Washington State
Department of Transportation

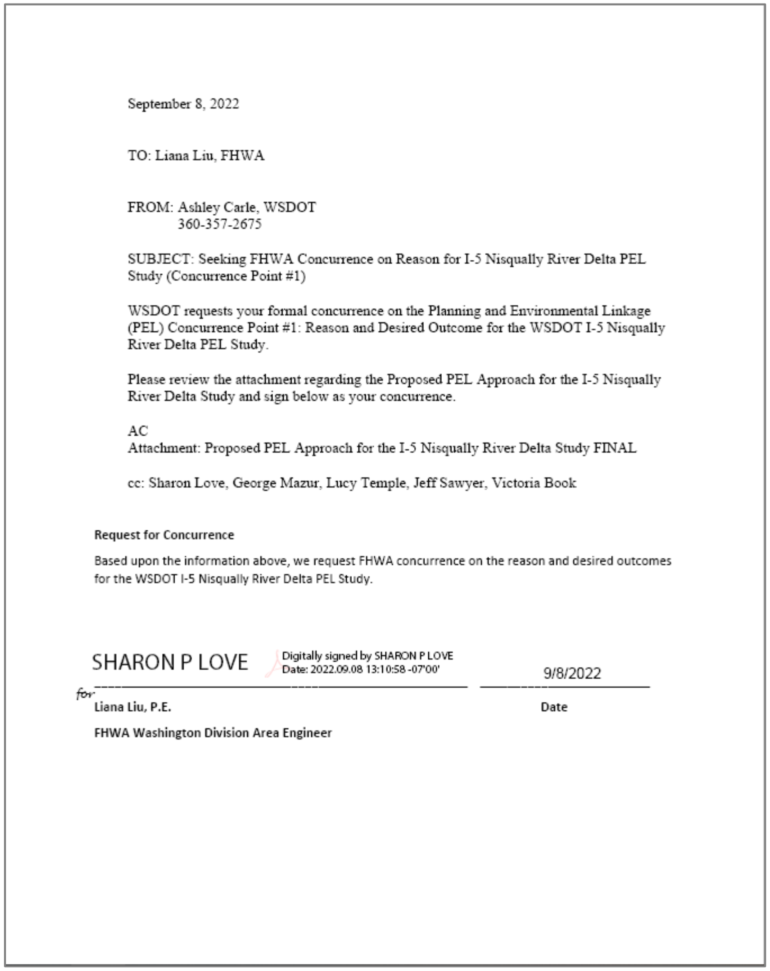
I-5 Marvin Road to Mounts Road

Planning and Environmental Linkages Study

Draft Appendices | June 2023

A FHWA CONCURRENCE

Concurrence Point #1



September 8, 2022

TO: Liana Liu, FHWA

FROM: Ashley Carle, WSDOT
360-357-2675

SUBJECT: Seeking FHWA Concurrence on Reason for I-5 Nisqually River Delta PEL Study (Concurrence Point #1)

WSDOT requests your formal concurrence on the Planning and Environmental Linkage (PEL) Concurrence Point #1: Reason and Desired Outcome for the WSDOT I-5 Nisqually River Delta PEL Study.

Please review the attachment regarding the Proposed PEL Approach for the I-5 Nisqually River Delta Study and sign below as your concurrence.

AC
Attachment: Proposed PEL Approach for the I-5 Nisqually River Delta Study FINAL

cc: Sharon Love, George Mazur, Lucy Temple, Jeff Sawyer, Victoria Book

Request for Concurrence

Based upon the information above, we request FHWA concurrence on the reason and desired outcomes for the WSDOT I-5 Nisqually River Delta PEL Study.

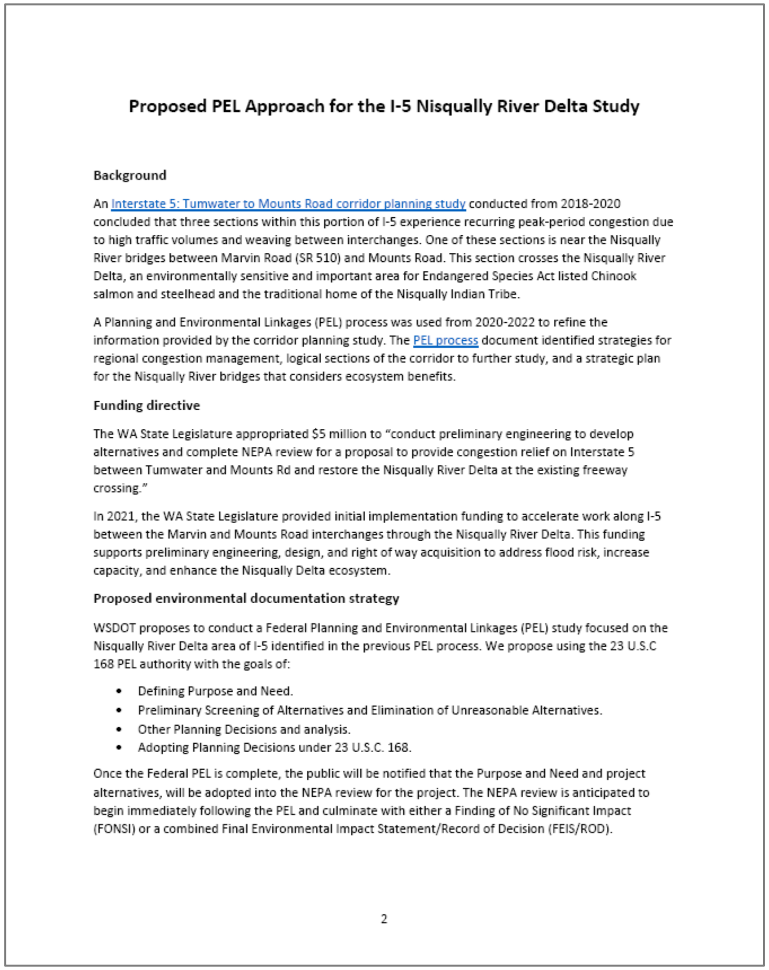
SHARON P LOVE Digitally signed by SHARON P LOVE
Date: 2022.09.08 13:10:58 -07'00'

9/8/2022

for

Liana Liu, P.E. **Date**

FHWA Washington Division Area Engineer



Proposed PEL Approach for the I-5 Nisqually River Delta Study

Background

An Interstate 5: Tumwater to Mounts Road corridor planning study conducted from 2018-2020 concluded that three sections within this portion of I-5 experience recurring peak-period congestion due to high traffic volumes and weaving between interchanges. One of these sections is near the Nisqually River bridges between Marvin Road (SR 510) and Mounts Road. This section crosses the Nisqually River Delta, an environmentally sensitive and important area for Endangered Species Act listed Chinook salmon and steelhead and the traditional home of the Nisqually Indian Tribe.

A Planning and Environmental Linkages (PEL) process was used from 2020-2022 to refine the information provided by the corridor planning study. The PEL process document identified strategies for regional congestion management, logical sections of the corridor to further study, and a strategic plan for the Nisqually River bridges that considers ecosystem benefits.

Funding directive

The WA State Legislature appropriated $5 million to "conduct preliminary engineering to develop alternatives and complete NEPA review for a proposal to provide congestion relief on Interstate 5 between Tumwater and Mounts Rd and restore the Nisqually River Delta at the existing freeway crossing."

In 2021, the WA State Legislature provided initial implementation funding to accelerate work along I-5 between the Marvin and Mounts Road interchanges through the Nisqually River Delta. This funding supports preliminary engineering, design, and right of way acquisition to address flood risk, increase capacity, and enhance the Nisqually Delta ecosystem.

Proposed environmental documentation strategy

WSDOT proposes to conduct a Federal Planning and Environmental Linkages (PEL) study focused on the Nisqually River Delta area of I-5 identified in the previous PEL process. We propose using the 23 U.S.C 168 PEL authority with the goals of:

- Defining Purpose and Need.
- Preliminary Screening of Alternatives and Elimination of Unreasonable Alternatives.
- Other Planning Decisions and analysis.
- Adopting Planning Decisions under 23 U.S.C. 168.

Once the Federal PEL is complete, the public will be notified that the Purpose and Need and project alternatives, will be adopted into the NEPA review for the project. The NEPA review is anticipated to begin immediately following the PEL and culminate with either a Finding of No Significant Impact (FONSI) or a combined Final Environmental Impact Statement/Record of Decision (FEIS/ROD).

2

Proposed PEL study area

The proposed project area includes eleven I-5 bridges that cross the Nisqually River Delta. The project area closely aligns with the Nisqually River drainage basin boundary/watershed.

The project area is situated between the urbanized areas in Thurston County and Joint Base Lewis McChord. The land uses immediately adjacent to the facility are mostly rural, including farmland and a Section 4(f) property, with minimal residences or businesses. JBLM is located northeast of the project area and is accessed from I-5. A growing logistics center and multiple population centers are accessible through the I-5 Marvin Rd interchange (Exit 111).

Figure 1. Proposed PEL study area.

The proposed project limits for the Federal PEL are from the I-5 Marvin Rd interchange (Exit 111) to the Mounts Rd interchange (Exit 116).

- **South end terminus**: The Marvin Rd (SR 510) interchange provides primary access to Yelm, eastern Thurston County, and to freight traffic to/from Hawks Prairie Business District. South of Marvin Rd, local trips, within Thurston County, begin to dominate I-5 usage.
- **North end terminus**: An approved and fully funded separate project is scheduled to construct HOV lanes from the JBLM Main Gate interchange (Exit 119) to the vicinity of the Mounts Rd interchange (Exit 116), beginning in 2023.

Unusual circumstances

a) I-5 is a critical highway connection serving Interstate travel between Canada and Mexico, as well as linking Pierce and Thurston County. The I-5 Nisqually River Delta crossing is vulnerable to flooding as climate change causes sea level rise and increased extreme flood events.

b) The Nisqually River Delta is a high-quality and essential fish habitat for species covered under the Endangered Species Act and other species.

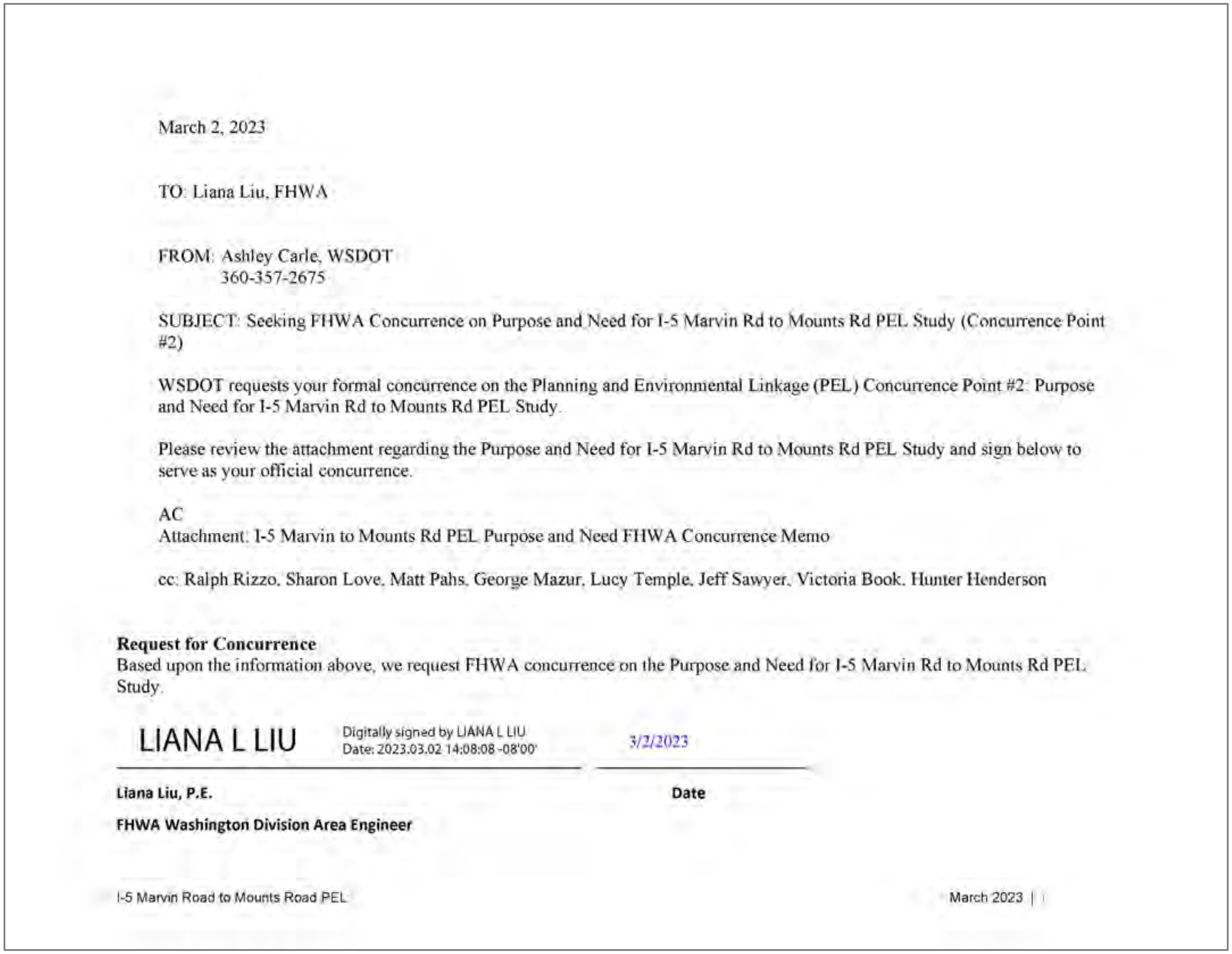
c) The I-5 crossing is not designed to accommodate river channel migration. A river bend is moving toward the NB bridge abutment and poses risks to the I-5 crossing, salmon habitat, and river hydrogeomorphic processes.

d) WSDOT signed a Memorandum of Understanding with the Nisqually Indian Tribe (NIT) describing our "desire to work cooperatively to plan, design, permit and construct the I-5 crossing of the Nisqually Delta". The project is being actively supported by NIT who anticipates a cooperating agency role during the NEPA process.

e) I-5 is adjacent to the Billy Frank Jr. Nisqually National Wildlife Refuge, a Section 4(f) property.

f) Joint Base Lewis McChord (JBLM) is located on the northeastern end of the project area in Pierce County. It is currently the largest single employment site in Washington State with commuters traveling through the project area.

Concurrence Point #2



March 2, 2023

TO: Liana Liu, FHWA

FROM: Ashley Carle, WSDOT
360-357-2675

SUBJECT: Seeking FHWA Concurrence on Purpose and Need for I-5 Marvin Rd to Mounts Rd PEL Study (Concurrence Point #2)

WSDOT requests your formal concurrence on the Planning and Environmental Linkage (PEL) Concurrence Point #2: Purpose and Need for I-5 Marvin Rd to Mounts Rd PEL Study.

Please review the attachment regarding the Purpose and Need for I-5 Marvin Rd to Mounts Rd PEL Study and sign below to serve as your official concurrence.

AC
Attachment: I-5 Marvin to Mounts Rd PEL Purpose and Need FHWA Concurrence Memo

cc: Ralph Rizzo, Sharon Love, Matt Pahs, George Mazur, Lucy Temple, Jeff Sawyer, Victoria Book, Hunter Henderson

Request for Concurrence
Based upon the information above, we request FHWA concurrence on the Purpose and Need for I-5 Marvin Rd to Mounts Rd PEL Study.

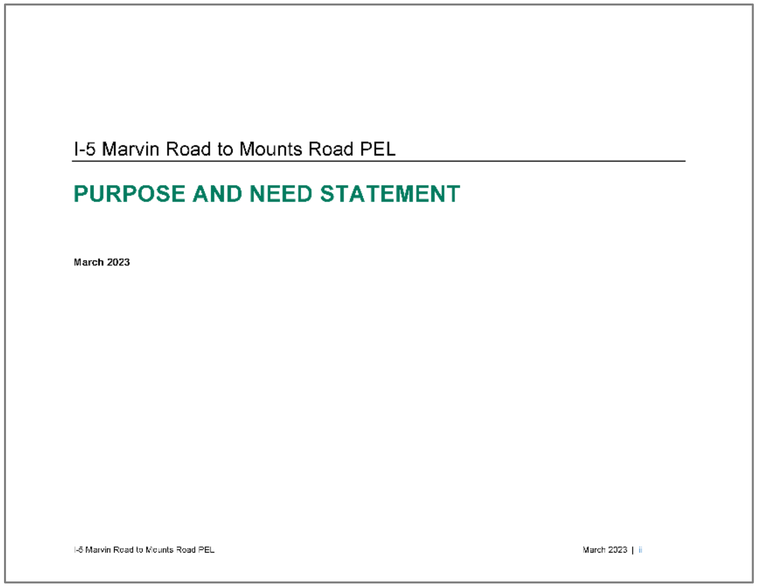
LIANA L LIU
Digitally signed by LIANA L LIU
Date: 2023.03.02 14:08:08 -08'00'

3/2/2023

Liana Liu, P.E. **Date**

FHWA Washington Division Area Engineer

I-5 Marvin Road to Mounts Road PEL March 2023 |

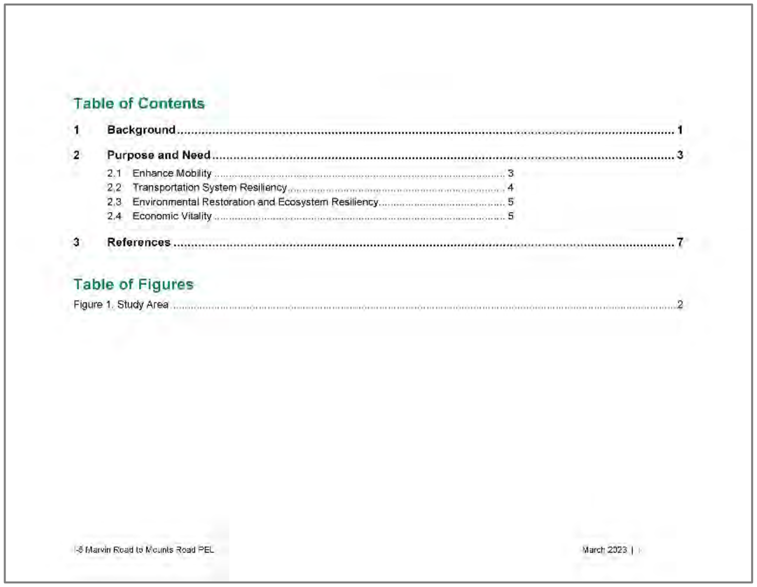


I-5 Marvin Road to Mounts Road PEL

PURPOSE AND NEED STATEMENT

March 2023

I-5 Marvin Road to Mounts Road PEL March 2023 | ii



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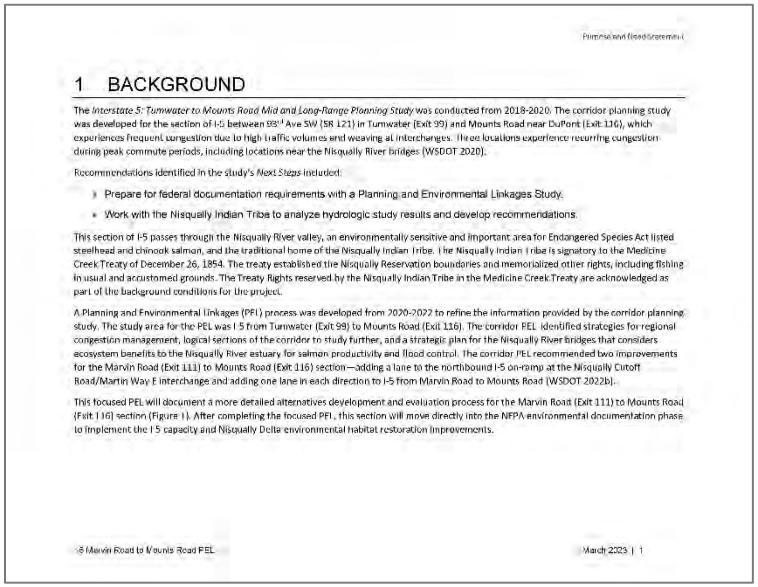


Purpose and Need Statement

1 BACKGROUND

The *Interstate 5: Tumwater to Mounts Road Mid and Long-Range Planning Study* was conducted from 2018-2020. The corridor planning study was developed for the section of I-5 between 93rd Ave SW (SR 121) in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116), which experiences frequent congestion due to high traffic volumes and weaving at interchanges. Three locations experience recurring congestion during peak commute periods, including locations near the Nisqually River bridges (WSDOT 2020).

Recommendations identified in the study's *Next Steps* included:

- Prepare for federal documentation requirements with a Planning and Environmental Linkages Study.
- Work with the Nisqually Indian Tribe to analyze hydrologic study results and develop recommendations.

This section of I-5 passes through the Nisqually River valley, an environmentally sensitive and important area for Endangered Species Act listed steelhead and chinook salmon, and the traditional home of the Nisqually Indian Tribe. The Nisqually Indian Tribe is signatory to the Medicine Creek Treaty of December 26, 1854. The treaty established the Nisqually Reservation boundaries and memorialized other rights, including fishing in usual and accustomed grounds. The Treaty Rights reserved by the Nisqually Indian Tribe in the Medicine Creek Treaty are acknowledged as part of the background conditions for the project.

A Planning and Environmental Linkages (PEL) process was developed from 2020-2022 to refine the information provided by the corridor planning study. The study area for the PEL was I-5 from Tumwater (Exit 99) to Mounts Road (Exit 116). The corridor PEL identified strategies for regional congestion management, logical sections of the corridor to study further, and a strategic plan for the Nisqually River bridges that considers ecosystem benefits to the Nisqually River estuary for salmon productivity and flood control. The corridor PEL recommended two improvements for the Marvin Road (Exit 111) to Mounts Road (Exit 116) section—adding a lane to the northbound I-5 on-ramp at the Nisqually Cutoff Road/Martin Way E interchange and adding one lane in each direction to I-5 from Marvin Road to Mounts Road (WSDOT 2022b).

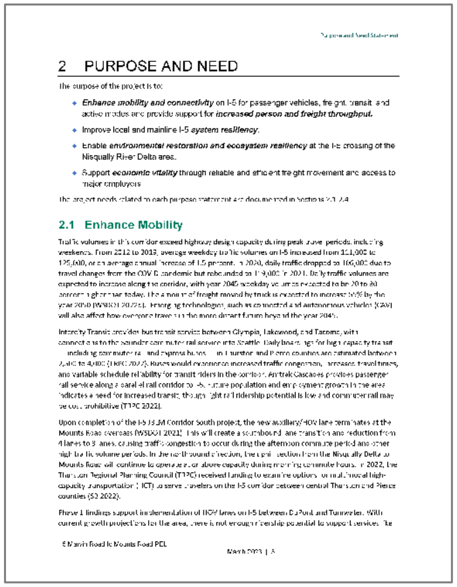
This focused PEL will document a more detailed alternatives development and evaluation process for the Marvin Road (Exit 111) to Mounts Road (Exit 116) section (Figure 1). After completing the focused PEL, this section will move directly into the NEPA environmental documentation phase to implement the I-5 capacity and Nisqually Delta environmental habitat restoration improvements.

I-5 Marvin Road to Mounts Road PEL March 2023 | 1

Purpose and Need Statement

Figure 1. Study Area

I-5 Marvin Road to Mounts Road PEL March 2023 | 2

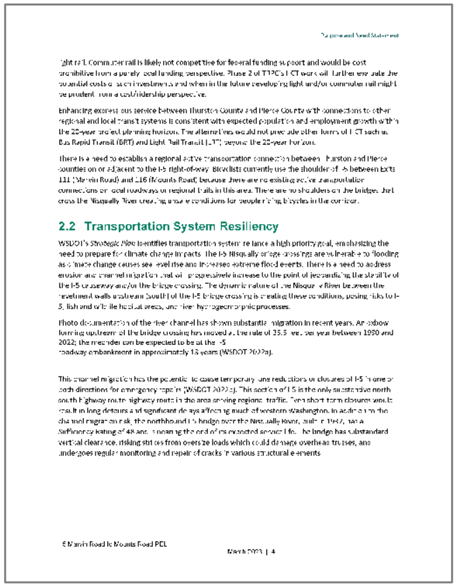


2 PURPOSE AND NEED

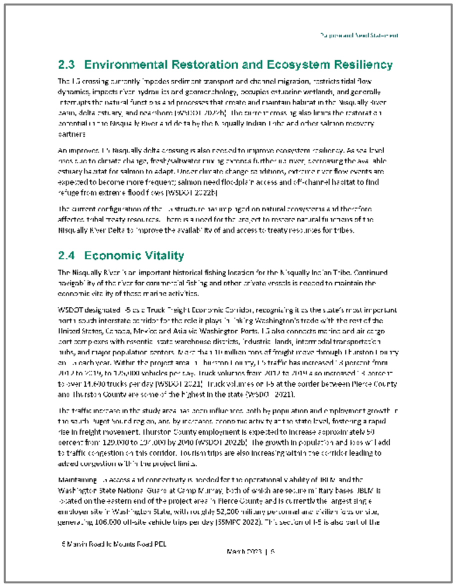
The purpose of the project is to:

- ***Enhance mobility and connectivity*** on I-5 for passenger vehicles, freight, transit, and active modes and provide support for ***increased person and freight throughput.***
- Improve local and mainline I-5 ***system resiliency***.
- Enable ***environmental restoration and ecosystem resiliency*** at the I-5 crossing of the Nisqually River Delta area.
- Support ***economic vitality*** through reliable and efficient freight movement and access to major employers.

2.1 Enhance Mobility

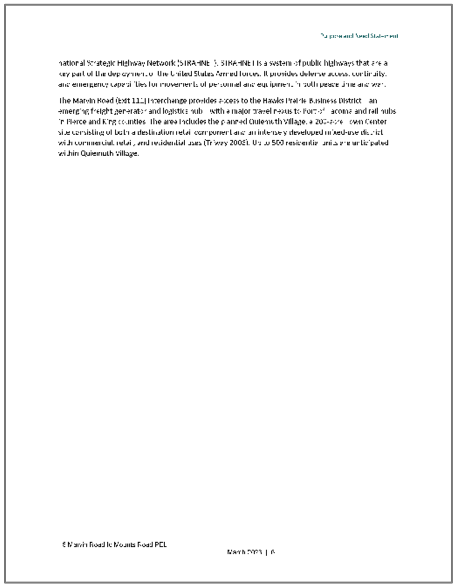


2.2 Transportation System Resiliency



2.3 Environmental Restoration and Ecosystem Resiliency

2.4 Economic Vitality



3 REFERENCES

Concurrence Point #3

May 10, 2023

TO: Liana Liu, FHWA

FROM: Ashley Carle, WSDOT
360-357-2675

SUBJECT: Seeking FHWA Concurrence on Alternatives Evaluation for I-5 Marvin Rd to Mounts Rd PEL Study (Concurrence Point #3)

WSDOT requests your formal concurrence on the Planning and Environmental Linkage (PEL) Concurrence Point #3: Alternatives Evaluation for I-5 Marvin Rd to Mounts Rd PEL Study.

Please review the attachment regarding the Alternatives Evaluation for I-5 Marvin Rd to Mounts Rd PEL Study and sign below to serve as your official concurrence.

AC
Attachment: I-5 Marvin to Mounts Rd PEL Study Alternatives Evaluation Memo

cc: Ralph Rizzo, Sharon Love, Matt Pahs, JoAnn Schueler, Gaius Sanoy, George Mazur, Lucy Temple, Victoria Book, Hunter Henderson; Hillary Pope, John Perlic

Request for Concurrence
Based upon the information above, we request FHWA concurrence on the Alternatives Evaluation for I-5 Marvin Rd to Mounts Rd PEL Study.

LIANA L LIU Digitally signed by LIANA L LIU
Date: 2023.05.11 11:27:21 -07'00'

5/11/2023

____ ____________________

Liana Liu, P.E. Date
FHWA Washington Division Area Engineer

B FHWA WSDOT PEL QUESTIONNAIRE

WSDOT PEL Questionnaire

The following information is consistent with the applicable PEL authorities (23 USC 168 and 23 CFR 450) and other FHWA policy on PEL process.

This questionnaire is intended to act as a summary of the Planning and Environmental Linkages (PEL) process and ease the transition from the PEL study to a National Environmental Policy Act (NEPA) analysis. Often, there is no overlap in personnel between the planning and NEPA project phases, so consequently much (or all) of the history of decisions, etc., is not passed along. Analysis details may differ between planning processes And NEPA project teams often inadvertently re-do work that was completed during the planning process.

Planning teams should be cautious during the alternative screening process, focusing on purpose and need, fatal flaw analysis, and possibly mode selection, to minimize problems during resource agency coordination. Alternatives that have fatal flaws or do not meet the purpose and need cannot be considered viable alternatives, even if they reduce impacts to a particular resource.

At the inception of the PEL study, the study team should decide how the work may later be incorporated into subsequent NEPA efforts. A key consideration is whether the PEL study will meet standards established by NEPA regulations and guidance. One example is the use of terminology consistent with NEPA vocabulary (e.g., purpose and need, alternatives, affected environment, environmental consequences).

Instructions: This questionnaire is a beneficial tool to keep leadership and program managers updated on a study’s progress. PEL study teams should review this questionnaire before starting a PEL, use it as a guide throughout the planning process, complete it as the study progresses, and attach it to the final PEL study as an executive summary, chapter, or appendix. Some of the basic questions to consider are: “What did you do?”, “What didn't you do?”, and “Why?”. PEL teams will include the completed questionnaire along with the PEL study submittal for FHWA review. FHWA will use this questionnaire to assist in determining if the results of the PEL can be incorporated into the NEPA process.

1. Background:

a. What is the name of the PEL document and other identifying project information (e.g., sub-account or STIP numbers)?

I-5 Marvin to Mounts Road Preliminary Environmental Linkages (PEL) Study

b. Who is the lead agency for the study? (FHWA, FTA, WSDOT, Local Agency)

Federal Highways Administration (FHWA) and Washington State Department of Transportation (WSDOT)

c. Provide a brief chronology of the planning activities (PEL study) including the year(s) the studies were completed.

2018-2020	Interstate 5: Tumwater to Mounts Road Mid and Long-Range Planning Study
2021-2022	I-5 Tumwater to Mounts Road PEL Study

d. Provide a description of the existing transportation corridor, including project limits, length of study corridor, modes, functional classification number of lanes, shoulder, access control and type of surrounding environment (urban vs. rural, residential vs. commercial, etc.)

I-5 is an important interstate freeway for both freight and commuter traffic in the south Puget Sound. It has three general purpose traffic lanes in each direction and a speed limit of 60 mph. I-5 is designated as an interstate freeway and is a part of the National Highway System. The transportation study area includes a 4.7-mile stretch of I-5 between the Marvin Road and Mounts Road interchanges, with three interchanges in the area: Marvin Road NE (Exit 111), Brown Farm Road NE/Nisqually Cut Off Road SE (Exit 114), and Mounts Road/Nisqually Road SW (Exit 116). The Marvin Road NE interchange is a diverging diamond interchange, the Brown Farm Road NE/Nisqually Cut Off Road SE interchange is similar to a typical diamond interchange, and the Mounts Road/Nisqually Road SW interchange is a diamond interchange. Currently, I-5 is three lanes in each direction between Mounts Road and Marvin Road.

While I-5 is the primary highway through the study area, a network of other state highways and local roads serve residents, travelers, and businesses from in and outside the region, with around 2,400 centerline miles of roads in Thurston County. However, very few local roads provide alternate paths to I-5 between Marvin Road NE and Mounts Road. There are only a few locations to cross I-5 in the study area, which concentrates traffic on certain local roads and encourages the use of I-5. This causes congestion and reduces the likelihood of people using active modes.

The areas surrounding the Marvin Road and Mounts Road interchanges (project termini) are developed

e. Who was included on the study team (Name and title of agency representatives, consultants, etc.)?

FHWA	
Sharon Love	Environmental Program Manager
Liana Lui	Olympic Region Area Engineer
WSDOT	
Ashley Carle	Multimodal Development Manager
George Mazur	Olympic Region Planning Manager
Hunter Henderson	Transportation Specialist
Mark Krulish	Project Communicator
Stefanie Randolph	Communications Manager
Lucy Temple	NEPA/SEPA/PEL Specialist
CONSULTANTS	
Parametrix	
John Perlic	Project Manager
Kirk Wilcox	Design Lead
Alex Atchison	Transportation Lead
Jenifer Young	Natural Resources Lead
Rachel Durham	Planning and Documentation
Erinn Ellig	Alternatives Evaluation Lead
Aaron Miller Paul Fendt John Phillips	Flood Plains and Sea Level Rise
Aaron Miller Julie Brandt	Surface Water and Water Quality
Mike Hall Tad Schwager	Fish/Wildlife/Vegetation
Josh Wozniak Kaylee Moser	Wetlands and Other Waters
Fred Young	Active Transportation
Joe Merth	Structures

SCJ Alliance	
Sharese Graham	Environmental Lead
Laura Barker	Planner
PRR	
Lauren Wheeler	Communications Lead
Hayley Nolan	Public Outreach
Confluence Environmental Company	
Sasha Visconty	Tribal Coordination
Calvin Douglas	Fisheries
Concord Engineering	
Tony Woody	Traffic Demand Modeling
HWA GeoSciences	
Sandy Brodahl	Geotechnical
Michael Minor & Associates	
Michael Minor	Air Quality/GHG/Energy and Noise
Osborn Consulting	
Deepa Mungasavalli	Water Resources
Swapna Sridharan	Stormwater
Ott-Sakai & Associates	
Kevin Sakai	Concept Design/Cost Estimates
RHC Engineering	
Suryata Halim	Highway/Interchange Design
Jane Li	Structures
West Consultants	
Andreas Kammereck	River Geomorphology
Willamette Cultural Resources Associates	
Austin Jenkins	Cultural Resources

f. List the recent, current, or near future planning studies or projects in the vicinity? What is the relationship of this study to those studies/projects?

I-5 Mounts Road to Thorne Lane Interchange – Corridor Improvements

The project would widen seven miles of Interstate 5 in Pierce County, from DuPont to Lakewood, adding an HOV lane in each direction. The proposed changes would reduce chronic traffic congestion through the JBLM corridor. The southern terminus of this project aligns with the northern terminus of the I-5 Marvin to Mounts Road PEL Study.

I-5 Tumwater to Mounts Road Mid and Long-Range Planning Study

The Interstate 5: Tumwater to Mounts Road Mid and Long-Range Planning Study was conducted from 2018-2020. The corridor planning study was developed for the section of I-5 between 93rd Ave SW (SR 121) in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116). Three locations experience recurring congestion during peak commute periods, including locations near the Nisqually River bridges (WSDOT 2020). This planning study includes the I-5 Marvin to Mounts Road PEL Study corridor.

I-5 Tumwater to Mounts Road PEL Study

A PEL process was developed from 2020-2022 to refine the information provided by the corridor planning study. The study area for the PEL was I-5 from Tumwater (Exit 99) to Mounts Road (Exit 116). The corridor PEL identified strategies for regional congestion management, logical sections of the corridor to study further, and a strategic plan for the Nisqually River bridges that considers ecosystem benefits to the Nisqually River estuary for salmon productivity and flood control. This PEL Study identified the Marvin to Mounts Road corridor for further analysis in a focused PEL.

I-5 Tumwater to Mounts Road, US-101 to Marvin Road NE

WSDOT is planning to advance the recommended widening of I-5, US-101/I-5 interchange improvements, Martin Way interchange improvements, and Part Time Shoulder Use (PTSU) project recommendations from the I-5 Tumwater to Mounts Road PEL Study in Section 1—US-101 to Pacific Avenue SE and Section 2—Pacific Avenue SE to Marvin Road NE. Initial NEPA work in Sections 1 & 2 will begin in 2023.

I-5 Tumwater to Mounts Road, Projects in Parallel Corridors to I-5

WSDOT is planning to advance recommended projects in parallel corridors to I-5 from the I-5 Tumwater to Mounts Road PEL Study. Projects include:

- 3 roundabouts on SR-507 east of Yelm at SR-702, Vail Road, and Bald Hill Road.

- A roundabout at the US-12/183rd Avenue in the City of Rochester

I-5 – SR 510 Interchange – Reconstruct Interchange, completed August 2021

WSDOT completed improvements at the I-5/SR-510 (Marvin Road NE) interchange in 2021. This was the first ‘diverging diamond’ interchange constructed in the State of Washington.

2. Methodology used:

a. Did the Study follow the FHWA PEL Process? If the Study was conducted by another US DOT Agency, provide a crosswalk table to demonstrate how the FHWA Process was utilized.

The I-5 Marvin Road to Mounts Road PEL Study is following 23 USC 168.

b. How did the Study meet each of the PEL coordination Points identified in 23 USC 168?

Concurrence Point #1 – Reason and Desired Outcomes

The WA State Legislature appropriated $5 million to “conduct preliminary engineering to develop alternatives and complete NEPA review for a proposal to provide congestion relief on Interstate 5 between Tumwater and Mounts Rd and restore the Nisqually River Delta at the existing freeway crossing.”

In 2021, the WA State Legislature provided initial implementation funding to accelerate work along I-5 between the Marvin and Mounts Road interchanges through the Nisqually River Delta. This funding supports preliminary engineering, design, and right of way acquisition to address flood risk, increase capacity, and enhance the Nisqually Delta ecosystem.

WSDOT proposes to conduct a Federal Planning and Environmental Linkages (PEL) study focused on the Nisqually River Delta area of I-5 identified in the previous PEL process. We propose using the 23 U.S.C. 168 PEL authority with the goals of:

- Defining Purpose and Need.
- Preliminary Screening of Alternatives and Elimination of Unreasonable Alternatives.
- Other Planning Decisions and analysis.
- Adopting Planning Decisions under 23 U.S.C. 168.

Once the Federal PEL is complete, the public will be notified that the Purpose and Need and project alternatives, will be adopted into the NEPA review for the project. The NEPA review is anticipated to begin immediately following the PEL and culminate with either a Finding of No Significant Impact (FONSI) or a combined Final Environmental Impact Statement/Record of Decision (FEIS/ROD).

FHWA provided concurrence on the reason and desired outcomes for the WSDOT I-5 Marvin to Mounts Road PEL Study on September 8, 2022.

Concurrence Point #2 – Purpose and Need

WSDOT engaged with the tribes, agencies, stakeholders, and the public to get input on the Purpose and Need for the PEL Study. Input and agreement on the Draft Purpose and Need statement was requested via the Agency, Technical, and Executive Advisory Groups, the public through various online platforms, and the tribes through formal government-to-government consultation. After considering all comments received, the Purpose and Need statement was revised.

FHWA provided concurrence on the Purpose and Need for the WSDOT I-5 Marvin to Mounts Road PEL Study on March 2, 2023.

Concurrence Point #3 – Alternatives Evaluation

WSDOT engaged with the tribes, agencies, stakeholders, and the public to get input on the

Concurrence Point #4 – Final Report

TBD

c. Did you use NEPA-like language? Why or why not?

The I-5 Marvin Road to Mounts Road PEL Study is using NEPA language. WSDOT intends to adopt the PEL Purpose and Need and Preferred Alternative(s) into NEPA at the conclusion of the PEL Study.

d. If NEPA language was not used, what were the actual terms used and how did you define them? (Provide examples or table to compare with standard NEPA language

N/A

e. What were the key steps and coordination points in the PEL decision-making process? Who were the decision-makers and who else participated in those key steps? For example, for the corridor vision, the decision was made by state DOT and the local agency, with buy-in from FHWA, the USACE, and USFWS.

As the federal lead agency and partner for the I-5 Marvin to Mounts Road PEL study, FHWA is providing input and guidance throughout the process. FHWA participated in Tribal coordination and attended all advisory group meetings. Involvement in the various outreach and engagement activities allowed them to hear, first-hand, the input received from the various other participating groups on the Purpose and Need and range of alternatives for the study.

Given the significance of this area and its location in the tribe's ancestral areas, WSDOT executed a Memorandum of Agreement with the Nisqually Indian Tribe to provide them with opportunities for additional input and review during the planning process.

f. How should the PEL information be presented in NEPA?

The Purpose and Need statement and alternative(s) that receive concurrence through the PEL will be adopted for the NEPA process. The outreach and community engagement process completed during the PEL will be summarized in the document, and the activities will be continued throughout the NEPA process. The methodology and existing conditions for each discipline area will also be the basis for the impact analysis and incorporated in the NEPA document. The PEL Study will be included as an appendix to the NEPA document.

3. Agency coordination:

a. Provide a synopsis of coordination with Federal, tribal, state, and local environmental, regulatory and resource agencies. Describe their level of participation and how you coordinated with them.

WSDOT formed advisory groups and met with community-based organizations (CBOs) to provide a forum for tribal, community and stakeholder-informed decision making on the Purpose and Need and a preferred alternative to study in a NEPA environmental review. The various advisory groups and PEL study participants are listed in the following table.

PEL Study Participants

Agency Coordination Group	Technical Advisory Group	Executive Advisory Group	CBOs, Special Interest Groups, Public
Billy Frank Jr. Nisqually National Wildlife Refuge Department of Archaeology and Historic Preservation Department of Natural Resources Environmental Protection Agency Federal Emergency Management Agency Federal Highway Administration Federal Transit Administration Joint Base Lewis McChord National Marine Fisheries Service National Oceanic and Atmospheric Administration Natural Resources Conservation Service Nisqually Indian Tribe Squaxin Island Tribe of Indians US Army Corps of Engineers US Coast Guard US Fish and Wildlife Service US Geological Survey Washington Department of Fish and Wildlife Washing Department of Ecology	Billy Frank Jr. Nisqually National Wildlife Refuge City of DuPont City of Lacey City of Lakewood City of Olympia City of Tumwater City of Yelm Federal Highway Administration Foothills Rails to Trails Coalition ForeverGreen Trails Friends of Nisqually NWRC Intercity Transit Joint Base Lewis-McCord Nisqually Indian Tribe Nisqually Land Trust Nisqually River Council Pierce County Pierce Transit Port of Olympia Port of Tacoma Sound Transit South Sound Military & Communities Partnership Squaxin Island Tribe of Indians Thurston County Thurston Regional Planning Council Town of Steilacoom Washington Environmental Council Washington State Patrol	City of DuPont City of Lacey City of Lakewood City of Olympia City of Tumwater City of Yelm Federal Highway Administration Intercity Transit Joint Base Lewis-McChord Nisqually Indian Tribe Pierce County Pierce Transit Port of Olympia Port of Tacoma Thurston County Thurston Regional Planning Council Town of Steilacoom	**Community and Social Service Groups** Housing Authority of Thurston County Multicultural Child & Family Hope Center Pierce County Building and Construction Trades Council Sound Outreach Pierce County Thurston County Chamber of Commerce United Way Thurston County **Interested Parties** Alliance for a Healthy South Sound Executive Committee South Puget Sound Salmon Enhancement Group Thurston County Noxious Weeds Thurston Economic Development Council Washington Trucking Association

The Agency Coordination Group (ACG) is comprised of agency representatives from local resource agencies and tribes. The Technical Advisory Group (TAG) is comprised of agency representatives from national and local resource agencies, including tribes. The EAG is comprised of elected leaders from study area jurisdictions, tribes and counties. The first meetings for each group were held in January 2023, followed by four more meetings held in February, March, April, and May 2023. Each meeting format included a PowerPoint presentation from the project team, poll questions to gauge understanding and ask for input, open discussion, and a question-and-answer session. An agenda and meeting materials were sent in advance of each meeting and a meeting summary and request for feedback was shared following each meeting. Meeting materials summarizing meeting outcomes and what we heard, along with a recording of each meeting, are available to view on the study webpage (*I-5 Marvin Rd to Mounts Rd PEL Study Webpage*).

At the onset of the PEL process, WSDOT sent letters to initiate government-to-government consultation with seven tribes and asked for input on the planning products produced during the PEL process. Three letters were sent to request input on the Draft Purpose and Need, the range of alternatives and screening criteria, and the Draft PEL Study.

b. What transportation agencies (e.g., for adjacent jurisdictions) did you coordinate with or were involved during the PEL study? This includes all federal agencies if the study is being led by a local agency or transit-oriented study seeking to utilize the FHWA PEL Process.

WSDOT coordinated with the following transportation agencies during the PEL Study:

- FHWA
- FTA
- Surface Transportation Board
- Puget Sound Regional Council
- Pierce Transit
- Intercity Transit
- Sound Transit
- Local jurisdictions

c. What steps will need to be taken with each agency during NEPA scoping?

PEL Study established the stakeholder groups that will be carried forward into NEPA and will be offered participating or cooperating status at that time.

4. Public coordination:

a. Provide a synopsis and table of your coordination efforts with the public and stakeholders.

