,934**	**27,528**
Percent	**49%**	**51%**	-	**50%**	**50%**	-	**49%**	**51%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**49%**	**51%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Vehicle Speed Report Summary

Location: N Meridian Ave N-O River Rd

Count Direction: Northbound / Southbound

Date Range: 8/3/2021 to 8/5/2021

Site Code: E

	Speed Range (mph)																	Total
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
Study Total																		
Northbound	1,460	1,844	2,008	2,708	6,233	13,659	17,146	8,486	2,062	414	85	26	18	8	2	0	0	56,159
Percent	2.6%	3.3%	3.6%	4.8%	11.1%	24.3%	30.5%	15.1%	3.7%	0.7%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Southbound	2,141	6,830	9,937	6,852	7,991	14,312	13,530	5,361	1,309	275	58	25	7	4	0	0	0	68,632
Percent	3.1%	10.0%	14.5%	10.0%	11.6%	20.9%	19.7%	7.8%	1.9%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Total	3,601	8,674	11,945	9,560	14,224	27,971	30,676	13,847	3,371	689	143	51	25	12	2	0	0	124,791
Percent	2.9%	7.0%	9.6%	7.7%	11.4%	22.4%	24.6%	11.1%	2.7%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Total Study Percentile Speed Summary			Total Study Speed Statistics		
Northbound			**Northbound**		
50th Percentile (Median)	35.0	mph	Mean (Average) Speed	33.4	mph
85th Percentile	41.0	mph	10 mph Pace	31.2 - 41.2	mph
95th Percentile	44.7	mph	Percent in Pace	55.7	%
Southbound			**Southbound**		
50th Percentile (Median)	30.2	mph	Mean (Average) Speed	28.1	mph
85th Percentile	38.5	mph	10 mph Pace	29.5 - 39.5	mph
95th Percentile	42.5	mph	Percent in Pace	40.6	%

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Location: N Meridian Ave N-O River Rd
Date Range: 8/3/2021 to 8/5/2021
Site Code: E

Tuesday, August 3, 2021
Northbound

Time	Speed Range (mph)																	Total
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	Volume
12:00 AM	0	0	0	1	7	18	36	20	5	1	0	0	0	0	0	0	0	**88**
1:00 AM	0	0	0	0	4	19	28	8	1	1	1	0	0	0	0	0	0	**62**
2:00 AM	1	0	0	0	11	16	32	14	3	1	0	0	0	0	0	0	0	**78**
3:00 AM	1	0	1	2	5	33	58	38	10	0	0	0	0	1	0	0	0	**149**
4:00 AM	1	1	1	4	12	70	196	131	32	3	0	0	0	0	0	0	0	**451**
5:00 AM	0	0	1	4	17	145	385	226	66	16	4	0	0	0	0	0	0	**864**
6:00 AM	5	13	32	37	112	269	418	221	57	7	0	0	0	0	0	0	0	**1,171**
7:00 AM	67	116	96	87	165	284	254	89	19	3	2	1	0	0	0	0	0	**1,183**
8:00 AM	44	62	55	55	77	224	258	144	34	5	1	0	0	0	0	0	0	**959**
9:00 AM	0	2	8	21	93	277	317	172	41	5	2	0	0	0	0	0	0	**938**
10:00 AM	2	7	5	21	131	291	331	166	35	12	3	0	2	0	0	0	0	**1,006**
11:00 AM	8	7	4	28	125	310	364	157	38	9	0	0	0	0	0	0	0	**1,050**
12:00 PM	7	5	11	68	218	322	306	151	31	4	0	0	0	0	0	0	0	**1,123**
1:00 PM	23	24	46	73	157	329	314	125	25	7	0	1	0	0	0	0	0	**1,124**
2:00 PM	13	1	15	56	188	328	366	168	34	8	0	0	1	0	0	0	0	**1,178**
3:00 PM	48	8	14	73	180	323	368	175	48	7	2	0	1	0	0	0	0	**1,247**
4:00 PM	116	174	144	132	167	247	181	70	31	8	3	0	1	0	0	0	0	**1,274**
5:00 PM	41	9	22	95	214	352	347	163	42	7	1	2	1	1	0	0	0	**1,297**
6:00 PM	16	0	0	18	92	282	281	167	51	7	3	3	0	0	0	0	0	**920**
7:00 PM	0	0	1	5	35	186	308	145	32	8	3	0	0	0	0	0	0	**723**
8:00 PM	0	0	0	19	33	134	256	137	20	8	1	1	2	1	2	0	0	**614**
9:00 PM	0	0	1	4	30	101	185	109	16	4	0	0	0	0	0	0	0	**450**
10:00 PM	0	0	1	7	13	54	92	72	20	6	2	0	0	0	0	0	0	**267**
11:00 PM	0	0	0	1	7	34	70	32	7	5	1	0	1	1	0	0	0	**159**
Total	**393**	**429**	**458**	**811**	**2,093**	**4,648**	**5,751**	**2,900**	**698**	**142**	**29**	**8**	**9**	**4**	**2**	**0**	**0**	**18,375**
Percent	**2.1%**	**2.3%**	**2.5%**	**4.4%**	**11.4%**	**25.3%**	**31.3%**	**15.8%**	**3.8%**	**0.8%**	**0.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	35.3	mph	Mean (Average) Speed	34.0	mph
85th Percentile	41.3	mph	10 mph Pace	31.4 - 41.4	mph
95th Percentile	44.9	mph	Percent in Pace	57.6	%

Location: N Meridian Ave N-O River Rd
Date Range: 8/3/2021 to 8/5/2021
Site Code: E

Tuesday, August 3, 2021
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	1	10	90	122	50	16	3	0	0	0	0	0	0	0	**292**
1:00 AM	0	0	0	0	10	48	84	31	18	2	0	0	0	0	0	0	0	**193**
2:00 AM	0	0	0	3	11	42	66	39	8	3	3	0	1	0	0	0	0	**176**
3:00 AM	0	0	0	2	8	66	76	38	10	0	0	0	0	0	0	0	0	**200**
4:00 AM	0	0	0	5	23	67	102	57	16	1	2	1	0	0	0	0	0	**274**
5:00 AM	0	0	0	2	13	92	171	110	28	8	0	2	0	0	0	0	0	**426**
6:00 AM	0	6	0	21	117	232	268	126	33	9	2	0	0	0	0	0	0	**814**
7:00 AM	0	12	30	84	158	316	288	123	40	10	2	0	0	0	0	0	0	**1,063**
8:00 AM	4	7	20	66	157	367	374	106	19	7	1	1	0	0	0	0	0	**1,129**
9:00 AM	3	17	57	96	192	434	345	112	32	1	2	1	0	0	0	0	0	**1,292**
10:00 AM	17	60	139	149	236	400	259	69	19	1	0	0	0	0	0	0	0	**1,349**
11:00 AM	9	39	124	211	298	434	267	65	6	0	0	0	0	0	0	0	0	**1,453**
12:00 PM	21	75	182	185	285	360	213	51	13	2	0	0	0	0	0	0	0	**1,387**
1:00 PM	61	203	293	273	278	245	143	38	6	1	0	0	0	0	0	0	0	**1,541**
2:00 PM	47	138	293	331	277	265	209	59	8	1	0	0	0	0	0	0	0	**1,628**
3:00 PM	169	509	596	253	89	31	8	0	0	0	0	0	0	0	0	0	0	**1,655**
4:00 PM	160	527	712	205	27	30	6	2	2	0	0	0	0	0	0	0	0	**1,671**
5:00 PM	121	398	625	248	120	78	40	14	1	0	0	0	0	0	0	0	0	**1,645**
6:00 PM	95	284	378	149	125	184	161	50	9	1	1	0	0	0	0	0	0	**1,437**
7:00 PM	0	0	0	2	40	269	360	158	37	9	1	0	0	0	0	0	0	**876**
8:00 PM	0	0	0	6	45	191	291	108	20	6	0	0	0	0	0	0	0	**667**
9:00 PM	0	0	0	0	26	154	207	99	28	0	0	0	0	0	0	0	0	**514**
10:00 PM	0	0	1	3	37	124	216	91	32	6	0	0	0	0	0	0	0	**510**
11:00 PM	0	0	0	0	16	84	157	82	30	8	1	0	1	0	0	0	0	**379**
Total	**707**	**2,275**	**3,450**	**2,295**	**2,598**	**4,603**	**4,433**	**1,678**	**431**	**79**	**15**	**5**	**2**	**0**	**0**	**0**	**0**	**22,571**
Percent	**3.1%**	**10.1%**	**15.3%**	**10.2%**	**11.5%**	**20.4%**	**19.6%**	**7.4%**	**1.9%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	30.0	mph	Mean (Average) Speed	27.9	mph
85th Percentile	38.3	mph	10 mph Pace	29.6 - 39.6	mph
95th Percentile	42.4	mph	Percent in Pace	40.18	%

Location: N Meridian Ave N-O River Rd
Date Range: 8/3/2021 to 8/5/2021
Site Code: E

Wednesday, August 4, 2021
Northbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	2	10	22	33	29	8	2	1	1	0	0	0	0	0	**108**
1:00 AM	0	0	1	0	5	20	32	10	3	1	1	0	0	0	0	0	0	**73**
2:00 AM	0	0	1	2	6	18	32	13	6	1	1	0	0	0	0	0	0	**80**
3:00 AM	0	0	0	0	14	26	55	48	8	4	2	1	3	1	0	0	0	**162**
4:00 AM	1	0	0	1	11	67	182	130	40	6	2	0	0	0	0	0	0	**440**
5:00 AM	0	0	0	5	29	176	382	214	52	11	5	0	1	0	0	0	0	**875**
6:00 AM	19	38	64	46	82	235	347	208	59	7	4	1	0	0	0	0	0	**1,110**
7:00 AM	19	57	72	105	136	254	343	144	24	1	1	0	0	0	0	0	0	**1,156**
8:00 AM	41	79	151	92	145	213	268	138	29	6	1	1	0	0	0	0	0	**1,164**
9:00 AM	2	4	26	55	134	303	357	139	35	5	2	1	0	0	0	0	0	**1,063**
10:00 AM	0	4	15	34	140	268	291	163	34	10	0	1	0	0	0	0	0	**960**
11:00 AM	4	6	17	42	176	327	306	132	38	7	0	0	1	0	0	0	0	**1,056**
12:00 PM	2	3	4	42	114	308	378	191	30	5	1	0	0	0	0	0	0	**1,078**
1:00 PM	13	3	26	57	192	295	325	168	54	5	1	2	0	0	0	0	0	**1,141**
2:00 PM	18	7	8	26	158	339	357	172	45	12	1	0	0	0	0	0	0	**1,143**
3:00 PM	47	2	24	80	175	328	367	174	50	11	3	0	0	0	0	0	0	**1,261**
4:00 PM	183	272	218	122	159	146	92	17	10	0	0	0	0	0	0	0	0	**1,219**
5:00 PM	81	120	133	167	210	287	235	93	17	4	0	0	0	0	0	0	0	**1,347**
6:00 PM	11	1	6	38	98	275	324	174	49	8	1	0	0	0	0	0	0	**985**
7:00 PM	0	0	5	14	35	159	354	159	33	8	1	0	0	0	0	0	0	**768**
8:00 PM	0	0	0	8	43	158	276	124	43	10	1	0	0	0	0	0	0	**663**
9:00 PM	0	0	4	4	14	125	191	86	24	10	1	2	0	0	0	0	0	**461**
10:00 PM	0	0	0	8	12	81	154	68	21	6	1	0	0	0	0	0	0	**351**
11:00 PM	0	0	0	1	5	50	77	31	13	2	2	0	0	0	0	0	0	**181**
Total	**441**	**596**	**775**	**951**	**2,103**	**4,480**	**5,758**	**2,825**	**725**	**142**	**33**	**10**	**5**	**1**	**0**	**0**	**0**	**18,845**
Percent	**2.3%**	**3.2%**	**4.1%**	**5.0%**	**11.2%**	**23.8%**	**30.6%**	**15.0%**	**3.8%**	**0.8%**	**0.2%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			**Speed Statistics**		
50th Percentile (Median)	35.0	mph	Mean (Average) Speed	33.4	mph
85th Percentile	41.0	mph	10 mph Pace	31.4 - 41.4	mph
95th Percentile	44.9	mph	Percent in Pace	55.4	%

Location: N Meridian Ave N-O River Rd
Date Range: 8/3/2021 to 8/5/2021
Site Code: E

Wednesday, August 4, 2021
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	2	9	93	112	54	14	5	0	0	1	0	0	0	0	**290**
1:00 AM	0	0	0	1	15	51	75	32	8	3	0	0	0	0	0	0	0	**185**
2:00 AM	0	0	0	2	12	45	73	42	9	4	1	0	0	0	0	0	0	**188**
3:00 AM	0	0	1	3	14	66	93	52	14	1	2	0	0	0	0	0	0	**246**
4:00 AM	0	0	0	5	23	76	107	71	22	4	0	0	0	0	0	0	0	**308**
5:00 AM	0	0	0	1	14	100	194	93	32	7	1	0	0	1	0	0	0	**443**
6:00 AM	3	1	18	29	58	207	290	139	37	14	0	2	0	0	0	0	0	**798**
7:00 AM	2	3	6	53	166	314	314	141	37	8	1	0	0	0	0	0	0	**1,045**
8:00 AM	6	5	7	15	161	347	358	138	28	9	2	3	0	0	0	0	0	**1,079**
9:00 AM	2	12	27	53	162	372	380	136	22	4	1	0	0	0	0	0	0	**1,171**
10:00 AM	2	5	32	73	143	435	367	125	25	5	2	0	0	0	0	0	0	**1,214**
11:00 AM	12	68	148	212	287	399	237	73	7	4	0	0	0	0	0	0	0	**1,447**
12:00 PM	13	36	91	160	273	409	303	111	27	0	0	0	0	0	0	0	0	**1,423**
1:00 PM	34	133	275	261	261	302	201	61	6	1	0	0	0	0	0	0	0	**1,535**
2:00 PM	13	144	227	280	395	357	184	78	16	2	1	0	0	0	0	0	0	**1,697**
3:00 PM	124	497	636	241	49	11	4	1	0	0	0	0	0	0	0	0	0	**1,563**
4:00 PM	191	469	622	276	100	38	4	1	0	0	0	0	0	0	0	0	0	**1,701**
5:00 PM	138	450	741	280	48	7	2	0	0	0	0	0	0	0	0	0	0	**1,666**
6:00 PM	44	128	278	223	273	364	151	47	16	2	1	0	0	0	0	0	0	**1,527**
7:00 PM	0	0	3	17	84	313	339	145	43	4	1	1	0	1	0	0	0	**951**
8:00 PM	0	0	0	9	58	255	281	106	29	8	5	1	1	0	0	0	0	**753**
9:00 PM	0	0	0	0	40	189	196	85	22	8	2	0	0	0	0	0	0	**542**
10:00 PM	0	0	4	8	61	206	277	100	23	7	1	1	0	0	0	0	0	**688**
11:00 PM	0	0	0	2	13	110	187	87	21	2	0	1	1	0	0	0	0	**424**
Total	**584**	**1,951**	**3,116**	**2,206**	**2,719**	**5,066**	**4,729**	**1,918**	**458**	**102**	**21**	**9**	**3**	**2**	**0**	**0**	**0**	**22,884**
Percent	**2.6%**	**8.5%**	**13.6%**	**9.6%**	**11.9%**	**22.1%**	**20.7%**	**8.4%**	**2.0%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			**Speed Statistics**		
50th Percentile (Median)	31.0	mph	Mean (Average) Speed	28.9	mph
85th Percentile	38.7	mph	10 mph Pace	29.8 - 39.8	mph
95th Percentile	42.8	mph	Percent in Pace	42.87	%

Location: N Meridian Ave N-O River Rd
Date Range: 8/3/2021 to 8/5/2021
Site Code: E

Thursday, August 5, 2021
Northbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	1	2	4	20	42	21	6	2	0	1	0	0	0	0	0	**99**
1:00 AM	0	0	0	1	7	17	38	20	5	2	0	0	0	0	0	0	0	**90**
2:00 AM	0	0	0	0	2	23	36	16	3	1	0	0	0	0	0	0	0	**81**
3:00 AM	0	0	0	1	7	26	59	44	10	4	0	0	0	0	0	0	0	**151**
4:00 AM	0	1	0	2	15	73	168	146	35	9	0	0	0	0	0	0	0	**449**
5:00 AM	0	2	11	23	35	210	400	242	57	10	2	0	1	0	0	0	0	**993**
6:00 AM	8	27	57	52	157	302	403	165	34	10	0	0	0	0	0	0	0	**1,215**
7:00 AM	74	195	176	96	134	202	155	64	7	1	0	0	0	0	0	0	0	**1,104**
8:00 AM	7	0	0	16	51	217	384	177	33	8	0	0	0	0	0	0	0	**893**
9:00 AM	3	0	4	9	60	295	365	164	31	10	1	1	0	1	0	0	0	**944**
10:00 AM	3	0	1	31	115	341	337	159	38	6	0	0	0	0	0	0	0	**1,031**
11:00 AM	79	80	36	43	145	290	261	105	20	6	3	0	0	0	0	0	0	**1,068**
12:00 PM	202	254	144	112	106	103	64	29	8	0	0	0	0	0	0	0	0	**1,022**
1:00 PM	34	75	41	54	192	289	282	108	37	7	1	0	0	0	0	0	0	**1,120**
2:00 PM	23	14	13	45	170	330	330	183	38	6	4	1	0	0	0	0	0	**1,157**
3:00 PM	32	32	93	123	230	330	267	141	37	2	0	0	0	0	0	0	0	**1,287**
4:00 PM	39	15	47	65	169	348	338	195	54	10	1	1	0	0	0	0	0	**1,282**
5:00 PM	85	88	97	164	187	306	281	121	24	8	1	0	1	0	0	0	0	**1,363**
6:00 PM	36	36	49	72	112	196	290	136	32	5	0	1	1	0	0	0	0	**966**
7:00 PM	0	0	2	12	56	182	319	154	50	6	2	2	0	0	0	0	0	**785**
8:00 PM	1	0	0	4	18	176	312	154	37	7	2	0	0	1	0	0	0	**712**
9:00 PM	0	0	2	14	44	139	253	86	20	4	3	1	1	0	0	0	0	**567**
10:00 PM	0	0	1	4	17	77	166	75	12	5	3	0	0	1	0	0	0	**361**
11:00 PM	0	0	0	1	4	39	87	56	11	1	0	0	0	0	0	0	0	**199**
Total	**626**	**819**	**775**	**946**	**2,037**	**4,531**	**5,637**	**2,761**	**639**	**130**	**23**	**8**	**4**	**3**	**0**	**0**	**0**	**18,939**
Percent	**3.3%**	**4.3%**	**4.1%**	**5.0%**	**10.8%**	**23.9%**	**29.8%**	**14.6%**	**3.4%**	**0.7%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary		
50th Percentile (Median)	34.8	mph
85th Percentile	40.8	mph
95th Percentile	44.5	mph

Speed Statistics		
Mean (Average) Speed	32.8	mph
10 mph Pace	31.0 - 41.0	mph
Percent in Pace	54.4	%

Location: N Meridian Ave N-O River Rd
Date Range: 8/3/2021 to 8/5/2021
Site Code: E

Thursday, August 5, 2021
Southbound

	Speed Range (mph)																	Total
Time	**0 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**40 - 45**	**45 - 50**	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**	**80 - 85**	**85 +**	**Volume**
12:00 AM	0	0	0	4	11	63	119	74	23	3	3	1	0	0	0	0	0	**301**
1:00 AM	0	0	0	2	6	55	64	39	18	3	1	0	0	0	0	0	0	**188**
2:00 AM	0	0	0	1	13	42	64	39	22	4	0	2	0	0	0	0	0	**187**
3:00 AM	0	0	0	1	7	63	82	57	14	8	1	0	0	0	0	0	0	**233**
4:00 AM	0	0	0	3	15	85	150	64	11	1	0	1	0	0	0	0	0	**330**
5:00 AM	0	2	1	10	37	111	160	85	13	5	2	1	0	0	0	0	0	**427**
6:00 AM	1	0	12	42	81	220	287	112	21	7	0	1	0	0	0	0	0	**784**
7:00 AM	12	8	42	83	196	305	272	105	25	8	1	2	0	0	0	0	0	**1,059**
8:00 AM	1	27	49	98	169	337	287	122	18	5	1	0	0	0	0	0	0	**1,114**
9:00 AM	5	18	48	118	270	377	291	97	17	0	1	0	0	0	0	0	0	**1,242**
10:00 AM	13	66	95	146	247	387	268	96	20	3	0	0	0	0	0	0	0	**1,341**
11:00 AM	12	15	48	91	266	453	305	106	26	1	0	0	1	0	0	0	0	**1,324**
12:00 PM	52	108	210	207	246	334	235	65	17	2	1	0	0	0	0	0	0	**1,477**
1:00 PM	38	109	200	206	321	353	230	73	19	1	1	0	0	0	0	0	0	**1,551**
2:00 PM	48	264	491	386	227	179	102	36	4	1	0	0	0	0	0	0	0	**1,738**
3:00 PM	128	455	567	309	142	83	35	10	3	0	0	0	0	0	0	0	0	**1,732**
4:00 PM	236	550	625	193	44	10	1	0	0	0	0	0	0	0	0	0	0	**1,659**
5:00 PM	188	600	566	194	19	0	0	0	0	0	0	0	0	0	0	0	0	**1,567**
6:00 PM	114	379	403	202	68	131	127	56	13	0	0	0	0	0	0	0	0	**1,493**
7:00 PM	2	0	4	31	145	297	351	151	44	10	0	1	1	1	0	0	0	**1,038**
8:00 PM	0	0	0	6	38	241	304	117	23	10	5	0	0	0	0	0	0	**744**
9:00 PM	0	0	1	11	47	189	210	75	23	5	1	0	0	0	0	0	0	**562**
10:00 PM	0	3	8	6	29	224	249	105	30	12	3	1	0	1	0	0	0	**671**
11:00 PM	0	0	1	1	30	104	175	81	16	5	1	1	0	0	0	0	0	**415**
Total	**850**	**2,604**	**3,371**	**2,351**	**2,674**	**4,643**	**4,368**	**1,765**	**420**	**94**	**22**	**11**	**2**	**2**	**0**	**0**	**0**	**23,177**
Percent	**3.7%**	**11.2%**	**14.5%**	**10.1%**	**11.5%**	**20.0%**	**18.8%**	**7.6%**	**1.8%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	29.6	mph	Mean (Average) Speed	27.7	mph
85th Percentile	38.4	mph	10 mph Pace	29.5 - 39.5	mph
95th Percentile	42.5	mph	Percent in Pace	38.84	%

Location: N Meridian Ave N-O River Rd
Date Range: 8/3/2021 to 8/5/2021
Site Code: E

Total Study Average
Northbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	2	7	20	37	23	6	2	0	1	0	0	0	0	0	**98**
1:00 AM	0	0	0	0	5	19	33	13	3	1	1	0	0	0	0	0	0	**75**
2:00 AM	0	0	0	1	6	19	33	14	4	1	0	0	0	0	0	0	0	**78**
3:00 AM	0	0	0	1	9	28	57	43	9	3	1	0	1	1	0	0	0	**153**
4:00 AM	1	1	0	2	13	70	182	136	36	6	1	0	0	0	0	0	0	**448**
5:00 AM	0	1	4	11	27	177	389	227	58	12	4	0	1	0	0	0	0	**911**
6:00 AM	11	26	51	45	117	269	389	198	50	8	1	0	0	0	0	0	0	**1,165**
7:00 AM	53	123	115	96	145	247	251	99	17	2	1	0	0	0	0	0	0	**1,149**
8:00 AM	31	47	69	54	91	218	303	153	32	6	1	0	0	0	0	0	0	**1,005**
9:00 AM	2	2	13	28	96	292	346	158	36	7	2	1	0	0	0	0	0	**983**
10:00 AM	2	4	7	29	129	300	320	163	36	9	1	0	1	0	0	0	0	**1,001**
11:00 AM	30	31	19	38	149	309	310	131	32	7	1	0	0	0	0	0	0	**1,057**
12:00 PM	70	87	53	74	146	244	249	124	23	3	0	0	0	0	0	0	0	**1,073**
1:00 PM	23	34	38	61	180	304	307	134	39	6	1	1	0	0	0	0	0	**1,128**
2:00 PM	18	7	12	42	172	332	351	174	39	9	2	0	0	0	0	0	0	**1,158**
3:00 PM	42	14	44	92	195	327	334	163	45	7	2	0	0	0	0	0	0	**1,265**
4:00 PM	113	154	136	106	165	247	204	94	32	6	1	0	0	0	0	0	0	**1,258**
5:00 PM	69	72	84	142	204	315	288	126	28	6	1	1	1	0	0	0	0	**1,337**
6:00 PM	21	12	18	43	101	251	298	159	44	7	1	1	0	0	0	0	0	**956**
7:00 PM	0	0	3	10	42	176	327	153	38	7	2	1	0	0	0	0	0	**759**
8:00 PM	0	0	0	10	31	156	281	138	33	8	1	0	1	1	1	0	0	**661**
9:00 PM	0	0	2	7	29	122	210	94	20	6	1	1	0	0	0	0	0	**492**
10:00 PM	0	0	1	6	14	71	137	72	18	6	2	0	0	0	0	0	0	**327**
11:00 PM	0	0	0	1	5	41	78	40	10	3	1	0	0	0	0	0	0	**179**
Total	**486**	**615**	**669**	**901**	**2,078**	**4,554**	**5,714**	**2,829**	**688**	**138**	**29**	**7**	**5**	**2**	**1**	**0**	**0**	**18,716**
Percent	**2.6%**	**3.3%**	**3.6%**	**4.8%**	**11.1%**	**24.3%**	**30.5%**	**15.1%**	**3.7%**	**0.7%**	**0.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary		
50th Percentile (Median)	35.0	mph
85th Percentile	41.0	mph
95th Percentile	44.7	mph

Total Study Speed Statistics		
Mean (Average) Speed	33.4	mph
10 mph Pace	31.2 - 41.2	mph
Percent in Pace	55.7	%

Location: N Meridian Ave N-O River Rd
Date Range: 8/3/2021 to 8/5/2021
Site Code: E

Total Study Average
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	2	10	82	118	59	18	4	1	0	0	0	0	0	0	**294**
1:00 AM	0	0	0	1	10	51	74	34	15	3	0	0	0	0	0	0	0	**188**
2:00 AM	0	0	0	2	12	43	68	40	13	4	1	1	0	0	0	0	0	**184**
3:00 AM	0	0	0	2	10	65	84	49	13	3	1	0	0	0	0	0	0	**227**
4:00 AM	0	0	0	4	20	76	120	64	16	2	1	1	0	0	0	0	0	**304**
5:00 AM	0	1	0	4	21	101	175	96	24	7	1	1	0	0	0	0	0	**431**
6:00 AM	1	2	10	31	85	220	282	126	30	10	1	1	0	0	0	0	0	**799**
7:00 AM	5	8	26	73	173	312	291	123	34	9	1	1	0	0	0	0	0	**1,056**
8:00 AM	4	13	25	60	162	350	340	122	22	7	1	1	0	0	0	0	0	**1,107**
9:00 AM	3	16	44	89	208	394	339	115	24	2	1	0	0	0	0	0	0	**1,235**
10:00 AM	11	44	89	123	209	407	298	97	21	3	1	0	0	0	0	0	0	**1,303**
11:00 AM	11	41	107	171	284	429	270	81	13	2	0	0	0	0	0	0	0	**1,409**
12:00 PM	29	73	161	184	268	368	250	76	19	1	0	0	0	0	0	0	0	**1,429**
1:00 PM	44	148	256	247	287	300	191	57	10	1	0	0	0	0	0	0	0	**1,541**
2:00 PM	36	182	337	332	300	267	165	58	9	1	0	0	0	0	0	0	0	**1,687**
3:00 PM	140	487	600	268	93	42	16	4	1	0	0	0	0	0	0	0	0	**1,651**
4:00 PM	196	515	653	225	57	26	4	1	1	0	0	0	0	0	0	0	0	**1,678**
5:00 PM	149	483	644	241	62	28	14	5	0	0	0	0	0	0	0	0	0	**1,626**
6:00 PM	84	264	353	191	155	226	146	51	13	1	1	0	0	0	0	0	0	**1,485**
7:00 PM	1	0	2	17	90	293	350	151	41	8	1	1	0	1	0	0	0	**956**
8:00 PM	0	0	0	7	47	229	292	110	24	8	3	0	0	0	0	0	0	**720**
9:00 PM	0	0	0	4	38	177	204	86	24	4	1	0	0	0	0	0	0	**538**
10:00 PM	0	1	4	6	42	185	247	99	28	8	1	1	0	0	0	0	0	**622**
11:00 PM	0	0	0	1	20	99	173	83	22	5	1	1	1	0	0	0	0	**406**
Total	**714**	**2,278**	**3,311**	**2,285**	**2,663**	**4,770**	**4,511**	**1,787**	**435**	**93**	**18**	**9**	**1**	**1**	**0**	**0**	**0**	**22,876**
Percent	**3.1%**	**10.0%**	**14.5%**	**10.0%**	**11.6%**	**20.9%**	**19.7%**	**7.8%**	**1.9%**	**0.4%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			Total Study Speed Statistics		
50th Percentile (Median)	30.2	mph	Mean (Average) Speed	28.1	mph
85th Percentile	38.5	mph	10 mph Pace	29.5 - 39.5	mph
95th Percentile	42.5	mph	Percent in Pace	40.6	%

idax
DATA SOLUTIONS

Location: N Meridian Ave N-O River Rd
Date Range: 8/3/2021 - 8/9/2021
Site Code: E

	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday					
	8/3/2021			8/4/2021			8/5/2021			8/6/2021			8/7/2021			8/8/2021			8/9/2021			Mid-Week Average		
Time	**NB**	**SB**	**Total**	**NB**	**SB**	**Total**	**NB**	**SB**	**Total**	**NB**	**SB**	**Total**	**NB**	**SB**	**Total**	**NB**	**SB**	**Total**	**NB**	**SB**	**Total**	**NB**	**SB**	**Total**
12:00 AM	88	292	380	108	290	398	99	301	400	-	-	-	-	-	-	-	-	-	-	-	-	98	294	393
1:00 AM	62	193	255	73	185	258	90	188	278	-	-	-	-	-	-	-	-	-	-	-	-	75	189	264
2:00 AM	78	176	254	80	188	268	81	187	268	-	-	-	-	-	-	-	-	-	-	-	-	80	184	263
3:00 AM	149	200	349	162	246	408	151	233	384	-	-	-	-	-	-	-	-	-	-	-	-	154	226	380
4:00 AM	451	274	725	440	308	748	449	330	779	-	-	-	-	-	-	-	-	-	-	-	-	447	304	751
5:00 AM	864	426	1,290	875	443	1,318	993	427	1,420	-	-	-	-	-	-	-	-	-	-	-	-	911	432	1,343
6:00 AM	1,171	814	1,985	1,110	798	1,908	1,215	784	1,999	-	-	-	-	-	-	-	-	-	-	-	-	1,165	799	1,964
7:00 AM	1,183	1,063	2,246	1,156	1,045	2,201	1,104	1,059	2,163	-	-	-	-	-	-	-	-	-	-	-	-	1,148	1,056	2,203
8:00 AM	959	1,129	2,088	1,164	1,079	2,243	893	1,114	2,007	-	-	-	-	-	-	-	-	-	-	-	-	1,005	1,107	2,113
9:00 AM	938	1,292	2,230	1,063	1,171	2,234	944	1,242	2,186	-	-	-	-	-	-	-	-	-	-	-	-	982	1,235	2,217
10:00 AM	1,006	1,349	2,355	960	1,214	2,174	1,031	1,341	2,372	-	-	-	-	-	-	-	-	-	-	-	-	999	1,301	2,300
11:00 AM	1,050	1,453	2,503	1,056	1,447	2,503	1,068	1,324	2,392	-	-	-	-	-	-	-	-	-	-	-	-	1,058	1,408	2,466
12:00 PM	1,123	1,387	2,510	1,078	1,423	2,501	1,022	1,477	2,499	-	-	-	-	-	-	-	-	-	-	-	-	1,074	1,429	2,503
1:00 PM	1,124	1,541	2,665	1,141	1,535	2,676	1,120	1,551	2,671	-	-	-	-	-	-	-	-	-	-	-	-	1,128	1,542	2,671
2:00 PM	1,178	1,628	2,806	1,143	1,697	2,840	1,157	1,738	2,895	-	-	-	-	-	-	-	-	-	-	-	-	1,159	1,688	2,847
3:00 PM	1,247	1,655	2,902	1,261	1,563	2,824	1,287	1,732	3,019	-	-	-	-	-	-	-	-	-	-	-	-	1,265	1,650	2,915
4:00 PM	1,274	1,671	2,945	1,219	1,701	2,920	1,282	1,659	2,941	-	-	-	-	-	-	-	-	-	-	-	-	1,258	1,677	2,935
5:00 PM	1,297	1,645	2,942	1,347	1,666	3,013	1,363	1,567	2,930	-	-	-	-	-	-	-	-	-	-	-	-	1,336	1,626	2,962
6:00 PM	920	1,437	2,357	985	1,527	2,512	966	1,493	2,459	-	-	-	-	-	-	-	-	-	-	-	-	957	1,486	2,443
7:00 PM	723	876	1,599	768	951	1,719	785	1,038	1,823	-	-	-	-	-	-	-	-	-	-	-	-	759	955	1,714
8:00 PM	614	667	1,281	663	753	1,416	712	744	1,456	-	-	-	-	-	-	-	-	-	-	-	-	663	721	1,384
9:00 PM	450	514	964	461	542	1,003	567	562	1,129	-	-	-	-	-	-	-	-	-	-	-	-	493	539	1,032
10:00 PM	267	510	777	351	688	1,039	361	671	1,032	-	-	-	-	-	-	-	-	-	-	-	-	326	623	949
11:00 PM	159	379	538	181	424	605	199	415	614	-	-	-	-	-	-	-	-	-	-	-	-	180	406	586
Total	**18,375**	**22,571**	**40,946**	**18,845**	**22,884**	**41,729**	**18,939**	**23,177**	**42,116**	-	-	-	-	-	-	-	-	-	-	-	-	**18,720**	**22,877**	**41,597**
Percent	**45%**	**55%**	-	**45%**	**55%**	-	**45%**	**55%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**45%**	**55%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Intersection **E Main St & 2nd St NE**
Date **08/03/2021**
Time **6-9AM;3-6PM**
Site **6**

Type **NB & WB Approaches**
Classification **Longest Queue (In Feet) per 15 min**

	E Main Ave			2nd St NE		
	Westbound			Northbound		
Start Time	Inside Lane	Middle Lane	Outside Lane	Inside Lane	Middle Lane	Outside Lane
6:00 AM	15	28	65	32	98	21
6:15 AM	79	28	34	40	66	66
6:30 AM	79	42	68	40	54	28
6:45 AM	49	45	101	32	144	87
7:00 AM	64	45	50	86	90	54
7:15 AM	64	59	114	70	92	85
7:30 AM	75	96	51	105	108	92
7:45 AM	60	84	119	48	84	28
8:00 AM	64	119	110	75	104	47
8:15 AM	45	158	67	62	84	68
8:30 AM	96	79	100	48	78	40
8:45 AM	79	121	83	43	36	26
3:00 PM	276	202	283	32	92	49
3:15 PM	203	171	170	56	48	75
3:30 PM	158	223	135	48	24	80
3:45 PM	222	202	236	132	78	47
4:00 PM	192	210	119	67	30	47
4:15 PM	234	180	248	59	36	92
4:30 PM	222	168	271	78	18	40
4:45 PM	143	121	153	51	104	63
5:00 PM	184	168	170	51	90	28
5:15 PM	199	174	135	83	74	61
5:30 PM	199	157	203	51	36	28
5:45 PM	147	146	237	75	96	47

Intersection **E Main Ave & Thompson St**
Start Date **08/03/2021**
Time **6-9AM;3-6PM**
Site **3**

Type **NB Approach**
Classification **Longest Queue (In Feet) per 15 min**

	E Main Ave & Thompson St		
	Northbound		
Start Time	Inside Lane	Middle Lane	Outside Lane
6:00 AM	235	75	248
6:15 AM	291	60	196
6:30 AM	226	115	269
6:45 AM	198	93	214
7:00 AM	179	137	264
7:15 AM	257	139	257
7:30 AM	171	156	181
7:45 AM	269	182	158
8:00 AM	170	97	227
8:15 AM	205	63	383
8:30 AM	321	105	147
8:45 AM	227	100	84
3:00 PM	154	59	56
3:15 PM	65	96	215
3:30 PM	168	59	215
3:45 PM	137	59	96
4:00 PM	226	107	120
4:15 PM	199	96	171
4:30 PM	163	70	198
4:45 PM	244	96	89
5:00 PM	144	96	82
5:15 PM	277	114	176
5:30 PM	255	100	189
5:45 PM	143	103	96

Intersetion **Shaw Rd E & E Pioneer**
Date **08/03/2021**
Time **6-9AM;3-6PM**
Site **19**

Type **NB & SB Approaches**
Classification **Longest Queue (In Feet) Per 15 min**

	Shaw Rd E			Shaw Rd E			
	Southbound			Northbound			
Start Time	Inside Lane	Middle Lane	Outside Lane	Inside Lane	Middle Lane	Middle Lane	Outside Lane
6:00 AM	31	16	15	64	24	375	225
6:15 AM	32	32	37	16	24	246	210
6:30 AM	91	51	59	32	27	504	225
6:45 AM	16	70	52	16	31	283	247
7:00 AM	47	51	75	16	24	386	195
7:15 AM	109	43	63	32	51	298	239
7:30 AM	32	84	79	64	72	300	247
7:45 AM	48	78	33	80	82	320	195
8:00 AM	90	32	116	64	84	390	195
8:15 AM	90	94	147	80	48	374	105
8:30 AM	92	86	83	64	63	196	217
8:45 AM	48	40	114	64	48	230	135
3:00 PM	52	209	195	48	36	99	90
3:15 PM	47	307	114	80	24	104	217
3:30 PM	16	310	196	48	39	120	195
3:45 PM	41	239	203	64	72	154	180
4:00 PM	16	272	165	32	58	118	195
4:15 PM	47	244	223	48	36	135	180
4:30 PM	64	242	205	48	27	135	165
4:45 PM	32	277	154	48	36	154	210
5:00 PM	77	134	151	16	39	53	187
5:15 PM	99	145	140	64	78	108	195
5:30 PM	47	118	171	64	48	135	157
5:45 PM	32	137	151	48	63	108	150

Memo

RE: Pavement Evaluation
Knutson Farms Industrial Park Project EIS
City of Puyallup, WA
October 7, 2021
Rev 0

Introduction

Knutson Farms, Inc. seeks to develop up to 2.6 million square feet of warehouse buildings on the 162-acre Knutson Farm property located in Pierce County, Washington. This proposed development will increase the truck traffic on the existing pavements for the local roads that will be used to access the site. The purpose of this analysis is to evaluate the impact of the additional truck traffic on the existing pavement and to determine how much pavement service life is remaining. A period of 5 years (2021 to 2026) has been selected as the time period for the comparative analysis of pavement with and without the project.

Field Investigation

HWA GeoSciences Inc. (HWA) performed an investigation of the existing pavement near the proposed project location, including for East Main Avenue, Shaw Road East, and East Pioneer Avenue. The investigation included drilling and retrieving pavement cores and falling weight deflectometer (FWD) testing. Existing asphaltic concrete (AC) pavement cores were retrieved, and the depth of crushed (aggregate) base (CB) was measured at each location. The FWD is a nondestructive test that is used to evaluate pavement component layer stiffness of existing pavement. The test simulates pavement loading by applying an impulse load to the pavement surface and measuring the pavement response by a series of sensors linearly spaced away from the loading plate. HWA used the FWD results to estimate the subgrade resilient modulus and the existing structural number using two different software programs.

For more detailed information regarding the pavement coring and FWD testing, refer to the HWA report that is included as Appendix A of this memorandum.

Pavement Coring Results

Pavement cores were performed at 28 locations along the three subject roadways. The locations of the pavement cores are shown on Figures 2A through 2K in the HWA report in Appendix A. As discussed below, the existing pavement thickness varied significantly for E. Main Ave. and E. Pioneer Ave. and was more consistent for Shaw Rd. E.

The pavement core results are summarized as follows:

- E. Main Ave:
  - Existing AC thickness ranged from 4 to 10 inches with an average of 7.6 inches
  - Existing CB thickness ranged from 1 to 11.5 inches with an average of 5.8 inches
  - 7.25 inches of Portland cement concrete pavement (PCCP) was encountered below the AC at one of the eight coring locations (Core C-03, Station 14+29, 4.5 feet from centerline, southbound inside lane).
- Shaw Road E:
  - Existing AC thickness ranged from 6.5 to 7.75 inches with an average of 7.2 inches
  - Existing CB thickness ranged from 3 to 5.5 inches with an average of 4 inches
- E. Pioneer Ave:
  - Existing AC thickness ranged from 4.25 to 12 inches with an average of 6.7 inches
  - Existing CB encountered at only four of the 12 core locations
    - The CB thickness at the four locations ranged from 1.5 to 4.75 inches with an average of 3.1 inches.
    - 5.75 inches of PCCP was encountered below the AC at one of the coring locations (Core C-17, Station 66+05, 4 feet from centerline, westbound inside lane).

Additional details regarding the pavement coring are provided in the HWA report, along with photographs of the cores in Figures A-1 through A-28.

FWD Results

The FWD testing was performed along each roadway alignment at a test location interval of approximately 100 feet. Results of the FWD testing are shown on Figures 3 through 11 in the HWA report. The results are presented in three separate charts for each roadway, depicting the maximum deflections at 9,000-pound load, estimated subgrade resilient moduli, and the estimated AASHTO structural number. The FWD results are summarized in Tables 4 through 12 in the HWA report in Appendix A.

Traffic Volume and ESAL's

Traffic counts were collected by IDAX for HDR on Shaw Road E, E. Pioneer Avenue and E. Main Avenue over the period of August 3rd through 5th, 2021. The specific locations of the traffic counts were described as follows:

- Site A: Shaw Road E, north of E. Pioneer Ave.

- Site C: E. Pioneer Avenue, east of 13th St. SE
- Site D: E. Main Avenue, north of 5th Ave. NE

The traffic was grouped by IDAX into four vehicle groups (Class 1 through Class 4) that reflect groupings of the FHWA Vehicle Classifications as follows:

- Class 1 (motorcycle, car, van, pickup) = FHWA Vehicle Classifications 1 to 3
- Class 2 (single-unit truck) = FHWA Vehicle Classifications 4 to 7
- Class 3 (double-unit truck) = FHWA Vehicle Classifications 8 to 10
- Class 4 (triple-unit truck) = FHWA Vehicle Classifications 11 to 13

The existing average daily traffic (ADT) was estimated for each of the three traffic count sites as shown in Table 1.

Table 1: Average Daily Traffic, Existing Year

Traffic Count Site	Roadway	ADT, Existing Year				
		Class 1	Class 2	Class 3	Class 4	Total
A	Shaw Road E, north of E. Pioneer Ave.	19209	2252	207	65	21733
C	E. Pioneer Ave., east of 13th St. SE	15373	1200	164	58	16795
D	E. Main Ave., north of 5th Ave. NE	24175	3237	289	67	27768

The estimated five-year background traffic growth is shown in Table 2.

Table 2: Daily Traffic Growth from 2021 to 2026

Traffic Count Site	Roadway	Daily Traffic Growth from 2021 to 2026				
		Class 1	Class 2	Class 3	Class 4	Total
A	Shaw Road E, north of E. Pioneer Ave.	1999	234	22	7	2262
C	E. Pioneer Ave., east of 13th St. SE	1600	125	17	6	1748
D	E. Main Ave., north of 5th Ave. NE	2516	337	30	7	2890

The estimated future traffic in 2026 with the background traffic growth and without the project (no-build option) is shown in Table 3.

Table 3: ADT in 2026 without Project

Traffic Count Site	Roadway	ADT, Future Year (2026)				
		Class 1	Class 2	Class 3	Class 4	Total
A	Shaw Road E, north of E. Pioneer Ave.	21208	2486	229	72	23995
C	E. Pioneer Ave., east of 13th St. SE	16973	1325	181	64	18543
D	E. Main Ave., north of 5th Ave. NE	26691	3574	319	74	30658

The future traffic in 2026 with the background traffic growth and including the project is estimated in Table 4.

Table 4: ADT in 2026 with the Project

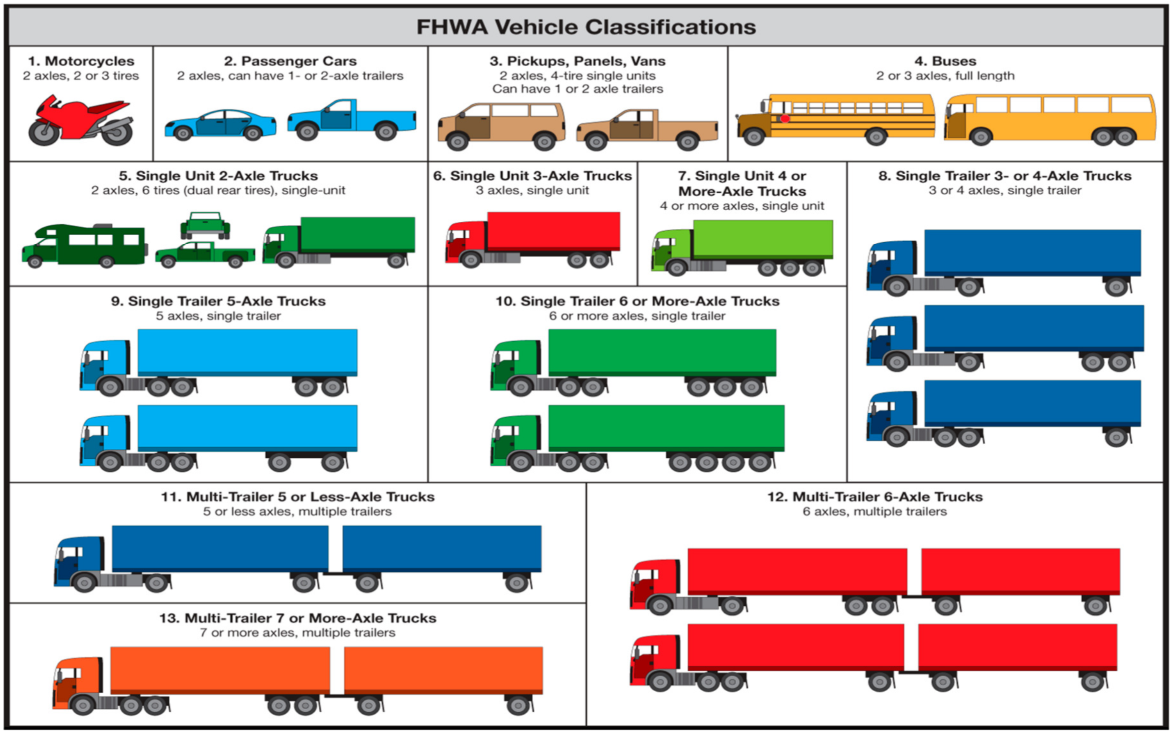
Traffic Count Site	Roadway	ADT, Future Year (2026)				
		Class 1	Class 2	Class 3	Class 4	Total
A	Shaw Road E, north of E. Pioneer Ave.	25076	3237	298	94	28705
C	E. Pioneer Ave., east of 13th St. SE	21809	1957	267	95	24128
D	E. Main Ave., north of 5th Ave. NE	36362	4502	401	94	41359

In order to estimate the traffic loading on the existing pavement, the traffic volumes were converted into Equivalent Single Axle Loads (ESALs). An ESAL is defined as equivalent to a single axle with dual wheels and a load of 18 kips (one kip = 1,000 pounds). The ESALs for each Class of traffic were estimated using the Washington Department of Transportation (WSDOT) simplified load factors presented in Table 5. The FHWA vehicle classifications are further defined in Figure 1.

Table 5: Vehicle Classifications and Load Factors

Vehicle Class	FHWA Vehicle Classifications	Assumed Load Factor
1	1, 2 & 3	0.0008
2	4, 5, 6 & 7	0.40
3	8, 9 & 10	1.00
4	11, 12 & 13	1.75

Figure 1: FHWA Vehicle Classifications



The traffic counts were completed at roadway locations with two lanes in each direction, and it was assumed that the directional distribution was 50%. A lane distribution factor of 90% was assigned.

The estimated ESAL calculations are presented in Tables B-1 through B-6 in Appendix B. For each roadway and the selected time period of 5 years (2021 to 2026), the ESALs were estimated both with and without the additional traffic generated by the project. The results are summarized in Table 6.

Table 6: ESAL Calculation Summary

Traffic Count Site	Roadway	ESALs No Build Option	ESALs with Project	Estimated Additional ESALs from Project
A	Shaw Road E, north of E. Pioneer Ave.	1,057,272	1,180,088	122,816
C	E. Pioneer Ave., east of 13th St. SE	647,738	763,408	115,669
D	E. Main Ave., north of 5th Ave. NE	1,470,527	1,619,657	149,130

Based on the above analysis, it is estimated that the Knutson Farms project will increase the pavement loading (in terms of additional ESALs) on the subject roadways by approximately 10%.

Condition Factor and Remaining Life Analysis

The pavement coring and FWD data were analyzed together to determine the pavement condition factor and remaining life of the existing pavement. The core thickness measurements and a summary of this analysis are provided in Tables C-1 through C-3 in Appendix C.

The structural number for each core location, assuming it was new pavement, was estimated with the following layer coefficients based on WSDOT design procedures:

- AC layer coefficient of 0.44
- CB layer coefficient of 0.13

The structural number was not estimated for the two locations where PCCP was encountered within the base layer.

The FWD analysis includes estimation of the structural number. The estimated structural number at the core locations was added to Tables C-1 through C-3. The structural numbers were obtained from Figures 5, 8 and 11 in the HWA report based on the roadway station and direction/lane recorded for each core location.

Section 5.3.3 of the AASHTO Guide for Design of Pavement Structures defines the condition factor (CF) as the pavement structural capacity after N number of ESALs divided by the original structural number (AASHTO, 1993). The CF of 1.00 is equivalent to new pavement with 100% remaining life and a CF of 0.5 is equivalent to pavement that has reached the end of its life (0% remaining life). The CF at each core location was estimated by dividing the structural number from the FWD results by the structural number from the core thickness, as shown in Tables C-1 through C-3.

Figure 5.2 in the AASHTO guide provides a relationship of the condition factor to the remaining life (RL) of pavement. Based on the estimated CF the remaining life was estimated from Figure 5.2 in AASHTO (1993) for each core location.

The purpose of this analysis is to compare the structural number of a new pavement to what is existing to determine how much life is remaining. The results of this analysis indicate the following:

- E. Main Avenue
    - Remaining Life (RL), ranges from 0% to 23% with an average of 9%
- Shaw Road E
    - RL ranges from 18% to 68% with an average of 38%
- E. Pioneer Avenue
    - The estimated structural number from the FWD was greater than the structural number estimated from the core thickness at five locations. The reason for this is unknown; it may be due to the presence of an unreported crushed base layer beneath the asphaltic concrete.
    - RL from the other six data points ranges from 8% to 63% with an average of 32%

Based on this analysis, E. Main Avenue has already reached the end of its service life, it is unknown if pavement rehabilitation work is planned. The increased traffic loading due to the project will cause Shaw Road E and E. Pioneer Avenue pavements to reach the end of service life approximately 10% sooner than for the no-build option.

References

American Association of State Highway and Transportation Officials (AASHTO), 1993, AASHTO Guide for Design of Pavement Structures, American Association of State Highway and Transportation Officials, Washington, D.C.

Appendix A

HWA GeoSciences Inc. Pavement Investigation Report

HWA GEOSCIENCES INC.
DBE/MWBE

August 4, 2021
HWA Project No. 2020-051-21

HDR Engineering Inc.
929 108th Avenue NE, Suite 1300
Bellevue, Washington 98004-4361

Attn: **Jake S. Pi, P.E.**

Subject: **City of Puyallup Knutson Farm EIS**
Pavement Investigation
Puyallup, Washington

Mr. Pi:

In accordance with your request, HWA GeoSciences Inc. (HWA) completed a pavement engineering investigation in support of the City of Puyallup Knutson Farm EIS Project. The purpose of our investigation was to assess pavement layer thicknesses and subgrade support conditions along the alignment.

PROJECT DESCRIPTION

As requested, HWA performed Falling Weight Deflectometer (FWD) testing and pavement coring to evaluate existing pavement layer thicknesses and subgrade support conditions along the following three alignments:

- E Main Avenue, from Shaw Road E to the Puyallup River bridge
- Shaw Road E, from E Pioneer Avenue to E Main Avenue
- E Pioneer Avenue, from the SR 512 interchange to Shaw Road E.

The locations of the project alignments are shown on Figure 1, Vicinity Map. The locations of the pavement cores and stationing used for FWD testing are shown on Figures 2A through 2K. All stationing was set by HWA during FWD testing, as no project stationing was provided. The stationing should be considered approximate, as it was measured in the first lane tested and extrapolated to the other lanes and discrepancy exists given geometry of each alignment.

SITE CONDITIONS

E MAIN AVENUE

The portion of E Main Avenue included in our study trends northeast-southwest across the Puyallup River floodplain and crosses the Puyallup River at the north end of the alignment. The alignment is relatively flat. The roadway is paved with Hot Mix Asphalt (HMA).

Channelization consists of two travel lanes in each direction, with a center turn lane along most of the alignment. At the south end of the alignment, two southbound travel lanes become left turn lanes and a third (outside) lane is used for through traffic on the north side of the road. The BNSF railroad runs along the south side of the alignment and several businesses are located on the south side of the road at the southwest end of the alignment.

SHAW ROAD E

Shaw Road E is oriented roughly north-south and is located in the flood plain of the Puyallup River. The roadway is relatively flat, except for a bridge that crosses over the BNSF rail line and Inter Avenue at the north end of the alignment. The roadway is paved with Hot Mix Asphalt, with two travel lanes in each direction along with a center/left turn lane along most of the alignment, with the exception of the bridge. Curb, gutter and sidewalk exist along both sides of the alignment. Surrounding land use is primarily agricultural with a large warehouse located southwest of the bridge.

E PIONEER AVENUE

E Pioneer Avenue runs roughly east-west along the Puyallup River floodplain, located just south of the BNSF rail line most of the alignment. The roadway is paved with HMA and the channelization consists of two travel lanes in each direction. Curb and gutter exist along both sides of the roadway, while sidewalk exists on the south side of the roadway only. Land use is primarily residential, with the exception of a new business development at the east end of the alignment.

PAVEMENT CORES

Pavement layer thicknesses and shallow subgrade support conditions were investigated in twenty-eight (28), 4-inch diameter pavement cores, designated Core-01 through Core-28. The pavement cores were completed between June 2 and June 10, 2021.

Approximate locations of the pavement cores are indicated on Figures 2A through 2K, Site and Exploration Plans. Appendix A provides photographic logs of each pavement core. Pavement coring and subsurface explorations through each core hole were performed by two geologists from HWA. All core holes were backfilled with compacted gravel and patched with Aquaphalt water-activated cold patch.

E MAIN AVENUE

Pavement cores Core-01 through Core-08 were completed along E Main Avenue, with two cores performed in each travel lane. The worst pavement distresses were observed in the outside wheel path of the southbound (SB) lane, where medium to high severity alligator/longitudinal/transverse cracking was observed. This distress appears to be related to thinner pavement and poor quality backfill associated with the storm drain along the north side of the alignment. Only one core, Core-03, encountered Portland Cement Concrete pavement below the HMA. This core, located in the southbound inside lane, encountered 7.25-inches of

Portland cement concrete (PCC) below the HMA. The extent of PCC below HMA could not be determined from coring, although FWD testing indicated lower deflections and higher AASHTO SN values for this lane from Station 5+97 to 18+03 and could be indicative of PCC below HMA. Table 1 summarizes the conditions encountered in Core-01 through Core-08.

Table 1. Pavement Core Results – E Main Avenue

Designation	Lane / Sta	HMA Thickness, in.	PCC Thickness, in.	Crushed Base Thickness, in.	Subgrade Notes
Core-01	SB IL / 21+65	10.0	-	7	Dense, silty sand with gravel
Core-02	SB OL / 17+86	4.0	-	2.5	Dense, silty sand with gravel
Core-03	SB IL / 14+29	6.5	7.25	-	Medium dense, silty sand with gravel
Core-04	SB OL / 10+46	6.0	-	7.0	Dense, silty sand with gravel
Core-05	NB OL / 5+34	9.5	-	11.5+	Terminated in CSBC
Core-06	NB IL / 11+29	8.5	-	1	Dense sand with silt and gravel
Core-07	NB OL / 15+16	9.5	-	8.5	Very dense, coarse crushed gravel (ballast)
Core-08	NB IL / 18+19	7.0	-	3.0	Very dense sand with silt, gravel and cobbles

SHAW ROAD E

Pavement cores Core-09 through Core-16 were completed along Shaw Road E, south of the BNSF bridge approach. No coring was performed north of the bridge due to the proximity to the intersection with E Main Avenue. Pavement layer thicknesses were relatively uniform, consisting of 6.5 to 7.75-inches of HMA underlain by 3.0 to 5.5-inches of dense crushed base. Dense to very dense, sand with silt and gravel fill was encountered below crushed base at all core locations. Table 2 presents a summary of pavement cores performed along Shaw Road E.

Table 2. Pavement Core Results – Shaw Road E

Designation	Lane / Sta	HMA Thickness, in.	PCC Thickness, in.	Crushed Base Thickness, in.	Subgrade Notes
Core-09	SB OL / 8+89	7.0	-	3.5	Very dense sand with silt, gravel and cobbles
Core-10	SB IL / 7+87	7.5	-	3.5	Dense sand with silt and gravel
Core-11	SB OL / 6+05	7.0	-	3.0	Dense sand with silt, gravel and cobbles
Core-12	SB IL / 4+15	7.75	-	4.25	Very dense sand with silt and gravel
Core-13	NB OL / 4+31	6.75	-	4.25	Dense sand with silt, gravel and cobbles
Core-14	NB IL / 5+85	7.5	-	4.5	Very dense sand with silt and gravel
Core-15	NB OL / 7+31	6.5	-	5.5	Very dense sand with silt and gravel
Core-16	NB IL / 8+47	7.25	-	3.75	Very dense sand with silt and gravel

E PIONEER AVENUE

Pavement cores Core-17 through Core-28 were completed along E Pioneer Avenue. Core-17 was the only location that encountered PCC (5.75-inches) below the HMA. Organic silt was found below the pavement at this location, as opposed to dense, granular fill encountered at all other locations. In general, pavement in the outside lanes of E Pioneer Avenue was thinner than the inside lanes, consisting of 4.5 to 5.5-inches of HMA. Crushed base was found at three of the six locations cored in the outside lanes and ranged in thickness from 1.5 to 3.0-inches. Dense to very dense fill consisting of sand with varying amounts of silt and gravel was encountered below the pavement section at all core locations, except at the location of Core-17.

Pavement along the inside lanes, between Shaw Road E and 15th Street SE, was considerably thicker and ranged from 8.25 to 12.0-inches. Core-19 and Core-25 encountered crushed aggregate without a sand matrix similar to the ballast material used below rail tracks.

West of 15th Street SE, the pavement section at all core locations was thinner and ranged from 4.25 to 5.0-inches in thickness with no crushed base. Very dense sand with silt and gravel fill was encountered below the pavement section in this area. Table 3 presents a summary of pavement coring results along E Pioneer Avenue.

Table 3. Pavement Core Results

Designation	Lane / Sta	HMA Thickness, in.	PCC Thickness, in.	Crushed Base Thickness, in.	Subgrade Notes
Core-17	WB IL / 66+05	9.75	5.75	-	Medium stiff organic silt
Core-18	WB OL / 58+09	5.5	-	1.5	Dense, sand with silt and gravel
Core-19	WB IL / 40+13	10.25	-	-	Very dense crushed rock (ballast)
Core-20	WB OL / 50+08	5.0	-	3.0	Dense sand with silt and gravel
Core-21	WB OL / 23+40	5.0	-	-	Very dense sand with silt and gravel
Core-22	WB IL / 22+67	5.0	-	-	Very dense sand with silt and gravel
Core-23	EB IL / 20+16	4.25	-	-	Very dense sand with silt and gravel
Core-24	EB OL / 22+88	4.5	-	-	Very dense sand with silt and gravel
Core-25	EB IL / 42+44	12.0	-	-	Very dense crushed rock (ballast)
Core-26	EB OL / 43+38	5.0	-	3.0	Dense sand with silt and gravel
Core-27	EB IL / 55+87	8.25	-	4.75	Dense, recycled asphalt and crushed gravel
Core-28	EB OL / 58+06	5.75	-	-	Very dense silty sand with gravel

FWD TESTING

Falling Weight Deflectometer (FWD) testing was conducted on May 26, 2021, along all travel lanes of E Pioneer Avenue and along Shaw Road E and E Main Avenue on May 27, 2021. Test spacing was approximately 100-feet along each alignment. FWD test stationing was determined by HWA during testing and is displayed along the center line of the Site and Exploration Plans, Figures 2A through 2K. The FWD testing was undertaken using a Dynatest Model 8081 Heavy Falling Weight Deflectometer. This FWD allows the pavement to be tested under a wide range of loading conditions (6,500 to 54,000 pounds) to simulate a variety of traffic loads.

For this project, pulse loads of approximately 6,000, 9,000 and 12,000 pounds were applied to the pavement surface at each test location. The corresponding pavement surface deflections were measured with velocity transducers located directly under the loaded area, and at 12, 24, 36, 48, 60, and 72-inches from the center of the loaded area.

E MAIN AVENUE

Figure 3 presents the maximum deflections (immediately under the applied load) normalized to a load of 9,000 pounds for all lanes tested. Figure 4 presents the backcalculated resilient modulus for each point tested. Figure 5 presents the backcalculated AASHTO structural number (SN) using the YONAPAVE method for each point tested.

Table 4 summarizes the FWD deflection data for E Main Avenue.

Table 4. FWD Test Results – Maximum Deflection Normalized to 9,000-pound Load

Test Lane	Number of Tests Included	Average Maximum Deflection, mils	Standard Deviation	Highest Deflection in Segment, mils	Lowest Deflection in Segment, mils
NB OL	11	10.1	2.3	14.8	7.1
NB IL	12	13.9	4.2	24.2	9.6
SB OL	12	28.0	17.0	67.3	10.6
SB IL	11	8.5	3.4	16.2	5.3

Table 5 summarizes the backcalculated resilient moduli values for E Main Avenue. The computer program Elmod, by Dynatest, was used for the backcalculation.

Table 5. FWD Test Results – Backcalculated Parameters – Subgrade Resilient Modulus

Test Lane	Number of Tests Included	Average Subgrade Resilient Modulus, ksi	Standard Deviation	Highest Value, ksi	Lowest Value, ksi
NB OL	11	13.5	4.3	19.9	6.7
NB IL	12	12.0	2.8	15.6	7.8
SB OL	12	7.2	3.6	11.7	1.8
SB IL	11	14.6	3.4	20.3	7.7

Table 6 summarizes the backcalculated AASHTO SN for E Main Avenue, using the YONAPAVE method (Hoffman, 2002).

Table 6. FWD Test Results – Backcalculated Parameters – Existing AASHTO SN

Test Lane	Number of Tests Included	Average Existing AASHTO SN	Standard Deviation	Highest Value, ksi	Lowest Value, ksi
NB OL	11	4.0	0.6	4.6	2.5
NB IL	12	3.3	0.7	4.2	2.0
SB OL	12	2.4	0.9	4.2	1.1
SB IL	11	4.6	0.8	5.8	3.0

As the tables and figures indicate, the northbound outside lane and southbound inside lane had the lowest deflections, highest resilient modulus and highest corresponding structural number for this alignment. The southbound outside lane had significantly higher deflections and lower structural number, as evidenced by the thinner section encountered in the pavement cores along with visible pavement distress.

SHAW ROAD E

Figure 6 presents the maximum deflections (immediately under the applied load) normalized to a load of 9,000 pounds for all lanes tested. Figure 7 presents the backcalculated resilient modulus for each point tested. Figure 8 presents the backcalculated AASHTO structural number (SN) using the YONAPAVE method for each point tested.

Table 7 summarizes the FWD deflection data for Shaw Road E.

Table 7. FWD Test Results – Maximum Deflection Normalized to 9,000-pound Load

Test Lane	Number of Tests Included	Average Maximum Deflection, mils	Standard Deviation	Highest Deflection in Segment, mils	Lowest Deflection in Segment, mils
NB OL	9	7.7	1.3	9.4	5.0
NB IL	9	6.7	0.8	7.8	5.4
SB OL	9	7.8	0.8	8.7	6.3
SB IL	9	6.5	0.5	7.5	6.1

Table 8 summarizes the backcalculated resilient moduli values for Shaw Road E. The computer program Elmod, by Dynatest, was used for the backcalculation.

Table 8. FWD Test Results – Backcalculated Parameters – Subgrade Resilient Modulus

Test Lane	Number of Tests Included	Average Subgrade Resilient Modulus, ksi	Standard Deviation	Highest Value, ksi	Lowest Value, ksi
NB OL	9	23.2	7.2	34.8	12.6
NB IL	9	30.3	8.8	42.3	13.9
SB OL	9	22.9	3.6	29.7	16.8
SB IL	9	30.1	6.7	39.3	20.1

Table 9 summarizes the backcalculated AASHTO SN for Shaw Road E, using the YONAPAVE method (Hoffman, 2002).

Table 9. FWD Test Results – Backcalculated Parameters – Existing AASHTO SN

Test Lane	Number of Tests Included	Average Existing AASHTO SN	Standard Deviation	Highest Value, ksi	Lowest Value, ksi
NB OL	9	3.3	0.3	3.9	2.9
NB IL	9	3.2	0.2	3.3	2.7
SB OL	9	3.0	0.3	3.5	2.7
SB IL	9	3.1	0.2	3.5	2.8

As indicated in the figures and tables, the inside lanes along this alignment had slightly lower deflections; however, the results are very consistent in general. The southbound outside lane appears to be the weakest lane along this alignment, with the highest average deflections, lowest average resilient modulus, and lowest structural number.

E PIONEER AVENUE

Figure 9 presents the maximum deflections (immediately under the applied load) normalized to a load of 9,000 pounds for all lanes tested. Figure 10 presents the backcalculated resilient modulus for each point tested. Figure 11 presents the backcalculated AASHTO structural number (SN) using the YONAPAVE method for each point tested.

Table 10 summarizes the FWD deflection data for E Pioneer Avenue.

Table 10. FWD Test Results – Maximum Deflection Normalized to 9,000-pound Load

Test Lane	Number of Tests Included	Average Maximum Deflection, mils	Standard Deviation	Highest Deflection in Segment, mils	Lowest Deflection in Segment, mils
EB OL	36	14.5	4.5	25.8	6.9
EB IL	32	13.1	4.2	25.8	7.0
WB OL	34	15.4	5.3	22.8	2.9
WB IL	34	13.5	4.5	23.8	2.0

Table 11 summarizes the backcalculated resilient moduli values for E Pioneer Avevue. The computer program Elmod, by Dynatest, was used for the backcalculation.

Table 11. FWD Test Results – Backcalculated Parameters – Subgrade Resilient Modulus

Test Lane	Number of Tests Included	Average Subgrade Resilient Modulus, ksi	Standard Deviation	Highest Value, ksi	Lowest Value, ksi
EB OL	36	14.7	4.7	31.3	7.2
EB IL	32	12.2	5.3	22.7	4.3
WB OL	34	15.0	6.5	39.5	9.0
WB IL	34	12.2	5.3	28.9	4.7

Table 12 summarizes the backcalculated AASHTO SN for E Pioneer Avenue, using the YONAPAVE method (Hoffman, 2002).

Table 12. FWD Test Results – Backcalculated Parameters – Existing AASHTO SN

Test Lane	Number of Tests Included	Average Existing AASHTO SN	Standard Deviation	Highest Value, ksi	Lowest Value, ksi
EB OL	36	2.8	0.6	4.4	1.9
EB IL	32	3.3	0.7	4.4	1.9
WB OL	34	2.8	1.0	6.2	1.9
WB IL	34	3.3	1.0	7.5	1.8

As indicated in the figures and tables, deflections were lower between Station 0+00 and 33+00. Although the pavement was thinner in this area where pavement cores were performed, the data shows that the subgrade support conditions are stronger due to very dense subgrade. Based on the FWD test results, thicker pavement may exist near the intersection with SR 512. East of Station 33+00, the outside lanes appear to have better subgrade support but a thinner pavement section. The inside lanes, east of Station 33+00, have a thicker pavement section, but slightly weaker subgrade support conditions. The inside lanes along this alignment have a slightly higher structural number.

CONDITIONS AND LIMITATIONS

Within the limitations of scope, schedule and budget, HWA attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical and pavement engineering at the time the report was prepared. No warranty, express or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or ground water at this site.

◆

We appreciate this opportunity to provide geotechnical and pavement engineering services on this project. If you have any questions or if we may be of further assistance, please contact the undersigned at (425) 774-0106.

Sincerely,

HWA GEOSCIENCES INC.

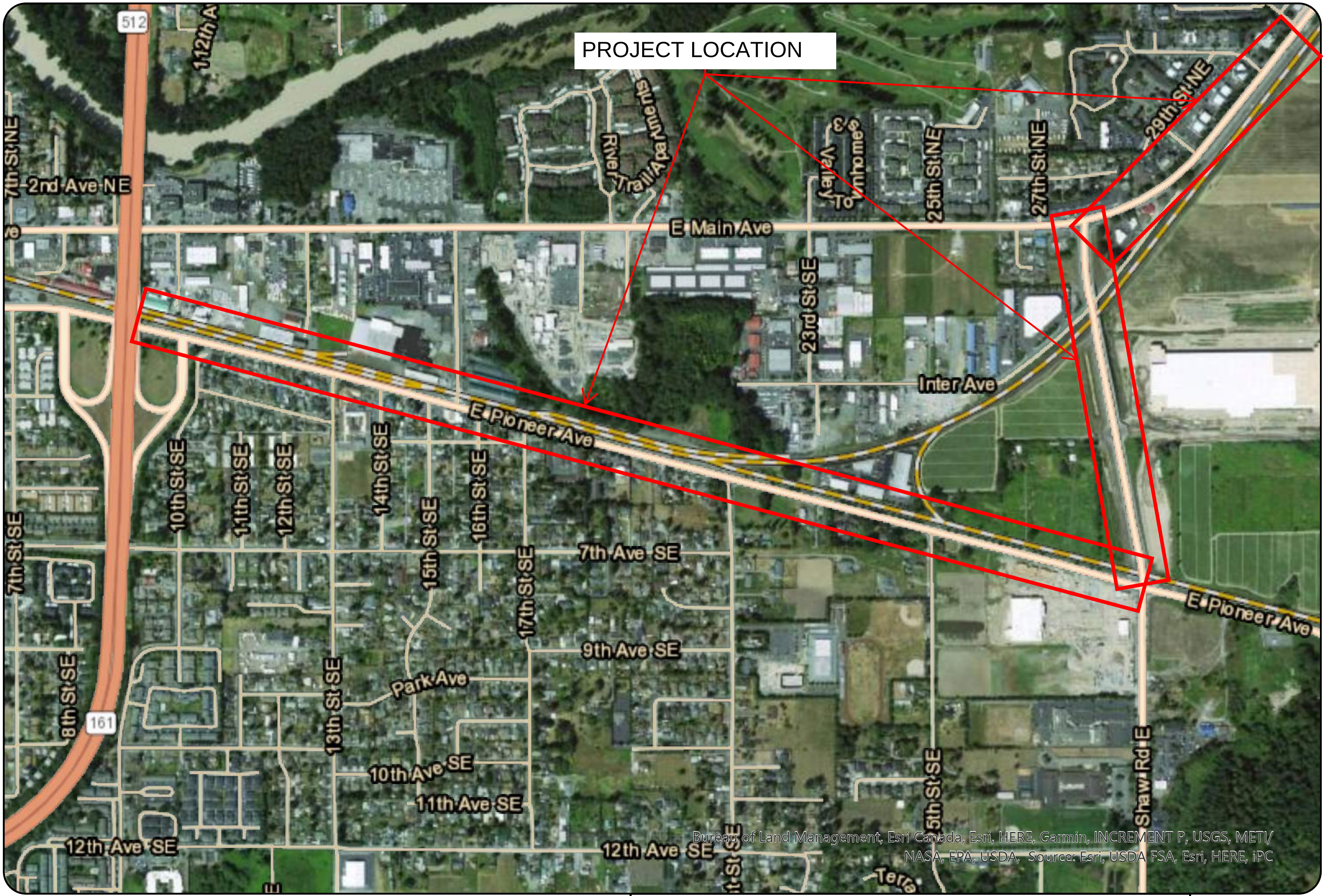
Bryan K. Hawkins, P.E.
Senior Geotechnical Engineer

ATTACHMENTS:

Figure 1	Vicinity Map
Figures 2A – 2K	Site and Exploration Plans
Figures 3 – 5	FWD Test Results – E Main Avenue
Figures 6 – 8	FWD Test Results – Shaw Road E
Figures 9 – 11	FWD Test Results – E Pioneer Avenue
Appendix A	Pavement Core Logs

REFERENCES:

Hoffman, 2002, *YONAPAVE – A Direct Method for Determining the Effective Structural Number of Flexible Pavements Based on FWD Deflections*.