Coordination Efforts

Event/Milestone	Date	Topic
Public notice		Required PEL Public Notice
FHWA Concurrence Point #1	September 8, 2022	Reason and Desired Outcome for the WSDOT I-5 Marvin to Mounts Rd PEL
Nisqually Indian Tribe Coordination meeting	September 21, 2022	Monthly status meeting
Nisqually Indian Tribe Coordination meeting	November 2, 2022	Monthly status meeting
FHWA Coordination meeting	November 3, 2022	Monthly status meeting
Nisqually Indian Tribe Coordination meeting	December 7, 2022	Monthly status meeting
FHWA Coordination meeting	December 7, 2022	Monthly status meeting
FHWA Coordination meeting	January 5, 2023	Monthly status meeting
Nisqually Indian Tribe Coordination meeting	January 10, 2023	Monthly status meeting
Agency Coordination Group meeting #1	January 11, 2023	Purpose & Need
Public review /Online Open House	Jan 17-31, 2023	Purpose & Need review and input
Government-to-Government Consultation w/Tribes	Jan 17, 2023	Purpose & Need review and input
Interested parties message	Jan 10, 2023	Options to participate in project
Technical Advisory Group meeting #1	January 17, 2023	Purpose & Need review and input
Executive Advisory Group meeting #1	January 30, 2023	Purpose & Need review and input
CBO Interviews	January - February	Gather information from groups that represent EJ populations in the area
Agency Coordination Group meeting #2	February 13, 2023	Review of Level 1 screening criteria
Technical Advisory Group meeting #2	February 15, 2023	Review of Level 1 screening criteria
Executive Advisory Group meeting #2	February 21, 2023	Review of Level 1 screening criteria

Event/Milestone	Date	Topic
Public review /Online Open House	February 15 – March 1, 2023	Range of alternatives review and comment
Government-to-Government Consultation w/Tribes	February 14, 2023	Range of alternatives and screening criteria review and comment
Nisqually Indian Tribe Coordination meeting	March 1, 2023	Monthly status meeting
FHWA Concurrence Point #2	March 2, 2023	Purpose and Need for the WSDOT I-5 Marvin to Mounts Rd PEL
FHWA Coordination meeting	March 8, 2023	Monthly status meeting
Squaxin Island Tribe Coordination meeting	March 8, 2023	Project overview and review of alternatives
Agency Coordination Group meeting #3	March 13, 2023	Review public comments, Level 1 Alternatives Evaluation Results and Level 2 Criteria
Technical Advisory Group meeting #3	March 14, 2023	Review public comments, Level 1 Alternatives Evaluation Results and Level 2 Criteria
Executive Advisory Group meeting #3	March 21, 2023	Review public comments, Level 1 Alternatives Evaluation Results and Level 2 Criteria
FHWA Coordination meeting	April 12, 2023	Monthly status meeting
Nisqually Indian Tribe Coordination meeting	April 14, 2023	Monthly status meeting
Agency Coordination Group meeting #4	April 17, 2023	Review Existing Conditions summaries and Alternatives Evaluation Criteria and Results
Technical Advisory Group meeting #4	April 18, 2023	Review Existing Conditions summaries and Alternatives Evaluation Criteria and Results
Executive Advisory Group meeting #4	April 19, 2023	Review Existing Conditions summaries and Alternatives Evaluation Criteria and Results
FHWA Concurrence Point #3	May 11, 2023	Alternatives Analysis for the WSDOT I-5 Marvin to Mounts Rd PEL
Agency Coordination Group meeting #5	May 15	PEL Study and next steps
Technical Advisory Group meeting #5	May 16	PEL Study and next steps
Executive Advisory Group meeting #5	May 17	PEL Study and next steps

Event/Milestone	Date	Topic
Government-to-Government Consultation w/Tribes	May 22, 2023	PEL Study and next steps review and comment
Public notice (Mailers)	May 19	Public Review Period - Draft PEL Study
Public review /Online Open House	June 1-30	Draft PEL Study
FHWA Concurrence Point #4	TBD	Final Report for the WSDOT I-5 Marvin to Mounts Rd PEL

5. Purpose & Need:

a. What was the scope of the PEL study and the reason for completing it?

WSDOT conducted a Federal PEL study focused on the Nisqually River Delta area of I-5 identified in the previous PEL process. They used the 23 U.S.C 168 PEL authority with the goals of:

- Defining Purpose and Need.
- Preliminary Screening of Alternatives and Elimination of Unreasonable Alternatives.
- Other Planning Decisions and analysis.
- Adopting Planning Decisions under 23 U.S.C. 168.

Once the Federal PEL was complete, the public was notified that the Purpose and Need and project alternatives will be adopted into the NEPA review for the project. The NEPA review is anticipated to begin immediately following the PEL and culminate with either a Finding of No Significant Impact (FONSI) or a combined Final Environmental Impact Statement/Record of Decision (FEIS/ROD).

See FHWA Concurrence Letter, September 8, 2022.

b. What is the vision for the corridor?

WSDOT has completed studies previously within the study area that provided data and ideas for strategies to improve system performance. WSDOT and its partners considered the strategies and data from these studies when developing the I-5 Marvin to Mounts Rd PEL. The Interstate 5: Tumwater to Mounts Road Mid and Long-Range Planning Study was conducted from 2018 to 2020. The corridor planning study was developed for the section of I-5 between 93rd Ave SW (SR 121) in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116), which experiences frequent congestion due to high traffic volumes and weaving at interchanges.

A PEL process was developed from 2020 to 2022 to refine the information provided by the corridor planning study. The study area for the PEL was I-5 from Tumwater (Exit 99) to Mounts Road (Exit 116). The corridor PEL identified strategies for regional congestion management, logical sections of the corridor to study further, and a strategic plan for the Nisqually River bridges that considers ecosystem benefits to the Nisqually River estuary for salmon productivity and flood control. The corridor PEL recommended two improvements for the Marvin Road (Exit 111) to Mounts Road (Exit 116) section: adding a lane to the northbound I-5 on-ramp at the Nisqually Cutoff Road/Martin Way E interchange and adding one lane in each direction to I-5 from Marvin Road to Mounts Road (WSDOT and TRPC 2022b).

c. What were the goals and objectives?

WSDOT did not develop specific goals and objectives for the I-5 Marvin to Mounts Rd PEL. Instead, one of the focus points for the PEL process was to fully develop the Purpose and Need statement for adoption into NEPA. The Purpose and Need for the project is described below and in Section 1.7 of the PEL Study.

d. What is the PEL the Purpose & Need statement?

The purpose of the project is to:

- ***Enhance mobility and connectivity*** on I-5 for passenger vehicles, freight, transit, and active modes and provide support for ***increased person and freight throughput***.
- Improve local and mainline I-5 ***system resiliency***.
- Enable ***environmental restoration and ecosystem resiliency*** at the I-5 crossing of the Nisqually River Delta area.
- Support ***economic vitality*** through reliable and efficient freight movement and access to major employers.

Section 1.7.2 of the PEL Study describes the Need statements for the project.

e. What steps will need to be taken during the NEPA process to make this a project-level purpose and need statement?

WSDOT’s intent is to review and get input on the Purpose and Need during coordination with the agencies, tribes, and other stakeholders during the PEL process so that it can be adopted into NEPA. During this process, WSDOT will receive written concurrence from FHWA on the Purpose and Need Statement (Concurrence Point #2) and on the PEL Study Study (Concurrence Point #4). In addition, written concurrence on the Purpose and Need will be sought from the participating tribes during government-to-government consultation.

Additional input on the Purpose and Need will be sought during NEPA scoping. “Adoption” of the Purpose and Need happens when NEPA is formally initiated with issuance of the Notice of Intent, which will explain the PEL Study planning products. The PEL Study will be incorporated by reference in the NEPA document.

6. Range of alternatives considered, screening criteria, and screening process:

a. What types of alternatives were looked at? (Provide a one or two sentence summary and reference document.)

The alternatives evaluated in the Initial Evaluation for the I-5 Marvin Road to Mounts Road section were identified based on information in the Interstate 5: Tumwater to Mounts Road Mid- and Long-Range Strategies Report (April 2020) and the Interstate 5 Tumwater to Mounts Road PEL Study (March 2022). For additional information, see Section 3 of the PEL Study for a full description of the alternatives evaluated in the PEL process.

b. How did you select the screening criteria and screening process?

The Initial Evaluation methodology was developed to measure how well each of the alternatives meet the draft Purpose and Need for the Project. Evaluation criteria identified for the Initial Evaluation are based on the draft purpose and need statements for the project. The analysis in the Initial Evaluation stage is primarily qualitative with some quantitative data used to develop performance ratings. A three-point rating scale was used to evaluate the alternatives: low performance, moderate performance, and high performance. See Section 4 of the PEL Study for a full description of the screening criteria and process.

c. For alternative(s) that were screened out, briefly summarize the reasons for eliminating or not recommending the alternative(s). (During the initial screenings, this generally will focus on fatal flaws.)

Alternatives that were screened out in the Level 1 screening were those that did not meet the Purpose and Need for the project. The remaining alternatives were evaluated in the Level 2 screening process for their performance in meeting the Purpose and Need for the project. For a detailed description of the screening process and results, see Section 4.3 of the PEL Study.

d. How did the team develop Alternatives? Was each alternative screened consistently?

The range of reasonable alternatives evaluated in the Initial Evaluation for the I-5 Marvin Road to Mounts Road section were identified based on information in the Interstate 5: Tumwater to Mounts Road Mid- and Long-Range Strategies Report (April 2020) and the Interstate 5 Tumwater to Mounts Road PEL Study (March 2022). This range of alternatives include:

- Alternative 1 — Operations Improvements (Design Options A through C)
- Alternative 2 — Widen I-5 for HOV lanes (Design Options A through D)
- Alternative 3 — Widen I-5 for GP lanes (Design Options A through D)
- Alternative 4 — Convert I-5 lanes from GP to HOV Lanes

Design Options A through D for Alternatives 2 and 3 and Design Options A through C for Alternatives 1 and 4 explored different bridge length options through the Nisqually River delta area including the Nisqually River crossing. This provided a range of options to consider for I-5 as well as providing ecosystem and habitat mitigation in the Nisqually River delta area. Table 4 summarizes the key components of each alternative.

The evaluation criteria selected to evaluate the proposed alternatives were developed based on the Purpose and Need Memorandum for the study. The Alternatives Screening was completed in two phases: Initial Evaluation and Detailed Evaluation. The Initial Evaluation consisted of a larger number of alternatives at a broader level, which eliminated unsuitable alternatives that did not meet the project's purpose and need. Alternatives with better performance were then advanced to the Detailed Evaluation, which provided a more thorough assessment of each alternative for inclusion in the NEPA documentation. This process was informed by federal, state, and local agencies; tribes; and other advisory-level stakeholders through regular coordination meetings, including the following three advisory groups throughout the PEL process.

The screening process was consistent for all alternatives and is described in more detail in Section 4 of the PEL Study.

e. Which alternatives were recommended? Which should be brought forward into NEPA and why?

Alternative 2—Widening for HOV Lanes was identified as the preferred alternative and is recommended for advancement into NEPA. This alternative adds one HOV lane in each direction from Marvin Road to Mounts Road and performed higher overall in the detailed evaluation compared to Alternative 3—Widening for GP Lanes.

In the *Enhance Mobility and Connectivity* category, **Alternative 2** improves travel times and reduces congestion for general purpose vehicles/trucks and HOV/transit vehicles.

In the *Economic Vitality* category - Alternative 2 performs high in the Access to Opportunity criteria.

f. Did the public, stakeholders, and agencies have an opportunity to comment during this process? Summarize the amount of public interest in the PEL Study.

This alternatives evaluation process was informed by federal, state, and local agencies; tribes; and other advisory-level stakeholders through regular coordination meetings, including the following three advisory groups throughout the PEL process.

Each group reviewed and provided input on the alternatives evaluation process, including review of the evaluation criteria, alternatives considered, initial evaluation, and detailed evaluation. The input received on the alternatives and evaluation criteria through the three advisory groups were incorporated into the alternatives evaluation, as appropriate. A project website also provided the opportunity for the public to provide input on the alternatives identification and evaluation process.

The WSDOT team held an online open house from February 15 to March 1, 2023 for public comments on the screening alternatives. Over 250 comments were received. What we heard:

- Consider an elevated roadway through this area to mitigate the impacts to fish and wildlife.
- Consider the impacts on induced demand from additional capacity.
- Improve existing and create new alternative routes around I-5.
- Keep I-5 open during construction.
- Maintain access to the Nisqually interchange (Exit 114).
- Build a freight-only lane.

g. Were there unresolved issues with the public, stakeholders, and/or agencies?

Although there was a large range of opinions on the alternatives, there are no unresolved issues.

7. Planning assumptions and analytical methods:

a. What is the forecast year used in the PEL study?

The traffic forecast and operations analysis will be conducted for the Existing Year 2023 and Horizon Year 2045.

b. What method was used for forecasting traffic volumes?

Year 2045 was selected because it is at least 20 years in the future, consistent with WSDOT's Interstate 5: Tumwater to Mounts Road Planning and Environmental Linkages Study (2022),and is consistent with TRPC's recently adopted updated to the Population and Employment forecast. Interim years (assuming a straight-line growth percentage) may be analyzed to support a practical implementation plan for the preferred alternative.

c. Are the planning assumptions and the corridor vision/purpose and need statement consistent with the long-range transportation plan?

Yes, as described above.

d. What were the future year policy and/or data assumptions used in the transportation planning process related to land use, economic development, transportation costs and network expansion?

See Section 1.6 of the PEL Study for the Planning Context.

8. What pieces of the PEL can transfer directly to the NEPA phase of a project?

The Purpose and Need for the project, the preferred alternative along with the justification for elimination of unreasonable alternatives, will be adopted into NEPA. Request for additional input on the Purpose and Need and alternatives will be sought during NEPA scoping. The methodology and existing conditions information prepared for each of the environmental disciplines also will be incorporated into the NEPA document.

9. Resources (wetlands, cultural, etc.) reviewed. For each resource or group of resources reviewed, provide the following:

a. In the PEL study, at what level of detail were the resources reviewed and what was the method of review?

The following resources were evaluated in the PEL:

- Stormwater and Water Quality
- Wetlands and Other Waters
- Fish, Wildlife, and Vegetation
- Floodplains and Sea Level Rise
- Geology and Soils
- Visual Quality
- Air Quality, GHG and Energy
- Cultural and Historic
- Noise
- Hazardous Materials
- Land Use, Farmlands and Section 6(f)
- Section 4(f)
- Socioeconomic and Environmental Justice

For each resource area, methodologies were developed for identifying data sources and evaluating impacts. Existing conditions were documented after completing fieldwork, where required.

b. Is this resource present in the area and what is the existing environmental condition for this resource?

A full description of the resources present in the study area and their existing conditions is included in Section 6 of the PEL Study.

c. What are the issues that need to be considered during NEPA, including potential resource impacts and potential mitigation requirements (if known)?

To fully analyze the potential effects of implementation of the preferred alternative, the NEPA phase will include the completion of impact assessments for each discipline identified during the PEL process. The Existing Conditions memoranda will be expanded into full Discipline Reports with the inclusion of those impact assessments and mitigation measures, where appropriate, based on the preliminary design of the preferred alternative and bridge design options.

d. How will the data provided need to be supplemented during NEPA?

Additional data collection, modeling, and coordination with agencies is anticipated. The next steps required to complete the Discipline Reports are described in Section 6 of the PEL Study, and in the Existing Conditions memoranda.

10. List resources that were not reviewed in the PEL study and why? Indicate whether they will need to be reviewed in NEPA and explain why.

In addition to those disciplines listed above, the NEPA document will also consider indirect and cumulative effects of the project. WSDOT will document potential indirect and cumulative effects for each discipline area as well as looking at the corridor and potentially region wide effect.

11. Were cumulative impacts considered in the PEL study? If yes, provide the information or reference where the analysis can be found.

Cumulative impacts were not considered in this PEL study, but is identified as a next step in the NEPA process.

12. Describe any mitigation strategies discussed at the planning level that should be analyzed during NEPA.

Mitigation strategies were not included in the PEL process, but will be explored in detail during NEPA.

13. What needs to be done during NEPA to make information from the PEL study available to the agencies and the public? Are there PEL study products which can be used or provided to agencies or the public during the NEPA scoping process?

All the PEL planning products were made available to the agencies, tribes, stakeholder groups and the public for review and comment. It is WSDOT’s intent to continue and expand upon the community and agency outreach that was completed as part of the PEL process (as described in Section 2, above) as the project moves into NEPA. WSDOT will continue to engage the Agency, Technical, and Executive Advisory Groups and tribes by holding regular meetings throughout the NEPA process to gain their input on the analysis and key decision points. At that time, the resource agencies and tribes will be invited to be either Cooperating or Participating agencies during the NEPA process. Other outreach will include, at a minimum:

- Continue government-to-government coordination with the tribes.
- Maintaining the project website with up-to-date information and project materials.
- Holding online and in-person open houses to provide project progress updates to the surrounding communities and solicit input.
- Holding regular briefings with non-governmental, community organizations and other groups that have requested them.
- Direct engagement with adjacent property owners to keep them apprised of the project progress and process, and to gain their input on aspects of the project that may directly impact them.
- Focused outreach to disadvantaged and overburdened communities.

14. Are there any other issues a future project team should be aware of?

a. Examples: Utility problems, access or ROW issues, encroachments into ROW, problematic landowners and/or groups, contact information for stakeholders, special or unique resources in the area, etc.

- Likely impacts to Section 4(f), Section 6(f) and cultural resources directly adjacent to the I-5 ROW
    - Medicine Creek Treaty National Memorial Site
    - Billy Frank Jr. Nisqually National Wildlife Refuge
- Potential impacts to agriculture due to saltwater intrusion

- Nisqually River Delta environmental considerations
- Lay down conduit for future utilities (would be included in the ITS component of the project)
- Potential encroachments into ROW for construction staging
- Maintaining access to wildlife refuge at all times, possible but needs coordination

15. Provide a table of identified projects and/or a proposed phasing plan for corridor build out.

Potential phasing:

- Phase 1 – Construct temporary widening of southbound I-5 into the median and shift the southbound I-5 lanes. Construct temporary widening of northbound I-5 at spot locations, including temporary bridges (Nisqually River truss bridge and south overflow channel bridge)
- Phase 2 – Construct the new southbound I-5 and shared-use path roadway and temporarily relocate the existing southbound and northbound I-5 lanes (six total) onto the new roadway. Demolish the existing I-5 northbound and southbound roadways and embankments.
- Phase 3 – Construct the new northbound roadway, relocate northbound I-5 traffic onto the new northbound lanes, and build the shared-use path on the north side of the southbound lanes.

16. Provide a list of what funding sources have been identified to fund projects from this PEL?

In 2021, the state Legislature provided initial implementation funding to accelerate work along I-5 between the Marvin Road (Exit 111) and Mounts Road (Exit 116) section interchanges through the Nisqually River Delta. This funding supports preliminary engineering, design, and right of way (ROW) acquisition to increase capacity, address flood risk, and enhance the Nisqually Delta ecosystem. This focused PEL will document a more detailed alternatives development and evaluation process for the Marvin Road (Exit 111) to Mounts Road (Exit 116) section. After completing the PEL, this section will move directly into the NEPA environmental documentation phase to implement the I-5 capacity and Nisqually Delta environmental habitat restoration improvements.

C COORDINATION AND PUBLIC PARTICIPATION SUMMARY

1 INTRODUCTION

The Washington State Department of Transportation (WSDOT), in cooperation with the Federal Highway Administration (FHWA), conducted a Planning and Environmental Linkages (PEL) Study to identify a long-term solution for northbound and southbound Interstate 5 (I-5) between the Marvin Road interchange (Exit 111) to the Mounts Road interchange (Exit 116). The PEL Study followed FHWA guidance and the WSDOT draft PEL handbook regarding the integration of transportation planning and the environmental review process established by the National Environmental Policy Act (NEPA). FHWA promotes the use of PEL studies to integrate environmental issues and public involvement with project planning and shorten the time required to take projects from planning to implementation. Following this PEL Study, the analysis of I-5 within the study area will move directly into the NEPA environmental documentation phase to implement the I-5 and Nisqually River Delta area environmental habitat restoration improvements.

One of the statutory requirements to adopt planning products into the environmental review process under PEL authority 23 USC 168(d) is to provide public notice, through publication or other means, to federal, state, local and Tribal governments of the planning products that may be relied on during subsequent environmental review. Those entities must be given the opportunity to participate in the PEL process. This document describes the agency and public coordination efforts undertaken by WSDOT during this PEL study.

2 STUDY PARTICIPANTS

WSDOT formed three advisory groups, met with community-based organizations (CBOs), and provided materials virtually to provide a forum for tribal, community and partner-informed decision making on the Purpose and Need, the range of alternatives, screening criteria, evaluation results, and a preferred alternative to study in a NEPA environmental review. The various advisory groups and PEL study participants are listed in Table C-1 and described in more detail below.

Table C-1. PEL Study Participants

Agency Coordination Group	Technical Advisory Committee	Executive Advisory Group	CBOs, Special Interest Groups, Public
Billy Frank Jr. Nisqually National Wildlife Refuge Department of Archaeology and Historic Preservation Department of Natural Resources Environmental Protection Agency Federal Emergency Management Agency Federal Highway Administration Federal Transit Administration Joint Base Lewis McChord National Marine Fisheries Service National Oceanic and Atmospheric Administration Natural Resources Conservation Service Nisqually Indian Tribe Squaxin Island Tribe of Indians US Army Corps of Engineers US Coast Guard US Fish and Wildlife Services US Geological Survey Washington Department of Fish and Wildlife Washington Department of Ecology	Billy Frank Jr. Nisqually National Wildlife Refuge City of DuPont City of Lacey City of Lakewood City of Olympia City of Tumwater City of Yelm Federal Highway Administration Foothills Rails to Trails Coalition ForeverGreen Trails Friends of Nisqually NWRC Intercity Transit Joint Base Lewis-McCord Nisqually Indian Tribe Nisqually Land Trust Nisqually River Council Pierce County Pierce Transit Port of Olympia Port of Tacoma Sound Transit South Sound Military & Communities Partnership Squaxin Island Tribe of Indians Thurston County Thurston Regional Planning Council Town of Steilacoom Washington Environmental Council Washington State Patrol	City of DuPont City of Lacey City of Lakewood City of Olympia City of Tumwater City of Yelm Federal Highway Administration Intercity Transit Joint Base Lewis-McChord Nisqually Indian Tribe Pierce County Pierce Transit Port of Olympia Port of Tacoma Thurston County Thurston Regional Planning Council Town of Steilacoom	**Community and Social Service Groups** Housing Authority of Thurston County Multicultural Child & Family Hope Center Pierce County Building and Construction Trades Council Sound Outreach Pierce County Thurston County Chamber of Commerce United Way Thurston County **Interested Parties** Alliance for a Healthy Sound Executive Committee South Puget Sound Salmon Enhancement Group Thurston County Noxious Weeds Thurston Economic Development Council Washington Trucking Association

2.1 Agency Coordination

As part of WSDOT’s commitment to engage partners early in the planning process, the study team implemented several activities to target involvement of federal, state and local agencies in the planning efforts for this PEL.

2.1.1 FHWA

As the federal lead agency and partner for the I-5 Marvin to Mounts Road PEL study, FHWA is providing input and guidance throughout the process. WSDOT and FHWA met monthly for regular status updates, to review the project schedule and deliverables, and to strategize on the planning process. FHWA also participated in Tribal coordination and attended all advisory group meetings. Involvement in the various outreach and engagement activities allowed them to hear, first-hand, the input received from the participants on the Purpose and Need, range of alternatives, alternatives evaluation process and results, and identified preferred alternative for the study.

2.1.2 Tribal Consultation

At the onset of this PEL process, WSDOT sent letters to initiate government-to-government consultation with seven tribes and asked for input on the planning products produced during the PEL process. Three letters were sent to request input on the Draft Purpose and Need, the range of alternatives, and the Draft PEL report.

Based on previous planning work on the project, guidance from cultural resources experts, location of Usual and Accustomed fishing grounds, tribal consultation areas, and past history of projects in the area, WSDOT requested consultation with the following tribes at the beginning of this PEL process: The Confederated Tribes of the Chehalis Reservation, Cowlitz Indian Tribe, Nisqually Indian Tribe, Puyallup Tribe of Indians, Squaxin Island Tribe of Indians, the Muckleshoot Indian Tribe, and the Confederated Tribes and Bands of the Yakama Nation. In addition to requesting participation in the advisory groups, WSDOT also offered individual meetings with each of the tribes to discuss questions and issues each may have about the project and to present the outcome of other engagement efforts if the tribe was unable to or did not consult.

3 OUTREACH ACTIVITIES

The following table provides a summary of the outreach efforts by WSDOT during this PEL process. These activities are described in more detail below.

Table C-2 – Outreach Efforts

Event/Milestone	Date	Topic
Public notice		Required PEL Public Notice
FHWA Concurrence Point #1	September 8, 2022	Reason and Desired Outcome for the WSDOT I-5 Marvin to Mounts Rd PEL
Nisqually Indian Tribe Coordination meeting	September 21, 2022	Monthly status meeting
Nisqually Indian Tribe Coordination meeting	November 2, 2022	Monthly status meeting
FHWA Coordination meeting	November 3, 2022	Monthly status meeting
Nisqually Indian Tribe Coordination meeting	December 7, 2022	Monthly status meeting
FHWA Coordination meeting	December 7, 2022	Monthly status meeting
FHWA Coordination meeting	January 5, 2023	Monthly status meeting
Nisqually Indian Tribe Coordination meeting	January 10, 2023	Monthly status meeting
Agency Coordination Group meeting #1	January 11, 2023	Purpose & Need
Public review /Online Open House	Jan 17-31, 2023	Purpose & Need review and input
Government-to-Government Consultation w/Tribes	Jan 17, 2023	Purpose & Need review and input
Interested parties message	Jan 10, 2023	Options to participate in project
Technical Advisory Group meeting #1	January 17, 2023	Purpose & Need review and input
Executive Advisory Group meeting #1	January 30, 2023	Purpose & Need review and input
CBO Interviews	January - February	Gather information from groups that represent EJ populations in the area
Agency Coordination Group meeting #2	February 13, 2023	Review of Level 1 screening criteria

Event/Milestone	Date	Topic
Technical Advisory Group meeting #2	February 15, 2023	Review of Level 1 screening criteria
Executive Advisory Group meeting #2	February 21, 2023	Review of Level 1 screening criteria
Public review /Online Open House	February 15 – March 1, 2023	Range of alternatives review and comment
Government-to-Government Consultation w/Tribes	February 14, 2023	Range of alternatives and screening criteria review and comment
Nisqually Indian Tribe Coordination meeting	March 1, 2023	Monthly status meeting
FHWA Concurrence Point #2	March 2, 2023	Purpose and Need for the WSDOT I-5 Marvin to Mounts Rd PEL
FHWA Coordination meeting	March 8, 2023	Monthly status meeting
Squaxin Island Tribe Coordination meeting	March 8, 2023	Project overview and review of alternatives
Agency Coordination Group meeting #3	March 13, 2023	Review public comments, Level 1 Alternatives Evaluation Results and Level 2 Criteria
Technical Advisory Group meeting #3	March 14, 2023	Review public comments, Level 1 Alternatives Evaluation Results and Level 2 Criteria
Executive Advisory Group meeting #3	March 21, 2023	Review public comments, Level 1 Alternatives Evaluation Results and Level 2 Criteria
Nisqually Indian Tribe Council briefing	March 22, 2023	Project overview and review of alternatives and initial round of screening
FHWA Coordination meeting	April 12, 2023	Monthly status meeting
Nisqually Indian Tribe Coordination meeting	April 14, 2023	Monthly status meeting
Agency Coordination Group meeting #4	April 17, 2023	Review Existing Conditions summaries and Alternatives Evaluation Criteria and Results
Technical Advisory Group meeting #4	April 18, 2023	Review Existing Conditions summaries and Alternatives Evaluation Criteria and Results
Executive Advisory Group meeting #4	April 19, 2023	Review Existing Conditions summaries and Alternatives Evaluation Criteria and Results
FHWA Concurrence Point #3	May 11, 2023	Alternatives Analysis for the WSDOT I-5 Marvin to Mounts Rd PEL
Agency Coordination Group meeting #5	May 15, 2023	PEL Study and next steps

Event/Milestone	Date	Topic
Technical Advisory Group meeting #5	May 16, 2023	PEL Study and next steps
Executive Advisory Group meeting #5	May 17, 2023	PEL Study and next steps
Government-to-Government Consultation w/Tribes	May 22, 2023	PEL Study and next steps review and comment
Public notice (Mailers)	May 19	Public Review Period - Draft PEL Study
Public review /Online Open House	June 1-30	Draft PEL Study
FHWA Concurrence Point #4	TBD	Final Report for the WSDOT I-5 Marvin to Mounts Rd PEL

3.1 Advisory Groups

3.1.1 Agency Coordination Group

WSDOT convened an Agency Coordination Group to:

- Represent their agency and environmental resources in the study area
- Provide data and input on direction of study
- Advise on alternative evaluation criteria and alternatives
- Help build consensus and support for alternative(s) selection

The ACG is comprised of agency representatives from federal and local resource agencies and tribes. The first ACG was held in January 2023, followed by four more meetings held in February, March, April, and May 2023. Each meeting format included a PowerPoint presentation from the project team, poll questions to gauge understanding and support, open discussion, and a question-and-answer session. An agenda and meeting materials were sent in advance of each meeting and a meeting summary and request for feedback was shared following each meeting. Meeting materials summarizing meeting outcomes and what we heard, along with a recording of each meeting, are available to view on the study webpage (*I-5 Marvin Rd to Mounts Rd PEL Study webpage*).

3.1.2 Technical Advisory Group

WSDOT convened a Technical Advisory Group to:

- Represent their agency and communities in the study area
- Provide data and input on direction of study
- Advise on alternative evaluation criteria and alternatives
- Help build consensus and support for alternative(s) selection

The TAG is comprised of agency representatives from federal, state and local resource agencies, including tribes. The first TAG was held in January 2023, followed by four meetings held in February, March, April, and May 2023. Meeting formats included a PowerPoint presentation from the project team, poll questions to gauge understanding and support, open discussion, and a question-and-answer session. An agenda and meeting materials were sent in advance of each meeting and a meeting summary and request for feedback was shared following each meeting. Meeting materials summarizing meeting outcomes and what we heard, along with a recording of each meeting, are available to view on the study webpage (*I-5 Marvin Rd to Mounts Rd PEL Study webpage*). TAG members were advised to share information with executive leadership following the meetings.

3.1.3 Executive Advisory Group

WSDOT convened an Executive Advisory Group to:

- Provide input on policy direction
- Share useful information/data and input
- Help build consensus and support for alternative(s) selection

The EAG is comprised of elected leaders from study area jurisdictions, tribes and counties. The Executive Advisory Group meetings were held following each TAG meeting. A total of five EAG meetings were held between January and May 2023. Similar to the TAG, the EAG members received an agenda and meeting materials in advance of each meeting and a meeting summary and request for feedback was shared following each meeting. Meeting materials summarizing meeting outcomes and what we heard, along with a recording of each meeting, are available to view on the study webpage (*I-5 Marvin Rd to Mounts Rd PEL Study Webpage*). EAG members also received an email notification in advance of each public comment period to include Purpose and Need, Alternatives Review and the Draft PEL Report.

3.1.4 Advisory Group Feedback

WSDOT received feedback from the advisory groups through meeting discussion and comments. The groups provided input on the Draft Purpose and Need Statement, the range of alternatives, specific resources that should be studied and issues to be aware of, the evaluation criteria, and the alternative evaluation results. Upon requesting members' agreement with the results of the PEL process, the vast majority of the participants supported the results presented in this report. FHWA participated in all advisory group meetings and concurs that the PEL results are supported by the advisory groups. Feedback received from advisory group members is detailed in meeting summaries on the study webpage (*I-5 Marvin Rd to Mounts Rd PEL Study Webpage*).

What We Heard:

Environment

- Minimize effects on wetlands and restore aquatic ecosystems and connectivity.
- Consider a design that will be resilient to sea-level rise, storm surge, river flow, and capacity to address all the nuances of sediment transportation.
- Consider river navigability for all waterway uses in addition to tribal use.
- Consider studying tsunami risks and effects on salinity.
- Concerns of what fill removal could have on the Billy Frank Jr. Nisqually National Wildlife Refuge, residents, farmers, and other surrounding properties.
- Consider studying what happens to flood plains when fill is removed from the corridor.
- Consider potential mitigation strategies needed for permitting processes, like Shoreline Permitting and the Coastal Zone Management Act.
- Consider cultural resource surveying and assess need for surveying critically, in partnership with tribes, to avoid further impact to cultural resources.
- Honor Treaty Right Obligations to the Nisqually Indian Tribe.

I-5 Corridor Widening and Transit Use

- Consider future planning efforts for widening I-5 and adding HOV lanes.
- Create capacity for future High-Capacity Transit infrastructure.

Environmental Justice

- Engage community members in development of mitigation strategies for Environmental Justice communities spanning all phases of the project.

Shared-Use Path

- Consider connecting the shared-use path to the Billy Frank Jr. Nisqually National Wildlife Refuge.
- Consider whether the shared-use path could be mitigation for visual quality impacts.

Construction and Traffic Staging

- Communicate how access will be maintained to Billy Frank Jr. Nisqually National Wildlife Refuge and surrounding businesses during construction.
- Communicate construction cost and timing and traffic staging during construction.

3.1.5 Other Consulted Parties

Some agencies, jurisdictions and organizations were unable or chose not to participate in the formal outreach activities during this PEL study. Those entities were provided the same project information sent to all other interested parties and given an opportunity to meet with the project team separately. WSDOT requested the following agencies and organizations participate: Washington Department of Natural Resources (DNR), BNSF Railway, Alliance for a Healthy Sound. When they could not participate, WSDOT briefed the BNSF liaison, and made presentations to DNR and Alliance for a Healthy Sound to ensure they were aware of PEL progress and activities.

3.2 Community Engagement

WSDOT developed a Community Engagement Plan and conducted extensive outreach with the community to incorporate their values into the PEL and project designs and to comply with the PEL authority requirement to provide notice and opportunities for input-from community members. The WSDOT team made extra efforts to ensure PEL input from under-represented communities by meeting people where they were – through their community-based organizations (as described below). WSDOT conducted a demographic analysis, using 2020 Census data, to identify communities in the project area. The WSDOT team transcreated all documents and messages and was prepared with translation services. Translation was not needed as fewer than 5% of the surrounding communities spoke languages other than English. WSDOT offered translation services upon request as part of the public materials. The various components to the Public and Community Participation strategy are described below.

3.2.1 Community Based Organizations (CBO)

The study team interviewed CBOs representing minority communities and communities with low-incomes or who provide mobility services to communities. WSDOT offered interviews online at a time that was convenient for the interviewee. The study team offered a questionnaire to two groups who wished to participate but were not able to arrange a time to meet with the team. See Appendix 3 to view more detailed interview summaries.

Purpose:

- Understand community awareness of the project and opportunities to engage in this PEL.
- Gather input on how the people they represent use I-5 within the study area.
- Gather insights on how to best engage these audiences in the upcoming NEPA process.

Organizations:

- Housing Authority of Thurston County
- Multicultural Child and Family Hope Center
- Pierce County Building and Construction Trades Council
- Sound Outreach
- Thurston County Chamber of Commerce
- United Way of Thurston County

What We Heard:

- Maintain access through the corridor for people getting to work.
- Increased traffic commuting north due to issues with affordable housing.
- Concerns about construction impacts.
- Curiosity around what the corridor changes will include and what they will look like.
- Frustration over not enough transit in Thurston County and along this corridor.

3.2.2 Open Houses

WSDOT hosted three online open houses on the agency's digital community engagement platform, "engage.wsdot.wa.gov." The format for WSDOT's online meeting experiences includes an introduction to the project and its purpose, complemented by maps and photos to make it easier for visitors to acclimate themselves to the project area and proposed improvements. The website included a project schedule, next steps, and contact information, along with probing questions on a comment form to encourage participation and input. WSDOT held online open houses for the public to learn more about the project, how to participate in this PEL process, and how their input will be considered in project designs.

Notification of the online open houses were shared through the project webpage, WSDOT's blog, Facebook, Twitter, and Reddit. A postcard announcing the Draft PEL Report was mailed to 60,000 residents in the region in advance of the public review period, which started on June 1, 2023. The postcard and a map of the mailing area is included as an attachment to this Coordination and Public Participation Summary.

Public Review of Purpose and Need: The WSDOT team held an online open house from January 17 to January 31, 2023 for the public to comment on the Purpose and Need. Approximately 50 comments were received.

What we heard:

- Build bypass roads and bridges for alternate routes during peak traffic or due to road closures.
- Create a separated shared-use path along the corridor.
- Prioritize transit, cycling, and other forms of transportation over highway expansion.
- Build for High-Capacity Transit (HCT) compatibility, including rail.

Public Review of Range of Alternatives: The WSDOT team held an online open house from February 15 to March 1, 2023 for public comments on the screening alternatives. Over 250 comments were received.

What we heard:

- Address any environmental effects from the project
- Consider an elevated roadway through this area to mitigate the impacts to fish and wildlife
- Make special consideration for the effects the project has on the surrounding area
- Ensure compatibility for future high-capacity transit (HCT), including rail
- Plan for a separated shared-use path for pedestrians and bicyclists

- Recognize that with additional capacity comes induced demand and that mobility options can also take demand off the freeway
- Keep I-5 open during construction
- Consider improved/new alternate routes around I-5 (similar to I-405) and connecting with SR 512
- Highlight the importance of and maintain access to the Brown Farm Road NE/Nisqually Cut Off Road SE/Exit 114

3.3 Information Distribution

WSDOT has been engaging with special interest groups and the public about their vision for the I-5 Marvin Road to Mounts Road corridor for over five years. First through the corridor planning process and 2020 report, then the initial PEL study that further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area (2022), and now in this PEL study. WSDOT has worked closely with partner agencies to reach communities through a variety of community engagement techniques.

- Project website for reference and sharing outcomes.
- WSDOT blog and promotion on Facebook, Reddit and Twitter.
- Project FAQ and talking points for project correspondence and media inquiries.
- Project contact list for email and phone follow-ups as needed and when the draft PEL is complete.
- CBO interviews representing minority communities and communities with low-incomes or who provide mobility services to communities.
- Project presentations to special interest groups that serve the study area, such as the Thurston Regional Planning Council, Nisqually River Council, and Alliance for a Healthy South Sound, to request their input.
- Project postcard mailed in June 2023 to 60,000 addresses in DuPoint, Steilacoom, Lacey, Yelm, and JBLM

D EXISTING CONDITIONS MEMOS

1 STORMWATER AND WATER QUALITY

1.1 Introduction

Project Background and Description

In 2020, WSDOT completed a corridor study of Interstate 5 between State Route 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This segment of I-5 is a main connector between Thurston and Pierce counties and provides access to Joint Base Lewis-McChord. The roadway travels across the Nisqually River estuary, traditional land of the Nisqually Indian Tribe and habitat for federally listed species of Puget Sound salmonids.

In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin Road and Mounts Road interchanges through the Nisqually River delta. A Planning and Environmental Linkages (PEL) study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

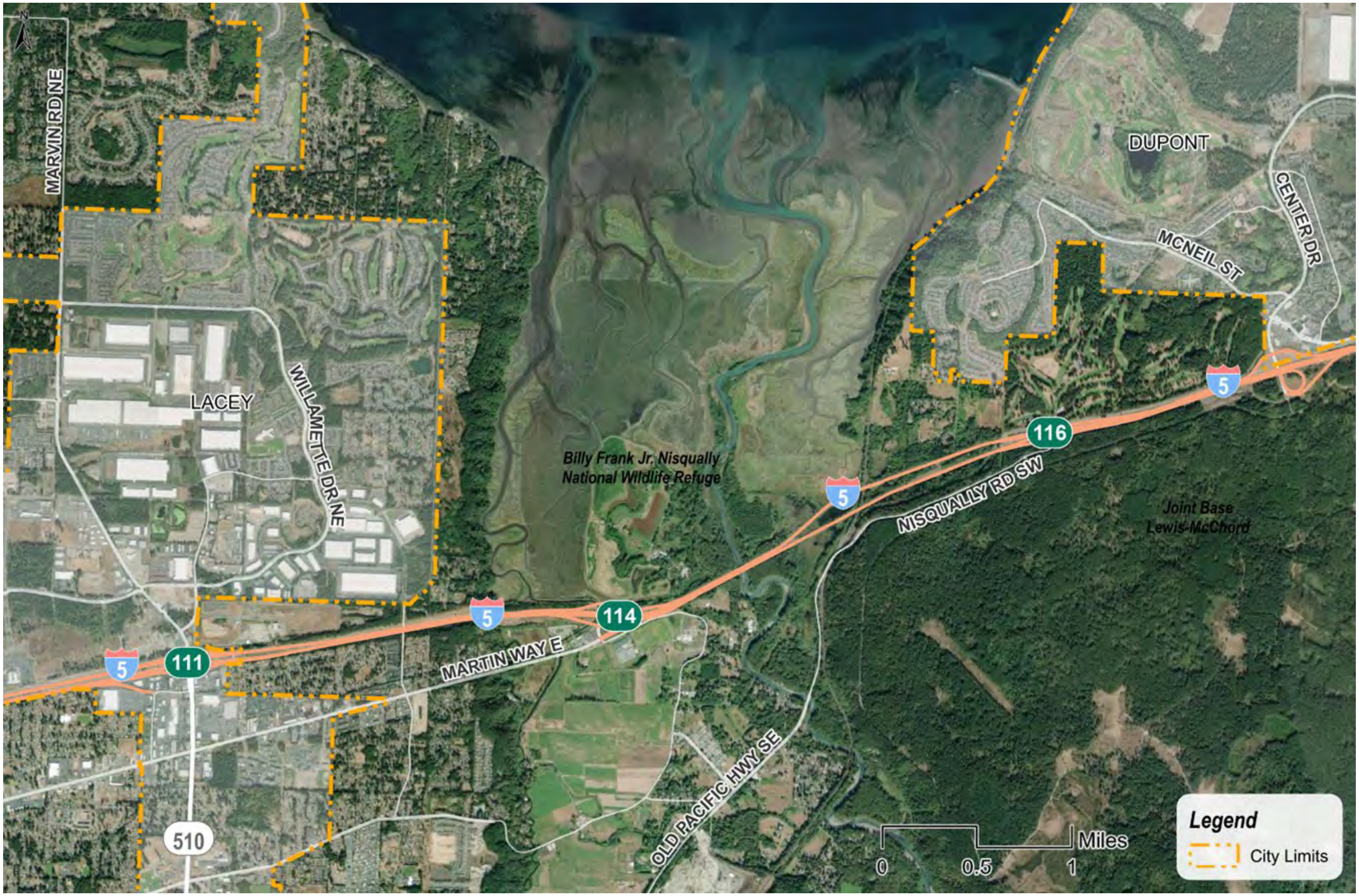
This next phase, a Focused PEL, is studying I-5 from Marvin Road to Mounts Road (Exit 111 to Exit 116). Figure D-1 shows the project vicinity map. The Focused PEL considers additional technical analyses and input from project partners to arrive at a final purpose and need and preferred alternative(s) to advance into National Environmental Policy Act (NEPA) environmental review beginning in 2023.

Funding is provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design, and right of way (ROW) acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing.

1.2 Purpose

This memorandum describes the existing conditions for stormwater, groundwater, and water quality within the I-5 Marvin Road to Mounts Road study area. Details regarding floodplains are presented in the Floodplains and Sea Level Rise Affected Environment Memorandum. Details regarding wetlands, aquatic species, and surface water habitat are presented in the Wetlands and Streams Assessment Report. Details regarding aquatic species are presented in the Fish, Wildlife, and Vegetation Affected Environment Memorandum.

Figure D-1. Project Vicinity Map



2 METHODS FOR STORMWATER AND WATER QUALITY ANALYSIS

2.1 Study Area

The proposed improvements would be located in the City of Lacey, Thurston County, and Pierce County. The study area for stormwater and water quality begins approximately 500 feet west of Exit 111 at Woodland Creek and ends 0.25 mile east of Exit 116 on I-5; it generally extends approximately 2,000 feet north or south from the edges of I-5 through this area. The study area is larger than the footprint of potential improvements and consists of portions of drainage basins adjacent to the area where project alternatives could be located. It encompasses locations where water resources are likely to be altered by the development and operation of the project and where these resources would likely receive direct runoff discharge from the project during construction and/or during long-term operation. The study area was mapped based on reviews of existing aerial photography, geographic information system (GIS) data, and technical reports for the vicinity of the study area from federal, state, county, and local jurisdictions; through coordination with these jurisdictions; and through field investigation. As concepts are refined and impacts are evaluated, the study area will also be refined as needed. A preliminary study area map is shown in Figure D-2.

2.2 Relevant Laws and Regulations

The federal, state, and local regulations that govern the protection or use of water resources that are applicable to the activities of this project are listed below. Local plans and/or policies that guide the use of water resources in the study area are also included. If a regulation, plan, or policy is updated to a newer version than that listed below, the most recent version that is legally applicable to the project will be referenced for the environmental analysis.

Federal

- Clean Water Act – 33 USC 1251 et seq., including Sections 401 – Water Quality Certification, 402 – National Pollutant Discharge Elimination System, and 404 – Permits for Dredge or Fill
- The National Environmental Policy Act (NEPA) – 42 USC 4321, 23 CFR 771 and 40 CFR 1500-150
- Safe Drinking Water Act – 42 USC 300 et seq., Chapter 6A

Figure D-2. Stormwater and Water Quality Study Area

State

- State Environmental Policy Act (SEPA) – WAC 197-11 and WAC 468-12 (WSDOT)
- State Water Quality Laws and Rules – RCW 90.48, WAC 173-201A, WAC 173-200 (Groundwater)
- National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit (Ecology 2017)
- NPDES Western Washington Phase I and Phase II Municipal Stormwater General Permits (Ecology 2019a)
- Accommodation of Stormwater Runoff onto Right of Way Executive Order (E 1103) – E1103.00
- Drinking Water – Source Water Protection - RCW 43.20.050 (WAC 246-290-135 for Group A systems; WAC 246-291 for Group B systems)
- Underground Injection Control – 40 CFR 144, RCW 43.21A.445, RCW 90.48, and WAC 173-218
- Growth Management Act (GMA) – RCW 36.70A, combined with Article 11 of the Washington State Constitution
- 2019 Stormwater Management Manual for Western Washington (Ecology Manual) (Ecology 2019b)
- Washington State Department of Transportation (WSDOT) Highway Runoff Manual (WSDOT 2019)
- WSDOT Hydraulics Manual (WSDOT 2022)
- Washington State Hydraulic Code, WAC 220-660

Local

Pierce County

- Storm Drainage and Surface Water Management, Title 11 Pierce County Code (PCC)
- Construction and Infrastructure Regulations – Site Development and Stormwater Drainage, Title 17A PCC
- Development Regulations – Storm Drainage and Site Development, Title 18C PCC
- Development Regulations – Critical Areas, Title 18E PCC
- Development Policies and Regulations – Shorelines, Title 18S PCC
- Pierce County Stormwater Management and Site Development Manual (Pierce County 2021)

Thurston County

- Thurston County Stormwater Standards, Title 15 Thurston County Code (TCC)
- Critical Areas, Title 24 TCC (Includes Chapter 24.10 Critical Aquifer Recharge Areas, Chapter 24.20 Frequently Flooded Areas)
- Thurston County Drainage Design & Erosion Control Manual (Thurston County 2022).

City of Lacey

- Building and Construction, Title 14 Lacey Municipal Code (LMC)
- Stormwater Management, Chapter 14.27 LMC
- Community Facilities, Chapter 15.22 LMC
- Zoning, Title 16 LMC
- City of Lacey 2022 Stormwater Design Manual (City of Lacey 2022)

Interagency Agreements

- Implementing Agreement Regarding Application of the Highway Runoff Manual (HRM) – In February 2009, WSDOT and Ecology signed an implementing agreement committing WSDOT to apply the HRM statewide
- Sole Source Aquifers (SSA) - This 2014 Memorandum of Understanding between the Federal Highway Administration (FHWA) Washington Division states that projects receiving FHWA financial assistance will prevent the introduction of hazardous levels of contaminants into an SSA.
- Highways & Drinking Water Well Sanitary Control Areas "Screening Criteria" - This 2006 agreement between WSDOT and the DOH clarifies expectations, establishes project screening criteria, and facilitates communication among WSDOT, DOH, and water purveyors when a proposed highway project intersects with the sanitary control area of a public water supply.

2.3 Data Sources and Data Collection Methods

Surface Waters and Shorelines

Available data from municipal sources and regulatory agencies applicable to stormwater and water quality in the study area was collected and reviewed to evaluate the affected environment. The water quality analysts also coordinated with other discipline authors on the environmental team, including those responsible for the fish, wildlife, and vegetation analysis and the wetlands analysis. Data sources include the following:

- U.S. Environmental Protection Agency (EPA) Water Quality Data Portal
- EPA Sole Source Aquifer program
- U.S. Geological Survey (USGS) National Water Information System
- Ecology Water Quality Assessment 303(d) and 305(b) lists
- Stream inventories and water quality reports from local jurisdictions
- Publicly available GIS aerial mapping
- Critical areas GIS data available from local jurisdictions
- WSDOT stormwater management facility information
    - Stormwater GIS Datasets
    - As-builts drawing and hydraulic reports
- Google Street View
- County tax assessor GIS water resources data

Groundwater

Groundwater data sources include EPA and local municipal maps showing groundwater wellhead protection areas, critical aquifer recharge areas, and sole source aquifers as well as reports and studies from local jurisdictions documenting groundwater, well, and hydrogeologic conditions.

2.4 Existing Conditions

Existing conditions were characterized within the study area to provide a baseline against which potential impacts of the project will be discussed. The baseline was developed by qualitatively evaluating water resources through field surveys, literature review, available GIS data, and a review of other affected environment memos. Mapped water resources are approximate, and no detailed delineations were made for this analysis. Field observations were conducted from publicly accessible roads and ROWs. No new flow or water quality data was collected.

Surface Water

The surface water baseline section describes the natural water bodies, stormwater infrastructure, land use, and soils in the study area. A general description of the existing natural water bodies in the study area is included, and fish-bearing waters and waters with state-designated impaired water quality are identified in text and depicted on a figure. Stream drainage basins are also shown on a map.

Discussion of existing stormwater infrastructure includes a qualitative review of existing stormwater management facilities, municipal drainage infrastructure, and existing surface water discharge points. The applicable surface water guidance manuals adopted by each local agency were used for this review. Information regarding water quality and stormwater problems was collected, as well as up-to-date maps of the stormwater systems serving the study area.

The description of land use includes a qualitative overview of existing pollution-generating impervious surface (PGIS) and non-pollution-generating impervious surface (NPGIS) within the project footprint, which is defined as the areas occupied by each alternative and any other modified areas, encompassing the I-5 mainline, structures, ramps, affected local roadways, and other relevant facilities or improvements.

Soil information is presented as hydrologic soil groups and shown on a figure for the study area.

Groundwater

The baseline for groundwater conditions was established through review of federally designated sole source aquifer areas and county- or city-designated critical aquifer recharge and/or wellhead protection areas that occur within the study area. These resources were narratively described and depicted on a figure.

2.5 Impact Evaluation Methods

The impact analysis will assess the potential direct, indirect, and cumulative water quality impacts of the project alternatives, including the No-Build Alternative. The impact analysis will be generally based on regulatory guidance and similar past projects.

Direct Impacts

Potential direct impacts from construction activities will be qualitatively assessed based on the proximity of activities to surface water bodies and local drainage systems. Construction impacts will be assessed regarding the potential for erosion and sediment transport, concrete work, material handling and transport, hazardous material storage and use, trenching, dewatering, and other construction-related activities applicable to water resources.

Potential direct impacts to water quality from project operation will be identified as follows:

- **Surface Water:** Changes in land use, including changes in PGIS, resulting from the project alternative(s) will be quantitatively evaluated and compared to existing conditions. The evaluation will consider PGIS from project-associated highway and interchange improvements. Based on these calculations, potential impacts to drainage systems and receiving waters from changes in flow and water quality will be analyzed. The impact analysis will be based on the PGIS changes calculated and stormwater management facilities proposed during the preliminary design phase. The analysis will be coordinated with the Wetlands and Other Waters team regarding potential channel erosion and other potential impacts associated with streams, lakes, and wetlands affected by the proposed project. A brief description of how the project is designed to account for climate change resilience in stormwater facility design will be provided if applicable; impacts to floodplains will be evaluated in the Floodplains and Sea Level Rise analysis. The analysis will also cover construction activities and their potential to impact surface water by altering the water resource, causing flooding or erosion, or through runoff from construction areas.
- **Groundwater:** Estimated changes in impervious surfaces and resulting effects on infiltration of surface water will be qualitatively evaluated for potential impacts to groundwater supply. Other impacts to groundwater quality will be identified based on potential alterations to groundwater flow or supply, including dewatering during construction or the placement of retaining walls, cuts, or deep foundations for project facilities.

Indirect Impacts

Indirect impacts are potential effects related to the project but not part of it which may be separated by distance or time but are still reasonably foreseeable. Indirect impacts to receiving waters will be qualitatively evaluated through consideration of each alternative’s potential changes to land use and/or pollutant sources. For example, if the proposed project were expected to decrease vehicle use compared to the No-Build Alternative, then an indirect impact would be a potential reduction in traffic-related pollutants in the watershed. Other indirect effects could result from increased developments by others (such as increased commercial development along the improved I-5 corridor), which could create new impervious surfaces as well as retrofit existing impervious surfaces with improved stormwater management facilities.

Cumulative Impacts

The cumulative impacts analysis will consider effects on water resources from other past, present, and reasonably foreseeable future actions, including other transportation or infrastructure projects and other land use actions or developments in the study area. Other projects that are reasonably foreseeable will be identified and considered in the cumulative impacts analysis.

2.6 Mitigation Development

Potential impacts to water quality will be avoided or minimized through project planning and design and the application of required best management practices (BMPs) during construction and operation. Measures to avoid and minimize potential impacts of the alternatives will be incorporated as appropriate. Where impacts cannot be avoided or minimized, mitigation measures will be developed.

Risks controlled by BMPs could include construction-related pollution and operational effects, such as pollutant transport and/or changes in runoff volumes, frequencies, and/or durations.

The project team will identify potential project design elements and BMPs for review and approval by WSDOT that will be implemented to control potential risks to water quality. Design elements and BMPs will most likely be taken from stormwater management design manuals adopted by the local agencies, NPDES permit program documents, and other industry guidance.

Potential mitigation for direct, indirect, and/or cumulative impacts will be identified and evaluated within the study area where adverse effects would occur, such as downstream hydrologic impacts resulting from uncontrolled increases in flows or the cumulative effects of multiple construction projects occurring in an area at once. The analysis assumes that the proposed project would be expected to be controlled by permit-required BMPs and related conditions; any mitigation, if needed, would be for controls beyond those which would be normally required by applicable regulations and permit conditions. Mitigation strategies will consider combined mitigation identified with other jurisdictions.

2.7 Existing Conditions

This section provides preliminary descriptions and mapping of existing surface water and groundwater conditions, based on the current understanding of the conceptual alternatives being considered for the PEL study. These conceptual alternatives are still under development; therefore, the potentially affected area may change as the design progresses. In addition, the conceptual design phase will include placement of stormwater treatment facilities, which have not yet been designed.

2.8 Surface Water

Natural Water Bodies

Existing local municipal and state data sources were reviewed to determine the existing water bodies within the study area. These include the Nisqually River, McAllister Creek, and Red Salmon Creek. Unnamed tributaries to these waterbodies are also present within the study area. Other water bodies, including Medicine Creek and Puget Sound, are located close to the study area, but are not expected to be directly affected by the proposed project, so are not discussed in detail in this memo.

The three named stream features, from west to east, are McAllister Creek, Nisqually River, and Red Salmon Creek. These streams are connected to floodplain wetlands, tidal sloughs, and tributaries upstream and downstream of the study area, but these connections were not assessed as part of this project. Additional unnamed features were identified in association with the three primary features, either as seasonal tributary drainages or backwater sloughs. Fish presence or absence was assessed by reviewing WDNR water type maps, the SWIFD fish distribution database, and using best professional judgment of observed field conditions. Based on these observations, several streams and associated wetlands provide suitable habitat for resident and anadromous fish. Fish presence is further discussed in the Vegetation, Wildlife, and Fish Existing Conditions Memorandum. Description of each stream's features are included in the summary tables below.

McAllister Creek originates 2.5 miles south of the study area in a spring-fed, headwater wetland complex known as Medicine Springs or McAllister Spring. From its source, the perennial creek meanders north through agricultural fields and along the toe of the steep slope to west. A low-gradient tributary from the east, named Medicine Creek on some maps, joins the creek near Hartman Road SE. Approximately 0.5 mile upstream of the study area, the creek is directed northeast, away from the hillside, in a straight diked channel, armored with Sakrete and riprap. McAllister Creek crosses under Martin Way, an access bridge to the Nisqually Commercial Park, the I-5 northbound off-ramp, northbound and southbound I-5 mainlines, and the I-5 southbound on-ramp before the constructed channel directs it due west back to a meandering tidal channel along the hillside. North of the study area, the creek and its floodplain are regularly inundated by the tide and are indistinguishable from the Nisqually River estuary and mudflats.

The Nisqually River originates on the south flank of Mount Rainier as snowmelt from the Nisqually Glacier. The total length is approximately 81 miles, with a watershed area of approximately 517 square miles. The river is impounded by two hydroelectric dams (La Grande Dam and Alder Dam) forming a 7-mile-long reservoir named Alder Lake near Elbe/Eatonville. Through the study area, the water level of the Nisqually River is tidally influenced. The river frequently overtops its banks due to high runoff, high tides, or a combination of both. Overbank channel features can be observed on both the right (east) and left (west) banks of the river as a network of hydrologic connectivity across the floodplain. North of I-5, the river becomes the Nisqually Estuary, discharging to the Nisqually Reach in South Puget Sound.

Red Salmon Creek flows into the estuary on the east side of the Nisqually Valley. The creek originates as runoff from hillslopes to the north, east, and south of the eastern end of the study area. The hydrologic connectivity of Red Salmon Creek and its tributaries has been affected by extensive fill prisms associated with the BNSF railroad line and I-5, along with several other local access roads. Red Salmon Creek flows through two culverts (BNSF railroad and Mounts Road SW) directly into the Red Salmon Slough, which is considered a feature of the Nisqually River Estuary.

Natural water bodies in Washington State are organized into administrative and planning boundaries known as Water Resource Inventory Areas (WRIAs). The original WRIA boundaries were established cooperatively by Washington State's natural resource agencies — the Departments of Ecology, Natural Resources, and Fish and Wildlife — in 1970. The boundaries were formalized under WAC 173-500-040 and authorized under the Water Resources Act of 1971, RCW 90.54. Ecology was given the responsibility for the development and management of the WRIAs, and they provide the regulatory foundation for each water body within their respective boundaries. The study area is located entirely within WRIA 11, the Nisqually Watershed, as shown in the Washington Department of Fish and Wildlife WRIA map (WDFW 2011). The Nisqually River is the largest water body present within the study area and is the only water body in the study area listed as a Shoreline of the State under the Washington State Shoreline Management Act (WAC 173-18).

Stormwater Infrastructure

Discharge Points

Between milepost (MP) 112 and 117 within the study area, highway runoff discharges to adjacent water bodies via roadside ditches, direct pipe outfalls, and sheet flow over roadway embankments. Existing stormwater infrastructure discharge points were reviewed primarily by evaluating WSDOT GIS layers, street view imagery, and aerial imagery. A detailed description of existing drainage patterns, outfall locations, and Threshold Discharge Area delineations will be prepared as the conceptual drainage design progresses. A general description of drainage pathways and receiving water bodies from west to east across the study area is presented below.

- Near exit 111, from MP 112 to MP 112.8, runoff sheet flows into roadside ditches that head east to a culvert, which carries flows north into a ditch that heads northeast.
- From MP 112.8 to MP 114.1 at the McAllister Creek crossing, runoff is collected via catch basins and discharges directly to McAllister Creek via a piped conveyance system.
- From MP 114.1 to MP 114.8, runoff is generally collected via catch basins, which each individually outlet to roadside ditches before entering adjacent unnamed tributaries or wetland areas.
- From MP 114.8 to MP 115.0, in the immediate vicinity of the Nisqually River, several pipes outlet directly to the Nisqually River from singular catch basins. The grassy median areas appear to discharge directly to the Nisqually River from both sides of the bridge as well.
- From MP 115 to MP 116.4, east of the Nisqually River, runoff either sheet flows into the roadway embankment or is captured by catch basins that outlet directly to adjacent wetlands and streams.
- East of milepost 116.5, runoff is captured and conveyed via a piped system to a tributary to Red Salmon Creek.

Existing Stormwater BMPs

Review of GIS data shows that that the majority of highway runoff enters receiving water bodies without receiving water quality treatment or flow control. A significant portion of highway runoff sheet flows into the vegetated median or roadway embankments before draining to adjacent water bodies; runoff flowing over these vegetated areas receives a small amount of runoff treatment. Most of the closed conveyance systems do not include water quality BMPs prior to discharging to receiving water bodies. WSDOT GIS data shows an existing detention pond at milepost 114.4, but this pond is small and does not treat a significant portion of I-5. WSDOT maintenance mapping shows a section of compost-amended vegetated filter strip that provides water quality treatment at MP 115.6. A bioswale at MP 116.5 provides water quality treatment for the piped conveyance system at Exit 116.

Land Use

Within the study area, existing PGIS is primarily I-5 roadway, shoulder, and interchange ramp areas. Existing PGIS in this area, which includes I-5 surfaces, on- and off-ramps, and interchange roadways, totals approximately 3.2 million square feet. Adjacent local roads and low density residential, commercial, and agricultural land uses are also present and contribute a relatively small amount of remaining PGIS and NPGIS.

Stormwater Runoff Characteristics Related to Soil Types

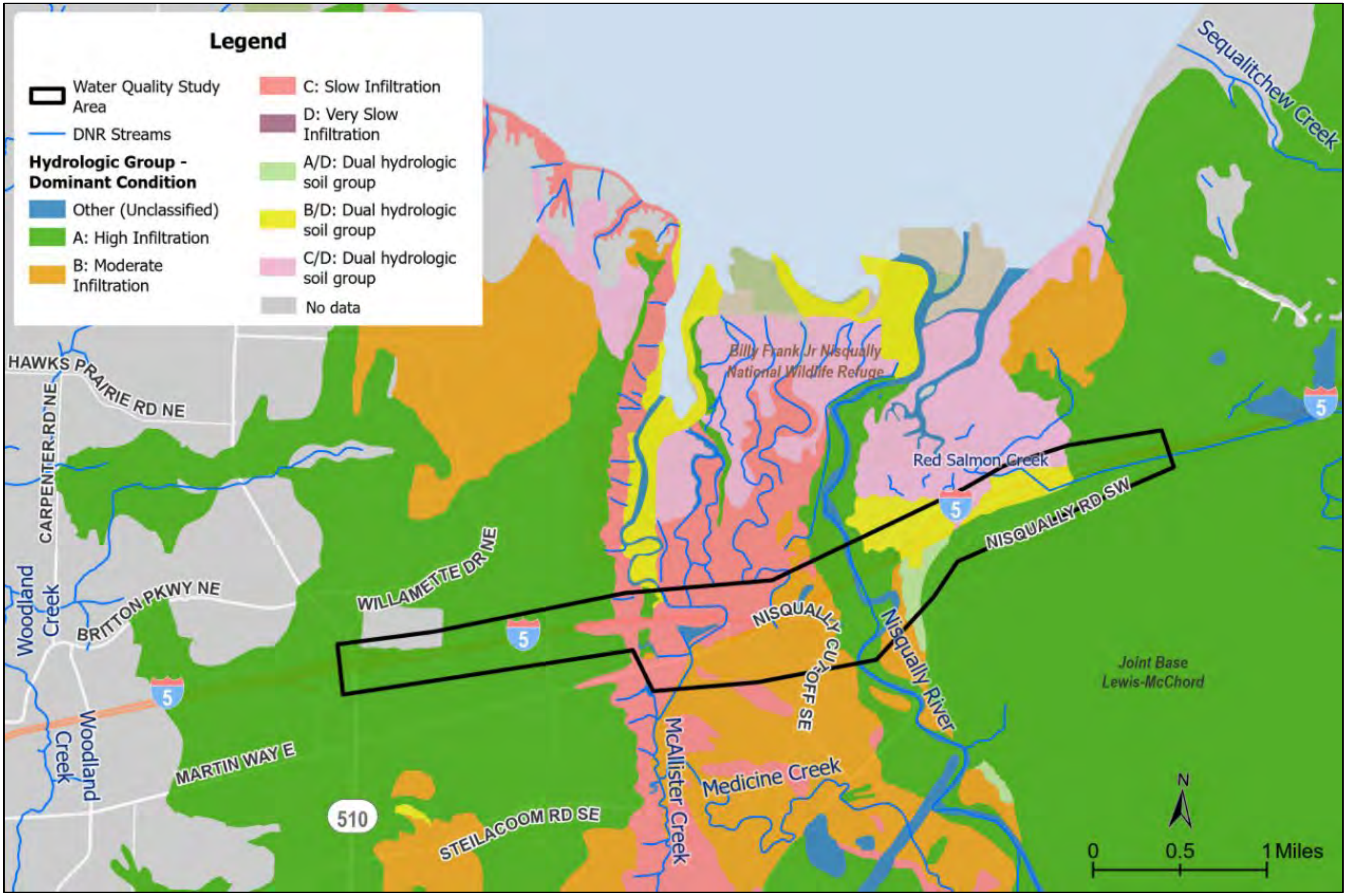
Soils within the study area are categorized into hydrologic soil groups based on physical and runoff characteristics. These soil categories can be used along with land use and hydrologic condition considerations to estimate runoff and infiltration capacities for planning and management practices. Soil Types A and B have moderate to high infiltration potential and moderate to low runoff potential, making them generally compatible with a variety of low-impact development approach stormwater facilities. Type C soils are not compatible with stormwater management facilities that rely on infiltration of surface waters, which includes many low-impact development approaches.

In general, the upland areas on the eastern and western ends of the study area consist of Type A soils with high infiltration rates. Within the low-lying valley of the Nisqually River and McAllister Creek, several different soil classifications are present. South of I-5 within the valley, soils are primarily Type A and B soils with high to moderate infiltration rates. The soils in the immediate vicinity of the Nisqually River are generally Type A soils with high infiltration rates. The hillslopes along the western edge of the valley and the wildlife refuge area consist of Type C soils with slow infiltration rates. The tidal areas north of the study area and in the vicinity of Red Salmon Creek generally consist of Type C/D and Type B/D soils. These dual hydrologic group soils are low infiltration capacity soils that are consistently wetted. Table D-1 summarizes the hydrologic soil group for each soil type in the study area. Soil locations are shown on Figure D-3.

Table D-1. Study Area Soils by Hydrologic Soil Group

Map Code	Soil Description
Hydrologic Soil Group A: High Infiltration	
33	Everett very gravelly sandy loam
73	Nisqually loamy fine sand
84	Pilchuck loamy sand
110	Spanaway gravelly sandy loam
2100	McChord-Everett complex
3103	Xerorthents
3112	Everett-Spanaway-Spana complex
25A	Nisqually loamy sand
29A	Pilchuck fine sand
31A	Puyallup fine sandy loam
Hydrologic Soil Group B: Moderate Infiltration	
89	Puyallup silt loam
Hydrologic Soil Group C: Low Infiltration	
30	Dystric Xerochrepts
88	Puget silt loam
115	Sultan silt loam
Hydrologic Soil Group D: Wet Soils	
45	Hydraquents, tidal
1102	Fluvaquents-Water complex
1105	Yelm-Steilacoom-Everett complex
20C	Kitsap silt loam
2A	Aquic Xerofluvents
43A	Tacoma silt loam
Other	
129, W	Water

Figure D-3. Soil Mapping by Hydrologic Soil Group



Water Quality

The federal Clean Water Act (33 U.S.C. §1251 et seq.) requires that all states restore their water bodies to be "fishable and swimmable." To evaluate the quality of surface waters in Washington, the Washington State Department of Ecology (Ecology) periodically completes a water quality assessment that includes all rivers, lakes, and marine waters. The assessed water bodies are placed into one of five categories that describe their water quality. Category 5 is defined as polluted (or "impaired") water that requires a Total Maximum Daily Load (TMDL). A category 4 waterbody is defined as impaired or threatened for one or more uses, but does not need a TMDL. Category 4 waterbodies are further broken down into subcategories a, b, and c, which define why a TMDL is not needed:

- TMDL is in place and being actively implemented
- A pollution control plan is in place that is expected to solve the pollution problems
- The impairment cannot be addressed through a TMDL (impairment is not due to a pollutant)

Section 303(d) of the Clean Water Act establishes a process to identify and clean up polluted water; those waters Ecology determines to be impaired are placed on the "303(d) list" and are prioritized for future cleanup. If a project site discharges to any of the listed bodies of water, additional water quality treatment or flow control measures may be required. The presence of fish in a water body may also influence stormwater management requirements and other regulatory obligations. Water quality impairments and fish presence for water bodies crossing or downstream of the study area are summarized in Table D-2. Additional information regarding fish presence is provided in the Vegetation, Fish, and Wildlife Affected Environment Memorandum.

Development within the study area and the lack of stormwater runoff treatment from I-5 and adjacent roadways has resulted in legacy contamination for water bodies in the study area. Table D-2 lists all of the water bodies designated as impaired on the 2018 EPA 303(d) list that are in or immediately downstream of the study area, and Figure D-4 displays them (Ecology 2018). Water quality impairments include fecal coliform bacteria in McAllister Creek and Wash Creek (a tributary to Red Salmon Creek), temperature in the Nisqually River and an unnamed tributary to Red Salmon Creek, and non-native aquatic plants in a pond at the eastern edge of the Nisqually River valley.

Table D-2. Water Quality Status of Surface Water Bodies in the I-5 Marvin to Mounts Road Study Area

Surface Water Body	Water Quality Impairment	Water Quality Impairment Category(1)	Fish-Bearing(2)
McAllister Creek	Bacteria – Fecal Coliform	4A	Yes
Nisqually River	Temperature	5	Yes
Unnamed Tributary to Red Salmon Creek	Temperature	5	Yes
Wash Creek (Tributary to Red Salmon Creek)	Bacteria – Fecal Coliform	5	Yes
Unnamed Pond (Wetland 10)(3)	Non-Native Aquatic Plants	4C	Potential

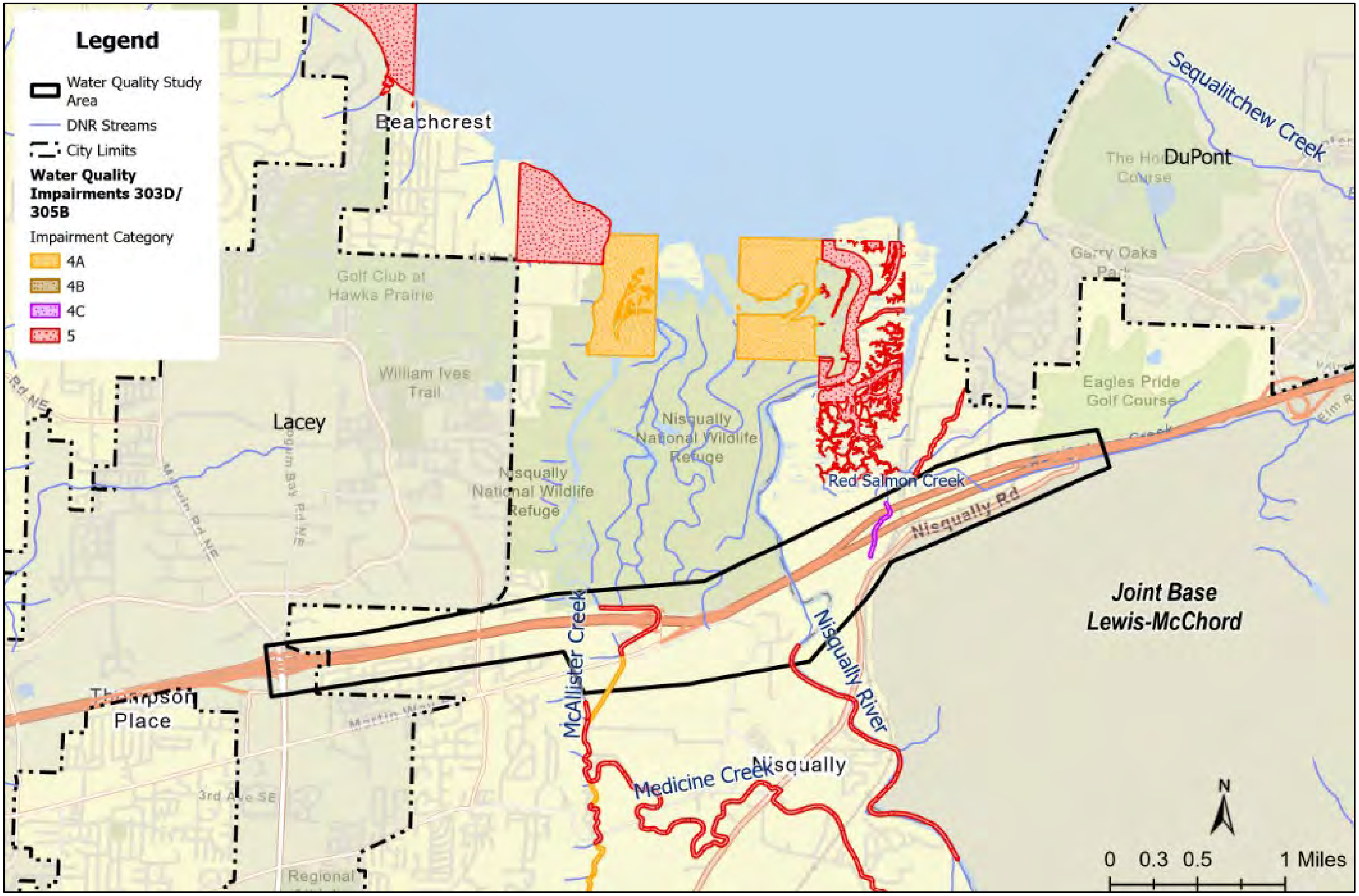
Notes:

Source: 2018 Washington Department of Ecology 303(d)/305(b)Water Quality Impairment List.

Indicates the documented or expected presence of fish in reaches in the study area. “Potential” indicates that no fish have been observed, but there is nothing precluding their presence in the stream. See the Vegetation, Fish, and Wildlife Affected Environment Memorandum for Additional Information.

The unnamed pond is identified as Wetland 10 in the Wetlands and Streams Affected Environment Memorandum. This wetland is the marshy area at the eastern edge of the Nisqually River Valley.

Figure D-4. Ecology 303(d) Water Quality Listings



2.9 Groundwater

The study area contains several groundwater resources, such as aquifer recharge and wellhead protection areas, that are highly susceptible to groundwater contamination. These areas are shown on Figure D-5.

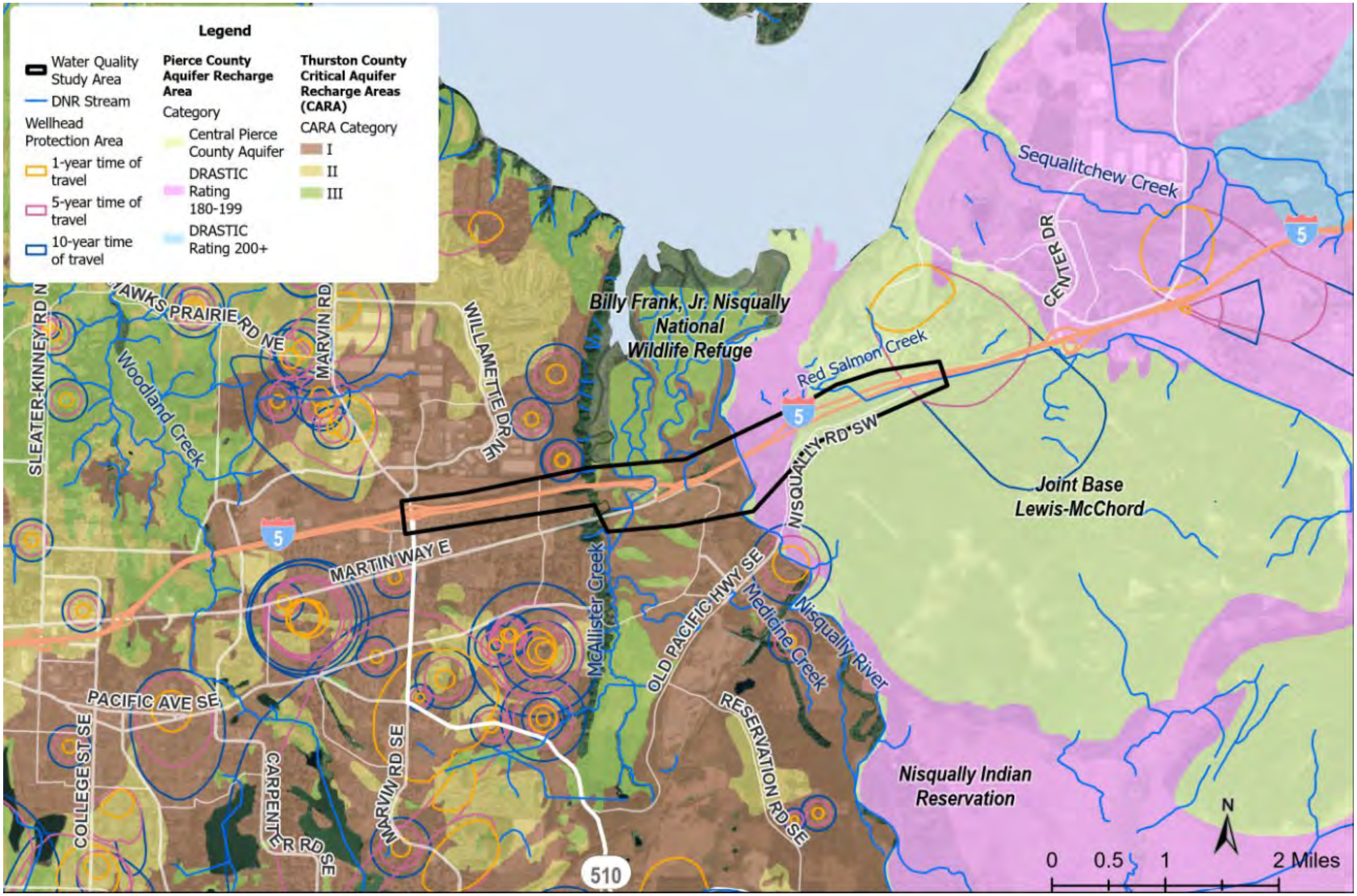
The Safe Drinking Water Act requires every state to develop a wellhead protection program. The state Department of Health (DOH) administers the wellhead protection program in Washington. Wellhead protection areas (WHPAs) are defined by protection categories that refer to the amount of time it would take contamination to reach the wellhead from the specified area within each boundary. Projection boundaries include the 1-, 5-, and 10-year time of travel boundaries. Figure D-5 shows 2 WHPAs with 5-year time of travel boundaries that intersect the study area: one at the western edge of the valley, and one at the eastern end of the study area. Required levels of protection and restrictions on certain activities increase for boundaries closer to the wellhead.

Pierce County maintains a publicly available Aquifer Recharge Area GIS layer, shown in Figure D-5. This layer is a combination of several different types of aquifer-related datasets. The Central Pierce County Aquifer area is mapped within this Aquifer Recharge Area layer and covers the entire portion of the study area within Pierce County. The Central Pierce County Aquifer is designated as a Sole Source Aquifer by the Environmental Protection Agency, as most residents in this area rely on groundwater as their only source of drinking water.

The Pierce County Aquifer Recharge Area layer also shows areas where DRASTIC ratings are available. The DRASTIC model was developed by the Environmental Protection Agency (EPA) with the National Water Well Association. It provides a basis for evaluating the vulnerability to pollution of groundwater resources based on the hydrogeologic parameters of depth to groundwater, net recharge, aquifer media, soil media, topography, the vadose zone, and hydraulic conductivity. The DRASTIC rating for the study area between the Nisqually River and the eastern edge of the valley is 180 to 199, which is defined as highly susceptible to groundwater contamination (Pierce County 2015). These ratings are designed to safeguard groundwater resources and wellhead protection areas by requiring mitigation or precluding future discharges of contaminants from new land use activities.

Thurston County regulates discharges to groundwater through Critical Aquifer Recharge Areas (CARAs). CARAs are present throughout the portion of the study area within Thurston County, west of the Nisqually River. CARAs are divided into three categories of aquifer sensitivity: extremely sensitive (I), highly sensitive (II), and moderately sensitive (III). Most of the study area within Thurston County is within extremely sensitive category I CARAs. Thurston County Code Chapter 24.10, Critical Aquifer Recharge Areas, describes the restrictions on activities within each CARA category. Figure D-5 shows groundwater resources in the study area.

Figure D-5. Groundwater Resources



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3 WETLANDS AND OTHER WATERS

3.1 Executive Summary

The Washington State Department of Transportation (WSDOT) is undertaking additional technical analyses and interested party input to arrive at a final purpose and need and preferred alternative(s) to advance into National Environmental Policy Act (NEPA) environmental review for the I-5 Marvin Road to Mounts Road project (project), which would provide congestion relief and environmental improvements between Exit 111 (Marvin Road) and Exit 116 (Mounts Road). Between these termini, the project area includes portions of unincorporated Pierce and Thurston County, Joint Base Lewis-McChord, the City of Lacey, the Billy Frank Jr. Nisqually National Wildlife Refuge, and traditional lands of the Nisqually Indian Tribe.

This wetland, stream, and high tide line assessment report provides information on the presence and location of wetlands and other waters and their buffers and will aid project designers in avoiding or minimizing potential impacts to these sensitive areas. These aquatic resources are regulated by the U.S. Army Corps of Engineers (USACE) as waters of the United States, by the Washington State Department of Ecology (Ecology) as waters of the state, and by Thurston and Pierce Counties through their municipal codes.

Wetlands and other waters identified within the project study area include:

- 23 freshwater and estuarine wetlands
- Three stream systems, including McAllister (Medicine) Creek, Nisqually Creek, and Red Salmon Creek and tributaries
- High tide line of tidally influenced waters of estuarine wetlands and McAllister (Medicine) Creek, Nisqually River, and Red Salmon Creek

Of the 23 wetlands identified, 13 are located within Thurston County and 10 are within Pierce County. All wetlands were rated using the 2014 Washington State Wetland Rating System for Western Washington and were assigned buffers based on the local municipal code.

Two Wetlands of High Conservation Value are mapped by Washington Department of Natural Resources within and adjacent to the study area. Several Washington Department of Fish and Wildlife Priority Habitats and Species are identified within or adjacent to the study area. Additional species and habitat information can be found in the Vegetation, Wildlife, and Fish Existing Conditions Memorandum associated with this project. A separate Biological Assessment will be prepared during the NEPA process to address federally listed endangered or threatened species and designated or proposed critical habitat.

3.2 Introduction

This report was prepared to support the Washington State Department of Transportation (WSDOT) I-5 Marvin Road to Mounts Road Planning and Environmental Linkages (PEL) study. The PEL is intended to develop a final purpose and need and preferred alternative(s) to advance into National Environmental Policy Act (NEPA) environmental review for the I-5 Marvin Road to Mounts Road project (project). The project would provide congestion relief and environmental improvements between Exit 111 (Marvin Road) and Exit 116 (Mounts Road). The purpose of this report is to identify and describe wetlands and streams in the project corridor.

This report helps WSDOT:

- Avoid and minimize impacts to wetlands and other waters during the project design process and construction.
- Document wetland and stream boundary determinations for review by regulatory authorities.
- Provide background information for wetland mitigation reports, should impacts be unavoidable.

The report will also provide supporting documentation for future permit applications, including a Clean Water Act (CWA) Section 404 Permit issued by the U.S. Army Corps of Engineers (USACE), CWA Section 401 Water Quality Certification issued by the Washington State Department of Ecology (Ecology), Hydraulic Project Approval from the Washington State Department of Fish and Wildlife (WDFW), and critical areas alteration permits from Thurston County and Pierce County.

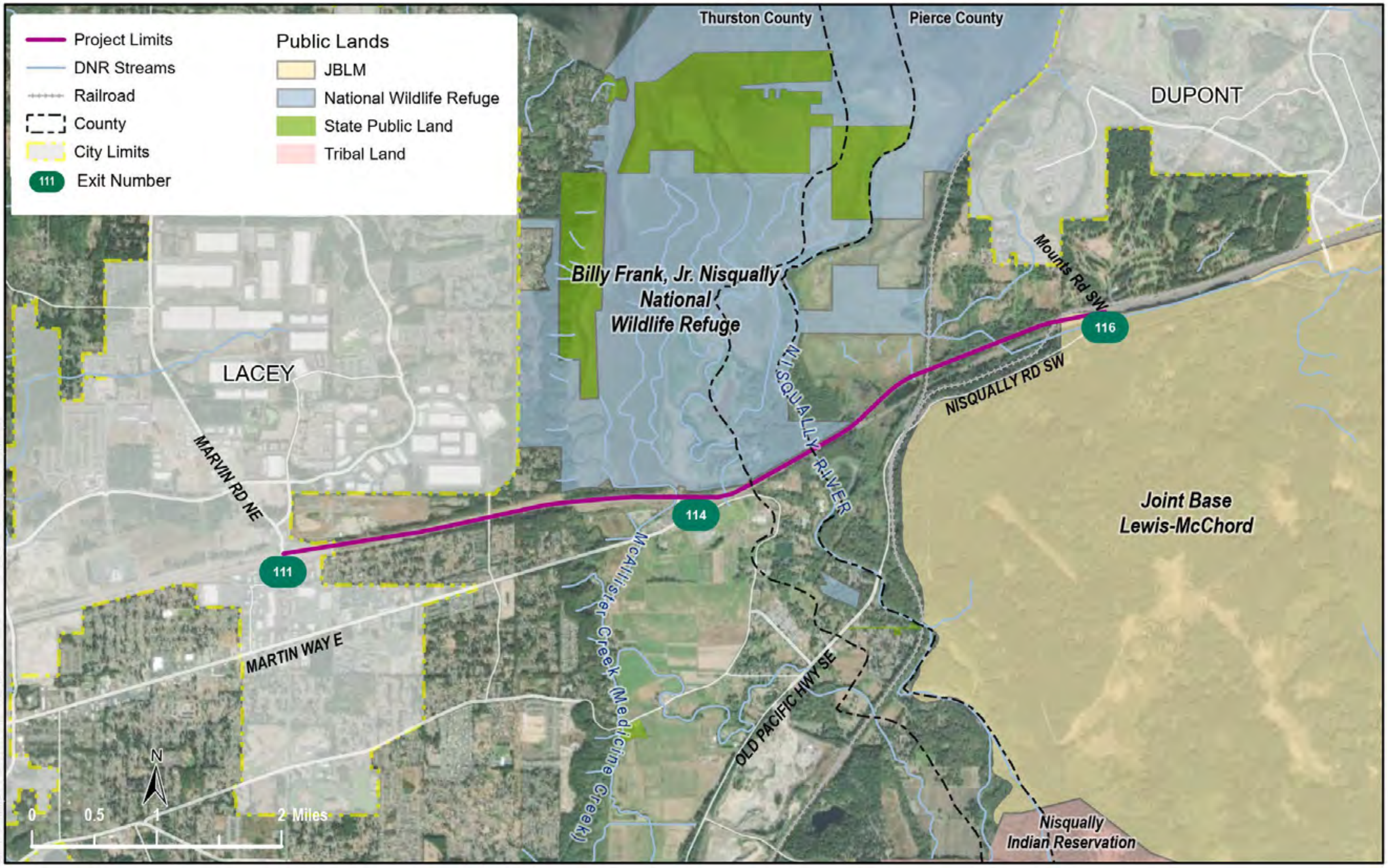
3.3 Proposed Project

3.3.1 Project Location

The study area for the I-5 Marvin Roan to Mounts Road project is located in Pierce and Thurston Counties, Washington (Figure D-6). The northern end of the study area lies within unincorporated Pierce County and the Joint Base Lewis McChord (JBLM) military base. The southern end is located within the Lacey city limits, in Thurston County. The project improvements would begin just south of Exit 111 (Marvin Road) and would end just north of Exit 116 (Mounts Road). Between these termini, the project area includes portions of unincorporated Pierce and Thurston County, JBLM, the City of Lacey, the Billy Frank Jr. Nisqually National Wildlife Refuge, and traditional lands of the Nisqually Indian Tribe.

The legal description of the project area is Township 18N, Range 1W, Section 12, and Township 18N, Range 1E, Sections 03, 04, 08, 07, 36, 37,39, and 43. The project is located in Land Resource Area A and Major Land Resource Area 2 (NRCS 2022).

Figure D-6. Project Vicinity Map



3.3.1 Project Purpose and Description

In 2020, WSDOT completed a corridor study of Interstate 5 (I-5) between State Route (SR) 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This segment of I-5 connects Thurston and Pierce Counties and provides access to JBLM. The roadway travels across the Nisqually River estuary, traditional land of the Nisqually Indian Tribe, and habitat for several federally listed fish and wildlife species.

In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin Road and Mounts Road interchanges through the Nisqually River delta. An initial PEL study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

The current phase, a Focused PEL, is studying I-5 from Marvin Road to Mounts Road (Exit 111 to Exit 116). The Focused PEL will consider additional technical analyses and project partner input to arrive at a final purpose and need and preferred alternative(s) to advance into National Environmental Policy Act (NEPA) environmental review beginning in 2023. Funding has been provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way (ROW) acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing.