Bureau of Land Management, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/ NASA, EPA, USDA, Source: Esri, USDA FSA, Esri, HERE, iPC

HWA GEOSCIENCES INC.
DBE/MWBE

VICINITY MAP

CITY OF PUYALLUP KNUTSON FARMS EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
1

PROJECT NO.
2020-051-21

Legend

⌖ **Core-#** PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN
E MAIN

CITY OF PUYALLUP KNUTSON FARM EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
2A

PROJECT NO.
2020-051-21

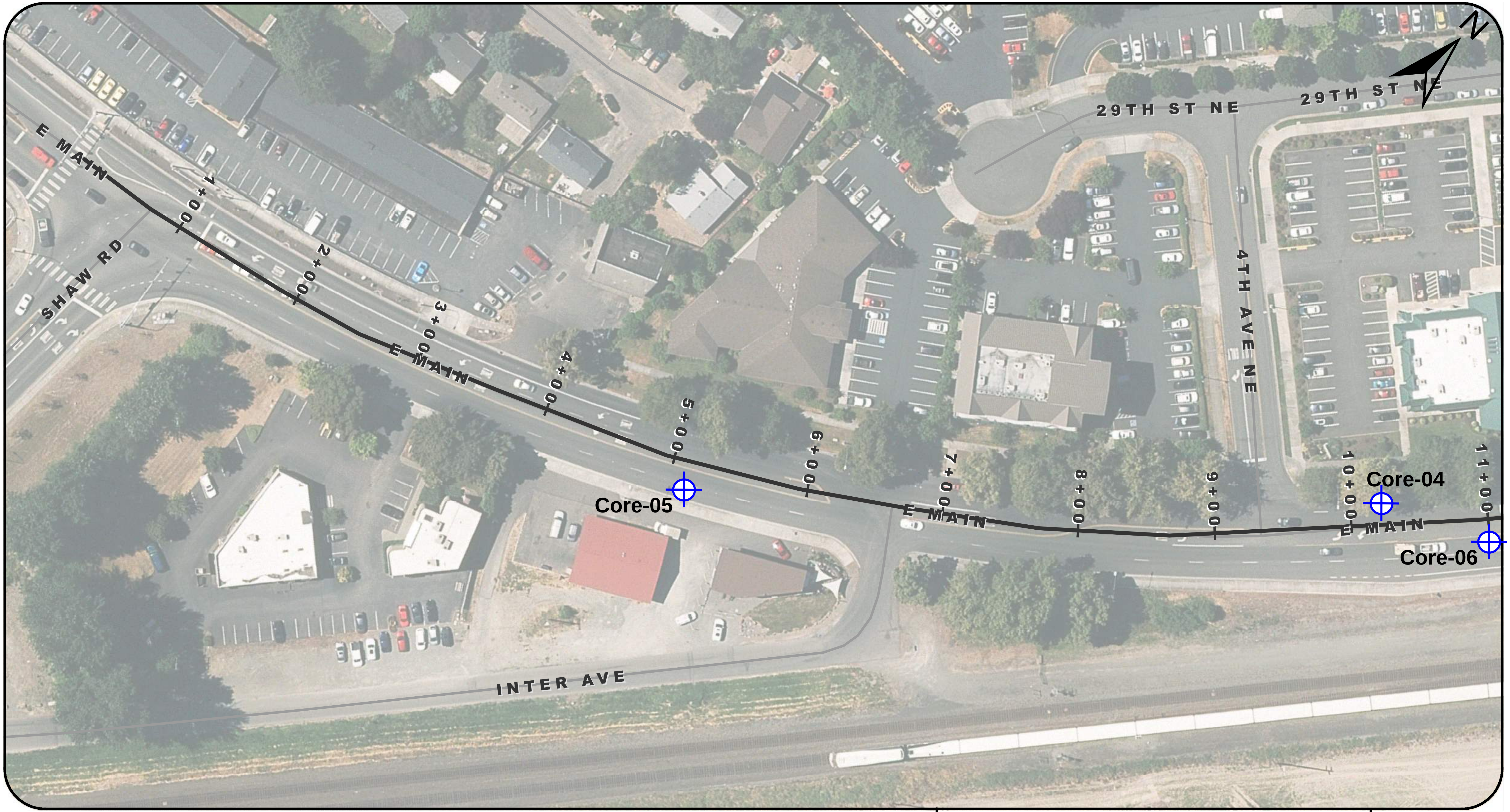
Legend

0 50 100 200
Feet

⌖ Core-# PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN **E MAIN**	FIGURE NO. **2B**
CITY OF PUYALLUP KNUTSON FARM EIS PAVEMENT INVESTIGATION PUYALLUP, WASHINGTON	PROJECT NO. 2020-051-21



Legend

0 50 100 200 Feet

⌖ **Core-#** PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

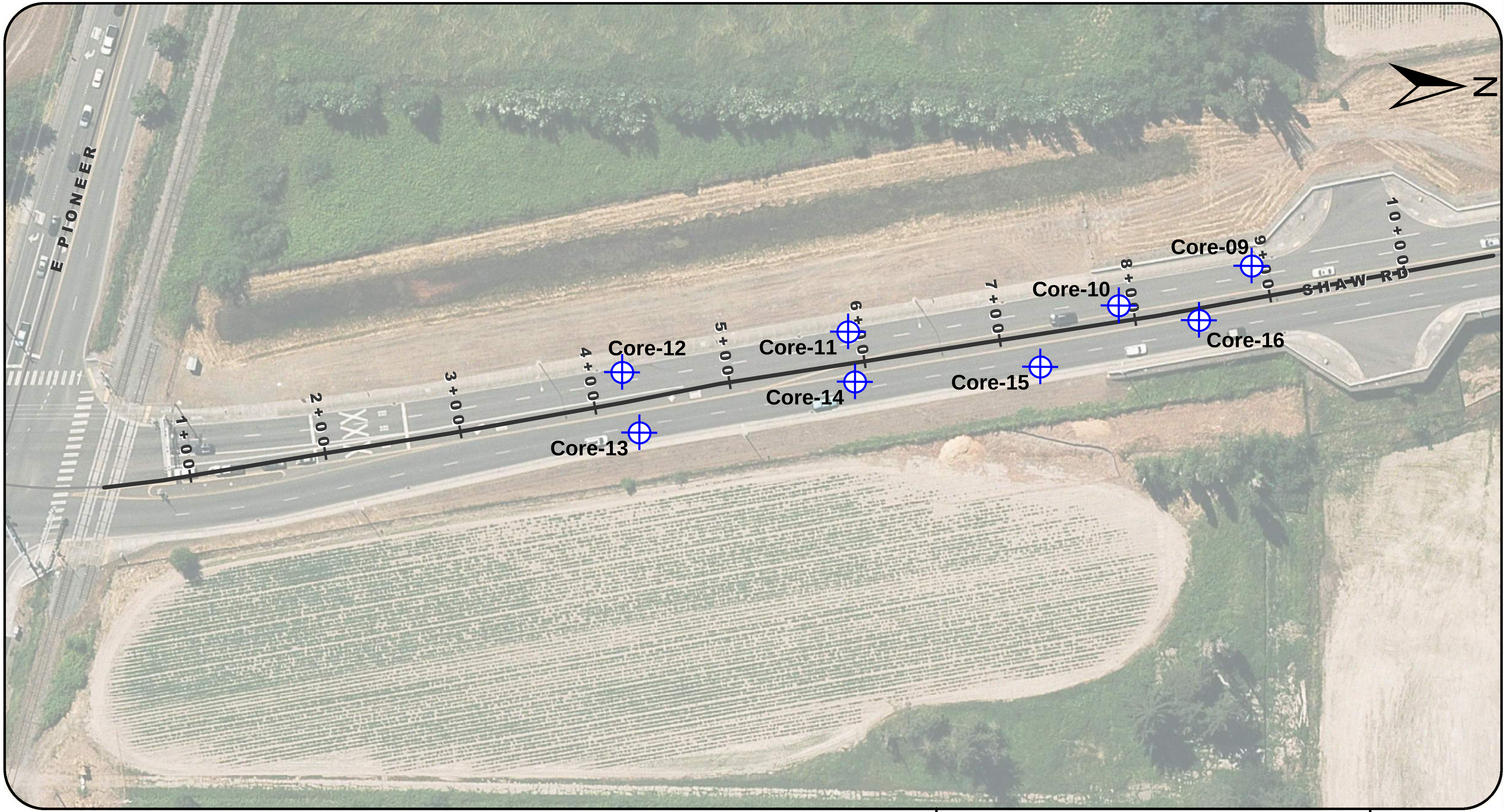
HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN
E MAIN

CITY OF PUYALLUP KNUTSON FARM EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
2C

PROJECT NO.
2020-051-21



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0 50 100 200 Feet

⌖ **Core-#** PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN
SHAW RD

CITY OF PUYALLUP KNUTSON FARM EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
2D

PROJECT NO.
2020-051-21

Legend

0 50 100 200 Feet

Core-# PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

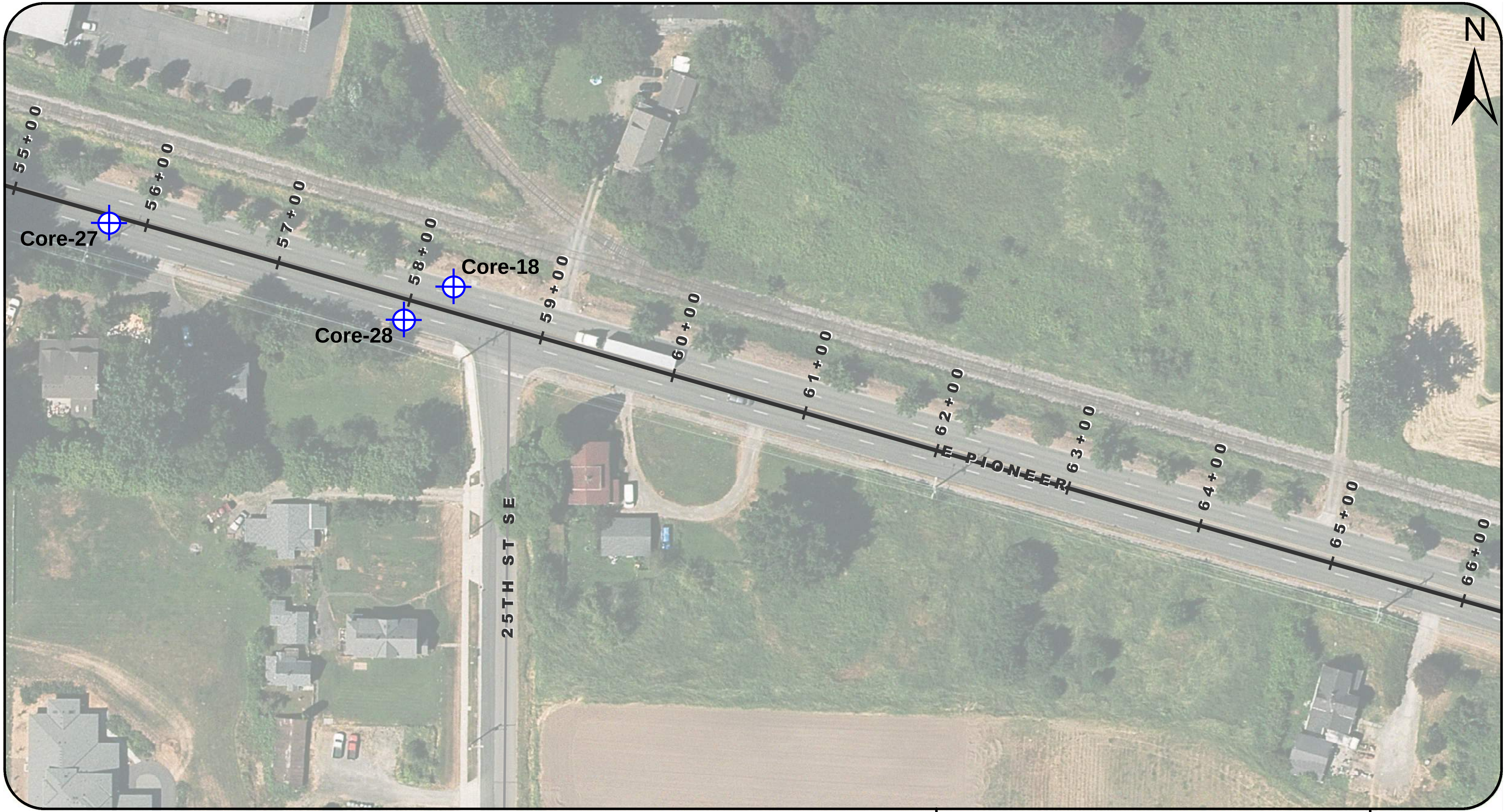
HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN
E PIONEER / SHAW RD

FIGURE NO.
2E

CITY OF PUYALLUP KNUTSON FARM EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

PROJECT NO.
2020-051-21



Legend

0 50 100 200 Feet

⊕Core-# PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

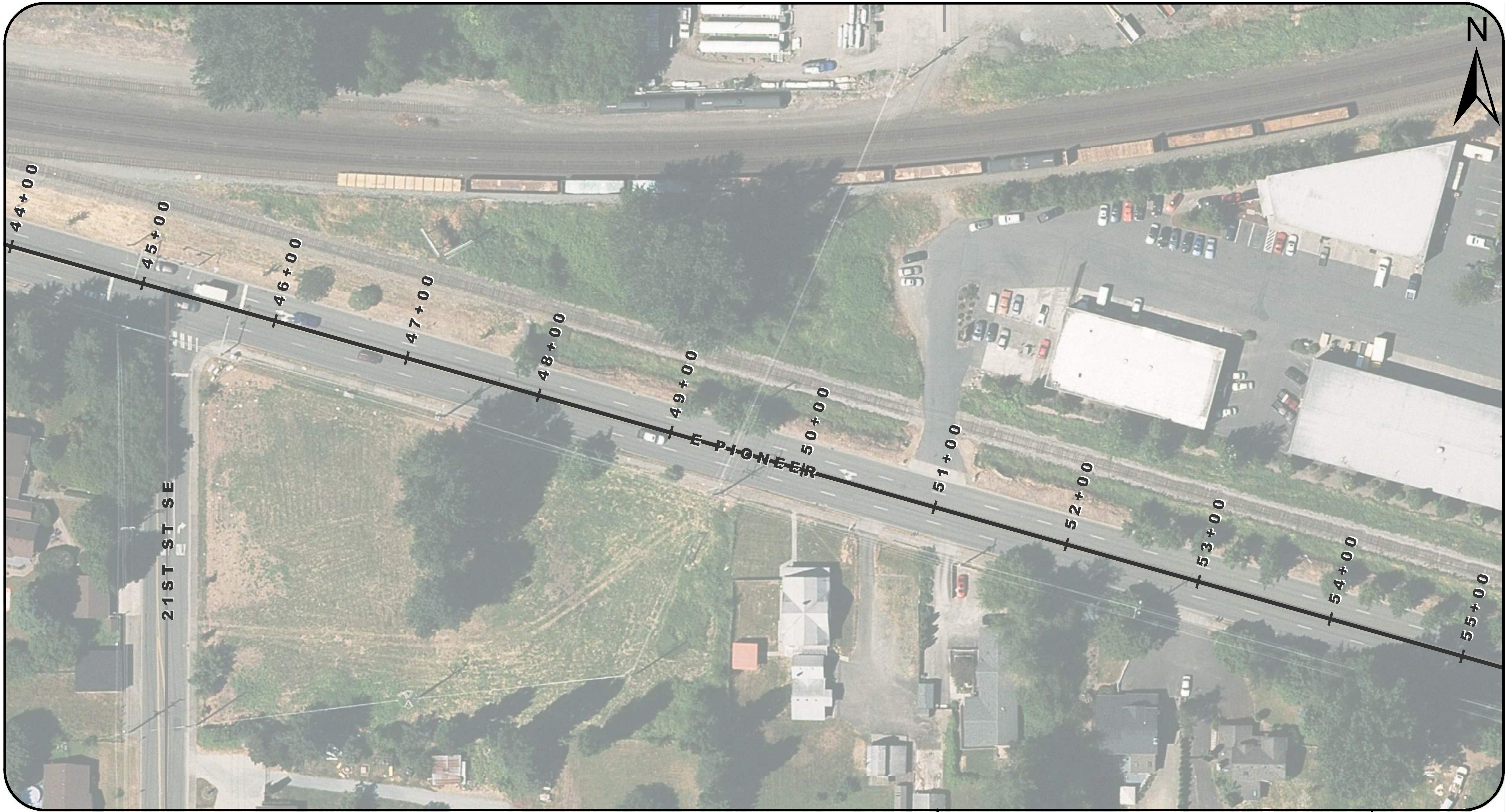
HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN
E PIONEER

CITY OF PUYALLUP KNUTSON FARM EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
2F

PROJECT NO.
2020-051-21



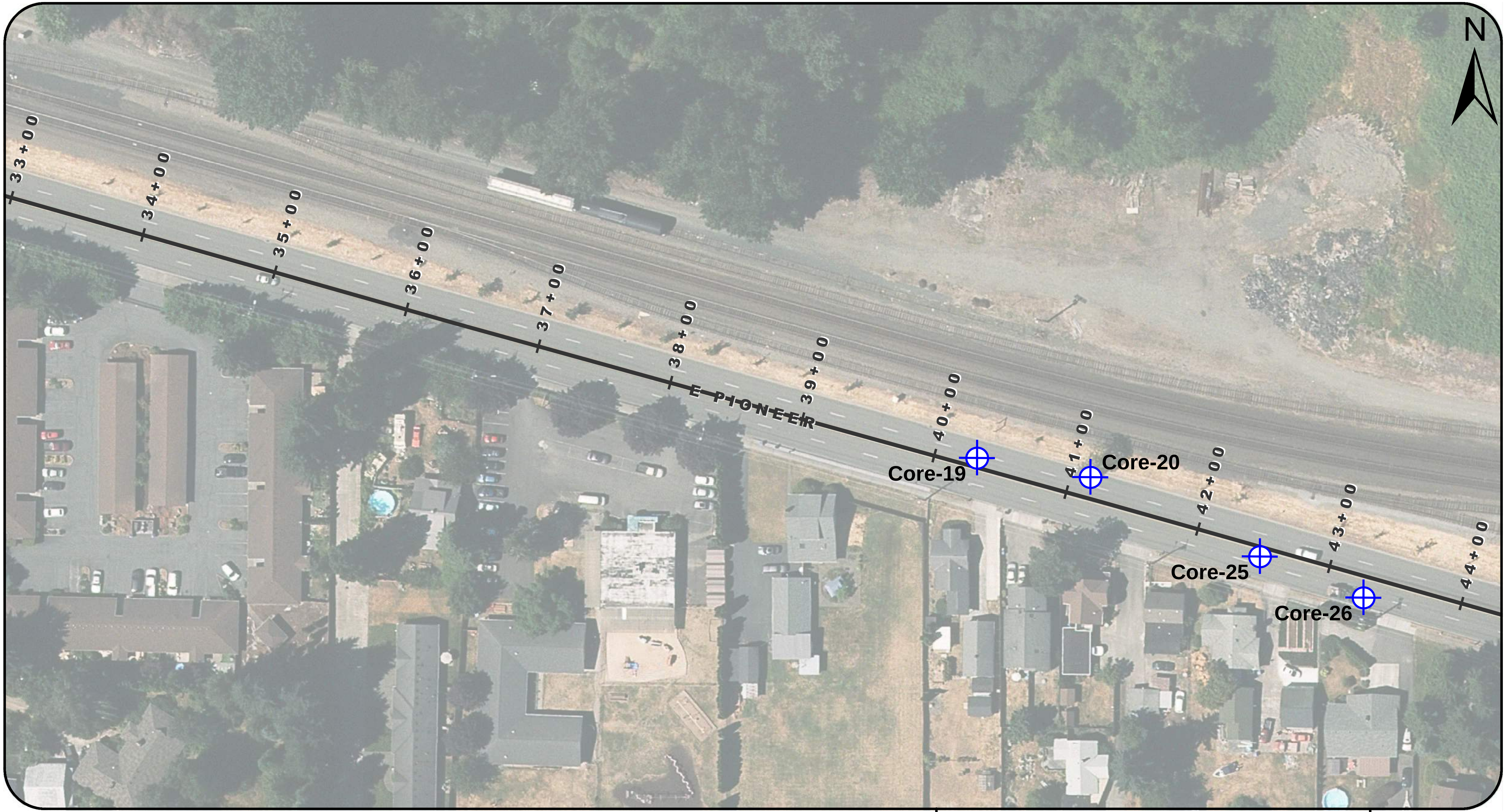
Legend

0 50 100 200 Feet

⌖ **Core-#** PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN E PIONEER	FIGURE NO. 2G
CITY OF PUYALLUP KNUTSON FARM EIS PAVEMENT INVESTIGATION PUYALLUP, WASHINGTON	PROJECT NO. 2020-051-21



Legend

0 50 100 200 Feet

⌖ **Core-#** PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN
E PIONEER

CITY OF PUYALLUP KNUTSON FARM EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
2H

PROJECT NO.
2020-051-21

Legend

⌖ Core-# PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

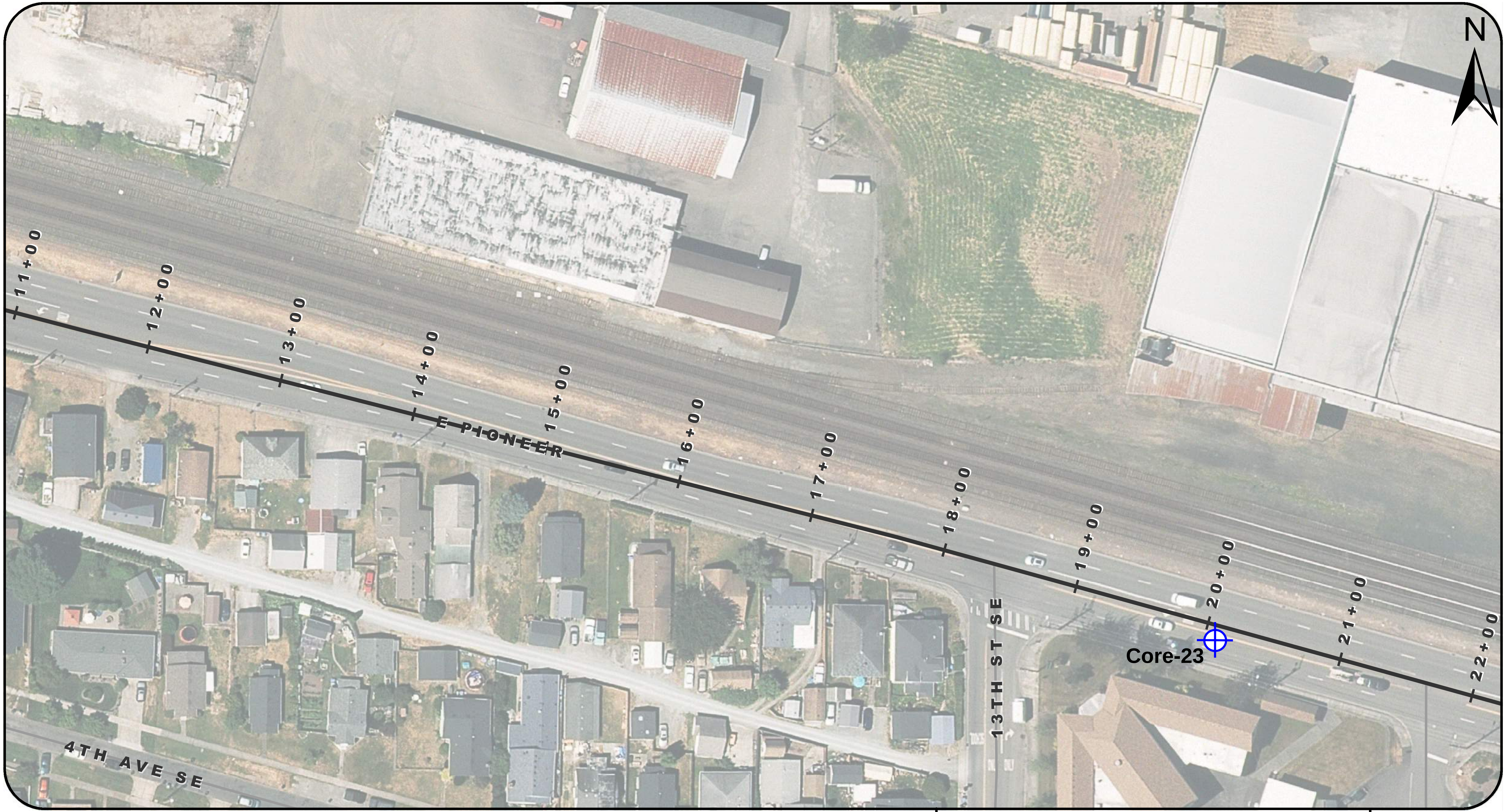
HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN
E PIONEER

FIGURE NO.
2I

CITY OF PUYALLUP KNUTSON FARM EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

PROJECT NO.
2020-051-21



Legend

⌖ **Core-#** PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

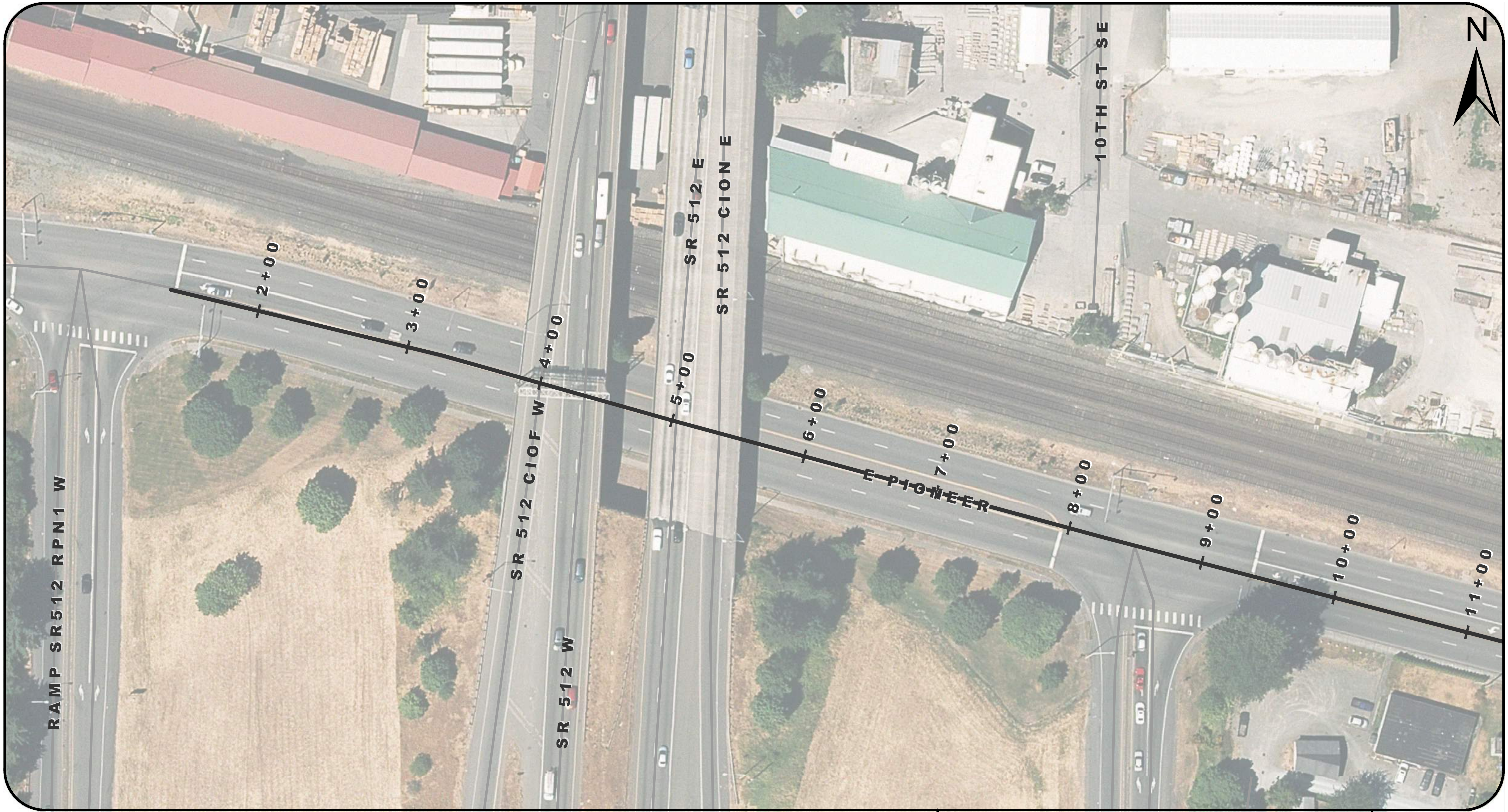
HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN
E PIONEER

FIGURE NO.
2J

CITY OF PUYALLUP KNUTSON FARM EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

PROJECT NO.
2020-051-21



Legend

0 50 100 200 Feet

⊕ **Core-#** PAVEMENT CORE DESIGNATION AND APPROXIMATE LOCATION

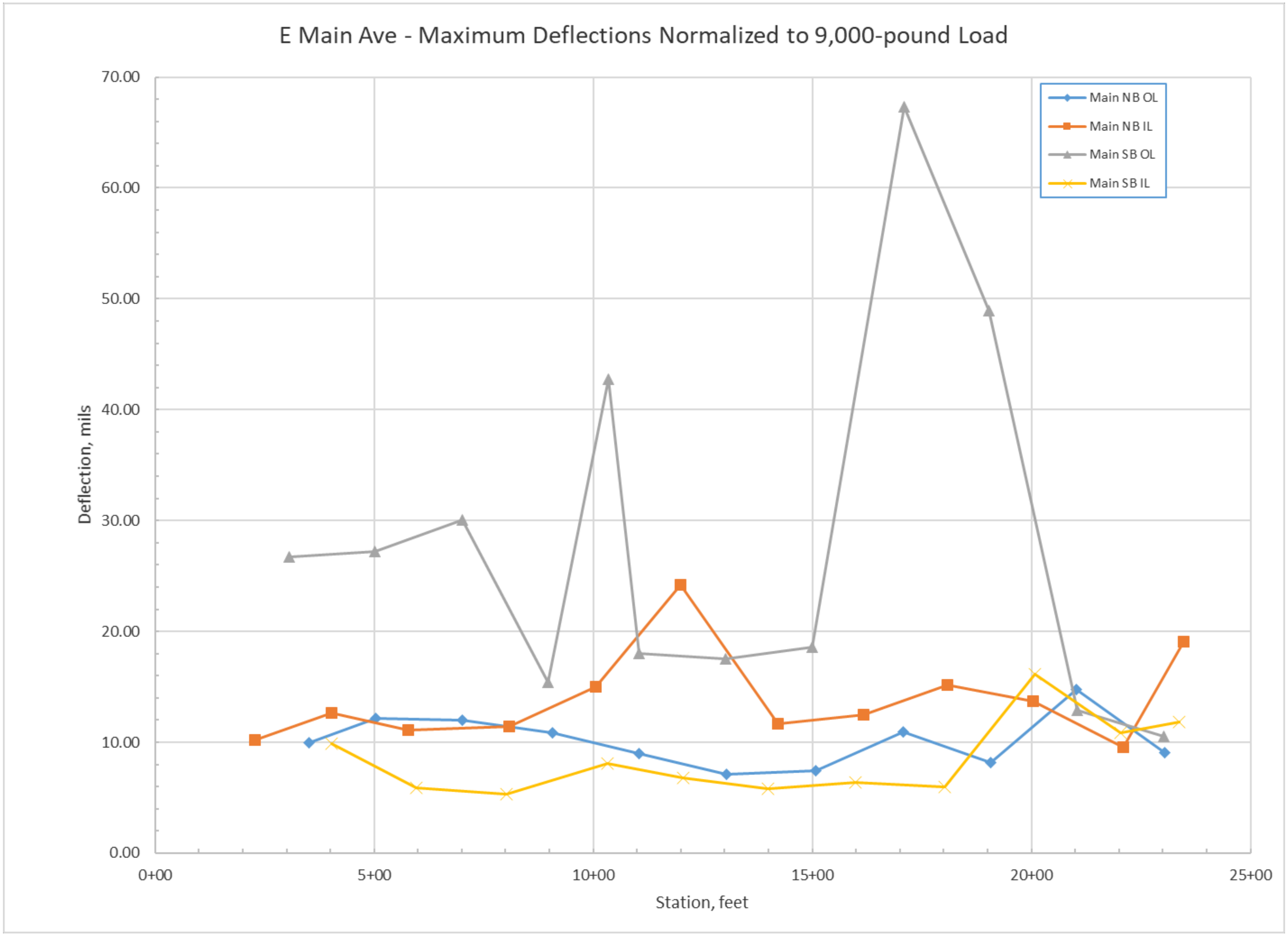
HWA GEOSCIENCES INC.
DBE/MWBE

SITE & EXPLORATION PLAN
E PIONEER

FIGURE NO.
2K

CITY OF PUYALLUP KNUTSON FARM EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

PROJECT NO.
2020-051-21



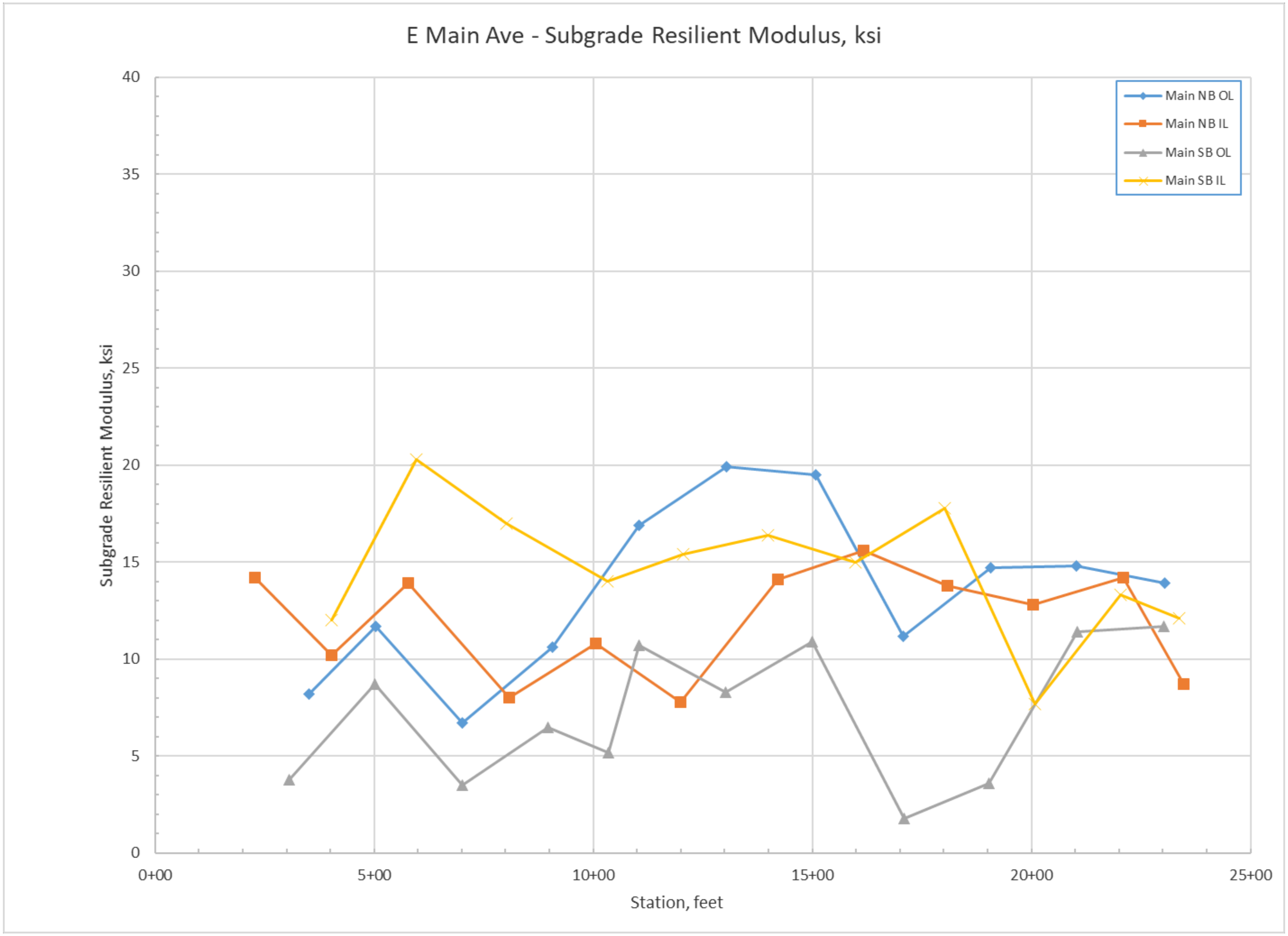
HWA GEOSCIENCES INC.
DBE/MWBE

MAXIMUM DEFLECTIONS AT 9,000 LB LOAD

CITY OF PUYALLUP KNUTSON FARMS EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
3

PROJECT NO.
2020-051



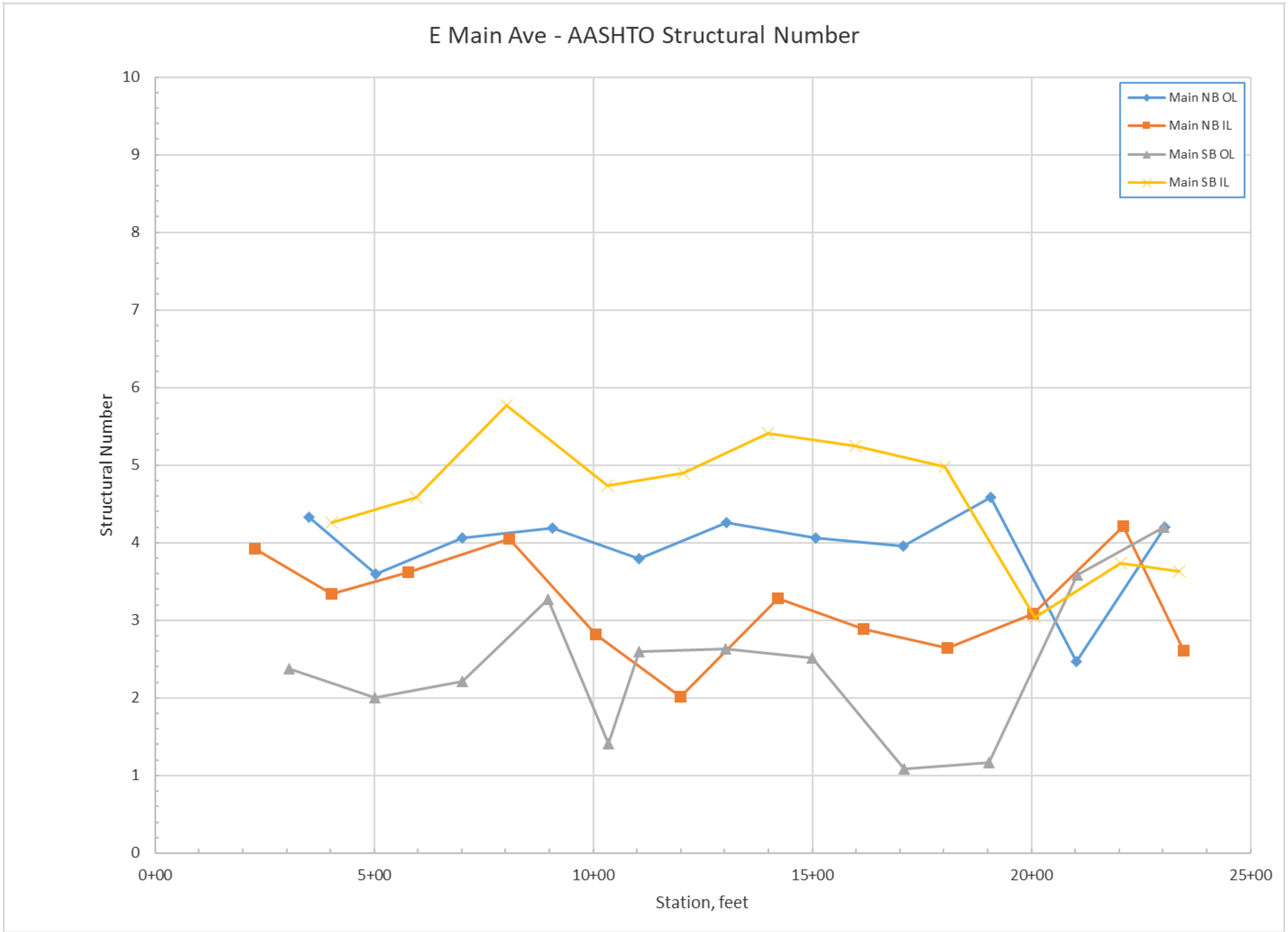
HWA GEOSCIENCES INC.
DBE/MWBE

SUBGRADE RESILIENT MODULI, KSI

CITY OF PUYALLUP KNUTSON FARMS EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
4

PROJECT NO.
2020-051



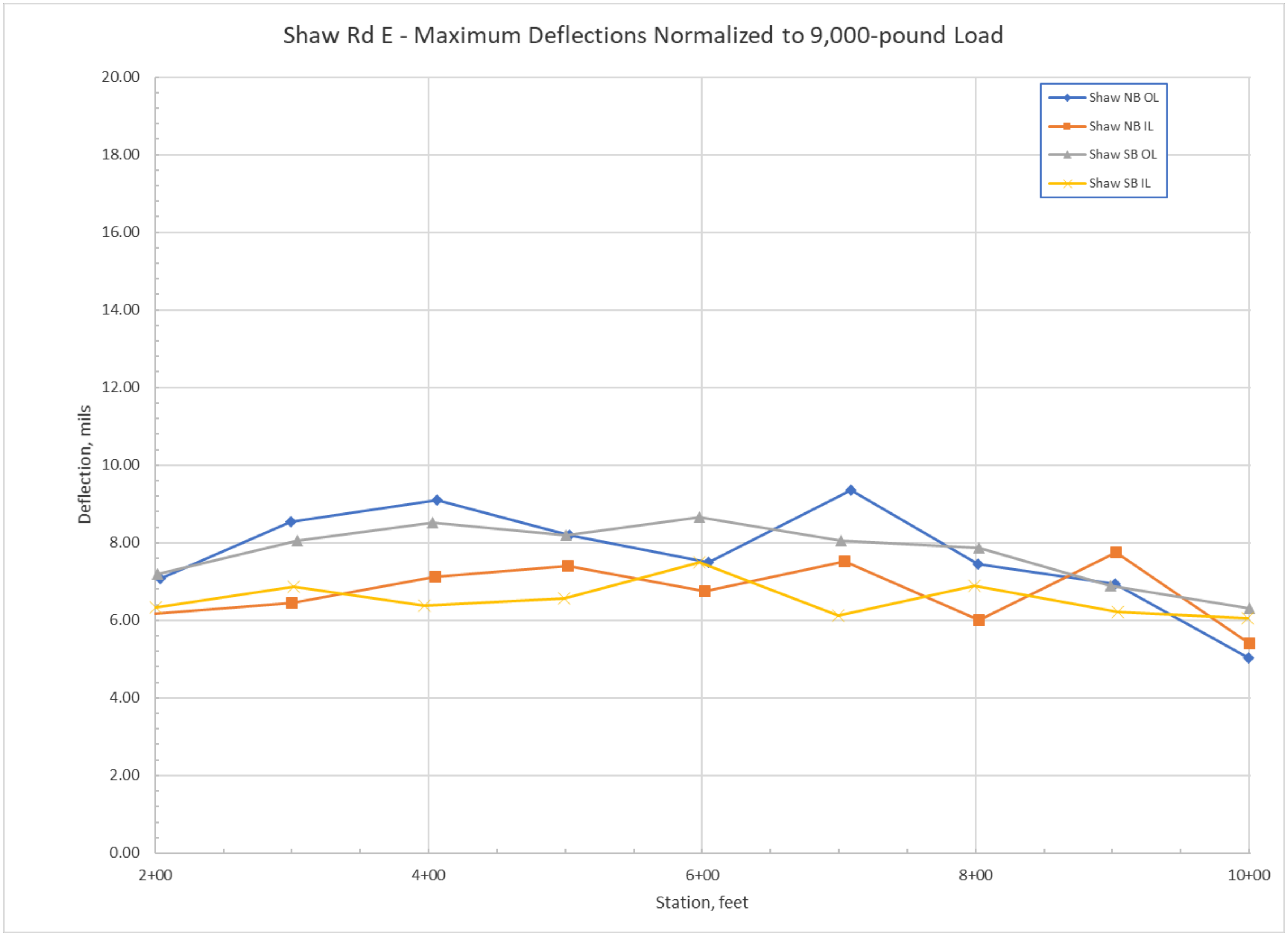
HWA GEOSCIENCES INC.
DBE/MWBE

AASHTO STRUCTURAL NUMBER

CITY OF PUYALLUP KNUTSON FARMS EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
5

PROJECT NO.
2020-051



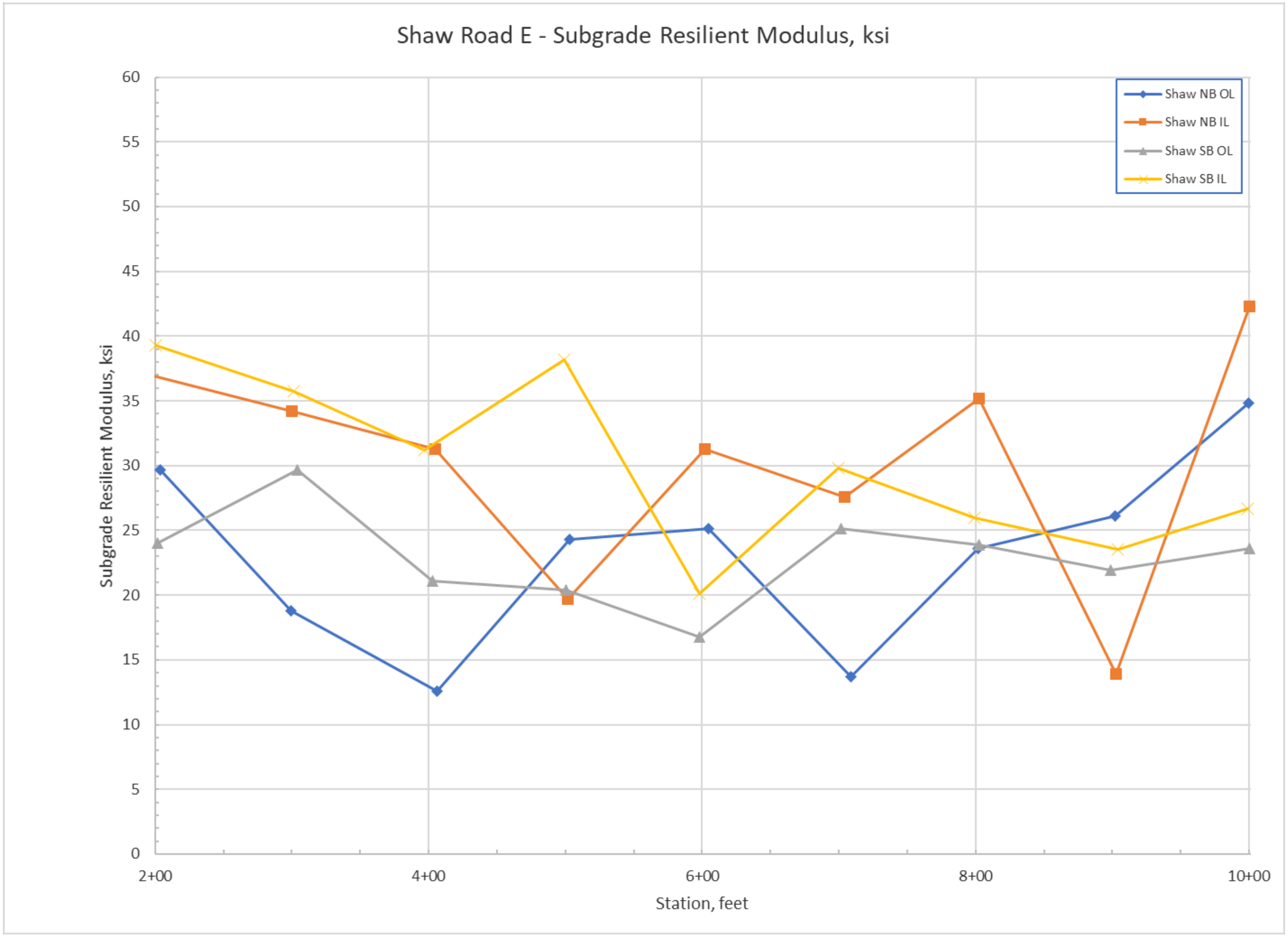
HWA GEOSCIENCES INC.
DBE/MWBE

MAXIMUM DEFLECTIONS AT 9,000 LB LOAD

CITY OF PUYALLUP KNUTSON FARMS EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
6

PROJECT NO.
2020-051



SUBGRADE RESILIENT MODULI, KSI

CITY OF PUYALLUP KNUTSON FARMS EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
7

PROJECT NO.
2020-051

HWA GEOSCIENCES INC.
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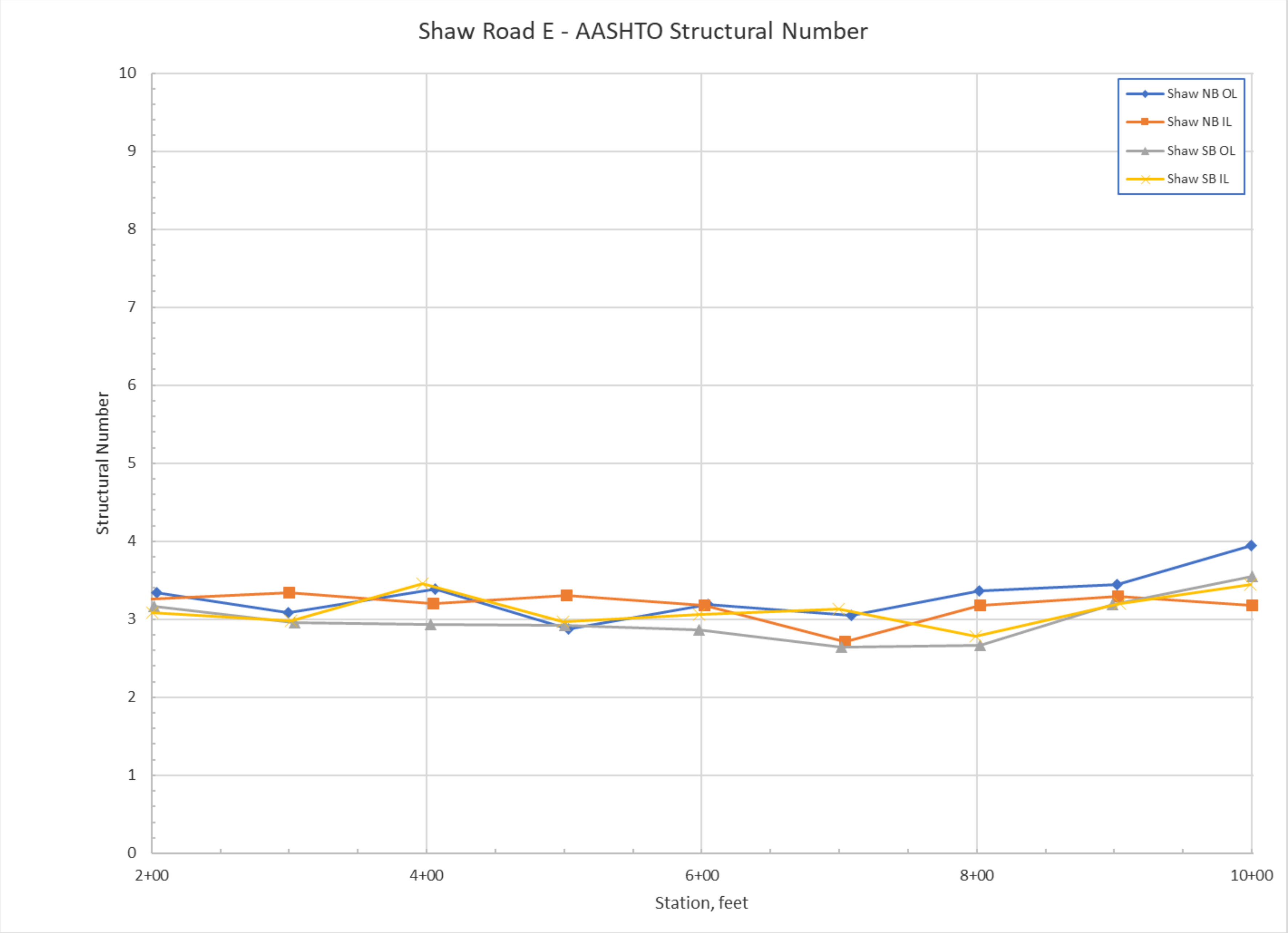


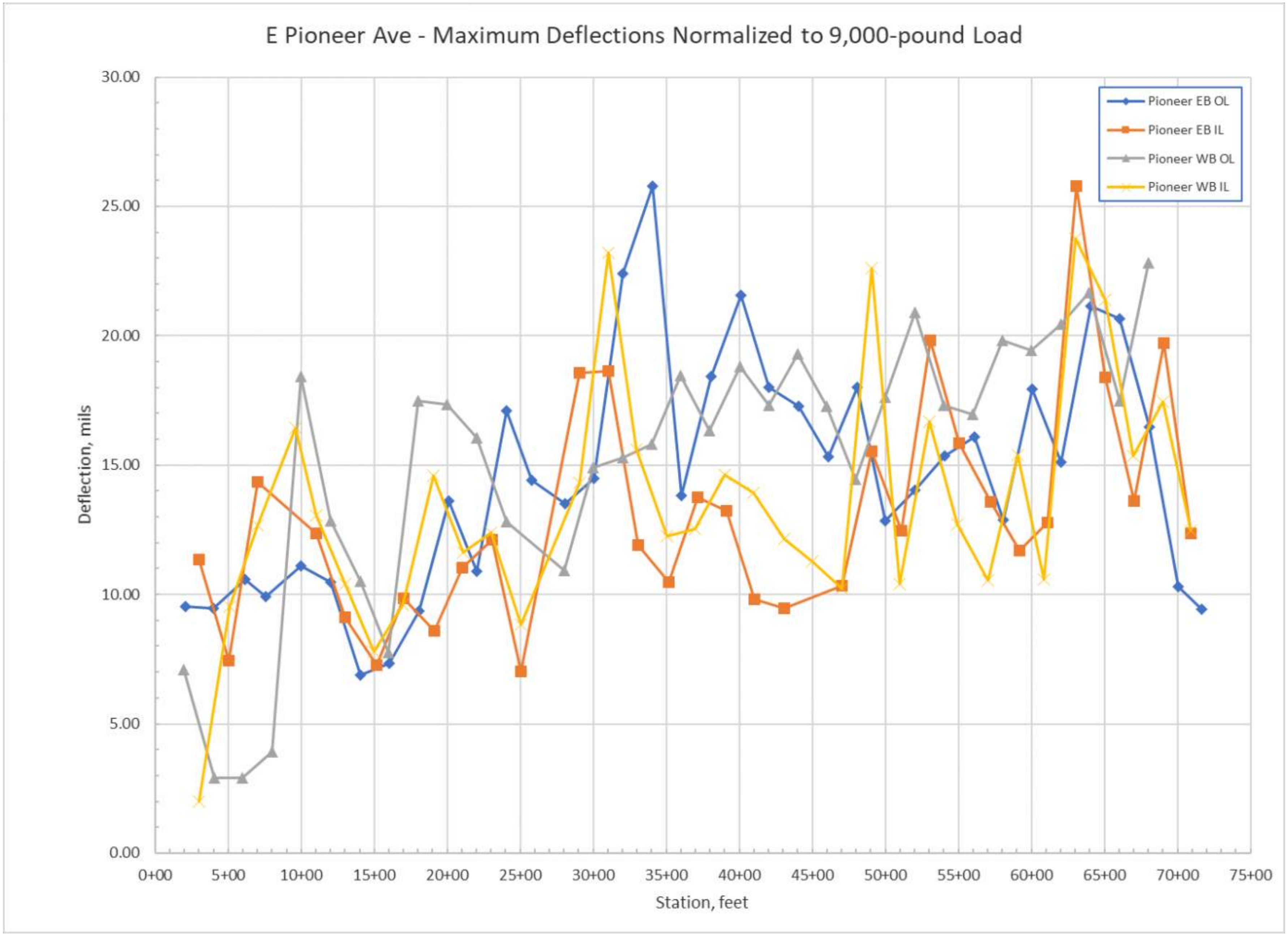
HWA GEOSCIENCES INC.
DBE/MWBE

AASHTO STRUCTURAL NUMBER

CITY OF PUYALLUP KNUTSON FARMS EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
8

PROJECT NO.
2020-051



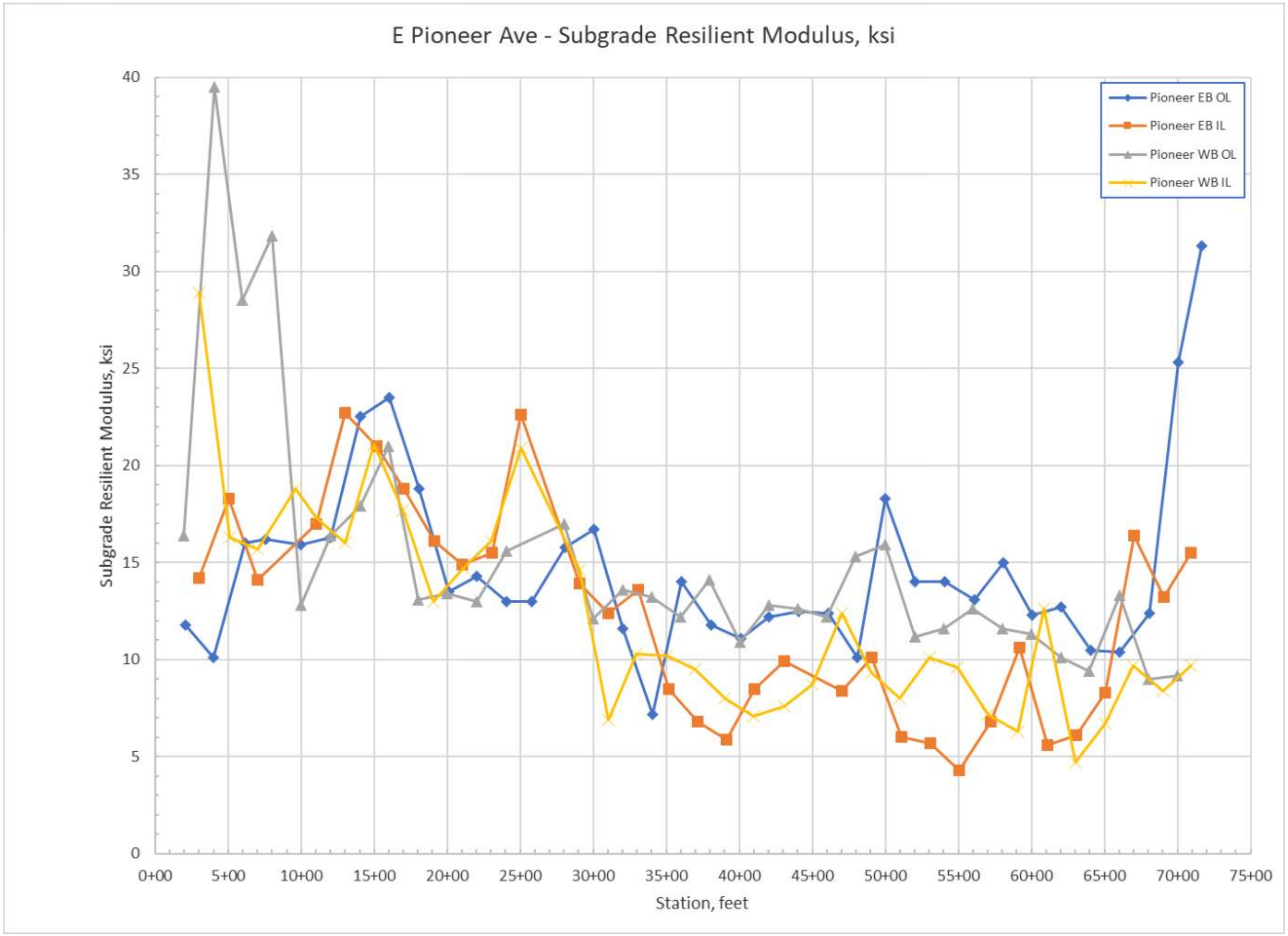
HWA GEOSCIENCES INC.
DBE/MWBE

MAXIMUM DEFLECTIONS AT 9,000 LB LOAD

CITY OF PUYALLUP KNUTSON FARMS EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
9

PROJECT NO.
2020-051



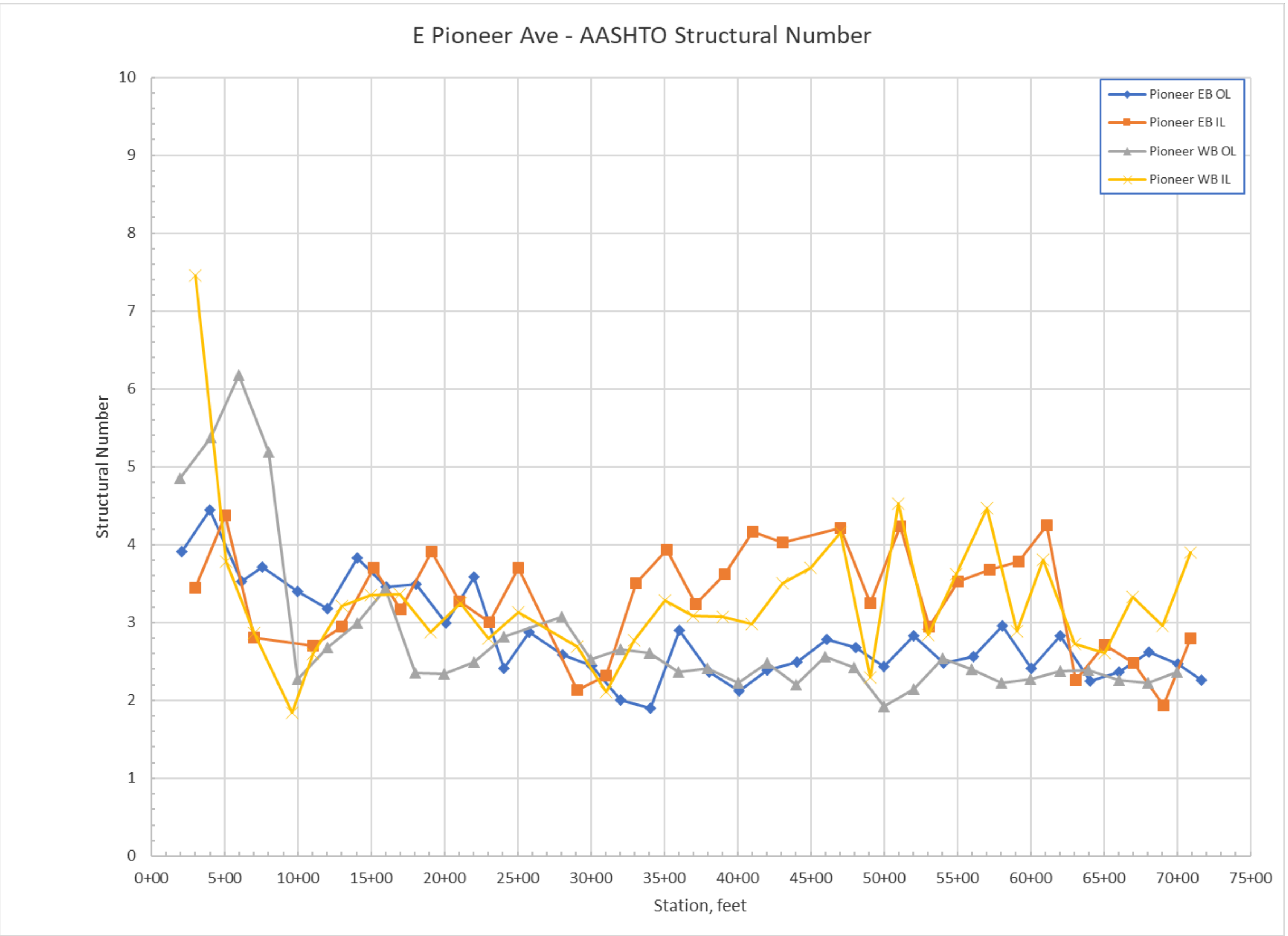
SUBGRADE RESILIENT MODULI, KSI

CITY OF PUYALLUP KNUTSON FARMS EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
10

PROJECT NO.
2020-051

HWA GEOSCIENCES INC.
DBE/MWBE



HWA GEOSCIENCES INC.
DBE/MWBE

AASHTO STRUCTURAL NUMBER

CITY OF PUYALLUP KNUTSON FARMS EIS
PAVEMENT INVESTIGATION
PUYALLUP, WASHINGTON

FIGURE NO.
11

PROJECT NO.
2020-051

Appendix A

Pavement Core Logs

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Main Ave., Westbound/Southbound inside lane, Sta 21+65, 4.5' from centerline.

LOCATION: See Figure 2A/2B
DATE COMPLETED: 6/2/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			10.0-inches Hot Mix Asphalt. 4 lifts: 2.0" x 3.0" x 2.25" x 2.75" No cracking at core location. Upper lift is unbonded. **(HMA)**				
			7.0-inches Crushed Surfacing Base Course. Dense, olive gray, fine to coarse crushed GRAVEL, with sand, moist. **(CSBC)**				
		SM	Dense, dark grayish brown, silty SAND, with gravel, moist. **(FILL)**				
			Corehole terminated at 1.5-feet below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-01

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-1

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Main Ave., Westbound/Southbound outside lane, Sta 17+86, 4.75' from curb.

LOCATION: See Figure 2A/2B
DATE COMPLETED: 6/2/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		4.0-inches Hot Mix Asphalt. 2 lifts: 1.5" x 2.5" Cored on alligator cracking in outside wheel path. Both lifts are unbonded. Core crumbled during drilling. **(HMA)**				
	▨	SM	2.5-inches Crushed Surfacing Top Course. Dense, brown, silty, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
	▨		Dense, brown, silty SAND, with gravel, moist. **(FILL)**				
			Corehole terminated at 1.0-foot below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
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Puyallup, WA

PAVEMENT CORE
Core-02

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-2

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Main Ave., Westbound/Southbound inside lane, Sta 14+29, 5' from centerline.

LOCATION: See Figure 2B
DATE COMPLETED: 6/2/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		6.5-inches Hot Mix Asphalt. 4 lifts: 1.75" x 1.75" x 1.75" x 1.25" No cracking at core location. First and second lifts are unbonded. Third and fourth lifts are unbonded. **(HMA)**				
	▒		7.25-inches Portland Cement Concrete. Horizontal crack in concrete 1.5-inches from bottom. **(PCC)**				
	░	SM	Medium dense, dark grayish brown, silty SAND, with scattered gravel, moist. **(FILL)**				
			Corehole terminated at 1.5-feet below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-03

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-3

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Main Ave., Westbound/Southbound outside lane, Sta 10+46, 4' from curb.

LOCATION: See Figure 2C
DATE COMPLETED: 6/2/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		6.0-inches Hot Mix Asphalt. 2 lifts: 3.0" x 3.0" Cored on alligator cracking. Cracked through both lifts. Both lifts are unbonded. **(HMA)**				
			7.0-inches Crushed Surfacing Base Course. Dense, olive gray, fine to coarse crushed GRAVEL, with sand, moist. **(CSBC)**				
		SM	Dense, dark grayish brown, silty SAND, with gravel, moist. **(FILL)**				
			Corehole terminated at 1.5-feet below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
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Puyallup, WA

PAVEMENT CORE
Core-04

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-4

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Main Ave., Eastbound/Northbound outside lane, Sta 5+34, 6' from curb.

LOCATION: See Figure 2C
DATE COMPLETED: 6/2/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		9.5-inches Hot Mix Asphalt. 4 lifts: 2.0" x 2.5" x 2.25" x 2.75" No cracking at core location. All lifts are bonded. Core broken during extraction. **(HMA)**				
	▨		Crushed Surfacing Base Course. Very dense, olive brown, fine to coarse crushed GRAVEL, with sand, moist. **(CSBC)**				
			Corehole terminated at 1.75-feet below ground surface due to refusal on very dense gravel. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

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Puyallup, WA

PAVEMENT CORE
Core-05

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-5

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Main Ave., Eastbound/Northbound inside lane, Sta 11+29, 8' from centerline.

LOCATION: See Figure 2B/2C
DATE COMPLETED: 6/3/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			8.5-inches Hot Mix Asphalt. 4 lifts: 2.5" x 2.0" x 2.0" x 2.0" Cored on high severity longitudinal crack. Cracked through all lifts. Upper three lifts are unbonded. **(HMA)**				
			1.0-inches Crushed Surfacing Top Course. Dense, olive gray, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		SP SM	Dense, brown, SAND, with silt and gravel, moist. **(FILL)**				
			Corehole terminated at 1.25-feet below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

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Puyallup, WA

PAVEMENT CORE
Core-06

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-6

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Main Ave., Eastbound/Northbound outside lane, Sta 15+16, 8' from curb.

LOCATION: See Figure 2B
DATE COMPLETED: 6/3/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		9.5-inches Hot Mix Asphalt. 4 lifts: 2.5" x 3.0" x 2.0" x 2.0" No cracking at core location. All lifts are bonded. **(HMA)**				
			8.5-inches Crushed Surfacing Top Course. Dense, gray, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		GP	Very dense, coarse crushed GRAVEL, moist. **(BALLAST)**				
			Corehole terminated at 1.7-feet below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-07

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-7

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Main Ave., Eastbound/Northbound inside lane, Sta 18+19, 5' from centerline.

LOCATION: See Figure 2A/2B
DATE COMPLETED: 6/3/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			7.0-inches Hot Mix Asphalt. 4 lifts: 1.25" x 1.5" x 2.0" x 2.25" No cracking at core location. All lifts are bonded. Core broken during extraction. **(HMA)**				
			3.0-inches Crushed Surfacing Top Course. Dense, brown, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		SP SM	Very dense, brown, SAND, with silt, gravel, and cobbles, moist. **(FILL)**				
			Corehole terminated at 1.0-foot below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-08

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-8

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: Shaw Road E, Southbound outside lane, Sta 8+89, 5.5' from curb.

LOCATION: See Figure 2D
DATE COMPLETED: 6/8/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		7.0-inches Hot Mix Asphalt. 4 lifts: 2.25" x 1.75" x 1.5" x 1.5" No cracking at core location. All lifts are bonded. **(HMA)**				
	▨		3.5-inches Crushed Surfacing Top Course. Dense, olive brown, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
	▨	SP SM	Very dense, brown, SAND, with silt, gravel, and cobbles, moist. **(FILL)**				
3							

Corehole terminated at 1.0-foot below ground surface. No groundwater seepage was observed.

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-09

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-9

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: Shaw Road E, Southbound inside lane, Sta 7+87, 6' from centerline striping.

LOCATION: See Figure 2D
DATE COMPLETED: 6/8/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		7.5-inches Hot Mix Asphalt. 4 lifts: 2.0" x 2.5" x 1.0" x 2.0" No cracking at core location. All lifts are bonded. **(HMA)**				
			3.5-inches Crushed Surfacing Top Course. Dense, olive brown, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		SP SM	Dense, olive brown, SAND, with silt, gravel, and scattered wood fragments, moist. **(FILL)**				
			Corehole terminated at 1.1-feet below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-10

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-10

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: Shaw Road E, Southbound outside lane, Sta 6+05, 7' from curb.

LOCATION: See Figure 2D
DATE COMPLETED: 6/8/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		7.0-inches Hot Mix Asphalt. 4 lifts: 2.25" x 2.75" x 1.0" x 1.0" No cracking at core location. Upper lift is unbonded. **(HMA)**				
			3.0-inches Crushed Surfacing Top Course. Dense, olive brown, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		SP SM	Dense, olive brown, SAND, with silt, gravel, and cobbles, moist. **(FILL)**				
3							

Corehole terminated at 1.1-feet below ground surface. No groundwater seepage was observed.

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-11

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-11

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: Shaw Road E, Southbound inside lane, Sta 4+15, 5' from left turn lane striping.

LOCATION: See Figure 2D
DATE COMPLETED: 6/8/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		7.75-inches Hot Mix Asphalt. 4 lifts: 2.5" x 2.5" x 1.5" x 1.25" No cracking at core location. All lifts are bonded. **(HMA)**				
			4.25-inches Crushed Surfacing Top Course. Dense, olive brown, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		SP SM	Very dense, olive brown, SAND, with silt and gravel, moist. **(FILL)**				
3							

Corehole terminated at 1.2-feet below ground surface. No groundwater seepage was observed.