3.3.2 Study Area

The study area for wetlands and other waters includes the WSDOT right of way (ROW) and the area extending 500 feet from the ROW (Figure D-7). The additional 500-foot radius is included to account for any potential work outside the ROW as well as potential buffer impacts from off-site wetlands or streams (Figure D-8). The study area is divided into two subareas: a delineated study area and a reconnoitered study area. The delineated study area includes all areas within the WSDOT ROW and other properties where right of entry has been granted. The reconnoitered study area includes those areas within 500 feet of WSDOT ROW where right of entry was unavailable.

If, subsequent to this analysis, impacts are proposed to occur beyond the delineated study area, those areas must have a complete Wetlands and Other Waters Assessment (such as delineation and rating) prior to permitting.

Figure D-7. Study Area Map

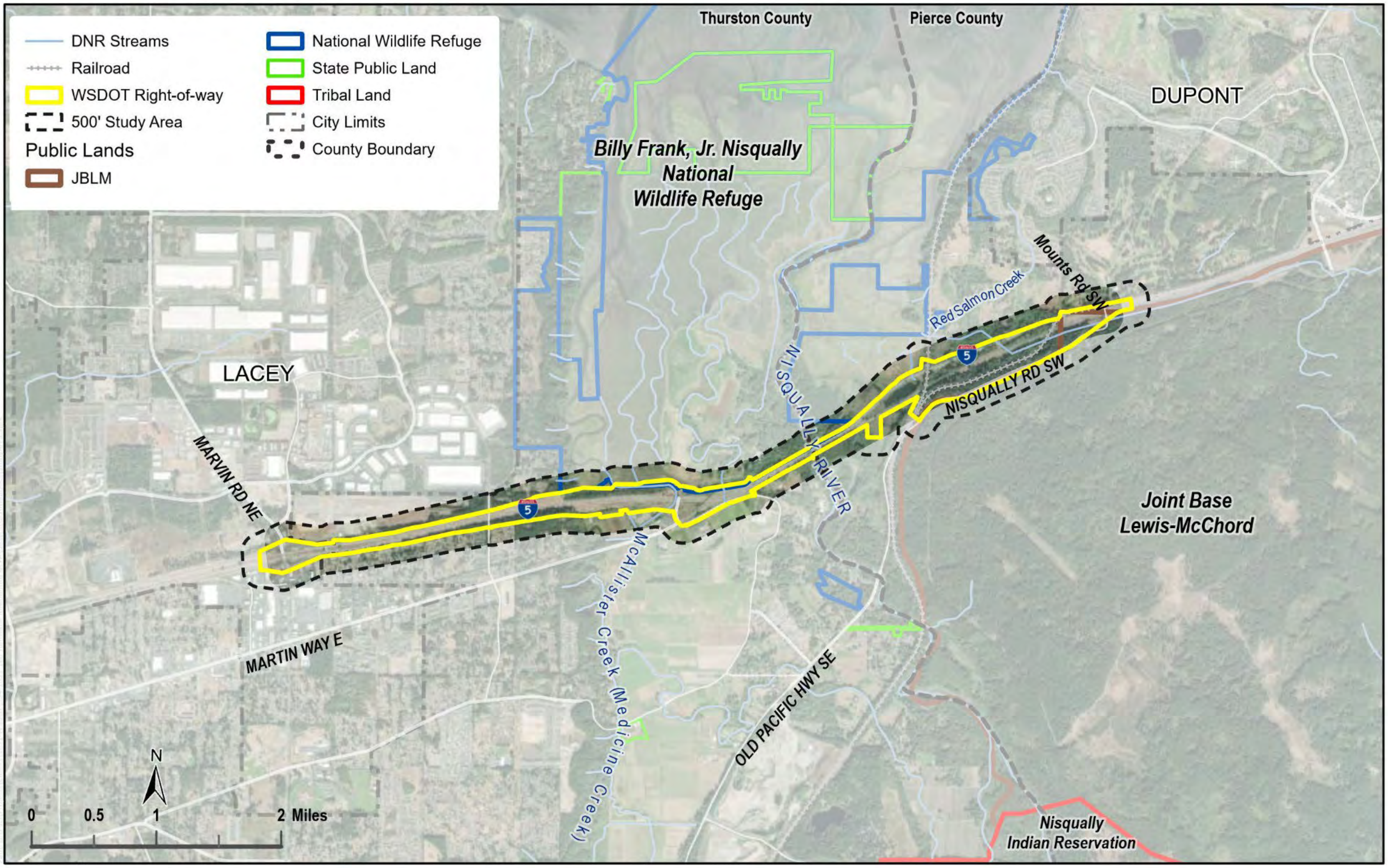


Figure D-8. Wetland Landscape

Landscape setting photo taken on January 10, 2023

3.4 Methods

The following data sources were reviewed for information on precipitation, topography, drainage patterns, soils, vegetation, and potential or known wetlands and streams in the project vicinity:

- Aerial photography of the project corridor (including Thurston and Pierce County aerial database and Google Earth database (Google Earth 2023))
- Thurston County Geodata hydrology maps (Thurston 2023)
- Pierce County GIS hydrology maps (Pierce County 2023)
- WDFW Statewide Integrated Fish Distribution (SWIFD) Map (WDFW 2023a)
- Priority Habitats and Species data (WDFW 2023b)
- Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS 2023)
- National Wetlands Inventory (NWI) online interactive mapper (USFWS 2023a)
- Climate data for King County as measured at the Olympia Airport Station (ACIS 2022)
- Washington Department of Natural Resources (WDNR) Forest Practices water type maps (WDNR 2023a)
- Washington Wetlands of High Conservation Value Map (WDNR 2023b)
- Washington State Water Quality Atlas for water quality standards (303d mapping) and improvement projects (Total Maximum Daily Loads) (Ecology 2023a, b)
- NOAA Tides and Currents Station Budd Inlet, South of Gull Harbor Washington 9446807 (NOAA 2022)
- United States Geological Survey Stream Stats Mapper (USGS 2023a)
- Critical area ordinance for Thurston County (TCC 24.25)
- Critical area ordinance for Pierce County (PCC 18E.30)

Wetland, stream, and aquatic resources assessment fieldwork was completed:

- Between December 2022 and February 2023.
- By Parametrix wetland biologists Kaylee Moser (Professional Wetland Scientist [PWS]), Josh Wozniak (PWS), Anna Hoenig (PWS), Irina Lapina (PWS), Colton Kyro, Amanda Weiss, Allie Mulvihill, and Aaron Thom.
- While walking the extent of the study area within the ROW.

Wetland and stream assessment and report preparation follows policy and guidance on the WSDOT Wetlands webpage (WSDOT 2023).

3.4.1 Wetland Delineation, Classification, Functions, and Buffers

Wetlands were delineated using routine methods described in:

- Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987)
- Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0) (WMVC Regional Supplement) (USACE 2010)

Wetland boundaries were delineated based on on-site observations of vegetation, soils, and hydrology in conjunction with background information listed above. Some wetlands in the project corridor have boundaries extending beyond the study area. Wetland boundaries were estimated using background information such as NWI, local critical areas mapping, NRCS web soil survey, elevation contours, aerial imagery, and field observations from a distance.

Wetlands were classified using the U.S. Fish and Wildlife Service classification system (Cowardin 1979; FGDC 2013) and the hydrogeomorphic classification system (HGM) (Brinson 1993). Wetlands were rated using the Washington State Wetland Rating System for Western Washington – 2014 Update (Hruby 2014). This rating system is also adopted by Thurston County and Pierce County in their respective critical areas codes. Wetland functions were assessed using the Wetland Functions Characterization Tool for Linear Projects (Null et al. 2000).

The study area falls between two different jurisdictions: Thurston County and Pierce County. Buffer widths range from 25 to 300 feet, depending on jurisdiction, wetland rating, and special characteristics (such as estuaries, bogs, and Wetlands of High Conservation Value). Wetland buffer condition within the study area was assessed using the following criteria:

- Land use (e.g., residential, forestry).
- Buffer vegetation structure (e.g., tree, shrub, herb, unvegetated).
- Buffer vegetation community (e.g., dominant plant species per strata, native vs. nonnative dominants, and description of invasive species or noxious weeds).

3.4.2 Stream Delineation, Classification, and Buffers

The ordinary high water line (OHWL) of each stream was delineated using the following definition provided in the Washington Administrative Code (WAC): " … the mark on the shores of all water that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in ordinary years as to mark upon the soil or vegetation a character distinct from the abutting upland. …" (WAC 77.55.011).

Fish presence/absence was determined based on WDNR water type maps (2023a), WDFW fish distribution mapping (2023a), and field observations.

Under Thurston County Code (TCC) 24.25.020, Type S streams are inventoried as "Shoreline of the State" under the Shoreline Master Program for Thurston County and require a buffer of 250 feet. Type F streams are fishing bearing streams. Type F streams greater than 20 feet require a buffer of 250 feet. Type F streams less than 20 feet require a buffer of 150 feet. Type Np and Ns streams draining to Type S or F streams or directly to Puget Sound require a buffer of 150 feet. Other streams not listed above, including streams without a surface connection to other waters require a buffer of 100 feet.

Under Pierce County Code (PCC) 18E.40.060, Type S1 streams are "marine waters designated as Marine Shoreline Critical Salmon Habitat" and require a buffer of 100 feet. Type F1 streams are fish-bearing and require a buffer of 150 feet. Type N1 waters are perennial or seasonal non-fish bearing streams and require a buffer of 115 feet. Type N2 waters are non-fishing bearing streams with specific hydrologic connection parameters and require a buffer of 65 feet. Type N3 waters are lakes or ponds that do not have any critical fish species and require a buffer of 35 feet.

3.4.3 High Tide Line Delineation and Buffers

The high tide line (HTL) was delineated for all tidally influenced waters in the study area (USACE 2020). The mean elevation of the highest predicted tide (HPT) over the 10-year period was applied to tidally influenced waters within the study area to establish the HTL. To establish HTL biologists reviewed:

- Mean elevation of HPT data for the HTL elevation relative to Budd Inlet, South of Gull Harbor Washington station number 9446807 for the 10-year period between January 1, 2022, and December 31, 2032 (NOAA 2022).
- Predicted higher high water tidal elevation and time for the days of field work between December 2022 and February 2023.
- Field indicators.

The HTL delineation occurred between December 2022 and February 2023. Biologists compared HPT elevation to field indicators by first locating high water field indicators for the dates of field work, and assuming the predicted higher high water tidal elevations for those days of field work aligned with and matched the field indicators of the higher high water tide, then estimating the difference in elevation from field indicators of the higher high water tide up to the HPT elevation, and finally looking for field indicators of HTL at the HPT. Site visits included observations during or immediately after king tides at the end of December 2022 and January 2023 since those elevations were estimated to be at or near the predicted HTL. Additionally, biologists established HTL observation points by setting pin flags at the edge of water and documenting changes of the water elevation at different points of the tidal cycle.

A marine riparian habitat buffer of 250 feet extending landward from the HTL is required under TCC 24.25.050. A buffer width of 150 feet is required for natural shoreline designations under PCC 18S.20.030.

Parametrix biologist Kaylee Moser and WSDOT biologist Erika Whitney coordinated with USACE liason Jennifer Lang on April 19, 2023 to discuss the HTL recommendation.

3.4.4 Wetland, Stream, and HTL Boundary Documentation

Boundaries of wetlands were documented using WSDOT Sensitive Areas Naming and Flagging Conventions (WSDOT 2023). Wetland sample point locations and boundaries of wetlands were marked with alphanumeric characters on pink flags. Stream and HTL locations were marked with blue and white flags.

All sample plot, wetland, stream, and HTL flags were instrument-surveyed by professional surveyors.

3.5 Existing Conditions

3.5.1 Landscape Setting

The study area is located on two glacially formed terraces and a broad floodplain that occurs between them. It is an area described as part of the Puget Sound Lowland region, which lies between the Cascade Range (to the east) and the Olympic Mountains (to the west). The Puget Sound Lowland region has a complex geological history where many of the landforms have been shaped by ancient volcanic activity, plate tectonics, and, most recently, glacial drift carving out the landscape and leaving an array of sediment distributions. The geology of the study area was influenced by successive glaciations during the Pleistocene era, most recently the Vashon Stade of the Fraser glaciation, which ended about 13,500 years ago. Pre-Vashon (older) and post-Vashon (younger) deposits are also found in the study area. In the Nisqually River valley, pre-Vashon sediments underlie a thick deposit of post-Vashon deposits of silt, sand, gravel, and peat that are associated with the Nisqually River, the delta, and the tidal estuary. The plateaus bordering the Nisqually River valley are underlain by a sequence of glacially overridden soils that were deposited during the Vashon ice sheet advance and/or directly emplaced by the Vashon ice sheet. As the Vashon ice sheet receded, meltwater streams flowed from the glacier and deposited thick layers of sand and gravel with cobbles and boulders, relatively free of silt and clay, in upper portions of the study area, with finer textured soils dominating the floodplain and estuary (WDNR 2023c).

The study area encompasses the broad and nearly flat floodplain and estuary of the Nisqually River and McAllister (Medicine) Creek, which lies close to sea level and is bordered by steep slopes that rise to approximately 250 feet at the Marvin Road and Mounts Road interchanges. Across the valley, I-5 is raised approximately 10 to 15 feet above the existing grade on a series of structures and embankments. At the western edge of the valley, a wide embankment (approaching 500 feet in some areas) rises west of the McAllister (Medicine) Creek crossing to convey the highway up the slope toward Martin Way, transitioning to a cut slope before meeting the original grade at the top of slope. The study area is also intersected by two steep railroad fill prisms between Mounts Road and the Nisqually River crossing.

The study area contains a mixture of native forests, shrublands, and open, grassy habitats with wetland and uplands intermixed on the landscape. Details on vegetation communities and plant species can be found in Section 4.3.2 and in the Fish, Wildlife and Vegetation Existing Conditions Memorandum associated with this project (Confluence 2023).

Land use in the study area includes extensive agricultural land and conservation/park land along with residential, commercial, military, industrial/transportation (railroads). Surrounding land use includes commercial and rural residential, with development concentrated on the south end of the study area.

The study area extends about 6 miles from north to south, passing through the Woodland Creek-Frontal Henderson Inlet watershed within Water Resource Inventory Area (WRIA) 13 - Deschutes Basin, and the McAllister Creek and Nisqually River-Frontal Puget Sound watersheds within WRIA 11 - Nisqually Basin. Main water drainages include McAllister (Medicine) Creek, the Nisqually River, and Red Salmon Creek, all of which drain into the Billy Frank, Jr. Nisqually Wildlife Refuge estuary system.

3.5.2 Climate, Precipitation, and Growing Season

Climate

The weather of the area surrounding to the study site is relatively mild, with a temperate climate. Summer temperatures have an average low of 47°F and average high of 78°F, with July and August being the warmest, driest months. Winter days typically stay in the mid-40s while winter nights drop down to the low 30s. November and December are typically the wettest months while December and January are the coldest on average, with scarce snow showers occurring in the area. The average annual precipitation total near Olympia is 51 inches (ACIS 2022).

Precipitation

The Regional Delineation Supplement Version 2.0 (USACE 2010) recommends using methods described in Chapter 19 in the Engineering Field Handbook (NRCS 2015) to determine if precipitation occurring in the 3 full months prior to the site visit was normal, drier than normal, or wetter than normal. Actual rainfall is compared to the normal range of the 30-year average. When considering the 3 prior months as a whole for December 2022 field work, drier than normal precipitation conditions were present prior to field work. When considering the 3 prior months as a whole for January 2023 field work, normal precipitation conditions were present prior to field work. When considering the 3 prior months as a whole for February 2023 field work, drier than normal precipitation conditions were present prior to field work. See Appendix A-1 for a detailed account into this precipitation data.

When considering the precipitation that was recorded in the 10 days preceding field work, conditions vary between light, moderate, and heavy, depending on the field work month. Moderate precipitation occurred 10 days prior to the beginning of December field work. Light precipitation occurred in the middle of December, and a few days of heavy precipitation ensued near the end of December before January field days. Moderate precipitation took place in mid-January and light to no precipitation occurred at the end of the month. Light precipitation occurred in February prior to field work (Appendix A-2).

Growing Season

The typical growing season for this area of western Washington occurs between April 5 and November 7 (ACIS 2022). However, indicators such as bud break, new leaf emergence, and new vegetation started showing in early February. The months of December and January, when a majority of the field work was conducted, were not considered to be the growing season based upon field indicators.

3.5.3 Wetlands

Overview

There were 23 wetlands identified in the study area. Wetlands within the WSDOT ROW were formally delineated and surveyed during the field assessments in winter 2022-2023. Wetlands outside of the WSDOT ROW but within the study area were estimated using background information such as NWI, local critical areas mapping, NRCS web soil survey, elevation contours, aerial imagery, and field observations from a distance. These areas will be formally delineated when property access is granted.

Using Ecology's four-tiered rating system, 11 wetlands rate as Category I, 6 wetlands are Category II, and 6 are Category III. These wetlands generally provide moderate to high levels of biological, chemical, and physical functions. Most of the wetlands have a depressional HGM class. Three of the wetlands are high-functioning estuarine wetlands.

Appendix B contains the wetland determination forms, Appendix C contains the wetland rating forms, and Appendix D contains the functional assessment summaries. Table D-3 provides general information about each wetland. Wetland boundaries are shown in Figure D-9 through Figure D-13.

Table D-3. Wetlands Within the Study Area

Wetland	Local Jurisdiction	Cowardin Classification[b]	HGM Classification	Ecology/Local Jurisdiction Rating[c,d]	Habitat Score[c]	Wetland Size (sf/acres)	Standard Buffer Width[e] (ft)
W1	Thurston County	PEM/PFO	Depressional, Riverine	I	8	1,194,608/27.4	280
W2	Thurston County	PEM/PSS	Depressional	III	4	153,978/3.5	140
W3	Thurston County	PEM/PFO	Depressional	III	3	27,731/0.6	100
W4	Thurston County	EEM	Estuarine	I	--	239,514/5.5	220
W5	Thurston County	PEM	Depressional	II	5	66,374/1.5	160
W6	Thurston County	PEM/PFO	Depressional	II	5	85,523/2.0	220
W7	Thurston County	PFO	Riverine	I	8	3,258,279/74.8	280
W8*	Thurston County	PEM	Depressional	III	5	10,277/0.2	160
W9	Thurston County	PEM	Depressional	III	4	195,666/4.5	140
W10	Pierce County	EEM/PEM/PSS/PFO	Estuarine, Riverine	I	--	32,842,714/754.0	220
W11	Pierce County	PSS	Depressional, Riverine	II	7	2,208/0.1	240
W12	Pierce County	EEM/PEM/PFO	Depressional, Estuarine, Riverine	I	8	651,739/15.0	150
W13	Pierce County	PEM	Slope	III	7	6,771/0.2	50
W14	Pierce County	PEM/PFO	Slope, Depressional, Riverine	II	7	51,739/1.2	100
W15	Pierce County	PSS	Slope	III	6	3,217/0.1	50
W16	Pierce County	PFO	Slope, Depressional, Riverine	II	7	8,841/0.2	100
W17	Pierce County	PEM/PSS/PFO	Depressional, Riverine	I	8	43,336/1.0	150
W18	Pierce County	PFO	Depressional	II	7	2,618/0.1	100
W19	Pierce County	PFO	Depressional, Riverine	II	8	11,181/0.3	100
W20	Pierce County	PAB/PEM/PFO	Depressional, Riverine	I	8	44,848/1.0	150

Wetland	**Local Jurisdiction**	**Cowardin Classification**[b]	**HGM Classification**	**Ecology/Local Jurisdiction Rating**[c,d]	**Habitat Score**[c]	**Wetland Size (sf/acres)**	**Standard Buffer Width**[e] **(ft)**
W21	Thurston County	EEM	Estuarine	I	--	~60,956,470/1399.4	250
W22	Thurston County	PEM/PFO	Depressional, Riverine	I	8	~7,616,099/174.8	280
W23	Thurston County	PEM/PFO	Depressional, Riverine	I	9	~1,836,351/142.2	300

[b] *NWI Class based on vegetation: EEM = estuarine emergent, PFO = palustrine forested, PSS = palustrine scrub-shrub, PEM = palustrine emergent, PAB = palustrine aquatic bed (Cowardin et al. 1979)*

[c/d] *Ecology rating (Hruby 2014) and Thurston County/Pierce County wetland rating*

[e] *Thurston County standard wetland buffer per TCC 24.30.045; Pierce County standard wetland buffer per PCC 18E.30.060*

**W8 is non-jurisdictional by USACE because it has formed on road fill between the I-5 main line and Nisqually off-ramp.*

Figure D-9. Wetland Boundaries and Stream Locations (a)

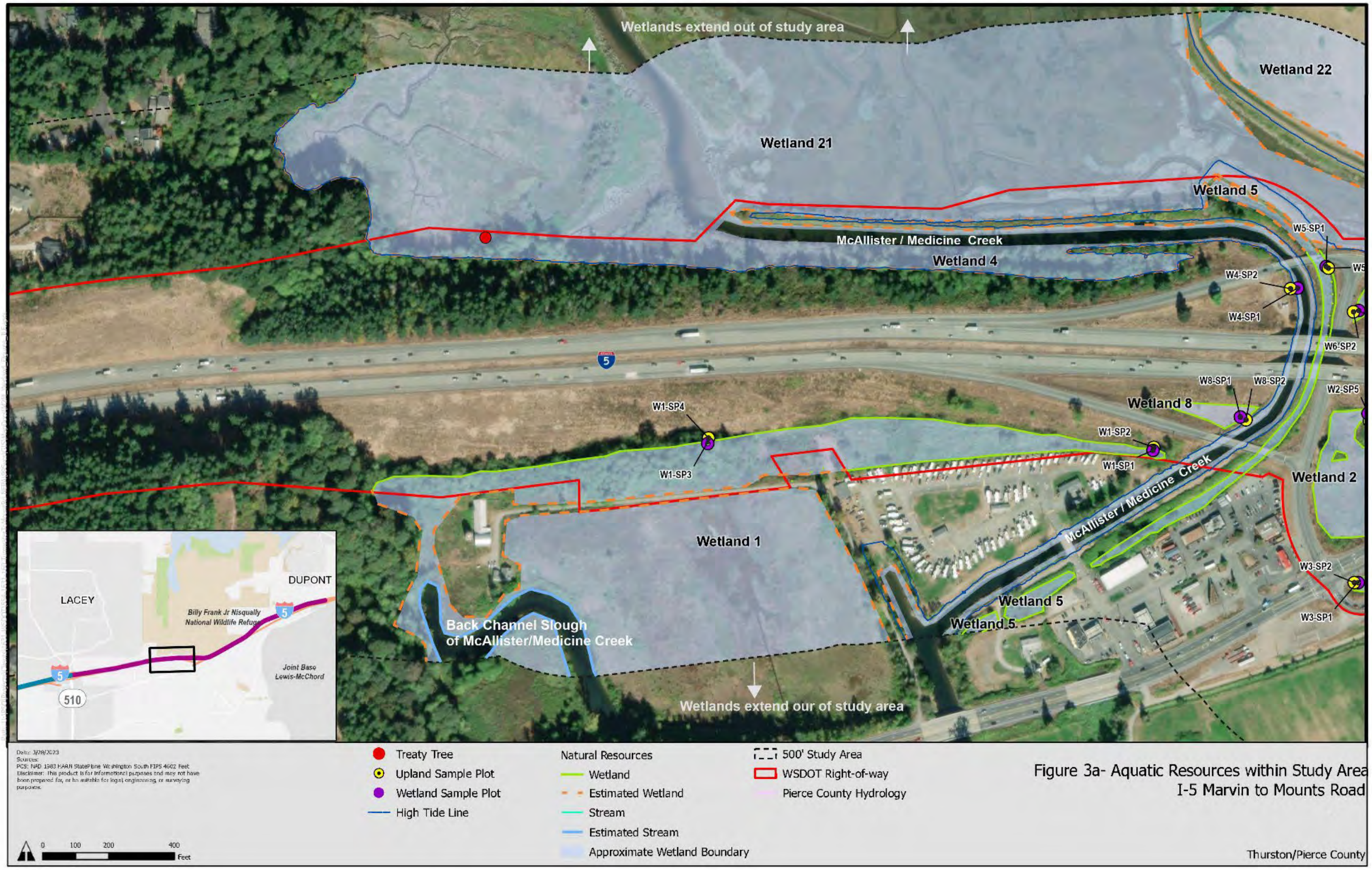


Figure D-10. Wetland Boundaries and Stream Locations (b)

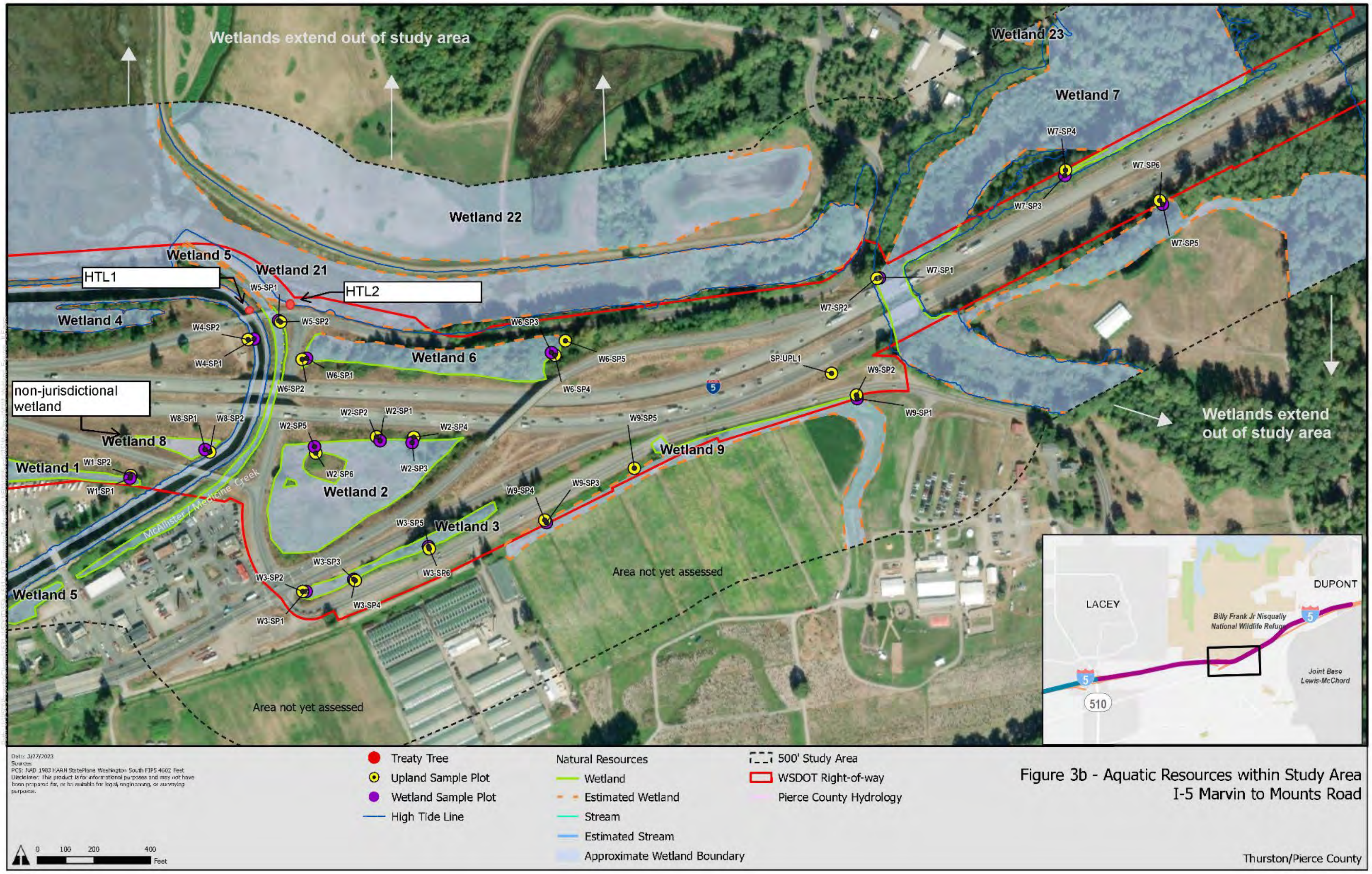


Figure D-11. Wetland Boundaries and Stream Locations (c)

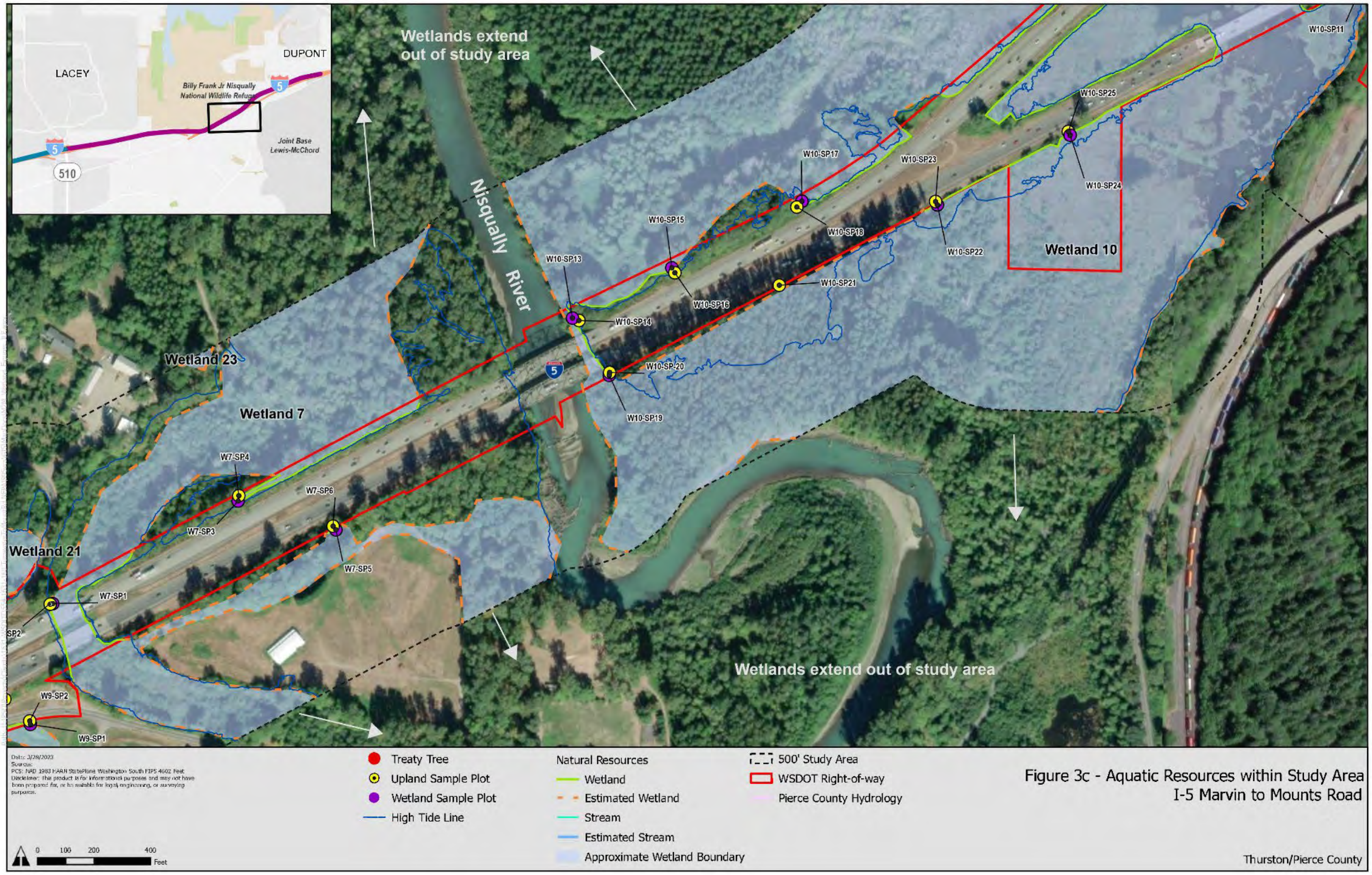


Figure D-12. Wetland Boundaries and Stream Locations (d)

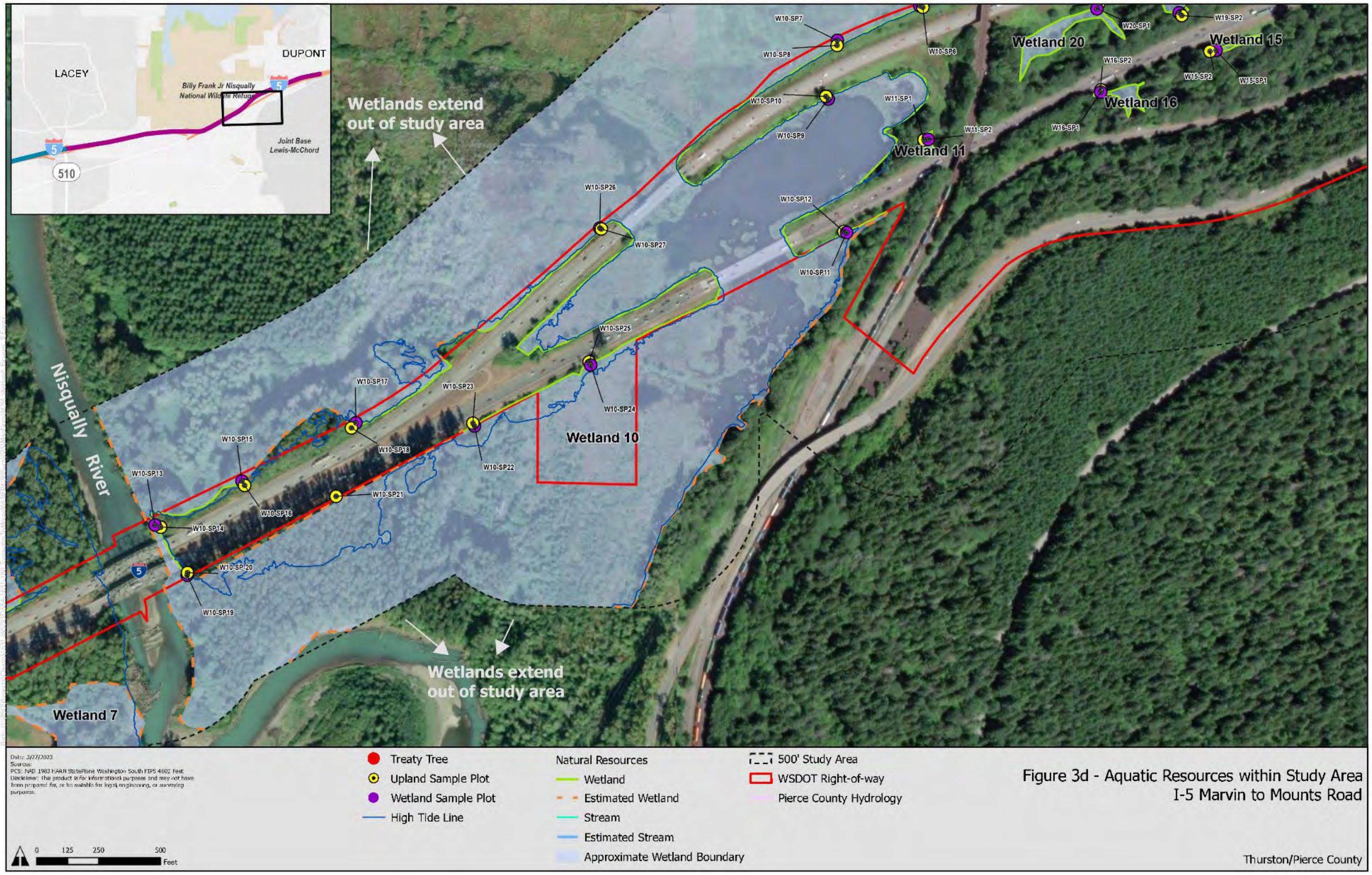
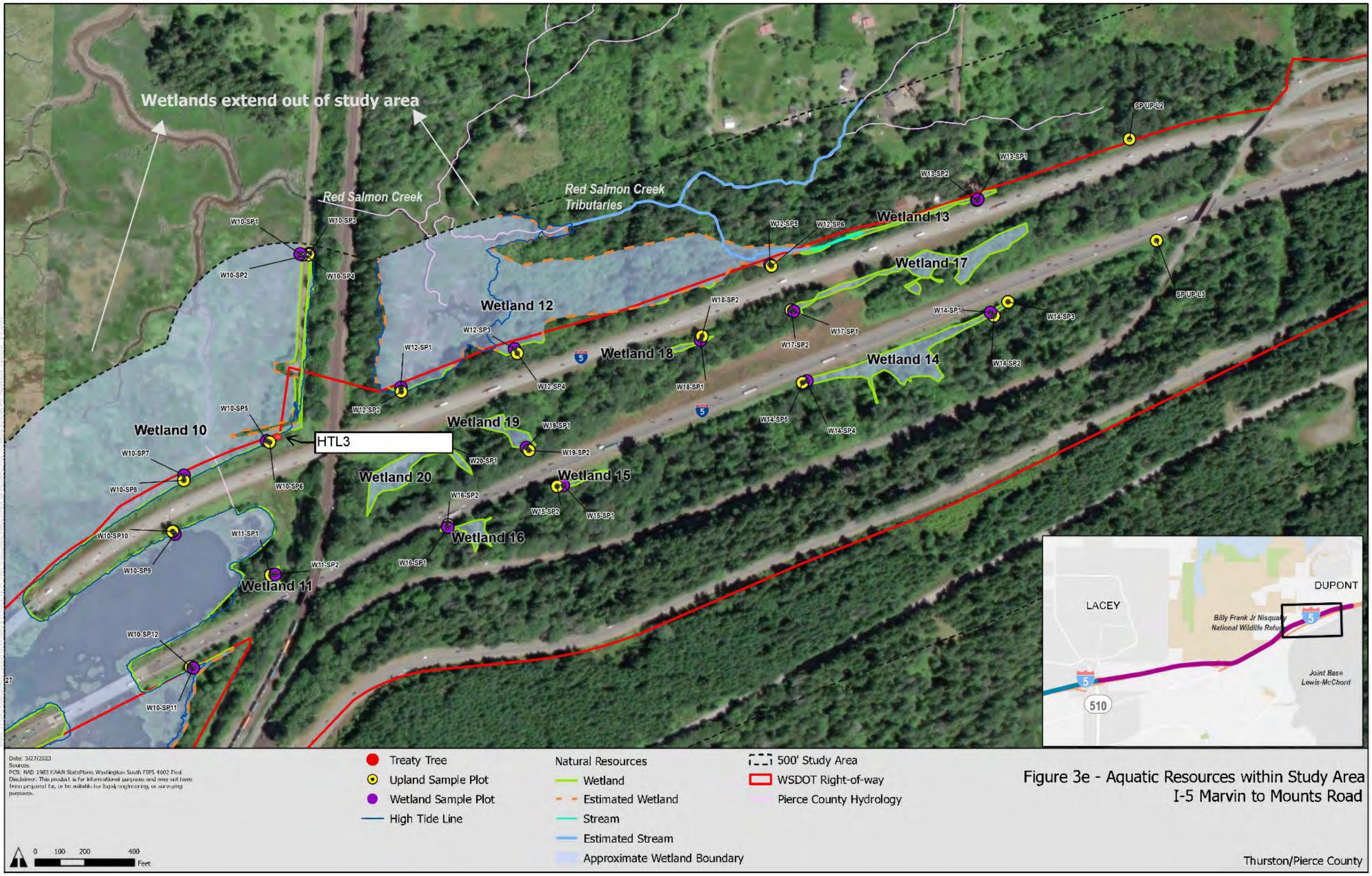


Figure D-13. Wetland Boundaries and Stream Locations (e)



Vegetation

Vegetation in the study area is typical of Puget Sound lowlands and estuaries with areas of disturbed roadside plant communities. Vegetation identified on site is limited because this study primarily took place outside of the growing season.

The emergent estuarine community was dominated by salt tolerant, native species, including inland saltgrass (*Distichlis spicata*), Lyngbye's sedge (*Carex lyngbyei*), Puget Sound gumweed (*Grindelia integrifolia*), and pickleweed (*Salicornia pacifica*).

The forested strata of the wetlands often contained red alder (*Alnus rubra*), Pacific willow (*Salix lasiandra*), Sitka spruce (*Picea sitchensis*), Oregon ash (*Fraxinus latifolia*), and black cottonwood (*Populus balsamifera).*

Dominant vegetation in scrub-shrub wetland areas included Himalayan blackberry (*Rubus armeniacus*), Pacific crabapple (*Malus fusca*), red osier dogwood (*Cornus sericea*), salmonberry (*Rubus spectabilis*), and willow saplings (*Salix spp*.)

Freshwater emergent wetlands were generally dominated by reed canary grass (*Phalaris arundinacea*), slough sedge (*Carex obnupta*), soft rush (*Juncus effusus*), and broadleaf cattail (*Typha latifolia*). Other nonnative roadside grass communities were present in areas of the wetland, especially along the wetland edge, and included primarily colonial bentgrass (*Agrostis capillaris*) and tall fescue (*Schedonorus arundinaceus*).

Figure D-14. Emergent Estuarine Wetland

Typical emergent estuarine wetland in the study area.

Figure D-15. Palustrine Emergent Wetland

Typical palustrine emergent wetland in the study area.

Figure D-16. Disturbed Palustrine Emergent Wetland

Typical disturbed palustrine emergent wetland in the study area.

Figure D-17. Scrub-Shrub Wetland

Typical scrub-shrub wetland in the study area.

Figure D-18. Forested Wetland

Typical forested wetland in the study area.

Soils

There were 25 soil types identified and mapped within the study area based on three soil surveys within varying jurisdictional Map Units (NRCS 2023):

Table D-4. Soil Types in the Study Area

Soil Type	NRCS Hydric Soil Rating
JBLM Area, Parts of Pierce and Thurston Counties (WA777)	
Nisqually loamy fine sand, 0 to 3 percent slopes	4
Pilchuck loamy sand, 0 to 3 percent slopes	5
Puyallup silt loam, 0 to 3 percent slopes	4
Fluvaquents-Water complex, 0 to 1 percent slopes	85
McChord-Everett complex, 3 to 15 percent slopes	0
Xerorthents, 30 to 100 percent slopes	0
Everett-Spanaway-Spana complex, 0 to 30 percent slopes	40
Pierce County Area, Washington (WA653)	
Aquic Xerofluvents, level	100
Kitsap silt loam, 8 to 15 percent slopes	2
Nisqually loamy sand	1
Pilchuck fine sand	10
Puyallup fine sandy loam	2
Tacoma silt loam	100
Yelm-Steilacoom-Everett complex, 0 to 30 percent slopes	35

Soil Type	NRCS Hydric Soil Rating
Thurston County Area, Washington (WA667)	
Xerorthents, 30 to 100 percent slopes	0
Everett very gravelly sandy loam, 8 to 15 percent slopes	0
Hydraquents, tidal	100
Pilchuck loamy sand	5
Pits, gravel	0
Puget silt loam	93
Puyallup silt loam	3
Spanaway gravelly sandy loam, 0 to 3 percent slopes	0
Sultan silt loam	8
Xerorthents, 0 to 5 percent slopes	0

The dominant soil types mapped in the study area are Everett very gravelly sandy loam, Spanaway gravelly sandy loam, Puyallup silt loam, Xerorthents, Dystric Xerochrepts, and Puget silt loam, each of which make up 6 to 17 percent of the study area. The rest of the soil types each make up a small percentage of the overall area. Soil drainage conditions vary across the study area, with hydric soils most prevalent in the center and eastern portions towards McAllister (Medicine) Creek and the Nisqually River estuary. The most common hydric soils in the study area were in the form of poorly drained silt loams (NRCS 2023). Mapped soils are described from west to east in the following sections.

Panaway gravelly sandy loam

Not hydric. The Spanaway series consists of very deep, somewhat excessively drained soils that formed in glacial outwash. They are on terraces and plains. Slopes are 0 to 15 percent. The mean annual precipitation is about 1,270 millimeters. The mean annual temperature is about 50°F. Used for woodland, pasture, cropland, homesites and wildlife habitat.

Pits/gravel

Location of Thurston County waste disposal/city dump.

Everett very gravelly sandy loam, 8 to 15 percent slopes

Not hydric. The Everett series consists of very deep, somewhat excessively drained soils that formed in glacial drift plains. They are on outwash terraces and escarpments, kames, moraines, and eskers. Slopes are 0 to 65 percent. Mean annual precipitation is about 1050 millimeters. Mean annual temperature is about 50°F. Used for livestock grazing, timber production, and urban development.

Dystric Xerochrepts, 60 to 90 percent slopes

Not hydric. These are newly formed alluvial soils.

Pilchuck loamy sand and Pilchuck fine sand

Somewhat hydric. The Pilchuck series consists of very deep, excessively drained and somewhat excessively drained soils that formed in gravelly and sandy alluvium. Pilchuck soils are on floodplains. Slopes are 0 to 8 percent. The mean annual precipitation is about 47 inches and mean annual temperature is about 50°F. These soils are used mostly for pasture or woodland.

Puget silt loam

Hydric. The Puget series consists of very deep, poorly drained soils that formed in recent alluvium on floodplains and low river terraces. Slopes are 0 to 3 percent. The average annual precipitation is about 40 inches. The mean annual temperature is about 50°F. Most of the Puget soil has been cleared and drained for use as cropland. Seeded grass pasture, grass-legume hay, oats, and green-chop are the major crops.

Puyallup silt loam and 31A - Puyallup fine sandy loam

Somewhat hydric. The Puyallup series consists of very deep, well-drained soils formed in recent alluvium. Puyallup soils are on floodplains and low terraces. Slopes are 0 to 3 percent. The mean annual temperature is about 50°F. The mean annual precipitation is about 1,140 centimeters. Used for cropland. Principal crops are hay, pasture, and row crops.

Hydraquents, tidal

Hydric. These are newly formed alluvial soils.

Sultan silt loam

Somewhat hydric. The Sultan series consists of very deep, moderately well-drained soils formed in recent alluvium on floodplains at elevations of near sea level to 120 feet. Slopes are 0 to 3 percent. Average annual precipitation is about 45 inches. Mean annual temperature is 50°F. Most of the Sultan soils have been cleared and are used for growing seeded grass pasture or row crops.

Xerorthents, 0 to 5 percent slopes

Not hydric. These are newly formed alluvial soils.

Aquic Xerofluvents

Hydric. These are newly formed alluvial soils.

Fluvaquents-Water complex, 0 to 1 percent slopes

Hydric. These are newly formed alluvial soils.

Tacoma silt loam

Hydric. The Tacoma series consists of very deep, very poorly drained soils formed in alluvium on tidal flats, flood plains, and deltas. Slopes are 0 to 2 percent. Average annual precipitation is about 40 inches. Mean annual temperature is about 50°F. Most are drained and protected from flooding and used for cropland. Some areas are now in sedges, grasses, and rushes, but were formerly in improved pasture.

Xerorthents, 30 to 100 percent slopes

Not hydric. These are newly formed alluvial soils.

Yelm-Steilacoom-Everett complex, 0 to 30 percent slopes

Hydric. The Yelm series consists of very deep, moderately well-drained soils formed in glacial outwash. They are in relict glacial lacustrine lakes and drainageways on terraces. Slopes are 0 to 30 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 49°F. Used mostly for woodland and wildlife habitat.

McChord-Everett complex, 3 to 15 percent slopes

Not hydric. The McChord series consists of a deep densic layer and moderately well drained soils formed in glacial drift. McChord soils are on glacially modified hills and have slopes of 0 to 65 percent. The mean annual precipitation is about 45 inches and the mean annual temperature is about 48 °F.

Kitsap silt loam, 8 to 15 percent slopes

Somewhat hydric. The Kitsap series consists of a very deep, somewhat poorly drained soil formed in glacial lacustrine sediments on terraces and terrace escarpments. Slopes are 0 to 70 percent. The mean annual precipitation is about 940 millimeters, and the mean annual air temperature is about 50°F. Typically used in timber production, crop production, and livestock grazing in cleared areas.

Nisqually loamy fine sand, 0 to 3 percent slopes and 25A – Nisqually loamy sand

Somewhat hydric. The Nisqually series consists of very deep, somewhat excessively drained soils formed in glacial outwash. Nisqually soils are on terraces with slopes of 0 to 15 percent. The mean annual precipitation is about 1,270 millimeters. The mean annual temperature is about 52°F. Used for irrigated cropland and dryland pasture.

Hydrology

Wetlands in the study area are supported by groundwater expression and elevated water tables, flooding from streams and tidal water, surface water runoff, and direct precipitation. The wetlands and streams in the study area flow through culverts and bridges, eventually discharging to Puget Sound through the Nisqually and McAllister (Medicine) Creek estuaries.

Wetland Functions

A summary of wetland functions and values is provided in Table D-5 below. Detailed functional summaries for all delineated and verified wetlands are provided in Appendix D. The Wetland Functions Characterization Tool for Linear Projects (Null et al. 2000) was used to evaluate wetland functions.

Table D-5. Functions and Values of Wetlands in the Study Area

Function/Value[a]	Wetland										
	1	2	3	4	5	6	7	8	9	10	11
Water Quality Functions											
Sediment Removal	X*	X	X	X	X	X	X*	X	X	X*	X
Nutrient and Toxicant Removal	X	X	X	X*	X	X	X	X	X	X*	X
Hydrologic Functions											
Flood Flow Alteration	X	-	X	X*	X	X	X	X	-	X	-
Erosion Control and Shoreline Stabilization	X*	-	-	X	-	-	X*	-	-	X*	-
Habitat Functions											
Production and Export of Organic Matter	X*	X	X	X	X	X	X*	X	X	X*	X
General Habitat Suitability	X	X*	X	X	X	X	X	X	X	X	X
Habitat for Aquatic Invertebrates	X*	X	X	X*	X*	X	X*	X	X	X*	X
Habitat for Amphibians	X	X	X*	-	X	X*	X*	X	X*	X	X
Habitat for Wetland-Associated Mammals	X*	-	-	X	-	-	X	-	X	X*	-
Habitat for Wetland-Associated Birds	X	X	X	X*	X	X	X	X	X	X*	X
General Fish Habitat	X	-	-	X*	-	-	X	-	-	X*	X
Native Plant Richness	X	X	X	X	-	X	X*	-	-	X	-

Function/Value[a]	Wetland										
	1	2	3	4	5	6	7	8	9	10	11
Special Characteristics											
Educational or Scientific Value	-	-	-	X	-	X	X*	-	-	X*	-
Uniqueness and Heritage	-	-	-	X	-	-	X	-	-	X*	-

Function/Value[a]	**Wetland**											
	12	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Water Quality Functions												
Sediment Removal	X*	X	X	X	X*	X	X	X	X	X	X*	X
Nutrient and Toxicant Removal	X*	X	X	X	X*	X	X	X	X*	-	X*	X
Hydrologic Functions												
Flood Flow Alteration	X	-	X	-	X	X	X	X	-	X*	-	X
Erosion Control and Shoreline Stabilization	X	X	-	-	X	X	-	X*	-	X*	X*	-
Habitat Functions												
Production and Export of Organic Matter	X*	X*	X	X	X*	X*	X	X	X*	X*	X*	X*
General Habitat Suitability	X*	X	X	X	X	X	X	X	X	X*	X*	X*
Habitat for Aquatic Invertebrates	X*	-	X	X	X	X	X	X*	X*	X*	X*	X*
Habitat for Amphibians	X*	-	X*	X	X	X	X	X	X	-	X*	X*
Habitat for Wetland-Associated Mammals	X*	-	X	X	-	X	-	X	X	X*	-	X
Habitat for Wetland-Associated Birds	X*	X	X	X*	X	X	X	X	X	X*	X*	X*
General Fish Habitat	X	X	X	-	X	X	-	X	X	X*	X	X
Native Plant Richness	X*	-	X	-	X	X*	-	X	X	X*	X	X
Special Characteristics												
Educational or Scientific Value	X	-	-	-	-	-	-	-	-	X*	X	X*
Uniqueness and Heritage	X	-	-	-	-	X	-	-	-	X*	X	X*

[a] *"-" indicates that the function is not present*

"X" indicates the function is present

"X" indicates a principal function of the wetland*

Wetland Buffers

Wetland buffers within the study area consist primarily of forested habitat dominated by native plants, although extensive nonnative shrub and herbaceous habitats also occur.

The forested buffer areas provide screening and habitat functions as well as connectivity to large blocks of upland forested habitat. For wetlands located near existing roads and development, the buffers function to filter stormwater flows before entering the wetlands.

Figure D-19. Typical Buffer

Photo of typical buffer in the study area.

Wetland Summary Tables

The following tables summarize the characteristics of the 23 wetlands identified within the study area.

Table D-6. Wetland W1 – Information Summary

<table>
<tr><td>Location:</td><td colspan="2">Southwest of the I-5 northbound (NB) ramp; west of McAllister (Medicine) Creek</td></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>I</td></tr>
<tr><td>Local Rating</td><td>I</td></tr>
<tr><td>Thurston County Buffer Width</td><td>280 feet</td></tr>
<tr><td>Wetland Size</td><td>27.4 acres</td></tr>
<tr><td>Cowardin Class</td><td>PEM/PFO</td></tr>
<tr><td>HGM Class</td><td>Depressional, Riverine</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W1-SP1, W1-SP3</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W1-SP2, W1-SP4</td></tr>
<tr><td colspan="3">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees: red alder, black cottonwood, Pacific willow, western redcedar (<i>Thuja plicata</i>). Shrubs: red osier dogwood, salmonberry. Herbaceous: reed canary grass, broadleaf cattail.</td></tr>
<tr><td>Soils</td><td colspan="2">Soils in W1 were examined at two locations. Generally, soils in W1 met the hydric soil indicator Depleted Matrix (F3). A representative soil profile for W1 can be found at W1-SP1. The first 7 inches below the surface soils consist of a dark greyish brown (10YR 4/2) gravelly silty loam. Soils from 7 to 12 inches are a dark greyish brown with redox features in the form of strong brown (7.5YR 2.5/8) concentrations within the matrix. Below 12 inches, the soil matrix consists of a grayish brown (10YR 5/2) gravely silty clay with strong brown (7.5YR 5/6) redox concentrations in the matrix. Descriptions above met the hydric soil indicator of Depleted Matrix (F3). Soils in W1-SP3 met the hydric soil indicator Depleted Below Dark Surface (A11).</td></tr>
<tr><td>Hydrology</td><td colspan="2">The wetland is situated in a depression south of I-5 and north of Martin Way E. McAllister (Medicine) Creek is east of the subject wetland, with an associated slough contained in the southwest portion of the wetland. W1 contains a constructed outlet that drains to McAllister Creek. A High Water Table (A2) and Saturation (A2) are dominant hydrology indicators for W1. The wetland receives hydrology from surface runoff, high groundwater table, and overflow from the adjacent slough. During the site visit on December 13, 2022, surface water was present at a depth of about 2 feet in the deepest parts of the wetland.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. A change in vegetation community, hydric soils, and surface water determined wetland boundary.</td></tr>
<tr><td colspan="3">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">The buffer function is low. The buffer contains grass habitat composed primarily of reed canary grass and scrub-shrub habitat composed of primarily of invasive Scotch broom with areas of tall Oregon grape (<i>Mahonia aquifolium</i>), oso berry (<i>Oemleria cerasiformis</i>), and Douglas-fir community. The western portion of the buffer is along a steep embankment supporting I-5, and the southeast portion of the buffer is a mobile home community and abuts Martin Way E.</td></tr>
</table>

Table D-7. Wetland W2 – Information Summary

<table>
<tr><td>Location:</td><td colspan="2">Within the WSDOT ROW between the Nisqually exit off-ramp and Brown Farm Rd NE</td></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>III</td></tr>
<tr><td>Local Rating</td><td>III</td></tr>
<tr><td>Thurston County Buffer Width</td><td>140 feet</td></tr>
<tr><td>Wetland Size</td><td>3.5 acres</td></tr>
<tr><td>Cowardin Class</td><td>PEM/PSS</td></tr>
<tr><td>HGM Class</td><td>Depressional</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W2-SP1, W2-SP3, W2-SP5</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W2-SP2, W2-SP4, W2-SP6</td></tr>
<tr><td colspan="3">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees – none. Shrubs – Pacific crab apple, Himalayan blackberry. Herbaceous – field horsetail (<i>Equisetum arvense</i>), reed canary grass, and soft rush.</td></tr>
<tr><td>Soils</td><td colspan="2">Soils in W2 were examined at three locations. Generally, soils in W2 met the hydric soil indicator Depleted Below Dark Surface (A11) and Depleted Matrix (F3).
A representative soil profile for W2 can be found at W2-SP1. The first 10 inches below the surface soils are a black (10YR 2/1) silty loam. Below 10 inches, soils consist of a dark greyish brown (10YR 4/2) with redox features in the form of yellowish brown (10YR 5/4) concentrations within the matrix. Descriptions above met the hydric soil indicator of Depleted Below Dark Surface (A11) and Depleted Matrix (F3). A hydrogen sulfide odor (A4) was also recorded at this location.
The hydric soil indicator Redox Dark Surface (F6) was also identified within W2.</td></tr>
<tr><td>Hydrology</td><td colspan="2">Wetland W2 is situated in a depression constricted on all sides by roads, including Brown Farm Rd NE to the west, I-5 to the north, and the Nisqually exit ramp to the east. The wetland outlet is a stormwater drain in the southwest corner of the wetland near Brown Farm Rd NE. A High Water Table (A2) and Saturation (A2) are the dominant hydrology indicators for W1. The wetland receives hydrology primarily from stormwater runoff and a high groundwater table. During the site visit on December 14, 2022, seasonal surface water ponding was present at a depth of less than 2 feet in the deepest parts of the wetland.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. A change in hydrology, hydric soils, and topography determined wetland boundary.</td></tr>
<tr><td colspan="3">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">W2 lacks a functioning buffer due to road fill prism surrounding the buffer. The limited buffer that exists is composed of nonnative grass community with scattered Himalayan blackberry and Scotch broom.</td></tr>
</table>

Table D-8. Wetland W3 – Information Summary

Location:	**Directly southwest of Nisqually I-5 on-ramp and Nisqually Cut Off Road SE intersection**	
	**Local Jurisdiction**	Thurston County
	Ecology Rating (2014)	III
	Local Rating	III
	Thurston County Buffer Width	100 feet
	Wetland Size	0.6 acre
	Cowardin Class	PEM/PFO
	HGM Class	Depressional
	Wetland Data Sheet(s)	Appendix B; W3-SP1, W3-SP3, W3-SP5
	Upland Data Sheet(s)	Appendix B; W3-SP2, W3-SP4, W3-SP6
Wetland Delineation		
Dominant Vegetation	Trees – red alder, black cottonwood. Shrubs – Himalayan blackberry. Herbaceous – reed canary grass, *Agrostis spp.,* soft rush, common buttercup (*Ranunculus repens*).	
Soils	Soils in W3 were examined at three locations. Soils in W3-SP1 and W3-SP3 met the hydric soil indicator Depleted Below Dark Surface (A11) and Depleted Matrix (F3). Soils in W3-SP5 met the indicator Redox Dark Surface (F6). A representative soil profile for W3 can be found at W3-SP1. The first 5 inches below the surface soils are a black (10YR 2/1) gravelly sandy loam. Below 5 inches, soils are a grayish brown (10YR 5/2) with redox features in the form of yellowish brown (10YR 5/6) concentrations within the matrix. Descriptions above met the hydric soil indicator of Depleted Below Dark Surface (A11) and Depleted Matrix (F3).	
Hydrology	Wetland W3 is a depression situated between the I-5 on-ramp to the north and Nisqually Cut Off Rd SE to the south. The primary source of hydrology is stormwater and surface sheet flow. The outlet is a culvert at the southwest end of the wetland. High Water Table (A2) and Saturation (A2) are primary hydrology indicators for W3. During the site visit on December 14, 2022, seasonal surface water ponding was present at a depth of less than 2 feet in the deepest parts of the wetland.	
Rationale for Delineation	Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. The obvious topographic break from the road fill prism determined the wetland boundary.	
Wetland Buffers		
Buffer Condition	The buffer function is low. The wetland buffer is mostly surrounded by road fill prism at the intersection for the I-5 on-ramp and Nisqually Cut Off Rd SE. A small patch of buffer exists east of W3. The buffer is primarily composed of nonnative herbs, grasses, and shrubs with a small, forested area of red alder and Douglas-fir.	

Table D-9. Wetland W4 – Information Summary

<table>
<tr><td>Location:</td><td colspan="2">West bank of McAllister (Medicine) Creek, between I-5 southbound (SB) lane and I-5 SB on-ramp</td></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>I</td></tr>
<tr><td>Local Rating</td><td>I</td></tr>
<tr><td>Thurston County Buffer Width</td><td>220 feet</td></tr>
<tr><td>Wetland Size</td><td>5.5 acres</td></tr>
<tr><td>Cowardin Class</td><td>EEM</td></tr>
<tr><td>HGM Class</td><td>Estuarine</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W4-SP1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W4-SP2</td></tr>
<tr><td colspan="3">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees – none. Shrubs – Himalayan blackberry. Herbaceous – salt-tolerant plants including Lyngbye’s sedge, pickleweed, inland saltgrass. Non-floating kelp species are also present in wetland W4.</td></tr>
<tr><td>Soils</td><td colspan="2">Soils excavated to 11 inches below the surface exhibited a dark greyish brown (10YR 4/2) silty clay with strong brown (7.5YR 4/6) redox concentrations in the matrix. A restrictive layer of compacted streambed was present 11 inches below the surface. Descriptions above meet the hydric soil indicator of Depleted Matrix (F3). Soils were significantly disturbed from dike wall fill.</td></tr>
<tr><td>Hydrology</td><td colspan="2">Tidal inundation and bank overflow from McAllister (Medicine) Creek are the primary sources of hydrology for wetland W4. Tidal influence comes from Nisqually estuary/Puget Sound. The wetland was located along the historic channel of McAllister (Medicine) Creek before the creek was rerouted during I-5 construction. During the site visit on January 5, 2023, surface water was present in the wetland from tidal influence. Surface Water (A1) and Water Marks (B1) were primary indicators of wetland hydrology.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">Estuarine wetland with hydric soils, hydrophytic vegetation, and tidally influenced wetland hydrology. The wetland boundary was delineated primarily based upon topography and the presence of hydrophytic vegetation.</td></tr>
<tr><td colspan="3">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">The buffer function on site is low and primarily consists of disturbed grass and forb communities with Scotch broom. The buffer within the project area is reduced due to road fill from I-5 and on-ramp.</td></tr>
</table>

Table D-10. Wetland W5 – Information Summary

<table>
<tr><th>Location:</th><th colspan="3">Directly east of McAllister (Medicine) Creek</th></tr>
<tr><td colspan="2" rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>II</td></tr>
<tr><td>Local Rating</td><td>II</td></tr>
<tr><td>Thurston County Buffer Width</td><td>160 feet</td></tr>
<tr><td>Wetland Size</td><td>1.5 acres</td></tr>
<tr><td>Cowardin Class</td><td>PEM</td></tr>
<tr><td>HGM Class</td><td>Depressional</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W5-SP1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W5-SP2</td></tr>
<tr><th colspan="4">Wetland Delineation</th></tr>
<tr><td>Dominant Vegetation</td><td colspan="3">Trees – none. Shrubs – <i>Salix spp</i>. Himalayan blackberry. Herbaceous – reed canary grass, broadleaf cattail.</td></tr>
<tr><td>Soils</td><td colspan="3">Soils were inundated during time of site visit on December 15, 2022. Soils from the surface to 6 inches below the surface consist of a very dark brown (10YR 2/2) gravelly silty clay loam. Soils below 6 inches consist of a dark gray (10YR 4/1) gravelly silty clay loam featuring muck with dark yellowish brown (10YR 4/6) redox concentrations in the matrix. These soil characteristics met the hydric soil indicator Depleted Matrix (F3) and Depleted Below Dark Surface (A11).</td></tr>
<tr><td>Hydrology</td><td colspan="3">Wetland W5 is a seasonally flooded ditch feature confined on all sides by dikes creating a depression. Primary sources of hydrology include stormwater drains and surface water runoff. The outlet of the wetland is highly constricted by a semi-functional tidal gate.Water within the wetland appears to have been used for agriculture irrigation purposes. . High Water Table (A2) and Saturation (A2) are primary hydrology indicators.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="3">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. The wetland boundary was determined primarily based upon the presence of hydrology, hydrophytic vegetation community, and topographic break.</td></tr>
<tr><th colspan="4">Wetland Buffers</th></tr>
<tr><td>Buffer Condition</td><td colspan="3">W5 lacks a functional buffer. The wetland is surrounded by Brown Farm Rd NE and development to the east and the east bank of the McAllister Creek dike to the west. Invasive Himalayan blackberry surrounds the wetland along the road prism and dike.</td></tr>
</table>

Table D-11. Wetland W6 – Information Summary

<table>
<tr><td>Location:</td><td colspan="2">Located between I-5 and Nisqually Wildlife Refuge entrance road (Brown Farm Rd NE)</td></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>II</td></tr>
<tr><td>Local Rating</td><td>II</td></tr>
<tr><td>Thurston County Buffer Width</td><td>220 feet</td></tr>
<tr><td>Wetland Size</td><td>2.0 acres</td></tr>
<tr><td>Cowardin Class</td><td>PEM/PFO</td></tr>
<tr><td>HGM Class</td><td>Depressional</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W6-SP1, W6-SP3</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W6-SP2, W6-SP4, W6-SP5</td></tr>
<tr><td colspan="3">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees – western redcedar, sweet cherry (<i>Prunus avium</i>), Pacific crabapple, Oregon ash. Shrubs – Himalayan blackberry, red osier dogwood. Herbaceous – reed canarygrass, soft rush, common velvet grass (<i>Holcus lanatus</i>), creeping buttercup.</td></tr>
<tr><td>Soils</td><td colspan="2">Soils in W6 were examined at two locations. Generally, soils in W6 met the hydric soil indicator Depleted Below Dark Surface (A11).
A representative soil profile for W6 can be found at W6-SP1. The first 11 inches below the surface soils are a very dark grayish brown (10YR 3/2) silty loam. After 11 inches, soils are a dark grayish brown (10YR 4/2) with redox features in the form of strong brown (7.5YR 4/6) concentrations within the matrix. Descriptions above met the hydric soil indicator of Depleted Below Dark Surface (A11).
The hydric soil indicator Redox Dark Surface (F6) was also identified within W6.</td></tr>
<tr><td>Hydrology</td><td colspan="2">The wetland is supported by a high groundwater table and stormwater water runoff from adjacent roads. The levee along Brown Farm Rd NE cuts off connection to the Nisqually estuary. No obvious inlet or outlet was identified in W6. During the site visit on December 15, 2022, seasonal surface water ponding was present at a depth of less than 0.5 feet in the deepest parts of the wetland.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology indicators. A change in vegetation, hydric soils and topography determined the wetland boundary.</td></tr>
<tr><td colspan="3">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">The buffer function is low and cut off by Brown Farm Rd NE and I-5, with a forested upland area existing to the east of W6 abutting the Nisqually River. Most of the buffer is composed of invasive grasses and shrubs lining the road fill prism. The forested portion of the buffer contains a canopy of Douglas-fir, cherry, black cottonwood, and red alder with a diverse shrub understory.</td></tr>
</table>

Table D-12. Wetland W7 – Information Summary

<table>
<tr><th>Location:</th><th colspan="2">Located directly east of the Nisqually River</th></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>I</td></tr>
<tr><td>Local Rating</td><td>I</td></tr>
<tr><td>Thurston County Buffer Width</td><td>280 feet</td></tr>
<tr><td>Wetland Size</td><td>74.8 acres</td></tr>
<tr><td>Cowardin Class</td><td>PFO</td></tr>
<tr><td>HGM Class</td><td>Riverine</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W7-SP1, W7-SP3, W7-SP5</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W7-SP2, W7-SP4, S7-SP6</td></tr>
<tr><td colspan="3">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees – red alder, black cottonwood, Pacific willow, Oregon ash, western redcedar. Shrubs – Himalayan blackberry, salmonberry, red osier dogwood. Herbaceous – slough sedge, reed canarygrass. Wetland W7 is mapped as a Wetland of High Conservation Value (WDNR 2023b).</td></tr>
<tr><td>Soils</td><td colspan="2">The soil profile in W7 was examined at three different locations. Generally, soils in W7 were problematic, containing fill material due to proximity of sample plot locations to the road fill prism.
A representative soil profile for W7 can be found at W7-SP3. The first 3 inches below the surface soils are a dark greyish brown (10YR 4/2) silty loam with yellowish brown (10YR 5/8) redox concentrations. From 3 to 6 inches, soils are a dark greyish brown (10YR 5/2) silty loam with strong brown (7.5YR 5/8) redox concentrations. Below 6 inches, the soil matrix is a gray (10YR 5/1) silty loam with strong brown redox concentrations in the matrix. Descriptions above met the hydric soil indicator of Depleted Matrix (F3).</td></tr>
<tr><td>Hydrology</td><td colspan="2">Wetland W7 is adjacent to the left bank of the Nisqually River and is a freshwater-tidally influenced system. Highway I-5 cuts through the center of the wetland with a bridge at the overflow channel location, close to the maintenance facilities for the Nisqually Wildlife Refuge. The primary hydrology source to the wetland is this overflow from the Nisqually River. Tidally influenced waters from the Nisqually River enter into the wetland near the Wa-He-Lute Indian School south of I-5 and outlets approximately 2,000 feet north of I-5.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">The wetland is in a topographic depression with hydrology influence from the Nisqually River causing hydric soils and hydrophytic vegetation. Determination was based on depressional topography and hydrophytic vegetation, soils, and hydrology.</td></tr>
<tr><td colspan="3">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">The buffer function is moderately high. The southwest portion of the buffer is limited by residential/agriculture land use and the Wa-He-Lute Indian School. The northern portion of the buffer has connectivity to the Nisqually Wildlife Refuge and is fairly undisturbed aside from visitors on walking trails.</td></tr>
</table>

Table D-13. Wetland W8 – Information Summary

<table>
<tr><th>Location:</th><th colspan="3">Non-jurisdictional wetland located on road fill between the I-5 mainline and Nisqually off-ramp.</th></tr>
<tr><td colspan="2" rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>III</td></tr>
<tr><td>Local Rating</td><td>III</td></tr>
<tr><td>Thurston County Buffer Width</td><td>160 feet</td></tr>
<tr><td>Wetland Size</td><td>0.2 acre</td></tr>
<tr><td>Cowardin Class</td><td>PEM</td></tr>
<tr><td>HGM Class</td><td>Depressional</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W8-SP1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W8-SP2</td></tr>
<tr><td colspan="4">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="3">Trees – none. Shrubs – tall Oregon grape. Herbaceous – reed canarygrass, soft rush, Canada thistle (<i>Cirsium arvense</i>), colonial bentgrass</td></tr>
<tr><td>Soils</td><td colspan="3">Soils in wetland W8 consist of compacted fill material with distinct hydric soils. Soils from the surface to 5 inches below the surface consist of a very dark brown (10YR 2/2) loam. Soils below 5 inches consist of a dark grayish brown (10YR 4/2) gravelly sandy loam featuring cobble with strong brown (7.5YR 4/6) redox concentrations in the matrix. These soil characteristics met the hydric soil indicator Depleted Below Dark Surface (A11).</td></tr>
<tr><td>Hydrology</td><td colspan="3">Wetland W8 sits in a small depression surrounded by I-5 fill prism and the McAllister (Medicine) Creek left-bank dike to the east. Stormwater runoff is the primary source of hydrology into the wetland. High Water Table (A2) and Saturation (A2) are primary hydrology indicators. During the site visit on January 5, 2023, seasonal ponding was present.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="3">Depressional wetland with hydric soils, hydrophytic vegetation and wetland hydrology. Evidence of hydric soil and wetland hydrology were the primary indicators for determining the wetland boundary. This wetland is non-jurisdictional by USACE because it has formed on road fill between the I-5 mainline and the Nisqually off-ramp.</td></tr>
<tr><td colspan="4">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="3">The buffer function is low and limited by the road fill prism and McAllister (Medicine) Creek dike. The buffer is primarily composed of nonnative grasses and forbs with scattered Scotch broom and blackberry. Sparse native upland vegetation is planted along the dike.</td></tr>
</table>

Table D-14. Wetland W9 – Information Summary

<table>
<tr><td>Location:</td><td colspan="3">Located along an agricultural field adjacent to Nisqually Cut Off Road SE</td></tr>
<tr><td colspan="2" rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>III</td></tr>
<tr><td>Local Rating</td><td>III</td></tr>
<tr><td>Thurston County Buffer Width</td><td>140 feet</td></tr>
<tr><td>Wetland Size</td><td>4.5 acres</td></tr>
<tr><td>Cowardin Class</td><td>PEM</td></tr>
<tr><td>HGM Class</td><td>Depressional</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W9-SP1, W9-SP3</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W9-SP2, W9-SP4, W9-SP5</td></tr>
<tr><td colspan="4">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="3">Trees – none. Shrubs – Himalayan blackberry. Herbaceous – reed canarygrass, tall fescue, Kentucky bluegrass (<i>Poa pratensis</i>), water parsley (<i>Oenanthe sarmentosa).</i></td></tr>
<tr><td>Soils</td><td colspan="3">Soils in W9 were examined at two locations. Soils in W9 met the hydric soil indicator Depleted Matrix (F3) and Redox Dark Surface (F6).

A representative soil profile for W9 can be found at W9-SP1. The first 4 inches below the surface soils are a very black (10YR 2/1) silty loam with strong brown (7.5YR 4/6) redox features in the form of concentrations in the matrix and pore linings. Below 4 inches, soils are a very dark gray (10YR 3/1) with redox features in the form of strong brown (7.5YR 5/8) redox features in the form of concentrations in the matrix and pore linings.</td></tr>
<tr><td>Hydrology</td><td colspan="3">This wetland is in a depression with Saturation (A3) and Oxidized Rhizospheres along Living Roots (C3) as primary indicators of hydrology. The wetland includes historic remnants of Leschi Slough. The wetland outlets via a culvert under Nisqually Cut Off Road SE and drains north into freshwater maintained wetland (W22) within the Nisqually Wildlife Refuge.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="3">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. Topographic change and abrupt vegetation community change helped to determine wetland boundaries.</td></tr>
<tr><td colspan="4">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="3">Buffer function is low. The buffer to the north is limited by Nisqually Cut Off Road SE. Buffer to the south is frequently disturbed by agriculture practices.</td></tr>
</table>

Table D-15. Wetland W10 – Information Summary

Location:	**Estuarine system west of Nisqually River**	
	**Local Jurisdiction**	Pierce County
	Ecology Rating (2014)	I
	Local Rating	I
	Pierce Co Buffer Width	220 feet
	Wetland Size	754 acres
	Cowardin Class	EEM/PEM/PSS/PFO
	HGM Class	Estuarine, Riverine
	Wetland Data Sheet(s)	Appendix B; W10-SP1, W10-SP3, W10-SP5, W10-SP7, W10-SP9, W10-SP11, W10-SP13, W10-SP15, W10-SP17, W10-SP19, W10-SP22, W10-SP24, W10-SP26
	Upland Data Sheet(s)	Appendix B; W10-SP2, W10-SP4, W10-SP6, W10-SP8, W10-SP10, W10-SP12, W10-SP14, W10-SP16, W10-SP18, W10-SP20, W10-SP23, W10-SP25, W10-SP27
Wetland Delineation		
Dominant Vegetation	Trees – red alder, black cottonwood, Sitka spruce, Pacific willow. Shrubs – Himalayan blackberry, salmonberry, red osier dogwood. Herbaceous – water parsley, soft rush, inland saltgrass, Brazilian elodea (*Egeria densa*), slough sedge, Lyngbye's sedge, broadleaf cattail, American-brooklime (*Veronica americana),* reed canary grass, colonial bent grass*,* common velvet grass	
Soils	Soils were explored down to 16 inches at 14 locations throughout the wetland within various vegetation classes. Soil profiles varied between these locations. Soils in W10 met the hydric soil indicators Histosol (A1), Histic Epipedon (A2), Hydrogen Sulfide (A4), Depleted Below Dark Surface (A11), Depleted Matrix (F3), and Redox Dark Surface (F6). A representative soil profile in W10 that met the hydric soil indicator Histosol can be found at W10-SP7. A black (7.5YR 2.5/1) organic sapric material exists from the surface to 16 inches below the surface. An example soil profile that met the indicator Redox Dark Surface can be found at W10-SP15. The first 6 inches below the soil surface is a very dark brown (10YR 2/2) sandy loam. Below 6 inches is a very dark grayish brown (2.5Y 3/2) sandy loam with dark yellowish brown (10YR4/4) concentrations in the matrix.	
Hydrology	W10 is a large estuarine wetland complex. The primary source of hydrology is tidal influence from the Puget Sound and overbank flooding from the Nisqually River. An overflow channel of the Nisqually is present within the wetland. Water enters into W10 approximately 2,000 feet south of I-5, flows through the ponded area within the center median, and outlets through a channel directly north of I-5. Sample plots within W10 met primary wetland hydrology indicators including Surface Water (A1), High Water Table (A2), Saturation (A3), Water Marks (B1), Water-Stained Leaves (B9), Hydrogen Sulfide Odor (C1), and Presence of Reduced Iron (C4).	
Rationale for Delineation	Wetland W10 is a large estuarine wetland of high conservation value with hydric soils, hydrophytic vegetation, and wetland hydrology. Wetland boundary was determined by the ordinary high tide and presence of hydric soils and hydrophytic vegetation.	
Wetland Buffers		
Buffer Condition	Buffer functions south of I-5 are fairly limited by roads and BNSF railroad lines directly adjacent to the estuary. To the north, the estuary within the Nisqually Wildlife Refuge is protected and undisturbed. There are forested bluffs along the eastern edge of the estuary with housing developments at the top of the bluffs.	

Table D-16. Wetland W11 – Information Summary

<table>
<tr><th>Location:</th><th colspan="2">Located in the center median between the I-5 lanes near the BNSF railroad line.</th></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>II</td></tr>
<tr><td>Local Rating</td><td>II</td></tr>
<tr><td>Pierce County Buffer Width</td><td>240 feet</td></tr>
<tr><td>Wetland Size</td><td>0.1 acre</td></tr>
<tr><td>Cowardin Class</td><td>PSS</td></tr>
<tr><td>HGM Class</td><td>Depressional, Riverine</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W11-SP2</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W11-SP1</td></tr>
<tr><td colspan="3">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees – none. Shrubs – Himalayan blackberry, salmonberry. Herbaceous – slough sedge.</td></tr>
<tr><td>Soils</td><td colspan="2">The first 6 inches in the soil layer is very dark brown (10YR 2/2) silty clay loam. Below 6 inches in the soil profile, the matrix is a very dark gray (5Y 3/1) gravelly loamy silt with dark yellowish brown (10YR 3/4) concentrations within the matrix. Descriptions above met the hydric soil indicator of Redox Dark Surface (F6).</td></tr>
<tr><td>Hydrology</td><td colspan="2">Wetland W11 is situated in a small depression adjacent to W10. Primary hydrology sources are a high groundwater table and stormwater inputs. Based on topography and historical aerials, W11 appears to be located next to an old road. Braided surface water flows within the wetland and is likely stormwater input. These flows outlet in the southeast corner of the wetland via a culvert and likely discharge into the ponded wetland within the center median (W10).</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. Abrupt change in vegetation community and change in topography determined wetland boundary.</td></tr>
<tr><td colspan="3">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">Buffer function is low. Buffer has been cut off by railroad and I-5. The wetland is separated from W10 by an old road vegetated by invasive grasses. Red alder and oso-berry exist in the remaining buffer.</td></tr>
</table>

Table D-17. Wetland W12 – Information Summary

Location:	**North of I-5 SB lane and east of BNSF railroad line, adjacent to Red Salmon Creek outlet culvert under railroad embankment.**	
	**Local Jurisdiction**	Pierce County
	Ecology Rating (2014)	I
	Local Rating	I
	Pierce County Buffer Width	150 feet
	Wetland Size	15 acres
	Cowardin Class	EEM/PEM/PFO
	HGM Class	Depressional, Riverine, Estuarine
	Wetland Data Sheet(s)	Appendix B; W12-SP1, W12-SP3, W12-SP5
	Upland Data Sheet(s)	Appendix B; W12-SP2, W12-SP4, W12-SP6
Wetland Delineation		
Dominant Vegetation	Trees – Oregon ash, black cottonwood, western redcedar, red alder. Shrubs – Himalayan blackberry, salmonberry. Herbaceous – reed canary grass, slough sedge, small-fruited bulrush (*Scirpus microcarpus*), stinging nettle (*Urtica dioica*), field horsetail (*Equisetum arvense*). The estuarine portion of the wetland has yet to be accessed; however, it is assumed to comprise less than 10 percent of the total wetland.	
Soils	The soil profile in W7 was examined at three different locations. Each of these locations met a different hydric soil indicator status. W12-SP1 met Sandy Redox (S5), W12-SP3 met Depleted Below Dark Surface (A11), and W12-SP6 met Redox Dark Surface (F6). The soil profile at W7-SP1 reveals a very dark brown (10YR 2/2) loam with organic fibers within the first 6 inches. From 6 to 9 inches below the surface soils are a black (10YR 2/1) loamy sand with dark yellowish brown (10YR 4/6) redox concentrations in the matrix. Below 9 inches soils are a dark gray (5Y 4/1) loamy sand with dark yellowish brown (10YR 4/4) redox concentrations in the matrix. Descriptions above met the hydric soil indicator Sandy Redox (S5).	
Hydrology	The primary sources of hydrology to W12 are flows from Red Salmon Creek and tributaries and a high groundwater table which flow into a large depression. Additional inputs from headwater wetlands south of I-5 provide hydrology to the wetland. Surface water ponds in the western portion of W12 near the railroad embankment, and significant beaver activity was observed here. Surface water outlets via a culvert in the northwest corner of the wetland, where Red Salmon Creek flows into the main estuary of Nisqually Wildlife Refuge. Red Salmon Creek is under tidal influence in this area, and the culvert (constructed in 1912) becomes highly constricted during high tide. A small portion of W12 has estuarine conditions; however, the majority of the wetland is under freshwater tidal influence.	
Rationale for Delineation	Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. Wetland delineation was based upon the significant change in topography, outer edge of standing water, and presence of hydrophytic vegetation.	
Wetland Buffers		
Buffer Condition	Buffer function is moderate. The buffer is limited by the railroad embankment to the west (cutting the wetland off from the large estuarine wetland (W10)) and I-5 to the south. Rural residential development is present to the north and east, beyond a stand of mature forest.	

Table D-18. Wetland W13 – Information Summary

<table>
<tr><th>Location:</th><th colspan="3">North of I-5 near the Mounts Road exit and directly northeast of W12.</th></tr>
<tr><td colspan="2" rowspan="9"></td><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>III</td></tr>
<tr><td>Local Rating</td><td>III</td></tr>
<tr><td>Pierce County Buffer Width</td><td>50 feet</td></tr>
<tr><td>Wetland Size</td><td>0.2 acre</td></tr>
<tr><td>Cowardin Class</td><td>PEM</td></tr>
<tr><td>HGM Class</td><td>Slope</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W13-SP1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W13-SP2</td></tr>
<tr><th colspan="4">Wetland Delineation</th></tr>
<tr><td>Dominant Vegetation</td><td colspan="3">Trees – none. Shrubs – none. Herbaceous – slough sedge, creeping buttercup.</td></tr>
<tr><td>Soils</td><td colspan="3">Soils from the surface to 4 inches below the surface consist of a very dark brown (10YR 3/1) loam. Soils from 4 to 10 inches consist of a very dark grayish brown (10YR 3/2) gravelly loam. Soils below 10 inches consist of a gray (5Y 5/1) clay with yellowish brown (10YR 5/6) redox concentrations in the matrix. These soil characteristics met the hydric soil indicator Depleted Below Dark Surface (A11).</td></tr>
<tr><td>Hydrology</td><td colspan="3">W13 is a narrow linear feature that drains into a tributary of Red Salmon Creek. The wetland is along a gradual slope with shallow pockets of seasonal ponding and outlets into a tributary of Red Salmon Creek at the west end. Inputs to the wetland include a high groundwater table and stormwater sheet flow from I-5 and residential roads.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="3">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. Change in vegetation community along with dry uplands soils helped to guide delineation.</td></tr>
<tr><th colspan="4">Wetland Buffers</th></tr>
<tr><td>Buffer Condition</td><td colspan="3">Buffer function is moderate. The south edge of the wetland abuts the road fill prism for I-5 and is severely limited. Along the northern wetland edge, there two residential houses approximately 30 feet from the wetland with several mature trees present.</td></tr>
</table>

Table D-19. Wetland W14 – Information Summary

<table>
<tr><td>Location:</td><td colspan="2">Situated south of I-5 and north of the BNSF railroad line, west of the Mounts Road exit.</td></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>II</td></tr>
<tr><td>Local Rating</td><td>II</td></tr>
<tr><td>Pierce County Buffer Width</td><td>100 feet</td></tr>
<tr><td>Wetland Size</td><td>1.2 acres</td></tr>
<tr><td>Cowardin Class</td><td>PEM/PFO</td></tr>
<tr><td>HGM Class</td><td>Slope, Depressional, Riverine</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W14-SP1, W14-SP4</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W14-SP2, W14-SP3, W14-SP5</td></tr>
<tr><td colspan="3">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees – black cottonwood, red alder, Pacific willow. Shrub – Himalayan blackberry, trailing blackberry, salmonberry, red osier dogwood. Herbaceous – reed canary grass, skunk cabbage (<i>Lysichiton americanus</i>), spotted jewelweed (<i>Impatiens capensis</i>) sword fern (<i>Polystichum munitum</i>) on hummocks.</td></tr>
<tr><td>Soils</td><td colspan="2">Soils in W14 were examined at two locations and both met the hydric soil indicator Redox Dark Surface (F6). A representative soil profile for W14 can be found at W14-SP1. The first 5 inches below the surface soils are a very dark grayish brown (10YR 3/2) silty loam. After 5 inches, the soil matrix is the same color with redox features in the form of strong brown (5YR 5/8) concentrations within the matrix.</td></tr>
<tr><td>Hydrology</td><td colspan="2">Wetland contains a slope feature with a seasonal freshwater seep originating from the adjacent northern hillslope. Water is impounded closer to the I-5 SB lane due to significant beaver activity. The outlet is a highly constricted culvert impacted by this beaver activity. Surface water from W14 (a headwater system) drains north into wetland (W17) within the center median area. Primary hydrology indicators for this wetland are a High Water Table and Saturation. The primary source of hydrology is a seasonal groundwater seep and associated stream.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. Wetland boundary was determined based on change in vegetation community and presence of saturated hydric soils.</td></tr>
<tr><td colspan="3">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">Buffer function is moderately low. The northern buffer is severely limited by the I-5 SB lane. To the south, approximately 115 feet from the wetland, is the BNSF railroad line. Mature forest is present between the wetland and railroad.</td></tr>
</table>

Table D-20. Wetland W15 – Information Summary

<table>
<tr><th colspan="2">Location:</th><th colspan="2">Situated south of I-5 and north of the BNSF railroad line, west of the Mounts Road exit.</th></tr>
<tr><td colspan="2" rowspan="9"></td><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>III</td></tr>
<tr><td>Local Rating</td><td>III</td></tr>
<tr><td>Pierce County Buffer Width</td><td>50 feet</td></tr>
<tr><td>Wetland Size</td><td>0.1 acre</td></tr>
<tr><td>Cowardin Class</td><td>PSS</td></tr>
<tr><td>HGM Class</td><td>Slope</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W15-SP1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W15-SP2</td></tr>
<tr><td colspan="4">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="3">Trees – none. Shrubs – Himalayan blackberry, salmonberry. Herbaceous – bedstraw (<i>Galium aparine</i>), giant horsetail (<i>Equisetum telmateia</i>), trailing blackberry.</td></tr>
<tr><td>Soils</td><td colspan="3">Soils excavated from the surface to 7 inches below the surface consist of a very dark brown (10YR 2/2) sandy loam. Soils from 7 to 12 inches consist of the same matrix color with dark grayish brown (2.5Y 4/2) depletions and dark yellowish brown (10YR 4/4) concentrations in the matrix. Soils from 12 to 16 inches consist of a very dark grayish brown (10YR 3/2) sandy loam with dark yellowish brown (10YR 4/4) redox concentrations in the matrix. These soil characteristics met the hydric soil indicator Redox Dark Surface (F6).</td></tr>
<tr><td>Hydrology</td><td colspan="3">Wetland W15 is situated in a small roadside depression along I-5. The primary hydrology source is precipitation and stormwater runoff from adjacent hillside and road. The outlet is a culvert that conveys flows north under I-5 and empties into wetland (W19) within the center median. Saturation and seasonal ponding hydroperiods were identified within this wetland.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="3">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. Wetland was delineated by a topographic change and change in vegetation community around wetland edge.</td></tr>
<tr><td colspan="4">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="3">Buffer function is moderately low. The northern buffer is severely limited by the I-5 SB lane. To the south, approximately 115 feet from the wetland, is the BNSF railroad line. Mature forest is present between the wetland and railroad line.</td></tr>
</table>

Table D-21. Wetland W16 – Information Summary

Location:	**Situated south of I-5 and north of the BNSF railroad line, west of the Mounts Road exit.**

Local Jurisdiction	Pierce County
Ecology Rating (2014)	II
Local Rating	II
Pierce County Buffer Width	100 feet
Wetland Size	0.2 acre
Cowardin Class	PFO
HGM Class	Slope, Depressional, Riverine
Wetland Data Sheet(s)	Appendix B; W16-SP1
Upland Data Sheet(s)	Appendix B; W16-SP2

Wetland Delineation	
Dominant Vegetation	Trees – red alder, western redcedar. Shrubs – Himalayan blackberry, vine maple (*Acer circinatum*), red osier dogwood, salmonberry. Herbaceous – reed canary grass, slough sedge, creeping buttercup, giant horsetail, sword fern on hummocks.
Soils	The first 9 inches in the soil layer consists of a black (10YR 2/1) silty clay loam. From 9 to 16 inches below the surface is a gray (2.5Y 5/1) silty clay loam with yellowish brown (10YR 5/6) concentrations in the matrix. Descriptions above met the hydric soil indicator Depleted Below Dark Surface (A11) and Depleted Matrix (F3).
Hydrology	This wetland contains a slope feature with a groundwater seep and stream feature that provide the primary sources of hydrology to a topographic depression adjacent to the fill prism of the I-5 NB lane. The outlet is a culvert that conveys flows north under I-5 and empties into wetland (W20) within the center median.
Rationale for Delineation	Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. Wetland was delineated by the topographic change and change in vegetation community around wetland edge.
Wetland Buffers	
Buffer Condition	Buffer function is moderately low. The northern buffer is severely limited by the I-5 SB lane. To the south, approximately 115 feet from the wetland, is the BNSF railroad line. Mature forest is present between the wetland and railroad.