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-12

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-12

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: Shaw Road E, Northbound outside lane, Sta 4+31, 10' from curb.

LOCATION: See Figure 2D
DATE COMPLETED: 6/3/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			6.75-inches Hot Mix Asphalt. 3 lifts: 2.25" x 2.5" x 2.0" Cored on high severity longitudinal crack. Crack extends through upper lift. Upper lift is unbonded. **(HMA)**				
			4.25-inches Crushed Surfacing Top Course. Dense, olive gray, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		SP SM	Dense, olive gray, SAND, with silt, gravel, and cobbles, moist. **(FILL)**				
			Corehole terminated at 1.25-feet below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-13

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-13

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: Shaw Road E, Northbound inside lane, Sta 5+85, 5' from centerline striping.

LOCATION: See Figure 2D
DATE COMPLETED: 6/7/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		7.5-inches Hot Mix Asphalt. 3 lifts: 2.5" x 2.0" x 3.0" No cracking at core location. All lifts are bonded. **(HMA)**				
	▨		4.5-inches Crushed Surfacing Top Course. Very dense, olive gray, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
	▨	SP SM	Very dense, olive gray, SAND, with silt and gravel, moist. **(FILL)**				
			Corehole terminated at 1.2-feet below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-14

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-14

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: Shaw Road E, Northbound outside lane, Sta 7+31, 10' from curb.

LOCATION: See Figure 2D
DATE COMPLETED: 6/3/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			6.5-inches Hot Mix Asphalt. 3 lifts: 2.0" x 2.25" x 2.25" Cored on low severity longitudinal crack with crack sealer. Crack doesn't appear to extend into core. All lifts are bonded. **(HMA)**				
			5.5-inches Crushed Surfacing Top Course. Very dense, olive gray, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		SP SM	Very dense, olive gray, SAND, with silt and gravel, moist. **(FILL)**				
3							

Corehole terminated at 1.2-feet below ground surface. No groundwater seepage was observed.

PAVEMENT CORE PHOTO

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HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
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Puyallup, WA

PAVEMENT CORE
Core-15

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PROJECT NO.: 2020-051 FIGURE: A-15

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: Shaw Road E, Northbound inside lane, Sta 8+47, 5' from centerline striping.

LOCATION: See Figure 2D
DATE COMPLETED: 6/7/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		7.25-inches Hot Mix Asphalt. 3 lifts: 2.5" x 2.25" x 2.5" No cracking at core location. Upper lift is unbonded. **(HMA)**				
	▨		3.75-inches Crushed Surfacing Top Course. Very dense, olive gray, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
	▨	SP SM	Very dense, olive gray, SAND, with silt and gravel, moist. **(FILL)**				
3							

Corehole terminated at 1.1-feet below ground surface. No groundwater seepage was observed.

PAVEMENT CORE PHOTO

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Pavement Investigation
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PAVEMENT CORE
Core-16

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PROJECT NO.: 2020-051 FIGURE: A-16

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Westbound inside lane, Sta 66+05, 4' from centerline.

LOCATION: See Figure 2E
DATE COMPLETED: 6/8/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			6.5-inches Hot Mix Asphalt. 4 lifts: 2.0" x 1.25" x 1.75" x 1.5" No cracking at core location. All lifts are bonded. **(HMA)**				
			2.25-inches Bituminous Sand. Bonded to HMA above and below. **(BS)**				
			1.0-inch Hot Mix Asphalt. 1 lift: 1.0" **(HMA)**				
			5.75-inches Portland Cement Concrete. **(PCC)**				
		OL	Medium stiff, brown, organic SILT, with sand, moist. **(QUATERNARY ALLUVIUM)**				
3							

Corehole terminated at 2.0-feet below ground surface. No groundwater seepage was observed.

PAVEMENT CORE PHOTO

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HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
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PAVEMENT CORE
Core-17

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PROJECT NO.: 2020-051 FIGURE: A-17

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Westbound outside lane, Sta 58+09, 5' from curb.

LOCATION: See Figure 2F
DATE COMPLETED: 6/7/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			5.5-inches Hot Mix Asphalt. 2 lifts: 2.75" x 2.75" No cracking at core location. Both lifts are unbonded. Chip seal at the top of each lift. **(HMA)**				
			1.5-inches Crushed Surfacing Top Course. Dense, olive gray, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		SP SM	Dense, olive brown, SAND, with silt and gravel, moist. **(FILL)**				
			Corehole terminated at 1.0-foot below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

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HWA GEOSCIENCES INC.

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Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-18

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PROJECT NO.: 2020-051 FIGURE: A-18

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Westbound inside lane, Sta 40+13, 4.5' from curb.

LOCATION: See Figure 2H
DATE COMPLETED: 6/9/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		10.25-inches Hot Mix Asphalt. 4 lifts: 2.0" x 2.0" x 2.0" x 4.25" No cracking at core location. Third and fourth lifts are unbonded. Chip seal at surface. **(HMA)**				
		GP	Ballast Gravel. Very dense, gray, 2-inch ballast GRAVEL, moist. **(BALLAST)**				
			Corehole terminated at 1.0-foot below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

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Puyallup, WA

PAVEMENT CORE
Core-19

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PROJECT NO.: 2020-051 FIGURE: A-19

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Westbound outside lane, Sta 50+08, 6' from curb.

LOCATION: See Figure 2H
DATE COMPLETED: 6/9/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		5.0-inches Hot Mix Asphalt. 2 lifts: 2.5" x 2.5" No cracking at core location. All lifts are bonded. Chip seal at surface. **(HMA)**				
			3.0-inches Crushed Surfacing Top Course. Dense, brown, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		SP SM	Dense, olive brown, SAND, with silt and gravel, moist. **(FILL)**				
			Corehole terminated at 1.0-foot below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

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HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
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PAVEMENT CORE
Core-20

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PROJECT NO.: 2020-051

FIGURE: A-20

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Westbound outside lane, Sta 23+40, 6' from curb.

LOCATION: See Figure 2I
DATE COMPLETED: 6/9/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			5.0-inches Hot Mix Asphalt. 3 lifts: 2.0" x 1.0" x 2.0" No cracking at core location. All lifts are bonded. **(HMA)**				
		SP SM	Very dense, dark grayish brown, SAND, with silt and gravel, moist. **(FILL)**				
			Corehole terminated at 1.0-foot below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

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PAVEMENT CORE
Core-21

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PROJECT NO.: 2020-051
FIGURE: A-21

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Westbound inside lane, Sta 22+67, 4' from turn lane striping.

LOCATION: See Figure 2I
DATE COMPLETED: 6/10/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		5.0-inches Hot Mix Asphalt. 4 lifts: 1.5" x 1.0" x 1.0" x 1.5" No cracking at core location. All lifts are bonded. **(HMA)**				
	▒	SP SM	Very dense, dark grayish brown, SAND, with silt and gravel, moist. **(FILL)**				
			Corehole terminated at 1.0-foot below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

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City of Puyallup Knutson Farms EIS
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PAVEMENT CORE
Core-22

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PROJECT NO.: 2020-051

FIGURE: A-22

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Eastbound inside lane, Sta 20+16, 3.5' from centerline.

LOCATION: See Figure 2J
DATE COMPLETED: 6/10/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		4.25-inches Hot Mix Asphalt. 3 lifts: 2.0" x 1.0" x 1.25" No cracking at core location. All lifts are bonded. **(HMA)**				
	▨	SP SM	Very dense, dark grayish brown, SAND, with silt and gravel, moist. **(FILL)**				
			Corehole terminated at 1.0-foot below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

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PAVEMENT CORE
Core-23

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PROJECT NO.: 2020-051 FIGURE: A-23

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Eastbound outside lane, Sta 22+88, 6' from curb.

LOCATION: See Figure 2I
DATE COMPLETED: 6/10/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		4.5-inches Hot Mix Asphalt. 4 lifts: 1.25" x 1.0" x 1.0" x 1.25" No cracking at core location. All lifts are bonded. **(HMA)**				
	▨	SP SM	Very dense, dark grayish brown, SAND, with silt and gravel, moist. **(FILL)**				
			Corehole terminated at 1.0-foot below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

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HWA GEOSCIENCES INC.

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Puyallup, WA

PAVEMENT CORE
Core-24

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-24

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Eastbound inside lane, Sta 42+44, 5' from centerline.

LOCATION: See Figure 2H
DATE COMPLETED: 6/9/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		12.0-inches Hot Mix Asphalt. 5 lifts: 2.25" x 2.75" x 1.5" x 1.25" x 4.25" No cracking at core location. Fourth and fifth lifts are unbonded. **(HMA)**				
		GP	Ballast Gravel. Very dense, gray, 2-inch ballast GRAVEL, moist. **(BALLAST)**				
3							

Corehole terminated at 1.2-feet below ground surface. No groundwater seepage was observed.

PAVEMENT CORE PHOTO

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City of Puyallup Knutson Farms EIS
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PAVEMENT CORE
Core-25

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PROJECT NO.: 2020-051 FIGURE: A-25

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Eastbound outside lane, Sta 43+38, 6.5' from curb.

LOCATION: See Figure 2H
DATE COMPLETED: 6/9/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			5.0-inches Hot Mix Asphalt. 2 lifts: 2.0" x 3.0" No cracking at core location. All lifts are bonded. Chip seal at the surface and between lifts. **(HMA)**				
			3.0-inches Crushed Surfacing Top Course. Dense, olive brown, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		SP SM	Dense, olive brown, SAND, with silt, gravel, and cobbles, moist. **(FILL)**				
			Corehole terminated at 0.9-feet below ground surface due to refusal on cobble. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

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HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
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Puyallup, WA

PAVEMENT CORE
Core-26

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PROJECT NO.: 2020-051 FIGURE: A-26

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Eastbound inside lane, Sta 55+87, 6.25' from centerline.

LOCATION: See Figure 2F
DATE COMPLETED: 6/7/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			8.25-inches Hot Mix Asphalt. 4 lifts: 2.0" x 1.5" x 1.5" x 3.25" No cracking at core location. All lifts are bonded. Chip seal at the surface. **(HMA)**				
			4.75-inches Crushed Surfacing Top Course. Dense, olive gray, fine crushed GRAVEL, with sand, moist. **(CSTC)**				
		GP	Dense, dark grayish brown, recycled asphalt and crushed gravel, moist. **(FILL)**				
			Corehole terminated at 1.4-feet below ground surface. No groundwater seepage was observed.				
3							

PAVEMENT CORE PHOTO

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HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-27

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PROJECT NO.: 2020-051 FIGURE: A-27

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: E Pioneer Ave., Eastbound outside lane, Sta 58+06, 6' from curb.

LOCATION: See Figure 2F
DATE COMPLETED: 6/7/21
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0	■		5.75-inches Hot Mix Asphalt. 2 lifts: 2.5" x 3.25" No cracking at core location. All lifts are bonded. Chip seal at the surface. **(HMA)**				
	▨	SM	Very dense, olive gray, silty SAND, with gravel, moist. **(FILL)**				
3							

Corehole terminated at 1.2-feet below ground surface. No groundwater seepage was observed.

PAVEMENT CORE PHOTO

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HWA GEOSCIENCES INC.

City of Puyallup Knutson Farms EIS
Pavement Investigation
Puyallup, WA

PAVEMENT CORE
Core-28

PAGE: 1 of 1

PROJECT NO.: 2020-051 FIGURE: A-28

Appendix B

Tables B-1 to B-6: ESAL Calculations

Table B-1: ESAL Calculations

Shaw North of Pioneer
No Build Option
8/24/2021

Project Name:	Knutson Farms Industrial Park
Functional Class:	Major Arterial
Pavement Type:	Flexible

		AADT	Class 1-3	Class 4-7	Class 8-10	Class 11-13
Design Life (years):		5	5	5	5	5
Growth Rate (%):		2	2	2	2	2
Data Year	2021	21,733	19209	2252	207	65
Future Year	2026	23,995	21,208	2,486	229	72

FHWA Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)												0.0
Class Volume (daily)	19,209	563	563	563	563	69	69	69	22	22	21	21,733
Growth Factor (G)	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	
Class Volume (total)	36,487,009	1,069,404	1,069,404	1,069,404	1,069,404	131,064	131,064	131,064	41,788	41,788	39,889	
Truck Load Factor (Tlf)	0.0008	0.4	0.4	0.4	0.4	1	1	1	1.75	1.75	1.75	
Class ESAL's	29,190	427,762	427,762	427,762	427,762	131,064	131,064	131,064	73,130	73,130	69,806	2,349,493

Total Number of Trucks:	4,794,274
Directional Distribution Factor (Dd)	0.5
Lane Distribution Factor (DL)	0.9
Design ESAL's	1,057,272

Explanation:

AADT = Average Annual Daily Traffic
Single Unit Truck = FHWA Truck Class Scheme for categories 4 through 7.
Combo Unit Truck = FHWA Truck Class Scheme for categories 8 through 13.
Growth Factor (G) = used to convert an annual traffic volume to a cumulative volume over the design period
Truck Load Factor (Tlf) = Distribution of load factors for each vehicle Class
Directional Distribution Factor (Dd) = percentage of traffic moving in the peak travel direction
Lane Distribution Factor (DL) = percentage of trucks using the design lane
ESAL's = 18-kip Equivalent Single Axle Load

Table B-2: ESAL Calculations

Shaw North of Pioneer
With Project Construction
8/24/2021

Project Name:	Knutson Farms Industrial Park
Functional Class:	Major Arterial
Pavement Type:	Flexible

		AADT	Class 1-3	Class 4-7	Class 8-10	Class 11-13
Design Life (years):		5	5	5	5	5
Growth Rate (%):		5.7224	5.475	7.524	7.524	7.55
Data Year	2021	21,733	19209	2252	207	65
Future Year	2026	28,705	25,076	3,237	298	94

FHWA Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)												0.0
Class Volume (daily)	19,209	563	563	563	563	69	69	69	22	22	21	21,733
Growth Factor (G)	5.58	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	
Class Volume (total)	39,111,088	1,194,167	1,194,167	1,194,167	1,194,167	146,354	146,354	146,354	46,688	46,688	44,566	
Truck Load Factor (Tlf)	0.0008	0.4	0.4	0.4	0.4	1	1	1	1.75	1.75	1.75	
Class ESAL's	31,289	477,667	477,667	477,667	477,667	146,354	146,354	146,354	81,704	81,704	77,990	2,622,417

Total Number of Trucks:	5,353,672
Directional Distribution Factor (Dd)	0.5
Lane Distribution Factor (DL)	0.9
Design ESAL's	1,180,088

Explanation:

AADT = Average Annual Daily Traffic
Single Unit Truck = FHWA Truck Class Scheme for categories 4 through 7.
Combo Unit Truck = FHWA Truck Class Scheme for categories 8 through 13.
Growth Factor (G) = used to convert an annual traffic volume to a cumulative volume over the design period
Truck Load Factor (Tlf) = Distribution of load factors for each vehicle Class
Directional Distribution Factor (Dd) = percentage of traffic moving in the peak travel direction
Lane Distribution Factor (DL) = percentage of trucks using the design lane
ESAL's = 18-kip Equivalent Single Axle Load

Table B-3: ESAL Calculations

E. Pioneer East of 13th St. SE
No Build Option
8/24/2021

Project Name:	Knutson Farms Industrial Park
Functional Class:	Major Arterial
Pavement Type:	Flexible

		AADT	Class 1-3	Class 4-7	Class 8-10	Class 11-13
Design Life (years):		5	5	5	5	5
Growth Rate (%):		2	2	2	2	2
Data Year	2021	16,795	15373	1200	164	58
Future Year	2026	18,543	16,973	1,325	181	64

FHWA Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)												0.0
Class Volume (daily)	15,373	300	300	300	300	54	55	55	19	19	20	16,795
Growth Factor (G)	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	
Class Volume (total)	29,200,624	569,842	569,842	569,842	569,842	102,572	104,471	104,471	36,090	36,090	37,989	
Truck Load Factor (Tlf)	0.0008	0.4	0.4	0.4	0.4	1	1	1	1.75	1.75	1.75	
Class ESAL's	23,360	227,937	227,937	227,937	227,937	102,572	104,471	104,471	63,158	63,158	66,482	1,439,419
											Total Number of Trucks:	2,701,053
											Directional Distribution Factor (Dd)	0.5
											Lane Distribution Factor (DL)	0.9
											Design ESAL's	647,738

Explanation:

AADT = Average Annual Daily Traffic
Single Unit Truck = FHWA Truck Class Scheme for categories 4 through 7.
Combo Unit Truck = FHWA Truck Class Scheme for categories 8 through 13.
Growth Factor (G) = used to convert an annual traffic volume to a cumulative volume over the design period
Truck Load Factor (Tlf) = Distribution of load factors for each vehicle Class
Directional Distribution Factor (Dd) = percentage of traffic moving in the peak travel direction
Lane Distribution Factor (DL) = percentage of trucks using the design lane
ESAL's = 18-kip Equivalent Single Axle Load

Table B-4: ESAL Calculations

E. Pioneer East of 13th St. SE
With Project Construction
8/24/2021

Project Name:	Knutson Farms Industrial Park
Functional Class:	Major Arterial
Pavement Type:	Flexible

		AADT	Class 1-3	Class 4-7	Class 8-10	Class 11-13
Design Life (years):		5	5	5	5	5
Growth Rate (%):		7.515	7.245	10.28	10.279	10.28
Data Year	2021	16,795	15373	1200	164	58
Future Year	2026	24,128	21,809	1,957	267	95

FHWA Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)												0.0
Class Volume (daily)	15,373	300	300	300	300	54	55	55	19	19	20	16,795
Growth Factor (G)	5.78	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	
Class Volume (total)	32,426,353	672,245	672,245	672,245	672,245	121,002	123,242	123,242	42,576	42,576	44,816	
Truck Load Factor (Tlf)	0.0008	0.4	0.4	0.4	0.4	1	1	1	1.75	1.75	1.75	
Class ESAL's	25,941	268,898	268,898	268,898	268,898	121,002	123,242	123,242	74,507	74,507	78,429	1,696,462

Total Number of Trucks:	3,186,433
Directional Distribution Factor (Dd)	0.5
Lane Distribution Factor (DL)	0.9
Design ESAL's	763,408

Explanation:

AADT = Average Annual Daily Traffic
Single Unit Truck = FHWA Truck Class Scheme for categories 4 through 7.
Combo Unit Truck = FHWA Truck Class Scheme for categories 8 through 13.
Growth Factor (G) = used to convert an annual traffic volume to a cumulative volume over the design period
Truck Load Factor (Tlf) = Distribution of load factors for each vehicle Class
Directional Distribution Factor (Dd) = percentage of traffic moving in the peak travel direction
Lane Distribution Factor (DL) = percentage of trucks using the design lane
ESAL's = 18-kip Equivalent Single Axle Load

Table B-5: ESAL Calculations

E. Main Ave. North of 5th Ave. NE
No Build Option
8/24/2021

Project Name:	Knutson Farms Industrial Park
Functional Class:	Major Arterial
Pavement Type:	Flexible

		AADT	Class 1-3	Class 4-7	Class 8-10	Class 11-13
Design Life (years):		5	5	5	5	5
Growth Rate (%):		2	2	2	2	2
Data Year	2021	27,768	24175	3237	289	67
Future Year	2026	30,658	26,691	3,574	319	74

FHWA Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)												0.0
Class Volume (daily)	24,175	809	809	809	810	96	96	97	22	22	23	27,768
Growth Factor (G)	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	
Class Volume (total)	45,919,800	1,536,675	1,536,675	1,536,675	1,538,574	182,350	182,350	184,249	41,788	41,788	43,688	
Truck Load Factor (Tlf)	0.0008	0.4	0.4	0.4	0.4	1	1	1	1.75	1.75	1.75	
Class ESAL's	36,736	614,670	614,670	614,670	615,430	182,350	182,350	184,249	73,130	73,130	76,454	3,267,837
											Total Number of Trucks:	6,824,812
											Directional Distribution Factor (Dd)	0.5
											Lane Distribution Factor (DL)	0.9
											Design ESAL's	1,470,527

Explanation:

AADT = Average Annual Daily Traffic
Single Unit Truck = FHWA Truck Class Scheme for categories 4 through 7.
Combo Unit Truck = FHWA Truck Class Scheme for categories 8 through 13.
Growth Factor (G) = used to convert an annual traffic volume to a cumulative volume over the design period
Truck Load Factor (Tlf) = Distribution of load factors for each vehicle Class
Directional Distribution Factor (Dd) = percentage of traffic moving in the peak travel direction
Lane Distribution Factor (DL) = percentage of trucks using the design lane
ESAL's = 18-kip Equivalent Single Axle Load

Table B-6: ESAL Calculations

E. Main Ave. North of 5th Ave. NE
With Project Construction
8/24/2021

Project Name:	Knutson Farms Industrial Park
Functional Class:	Major Arterial
Pavement Type:	Flexible

		AADT	Class 1-3	Class 4-7	Class 8-10	Class 11-13
Design Life (years):		5	5	5	5	5
Growth Rate (%):		8.294	8.5065	6.82	6.76	6.9
Data Year	2021	27,768	24175	3237	289	67
Future Year	2026	41,359	36,362	4,502	401	94

FHWA Vehicle Class	1 - 3	4	5	6	7	8	9	10	11	12	13	Total
Distribution (%)												0.0
Class Volume (daily)	24,175	809	809	809	810	96	96	97	22	22	23	27,768
Growth Factor (G)	5.93	5.73	5.73	5.73	5.73	5.72	5.72	5.72	5.74	5.74	5.74	
Class Volume (total)	52,291,524	1,692,019	1,692,019	1,692,019	1,694,110	200,543	200,543	202,632	46,086	46,086	48,181	
Truck Load Factor (Tlf)	0.0008	0.4	0.4	0.4	0.4	1	1	1	1.75	1.75	1.75	
Class ESAL's	41,833	676,807	676,807	676,807	677,644	200,543	200,543	202,632	80,651	80,651	84,317	3,599,237

Total Number of Trucks:	7,514,238
Directional Distribution Factor (Dd)	0.5
Lane Distribution Factor (DL)	0.9
Design ESAL's	1,619,657

Explanation:

AADT = Average Annual Daily Traffic
Single Unit Truck = FHWA Truck Class Scheme for categories 4 through 7.
Combo Unit Truck = FHWA Truck Class Scheme for categories 8 through 13.
Growth Factor (G) = used to convert an annual traffic volume to a cumulative volume over the design period
Truck Load Factor (Tlf) = Distribution of load factors for each vehicle Class
Directional Distribution Factor (Dd) = percentage of traffic moving in the peak travel direction
Lane Distribution Factor (DL) = percentage of trucks using the design lane
ESAL's = 18-kip Equivalent Single Axle Load

Appendix C

Tables C-1 to C-3: Condition Factor and Remaining Life

Table C-1: Condition Factor and Remaining Life

E. Main Avenue
8/24/2021

E. Main Ave.							
	Coring Results						
Pavement Core Location	Asphaltic Concrete (AC) inch	Crushed Base (CB) inch	Core Structural Number SN-Core	FWD Tested Structural Number SN-FWD	Structural Number Reduction ΔSN	Condition Factor CF	Remaining Life RL (%)
C-01	10	7	5.31	3.5	1.81	0.66	6
C-02	4	2.5	2.09	1.05	1.04	0.50	0
C-03	6.5	PCCP		5.4			
C-04	6	7	3.55	1.75	1.80	0.49	0
C-05	9.5	11.5	5.68	3.8	1.88	0.67	6
C-06	8.5	1	3.87	2.1	1.77	0.54	3
C-07	9.5	8.5	5.29	4.1	1.19	0.78	23
C-08	7	3	3.47	2.7	0.77	0.78	23
Min	**4**	**1**	**2.09**	**1.05**	**0.77**	**0.49**	**0**
Max	**10**	**11.5**	**5.68**	**5.4**	**1.88**	**0.78**	**23**
Average	**7.63**	**5.79**	**4.18**	**3.05**	**1.46**	**0.63**	**9**

Table C-2: Condition Factor and Remaining Life

Shaw Road E
8/24/2021

Shaw Road E.							
	Coring Results						
Pavement Core Location	Asphaltic Concrete (AC) inch	Crushed Base (CB) inch	Core Structural Number SN-Core	FWD Tested Structural Number SN-FWD	Structural Number Reduction ΔSN	Condition Factor CF	Remaining Life RL (%)
C-09	7	3.5	3.54	3	0.54	0.85	38
C-10	7.5	3.5	3.76	2.8	0.96	0.75	18
C-11	7	3	3.47	2.8	0.67	0.81	28
C-12	7.75	4.25	3.96	3.3	0.66	0.83	32
C-13	6.75	4.25	3.52	3.3	0.22	0.94	68
C-14	7.5	4.5	3.89	3.2	0.69	0.82	30
C-15	6.5	5.5	3.58	3.1	0.48	0.87	44
C-16	7.25	3.75	3.68	3.2	0.48	0.87	44
Min	**6.5**	**3**	**3.47**	**2.8**	**0.22**	**0.75**	**18**
Max	**7.75**	**5.5**	**3.96**	**3.3**	**0.96**	**0.94**	**68**
Average	**7.16**	**4.03**	**3.67**	**3.09**	**0.59**	**0.84**	**38**

Table C-3: Condition Factor and Remaining Life

E. Pioneer Avenue

8/24/2021

E Pioneer Ave.							
	Coring Results						
Pavement Core Location	Asphaltic Concrete (AC) inch	Crushed Base (CB) inch	Core Structural Number SN-Core	FWD Tested Structural Number SN-FWD	Structural Number Reduction ΔSN	Condition Factor CF	Remaining Life RL (%)
C-17	9.75	PCCP		2.9			
C-18	5.5	1.5	2.62	2.2	0.42	0.84	38
C-19	10.25		4.51	3	1.51	0.67	8
C-20	5	3	2.59	2	0.59	0.77	23
C-21	5		2.20	2.5	-0.30	1.14	
C-22	5		2.20	3	-0.80	1.36	
C-23	4.25		1.87	3.5	-1.63	1.87	
C-24	4.5		1.98	3.5	-1.52	1.77	
C-25	12		5.28	4.1	1.18	0.78	23
C-26	5	3	2.59	2.4	0.19	0.93	63
C-27	8.25	4.75	4.25	3.6	0.65	0.85	38
C-28	5.75		2.53	2.75	-0.22	1.09	
Min	**4.25**	**1.5**	**1.87**	**2**	**-1.63**	**0.67**	**8**
Max	**12**	**4.75**	**5.28**	**4.1**	**1.51**	**1.87**	**63**
Average	**6.69**	**3.06**	**2.96**	**2.95**	**0.01**	**1.10**	**32**
Average without Highlighted			**3.64**	**2.88**	**0.76**	**0.80**	**32**

Attachment C – Intersection Traffic Queue Estimates

Intersection Summary - AM Peak Hour

Node	Intersection	Existing 2021		No Action 2026		Scenario A		Scenario B		Scenario C		Scenario D		Scenario E		Signalized/Unsignalized
		Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	
100	Traffic Ave/Fryar Ave & Main St/Cannery Wy	25.7	C	42.9	D	45.7	D	38.0	D	45.8	D	45.7	D	18.3	B	S
200	Traffic Ave & State St	2.3	A	14.4	B	16.2	B	6.8	A	17.6	B	17.0	B	2.3	A	S
300	E Main Ave & SR 410 WB /Thompson St	15.8	B	20.6	C	19.9	B	28.8	C	14.8	B	19.1	B	7.5	A	S
400	E Main Ave & SR 410 EB	14.5	B	16.6	B	23.9	C	74.8	E	22.0	C	21.5	C	14.7	B	S
500	E Main Ave & 5th Ave NE	7.0	A	7.1	A	7.3	A	115.5	F	7.3	A	7.1	A	7.1	A	U
600	E Main Ave & Shaw Rd E	11.1	B	12.4	B	14.6	B	36.5	D	14.9	B	14.1	B	14.9	B	S
700	E Main Ave 15th St SE	6.4	A	7.4	A	8.3	A	8.1	A	8.3	A	7.9	A	7.9	A	S
800	E Main Ave & 5th St SE	9.0	A	10.0	A	10.7	B	10.4	B	10.4	B	10.4	B	11.9	B	S
900	E Main Ave/W Stewart Ave & 2nd St NE	11.4	B	12.3	B	15.0	B	14.7	B	14.9	B	13.9	B	15.0	B	S
1000	N Meridian Ave & SR 167 EB	30.9	C	31.4	C	31.4	C	60.6	E	31.4	C	31.9	C	28.5	C	S
1100	N Meridian Ave & SR 167 WB	19.9	B	21.4	C	21.4	C	52.0	D	21.4	C	21.8	C	16.0	B	S
1200	N Meridian Ave & Valley Ave NE	25.9	C	26.6	C	26.6	C	31.0	C	26.6	C	26.7	C	32.8	C	S
1300	E Pioneer & SR 512 WB ramps	18.0	B	18.6	B	20.5	C	23.1	C	20.4	C	19.9	B	22.3	C	S
1400	E Pioneer & SR 512 EB ramps	9.8	A	10.3	B	11.4	B	10.9	B	11.1	B	10.6	B	9.7	A	S
1500	E Pioneer & 13th St SE	8.7	A	8.9	A	10.0	B	11.8	B	10.2	B	9.4	A	10.1	B	U
1600	E Pioneer & 15th St SE	5.0	A	5.5	A	5.8	A	6.4	A	5.7	A	5.6	A	5.9	A	S
1700	E Pioneer & 21st St SE	6.5	A	6.9	A	7.4	A	3.4	A	7.4	A	7.3	A	8.1	A	S
1800	E Pioneer & 25th St SE	11.8	B	11.6	B	15.0	C	26.5	C	14.8	B	14.1	B	15.4	C	U
1900	E Pioneer & Shaw Rd E	28.6	C	33.0	C	42.9	D	76.9	E	43.1	D	41.5	D	34.1	C	S
2000	E Pioneer & 33rd St SE	6.7	A	9.4	A	8.9	A	29.1	C	8.1	A	8.7	A	8.3	A	U
2100	33rd St SE & 80th Ave SE	8.6	A	7.7	A	9.3	A	14.7	B	9.3	A	9.3	A	7.2	A	U
2200	Shaw Rd E & Highlands Blvd	15.9	C	23.2	C	27.1	D	169.6	F	28.2	D	20.4	C	17.7	C	U
2300	Shaw Rd E & 16 th Ave SE	13.0	B	17.7	C	26.0	D	102.5	F	25.4	D	16.9	C	14.7	B	U
2400	Shaw Rd E & 23rd Ave SE/Crystal Ridge Dr SE	16.9	B	18.9	B	21.5	C	40.1	D	21.5	C	19.3	B	20.2	C	S
2500	Shaw Rd E & Forest Green Blvd	10.2	B	12.7	B	12.7	B	17.2	B	12.9	B	12.2	B	14.4	B	U
2600	Shaw Rd E & Manorwood Dr	9.5	A	11.1	B	11.7	B	12.8	B	11.9	B	11.5	B	10.9	B	U
2700	Shaw Rd E & 39th Ave SE	12.5	B	14.4	B	16.0	B	14.9	B	15.9	B	15.1	B	32.6	C	S
2800	Shaw Rd E and 5th Ave SE*	0.7	A	0.8	A	15.0	B	104.2	F	14.9	B	8.4	A	6.8	A	U/S
2900	33rd St SE & 5th Ave SE	0.4	A	0.7	A	0.7	A	0.5	A	0.8	A	0.8	A	0.5	A	U
3000	Shaw Rd E & Safeway Driveway	8.1	A	8.3	A	13.4	B	93.6	F	13.2	B	11.3	B	5.5	A	S
3100	80th St & Driveway	0.6	A	0.9	A	5.9	A	5.9	A	5.9	A	5.4	A	5.8	A	U
3200	SR 162 and W Pioneer	19.7	B	24.0	C	24.0	C	23.9	C	23.9	C	24.2	C	32.3	C	S
3300	SR 162 & 80th St	10.3	B	13.1	B	12.3	B	12.6	B	12.6	B	12.3	B	5.7	A	U
3400	SR 162 & SR 410 EB	14.2	B	17.7	B	21.3	C	21.7	C	21.2	C	21.2	C	13.6	B	S
3500	SR 162 & SR 410 WB	14.9	B	16.8	B	18.0	B	18.2	B	17.9	B	18.2	B	19.2	B	S

Travel Time Summary - AM Peak Hour

	Segment	Distance (miles)	Existing	No-Build 2026	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
			Travel Time (min)	Travel Time (min)	Travel Time (min)	Travel Time (min)	Travel Time (min)	Travel Time (min)	Travel Time (min)
1	E Pioneer, 7th to 33rd EB	1.68	4.17	4.52	4.47	4.45	4.45	4.40	4.68
2	E Pioneer, 33rd to 7th WB	1.68	4.20	4.26	4.35	4.28	4.34	4.34	4.24
3	Shaw/39th to Main/State NB	2.38	4.33	6.13	6.93	7.12	6.35	6.60	5.56
4	Traffic/State to Shaw/39th SB	2.38	4.26	5.96	6.49	6.97	5.98	6.35	6.18

Intersection Summary - PM Peak Hour

Node	Intersection	Existing 2021		No Action 2026		Scenario A		Scenario B		Scenario C		Scenario D		Scenario E		Signalized/Unsignalized
		Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	Delay (sec/veh)	Estimated LOS	
100	Traffic Ave/Fryar Ave & Main St/Cannery Wy	37.7	D	63.7	E	71.7	E	76.1	E	45.0	D	63.1	E	41.1	D	S
200	Traffic Ave & State St	2.9	A	44.8	D	69.3	E	80.1	F	47.4	D	42.1	D	42.5	D	S
300	E Main Ave & SR 410 WB /Thompson St	28.6	C	60.1	E	103.1	F	111.4	F	82.4	F	89.1	F	74.5	E	S
400	E Main Ave & SR 410 EB	17.3	B	35.7	D	157.4	F	168.7	F	64.7	E	94.4	F	32.3	C	S
500	E Main Ave & 5th Ave NE	7.3	A	7.4	A	154.6	F	136.5	F	29.1	D	16.7	C	19.5	C	U
600	E Main Ave & Shaw Rd E	16.6	B	21.1	C	56.9	E	88.3	F	31.1	C	26.2	C	29.6	C	S
700	E Main Ave 15th St SE	9.3	A	10.2	B	10.8	B	10.9	B	11.5	B	10.6	B	10.7	B	S
800	E Main Ave & 5th St SE	13.9	B	15.2	B	16.2	B	15.9	B	17.6	B	16.5	B	17.0	B	S
900	E Main Ave/W Stewart Ave & 2nd St NE	9.8	A	10.6	B	11.5	B	11.3	B	11.8	B	11.4	B	11.7	B	S
1000	N Meridian Ave & SR 167 EB	24.3	C	30.0	C	30.1	C	30.1	C	30.1	C	30.6	C	30.6	C	S
1100	N Meridian Ave & SR 167 WB	9.7	A	12.8	B	12.9	B	12.9	B	12.9	B	13.0	B	13.0	B	S
1200	N Meridian Ave & Valley Ave NE	49.0	D	138.4	F	138.4	F	138.4	F	138.4	F	138.9	F	138.9	F	S
1300	E Pioneer & SR 512 WB ramps	23.7	C	34.4	C	21.0	C	19.8	B	24.8	C	20.4	C	23.7	C	S
1400	E Pioneer & SR 512 EB ramps	8.9	A	15.2	B	11.2	B	11.1	B	11.9	B	10.4	B	11.1	B	S
1500	E Pioneer & 13th St SE	10.3	B	11.2	B	13.7	B	13.3	B	12.5	B	12.1	B	11.2	B	U
1600	E Pioneer & 15th St SE	10.7	B	11.6	B	12.6	B	13.2	B	14.9	B	12.5	B	14.9	B	S
1700	E Pioneer & 21st St SE	9.3	A	9.6	A	10.2	B	4.3	A	11.8	B	9.7	A	9.2	A	S
1800	E Pioneer & 25th St SE	16.2	C	17.5	C	74.9	F	44.6	D	31.5	C	21.8	C	18.3	C	U
1900	E Pioneer & Shaw Rd E	38.9	D	49.2	D	84.0	F	138.3	F	73.9	E	66.6	E	53.8	D	S
2000	E Pioneer & 33rd St SE	9.2	A	13.8	B	14.4	B	171.7	F	34.1	D	13.8	B	15.0	C	U
2100	33rd St SE & 8th Ave SE	7.4	A	8.1	A	8.6	A	163.4	F	9.4	A	8.2	A	8.0	A	U
2200	Shaw Rd E & Highlands Blvd	19.9	C	36.3	E	51.5	F	216.7	F	63.2	F	55.7	F	68.5	F	U
2300	Shaw Rd E & 16 th Ave SE	25.7	D	33.1	D	42.4	E	69.0	E	45.7	E	38.1	E	46.7	E	U
2400	Shaw Rd E & 23rd Ave SE/Crystal Ridge Dr SE	24.5	C	41.1	D	39.9	D	109.8	F	54.9	D	41.4	D	44.8	D	S
2500	Shaw Rd E & Forest Green Blvd	15.4	C	22.3	C	22.0	C	17.1	B	22.2	C	22.3	C	24.9	C	U
2600	Shaw Rd E & Manorwood Dr	15.4	C	26.2	D	21.3	C	15.3	B	22.7	C	20.8	C	28.0	D	U
2700	Shaw Rd E & 39th Ave SE	32.6	C	75.7	E	70.2	E	44.7	D	44.3	D	75.8	E	49.3	D	S
2800	Shaw Rd E and 5th Ave SE	1.1	A	1.3	A	62.7	E	120.1	F	41.5	D	38.2	D	10.9	B	U/S
2900	33rd St SE & 5th Ave SE*	0.1	A	0.5	A	6.6	A	6.6	A	6.6	A	6.3	A	6.3	A	U
3000	Shaw Rd E & Safeway Driveway	11.4	B	13.5	B	14.6	B	75.4	E	20.4	C	12.1	B	10.8	B	S
3100	80th St & Driveway	1.3	A	1.2	A	7.6	A	5.9	A	7.5	A	6.8	A	6.7	A	U
3200	SR 162 and W Pioneer	20.7	C	24.3	C	25.3	C	25.2	C	30.7	C	24.9	C	30.1	C	S
3300	SR 162 & 80th St	20.7	C	28.3	D	85.5	F	12.6	B	52.9	F	42.7	E	46.5	E	S
3400	SR 162 & SR 410 EB	12.8	B	15.9	B	16.1	B	16.6	B	25.4	C	16.3	B	24.1	C	S
3500	SR 162 & SR 410 WB	15.4	B	20.4	C	21.5	C	21.8	C	22.1	C	21.0	C	21.8	C	S

Travel Time Summary - PM Peak Hour

	Segment	Distance (miles)	Existing	No-Build 2026	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
			Travel Time (min)	Travel Time (min)	Travel Time (min)	Travel Time (min)	Travel Time (min)	Travel Time (min)	Travel Time (min)
1	E Pioneer, 7th to 33rd EB	1.68	5.00	5.34	6.63	7.23	6.11	5.70	5.53
2	E Pioneer, 33rd to 7th WB	1.68	5.07	4.68	5.29	7.29	5.39	4.82	4.94
3	Shaw/39th to Main/State NB	2.38	6.02	6.54	14.82	14.28	7.15	9.05	5.95
4	Traffic/State to Shaw/39th SB	2.38	7.92	9.00	11.03	20.83	11.67	10.85	10.28

2021 Existing AM

Node #	Primary Road	Secondary Road	Signalized? (Y/N)	Approach	Movement	Movement						Intersection
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	80	79	99%	19.2	53	38	25.7
					EBT	75	78	104%	20.3	53	41	
					EBR	113	110	97%	5.1	64	50	
				WB	WBL	47	47	100%	17.8	33	24	
					WBT	104	104	100%	22.6	90	67	
					WBR	31	33	106%	17.8	104	79	
				NB	NBL	310	301	97%	33.6	499	332	
					NBT	586	587	100%	28.6	654	469	
					NBR	91	93	102%	14.7	67	50	
				NE	NER	7	9	129%	5.2	26	11	
				SB	SBL	16	15	94%	45.4	22	13	
					SBT	166	163	98%	33.6	131	101	
					SBR	33	34	103%	16.4	162	139	
200	Traffic Ave	State St	Y	EB	EBL	16	18	113%	34.6	36	12	2.3
					EBR	3	3	100%	7.3	19	3	
				NB	NBL	7	7	100%	28.7	12	6	
					NBT	971	969	100%	1.8	130	40	
				SB	SBT	318	314	99%	1.3	38	20	
					SBR	7	5	71%	2.4	18	5	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	157	154	98%	45.6	159	123	15.8
					EBT	11	10	91%	37.2	17	6	
					EBR	122	124	102%	7.9	54	47	
				WB	WBL	40	39	98%	41.6	47	29	
					WBT	44	44	100%	44.0	50	33	
					WBR	12	13	108%	8.6	19	11	
				NB	NBL	338	340	101%	19.3	302	183	
					NBT	809	812	100%	8.7	251	153	
					NBR	100	101	101%	8.6	251	153	
				SB	SBL	2	1	50%	9.7	2	0	
					SBT	184	182	99%	15.5	157	97	
					SBR	135	134	99%	10.5	211	150	
400	E Main Ave	SR 410 EB	Y	EB	EBL	358	367	103%	35.3	323	265	14.5
					EBR	219	210	96%	7.8	68	53	
				NB	NBL	102	104	102%	14.4	57	35	
					NBT	889	887	100%	11.1	227	166	
				SB	SBT	284	282	99%	5.5	82	62	
					SBR	62	64	103%	4.3	68	46	
500	E Main Ave	5th Ave NE	N	EB	EBL	18	17	94%	7.0	33	22	7.0
					EBR	10	10	100%	5.9	0	0	
				NB	NBL	28	30	107%	1.9	15	5	
					NBT	973	976	100%	0.3	0	0	
				SB	SBT	462	453	98%	0.4	0	0	
					SBR	41	38	93%	1.0	0	0	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	263	260	99%	18.5	80	66	11.1
					EBR	50	51	102%	5.6	70	55	
				WB	WBL	255	258	101%	16.3	77	65	
					WBT	217	203	94%	7.9	66	50	
				NB	NBL	155	153	99%	14.9	85	61	
					NBR	738	747	101%	7.2	160	105	
700	E Main Ave	15th St SE	Y	EB	EBL	2	2	100%	7.5	3	0	6.4
					EBT	206	204	99%	10.0	75	57	
					EBR	35	36	103%	5.9	5	0	
				WB	WBL	59	55	93%	4.0	21	11	
					WBT	288	274	95%	5.0	76	53	
					WBR	25	25	100%	0.7	2	0	
				NB	NBL	85	85	100%	10.5	60	40	
					NBT	28	25	89%	11.1	60	40	
					NBR	105	106	101%	0.8	0	0	
				SB	SBL	2	3	150%	12.4	13	6	
					SBT	11	9	82%	9.8	13	6	
					SBR	0	0	100%	0.0	21	11	
800	E Main Ave	5th Ave SE	Y	EB	EBL	0	0	100%	0.0	0	0	9.0
					EBT	192	192	100%	8.8	100	73	
					EBR	5	4	80%	8.0	121	93	
				WB	WBL	36	39	108%	9.0	21	14	
					WBT	238	226	95%	9.5	100	70	
					WBR	81	77	95%	7.7	127	97	
				NB	NBL	11	11	100%	13.4	15	7	
					NBT	22	21	95%	13.7	39	25	
					NBR	117	119	102%	6.5	67	53	
				SB	SBL	43	40	93%	12.7	28	22	
					SBT	23	24	104%	10.3	16	10	
					SBR	3	3	100%	4.4	34	26	
900	E Main Ave	2nd St SE	Y	EB	EBL	42	44	105%	28.0	48	28	11.4
					EBT	197	197	100%	26.9	135	113	
				NB	NBL	54	56	104%	5.8	109	81	
					NBT	764	758	99%	5.3	109	81	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	85	83	98%	28.7	67	49	
					WBR	167	158	95%	9.7	111	93	

2021 Existing AM

Node #	Primary Road	Secondary Road	Signalized? (Y/N)	Approach	Movement	Movement						Intersection
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	1030	1017	99%	44.5	527	372	**30.9**
				NB	NBT	666	657	99%	32.1	279	234	
					NBR	500	497	99%	3.0	0	0	
				SB	SBL	466	460	99%	42.9	343	283	
					SBT	434	422	97%	16.0	162	123	
1100	Meridian	SR 167 WBR	Y	WB	WBR	1113	1121	101%	84.9	806	553	**19.9**
				NB	NBT	666	658	99%	14.7	59	48	
				SB	SBT	900	891	99%	3.6	30	8	
1200	Meridian	Valley Ave	Y	EB	EBL	22	21	95%	56.3	35	21	**25.9**
					EBT	146	148	101%	51.9	119	93	
					EBR	295	293	99%	27.5	192	153	
				WB	WBL	244	240	98%	59.8	150	131	
					WBT	137	137	100%	42.2	103	84	
					WBR	56	54	96%	17.4	138	119	
				NB	NBL	500	499	100%	34.1	296	235	
					NBT	962	965	100%	13.6	285	239	
					NBR	317	314	99%	2.5	43	20	
				SB	SBL	29	31	107%	56.2	39	24	
					SBT	361	355	98%	25.2	190	137	
					SBR	18	16	89%	6.3	4	0	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	289	289	100%	10.6	85	63	**18.0**
					EBR	32	34	106%	7.2	122	101	
				WB	WBL	146	139	95%	44.2	140	111	
					WBT	308	305	99%	2.4	43	31	
				NB	NBL	120	122	102%	52.1	131	98	
					NBR	50	47	94%	6.0	62	49	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	236	237	100%	7.4	74	49	**9.8**
					EBR	103	100	97%	4.5	52	28	
				WB	WBL	44	45	102%	49.5	54	44	
					WBT	394	384	97%	4.3	64	44	
				NB	NBL	60	60	100%	40.6	67	39	
					NBR	249	247	99%	8.1	110	56	
1500	E Pioneer	13th St SE	N	EB	EBT	469	469	100%	0.2	0	0	**8.7**
					EBR	16	15	94%	0.6	0	0	
				WB	WBL	17	17	100%	2.2	7	3	
					WBT	412	406	99%	0.1	0	0	
				NB	NBL	26	25	96%	8.7	32	22	
					NBR	43	46	107%	6.0	44	34	
1600	E Pioneer	15th St SE	Y	EB	EBL	198	199	101%	2.8	53	27	**5.0**
					EBT	314	314	100%	5.0	53	42	
				WB	WBT	361	358	99%	4.5	67	49	
					WBR	67	65	97%	3.3	23	13	
				SB	SBL	34	35	103%	11.7	0	0	
					SBR	68	66	97%	12.6	2	0	
1700	E Pioneer	21st St	Y	EB	EBT	333	333	100%	8.7	72	57	**6.5**
					EBR	15	17	113%	5.4	27	14	
				WB	WBL	47	47	100%	3.7	44	30	
					WBT	407	404	99%	1.9	44	30	
				NB	NBL	21	19	90%	16.3	19	12	
					NBR	49	52	106%	27.9	54	42	
1800	E Pioneer	25th St SE	N	EB	EBT	373	375	101%	0.4	0	0	**11.8**
					EBR	9	10	111%	0.8	0	0	
				WB	WBL	0	0	100%	0.0	0	0	
					WBT	445	438	98%	0.3	0	0	
				NB	NBL	10	13	130%	11.8	27	20	
					NBR	5	6	120%	5.4	27	19	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	151	156	103%	43.0	170	105	**28.6**
					EBT	135	135	100%	37.7	128	94	
					EBR	71	69	97%	6.3	86	69	
				WB	WBL	78	77	99%	40.0	83	58	
					WBT	204	205	100%	41.4	242	196	
					WBR	74	73	99%	32.0	114	50	
				NB	NBL	143	138	97%	47.8	79	66	
					NBT	666	666	100%	18.7	236	164	
					NBR	47	50	106%	13.7	282	210	
				SB	SBL	28	27	96%	53.0	41	31	
					SBT	236	240	102%	22.7	107	92	
					SBR	41	40	98%	23.0	107	92	
2000	E Pioneer	33rd St SE	N	EB	EBL	26	27	104%	5.8	41	16	**6.7**
					EBT	184	183	99%	2.6	34	17	
				WB	WBT	282	281	100%	1.6	42	27	
					WBR	1	1	100%	0.5	8	0	
				SB	SBL	1	1	100%	6.7	46	39	
					SBR	74	74	100%	5.5	10	4	
2100	33rd St SE	80th St	N	WB	WBL	71	70	99%	0.6	0	0	**8.6**
					WBR	1	1	100%	0.4	0	0	
				NB	NBT	9	10	111%	8.6	28	13	
					NBR	18	19	106%	0.8	0	0	
				SB	SBL	0	0	100%	0.0	26	4	
					SBT	4	6	150%	8.3	34	5	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	4	3	75%	15.9	20	5	**15.9**
					WBR	64	68	106%	13.9	68	56	
				NB	NBT	794	785	99%	2.2	4	0	
					NBR	2	2	100%	2.2	0	0	
				SB	SBL	11	12	109%	7.5	13	4	
					SBT	266	265	100%	1.5	0	0	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	16	18	113%	13.0	24	11	**13.0**
					EBR	3	3	100%	7.5	14	3	
				NB	NBL	3	4	133%	5.2	19	0	
					NBT	780	769	99%	4.4	17	0	
				SB	SBT	268	266	99%	0.9	0	0	
					SBR	2	2	100%	1.4	0	0	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	91	90	99%	50.1	110	73	**16.9**
					EBT	11	12	109%	51.2	26	16	
					EBR	31	31	100%	12.0	57	43	
				WB	WBL	15	16	107%	47.7	26	11	
					WBT	23	25	109%	59.6	55	24	
					WBR	21	20	95%	20.6	90	57	
				NB	NBL	39	42	108%	13.5	17	7	
					NBT	671	664	99%	12.0	347	224	
					NBR	5	4	80%	9.1	10	0	
				SB	SBL	4	3	75%	27.0	2	0	
					SBT	229	227	99%	12.2	86	59	
					SBR	38	37	97%	4.9	20	8	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	9	9	100%	10.2	42	29	**10.2**
					EBR	30	29	97%	6.6	41	28	
				NB	NBL	13	13	100%	3.9	6	2	
					NBT	706	700	99%	2.7	0	0	
				SB	SBT	274	273	100%	2.6	0	0	

2021 Existing AM

Node #	Primary Road	Secondary Road	Signalized? (Y/N)	Approach	Movement	Movement						Intersection
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
					SBR	1	1	100%	2.8	0	0	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	16	18	113%	9.5	28	18	**9.5**
					EBR	8	6	75%	6.8	20	8	
				NB	NBL	1	1	100%	5.6	1	0	
					NBT	703	698	99%	2.2	0	0	
				SB	SBT	298	295	99%	2.0	0	0	
					SBR	6	6	100%	2.1	0	0	
2700	Shaw Rd E	39th Ave SE	Y	EB	EBL	119	119	100%	21.6	76	61	**12.5**
					EBT	0	0	100%	0.0	76	61	
					EBR	134	134	100%	6.2	83	69	
				WB	WBL	0	0	100%	0.0	7	2	
					WBT	2	2	100%	32.5	7	2	
					WBR	2	4	200%	8.5	2	0	
				NB	NBL	339	344	101%	19.7	165	131	
					NBT	583	577	99%	7.2	221	124	
					NBR	0	0	100%	0.0	233	146	
				SB	SBL	0	0	100%	0.0	0	0	
					SBT	119	194	163%	17.3	96	81	
					SBR	111	106	95%	6.7	28	12	
2800	Shaw Rd E	5th Ave SE (Future)	N	WB	WBL	0	0	100%	0.0	9	5	**0.7**
					WBR	2	4	200%	8.6	14	7	
				NB	NBT	891	892	100%	0.7	0	0	
					NBR	0	0	100%	0.0	0	0	
				SB	SBL	0	0	100%	0.0	0	0	
					SBT	305	308	101%	0.5	0	0	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	0	0	**0.4**
					EBR	0	0	100%	0.0	0	0	
				NB	NBL	0	0	100%	0.0	0	0	
					NBT	10	10	100%	0.4	0	0	
				SB	SBT	4	6	150%	0.0	0	0	
					SBR	0	0	100%	0.0	0	0	
3000	Shaw Rd E	Safeway	Y	EB	EBL	87	86	99%	61.5	99	83	**8.1**
					EBR	42	41	98%	8.0	56	47	
				NB	NBL	89	84	94%	5.9	18	7	
					NBT	769	770	100%	4.7	79	59	
				SB	SBT	302	300	99%	3.8	56	35	
					SBR	83	85	102%	1.6	26	13	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	3	3	100%	0.6	1	0	**0.6**
					EBT	18	16	89%	0.1	0	0	
				WB	WBT	72	71	99%	0.1	0	0	
					WBR	0	0	100%	0.0	0	0	
				SB	SBL	0	0	100%	0.0	0	0	
					SBR	0	0	100%	0.0	0	0	
3200	SR 162	Pioneer	Y	EB	EBL	28	28	100%	58.2	42	32	**19.7**
					EBT	4	5	125%	51.1	42	32	
					EBR	101	99	98%	6.2	50	44	
				WB	WBL	7	6	86%	60.6	51	27	
					WBT	16	14	88%	57.2	51	27	
					WBR	20	20	100%	16.2	84	36	
				NB	NBL	231	224	97%	64.5	274	196	
					NBT	512	506	99%	4.3	93	60	
					NBR	2	2	100%	2.8	2	0	
				SB	SBL	4	5	125%	65.4	12	5	
					SBT	269	260	97%	9.5	126	73	
					SBR	35	34	97%	6.3	182	121	
3300	SR 162	80th St	N	EB	EBL	14	15	107%	10.3	17	11	**10.3**
					EBR	1	1	100%	6.5	8	0	
				NB	NBL	9	10	111%	1.8	5	0	
					NBT	551	547	99%	0.9	0	0	
				SB	SBT	307	300	98%	0.9	3	0	
					SBR	63	62	98%	2.8	18	8	
3400	SR 162	EB	Y	EB	EBL	154	151	98%	42.1	134	105	**14.2**
					EBR	200	196	98%	6.9	68	56	
				NB	NBT	661	655	99%	12.5	273	196	
					NBR	32	31	97%	12.3	41	6	
				SB	SBL	56	54	96%	11.2	32	16	
					SBT	149	144	97%	3.8	40	21	
3500	SR 162	WB	Y	WB	WBL	74	73	99%	46.1	91	51	**14.9**
					WBR	107	104	97%	5.3	9	0	
				NB	NBL	279	279	100%	41.0	247	194	
					NBT	536	527	98%	2.2	68	46	
				SB	SBT	131	125	95%	10.3	61	36	
					SBR	108	109	101%	3.0	4	0	

2021 Existing PM

						Movement						Intersection
Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	88	86	98%	63.4	236	78	**37.7**
					EBT	239	230	96%	73.8	706	404	
					EBR	358	353	99%	30.1	389	165	
				WB	WBL	107	100	93%	50.3	108	74	
					WBT	155	153	99%	58.9	254	173	
					WBR	45	42	93%	47.1	148	90	
				NB	NBL	196	193	98%	56.7	211	167	
					NBT	296	291	98%	17.1	190	139	
					NBR	83	84	101%	5.8	63	42	
				NE	NER	11	11	100%	7.7	35	16	
				SB	SBL	85	81	95%	65.3	91	72	
					SBT	516	518	100%	23.4	220	183	
					SBR	115	114	99%	17.7	253	225	
200	Traffic Ave	State St	Y	EB	EBL	26	22	85%	22.5	27	14	**2.9**
					EBR	9	9	100%	10.2	27	7	
				NB	NBL	17	16	94%	15.1	20	13	
					NBT	549	544	99%	1.4	66	28	
				SB	SBT	963	946	98%	3.0	115	86	
					SBR	2	3	150%	4.3	82	53	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	88	90	102%	43.0	95	68	**28.6**
					EBT	12	13	108%	38.6	18	9	
					EBR	261	255	98%	15.3	133	103	
				WB	WBL	269	265	99%	40.9	247	188	
					WBT	137	138	101%	37.6	118	93	
					WBR	11	11	100%	11.7	13	7	
				NB	NBL	290	260	90%	31.9	227	172	
					NBT	467	459	98%	11.8	184	126	
					NBR	159	147	92%	13.9	184	126	
				SB	SBL	9	9	100%	24.2	8	2	
					SBT	622	618	99%	35.2	452	377	
					SBR	341	324	95%	36.5	506	432	
400	E Main Ave	SR 410 EB	Y	EB	EBL	263	262	100%	37.2	185	147	**17.3**
					EBR	561	557	99%	16.3	342	258	
				NB	NBL	220	202	92%	44.7	179	147	
					NBT	653	607	93%	8.1	147	112	
				SB	SBT	1049	1037	99%	13.5	460	346	
					SBR	103	99	96%	9.7	445	332	
500	E Main Ave	5th Ave NE	N	EB	EBL	50	49	98%	7.3	53	39	**7.3**
					EBR	51	45	88%	6.3	7	3	
				NB	NBL	38	37	97%	4.0	33	20	
					NBT	823	767	93%	0.4	0	0	
				SB	SBT	1568	1553	99%	1.1	0	0	
					SBR	42	40	95%	1.2	0	0	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	347	324	93%	22.1	96	79	**16.6**
					EBR	179	176	98%	10.1	104	89	
				WB	WBL	976	954	98%	25.2	249	221	
					WBT	643	636	99%	8.7	240	165	
				NB	NBL	156	147	94%	23.0	97	67	
					NBR	514	482	94%	7.0	86	60	
700	E Main Ave	15th St SE	Y	EB	EBL	5	4	80%	10.2	5	0	**9.3**
					EBT	369	352	95%	15.6	140	107	
					EBR	101	102	101%	7.4	17	11	
				WB	WBL	228	214	94%	5.3	52	42	
					WBT	509	502	99%	6.7	135	98	
					WBR	62	61	98%	0.9	4	0	
				NB	NBL	75	74	99%	17.6	53	42	
					NBT	23	23	100%	18.2	53	42	
					NBR	111	108	97%	0.8	0	0	
				SB	SBL	46	45	98%	18.4	53	38	
					SBT	38	36	95%	17.8	53	38	
					SBR	11	12	109%	11.1	72	56	
800	E Main Ave	5th Ave SE	Y	EB	EBL	5	5	100%	18.6	7	2	**13.9**
					EBT	276	292	106%	14.3	144	105	
					EBR	27	28	104%	11.5	168	130	
				WB	WBL	173	161	93%	13.5	53	41	
					WBT	476	455	96%	13.3	202	140	
					WBR	80	74	93%	12.7	230	164	
				NB	NBL	15	15	100%	23.1	14	9	
					NBT	39	38	97%	21.4	53	29	
					NBR	71	69	97%	9.4	81	55	
				SB	SBL	72	69	96%	15.2	43	31	
					SBT	79	80	101%	15.4	45	38	
					SBR	9	8	89%	8.5	74	65	
900	E Main Ave	2nd St SE	Y	EB	EBL	52	56	108%	10.2	32	18	**9.8**
					EBT	308	299	97%	9.4	93	74	
				NB	NBL	71	65	92%	10.0	120	101	
					NBT	678	650	96%	10.0	120	101	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	258	251	97%	11.0	105	80	

2021 Existing PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
					WBR	242	225	93%	8.1	122	102	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	727	727	100%	49.4	331	293	**24.3**
				NB	NBT	553	555	100%	39.4	357	222	
					NBR	1256	1237	98%	6.5	0	0	
				SB	SBL	971	915	94%	32.6	431	424	
					SBT	868	865	100%	10.3	202	157	
1100	Meridian	SR 167 WBR	Y	WB	WBR	627	618	99%	38.3	180	144	**9.7**
				NB	NBT	553	557	101%	16.9	54	37	
				SB	SBT	1839	1799	98%	14.0	243	207	
1200	Meridian	Valley Ave	Y	EB	EBL	49	47	96%	64.4	67	49	**49.0**
					EBT	323	320	99%	51.3	195	153	
					EBR	543	520	96%	74.3	584	372	
				WB	WBL	609	606	100%	92.8	645	423	
					WBT	147	147	100%	34.4	89	73	
					WBR	61	57	93%	14.6	124	108	
				NB	NBL	428	405	95%	30.0	220	163	
					NBT	482	478	99%	16.7	154	127	
					NBR	270	271	100%	3.6	72	46	
				SB	SBL	15	14	93%	78.3	29	14	
					SBT	687	687	100%	46.8	454	313	
					SBR	12	13	108%	20.5	1	0	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	433	426	98%	14.8	145	95	**23.7**
					EBR	87	89	102%	11.5	182	132	
				WB	WBL	372	351	94%	59.1	431	300	
					WBT	445	429	96%	3.0	53	41	
				NB	NBL	84	84	100%	52.1	95	65	
					NBR	61	58	95%	5.3	50	37	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	410	394	96%	7.4	76	60	**8.9**
					EBR	84	84	100%	5.9	56	36	
				WB	WBL	34	32	94%	49.9	36	28	
					WBT	748	716	96%	5.4	121	89	
				NB	NBL	69	72	104%	39.0	60	52	
					NBR	315	306	97%	8.6	87	58	
1500	E Pioneer	13th St SE	N	EB	EBT	676	653	97%	0.2	0	0	**10.3**
					EBR	49	48	98%	0.7	0	0	
				WB	WBL	60	55	92%	4.0	20	11	
					WBT	761	731	96%	0.2	0	0	
				NB	NBL	21	19	90%	10.3	25	16	
					NBR	45	45	100%	6.6	39	29	
1600	E Pioneer	15th St SE	Y	EB	EBL	149	148	99%	2.8	32	20	**10.7**
					EBT	572	550	96%	10.1	82	65	
				WB	WBT	509	483	95%	9.9	100	84	
					WBR	59	56	95%	7.9	52	38	
				SB	SBL	151	152	101%	13.3	0	0	
					SBR	312	305	98%	16.2	4	2	
1700	E Pioneer	21st St	Y	EB	EBT	691	667	97%	11.8	103	86	**9.3**
					EBR	32	33	103%	8.7	54	37	
				WB	WBL	82	76	93%	7.5	66	49	
					WBT	549	522	95%	3.2	66	49	
				NB	NBL	19	19	100%	20.0	20	12	
					NBR	76	73	96%	30.7	52	43	
1800	E Pioneer	25th St SE	N	EB	EBT	753	725	96%	1.0	0	0	**16.2**
					EBR	14	14	100%	1.0	0	0	
				WB	WBL	3	3	100%	3.4	3	0	
					WBT	626	596	95%	0.3	0	0	
				NB	NBL	5	5	100%	16.2	24	11	
					NBR	7	7	100%	5.0	24	11	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	174	176	101%	44.8	103	84	**38.9**
					EBT	386	356	92%	44.9	219	174	
					EBR	180	172	96%	9.7	100	88	
				WB	WBL	151	144	95%	51.7	129	107	
					WBT	248	239	96%	48.3	308	217	
					WBR	50	48	96%	38.9	149	30	
				NB	NBL	139	131	94%	53.9	79	60	
					NBT	446	405	91%	37.1	175	146	
					NBR	104	104	100%	27.0	221	189	
				SB	SBL	92	90	98%	41.9	94	70	
					SBT	849	819	96%	36.0	392	324	
					SBR	214	217	101%	38.1	392	324	
2000	E Pioneer	33rd St SE	N	EB	EBL	91	87	96%	9.1	141	61	**9.2**
					EBT	482	460	95%	8.3	154	73	
				WB	WBT	298	291	98%	2.3	61	38	
					WBR	9	9	100%	1.0	19	0	
				SB	SBL	4	4	100%	9.2	63	50	
					SBR	151	141	93%	6.3	28	17	
2100	33rd St SE	80th St	N	WB	WBL	143	132	92%	0.9	0	0	**7.4**
					WBR	1	1	100%	1.0	0	0	
				NB	NBT	8	8	100%	7.4	11	3	
					NBR	92	88	96%	0.7	0	0	
				SB	SBL	4	4	100%	5.5	31	18	
					SBT	12	12	100%	7.3	49	29	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	2	2	100%	19.9	10	5	**19.9**
					WBR	39	39	100%	10.0	58	43	
				NB	NBT	555	534	96%	1.8	1	0	
					NBR	13	7	54%	1.7	0	0	
				SB	SBL	77	77	100%	9.8	20	15	
					SBT	1093	1052	96%	6.5	0	0	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	8	7	88%	25.7	12	6	**25.7**
					EBR	2	1	50%	11.6	0	0	
				NB	NBL	5	2	40%	22.6	0	0	
					NBT	560	536	96%	4.1	0	0	
				SB	SBT	1039	1002	96%	3.4	0	0	
					SBR	56	51	91%	2.6	0	0	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	87	82	94%	45.0	92	64	**24.5**
					EBT	48	50	104%	55.1	106	63	
					EBR	54	53	98%	28.7	137	92	
				WB	WBL	37	35	95%	46.5	34	23	
					WBT	26	26	100%	55.3	53	24	
					WBR	25	19	76%	20.6	84	52	
				NB	NBL	45	44	98%	31.7	18	10	
					NBT	453	439	97%	10.9	156	115	
					NBR	28	25	89%	6.2	29	11	
				SB	SBL	27	27	100%	27.5	11	5	
					SBT	866	831	96%	26.6	420	261	
					SBR	148	143	97%	19.7	40	28	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	26	24	92%	15.4	44	33	**15.4**
					EBR	26	26	100%	13.4	44	33	
				NB	NBL	27	25	93%	11.9	27	8	
					NBT	500	485	97%	2.5	10	0	

2021 Existing PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
				SB	SBT	924	883	96%	4.4	0	0	
					SBR	33	33	100%	4.1	0	0	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	22	18	82%	14.5	33	18	15.4
					EBR	13	13	100%	10.9	27	16	
				NB	NBL	11	11	100%	15.4	8	4	
					NBT	505	493	98%	1.8	0	0	
				SB	SBT	903	862	95%	3.9	0	0	
					SBR	47	47	100%	3.8	0	0	
2700	Shaw Rd E	39th Ave SE	Y	EB	EBL	168	167	99%	34.3	128	109	32.6
					EBT	6	7	117%	41.6	128	109	
					EBR	383	381	99%	20.3	189	158	
				WB	WBL	2	2	100%	60.1	13	9	
					WBT	6	5	83%	50.5	13	9	
					WBR	8	9	113%	9.7	4	3	
				NB	NBL	354	354	100%	65.7	477	347	
					NBT	340	331	97%	13.7	122	82	
					NBR	2	2	100%	4.3	132	101	
				SB	SBL	3	4	133%	53.7	4	2	
					SBT	690	649	94%	37.2	357	288	
					SBR	223	216	97%	12.9	31	16	
2800	Shaw Rd E	5th Ave SE (Future)	N	WB	WBL	0	0	100%	0.0	0	0	1.1
					WBR	0	0	100%	0.0	0	0	
				NB	NBT	670	628	94%	0.6	0	0	
					NBR	0	0	100%	0.0	0	0	
				SB	SBL	0	0	100%	0.0	0	0	
					SBT	1155	1129	98%	1.3	0	0	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	0	0	0.1
					EBR	0	0	100%	0.0	0	0	
				NB	NBL	0	0	100%	0.0	0	0	
					NBT	9	8	89%	0.1	0	0	
				SB	SBT	16	16	100%	-0.1	0	0	
					SBR	0	0	100%	0.0	0	0	
3000	Shaw Rd E	Safeway	Y	EB	EBL	89	92	103%	61.8	150	97	11.4
					EBR	255	249	98%	12.0	100	87	
				NB	NBL	74	73	99%	10.9	16	8	
					NBT	600	556	93%	8.0	56	35	
				SB	SBT	1032	988	96%	9.4	225	155	
					SBR	148	144	97%	4.8	196	130	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	0	3	100%	1.3	0	0	1.3
					EBT	96	88	92%	0.1	0	0	
				WB	WBT	144	134	93%	0.2	0	0	
					WBR	0	13	100%	0.9	0	0	
				SB	SBL	0	0	100%	0.0	0	0	
					SBR	0	0	100%	0.0	0	0	
3200	SR 162	Pioneer	Y	EB	EBL	69	70	101%	50.4	82	67	20.7
					EBT	10	10	100%	51.5	82	67	
					EBR	263	258	98%	18.8	148	101	
				WB	WBL	4	3	75%	38.6	37	24	
					WBT	16	18	113%	48.4	37	24	
					WBR	11	11	100%	13.2	50	24	
				NB	NBL	200	193	97%	57.3	183	152	
					NBT	390	388	99%	5.6	96	66	
					NBR	8	7	88%	2.0	6	2	
				SB	SBL	20	19	95%	62.0	28	17	
					SBT	711	679	95%	15.2	418	315	
					SBR	66	70	106%	14.2	432	345	
3300	SR 162	80th St	N	EB	EBL	60	55	92%	20.7	44	36	20.7
					EBR	36	33	92%	12.1	42	29	
				NB	NBL	8	12	150%	5.5	18	2	
					NBT	462	459	99%	1.0	13	0	
				SB	SBT	761	737	97%	2.6	17	0	
					SBR	136	135	99%	3.9	42	12	
3400	SR 162	EB	Y	EB	EBL	147	147	100%	29.4	109	83	12.8
					EBR	439	432	98%	23.1	264	177	
				NB	NBT	475	463	97%	13.2	254	171	
					NBR	116	107	92%	12.7	112	49	
				SB	SBL	124	128	103%	9.3	39	30	
					SBT	692	675	98%	2.8	127	71	
3500	SR 162	WB	Y	WB	WBL	128	121	95%	37.7	109	78	15.4
					WBR	116	120	103%	5.3	8	2	
				NB	NBL	223	213	96%	28.1	170	127	
					NBT	399	398	100%	3.6	100	60	
				SB	SBT	688	685	100%	18.9	417	337	
					SBR	207	204	99%	6.4	17	4	

2026 No Build AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	88	88	100%	20.9	71	49	**42.9**
					EBT	83	86	104%	24.1	61	46	
					EBR	128	124	97%	5.1	68	55	
				WB	WBL	60	58	97%	20.8	44	30	
					WBT	115	112	97%	26.6	97	76	
					WBR	34	35	103%	19.5	97	82	
				NB	NBL	383	370	97%	49.5	1118	830	
					NBT	713	694	97%	59.8	1151	876	
					NBR	113	109	96%	45.1	73	54	
				NE	NER	8	11	138%	5.6	33	13	
				SB	SBL	18	16	89%	49.2	25	13	
					SBT	186	185	99%	37.3	146	112	
					SBR	36	38	106%	19.5	175	146	
200	Traffic Ave	State St	Y	EB	EBL	18	18	100%	36.4	36	13	**14.4**
					EBR	3	3	100%	9.1	16	4	
				NB	NBL	10	8	80%	31.9	12	7	
					NBT	1191	1175	99%	17.9	457	282	
				SB	SBT	364	361	99%	1.5	48	20	
					SBR	9	7	78%	1.4	25	6	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	213	211	99%	60.1	267	200	**20.6**
					EBT	12	12	100%	43.2	25	9	
					EBR	136	138	101%	10.2	73	52	
				WB	WBL	46	45	98%	43.0	53	32	
					WBT	48	49	102%	43.2	56	41	
					WBR	12	13	108%	13.0	16	10	
				NB	NBL	397	389	98%	23.6	374	260	
					NBT	976	967	99%	12.9	419	263	
					NBR	109	106	97%	12.7	419	263	
				SB	SBL	2	2	100%	12.5	3	0	
					SBT	210	208	99%	16.3	154	109	
					SBR	155	151	97%	12.6	208	163	
400	E Main Ave	SR 410 EB	Y	EB	EBL	410	415	101%	34.9	403	317	**16.6**
					EBR	246	242	98%	8.1	72	55	
				NB	NBL	119	118	99%	18.3	71	44	
					NBT	1072	1057	99%	14.9	317	215	
				SB	SBT	320	318	99%	6.4	105	72	
					SBR	72	75	104%	5.1	90	57	
500	E Main Ave	5th Ave NE	N	EB	EBL	20	21	105%	7.1	37	22	**7.1**
					EBR	10	10	100%	6.0	0	0	
				NB	NBL	34	35	103%	2.0	18	5	
					NBT	1191	1155	97%	0.4	0	0	
				SB	SBT	521	517	99%	0.5	0	0	
					SBR	45	42	93%	0.9	0	0	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	313	314	100%	19.4	99	76	**12.4**
					EBR	62	62	100%	6.1	76	59	
				WB	WBL	279	282	101%	17.9	85	72	
					WBT	252	243	96%	7.6	99	64	
				NB	NBL	187	184	98%	16.6	102	80	
					NBR	892	879	99%	9.1	204	151	
700	E Main Ave	15th St SE	Y	EB	EBL	2	2	100%	7.3	3	0	**7.4**
					EBT	260	257	99%	11.6	104	72	
					EBR	42	42	100%	6.4	7	0	
				WB	WBL	70	70	100%	4.6	33	14	
					WBT	344	331	96%	5.4	87	62	
					WBR	25	23	92%	0.7	2	0	
				NB	NBL	97	100	103%	12.6	67	50	
					NBT	31	27	87%	12.8	67	50	
					NBR	116	119	103%	0.9	0	0	
				SB	SBL	2	3	150%	11.4	13	7	
					SBT	12	10	83%	11.1	13	7	
					SBR	0	0	100%	0.0	22	11	
800	E Main Ave	5th Ave SE	Y	EB	EBL	0	0	100%	0.0	0	0	**10.0**
					EBT	237	239	101%	9.8	127	86	
					EBR	6	5	83%	9.4	146	105	
				WB	WBL	36	34	94%	11.1	19	11	
					WBT	284	278	98%	10.4	125	86	
					WBR	88	86	98%	9.3	152	111	
				NB	NBL	12	12	100%	13.5	19	10	
					NBT	24	22	92%	15.1	50	26	
					NBR	131	131	100%	7.1	79	56	
				SB	SBL	48	45	94%	13.6	28	21	
					SBT	25	27	108%	12.0	19	13	
					SBR	3	3	100%	4.6	41	27	
				EB	EBL	46	46	100%	26.9	47	28	**12.3**

2026 No Build AM

						Movement						Intersection
Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
900	E Main Ave	2nd St SE	Y	EB	EBT	243	244	100%	28.2	176	148	
				NB	NBL	59	60	102%	6.1	126	94	
					NBT	844	837	99%	6.1	126	94	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	99	103	104%	26.3	84	56	
					WBR	200	191	96%	10.2	123	102	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	1037	1025	99%	45.8	589	391	**31.4**
				NB	NBT	679	670	99%	33.1	297	240	
					NBR	524	520	99%	3.3	0	0	
				SB	SBL	478	471	99%	42.1	326	275	
					SBT	448	434	97%	16.9	158	126	
1100	Meridian	SR 167 WBR	Y	WB	WBR	1120	1127	101%	93.0	1007	591	**21.4**
				NB	NBT	679	670	99%	16.4	62	48	
				SB	SBT	926	915	99%	3.7	37	12	
1200	Meridian	Valley Ave	Y	EB	EBL	22	21	95%	58.8	36	23	**26.6**
					EBT	147	149	101%	51.9	112	93	
					EBR	296	296	100%	26.6	194	161	
				WB	WBL	272	265	97%	63.5	164	144	
					WBT	139	140	101%	40.5	95	85	
					WBR	56	54	96%	16.4	130	119	
				NB	NBL	521	517	99%	34.4	302	257	
					NBT	961	966	101%	13.6	297	240	
					NBR	317	314	99%	2.5	51	17	
				SB	SBL	29	31	107%	57.0	38	23	
					SBT	358	352	98%	25.8	181	131	
					SBR	18	16	89%	6.0	4	0	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	324	328	101%	11.8	110	81	**18.6**
					EBR	35	36	103%	9.9	148	118	
				WB	WBL	172	167	97%	44.7	170	134	
					WBT	349	346	99%	2.9	53	34	
				NB	NBL	132	132	100%	53.9	157	116	
					NBR	84	83	99%	6.4	74	59	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	294	298	101%	8.5	83	60	**10.3**
					EBR	114	112	98%	5.8	62	38	
				WB	WBL	55	56	102%	47.3	61	46	
					WBT	455	446	98%	4.1	74	54	
				NB	NBL	66	65	98%	42.2	80	46	
					NBR	276	271	98%	8.9	126	61	
1500	E Pioneer	13th St SE	N	EB	EBT	552	554	100%	0.2	0	0	**8.9**
					EBR	18	15	83%	0.6	0	0	
				WB	WBL	23	21	91%	3.1	10	5	
					WBT	481	475	99%	0.1	0	0	
				NB	NBL	29	28	97%	8.9	32	22	
					NBR	50	50	100%	6.1	44	35	
1600	E Pioneer	15th St SE	Y	EB	EBL	218	217	100%	3.4	52	31	**5.5**
					EBT	384	386	101%	5.3	60	49	
				WB	WBT	426	418	98%	5.0	73	56	
					WBR	79	77	97%	4.0	30	18	
				SB	SBL	38	38	100%	12.4	0	0	
					SBR	78	78	100%	13.5	2	0	
1700	E Pioneer	21st St	Y	EB	EBT	404	406	100%	9.4	88	67	**6.9**
					EBR	18	19	106%	5.4	39	22	
				WB	WBL	49	47	96%	4.6	61	38	
					WBT	483	477	99%	2.1	61	38	
				NB	NBL	22	20	91%	18.1	16	12	
					NBR	56	58	104%	27.4	56	43	
1800	E Pioneer	25th St SE	N	EB	EBT	450	453	101%	0.6	0	0	**11.6**
					EBR	10	10	100%	0.8	0	0	
				WB	WBL	0	0	100%	0.0	0	0	
					WBT	520	510	98%	0.3	0	0	
				NB	NBL	12	14	117%	11.6	28	20	
					NBR	5	5	100%	6.0	28	20	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	204	206	101%	47.8	214	149	**33.0**
					EBT	155	154	99%	38.0	138	113	
					EBR	84	83	99%	6.6	92	77	
				WB	WBL	86	87	101%	43.1	88	67	
					WBT	221	221	100%	44.5	273	219	
					WBR	79	76	96%	38.4	177	91	
				NB	NBL	192	180	94%	51.6	102	82	
					NBT	792	782	99%	23.6	299	234	
					NBR	52	54	104%	18.3	345	280	
				SB	SBL	45	45	100%	55.3	61	41	
					SBT	243	246	101%	27.4	123	99	
					SBR	52	55	106%	28.2	123	99	
2000	E Pioneer	33rd St SE	N	EB	EBL	35	36	103%	5.6	50	19	**9.4**
					EBT	217	216	100%	3.3	54	23	
				WB	WBT	314	312	99%	1.6	42	30	
					WBR	2	2	100%	0.8	7	0	
				SB	SBL	1	1	100%	9.4	45	37	
					SBR	72	71	99%	5.6	12	5	
2100	33rd St SE	80th St	N	WB	WBL	71	69	97%	0.6	0	0	**7.7**
					WBR	1	1	100%	0.7	0	0	
				NB	NBT	18	17	94%	7.7	30	18	
					NBR	19	21	111%	0.7	0	0	
				SB	SBL	0	0	100%	0.0	12	2	
					SBT	2	3	150%	7.0	19	3	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	5	4	80%	23.2	18	9	**23.2**
					WBR	71	75	106%	17.9	79	59	
				NB	NBT	945	929	98%	2.3	0	0	
					NBR	3	3	100%	2.0	0	0	
				SB	SBL	14	14	100%	10.1	12	6	
					SBT	332	332	100%	1.8	0	0	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	20	22	110%	17.7	29	13	**17.7**
					EBR	4	2	50%	8.0	11	3	
				NB	NBL	3	3	100%	9.2	62	0	
					NBT	928	915	99%	4.6	58	0	
				SB	SBT	333	331	99%	1.1	0	0	
					SBR	4	5	125%	1.0	0	0	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	118	113	96%	50.9	138	94	**18.9**
					EBT	12	13	108%	49.3	33	15	
					EBR	33	35	106%	11.3	61	44	
				WB	WBL	18	18	100%	44.5	27	16	
					WBT	25	27	108%	64.8	64	37	
					WBR	27	27	100%	23.3	98	74	
				NB	NBL	45	44	98%	17.7	19	9	
					NBT	786	780	99%	14.7	502	280	
					NBR	6	5	83%	8.1	7	0	
				SB	SBL	6	6	100%	24.4	4	2	
					SBT	275	273	99%	13.3	108	76	

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Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
					SBR	56	54	96%	6.1	25	14	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	17	14	82%	12.7	43	34	**12.7**
					EBR	33	34	103%	7.2	43	34	
				NB	NBL	17	18	106%	4.9	20	2	
					NBT	823	816	99%	3.0	8	0	
				SB	SBT	320	321	100%	2.8	0	0	
					SBR	6	7	117%	2.6	0	0	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	25	26	104%	11.1	36	22	**11.1**
					EBR	9	8	89%	7.2	21	8	
				NB	NBL	1	1	100%	4.2	1	0	
					NBT	815	809	99%	2.5	0	0	
				SB	SBT	339	341	101%	2.2	0	0	
					SBR	14	12	86%	2.5	0	0	
2700	Shaw Rd E	39th Ave SE	Y	EB	EBL	143	140	98%	22.8	98	67	**14.4**
					EBT	0	0	100%	0.0	98	67	
					EBR	148	150	101%	6.5	80	72	
				WB	WBL	0	0	100%	0.0	7	1	
					WBT	2	2	100%	36.5	7	1	
					WBR	2	4	200%	8.4	0	0	
				NB	NBL	375	379	101%	25.0	305	158	
					NBT	671	666	99%	8.0	254	166	
					NBR	0	0	100%	0.0	283	182	
				SB	SBL	0	0	100%	0.0	0	0	
					SBT	221	224	101%	19.2	151	101	
					SBR	127	125	98%	7.0	32	19	
2800	Shaw Rd E	5th Ave SE (Future)	N	WB	WBL	0	0	100%	0.0	9	5	**0.8**
					WBR	5	4	80%	10.0	14	7	
				NB	NBT	1074	1062	99%	0.9	0	0	
					NBR	1	1	100%	1.3	0	0	
				SB	SBL	1	1	100%	6.8	2	0	
					SBT	340	343	101%	0.5	0	0	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	0	0	**0.7**
					EBR	0	0	100%	0.0	0	0	
				NB	NBL	3	3	100%	0.7	0	0	
					NBT	16	16	100%	0.2	0	0	
				SB	SBT	2	3	150%	-0.1	0	0	
					SBR	0	1	100%	0.1	0	0	
3000	Shaw Rd E	Safeway	Y	EB	EBL	85	84	99%	60.3	104	77	**8.3**
					EBR	49	47	96%	7.9	59	51	
				NB	NBL	96	97	101%	5.7	24	8	
					NBT	951	937	99%	6.0	87	67	
				SB	SBT	325	327	101%	4.3	57	34	
					SBR	88	87	99%	1.3	37	12	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	3	3	100%	0.9	2	0	**0.9**
					EBT	16	17	106%	0.1	0	0	
				WB	WBT	72	71	99%	0.1	0	0	
					WBR	0	0	100%	0.0	0	0	
				SB	SBL	0	0	100%	0.0	0	0	
					SBR	0	0	100%	0.0	0	0	
3200	SR 162	Pioneer	Y	EB	EBL	34	33	97%	55.3	51	34	**24.0**
					EBT	4	4	100%	53.4	51	34	
					EBR	118	117	99%	7.1	55	46	
				WB	WBL	8	7	88%	55.4	50	31	
					WBT	18	17	94%	54.9	50	31	
					WBR	21	22	105%	18.9	74	43	
				NB	NBL	260	248	95%	78.8	567	237	
					NBT	565	559	99%	7.7	100	61	
					NBR	2	2	100%	8.9	3	0	
				SB	SBL	8	8	100%	61.6	15	9	
					SBT	295	288	98%	10.0	151	86	
					SBR	38	37	97%	8.5	202	121	
3300	SR 162	80th St	N	EB	EBL	14	15	107%	13.1	19	12	**13.1**
					EBR	2	2	100%	5.1	12	3	
				NB	NBL	10	10	100%	2.8	5	1	
					NBT	610	606	99%	1.0	0	0	
				SB	SBT	339	332	98%	0.8	4	0	
					SBR	62	61	98%	2.9	19	7	
3400	SR 162	EB	Y	EB	EBL	170	168	99%	41.7	148	114	**17.7**
					EBR	219	217	99%	7.5	74	62	
				NB	NBT	733	724	99%	18.5	432	300	
					NBR	38	36	95%	19.3	132	25	
				SB	SBL	62	61	98%	14.5	41	26	
					SBT	168	163	97%	4.3	50	26	
3500	SR 162	WB	Y	WB	WBL	86	86	100%	45.3	88	62	**16.8**
					WBR	118	114	97%	5.4	8	2	
				NB	NBL	344	334	97%	42.8	340	265	
					NBT	559	555	99%	2.9	80	47	
				SB	SBT	144	139	97%	12.9	66	50	
					SBR	119	119	100%	3.8	8	2	

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Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement					
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	97	86	89%	141.9	845	378
					EBT	264	236	89%	150.1	1604	1162
					EBR	396	386	97%	117.5	1624	1158
				WB	WBL	118	131	111%	65.2	248	111
					WBT	171	167	98%	65.8	301	222
					WBR	50	47	94%	50.8	177	116
				NB	NBL	216	209	97%	59.8	228	173
					NBT	327	318	97%	18.0	210	171
					NBR	92	92	100%	6.9	60	45
				NE	NER	12	13	108%	19.3	34	17
				SB	SBL	94	89	95%	70.0	105	88
					SBT	570	626	110%	29.6	301	243
					SBR	126	128	102%	22.3	346	280
200	Traffic Ave	State St	Y	EB	EBL	29	27	94%	26.8	27	14
					EBR	10	8	81%	61.0	27	11
				NB	NBL	19	57	304%	26.7	23	15
					NBT	650	591	91%	2.9	131	64
				SB	SBT	1183	1083	92%	68.9	1022	630
					SBR	2	2	91%	70.4	982	589
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	110	110	100%	43.8	143	73
					EBT	13	15	113%	40.6	44	11
					EBR	300	293	98%	31.7	409	298
				WB	WBL	300	285	95%	55.9	653	362
					WBT	151	149	99%	43.8	253	107
					WBR	12	12	99%	20.8	46	6
				NB	NBL	344	309	90%	70.6	393	339
					NBT	546	527	96%	25.3	338	220
					NBR	178	167	94%	25.0	338	220
				SB	SBL	10	8	81%	81.4	11	4
					SBT	765	691	90%	97.4	793	782
					SBR	418	364	87%	88.5	847	836
400	E Main Ave	SR 410 EB	Y	EB	EBL	294	296	101%	42.8	214	169
					EBR	634	626	99%	20.9	462	344
				NB	NBL	248	217	88%	194.5	383	283
					NBT	774	721	93%	16.9	193	152
				SB	SBT	1237	1151	93%	25.4	653	554
					SBR	128	116	91%	20.1	638	540
500	E Main Ave	5th Ave NE	N	EB	EBL	55	55	100%	7.4	49	40
					EBR	56	51	91%	6.6	9	0
				NB	NBL	42	33	79%	4.9	34	22
					NBT	967	906	94%	0.6	0	0
				SB	SBT	1825	1729	95%	1.4	0	0
					SBR	46	42	91%	1.3	0	0
600	E Main Ave	Shaw Rd E	Y	EB	EBT	404	395	98%	23.4	111	94
					EBR	214	209	98%	12.3	118	99
				WB	WBL	1154	1084	94%	35.0	296	261
					WBT	728	697	96%	8.9	241	184
				NB	NBL	181	176	97%	27.0	94	84
					NBR	604	550	91%	8.8	93	72
700	E Main Ave	15th St SE	Y	EB	EBL	6	5	91%	10.8	4	0
					EBT	423	416	98%	16.9	169	123
					EBR	114	109	96%	7.9	14	8
				WB	WBL	254	234	92%	6.2	64	42
					WBT	590	576	98%	7.3	142	118
					WBR	68	62	91%	1.0	5	0
				NB	NBL	85	84	99%	19.0	64	48
					NBT	25	23	91%	19.0	64	48
					NBR	125	138	111%	1.0	0	0
				SB	SBL	51	55	108%	19.6	58	44
					SBT	42	41	98%	18.4	58	44
					SBR	12	13	107%	13.5	77	62
800	E Main Ave	5th Ave SE	Y	EB	EBL	6	6	109%	18.7	6	2
					EBT	322	314	98%	15.7	145	110
					EBR	30	29	97%	13.2	170	135
				WB	WBL	191	171	90%	14.8	67	46
					WBT	556	524	94%	14.3	262	171
					WBR	88	85	96%	13.1	290	199
				NB	NBL	17	16	97%	26.2	21	9
					NBT	43	40	93%	24.7	62	40
					NBR	78	79	101%	10.1	87	66
				SB	SBL	79	79	99%	19.2	50	34
					SBT	87	91	104%	17.7	56	41
					SBR	10	9	91%	7.0	86	66
				EB	EBL	57	58	101%	10.2	38	21

2026 No Build PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement					
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)
900	E Main Ave	2nd St SE	Y	EB	EBT	344	345	100%	9.7	119	83
				NB	NBL	78	77	98%	12.0	150	116
					NBT	749	741	99%	11.1	150	116
					NBR	0	0	100%	0.0	0	0
				WB	WBT	292	272	93%	11.8	118	88
					WBR	290	274	94%	8.8	139	113
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	727	828	114%	47.7	343	317
				NB	NBT	553	690	125%	55.6	864	620
					NBR	1256	1335	106%	15.4	0	0
				SB	SBL	971	950	98%	33.7	432	424
					SBT	868	899	104%	12.0	236	191
1100	Meridian	SR 167 WBR	Y	WB	WBR	627	707	113%	39.5	195	154
				NB	NBT	553	694	125%	37.3	120	80
				SB	SBT	1839	1864	101%	17.4	272	246
1200	Meridian	Valley Ave	Y	EB	EBL	49	62	127%	285.9	91	58
					EBT	323	251	78%	287.7	192	135
					EBR	543	488	90%	506.1	1682	1636
				WB	WBL	609	623	102%	193.3	1633	1147
					WBT	147	166	113%	47.8	115	88
					WBR	61	64	105%	36.9	146	122
				NB	NBL	428	546	128%	30.4	294	263
					NBT	482	535	111%	14.6	168	143
					NBR	270	298	110%	3.3	104	39
				SB	SBL	15	16	107%	94.2	26	16
					SBT	687	762	111%	56.4	648	409
					SBR	12	22	183%	23.5	2	0
1300	E Pioneer	SR 512 WB	Y	EB	EBT	487	471	97%	15.4	165	105
					EBR	96	96	100%	13.2	202	142
				WB	WBL	440	404	92%	99.9	728	564
					WBT	503	488	97%	3.9	64	46
				NB	NBL	93	93	100%	51.7	114	76
					NBR	84	80	95%	5.4	62	47
1400	E Pioneer	SR 512 EB	Y	EB	EBT	479	463	97%	8.2	102	67
					EBR	93	91	98%	6.6	78	44
				WB	WBL	42	43	104%	53.5	44	33
					WBT	867	825	95%	17.1	256	167
				NB	NBL	76	77	101%	47.1	62	50
					NBR	351	345	98%	10.4	88	69
1500	E Pioneer	13th St SE	N	EB	EBT	778	761	98%	0.3	0	0
					EBR	54	50	92%	0.7	0	0
				WB	WBL	67	60	89%	5.5	21	15
					WBT	887	862	97%	0.3	0	0
				NB	NBL	23	21	91%	11.2	33	19
					NBR	51	49	97%	7.0	43	31
1600	E Pioneer	15th St SE	Y	EB	EBL	167	165	99%	4.0	43	28
					EBT	662	642	97%	10.8	105	76
				WB	WBT	608	570	94%	11.0	133	112
					WBR	67	65	97%	8.5	85	64
				SB	SBL	169	156	92%	13.3	0	0
					SBR	346	352	102%	17.6	5	2
1700	E Pioneer	21st St	Y	EB	EBT	796	757	95%	12.2	124	108
					EBR	35	33	93%	9.4	75	60
				WB	WBL	92	89	97%	8.9	74	59
					WBT	655	614	94%	3.3	74	59
				NB	NBL	21	22	105%	21.8	28	16
					NBR	85	80	94%	31.2	59	48
1800	E Pioneer	25th St SE	N	EB	EBT	866	823	95%	1.3	0	0
					EBR	15	14	91%	1.1	0	0
				WB	WBL	3	4	121%	7.1	4	0
					WBT	741	699	94%	0.3	0	0
				NB	NBL	6	6	109%	17.5	28	11
					NBR	8	9	116%	8.5	27	11
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	203	196	96%	65.5	129	93
					EBT	444	416	94%	60.4	280	221
					EBR	204	197	97%	11.3	103	89
				WB	WBL	168	163	97%	67.1	170	133
					WBT	276	268	97%	56.8	362	278
					WBR	60	58	96%	48.4	188	47
				NB	NBL	170	160	94%	62.4	85	75
					NBT	521	476	91%	46.9	220	182
					NBR	116	104	90%	35.7	265	227
				SB	SBL	133	127	96%	50.4	110	87
					SBT	962	898	93%	44.1	474	397
					SBR	267	257	96%	46.7	474	397
2000	E Pioneer	33rd St SE	N	EB	EBL	140	133	95%	13.8	144	106
					EBT	542	512	94%	11.8	159	115
				WB	WBT	335	333	99%	3.1	82	59
					WBR	10	24	242%	1.2	25	6
				SB	SBL	4	4	91%	10.3	63	56
					SBR	169	161	95%	6.7	29	21
2100	33rd St SE	80th St	N	WB	WBL	159	153	96%	0.9	0	0
					WBR	1	1	91%	1.0	0	0
				NB	NBT	45	48	107%	8.1	34	29
					NBR	106	109	103%	0.7	8	0
				SB	SBL	4	8	181%	7.1	37	23
					SBT	14	12	84%	7.9	58	36
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	2	2	91%	36.3	13	8
					WBR	45	45	100%	11.5	59	44
				NB	NBT	657	603	92%	2.0	0	0
					NBR	14	11	77%	1.4	0	0
				SB	SBL	87	84	97%	14.0	28	17
					SBT	1261	1198	95%	11.5	0	0
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	10	10	102%	33.1	11	6
					EBR	2	1	45%	23.2	0	0
				NB	NBL	6	5	91%	27.9	0	0
					NBT	660	607	92%	5.6	0	0
				SB	SBT	1198	1145	96%	9.5	0	0
					SBR	64	54	85%	8.7	0	0

2026 No Build PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement					
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	106	104	98%	44.9	103	73
					EBT	53	54	102%	57.8	105	68
					EBR	60	60	101%	35.2	134	98
				WB	WBL	41	38	93%	47.9	41	21
					WBT	29	28	98%	54.8	48	27
					WBR	29	25	87%	21.1	83	57
				NB	NBL	50	47	95%	45.1	24	14
					NBT	531	487	92%	12.6	226	167
					NBR	31	29	94%	6.7	32	18
				SB	SBL	32	29	91%	53.5	14	7
					SBT	995	928	93%	54.5	519	384
					SBR	173	165	95%	46.2	47	29
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	32	27	85%	22.3	43	33
					EBR	29	29	101%	17.1	43	32
				NB	NBL	30	24	81%	14.6	28	8
					NBT	580	541	93%	2.5	11	0
				SB	SBT	1055	990	94%	5.7	0	0
					SBR	40	39	96%	5.3	0	0
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	28	24	85%	18.9	36	22
					EBR	14	15	105%	26.2	25	14
				NB	NBL	12	10	82%	19.1	12	6
					NBT	581	543	93%	1.8	0	0
				SB	SBT	1028	955	93%	16.2	0	0
					SBR	56	51	91%	15.0	0	0
2700	Shaw Rd E	39th Ave SE	Y	EB	EBL	193	193	100%	34.9	158	123
					EBT	7	7	106%	35.9	158	123
					EBR	423	415	98%	23.3	203	179
				WB	WBL	2	5	226%	57.0	15	8
					WBT	7	8	121%	52.0	15	8
					WBR	9	10	113%	10.4	4	0
				NB	NBL	391	358	92%	174.2	1529	989
					NBT	391	351	90%	100.7	159	90
					NBR	2	6	272%	89.7	185	104
				SB	SBL	3	5	151%	83.8	6	2
					SBT	785	707	90%	71.0	481	384
					SBR	254	238	94%	35.0	40	25
2800	Shaw Rd E	5th Ave SE (Future)	N	WB	WBL	1	0	0%	0.0	0	0
					WBR	2	0	0%	6.0	0	0
				NB	NBT	783	730	93%	0.8	0	0
					NBR	1	2	167%	1.3	0	0
				SB	SBL	6	5	83%	6.3	6	0
					SBT	1361	1286	94%	1.6	0	0
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	0	0
					EBR	0	0	100%	0.0	0	0
				NB	NBL	0	4	100%	0.5	0	0
					NBT	0	45	100%	0.2	0	0
				SB	SBT	0	20	100%	0.0	0	0
					SBR	0	0	100%	0.0	0	0
3000	Shaw Rd E	Safeway	Y	EB	EBL	98	99	101%	67.4	166	103
					EBR	282	279	99%	16.2	143	103
				NB	NBL	82	69	84%	14.0	14	9
					NBT	709	651	92%	12.1	61	39
				SB	SBT	1170	1102	94%	9.8	250	166
					SBR	163	152	93%	4.8	220	137
3100	80th St	Knutson Farms Driveway	N	EB	EBL	0	9	100%	1.2	3	0
					EBT	106	108	102%	0.1	0	0
				WB	WBT	159	155	97%	0.2	0	0
					WBR	0	2	100%	0.6	0	0
				SB	SBL	0	0	100%	0.0	0	0
					SBR	0	0	100%	0.0	0	0
3200	SR 162	Pioneer	Y	EB	EBL	81	81	100%	55.4	98	75
					EBT	11	12	109%	54.5	98	75
					EBR	295	291	99%	25.4	215	128
				WB	WBL	4	4	91%	68.6	51	19
					WBT	18	18	102%	50.3	51	19
					WBR	12	14	115%	15.2	68	24
				NB	NBL	224	216	97%	64.0	239	187
					NBT	431	430	100%	6.7	96	74
					NBR	9	9	102%	2.3	5	0
				SB	SBL	22	21	95%	57.2	30	21
					SBT	785	761	97%	18.1	525	389
					SBR	76	83	109%	16.9	563	416
3300	SR 162	80th St	N	EB	EBL	66	60	91%	28.3	50	35
					EBR	40	47	118%	16.0	46	30
				NB	NBL	9	12	136%	6.8	44	10
					NBT	515	514	100%	1.3	30	2
				SB	SBT	843	819	97%	3.0	32	8
					SBR	150	146	97%	4.5	52	25
3400	SR 162	EB	Y	EB	EBL	162	163	100%	29.2	112	93
					EBR	485	471	97%	31.5	376	231
				NB	NBT	524	512	98%	16.8	318	243
					NBR	130	126	97%	17.3	213	88
				SB	SBL	137	139	102%	12.0	64	35
					SBT	767	751	98%	3.1	182	96
3500	SR 162	WB	Y	WB	WBL	144	143	99%	39.3	118	95
					WBR	128	127	99%	5.2	10	2
				NB	NBL	246	241	98%	28.0	181	139
					NBT	441	435	99%	4.6	114	80
				SB	SBT	760	748	98%	28.5	852	563
					SBR	229	225	98%	12.5	21	10

2026 Scenario A AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	88	88	100%	20.5	68	48	**45.7**
					EBT	83	86	104%	23.3	65	46	
					EBR	128	124	97%	5.2	72	55	
				WB	WBL	60	58	97%	19.5	45	30	
					WBT	115	112	97%	26.4	96	75	
					WBR	34	35	103%	21.3	100	86	
				NB	NBL	383	364	95%	54.1	1144	913	
					NBT	726	700	96%	65.1	1160	993	
					NBR	113	110	97%	48.5	63	55	
				NE	NER	8	11	138%	5.4	33	13	
				SB	SBL	18	16	89%	48.7	25	14	
					SBT	216	214	99%	36.7	159	115	
					SBR	32	38	119%	19.7	179	152	
200	Traffic Ave	State St	Y	EB	EBL	18	18	100%	35.1	34	12	**16.2**
					EBR	3	3	100%	9.6	16	4	
				NB	NBL	10	8	80%	28.4	13	7	
					NBT	1204	1186	99%	20.6	597	342	
				SB	SBT	394	389	99%	1.6	47	22	
					SBR	9	7	78%	1.1	26	7	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	213	211	99%	42.6	202	151	**19.9**
					EBT	12	12	100%	36.3	24	8	
					EBR	136	138	101%	8.5	63	52	
				WB	WBL	46	45	98%	43.1	53	32	
					WBT	48	49	102%	42.6	55	41	
					WBR	12	13	108%	15.4	16	10	
				NB	NBL	479	470	98%	21.7	391	235	
					NBT	989	983	99%	16.0	598	347	
					NBR	109	106	97%	16.1	598	347	
				SB	SBL	2	2	100%	21.1	3	0	
					SBT	240	237	99%	15.0	178	112	
					SBR	155	151	97%	12.4	232	166	
400	E Main Ave	SR 410 EB	Y	EB	EBL	410	414	101%	52.6	589	384	**23.9**
					EBR	437	427	98%	15.1	208	153	
				NB	NBL	119	116	97%	14.3	68	47	
					NBT	1167	1149	98%	20.5	417	295	
				SB	SBT	350	345	99%	16.9	126	108	
					SBR	72	75	104%	14.0	111	94	
500	E Main Ave	5th Ave NE	N	EB	EBL	20	21	105%	7.3	37	22	**7.3**
					EBR	10	10	100%	6.0	0	0	
				NB	NBL	34	35	103%	2.1	19	9	
					NBT	1266	1256	99%	0.7	0	0	
				SB	SBT	742	732	99%	0.8	0	0	
					SBR	45	42	93%	1.0	0	0	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	313	314	100%	19.4	92	80	**14.6**
					EBR	182	180	99%	8.9	121	99	
				WB	WBL	500	499	100%	20.8	140	118	
					WBT	252	244	97%	7.0	91	66	
				NB	NBL	239	239	100%	22.1	152	120	
					NBR	987	979	99%	11.1	270	190	
700	E Main Ave	15th St SE	Y	EB	EBL	2	2	100%	9.3	2	0	**8.3**
					EBT	377	375	99%	12.6	151	107	
					EBR	42	42	100%	7.3	4	0	
				WB	WBL	70	69	99%	4.7	28	16	
					WBT	396	384	97%	5.6	107	66	
					WBR	25	23	92%	0.8	2	0	
				NB	NBL	97	100	103%	13.6	72	55	
					NBT	31	27	87%	15.1	72	55	
					NBR	116	119	103%	0.9	0	0	
				SB	SBL	2	3	150%	11.7	15	7	
					SBT	12	10	83%	14.1	15	7	
					SBR	0	0	100%	0.0	26	12	
800	E Main Ave	5th Ave SE	Y	EB	EBL	0	0	100%	0.0	0	0	**10.7**
					EBT	357	356	100%	9.4	178	128	
					EBR	6	5	83%	8.7	200	150	
				WB	WBL	36	34	94%	11.3	21	11	
					WBT	336	332	99%	11.2	138	95	
					WBR	88	86	98%	10.1	165	123	
				NB	NBL	12	12	100%	15.1	17	9	
					NBT	24	22	92%	18.0	52	33	
					NBR	131	131	100%	9.0	79	62	
				SB	SBL	48	45	94%	16.1	31	24	
					SBT	25	27	108%	14.4	21	12	
					SBR	3	3	100%	5.6	43	27	
900	E Main Ave	2nd St SE	Y	EB	EBL	46	46	100%	32.0	87	33	**15.0**
					EBT	363	362	100%	30.4	261	221	
				NB	NBL	59	60	102%	8.1	135	113	
					NBT	844	836	99%	7.5	135	113	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	125	128	102%	25.5	97	70	
					WBR	226	219	97%	10.4	121	106	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	1037	1025	99%	45.8	589	391	**31.4**
				NB	NBT	679	670	99%	33.1	297	240	
					NBR	524	520	99%	3.3	0	0	
				SB	SBL	478	471	99%	42.1	326	275	
					SBT	448	434	97%	16.9	159	128	
1100	Meridian	SR 167 WBR	Y	WB	WBR	1120	1127	101%	93.0	1007	591	**21.4**
				NB	NBT	679	670	99%	16.4	62	48	
				SB	SBT	926	915	99%	3.7	37	12	
				EB	EBL	22	21	95%	58.8	36	23	**26.6**
					EBT	147	149	101%	51.9	112	93	
					EBR	296	296	100%	26.6	194	161	
					WBL	272	265	97%	63.5	164	144	

2026 Scenario A AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
1200	Meridian	Valley Ave	Y	WB	WBT	139	140	101%	40.5	95	85	
					WBR	56	54	96%	16.4	130	119	
				NB	NBL	521	517	99%	34.4	302	257	
					NBT	961	966	101%	13.6	297	240	
					NBR	317	314	99%	2.5	51	17	
				SB	SBL	29	31	107%	57.0	38	23	
					SBT	358	352	98%	25.8	181	131	
					SBR	18	16	89%	6.0	4	0	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	355	353	99%	12.2	119	86	**20.5**
					EBR	35	35	100%	8.3	161	127	
				WB	WBL	225	216	96%	45.5	215	178	
					WBT	362	357	99%	3.0	53	35	
				NB	NBL	132	135	102%	60.2	154	119	
					NBR	86	83	97%	6.1	73	59	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	327	326	100%	8.1	91	68	**11.4**
					EBR	114	111	97%	5.5	65	45	
				WB	WBL	55	56	102%	46.6	64	48	
					WBT	521	505	97%	4.6	88	61	
				NB	NBL	66	65	98%	43.6	74	48	
					NBR	398	391	98%	14.0	245	105	
1500	E Pioneer	13th St SE	N	EB	EBT	707	704	100%	0.2	0	0	**10.0**
					EBR	18	15	83%	0.6	0	0	
				WB	WBL	23	21	91%	4.0	11	6	
					WBT	547	534	98%	0.2	0	0	
				NB	NBL	29	28	97%	10.0	32	22	
					NBR	50	50	100%	6.6	44	34	
1600	E Pioneer	15th St SE	Y	EB	EBL	218	217	100%	4.1	52	37	**5.8**
					EBT	539	534	99%	5.3	74	63	
				WB	WBT	492	478	97%	5.1	81	63	
					WBR	79	76	96%	4.3	40	23	
				SB	SBL	38	38	100%	14.3	0	0	
					SBR	78	78	100%	15.3	3	0	
1700	E Pioneer	21st St	Y	EB	EBT	559	550	98%	9.6	124	95	**7.4**
					EBR	18	19	106%	7.2	74	47	
				WB	WBL	49	47	96%	4.9	60	40	
					WBT	549	542	99%	2.4	60	40	
				NB	NBL	22	20	91%	18.2	18	12	
					NBR	56	58	104%	31.2	53	42	
1800	E Pioneer	25th St SE	N	EB	EBT	605	601	99%	0.9	0	0	**15.0**
					EBR	10	10	100%	0.9	0	0	
				WB	WBL	0	0	100%	0.0	0	0	
					WBT	586	568	97%	0.4	0	0	
				NB	NBL	12	14	117%	15.0	28	20	
					NBR	5	5	100%	5.2	28	19	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	359	357	99%	45.2	364	261	**42.9**
					EBT	155	155	100%	31.4	118	96	
					EBR	84	83	99%	4.9	84	64	
				WB	WBL	99	99	100%	47.2	115	79	
					WBT	221	222	100%	49.0	328	253	
					WBR	79	77	97%	40.2	119	31	
				NB	NBL	192	183	95%	79.2	124	98	
					NBT	824	812	99%	39.1	412	362	
					NBR	82	74	90%	32.3	458	408	
				SB	SBL	45	43	96%	62.0	77	47	
					SBT	257	249	97%	39.9	191	158	
					SBR	118	113	96%	39.0	191	158	
2000	E Pioneer	33rd St SE	N	EB	EBL	65	56	86%	5.1	46	27	**8.9**
					EBT	217	217	100%	3.1	47	30	
				WB	WBT	314	312	99%	1.8	47	31	
					WBR	2	2	100%	0.8	7	0	
				SB	SBL	1	1	100%	8.9	47	38	
					SBR	85	83	98%	5.8	11	6	
2100	33rd St SE	80th St	N	WB	WBL	71	69	97%	0.6	0	0	**9.3**
					WBR	1	2	200%	0.5	0	0	
				NB	NBT	48	38	79%	7.7	41	26	
					NBR	19	21	111%	0.6	5	0	
				SB	SBL	0	0	100%	9.3	34	17	
					SBT	15	15	100%	7.3	53	26	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	5	4	80%	23.5	18	9	**27.1**
					WBR	76	80	105%	27.1	88	68	
				NB	NBT	1002	982	98%	2.9	10	0	
					NBR	3	3	100%	2.0	0	0	
				SB	SBL	16	16	100%	12.3	13	5	
					SBT	357	356	100%	2.2	0	0	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	26	26	100%	26.0	28	16	**26.0**
					EBR	4	2	50%	8.8	10	3	
				NB	NBL	3	3	100%	7.4	128	3	
					NBT	979	961	98%	7.5	123	2	
				SB	SBT	355	352	99%	1.4	0	0	
					SBR	7	7	100%	1.3	0	0	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	130	125	96%	52.1	147	99	**21.5**
					EBT	12	13	108%	54.1	36	17	
					EBR	33	35	106%	12.1	63	43	
				WB	WBL	18	19	106%	42.9	24	17	
					WBT	25	27	108%	63.0	63	40	
					WBR	33	32	97%	25.3	97	74	
				NB	NBL	45	45	100%	19.4	18	9	
					NBT	819	806	98%	18.3	591	376	
					NBR	6	5	83%	10.9	13	0	
				SB	SBL	9	8	89%	24.9	7	0	
					SBT	289	285	99%	14.6	112	83	
					SBR	61	57	93%	7.0	26	15	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	19	17	89%	12.7	46	36	**12.7**
					EBR	33	34	103%	7.7	46	35	
				NB	NBL	17	18	106%	6.4	69	3	
					NBT	851	840	99%	4.5	59	0	
				SB	SBT	331	330	100%	3.6	0	0	
					SBR	9	10	111%	4.2	0	0	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	31	31	100%	11.6	39	27	**11.7**
					EBR	9	8	89%	6.7	21	9	
				NB	NBL	1	1	100%	11.7	1	0	
					NBT	837	825	99%	3.1	0	0	
				SB	SBT	348	352	101%	3.1	0	0	
					SBR	16	14	88%	3.3	0	0	
				EB	EBL	156	152	97%	22.5	98	74	**16.0**
					EBT	0	0	100%	0.0	98	74	
					EBR	148	150	101%	6.6	81	72	
					WBL	0	0	100%	0.0	7	2	

2026 Scenario A AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
2700	Shaw Rd E	39th Ave SE	Y	WB	WBT	2	2	100%	33.3	7	2	
					WBR	2	4	200%	8.8	2	0	
				NB	NBL	375	379	101%	27.3	308	178	
					NBT	680	669	98%	10.2	273	166	
					NBR	0	0	100%	0.0	278	168	
				SB	SBL	0	0	100%	0.0	0	0	
					SBT	225	226	100%	20.6	156	102	
					SBR	132	130	98%	7.7	33	18	
2800	Shaw Rd E	5th Ave SE (Future)	Y	WB	WBL	80	73	91%	32.9	60	46	**15.0**
					WBR	152	151	99%	12.0	99	85	
				NB	NBT	1074	1053	98%	16.3	402	340	
					NBR	188	177	94%	7.4	383	322	
				SB	SBL	342	333	97%	24.2	218	150	
					SBT	340	342	101%	3.7	46	32	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	0	0	**0.7**
					EBR	0	0	100%	0.0	0	0	
				NB	NBL	18	13	72%	0.7	1	0	
					NBT	31	27	87%	0.2	0	0	
				SB	SBT	15	15	100%	0.1	0	0	
					SBR	0	1	100%	0.1	0	0	
3000	Shaw Rd E	Safeway	Y	EB	EBL	85	85	100%	73.4	114	89	**13.4**
					EBR	49	47	96%	7.9	59	50	
				NB	NBL	96	96	100%	6.8	20	11	
					NBT	1013	986	97%	13.1	154	92	
				SB	SBT	352	346	98%	4.8	65	44	
					SBR	88	86	98%	1.4	33	19	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	3	4	133%	1.6	2	0	**5.9**
					EBT	16	17	106%	0.1	0	0	
				WB	WBT	72	71	99%	0.4	0	0	
					WBR	62	56	90%	0.9	0	0	
				SB	SBL	27	24	89%	5.9	24	17	
					SBR	0	0	100%	0.0	34	25	
3200	SR 162	Pioneer	Y	EB	EBL	34	33	97%	55.0	55	35	**24.0**
					EBT	4	4	100%	53.4	55	35	
					EBR	118	117	99%	7.4	59	48	
				WB	WBL	8	7	88%	54.0	50	31	
					WBT	18	17	94%	54.9	50	31	
					WBR	21	22	105%	19.1	75	43	
				NB	NBL	260	248	95%	78.1	587	240	
					NBT	596	588	99%	8.8	110	70	
					NBR	2	2	100%	9.1	3	0	
				SB	SBL	8	8	100%	61.3	14	8	
					SBT	308	299	97%	10.3	169	105	
					SBR	38	37	97%	8.8	223	149	
3300	SR 162	80th St	N	EB	EBL	28	28	100%	12.3	27	19	**12.3**
					EBR	15	14	93%	6.7	21	15	
				NB	NBL	41	39	95%	3.1	43	7	
					NBT	610	606	99%	1.4	32	0	
				SB	SBT	339	332	98%	1.2	15	0	
					SBR	93	89	96%	3.4	38	12	
3400	SR 162	EB	Y	EB	EBL	170	168	99%	42.0	151	113	**21.3**
					EBR	219	217	99%	9.1	97	78	
				NB	NBT	733	723	99%	25.1	562	399	
					NBR	52	48	92%	24.4	104	7	
				SB	SBL	62	60	97%	15.0	44	27	
					SBT	199	191	96%	4.0	58	24	
3500	SR 162	WB	Y	WB	WBL	117	114	97%	44.3	108	83	**18.0**
					WBR	118	114	97%	5.4	8	2	
				NB	NBL	344	335	97%	41.3	360	293	
					NBT	559	555	99%	4.2	95	53	
				SB	SBT	144	139	97%	17.1	77	56	
					SBR	119	119	100%	4.3	8	2	

2026 Scenario A PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	97	77	79%	153.9	684	193	**71.7**
					EBT	264	211	80%	173.0	1641	1062	
					EBR	396	342	86%	153.3	1657	985	
				WB	WBL	118	136	115%	72.0	240	130	
					WBT	171	167	98%	59.7	278	223	
					WBR	50	48	96%	45.2	176	112	
				NB	NBL	216	164	76%	59.3	212	145	
					NBT	357	285	80%	19.0	226	167	
					NBR	92	97	105%	7.0	69	51	
				NE	NER	12	14	117%	70.7	62	30	
				SB	SBL	94	89	95%	69.8	118	83	
					SBT	583	639	110%	37.8	328	247	
					SBR	126	127	101%	24.0	380	294	
200	Traffic Ave	State St	Y	EB	EBL	29	28	98%	23.7	28	18	**69.3**
					EBR	10	7	70%	74.6	20	9	
				NB	NBL	19	14	75%	20.8	22	11	
					NBT	680	519	76%	2.5	91	37	
				SB	SBT	1196	1058	88%	104.4	1154	943	
					SBR	2	2	91%	66.9	1114	903	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	110	108	98%	40.8	99	77	**103.1**
					EBT	13	14	106%	42.8	28	13	
					EBR	300	298	99%	51.6	285	183	
				WB	WBL	300	224	75%	250.1	716	699	
					WBT	151	116	77%	168.4	202	142	
					WBR	12	9	74%	128.0	21	7	
				NB	NBL	533	501	94%	113.7	689	684	
					NBT	576	415	72%	53.7	368	168	
					NBR	178	116	65%	49.9	368	168	
				SB	SBL	10	9	91%	80.7	11	6	
					SBT	778	679	87%	115.0	788	782	
					SBR	418	346	83%	92.5	842	836	
400	E Main Ave	SR 410 EB	Y	EB	EBL	294	170	58%	427.1	1443	1432	**157.4**
					EBR	715	476	67%	138.8	390	268	
				NB	NBL	248	188	76%	165.8	300	224	
					NBT	994	868	87%	253.3	1370	1363	
				SB	SBT	1250	1088	87%	56.3	651	605	
					SBR	128	108	85%	56.8	637	590	
500	E Main Ave	5th Ave NE	N	EB	EBL	55	55	100%	27.5	50	43	**154.6**
					EBR	56	51	91%	6.7	11	1	
				NB	NBL	42	32	76%	130.1	35	24	
					NBT	1187	1052	89%	154.6	1597	1409	
				SB	SBT	1919	1539	80%	2.9	77	26	
					SBR	46	37	80%	1.8	77	26	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	404	382	94%	45.2	124	101	**56.9**
					EBR	266	308	116%	12.8	160	134	
				WB	WBL	1248	1035	83%	46.9	797	461	
					WBT	728	545	75%	8.3	224	160	
				NB	NBL	303	341	112%	111.6	1243	523	
					NBR	824	781	95%	103.4	1264	522	
700	E Main Ave	15th St SE	Y	EB	EBL	6	5	91%	9.2	4	0	**10.8**
					EBT	475	526	111%	17.1	240	178	
					EBR	114	109	96%	8.2	17	8	
				WB	WBL	254	190	75%	6.3	54	35	
					WBT	712	646	91%	7.4	219	153	
					WBR	68	50	73%	0.9	4	0	
				NB	NBL	85	82	97%	20.6	73	51	
					NBT	25	24	95%	20.0	73	51	
					NBR	125	128	103%	0.9	0	0	
				SB	SBL	51	48	95%	20.1	68	44	
					SBT	42	41	98%	19.5	68	44	
					SBR	12	13	107%	15.3	87	63	
800	E Main Ave	5th Ave SE	Y	EB	EBL	6	5	91%	19.9	7	2	**16.2**
					EBT	374	417	112%	14.9	221	161	
					EBR	30	31	104%	14.1	245	186	
				WB	WBL	191	148	77%	17.7	55	42	
					WBT	678	643	95%	15.9	359	254	
					WBR	88	72	82%	14.6	387	279	
				NB	NBL	17	16	97%	27.1	19	11	
					NBT	43	41	95%	27.2	67	37	
					NBR	78	79	101%	11.9	93	64	
				SB	SBL	79	81	102%	19.5	60	39	
					SBT	87	89	102%	18.5	65	43	
					SBR	10	13	131%	12.1	94	72	
900	E Main Ave	2nd St SE	Y	EB	EBL	57	56	98%	10.3	35	19	**11.5**
					EBT	396	449	113%	10.2	166	125	
				NB	NBL	78	77	98%	14.2	154	128	
					NBT	749	742	99%	13.0	154	128	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	353	333	94%	11.6	135	100	
					WBR	351	338	96%	9.6	153	125	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	833	828	99%	47.8	347	317	**30.1**
				NB	NBT	699	692	99%	55.5	970	627	
					NBR	1380	1335	97%	15.3	0	0	
				SB	SBL	1149	946	82%	34.0	428	424	
					SBT	1032	898	87%	12.2	236	191	
1100	Meridian	SR 167 WBR	Y	WB	WBR	707	707	100%	39.6	194	153	**12.9**
				NB	NBT	699	695	99%	37.3	121	78	
				SB	SBT	2181	1860	85%	17.9	279	255	
				EB	EBL	87	61	70%	285.3	86	57	**138.4**
					EBT	367	245	67%	286.4	185	129	
					EBR	744	481	65%	517.9	1678	1635	
					WBL	674	627	93%	186.9	1567	1094	

2026 Scenario A PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
1200	Meridian	Valley Ave	Y	WB	WBT	163	167	102%	47.2	116	96	
					WBR	67	64	96%	35.5	150	129	
				NB	NBL	569	547	96%	29.7	300	247	
					NBT	540	536	99%	14.2	170	140	
					NBR	297	298	100%	3.4	103	38	
				SB	SBL	16	16	100%	95.4	26	17	
					SBT	763	762	100%	59.1	656	436	
					SBR	22	22	100%	24.0	2	0	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	500	498	100%	20.9	206	135	**21.0**
					EBR	96	96	100%	18.4	249	177	
				WB	WBL	563	608	108%	35.4	493	403	
					WBT	534	514	96%	3.0	65	52	
				NB	NBL	93	93	100%	42.2	86	63	
					NBR	85	81	95%	5.1	58	45	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	493	490	99%	8.5	133	84	**11.2**
					EBR	93	90	97%	6.8	109	61	
				WB	WBL	42	44	106%	48.0	52	33	
					WBT	1021	1048	103%	7.1	224	157	
				NB	NBL	76	78	102%	41.6	69	54	
					NBR	403	446	111%	15.6	202	144	
1500	E Pioneer	13th St SE	N	EB	EBT	844	886	105%	0.3	0	0	**13.7**
					EBR	54	50	92%	0.8	0	0	
				WB	WBL	67	53	79%	6.3	23	15	
					WBT	1041	1076	103%	0.3	0	0	
				NB	NBL	23	21	91%	13.7	29	19	
					NBR	51	49	97%	7.2	48	35	
1600	E Pioneer	15th St SE	Y	EB	EBL	167	164	98%	5.6	60	33	**12.6**
					EBT	728	766	105%	11.4	189	119	
				WB	WBT	762	778	102%	12.0	185	151	
					WBR	67	59	88%	11.1	137	103	
				SB	SBL	169	158	94%	15.5	0	0	
					SBR	346	353	102%	18.6	8	2	
1700	E Pioneer	21st St	Y	EB	EBT	862	886	103%	13.9	214	170	**10.2**
					EBR	35	34	96%	11.2	164	121	
				WB	WBL	92	77	84%	9.0	92	74	
					WBT	809	820	101%	3.5	92	74	
				NB	NBL	21	21	100%	26.7	21	16	
					NBR	85	82	97%	32.5	76	53	
1800	E Pioneer	25th St SE	N	EB	EBT	932	927	100%	16.3	250	91	**74.9**
					EBR	15	15	97%	4.2	250	91	
				WB	WBL	3	3	91%	7.4	16	1	
					WBT	895	891	100%	0.3	9	0	
				NB	NBL	6	7	127%	74.9	49	15	
					NBR	8	8	104%	38.0	49	15	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	269	300	111%	149.3	1118	819	**84.0**
					EBT	444	400	90%	120.4	1179	928	
					EBR	204	194	95%	15.7	227	111	
				WB	WBL	198	214	108%	111.5	768	431	
					WBT	276	265	96%	97.6	878	451	
					WBR	60	57	94%	89.2	569	82	
				NB	NBL	170	163	96%	65.6	107	91	
					NBT	535	495	93%	50.2	308	269	
					NBR	129	128	99%	40.1	353	315	
				SB	SBL	133	101	76%	71.4	109	91	
					SBT	993	800	81%	74.8	949	882	
					SBR	421	450	107%	91.4	949	882	
2000	E Pioneer	33rd St SE	N	EB	EBL	153	145	94%	14.4	278	204	**14.4**
					EBT	542	479	88%	13.1	290	217	
				WB	WBT	335	331	99%	14.2	334	78	
					WBR	10	23	231%	6.9	265	19	
				SB	SBL	4	2	45%	11.1	98	68	
					SBR	199	220	111%	10.0	63	33	
2100	33rd St SE	80th St	N	WB	WBL	159	153	96%	1.1	4	0	**8.6**
					WBR	1	2	181%	0.6	4	0	
				NB	NBT	58	59	102%	7.9	34	29	
					NBR	106	109	103%	0.7	8	0	
				SB	SBL	4	3	68%	7.0	54	44	
					SBT	44	69	156%	8.6	77	67	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	2	3	136%	51.5	15	5	**51.5**
					WBR	48	49	102%	12.5	62	48	
				NB	NBT	681	642	94%	2.0	15	0	
					NBR	14	13	91%	1.7	0	0	
				SB	SBL	93	82	88%	16.7	33	21	
					SBT	1317	1187	90%	12.8	498	112	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	13	13	101%	42.4	21	13	**42.4**
					EBR	2	1	45%	13.7	5	0	
				NB	NBL	6	4	72%	37.6	93	19	
					NBT	682	647	95%	6.1	87	17	
				SB	SBT	1248	1125	90%	10.2	436	159	
					SBR	70	62	89%	11.1	436	159	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	111	111	100%	48.0	123	89	**39.9**
					EBT	53	55	104%	57.1	118	69	
					EBR	60	60	101%	31.5	147	98	
				WB	WBL	41	37	91%	49.6	46	31	
					WBT	29	28	98%	57.3	70	41	
					WBR	32	30	95%	26.1	102	71	
				NB	NBL	50	49	99%	45.3	32	25	
					NBT	545	510	94%	13.4	233	189	
					NBR	31	30	97%	6.7	30	20	
				SB	SBL	38	36	95%	56.2	16	9	
					SBT	1027	916	89%	51.8	1273	1044	
					SBR	185	159	86%	44.5	53	35	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	35	32	92%	22.0	52	42	**22.0**
					EBR	29	31	108%	17.2	51	42	
				NB	NBL	30	27	91%	16.1	55	20	
					NBT	593	561	95%	3.2	35	6	
				SB	SBT	1082	971	90%	5.7	63	0	
					SBR	46	44	95%	5.6	63	0	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	31	28	89%	19.6	36	27	**21.3**
					EBR	14	15	105%	21.3	30	16	
				NB	NBL	12	11	91%	19.3	11	7	
					NBT	590	563	95%	1.8	0	0	
				SB	SBT	1049	938	89%	12.6	444	102	
					SBR	62	53	86%	10.4	444	102	
				EB	EBL	200	203	101%	36.1	155	129	**70.2**
					EBT	7	7	106%	36.3	155	129	
					EBR	423	417	99%	23.0	241	200	
					WBL	2	5	226%	57.1	31	19	

2026 Scenario A PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
2700	Shaw Rd E	39th Ave SE	Y	WB	WBT	7	8	121%	60.8	31	19	
					WBR	9	10	113%	9.4	18	6	
				NB	NBL	391	359	92%	162.0	1580	1122	
					NBT	395	361	91%	92.3	714	131	
					NBR	2	6	272%	72.7	563	129	
				SB	SBL	3	6	181%	80.2	19	9	
					SBT	793	691	87%	64.8	1177	934	
					SBR	268	238	89%	30.9	53	36	
2800	Shaw Rd E	5th Ave SE (Future)	N	WB	WBL	186	267	143%	178.3	1661	1518	62.7
					WBR	343	477	139%	132.9	1666	1510	
				NB	NBT	783	690	88%	45.8	640	259	
					NBR	81	131	161%	31.7	622	241	
				SB	SBL	152	256	168%	30.5	266	157	
					SBT	1361	1084	80%	25.9	532	415	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	0	0	6.6
					EBR	0	38	100%	6.6	41	33	
				NB	NBL	0	14	100%	0.5	1	0	
					NBT	0	47	100%	0.2	0	0	
				SB	SBT	0	34	100%	0.1	0	0	
					SBR	0	0	100%	0.0	0	0	
3000	Shaw Rd E	Safeway	Y	EB	EBL	98	102	104%	71.7	189	135	14.6
					EBR	282	277	98%	18.2	173	125	
				NB	NBL	82	72	88%	15.0	19	9	
					NBT	736	688	94%	13.7	85	56	
				SB	SBT	1231	1077	87%	9.9	260	192	
					SBR	163	129	79%	4.5	232	161	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	0	16	100%	1.4	5	2	7.6
					EBT	106	93	88%	0.2	0	0	
				WB	WBT	159	155	97%	0.3	0	0	
					WBR	27	50	185%	0.8	0	0	
				SB	SBL	63	118	187%	7.6	51	41	
					SBR	0	2	100%	6.3	63	54	
3200	SR 162	Pioneer	Y	EB	EBL	81	80	99%	55.2	100	75	25.3
					EBT	11	11	100%	55.3	100	75	
					EBR	295	293	99%	29.4	229	140	
				WB	WBL	4	4	91%	54.7	48	22	
					WBT	18	15	85%	51.5	48	22	
					WBR	12	14	115%	12.6	56	29	
				NB	NBL	224	223	100%	66.0	283	188	
					NBT	444	454	102%	7.0	122	84	
					NBR	9	9	102%	4.1	8	2	
				SB	SBL	22	20	91%	58.3	29	21	
					SBT	816	816	100%	19.3	642	445	
					SBR	76	72	95%	18.5	689	485	
3300	SR 162	80th St	N	EB	EBL	97	116	119%	85.5	247	166	85.5
					EBR	71	93	131%	66.2	248	167	
				NB	NBL	22	38	174%	8.9	82	32	
					NBT	515	513	100%	2.3	65	17	
				SB	SBT	843	817	97%	3.7	53	11	
					SBR	163	169	104%	5.4	84	32	
3400	SR 162	EB	Y	EB	EBL	162	162	100%	29.2	108	91	16.1
					EBR	485	472	97%	31.9	382	238	
				NB	NBT	524	507	97%	17.0	406	262	
					NBR	161	187	116%	16.9	262	125	
				SB	SBL	137	141	103%	11.9	60	35	
					SBT	780	773	99%	3.6	150	92	
3500	SR 162	WB	Y	WB	WBL	157	165	105%	37.3	136	106	21.5
					WBR	128	128	100%	5.4	8	2	
				NB	NBL	246	241	98%	26.8	185	144	
					NBT	441	430	98%	5.0	121	87	
				SB	SBT	760	750	99%	30.7	847	585	
					SBR	229	225	98%	13.9	22	10	

2026 Scenario B AM

Node #	Primary Road	Secondary Road	Approach	Movement	Movement				Intersection
					Served Volume (vph)	Vehicle Delay (sec)	Max Queue (ft)	Average Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	EB	EBL	96	20.3	139	11	38.0
				EBT	87	22.3	109	11	
				EBR	144	6.0	109	5	
			WB	WBL	67	18.1	108	6	
				WBT	115	24.8	159	20	
				WBR	37	21.6	192	11	
			NB	NBL	335	43.2	1170	326	
				NBT	645	52.3	1182	416	
				NBR	92	35.4	99	3	
			NE	NER	11	5.5	59	1	
			SB	SBL	17	50.7	68	5	
				SBT	275	42.1	306	67	
				SBR	78	28.7	357	65	
200	Traffic Ave	State St	EB	EBL	16	35.8	57	3	6.8
				EBR	5	8.9	58	0	
			NB	NBL	9	32.8	33	1	
				NBT	1055	8.9	600	51	
			SB	SBT	473	0.7	87	1	
				SBR	7	1.8	40	0	
300	E Main Ave	SR 410 WB/Thompson St	EB	EBL	205	42.6	567	55	28.8
				EBT	13	43.2	304	10	
				EBR	515	32.7	758	146	
			WB	WBL	47	44.9	89	12	
				WBT	51	44.0	117	13	
				WBR	14	9.5	39	1	
			NB	NBL	433	39.4	686	153	
				NBT	848	22.3	686	151	
				NBR	101	23.4	686	151	
			SB	SBL	1	41.4	12	0	
				SBT	291	19.7	355	43	
				SBR	188	16.3	409	67	
400	E Main Ave	SR 410 EB	EB	EBL	450	62.9	1368	312	74.8
				EBR	370	31.1	447	53	
			NB	NBL	88	1265.6	1395	1150	
				NBT	930	35.1	666	148	
			SB	SBT	767	20.4	377	73	
				SBR	84	23.0	362	65	
500	E Main Ave	5th Ave NE	EB	EBL	17	107.7	65	4	115.5
				EBR	11	6.0	3	0	
			NB	NBL	23	115.5	56	0	
				NBT	1027	62.9	1530	455	
			SB	SBT	1087	2.8	94	9	
				SBR	46	1.7	94	9	
600	E Main Ave	Shaw Rd E	EB	EBT	300	44.7	295	43	36.5
				EBR	181	11.4	189	16	
			WB	WBL	810	59.3	1018	245	
				WBT	251	7.3	196	7	
			NB	NBL	181	32.7	309	35	
				NBR	836	27.5	1109	184	
700	E Main Ave	15th St SE	EB	EBL	2	13.5	16	0	8.1
				EBT	364	11.9	275	14	
				EBR	47	7.7	44	0	
			WB	WBL	66	4.3	69	1	
				WBT	346	5.8	213	8	
				WBR	24	0.9	12	0	
			NB	NBL	97	13.5	124	9	
				NBT	30	15.1	124	9	
				NBR	139	1.0	0	0	
			SB	SBL	3	14.8	41	1	
				SBT	13	11.1	41	1	
				SBR	0	0.0	60	1	
800	E Main Ave	5th Ave SE	EB	EBL	1	7.6	2	0	10.4
				EBT	326	9.0	298	14	
				EBR	6	7.3	323	17	
			WB	WBL	33	12.0	61	1	
				WBT	308	11.4	293	13	
				WBR	83	9.6	321	19	
			NB	NBL	16	15.8	59	1	
				NBT	24	15.9	108	4	
				NBR	135	8.2	133	10	
			SB	SBL	48	15.2	60	4	
				SBT	26	12.3	41	1	
				SBR	3	5.1	70	2	
900	E Main Ave	2nd St SE	EB	EBL	48	29.6	246	8	14.7
				EBT	335	31.4	416	75	
			NB	NBL	61	8.4	218	21	
				NBT	856	7.4	218	21	

2026 Scenario B AM

Node #	Primary Road	Secondary Road	Approach	Movement	Movement				Intersection
					Served Volume (vph)	Vehicle Delay (sec)	Max Queue (ft)	Average Queue (ft)	Vehicle Delay (sec)
				NBR	0	0.0	0	0	
			WB	WBT	109	25.0	177	16	
				WBR	219	11.3	213	19	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	WB	WBL	1108	93.4	1685	360	60.6
			NB	NBT	850	88.0	1558	560	
				NBR	640	37.5	0	0	
			SB	SBL	671	38.8	463	148	
				SBT	651	16.5	297	43	
1100	Meridian	SR 167 WBR	WB	WBR	1301	245.8	3401	1595	52.0
			NB	NBT	850	50.2	463	121	
			SB	SBT	1334	9.4	554	36	
1200	Meridian	Valley Ave	EB	EBL	38	58.0	135	16	31.0
				EBT	225	48.2	220	53	
				EBR	562	30.5	613	104	
			WB	WBL	302	74.9	280	98	
				WBT	212	42.1	222	46	
				WBR	73	23.2	257	69	
			NB	NBL	753	33.9	405	158	
				NBT	1032	17.7	398	84	
				NBR	363	2.7	364	7	
			SB	SBL	35	55.9	105	11	
				SBT	472	35.9	385	77	
				SBR	56	12.2	29	0	
1300	E Pioneer	SR 512 WB	EB	EBT	397	13.7	207	23	23.1
				EBR	41	10.3	245	37	
			WB	WBL	276	49.4	479	100	
				WBT	360	2.7	119	3	
			NB	NBL	139	77.6	539	83	
				NBR	303	12.0	303	23	
1400	E Pioneer	SR 512 EB	EB	EBT	579	9.3	255	22	10.9
				EBR	120	7.1	232	14	
			WB	WBL	61	47.4	129	17	
				WBT	571	5.1	201	10	
			NB	NBL	66	45.3	142	17	
				NBR	300	11.5	289	22	
1500	E Pioneer	13th St SE	EB	EBT	858	0.3	0	0	11.8
				EBR	19	0.7	0	0	
			WB	WBL	20	6.6	42	1	
				WBT	602	0.2	0	0	
			NB	NBL	28	11.8	58	2	
				NBR	53	7.2	62	3	
1600	E Pioneer	15th St SE	EB	EBL	230	4.8	154	4	6.4
				EBT	683	5.7	189	12	
			WB	WBT	527	5.8	182	10	
				WBR	69	4.8	134	3	
			SB	SBL	45	13.8	0	0	
				SBR	93	15.9	10	0	
1700	E Pioneer	21st St	EB	EBT	710	3.2	157	8	3.4
				EBR	16	3.0	107	1	
			WB	WBL	48	6.8	123	4	
				WBT	583	2.2	123	4	
			NB	NBL	20	21.3	46	2	
				NBR	60	9.1	77	3	
1800	E Pioneer	25th St SE	EB	EBT	743	11.7	431	46	26.5
				EBR	11	2.1	431	46	
			WB	WBL	0	0.0	0	0	
				WBT	613	0.4	0	0	
			NB	NBL	12	26.5	54	3	
				NBR	7	7.7	53	3	
1900	E Pioneer	Shaw Rd E	EB	EBL	322	130.8	1398	544	76.9
				EBT	292	89.8	1416	279	
				EBR	84	9.1	127	4	
			WB	WBL	114	63.4	246	33	
				WBT	282	66.4	1064	233	
				WBR	94	70.2	1106	145	
			NB	NBL	156	105.3	193	61	
				NBT	684	67.9	478	291	
				NBR	110	54.3	524	331	
			SB	SBL	70	94.3	233	44	
				SBT	247	56.5	605	89	
				SBR	114	57.3	605	89	
2000	E Pioneer	33rd St SE	EB	EBL	251	29.1	894	96	29.1
				EBT	221	23.1	908	99	
			WB	WBT	347	4.8	278	12	
				WBR	33	7.7	211	6	
			SB	SBL	12	11.8	148	10	
				SBR	152	7.8	114	3	

2026 Scenario B AM

Node #	Primary Road	Secondary Road	Approach	Movement	Movement				Intersection
					Served Volume (vph)	Vehicle Delay (sec)	Max Queue (ft)	Average Queue (ft)	Vehicle Delay (sec)
2100	33rd St SE	80th St	WB	WBL	81	9.0	259	8	14.7
				WBR	23	4.2	67	1	
			NB	NBT	249	14.7	206	21	
				NBR	35	4.1	213	11	
			SB	SBL	10	9.4	152	6	
				SBT	84	10.1	175	9	
2200	Shaw Rd E	Highlands Blvd	WB	WBL	4	104.5	165	17	169.6
				WBR	72	169.6	509	141	
			NB	NBT	976	25.2	1061	266	
				NBR	3	11.6	0	0	
			SB	SBL	19	21.7	52	2	
				SBT	385	3.0	0	0	
2300	Shaw Rd E	16th Ave SE	EB	EBL	26	102.5	261	36	102.5
				EBR	5	86.0	258	33	
			NB	NBL	4	38.3	1667	325	
				NBT	980	33.7	1664	322	
			SB	SBT	376	1.4	0	0	
				SBR	10	1.6	0	0	
2400	Shaw Rd E	23rd Ave SE	EB	EBL	141	50.0	271	42	40.1
				EBT	15	47.0	103	6	
				EBR	36	12.6	132	7	
			WB	WBL	18	41.5	61	4	
				WBT	26	1.7	47	0	
				WBR	41	18.4	83	5	
			NB	NBL	42	89.1	115	14	
				NBT	834	44.6	1576	405	
				NBR	6	28.3	69	0	
			SB	SBL	14	78.2	60	5	
				SBT	306	26.8	564	53	
				SBR	59	22.5	608	70	
2500	Shaw Rd E	Forrest Green Blvd	EB	EBL	25	17.2	90	6	17.2
				EBR	33	9.8	90	5	
			NB	NBL	18	6.0	428	21	
				NBT	877	4.6	385	19	
			SB	SBT	349	3.5	46	1	
				SBR	12	4.0	46	1	
2600	Shaw Rd E	Manorwood Dr	EB	EBL	36	12.8	62	3	12.8
				EBR	10	6.7	45	0	
			NB	NBL	1	10.8	14	0	
				NBT	868	2.8	117	3	
			SB	SBT	368	2.6	0	0	
				SBR	17	2.5	0	0	
2700	Shaw Rd E	39th Ave SE	EB	EBL	153	23.4	181	21	14.9
				EBT	0	0.0	181	21	
				EBR	154	7.0	125	9	
			WB	WBL	0	0.0	0	0	
				WBT	2	1.8	0	0	
				WBR	4	6.6	0	0	
			NB	NBL	382	25.7	679	65	
				NBT	716	8.8	496	31	
				NBR	0	0.0	501	25	
			SB	SBL	0	0.0	0	0	
				SBT	237	19.6	286	25	
				SBR	138	7.9	125	2	
2800	Shaw Rd E	5th Ave SE (Future)	WB	WBL	68	261.2	748	617	104.2
				WBR	195	260.4	748	617	
			NB	NBT	890	74.8	1065	430	
				NBR	171	75.4	1065	430	
			SB	SBL	576	136.5	1405	776	
				SBT	373	27.1	126	5	
2900	33rd St SE	5th Ave SE	EB	EBL	0	0.0	0	0	0.5
				EBR	0	0.0	0	0	
			NB	NBL	0	0.0	0	0	
				NBT	272	0.4	0	0	
			SB	SBT	98	0.5	0	0	
				SBR	0	0.0	0	0	
3000	Shaw Rd E	Safeway	EB	EBL	85	136.2	262	58	93.6
				EBR	52	14.4	92	3	
			NB	NBL	82	93.1	83	1	
				NBT	887	139.1	1678	747	
			SB	SBT	362	4.5	150	5	
				SBR	83	1.4	120	2	
3100	80th St	Knutson Farms Driveway	EB	EBL	15	4.4	46	1	5.9
				EBT	85	0.7	18	0	
			WB	WBT	153	3.8	250	5	
				WBR	50	5.6	250	5	
			SB	SBL	118	11.3	120	7	

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Node #	Primary Road	Secondary Road	Approach	Movement	Movement				Intersection
					Served Volume (vph)	Vehicle Delay (sec)	Max Queue (ft)	Average Queue (ft)	Vehicle Delay (sec)
			SB	SBR	2	6.5	132	9	
3200	SR 162	Pioneer	EB	EBL	33	55.3	106	12	**23.9**
				EBT	4	53.4	106	12	
				EBR	117	7.3	90	6	
			WB	WBL	7	54.0	96	9	
				WBT	17	54.9	96	9	
				WBR	22	19.1	131	9	
			NB	NBL	248	78.1	938	160	
				NBT	588	8.7	298	10	
				NBR	2	9.2	12	0	
			SB	SBL	8	61.2	37	3	
				SBT	299	10.3	288	20	
				SBR	37	8.8	344	32	
3300	SR 162	80th St	EB	EBL	27	13.0	67	2	**12.6**
				EBR	14	7.0	67	1	
			NB	NBL	39	3.1	146	1	
				NBT	606	1.4	105	0	
			SB	SBT	332	1.2	49	0	
				SBR	89	3.4	109	1	
3400	SR 162	EB	EB	EBL	168	42.3	233	42	**21.7**
				EBR	217	9.1	174	14	
			NB	NBT	721	25.8	1162	159	
				NBR	48	25.1	537	21	
			SB	SBL	60	14.9	103	4	
				SBT	191	3.9	115	3	
3500	SR 162	WB	WB	WBL	114	44.3	185	30	**18.2**
				WBR	114	5.4	36	0	
			NB	NBL	335	41.9	637	118	
				NBT	554	4.3	237	6	
			SB	SBT	139	17.2	148	13	
				SBR	119	4.3	37	0	

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Node #	Primary Road	Secondary Road	Approach	Movement	Movement				Intersection
					Served Volume (vph)	Vehicle Delay (sec)	Max Queue (ft)	Average Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	EB	EBL	68	154.0	779	141	**76.1**
				EBT	188	177.0	1659	984	
				EBR	300	149.1	1678	943	
			WB	WBL	129	88.4	577	88	
				WBT	164	63.3	495	91	
				WBR	46	51.3	477	33	
			NB	NBL	167	58.6	409	67	
				NBT	295	18.9	460	43	
				NBR	98	7.3	109	4	
			NE	NER	13	74.3	114	17	
			SB	SBL	83	76.2	229	33	
				SBT	594	56.3	1120	190	
				SBR	121	38.0	1175	207	
200	Traffic Ave	State St	EB	EBL	26	40.3	143	24	**80.1**
				EBR	6	406.9	150	34	
			NB	NBL	14	44.9	61	3	
				NBT	530	5.7	330	16	
			SB	SBT	951	122.5	1204	594	
				SBR	2	94.3	1164	565	
300	E Main Ave	SR 410 WB/Thompson St	EB	EBL	98	56.1	219	24	**111.4**
				EBT	13	63.2	130	14	
				EBR	252	84.1	709	224	
			WB	WBL	214	264.2	760	565	
				WBT	111	171.3	549	78	
				WBR	9	125.2	87	1	
			NB	NBL	537	103.8	717	591	
				NBT	437	51.5	700	105	
				NBR	124	49.0	700	105	
			SB	SBL	9	95.0	38	1	
				SBT	606	138.4	819	578	
				SBR	310	103.0	873	631	
400	E Main Ave	SR 410 EB	EB	EBL	176	387.8	1479	1212	**168.7**
				EBR	445	178.8	1505	1114	
			NB	NBL	196	165.4	581	170	
				NBT	926	233.2	1393	1064	
			SB	SBT	959	74.6	686	378	
				SBR	97	71.1	671	364	
500	E Main Ave	5th Ave NE	EB	EBL	55	27.0	94	3	**136.5**
				EBR	51	9.7	42	0	
			NB	NBL	35	119.0	82	2	
				NBT	1114	136.5	1586	754	
			SB	SBT	1301	57.1	1316	387	
				SBR	30	31.4	1316	387	
600	E Main Ave	Shaw Rd E	EB	EBT	377	39.6	179	28	**88.3**
				EBR	257	139.4	1213	360	
			WB	WBL	823	151.0	1619	853	
				WBT	465	29.9	430	70	
			NB	NBL	338	112.6	1088	386	
				NBR	813	58.7	1092	317	
700	E Main Ave	15th St SE	EB	EBL	5	8.7	17	0	**10.9**
				EBT	521	17.1	446	38	
				EBR	108	8.5	55	0	
			WB	WBL	170	6.1	119	3	
				WBT	592	7.2	392	20	
				WBR	46	0.9	11	0	
			NB	NBL	82	20.0	125	12	
				NBT	23	20.4	125	12	
				NBR	126	0.9	0	0	
			SB	SBL	48	18.1	107	9	
				SBT	41	20.2	107	9	
				SBR	13	13.3	127	11	
800	E Main Ave	5th Ave SE	EB	EBL	5	16.8	21	0	**15.9**
				EBT	412	14.8	369	36	
				EBR	31	13.5	394	44	
			WB	WBL	140	16.9	119	5	
				WBT	607	15.4	591	45	
				WBR	67	13.9	619	54	
			NB	NBL	16	25.0	53	2	
				NBT	40	27.1	129	9	
				NBR	78	12.1	154	16	
			SB	SBL	80	19.6	104	9	
				SBT	88	17.9	109	9	
				SBR	13	11.6	138	12	
900	E Main Ave	2nd St SE	EB	EBL	56	9.8	120	2	**11.3**
				EBT	443	10.2	273	21	
			NB	NBL	77	14.4	239	33	
				NBT	740	12.6	239	33	
				NBR	0	0.0	0	0	
			WB	WBT	314	11.4	315	16	
				WBR	321	9.2	258	17	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	WB	WBL	828	47.8	490	133	**30.1**
			NB	NBT	692	55.5	1657	274	
				NBR	1335	15.3	0	0	
			SB	SBL	946	34.0	449	205	
				SBT	898	12.2	370	44	
1100	Meridian	SR 167 WBR	WB	WBR	707	39.6	687	72	**12.9**
			NB	NBT	695	37.3	558	93	
			SB	SBT	1860	17.9	696	183	
			EB	EBL	61	285.3	167	18	
				EBT	245	286.4	341	54	
				EBR	481	517.9	1694	1326	
				WBL	627	186.9	1618	818	