Table D-22. Wetland W17 – Information Summary

Location:	**Located within the center median between I-5 NB and SB lanes, west of the Mounts Road exit**	
	**Local Jurisdiction**	Pierce County
	Ecology Rating (2014)	I
	Local Rating	I
	Pierce County Buffer Width	150 feet
	Wetland Size	1 acre
	Cowardin Class	PEM/PSS/PFO
	HGM Class	Depressional/Riverine
	Wetland Data Sheet(s)	Appendix B; W17-SP1
	Upland Data Sheet(s)	Appendix B; W17-SP2
Wetland Delineation		
Dominant Vegetation	Trees – red alder, Oregon ash, black cottonwood, western redcedar. An Oregon white oak (*Quercus garryana*) woodland stand is present along the northern boundary of the wetland. Shrubs – salmonberry, Himalayan blackberry. Herbaceous – slough sedge, soft rush.	
Soils	Soils excavated to 16 inches were a very dark grayish brown (2.5Y 3/2) loamy sand. Evidence of hydric soil indicator Hydrogen Sulfide (A4) was identified at the sample plot location.	
Hydrology	The wetland is situated in a linear depression within the center median, bounded by road fill prisms for I-5. The primary source of hydrology to the wetland is surface water flows from headwater wetlands to the south of I-5, stormwater sheet flow from I-5, and a high groundwater table. At the west end of wetland, surface water flows from W14 discharge into W17. A beaver lodge is present at this culvert inlet and water permanently impounds in this area. Water outlets via a culvert at the north edge of the impounded water, and signs of beaver damming are present at this outlet. Towards the east end of the wetland, surface water flows from W14 enter the wetland through a culvert, flow west through the wetland, and outlet into a culvert. From here, surface water flows north into wetland (W12/W13) north of I-5.	
Rationale for Delineation	Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. Wetland was delineated by the topographic change and change in vegetation community around wetland edge.	
Wetland Buffers		
Buffer Condition	Buffer function is low. Buffers for W17 are severely limited by I-5 to the north and south. A limited buffer of mature forest is present to the east and west of the wetland.	

Table D-23. Wetland W18 – Information Summary

<table>
<tr><th colspan="2">Location:</th><th colspan="2">Located within the center median between I-5 NB and SB lanes, west of the Mounts Road exit</th></tr>
<tr><td colspan="2" rowspan="9"></td><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>II</td></tr>
<tr><td>Local Rating</td><td>II</td></tr>
<tr><td>Pierce County Buffer Width</td><td>100 feet</td></tr>
<tr><td>Wetland Size</td><td>0.1 acre</td></tr>
<tr><td>Cowardin Class</td><td>PFO</td></tr>
<tr><td>HGM Class</td><td>Depressional</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W18-SP1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W18-SP2</td></tr>
<tr><th colspan="4">Wetland Delineation</th></tr>
<tr><td>Dominant Vegetation</td><td colspan="3">Trees – red alder, western redcedar, western hemlock (<i>Tsuga heterophylla</i>). Shrubs – none. Herbaceous – slough sedge.</td></tr>
<tr><td>Soils</td><td colspan="3">The first 8 inches in the soil profile consists of a very dark brown (10YR 2/2) silty clay loam. From 9 to 16 inches below the surface is a grayish brown (2.5Y 5/2) silty clay loam with brown (10YR 4/3) redox concentrations in the matrix. Descriptions above met the hydric soil indicator Depleted Matrix (F3).</td></tr>
<tr><td>Hydrology</td><td colspan="3">W18 is situated in a depression within the landscape, adjacent to the fill prism along the I-5 SB lane. Primary hydrology sources include a high water table and stormwater runoff from I-5. This wetland does not have an obvious outlet and seasonally ponds.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="3">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. Wetland was delineated by the topographic change and change in vegetation community around wetland edge.</td></tr>
<tr><th colspan="4">Wetland Buffers</th></tr>
<tr><td>Buffer Condition</td><td colspan="3">Buffer function is low. Buffers for W18 are severely limited by I-5 to the north and south. A limited buffer of mature forest is present to the east and west of the wetland.</td></tr>
</table>

Table D-24. Wetland W19 – Information Summary

<table>
<tr><th colspan="3">WETLAND W19 – INFORMATION SUMMARY</th></tr>
<tr><td>Location:</td><td colspan="2">Located within the center median between I-5 NB and SB lanes, west of the Mounts Road exit</td></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>II</td></tr>
<tr><td>Local Rating</td><td>II</td></tr>
<tr><td>Pierce County Buffer Width</td><td>100 feet</td></tr>
<tr><td>Wetland Size</td><td>0.3 acre</td></tr>
<tr><td>Cowardin Class</td><td>PFO</td></tr>
<tr><td>HGM Class</td><td>Depressional, Riverine</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W19-SP1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W19-SP2</td></tr>
<tr><th colspan="3">Wetland Delineation</th></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees – none. Shrubs – salmonberry. Herbaceous – slough sedge, piggyback-plant (<i>Tolmiea menziesii</i>).</td></tr>
<tr><td>Soils</td><td colspan="2">The first 9 inches in the soil profile consists of a dark grayish brown (2.5Y 4/2) silty loam with dark yellowish brown (10YR 4/4) redox concentrations in the matrix. From 9 to 16 inches below the surface soils are a gray (2.5Y 5/1) silty clay loam with strong brown (7.5YR 5/8) redox concentrations in the matrix. Descriptions above met the hydric soil indicator Depleted Matrix (F3).</td></tr>
<tr><td>Hydrology</td><td colspan="2">The primary source of hydrology to the wetland is surface water flows from headwater wetlands to the south of I-5, stormwater sheet flow from I-5, and a high groundwater table. At the south end of the wetland, surface water flows from W15 discharge into W19. Surface water flows through braided channels within the wetland and outlet through a culvert at the north end of the culvert. From here surface water flows north into wetland W12 north of I-5. Seasonal ponding is present within the wetland.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. Wetland was delineated by the topographic change and change in vegetation community around wetland edge.</td></tr>
<tr><th colspan="3">Wetland Buffers</th></tr>
<tr><td>Buffer Condition</td><td colspan="2">Buffer function is low. Buffers for W19 are severely limited by I-5 to the north and south. A limited buffer of mature forest is present to the east and west of the wetland.</td></tr>
</table>

Table D-25. Wetland W20 – Information Summary

<table>
<tr><th>Location:</th><th colspan="2">Located within the center median between I-5 NB and SB lanes, west of the Mounts Road exit</th></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>I</td></tr>
<tr><td>Local Rating</td><td>I</td></tr>
<tr><td>Pierce County Buffer Width</td><td>150 feet</td></tr>
<tr><td>Wetland Size</td><td>1.0 acre</td></tr>
<tr><td>Cowardin Class</td><td>PAB/PEM/PFO</td></tr>
<tr><td>HGM Class</td><td>Depressional, Riverine</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; W20-SP1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; W20-SP2</td></tr>
<tr><td colspan="3">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees – red alder, western redcedar. Shrub – Himalayan blackberry, Pacific willow, red osier dogwood. Herbaceous – reed canary grass, lake yellow-cress (<i>Rorippa aquatica</i>), duckweed (<i>Lemna minor</i>). The palustrine aquatic bed Cowardin class comprises less than 10 percent of the total wetland area.</td></tr>
<tr><td>Soils</td><td colspan="2">Soils from the surface to 2 inches below the surface consist of a black (10YR 2/1) loam. Soils from 10 to 16 inches consist of a dark grayish brown (10YR 4/2) gravelly loam with brown (7.5YR 4/4) redox concentrations in the matrix. These soil characteristics met the hydric soil indicator Depleted Matrix (F3).</td></tr>
<tr><td>Hydrology</td><td colspan="2">The primary source of hydrology to the wetland is surface water flows from headwater wetlands to the south of I-5, stormwater sheet flow from I-5, and a high groundwater table. At the south end of wetland, surface water flows from W16 discharge into W20. Surface water flows through braided channels within the wetland and outlet through a culvert at the north end of the wetland. From here surface water flows north into wetland W12 north of I-5. Permanent and seasonal ponding are present within the wetland.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">Depressional wetland with hydric soils, hydrophytic vegetation, and wetland hydrology. The presence of hydric soils and wetland hydrology helped to determine the wetland boundary.</td></tr>
<tr><td colspan="3">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">Buffer function is low. Buffers for W20 are severely limited by I-5 to the north and south, and the BNSF railroad line to the west. A limited buffer of mature forest is present east of the wetland.</td></tr>
</table>

Table D-26. Wetland W21 – Information Summary

<table>
<tr><td>Location:</td><td colspan="2">Estuarine wetland near McAllister Creek (west side of Billy Frank Jr. Nisqually Wildlife Refuge)</td></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>I</td></tr>
<tr><td>Local Rating</td><td>I</td></tr>
<tr><td>Thurston County Buffer Width</td><td>250 feet</td></tr>
<tr><td>Wetland Size</td><td>1,399.4 acres</td></tr>
<tr><td>Cowardin Class</td><td>EEM</td></tr>
<tr><td>HGM Class</td><td>Estuarine</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; Sampling Point BM Wetland 1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; Sampling Point BM Upland 1</td></tr>
<tr><td colspan="3">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees – none. Shrub- none. Herbaceous – salt-tolerant plants, including inland saltgrass, Puget Sound gumweed, pickleweed, and Lyngbye’s sedge. Wetland W21 is mapped as a Wetland of High Conservation Value (WDNR 2023b).</td></tr>
<tr><td>Soils</td><td colspan="2">Access to the Billy Frank Jr. Nisqually Wildlife Refuge had not been formally granted at the time of the survey. Wetland conditions were observed from the WSDOT ROW; therefore, soil pits have yet to be excavated within W21. NRCS maps soils within W21 as Puget silt loam, and it is anticipated that the soils have organics accumulation within the top layer (2023).</td></tr>
<tr><td>Hydrology</td><td colspan="2">The primary hydrology source for W21 is tidal influence from the Puget Sound and surface water flows from McAllister (Medicine) Creek.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">W21 was observed during high- and low-tide conditions and has obvious wetland hydrology and salt-tolerant hydrophytic vegetation. The southern boundary of the wetland is directly adjacent to the road fill prism of I-5 and Brown Farm Road NE. The northeast boundary of the wetland is along a dike separating freshwater wetlands within the Billy Frank Jr. Nisqually Wildlife Refuge. To the west, the estuarine wetland is bound by steep bluffs.</td></tr>
<tr><td colspan="3">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="2">Buffer function is moderately high. A large portion of the dikes and levees within the estuary were removed in 2009 for the Nisqually Estuarine Restoration project. This project expanded the estuary system and allowed for greatly improved hydrologic and habitat connectivity. The buffer to the east is composed of high functioning freshwater wetlands separated from the estuary by a new dike constructed during the restoration efforts. Mature forest is present along the steep bluffs to the west, with commercial and residential land uses near the top of the bluffs.</td></tr>
</table>

Table D-27. Wetland W22 – Information Summary

<table>
<tr><th>Location:</th><th colspan="2">Freshwater wetland within the center of the Billy Frank Jr. Nisqually Wildlife Refuge, west of the Visitor Center.</th></tr>
<tr><td rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>I</td></tr>
<tr><td>Local Rating</td><td>I</td></tr>
<tr><td>Thurston County Buffer Width</td><td>280 feet</td></tr>
<tr><td>Wetland Size</td><td>174.8 acres</td></tr>
<tr><td>Cowardin Class</td><td>PEM/PFO</td></tr>
<tr><td>HGM Class</td><td>Depressional, Riverine</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; Sampling Point BN Wetland 1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; Sampling Point BN Upland 1</td></tr>
<tr><th colspan="3">Wetland Delineation</th></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Trees –Sitka spruce, black cottonwood, Pacific willow. Shrub – Himalayan blackberry, salmonberry, red osier dogwood. Herbaceous – reed canarygrass, soft rush.</td></tr>
<tr><td>Soils</td><td colspan="2">Access to the Billy Frank Jr. Nisqually Wildlife Refuge had not been formally granted at the time of the survey. Wetland conditions were observed from the trails near the Billy Frank Jr. Nisqually Wildlife Refuge Visitor Center; therefore, soil pits have yet to be excavated within W22. NRCS maps soils within W22 as Puget silt loam, Sultan silt loam, and Tacoma silt loam. It is anticipated that the soils have organics accumulation within the top layer (2023).</td></tr>
<tr><td>Hydrology</td><td colspan="2">W21 is a freshwater system with a high groundwater table and is hydrologically maintained by the wildlife refuge to provide optimal habitat conditions for waterfowl. It is separated from the estuary by dikes to exclude saltwater influence. In the winter, additional freshwater is pumped into the wetlands, creating large areas of seasonal ponding that are drawn down in the spring. Leschi Slough flows through the wetland and outlets through a culvert with flow control systems into the estuary at the northeast corner of W22.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="2">W22 was visited during the winter seasonal flooding event and contains hydrophytic vegetation. The wetland boundary is clearly defined along the dike system surrounding the wetland.</td></tr>
<tr><th colspan="3">Wetland Buffers</th></tr>
<tr><td>Buffer Condition</td><td colspan="2">Buffer function is moderately high. The buffer extends largely into the high functioning estuary system separated from freshwater wetland W22 by a dike. To the east, the buffer extends into the Visitor Center area and another freshwater wetland system (W23), also separated from W22 by a dike.</td></tr>
</table>

Table D-28. Wetland W23 – Information Summary

<table>
<tr><th>Location:</th><th colspan="3">Freshwater wetland within the center of the Nisqually Wildlife Refuge, east of the Visitor Center.</th></tr>
<tr><td colspan="2" rowspan="9"></td><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>Ecology Rating (2014)</td><td>I</td></tr>
<tr><td>Local Rating</td><td>I</td></tr>
<tr><td>Thurston County Buffer Width</td><td>300 feet</td></tr>
<tr><td>Wetland Size</td><td>142.2 acres</td></tr>
<tr><td>Cowardin Class</td><td>PEM/PFO</td></tr>
<tr><td>HGM Class</td><td>Depressional</td></tr>
<tr><td>Wetland Data Sheet(s)</td><td>Appendix B; Sampling Point BO Wetland 1</td></tr>
<tr><td>Upland Data Sheet(s)</td><td>Appendix B; Sampling Point BO Upland 1</td></tr>
<tr><td colspan="4">Wetland Delineation</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="3">Trees – Pacific crabapple, Sitka spruce, black cottonwood, Pacific willow, red alder. Shrub – Himalayan blackberry, salmonberry, red osier dogwood. Herbaceous – reed canarygrass, common cattail, soft rush, slough sedge.</td></tr>
<tr><td>Soils</td><td colspan="3">Access to the Nisqually Wildlife Refuge had not been formally granted at the time of the survey. Wetland conditions were observed from the trails near the Nisqually Wildlife Refuge Visitor Center; therefore, soil pits have yet to be excavated within W23. NRCS maps soils within W23 as Puget silt loam, Puyallup silt loam, and Sultan silt loam. It is anticipated that the soils have organics accumulation within the top layer (2023).</td></tr>
<tr><td>Hydrology</td><td colspan="3">W23 is maintained as a freshwater wetland. The primary hydrology source for W23 is a high groundwater table. The eastern boundary of the wetland is hydrologically separated from the Nisqually River by a dike. Surface water seasonally and permanently ponds in the wetland and offers a highly interspersed mosaic of hydroperiods. In the northwest corner of the wetland, surface water outlets the system via a culvert with flow control systems to prevent saltwater intrusion.</td></tr>
<tr><td>Rationale for Delineation</td><td colspan="3">W23 contains obvious hydrology within permanent and seasonal ponding and contains hydrophytic vegetation. The wetland boundary is clearly defined along the dike system surrounding the wetland.</td></tr>
<tr><td colspan="4">Wetland Buffers</td></tr>
<tr><td>Buffer Condition</td><td colspan="3">Buffer function is moderately high. To the north the buffer extends into the high functioning estuary system separated from freshwater wetland W23 by a dike. To the west the buffer extends into another freshwater wetland system (W22), also separated from W22 by a dike. To the south the buffer extends into the Visitor Center and maintenance facilities. To the east the buffer extends into the riparian corridor for the Nisqually River and is separated from Wetland W23 by a dike.</td></tr>
</table>

3.5.4 Streams

Four stream features were identified in the study area (Figures D-9 through D-13) representing a variety of watershed sizes and hydrologic functions. The three named stream features, from west to east, are McAllister (Medicine) Creek, the Nisqually River, and Red Salmon Creek. These streams are connected to floodplain wetlands, tidal sloughs, and tributaries upstream and downstream of the study area, but those connections were not assessed as part of this project. Additional unnamed features were identified in association with the three primary features, either as seasonal tributary drainages or backwater sloughs. Fish presence or absence was assessed by reviewing WDNR water type maps, the SWIFD fish distribution database, and using best professional judgment of observed field conditions. Based on these observations, several streams and associated wetlands provide suitable habitat for resident and anadromous fish. An overview of streams within the study area is included in Table D-29, and descriptions of each stream's features are included in the summary tables below.

McAllister (Medicine) Creek originates 2.5 miles south of the study area in a spring-fed, headwater wetland complex known as Medicine Springs or McAllister Spring. From its source, the perennial creek meanders north through agricultural fields and along the toe of the steep slope to the west. A low-gradient tributary from the east, named Medicine Creek on some maps, joins the creek near Hartman Road SE. Approximately 0.5 mile upstream of the study area, the creek is directed northeast, away from the hillside, in a straight diked channel, armored with Sakrete and riprap. McAllister (Medicine) Creek crosses under Martin Way, an access bridge to the Nisqually Commercial Park, the I-5 northbound off-ramp, the northbound and southbound I-5 mainlines, and the I-5 southbound on-ramp before the constructed channel directs it due west back to a meandering tidal channel along the hillside. North of the study area, the creek and its floodplain are regularly inundated by the tide and are indistinguishable from the Nisqually River estuary and mudflats. Salt-tolerant herbaceous plants line the banks of the creek from its mouth at the estuary, through the project area, and for a significant distance up-stream and south of the project area. This stream is mapped as a DNR Water Type S or designated shoreline of the state (WDNR 2023a). WDFW data indicates documented use of McAllister (Medicine) Creek by Chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead, and resident cutthroat trout (WDFW 2023a).

The Nisqually River originates on the south flank of Mount Rainier as snowmelt from the Nisqually Glacier. The total length of the river is approximately 81 miles, with a watershed area of approximately 517 square miles. The river is impounded by two hydroelectric dams (La Grande Dam and Alder Dam), forming a 7-mile long reservoir named Alder Lake near Elbe/Eatonville. Through the study area, the water level of the Nisqually River is tidally influenced. The river frequently overtops its banks due to high runoff, high tides, or a combination of both. Overbank channel features can be observed on both the right (east) and left (west) banks of the river as a network of hydrologic connectivity across the floodplain. North of I-5, the river becomes the Nisqually Estuary, discharging to the Nisqually Reach in South Puget Sound. The Nisqually River is mapped as Type S (WDNR 2023a) and supports runs of anadromous fish species, such as fall

Chinook salmon, winter chum salmon, coho salmon, pink salmon, sockeye salmon, winter steelhead, and resident cutthroat trout (WDFW 2023a). These runs support a culturally important Tribal fishery for the Nisqually Indian Tribe.

Red Salmon Creek flows into the estuary on the east side of the Nisqually Valley. The creek originates as runoff from hillslopes to the north, east, and south of wetland W12. The hydrologic connectivity of Red Salmon Creek and its tributaries has been affected by extensive fill prisms associated with the BNSF railroad line and I-5, along with several other local access roads. Water levels in the lower reach are tidally influenced, and beaver activity was noted in the marsh east of the railroad. Red Salmon Creek flows through two culverts (BNSF railroad and Mounts Road SW) directly into the Red Salmon Slough, which is considered a feature of the Nisqually River Estuary.

Table D-29. Streams Within the Study Area

Stream Name	Local Jurisdiction	WDNR Water Type[a]	Local Stream Typing[b]	Stream Buffer Width (feet) [c]
Backwater Slough of McAllister (Medicine) Creek	Thurston County	F/N	F	250
McAllister (Medicine) Creek	Thurston County	S	S	250
Nisqually River	Thurston/Pierce County	S	S	250 (Thurston County)/ 100 (Pierce County)
Red Salmon Creek	Pierce County	F	F1	150
Tributaries to Red Salmon Creek	Pierce County	F	F1	150

[a] *WDNR Water Types: Type S=shoreline; Type F=fish-bearing; Type N=Non-fish bearing (WDNR 2023a)*

[b] *Local stream typing applied per Thurston County TCC 24.25.020 and Pierce County PCC 18E.40.060.*

[c] *Local jurisdiction stream buffers applied per Thurston County TCC 24.25.020 and Pierce County PCC 18E.40.060.*

Table D-30. Backwater Slough of McAllister (Medicine) Creek - Information Summary

<table>
<tr><td rowspan="8" colspan="1"></td><th>Stream Name</th><th>Backwater Slough of McAllister (Medicine) Creek</th></tr>
<tr><td>Long./Lat. ID Number</td><td>1227230470655</td></tr>
<tr><td>WRIA Name/Stream #</td><td>WRIA 11 Nisqually
17110015012856</td></tr>
<tr><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>DNR Water Type</td><td>F/N</td></tr>
<tr><td>Local Stream Rating</td><td>F</td></tr>
<tr><td>Buffer Width</td><td>250</td></tr>
<tr><td>Documented Fish Use[a]</td><td>Gradient accessible: Fall chinook, coho, pink, sockeye, winter steelhead</td></tr>
<tr><td>Location of Stream Relative to Study Area</td><td colspan="2">The slough is located on the west side of the study area, south of I-5. The stream feature is within wetland W1, outside of WSDOT ROW on a private parcel.</td></tr>
<tr><td>Connectivity</td><td colspan="2">The slough connects to McAllister (Medicine) Creek near its crossing under Martin Way. This meandering feature appears to represent the historic alignment of McAllister (Medicine) Creek before it was channelized and diverted to the east and fragmented by the fill prisms for Martin Way and I-5.</td></tr>
<tr><td>Fish Habitat</td><td colspan="2">The backwater slough of McAllister (Medicine) Creek offers off-channel rearing habitat for fish species within McAllister (Medicine) Creek</td></tr>
<tr><td>Riparian/Buffer Condition</td><td colspan="2">As noted above, the slough is within wetland W1, a PEM/PFO wetland. The eastern portion of the riparian corridor is limited by pasture fields. To the west the riparian corridor expands and includes native species such as red alder, Douglas-fir, salmonberry, and sword fern.</td></tr>
</table>

Table D-31. McAllister Creek (Medicine) Creek- Information Summary

<table>
<tr><td rowspan="8" colspan="2"></td><th>Stream Name</th><th>McAllister (Medicine) Creek</th></tr>
<tr><td>Long./Lat. ID Number</td><td>1227271470864</td></tr>
<tr><td>WRIA Name/Stream #</td><td>WRIA 11 Nisqually
17110015012812</td></tr>
<tr><td>Local Jurisdiction</td><td>Thurston County</td></tr>
<tr><td>DNR Water Type</td><td>S</td></tr>
<tr><td>Local Stream Rating</td><td>S</td></tr>
<tr><td>Buffer Width</td><td>250</td></tr>
<tr><td>Documented Fish Use[a]</td><td>Fall Chinook, coho, winter chum, winter steelhead, sockeye, pink, resident coastal cutthroat</td></tr>
<tr><td>Location of Stream Relative to Study Area</td><td colspan="3">McAllister (Medicine) Creek flows under I-5 at the McAllister Creek Bridges near the Nisqually Cut-Off Road (MP 114). The creek flows generally from south to north in a constructed channel and terminates in the Nisqually Estuary on the north side of the study area.</td></tr>
<tr><td>Connectivity</td><td colspan="3">The headwaters of McAllister Creek originate south of the project in a spring-fed, headwater wetland complex approximately 2.5 linear miles south of the project. The creek flows through mixed forested and shrub-dominated wetland areas in its upper reaches, then through agricultural lands, with its lower reaches encompassed by dike walls that experience tidal water intrusion during high tide cycles. Just downstream of the project, the creek meets the mud flats of the extensive Nisqually Estuary, where the flow of McAllister Creek forms a tidal channel in the estuarine mudflats.</td></tr>
<tr><td>Fish Habitat</td><td colspan="3">McAllister (Medicine) Creek provides habitat for several salmonids and other fish, despite the altered landscape including diking and lack of riparian vegetation. In addition to presence of several salmonids, spawning for winter chum is documented in the creek (WDFW 2023a). McAllister Creek is designated critical habitat for Puget Sound steelhead (NMFS 2023b).</td></tr>
<tr><td>Riparian/Buffer Condition</td><td colspan="3">In the immediate vicinity of the project, the creek lacks a functional buffer. The dike walls grade up to fill material supporting transportation infrastructure.</td></tr>
</table>

Table D-32. Nisqually River – Information Summary

<table>
<tr><td rowspan="8" colspan="2"></td><td>**Stream Name**</td><td>**Nisqually River**</td></tr>
<tr><td>**Long./Lat. ID Number**</td><td>*1226913471008*</td></tr>
<tr><td>**WRIA Name/Stream #**</td><td>WRIA 11 Nisqually
17110015000025</td></tr>
<tr><td>**Local Jurisdiction**</td><td>Thurston/Pierce County</td></tr>
<tr><td>**DNR Water Type**</td><td>S</td></tr>
<tr><td>**Local Stream Rating**</td><td>S</td></tr>
<tr><td>**Buffer Width**</td><td>250 (Thurston County)/ 100 (Pierce County)</td></tr>
<tr><td>**Documented Fish Use[a]**</td><td>Winter chum, winter steelhead, coastal cutthroat, fall Chinook, Dolly Varden/bull trout, pink, coho, sockeye</td></tr>
<tr><td>**Location of Stream Relative to Study Area**</td><td colspan="3">The Nisqually River flows from south to north through the middle of the study area, crossing I-5 under the Nisqually River Bridge (MP 115). Water levels in the study area are tidally influenced.</td></tr>
<tr><td>**Connectivity**</td><td colspan="3">Flowing from south to north, the Nisqually River is riverine (freshwater tidal) upstream of the study area and estuarine downstream of the study area. The existing bridges span the active channel. The historic floodplain is relatively undeveloped, but hydrologic connectivity is impeded by the I-5 fill prism. An overflow channel along the left bank of the Nisqually River flows through a forested wetland complex (W7) and outlets into the river approximately 2,000 feet north of I-5. An overflow channel along the right bank of the Nisqually River flows through freshwater and estuarine wetland (W10) and outlets just north of I-5 near the Nisqually River bridge.</td></tr>
<tr><td>**Fish Habitat**</td><td colspan="3">The Nisqually River within the study area provides a migratory corridor for multiple species of anadromous salmonids to reach the extensive spawning and rearing habitat upstream. Floodplain marsh and overflow channels also provide rearing habitat for some species.</td></tr>
<tr><td>**Riparian/Buffer Condition**</td><td colspan="3">Riparian vegetation is intact on both sides of the river and consists of mature forest composed of black cottonwood, western redcedar, and Douglas-fir with salmonberry, red osier dogwood, and slough sedge in the understory.</td></tr>
</table>

Table D-33. Red Salmon Creek - Information Summary

<table>
<tr><td colspan="2" rowspan="8"></td><td>Stream Name</td><td>Red Salmon Creek</td></tr>
<tr><td>Long./Lat. ID Number</td><td>1226858470964</td></tr>
<tr><td>WRIA Name/Stream #</td><td>WRIA 11 Nisqually
17110015000224
17110015000654</td></tr>
<tr><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>DNR Water Type</td><td>F</td></tr>
<tr><td>Local Stream Rating</td><td>F1</td></tr>
<tr><td>Buffer Width</td><td>150</td></tr>
<tr><td>Documented Fish Use[a]</td><td>The lower, tidal marsh portion of Red Salmon Creek is utilized by winter chum, fall Chinook, coho, pink, sockeye, winter steelhead, resident coastal cutthroat. Above the tidally influenced area, the freshwater tributary within the study area is known to be utilized by winter chum.</td></tr>
<tr><td>Location of Stream Relative to Study Area</td><td colspan="3">The Red Salmon Creek watershed is located on the east end of the study area, originating as runoff from an approximately 5 square mile watershed in the hills of Dupont and JBLM. The creek flows into a low-elevation tidal marsh area (wetland W12) that is impounded by the BNSF railroad berm, then west through a culvert and into the Red Salmon Creek tidal channel that combines with the Nisqually Delta/Estuary (W10). Several tributaries/forks are identified outside of the study area.</td></tr>
<tr><td>Connectivity</td><td colspan="3">The mainstem of Red Salmon Creek flows from east to west through the study area on the north side of I-5, crossing the northbound and southbound lanes via extensive culverts. In the median between lanes, the creek is daylighted within wetland W17, where it has been impounded by beaver activity.</td></tr>
<tr><td>Fish Habitat</td><td colspan="3">In the tidally influenced area, Red Salmon Creek provides rearing habitat for juvenile salmonids. Upstream, winter chum spawning habitat is found within the study area.</td></tr>
<tr><td>Riparian/Buffer Condition</td><td colspan="3">The riparian zone is forested with mixed conifer and deciduous species (red alder, Western redcedar, Douglas-fir, black cottonwood, Oregon ash, red osier dogwood, salmon berry, slough sedge), but is limited on the south side by I-5.</td></tr>
</table>

3.5.5 High Tide Line

Field indicators in relation to the HPT were used to place the HTL at an elevation of 16.27 feet relative to mean lower low water of 0 at NOAA Station 9446807 (Budd Inlet, South of Gull Harbor, WA). The observed HTL field indicators matched the 10-year average of the HPT of 16.27 feet. The 16.27-foot elevation for the HTL was applied throughout the study area using topographic elevations.

Prior to field work, biologists reviewed the mean elevation of HPT over a 10-year period for Budd Inlet, Washington NOAA Station 9446807 between January 1, 2022 and December 31, 2032. The HPT for this time period is 16.27 feet (NOAA 2022). The predicted higher high water elevation and time for the time of field work were reviewed between December 2022 and February 2023. Biologists compared predicted HPT elevation to field indicators observed during field work. Site visits included observations during or immediately after king tides at the end of December 2022 and January 2023, since those elevations were estimated to be at or near the predicted HTL. HTL observation points were established at various locations within the study area. The high tide line and these observation point locations are shown on Figures D-9 through D-13.

An example of the HTL delineation conducted throughout the study area is presented below for McAllister Creek (Observation point HTL1). The last higher high tide of 15.22 feet occurred on December 14, 2022. Biologists visited the area on December 15, 2022 at 10:00am, when the predicted tide level was around 13 feet. Biologists observed field indicators of the previous higher high tide at 15.22 feet and measured up 1.05 feet to the HPT of 16.27 feet.

Figure D-20. High Tide Line Delineation

(Left) HTL delineation on McAllister Creek on December 15, 2022. (Right) HTL verification during king tide event at on McAllister Creek on December 28, 2022.Additional HTL observation points were recorded within the study area and are presented below.

Biologists then returned to the site on December 28, 2022 at 10:44am to review the HTL delineation during the king tide event, when the higher high tide was 16.48 at 10:09am. The HTL delineation flagging was appropriately placed based on this assessment.

Figure D-21. High Tide Line 2

(Left) Observation point HTL2 at Nisqually Estuary near McAllister Creek. Photograph taken on December 28, 2022 at 8:07am with a predicted tide of 10.20 feet. (Right) Observation point HTL2 at Nisqually Estuary near McAllister Creek. Photograph taken on December 28, 2022 at 10:15am with a predicted tide of 16.48 feet.

Figure D-22. Observation point HTL3

(Left) Observation point HTL3 at Nisqually Estuary near Mounts Road SW. Photograph taken on January 9, 2023 at 3:30pm, with a predicted tide of 8.43 feet. (Right) Observation point HTL3 at Nisqually Estuary near Mounts Road SW. Photograph taken on January 10, 2023 at 9:45am, with a predicted tide of 14.17 feet.

Table D-34. HTL McAllister (Medicine) Creek and Estuary - Information Summary

<table>
<tr><td rowspan="7"></td><th>Waterbody Name</th><th>Tributaries to Red Salmon Creek</th></tr>
<tr><td>**Local Jurisdiction**</td><td>Thurston County</td></tr>
<tr><td>**WRIA**</td><td>WRIA 11 Nisqually</td></tr>
<tr><td>**Thurston Co. SMP shoreline designation**[a]</td><td>Natural Environment</td></tr>
<tr><td>**HTL elevation**[b]</td><td>16.27 feet</td></tr>
<tr><td>**Buffer Width**</td><td>250 feet</td></tr>
<tr><td>**HTL Relative to Project Corridor**</td><td>HTL is perpendicular to I-5 bridges and I-5 SB ramp bridge</td></tr>
<tr><th colspan="3">Field Observations</th></tr>
<tr><td>**Field Indicators**</td><td colspan="2">Above the HTL:
-Change to upland vegetation including Scotch broom, common velvet grass, and orchard grass (*Dactylis glomerata*), and presence of moss/lichen on riprap.
-No scour, wrack, deposition, or tidal influence observed.
Below the HTL:
-Change to salt tolerant and hydrophytic vegetation, including Lyngbye's sedge, pickleweed, and inland saltgrass. Kelp also observed.
-Wrack observed.
-Benches partially formed as a result of tidal flows, indicated by sloughing and drainage patterns.</td></tr>
<tr><td>**HTL Buffer Condition**</td><td colspan="2">Buffers present to the west of the wetland are primarily disturbed herbaceous grasses and shrub species, including Scotch broom, tall Oregon grape, and Himalayan blackberry. This area is formed on fill material between I-5 and the I-5 SB ramp and offers low buffer function. Buffers present to the east of the wetland are along a constructed dike vegetated primarily by Himalayan blackberry and Scotch broom and also offer low buffer function.</td></tr>
</table>

[a] *Shoreline Master Program environmental designation.*

HTL elevation relative to Budd Inlet, South of Gull Harbor Washington 9446807 Station

Table D-35. HTL Nisqually River Estuary - Information Summary

<table>
<tr><td rowspan="7"></td><th>Waterbody Name</th><th>Nisqually River</th></tr>
<tr><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>WRIA</td><td>WRIA 11- Nisqually</td></tr>
<tr><td>Thurston Co./Pierce Co, SMP shoreline designation[a]</td><td>Natural Environment/</td></tr>
<tr><td>HTL elevation[b]</td><td>16.27 feet</td></tr>
<tr><td>Buffer Width</td><td>250 feet/150 feet</td></tr>
<tr><td>HTL Relative to Project Corridor</td><td>The HTL is mapped along the fill prism of I-5, west of Nisqually River. The HTL follows along bridges under I-5 and into the ponded center median area.</td></tr>
<tr><th colspan="3">Field Observations</th></tr>
<tr><td>Field Indicators</td><td colspan="2">Above the HTL:
-Change to upland vegetation, including common velvet grass, orchard grass, and Scotch broom.
-No scour, rack, deposition, or tidal influence observed.
Below the HTL:
-Change to salt tolerant and hydrophytic vegetation, including Lyngbye’s sedge, pickleweed, and inland saltgrass.
-Wrack observed.</td></tr>
<tr><td>HTL Buffer Condition</td><td colspan="2">Buffers present to the west of the wetland are primarily disturbed herbaceous grasses and shrub species, including Scotch broom, tall Oregon grape, and Himalayan blackberry. This area is formed on fill material between I-5 and the I-5 SB ramp and offers low buffer function. Buffers present to the east of the wetland are along a constructed dike vegetated primarily by Himalayan blackberry and Scotch broom and also offer low buffer function.</td></tr>
</table>

[a] *Shoreline Master Program environmental designation.*

HTL elevation relative to Budd Inlet, South of Gull Harbor Washington 9446807 Station

Table D-36. HTL Red Salmon Creek - Information Summary

<table>
<tr><td rowspan="7" colspan="2"></td><th>Waterbody Name</th><th>Red Salmon Creek</th></tr>
<tr><td>Local Jurisdiction</td><td>Pierce County</td></tr>
<tr><td>WRIA</td><td>WRIA 11- Nisqually</td></tr>
<tr><td>Perice Co. SMP shoreline designation[a]</td><td>Natural Environment</td></tr>
<tr><td>HTL elevation[b]</td><td>16.27 feet</td></tr>
<tr><td>Buffer Width</td><td>150 feet</td></tr>
<tr><td>HTL Relative to Project Corridor</td><td>The HTL of Red Salmon Creek surrounds a large marsh north of I-5 and directly east of the BNSF railroad line near the Mounts Road exit.</td></tr>
<tr><th colspan="4">Field Observations</th></tr>
<tr><td>Field Indicators</td><td colspan="3">Above the HTL:
-Change to upland vegetation, including Douglas-fir, snowberry, and sword fern.
-No scour, rack, deposition, or tidal influence observed.
Below the HTL:
-Change to hydrophytic vegetation, including broadleaf cattail and water parsley within the freshwater tidally influenced portion. Access has not yet been granted near the outlet of Red Salmond Creek, and a small area of salt-tolerant plants, such as inland saltgrass, is anticipated.
-Wrack observed.
-Benches partially formed as a result of tidal flows, indicated by sloughing and drainage patterns.</td></tr>
<tr><td>HTL Buffer Condition</td><td colspan="3">The buffer is limited by the railroad embankment to the west, which cuts the wetland off from the large estuarine wetland (W10), and I-5 to the south. Rural residential development is present to the north and east, beyond a stand of mature forest.</td></tr>
</table>

[a] *Shoreline Master Program environmental designation.*

HTL elevation relative to Budd Inlet, South of Gull Harbor Washington 9446807 Station

3.5.6 Species and Habitats of Interest

A separate biological assessment will be prepared during the NEPA phase to address potential impacts to federally listed threatened or endangered species and designated critical habitat. The following information is a brief overview of potential Endangered Species Act species and habitat that may occur in the project vicinity. In addition, information on sensitive or unique wildlife, plants, and habitats occurring in Washington State is provided.

Federally listed endangered, threatened, or candidate species are known to occur within the study area (WDFW 2023a, b; USFWS 2023b; NMFS 2023a, b). Federally listed fish and wildlife species that may occur in the study area are listed in Table D-37 below.

Table D-37. ESA-Listed and Proposed Fish and Wildlife Species That May Occur in the Study Area

Common Name	Scientific Name	Federal Status	Critical Habitat
Fish			
Bull trout	Salvelinus confluentus	Threatened	Yes
Chinook salmon (PS ESU)	Oncorhynchus tshawytscha	Threatened	Yes
Steelhead (PS DPS)	O. mykiss	Threatened	Yes
Bocaccio rockfish (PS/GB DPS)	Sebastes paucispinis	Endangered	Yes; does not include study area
Yelloweye rockfish (PS/GB DPS)	S. ruberrimus	Threatened	Yes; does not include study area
Birds			
Marbled Murrelet	*Brachyramphus marmoratus*	Threatened	Yes: does not include study area
Northern Spotted Owl	*Stix occidentalis caurina*	Threatened	Yes: does not include study area
Streaked Horned Lark	*Eremophila alpestris strigata*	Threatened	Yes: does not include study area
Yellow-Billed Cuckoo	*Coccyzus americanus*	Threatened	Yes: does not include study area
Mammals			
North American Wolverine	*Gulo gulo luscus*	Proposed Threatened	No
Roy Prairie Pocket Gopher	*Thomomys mazama glacialis*	Threatened	Yes: does not include study area
Yelm Pocket Gopher	*Thomomys mazama yelmensis*	Threatened	Yes: does not include study area

Common Name	Scientific Name	Federal Status	Critical Habitat
Marine Mammals			
Humpback whale (Central America DPS and Mexico DPS)	*Megaptera novaeangliae*	Endangered	Yes: does not include study area
Killer Whale (Southern Resident DPS)	*Orcinus orca*	Threatened	Yes: does not include study area
Insects			
Taylor’s Checkerspot	*Euphydryas Editha taylori*	Endangered	Yes: does not include study area

DPS = distinct population segment; ESU = evolutionarily significant unit; GB = Georgia Basin; PS=Puget Sound

The WDNR Natural Heritage Program identifies Washington State threatened, endangered, and sensitive plants, as well as Wetlands of High Conservation Value. A variety of high-quality native habitats supporting native plant species are mapped to occur within close proximity to the study area, but no populations of rare plants are mapped to occur within a mile of the study area (WDNR 2023b). Estuarine wetland W21 and freshwater tidally influenced W7 are mapped as Wetlands of High Conservation Value. Rare ecosystems mapped within the vicinity of the study area are listed in Table D-38 below.

Table D-38. Rare Ecosystems Mapped Within the Vicinity of the Study Area

Ecosystem	Description	Mapped Location Proximity to Study Area
Oregon White Oak/Common Snowberry/Long-stolon Sedge Woodland	Very rare native ecosystem	Within JBLM, at least ½ mile from study area. A small stand (0.5 acre in size) of mixed Oregon white oak and conifer trees is present within the center median of the I-5 lanes in the eastern portion of the study area.
Black Cottonwood - Bigleaf Maple/Scouring-rush Riparian Forest	Uncommon to find this forest type with a dense native scouring rush understory.	Mapped about ½ mile upstream along Nisqually River; however, the habitat occurs within the study area.
Red Alder/Salmonberry/Slough Sedge - Skunkcabbage Swamp Forest	Less common for this habitat to occur without invasive species.	Mapped about ½ mile downstream along Nisqually River; however, the habitat occurs within the study area.
Tidal Salt Marsh	Regionally rare and imperiled habitat.	Mapped location 300 feet north of the project; however, the habitat occurs within the study area.

The WDFW Priority Habitats and Species Information documents priority habitats and state priority species within the study area (WDFW 2023b). WDFW maps priority habitat for Western gray squirrel (*Sciurus griseus*), Western pond turtle (*Actinemys marmorata*), wood duck (*Aix sponsa*), and waterfowl concentrations within estuarine and freshwater wetlands. Habitat is mapped for the following fish species:

Chum salmon (*O. keta*), Chinook salmon, coho salmon (*O. kisutch*), pink salmon (*O. gorbuscha*), winter steelhead, and resident coastal cutthroat (*O. clarkii*).

3.6 Limitations

This wetland and stream assessment report documents the investigation, best professional judgment, and conclusions of Parametrix based on the site conditions encountered at the time of this study. The wetland, stream, and HTL delineation was performed in compliance with accepted standards for professional wetland biologists and applicable federal, state, and local laws and ordinances, and WSDOT policies and guidance. The information contained in this report is correct and complete to the best of our knowledge. It should be considered a preliminary jurisdictional determination of wetlands and other waters until it has been reviewed and approved in writing by the appropriate jurisdictional authorities. The final determination of the wetland boundary, classification, and required setback and buffer will be made by local, state, and federal jurisdictions.

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3.8 Background Information

Appendix A includes the following sub-appendices:

A-1 Comparison of Observed and Normal Precipitation for Olympia Airport, Washington Station

A-2 Daily Precipitation for 10 Days Preceding Fieldwork, Olympia Airport, Washington Station

A-3 USGS Topographic Map

A-4 National Wetland Inventory Map

A-5 NRCS Soil Survey Map

3.8.1 Comparison of Observed and Normal Precipitation

The Regional Delineation Supplement Version 2.0 (USACE 2010) recommends using methods described in Chapter 19 in Engineering Field Handbook (NRCS 2015) to determine if precipitation occurring in the 3 full months prior to the site visit was normal, drier than normal, or wetter than normal. Actual rainfall is compared to the normal range of the 30-year average. The following tables show this information. As fieldwork occurred over several months, several precipitation tables are presented.