2026 Scenario B PM

Node #	Primary Road	Secondary Road	Approach	Movement	Movement				Intersection
					Served Volume (vph)	Vehicle Delay (sec)	Max Queue (ft)	Average Queue (ft)	Vehicle Delay (sec)
1200	Meridian	Valley Ave	WB	WBT	167	47.2	186	31	**138.4**
				WBR	64	35.5	221	47	
			NB	NBL	547	29.7	373	80	
				NBT	536	14.2	289	26	
				NBR	298	3.4	239	4	
			SB	SBL	16	95.4	62	7	
				SBT	762	59.1	830	243	
				SBR	22	24.0	9	0	
1300	E Pioneer	SR 512 WB	EB	EBT	498	19.0	258	41	**19.8**
				EBR	96	16.7	300	65	
			WB	WBL	533	33.8	681	133	
				WBT	456	2.9	103	4	
			NB	NBL	93	42.2	130	24	
				NBR	81	5.3	94	3	
1400	E Pioneer	SR 512 EB	EB	EBT	490	7.8	218	14	**11.1**
				EBR	90	5.7	194	10	
			WB	WBL	38	48.8	86	10	
				WBT	908	6.5	388	21	
			NB	NBL	77	43.5	144	19	
				NBR	445	16.2	355	50	
1500	E Pioneer	13th St SE	EB	EBT	885	0.3	0	0	**13.3**
				EBR	51	0.7	0	0	
			WB	WBL	45	6.4	53	1	
				WBT	928	0.3	0	0	
			NB	NBL	21	13.3	53	2	
				NBR	49	7.0	66	2	
1600	E Pioneer	15th St SE	EB	EBL	164	7.9	210	6	**13.2**
				EBT	765	11.2	244	29	
			WB	WBT	622	11.6	233	26	
				WBR	47	12.3	286	46	
			SB	SBL	158	17.7	13	0	
				SBR	352	20.8	24	0	
1700	E Pioneer	21st St	EB	EBT	887	4.1	222	12	**4.3**
				EBR	34	3.6	171	3	
			WB	WBL	60	10.0	150	7	
				WBT	645	2.8	150	7	
			NB	NBL	21	20.4	52	2	
				NBR	82	9.9	97	4	
1800	E Pioneer	25th St SE	EB	EBT	925	31.3	568	130	**44.6**
				EBR	15	9.3	568	130	
			WB	WBL	2	9.3	35	0	
				WBT	695	0.3	7	0	
			NB	NBL	0	0.0	0	0	
				NBR	8	44.6	118	14	
1900	E Pioneer	Shaw Rd E	EB	EBL	303	162.0	1402	679	**138.3**
				EBT	395	146.1	1425	757	
				EBR	187	70.8	1319	387	
			WB	WBL	0	0.0	0	0	
				WBT	158	232.4	1190	682	
				WBR	34	240.3	1241	728	
			NB	NBL	160	68.8	187	45	
				NBT	489	45.6	440	109	
				NBR	125	36.7	485	139	
			SB	SBL	77	110.2	188	32	
				SBT	603	170.9	994	744	
				SBR	360	140.3	994	744	
2000	E Pioneer	33rd St SE	EB	EBL	139	16.1	639	45	**171.7**
				EBT	453	14.4	653	48	
			WB	WBT	188	171.7	1676	682	
				WBR	14	164.2	1676	663	
			SB	SBL	1	61.3	320	149	
				SBR	177	61.1	285	127	
2100	33rd St SE	80th St	WB	WBL	118	146.0	771	171	**163.4**
				WBR	1	163.4	771	171	
			NB	NBT	56	10.3	81	2	
				NBR	97	3.5	54	1	
			SB	SBL	2	6.1	94	4	
				SBT	65	46.5	118	10	
2200	Shaw Rd E	Highlands Blvd	WB	WBL	3	67.8	73	2	**216.7**
				WBR	48	19.6	112	8	
			NB	NBT	655	5.1	480	16	
				NBR	13	2.0	0	0	
			SB	SBL	62	193.6	81	2	
				SBT	892	216.7	1691	1491	
2300	Shaw Rd E	16th Ave SE	EB	EBL	13	15.9	45	1	**69.0**
				EBR	0	0.0	0	0	
			NB	NBL	0	0.0	0	0	
				NBT	1	52.6	43	1	
			SB	SBT	4	30.6	594	18	
				SBR	46	69.0	1109	717	
2400	Shaw Rd E	23rd Ave SE	EB	EBL	111	39.1	212	27	**109.8**
				EBT	54	41.3	198	19	
				EBR	59	23.7	227	26	
			WB	WBL	37	37.8	96	8	
				WBT	28	1.4	61	0	
				WBR	30	8.7	106	2	
			NB	NBL	50	67.4	127	16	
				NBT	522	38.5	1033	160	
				NBR	31	17.9	87	1	
			SB	SBL	27	191.6	67	4	
				SBT	698	190.6	1670	1282	
				SBR	118	187.7	1675	1283	
			EB	EBL	32	17.1	92	5	
				EBR	31	13.3	91	5	

2026 Scenario B PM

Node #	Primary Road	Secondary Road	Approach	Movement	Movement				Intersection
					Served Volume (vph)	Vehicle Delay (sec)	Max Queue (ft)	Average Queue (ft)	Vehicle Delay (sec)
2500	Shaw Rd E	Forrest Green Blvd	NB	NBL	28	12.6	198	4	**17.1**
				NBT	575	2.9	145	2	
			SB	SBT	762	4.4	0	0	
				SBR	34	3.9	0	0	
2600	Shaw Rd E	Manorwood Dr	EB	EBL	29	15.3	72	2	**15.3**
				EBR	15	12.4	67	1	
			NB	NBL	12	14.9	39	1	
				NBT	575	1.9	0	0	
			SB	SBT	748	4.0	66	0	
				SBR	42	3.2	66	0	
2700	Shaw Rd E	39th Ave SE	EB	EBL	203	35.2	264	45	**44.7**
				EBT	7	39.0	264	45	
				EBR	417	18.6	361	60	
			WB	WBL	5	4.8	22	0	
				WBT	8	1.8	22	0	
				WBR	10	6.8	9	0	
			NB	NBL	373	112.7	1526	534	
				NBT	373	48.4	538	29	
				NBR	6	41.6	509	23	
			SB	SBL	4	48.3	65	1	
				SBT	565	33.8	935	145	
				SBR	196	10.3	100	2	
2800	Shaw Rd E	5th Ave SE (Future)	WB	WBL	257	193.0	1670	936	**120.1**
				WBR	476	112.9	1605	552	
			NB	NBT	691	39.0	578	114	
				NBR	132	28.5	560	104	
			SB	SBL	200	138.1	1244	362	
				SBT	809	185.1	1414	803	
2900	33rd St SE	5th Ave SE	EB	EBL	0	0.0	0	0	**6.6**
				EBR	37	6.6	60	1	
			NB	NBL	13	0.6	5	0	
				NBT	44	0.2	0	0	
			SB	SBT	34	0.1	0	0	
				SBR	0	0.0	0	0	
3000	Shaw Rd E	Safeway	EB	EBL	89	182.3	822	396	**75.4**
				EBR	242	174.1	858	459	
			NB	NBL	72	36.3	95	3	
				NBT	686	32.5	236	8	
			SB	SBT	811	80.4	539	344	
				SBR	99	27.5	509	317	
3100	80th St	Knutson Farms Driveway	EB	EBL	15	4.4	46	1	**5.9**
				EBT	85	0.7	18	0	
			WB	WBT	153	3.8	250	5	
				WBR	50	5.6	250	5	
			SB	SBL	118	11.3	120	7	
				SBR	2	6.5	132	9	
3200	SR 162	Pioneer	EB	EBL	80	55.3	106	12	**25.2**
				EBT	11	53.4	106	12	
				EBR	294	7.3	90	6	
			WB	WBL	4	54.0	96	9	
				WBT	15	54.9	96	9	
				WBR	14	19.1	131	9	
			NB	NBL	221	78.1	938	160	
				NBT	451	8.7	298	10	
				NBR	9	9.2	12	0	
			SB	SBL	20	61.2	37	3	
				SBT	814	10.3	288	20	
				SBR	72	8.8	344	32	
3300	SR 162	80th St	EB	EBL	112	13.0	67	2	**12.6**
				EBR	89	7.0	67	1	
			NB	NBL	38	3.1	146	1	
				NBT	510	1.4	105	0	
			SB	SBT	819	1.2	49	0	
				SBR	168	3.4	109	1	
3400	SR 162	EB	EB	EBL	162	42.3	233	42	**16.6**
				EBR	475	9.1	174	14	
			NB	NBT	501	25.8	1162	159	
				NBR	186	25.1	537	21	
			SB	SBL	142	14.9	103	4	
				SBT	777	3.9	115	3	
3500	SR 162	WB	WB	WBL	165	44.3	185	30	**21.8**
				WBR	128	5.4	36	0	
			NB	NBL	238	41.9	637	118	
				NBT	427	4.3	237	6	
			SB	SBT	753	17.2	148	13	
				SBR	226	4.3	37	0	

2026 Scenario C AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	88	88	100%	20.6	109	46	**45.8**
					EBT	83	87	105%	25.0	84	26	
					EBR	128	124	97%	5.2	262	31	
				WB	WBL	60	59	98%	19.5	336	106	
					WBT	115	112	97%	27.0	122	91	
					WBR	34	35	103%	21.5	148	70	
				NB	NBL	383	365	95%	53.4	1157	705	
					NBT	726	699	96%	65.4	1163	782	
					NBR	113	108	96%	48.8	87	62	
				NE	NER	8	11	138%	6.0	54	0	
				SB	SBL	18	16	89%	47.2	22	0	
					SBT	216	212	98%	36.6	188	129	
					SBR	32	38	119%	21.0	320	26	
200	Traffic Ave	State St	Y	EB	EBL	18	18	100%	37.1	45	20	**17.6**
					EBR	3	3	100%	9.6	37	0	
				NB	NBL	10	8	80%	31.2	24	0	
					NBT	1204	1186	99%	22.5	537	90	
				SB	SBT	394	389	99%	1.5	83	0	
					SBR	9	7	78%	1.0	36	0	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	213	211	99%	47.2	244	173	**14.8**
					EBT	12	12	100%	31.2	23	0	
					EBR	136	138	101%	8.2	88	42	
				WB	WBL	46	45	98%	32.2	91	22	
					WBT	48	50	104%	32.1	116	24	
					WBR	12	13	108%	17.3	37	0	
				NB	NBL	479	473	99%	14.4	318	98	
					NBT	989	989	100%	10.2	213	155	
					NBR	109	107	98%	9.7	213	155	
				SB	SBL	2	2	100%	26.0	0	0	
					SBT	240	238	99%	8.2	253	58	
					SBR	155	151	97%	7.1	307	112	
400	E Main Ave	SR 410 EB	Y	EB	EBL	410	414	101%	50.5	888	373	**22.0**
					EBR	437	427	98%	19.5	236	141	
				NB	NBL	119	117	98%	15.1	75	34	
					NBT	1167	1153	99%	16.8	444	265	
				SB	SBT	350	344	98%	13.4	151	94	
					SBR	72	75	104%	8.0	136	79	
500	E Main Ave	5th Ave NE	N	EB	EBL	20	21	105%	7.3	49	0	**7.3**
					EBR	10	10	100%	6.0	0	0	
				NB	NBL	34	35	103%	2.1	49	0	
					NBT	1266	1255	99%	0.6	0	0	
				SB	SBT	742	732	99%	0.7	0	0	
					SBR	45	42	93%	1.6	0	0	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	313	315	101%	19.3	161	71	**14.9**
					EBR	182	180	99%	8.6	125	88	
				WB	WBL	500	494	99%	21.9	178	104	
					WBT	252	243	96%	6.9	158	64	
				NB	NBL	239	239	100%	23.1	221	101	
					NBR	987	978	99%	11.2	378	181	
700	E Main Ave	15th St SE	Y	EB	EBL	2	2	100%	10.5	0	0	**8.3**
					EBT	377	375	99%	12.6	248	90	
					EBR	42	42	100%	7.3	0	0	
				WB	WBL	70	69	99%	4.6	28	21	
					WBT	396	385	97%	5.6	151	49	
					WBR	25	23	92%	0.8	0	0	
				NB	NBL	97	100	103%	13.9	97	50	
					NBT	31	27	87%	14.7	97	50	
					NBR	116	119	103%	0.9	0	0	
				SB	SBL	2	3	150%	11.4	33	0	
					SBT	12	10	83%	13.3	33	0	
					SBR	0	0	100%	0.0	52	0	
800	E Main Ave	5th Ave SE	Y	EB	EBL	0	0	100%	0.0	0	0	**10.4**
					EBT	357	356	100%	9.1	297	108	
					EBR	6	5	83%	9.0	322	132	
				WB	WBL	36	34	94%	10.5	36	0	
					WBT	336	333	99%	11.0	213	91	
					WBR	88	86	98%	9.4	241	118	
				NB	NBL	12	12	100%	15.6	27	0	
					NBT	24	22	92%	17.8	80	32	
					NBR	131	131	100%	8.6	104	62	
				SB	SBL	48	45	94%	16.0	46	23	
					SBT	25	27	108%	15.4	44	9	
					SBR	3	3	100%	4.4	73	23	
900	E Main Ave	2nd St SE	Y	EB	EBL	46	46	100%	31.8	85	22	**14.9**
					EBT	363	362	100%	30.4	375	216	
				NB	NBL	59	60	102%	8.1	207	120	
					NBT	844	836	99%	7.5	207	120	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	125	128	102%	24.7	118	73	
					WBR	226	220	97%	10.6	162	92	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	1037	1025	99%	45.8	186	91	**31.4**
				NB	NBT	679	670	99%	33.1	419	223	
					NBR	524	520	99%	3.3	0	0	
				SB	SBL	478	471	99%	42.1	427	291	
					SBT	448	434	97%	16.9	224	155	
1100	Meridian	SR 167 WBR	Y	WB	WBR	1120	1127	101%	93.0	1346	410	**21.4**
				NB	NBT	679	670	99%	16.4	125	43	
				SB	SBT	926	915	99%	3.7	221	0	
				EB	EBL	22	21	95%	58.8	80	22	**26.6**
					EBT	147	149	101%	51.9	143	80	
					EBR	296	296	100%	26.6	308	170	
					WBL	272	265	97%	63.5	200	146	

2026 Scenario C AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
1200	Meridian	Valley Ave	Y	WB	WBT	139	140	101%	40.5	165	83	
					WBR	56	54	96%	16.4	199	118	
				NB	NBL	521	517	99%	34.4	377	232	
					NBT	961	966	101%	13.6	370	226	
					NBR	317	314	99%	2.5	112	0	
				SB	SBL	29	31	107%	57.0	71	22	
					SBT	358	352	98%	25.8	191	123	
					SBR	18	16	89%	6.0	11	0	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	355	354	100%	12.1	169	77	**20.4**
					EBR	35	35	100%	9.5	212	119	
				WB	WBL	225	216	96%	45.3	324	208	
					WBT	362	355	98%	2.8	82	46	
				NB	NBL	132	135	102%	60.1	209	117	
					NBR	86	83	97%	6.1	106	55	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	327	326	100%	7.8	152	45	**11.1**
					EBR	114	111	97%	5.3	128	21	
				WB	WBL	55	56	102%	45.2	147	47	
					WBT	521	504	97%	4.4	123	50	
				NB	NBL	66	65	98%	43.8	131	47	
					NBR	398	391	98%	13.8	277	92	
1500	E Pioneer	13th St SE	N	EB	EBT	707	703	99%	0.2	0	0	**10.2**
					EBR	18	15	83%	0.6	0	0	
				WB	WBL	23	21	91%	4.1	21	0	
					WBT	547	535	98%	0.2	0	0	
				NB	NBL	29	28	97%	10.2	42	35	
					NBR	50	50	100%	6.6	45	40	
1600	E Pioneer	15th St SE	Y	EB	EBL	218	218	100%	4.1	80	23	**5.7**
					EBT	539	535	99%	5.1	137	68	
				WB	WBT	492	478	97%	5.3	150	51	
					WBR	79	76	96%	4.5	102	0	
				SB	SBL	38	38	100%	14.1	0	0	
					SBR	78	78	100%	15.4	0	0	
1700	E Pioneer	21st St	Y	EB	EBT	559	553	99%	9.9	142	78	**7.4**
					EBR	18	19	106%	7.7	92	25	
				WB	WBL	49	47	96%	5.1	147	46	
					WBT	549	542	99%	2.3	147	46	
				NB	NBL	22	20	91%	19.9	28	9	
					NBR	56	58	104%	29.6	78	45	
1800	E Pioneer	25th St SE	N	EB	EBT	605	599	99%	0.9	0	0	**14.8**
					EBR	10	10	100%	0.9	0	0	
				WB	WBL	0	0	100%	0.0	0	0	
					WBT	586	568	97%	0.4	0	0	
				NB	NBL	12	14	117%	14.8	39	34	
					NBR	5	5	100%	5.5	38	33	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	359	358	100%	46.5	413	237	**43.1**
					EBT	155	156	101%	32.9	151	104	
					EBR	84	83	99%	5.1	118	74	
				WB	WBL	99	99	100%	47.4	200	47	
					WBT	221	222	100%	48.3	482	233	
					WBR	79	77	97%	40.0	89	0	
				NB	NBL	192	184	96%	78.6	177	106	
					NBT	824	811	98%	39.0	448	370	
					NBR	82	74	90%	33.0	494	416	
				SB	SBL	45	43	96%	64.5	132	23	
					SBT	257	250	97%	40.3	250	173	
					SBR	118	113	96%	38.8	250	173	
2000	E Pioneer	33rd St SE	N	EB	EBL	65	56	86%	5.3	142	21	**8.1**
					EBT	217	217	100%	3.1	155	0	
				WB	WBT	314	312	99%	1.8	67	0	
					WBR	2	2	100%	0.8	0	0	
				SB	SBL	1	1	100%	8.1	59	33	
					SBR	85	83	98%	5.8	24	0	
2100	33rd St SE	80th St	N	WB	WBL	71	69	97%	0.6	0	0	**9.3**
					WBR	1	2	200%	0.5	0	0	
				NB	NBT	48	38	79%	7.9	67	29	
					NBR	19	21	111%	0.6	0	0	
				SB	SBL	0	0	100%	9.3	46	0	
					SBT	15	15	100%	7.3	70	0	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	5	4	80%	19.6	51	0	**28.2**
					WBR	76	80	105%	28.2	152	59	
				NB	NBT	1002	982	98%	3.1	0	0	
					NBR	3	3	100%	2.0	0	0	
				SB	SBL	16	16	100%	13.0	38	0	
					SBT	357	356	100%	2.2	0	0	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	26	26	100%	25.4	52	19	**25.4**
					EBR	4	2	50%	8.5	0	0	
				NB	NBL	3	3	100%	7.1	11	0	
					NBT	979	960	98%	7.4	0	0	
				SB	SBT	355	352	99%	1.4	0	0	
					SBR	7	7	100%	1.3	0	0	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	130	124	95%	50.1	189	92	**21.5**
					EBT	12	13	108%	49.1	60	22	
					EBR	33	35	106%	11.8	89	50	
				WB	WBL	18	19	106%	43.8	45	0	
					WBT	25	27	108%	61.4	98	36	
					WBR	33	32	97%	23.0	133	70	
				NB	NBL	45	45	100%	20.4	48	0	
					NBT	819	807	99%	18.8	713	338	
					NBR	6	5	83%	11.5	0	0	
				SB	SBL	9	8	89%	28.8	31	0	
					SBT	289	286	99%	14.2	204	99	
					SBR	61	58	95%	7.4	59	0	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	19	18	95%	12.9	89	40	**12.9**
					EBR	33	34	103%	7.6	89	39	
				NB	NBL	17	18	106%	5.8	21	0	
					NBT	851	842	99%	4.1	0	0	
				SB	SBT	331	330	100%	3.6	0	0	
					SBR	9	10	111%	4.6	0	0	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	31	31	100%	11.9	43	37	**11.9**
					EBR	9	8	89%	7.0	40	0	
				NB	NBL	1	1	100%	4.4	0	0	
					NBT	837	825	99%	3.0	0	0	
				SB	SBT	348	351	101%	3.1	0	0	
					SBR	16	14	88%	3.4	0	0	
				EB	EBL	156	152	97%	23.1	147	74	**15.9**
					EBT	0	0	100%	0.0	147	74	
					EBR	148	150	101%	6.5	101	76	
					WBL	0	0	100%	0.0	12	0	

2026 Scenario C AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
2700	Shaw Rd E	39th Ave SE	Y	WB	WBT	2	2	100%	29.9	12	0	
					WBR	2	4	200%	8.3	0	0	
				NB	NBL	375	379	101%	26.7	548	164	
					NBT	680	669	98%	10.2	637	165	
					NBR	0	0	100%	0.0	681	206	
				SB	SBL	0	0	100%	0.0	0	0	
					SBT	225	227	101%	20.7	262	93	
					SBR	132	130	98%	7.6	62	0	
2800	Shaw Rd E	5th Ave SE (Future)	Y	WB	WBL	80	73	91%	33.0	90	45	**14.9**
					WBR	152	151	99%	11.5	134	78	
				NB	NBT	1074	1051	98%	15.8	509	284	
					NBR	188	177	94%	7.5	491	266	
				SB	SBL	342	335	98%	25.1	336	155	
					SBT	340	342	101%	3.5	88	24	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	0	0	**0.8**
					EBR	0	0	100%	0.0	0	0	
				NB	NBL	18	13	72%	0.8	0	0	
					NBT	31	27	87%	0.2	0	0	
				SB	SBT	15	15	100%	0.1	0	0	
					SBR	0	1	100%	0.1	0	0	
3000	Shaw Rd E	Safeway	Y	EB	EBL	85	85	100%	73.2	189	92	**13.2**
					EBR	49	47	96%	7.9	72	57	
				NB	NBL	96	97	101%	6.9	45	0	
					NBT	1013	986	97%	13.0	199	90	
				SB	SBT	352	348	99%	4.6	97	44	
					SBR	88	86	98%	1.4	66	0	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	3	4	133%	0.9	0	0	**5.9**
					EBT	16	17	106%	0.1	0	0	
				WB	WBT	72	71	99%	0.4	0	0	
					WBR	62	56	90%	0.9	0	0	
				SB	SBL	27	24	89%	5.9	34	27	
					SBR	0	0	100%	0.0	46	39	
3200	SR 162	Pioneer	Y	EB	EBL	34	33	97%	55.3	50	44	**23.9**
					EBT	4	4	100%	53.4	50	44	
					EBR	118	117	99%	7.3	81	39	
				WB	WBL	8	7	88%	54.0	85	22	
					WBT	18	17	94%	54.9	85	22	
					WBR	21	22	105%	19.1	119	25	
				NB	NBL	260	248	95%	78.1	420	267	
					NBT	596	588	99%	8.7	155	68	
					NBR	2	2	100%	9.2	0	0	
				SB	SBL	8	8	100%	61.2	38	0	
					SBT	308	299	97%	10.3	303	96	
					SBR	38	37	97%	8.8	359	152	
3300	SR 162	80th St	N	EB	EBL	28	28	100%	12.6	38	21	**12.6**
					EBR	15	14	93%	6.8	38	0	
				NB	NBL	41	39	95%	3.1	38	0	
					NBT	610	606	99%	1.4	0	0	
				SB	SBT	339	332	98%	1.2	0	0	
					SBR	93	89	96%	3.4	44	0	
3400	SR 162	EB	Y	EB	EBL	170	168	99%	42.2	199	103	**21.2**
					EBR	219	217	99%	9.1	190	75	
				NB	NBT	733	722	98%	24.8	945	273	
					NBR	52	48	92%	24.0	300	0	
				SB	SBL	62	60	97%	15.1	82	26	
					SBT	199	191	96%	4.0	111	23	
3500	SR 162	WB	Y	WB	WBL	117	114	97%	44.3	157	68	**17.9**
					WBR	118	114	97%	5.4	31	0	
				NB	NBL	344	335	97%	41.2	554	191	
					NBT	559	555	99%	4.2	145	26	
				SB	SBT	144	139	97%	17.1	99	44	
					SBR	119	119	100%	4.3	0	0	

2026 Scenario C PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	97	89	92%	65.5	483	51	**45.0**
					EBT	264	237	90%	72.2	1093	108	
					EBR	396	391	99%	69.3	1646	154	
				WB	WBL	118	137	116%	41.6	853	46	
					WBT	171	168	98%	36.5	431	81	
					WBR	50	48	96%	25.3	1002	98	
				NB	NBL	216	209	97%	61.8	432	73	
					NBT	357	353	99%	30.8	1084	104	
					NBR	92	119	129%	10.5	1037	100	
				NE	NER	12	14	117%	29.9	1333	78	
				SB	SBL	94	89	95%	62.6	1016	93	
					SBT	583	646	111%	35.9	1411	115	
					SBR	126	130	103%	27.1	1285	52	
200	Traffic Ave	State St	Y	EB	EBL	29	28	98%	56.9	484	72	**47.4**
					EBR	10	7	70%	68.3	1202	86	
				NB	NBL	19	17	91%	56.1	780	86	
					NBT	680	653	96%	1.3	1230	119	
				SB	SBT	1196	1105	92%	75.0	1283	77	
					SBR	2	2	91%	82.1	1357	116	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	110	108	98%	65.2	1284	110	**82.4**
					EBT	13	14	106%	60.9	1120	84	
					EBR	300	297	99%	25.4	759	144	
				WB	WBL	300	251	84%	209.3	786	134	
					WBT	151	131	87%	230.2	1309	110	
					WBR	12	10	82%	162.2	1188	65	
				NB	NBL	533	605	113%	80.6	730	121	
					NBT	576	556	96%	11.1	1180	59	
					NBR	178	160	90%	11.6	1380	118	
				SB	SBL	10	10	101%	68.7	861	96	
					SBT	778	716	92%	106.9	819	88	
					SBR	418	368	88%	88.5	772	145	
400	E Main Ave	SR 410 EB	Y	EB	EBL	294	270	92%	108.9	1257	144	**64.7**
					EBR	715	721	101%	40.4	792	140	
				NB	NBL	248	226	91%	62.4	1148	105	
					NBT	994	1062	107%	98.6	1269	153	
				SB	SBT	1250	1147	92%	42.6	796	132	
					SBR	128	114	89%	37.7	859	105	
500	E Main Ave	5th Ave NE	N	EB	EBL	55	55	100%	12.4	1095	98	**29.1**
					EBR	56	51	91%	6.8	1187	140	
				NB	NBL	42	40	95%	29.1	992	97	
					NBT	1187	1271	107%	15.2	974	123	
				SB	SBT	1919	1829	95%	1.4	1001	143	
					SBR	46	43	93%	2.2	868	134	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	404	384	95%	45.0	898	153	**31.1**
					EBR	266	306	115%	24.8	906	145	
				WB	WBL	1248	1214	97%	46.2	889	146	
					WBT	728	662	91%	13.2	836	121	
				NB	NBL	303	399	132%	45.6	1008	141	
					NBR	824	944	115%	14.3	948	105	
700	E Main Ave	15th St SE	Y	EB	EBL	6	5	91%	9.2	727	127	**11.5**
					EBT	475	520	110%	18.1	669	136	
					EBR	114	108	95%	8.8	850	104	
				WB	WBL	254	227	89%	6.9	913	130	
					WBT	712	772	108%	8.7	772	144	
					WBR	68	58	85%	0.9	708	136	
				NB	NBL	85	82	97%	23.3	859	135	
					NBT	25	23	91%	21.7	872	101	
					NBR	125	126	101%	0.9	822	140	
				SB	SBL	51	48	95%	20.6	689	136	
					SBT	42	40	95%	21.4	844	101	
					SBR	12	13	107%	14.0	898	130	
800	E Main Ave	5th Ave SE	Y	EB	EBL	6	5	91%	21.9	801	146	**17.6**
					EBT	374	410	110%	15.0	816	138	
					EBR	30	30	101%	15.0	725	128	
				WB	WBL	191	170	89%	20.2	870	113	
					WBT	678	728	107%	17.8	828	137	
					WBR	88	80	91%	16.7	843	111	
				NB	NBL	17	16	97%	28.9	853	149	
					NBT	43	40	93%	28.5	699	113	
					NBR	78	78	100%	12.7	821	125	
				SB	SBL	79	80	101%	20.0	722	124	
					SBT	87	88	101%	20.4	889	108	
					SBR	10	12	121%	13.5	902	142	
900	E Main Ave	2nd St SE	Y	EB	EBL	57	56	98%	10.7	773	117	**11.8**
					EBT	396	443	112%	9.8	831	92	
				NB	NBL	78	77	98%	15.2	721	114	
					NBT	749	742	99%	13.8	877	162	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	353	375	106%	11.7	828	123	
					WBR	351	377	107%	10.0	822	101	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	833	828	99%	47.8	772	165	**30.1**
				NB	NBT	699	692	99%	55.5	846	178	
					NBR	1380	1335	97%	15.3	647	111	
				SB	SBL	1149	946	82%	34.0	857	192	
					SBT	1032	898	87%	12.2	824	106	
1100	Meridian	SR 167 WBR	Y	WB	WBR	707	707	100%	39.6	802	142	**12.9**
				NB	NBT	699	695	99%	37.3	827	155	
				SB	SBT	2181	1860	85%	17.9	792	151	
				EB	EBL	87	61	70%	285.3	992	130	**138.4**
					EBT	367	245	67%	286.4	716	140	
					EBR	744	481	65%	517.9	918	185	
					WBL	674	627	93%	186.9	824	129	

2026 Scenario C PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
1200	Meridian	Valley Ave	Y	WB	WBT	163	167	102%	47.2	938	177	
					WBR	67	64	96%	35.5	731	163	
				NB	NBL	569	547	96%	29.7	732	174	
					NBT	540	536	99%	14.2	1127	130	
					NBR	297	298	100%	3.4	933	166	
				SB	SBL	16	16	100%	95.4	863	145	
					SBT	763	762	100%	59.1	1029	131	
					SBR	22	22	100%	24.0	904	139	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	500	496	99%	23.0	1013	138	**24.8**
					EBR	96	95	99%	20.0	718	173	
				WB	WBL	563	624	111%	44.4	1033	146	
					WBT	534	532	100%	1.4	719	163	
				NB	NBL	93	93	100%	58.6	1136	139	
					NBR	85	81	95%	5.0	947	129	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	493	489	99%	8.0	925	152	**11.9**
					EBR	93	90	97%	5.6	733	151	
				WB	WBL	42	45	108%	45.1	720	179	
					WBT	1021	1080	106%	8.9	874	154	
				NB	NBL	76	77	101%	42.6	1010	143	
					NBR	403	445	110%	16.1	1010	151	
1500	E Pioneer	13th St SE	N	EB	EBT	844	882	105%	0.3	838	148	**12.5**
					EBR	54	51	94%	0.8	1054	126	
				WB	WBL	67	54	80%	6.4	990	147	
					WBT	1041	1104	106%	0.3	1008	151	
				NB	NBL	23	21	91%	12.5	1023	122	
					NBR	51	49	97%	6.7	731	158	
1600	E Pioneer	15th St SE	Y	EB	EBL	167	164	98%	4.6	734	154	**14.9**
					EBT	728	764	105%	9.5	1089	109	
				WB	WBT	762	808	106%	8.7	598	126	
					WBR	67	62	92%	7.9	1063	148	
				SB	SBL	169	159	94%	31.0	560	124	
					SBR	346	351	101%	39.8	1003	127	
1700	E Pioneer	21st St	Y	EB	EBT	862	878	102%	16.6	891	107	**11.8**
					EBR	35	34	96%	13.5	530	110	
				WB	WBL	92	81	88%	9.4	515	134	
					WBT	809	855	106%	3.3	1101	132	
				NB	NBL	21	21	100%	37.4	964	105	
					NBR	85	82	97%	43.3	646	120	
1800	E Pioneer	25th St SE	N	EB	EBT	932	940	101%	4.2	896	101	**31.5**
					EBR	15	15	97%	1.4	275	80	
				WB	WBL	3	3	91%	9.0	1109	128	
					WBT	895	930	104%	0.3	356	95	
				NB	NBL	6	7	127%	31.5	434	105	
					NBR	8	8	104%	9.8	980	110	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	269	310	115%	113.9	949	79	**73.9**
					EBT	444	404	91%	99.8	446	110	
					EBR	204	194	95%	13.8	512	104	
				WB	WBL	198	197	100%	145.6	978	105	
					WBT	276	244	88%	116.3	479	135	
					WBR	60	53	88%	110.1	685	87	
				NB	NBL	170	165	97%	63.1	922	95	
					NBT	535	502	94%	22.5	353	76	
					NBR	129	128	99%	16.4	687	107	
				SB	SBL	133	114	86%	53.7	278	70	
					SBT	993	908	91%	70.0	344	76	
					SBR	421	513	122%	80.7	704	95	
2000	E Pioneer	33rd St SE	N	EB	EBL	153	148	96%	14.4	277	87	**34.1**
					EBT	542	498	92%	13.3	1022	84	
				WB	WBT	335	310	92%	34.1	1014	99	
					WBR	10	22	221%	29.2	245	69	
				SB	SBL	4	1	23%	17.1	493	105	
					SBR	199	215	108%	13.4	615	118	
2100	33rd St SE	80th St	N	WB	WBL	159	151	95%	2.0	500	100	**9.4**
					WBR	1	2	181%	0.7	1094	77	
				NB	NBT	58	59	102%	8.2	1022	78	
					NBR	106	110	104%	0.7	529	107	
				SB	SBL	4	2	45%	6.7	236	74	
					SBT	44	68	154%	9.4	859	119	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	2	2	91%	63.2	847	141	**63.2**
					WBR	48	48	100%	13.4	503	98	
				NB	NBT	681	664	98%	2.5	280	71	
					NBR	14	13	91%	1.7	816	101	
				SB	SBL	93	88	95%	48.4	1236	70	
					SBT	1317	1216	92%	51.7	577	115	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	13	13	101%	45.7	240	66	**45.7**
					EBR	2	1	45%	24.1	782	112	
				NB	NBL	6	4	72%	39.5	758	114	
					NBT	682	664	97%	6.4	485	123	
				SB	SBT	1248	1138	91%	24.7	260	58	
					SBR	70	66	95%	23.7	1273	69	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	111	112	101%	52.6	272	56	**54.9**
					EBT	53	54	102%	58.1	1234	66	
					EBR	60	60	101%	33.7	438	90	
				WB	WBL	41	37	91%	49.6	657	107	
					WBT	29	27	94%	64.2	282	50	
					WBR	32	30	95%	25.7	1238	66	
				NB	NBL	50	51	103%	37.7	422	85	
					NBT	545	530	97%	14.3	1166	70	
					NBR	31	31	100%	6.3	262	50	
				SB	SBL	38	38	101%	77.1	743	83	
					SBT	1027	920	90%	79.3	516	79	
					SBR	185	166	90%	71.5	629	61	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	35	32	92%	22.2	267	42	**22.2**
					EBR	29	31	108%	17.4	710	45	
				NB	NBL	30	29	97%	18.9	266	48	
					NBT	593	583	98%	3.2	677	50	
				SB	SBT	1082	967	89%	5.8	1187	69	
					SBR	46	44	95%	5.3	604	83	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	31	29	93%	18.3	260	50	**22.7**
					EBR	14	15	105%	22.4	1192	69	
				NB	NBL	12	12	99%	22.7	734	42	
					NBT	590	584	99%	2.0	265	53	
				SB	SBT	1049	935	89%	13.4	761	75	
					SBR	62	55	89%	11.4	809	84	
				EB	EBL	200	203	101%	45.6	374	48	**44.3**
					EBT	7	7	106%	50.0	346	41	
					EBR	423	416	98%	29.8	941	89	
					WBL	2	5	226%	75.2	582	72	

2026 Scenario C PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
2700	Shaw Rd E	39th Ave SE	Y	WB	WBT	7	8	121%	63.7	363	32	
					WBR	9	10	113%	11.7	912	80	
				NB	NBL	391	388	99%	52.8	423	48	
					NBT	395	385	97%	13.0	895	85	
					NBR	2	6	272%	8.1	839	73	
				SB	SBL	3	6	181%	104.6	798	74	
					SBT	793	680	86%	69.3	431	45	
					SBR	268	247	92%	33.1	432	34	
2800	Shaw Rd E	5th Ave SE (Future)	N	WB	WBL	186	320	172%	126.0	763	66	**41.5**
					WBR	343	589	172%	90.2	566	59	
				NB	NBT	783	726	93%	15.9	520	47	
					NBR	81	138	170%	9.2	278	38	
				SB	SBL	152	275	181%	28.3	699	69	
					SBT	1361	1228	90%	18.3	928	73	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	858	67	**6.6**
					EBR	0	37	100%	6.6	990	58	
				NB	NBL	0	14	100%	0.7	773	70	
					NBT	0	47	100%	0.2	955	60	
				SB	SBT	0	34	100%	0.1	606	53	
					SBR	0	0	100%	0.0	463	35	
3000	Shaw Rd E	Safeway	Y	EB	EBL	98	102	104%	59.2	675	37	**20.4**
					EBR	282	276	98%	22.6	718	59	
				NB	NBL	82	73	89%	23.4	1212	57	
					NBT	736	695	94%	19.3	884	76	
				SB	SBT	1231	1146	93%	18.7	1081	70	
					SBR	163	143	88%	5.7	581	43	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	0	17	100%	1.4	797	36	**7.5**
					EBT	106	95	90%	0.2	812	65	
				WB	WBT	159	152	96%	0.3	863	38	
					WBR	27	50	185%	0.8	882	77	
				SB	SBL	63	118	187%	7.5	1222	62	
					SBR	0	2	100%	6.4	1155	81	
3200	SR 162	Pioneer	Y	EB	EBL	81	81	100%	32.5	1221	53	**30.7**
					EBT	11	11	100%	33.3	914	46	
					EBR	295	293	99%	21.5	1133	91	
				WB	WBL	4	4	91%	37.7	1223	62	
					WBT	18	15	85%	30.6	954	51	
					WBR	12	14	115%	7.7	892	44	
				NB	NBL	224	221	99%	39.5	932	71	
					NBT	444	452	102%	8.4	1166	102	
					NBR	9	9	102%	2.8	912	48	
				SB	SBL	22	20	91%	60.2	1303	62	
					SBT	816	805	99%	42.9	931	75	
					SBR	76	72	95%	42.4	1193	103	
3300	SR 162	80th St	N	EB	EBL	97	116	119%	52.9	783	52	**52.9**
					EBR	71	93	131%	4.7	985	77	
				NB	NBL	22	38	174%	7.3	1298	69	
					NBT	515	509	99%	9.4	1164	95	
				SB	SBT	843	808	96%	35.4	450	53	
					SBR	163	166	102%	34.2	1027	80	
3400	SR 162	EB	Y	EB	EBL	162	162	100%	38.3	512	42	**25.4**
					EBR	485	470	97%	46.0	1386	78	
				NB	NBT	524	504	96%	26.9	1025	71	
					NBR	161	186	115%	25.2	1293	103	
				SB	SBL	137	141	103%	15.3	1096	60	
					SBT	780	774	99%	11.4	560	38	
3500	SR 162	WB	Y	WB	WBL	157	165	105%	38.4	286	44	**22.1**
					WBR	128	128	100%	5.3	1410	91	
				NB	NBL	246	237	96%	49.6	1183	88	
					NBT	441	429	97%	5.6	319	52	
				SB	SBT	760	755	99%	25.4	1015	68	
					SBR	229	226	99%	11.2	1513	106	

2026 Scenario D AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	88	88	100%	21.3	66	45	**45.7**
					EBT	83	86	104%	23.6	60	46	
					EBR	128	124	97%	5.2	67	54	
				WB	WBL	60	59	98%	19.6	40	32	
					WBT	115	112	97%	27.0	92	77	
					WBR	34	35	103%	21.3	96	86	
				NB	NBL	383	366	96%	54.7	1152	926	
					NBT	713	696	98%	64.5	1159	958	
					NBR	113	109	96%	48.4	69	49	
				NE	NER	8	11	138%	5.8	33	13	
				SB	SBL	18	16	89%	49.7	24	14	
					SBT	186	204	110%	36.9	152	111	
					SBR	36	38	106%	20.4	175	146	
200	Traffic Ave	State St	Y	EB	EBL	18	18	100%	35.6	34	12	**17.0**
					EBR	3	3	100%	9.5	16	4	
				NB	NBL	10	8	80%	29.4	12	7	
					NBT	1191	1178	99%	21.6	591	327	
				SB	SBT	364	379	104%	1.5	48	20	
					SBR	9	7	78%	1.1	25	5	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	213	211	99%	42.5	212	150	**19.1**
					EBT	12	12	100%	36.3	24	8	
					EBR	136	138	101%	8.5	65	50	
				WB	WBL	46	45	98%	42.9	53	32	
					WBT	48	49	102%	42.6	55	41	
					WBR	12	13	108%	15.8	15	10	
				NB	NBL	397	445	112%	19.4	428	156	
					NBT	976	976	100%	15.5	569	314	
					NBR	109	106	97%	15.7	569	314	
				SB	SBL	2	2	100%	22.5	3	0	
					SBT	210	228	109%	14.4	149	114	
					SBR	155	151	97%	12.0	204	168	
400	E Main Ave	SR 410 EB	Y	EB	EBL	410	415	101%	49.2	577	367	**21.5**
					EBR	246	360	146%	5.6	171	111	
				NB	NBL	119	117	98%	13.9	64	45	
					NBT	1072	1115	104%	19.0	394	272	
				SB	SBT	320	335	105%	16.6	123	102	
					SBR	72	74	103%	13.3	108	87	
500	E Main Ave	5th Ave NE	N	EB	EBL	20	21	105%	7.1	37	22	**7.1**
					EBR	10	10	100%	6.0	0	0	
				NB	NBL	34	35	103%	2.3	19	7	
					NBT	1191	1222	103%	0.5	0	0	
				SB	SBT	521	655	126%	0.6	0	0	
					SBR	45	42	93%	0.9	0	0	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	313	314	100%	19.0	98	80	**14.1**
					EBR	62	140	226%	7.5	104	90	
				WB	WBL	279	420	151%	19.3	118	98	
					WBT	252	244	97%	6.9	90	61	
				NB	NBL	187	219	117%	21.5	137	106	
					NBR	892	945	106%	11.3	292	196	
700	E Main Ave	15th St SE	Y	EB	EBL	2	2	100%	6.4	3	0	**7.9**
					EBT	260	336	129%	12.0	117	103	
					EBR	42	42	100%	7.1	7	0	
				WB	WBL	70	69	99%	4.5	23	14	
					WBT	344	363	106%	5.5	90	68	
					WBR	25	23	92%	0.8	2	0	
				NB	NBL	97	100	103%	13.0	65	46	
					NBT	31	27	87%	14.5	65	46	
					NBR	116	119	103%	0.9	0	0	
				SB	SBL	2	3	150%	12.0	16	7	
					SBT	12	10	83%	12.9	16	7	
					SBR	0	0	100%	0.0	25	13	
800	E Main Ave	5th Ave SE	Y	EB	EBL	0	0	100%	0.0	0	0	**10.4**
					EBT	237	316	133%	9.4	170	107	
					EBR	6	5	83%	9.5	193	126	
				WB	WBL	36	34	94%	10.9	17	11	
					WBT	284	313	110%	10.8	134	96	
					WBR	88	87	99%	9.5	161	123	
				NB	NBL	12	12	100%	15.1	16	9	
					NBT	24	22	92%	18.9	52	35	
					NBR	131	131	100%	8.3	78	63	
				SB	SBL	48	45	94%	14.6	33	22	
					SBT	25	27	108%	13.7	20	13	
					SBR	3	3	100%	5.0	44	28	
				EB	EBL	46	46	100%	29.6	61	33	**13.9**

2026 Scenario D AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
900	E Main Ave	2nd St SE	Y	EB	EBT	243	322	133%	28.7	221	188	
				NB	NBL	59	60	102%	7.7	135	110	
					NBT	844	836	99%	7.2	135	110	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	99	118	119%	25.1	96	66	
					WBR	200	209	105%	10.1	132	111	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	1037	1025	99%	47.5	620	426	**31.9**
				NB	NBT	679	685	101%	33.5	311	244	
					NBR	524	520	99%	3.3	0	0	
				SB	SBL	478	473	99%	42.3	345	277	
					SBT	448	471	105%	16.8	177	142	
1100	Meridian	SR 167 WBR	Y	WB	WBR	1120	1127	101%	96.2	985	593	**21.8**
				NB	NBT	679	685	101%	16.9	62	50	
				SB	SBT	926	951	103%	3.8	34	10	
1200	Meridian	Valley Ave	Y	EB	EBL	22	21	95%	58.8	36	23	**26.7**
					EBT	147	149	101%	52.2	110	93	
					EBR	296	333	113%	26.7	195	164	
				WB	WBL	272	265	97%	63.5	164	144	
					WBT	139	140	101%	40.4	95	85	
					WBR	56	54	96%	16.5	131	119	
				NB	NBL	521	532	102%	34.3	302	268	
					NBT	961	966	101%	13.6	301	235	
					NBR	317	314	99%	2.6	56	24	
				SB	SBL	29	31	107%	57.0	38	24	
					SBT	358	352	98%	26.1	185	136	
					SBR	18	16	89%	6.4	5	0	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	324	343	106%	12.1	114	80	**19.9**
					EBR	35	36	103%	8.6	157	122	
				WB	WBL	172	200	116%	46.6	196	163	
					WBT	349	351	101%	2.9	50	32	
				NB	NBL	132	134	102%	56.2	161	126	
					NBR	84	83	99%	6.3	75	60	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	294	313	106%	7.6	93	69	**10.6**
					EBR	114	111	97%	5.2	69	46	
				WB	WBL	55	56	102%	49.9	62	48	
					WBT	455	484	106%	4.4	87	59	
				NB	NBL	66	66	100%	42.9	81	48	
					NBR	276	350	127%	11.2	195	82	
1500	E Pioneer	13th St SE	N	EB	EBT	552	649	118%	0.2	0	0	**9.4**
					EBR	18	15	83%	0.6	0	0	
				WB	WBL	23	21	91%	3.7	11	4	
					WBT	481	512	106%	0.2	0	0	
				NB	NBL	29	28	97%	9.4	32	22	
					NBR	50	50	100%	6.4	44	35	
1600	E Pioneer	15th St SE	Y	EB	EBL	218	217	100%	3.8	57	33	**5.6**
					EBT	384	480	125%	4.9	70	58	
				WB	WBT	426	455	107%	5.4	86	69	
					WBR	79	76	96%	4.4	41	24	
				SB	SBL	38	38	100%	12.1	0	0	
					SBR	78	78	100%	14.4	1	0	
1700	E Pioneer	21st St	Y	EB	EBT	404	498	123%	9.9	106	89	**7.3**
					EBR	18	19	106%	6.6	56	38	
				WB	WBL	49	47	96%	5.0	56	43	
					WBT	483	519	107%	2.2	56	43	
				NB	NBL	22	20	91%	20.2	19	12	
					NBR	56	58	104%	29.3	55	42	
1800	E Pioneer	25th St SE	N	EB	EBT	450	548	122%	0.8	0	0	**14.1**
					EBR	10	10	100%	0.9	0	0	
				WB	WBL	0	0	100%	0.0	0	0	
					WBT	520	545	105%	0.4	0	0	
				NB	NBL	12	14	117%	14.1	28	21	
					NBR	5	5	100%	5.1	28	20	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	204	302	148%	40.9	263	207	**41.5**
					EBT	155	156	101%	30.3	131	94	
					EBR	84	83	99%	5.0	81	66	
				WB	WBL	86	95	110%	47.6	102	80	
					WBT	221	222	100%	48.7	333	262	
					WBR	79	77	97%	40.5	126	28	
				NB	NBL	192	182	95%	75.7	117	98	
					NBT	792	796	101%	38.1	415	360	
					NBR	52	66	127%	30.9	461	406	
				SB	SBL	45	43	96%	63.3	71	53	
					SBT	243	245	101%	39.1	176	153	
					SBR	52	92	177%	38.7	176	153	
2000	E Pioneer	33rd St SE	N	EB	EBL	35	49	140%	5.2	41	25	**8.7**
					EBT	217	216	100%	3.0	46	29	
				WB	WBT	314	312	99%	1.7	49	29	
					WBR	2	2	100%	0.8	7	0	
				SB	SBL	1	1	100%	8.7	44	38	
					SBR	72	78	108%	5.7	10	5	
2100	33rd St SE	80th St	N	WB	WBL	71	69	97%	0.6	0	0	**9.3**
					WBR	1	2	200%	0.5	0	0	
				NB	NBT	18	30	167%	7.5	36	26	
					NBR	19	21	111%	0.6	0	0	
				SB	SBL	0	0	100%	9.3	26	9	
					SBT	2	10	500%	7.3	40	14	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	5	4	80%	20.4	18	9	**20.4**
					WBR	71	78	110%	19.2	78	62	
				NB	NBT	945	958	101%	2.3	13	0	
					NBR	3	3	100%	2.0	0	0	
				SB	SBL	14	15	107%	9.4	18	5	
					SBT	332	348	105%	2.3	0	0	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	20	23	115%	16.9	26	13	**16.9**
					EBR	4	2	50%	8.4	10	3	
				NB	NBL	3	3	100%	8.5	55	0	
					NBT	928	940	101%	4.9	53	0	
				SB	SBT	333	345	104%	1.4	0	0	
					SBR	4	6	150%	1.3	0	0	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	118	119	101%	50.6	141	93	**19.3**
					EBT	12	13	108%	48.1	38	16	
					EBR	33	35	106%	11.6	69	44	
				WB	WBL	18	19	106%	45.8	30	16	
					WBT	25	27	108%	58.8	65	35	
					WBR	27	30	111%	22.5	100	69	
				NB	NBL	45	44	98%	17.6	21	9	
					NBT	786	796	101%	15.3	592	301	
					NBR	6	5	83%	7.1	112	77	
				SB	SBL	6	7	117%	30.9	5	2	
					SBT	275	281	102%	14.0	27	15	

2026 Scenario D AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand (vph)	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
					SBR	56	56	100%	7.0	7	0	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	17	17	100%	12.2	44	36	**12.2**
					EBR	33	34	103%	7.9	44	34	
				NB	NBL	17	18	106%	5.2	16	3	
					NBT	823	829	101%	3.0	5	0	
				SB	SBT	320	327	102%	3.8	0	0	
					SBR	6	9	150%	4.6	0	0	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	25	29	116%	11.5	36	24	**11.5**
					EBR	9	8	89%	7.2	21	10	
				NB	NBL	1	1	100%	8.4	2	0	
					NBT	815	819	100%	2.5	0	0	
				SB	SBT	339	348	103%	3.3	11	0	
					SBR	14	13	93%	3.5	11	0	
2700	Shaw Rd E	39th Ave SE	Y	EB	EBL	143	147	103%	22.6	99	71	**15.1**
					EBT	0	0	100%	0.0	99	71	
					EBR	148	150	101%	6.5	80	72	
				WB	WBL	0	0	100%	0.0	8	2	
					WBT	2	2	100%	30.9	8	2	
					WBR	2	4	200%	8.8	2	0	
				NB	NBL	375	379	101%	25.5	321	165	
					NBT	671	669	100%	9.0	290	172	
					NBR	0	0	100%	0.0	246	176	
				SB	SBL	0	0	100%	0.0	0	0	
					SBT	221	225	102%	20.2	149	106	
					SBR	127	128	101%	8.1	29	20	
2800	Shaw Rd E	5th Ave SE (Future)	N	WB	WBL	0	47	100%	33.3	92	78	**8.4**
					WBR	5	100	2000%	11.9	45	34	
				NB	NBT	1074	1048	98%	7.7	273	196	
					NBR	1	111	11100%	3.3	255	184	
				SB	SBL	1	216	21600%	16.2	95	69	
					SBT	340	341	100%	2.7	43	22	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	0	0	**0.8**
					EBR	0	0	100%	0.0	0	0	
				NB	NBL	3	9	300%	0.8	2	0	
					NBT	16	22	138%	0.2	0	0	
				SB	SBT	2	10	500%	0.1	0	0	
					SBR	0	1	100%	0.1	0	0	
3000	Shaw Rd E	Safeway	Y	EB	EBL	85	85	100%	72.5	114	89	**11.3**
					EBR	49	47	96%	8.0	59	50	
				NB	NBL	96	96	100%	6.2	25	9	
					NBT	951	963	101%	9.8	128	75	
				SB	SBT	325	337	104%	4.6	75	45	
					SBR	88	86	98%	1.3	45	20	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	3	4	133%	1.3	2	0	**5.4**
					EBT	16	17	106%	0.1	0	0	
				WB	WBT	72	71	99%	0.2	0	0	
					WBR	0	36	100%	0.7	0	0	
				SB	SBL	0	15	100%	5.4	17	12	
					SBR	0	0	100%	0.0	24	17	
3200	SR 162	Pioneer	Y	EB	EBL	34	33	97%	54.6	54	35	**24.2**
					EBT	4	4	100%	53.4	54	35	
					EBR	118	117	99%	7.5	59	49	
				WB	WBL	8	7	88%	54.0	50	31	
					WBT	18	17	94%	55.6	50	31	
					WBR	21	22	105%	18.9	75	43	
				NB	NBL	260	248	95%	78.5	596	239	
					NBT	565	576	102%	8.8	103	69	
					NBR	2	2	100%	8.9	3	0	
				SB	SBL	8	8	100%	62.5	15	8	
					SBT	295	295	100%	10.3	173	103	
					SBR	38	37	97%	8.9	218	148	
3300	SR 162	80th St	N	EB	EBL	14	23	164%	12.3	25	15	**12.3**
					EBR	2	9	450%	6.1	17	10	
				NB	NBL	10	28	280%	3.0	20	4	
					NBT	610	605	99%	1.3	13	0	
				SB	SBT	339	332	98%	1.1	13	0	
					SBR	62	79	127%	3.2	34	10	
3400	SR 162	EB	Y	EB	EBL	170	168	99%	42.4	153	113	**21.2**
					EBR	219	217	99%	8.9	95	79	
				NB	NBT	733	723	99%	24.6	547	379	
					NBR	38	44	116%	25.0	136	32	
				SB	SBL	62	60	97%	15.0	47	28	
					SBT	168	181	108%	4.2	58	28	
3500	SR 162	WB	Y	WB	WBL	86	104	121%	45.4	106	75	**18.2**
					WBR	118	114	97%	5.4	8	2	
				NB	NBL	344	335	97%	42.7	372	314	
					NBT	559	555	99%	4.2	103	52	
				SB	SBT	144	139	97%	16.7	77	54	
					SBR	119	119	100%	4.2	8	2	

2026 Scenario D PM

						Movement						Intersection
Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	97	86	89%	144.2	679	225	**63.1**
					EBT	264	234	89%	150.4	1491	1145	
					EBR	396	383	97%	120.5	1346	897	
				WB	WBL	118	136	115%	65.2	184	124	
					WBT	171	168	98%	60.8	314	207	
					WBR	50	47	94%	50.0	152	103	
				NB	NBL	216	185	86%	58.5	240	181	
					NBT	357	334	94%	19.5	265	199	
					NBR	92	92	100%	7.5	64	48	
				NE	NER	12	11	92%	19.4	29	16	
				SB	SBL	94	89	95%	68.7	100	80	
					SBT	583	638	109%	29.1	299	245	
					SBR	126	126	100%	21.4	350	285	
200	Traffic Ave	State St	Y	EB	EBL	29	27	94%	22.6	28	15	**42.1**
					EBR	10	8	81%	72.8	35	11	
				NB	NBL	19	15	80%	21.8	17	11	
					NBT	670	587	88%	2.6	108	50	
				SB	SBT	1192	1102	92%	63.6	997	423	
					SBR	2	2	91%	59.8	957	385	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	110	109	99%	40.7	103	76	**89.1**
					EBT	13	15	113%	35.3	39	10	
					EBR	300	297	99%	37.0	212	151	
				WB	WBL	300	225	75%	252.2	714	703	
					WBT	151	116	77%	168.6	227	144	
					WBR	12	8	66%	117.9	25	7	
				NB	NBL	468	492	105%	98.7	684	650	
					NBT	566	485	86%	41.4	353	236	
					NBR	178	142	80%	38.1	353	236	
				SB	SBL	10	9	91%	66.7	11	5	
					SBT	774	701	91%	95.3	789	716	
					SBR	418	367	88%	81.2	843	770	
400	E Main Ave	SR 410 EB	Y	EB	EBL	294	214	73%	245.8	1317	1084	**94.4**
					EBR	687	569	83%	79.3	255	152	
				NB	NBL	248	213	86%	163.9	477	394	
					NBT	918	923	101%	116.9	996	698	
				SB	SBT	1246	1108	89%	47.2	603	554	
					SBR	128	111	87%	46.4	588	539	
500	E Main Ave	5th Ave NE	N	EB	EBL	55	55	100%	11.2	50	41	**16.7**
					EBR	56	48	85%	6.3	9	0	
				NB	NBL	42	39	93%	14.5	42	19	
					NBT	1110	1142	103%	16.7	225	57	
				SB	SBT	1887	1646	87%	2.9	111	66	
					SBR	46	38	82%	1.9	111	66	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	404	384	95%	21.4	116	98	**26.2**
					EBR	248	275	111%	13.5	138	117	
				WB	WBL	1216	1085	89%	47.9	874	567	
					WBT	728	603	83%	8.8	226	178	
				NB	NBL	261	329	126%	41.9	281	221	
					NBR	747	810	108%	9.9	221	153	
700	E Main Ave	15th St SE	Y	EB	EBL	6	4	72%	12.3	5	0	**10.6**
					EBT	457	487	107%	16.7	203	168	
					EBR	114	108	95%	8.4	22	11	
				WB	WBL	254	216	85%	6.3	53	37	
					WBT	670	659	98%	7.7	268	153	
					WBR	68	56	82%	0.9	4	2	
				NB	NBL	85	81	96%	19.8	64	47	
					NBT	25	22	87%	20.1	64	47	
					NBR	125	127	102%	0.9	0	0	
				SB	SBL	51	48	95%	19.8	60	45	
					SBT	42	40	95%	20.1	60	45	
					SBR	12	13	107%	13.6	79	63	
800	E Main Ave	5th Ave SE	Y	EB	EBL	6	4	72%	22.1	5	2	**16.5**
					EBT	356	376	106%	14.8	170	146	
					EBR	30	30	101%	13.1	195	170	
				WB	WBL	191	165	86%	17.5	64	44	
					WBT	636	650	102%	16.5	333	246	
					WBR	88	82	93%	15.2	361	271	
				NB	NBL	17	15	91%	25.2	18	10	
					NBT	43	40	93%	28.4	69	40	
					NBR	78	79	101%	12.4	95	66	
				SB	SBL	79	76	96%	19.1	54	33	
					SBT	87	89	102%	19.4	60	42	
					SBR	10	8	81%	11.8	89	71	
900	E Main Ave	2nd St SE	Y	EB	EBL	57	57	99%	10.3	33	23	**11.4**
					EBT	378	411	109%	10.0	144	104	
				NB	NBL	78	78	100%	13.6	169	128	
					NBT	749	742	99%	12.7	169	128	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	332	334	101%	11.7	155	104	
					WBR	330	336	102%	9.6	145	118	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	833	828	99%	47.7	344	317	**30.6**
				NB	NBT	699	705	101%	57.1	937	619	
					NBR	1380	1335	97%	16.9	0	0	
				SB	SBL	1149	949	83%	33.8	427	423	
					SBT	1032	930	90%	11.7	237	188	
1100	Meridian	SR 167 WBR	Y	WB	WBR	707	706	100%	39.7	195	153	**13.0**
				NB	NBT	699	706	101%	40.3	139	93	
				SB	SBT	2181	1894	87%	17.4	273	250	
				EB	EBL	87	61	70%	292.5	86	53	**138.9**
					EBT	367	245	67%	287.4	172	132	
					EBR	744	516	69%	501.2	1679	1647	
					WBL	674	624	93%	181.7	1598	1039	

2026 Scenario D PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
1200	Meridian	Valley Ave	Y	WB	WBT	163	167	102%	46.2	113	94	
					WBR	67	64	96%	34.1	147	129	
				NB	NBL	569	558	98%	30.7	312	272	
					NBT	540	535	99%	14.6	173	137	
					NBR	297	298	100%	3.3	83	45	
				SB	SBL	16	16	100%	97.0	26	17	
					SBT	763	762	100%	58.7	652	462	
					SBR	22	22	100%	22.6	2	0	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	496	495	100%	19.7	192	126	**20.4**
					EBR	96	96	100%	17.3	235	169	
				WB	WBL	520	564	109%	35.7	458	354	
					WBT	523	509	97%	3.1	61	48	
				NB	NBL	93	92	99%	42.0	89	57	
					NBR	84	80	95%	5.1	58	45	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	488	484	99%	7.2	131	76	**10.4**
					EBR	93	91	98%	5.2	108	55	
				WB	WBL	42	38	91%	47.7	43	30	
					WBT	968	1001	103%	7.1	193	157	
				NB	NBL	76	77	101%	42.6	70	57	
					NBR	385	413	107%	13.8	173	120	
1500	E Pioneer	13th St SE	N	EB	EBT	821	845	103%	0.3	0	0	**12.1**
					EBR	54	51	94%	0.8	0	0	
				WB	WBL	67	61	91%	6.4	25	16	
					WBT	988	1022	103%	0.3	0	0	
				NB	NBL	23	21	91%	12.1	27	19	
					NBR	51	49	97%	7.2	47	35	
1600	E Pioneer	15th St SE	Y	EB	EBL	167	163	98%	5.0	49	32	**12.5**
					EBT	705	727	103%	11.2	150	116	
				WB	WBT	709	732	103%	11.8	163	140	
					WBR	67	60	89%	10.2	115	92	
				SB	SBL	169	160	95%	15.4	0	0	
					SBR	346	350	101%	18.9	6	2	
1700	E Pioneer	21st St	Y	EB	EBT	839	849	101%	12.8	229	161	**9.7**
					EBR	35	33	93%	10.7	179	111	
				WB	WBL	92	79	86%	8.8	87	70	
					WBT	756	778	103%	3.5	87	70	
				NB	NBL	21	21	100%	26.0	20	14	
					NBR	85	82	97%	32.7	77	56	
1800	E Pioneer	25th St SE	N	EB	EBT	909	916	101%	3.3	48	2	**21.8**
					EBR	15	14	91%	1.3	48	2	
				WB	WBL	3	3	91%	6.1	4	0	
					WBT	842	853	101%	0.3	0	0	
				NB	NBL	6	5	91%	21.8	27	11	
					NBR	8	7	91%	7.0	26	11	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	246	276	112%	93.8	652	384	**66.6**
					EBT	444	409	92%	74.9	808	535	
					EBR	204	193	95%	9.8	120	105	
				WB	WBL	188	197	105%	78.7	336	211	
					WBT	276	266	96%	67.5	566	354	
					WBR	60	56	93%	61.7	194	66	
				NB	NBL	170	150	88%	60.9	97	81	
					NBT	530	471	89%	44.9	273	241	
					NBR	125	112	90%	34.8	319	287	
				SB	SBL	133	111	84%	70.9	123	92	
					SBT	983	866	88%	71.6	940	820	
					SBR	368	409	111%	85.1	940	820	
2000	E Pioneer	33rd St SE	N	EB	EBL	149	135	90%	13.8	258	207	**13.8**
					EBT	542	491	91%	12.3	272	219	
				WB	WBT	335	335	100%	3.7	85	62	
					WBR	10	9	91%	1.2	28	9	
				SB	SBL	4	4	91%	9.8	68	58	
					SBR	189	197	104%	7.0	33	23	
2100	33rd St SE	80th St	N	WB	WBL	159	151	95%	0.9	0	0	**8.2**
					WBR	1	2	181%	0.5	0	0	
				NB	NBT	54	50	93%	8.2	33	27	
					NBR	106	94	89%	0.7	12	0	
				SB	SBL	4	3	68%	6.6	46	39	
					SBT	34	51	149%	8.0	70	60	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	2	1	45%	55.7	12	0	**55.7**
					WBR	47	51	108%	11.9	58	45	
				NB	NBT	672	645	96%	1.9	0	0	
					NBR	14	6	42%	1.7	0	0	
				SB	SBL	91	80	88%	19.6	30	17	
					SBT	1298	1199	92%	17.0	166	100	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	12	12	101%	38.1	19	11	**38.1**
					EBR	2	0	0%	26.1	3	0	
				NB	NBL	6	2	36%	34.8	92	3	
					NBT	674	641	95%	4.8	89	1	
				SB	SBT	1231	1131	92%	11.6	244	172	
					SBR	68	62	91%	11.1	244	172	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	109	113	104%	46.5	132	78	**41.4**
					EBT	53	54	102%	54.8	112	71	
					EBR	60	57	96%	32.2	141	101	
				WB	WBL	41	39	95%	48.1	47	30	
					WBT	29	28	98%	56.8	59	34	
					WBR	31	26	85%	19.8	94	64	
				NB	NBL	50	47	95%	43.6	31	20	
					NBT	540	509	94%	12.4	229	184	
					NBR	31	25	81%	5.5	28	13	
				SB	SBL	36	33	92%	57.8	16	8	
					SBT	1016	925	91%	55.5	1420	1132	
					SBR	181	160	88%	48.1	49	38	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	34	29	86%	22.3	53	44	**22.3**
					EBR	29	31	108%	17.7	53	43	
				NB	NBL	30	25	84%	14.6	82	21	
					NBT	588	554	94%	2.9	70	8	
				SB	SBT	1073	980	91%	10.1	168	121	
					SBR	44	41	92%	8.9	168	121	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	30	26	86%	19.3	41	24	**20.8**
					EBR	14	13	91%	20.8	25	14	
				NB	NBL	12	10	82%	20.5	12	5	
					NBT	587	557	95%	1.8	0	0	
				SB	SBT	1042	945	91%	16.8	433	277	
					SBR	60	57	95%	15.8	433	277	
				EB	EBL	198	200	101%	35.0	166	125	**75.8**
					EBT	7	7	106%	32.1	166	125	
					EBR	423	414	98%	23.8	236	204	
					WBL	2	2	91%	48.6	16	8	

2026 Scenario D PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
2700	Shaw Rd E	39th Ave SE	Y	WB	WBT	7	6	91%	53.9	16	8	
					WBR	9	8	91%	7.8	3	0	
				NB	NBL	391	365	93%	170.1	1653	1213	
					NBT	393	360	92%	97.4	486	116	
					NBR	2	3	136%	86.6	504	126	
				SB	SBL	3	2	60%	69.5	5	2	
					SBT	790	702	89%	73.2	1293	993	
					SBR	263	242	92%	38.5	232	187	
2800	Shaw Rd E	5th Ave SE (Future)	N	WB	WBL	122	229	187%	62.1	477	237	**38.2**
					WBR	226	436	193%	25.6	296	192	
				NB	NBT	783	714	91%	32.1	315	242	
					NBR	54	88	162%	23.5	297	224	
				SB	SBL	102	176	173%	42.5	173	105	
					SBT	1361	1181	87%	42.4	651	514	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	0	0	**6.3**
					EBR	0	27	100%	6.3	34	29	
				NB	NBL	0	12	100%	0.5	2	0	
					NBT	0	40	100%	0.2	0	0	
				SB	SBT	0	27	100%	0.1	0	0	
					SBR	0	0	100%	0.0	0	0	
3000	Shaw Rd E	Safeway	Y	EB	EBL	98	107	109%	70.4	212	132	**12.1**
					EBR	282	283	101%	18.7	149	123	
				NB	NBL	82	61	75%	8.1	14	6	
					NBT	726	632	87%	5.2	75	51	
				SB	SBT	1211	1117	92%	9.8	244	184	
					SBR	163	136	83%	4.3	214	156	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	0	4	100%	1.8	3	0	**6.8**
					EBT	106	93	88%	0.2	0	0	
				WB	WBT	159	151	95%	0.3	0	0	
					WBR	17	35	206%	0.8	0	0	
				SB	SBL	42	76	181%	6.8	38	33	
					SBR	0	2	100%	6.5	51	45	
3200	SR 162	Pioneer	Y	EB	EBL	81	81	100%	55.2	100	78	**24.9**
					EBT	11	11	100%	56.4	100	78	
					EBR	295	293	99%	28.0	232	138	
				WB	WBL	4	3	68%	46.6	38	20	
					WBT	18	15	85%	50.4	38	20	
					WBR	12	14	115%	11.0	52	20	
				NB	NBL	224	221	99%	64.0	244	189	
					NBT	440	447	102%	6.7	109	85	
					NBR	9	7	79%	2.9	6	0	
				SB	SBL	22	21	95%	57.5	29	22	
					SBT	805	804	100%	19.4	687	435	
					SBR	76	72	95%	18.7	712	489	
3300	SR 162	80th St	N	EB	EBL	86	94	109%	42.7	127	90	**42.7**
					EBR	60	73	122%	26.2	128	90	
				NB	NBL	18	33	185%	8.5	75	24	
					NBT	515	510	99%	1.8	58	8	
				SB	SBT	843	825	98%	3.6	55	11	
					SBR	159	155	97%	5.0	81	33	
3400	SR 162	EB	Y	EB	EBL	162	162	100%	30.1	110	94	**16.3**
					EBR	485	472	97%	32.5	432	237	
				NB	NBT	524	503	96%	17.3	350	249	
					NBR	150	168	112%	17.1	230	121	
				SB	SBL	137	143	104%	11.4	55	35	
					SBT	776	766	99%	3.5	161	94	
3500	SR 162	WB	Y	WB	WBL	153	160	104%	38.2	137	103	**21.0**
					WBR	128	128	100%	5.4	10	2	
				NB	NBL	246	240	97%	27.7	182	148	
					NBT	441	427	97%	4.8	102	79	
				SB	SBT	760	751	99%	29.3	758	549	
					SBR	229	225	98%	12.9	20	9	

2026 Scenario E AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	88	37	42%	11.2	76	47	**18.3**
					EBT	83	99	119%	15.4	66	47	
					EBR	128	162	127%	5.5	70	54	
				WB	WBL	60	80	133%	11.2	41	30	
					WBT	115	96	83%	13.2	95	77	
					WBR	34	31	91%	7.5	106	80	
				NB	NBL	383	148	39%	27.1	1129	894	
					NBT	726	274	38%	19.0	1163	1001	
					NBR	113	70	62%	5.4	63	52	
				NE	NER	8	11	138%	6.4	33	14	
				SB	SBL	18	18	100%	35.0	26	13	
					SBT	216	205	95%	33.8	149	115	
					SBR	32	0	0%	0.0	180	145	
200	Traffic Ave	State St	Y	EB	EBL	18	17	94%	34.9	34	13	**2.3**
					EBR	3	5	167%	9.6	17	4	
				NB	NBL	10	12	120%	29.2	12	7	
					NBT	1204	474	39%	1.0	574	313	
				SB	SBT	394	440	112%	1.6	52	20	
					SBR	9	3	33%	2.3	32	8	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	213	94	44%	4.2	216	162	**7.5**
					EBT	12	13	108%	44.4	25	7	
					EBR	136	254	187%	12.3	63	51	
				WB	WBL	46	67	146%	1.6	49	27	
					WBT	48	37	77%	48.9	47	34	
					WBR	12	3	25%	10.1	14	9	
				NB	NBL	479	301	63%	7.4	208	112	
					NBT	989	390	39%	3.7	254	159	
					NBR	109	116	106%	5.3	254	159	
				SB	SBL	2	5	250%	7.7	2	0	
					SBT	240	264	110%	5.9	113	82	
					SBR	155	175	113%	5.1	165	129	
400	E Main Ave	SR 410 EB	Y	EB	EBL	410	206	50%	40.5	571	369	**14.7**
					EBR	437	570	130%	13.0	168	110	
				NB	NBL	119	134	113%	15.7	68	45	
					NBT	1167	604	52%	10.3	368	253	
				SB	SBT	350	540	154%	11.7	96	85	
					SBR	72	44	61%	9.4	82	70	
500	E Main Ave	5th Ave NE	N	EB	EBL	20	15	75%	7.1	37	22	**7.1**
					EBR	10	16	160%	6.2	0	0	
				NB	NBL	34	28	82%	4.0	17	5	
					NBT	1266	722	57%	0.4	0	0	
				SB	SBT	742	1083	146%	0.4	0	0	
					SBR	45	27	60%	0.9	0	0	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	313	270	86%	21.7	98	80	**14.9**
					EBR	182	235	129%	10.5	102	86	
				WB	WBL	500	716	143%	20.3	117	97	
					WBT	252	381	151%	7.2	84	64	
				NB	NBL	239	214	90%	25.1	132	103	
					NBR	987	485	49%	7.0	250	194	
700	E Main Ave	15th St SE	Y	EB	EBL	2	3	150%	4.5	2	0	**7.9**
					EBT	377	362	96%	13.4	127	92	
					EBR	42	67	160%	7.1	8	0	
				WB	WBL	70	140	200%	4.2	24	18	
					WBT	396	419	106%	5.1	101	67	
					WBR	25	36	144%	0.8	2	0	
				NB	NBL	97	87	90%	15.6	69	50	
					NBT	31	23	74%	15.9	69	50	
					NBR	116	136	117%	1.0	0	0	
				SB	SBL	2	8	400%	18.1	17	7	
					SBT	12	4	33%	15.6	17	7	
					SBR	0	1	100%	11.8	26	12	
800	E Main Ave	5th Ave SE	Y	EB	EBL	0	3	100%	10.1	0	0	**11.9**
					EBT	357	306	86%	11.3	154	103	
					EBR	6	18	300%	10.0	178	126	
				WB	WBL	36	86	239%	11.6	20	9	
					WBT	336	369	110%	11.8	131	101	
					WBR	88	49	56%	9.8	159	129	
				NB	NBL	12	18	150%	17.0	21	8	
					NBT	24	52	217%	18.2	53	32	
					NBR	131	96	73%	9.0	83	61	
				SB	SBL	48	32	67%	15.7	32	20	
					SBT	25	39	156%	14.9	21	12	
					SBR	3	4	133%	9.2	44	27	
900	E Main Ave	2nd St SE	Y	EB	EBL	46	40	87%	29.0	58	33	**15.0**
					EBT	363	327	90%	28.5	220	189	
				NB	NBL	59	86	146%	8.2	129	108	
					NBT	844	810	96%	7.3	129	108	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	125	190	152%	28.6	93	68	
					WBR	226	200	88%	11.3	122	103	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	1037	1150	111%	40.8	620	426	**28.5**
				NB	NBT	679	409	60%	32.9	311	244	
					NBR	524	797	152%	3.3	0	0	
				SB	SBL	478	526	110%	44.9	345	277	
					SBT	448	465	104%	18.8	177	142	
1100	Meridian	SR 167 WBR	Y	WB	WBR	1120	1000	89%	66.9	985	593	**16.0**
				NB	NBT	679	410	60%	16.7	62	50	
				SB	SBT	926	995	107%	4.9	34	10	
				EB	EBL	22	27	123%	57.4	36	23	**32.8**
					EBT	147	185	126%	49.5	110	93	
					EBR	296	291	98%	23.2	195	164	
					WBL	272	323	119%	96.8	164	144	

2026 Scenario E AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
1200	Meridian	Valley Ave	Y	WB	WBT	139	107	77%	40.1	95	85	
					WBR	56	29	52%	12.9	131	119	
				NB	NBL	521	596	114%	30.8	302	268	
					NBT	961	521	54%	11.5	301	235	
					NBR	317	289	91%	3.4	56	24	
				SB	SBL	29	9	31%	57.5	38	24	
					SBT	358	381	106%	30.2	185	136	
					SBR	18	10	56%	7.7	5	0	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	355	320	90%	12.9	119	81	**22.3**
					EBR	35	59	169%	8.7	162	122	
				WB	WBL	225	293	130%	47.8	194	161	
					WBT	362	311	86%	2.7	50	36	
				NB	NBL	132	113	86%	59.2	172	122	
					NBR	86	104	121%	5.9	76	61	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	327	369	113%	6.8	83	69	**9.7**
					EBR	114	55	48%	4.8	61	46	
				WB	WBL	55	19	35%	50.8	63	50	
					WBT	521	551	106%	4.7	82	60	
				NB	NBL	66	55	83%	39.8	74	43	
					NBR	398	361	91%	14.1	201	86	
1500	E Pioneer	13th St SE	N	EB	EBT	707	691	98%	0.2	0	0	**10.1**
					EBR	18	37	206%	0.7	0	0	
				WB	WBL	23	38	165%	4.5	12	4	
					WBT	547	546	100%	0.1	0	0	
				NB	NBL	29	23	79%	10.1	32	23	
					NBR	50	55	110%	6.6	44	35	
1600	E Pioneer	15th St SE	Y	EB	EBL	218	131	60%	3.3	58	30	**5.9**
					EBT	539	615	114%	5.3	69	55	
				WB	WBT	492	508	103%	5.4	90	63	
					WBR	79	45	57%	4.1	44	24	
				SB	SBL	38	39	103%	14.5	0	0	
					SBR	78	77	99%	15.7	3	0	
1700	E Pioneer	21st St	Y	EB	EBT	559	635	114%	10.6	102	82	**8.1**
					EBR	18	19	106%	8.3	52	30	
				WB	WBL	49	62	127%	6.2	56	40	
					WBT	549	538	98%	2.1	56	40	
				NB	NBL	22	15	68%	22.3	18	12	
					NBR	56	63	113%	33.3	54	43	
1800	E Pioneer	25th St SE	N	EB	EBT	605	687	114%	1.0	0	0	**15.4**
					EBR	10	9	90%	0.9	0	0	
				WB	WBL	0	2	100%	3.8	0	0	
					WBT	586	595	102%	0.3	0	0	
				NB	NBL	12	8	67%	15.4	28	20	
					NBR	5	11	220%	5.1	28	20	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	359	259	72%	42.5	283	202	**34.1**
					EBT	155	303	195%	38.3	124	95	
					EBR	84	124	148%	7.3	82	67	
				WB	WBL	99	111	112%	42.5	102	78	
					WBT	221	217	98%	41.8	336	253	
					WBR	79	48	61%	33.8	131	52	
				NB	NBL	192	138	72%	48.7	115	97	
					NBT	824	448	54%	30.3	416	361	
					NBR	82	109	133%	19.5	462	407	
				SB	SBL	45	61	136%	44.7	73	47	
					SBT	257	464	181%	30.2	187	153	
					SBR	118	197	167%	33.0	187	153	
2000	E Pioneer	33rd St SE	N	EB	EBL	65	97	149%	8.3	40	23	**8.3**
					EBT	217	373	172%	6.3	46	26	
				WB	WBT	314	305	97%	1.9	49	30	
					WBR	2	10	500%	1.0	7	0	
				SB	SBL	1	1	100%	6.6	44	38	
					SBR	85	71	84%	5.7	10	5	
2100	33rd St SE	80th St	N	WB	WBL	71	62	87%	0.6	0	0	**7.2**
					WBR	1	2	200%	0.5	0	0	
				NB	NBT	48	47	98%	7.2	37	25	
					NBR	19	60	316%	0.6	0	0	
				SB	SBL	0	0	100%	7.2	26	9	
					SBT	15	10	67%	6.9	40	14	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	5	2	40%	17.7	20	9	**17.7**
					WBR	76	81	107%	13.3	75	63	
				NB	NBT	1002	659	66%	1.9	12	0	
					NBR	3	6	200%	1.6	0	0	
				SB	SBL	16	75	469%	11.5	15	6	
					SBT	357	612	171%	4.0	0	0	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	26	22	85%	14.7	27	15	**14.7**
					EBR	4	4	100%	9.6	10	3	
				NB	NBL	3	6	200%	8.8	43	0	
					NBT	979	644	66%	4.2	41	0	
				SB	SBT	355	578	163%	2.5	0	0	
					SBR	7	31	443%	2.8	0	0	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	130	88	68%	46.9	150	97	**20.2**
					EBT	12	38	317%	54.3	39	15	
					EBR	33	41	124%	23.4	70	43	
				WB	WBL	18	32	178%	46.8	26	15	
					WBT	25	23	92%	59.3	62	38	
					WBR	33	21	64%	21.8	97	72	
				NB	NBL	45	52	116%	18.9	24	9	
					NBT	819	542	66%	12.1	487	319	
					NBR	6	28	467%	6.3	13	0	
				SB	SBL	9	23	256%	25.0	7	1	
					SBT	289	468	162%	19.6	140	83	
					SBR	61	91	149%	14.1	23	15	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	19	27	142%	14.4	45	35	**14.4**
					EBR	33	24	73%	9.2	45	34	
				NB	NBL	17	28	165%	6.3	13	3	
					NBT	851	597	70%	2.5	8	0	
				SB	SBT	331	520	157%	4.7	0	0	
					SBR	9	23	256%	5.0	0	0	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	31	25	81%	10.9	36	25	**10.9**
					EBR	9	12	133%	9.4	21	10	
				NB	NBL	1	12	1200%	8.5	2	0	
					NBT	837	601	72%	1.9	0	0	
				SB	SBT	348	510	147%	4.7	0	0	
					SBR	16	34	213%	3.6	0	0	
				EB	EBL	156	96	62%	26.0	103	72	**32.6**
					EBT	0	2	100%	16.4	103	72	
					EBR	148	199	134%	9.2	79	72	
					WBL	0	0	100%	23.0	8	2	

2026 Scenario E AM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
2700	Shaw Rd E	39th Ave SE	Y	WB	WBT	2	2	100%	35.7	8	2	
					WBR	2	4	200%	7.8	2	0	
				NB	NBL	375	517	138%	60.5	307	170	
					NBT	680	514	76%	28.3	265	166	
					NBR	0	4	100%	30.6	281	176	
				SB	SBL	0	2	100%	33.4	0	0	
					SBT	225	374	166%	24.1	140	110	
					SBR	132	146	111%	9.6	32	18	
2800	Shaw Rd E	5th Ave SE (Future)	Y	WB	WBL	80	48	60%	33.1	45	33	**6.8**
					WBR	152	100	66%	8.6	89	78	
				NB	NBT	1074	600	56%	7.0	285	172	
					NBR	188	152	81%	4.6	272	153	
				SB	SBL	342	271	79%	11.0	97	71	
					SBT	340	676	199%	3.3	41	25	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	0	0	**0.5**
					EBR	0	0	100%	0.0	0	0	
				NB	NBL	18	10	56%	0.5	2	0	
					NBT	31	39	126%	0.2	0	0	
				SB	SBT	15	10	67%	0.1	0	0	
					SBR	0	1	100%	0.1	0	0	
3000	Shaw Rd E	Safeway	Y	EB	EBL	85	35	41%	66.2	114	89	**5.5**
					EBR	49	96	196%	6.8	59	50	
				NB	NBL	96	69	72%	5.7	17	8	
					NBT	1013	663	65%	3.5	115	73	
				SB	SBT	352	610	173%	4.5	67	47	
					SBR	88	90	102%	2.0	37	19	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	3	3	100%	1.2	2	0	**5.8**
					EBT	16	57	356%	0.1	0	0	
				WB	WBT	72	64	89%	0.4	0	0	
					WBR	62	58	94%	0.7	0	0	
				SB	SBL	27	15	56%	5.8	17	12	
					SBR	0	0	100%	0.0	24	17	
3200	SR 162	Pioneer	Y	EB	EBL	34	32	94%	56.3	54	35	**32.3**
					EBT	4	4	100%	50.1	54	35	
					EBR	118	117	99%	8.1	59	48	
				WB	WBL	8	4	50%	49.4	50	31	
					WBT	18	23	128%	55.0	50	31	
					WBR	21	20	95%	19.6	75	43	
				NB	NBL	260	256	98%	98.4	596	239	
					NBT	596	549	92%	20.0	103	69	
					NBR	2	9	450%	23.2	3	0	
				SB	SBL	8	11	138%	52.6	15	8	
					SBT	308	372	121%	11.2	174	99	
					SBR	38	32	84%	10.0	219	148	
3300	SR 162	80th St	N	EB	EBL	28	40	143%	3.0	25	15	**5.7**
					EBR	15	31	207%	1.0	17	10	
				NB	NBL	41	27	66%	3.1	20	4	
					NBT	610	573	94%	4.7	13	0	
				SB	SBT	339	384	113%	5.0	13	0	
					SBR	93	95	102%	5.7	34	10	
3400	SR 162	EB	Y	EB	EBL	170	92	54%	41.0	151	113	**13.6**
					EBR	219	292	133%	12.4	95	77	
				NB	NBT	733	570	78%	14.3	543	387	
					NBR	52	182	350%	13.5	247	54	
				SB	SBL	62	37	60%	10.8	46	29	
					SBT	199	287	144%	5.3	54	28	
3500	SR 162	WB	Y	WB	WBL	117	127	109%	44.2	106	75	**19.2**
					WBR	118	90	76%	5.2	8	2	
				NB	NBL	344	282	82%	39.1	375	312	
					NBT	559	0	0%	0.0	101	54	
				SB	SBT	144	0	0%	0.0	77	53	
					SBR	119	0	0%	0.0	8	2	

2026 Scenario E PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
100	Traffic Ave/Fryar Ave	SW 6th Street	Y	EB	EBL	97	91	94%	51.5	331	45	**41.1**
					EBT	264	245	93%	62.6	485	106	
					EBR	396	407	103%	54.6	1028	108	
				WB	WBL	118	136	115%	37.0	848	47	
					WBT	171	168	98%	36.3	283	71	
					WBR	50	47	94%	24.4	504	85	
				NB	NBL	216	212	98%	62.7	326	68	
					NBT	357	379	106%	26.4	1038	112	
					NBR	92	104	113%	8.0	587	102	
				NE	NER	12	11	92%	25.1	663	80	
				SB	SBL	94	89	95%	61.6	1230	107	
					SBT	583	644	110%	35.1	700	97	
					SBR	126	127	101%	27.1	1197	46	
200	Traffic Ave	State St	Y	EB	EBL	29	28	98%	57.7	355	55	**42.5**
					EBR	10	8	81%	52.9	742	85	
				NB	NBL	19	17	91%	56.6	425	82	
					NBT	670	670	100%	1.2	1196	118	
				SB	SBT	1192	1116	94%	67.4	842	77	
					SBR	2	2	91%	75.6	971	91	
300	E Main Ave	SR 410 WB/Thompson St	Y	EB	EBL	110	108	98%	64.4	863	99	**74.5**
					EBT	13	15	113%	58.4	993	78	
					EBR	300	296	99%	25.1	664	114	
				WB	WBL	300	250	83%	203.7	636	123	
					WBT	151	129	85%	211.7	910	110	
					WBR	12	9	74%	143.9	902	66	
				NB	NBL	468	531	113%	63.0	561	116	
					NBT	566	570	101%	3.6	1006	59	
					NBR	178	170	96%	4.2	865	113	
				SB	SBL	10	9	91%	69.3	703	89	
					SBT	774	721	93%	102.5	499	85	
					SBR	418	375	90%	84.7	758	94	
400	E Main Ave	SR 410 EB	Y	EB	EBL	294	296	101%	43.0	994	128	**32.3**
					EBR	687	732	106%	20.1	506	135	
				NB	NBL	248	231	93%	29.2	772	79	
					NBT	918	982	107%	27.1	1025	137	
				SB	SBT	1246	1151	92%	41.9	511	118	
					SBR	128	114	89%	35.8	867	106	
500	E Main Ave	5th Ave NE	N	EB	EBL	55	55	100%	7.3	819	80	**19.5**
					EBR	56	48	85%	6.4	1012	139	
				NB	NBL	42	39	93%	19.5	771	78	
					NBT	1110	1159	104%	0.7	758	115	
				SB	SBT	1887	1840	98%	1.4	1062	133	
					SBR	46	43	93%	2.2	603	141	
600	E Main Ave	Shaw Rd E	Y	EB	EBT	404	380	94%	45.4	868	136	**29.6**
					EBR	248	273	110%	22.8	905	98	
				WB	WBL	1216	1196	98%	45.2	612	109	
					WBT	728	684	94%	15.7	796	104	
				NB	NBL	261	336	129%	35.3	764	124	
					NBR	747	822	110%	11.0	763	77	
700	E Main Ave	15th St SE	Y	EB	EBL	6	4	72%	11.4	626	127	**10.7**
					EBT	457	481	105%	17.7	658	123	
					EBR	114	107	94%	8.8	844	94	
				WB	WBL	254	236	93%	6.2	854	130	
					WBT	670	711	106%	7.6	599	138	
					WBR	68	63	92%	0.9	657	105	
				NB	NBL	85	80	94%	21.2	741	101	
					NBT	25	22	87%	21.2	814	86	
					NBR	125	125	100%	1.0	642	127	
				SB	SBL	51	48	95%	19.9	660	127	
					SBT	42	40	95%	19.8	790	78	
					SBR	12	13	107%	15.3	766	138	
800	E Main Ave	5th Ave SE	Y	EB	EBL	6	4	72%	13.3	665	126	**17.0**
					EBT	356	372	105%	14.3	656	129	
					EBR	30	30	101%	12.2	651	111	
				WB	WBL	191	176	92%	18.1	772	103	
					WBT	636	684	108%	17.5	713	126	
					WBR	88	86	97%	15.4	798	85	
				NB	NBL	17	15	91%	26.0	661	140	
					NBT	43	40	93%	28.6	628	105	
					NBR	78	78	100%	13.2	640	133	
				SB	SBL	79	75	94%	20.4	663	115	
					SBT	87	89	102%	20.0	813	92	
					SBR	10	8	81%	10.7	678	160	
900	E Main Ave	2nd St SE	Y	EB	EBL	57	57	99%	10.4	547	105	**11.7**
					EBT	378	405	107%	9.7	800	84	
				NB	NBL	78	78	100%	14.2	622	118	
					NBT	749	742	99%	13.5	667	143	
					NBR	0	0	100%	0.0	0	0	
				WB	WBT	332	352	106%	11.6	633	116	
					WBR	330	355	108%	9.8	767	74	
1000	SR 167 EB on/WBL	SR 167 EB on/WBL	Y	WB	WBL	833	828	99%	47.7	644	197	**30.6**
				NB	NBT	699	705	101%	57.1	709	169	
					NBR	1380	1335	97%	16.9	594	109	
				SB	SBL	1149	949	83%	33.8	675	173	
					SBT	1032	930	90%	11.7	650	105	
1100	Meridian	SR 167 WBR	Y	WB	WBR	707	706	100%	39.7	680	126	**13.0**
				NB	NBT	699	706	101%	40.3	670	144	
				SB	SBT	2181	1894	87%	17.4	714	151	
				EB	EBL	87	61	70%	292.5	743	126	**138.9**
					EBT	367	245	67%	287.4	684	143	
					EBR	744	516	69%	501.2	708	158	
					WBL	674	624	93%	181.7	712	114	

2026 Scenario E PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
1200	Meridian	Valley Ave	Y	WB	WBT	163	167	102%	46.2	768	166	
					WBR	67	64	96%	34.1	690	132	
				NB	NBL	569	558	98%	30.7	696	151	
					NBT	540	535	99%	14.6	1010	120	
					NBR	297	298	100%	3.3	773	144	
				SB	SBL	16	16	100%	97.0	724	149	
					SBT	763	762	100%	58.7	854	127	
					SBR	22	22	100%	22.6	687	128	
1300	E Pioneer	SR 512 WB	Y	EB	EBT	496	492	99%	21.0	802	133	**23.7**
					EBR	96	94	98%	19.6	698	155	
				WB	WBL	520	568	109%	44.5	839	144	
					WBT	523	522	100%	1.3	682	148	
				NB	NBL	93	92	99%	57.7	1045	129	
					NBR	84	80	95%	4.8	822	115	
1400	E Pioneer	SR 512 EB	Y	EB	EBT	488	482	99%	6.9	832	116	**11.1**
					EBR	93	90	97%	5.1	684	147	
				WB	WBL	42	38	91%	42.6	672	138	
					WBT	968	1014	105%	8.6	766	107	
				NB	NBL	76	77	101%	43.9	828	131	
					NBR	385	411	107%	14.5	979	136	
1500	E Pioneer	13th St SE	N	EB	EBT	821	839	102%	0.3	807	128	**11.2**
					EBR	54	51	94%	0.7	971	119	
				WB	WBL	67	62	92%	7.0	918	109	
					WBT	988	1033	105%	0.2	990	149	
				NB	NBL	23	21	91%	11.2	892	120	
					NBR	51	49	97%	6.7	691	130	
1600	E Pioneer	15th St SE	Y	EB	EBL	167	162	97%	4.4	667	127	**14.9**
					EBT	705	722	102%	8.9	793	87	
				WB	WBT	709	747	105%	8.7	569	121	
					WBR	67	62	92%	6.3	922	144	
				SB	SBL	169	161	95%	31.3	522	118	
					SBR	346	349	101%	39.8	715	137	
1700	E Pioneer	21st St	Y	EB	EBT	839	849	101%	13.2	592	98	**9.2**
					EBR	35	33	93%	9.8	496	78	
				WB	WBL	92	83	91%	7.1	493	126	
					WBT	756	794	105%	2.3	820	117	
				NB	NBL	21	21	100%	25.4	587	96	
					NBR	85	82	97%	31.7	537	106	
1800	E Pioneer	25th St SE	N	EB	EBT	909	918	101%	1.5	831	73	**18.3**
					EBR	15	14	91%	1.1	256	65	
				WB	WBL	3	3	91%	1.7	877	107	
					WBT	842	873	104%	0.3	331	60	
				NB	NBL	6	5	91%	18.3	407	97	
					NBR	8	7	91%	7.2	616	103	
1900	E Pioneer	Shaw Rd E	Y	EB	EBL	246	279	113%	57.3	1067	76	**53.8**
					EBT	444	407	92%	72.1	394	113	
					EBR	204	193	95%	10.5	406	107	
				WB	WBL	188	193	103%	91.3	941	68	
					WBT	276	259	94%	85.2	387	124	
					WBR	60	54	89%	76.9	802	86	
				NB	NBL	170	152	89%	63.8	825	58	
					NBT	530	475	90%	20.8	338	80	
					NBR	125	112	90%	16.6	658	92	
				SB	SBL	133	121	91%	46.1	244	60	
					SBT	983	944	96%	54.9	311	64	
					SBR	368	441	120%	57.0	672	93	
2000	E Pioneer	33rd St SE	N	EB	EBL	149	138	92%	15.0	243	79	**15.0**
					EBT	542	501	92%	13.6	1022	84	
				WB	WBT	335	329	98%	4.2	1022	64	
					WBR	10	9	91%	2.6	248	68	
				SB	SBL	4	4	91%	11.9	495	104	
					SBR	189	194	103%	7.4	656	97	
2100	33rd St SE	80th St	N	WB	WBL	159	150	94%	1.0	372	109	**8.0**
					WBR	1	2	181%	0.8	1068	72	
				NB	NBT	54	51	95%	8.0	1050	81	
					NBR	106	95	90%	0.7	472	103	
				SB	SBL	4	3	68%	7.0	242	80	
					SBT	34	49	143%	8.0	724	108	
2200	Shaw Rd E	Highlands Blvd	N	WB	WBL	2	1	45%	50.0	741	134	**68.5**
					WBR	47	46	98%	11.1	339	86	
				NB	NBT	672	659	98%	1.9	264	67	
					NBR	14	6	42%	1.7	801	115	
				SB	SBL	91	150	165%	68.5	1213	60	
					SBT	1298	1231	95%	27.2	405	112	
2300	Shaw Rd E	16th Ave SE	N	EB	EBL	12	10	85%	46.7	251	62	**46.7**
					EBR	2	0	0%	41.1	725	103	
				NB	NBL	6	2	36%	23.1	785	111	
					NBT	674	656	97%	4.8	389	109	
				SB	SBT	1231	1157	94%	14.4	276	57	
					SBR	68	65	96%	13.5	1319	68	
2400	Shaw Rd E	23rd Ave SE	Y	EB	EBL	109	110	101%	47.7	270	50	**44.8**
					EBT	53	52	98%	55.1	1286	60	
					EBR	60	55	92%	31.9	401	85	
				WB	WBL	41	37	91%	47.1	691	80	
					WBT	29	27	94%	59.7	267	53	
					WBR	31	25	82%	20.9	1333	62	
				NB	NBL	50	49	99%	48.4	420	90	
					NBT	540	526	97%	13.1	1251	69	
					NBR	31	26	84%	6.4	281	47	
				SB	SBL	36	35	98%	60.6	710	77	
					SBT	1016	948	93%	61.2	514	80	
					SBR	181	165	91%	53.8	534	66	
2500	Shaw Rd E	Forrest Green Blvd	N	EB	EBL	34	29	86%	24.9	274	46	**24.9**
					EBR	29	30	105%	21.2	544	38	
				NB	NBL	30	26	87%	20.3	314	45	
					NBT	588	576	98%	3.1	528	44	
				SB	SBT	1073	995	93%	7.7	1126	65	
					SBR	44	41	92%	7.5	510	73	
2600	Shaw Rd E	Manorwood Dr	N	EB	EBL	30	26	86%	19.6	232	47	**28.0**
					EBR	14	13	91%	28.0	1246	50	
				NB	NBL	12	11	91%	21.1	520	52	
					NBT	587	579	99%	2.0	273	50	
				SB	SBT	1042	956	92%	19.6	618	51	
					SBR	60	59	99%	18.1	584	70	
				EB	EBL	198	201	101%	47.1	198	43	**49.3**
					EBT	7	7	106%	46.9	329	31	
					EBR	423	415	98%	32.8	537	90	
					WBL	2	2	91%	88.8	552	62	

2026 Scenario E PM

Node #	Primary Road	Secondary Road	Signalized?	Approach	Movement	Movement						Intersection
						Demand	Served Volume (vph)	Percent served	Vehicle Delay (sec)	95th Percentile Queue (ft)	50th Percentile Queue (ft)	Vehicle Delay (sec)
2700	Shaw Rd E	39th Ave SE	Y	WB	WBT	7	6	91%	64.5	415	32	
					WBR	9	8	91%	8.8	622	76	
				NB	NBL	391	392	100%	51.9	343	40	
					NBT	393	381	97%	12.3	675	80	
					NBR	2	3	136%	9.7	746	77	
				SB	SBL	3	2	60%	119.2	665	62	
					SBT	790	696	88%	80.6	396	45	
					SBR	263	249	95%	43.3	472	34	
2800	Shaw Rd E	5th Ave SE (Future)	N	WB	WBL	122	233	191%	39.6	479	57	**10.9**
					WBR	226	438	193%	18.8	562	52	
				NB	NBT	783	718	92%	10.5	560	43	
					NBR	54	89	164%	5.4	328	37	
				SB	SBL	102	187	183%	13.1	509	67	
					SBT	1361	1282	94%	3.3	670	65	
2900	33rd St SE	5th Ave SE	N	EB	EBL	0	0	100%	0.0	487	62	**6.3**
					EBR	0	25	100%	6.3	743	65	
				NB	NBL	0	12	100%	0.7	351	64	
					NBT	0	40	100%	0.2	742	52	
				SB	SBT	0	27	100%	0.1	480	53	
					SBR	0	0	100%	0.0	294	29	
3000	Shaw Rd E	Safeway	Y	EB	EBL	98	104	106%	59.8	350	41	**10.8**
					EBR	282	273	97%	17.0	674	45	
				NB	NBL	82	62	76%	8.0	827	83	
					NBT	726	637	88%	5.0	592	58	
				SB	SBT	1211	1179	97%	9.3	792	69	
					SBR	163	148	91%	2.6	372	28	
3100	80th St	Knutson Farms Driveway	N	EB	EBL	0	4	100%	1.0	285	32	**6.7**
					EBT	106	94	89%	0.1	560	42	
				WB	WBT	159	150	94%	0.3	328	32	
					WBR	17	35	206%	0.7	624	46	
				SB	SBL	42	76	181%	6.7	859	55	
					SBR	0	2	100%	5.8	496	55	
3200	SR 162	Pioneer	Y	EB	EBL	81	81	100%	32.5	976	50	**30.1**
					EBT	11	11	100%	33.2	500	37	
					EBR	295	292	99%	20.7	522	72	
				WB	WBL	4	3	68%	33.3	844	60	
					WBT	18	15	85%	31.2	615	32	
					WBR	12	14	115%	7.6	448	25	
				NB	NBL	224	220	98%	40.2	635	50	
					NBT	440	446	101%	8.2	588	80	
					NBR	9	7	79%	2.6	407	30	
				SB	SBL	22	21	95%	56.3	910	65	
					SBT	805	793	99%	41.7	570	57	
					SBR	76	71	94%	40.9	566	95	
3300	SR 162	80th St	N	EB	EBL	86	95	110%	46.5	367	46	**46.5**
					EBR	60	73	122%	2.2	566	58	
				NB	NBL	18	33	185%	6.7	1054	65	
					NBT	515	509	99%	8.6	511	98	
				SB	SBT	843	819	97%	32.8	238	43	
					SBR	159	154	97%	31.6	424	63	
3400	SR 162	EB	Y	EB	EBL	162	162	100%	34.6	283	31	**24.1**
					EBR	485	471	97%	40.6	667	92	
				NB	NBT	524	504	96%	26.9	483	53	
					NBR	150	167	111%	24.7	550	94	
				SB	SBL	137	143	104%	15.2	464	46	
					SBT	776	769	99%	11.5	277	37	
3500	SR 162	WB	Y	WB	WBL	153	161	105%	38.4	234	42	**21.8**
					WBR	128	128	100%	5.3	646	89	
				NB	NBL	246	239	97%	49.9	942	88	
					NBT	441	0	0%	0.0	205	38	
				SB	SBT	760	0	0%	0.0	475	58	
					SBR	229	0	0%	0.0	695	100	

CULTURAL RESOURCES REPORT COVER SHEET

DAHP Project Number: 2021-08-05890

Author: Brian Durkin, MS, Chrisanne Beckner, MS, and Celena McPeak, BA, Historical Research Associates, Inc.

Title of Report: Cultural Resources Inventory Technical Report for the City of Puyallup's Knutson Farms Industrial Park Project, Puyallup, Pierce County, Washington

Date of Report: December 2022

County(ies): King Section: 25 and 21 Township: 20N Range: 04E

Quad: Puyallup and Sumner Acres: 1+

PDF of report submitted (REQUIRED) X Yes

Historic Property Inventory Forms to be Approved Online? X Yes ☐ No

Archaeological Site(s)/Isolate(s) Found or Amended? ☐ Yes X

TCP(s) found? ☐ Yes X No

Replace a draft? ☐ Yes X No

Satisfy a DAHP Archaeological Excavation Permit requirement? ☐ Yes # X No

Were Human Remains Found? ☐ Yes DAHP Case # X No

DAHP Archaeological Site #:

- Submission of PDFs is required.
- Please be sure that any PDF submitted to DAHP has its cover sheet, figures, graphics, appendices, attachments, correspondence, etc., compiled into one single PDF file.
- Please check that the PDF displays correctly when opened.

Cultural Resources Inventory Technical Report for the City of Puyallup's Knutson Farms Industrial Park Project, Puyallup, Pierce County, Washington

Submitted to:
HDR Engineering, Inc.

Submitted by:
Historical Research Associates, Inc.
Brian Durkin, MS
Chrisanne Beckner, MS
Celena McPeak, BA

Seattle, Washington
December 16, 2022

Historical
Research
Associates, Inc.

This project was implemented by HRA Principal Investigators Chrisanne Beckner, MS, and Brian Durkin, MS, who meet the Secretary of the Interior's professional qualifications and standards for architectural history and archaeology, respectively. This report is intended for the exclusive use of the Client and its representatives. It contains professional conclusions and recommendations concerning the potential for project-related impacts to cultural resources based on the results of HRA's investigation. It should not be considered to constitute project clearance with regard to the treatment of cultural resources or permission to proceed with the project described in lieu of review by the appropriate reviewing or permitting agency. This report should be submitted to the appropriate state and local review agencies for their comments prior to the commencement of the project.

Executive Summary

HDR Engineering, Inc. (HDR), contracted with Historical Research Associates, Inc. (HRA), to conduct a cultural resources inventory for the City of Puyallup Knutson Farms Industrial Park Environmental Assessment (Project). This development is a proposed warehouse/industrial project, on a proposed seven lot short plat (consisting of seven buildings), comprising approximately 2.6 million square feet of new floor area, with associated grading, paved parking, railroad access, and related infrastructure on 126 acres of mostly farmland, which is defined as the Project area of impacts (AI). The City of Puyallup is the lead agency and has determined that the project is not categorically exempt from compliance with the Washington State Environmental Protection Act (SEPA).

HRA conducted two phases of archaeological survey responding to an expectation that, based on geotechnical sampling, active flood sediments could have buried archaeological materials relatively deeply on this landform that is rated as Very High Risk to High Risk for archaeological resources in the Washington State Department of Archaeology and Historic Preservation's (DAHP) predictive model. The surveys included pedestrian survey and deep auger probes that examined the potential for archaeological materials as deep as 12 feet below the surface to match the depth of subsurface disturbance from construction of the proposed buildings and associated utilities and facilities. HRA identified no archaeological materials or deposits. HRA recommends no additional archaeological investigation for the Project as currently designed.

HRA's architectural historian surveyed four parcels with built-environment resources and recommends that one historic resource qualifies for listing in the National Register of Historic Places (NRHP). The primary residence with two functionally related units at 7525 134th Ave. E (parcel 0420253704) is significant for its association with local agricultural history and qualifies for listing in the NRHP under Criterion A.

The Project proposes to construct an industrial development on the site of Knutson Farms. If construction requires demolition of the buildings at 7525 134th Ave. E and the loss of all associated farmland, this may constitute an environmental impact under SEPA. If a significant, adverse impact cannot be avoided, the project team should work together with the lead agency to reduce or mitigate the environmental impact. Mitigation measures may include, for instance, avoiding demolition, preserving some percentage of traditional farmland, and/or incorporating interpretive documentation into the project design.

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1. Introduction

HDR Engineering, Inc. (HDR), has contracted with Historical Research Associates, Inc. (HRA), to conduct a cultural resources inventory for the City of Puyallup Knutson Farms Industrial Park Environmental Impact Statement (EIS; Project). The Project is located in Pierce County, Washington, in the southeast quadrant of Section 25 and the western half of Section 51 of Township 20 North, Range 4 East, Willamette Meridian, in Pierce County, Washington, on the Puyallup and Sumner U.S. Geological Survey (USGS) quadrangle (Figure 1-1).

1.1 Project Description

This development is a proposed warehouse/industrial project on a proposed seven lot short plat (consisting of seven buildings varying in size from approximately 190,000 square feet to 490,000 square feet and approximately 40 feet tall), comprising approximately 2.6 million square feet of new floor area, with associated grading, a railroad access alternative, landscaping, 2,203 total paved parking spaces, and related infrastructure that will impact a total of 126 acres of a 188-acre property. To avoid wetlands and floodplains adjacent to the Puyallup River, the Project would maintain approximately 62 acres of open space on the norther portion of the site. The Project is anticipated to consist of warehousing, distribution, freight movement, or manufacturing facilities.

While the City of Puyallup is serving as the lead agency on the EIS and State Environmental Policy Act (SEPA) review, the project site is located in unincorporated Pierce County, within the City's Urban Growth Area and adjacent to Puyallup's corporate limits.

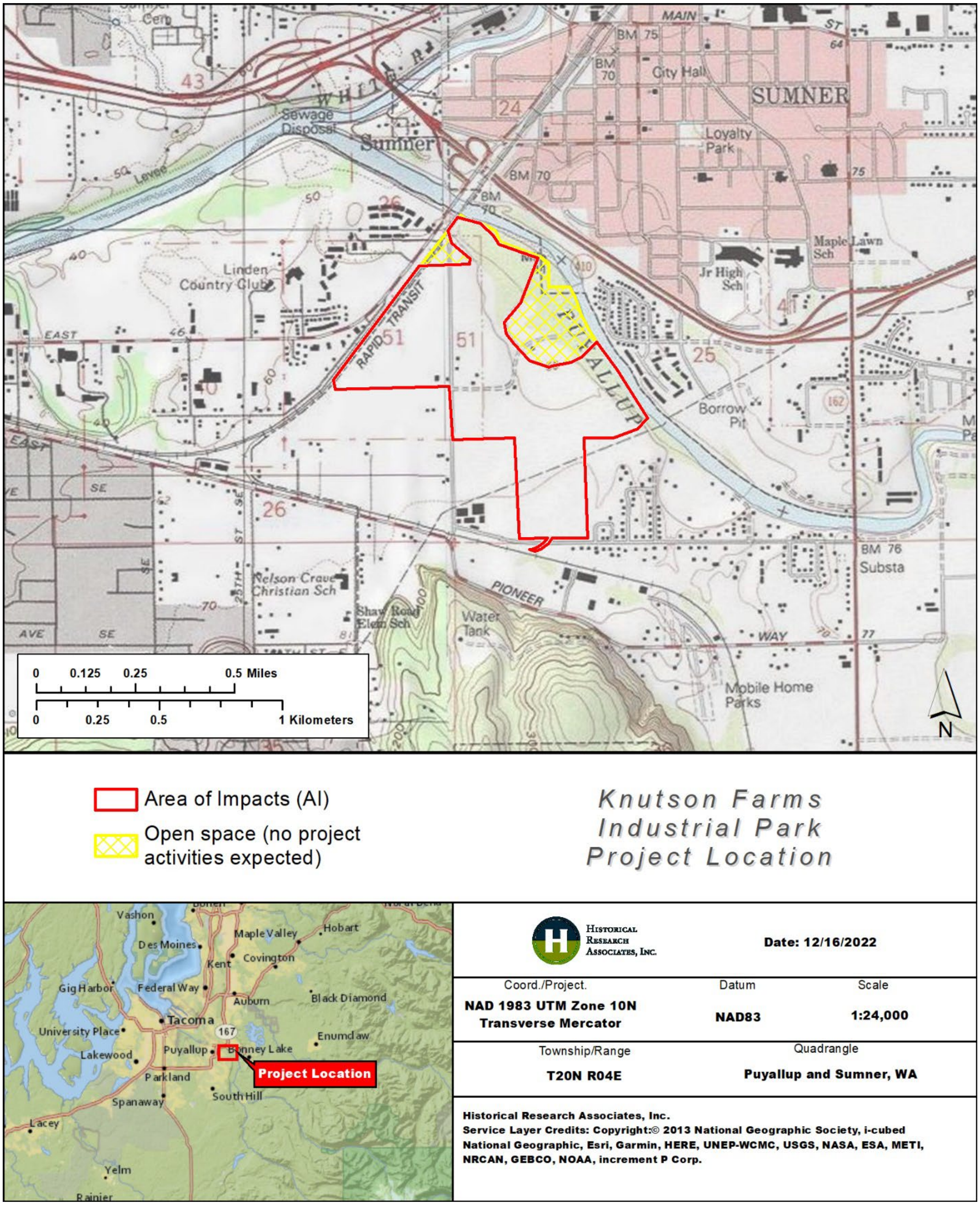


Figure 1-1. Project location.

1.2 Regulatory Context

The City of Puyallup has determined that the Project requires compliance with SEPA. SEPA review is required for any state or local agency decision that constitutes an "action," defined as either an agency decision to license, fund, or undertake a specific project; or an agency decision on policies, plans, and programs. The SEPA process helps state and local agencies identify and analyze environmental impacts associated with governmental decisions such as issuing permits for private projects, constructing public facilities, or adopting regulations and policies like comprehensive plans or water quality regulations (Department of Ecology 2021). Compliance with RCW 27.44 (Indian Grave and Records) and RCW 27.53 (Archaeological Sites and Resources) is also required.

Additionally, local codes must also be complied with including Pierce County Code 18S.30.020 (Archaeological, Cultural and Historic resources), and City of Puyallup Chapter 21.14 (Inadvertent Discovery of Archaeological Resources); and Chapter 21.22 (Historic Preservation). The Puyallup City Comprehensive Plans cultural resources elements CC 7 and CC 8 also outline the city's goals for the city's Historic Preservation Program. The City also has an Historic Preservation Plan which outlines the city's policies.

1.3 Area of Impacts

The area of impacts (AI) is defined as the area in which project activities have the potential to impact cultural resources, should any be present. The AI includes the combined footprint of the Project and all locations where ground disturbance will occur (Figures 1-2 and 1-3). The AI covers approximately 126 acres. Ground disturbance will include leveling and clearing, installation of utilities, construction of the seven buildings, extension of an adjacent railroad line, and associated landscaping.

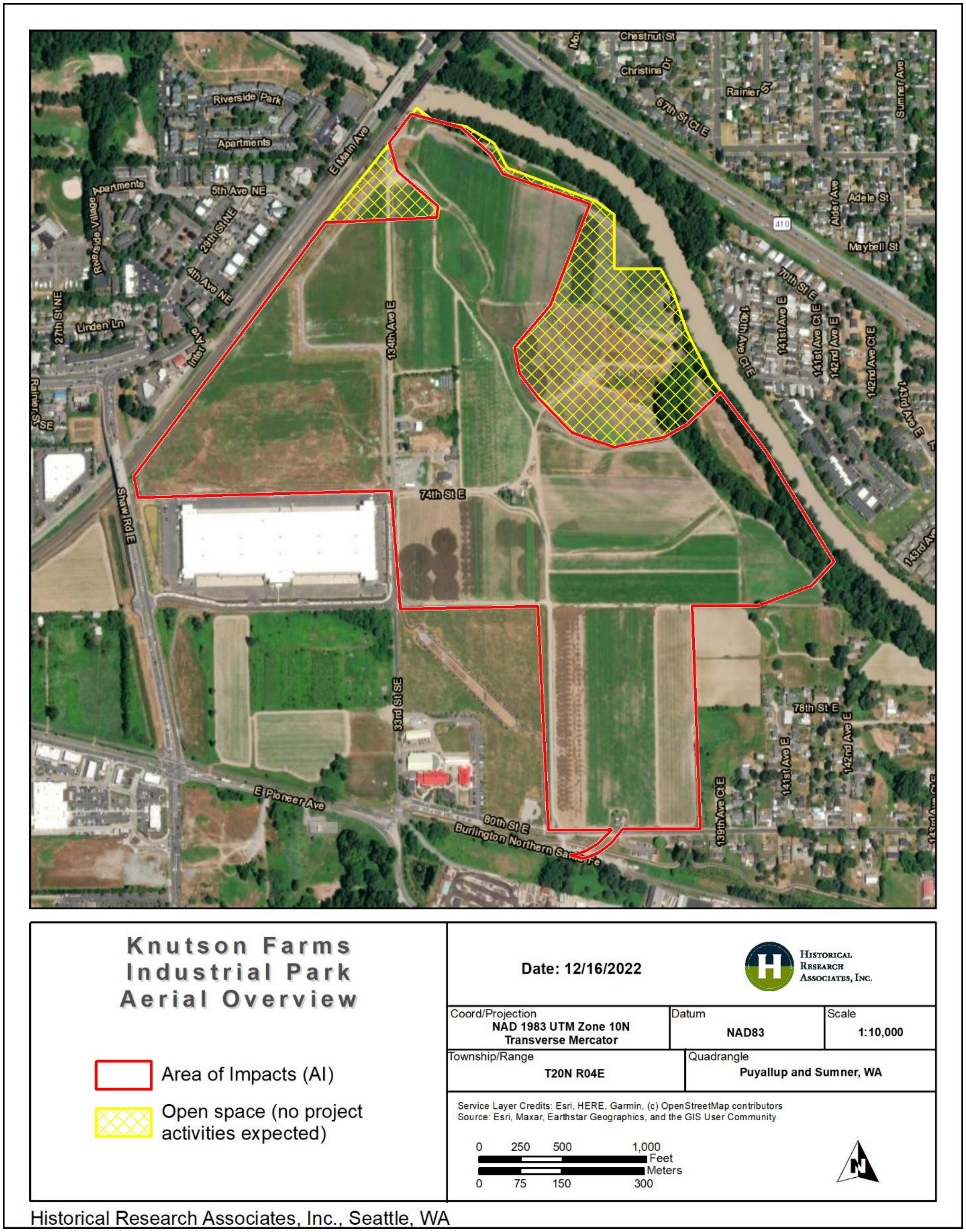


Figure 1-2. Aerial overview of area of impacts (AI).

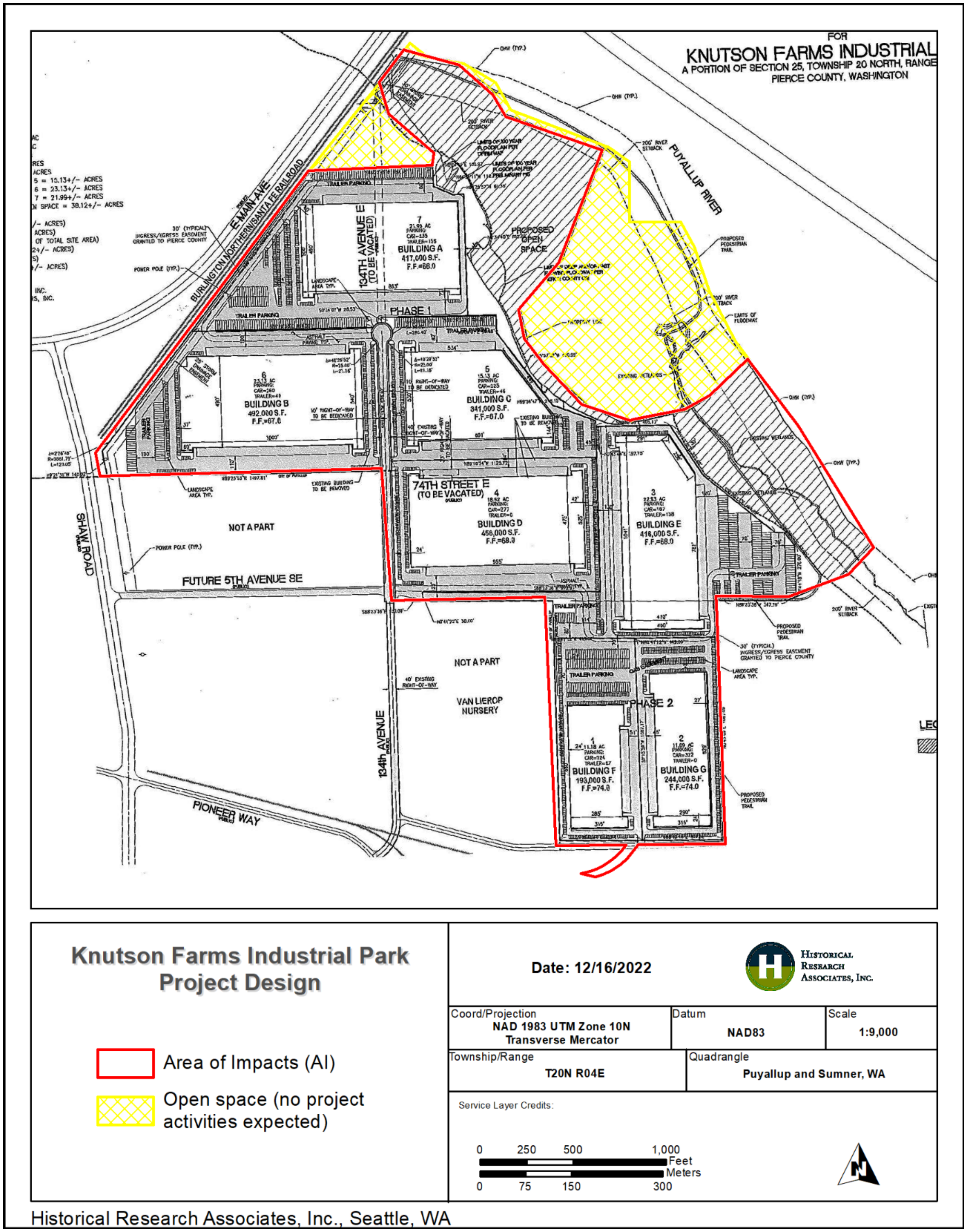


Figure 1-3. AI overlain with project design drawing.

2. Background Research

2.1 Research Methods

HRA Archaeologist Celena McPeak, BA, conducted background research for the Project using a research radius of 0.5 mile (mi). McPeak searched the Washington Department of Archaeology and Historic Preservation (DAHP) online database (Washington Information System for Architectural and Archaeological Records [WISAARD]) for previous cultural resources studies, archaeological site records, cemetery records, and historic properties listed in the National Register of Historic Places (NRHP) or the Washington Heritage Register (WHR) within the research radius. He also reviewed the statewide predictive model layer on WISAARD for probability estimates for archaeological resources within the research radius.

McPeak searched HRA's in-house library for information on the environmental, archaeological, and historical context of the AI and vicinity. She reviewed ethnographic sources (e.g., Hilbert et al. 2001) for information regarding place names, burials, and land-use practices. She also reviewed historic-period plats from the U.S. Surveyor General's (USSG) General Land Office (GLO) for the presence of structures and features that might be extant within the AI, as well as indicators of potential archaeological sites and past land-use patterns. McPeak consulted other online historic-period map archives to determine the history of land use in the AI.

HRA Architectural Historian Chrisanne Beckner, MA, conducted additional archival research, reviewing HRA's in-house library, previously conducted cultural resources surveys, Pierce County assessor records, as well as additional online sources, including local histories, newspaper archives, and historical maps and aerials. HRA also reviewed NRHP/WHR-listed and eligible buildings, structures, and objects in the WISAARD databases and resources listed in the Pierce County Register of Historic Places (PCRHP) and the City of Puyallup's Register of Historic Places (PRHP). In preparation for field survey, HRA identified architectural resources within the AI constructed in 1976 or earlier (i.e., resources 45 years or older) as per SEPA guidelines, and because these resources might reach the 50-year age threshold for NRHP eligibility before the project is completed.

2.2 Research Results

2.2.1 Previous Cultural Resources Studies

A total of 16 surveys have been completed within 0.5 mi of the AI (Table 2-1). Four cultural resource surveys have been conducted within the AI. Two of the studies within the AI were conducted for the Northwest Pipeline Washington Expansion Project (McClintock et al. 2013, 2014). The third survey within the AI was a pedestrian and subsurface archaeological survey for construction of Shaw Road (Gill and Berger 2007), which overlaps with Puget Sound Energy's Alderton to White River Expansion project (Flenniken and Trautman 2015). None of these studies within the AI recorded cultural resources.

Other cultural resources studies conducted within 0.5 mi of the AI were associated with recreational trails (Cole 2002; Hartmann 2010; Shong and Miss 2003), a waste water treatment plant expansion (Piper 2014; Shong and Piper 2014), building construction, and transportation projects (Arthur 2016;

Baldwin 2018; Baldwin and Chambers 2014; Elliot and Mayer 2019; Mueller 2016; Stipe 2016). No cultural resources were found. Finally, a sewer system upgrade in the city of Sumner identified historic-period archaeological site 45PI1415 less than 500 feet (ft) northeast of the AI (Baldwin 2017).

Table 2-1. Previous Cultural Resources Studies in the AI.

Reference	**NADB#**	**Title**	**Distance and Direction from AI**	**Cultural Resources Identified Within the AI**
Cole 2002	1342062	Cultural Resources Investigations for the Foothills Linear Park/Trail, McMillan to Meeker (CSM 6169)	< 500 ft south	None
Shong and Miss 2003	1342354	Heritage Resources Investigations for the City of Puyallup Riverfront Trail Project Phase 2 (SR 512 to East Main), Pierce County, Washington	< 500 ft northwest	None
Gill and Berger 2007	1343597	Cultural Resources Survey for the Shaw Road Extension Project, Pierce County, Washington	Within	None
Hartmann 2010	1354482	Letter to Charles "Ted" Hill RE: Cultural Resources Assessment for the White River Trail (Confluence to Bridge St) Project, Sumner, Pierce Country, WA	0.35 mi north	None
McClintock et al. 2013	1684387	Northwest Pipeline GP Washington Expansion Project Cultural Resources Overview and Survey Report	Within	None
Piper 2013	1684861	Cultural Resources Assessment for Sumner Waste Water Treatment Plant Phase 2 Expansion, Pierce County, Washington	< 500 ft north	None
McClintock et al. 2014	1688049	Northwest Pipeline LLC Washington Expansion Project – Addendum to Cultural Resources Overview and Survey Report: Survey of Highway 410 Reroute and Temporary Extra Workspace Areas and Easements	Within	None

Table 2-1. Previous Cultural Resources Studies in the AI.

Reference	NADB#	Title	Distance and Direction from AI	Cultural Resources Identified Within the AI
Baldwin and Chambers 2014	1985858	Cultural Resources Assessment for the Bride Street Bridge Replacement Project, Sumner, Pierce County, Washington.	0.5 mi north	None
Shong and Piper 2014	1985901	Letter to Jim Dougherty RE: Results of Cultural Resources Monitoring for the Sumner Wastewater Treatment Plant Phase 2 Expansion, Pierce County, Washington.	< 500 ft north	None
Flenniken and Trautman 2015	1686993	Cultural Resource Survey, Puget Sound Energy, Alderton to White River, Pierce 230kV Expansion, Transmission Project, Pierce County.	Within	None
Arthur 2016	1689129	Historic Properties Evaluation for the Proposed Pioneer Crossing Project, 2614 E. Pioneer Avenue, Puyallup, Washington	0.4 mi southwest	None
Mueller 2016	1689036	River Grove Levee Cultural Survey, PUY-04-16	< 500 ft east	None
Stipe 2016	1689752	Van Lierop Property Cultural Resource Survey	< 100 ft west	None
Baldwin 2017	1690364	A Cultural Resource Monitoring Report for the City of Sumner, Sewer System Upgrades Project, Pierce County, Washington	< 500 ft north/northeast	None
Baldwin 2018	1690390	Cultural Resources Review for the SR 410 Traffic Avenue Interchange, City of Sumner, Pierce County, Washington	< 500 ft north/northeast	None
Elliot and Mayer 2019	1693087	Cultural Resources Assessment, 2401 Inter Avenue SE, Puyallup, Washington	0.37 mi west	None

2.2.2 Previously Recorded Archaeological Sites

Two previously recorded sites are located within 0.5 mi of the AI. Site 45PI01360 is approximately 0.4 mi south of the AI. The site is a 1.5 mi segment of the Cascade Junction Wilkeson Branch of the

North Pacific & Cascade Railroad that was abandoned in 1984. As of 2015, Pierce County paved and converted the abandoned railroad alignment to the Foothills Trail for pedestrian access. When the alignment was surveyed in 2002, only a few displaced materials, such as rails and ties were observed (Cole 2002; Trautman 2015). The site's eligibility for listing in the NRHP has not been evaluated.

Site 45PI01415 is located approximately 0.3 mi northeast of the AI. The site is a large historic-period domestic dump comprising artifacts manufactured between 1900 and 1970 (Paton and Hanson 2016). The site's eligibility for listing in the NRHP has not been evaluated.

2.2.3 Register-Listed Properties

There are no properties listed in the NRHP or WHR within 1.0 mi of the AI (DAHP 2021). The closest property eligible for listing in the NRHP and WHR is the Stuck River Bridge, also known as the Sumner Bridge, a Parker truss bridge that carries Bridge Street over the White River approximately 0.6 mi north of the AI. The Federal Highway Administration determined the bridge eligible for listing in the WHR and NRHP in 2014 (DAHP 2021).

Additionally, there are no resources listed on the Pierce County or Puyallup registers of historic places within 0.5 mi of the AI (City of Puyallup 2021a; Pierce County 2021).

2.2.4 Cemeteries

There are no documented cemeteries within 0.5 mi of the AI. The closest is the Sumner Cemetery, located approximately 1.3 mi northwest of the AI. It includes the Woodlawn Abby Mausoleum and has also been known as Woodlawn Cemetery, Sumner Pioneer Cemetery, or Puyallup Valley Pioneer Cemetery. The earliest known grave dates to the 1850s. Sumner Cemetery is still used by the surrounding community (DAHP 1982).

2.2.5 Historic-Period Maps and Aerial Photographs

The earliest created maps of the area were cadastral surveys. These surveys were conducted under the Land Ordinance of 1785 to divide the land in the United States and establish plots to be sold. The surveyors, working for the GLO, produced plats that document the landscape and some cultural features that were present at the time of each survey. The first of these surveys done in Pierce County took place in 1864. At that time, only two homesteads were recorded in the vicinity of the AI. R.S. More's property overlaps with the AI, and I. Woolery's property was to the east, in the vicinity of the current Sumner Cemetery (USSG 1864). In the 1865, another GLO plat was produced, showing a few more settlers in the area. I. Woolery and R. S. More expanded their properties, and R. Nix acquired land to the west of the AI. Other residents in the valley included J. B. Leach, J. W. McCarthy, William Kinkaid, and A. Morrison (USSG 1865).

In 1889, Frederick G. Plummer published a Pierce County atlas. His map showed multiple residents around the area most likely farming. Two railroads were built between 1874 and 1889. One aligned northeast–southwest, less than 0.1 mi west of the AI, and the other east–west, less than 0.1 mi south of the AI. Both of these railroads are still present and operational today. Additionally, a new road system was built through the area. More, Nix, and Woolery still lived in their original plots. J. G. Williams and F. A. Clark obtained the previously empty plots on the AI (Plummer 1889).

By 1951, the closest cities to the AI, Meeker and Sumner, were highly developed. The road systems in the valley became more complex, and residential plots became smaller (Metsker 1951). Within the AI, the well-known farmer E. C. Orton owned a big plot where he was famous for producing tulip bulbs. Portions of Orton's property were sold or given away by the 1960s; however, he remained a farmer in the area (Collins 1982; Metsker 1960, 1965). The city of Meeker became a neighborhood within the city of Puyallup by 1960. Interstate 410 was established to the north of AI on the other side of the Puyallup River (Metsker 1960).

2.2.6 DAHP Predictive Model

The DAHP predictive model for archaeological sites is based on statewide information using largescale factors. Information on geology, soils, site types, landforms, and from GLO maps was used to establish or predict probabilities for archaeological resources throughout the state. The DAHP model uses five categories of prediction: Low Risk, Moderately Low Risk, Moderate Risk, High Risk, and Very High Risk. The AI is located in an area with Very High Risk to High Risk for archaeological resources. In general, the southern and eastern portions of the AI are classified as Very High Risk. The high risk areas are in the north and east portions of the AI.

3. Environmental Context

3.1 Topography and Geology

Recurring episodes of glaciation have changed the topography of the Puget Sound region during the Pleistocene epoch, between 18,000 and 15,000 years ago. The Puget Lobe of the Cordilleran icecap scoured and covered the region, making several advances and retreats (Pielou 2008; Porter and Swanson 1998). The last phase of this glaciation was the Vashon Stade (Franklin and Dyrness 1973:16–17; Orr and Orr 2002:17).

The AI is in the Puget Trough Physiographic region, which runs from the border of Canada to the Willamette Valley of Oregon (Franklin and Dyrness 1973:6; Pojar and Mackinnnon 2004). Today the Puget Trough is characterized by rolling hills with rivers, lakes, and inlets, an area approximately 2,000 square mi in size. The Puget Trough was carved out and shaped by thousands of years of glacial, sedimentary, and volcanic activity. Subduction of tectonic plates and processes of coastal uplift provided a back and forth effect that raised the Coastal Range, which includes the Olympic Mountains, and lowered the interior areas, forming the Puget Lowland or Puget Trough. Glacial activity, and the resulting floods when the glaciers melted, caused the area to be scoured and carved (Orr and Orr 2002:263). This resulted in the formation of north–south trending ridges interspersed with drainages in the Puget Sound area (Porter and Swanson 1998). Glacial outwash materials accumulated in thick layers atop older bedrock. Human occupation could have occurred in the project area after the retreat of the glaciers, by approximately 14,000 years ago.

The surface geology in the AI is described as a Holocene Alluvium described as loose, stratified to massively bedded fluvial silt, sand, and gravel (Schuster et al. 2015). The majority of the soil within the AI is part of the Briscot soil series. A typical soil profile of this series is a dark grayish-brown silty loam from 0 to 22 centimeters (cm) below the surface (bs), then a grayish-brown silt loam with large prominent redox concentrations from 22 to 43 cmbs, and then a grayish-brown finely stratified silt loam, fine sand and fine sandy loam with large prominent redox concentrations from 43 to 150 cmbs. The Birscot series forms in recent alluvium on floodplains (NRCS 2020). Other soils series present in small sections of the AI include Sultan silt loam in the northwest corner of the AI, Pilchuck fine sand along the banks of the Puyallup River, and Puyallup fine sandy loam along the eastern boundary of the AI (NRCS 2021).

3.2 Climate and Vegetation

Between 12,000 and 7,000 years ago, major climate changes occurred throughout western Washington, resulting in a warmer, drier climate than today's climate (Whitlock 1992). Shifts occurred between 6,000 and 5,000 years ago, causing a cooler, moister climate and altered the vegetation across the landscape. Mosaic-forest parkland shifted to a closed-canopy forest, much like that of today. Typically, the current Pacific Northwest climate is one of cool summers and wet, mild winters (Suttles 1990:17).

Today, western Washington is part of the *Tsuga heterophylla* (western hemlock) vegetation zone. This vegetation zone has a wet, mild maritime climate. Latitude, elevation, and relative location to the mountain ranges can affect climatic variations within this zone (Franklin and Dyrness 1973:70–71).

Lying in the rainshadow of the Olympic Mountains, the area typically has a current precipitation range from 80–90 cm annually (Franklin and Dyrness 1973:88).

Dominant tree species in this vegetation zone include Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata*) (Pojar and Mackinnon 2004:30–42). Grand fir (*Abies grandis*), Sitka spruce (*Picea sitchensis*), and western white pine (*Pinus monticola*) are less common, but still present (Barnosky et al. 1987; Brubaker 1991; Franklin and Dyrness 1973:72; Whitlock 1992). Secondary species include red alder (*Alnus rubra*) and big-leaf maple (*Acer macrophyllum*) (Franklin and Dyrness 1973). Historic-period and modern use of the AI has likely allowed vegetation that that thrives in disturbed soils (i.e., blackberry and Scotch broom) to flourish.

3.3 Fauna

During prehistoric and ethnographic times, fauna was plentiful and diverse in the vicinity of the AI. Large mammals would have included deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), black bear (*Ursus americanus*), mountain lion (i.e., cougar, *Felis concolor*), and coyote (*Canis latrans*). Medium and small mammals consisted of red fox (*Vulpes vulpes*), snowshoe hare (*Lepus americanus*), porcupine (*Erethizon dorsatum*), raccoon (*Procyon lotor*), and weasel (*Mustela frenata*) (Kruckeberg 1991; Larrison 1967).

Riverine and lacustrine species in the Puyallup River and within the southern section of the Puget Sound would have consisted of all five species of salmon, freshwater fish (such as trout [*Oncorhynchus* sp.], whitefish [*Coregonus* sp.], and eels [*Anguillidae* sp.]), otter (*Lutra candensis*), muskrat (*Ondatra zibethica*), beaver (*Castor canadensis*), and waterfowl (*Aix* and *Anas* sp.) (Kruckeberg 1991; Larrison 1967; Suttles and Lane 1990). Important shellfish species included butter clam (*Saxidomus giganteus*), littleneck clam (*Protothaca staminea*), horse clam (*Schizotherus nuttalli, S. capax*), geoduck (*Panopea generosa*), thin-shelled clam (*Protothaca tenerrima*), razor clam (*Siliqua patula*), and bay mussel (*Mytilus edulis*) (Suttles 1990:28).

4. Cultural Context

4.1 Precontact Context

The project is located within the Southwestern Coast Salish region of the Northwest Coast culture area (Ames and Maschner 1999:19). Several cultural chronologies have been formulated for this region, each based on a different set of archaeological sites depending on the scale of the analysis and the availability of data at the time. The following overview uses the terminology set forth in the general Northwest Coast chronology developed by Ames and Maschner (1999).

In general, people in western Washington are thought to have used an increasing number and diversity of plant and animal resources during the Archaic Period (12,500–6400 years before present [B.P.]). Archaeological data indicate this period is characterized by broad-spectrum foraging economies emphasizing terrestrial resources associated with the oak woodland and savanna. Lithic tools include dart points that were hafted for use with an atlatl or throwing-stick. The Bear Creek Site (45KI839) in Redmond has provided rare and valuable information regarding the Archaic Period of the Puget Sound area (Kopperl et al. 2016). Extensive excavation and analysis at the site revealed a peat stratum that dates to between 8,000 and 10,000 years old and a buried cultural stratum that dates to between 10,000 and 12,000 years old. This early Holocene stratum contained evidence of salmon harvesting in the Lake Sammamish basin as well as large mammal hunting based on protein residue analysis. Lithic artifacts primarily consist of fine-grained volcanic material, metasediment, and, to a lesser extent, cryptocrystalline silicate (CCS). Toward the end of the Archaic period, hunting and gathering shifted to more extensive use of riverine resources as these resources were enhanced by changes in the environment that stabilized river gradients and flows, leading to the cultural changes of the Pacific Period (6400–200 B.P.) (Ames and Maschner 1999).

Early Pacific Period (6400–3700 B.P.) changes in climate and environments are widely believed to have facilitated the development of Pacific Period cultures. Warmer and drier conditions of the early Holocene gave way to cool and wet climates, and oceans rose to approximately modern levels. These changes produced environments similar to those we know today in the Pacific Northwest, and precontact people adapted to utilization of the resources associated with temperate rain forests and productive fisheries. Early Pacific Period technological adaptations reflect a shift from subsistence emphasis on terrestrial mammals to marine mammals, fish, and shellfish indicated by a diversity of bone and antler tools including barbed points for harpoons. Woodworking tools include groundstone celts and mauls (Ames and Maschner 1999). Shell middens have been found dating to this period, including the DuPont Southwest Site (45PI72), overlooking the Nisqually Reach, that dates to at least 5,200 years ago (Wessen 1989), and the West Point Site Complex (Sites 45KI429 and 45KI429) in Seattle that dates to at least 4,250 years ago (Larson and Lewarch 1995).

The Middle Pacific Period (3700–2400 B.P.) is marked by the introduction of plank houses and plank-house villages, evidence for the accumulation of wealth and social inequality. These are characteristics that continued into the historic-period. Storage pit features at some sites indicate that food storage was important. Intensification of salmon fishing corresponds with the appearance of girdled and perforated net sinkers and fish weirs (Ames and Maschner 1999). Villages tended to be located in coastal areas and near the mouths of major rivers such as the Duwamish No. 1 Site (45KI23) in Seattle and the Tualdad Altu Site (45KI59) in Renton (Campbell 1981; Chatters et al. 1990).

Archaeological data suggest Late Pacific Period (2400–200 B.P.) cultures were similar to those observed in early historic times. Changes within the Late Pacific Period include increasingly specialized subsistence patterns focused on seasonally abundant food resources (especially camas and salmon) and technologies for preserving and storing these foods for use in winter. Changes in the lithic technology include the introduction of small, notched projectile points, indicating the adoption of bow and arrow technology (Ames and Maschner 1999).

4.2 Ethnohistoric Context

The AI is in the traditional territory of the Puyallup Indian Tribe, a subgroup of the Southern Coast Salish (Carpenter 2002:30; Smith 1940). The Southern Coast Salish comprised two language groups, the Twana and the Lushootseed (further subdivided into Northern and Southern groups). The Puyallup were part of the Southern Lushootseed dialect group (Suttles and Lane 1990:486). These groups followed the general Southern Coast Salish subsistence and settlement pattern.

The ethnographically recorded lifeways centered around making seasonal rounds based on resource availability. Winter villages would have been semi-permanent to permanent locations with large cedar plank dwellings, spacious enough for several families to share, typically 100–200 ft long. The houses were built from cedar planks split from tree trunks by the use of elk horn wedges and the boards were smoothed with adzes (Carpenter 1986:3). Southern Coast Salish groups placed wall boards horizontally within the longhouses and used twisted cedar twigs to tie them to the vertical pole framework (Haeberlin and Gunther 1930:15). Small partition walls of mats were incorporated into the winter village longhouses to give each family privacy (Haeberlin and Gunther 1930:16). Seasonal campsites were used during the spring, summer, and autumn, when groups traveled to hunting, fishing, and berry picking grounds. Seasonal campsite dwellings had pole frames covered with mats (Carpenter 1986:4; Suttles and Lane 1990:491). The typical Puyallup summer dwelling was either tipi-shaped or square. A frame of poles was lashed together at the top and covered with mats, which were tied with dried cattail rushes (Haeberlin and Gunther 1930:18–19).

Subsistence strategies were also based on seasonal rounds, where small task groups would travel to specific resource locations to hunt, fish, and gather plants and other materials, such as stone for lithic tools. Blacktailed deer and elk were the most important terrestrial animals. All five species of salmon, along with other fish, were caught using seines, gill nets, weirs, and traps (Suttles and Lane 1990:489). Winter fishing was often done in the Puyallup River, and this territory was shared with the Nisqually (Haeberlin and Gunther 1930:9). Waterfowl and shellfish were important resources as well (Belcher 1985; Suttles and Lane 1990:489). A variety of plants was commonly used by the Southern Coast Salish groups (e.g., roots, bulbs, sprouts, nuts). Acorn processing was common for the Puyallup (Haeberlin and Gunther 1930:21). A diverse array of berries was also noted by Gunther (1945), including blackberry, elderberry, salmonberry, thimbleberry, blackcap, salal berry, huckleberry, and blueberry. The Puyallup shared berry picking grounds with the Nisqually (Haeberlin and Gunther 1930:9). Camas and other roots were important staples that were dug on the Nisqually prairie (Carpenter 1986:8; Haeberlin and Gunther 1930:20).

The nearest ethnographically recorded village is st¢Á, which translates to “something pulled” located along the White River north of Sumner (Hilbert et al. 2001:258). When the river, then known as the Stuck River, changed course, the village was moved south to the confluence of the White and Puyallup Rivers (approximately 0.7 mi northwest of the AI) (Smith 1940:10). The confluence of the White and Puyallup Rivers is known as st¢Áucid, which translates to “pulled mouth; pulled opening;

pulled river mouth" (Hilbert et al. 2001:258). The town of Sumner is ¨i¨istalb, which translates to "sandy," and the town of Puyallup is sïil¢çac, which translates to "strawberry plant" (Hilbert et al. 2001:258). To the north of the AI, a depression on the top of the plateau likely used to snare deer was known as □ǝ€abid, which translates to "dig something" (Hilbert et al. 2001:258). Other ethnographically recorded place names have been recorded along the Puyallup River, to the east of the AI. A place along the Puyallup River at the town of McMillian is known as ñùay€ac, which translates to "where dog salmon grow." Another place along the river, north of Orting, is known as ¨¢¿¨¢¿i□,which translates to "horse tail roots" (Hilbert et al. 2001:254)

4.3 Historic-Period Context

In 1833, Dr. William F. Tolmie visited the Puyallup Valley as part of his work with the Hudson's Bay Company trappers. He is believed to be the first Euroamerican visitor to the region. By 1846, the Oregon Treaty between the British and United States ceded the Northwest to the Americans, and in 1850, with the federal Donation Land Act, Euroamerican settlement increased. In 1853, a wagon train on its way to the Puget Sound came northwest of the Oregon Trail and over Naches Pass to the Puyallup Valley (Becker 2006; Chesley 2008). The first American settlers were impressed with the valley's rich soil and began to build their homes on the ancestral lands of the Puyallup Tribe (Price and Anderson 2002:19).

While the Puyallup peoples and the first Euroamerican settlers formed cooperative relationships, this early peace was soon broken. In 1854, Washington Territory's first territorial governor, Isaac I. Stevens, convinced 62 leaders of Northwest Native American tribes to sign the Medicine Creek Treaty, ceding their rights to approximately 2.24 million acres of land. The Puyallup Tribe received, in exchange, guaranteed hunting and fishing rights along with 1,280 acres for the Puyallup Reservation and cash stipends over ten years (Chesley 2008). The reservation lands proved woefully insufficient, and the resulting Indian Wars of 1855–1856 stalled Euroamerican settlement in the region, but only briefly (Becker 2006; Douglas 2016).

In the 1860s, the rich river valley quickly attracted farmers who recognized the region's agricultural potential, including Ezra Meeker, who arrived with his family in 1862. When, in 1865, Charles Wood first brought hops to the region, the Meeker family was quick to acquire some of the roots for planting. Hops, integral to brewing, thrived in the Puyallup River Valley, and the Meekers were excellent salespeople, quickly marketing their crops overseas. As a successful hop grower, Ezra Meeker carved 20 acres from his farm in 1877 and platted the new town of Puyallup. At the same time, the Northern Pacific Railway was constructing a new railroad southwest of the Puyallup River, connecting Tacoma and Wilkeson as part of its transcontinental route. The new railroad faced financial difficulties but would eventually open up the Puget Sound to the nation's East Coast, providing shipping for local products and spurring the growth of commercial centers like Tacoma (Robertson 1995:236).