Rainfall Documentation: December 2022

Date: 12-23-2022

Period of Record: 1992-2022

Weather Station: Olympia Airport, WA

Growing season: 4/5 to 11/6

County: Thurston

Table D-39. Rainfall Documentation (December 2022)

Prior Month	Name	3 yrs. in 10 less than	3 yrs. in 10 more than	Measured Rainfall	Condition	Condition Value	Month Weight	Score	Result
3rd	Sept	0.93	2.45	0.13	Dry	1	1	1	Dry = 6-9
2nd	Oct	3.39	6.13	3.17	Dry	1	2	2	Normal = 10-14
Most recent	Nov	5.84	9.94	8.18	Normal	2	3	6	Wet = 15-18
Month Examined	December						Total	9	Dry

Note: If sum is

- 6 – 9 then prior period has been drier than normal
- 10 – 14 then prior period has been normal
- 15 – 18 then prior period has been wetter than normal

Condition value:

- Dry = 1
- Normal = 2
- Wet = 3

Conclusions: The period prior to field visits in December has been drier than normal.

Rainfall Documentation: January 2023

Date: 1-30-2023

Period of Record: 1993-2023

Weather Station: Olympia Airport, WA

Growing season: 4/6 to 11/7

County: Thurston

Table D-40. Rainfall Documentation (January 2023)

Prior Month	Name	3 yrs. in 10 less than	3 yrs. in 10 more than	Measured Rainfall	Condition	Condition Value	Month Weight	Score	Result
3rd	Oct	3.44	6.22	3.17	Dry	1	1	1	Dry = 6-9
2nd	Nov	5.84	10.01	8.18	Normal	2	2	4	Normal = 10-14
most recent	Dec	6.17	9.29	7.73	Normal	2	3	6	Wet = 15-18
Month Examined	January						Total	11	Normal

Note: If sum is

- 6 – 9 then prior period has been drier than normal
- 10 – 14 then prior period has been normal
- 15 – 18 then prior period has been wetter than normal

Condition value:

- Dry = 1
- Normal = 2
- Wet = 3

Conclusions: The period prior to field visits in January has been normal.

Rainfall Documentation: February 2023

Date: 2-6-2023

Period of Record: 1993-2023

Weather Station: Olympia Airport, WA

Growing season: 4/6 to 11/7

County: Thurston

Table D-41. Rainfall Documentation (February 2023)

Prior Month	Name	3 yrs. in 10 less than	3 yrs. in 10 more than	Measured Rainfall	Condition	Condition Value	Month Weight	Score	Result
3rd	Nov	5.84	10.01	8.18	Normal	2	1	2	Dry = 6-9
2nd	Dec	6.17	9.29	7.73	Normal	2	2	4	Normal = 10-14
most recent	Jan	5.96	9.22	3.70	Dry	1	3	3	Wet = 15-18
Month Examined	**February**						**Total**	**9**	**Dry**

Note: If sum is

- 6 – 9 then prior period has been drier than normal
- 10 – 14 then prior period has been normal
- 15 – 18 then prior period has been wetter than normal

Condition value:

- Dry = 1
- Normal = 2
- Wet = 3

Conclusions: The period prior to field visits in February has been drier than normal.

4 DAILY PRECIPITATION FOR 10 DAYS PRECEDING FIELDWORK, BELFAIR, WASHINGTON

To determine if light, moderate, or heavy precipitation occurred in the 10 days prior to field work, the 10 day total is compared to 1/3 of the monthly average precipitation for the month evaluated.

Daily precipitation data preceding December 13 to 16, 2022, field visit for Thurston County, Washington.

Date (2022)	Daily Precipitation (inches)[a]
3-Dec	0.18
4-Dec	0.24
5-Dec	0.05
6-Dec	0.07
7-Dec	0.02
8-Dec	0.16
9-Dec	0.42
10-Dec	0.11
11-Dec	0.03
12-Dec	T
Sum	**2.56**

[a] ACIS 2022

"T" values indicate a trace value was recorded.

Conclusions: Moderate precipitation was recorded in the 10 days preceding field work.

Daily precipitation data preceding December 22, 2022, field visit for Thurston County, Washington.

Date (2022)	Daily Precipitation (inches)[a]
12-Dec	T
13-Dec	0.00
14-Dec	T
15-Dec	0.00
16-Dec	0.00
17-Dec	0.03
18-Dec	0.10
19-Dec	0.03
20-Dec	0.54
21-Dec	0.01
Sum	**1.42**

[a] ACIS 2022

"T" values indicate a trace value was recorded.

Conclusions: Light precipitation was recorded in the 10 days preceding field work.

Daily precipitation data preceding January 4, 2023, field visit for Thurston County, Washington.

Date (2022-2023)	Daily Precipitation (inches)[a]
25-Dec	0.40
26-Dec	2.10
27-Dec	1.18
28-Dec	0.30
29-Dec	0.50
30-Dec	1.06
31-Dec	0.05
1-Jan	1.88
2-Jan	0.26
3-Jan	0.06
Sum	**4.55**

[a] ACIS 2022

Conclusions: Heavy precipitation was recorded in the 10 days preceding field work.

Daily precipitation data preceding January 9 to 11, 2023, field visit for Thurston County, Washington.

Date (2022-2023)	Daily Precipitation (inches)[a]
30-Dec	0.20
31-Dec	0.06
1-Jan	0.00
2-Jan	0.01
3-Jan	0.07
4-Jan	0.06
5-Jan	0.06
6-Jan	0.36
7-Jan	0.36
8-Jan	0.38
9-Jan	0.33
10-Jan	0.01
Sum	**2.48**

[a] ACIS 2022

Conclusions: Light precipitation was recorded in the 10 days preceding field work.

Daily precipitation data preceding January 22, 2023, field visit for Thurston County, Washington.

Date (2023)	Daily Precipitation (inches)[a]
12-Jan	0.34
13-Jan	0.35
14-Jan	0.07
15-Jan	0.51
16-Jan	T
17-Jan	0.07
18-Jan	0.16
19-Jan	T
20-Jan	0.00
21-Jan	0.27
Sum	**2.35**

[a] ACIS 2022

“T” values indicate a trace value was recorded.

Conclusions: Light precipitation was recorded in the 10 days preceding field work.

Daily precipitation data preceding January 30, 2023, field visit for Thurston County, Washington.

Date (2023)	Daily Precipitation (inches)[a]
20-Jan	T
21-Jan	0.00
22-Jan	T
23-Jan	0.00
24-Jan	0.00
25-Jan	0.03
26-Jan	0.10
27-Jan	0.03
28-Jan	0.54
29-Jan	0.01
Sum	**0.87**

[a] ACIS 2022

"T" values indicate a trace value was recorded.

Conclusions: Light precipitation was recorded in the 10 days preceding field work.

Daily precipitation data preceding February 6, 2023, field visit for Thurston County, Washington.

Date (2023)	Daily Precipitation (inches)[a]
27-Jan	0.01
28-Jan	0.10
29-Jan	0.00
30-Jan	0.00
31-Jan	0.00
1-Feb	0.00
2-Feb	0.00
3-Feb	0.42
4-Feb	0.32
5-Feb	0.24
Sum	**1.25**

[a] ACIS 2022

Conclusions: Light precipitation was recorded in the 10 days preceding field work.

5 FISH, WILDLIFE, AND VEGETATION

5.1 Intoduction

This technical memorandum is an initial step in the development of the proposed alternatives for the I-5 Marvin to Mounts Road Focused Planning and Environmental Linkages (PEL) study. It summarizes existing information about vegetation, wildlife, and fish in the study area. The memorandum also identifies the sources of information that were used and describes the methods that will be used for evaluating the potential impacts of the alternatives (including No Action) on these resources during future National Environmental Policy Act (NEPA) analysis.

5.1.1 Project Background and Description

In 2020, the Washington State Department of Transportation (WSDOT) completed a corridor study of Interstate 5 (I-5) between State Route (SR) 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This segment of I-5 connects Thurston and Pierce Counties and provides access to JBLM. The roadway travels across the Nisqually River estuary, traditional land of the Nisqually Indian Tribe, and habitat for several federally listed fish and wildlife species.

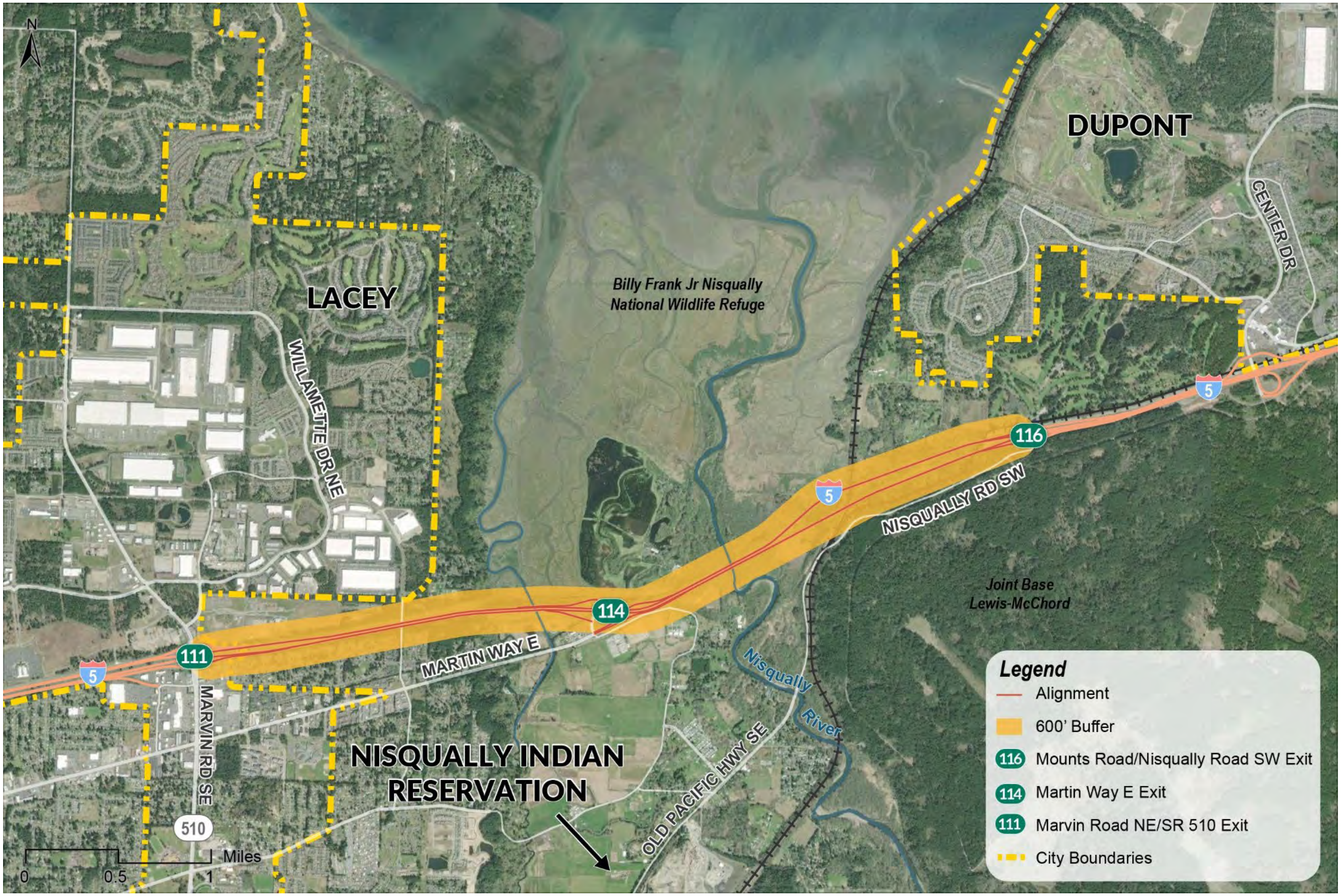
In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin Road and Mounts Road interchanges through the Nisqually River delta. An initial PEL study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

The current phase, a Focused PEL, is studying I-5 from Marvin Road to Mounts Road (Exit 111 to Exit 116). The Focused PEL considers additional technical analyses and partner input to arrive at a final purpose and need and preferred alternative(s) to advance into NEPA environmental review beginning in 2023. Funding has been provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way (ROW) acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing.

5.1.2 Project Vicinity

The project is in western Washington State, northeast of Olympia, along I-5 between exits 111 and 116 (Figure D-23). North of the study area is the Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge), which is known for a high diversity of fish, migratory birds, and other wildlife. To the south of the study area, low-lying areas consist primarily of agricultural land uses, with a mix of commercial, residential, and undeveloped forested areas. On the east and west sides of the study area, steep, forested slopes frame the broad river valley with a mix of evergreen and deciduous species. Known aquatic resources with fish use or potential fish use within the study area include the Nisqually Delta estuarine system and the freshwater resources of the Nisqually River, McAllister (Medicine) Creek, and Red Salmon Creek. These aquatic resources also contain a variety of associated sloughs, tributaries, channels, and wetland features with documented or potential fish use.

Figure D-23. Project Vicinity Map



5.2 Methods for Vegetation, Wildlife, and FIsh Analysis

The following subsections (1) define the areas within which potential project-related effects on vegetation, wildlife, and fish will be evaluated, (2) identify laws and regulations pertinent to these resources, (3) identify the sources that were reviewed for information about vegetation, wildlife, and fish in the study area, and (4) provide an overview of the methodology that will be used to assess the impacts of the alternatives.

5.2.1 Study Area

The study area for vegetation and wildlife and includes all areas within the WSDOT right of way (ROW) along northbound and southbound lanes of I-5 between exits 111 and 116, as well as an additional 500 feet beyond the ROW on adjacent parcels where access has been approved. This represents a conservative estimate of the area in which project construction could affect vegetation cover and habitat quality for terrestrial wildlife. Similarly, the study area for potential impacts to fish and fish habitat includes all rivers, streams, and waterbodies within approximately 500 feet of the I-5 ROW. The analysis area for potential impacts to fish and fish habitat includes aquatic resources in which project construction or operation could result in elevated levels of turbidity, sediment, and pollutants. A preliminary map of the study area is shown in Figure D-24.

Additional potential project impacts could occur as a result of in-air and in-water noise. The analysis area for in-air and in-water noise associated with potential construction activities such as pile driving will be assessed during Endangered Species Act (ESA) consultation and preparation of the biological assessment during the NEPA phase.

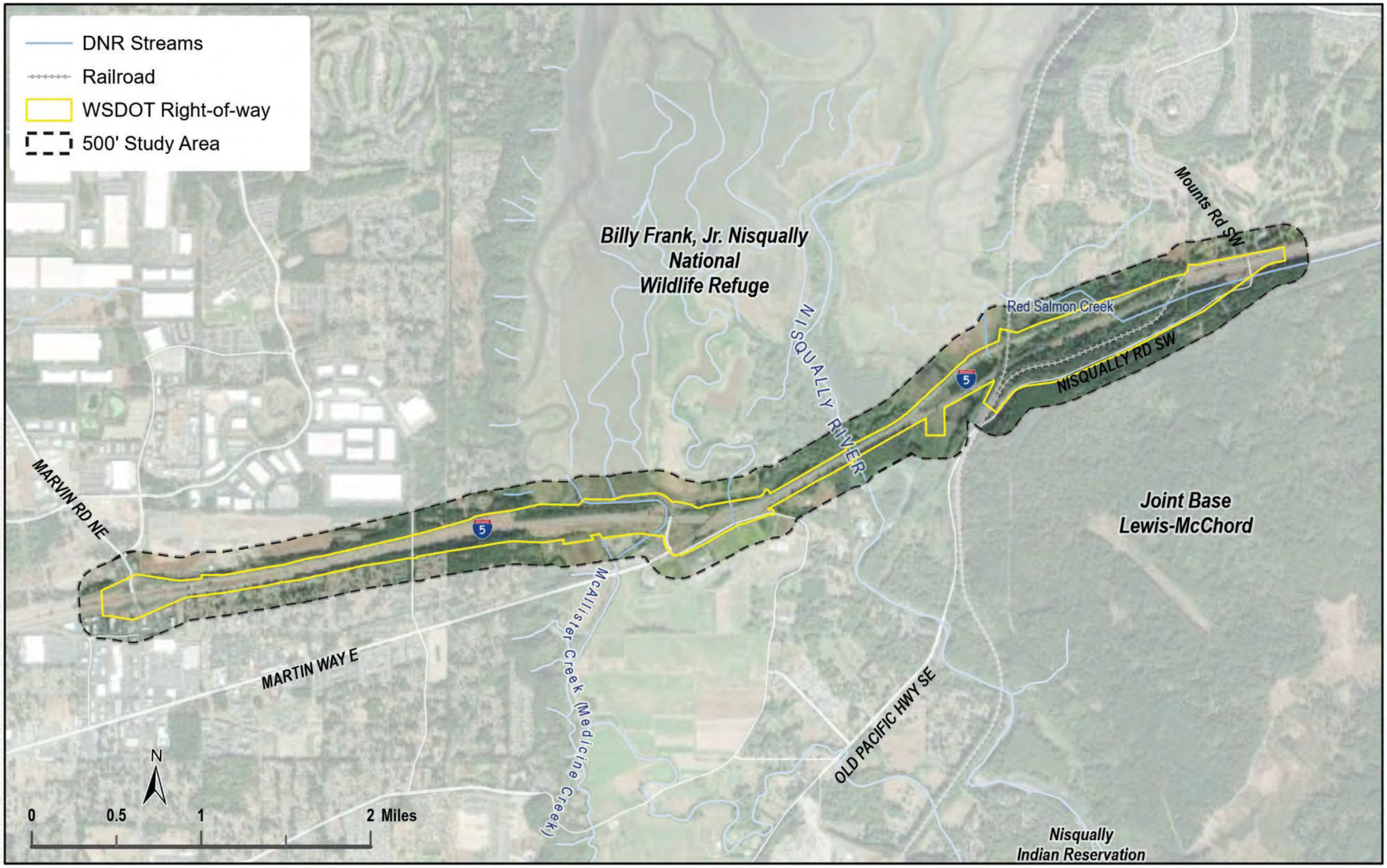
5.2.2 Relevant Laws and Regulations

The federal, state, and local laws and regulations that may apply to vegetation, wildlife, and fish within the study area include the following.

Federal

- Clean Water Act
- Endangered Species Act Section 7
- Magnuson-Stevens Fishery Conservation and Management Act
- Migratory Bird Treaty Act
- Bald and Golden Eagle Protection Act

Figure D-24. Vegetation, Wildlife, and Fish Study Area



State

- Washington State Hydraulic Code (220-660 Washington Administrative Code [WAC])
- Washington Department of Fish and Wildlife (WDFW) State and Protected Species (220-610 WAC)
- Fish and Wildlife (Title 77 Revised Code of Washington [RCW])
- WSDOT Executive Order E 1031 Protections and Connections for High Quality Natural Habitats
- State Environmental Policy Act

Local

- Thurston County Municipal Code Title 24 (Critical Areas), Title 19 (Shoreline Master Program)
- Pierce County Code Title 18 (Critical Areas), Title 19 (Shoreline Master Program)
- Lacey Municipal Code Chapter 14.33 (Habitat Conservation Areas Protection)

5.2.3 Data Sources and Data Collection Methods

The following sources of information were reviewed to support the analysis of vegetation, wildlife, and fish in the study area.

- Pierce County Code (PCC) Critical Areas (PCC 18E.40.20)
- Pierce County Critical Areas Map Interactive Mapping Tool (Pierce County 2023a)
- Thurston County Code (TCC) Critical Areas (TCC 24.25)
- Thurston County Critical Areas Map Interactive Mapping Tool (Thurston County 2023a)
- WDFW Priority Habitats and Species (PHS) List (WDFW 2022)
- WDFW PHS Data and Maps (WDFW 2023a)

Sources of information specific to vegetation include:

- WDNR Natural Heritage Program (NHP) (WDNR 2022b)
- Pierce County and Thurston County Noxious Weed Lists (Washington State Noxious Weed Control Board 2022)
- Natural Resource Conservation Service (NRCS) soil mapping (NRCS 2022)
- National Wetland Inventory mapping (USFWS 2022b)

Sources of information specific to wildlife and wildlife habitat include:

- USFWS Geospatial Data (USFWS 2022b)

- National Bald Eagle Management Guidelines (USFWS 2007)
- eBird Northwest (Cornell Laboratory of Ornithology 2023)
- Personal communications with staff at the Nisqually Indian Tribe, the National Wildlife Refuge, WDFW, and other local organizations

Sources of information specific to fish and fish habitat include:

- National Marine Fisheries Service (NMFS) ESA status reviews and listing information (NMFS 2023b)
- NMFS ESA Critical Habitat Report Online Mapper (NMFS 2023a)
- Northwest Indian Fisheries Commission (NWIFC) Statewide Integrated Fish Distribution (SWIFD) Web Map (NWIFC 2023)
- U.S. Fish and Wildlife Service (USFWS) ESA status reviews and listing information (USFWS 2023a)
- USFWS ESA Critical Habitat Report Online Mapper (USFWS 2023b)
- WDFW Fish Passage Inventory, Assessment, and Prioritization Manual (2019)
- WDFW SalmonScape Mapper (WDFW 2023b)
- WDFW Forage Fish Spawning Map (WDFW 2023c)
- WDFW Water Resource Inventory Area (WRIA) Map (WDFW 2023d)
- Washington Department of Natural Resources (WDNR) Puget Sound Seagrass Monitoring Data and Maps (WDNR 2023a)
- Nisqually Estuary Baseline Fish Ecology Study (Ellings and Hodgson 2007)
- Foraging and Growth Potential of Juvenile Chinook Salmon after Tidal Restoration of a Large River Delta (David et al. 2014)
- Freshwater Tidal Forests and Estuarine Wetlands May Confer Early Life Growth Advantages for Delta-Reared Chinook Salmon Davis et al. 2018)
- Changes in Habitat Availability for Outmigrating Juvenile Salmon (*Oncorhynchus* spp.) following Estuary Restoration (Ellings et al. 2016)
- Enhanced invertebrate prey production following estuarine restoration supports foraging for multiple species of juvenile salmonids (*Oncorhynchus* spp.) (Woo et al. 2018)
- A Mosaic of Estuarine Habitat Types with Prey Resources from Multiple Environmental Strata Supports a Diversified Foraging Portfolio for Juvenile Chinook Salmon (Woo et al. 2019)

Wildlife and vegetation surveys involved identifying important habitats (e.g., riparian areas, tidal marshes, prairies, and woodlands, and infrastructure features and structures such as bridges, as well as other areas with which ESA-listed or state-listed species have a primary association) on aerial imagery. Biologists then visited areas where such habitats have been identified, walking the ROW and other legally accessible portions of the study area and documenting vegetation communities, evidence of wildlife presence, and potential habitat for species of concern. Accessible portions of WDFW priority habitat areas and WDNR high-quality ecosystems in the study area were also visited.

To document fish and fish habitat conditions in the study area, project ecologists reviewed existing information, performed an aerial photograph assessment, and conducted site visits on parcels where access was approved. Fish habitat was assessed by walking the shoreline or wading in the aquatic resources within the study area. Documented channel characteristics included potential fish usage, hydrologic functions, channel bed and bank conditions, substrate composition, the presence of woody material, and riparian vegetation. Based on site conditions, the channel width, wetted width, and water depth were measured or approximated at select locations to document average conditions. Photographs were taken to document habitat conditions.

The ordinary high water mark (OHWM) or the high tide line (HTL) of aquatic resources within the study area were delineated while walking or wading the channel shorelines and identifying the boundaries with flagging for professional survey. OHWM and HTL boundaries were identified consistent with RCW 90.58 and WAC 173-22 and federal guidance (33 Code of Federal Regulations (CFR) § 328 .3).

5.2.4 Impact Evaluation Methods

Long-Term Impacts

Direct, long-term impacts to fish and fish habitat will be determined by evaluating the area of stream, river, and estuarine habitat that will be permanently disturbed with new structures as well as the areas of permanent vegetation disturbance within the stream’s regulatory buffer. Qualitative considerations will include such factors as the regional significance of the affected resource, fish habitat value (such as its role as a migration corridor or spawning), degree of connectivity and loss of habitat following project implementation, overall habitat quality, and potential for enhancing or restoring aquatic habitat or connectivity. Impacts to aquatic species from water quality degradation and loss of habitat during project operation will also be assessed.

Direct long-term impacts to vegetation and wildlife habitat will be determined by evaluating the acreage of habitats of concern that would be affected by the build alternative(s). Important habitat areas and tree protection areas will be overlaid with project impact areas to determine the extent of impacts to those habitats and associated species. Direct impacts to identified populations of rare plants will be determined by evaluating acreage of these populations that would be affected by construction and operation of the build alternative(s).

Impacts to vegetation and wildlife habitat will also be assessed qualitatively by considering such factors as the regional significance of the resource, wildlife habitat value (such as its role as a wildlife migration corridor), degree of fragmentation and loss of the habitat following project implementation, overall habitat quality, and the potential for enhancing or restoring unique plant communities or wildlife habitat or connectivity. Impacts to wildlife, including disturbance from increases in human access, noise, and light, will also be assessed. The team will also analyze the potential for the project to cause the spread of noxious or invasive plant species and will explore options for avoiding, minimizing, and mitigating the spread of those species.

The analysis of impacts to special-status fish and wildlife species, including those protected under the ESA, will be based on the extent and intensity of impacts to habitats with which each species is associated. Impact analyses for these species will also address the potential for adverse effects related to increases in human access, noise, light, and the risk of degraded water quality during project operation. These analyses will account for the probability and intensity of exposure to project-related operation effects. The analysis of the potential for long-term impacts to fish and fish habitat due to water quality degradation or changes in hydrologic regimes will be based on information in the stormwater technical memorandum prepared for this project.

Indirect Impacts and Delayed Consequences

Indirect impacts to vegetation, wildlife, and fish will be analyzed qualitatively. Indirect impacts may include those related to potential changes in land use patterns resulting from modifications to highway interchanges. Indirect impacts may also occur through the implementation of mitigation measures for other environmental impacts. A similar analysis will be performed for ESA species that, under the context of the ESA, are identified as having the potential to experience delayed consequences.

Cumulative Impacts

The cumulative impacts analysis will consider effects on vegetation, wildlife, fish, and wetlands from other past, present, and reasonably foreseeable future actions, including other transportation or infrastructure projects and other land use actions or developments in the study area. Other projects that are reasonably foreseeable will be identified and considered in the cumulative impacts analysis.

Short-Term Construction Impacts

Direct, short-term impacts to fish and fish habitat will be determined by evaluating the area of stream habitat that will be temporarily disturbed during construction as well as the areas of temporary vegetation disturbance within the stream’s regulatory buffer. Impacts to aquatic species from temporary water quality degradation and loss of habitat during construction will also be assessed.

Direct short-term impacts to vegetation and wildlife habitat will be determined by evaluating the acreage of habitats of concern that would be temporarily disturbed during construction. Important habitat areas and tree protection areas will be overlaid with project impact areas to determine the extent of temporary impacts to those habitats and associated species. Direct short-term impacts to identified populations of rare plants will be determined by evaluating acreage of these populations that would be temporarily affected by construction of the build alternative(s).

The analysis of short-term impacts to special-status fish and wildlife species, including those protected under the ESA, will be based on the extent and intensity of impacts to habitats with which each species is associated. Impact analyses for these species will also address the potential for adverse effects related to increases in human access, noise, light, and the risk of degraded water quality during construction. These analyses will account for the probability and intensity of exposure to project-related construction effects.

5.2.5 Mitigation Development

The project team will identify measures for avoiding, minimizing, and mitigating impacts to vegetation, wildlife, and fish to the extent possible. During the planning and design process, impact avoidance and minimization will be emphasized; however, the improvements will likely result in unavoidable impacts to important species and habitats. Conceptual compensatory mitigation for unavoidable impacts to important habitats will be identified if necessary.

5.3 Existing Conditions

This section describes the existing environmental resources within the study area for vegetation, wildlife, and fish. Vegetation is discussed first because it forms the primary basis for wildlife and fish habitat.

Species known to use habitats in the study area are those whose presence is documented by the information sources identified in Section 2.3 of this memorandum as well as those observed during site visits conducted for this analysis. Species with a known or expected distribution that encompasses the study area and species associated with habitat types in the study area are considered potentially present.

5.3.1 Vegetation

This section describes vegetation community types in the study area as well as species with special status that have the potential to occur within these community types.

Vegetation Communities in the Study Area

Habitats within the study area are defined by existing vegetation communities, structures, landscape position, and the presence of water such as creeks and wetlands. Boundaries and descriptions of vegetation communities and wildlife habitat are based on preliminary assessments of aerial photography and other data sources (WDFW 2023b; WDNR 2022b), followed by ground-truthing of conditions within the accessible portions of the ROW. Within each vegetation community, habitat conditions were assessed, a complete plant list was compiled, and dominant species were noted.

The vegetation communities observed during the assessment of the study area are described in Table D-42 along with notes on relative habitat value for native species and the acreage of each type within the study area. The vegetation communities within the study area are mapped in Figure D-25.

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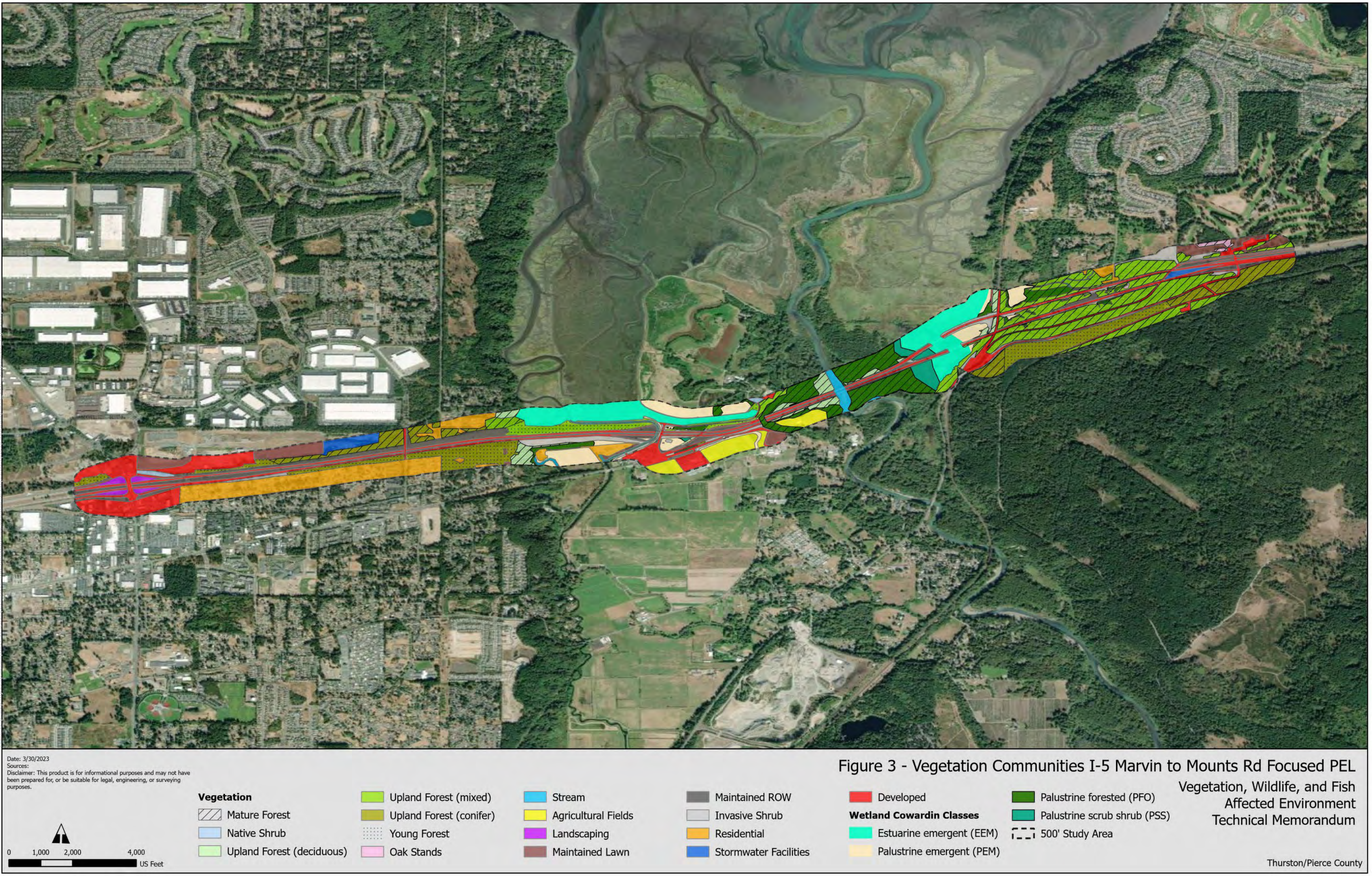
Table D-42. Vegetation Communities/Habitat Types Within the Study Area

Vegetation Community/ Habitat Type	Description	Habitat Value	Size Within Study Area (acres)
Estuarine Wetlands	Tidally influenced emergent wetland areas dominated by salt tolerant plants, including Lyngbye's sedge, saltgrass, and pickleweed.	High. These wetlands are of high conservation value and provide important fish and wildlife habitat. It would take months to years to recover this habitat following disturbance.	48
Forested Wetlands	Wetland areas dominated by trees including red alder and Oregon ash. These wetlands may contain multiple wetland-associated vegetation strata, including subcanopy, shrub understory, and herbaceous layer. Some areas are dominated with native understory. Invasive species (Himalayan blackberry, reed canary grass) dominate others.	High. These wetlands have a high structural complexity and may have mature forest stands with dense understory. It would take years to decades to recover this habitat following disturbance.	79.5
Emergent Wetlands	Wetland areas dominated by rushes, sedges, and grasses. Reed canary grass has dominated many of these wetlands in the study area.	Medium to High. These wetlands have low to moderate structural complexity with high function. It would take months to years to recover this habitat following disturbance	92.4
Scrub-Shrub Wetlands	Wetland areas dominated by shrub species such as salmonberry and willow. Himalayan blackberry dominates a large component of the scrub-shrub wetlands in the study area.	Medium to High. These wetlands have moderate structural complexity. It would take months to years to recover this habitat following disturbance.	12.8
Oak Woodlands	Oregon white oak/conifer stand associations where Oregon white oak makes up 25% of the canopy cover. This habitat is rare and occurs in the eastern portion of the study area.	High. Oak woodland habitat is a Critical Habitat and provides refuge for endangered species. It takes years to decades to recover this habitat following disturbance, and it may never be replaced. Oregon white oaks are a slow-growing species with low sapling recruitment rates. This habitat type is limited in the study area and would take a long time (decades or longer) to reestablish.	3
Stream Channel	Relatively non-vegetated stream and river channels. Some submerged aquatic vegetation is present.	High. Many in-stream processes elevate the value of this habitat to terrestrial and aquatic wildlife. It would take months to years to recover this habitat following disturbance.	12.8
Upland Forest (deciduous)	Areas dominated by trees, primarily black cottonwood, red alder and bigleaf maple. Oregon ash, bitter cherry, and a variety of nonnative trees are also present within this habitat type. This habitat dominates areas along the Nisqually River.	Medium to High, depending on age. There is moderate to high structural complexity. Young stands have a shorter replacement time period than mature forest stands. Native understory plants are common and dominate some areas. In other areas, invasive plants (e.g., ivy, nonnative blackberries) dominate, reducing the native habitat. The forest's proximity to road areas increases noise and air pollution, increases collision risk, and decreases habitat quality. It also acts as a buffer from these impacts on adjacent areas. These trees typically possess short lifespans; however, it would still take a long time (years to decades) to recover this habitat following disturbance.	25

Vegetation Community/ Habitat Type	Description	Habitat Value	Size Within Study Area (acres)
Upland Forest (mixed)	Areas with mixed forest stands of conifers and deciduous trees. Dominant trees are primarily big leaf maple and Douglas-fir. Pacific madrone may also be present within this habitat type. This habitat occurs primarily on the valley sidewalls and the cut/fill slopes of the freeway.	Medium to High, depending on age. There is moderate to high structural complexity. Young stands have a shorter replacement time period than mature forest stands. Native understory plants are common and dominate some areas. In other areas, invasive plants (e.g., ivy, non-native blackberries) dominate, reducing the native habitat. The forest's proximity to road areas increases noise and air pollution, increases collision risk, and decreases habitat quality. It also acts as a buffer from these impacts on adjacent areas. It would take a long time (decades or longer) to recover this habitat following disturbance, depending on the age of the stand. The mix of tree types makes the food availability and habitat valuable for wildlife.	165.4
Upland Forest (conifer)	Areas dominated by conifers, primarily Douglas-fir. Some areas contain western red cedar, western hemlock, grand fir, and Sitka spruce. The habitat mainly occurs in the eastern portion of the study area, near JBLM.	Medium to high, depending on age. Douglas-fir forests are common in the area. Young stands have a shorter replacement time period than mature forest stands. Native understory plants are common and dominate some areas. In other areas, invasive plants (e.g., ivy, nonnative blackberries) dominate, reducing the native habitat. The forest's proximity to road areas increases noise and air pollution, increases collision risk, and decreases habitat quality. It also acts as a buffer from these impacts on adjacent areas. It would take a long time (decades or longer) to recover this habitat following disturbance, depending on the age of the stand.	128
Native Shrub	Areas dominated by native shrubs including oso berry, snowberry, and Oregon grape.	Medium. Native shrubland is not common in the study area. There is moderate structural complexity. This habitat type takes less time (months to years) to reestablish than forest habitat.	3.2
Landscaping	Areas planted with horticultural trees and shrubs. Some of these areas include native species but are in disturbed roadside areas with limited vegetation structure.	Low. There is low habitat structure, and the disturbance is high. These areas may provide some browsing habitat for herbivores, such as deer, rabbits, and rodents, and some limited foraging and nesting habitat for birds, but are typically surrounded by roadways within the study area. This habitat type would take a short time (weeks to months) to reestablish.	7.1
Invasive Shrub	Nonnative shrubs, including dense Himalayan blackberry and Scotch broom, often with nonnative herbaceous layer. These areas may be part of the maintained right of way, but invasive shrubs persist.	Low. There is low habitat structure, and the disturbance is high. These areas may provide some cover for wildlife and nesting habitat for birds. This habitat type would take a short time (weeks to months) to reestablish.	42

Vegetation Community/ Habitat Type	Description	Habitat Value	Size Within Study Area (acres)
Maintained Lawn	This cover type includes regularly mown nonnative grasses and forbs.	Low. There is low habitat structure, and the disturbance is high. These areas may provide some browsing habitat for herbivores, such as deer, rabbits, and rodents, and some limited foraging habitat for birds. This habitat type would take a short time (weeks) to reestablish.	37.7
Maintained Right of Way	Areas along roadways that are maintained for vehicular safety and are regularly mowed. These areas are disturbed regularly with maintenance actions, herbicide application, roadway noise, and pollution. These areas are dominated by nonnative grasses and forbs with scattered scotch broom and blackberry.	Low. There is limited habitat structure, and the periodic maintenance causes high disturbance. These areas may provide some browsing habitat for herbivores such as deer, rabbits, and rodents, and some limited foraging habitat for birds. This habitat type would take a short time (weeks) to reestablish.	76.5
Agricultural Fields	Areas regularly mowed, tilled, or fertilized.	Low. Regular farm maintenance causes high disturbance and does not provide suitable habitat for wildlife. Wildlife can travel through these areas to reach other habitat types. This habitat type would take a short time (days to weeks) to reestablish.	28.4
Stormwater Facilities	Areas excavated to reduce volume, flow rate, and pollutants from stormwater runoff. Most areas are dominated by nonnative grass species and are typically maintained through mowing and dredging.	Low. The limited structural diversity and periodic disturbance regime limits the value to wildlife. The ponded habitat tends to have a highly variable water table and polluted water source, severely limiting the value of the habitat to aquatic species. This habitat type would be quick to reestablish (days to weeks) to current conditions after disturbance.	12.7
Residential	Areas dominated by single family homes. Some small patches of upland forest occur.	Low. Low to moderate structural complexity (if mature trees occur) but dominated by paved roads, lawns, and houses. These areas receive a moderate level of disturbance, including domestic animals, and provide habitat for non-sensitive wildlife species. This habitat type would take a short time (weeks to months) to reestablish.	91
Developed Unvegetated Surfaces	Paved roadways, parking areas, and commercial areas with impervious surfaces.	Low. There is minimal structural complexity. These areas generally lack wildlife habitat features and are a risk to wildlife. Developed unvegetated surfaces without vehicle or foot traffic (e.g., roofs) may have some habitat value because structures may provide cover, perch, and even nesting opportunities. This habitat type would take a short time (days to weeks) to reestablish.	205.6

Figure D-25. Vegetation Communities/Habitat Types Within the Study Area



ESA-Listed Plant Species

Two ESA-listed plant species potentially occur within the study area based on information compiled from the USFWS (2023a). No plant species proposed for ESA listing were identified as potentially occurring in the study area. ESA-listed plant species status and potential presence in the study area are described in the following subsections and presented in Table D-43. The analysis of potential impacts to ESA-listed species will be performed as part of the Biological Assessment (BA) after a preferred alternative for the project is identified.

Table D-43. ESA-Listed Plant Species that May Occur in the Study Area

Common Name	Scientific Name	Federal Status	Critical Habitat
Golden paintbrush	*Castilleja levisecta*	Threatened	No
Marsh sandwort	*Arenaria paludicola*	Endangered	No

USFWS 2023a

Golden Paintbrush

Golden paintbrush was listed as threatened under the ESA in 1997 (62 FR 31740). The species was proposed for delisting in 2021 (86 FR 34695). No critical habitat has been designated for this species.

This perennial plant is native to the prairies of Washington State, Oregon, and southern British Columbia. Habitat includes gravelly, glacial outwash prairie, upland prairie, and flat grasslands, some characterized by mounded topography and thickets of low deciduous shrubs. As those prairie ecosystems were dramatically fractured and reduced in size by development, agriculture, and fire suppression, golden paintbrush too became increasingly rare. However, the population has rebounded in recent years due to recovery efforts by public and private partners. At the time the species was federally listed as threatened in 1997, fewer than 20,000 plants remained at just 10 sites. By 2018, more than half a million plants could be found at 48 sites (USFWS 2023c). Prairie habitat typically associated with this species is not present in the study area. Grassland habitat in the study area includes WSDOT right of way and wetland and upland grass and herbaceous fields. Golden paintbrush is not expected to occur in the study area.

Marsh Sandwort

Marsh sandwort was listed as endangered under the ESA in 1993 (58 FR 41378). No critical habitat has been designated for this species.

Marsh sandwort is a small perennial herbaceous coastal species that was historically known to occur in marshes and other perennially mesic areas (i.e., streams, creeks) from central Washington (Pierce County) to southern California (Los Angeles County).

At the time of the 1993 listing, there was only one known extant population of marsh sandwort, located in Southern California in San Luis Obispo County. Marsh sandwort is believed to be extirpated from Washington and along the Pacific coast to Southern California (USFWS 2023d). Marsh sandwort is not expected to occur in the study area.

State and Local Priority Plant Species

A variety of high-quality native habitats supporting native plant species are mapped to occur within close proximity to the study area, but no populations of rare plants are mapped to occur within a mile of the study area (WDNR 2022b). Table D-44 describes the WNDR mapped habitats, and Table D-45 lists the 2021 Washington State and Local Priority Plant Species that occur in Pierce and Thurston Counties, as well as in JBLM, within habitats that may occur in the project study area. WDNR mapped habitats are included in Appendix A.

Table D-44. Rare Ecosystems Mapped Within the Vicinity of the Study Area

Ecosystem	Description	Mapped Location Proximity to Study Area
Oregon White Oak/Common Snowberry/Long-stolon Sedge Woodland	Very rare native ecosystem	Within JBLM, at least ½ mile from study area. A small stand (0.5 acre) of mixed Oregon white oak and conifer trees is present within the center median of the I-5 lanes in the eastern portion of the study area.
Black Cottonwood - Bigleaf Maple/Scouring-rush Riparian Forest	Uncommon to find this forest type with a dense native scouring rush understory.	Mapped about ½ mile upstream along Nisqually River; however, the habitat occurs within the study area.
Red Alder/Salmonberry/Slough Sedge - Skunkcabbage Swamp Forest	Less common for this habitat to occur without invasive species.	Mapped about ½ mile downstream along Nisqually River; however, the habitat occurs within the study area.
Tidal Salt Marsh	Regionally rare and imperiled habitat.	Mapped location 300 feet north of the project; however, the habitat occurs within the study area.