By 1891, the *New York Times* reported that hop farming in the Puyallup River Valley was responsible for bringing $20,000,000 into the state and employing 15,000 people. The next year, the crop was crushed. Hop lice invaded Puyallup farms and decimated crops throughout the region, including Meeker's. Farmers unable to recover their hop fortunes turned instead to blackberries, raspberries, strawberries, and loganberries, which were developed in the region. The valley also became known for its profusion of flower bulbs, including daffodils, for which the region would become known. Poultry and dairy farms added to the agricultural growth of the valley (BOLA 2007; Chesley 2008).

In 1900, Puyallup hosted its first "Valley Fair" to show off its local produce. This annual event would later grow into the Washington State Fair. By 1912, the Puyallup and Sumner Fruitgrowers' Association would claim a total of 1,300 members. The association's cannery had by then preserved almost three million pounds of produce (Becker 2006; Price and Anderson 2002:74).

While the Puyallup River Valley was home to fertile farmland, it was also subject to regular flooding. Pierce and King Counties regularly partnered on flood control measures beginning in the early twentieth century. They began constructing levies and diversion dams and re-channelized the valley's many tributaries. In the 1930s, the U.S. Army Corps of Engineers constructed the Mud Mountain Retarding Dam on the upper reaches of the White River to further control flooding and then went on to re-channel more than 2 mi of the Puyallup River (BOLA 2007; Ott 2016; Pierce County Public Works 2013).

While the valley was subject to flooding, the region's damp valley climate also proved perfect for cultivating daffodils. In 1926, Charles Orton, brother of E. C. Orton, invited local civic leaders from towns throughout western Washington to visit his estate and view the daffodils in bloom. By 1927, the valley, home to the Puyallup Valley Bulb Exchange, was producing 23 million bulbs. Just two years later, the total was 60 million, and local residences would go on to use bulbs as currency during the Great Depression. Since 1934, the region has been celebrating the daffodil harvest with a series of events, including the Daffodil Parade, which has since grown into the Daffodil Festival (Chesley 2007).

Events like the original Daffodil Parade helped promote the region's flower bulbs during a time of economic upheaval. The Puyallup Valley, like many agricultural areas, had boosted crop production for World War I, but saw a slow and painful decline during the Great Depression. Not until World War II would farmers ramp up production again. In the 1940s, as industry boomed throughout the Puget Sound, the Puyallup Valley contributed to the war effort, as did other local industries. The Boeing Company alone required 7,500 additional staff just to meet government contracts (Price and Anderson 2002:101). While the Puget Sound region ramped up local production, it also suffered profound effects from the forced incarceration of Japanese Americans.

In 1942, following President Franklin D. Roosevelt's Executive Order 9066, the West Coast's Japanese Americans were forced into assembly areas, including the Puyallup Assembly Center, hastily erected in the Puyallup fairgrounds. From the Puyallup Assembly Center, also known as Camp Harmony, 7,500 Japanese Americans were sent to inland prison camps for the duration of the war. Incarceration disrupted lives, businesses, educational trajectories, and split friends and family, permanently altering the demographics of the region, as not all families, many of which were successful farmers in Pierce and King Counties, chose to return to the West after the war (Fiset 2008; Price and Anderson 2002:104).

In the late 1940s, the Puget Sound region, including the Puyallup Valley, received returning servicemen anxious to start families and return to civilian jobs. The postwar years saw new construction, improvements to local roadways, and continued narrowing and straightening of the Puyallup River. The rail line through Puyallup that linked Tacoma and Seattle fell out of favor in the 1940s as trucking grew in popularity (Price and Anderson 2002:109).

Tacoma and Puyallup continued to grow along with the greater Puget Sound region in the mid-century as projects, including the completion of Interstate 5 from California to Canada, improved access between regional hubs. While growth took place throughout the Puget Sound region, it had a particularly profound effect on once agricultural communities in the Puyallup Valley, as more and more farmland was lost to development. As early as 1985, Pierce County asked voters to approve a

$15 million plan to purchase development rights and preserve farmland. It was voted down. The expansion of freeways, the construction of new residential, commercial, and industrial developments on former farmland, and the increasing competition from bulb growers in other Washington counties and outside the United States has permanently altered the Puyallup Valley's character. According to the *Seattle Times*, by 1992, there were only two of the original forty farms left in the Puyallup Valley producing daffodils, the VanLierop Bulb Farm and Knutson Farms, Inc., the former E. C. Orton farm (*Seattle Times* 1992). The VanLierop Farm, once bordering the Knutson Farm to the west, has since been acquired by the City of Puyallup and transformed into a community park (City of Puyallup 2021b).

Development has continued. In 1990, the state's High Capacity Transportation Act allowed King, Pierce, and Snohomish Counties to cooperate on a high-capacity transit system. A three-county committee began meeting in 1992 and put forward a tri-county plan for light rail, commuter trains, and regional bus service. Sound Transit's Sounder commuter trains began carrying passengers between Seattle and Tacoma with service along the BNSF rails in Puyallup in 2000, making the Puyallup Valley even more attractive to developers (Cohen 2017).

5. Expectation for Archaeological Resources

HRA's expectations for the likelihood of encountering archaeological materials within the AI are based on the background research (Section 2), the environmental context (Section 3), and the cultural context (Section 4). This expectation assists with the development of treatment methods of cultural materials, if they are encountered.

HRA expected a high likelihood of encountering a precontact archaeological deposit during the archaeological survey. The AI is located on alluvium deposited by the Puyallup River and creates the potential for deeply buried precontact archaeological deposits. The ethnographic and archaeological record indicate that land-use practices made use of areas along the Puyallup River. However, the AI was and continues to be an active farm that involves modification of the sediments near the surface and would have disturbed or destroyed any archaeological deposit near the surface. Therefore, a precontact archaeological deposit within the AI will be deeply buried.

HRA expected a moderate likelihood of encountering historic-period archaeological deposits during the archaeological survey. The AI and vicinity were utilized during the historic period, as depicted in the historic-period maps and land records.

6. Archaeological and Architectural Survey Methods

6.1 Archaeological Survey Methods

HRA conducted two surveys of the AI, the Phase 2 focused on a subset of the full AI, while Phase 1 included a archaeological pedestrian survey of the parcels identified for development amounting to approximately 126 acres. Survey transects were at most 20 meters (m) and at least 10 m apart for the survey. The surveyors sought out and examined all ground exposures (e.g., exposed bank, roads, trails, ditches) for evidence of subsurface features and/or cultural materials.

The AI landform is shown as very high risk in DAHP's predictive model, and prior geotechnical sampling indicated that the property exhibits extensive flood sediments, requiring an intensive level of subsurface examination through excavation of test probes. The Phase 1 survey included a low-resolution sample of deep bucket auger probes placed tactically in the different areas of differing depths of impact based on the project design and geotechnical analysis (Riegel and Campbell 2015). The bucket augers were 8 inches in diameter and 3 ft extensions were added until the auger probe reached termination depth. These probes sought evidence of buried surfaces and archaeological deposits.

Table 6-1 presents the existing surface elevation, the maximum depth of excavation planned for each building footprint or drainage feature, and the maximum depth below the existing ground surface to reach that depth. The last two columns of the table present the area of each project element and the estimated number of probes, associated with each feature, to be excavated during this first phase of the survey.

Table 6-1. Proposed Depth of Ground Disturbance and Proposed Depth and Number of Probes.

Project Element	Highest Existing Surface Elevation (in Feet)	Finished Floor Elevation (Feet)	Lowest Elevation Reached through Excavation (Feet)	Maximum Depth of Probe Below Ground Surface (Feet)	Area (Acres)	Estimated Number of Phase 1 Probes
Building A	66	66	60	6	9.1	4
Building B	66	67	61	5	12	3
Building C	67	67	61	6	8.7	4
Building D	71	68	62	9	10.3	5
Building E	74	68	62	12	10.1	4
Building F	76	74	68	8	4.8	3
Building G	76	74	68	8	5.8	3
Infiltration Dispersion Features	Varies across the project area	N/A	58	9	N/A	12
Catch Basins through Parking Areas	Varies across the project area	N/A	57	9	N/A	12

Table 6-1. Proposed Depth of Ground Disturbance and Proposed Depth and Number of Probes.

Project Element	**Highest Existing Surface Elevation (in Feet)**	**Finished Floor Elevation (Feet)**	**Lowest Elevation Reached through Excavation (Feet)**	**Maximum Depth of Probe Below Ground Surface (Feet)**	**Area (Acres)**	**Estimated Number of Phase 1 Probes**
Riparian buffer "clearing and grading areas"	Varies	N/A	Unknown	Unknown	35	10

Each probe was designed to reach the maximum depth of construction impacts in its location, as feasible. All excavated sediments were screened through ¼-inch mesh to identify any small cultural items that may be present. All probes were backfilled, and their locations were plotted using a global position system device onto a project map on a tablet.

HRA designed Phase 2 of the archaeological survey based on the results of Phase 1. The methods used for the Phase 2 survey were discussed with DAHP and the Puyallup Tribe's Tribal Historic Preservation Officer (THPO) in advance of initiation of the fieldwork. The focus of the Phase 2 survey was to further investigate buried surfaces identified during Phase 1 by HRA's geoarchaeologist Michele Punke, PhD. The identification of a buried surface in a given auger probe during Phase 1 resulted in the excavation of 12 auger probes excavated in the cardinal and ordinal directions of the probe in Phase 2. Each Phase 2 probe reached the maximum depth of construction impacts in its location.

6.2 Architectural Survey Methods

HRA Senior Architectural Historian Chrisanne Beckner, MA, conducted field research for the project, taking digital photographs and field notes documenting materials, style, and the history of use and alteration of each resource. Survey data was used to evaluate architectural resources against criteria for listing in the NRHP, WHR, PCRHP, or PRHP. Results are located in Section 8 and in historic property inventory forms created in Washington's WISAARD database (Appendix B).

6.3 National Register of Historic Places Criteria for Evaluation

The criteria for listing a property in the NRHP require that, in addition to a site, building, structure, object, or district being over 50 years of age and possessing integrity, it must meet at least one of the following criteria (NPS 1997:44), outlined in 36 CFR 60.4:

A. Property is associated with events that have made a significant contribution to the broad patterns of our history; or

B. Property is associated with the lives of persons significant in our past; or

C. Property embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction; or

D. Property has yielded, or is likely to yield, information important in prehistory or history.

In addition to possessing significance under at least one of the criteria listed above, a property must retain integrity, which is a measure of how a property conveys its significance. To retain integrity, a property must retain several if not all of the following seven aspects:

- Location: the place where the property was constructed or the place where the historic event occurred.
- Design: the combination of elements that create the form, plan, space, structure, and style of a property.
- Setting: the physical environment of a historic property.
- Materials: the physical elements that were combined or deposited during a particular period of time, and in a particular pattern or configuration, to form a historic property.
- Workmanship: the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
- Feeling: a property's expression of the aesthetic or historic sense of a particular period of time.
- Association: the direct link between an important historic event or person and a historic property.

6.4 Washington Heritage Register Criteria for Evaluation

Sites that are listed in the NRHP are automatically added to the WHR (25-12 Washington Administrative Code [WAC]); as such, a separate nomination is not needed. Additionally, to be independently eligible for listing in the WHR, a building, site, structure, or object must meet the following criteria (DAHP 2021).

- Must be at least 50 years old. If newer, the resource should have documented exceptional significance.
- The resource should have a high to medium level of integrity, i.e. it should retain important character defining features from its historic period of construction.
- The resource should have documented historical significance at the local, state, or federal level.
- ACHP review and listing requires the consent of the owner (DAHP 2021).

6.5 Pierce County Register of Historic Places Criteria for Evaluation

A property must be at least 50 years of age, although exceptions may be allowed for special resources, and possess the quality of significance in American history, architecture, archaeology, culture and have integrity of location, design, setting, materials, workmanship, feeling and association. The property must meet one or more of the following criteria:

1. It is associated with events that have made a significant contribution to the broad patterns of our history; or
2. It is associated with the lives of persons significant in Pierce County's past; or
3. It embodies the distinctive characteristics of a type, period or method of construction or that represents the distinguishable entity whose components may lack individual distinction; or
4. It has yielded or may be likely to yield information important in prehistory or history (Pierce County 2021)

6.6 Puyallup Register of Historic Places

The City Puyallup’s Municipal Code Chapter 21.22.025 Puyallup Register of Historic Places (PRHP) outlines the process for determining designation on the Register. Any building, structure, site, object, or district may be designated for inclusion in the Puyallup register of historic places if it meets the requirements provided for as noted below:

A. It is significantly associated with the history, architecture, archaeology, engineering, or cultural heritage of the community;

B. It has integrity;

C. It is at least 50 years old or is of lesser age and has exceptional importance; and

D. It falls in at least one of the following categories:

    (i) Is associated with events that have made a significant contribution to the broad patterns of national, state, or local history;
    (ii) Embodies the distinctive architectural characteristics of a type, period, style, or method of design or construction, or represents a significant and distinguishable entity whose components may lack individual distinction;
    (iii) Is an outstanding work of a designer, builder, or architect who has made a substantial contribution to the art;
    (iv) Exemplifies or reflects special elements of the city’s cultural, social, economic, political, aesthetic, engineering, or architectural history;
    (v) Is associated with the lives of persons significant in national, state, or local history;
    (vi) Has yielded or may be likely to yield important archaeological information related to history or prehistory;
    (vii) Is a building or structure removed from its original location but which is significant primarily for architectural value, or which is the only surviving structure significantly associated with a historic person or event;
    (viii) Is a birthplace or grave of a historical figure of outstanding importance and is the only surviving structure or site associated with that person;
    (ix) Is a cemetery which derives its primary significance from age, from distinctive design features, or from association with historic events, or cultural patterns;
    (x) Is a reconstructed building that has been executed in a historically accurate manner on the original site; or

(xi) Is a creative and unique example of folk architecture and design created by persons not formally trained in the architectural or design professions, and which does not fit into formal architectural or historical categories.

7. Archaeological Survey Results

HRA conducted the archaeological survey in two phases. Phase 1 was completed from May 10 to 13, 2021, by Brent Hicks, MA; Ayla Aymond, MS; Samantha Thiel, MA; Alex Atkinson, MA; Celena McPeak, BA; Cecelia Wolman, BA; Ryan Rasmussen; BA, and Justin Butler, BA. HRA observed no precontact or historic-period cultural materials during Phase 1. After Phase 1 was completed, HRA's geoarchaeologist Michele Punke, PhD, reviewed the field data and identified four augers that contained potential buried surfaces that had the potential to contain cultural materials. Phase 2 of the archaeological survey focused on the area around those four auger probes. HRA archaeologists Brian Durkin, MS; Joe Gluck, BA; Cecelia Wolman, BA; Sage King, BA; and Rose Johnson, BA, completed Phase 2 from June 28 to July 2, 2021. HRA observed no precontact or historic-period cultural materials during Phase 2.

7.1 Phase 1 Results

Phase 1 of the archaeological survey involved both pedestrian survey and subsurface testing of the AI(Figure 7-1; Table A-1; Table A-2). HRA archaeologists completed the pedestrian survey of the AI using parallel transects spaced at 20 m. Ground visibility varied between high within the agricultural fields that had been harvested and low within the fields that had been overgrown by vegetation and the ditches next to the fields (Figure 7-2). The vegetation within the AI is dominated by the planted crops with grasses and invasive species (i.e., Himalayan blackberry) on the edges of the fields (Figure 7-3). The surface of the AI was heavily modified by the ongoing agricultural activities. The fields within the AI have been plowed, planted, harvested, and cleared using mechanical farm equipment. The area around the fields have been modified by irrigation pipes, ditches, and gravel roads (Figure 7-4 and Figure 7-5). HRA observed no precontact or historic-period cultural materials during the pedestrian survey.

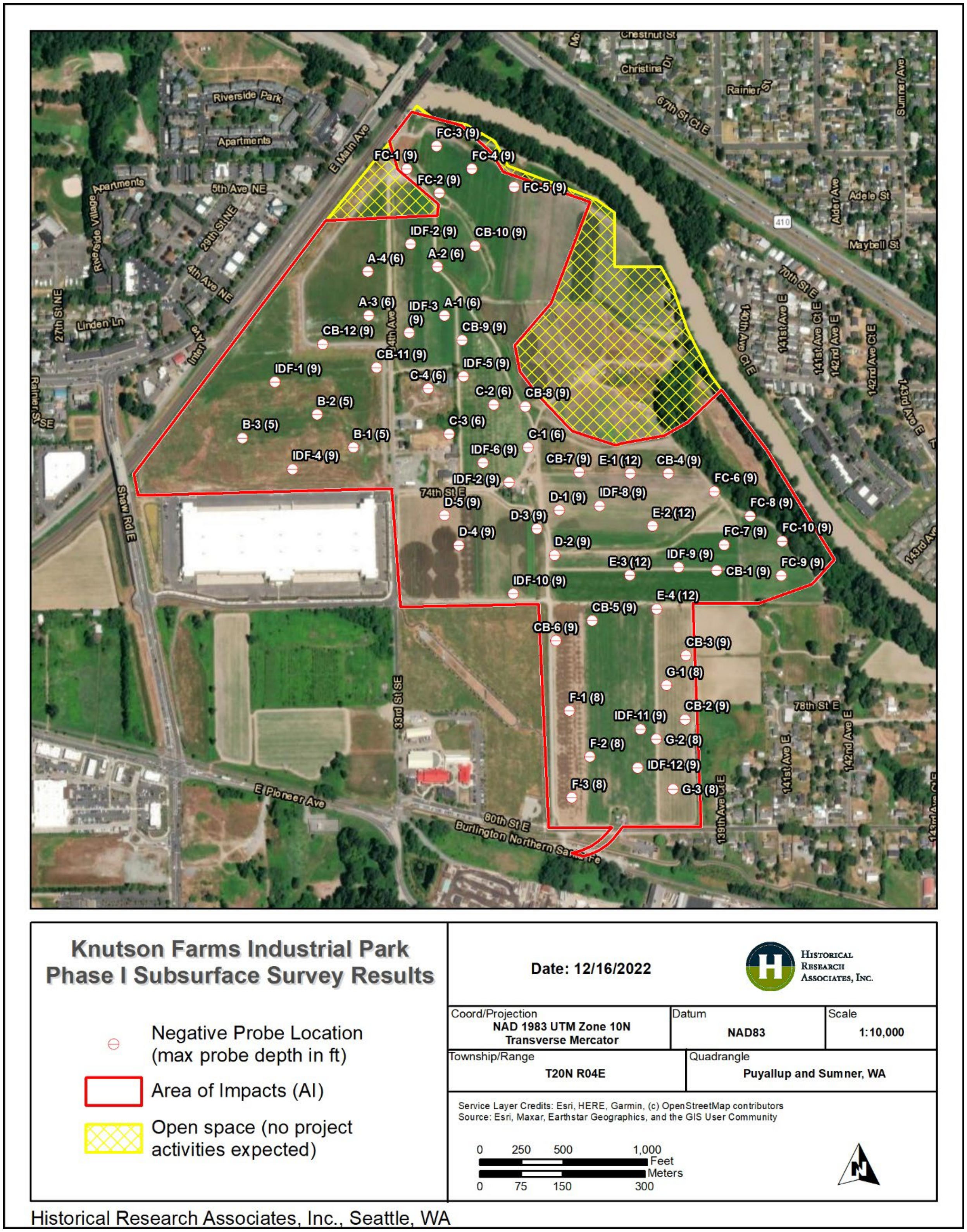


Figure 7-1. Phase 1 auger probe locations.

Figure 7-2. Overview of the AI within plowed agricultural field, view southeast.

Figure 7-3. Overview of the AI within planted agricultural field, view north.

Figure 7-4. Overview of the northwest section of the AI, view north.

Figure 7-5. Overview of the AI showing road and along the terrace south of the Puyallup River, view east.

HRA archaeologists excavated 59 auger probes within the AI (Appendix A). The locations of the auger probes were based on the footprints of the proposed buildings and associated utilities and in several locations were slightly adjusted to avoid damaging the existing crops (Figure 7-6). The desired depths of the auger probes were based on the proposed depth of ground disturbance and varied from 1.52 m (5 ft) to 3.65 m (12 ft). The majority of the probes reached the proposed depth of ground disturbance, but 24 were terminated early due to water inundation or impenetrable gravels. Although terminated early, these probes were able to reach a depth typically within 20 cm of the maximum depth of proposed ground disturbance or a nearby probe reached the desired depth, which provided for an adequate subsurface sample. HRA observed no precontact or historic-period cultural materials during the Phase 1 subsurface survey. Modern or temporally nondiagnostic cultural materials were observed within thirteen of the auger probes. The cultural materials included plastic, colorless and amber glass fragments, a wire nail, and a white earthenware ceramic fragment at a depth between the surface and up to 172 cm below the surface (Table A-1).

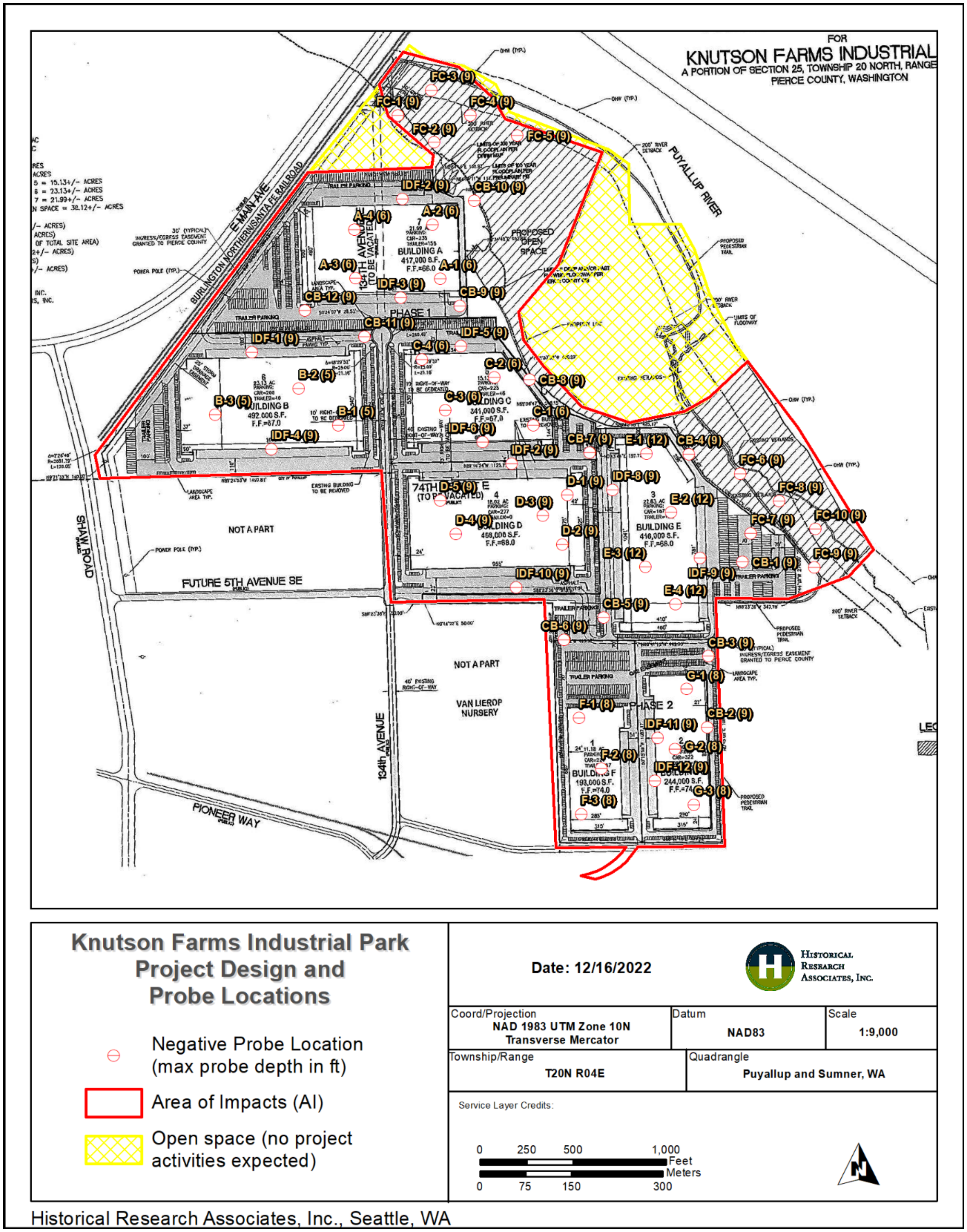


Figure 7-6. Auger probe results overlain on project design.

The sediments within the auger probes were consistent with the expected sediments discussed in Section 3 and consisted of an agricultural plow zone overlaying a very deep stratified silty and sandy alluvium (Figure 7-7). The soil profiles of the auger probes varied by location and the number of stratigraphic layers present. This amount of variation is typical in areas along rivers and within flood plains. Although variable, the typical sediments near the surface consisted of a grayish-brown to brown fine sandy silt with few subangular to subrounded gravels. This layer was the plow zone and typically extended to 60 cmbs, but in auger probe FC-9, disturbance extended to 134 cmbs. Below this layer was a grayish-brown sandy silt with few subrounded gravels with orange redox concentrations. This layer is the beginning of the deep alluvial deposit, and the layers below varied in color from a dark gray to light brown, in texture from a fine sandy silt to medium sand, and in gravel content from no gravels present to many subrounded gravels and pebbles. These layers were deposited during the natural flow of the Puyallup River and flooding events. Typically, at 2 m below the surface, and continuing to the bottom of the auger probes, was a dark gray coarse sand with very many subrounded to rounded gravels and pebbles or a gray silt.

Figure 7-7. Auger probe A-4-NW showing typical soils from the surface to approximately 1 m.

Within auger probes A-4, CB-9, D-5, and E-4, an organic-rich stratigraphic layer was observed. The presence of organic-rich deposit creates the potential for a stable surface that could have allowed human occupation and the creation of an archaeological deposit. Within auger probe A-4, the buried surface occurred between 100 and 162 cmbs and consisted of a dark gray silt mottled with orange redox with small organic fragments and then between 162 and 170 cmbs was black fine sand. Within auger probe CB-9, the buried surface was at 230 to 270 cmbs and was a light brown sandy silt with redox concentrations and organic debris. Within auger probe D-5, the buried surface was observed between 189 and 260 cmbs and was a dark gray sandy silt with few organic fragments. Within auger probe E-4, the buried surface was observed between 259 and 315 cmbs and was a dark gray sand with wooden fragments and a non-cultural small mammal bone fragment. These stratigraphic layers had the potential to be part of a larger stable buried surface that could contain cultural materials and became the focus of the Phase 2 survey.

7.2 Phase 2 Results

The Phase 2 survey was designed based on the results of observing four potential buried surfaces within the auger probes and no cultural materials within the auger probes during Phase 1 of the survey. This phase of the survey focused on sampling the area immediately around the four probes that contained the potential buried surfaces to determine the horizontal extent of the potential surface and survey the buried surface using auger probes spaced at 10 m intervals. HRA excavated a total of 48 auger probes, 12 at each of the four locations where buried surfaces were present, during Phase 2 of the archaeological survey (Figure 7-8). The field conditions during Phase 2 were similar to the Phase 1 survey, except the crops surrounding A-4 had been harvested and crops around D-5 and E-4 had grown. No precontact or historic-period cultural materials were observed during the Phase 2 survey. HRA observed temporally non-diagnostics aqua, brown, and colorless glass fragments between the surface and up to 40 cm below the surface (Table A-2).

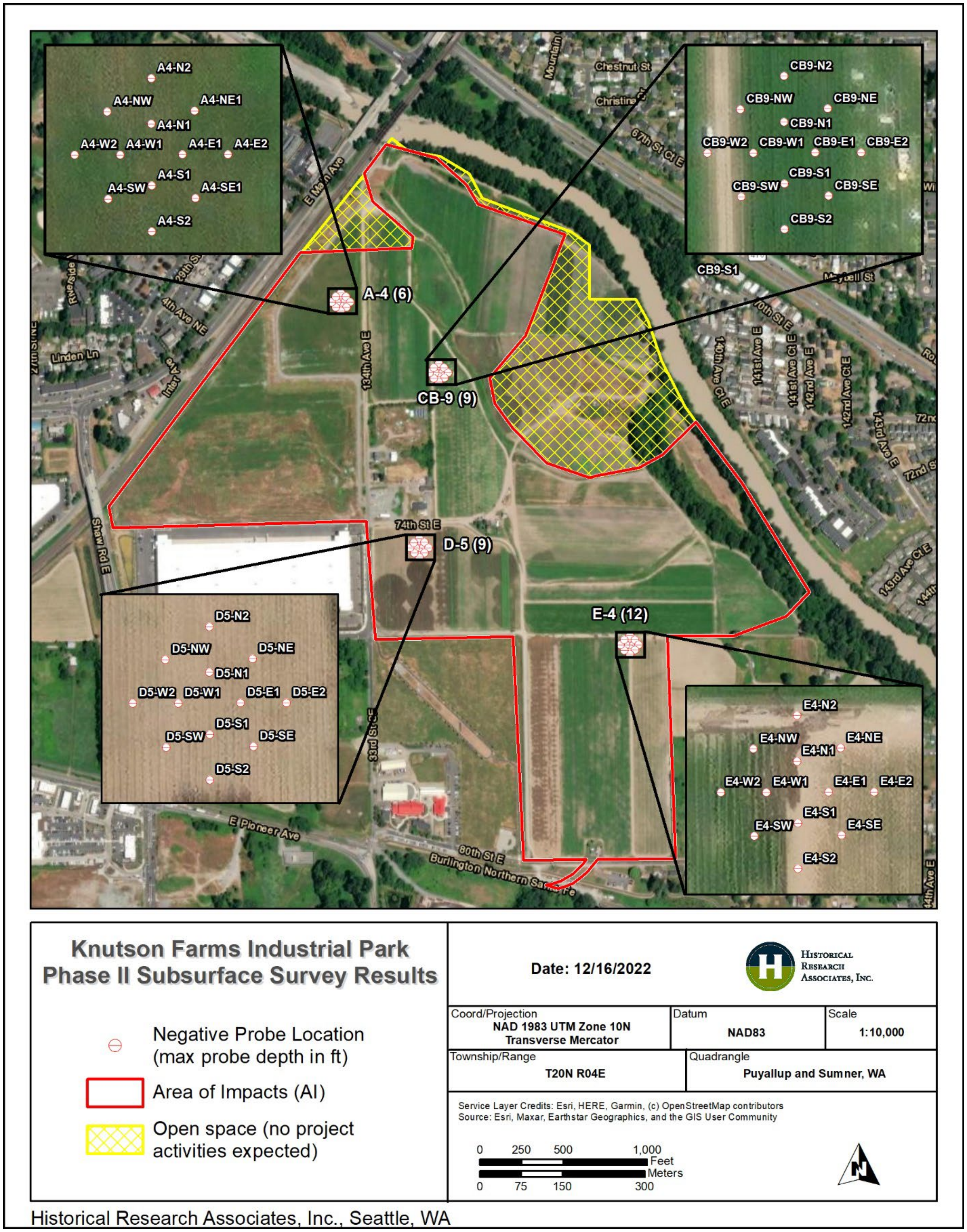


Figure 7-8. Phase 2 auger probe locations and results.

Twelve auger probes were excavated around auger probe A4 in the cardinal and ordinal directions, and all the probes reached the maximum proposed depth of ground disturbance in this area of 182 cm (6 ft). The sediments observed within the 12 Phase 2 auger probes were similar to the sediments recorded in auger probe A4. A typical profile around A4 consisted of a light brown sandy silt with no gravels from the surface to typically 80 cmbs. This stratigraphic layer was part of the agricultural plow zone. Then the sediments transitioned to a grayish-brown silty sand with redox concentrations to typically 115 cmbs. Around 115 cmbs, organic debris including woody fragments and leaf detritus was observed within four auger probes (A4-N1, A4-E2, A4-W2, and A4-NW). This stratigraphic layer extended to typically 150 cmbs and was a grayish-brown sand with redox concentrations. No organic materials were observed within any of the auger probes to the south of A4. Below the organic layer, the sediments were similar, but the organic materials were absent. This layer continued to 195 cmbs. The profiles observed within the shovel probes were similar to the Sultan Soil series that is mapped at this location (NRCS 2021).

Twelve auger probes were excavated around auger probe CB-9 in the cardinal and ordinal directions, and all the probes reached the maximum proposed depth of ground disturbance in this area of 274 cm (9 ft). The sediments observed were variable between these auger probes. The plow zone was observed between the surface and up to 75 cmbs. The alluvial deposits below the plow zone varied between a brownish-gray fine sandy silt with no gravels and redox concentrations to a brown fine sand (Figure 7-9). Organic material was observed in five auger probes (CB-9-N2, CB-9-E2, CB-9-S1, CB-9-S2, and CB-9-W1) at depths as shallow as 110 cmbs and extended to 275 cmbs. The buried surface layer ranged from 18 to 80 cm thick and contained detritus and small charcoal fragments. The sediments within the buried surface layer were a light gray to grayish-brown fine sandy silt to silt. The layers below the buried surface were more typically a gray silt or dark gray sand with redox concentrations.

Figure 7-9. Auger probe CB-9-N1 showing typical surface soils.

Twelve auger probes were excavated around auger probe D5 in the cardinal and ordinal directions, and all the probes reached the maximum proposed depth of ground disturbance in this area of 274 cm (9 ft). The sediments observed within these probes were again the agricultural plow zone that extended to 65 cmbs and then a grayish-brown silty sand to sand with no gavels and redox concentrations to typically 175 cmbs. Eleven of the auger probes (D5-N1, D5-N2, D5-E1, D5-E2, D5-SE, D5-S1, D5-S2, D5-SW, D5-W1, and D5-W2) contained an organic enriched layer that began as shallow as 155 cm and was observed at a maximum depth of 290 cmbs. The buried surface layer ranged from 5 to 100 cm thick. The color of the sediments within the buried surface layer were a grayish-brown, gray, dark brownish-gray, and a yellowish-brown, and the texture varied from a silty sand to a sandy silt with redox concentrations and organic material that consisted of leaf detritus and wood fragments. Below the organic layer, the sediments were consistently a dark gray silt with pockets of yellowish-brown medium sand.

Twelve auger probes were excavated around auger probe E4 in the cardinal and ordinal directions, and all the probes reached the maximum proposed depth of ground disturbance in this area of 365 cm (12 ft). The plow zone was also present within the auger probes excavated around E4 and extended to a maximum depth of 55 cmbs. Numerous alluvial stratigraphic layers were observed before the buried surface was encountered. These layers varied in color from a grayish-brown to a dark gray and were typically a silty sand with pockets of medium sand. As was observed within E-4, the buried surface typically began at 220 cmbs and extended up to the maximum depth of ground disturbance, 365 cmbs. Nine of the auger probes (E4-N1, E4-N2, E4-E1, E4-E2, E4-SE, E4-S1, E4-S2, E4-SW, and E4-NW) around E4 contained an organic enriched layer. The sediments observed within this buried surface were consistently a dark brownish-gray silty sand with many organic fragments and few subrounded gravels (Figure 7-10). The buried surface layer ranged from 15 to 109 cm thick and the organic material consisted of small to medium wood fragments. Underlying the buried surface was a dark grayish-brown silty sand with redox concentrations that continued to the maximum proposed depth of the ground disturbance.

Figure 7-10. Buried surface layer within auger probe E-4-E1 between 220-335 cm below the surface.

The results of the Phase 2 archaeological survey confirmed that the four buried surfaces observed within the auger probes excavated during Phase 1 of the archaeological survey extended beyond the single auger probe and at all four locations extended at least 20 m in a single direction of the original observation. These surfaces were stable enough to accumulate organic materials but did not contain any precontact or historic-period cultural materials.

8. Architectural Survey Results

HRA identified four parcels within the AI with previously unevaluated architectural resources constructed in 1976 or earlier (Figure 8-1).

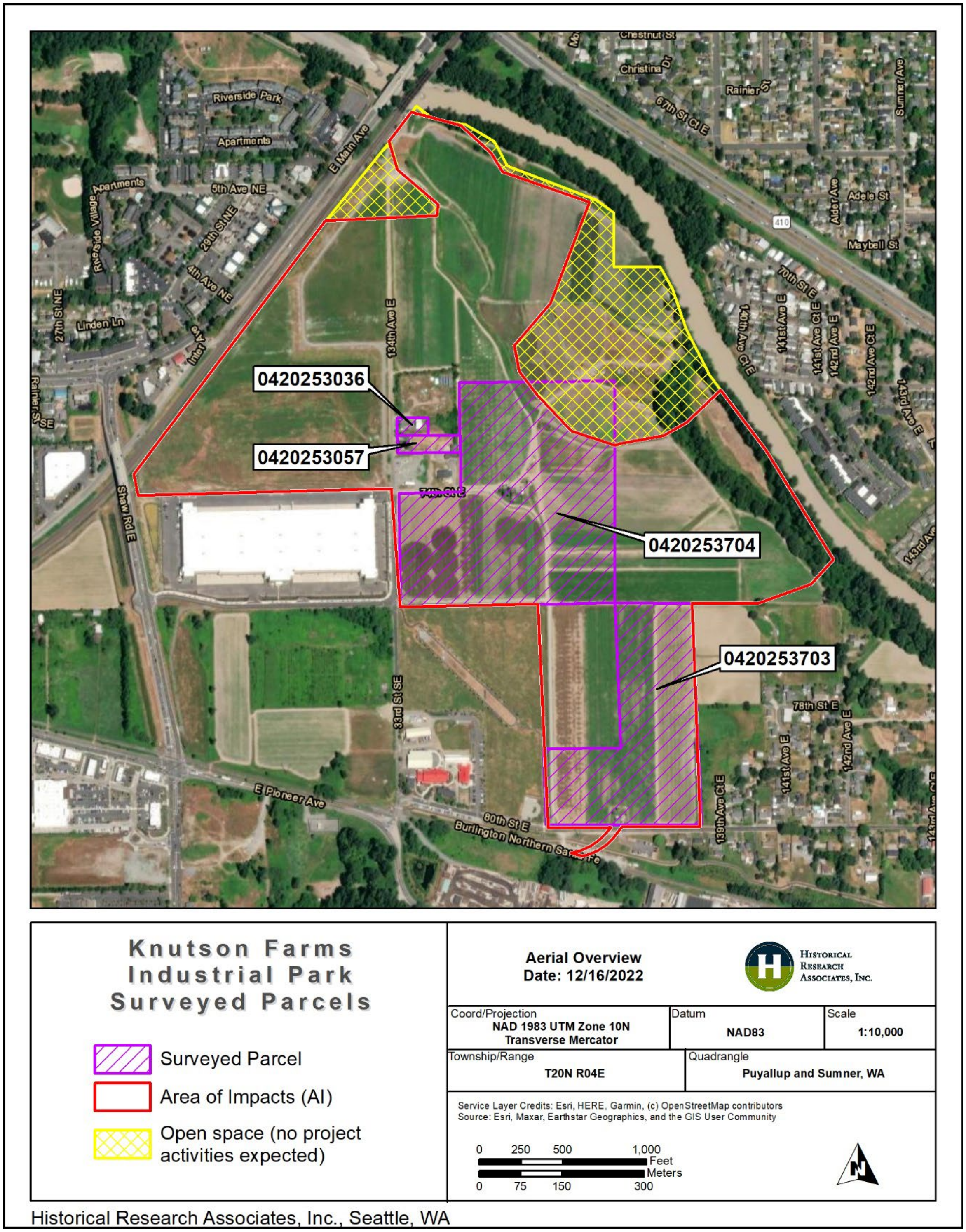


Figure 8-1. Surveyed parcels.

8.1 13719 80th St. E

According to the Pierce County Assessor, the residence at 13719 80th St. E on parcel 0420253703 was constructed in 1930 (Pierce County Assessor 2021) (Figures 8-2 and 8-3). The building has possibly been enlarged to the rear, where a shallow shed roof projects over a possible addition. The building's facade includes a central entry door with a projecting gable roof over a concrete stoop. The entry is flanked east and west by sliding, aluminum-framed windows. Side elevations include small, single-light, wood-framed windows, some of which are covered with plywood, sliding, aluminum-framed windows, and louvered vents in the gables. An associated detached, single-car garage is located to the east. It is also clad in clapboards and includes an overhead garage door.

Figure 8-2. 13719 80th St. E, facade, view north.

Figure 8-3. 13719 80th St. E, west elevation, view northeast.

Integrity

From its period of construction (1930), the bungalow at 13719 80th St. E retains integrity of location, setting, and association, as it remains on its original parcel in association with surrounding agricultural land. Alterations and additions, including a likely addition to the rear and incompatible window replacement have diminished the building's integrity of design, materials, and workmanship. Additionally, although the building has a bungalow form, it no longer serves as a single-family residence for a single parcel but is part of a larger farming operation. The building does not possess integrity of feeling.

Evaluation

The building at 13719 80th St. E was constructed in 1930 and is located at the southern end of a 16.46-acre parcel associated with the twentieth-century agricultural activity of the Puyallup Valley. The building and its associated farm land is located west of the Puyallup River and is part of what is now known as the Knutson Farms, a business founded by Harold Knutson in the 1930s, although Knutson did not acquire this land from E. C. Orton, a member of one of the region's early bulb farming families, until 1957, when the elder bulb farmer retired (*Seattle Times* 1957). According to a 1957 article in the *Seattle Times*, "Orton, who is retiring, said in Sumner that the sale includes between 400 and 500 acres of top-quality land… It has been used mainly to grow bulbs and hothouse rhubarb and a small amount of Hereford beef stock" (*Seattle Times* 1957). Harold Knutson passed the business to his son, Roger, in the 1970s.

Unlike parcels farther north, this location was not originally farmed by the Ortons. It appears in historic atlases as belonging to "L. M. Marther" in 1951 and appears, from historic maps, to have become part of the Orton and Knutson property in the mid-twentieth century (Metsker 1951, 1960, 1965). Research did not reveal anything about the Marther family.

This parcel has long been cultivated, but this building is not the headquarters for the Knutson Farms or the Knutson family. It appears to be a secondary cultivated field supporting the Knutson Farms, which is primarily located across the Puyallup River at 16406 78th St E in Sumner (Chesley 2007; Metsker 1951; *Seattle Times* 1976).

The bungalow at 13719 80th St. E, identified as "commercial" in county records, is most likely a utilitarian building associated with farming practices and the farm's supporting staff. Although not the headquarters for either the Orton or Knutson farms, the building is associated with significant events and trends in local agricultural history due to its association with the fields cultivated by the Orton and Knutson families (Criterion A). The building, while owned by significant farmers, including the Orton and Knutson families, is not known to have served as family or business headquarters for either family. Both the Knutson and E. C. Orton families regularly appear in historic records as residing in Sumner. It is not known to be significant for its association with persons possessing documented significance in local, state, or national history (Criterion B). While the building retains the massing and symmetrical facade of an early twentieth century bungalow, it has been altered and does not retain the multi-light wood-framed windows or ornamental details that would identify it as an example of a particular type, period, or method of construction. It is not the work of a master, does not possess high artistic values, and does not represent a significant and distinguishable entity whose components may lack individual distinction (i.e., qualify as part of a district) (Criterion C). Finally, the building was built of common construction methods and well-known materials and is unlikely to answer important research questions or yield information about human history that can only be answered by the actual physical material, design, construction methods, or interrelation of these resources (Criterion D).

While the building and its surrounding parcel 0420253703 are significant under Criterion A, the building is no longer associated with a small family farm and has been incompatibly altered. It does not retain sufficient integrity from its period of construction (1930) to convey its significance. Therefore, due to a loss of integrity, HRA recommends the building is not eligible for listing in the NRHP under any criteria.

Additionally, HRA recommends the building is not eligible for listing in the WHR, PCRHP, or PRHP under any criteria.

8.2 7525 134th Ave. E

According to the Pierce County Assessor, the primary building on the 33.78-acre parcel 0420253704 addressed as 7525 134th Ave. E was constructed in 1920 (Figures 8-4–8-6). It appears in the earliest available historic aerials (1931) (NETROnline 2021; Pierce County Assessor 2021). The building faces north toward 74th St. E and is associated with two functionally related units, a garage/chicken coop (ca. 1970) and storage shed/barn (ca. 1920) (Figures 8-7–8-9). The primary residence is an American foursquare. It sits on a poured-concrete foundation, is clad in clapboards, and is topped by a hipped, asphalt shingle roof. The building is square in plan with a projection off the rear topped by a single-story shed roof. The building's facade includes a gabled porch roof supported by square posts over a post and pier stoop. Flanking the central entry door to the west is a large vinyl picture window over shallow sliding windows. To the west of the entry is a one-over-one aluminum-framed window. The second story includes two one-over-one aluminum-framed windows. The west elevation includes two aluminum-framed windows per floor. The east elevation includes one on the lower floor and two on the upper floor. The building's rear elevation includes one aluminum-framed window on the upper story over the single-story projection, which includes small, aluminum-framed windows on all elevations and a separate entrance with stair on the east elevation.

Functionally related buildings include a garage/chicken coop to the east of the primary residence (ca. 1970) with a sliding garage door facing north. It is clad in vertical planks and topped by an asphalt shingled, front-gabled roof. A wood-framed two-light window faces west alongside an open door frame. To the rear of the garage, plywood has been used to construct a single story projection with asphalt shed roof. The projection's southern wall is partially covered by wood slats secured with chicken wire. A covered window is located on the east elevation. According to historic aerials, the building dates to ca. 1970 (NETROnline 2021).

Additionally, a two-story storage shed/barn is located northeast of the residence and appears in 1931 aerials (NETROnline 2021). It likely dates to ca. 1920. It is built of post and beam on a dirt floor. The building is constructed against a slope so that the lower level is partially visible. The lower floor is partially enclosed by walls of poured-concrete, stacked pieces of broken concrete, and plank siding. It is open to the north with bare framing to the east. It is topped by a shed roof of corrugated metal. Above the first floor, the partial second floor is clad in plank siding with bare framing facing north. Two wood-framed openings are located on the south and west elevations. The partial second floor is partially topped by a roof of corrugated metal over wood planks.

Figure 8-4. 7525 134th Ave. E, residence, view southeast.

Figure 8-5. 7525 134th Ave. E, residence, view south.

Figure 8-6. 7525 134th Ave. E, residence and associated garage, view northwest.

Figure 8-7. 7525 134th Ave. E, garage, view southwest.

Figure 8-8. 7525 134th Ave. E, barn, view southwest.

Figure 8-9. 7525 134th Ave. E, barn, view north.

Integrity

From its period of construction (ca. 1920), the residence, with functionally related garage/chicken coop and storage shed/barn, at 7525 134th Ave. E retains integrity of location, setting, and association, as it remains on its original parcel in association with surrounding agricultural land. Alterations and additions, including an addition to the rear of the residence, incompatible replacement windows, and alterations including a projecting first floor bay on the storage shed/barn have diminished the resources' integrity of design, materials, workmanship, and feeling (NETROnline 2021). The garage/chicken coop is a relatively late addition to the parcel (ca. 1970) and retains integrity of location, setting, design, materials, workmanship, feeling, and association.

Evaluation

The primary residence, storage shed/barn, and garage/chicken coop at 7525 134th Ave. E on parcel 0420253704 were constructed ca. 1920. They are associated with the twentieth-century agricultural activity of the Puyallup Valley. The residence and its associated units are located west of the Puyallup River on the Knutson Farms, a business founded by Harold Knutson in the 1930s, although Knutson did not acquire this land from E. C. Orton, a member of one of the region's early bulb farming families, until 1957, when the elder bulb farmer retired (*Seattle Times* 1957). According to a 1957 article in the *Seattle Times*, "Orton, who is retiring, said in Sumner that the sale includes between 400 and 500 acres of top-qualify land… It has been used mainly to grow bulbs and hothouse rhubarb and a small amount of Hereford beef stock" (*Seattle Times* 1957). Harold Knutson passed the business to his son, Roger, in the 1970s.

This parcel has long been cultivated, although this location is not the headquarters for the Knutson Farms or the Knutson family. It appears to be a secondary, cultivated field for the business, which is primarily housed across the Puyallup River at 16406 78th St E in Sumner (Chesley 2007; Metsker 1951; *Seattle Times* 1976).

The foursquare at 7525 134th Ave. E, identified as "commercial" in county records, is most likely a residential building associated with farming practices and the farm's supporting staff. Although not the headquarters for the Knutson Farms, the building is associated with significant events and trends in local agricultural history due to its association with the fields cultivated by the Orton and Knutson families (Criterion A). The building, while owned by significant farmers, including the Orton and Knutson families, may have served as a primary residence or headquarters for members of either family in the early or mid-twentieth century, although this could not be confirmed. Both the Knutson and E. C. Orton families regularly appear in historic records as residing in Sumner. The buildings are not known to be significant for their association with persons possessing documented significance in local, state, or national history (Criterion B). While the residence is a recognizable example of an American foursquare, with the boxy plan and hipped roof typical of the type, it does not possess the wood-framed windows, diamond panes, porch, or ornamental trim found on distinctive examples. The storage shed/barn has been heavily altered and is not a recognizable example of a particular type of barn or storage shed. The garage/chicken coop is a relatively late addition and possess no architectural significance. None of the buildings possess the distinctive characteristics of a particular type, period, or method of construction. The residence and storage shed/barn and garage/chicken coop are not the works of a master, do not possess high artistic values, and do not represent a significant and distinguishable entity whose components may lack individual distinction (i.e., qualify as parts of a district) (Criterion C). Finally, the residence, storage shed/barn, and garage/chicken coop were built of common construction methods and well-known materials and are unlikely to answer important research questions or yield information about human history that can only be answered by the actual physical material, design, construction methods, or interrelation of these resources (Criterion D).

The residence, with its functionally related units, is significant under Criterion A. While some integrity has been lost, the resources continue to convey their significance. HRA recommends the residence, storage shed/barn, and garage/chicken coop are eligible for listing in the NRHP at the local level under Criterion A. The eligible resource is bound by the present and historic tax parcel boundaries, which include the associated farmland. The period of significance for the building and its functionally related units dates to its construction in 1920 and continues through 1970.

Additionally, the residence and functionally related units are eligible for listing in the WHR at the local level, and/or the PCRHP under Criterion 1, and/or the PRHP under Criterion D(i).

8.3 7301 134th Ave. E

According to the Pierce County Assessor, the residence at 7301 134th Ave. E on parcel 0420253057 was constructed in 1970 (Pierce County Assessor 2021) (Figures 8-10 and 8-11). However, this may be in error, as a building with similar massing appears in aerial photographs in 1955 (NETROnline 2021). The building is assumed to have been constructed ca. 1955. It is two stories, rectangular in plan, and faces west. The building sits on a poured-concrete foundation, is clad in vinyl siding, and is topped by a front-gabled roof with no eaves covered in asphalt shingles. A large projecting porch with wood railing is located above a covered bay on the lower floor on the south elevation. The building's two primary entries are located below the projecting porch. The west-facing facade features square, wood-framed windows and a one-over-one wood-framed window on the lower floor, along with a large wood-framed picture window on the upper floor with two vinyl-framed replacement windows. Wood-framed windows remain on the lower floor of the south elevation, while upper windows and a sliding door are vinyl-framed. The building's north elevation includes a wood porch with exterior stair to the upper floor, which includes single and paired vinyl-framed windows.

Figure 8-10. 7301 134th Ave. E, view northeast.

Figure 8-11. 7301 134th Ave. E, view southeast.

Integrity

From its period of construction (ca. 1955), the residence at 7301 134th Ave. E retains integrity of location and setting, as it remains on its original parcel in association with surrounding agricultural land. Alterations including incompatible replacement siding and incompatible replacement windows, as well as a recent change of use, and possible division into multiple units has diminished its integrity of design, materials, workmanship, feeling, and association.

Evaluation

The residence at 7301 134th Ave. E was constructed ca. 1955 as a single family residence. It was owned by the Kusminsky and Lathrop families before being acquired by Knutson Farms in 2017 (Pierce County Assessor 2021). While the building is now part of the operations of the Knutson Farms, it was originally owned by single families who were not located on farm parcels but on narrow, deep residential parcels. The building does not have a significant association with the agricultural history of the Knutson Farms and does not appear to be significant for any other association with events or a series of events important in local, state, or national history (Criterion A). The building, while owned by a significant farming family now, is not known to have served as a primary residence or headquarters for a farming family prior to its sale in 2017. It is not significant for its association with persons possessing documented significance in local, state, or national history (Criterion B). The building is modest in plan, rectangular, with few character defining features of any particular type, apart from its massing and minimal eaves. It does not possess the distinctive characteristics of a particular type, period, or method of construction. It is not the work of a master, does not possess high artistic values, and does not represent a significant and distinguishable entity whose components may lack individual distinction (i.e., qualify as part of a district) (Criterion C). Finally, the residence was built of common construction methods and well-known materials and is unlikely to answer important research questions or yield information about human history that can only be answered by the actual physical material, design, construction methods, or interrelation of these resources (Criterion D).

The residence at 7301 134th Ave. E does not meet any criteria for listing in the NRHP and does not retain integrity from its period of construction (ca. 1955). HRA recommends the residence is not eligible for listing in the NRHP under any criteria.

Additionally, HRA recommends the building is not eligible for listing in the WHR, PCRHP, or PRHP under any criteria.

8.4 7215 134th Ave. E

According to the Pierce County Assessor, the residence at 7215 134th Ave. E on parcel 0420253036 was constructed in 1940 (Pierce County Assessor 2021) (Figures 8-12 and 8-13). Historic aerials suggest that a functionally related outbuilding, a large barn now used as a garage east of the residence, was constructed ca. 1955 (NETROnline 2021) (Figures 8-14 and 8-15). The single-story residence at 7215 134th Ave. E sits above a basement on a poured-concrete foundation, is clad in vinyl siding, and is topped by an asphalt-shingle, cross-gabled roof. The building's facade includes a wood stair with wood posts and rail to a recessed porch and recessed entry door, paired with a vinyl window with shutters under the projecting porch roof. The recessed entry is flanked on the north by a front-facing gable with central vinyl sliding window over a projecting vinyl bay window. On the south is an additional one-over-one vinyl window. The south elevation includes no visible fenestration. The north elevation includes a single vinyl-framed sliding window, two narrow vinyl-framed windows, and a shed dormer with four shallow, vinyl-framed windows.

To the east of the residence, the functionally related barn/garage sits on a poured-concrete foundation, is clad in vinyl siding, and is topped by a standing-seam metal, gambrel roof. Windows are vinyl framed, sliding or fixed. A covered bay is located south of the primary mass, and an enclosed bay is located to the north. Two overhead garage doors are centrally located.

Figure 8-12. 7215 134th Ave. E, view east.

Figure 8-13. 7215 134th Ave. E, view southeast.

Figure 8-14. 7215 134th Ave. E, outbuilding, view east.

Figure 8-15. 7215 134th Ave. E, outbuilding, view southeast.

Integrity

From its period of construction (1940), the residence at 7215 134th Ave. E retains integrity of location and setting, as it remains on its original parcel in association with surrounding agricultural land. Alterations including incompatible replacement siding and incompatible replacement windows, as well as a change of use once the building was acquired by Knutson Farms in 2017, have diminished its integrity of design, materials, workmanship, feeling, and association.

Evaluation

The residence at 7215 134th Ave. E was constructed in 1940, with its functionally related outbuilding appearing ca. 1955. It was owned by the Kusminsky family before being acquired by Knutson Farms in 2017 (Pierce County Assessor 2021). While the building is now part of the operations of the Knutson Farms, it was originally owned by a single family not located on a farm parcel but on a relatively small residential parcel. The building does not have a significant association with the agricultural history of the Knutson Farms and does not appear to be significant for any other association with events or series of events important in local, state, or national history (Criterion A). The building, while owned by a significant farming family now, is not known to have served as a primary residence or headquarters for a farming family prior to its sale in 2017. It is not significant for its association with persons possessing documented significance in local, state, or national history (Criterion B). The building is a modest example of a mid-century resource with few character-defining features due to alterations including window and siding replacement. It does not possess the distinctive characteristics of a type, period, or method of construction. It is not the work of a master, does not possess high artistic values, and does not represent a significant and distinguishable entity whose components may lack individual distinction (i.e., qualify as part of a district) (Criterion

C). Finally, the residence was built of common construction methods and well-known materials and is unlikely to answer important research questions or yield information about human history that can only be answered by the actual physical material, design, construction methods, or interrelation of these resources (Criterion D).

The residence, with its functionally related garage, at 7215 134th Ave. E does not meet any criteria for listing in the NRHP and does not retain integrity from its period of construction (ca. 1940). HRA recommends the residence is not eligible for listing in the NRHP under any criteria.

Additionally, HRA recommends the residence and garage are not eligible for listing in the WHR, PCRHP, or PRHP under any criteria.

9. Summary and Recommendations

HRA conducted two phases of archaeological survey including deep auger test probes and identified and further examined buried surfaces in four areas within the AI. Despite the number and, in Phase 2, the intensity of the auger test probes, HRA identified no archaeological deposits or precontact or historic-period artifacts anywhere within the AI. HRA recommends that no additional archaeological investigations are needed associated with the proposed project as currently designed.

HRA's architectural historian surveyed four parcels in the AI with built-environment resources and recommends that one qualifies for listing in the NRHP. The primary residence with two functionally related units at 7525 134th Ave. E on parcel 0420253074 is significant for its association with local agricultural history and qualifies for listing in the NRHP under Criterion A (Figure 9-1).

The project proposes to construct an industrial development on the site of the former Orton farm. If construction requires demolition of the buildings at 7525 134th Ave. E on parcel 0420253074 and the loss of all associated farmland, this may constitute an environmental impact under SEPA. If a significant, adverse impact cannot be avoided, the project team should work together with the lead agency to reduce or mitigate the environmental impact. Mitigation measures may include, for instance, avoiding demolition, preserving some percentage of traditional farmland, and/or incorporating interpretive documentation into the project design.

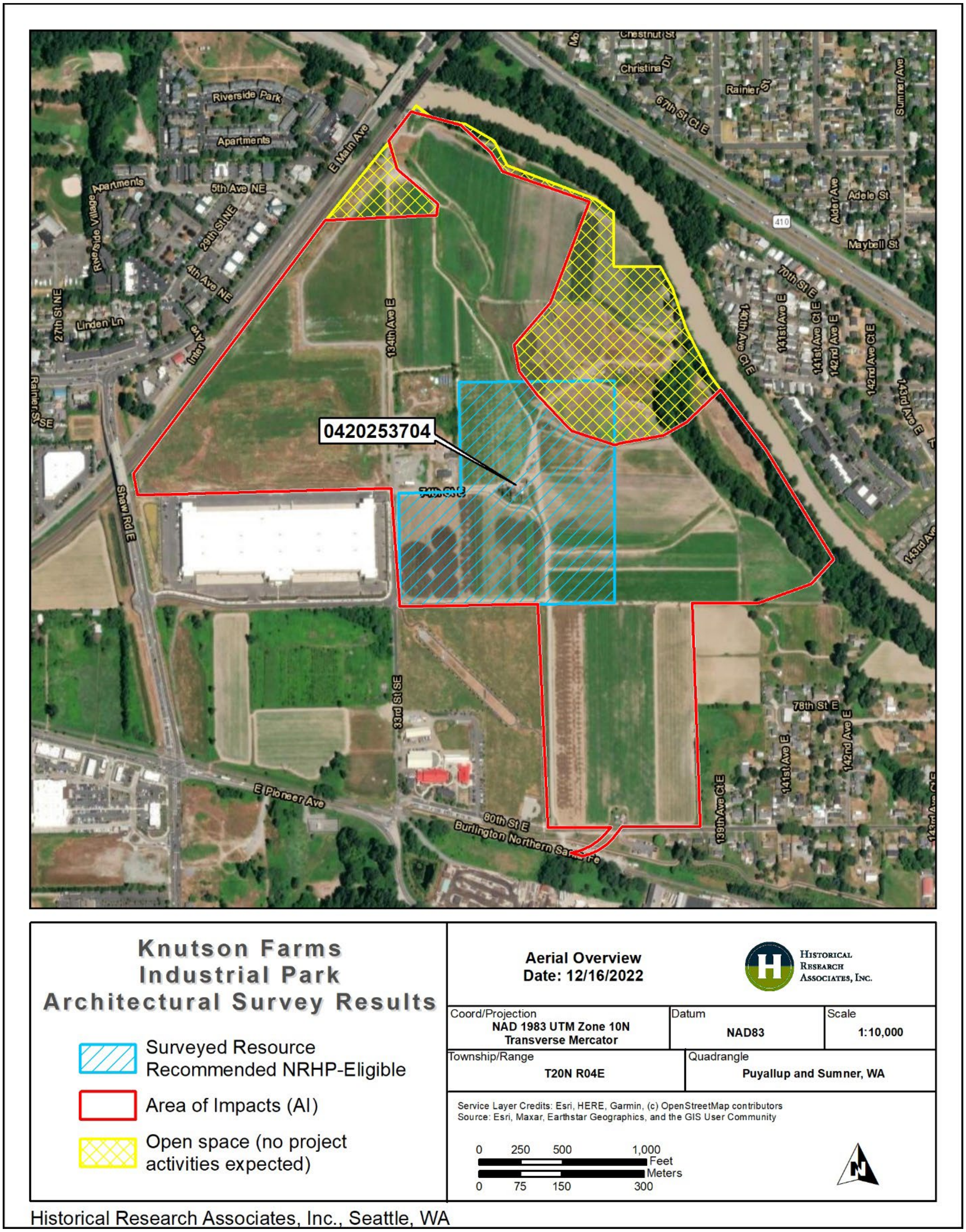


Figure 9-1. Surveyed Resources HRA recommends eligible for listing in the NRHP.

10. References

Ames, Kenneth M., and Herbert D. G. Maschner

1999 *Peoples of the Northwest Coast, Their Archaeology and Prehistory*. Thames and Hudson Limited, London, England.

Arthur, Ed

2016 *Historic Properties Evaluation For The Proposed Pioneer Crossing Project, 2614 E. Pioneer Avenue, Puyallup, Washington*. Caldera Archaeology, Bellingham, Washington. Prepared for Mead and Hunt, Issaquah, Washington.

Baldwin, Garth

2017 *A Cultural Resource Monitoring Report for the City of Sumner, Sewer System Upgrades Project, Pierce County, Washington*. Drayton Archaeology, Bellingham, Washington. Prepared for Widener and Associates, Everett, Washington.

2018 *Cultural Resources Review for the SR 410 Traffic Avenue Interchange, City of Sumner, Pierce County, Washington*. Drayton Archaeology, Bellingham, Washington. Prepared for Widener and Associates, Everett, Washington.

Baldwin, Garth, and Jennifer Chambers

2014 *Cultural Resources Assessment for the Bridge Street Bridge Replacement Project, Sumner, Pierce County, Washington*. Drayton Archaeology, Bellingham, Washington. Prepared for Widener and Associates, Everett, Washington.

Barnosky, Cathy W., Patricia M. Anderson, and Patrick J. Bartlein

1987 The Northwestern U.S. During Deglaciation: Vegetation History and Paleoclimatic Implication. In *North America and Adjacent Oceans During the Last Deglaciation*, Vol. K-3, edited by W. F. Ruddiman and H. E. Wright, Jr., pp. 289–321. Geological Society of America, Boulder, Colorado.

Becker, Paula

2006 Pierce County — Thumbnail History. HistoryLink.org Essay 8001. Electronic document, http://www.historylink.org/File/8001, accessed August 19, 2021.

Belcher, William R.

1985 Shellfish Utilization Among the Puget Sound Salish. *Northwest Anthropological Research Notes* 19(1):83–92. Moscow, Idaho.

BOLA Architecture and Planning

2007 Puyallup Historic Survey Report for The City of Puyallup, Pierce County, and the Washington State Department of Archaeology and Historic Preservation. On file with the City of Puyallup.

Borden, R. K., and K. G. Troost

2001 Late Pleistocene Stratigraphy in the south-central Puget Lowland, Pierce County, Washington. Washington State Department of Natural Resources, Report of Investigations 33. Olympia, Washington.

Brubaker, Linda B.

1991 Climate Change and the Origin of Old-Growth Douglas-Fir Forests in the Puget Sound Lowland. In *Wildlife and Vegetation of Unmanaged Douglas-Fir Forests*, edited by Leonard F. Ruggiero, Keith B. Aubry, Andrew B. Carey, and Mark F. Huff, pp. 17–24. U. S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report PNW- GTR-286. Portland, Oregon.

Campbell, Sarah K.

1981 *The Duwamish No. 1 Site: A Lower Puget Sound Shell Midden*. Research Report 1, Office of Public Archaeology, Seattle, Washington.

Carpenter, Cecelia Svinth

1986 *Fort Nisqually: A Documented History of Indian and British Interaction*. Tahoma Research Publication, Tacoma, Washington.

2002 The Nisqually, My People. *Tahoma Research Publication*, Tacoma, Washington.

Chatters, Jim, David Rhode, and Karin Hoover

1990 Tauldad Altu (45KI59): A Prehistoric Riverine Village in Southern Puget Sound. *Archaeology in Washington* II:23–48.

Chesley, Frank

2007 First Puyallup Daffodil Parage Chugs Out on March 17, 1934. HistoryLink.org Essay 8365. Electronic document, https://www.historylink.org/File/8365, accessed August 25, 2021.

2008 Puyallup—Thumbnail History. HistoryLink.org Essay 8447. Electronic document, https://www.historylink.org/File/8447, accessed August 19, 2021.

City of Puyallup

2021a Puyallup Register of Historic Places. Electronic document, https://www.cityofpuyallup.org/470/Registering-Your-Property, accessed September 7, 2021.

2021b Van Lierop Park. Electronic document, https://www.cityofpuyallup.org/1278/Van-Lierop-Park, accessed August 25, 2021. Cohen, Josh

2017 Sound Transit (King, Pierce, and Snohomish counties). HistoryLink Essay No. 8002. Electronic document, https://www.historylink.org/File/8002, accessed August 19, 2021.

Cole, Stephen

2002 *Cultural Resources Investigations for the Foothills Linear ParkiTrail, McMillan to Meeker (CSM 6169)*. Northwest Archaeological Associates, Inc., Seattle, Washington. Prepared for Pierce County Public Works and Utilities, Tacoma, Washington and Entranco, Seattle, Washington.

Collins, William

1982 National Register of Historic Places Inventory-Nomination Form for the Charles W. Orton Residence. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

Department of Archaeology and Historic Preservation (DAHP)

1982 Sumner Cemetery (PI00891) Cemetery Detail Report. State of Washington Archaeological Site Inventory Form. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

2021 Washington Information System for Architectural and Archaeological Records Data. Electronic document, www.dahp.wa.gov, accessed August 26, 2021.

Department of Ecology

2021 SEPA Guide for Lead Agencies. Electronic document, https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/Guide-for-lead-agencies, accessed September 7, 2021

Douglas, Miguel

2016 Puyallup Land Claims Settlement (1990). HistoryLink.org Essay 20157. Electronic document, http://www.historylink.org/File/20157, August 19, 2021.

Elliot, Patrick, and James Mayer

2019 *Cultural Resources Assessment, 2401 Inter Avenue SE, Puyallup, Washington*. Jacobs, Bellevue, Washington. Prepared for 2401 Inter LLC.

Fiset, Louis

2008 Camp Harmony (Puyallup Assembly Center), 1942. HistoryLink.org Essay 8748. Electronic document, https://www.historylink.org/File/8748, accessed August 19, 2021.

Flenniken, Jeffery, and Pam Trautman

2015 *Cultural Resource Survey, Puget Sound Energy, Alderton to White River, Pierce 230kV Expansion, Transmission Project Pierce County, Washington*. Lithic Analysts, Silverthorne, Washington. Prepared GeoEngineers, Inc., Tacoma and Puget Sound Energy, Tacoma, Washington.

Franklin, J. F., and C. T. Dyrness

1973 Natural Vegetation of Oregon and Washington. USDA Forest Service, General Technical Report PNW-8, Washington, D.C.

Gill, Matthew, and Margaret Berger

2007 *Cultural Resources Survey for the Shaw Road Extension Project. Pierce County, Washington*. Cultural Resources Consultants, Inc., Bainbridge Island, Washington. Prepared for Parametrix, Inc., Puyallup, Washington.

Gunther, Erna

1945 Ethnobotany of Western Washington. *University of Washington Publications in Anthropology* 10(1):1–62. Seattle.

Haeberlin, Herman K., and Erna Gunther

1930 *The Indians of Puget Sound*. University of Washington Press, Seattle.

Hartmann, Glenn

2010 *Letter to Charles "Ted" Hill RE: Cultural Resources Assessment for the White River Trail (Confluence to Bridge St) Project, Sumner, Pierce Country, WA*. Cultural Resources Consultants, Inc., Bainbridge Island, Washington. Prepared for City of Sumner.

Hilbert, Vi, Jay Miller, and Zalmai Zahir

2001 *Puget Sound Geography: Original Manuscript from T. T. Waterman*. Edited with additional material from Vi Hilbert, Jay Miller, and Zalmai Zahir. Lushootseed Press, Seattle, Washington.

Kopperl, Robert, Charles Hodges, Christian Miss, Johonna Shea, and Alecia Spooner

2016 *Archaeology of King County, Washington: A Context Statement for Native American Archaeological Resources*. SWCA Environmental Consultants, Seattle, Washington. Prepared for the King County Historic Preservation Program, Seattle, Washington.

Kruckeberg, Arthur R.
1991 *The Natural History of Puget Sound Country*. University of Washington Press, Seattle.

Larrison, Earl J.
1967 *Mammals of the Northwest: Washington, Oregon, Idaho, and British Columbia*. Seattle Audubon Society, Seattle, Washington.

Larson, Lynn L., and Dennis E. Lewarch (editors)
1995 *The Archaeology of West Point, Seattle, Washington: 4,000 Years of Hunter-Fisher-Gatherer Land Use in Southern Puget Sound Volume 1, Parts 1 and 2*. Larson Anthropological Archaeological Services, Ltd., Seattle, Washington. Prepared for King County Department of Metropolitan Services, Seattle, Washington. Submitted to CH2M Hill, Bellevue, Washington. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

McClintock, Robin, Aaron Fergusson, and Julie Witt
2013 *Northwest Pipeline GP Washington Expansion Project Cultural Resources Overview and Survey Report*. CH2MHILL, Bellevue, Washington. Prepared for Williams Northwest Pipeline GP.

McClintock, Robin, Julie Wilt, Jennifer Gilpin, Carol Schultze, Jenny Dellert, and Jordan Pickrell
2014 *Northwest Pipeline LLC Washington Expansion Project - Addendum to Cultural Resources Overview and Survey Report: Survey of Highway 410 Reroute and Temporary Extra Workspace Areas and Easements*. CH2MHILL, Bellevue, Washington and HRA, Inc., Seattle, Washington. Prepared for Williams Northwest Pipeline GP.

Metsker, Chas. F (Metsker)
1951 Page 028 - Township 20 N., Range 4 E., Puyallup, Sumner, Firwood, Milton, Alderton, Arden, McAleer. Metsker Maps, Seattle, Washington. Electronic document, http://www.historicmapworks.com, accessed August 25, 2021.

1960 Page 079 - Sumner, alderton, Puyallup, No. Puyallup, Puyallup River. Metsker Maps, Seattle, Washington. Electronic document, http://www.historicmapworks.com, accessed August 25, 2021.

1965 Township 20 North - Range 4 East., Edgewood, Stuck River - Page 080. Electronic document, http://www.historicmapworks.com, accessed August 25, 2021.

Mueller, Andrew
2016 *River Grove Levee Cultural Survey, PUY-04-16*. U.S. Army Corps of Engineers, Seattle District.

National Park Service (NPS)
1997 *National Register Bulletin: How to Apply the National Register Criteria for Evaluation*. Electronic document, http://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_2.htm, accessed August 27, 2021.

Natural Resources Conservation Service (NRCS)
2020 Web Soil Survey Map. Electronic document, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx, accessed August 24, 2021

NETROnline
2021 Historic Aerials: Puyallup, Washington. Electronic document, https://www.historicaerials.com/viewer, accessed August 25, 2021.

Orr, William N., and Elizabeth L. Orr
2002 *Geology of the Pacific Northwest.* Second Edition. Waveland Press, Incorporated, Long Grove, Illinois.

Ott, Jennifer
2016 King and Pierce County Commissioners Form the Inter-County River Improvement Commission on January 19, 1914. HistoryLink.org Essay 20233. Electronic document, http://www.historylink.org/File/20233, accessed August 19, 2021.

Paton, Courtney, and Marsha Hanson
2016 State of Washington Archaeological Site Inventory Form for 45PI1415. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

Pielou, Evelyn C.
2008 *After the Ice Age: The Return of Life to Glaciated North America.* University of Chicago Press, Chicago, Illinois.

Pierce County
2021 Pierce County Register of Historic Places. Electronic document, https://www.piercecountywa.gov/5938/Landmarks-and-Historic-Preservation, accessed September 7, 2021.

Pierce County Assessor
2021 Pierce County, Washington: About My Property. Electronic document, https://pals.piercecountywa.gov/palsonline/#/AboutMyProperty, accessed August 30, 2021.

Pierce County Public Works
2013 Pierce County Rivers Flood Hazard Management Plan. Electronic document, https://www.piercecountywa.org/ArchiveCenter/ViewFile/Item/375, accessed August 19, 2021.

Piper, Jessie
2013 *Cultural Resources Assessment for Sumner Waste Water Treatment Plant Phase 2 Expansion, Pierce County, Washington.* SWCA/Northwest Archaeological Associates, Seattle, Washington. Prepared for Gray and Osborne Consulting Engineers, Seattle, Washington.

Plummer, Frederick
1889 Township 20 North Range 4 East. Pierce County 1889. Frederick G. Plummer. Electronic document, www.historicmapworks.com, accessed August 25, 2021.

Pojar, Jim, and Andy Mackinnon
2004 *Revised Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, and Alaska.* B.C. Ministry of Forests and Lone Pine Publishing, Vancouver, British Columbia, Canada.

Porter, Stephen C., and Terry W. Swanson
1998 Radiocarbon Age Constraints on Rates of Advance and Retreat of the Puget Lobe of the Cordilleran Ice Sheet during the Last Glaciation. *Quaternary Research* 50:205–213.

Price, Lori, and Ruth Anderson
2002 Puyallup, A Pioneer Paradise. Arcadia Publishing, Charleston, South Carolina.

Riegel, Scott, and Kyle Campbell
2015 *Preliminary Geotechnical Engineering Study Knutson Property Warehouse Distribution Development Pierce County, Washington*. Earth Solutions NW, LLC, Bellevue, Washington. Prepared for Michelson Commercial Realty and Development.

Robertson, Donald R.
1995 *Encyclopedia of Western Railroad History*, Volume III: Oregon and Washington. Caxton Printers, Ltd., Caldwell, Idaho.

Schuster, J. E., A. A. Cabibbo, J. F. Schilter, and I. J. Hubert
2015 Geologic map of the Tacoma 1:100,000-scale quadrangle, Washington, Washington Division of Geology and Earth Resources, Map Series 2015-03, 1:100,000

Seattle Times
1957 People in the New: O'Sheas to Quit Show Business; Foreman Buys Out Bulb Expert. January 31.

1976 Quality Flowers in Puyallup Valle: Daffodil Industry in Full Swing. April 3.

1992 Bloom is Off Daffodil Farming—Puyallup's Proud Festival Symbol Being Plowed Under By Growth. April 3.

Shong, Michael, and Christian Miss
2003 *Heritage Resources Investigations for the City Of Puyallup Riverfront Trail Project-Phase 2 (Sr 512 To East Main) Pierce County, Washington*. Northwest Archaeological Associates, Inc., Seattle, Washington. Prepared for Perteet Engineering, Lakewood, Washington.

Shong, Michael, and Jessie Piper
2014 *Results of Cultural Resources Monitoring for the Sumner Wastewater Treatment Plant Phase 2 Expansion, Pierce County, Washington*. SWCA Project No. 29409. Northwest Archaeological Associates, Inc., Seattle, Washington. Prepared for Gray and Osborne Consulting Engineers, Seattle, Washington.

Smith, Marian W.
1940 *The Puyallup-Nisqually*. Columbia University Press, New York.

Stipe, Frank
2016 *Van Lierop Property Cultural Resource Survey*. Tetratech, Bothell, Washington. Prepared for Talasaea Resource and Environmental Planning, Woodinville, Washington

Suttles, Wayne
1990 Environment. In *Northwest Coast*, edited by Wayne Suttles, pp. 16–29. Handbook of North American Indians, Vol. 7, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Suttles, Wayne, and Barbara Lane
1990 Southern Coast Salish. In *Northwest Coast*, edited by Wayne Suttles, pp. 485–502. Handbook of North American Indians, Vol. 7, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C

Trautman, Pam
2015 State of Washington Archaeological Site Inventory Form for 45PI1360. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

U.S. Surveyor General (USSG)

1864 Department of the Interior, General Land Office, Cadastral Survey of Township 20 North, Range 4 East. U.S. Department of Interior, Washington, D.C.

1865 Department of the Interior, General Land Office, Cadastral Survey of Township 20 North, Range 4 East. U.S. Department of Interior, Washington, D.C.

Wessen, Gary C.

1989 A *Report of Archaeological Testing at the Dupont Southwest Site (45-PI-72), Pierce County, Washingto*n. Western Heritage, Olympia, Washington. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

Whitlock, Cathy

1992 Vegetational and Climatic History of the Pacific Northwest During the Last 20,000 Years: Implications for Understanding Present-Day Biodiversity. *Northwest Environmental Journal* 8:5–28.

Appendix A. Auger Probe Table

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	**Proposed Depth of Ground Disturbance**	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
A-1	182	194	0–50: Grayish-brown silty sand with few subrounded gravels—*alluvium* 50–125: Grayish-brown silty sand with oxidation and no gravels—*alluvium* 125–194: Brown silty sand with gray mottling and oxidations *Terminated at desired depth*	5226871, 556843	None
A-2	182	190	0–48: Compact grayish-brown silty sand with few subrounded gravels—*alluvium* 48–108: Grayish-brown silty sand with oxidation and no gravels—*alluvium* 108–190: Brownish-gray silty sand with oxidation *Terminated at desired depth*	5226960, 556830	None
A-3	182	190	0–144: Brown silty fine to coarse sand with common subrounded gravels and roots 144–190: Brown silty fine to coarse sand mottled with gray sand *Terminated at desired depth*	5226872, 556704	None
A-4	182	190	0–60: Grayish-brown silty sand with some slight oxidation mottling, and no gravels—*alluvium* 60–100: Brownish-gray sand with some oxidation and no gravels—*alluvium* 100–162: Dark gray silt with mottled oxidation and small organics—*buried surface* 162–170: Black fine sand 170–190: Gray fine silt with oxidation and few organics—*buried surface* *Terminated at desired depth*	5226952, 556702	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	Proposed Depth of Ground Disturbance	Maximum Depth (cmbs)	Description (cmbs): Description—*Comments*	Location of Probe (UTM)	Cultural Materials
B-1	152	90	0–70: Grayish-brown silty fine sand with very many angular medium to large gravels and very few roots 70–90: Brown silt with many subrounded medium gravels and orange oxidation *Terminated due to gravel obstruction*	5226631, 556676	None
B-2	152	184	0–184: Brown to grayish-brown silty fine sand with very few angular to subrounded small pebbles *Terminated at desired depth*	5226692, 556610	0–40 cmbs: colorless glass fragment
B-3	152	274	0–110: Dark brown sandy silt with some subrounded cobbles—*alluvium* 110–213: Dark gray silty sand 213–259: Very dark gray silty clay with few angular gravels 259–274: Dark brown fine sandy silt with a thin black organic bedded layer and many organic fragments *Terminated at desired depth*	5226648, 556474	None
C-1	182	265	0–110: Light brown sandy silt with no roots with few small subangular gravel 110–115: Gray sandy silt with oxidation 115–255: Gray fine sandy silt with oxidation and woody debris 255–265: Gray sand with very few organics *Terminated due to water table*	5226631, 556995	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	**Proposed Depth of Ground Disturbance**	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
C-2	182	183	0–40: Dark brown very fine sandy silt with few subangular gravels and cobbles 40–79: Dark brown coarse sandy silt with oxidation 79–96: Light gray compacted sandy silt with oxidation 96–183: Light gray fine sand *Terminated at desired depth*	5226709, 556932	None
C-3	182	194	0–80: Dry grayish-brown fine sandy silt with oxidation, many roots, and no gravels—*alluvium* 80–120: Grayish-brown silty sand with some slight oxidation mottling, and no gravels—*alluvium* 120–194: Gray and brown mottled silty sand with oxidation and no gravels—*alluvium, water at 120 cmbs* *Terminated at desired depth*	5226656, 556851	None
C-4	-	-	Not excavated due to existing structures	-	-
CB-1	274	285	0–86: Grayish-brown sandy silt with few subangular small gravels 86–235: Light gray fine sandy with oxidation 235–245: Grayish-brown fine grained silty sand 245-285: Grayish brown fine sandy silt with frequent oxidation pockets *Terminated at desired depth*	5226739, 556813	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	**Proposed Depth of Ground Disturbance**	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
CB-2	274	205	0–45: Light brown silty fine to medium sand with no gravels and very few roots 45–60: Gray-brown fine sandy silt with no gravels 60–110: Brownish-gray sand with pockets of sandy silt and oxidation 110–205: Dark brownish-gray coarse sand with small pebbles *Terminated due to water inundation*	5226407, 557338	0–45 cmbs: colorless flat glass fragment
CB-3	274	280	0–38: Light brown fine sandy silt with no gravels 38–80: Dark gray fine to medium sand with no gravels and oxidation 80–105: Grayish-brown fine sandy silt with no gravels and oxidation 105–206: Dark gray fine to medium sand with no gravels 206–232: Dark gray silty medium sand 232–280: Dark gray medium sandy silt *Terminated at desired depth*	5226136, 557281	None
CB-4	274	244	0–80: Light brown sandy silt with pockets of gray finer sand 80–244: Light brown sandy silt with pockets of gray finer sand and few gravels *Terminated due to impenetrable gravel*	5226252, 557282	0–80 cmbs: colorless glass fragment
CB-5	274	245	0–34: Light brown fine sandy silt with no gravels and very few roots 34–216: Light gray fine sandy silt with no gravels and orange oxidation 216–245: Light gray fine sandy silt with no gravels, orange oxidation, and woody debris *Terminated due to water inundation*	5226315, 557111	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	Proposed Depth of Ground Disturbance	Maximum Depth (cmbs)	Description (cmbs): Description—*Comments*	Location of Probe (UTM)	Cultural Materials
CB-6	274	242	0–33: Light brown fine sandy silt with no gravels and very few roots 33–62: Light grayish-brown silty fine sand with oxidation and no gravels 62–85: Brownish-gray silty sand with oxidation 85–242: Brownish-gray silty sand and compact silt pockets with oxidation *Terminated due to water inundation*	5226279, 557046	None
CB-7	274	284	0–45: Light brown fine sandy silt with few rounded gravels 45–284: Grayish-brown fine to medium sand with few rounded gravels *Terminated at desired depth*	5226587, 557088	None
CB-8	274	275	0–10: Light brown sandy silt with few subangular gravels 10–15: Grayish-brown sandy silt 15–200: Brown sandy silt with oxidation and pockets of grayish brown sand. 200–275: Dark gray silty sand with oxidation *Terminated at desired depth*	5226706, 556990	None
CB-9	274	280	0–25: Light grayish-brown sandy silt with few subangular gravels 25–67: Brownish-gray silty fine sand with oxidation 67–230: Brownish-gray silty very fine sand with oxidation—*moisture increases with depth* 230–270: Light brown sandy silt with oxidation and few organic fragments 270–280: Light brown mixed with dark gray very fine silt with no gravels and pockets of clay *Terminated at desired depth*	5226827, 556875	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	**Proposed Depth of Ground Disturbance**	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
CB-10	274	55	0–55: Grayish-brown silty medium to coarse sand with common subangular gravels, pebbles, and cobbles *Terminated due to infilling*	5226999, 556898	None
CB-11	274	274	0–10: Light brown sandy silt with many subangular gravels 10–22: Dark gray compact very fine sandy silt with no gravels 22–90: Brown compact sandy silt with no gravels 90–274: Light gray to dark gray silt loam with orange mottling *Terminated at desired depth*	5226777, 556719	None
CB-12	274	282	0–101: Light brown sandy silt with no gravels 101–165: Grayish-brown sandy silt with oxidation 165–251: Grayish silty clay with few subrounded gravels and oxidation 251–282: Dark gray sandy silt with few subangular gravels *Terminated at desired depth*	5226819, 556621	None
D-1	274	281	0–45: Dark brown sandy silt with few subangular gravels 45–55: Light brownish-gray sandy silt with oxidation 55–70: Light brownish gray sand with oxidation 70–145: Light brownish-gray silty sand with oxidation 145–220: Dark brownish-gray fine sandy silt with oxidation 220–281: Dark brownish-gray silty sand with oxidation—*water at 280 cmbs* *Terminated at desired depth*	5226517, 557051	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	**Proposed Depth of Ground Disturbance**	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
D-2	274	276	0–34: Light brown sandy silt with few subangular gravels 34–65: Dark brownish-gray sand with no gravels 65–115: Dark brownish-gray sandy silt with oxidation 115–130: Dark brownish-gray sandy silt 130–150: Gray silty sand with oxidation 150–276: Gray sandy silt with oxidation and wooden fragments *Terminated at desired depth*	5226435, 557043	None
D-3	274	275	0–64: Light brown silty fine sand with some small subangular to rounded gravels with few roots 64–190: Brownish-gray silty sand with oxidation 190–275: Light gray silt with oxidation and woody fragments *Terminated at desired depth*	5226483, 557011	0–64 cmbs: colorless glass fragment
D-4	274	274	0–30: Light brown fine sandy silt with no gravels 30–115: Light gray fine sandy silt with woody debris 115–140: Dark gray fine silty sand with oxidation 140–165: Gray fine silty sand with few gravels and oxidation 165–274: Dark gray silty sand with no gravels *Terminated at desired depth*	5226453, 556868	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	**Proposed Depth of Ground Disturbance**	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
D-5	274	295	0–35: Grayish-brown mixed with dark gray sandy silt with oxidation and very few subangular gravels and cobbles 35–40: Light gray sandy silt with oxidation and very few subangular gravels and cobbles 40–60: Grayish-brown mixed with dark gray sandy silt with oxidation and few subangular gravels and cobbles 60–189: Grayish-brown medium sand—*water at 167 cmbs* 189–260: Dark gray sandy silt with few organic fragments 260–295: Dark gray silty loam *Terminated at desired depth*	5226508, 556843	35–60 cmbs: plastic fragments
E-1	365	153	0–43: Grayish-brown silty sand with few small subangular gravels and pebbles 43–153: Dark brownish-gray coarse sand with common subangular gravels, pebbles *Terminated due to gravel obstruction*	5226584, 557181	None
E-2	365	235	0–30: Light brown silty fine sand with few gravels and very few fine roots 30–90: Grayish-brown silty fine sand with no gravels 90–115: Brownish-gray silty sand 115–150: Brownish-gray silty sand with pockets of silt 150–230: Brownish-gray medium sand with oxidation 230–235: Dark gray coarse sand with common gravels *Terminated due to gravel obstruction*	5226488, 557222	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	**Proposed Depth of Ground Disturbance**	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
E-3	365	260	0–38: Grayish-brown sandy silt with few subangular gravels 38–165: Brownish-gray coarse sand with small subrounded pebbles 165–260: Dark gray coarse sand with few subrounded gravels, cobbles *Terminated due to gravel obstruction*	5226399, 557180	20 cmbs: small colorless glass fragment
E-4	365	370	0–45: Grayish-brown silty sand with few subrounded gravels—*alluvium* 45–60: Brownish-gray coarse sand with no gravels—*alluvium* 60–130: Brownish-gray very fine sandy silt with oxidation—*alluvium* 130–214: Brownish-gray medium to fine sandy silt with oxidation 214–259: Light gray silty with oxidation—*alluvium* 259–315: Dark gray sand with wooden fragments 315–370: Brown silt with some dark gray mottles—*water at 370* *Terminated at desired depth*	5226337, 557229	None
F-1	243	223	0–30: Light brown fine sandy silt 30–50: Light gray silty sand with oxidation 50–140: Brownish-gray sand with oxidation 140–160: Dark gray dam sand occasional pockets of silt 160–223: Gray silty very fine sand with oxidation *Terminated due to water inundation*	5226151, 557070	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	Proposed Depth of Ground Disturbance	Maximum Depth (cmbs)	Description (cmbs): Description—*Comments*	Location of Probe (UTM)	Cultural Materials
F-2	243	220	0–47: Dark brown sandy silt with no gravels 47–75: Light brownish-gray silty very fine sand with oxidation 75–100: Light brownish-gray silty very fine sand with pockets of compact silt and oxidation 100–115: Dark grayish-orange sand 115–215: Light brownish-gray silty very fine sand with pockets of compact silt and oxidation 215–220: Light brownish-gray silty very fine sand with pockets of compact silt and oxidation—*water at 215 cmbs* *Terminated due to water inundation*	5226067, 557107	None
F-3	243	213	0–30: Gray brown fine sandy silt with no gravels 30–120: Light gray silty fine sand with oxidation and no gravels 120–140: Dark gray fine silty sand with oxidation 140–200: Light gray silty fine sand with oxidation and woody debris 200–213: Dark gray silt with debris *Terminated at desired depth*	5225993, 557074	None
FC-1	274	274	0–207: Brown sandy silt with many subangular to rounded gravels and orange oxidation 207–274: Wet brown silty loam with red oxidation *Terminated at desired depth*	5227140, 556773	0–30 cmbs: white ware fragment, colorless glass fragment, blue plastic fragment
FC-2	274	183	0–109: Brownish-gray silty sand with few subangular gravels 109–167: Dark brown silty sand—*water at 167 cmbs* 167–183: Dark grayish-brown sand *Terminated due to water inundation*	5227095, 556833	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	Proposed Depth of Ground Disturbance	Maximum Depth (cmbs)	Description (cmbs): Description—*Comments*	Location of Probe (UTM)	Cultural Materials
FC-3	274	164	0–152: Grayish-brown silty sand with few subangular gravels 152–164: Grayish-brown medium coarse sand with many rounded to subrounded gravels *Terminated due to impenetrable gravels*	5227181, 556828	0–152 cmbs: colorless glass fragment
FC-4	274	229	0–134: Grayish-brown fine silty sand with few subangular gravels 134–165: Grayish-brown fine sandy silt with few subrounded gravels and orange oxidation 165–182: Black medium to coarse sand with few subangular gravels and organic fragments 182–229: Grayish-brown fine silty sand with few subangular gravels *Terminated due to water inundation*	5227139, 556893	None
FC-5	274	170	0–36: Brownish-gray silty sand with few subangular gravels 36–164: Grayish-brown silty sand with few subangular gravels and charcoal fragments 164–170: Grayish-brown silty sand with common subrounded gravels—*water at 170 cmbs* *Terminated due to water inundation*	5227107, 556970	None
FC-6	274	226	0–38: Dark brown very fine sandy silt with few gravels 38–86: Light brown very fine sandy silt 86–140: Gray silty sand 140–226: Gray silty sand with common gravels *Terminated due to impenetrable gravels*	5226551, 557335	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	**Proposed Depth of Ground Disturbance**	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
FC-7	274	294	0–75: Brown fine sandy silt with no gravels 75–120: Very dark brown and black sand 120–190: Grayish-brown very fine sandy silt with no gravels 190–240: Grayish-brown coarse silty sand with oxidation 240–294: Grayish-brown fine sandy silt with oxidation and few small organic fragments *Terminated at desired depth*	5226454, 557352	None
FC-8	274	295	0–56: Grayish-brown sandy silt with subangular gravels 56–84: Brownish-gray silty sand with no gravels 84–235: Brown sandy silt with oxidation 235–255: Dark brown coarse sandy silt with oxidation and organic fragments 255–295: Brown sandy silt with oxidation and pockets of sand *Terminated at desired depth*	5226506, 557399	None
FC-9	274	253	0–60: Grayish-brown sandy silt with few small roots and few subangular gravels 60–190: Brownish-gray sand 190–253: Dark gray fine to medium sand with no gravels 253: Dark gray fine to medium sand with many gravels and cobbles *Terminated due to impenetrable gravels*	5226398, 557457	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	Proposed Depth of Ground Disturbance	Maximum Depth (cmbs)	Description (cmbs): Description—*Comments*	Location of Probe (UTM)	Cultural Materials
FC-10	274	290	0–225: Grayish-brown sandy silt with few small subangular gravels and oxidation 225–250: Grayish-brown silty sand with oxidation 250–290: Grayish-brown sandy silt with mottled dark gray sand and orange oxidation *Terminated at desired depth*	5226461, 557458	None
G-1	243	262	0–46: Dark brown sandy silt with no gravels 64–160: Dark brownish-gray silty sand with compact silt and oxidation 160–262: Dark brownish-gray fine to medium sand *Terminated at desired depth*	5226198, 557247	None
G-2	243	228	0–33: Light brown fine sandy silt with no gravels and very few roots 33–35: Gray fine to medium sand with no gravels 35–70: Grayish-brown fine sandy silt with no gravels 70–95: Gray sand with oxidation 95–110: Dark gray silty sand with oxidation 110–228: Gray silty sand with few gravels *Terminated due to water inundation*	5226099, 557228	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	**Proposed Depth of Ground Disturbance**	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
G-3	243	268	0–40: Light brown sandy silt with no gravels 40–70: Dark gray fine to medium sand no gravels 70–105: Brownish-gray mix of coarse sand and very fine sandy silt with no gravels and oxidation 105–140: Gray very fine sandy silt with oxidation 140–180: Brownish-gray mix of coarse sand and very fine sandy silt with no gravels and oxidation 180-268: Dark gray fine silty sand with grayish-brown compact silt mottling with few organic fragments *Terminated at desired depth*	5226009, 557259	0–40 cmbs: colorless glass fragment
IDF-1	274	246	0–182: Brown silty fine to coarse sand with very few subrounded gravels, fine roots, and oxidation 182–246: Brown silty fine to coarse sand with very few subrounded gravels and oxidation *Terminated due to water inundation*	5226750, 556533	None
IDF-2	274	287	0–195: Grayish-brown compact sandy silt with oxidation and no gravels 195–213: Grayish-brown sand with oxidation 213–287: Dark gray silty clay with no gravels *Terminated at desired depth*	5227002, 556780	None
IDF-3	274	183	0–183: Grayish-brown compacted sandy silt with oxidation and very few subangular gravels *Terminated due to water inundation*	5226568, 556960	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	Proposed Depth of Ground Disturbance	Maximum Depth (cmbs)	Description (cmbs): Description—*Comments*	Location of Probe (UTM)	Cultural Materials
IDF-4	274	275	0–172: Grayish-brown silty sand with small subangular and angular gravels, cobbles and oxidation 172–215: Grayish-brown medium sand with oxidation 215–224: Grayish-brown medium sand with oxidation and organic debris 224–275: Gray silty clay *Terminated at desired depth*	5226841, 556778	0–172 cmbs: 2 colorless glass fragments
IDF-5	274	280	0–40: Light brown sandy silt with few subangular gravels 40–90: Brownish-gray sandy silt with oxidation 90–150: Gray medium to coarse sand 150–210: Dark gray silty sand 210–270: Dark gray silty coarse sand with oxidation 270–280: Very fine silt with pockets of clay and oxidation *Terminated at desired depth*	5226592, 556566	None
IDF-6	274	295	0–48: Light brown sandy silt with few gravels 48–72: Gray brown silty fine sand with no gravels and oxidation 72–140: Gray fine to medium sand with no gravels and oxidation 140–150: Dark gray fine to medium sand with no gravels 150–250: Gray-brown very fine sandy silt with oxidation and common organic materials—*water table at 160 cmbs* 250–295: Very fine silt with pockets of clay and sand *Terminated at desired depth*	5226761, 556877	None

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	Proposed Depth of Ground Disturbance	Maximum Depth (cmbs)	Description (cmbs): Description—*Comments*	Location of Probe (UTM)	Cultural Materials
IDF-7	274	285	0–45: Light brown very compact fine sandy silt with common gravels 45–80: Grayish-brown fine sandy silt with no gravels and oxidation 80–180: Brown fine sandy silt with no gravels and oxidation 180–200: Grayish-brown fine sandy silt with oxidation and small charcoal fragments 200–260: Grayish-brown fine sandy silt with organic debris and oxidation 260–285: Dark brown coarse sandy silt with pockets of sand and oxidation *Terminated at desired depth*	5226603, 556913	0–45 cmbs: colorless glass fragment, amber glass fragment
IDF-8	274	200	0–40: Dark brown very fine sandy silt with small subangular gravels 40–50: Light brown very fine sandy silt 50–135: Gray sand with oxidation 135–190: Dark gray coarse sand with common gravels 190–200: Dark gray coarse sand with very many gravels and pebbles *Terminated at cobble obstruction*	5226525, 557126	50–60 cmbs: 10 nail fragments
IDF-9	274	285	0–45: Grayish-brown sandy silt with few small subangular gravels 45–111: Brownish-gray coarse sand with oxidation 111–147: Light gray silty sand with red oxidation 147–245: Brownish-gray coarse sand with oxidation 245–285: Brown fine sandy silt with oxidation—*moisture increases with depth* *Terminated at desired depth*	5226413, 557269	30 cmbs: small colorless glass fragment

Table A-1. Phase 1 Shovel Probe Table.

Shovel Probe	**Proposed Depth of Ground Disturbance**	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
IDF-10	274	277	0–35: Light brown sandy silt with no gravels 35–40: Light gray sandy silt with oxidation 40–46: Dark gray silty sand 46–100: Dark gray silty sand with oxidation 100–246: Dark gray silty loam with oxidation and woody debris 246–277: Dark gray sandy silt with woody debris *Terminated at desired depth*	5226365, 556967	None
IDF-11	274	224	0–39: Brown compact sandy silt with very few gravels 39–105: Light gray silty sand with very few gravels 105–221: Dark gray mixed with black sand with no gravels *Terminated due to water table*	5226118, 557200	None
IDF-12	274	264	0–48: Brown compact sandy silt with very few gravels 48–180: Light gray sandy silt 180–214: Light gray silt with very few gravels and oxidation 214-244: Wet dark gray silt with woody debris 244–264: Dark gray silty sand with oxidation—*water table at 250 cmbs* *Terminated due to water table*	5226047, 557195	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
A4-N1	195	0–80: Light brown sandy silt with no gravels 80–124: Grayish-brown silty sand with redox concentrations 124–145: Grayish-brown sand with redox concentrations and few organic fragments—*buried surface* 145–150: Grayish-brown silty sand with redox concentrations 150–170: Mixed brown silt with organic fragments and grayish brown sandy silt—*buried surface* 170–195: Brownish gray silt with redox concentrations *Terminated at desired depth*	5226962, 556700	None
A4-N2	180	0–30: Brown sandy silt with no gravels 30–75: Brownish-gray fine sandy silt with no gravels and redox concentrations 75–168: Reddish-brown fine sandy silt with redox concentrations 168–180: Dark gray fine sand with common redox concentrations *Terminated at desired depth*	5226972, 556700	None
A4-NE	190	0–36: Light brown sandy silt with no gravels 36–75: Light brown sandy silt with redox concentrations 75–110: Light grayish-brown sandy silt 110–140: Light gray sand with redox concentrations 140–167: Dark gray sandy silt with redox concentrations 167–190: Dark gray sand *Terminated at desired depth*	5226965, 556709	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	Maximum Depth (cmbs)	Description (cmbs): Description—*Comments*	Location of Probe (UTM)	Cultural Materials
A4-E1	185	0–70: Compact brown silt with no gravels 70–100: Gray-brown sandy silt with no gravels 100–130: Dark gray silt with no gravels and redox concentrations 130–160: Dark gray silty sand with no gravels and redox concentrations 160–185: Dark gray sand with no gravels *Terminated at desired depth*	5226956, 556707	None
A4-E2	187	0–58: Brown silt sand with no gravels 58–85: Grayish-brown silt with redox concentration 85–109: Gray silt with redox concentrations 109–187: Dark gray silt sand with few organic fragments—*buried surface* *Terminated at desired depth*	5226956, 556717	None
A4-SE	190	0–40: Brown sandy silt with no gravels 40–60: Gray compact silt with no gravels and redox concentrations 60–70: Gray silt with no gravels and redox concentrations 70–90: Gray silt and compact redox concentrations 90–110: Dark gray sand 110–140: Gray sand with silt and redox concentrations 140–190: Dark gray sand no gravels *Terminated at desired depth*	5226946, 556710	35 cmbs: nondiagnostic aqua vessel glass
A4-S1	180	0–30: Brown sandy silt with no gravels 30–120: Brown silty sand with common redox concentrations 120–140: Yellowish-brown silty sand with no gravels 140–150: Black mixed with dark gray silty sand with redox concentrations and no gravels—*buried surface* 150–180: Dark brownish-gray silt with few redox concentrations *Terminated at desired depth*	5226949, 556700	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
A4-S2	180	0–30: Brown sandy silt with no gravels 30–120: Brownish-gray fine sandy silt with redox concentration 120–140: Yellowish-brown silty sand no gravels 140–180: Dark brownish-gray silt with few redox concentrations *Terminated at desired depth*	5226939, 556700	0–15 cmbs: nondiagnostic brown glass fragments
A4-SW	180	0–30: Brown sandy silt with no gravels 30–130: Brownish-gray fine sandy silt with no gravels and redox concentrations 130–160: Reddish-brown fine sandy silt with redox concentrations 160–180: Dark brownish-gray silt with some redox concentrations and no gravels *Terminated at desired depth*	5226946, 556690	None
A4-W1	190	0–30: Brown sandy silt with no gravel 30–145: Brownish-gray fine sandy silt with no gravels 145–185: Dark gray fine sand with no gravels *Terminated at desired depth*	5226956, 556693	None
A4-W2	180	0–30: Brown sandy silt with no gravels 30–90: Brownish-gray fine sandy silt with no gravels and redox concentrations 90–95: Reddish-brown fine sandy silt with redox concentrations 95–115: Dark gray silt with many redox concentrations 115–125: Dark brownish-gray sandy silt with woody fragments and organic debris—*buried surface* 125–145: Dark gray fine sand with redox concentrations 145–180: Dark gray silt with few redox concentrations *Terminated at desired depth*	5226956, 556683	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
A4-NW	185	0–40: Brown fine sandy silt with no gravels 40–95: Compact brown sandy silt with no gravels 95–107: Dark grayish-brown sand with redox concentrations and no gravels 107–125: Gray silt with redox concentrations 125–140: Grayish-brown silty sand with redox concentrations and organic fragments—*buried surface* 140–185: Gray sand with redox concentrations *Terminated at desired depth*	5226965, 556690	None
CB9-N1	275	0–35: Compact brown silty sand with few subrounded gravels and many roots 35–175: Light yellowish-brown silty sand with redox concentrations 175–225: Yellowish-brown fine sandy silt with no gravels and redox concentrations 225–275: Light gray fine sandy silty with redox concentrations *Terminated at desired depth*	5226833, 556878	None
CB9-N2	282	0–35: Brown sandy silt with few subangular gravels and common roots 35–165: Brownish-gray sandy silt with no gravels and redox concentration 165–195: Yellowish-brown mixed with brownish-gray with redox concentrations and no gravels 195–275: Brownish-gray fine sandy silt with redox concentrations and few organic fragments—*buried surface* 275–277: Dark gray sand with no gravels 277–282: Dark gray silt with no gravels *Terminated at desired depth*	5226843, 556878	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
CB9-NE	278	0–35: Compact light brown fine sandy silt with many roots 35–130: Light grayish-brown sandy silt with redox concentrations and no gravels 130–165: Grayish-brown fine sandy silt with redox concentrations and no gravels 165–278: Light grayish-brown sandy silt with redox concentrations *Terminated at desired depth*	5226836, 556888	None
CB9-E1	280	0–55: Brown silt with no gravels and few roots 55–70: Grayish-brown silt with redox concentrations 70–150: Grayish-brown silty sand with redox concentrations 150–190: Brown silty sand with redox concentrations no gravels 190–230: Grayish-brown sandy with redox concentrations 230–280: Gray sandy silt with redox concentrations *Terminated at desired depth*	5226827, 556885	None
CB9-E2	290	0–45: Light brown silty sand 45–110: Light grayish-brown silty sand with redox concentrations 110–186: Light brown sand with redox concentrations and small charcoal fragments—*buried surface* 186–260: Gray fine sandy silt with redox concentrations 260–290: Gray sandy silt with sandy inclusion and redox concentrations *Terminated at desired depth*	5226827, 556895	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
CB9-SE	290	0–30: Light brown sandy silty—*plow zone* 30–90: Grayish-brown silty sand with redox concentrations 90–180: Light brown sand 180–260: Gray silty sand with redox concentrations 260–290: Dark gray sand with pockets of gray silty sand with redox concentrations *Terminated at desired depth*	5226817, 556888	None
CB9-S1	280	0–50: Very compact brown sandy silt with no gravels and common rootlets 50–107: Grayish-brown sandy silt with redox concentrations 107–160: Grayish-brown silty sand with no gravels and redox concentrations 160–262: Gray silty with redox concentrations 262–280: Gray silt with many organic fragments with redox concentrations—*buried surface* *Terminated at desired depth*	5226820, 556879	None
CB9-S2	280	0–55: Light brown sandy silt 55–66: Light grayish-brown silty sand with redox concentrations 66–126: Light gray silty sand 126–140: Brown fine sand 140–217: Brownish-gray sandy silt with redox concentrations 217–240: Light grayish-brown fine sandy silt with redox concentrations and some organic fragments—*buried surface* 240–260: Light gray silt with redox concentrations and black organic fragments—*buried surface* 260–275: Reddish-brown sand 275–280: Gray silt with redox concentrations and sand inclusions *Terminated at desired depth*	5226810, 556879	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
CB9-SW	290	0–75: Light reddish-brown silty sand with redox concentrations 75–100: Brownish-gray silty sand with redox concentrations 100–120: Light brown sand with no gravels 120–150: Brownish-gray silty sand with redox concentrations 150–175: Yellowish-brown sandy silt with redox concentrations 175–195: Brownish silt with redox concentrations 195–275: Gray silt 275–285: Reddish-brown sand 285–290: Gray silty sand *Terminated at desired depth*	5226817,556869	None
CB9-W1	280	0–40: Compact brown silt 40–75: Compact grayish-brown silty with no gravels 75–100: Compact grayish-brown silty with no gravels and redox concentrations 100–135: Grayish-brown silty sand with no gravels and redox concentrations 135–205: Grayish-brown sandy silt with no gravels and redox concentrations and a few organic fragments—*buried surface* 205–240: Grayish-brown sandy silt with dark gray sand and redox concentration 240–280: Dark gray silt with orange redox concentrations *Terminated at desired depth*	5226826, 556872	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
CB9-W2	278	0–44: Brown sandy silt with few small subangular gravels 44–90: Light reddish-brown silty sand with few subangular gravels 90–132: Brownish-gray sandy silt with redox concentrations and no gravels 132–140: Dark reddish-brown sand with redox concentrations 140–250: Light brownish-gray sandy silt with redox concentrations 250–278: Dark gray silt with no gravels *Terminated at desired depth*	5226826, 556862	None
CB9-NW	280	0–35: Brown sandy silt with no gravels 35–275: Brownish-gray sandy silt with redox concentrations 275–280: Dark gray silt with no gravels *Terminated at desired depth*	5226836, 556869	None
D5-N1	290	0–70: Light brown sandy silt 70–90: Light grayish-brown silty sand 90–137: Gray sand with redox concentrations 137–195: Brownish-gray silty sand with redox concentrations 195–250: Gray silt 250–290: Mixed grayish-brown sandy silt with pockets of yellowish-brown sand and few small organics—*buried surface* *Terminated at desired depth*	5226514, 556842	None
D5-N2	285	0–55: Light brown sandy silt 55–80: Light grayish-brown silty sand 80–175: Grayish-brown sand with redox concentrations 175–190: Brownish-gray silty sand with redox concentrations and organic debris—*buried surface* 190–285: Gray silt *Terminated at desired depth*	5226524, 556842	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
D5-NE	285	0–40: Brown sandy silt 40–67: Brownish-gray sandy silt with redox concentrations 67–100: Dark gray medium sand with redox concentrations 100–215: Dark brownish-gray fine sandy silt with redox concentrations 215–280: Dark gray silt with no gravels 280–285: Dark gray medium to fine sand *Terminated at desired depth*	5226517, 556852	None
D5-E1	290	0–60: Light grayish-brown silty sand 60–140: Brown silty sand with redox concentrations 140–170: Brownish-gray silty sand with redox concentrations 170–240: Light brownish-gray silty sand with redox concentrations with black organic fragments—*buried surface* 240–260: Gray silt mottled with brown sandy silt and organic fragments—*buried surface* 260–290: Gray silt *Terminated at desired depth*	5226508, 556849	None
D5-E2	280	0–40: Brown sandy silt with common roots 40–175: Dark brownish-gray sandy silt with redox concentrations 175–235: Dark brownish-gray sandy silt with redox concentrations and organic fragments—*buried surface* 235–275: Dark gray silty with no gravels 275–280: Dark gray medium sand *Terminated at desired depth*	5226508, 556859	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
D5-SE	275	0–30: Brown sandy silt 30–75: Grayish-brown sandy silt with redox concentrations 75–100: Grayish-brown silty sand with no gravels and redox concentrations 100–195: Grayish-brown silt with redox concentrations and no gravels 195–200: Grayish-brown silt with no gravels and few organic fragments—*buried surface* 200–242: Dark gray silt with no gravels 242–275: Dark gray sand *Terminated at desired depth*	5226498, 556852	None
D5-S1	290	0–40: Light grayish-brown silty sand 40–60: Light gray silty sand with redox concentrations 60–130: Grayish-brown silty sand with pockets of light brown sand 130–230: Light brownish-gray sandy silt with redox concentrations and organic fragments—*buried surface* 230–290: Gray silt with redox concentrations and few organic fragments—*buried surface* *Terminated at desired depth*	5226501, 556843	None
D5-S2	290	0–40: Light brown silty sand 40–70: Light gray silty sand with redox concentrations 70–130: Grayish-brown silty sand 130–220: Light brownish-gray sandy silt with redox concentrations and few organic fragments—*buried surface* 220–270: Gray silt with few organic fragments—*buried surface* 270–290: Gray silty sand	5226491, 556843	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
D5-SW	280	0–50: Light grayish-brown silty sand 50–60: Grayish-brown silty sand with redox concentrations 60–100: Dark grayish-brown sand with redox concentrations 100–130: Grayish-brown sand with redox concentrations—*buried surface* 130–150: Light brownish-gray silty sand with redox concentrations and few organic fragments—*buried surface* 150–280: Dark gray silt *Terminated at desired depth*	5226498, 556833	None
D5-W1	282	0–65: Brown silty sand with no gravels and many roots 65–155: Grayish-brown sandy silt with redox concentrations 155–175: Grayish-brown sandy silt with redox concentrations and few subrounded gravels 175–192: Grayish-brown sandy silt with redox concentrations 192–270: Gray silt 270–282: Yellowish-brown sandy silt with few organic fragments—*buried surface* *Terminated at desired depth*	5226507, 556836	None
D5-W2	275	0–35: Brown sandy silt with common roots 35–150: Grayish-brown silty sand with no gravels and redox concentrations 150–155: Grayish-brown sandy silt with no gravels, common organic fragments and redox concentration—*buried surface* 155–170: Dark gray silt with many organic fragments and redox concentration—*buried surface* 170–275: Dark gray silt with pockets of coarse sand	5226507, 556826	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
D5-NW	292	0–60: Light brown sandy silt 60–180: Grayish-brown sand with redox concentrations 180–192: Grayish-brown silty sand with redox concentrations 192–280: Gray silt with redox concentrations and black organic fragments and wood debris—*buried surface* 280–292: Gray silt *Terminated at desired depth*	5226517, 556833	None
E4-N1	370	0–45: Brown sandy silt 45–76: Dark grayish-brown sand with redox concentrations 76–130: Brownish-gray sandy silt with redox concentrations 130–220: Brownish-gray sand with redox concentrations 220–329: Brownish-gray silty sand with redox concentrations, common organic fragments, and woody debris—*buried surface* 329–370: Dark gray sand *Terminated at desired depth*	5226337, 557226	None
E4-N2	370	0–44: Compact brown sandy silt 44–82: Grayish-brown silty sand 82–340: Grayish-brown silty sand with redox concentrations and few organic fragments—*buried surface* 340–370: Gray sandy silt *Terminated at desired depth*	5226347, 557226	None
E4-NE	382	0–55: Brown sandy silt with roots 55–72: Yellowish-brown medium sand 72–210: Grayish-brown silty sand with redox concentrations 210–335: Grayish-brown sandy silt with redox concentrations and pockets of grayish-brown sand 335–382: Dark gray silt with no gravels *Terminated at desired depth*	5226340, 557235	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
E4-E1	380	0–47: Brown sandy silt with roots 47–78: Yellowish-brown medium sand 78–220: Grayish-brown silty sand with redox concentrations 220–335: Grayish-brown sandy silt with redox concentrations and organic debris—*buried surface* 335–380: Dark gray silt with no gravels *Terminated at desired depth*	5226330, 557233	None
E4-E2	372	0–55: Light brown fine sandy silt 55–70: Light brown medium sandy silt 70–85: Light brown silty sand with redox concentrations 85–170: Light brown silty fine sand with redox concentrations 170–230: Gray fine sandy silt with redox concentrations and bedded sand 230–285: Dark gray silty sand with few small organic fragments—*buried surface* 285–345: Gray silty fine sand with redox concentrations 345–350: Black silty sand with many small organic fragments—*buried surface* 350–365: Dark gray sandy silt 365–372: Gray silt *Terminated at desired depth*	5226330, 557243	None
E4-SE	365	0–40: Brown sandy silt with common roots 40–90: Brown sand 90–230: Grayish-brown silty sand with few subangular gravels and redox concentrations 230–270: Brownish-gray silty sand with organic fragments—*buried surface* 270–365: Brownish-gray sand with many organic fragments and woody debris—*buried surface*	5226321, 557236	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
E4-S1	364	0–45: Light brown sandy silt with no gravels 45–65: Light grayish-brown silty sand with redox concentrations 65–125: Brownish-gray sand with redox concentrations 125–266: Gray sandy silt with redox concentrations 266–300: Gray sandy silt with redox concentrations 300–364: Dark gray silty sand with few small organic fragments—*buried surface* *Terminated at desired depth*	5226324, 557226	None
E4-S2	365	0–40: Brown sandy silt with no gravels 40–80: Light brownish-gray silty sand with redox concentration 80–350: Dark brownish-gray silty sand with redox concentrations 350–365: Dark brownish-gray sand with many subrounded gravels and few organic fragments—*buried surface* *Terminated at desired depth*	5226314, 557226	None
E4-SW	370	0–40: Brown sandy silt 40–110: Grayish-brown silty sand with redox concentrations 110–190: Light brownish-gray silty sand with redox concentrations 190–210: Dark gray medium sand 210–250: Light brownish-gray silty sand with redox concentrations with organic material—*buried surface* 250–270: Dark gray medium sand with few subrounded gravels and pebbles 270–370: Brownish-gray fine sand with few small subrounded gravels and few organics—*buried surface*	5226321, 557217	None

Table A-2. Phase 2 Auger Probe Table.

Shovel Probe	**Maximum Depth (cmbs)**	**Description (cmbs): Description—*Comments***	**Location of Probe (UTM)**	**Cultural Materials**
E4-W1	365	0–35: Brown sandy silt 35–75: Grayish-brown medium sandy silt 75–155: Grayish-brown medium sandy silt with redox concentrations 155–270: Gray fine sand with redox concentrations 270–365: Grayish-brown silty fine sand *Terminated at desired depth*	5226330, 557219	None
E4-W2	370	0–32: Light brown sandy silt 32–100: Grayish-brown silty sand 100–155: Brownish-gray sandy silt with redox concentrations 155–370: Dark grayish-brown silty sand with redox concentrations *Terminated at desired depth*	5226330, 557209	None
E4-NW	350	0–40: Brown sandy silt 40–55: Brownish-gray medium sandy silt 55–160: Gray medium sandy silt with redox concentrations 160–225: Gray fine sandy silt with redox concentrations and organic debris—*buried surface* 225–255: Brownish-gray fine sandy silt with redox concentrations and woody debris 255–350: Dark gray fine silty sand *Terminated at desired depth*	5226340, 557216	None

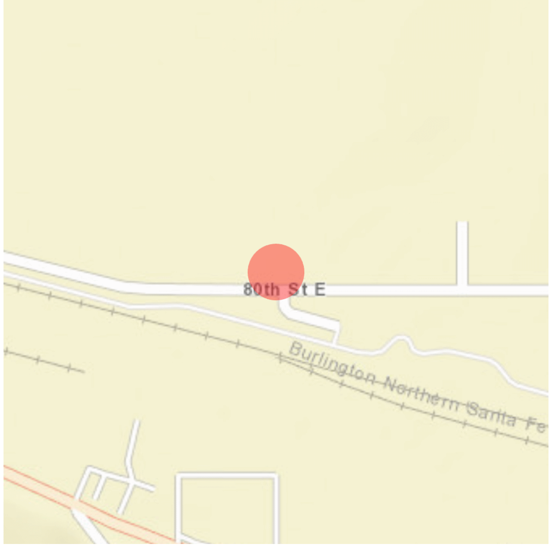
Appendix B. Historic Property Inventory Forms

Historic Property Report

Resource Name: Marther House

Property ID: 725699

Location



Address:	13719 80th St E, Puyallup, Washington, 98372
Geographic Areas:	Pierce County, SUMNER Quadrangle, T20R04E25

Information

Number of stories: 1.00

Construction Dates:

Construction Type	Year	Circa
Built Date	1930	☑

Historic Use:

Category	Subcategory
Domestic	Domestic - Single Family House
Domestic	Domestic - Single Family House

Historic Context:

Category
Architecture

Architect/Engineer:

Category	Name or Company

Thematics:

Local Registers and Districts

Name	Date Listed	Notes

Project History

Project Number, Organization, Project Name	Resource Inventory	SHPO Determination	SHPO Determined By, Determined Date
2021-08-05890, , City of Puyallup’s Knutson Farms Industrial Park Project, Puyallup, Pierce County, Washington	8/30/2021	Survey/Inventory	

Photos

13719 80th St. E, facade, view north.

13719 80th St. E, west elevation, view northeast.

Inventory Details - 8/30/2021

Common name: Knutson Farms

Date recorded: 8/30/2021

Field Recorder: Chrisanne Beckner

Field Site number:

SHPO Determination

Detail Information

Characteristics:

Category	Item
Foundation	Concrete - Poured
Form Type	Single Dwelling - Bungalow
Roof Type	Gable - Side
Roof Material	Asphalt/Composition - Shingle
Cladding	Wood - Clapboard
Structural System	Wood - Platform Frame
Plan	Rectangle

Styles:

Period	Style Details
Mid-Late 19th and Early 20th Century Revivals	Cape Cod

Surveyor Opinion

Significance narrative: Integrity

From its period of construction (1930), the bungalow at 13719 80th St. E retains integrity of location, setting, and association, as it remains on its original parcel in association with surrounding agricultural land. Alterations and additions, including a likely addition to the rear and incompatible window replacement have diminished the building’s integrity of design, materials, and workmanship. Additionally, although the building has a bungalow form, it no longer serves as a single-family residence for a single parcel but is part of a larger farming operation. The building does not possess integrity of feeling.

Evaluation

The building at 13719 80th St. E was constructed in 1930 and is located at the southern end of a 16.46-acre parcel associated with the twentieth-century agricultural activity of the Puyallup Valley. The building and its associated farm land is located west of the Puyallup River and is part of what is now known as the Knutson Farms, a business founded by Harold Knutson in the 1930s, although Knutson did not acquire this land from E. C. Orton, a member of one of the region’s early bulb farming families, until 1957, when the elder bulb farmer retired (Seattle Times 1957). According to a 1957 article in the Seattle Times, “Orton, who is retiring, said in Sumner that the sale includes between 400 and 500 acres of top-quality land… It has been used mainly to grow bulbs and hothouse rhubarb and a small amount of Hereford beef stock" (Seattle Times 1957). Harold Knutson passed the business to his son, Roger, in the 1970s.

Unlike parcels farther north, this location was not originally farmed by the Ortons. It appears in historic atlases as belonging to "L. M. Marther" in 1951 and appears, from historic maps, to have become part of the Orton and Knutson property in the mid-twentieth century (Metsker 1951, 1960, 1965). Research did not reveal anything about the Marther family.

This parcel has long been cultivated, but this building is not the headquarters for the Knutson Farms or the Knutson family. It appears to be a secondary cultivated field supporting the Knutson Farms, which is primarily located across the Puyallup River at 16406 78th St E in Sumner (Chesley 2007; Metsker 1951; Seattle Times 1976).

The bungalow at 13719 80th St. E, identified as "commercial" in county records, is most likely a utilitarian building associated with farming practices and the farm's supporting staff. Although not the headquarters for either the Orton or Knutson farms, the building is associated with significant events and trends in local agricultural history due to its association with the fields cultivated by the Orton and Knutson families (Criterion A). The building, while owned by significant farmers, including the Orton and Knutson families, is not known to have served as family or business headquarters for either family. Both the Knutson and E. C. Orton families regularly appear in historic records as residing in Sumner. It is not known to be significant for its association with persons possessing documented significance in local, state, or national history (Criterion B). While the building retains the massing and symmetrical facade of an early twentieth century bungalow, it has been altered and does not retain the multi-light wood-framed windows or ornamental details that would identify it as an example of a particular type, period, or method of construction. It is not the work of a master, does not possess high artistic values, and does not represent a significant and distinguishable entity whose components may lack individual distinction (i.e., qualify as part of a district) (Criterion C). Finally, the building was built of common construction methods and well-known materials and is unlikely to answer important research questions or yield information about human history that can only be answered by the actual physical material, design, construction methods, or interrelation of these resources (Criterion D).

While the building and its surrounding parcel are significant under Criterion A, the building is no longer associated with a small family farm and has been incompatibly altered. It does not possess sufficient integrity from its period of construction (1930) to convey its significance. Therefore, due to a loss of integrity, HRA recommends the building is not eligible for listing in the NRHP under any criteria.

Physical description: According to the Pierce County Assessor, the residence at 13719 80th St. E was constructed in 1930 (Pierce County Assessor 2021). The small, one-story, rectangular bungalow faces south toward 80th St. E. It sits on a poured-concrete foundation, is clad in clapboards, and is topped by a side-gabled, asphalt-shingle roof. The building has possibly been enlarged to the rear, where a shallow shed roof projects over a possible addition. The building's facade includes a central entry door with a projecting gable roof over a concrete stoop. The entry is flanked east and west by sliding, aluminum-framed windows. Side elevations include small, single-light, wood-framed windows, some of which are covered with plywood, sliding, aluminum-framed windows, and louvered vents in the gables. An associated detached, single-car garage is located to the east. It is also clad in clapboards and includes an overhead garage door.

Bibliography:

Chelsley, Frank
2007 First Puyallup Daffodil Parage Chugs Out on March 17, 1934. HistoryLink.org Essay 8365. Electronic document, https://www.historylink.org/File/8365, accessed August 25, 2021.

Metsker, Chas. F (Metsker)
1951 Page 028 - Township 20 N., Range 4 E., Puyallup, Sumner, Firwood, Milton, Alderton, Arden, McAleer. Metsker Maps, Seattle, Washington. Electronic document, http://www.historicmapworks.com, accessed August 25, 2021.
1960 Page 079 - Sumner, alderton, Puyallup, No. Puyallup, Puyallup River. Metsker Maps, Seattle, Washington. Electronic document, http://www.historicmapworks.com, accessed August 25, 2021.
1965 Township 20 North - Range 4 East., Edgewood, Stuck River - Page 080. Electronic document, http://www.historicmapworks.com, accessed August 25, 2021.

Pierce County Assessor
2021 Pierce County, Washington: About My Property. Electronic document, https://pals.piercecountywa.gov/palsonline/#/AboutMyProperty, accessed August 30, 2021.

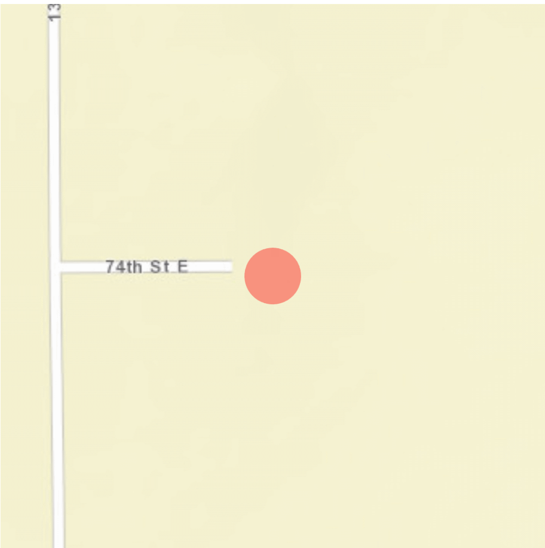
Seattle Times
1957 People in the New: O’Sheas to Quit Show Business; Foreman Buys Out Bulb Expert. January 31.
1976 Quality Flowers in Puyallup Valle: Daffodil Industry in Full Swing. April 3.

Historic Property Report

Resource Name: Orton House

Property ID: 725700

Location



Address: 7525 134th Ave E, Puyallup, Washington, 98372

Geographic Areas: T20R04E25, SUMNER Quadrangle, Pierce County

Information

Number of stories: 2.00

Construction Dates:

Construction Type	Year	Circa
Built Date	1920	☐

Historic Use:

Category	Subcategory
Domestic	Domestic - Single Family House
Domestic	Domestic - Single Family House

Historic Context:

Category
Architecture
Agriculture

Architect/Engineer:

Category	Name or Company

Thematics:

Local Registers and Districts

Name	Date Listed	Notes

Project History

Project Number, Organization, Project Name	Resource Inventory	SHPO Determination	SHPO Determined By, Determined Date
2021-08-05890, , City of Puyallup’s Knutson Farms Industrial Park Project, Puyallup, Pierce County, Washington	8/30/2021	Survey/Inventory	

Photos

7525 134th Ave. E, residence, view south.

7525 134th Ave. E, barn, view north.

7525 134th Ave. E, garage, view southwest.

7525 134th Ave. E, barn, view southwest.

7525 134th Ave. E, residence and associated garage, view northwest.

7525 134th Ave. E, residence, view southeast.

Inventory Details - 8/30/2021

Common name:

Date recorded: 8/30/2021

Field Recorder: Chrisanne Beckner

Field Site number:

SHPO Determination

Detail Information

Characteristics:

Category	Item
Foundation	Concrete - Poured
Form Type	Single Dwelling - American Foursquare
Roof Type	Hip
Roof Material	Asphalt/Composition - Shingle
Cladding	Wood - Clapboard
Structural System	Wood - Platform Frame
Plan	Square

Styles:

Period	Style Details
Late 19th and Early 20th Century American Movements	Prairie

Surveyor Opinion

Property appears to meet criteria for the National Register of Historic Places: Yes

Significance narrative: Integrity

From its period of construction (ca. 1920), the residence with functionally related storage shed/barn at 7525 134th Ave. E retains integrity of location, setting, and association, as it remains on its original parcel in association with surrounding agricultural land. Alterations and additions, including an addition to the rear of the residence, incompatible replacement windows, and alterations including a projecting first floor bay on the storage shed/barn have diminished the resources' integrity of design, materials, workmanship, and feeling (NETROnline 2021). The garage/chicken coop is a relatively late addition to the parcel (ca. 1970) and retains integrity of location, setting, design, materials, workmanship, feeling, and association.

Evaluation

The primary residence and associated storage shed/barn at 7525 134th Ave. E were constructed ca. 1920. They are associated with the twentieth-century agricultural activity of the Puyallup Valley. The residence and storage shed/barn are located west of the Puyallup River on the Knutson Farms, a business founded by Harold Knutson in the 1930s, although Knutson did not acquire this land from E. C. Orton, a member of one of the region's early bulb farming families, until 1957, when the elder bulb farmer retired (Seattle Times 1957). According to a 1957 article in the Seattle Times, "Orton, who is retiring, said in Sumner that the sale includes between 400 and 500 acres of top-qualify land… It has been used mainly to grow bulbs and hothouse rhubarb and a small amount of Hereford beef stock" (Seattle Times 1957). Harold Knutson passed the business to his son, Roger, in the 1970s.

This parcel has long been cultivated, although this location is not the headquarters for the Knutson Farms or the Knutson family. It appears to be a secondary, cultivated field for the business, which is primarily housed across the Puyallup River at 16406 78th St E in Sumner (Chesley 2007; Metsker 1951; Seattle Times 1976).

The foursquare at 7525 134th Ave. E, identified as "commercial" in county records, is most likely a residential building associated with farming practices and the farm's supporting staff. Although not the headquarters for the Knutson Farms, the building is associated with significant events and trends in local agricultural history due to its association with the fields cultivated by the Orton and Knutson families (Criterion A). The building, while owned by significant farmers, including the Orton and Knutson families, may have served as a primary residence or headquarters for members of either family in the early or mid-twentieth century, although this could not be confirmed. Both the Knutson and E. C. Orton families regularly appear in historic records as residing in Sumner. The buildings are not known to be significant for their association with persons possessing documented significance in local, state, or national history (Criterion B). While the residence is a recognizable example of an American foursquare, with the boxy plan and hipped roof typical of the type, it does not possess the wood-framed windows, diamond panes, porch, or ornamental trim found on distinctive examples. The storage shed/barn has been heavily altered and is not a recognizable example of a particular type of barn or storage shed. The garage/chicken coop is a relatively late addition and possess no architectural significance. None of the buildings possess the distinctive characteristics of a particular type, period, or method of construction. The residence and storage shed/barn and garage/chicken coop are not the works of a master, do not possess high artistic values, and do not represent a significant and distinguishable entity whose components may lack individual distinction (i.e., qualify as parts of a district) (Criterion C). Finally, the residence, storage shed/barn, and garage/chicken coop were built of common construction methods and well-known materials and are unlikely to answer important research questions or yield information about human history that can only be answered by the actual physical material, design, construction methods, or interrelation of these resources (Criterion D).

The residence, storage shed/barn, and garage/chicken coop are significant under Criterion A. While some integrity has been lost, the residence and functionally related units continue to convey their significance. HRA recommends the residence, storage shed/barn, and garage/chicken coop are eligible for listing in the NRHP under Criterion A. The eligible resource, the primary building and functionally related units, is bound by the present and historic tax parcel boundaries, which include the associated farmland. The period of significance for the building and its functionally related units dates to its construction in 1920 and continues through 1970.

Physical description:

According to the Pierce County Assessor, the primary building on the 33.78-acre parcel addressed as 7525 134th Ave. E was constructed in 1920. It appears in the earliest available historic aerials (1931) (NETROnline 2021; Pierce County Assessor 2021). The building faces north toward 74th St. E and is associated with two functionally related units, a garage/chicken coop (ca. 1970) and storage shed/barn (ca. 1920). The primary residence is an American foursquare. It sits on a poured-concrete foundation, is clad in clapboards, and is topped by a hipped, asphalt shingle roof. The building is square in plan with a projection off the rear topped by a single-story shed roof. The building’s facade includes a gabled porch roof supported by square posts over a post and pier stoop. Flanking the central entry door to the west is a large vinyl picture window over shallow sliding windows. To the west of the entry is a one-over-one aluminum-framed window. The second story includes two one-over-one aluminum-framed windows. The west elevation includes two aluminum-framed windows per floor. The east elevation includes one on the lower floor and two on the upper floor. The building’s rear elevation includes one aluminum-framed window on the upper story over the single-story projection, which includes small, aluminum-framed windows on all elevations and a separate entrance with stair on the east elevation.

Functionally related buildings include a garage/chicken coop to the east of the primary residence (ca. 1970) with a sliding garage door facing north. It is clad in vertical planks and topped by an asphalt shingled, front-gabled roof. A wood-framed two-light window faces west alongside an open door frame. To the rear of the garage, plywood has been used to construct a single story projection with asphalt shed roof. The projection’s southern wall is partially covered by wood slats secured with chicken wire. A covered window is located on the east elevation. According to historic aerials, the building dates to ca. 1970 (NETROnline 2021).

Additionally, a two-story storage shed/barn is located northeast of the residence and appears in 1931 aerials (NETROnline 2021). It likely dates to ca. 1920. It is built of post and beam on a dirt floor. The building is constructed against a slope so that the lower level is partially visible. The lower floor is partially enclosed by walls of poured-concrete, stacked pieces of broken concrete, and plank siding. It is open to the north with bare framing to the east. It is topped by a shed roof of corrugated metal. Above the first floor, the partial second floor is clad in plank siding with bare framing facing north. Two wood-framed openings are located on the south and west elevations. The partial second floor is partially topped by a roof of corrugated metal over wood planks.

Bibliography:

Chelsley, Frank
2007 First Puyallup Daffodil Parage Chugs Out on March 17, 1934. HistoryLink.org Essay 8365. Electronic document, https://www.historylink.org/File/8365, accessed August 25, 2021.

Metsker, Chas. F (Metsker)
1951 Page 028 - Township 20 N., Range 4 E., Puyallup, Sumner, Firwood, Milton, Alderton, Arden, McAleer. Metsker Maps, Seattle, Washington. Electronic document, http://www.historicmapworks.com, accessed August 25, 2021.
1960 Page 079 - Sumner, alderton, Puyallup, No. Puyallup, Puyallup River. Metsker Maps, Seattle, Washington. Electronic document, http://www.historicmapworks.com, accessed August 25, 2021.
1965 Township 20 North - Range 4 East., Edgewood, Stuck River - Page 080. Electronic document, http://www.historicmapworks.com, accessed August 25, 2021.

NETROnline
2021 Historic Aerials: Puyallup, Washington. Electronic document, https://www.historicaerials.com/viewer, accessed August25, 2021.

Pierce County Assessor
2021 Pierce County, Washington: About My Property. Electronic document, https://pals.piercecountywa.gov/palsonline/#/AboutMyProperty, accessed August 30, 2021.

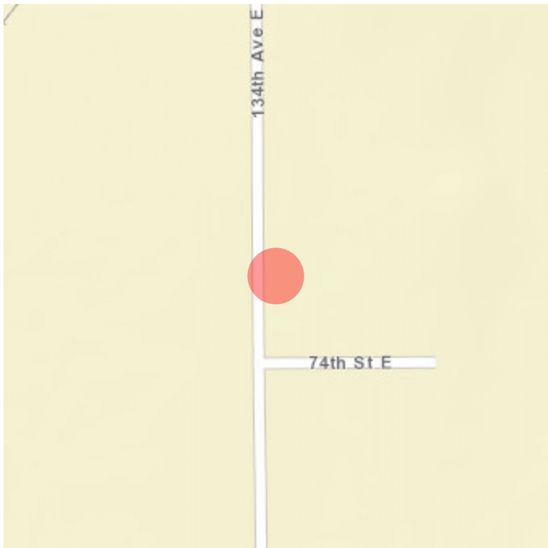
Seattle Times
1957 People in the New: O'Sheas to Quit Show Business; Foreman Buys Out Bulb Expert. January 31.
1976 Quality Flowers in Puyallup Valle: Daffodil Industry in Full Swing. April 3.

Historic Property Report

Resource Name: Kusminsky House

Property ID: 725701

Location



Address: 7301 134th Ave E, Puyallup, Washington, 98372

Geographic Areas: PUYALLUP Quadrangle, Pierce County, T20R04E51

Information

Number of stories: 2.00

Construction Dates:

Construction Type	Year	Circa
Built Date	1955	☑

Historic Use:

Category	Subcategory
Domestic	Domestic - Multiple Family House
Domestic	Domestic - Single Family House
Domestic	Domestic - Multiple Family House
Domestic	Domestic - Single Family House

Historic Context:

Category
Architecture

Architect/Engineer:

Category	Name or Company

Thematics:

Local Registers and Districts

Name	Date Listed	Notes

Project History

Project Number, Organization, Project Name	Resource Inventory	SHPO Determination	SHPO Determined By, Determined Date
2021-08-05890, , City of Puyallup’s Knutson Farms Industrial Park Project, Puyallup, Pierce County, Washington	8/30/2021	Survey/Inventory	

Photos

7301 134th Ave. E, view northeast.

7301 134th Ave. E, view southeast.

Historic Property Report

Resource Name: Kusminsky House

Property ID: 725701

Inventory Details - 8/30/2021

Common name:	
Date recorded:	8/30/2021
Field Recorder:	Chrisanne Beckner
Field Site number:	
SHPO Determination	

Detail Information

Characteristics:

Category	Item
Foundation	Concrete - Poured
Form Type	Single Dwelling - Side Gable
Roof Type	Gable - Side
Roof Material	Asphalt/Composition - Shingle
Cladding	Vinyl Siding
Structural System	Wood - Platform Frame
Plan	Rectangle

Styles:

Period	Style Details
Modern Movement	Modern

Surveyor Opinion

Historic Property Report

Resource Name: Kusminsky House

Property ID: 725701

Significance narrative:

Integrity

From its period of construction (ca. 1955), the residence at 7301 134th Ave. E retains integrity of location and setting, as it remains on its original parcel in association with surrounding agricultural land. Alterations including incompatible replacement siding and incompatible replacement windows, as well as a recent change of use, and possible division into multiple units has diminished its integrity of design, materials, workmanship, feeling, and association.

Evaluation

The residence at 7301 134th Ave. E was constructed ca. 1955 as a single family residence. It was owned by the Kusminsky and Lathrop families before being acquired by Knutson Farms in 2017 (Pierce County Assessor 2021). While the building is now part of the operations of the Knutson Farms, it was originally owned by single families who were not located on farm parcels but on narrow, deep residential parcels. The building does not have a significant association with the agricultural history of the Knutson Farms and does not appear to be significant for any other association with events or a series of events important in local, state, or national history (Criterion A). The building, while owned by a significant farming family now, is not known to have served as a primary residence or headquarters for a farming family prior to its sale in 2017. It is not significant for its association with persons possessing documented significance in local, state, or national history (Criterion B). The building is modest in plan, rectangular, with few character defining features of any particular type, apart from its massing and minimal eaves. It does not possess the distinctive characteristics of a particular type, period, or method of construction. It is not the work of a master, does not possess high artistic values, and does not represent a significant and distinguishable entity whose components may lack individual distinction (i.e., qualify as part of a district) (Criterion C). Finally, the residence was built of common construction methods and well-known materials and is unlikely to answer important research questions or yield information about human history that can only be answered by the actual physical material, design, construction methods, or interrelation of these resources (Criterion D).

The residence at 7301 134th Ave. E does not meet any criteria for listing in the NRHP and possesses poor integrity from its period of construction (ca. 1955). HRA recommends the residence is not eligible for listing in the NRHP under any criteria.

Physical description:

According to the Pierce County Assessor, the residence at 7301 134th Ave. E was constructed in 1970 (Pierce County Assessor 2021). However, this may be in error, as a building with similar massing appears in aerial photographs in 1955 (NETROnline 2021). The building is assumed to have been constructed ca. 1955. It is two stories, rectangular in plan, and faces west. The building sits on a poured-concrete foundation, is clad in vinyl siding, and is topped by a front-gabled roof with no eaves covered in asphalt shingles. A large projecting porch with wood railing is located above a covered bay on the lower floor on the south elevation. The building’s two primary entries are located below the projecting porch. The west-facing facade features square, wood-framed windows and a one-over-one wood-framed window on the lower floor, along with a large wood-framed picture window on the upper floor with two vinyl-framed replacement windows. Wood-framed windows remain on the lower floor of the south elevation, while upper windows and a sliding door are vinyl-framed. The building’s north elevation includes a wood porch with exterior stair to the upper floor, which includes single and paired vinyl-framed windows.

Bibliography:

NETROnline
2021 Historic Aerials: Puyallup, Washington. Electronic document, https://www.historicaerials.com/viewer, accessed August 25, 2021. ‘

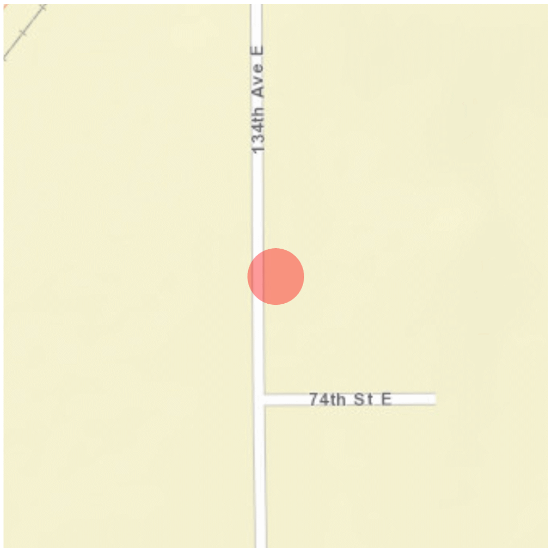
Pierce County Assessor
2021 Pierce County, Washington: About My Property. Electronic document, https://pals.piercecountywa.gov/palsonline/#/AboutMyProperty, accessed August 30, 2021.

Historic Property Report

Resource Name: Kusminsky House

Property ID: 725702

Location



Address: 7215 134th Ave E, Puyallup, Washington, 98372

Geographic Areas: PUYALLUP Quadrangle, Pierce County, T20R04E51

Information

Number of stories: 1.00

Construction Dates:

Construction Type	Year	Circa
Built Date	1940	☑

Historic Use:

Category	Subcategory
Domestic	Domestic - Single Family House
Domestic	Domestic - Single Family House

Historic Context:

Category
Architecture

Architect/Engineer:

Category	Name or Company

Thematics:

Local Registers and Districts

Name	Date Listed	Notes

Project History

Project Number, Organization, Project Name	Resource Inventory	SHPO Determination	SHPO Determined By, Determined Date
2021-08-05890, , City of Puyallup’s Knutson Farms Industrial Park Project, Puyallup, Pierce County, Washington	8/30/2021	Survey/Inventory	

Photos

7215 134th Ave. E, view east.

7215 134th Ave. E, outbuilding, view southeast.

7215 134th Ave. E, outbuilding, view east.

7215 134th Ave. E, view southeast.

Inventory Details - 8/30/2021

Common name:	Knutson Farms
Date recorded:	8/30/2021
Field Recorder:	Chrisanne Beckner
Field Site number:	
SHPO Determination	

Detail Information

Characteristics:

Category	**Item**
Foundation	Concrete - Poured
Form Type	Single Dwelling - Cross Gable
Roof Type	Gable - Cross
Roof Material	Asphalt/Composition - Shingle
Cladding	Vinyl Siding
Structural System	Wood - Platform Frame
Plan	L-Shape

Styles:

Period	**Style Details**
Modern Movement	Modern

Surveyor Opinion

Property appears to meet criteria for the National Register of Historic Places: No

Significance narrative:

Integrity

From its period of construction (1940), the residence at 7215 134th Ave. E retains integrity of location and setting, as it remains on its original parcel in association with surrounding agricultural land. Alterations including incompatible replacement siding and incompatible replacement windows, as well as a change of use once the building was acquired by Knutson Farms in 2017, have diminished its integrity of design, materials, workmanship, feeling, and association.

Evaluation

The residence at 7215 134th Ave. E was constructed in 1940, with its functionally related outbuilding appearing ca. 1955. It was owned by the Kusminsky family before being acquired by Knutson Farms in 2017 (Pierce County Assessor 2021). While the building is now part of the operations of the Knutson Farms, it was originally owned by a single family not located on a farm parcel but on a relatively small residential parcel. The building does not have a significant association with the agricultural history of the Knutson Farms and does not appear to be significant for any other association with events or series of events important in local, state, or national history (Criterion A). The building, while owned by a significant farming family now, is not known to have served as a primary residence or headquarters for a farming family prior to its sale in 2017. It is not significant for its association with persons possessing documented significance in local, state, or national history (Criterion B). The building is a modest example of a mid-century resource with few character-defining features due to alterations including window and siding replacement. It does not possess the distinctive characteristics of a type, period, or method of construction. It is not the work of a master, does not possess high artistic values, and does not represent a significant and distinguishable entity whose components may lack individual distinction (i.e., qualify as part of a district) (Criterion C). Finally, the residence was built of common construction methods and well-known materials and is unlikely to answer important research questions or yield information about human history that can only be answered by the actual physical material, design, construction methods, or interrelation of these resources (Criterion D).

The residence, with its functionally related garage, at 7215 134th Ave. E does not meet any criteria for listing in the NRHP and possesses poor integrity from its period of construction (ca. 1940). HRA recommends the residence is not eligible for listing in the NRHP under any criteria.

Physical description:

According to the Pierce County Assessor, the residence at 7215 134th Ave. E was constructed in 1940 (Pierce County Assessor 2021). Historic aerials suggest that a functionally related outbuilding, a large barn now used as a garage east of the residence, was constructed ca. 1955 (NETROnline 2021). The single-story residence at 7215 134th Ave. E sits above a basement on a poured-concrete foundation, is clad in vinyl siding, and is topped by an asphalt-shingle, cross-gabled roof. The building's facade includes a wood stair with wood posts and rail to a recessed porch and recessed entry door, paired with a vinyl window with shutters under the projecting porch roof. The recessed entry is flanked on the north by a front-facing gable with central vinyl sliding window over a projecting vinyl bay window. On the south is an additional one-over-one vinyl window. The south elevation includes no visible fenestration. The north elevation includes a single vinyl-framed sliding window, two narrow vinyl-framed windows, and a shed dormer with four shallow, vinyl-framed windows.

To the east of the residence, the functionally related barn/garage sits on a poured-concrete foundation, is clad in vinyl siding, and is topped by a standing-seam metal, gambrel roof. Windows are vinyl framed, sliding or fixed. A covered bay is located south of the primary mass, and an enclosed bay is located to the north. Two overhead garage doors are centrally located.

Bibliography:

NETROnline
2021 Historic Aerials: Puyallup, Washington. Electronic document, https://www.historicaerials.com/viewer, accessed August25, 2021.

Pierce County Assessor
2021 Pierce County, Washington: About My Property. Electronic document, https://pals.piercecountywa.gov/palsonline/#/AboutMyProperty, accessed August30, 2021.