Table D-45. Washington Vascular Plant Species of Conservation Concern That May Occur in or near the Study Area

Species	Common Name	State Rank	State Status	Pierce	Thurston	JBLM
Actaea elata var. elata	Tall bugbane	S3	Sensitive	◆	◆	
Arenaria paludicola	Marsh sandwort	SX	Extirpated	◆		
Carex densa	Dense sedge	S2	Sensitive	◆	◆	
Castilleja levisecta	Golden paintbrush	S2	Threatened	◆	◆	
Cirsium remotifolium var. remotifolium	Weak thistle	S1	Endangered	◆		◆
Euonymus occidentalis var. occidentalis	Western wahoo	S2	Sensitive		◆	
Heterotheca oregona	Oregon goldenweed	S2	Sensitive	◆		◆
Howellia aquatilis	Water howellia	S2	Threatened	◆	◆	
Isoetes nuttallii	Nuttall’s quillwort	S2	Sensitive	◆		◆
Lathyrus torreyi	Torrey's peavine	S1	Sensitive	◆		
Lathyrus vestitus var. ochropetalus	Pacific peavine	S1	Endangered		◆	
Leptosiphon minimus	True babystars	S1S2	Threatened	◆	◆	
Lycopodiella inundata	Northern bog clubmoss	S2	Sensitive	◆		◆
Meconella oregana	White meconella	S1	Endangered	◆		
Montia diffusa	Branched montia	S1S2	Sensitive	◆		
Nuttallanthus canadensis	Old field blue toadflax	S1	Sensitive	◆	◆	
Nuttallanthus texanus	Texas blue toadflax	S1	Sensitive	◆	◆	
Pityopus californicus	Pine-foot	S1	Sensitive	◆	◆	
Polemonium carneum	Salmon Jacob's-ladder	S2	Threatened		◆	
Potamogeton obtusifolius	Blunt-leaved pondweed	S2	Sensitive		◆	
Sericocarpus rigidus	Columbia white-topped aster	S3	Sensitive	◆	◆	
Sidalcea virgata	Rose checkermallow	S1	Sensitive		◆	
Silene scouleri ssp. scouleri	Scouler's catchfly	S1	Sensitive	◆	◆	
Symphyotrichum hallii	Hall's aster	S2	Sensitive		◆	
Trillium albidum var. parviflorum	Small-flowered trillium	S2S3	Sensitive	◆	◆	
Whipplea modesta	Whipplevine	S1	Sensitive		◆	
Woodwardia fimbriata	Giant chain-fern	S2	Sensitive	◆	◆	
Wyethia angustifolia	Narrow-leaf mule's-ears	S1	Sensitive		◆	

State rank: status of a species, subspecies, or variety within the state of Washington. S1 = critically imperiled; S2 = imperiled; S3 = vulnerable; SX = presumed extirpated.

5.3.2 Wildlife

This section describes wildlife and wildlife habitat in the study area, focusing on species of concern as established by federal, state, and local regulations.

Wildlife Habitat and Presence in the Study Area

The dominant physical feature in the study area is I-5, including the roadway, maintained right of way, and associated stormwater facilities. All of these features offer low habitat value due to minimal structural diversity and high levels of noise and human disturbance. These features do not support diverse or abundant wildlife communities. Red-tailed hawks and other raptors prey on voles and other small mammals that are found in grassy habitats associated with the highway. Agricultural lands in the valley bottom have similar value as wildlife habitat.

Cover types with a greater degree of structural complexity can support a more diverse array of wildlife species. Such cover types may include predominantly native plant species (e.g., Native Shrub, Emergent Wetlands, Scrub-Shrub Wetlands) or nonnative species (e.g., Landscaping, Invasive Shrub, Residential). Wildlife characteristic of such areas may include squirrels and other rodents, deer, raccoons, opossum, coyotes, cats and dogs (domestic or feral) and various species of birds. Other species, such as cougar and black bear, may also use those habitats while traveling between larger blocks of suitable habitat. Wetland habitats may support amphibians such as chorus frogs, red-legged frogs, northwestern salamanders, and long-toed salamanders.

Areas with the greatest abundance and diversity of wildlife include those with complex habitat features, such as snags, logs, and large trees in forested areas or marshes and other aquatic features in estuarine areas. Areas along the edges between structurally distinct cover types (e.g., forested and non-forested habitats) also support diverse and abundant wildlife communities.

The study area overlaps several areas identified as priority habitat areas by WDFW (2023a), all of them associated with the Nisqually River or its delta (Table D-46).

Table D-46. WDFW Priority Habitat Areas in the Study Area

Site Name	Description
Upper Nisqually Bald Eagle Use Area	Downstream end of a corridor that extends into the Cascade Mountains. Includes multiple nesting territories along the Nisqually River and associated drainages.
Pierce County Large Waterfowl Areas	One of several agricultural areas in Pierce County with large concentrations of waterfowl.
Nisqually Delta Waterfowl Area	Area extending from Medicine Springs to Nisqually Flats, including non-farmed wetlands and wet pasture lands that support large numbers of breeding waterfowl.
Nisqually/McAllister Creek Wood Duck Breeding Area	Wood duck nesting and brood areas extending along McAllister (Medicine) Creek and the Nisqually River and into the Nisqually River delta.
Nisqually Delta Waterfowl Area	Area extending from Medicine Springs to Nisqually Flats, including non-farmed wetlands and wet pasture lands that support large numbers of breeding waterfowl.
Pierce County Candidate Open Space Areas	Naturally vegetated area along the Nisqually River, including native vegetation that serves as high-quality wildlife habitat; WDFW recommends consideration for protection as a conservation or natural area.
Nisqually River Wetlands	Riverine, forested, emergent marsh, scrub-shrub, and agricultural wetlands providing habitat for fish, waterfowl, and other wildlife.
Region 6 Saltwater Wetlands	Salt marshes, salt meadows, and brackish marshes along the Puget Sound shoreline.

Riparian areas are another priority habitat type that are not necessarily mapped in the WDFW PHS database but are present, by definition, along the Nisqually River and other streams in the study area. In addition, project biologists identified and mapped stands of Oregon white oak in the study area. Oak trees and stands of oak trees provide an important source of food, cover, nest sites, and arboreal movement routes for more than 200 species of vertebrate wildlife, including several species that are protected by state or federal law, such as the western gray squirrel (Larsen and Morgan 1998).

The following subsections describe special-status species and habitats in the study area.

ESA-Listed Wildlife Species

Nine ESA-listed wildlife species and one species proposed for listing potentially occur within the study area, based on information compiled from the USFWS (2023a) and NMFS (2023b). They include four bird species, three mammals, two marine mammals, and one insect species. ESA-listed species that may occur in the study area are presented in Table D-47, and the status and potential presence of these species in the study area are described in the following subsections. The analysis of potential impacts to ESA-listed species will be performed as part of the BA when a preferred alternative for the project is identified.

Table D-47. ESA-Listed and Proposed Wildlife Species That May Occur in the Study Area

Common Name	Scientific Name	Federal Status	Critical Habitat
Birds			
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	Yes: does not include study area
Northern spotted owl	*Stix occidentalis caurina*	Threatened	Yes: does not include study area
Streaked horned lark	*Eremophila alpestris strigata*	Threatened	Yes: does not include study area
Yellow-billed cuckoo	*Coccyzus americanus*	Threatened	Yes: does not include study area
Mammals			
North American wolverine	*Gulo gulo luscus*	Proposed Threatened	No
Roy Prairie pocket gopher	*Thomomys mazama glacialis*	Threatened	Yes: does not include study area
Yelm pocket gopher	*Thomomys mazama yelmensis*	Threatened	Yes: does not include study area
Marine mammals			
Humpback whale (Central America DPS and Mexico DPS)	*Megaptera novaeangliae*	Endangered	Yes: does not include study area
Killer whale (Southern Resident DPS)	*Orcinus orca*	Threatened	Yes: does not include study area
Insects			
Taylor’s checkerspot	*Euphydryas editha taylori*	Endangered	Yes: does not include study area

NMFS 2023b; USFWS 2023a

DPS = distinct population segment

Marbled Murrelet

Marbled murrelet was listed as threatened under the ESA in 1992 (57 FR 45328). Critical habitat was designated in 1996 (61 FR 26256). The most recent version of critical habitat for marbled murrelet was designated in 2011 (76 FR 61599).

Marbled murrelets require old growth forest to nest and proximity to marine areas for feeding (USFWS 2023e). The study area includes Nisqually Delta estuarine habitat, and marbled murrelets may forage in the Nisqually Delta and the Nisqually Reach of Puget Sound outside the study area. Marbled murrelets are not expected to occur in the forested habitat of the study area but could potentially forage in the estuary habitat of the Nisqually Delta. The closest designated critical habitat to the study area is more than 15 miles west of the study area (Data Basin 2023; USFWS 2023b).

Northern Spotted Owl

Northern spotted owl was listed as threatened under the ESA in 1990 (55 FR 26114). The most recent version of critical habitat for Northern spotted owl was designated in 2021 (86 FR 4820).

The northern spotted owl is most closely associated with old-growth coniferous forest and requires large tracts of habitat to survive and reproduce (USFWS 2023f). In Washington, suitable spotted owl habitat generally may be defined as mature and old-growth coniferous forest below 4,000 feet in elevation (Thomas et al. 1990). Northern spotted owls are not expected to occur in the forested habitat of the study area. The closest designated critical habitat to the study area is more than 40 miles east of the study area (Data Basin 2023; USFWS 2023b).

Streaked Horned Lark

Streaked horned lark was listed as threatened in 2013 (78 FR 61452), and critical habitat was also designated in 2013 (78 FR 61505).

The streaked horned lark was once widespread throughout western Washington, Oregon, and British Columbia. Due primarily to habitat loss, this subspecies now breeds and winters over a fraction of its former range. USFWS currently estimates the overall population of streaked horned larks at between 1,170 and 1,610 individuals (USFWS 2023g).

The breeding range for this species historically extended from southern British Columbia south through the Puget lowlands; the Washington coast; the Lower Columbia River, Willamette, Rogue, and Umpqua River valleys; and the Oregon coast (USFWS 2023g). It has been eliminated as a breeding species from at least half of that range and is no longer found in southern British Columbia, the San Juan Islands, the northern Puget Trough, or the Washington coast north of Grays Harbor (Pearson and Altman 2005; USFWS 2023g).

Streaked horned larks prefer wide-open spaces characterized by flat, treeless landscapes of 300 acres or more, sparse grass/forb vegetation, and few or no shrubs. They will use smaller habitat patches if there is an adjacent open landscape, such as agricultural fields or water. Active establishment of territories and breeding occurs from late March until early August (USFWS 2023e). Suitable habitat for streaked horned larks is not present in the study area. Critical habitat for the streaked horn lark has not been designated in the study area (USFWS 2023b).

Yellow-Billed Cuckoo

The western distinct population segment (DPS) of the yellow-billed cuckoo was listed as threatened in 2014 (79 FR 59992). Critical habitat was designated in 2021 (86 FR 20798) and does not include any locations in Washington.

The yellow-billed cuckoo nests in deciduous habitats with clearings and dense shrubby vegetation, especially those near rivers, streams and wetlands. However, the last confirmed record of cuckoos nesting in Washington occurred in Seattle in 1923. The yellow-billed cuckoo is no longer believed to breed in Washington State (USFWS 2023h). Just 20 sightings have been documented in

Washington since the 1950s, with 19 occurring from 1974 to 2016. None of these sightings have been in the vicinity of the study area. Suitable habitat consists of large patches of mature and second-growth deciduous habitats with dense shrubby vegetation and clearings, particularly near waterbodies. In California, suitable habitat included sites greater than 100 acres in size and wider than 650 feet (Wiles and Kalasz 2017). Suitable habitat for the yellow-billed cuckoo is not present in the study area. Critical habitat does not include any locations in Washington (USFWS 2023b).

North American Wolverine

The North American wolverine was proposed for listing as threatened in 2013 (78 FR 7863). The proposed listing status is currently under review by the USFWS (87 FR 71557). No critical habitat has been proposed or designated for the species.

Wolverines commonly occur in boreal forest, taiga, and tundra ecosystems. They occupy rugged, remote country, spending most of the time in high elevations near or above timberline. In Washington, they occupy alpine and subalpine forest habitats (USFWS 2023i). Suitable habitat for wolverine is not present in the study area.

Roy Prairie and Yelm Pocket Gopher

Roy Prairie pocket gopher and Yelm pocket gopher are two of four subspecies of the Mazama pocket gopher (*Thomomys mazama*) that were listed as threatened under the ESA in 2014 (79 FR 19760). Critical habitat was also designated in 2014 (79 FR 19712). The two other subspecies, Tenino pocket gopher (*T. m. tumuli*) and Olympia pocket gopher (*T. m. pugetensis*), are not identified by the USFWS as potentially occurring within the study area (USFWS 2023a). Olympia, Tenino, and Yelm pocket gophers are only found in Thurston County, and the Roy Prairie pocket gopher is found in Pierce County (USFWS 2023j). The USFWS has promulgated a special 4(d) rule for the Mazama pocket gopher that exempts some activities from the ESA Section 9 take prohibitions, including some existing maintenance activities at airports and farms, livestock grazing, some agricultural activities, and certain activities on single-family residential properties (Stinson 2020; USFWS 2023j).

A substantial portion of the body of knowledge about Mazama pocket gopher comes from studies of subspecies or studies that did not differentiate between subspecies. Research to date has not identified any substantial differences in the habitat associations or behavior of the four ESA-listed subspecies of Mazama pocket gopher (Stinson 2020; USFWS 2022a, 2022b). For these reasons, information on the biology, life history, and conservation needs of the Mazama pocket gopher apply to all four listed subspecies, and specifically the two subspecies (Roy Prairie pocket gopher and Yelm pocket gopher) identified as potentially occurring in the study area.

Roy Prairie pocket gopher and Yelm pocket gopher are primarily found on open meadows, prairies, and grassland habitats of the glacial outwash plain where there are porous, well-drained soils in areas with herbaceous vegetation, many of which were historically prairies and savannahs. Both subspecies also occasionally inhabit areas with loamy sand or gravelly soils when the tree cover has been removed and herbaceous vegetation is established. Much of the historical gopher habitat of south Puget Sound with appropriate soils and vegetation has been degraded by Scotch broom (*Cytisus scoparius*), fragmented, or converted to impervious surfaces (Stinson 2020; USFWS 2022a, 2022b, and 2023j). Enhancement of remnant prairies from degraded to high-quality may prove the difference between pocket gopher barely surviving versus thriving. In addition to remnant prairies, sites occupied by Mazama pocket gophers in Washington include grassy fields at airports, pastures, fields, Christmas tree farms, and occasionally clearcuts (Stinson 2013, 2020).

Mazama pocket gophers are seldom found in densely developed areas or sites with very rocky soil. There are perhaps three to four large pocket gopher populations (i.e., thousands of animals) in Thurston and Pierce counties. The largest populations appear to be found on the Olympia and Shelton Airports, Scatter Creek Wildlife Area, and JBLM. Many surviving gopher subpopulations are small (<50 animals) and appear to be isolated from other subpopulations, although there are few data on dispersal to help delineate genetically connected populations (Stinson 2013, 2020).

Pocket gopher habitat includes specific soil series. These soils have been identified as preferred soils and less-preferred soils (Stinson 2020; USFWS 2022a, 2022b). Nisqually fine loamy sand, 0 to 15 percent slopes, is a preferred soil that occurs in about 12 percent of the study area; Everett very sandy gravelly loam, 0 to 15 percent slopes, is a less-preferred soil that occurs in about 10 percent of the study area (NRCS 2022). The preferred soil series is located on the east side of the study area in the area where Nisqually Road SW crosses I-5 and includes the I-5 ROW, forested areas, and the Eagles Pride Golf Course. The less-preferred soils are located on the west side of the study area in the area where Orion Road NE crosses below I-5 and includes the I-5 ROW and residential and commercial development. The only grassland habitat in these areas includes the I-5 ROW and median, which are dominated by fill substrate.

USFWS has identified pocket gopher recovery areas in Pierce and Thurston Counties. Within the study area, the Roy Prairie pocket gopher recovery area is in Pierce County on the south side of I-5. The Yelm pocket gopher recover area is in Thurston County south of I-5 and in the western portion of the study area (USFWS 2017, 2022a, and 2022b).

WDFW and USFWS surveys for pocket gophers from 2012 to 2017 do not identify any pocket gophers within about 2 miles of the study area. Similarly, there are no confirmed pocket gopher occupancy sites identified within about 2 miles of the study area (Stinson 2020). Suitable habitat for the pocket gopher subspecies—the combination of preferred soils and prairie habitat—is not present in the study area. There is no designated critical habitat located within 2 miles of the study area (Stinson 2020; USFWS 2022a, 2022b, 2023b). Since potential pocket gopher soils are present within the study area, pocket gopher surveys are proposed to be performed per USFWS protocols, within 1 year prior to project construction activities in areas with potential pocket gopher soils.

Humpback Whale

The Central America and Mexico DPSs of humpback whales were listed as endangered in 1970 under the Endangered Species Conservation Act, the precursor to the ESA (NMFS 2023c). This listing was reaffirmed in September 2016 (81 FR 62259). Critical habitat was designated in 2021 (86 FR 21082).

Humpback whales have not typically been known to inhabit inland and coastal waters, but sightings have become more common within Puget Sound (NMFS 2023c). Puget Sound is now experiencing what has been termed a “humpback comeback,” as humpbacks are being spotted more frequently in the inland and coastal waters (Banse 2019). This is largely believed to be related to an overall population expansion, as well as potential shifts in oceanographic conditions and prey availability. Cascadia Research Collective estimates that about 1,600 whales feed off the west coast of North America, with about 500 off Washington and British Columbia, specifically (Puget Sound Express 2019).

The resurgence of humpback whales seen within Puget Sound is largely concentrated within north Puget Sound. Whale watchers in the Strait of Juan de Fuca have a greater than 90 percent chance of seeing a humpback whale at certain times of the year (Banse 2019). Especially during the summer, humpback whales are common along coastlines and near the surface of the water. The marine environment of Puget Sound is outside the estuarine habitat of the Nisqually Delta within the study area. Humpback whales would not occur in the shallow estuarine habitat of the Nisqually Delta, and humpback whale sightings are uncommon in south Puget Sound. Critical habitat does not include the inland waters of Puget Sound (NMFS 2023a).

Southern Resident Killer Whale

Southern resident killer whale was listed as endangered under the ESA in 2005 (70 FR 69903), and its endangered status was reaffirmed in 2007 (72 FR 16284). Critical habitat was designated in 2006 (71 FR 69054).

The Southern Resident DPS contains J pod, K pod, and L pod and was estimated to include approximately 73 individuals as of July 2019, its lowest number in 32 years (NMFS 2023d). The geographic distribution of Southern Resident killer whales is year-round in the coastal waters off Oregon, Washington, and Vancouver Island, and off the coast of central California and the Queen Charlotte Islands (Center for Biological Diversity 2001). In the summer, Southern Resident killer whales are typically found in the Georgia Strait, Strait of Juan de Fuca, and the outer coastal waters of the continental shelf. In the fall, the J pod migrates into Puget Sound, while the rest of the population makes extended trips through the Strait of Juan de Fuca. In the winter, the K and L pods retreat from inland waters and are seldom detected in the core areas until late spring. The J pod generally remains in inland waterways throughout the winter, with most of their activity in Puget Sound. Other winter movements and range of Southern Residents are not well understood (NMFS 2023d).

The marine environment of Puget Sound is outside the estuarine habitat of the Nisqually Delta within the study area. Killer whales occasionally occur in South Puget Sound but would not be unlikely to enter the shallow estuarine habitat of the Nisqually Delta. Critical habitat includes Puget Sound waters deeper than 20 feet and therefore does not include the Nisqually Delta habitat (NMFS 2023a).

Taylor's Checkerspot

Taylor's checkerspot, a butterfly, was listed as endangered under the ESA in 2013 (78 FR 61451). Critical habitat was also designated in 2013 (78 FR 61505).

The Taylor's checkerspot inhabits short-stature grasslands with nectar flowers in low-elevation prairies and meadows, coastal meadows and stabilized dunes, and montane meadows and balds. Balds are shallow-soiled, grass, herbaceous vegetation, or lichen and moss-dominated sites that occur within forested lands. Within the south Puget Sound region, the butterfly has been found on prairies and balds (Potter 2016; USFWS 2023k).

Prairie habitats have a predominance of original vegetation, with host plants often including the native seaside plantain (*Plantago maritima macrocarpa*) and the nonnative English plantain (*P. major lanceolata*). Taylor's checkerspot are sedentary insects, inhabiting their sites year-round as an egg, larva, pupa, and adult. Taylor's checkerspot are not migratory, and dispersal movements in Taylor's checkerspot have rarely been found to exceed 1.2 to 1.9 miles (2 to 3 kilometers) (Potter 2016).

In 2006, Taylor's checkerspot was known to occur on 10 Washington sites in Clallam, Pierce, and Thurston counties. In the 2016 status review, extirpation of the butterfly had been observed on seven of the 10 sites. Despite continued exploratory searches to locate additional populations, none have been found since 2009 (Potter 2106). The largest populations of Taylor's checkerspot in Washington are in Pierce County at JBLM (Potter 2016). In Thurston County, Taylor's checkerspot are extant at Scatter Creek Wildlife Area and Tenalquot Preserve (Linders et al. 2020).

Taylor's checkerspot has not been documented in the study area, and suitable habitat for the species is not present in the study area.

Other Wildlife Species of Concern

Other wildlife species of concern typically include the ESA-listed species as well as species protected by other federal and state laws and the critical areas regulations of local jurisdictions (see Section 2.2). ESA-listed species are discussed above (see Section 3.2.2). The remainder of this subsection identifies other species of concern that may be present in the study area.

Project biologists reviewed the list of WDFW priority wildlife species likely to be present in Thurston County or Pierce County. Many of those species have limited geographical distributions that do not encompass the study area. Others (e.g., marine mammals) are associated with habitats that are not found in the study area. Table D-48 identifies priority wildlife species that could be present, based on the species' distributions and the habitat types present in the study area.

1 **Table D-48. Species of Concern in the I-5 Marvin to Mounts Road Study Area**

Species	Status[1]	Potential Presence of Species or Suitable Habitat
Amphibians		
Pacific giant salamander (*Dicamptodon tenebrosus*)	TC SLI	Associated with streams and nearby areas in moist coniferous forest; individuals have been observed in the lower portion of the Nisqually River valley.
Western toad (*Anaxyrus boreas*)	SC	No recent observation records near the study area. May breed in permanent wetlands, ponds, lakes, and off-channel habitats or rivers; adults may move through uplands for several miles.
Birds		
American bittern (*Botaurus lentiginosus*)	TC SLI	Uncommon inhabitant of freshwater marshes and wet meadows in Puget Trough lowlands. eBird (2023) reports observations of this species at the Nisqually refuge, year-round.
American kestrel (*Falco sparverius*)	TC SLI	Associated with open habitats, including native grasslands and agricultural areas, nesting in natural cavities and nest boxes. eBird (2023) reports frequent observations of this species in the study area, in the refuge and in agricultural areas to the south.
Bald eagle (*Haliaeetus leucocephalus*)	BGEPA	Suitable habitat (coastlines and rivers with large trees) is present throughout the study area. Active nest territories have been identified on refuge lands near the study area.
Band-tailed pigeon (*Patagioenas fasciata*)	PS—RC	Suitable habitat is present in forested areas in the study area. eBird (2023) reports several observations of this species in and near the study area. Several mineral sites where band-tailed pigeons congregate are present on refuge lands more than 1 mile from the study area.
Brant (*Branta bernicla*)	PS—RC	Frequently observed on refuge lands near the study area, sometimes in large numbers.
Common goldeneye (*Bucephala clangula*)	PS—BA	Frequently observed on refuge lands near the study area, sometimes in large numbers; not known or expected to breed in the area.
Common loon (*Gavia immer*)	SS PS—BA & RC	Regularly observed on refuge lands near the study area, primarily during winter and migratory periods; not known or expected to breed in the area.
Great blue heron (*Ardea herodias*)	PS—BA	WDFW (2023) identifies breeding colonies on refuge lands north of the study area but does not provide recent monitoring data.
Hooded merganser (*Lophodytes cucullatus*)	PS—BA	Commonly seen on refuge lands near the study area year-round. Nests in tree cavities near small, forested, freshwater wetlands with emergent vegetation.
Lazuli bunting (*Passerina amoena*)	TC SLI	Found in shrubby areas along dry hillsides, agricultural hedgerows, or streamside thickets. eBird (2023) reports infrequent observations of this species near McAllister (Medicine) Creek and on the refuge.
Northern goshawk (*Accipiter gentilis*)	SC	Suitable nesting habitat (mature or old coniferous forest with closed canopy and multiple canopy layers and a high density of large trees) may be present in the study area. Neither WDFW (2023) nor eBird (2023) reports any observations of this species within 5 miles of the study area.
Northern harrier (*Circus cyaneus*)	TC SLI	Associated with marshes, fields, and prairie habitats. eBird (2023) reports frequent observations of this species in the study area, in the refuge, and along Medicine Creek to the south.

Species	Status[1]	Potential Presence of Species or Suitable Habitat
Olive-sided flycatcher (*Contopus cooperi*)	TC SLI	Associated with forest habitats adjacent to clearings, burns, or wetlands. Occasionally seen at the Nisqually refuge (eBird 2023).
Oregon vesper sparrow (*Pooecetes gramineus*)	SE	Associated with moderately short and structurally diverse grass and forb cover in dry, open landscapes. Nearest known populations are on JBLM, several miles from the study area. Rarely seen at the Nisqually refuge (eBird 2023).
Osprey (*Pandion haliaetus*)	PC SLI	Suitable nesting and foraging habitat (coastlines, lakes, and rivers with abundant fish) is present in the tidal marsh and riparian zones of the study area. eBird (2023) reports multiple observations in and near the study area, and WDFW (2023) identifies a historical nest site in the study area.
Short-eared owl (*Asio flammeus*)	TC SLI	Associated with grasslands. Occasionally seen at the Nisqually refuge, primarily outside the breeding season (eBird 2023).
Slender-billed white-breasted nuthatch (*Sitta carolinensis*)	SC	Associated with oak and oak-conifer woodlands. Rarely seen at the Nisqually refuge (eBird 2023).
Trumpeter swan (*Cygnus buccinator*)	PS—RC	Occasionally seen on refuge lands near the study area during winter, sometimes in groups of more than a dozen.
Tundra swan (*Cygnus columbianus*)	PS—RC	Occasionally seen on refuge lands near the study area during winter, sometimes in groups of more than a dozen.
Vaux's swift (*Chaetura vauxi*)	PS—BA	Suitable habitat (large hollow snags or live trees) is present in forested areas in the study area. eBird (2023) reports several observations of this species in and near the study area during the breeding season.
Western bluebird (*Sialia mexicana*)	PC SLI	Associated with woodland/prairie mosaic habitat. Largest breeding location in western Washington is at JBLM, several miles from the study area. Rarely seen at the Nisqually refuge (eBird 2023).
Western grebe (*Aechmophorus occidentalis*)	PS—RC & BA	Regularly seen on refuge lands near the study area year-round, but in greatest numbers during late autumn and winter. Not known or expected to breed in the area.
Western meadowlark (*Sturnella neglecta*)	TC SLI	Associated with native grassland habitats. eBird (2023) reports frequent observations of this species in and near the study area, primarily outside the breeding season.
Wood duck (*Aix sponsa*)	PS—BA	WDFW (2023) identifies suitable breeding habitat in the study area, in the Nisqually Estuary and along the Nisqually River and McAllister (Medicine) Creek.

Species	Status[1]	Potential Presence of Species or Suitable Habitat
Invertebrates		
Leschi's millipede (*Leschius mcallisteri*)	SC	Associated with mature valley-bottom forest near perennial springs. Only known site is Medicine Springs, approximately 2.5 miles south of the study area.
Mardon skipper (*Polites mardon*)	SE	Found only in open, grass-dominated habitats with abundant Roemer's fescue interspersed with early blue violet, generally on well-drained glacial soils. No reported observations within 5 miles of the study area (Lotts and Naberhaus 2023).
Puget blue (*Plebejus icarioides blackmorei*)	SC	Associated with sickle-keeled lupine (*Lupinus albicaulis*) in open native grasslands, generally on well-drained glacial soils. No reported observations within 5 miles of the study area (Lotts and Naberhaus 2023).
Valley silverspot (*Speyeria zerene bremnerii*)	SC	Associated primarily with early blue violet (*Viola adunca*) in open native grasslands, generally on well-drained glacial soils. No reported observations within 5 miles of the study area (Lotts and Naberhaus 2023).
Mammals		
California sea lion (*Zalophus californianus*)	MMPA	May occasionally enter the Nisqually River to feed on migrating salmon.
Harbor seal (*Phoca vitulina*)	MMPA	May occasionally enter the Nisqually River to feed on migrating salmon.
Steller sea lion (*Eumetopias jubatus*)	MMPA	May occasionally enter the Nisqually River to feed on migrating salmon.
Pacific fisher (*Pekania pennanti*)	SE	Suitable habitat may be present in areas with mature forest habitat. The species was considered extirpated from western Washington until reintroduction efforts began recently on lands managed by the National Park Service and National Forest Service in the Cascade Range and Olympic Mountains, more than 50 miles from the study area. WDFW (2023) reports no observations of this species within 1 mile of the study area.
Roosting concentrations of big-brown bat (*Eptesicus fuscus*) or bats of the genus *Myotis*	PS—RC	May be found in trees, in buildings, or under bridges. WDFW (2023) reports no roost sites within 1 mile of the study area.
Townsend's big-eared bat (*Corynorhinus townsendii*)	SC	There are no caves or mines in the study area. Potentially suitable roost sites may be present in barns, abandoned houses, actively used buildings, or concrete bunkers near the study area. WDFW (2023) reports no observations of this species in the study area.
Western gray squirrel (*Sciurus griseus griseus*)	ST	Associated with mature oak woodlands and conifer forests on JBLM. WDFW (2023) reports two observations of this species near the study area; there is no evidence of a population in the study area.

Species	Status[1]	Potential Presence of Species or Suitable Habitat
Reptiles		
Northwestern pond turtle (*Actinemys marmorata*)	SE	Potentially suitable breeding habitat (wetlands, ponds, lakes, reservoirs, or slow-moving streams with still, shallow areas and emergent vegetation) may be present in wetlands in the study area. WDFW (2023) reports a single observation in 1991 of this species in the study area. The nearest known extant population is on WDFW-managed lands more than 10 miles from the study area.

[1] (SE) State Endangered, (ST) State Threatened, (SS) State Sensitive, (SC) State Candidate, (PS—RC) WDFW Priority Species (regular concentrations only), (PS—BA) WDFW Priority Species (breeding areas only), (BGEPA) species protected under the Bald and Golden Eagle Protection Act, (PC SLI) Pierce County Species of Local Importance, (TC SLI) Thurston County Species of Local importance

The Migratory Bird Treaty Act of 1918, administered by USFWS, makes it unlawful to take any migratory bird, or the parts, nests, or eggs of any such bird, except under the terms of a valid permit. In the context of this Act, take is defined as “pursue, hunt, shoot, capture, collect, kill, or attempt to pursue, hunt, shoot, capture, collect, or kill” (16 U.S. Code [USC] 715n). Nearly all bird species that may occur in the study area are protected under the Migratory Bird Treaty Act. Birds or bird nests protected under the Act may be present in any of the cover types described in Section 3.1.1, Vegetation Communities in the Study Area. Forested areas, wetlands, and other areas with comparatively complex cover types are likely to support greater densities and more diverse assemblages of nesting birds. A bird protection plan would be developed by the contractor and approved by WSDOT before project construction begins.

The Bald and Golden Eagle Protection Act (16 USC 668 et seq.) protects bald and golden eagles by prohibiting take of eagles or their nests, except as authorized by USFWS. Take is defined to include pursuing, shooting, poisoning, wounding, killing, capturing, trapping, collecting, molesting, or disturbing bald or golden eagles. Construction or other activities during the breeding season (January 1 through August 31) near an active nest may require a permit from USFWS. No bald eagle nest sites have been identified within the study area; however, several nest sites are present within 1 mile. Management guidelines issued by USFWS (2007) recommend the avoidance of blasting and other activities that produce extremely loud noises (e.g., impact pile driving) within 0.5 mile of active bald eagle nests. Golden eagles are neither known nor expected to nest in or near the study area.

The Marine Mammal Protection Act (MMPA) prohibits harassment or harm of whales, porpoises, seals, sea lions, and other marine mammals. Several species of marine mammals may be present in the marine waters of Puget Sound offshore of the Nisqually Delta. Commonly observed species in southern Puget Sound include harbor seals, California sea lions, Steller sea lions, and harbor porpoises. Harbor seals and sea lions may occasionally venture into the lower reaches of the Nisqually River to feed on migrating salmon. WDFW also identifies seals and sea lions as priority species but considers them a management priority only at haulouts (WDFW 2008). WDFW (2023a) does not identify any seal or sea lion haulouts in the study area.

Local critical area regulations define additional plant and animal species of concern as well as specific habitat types that are considered for protection. Portions of the project area fall within the jurisdictions of the city of Lacey, Thurston County, and Pierce County. Species and habitats of concern for each jurisdiction are summarized below.

City of Lacey

The city of Lacey's critical areas regulations apply to lots or parcels within the municipal boundary of Lacey. The Lacey Municipal Code (Section 14.33.060) identifies the following as Fish and Wildlife Habitat Conservation Areas (FWHCA):

- Areas with which state or federally designated endangered, threatened, or sensitive species have a primary association.
- Priority habitats and areas associated with state priority species, as identified by WDFW.
- Waters of the state.
- Land essential for preserving connections between habitat blocks and open spaces.
- Riparian ecosystems including salmonid habitat.

Thurston County

TCC 24.25.065 establishes FWHCAs for the following habitats and species:

- Plant and animal species listed as endangered or threatened under the ESA (or that are candidates for listing), as well as their habitats of primary association.
- Priority species identified by WDFW and their habitats of primary association.
- Priority habitats identified by WDFW.
- Prairie habitats.
- Oregon white oak woodlands, stands, and trees within 0.5 mile of stands.
- State-listed plant species, such as those occurring on the WDNR list of known occurrences of rare plants.
- Habitats and species of local importance, including
    - Cottonwood floodplains along the Nisqually River.
    - Certain birds associated with prairie habitats (e.g., western meadowlark, lazuli bunting, common nighthawk).
    - American bittern.
    - Olive-sided flycatcher.
    - Short-eared owl.

Pierce County

PCC 18E.40.020 establishes FWHCAs for the following habitats and species:

- Areas (1) with which federally listed endangered, threatened, or candidate species of fish or wildlife, or state-listed endangered, threatened, sensitive, or candidate species have a primary association; and (2) that, if altered, may reduce the likelihood that the species will survive and reproduce over the long term.
- Species of local importance (including osprey, several species of fish, and vulnerable aggregations of fish and wildlife as defined by the WDFW PHS program).
- Habitats of local importance, including
    - Oregon white oak trees and woodlands.
    - Prairies.
    - Old growth/mature forests.
    - Snag-rich areas and downed logs.
    - Natural waters and adjacent riparian-shoreline areas.
    - Estuaries and tidal marshes.
    - Connectable relic channels and oxbows.
    - Wetlands.
    - Heron rookeries.
    - Habitat for cavity-nesting ducks.
    - Non-artificial nesting sites for western bluebirds.

5.3.3 Fish

This section describes fish and fish habitat in the study area. As described in this section, the study area includes a variety of aquatic resources that provide known and potential habitat for fish species.

Fish Habitat and Presence in the Study Area

The study area is in the Nisqually Basin Water Resource Inventory Area (WRIA) 11, Nisqually (WDFW 2023d). Aquatic resources with documented fish use or potential fish use within the study area include the Nisqually Delta, the Nisqually River, McAllister (Medicine) Creek, and Red Salmon Creek. As described in the aquatic resource specific subsections below, many of these resources have associated tributaries, sloughs, overflow channels, and wetland habitats that also provide documented or potential fish use.

There are also several drainages in the eastern part of the study area that flow through culverts beneath I-5 and into the fish habitat of Red Salmon Creek. Aquatic resources in the study area that provide documented or potential fish habitat are presented in Table D-49 and in Figure D-26.

Table D-49. Aquatic Resources That Provide Documented or Potential Fish Habitat in the Study Area

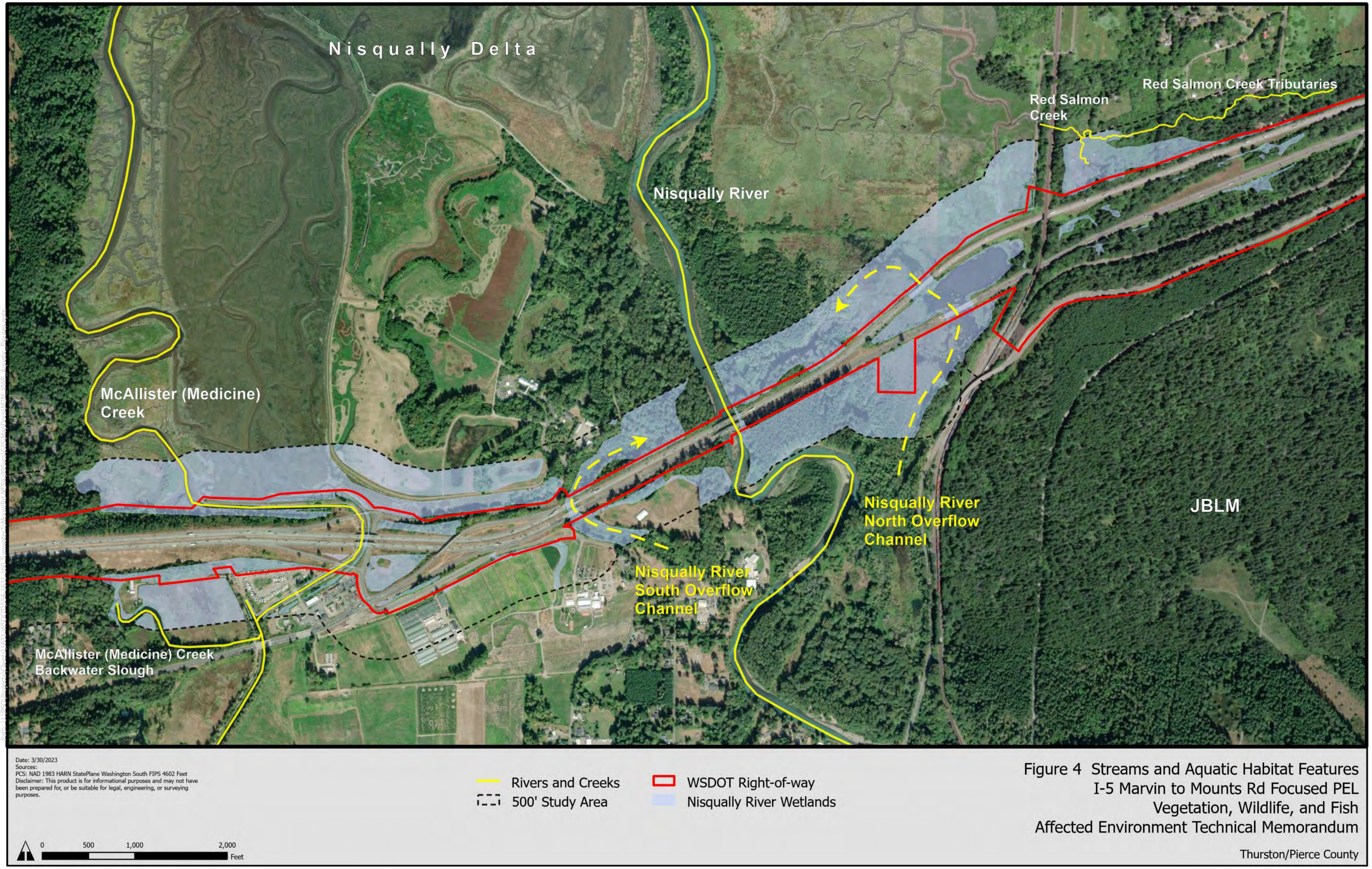
Aquatic Resource	Local Jurisdiction	WDNR Water Type[a]	Buffer Width (feet)[b]
Nisqually Delta	Pierce County/ Thurston County	S	100 (Pierce County) 250 (Thurston County)
Nisqually River	Pierce County/ Thurston County	S	100 (Pierce County) 250 (Thurston County)
Nisqually River North Overflow Channel	Pierce County	F	150
Nisqually River South Overflow Channel	Thurston County	F	250
Nisqually River Wetlands	Pierce County/ Thurston County	Not applicable	Not applicable[c]
McAllister (Medicine) Creek	Thurston County	S	250
McAllister (Medicine) Creek Backwater Slough	Thurston County	F	250
Red Salmon Creek	Pierce County	F	150
Red Salmon Creek Tributaries	Pierce County	F	150

a WDNR Water Types: S=Shoreline, F=Fish bearing, N=Non-fish (WDNR 2023a)

b Local jurisdiction stream buffers applied for PCC 18E.40.060 and TCC 24.25.020

c WDNR water typing categories do not apply to wetlands; see Draft Wetland and Stream Assessment Report for wetland buffers.

Figure D-26. Streams and Aquatic Habitat Features Within the Study Area



Date: 3/30/2023
Sources:
PCS: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Figure 4 Streams and Aquatic Habitat Features
I-5 Marvin to Mounts Rd Focused PEL
Vegetation, Wildlife, and Fish
Affected Environment Technical Memorandum
Thurston/Pierce County

Nisqually Delta

The Nisqually Delta is one of the largest salmon-bearing tidal estuary ecosystems in Puget Sound. The Nisqually Delta encompasses the largest tidal marsh restoration project in the Pacific Northwest, a massive effort to assist in the recovery of Puget Sound salmon and wildlife populations. The delta has been the site of multiple restoration efforts aimed at converting diked farmland back to tidal marsh. After a century of diking off tidal flow, the Brown Farm Dike was removed to inundate 761 acres (308 hectares) of the Refuge along with 23 acres (57 hectares) of wetlands restored by the Nisqually Indian Tribe. Breaching dikes and removing tide gates returned tidal exchange and flow of salt water to the marsh plain. It allowed regeneration of marsh vegetation, benefiting many species of plants, animals, and birds that reside in the refuge or use it as a migratory stopover. The Refuge and close partners, including the tribe, USFWS, and Ducks Unlimited, have restored more than 22 miles (35 kilometers) of the historic tidal slough systems and reconnected historic floodplains to Puget Sound, increasing potential salt marsh habitat in the southern reach of Puget Sound by 50 percent. Estuarine restoration of this magnitude and the potential contribution to restoration science is unprecedented in Puget Sound. Because of the mosaic of estuarine habitats, this large-scale restoration is expected to result in a considerable increase in regional ecological functions and services, representing one of the most significant advances to date towards the recovery of Puget Sound (Nisqually Delta Restoration 2023; USGS 2023; Woo et al. 2018).

The range of diverse habitat types within the Nisqually Delta include brackish marshes with large freshwater inputs, tidally influenced forested riverine, emergent forest transition, estuary emergent marsh, delta mudflat, and nearshore habitats, all of which contribute to the survival of out-migrating salmon (Ellings et al. 2016). The Nisqually Delta's habitat quality and its importance to fish and fish habitat in the region has been documented during a variety of pre-restoration and post-restoration fish and benthic invertebrate monitoring that has been performed through cooperative efforts of the tribe, the Refuge, Ducks Unlimited, USFWS, and the USGS Western Fisheries Research Center (David et al. 2014, Davis et al. 2018; Ellings and Hodgson 2007; Ellings et al. 2016; Nisqually Delta Restoration 2023; Woo et al. 2018, 2019).

Fish species documented in the Nisqually Delta include ESA-listed fall Chinook salmon (*Oncorhynchus tshawytscha*), winter steelhead trout (*O. mykiss*), and bull trout (*Salvelinus malma*). Additional fish species include winter chum salmon (*O. keta*), coho salmon (*O. kisutch*), cutthroat trout (*O. clarkii clarkii*), sockeye salmon (*O. nerka*), and pink salmon (*O. gorbuscha*) (NWIFC 2023; WDFW 2023a, 2023b). Additional analysis of federally listed species and critical habitats protected under the ESA, as identified by USFWS and NMFS, is presented in Section 3.3.2.

The Nisqually Delta habitat is also important for many non-salmonid fishes, such as shiner perch (*Cymatogaster aggregata*), starry flounder (*Platichthys stellatus*), threespine stickleback (*Gasterosteus aculeatus*), and sculpin (*Cottus and Leptocottus spp*.). Salmon prey species documented in the Nisqually Delta include Pacific sand lance (*Ammodytes hexapterus*) and Pacific herring (*Clupea harengus pallasi*) (Ellings and Hodgson 2007).

Nisqually River

The Nisqually River flows from the glaciers of Mount Rainer's southern face to south Puget Sound, a distance of 78 miles, from Mount Rainier National Park to the Refuge. It is one of the healthiest and least developed rivers in the region and one of the most important salmon and steelhead rivers flowing into Puget Sound. The system is home to six native salmonid species. It is also the only river in the country bookended by federally protected areas (Western Rivers Conservancy 2023).

Two hydroelectric dams impede the upper river, but both lie above an existing natural fish passage barrier and therefore do not block historic spawning habitat for fish. At the river's mouth, the river flows into the Nisqually Delta, as described above, the largest tidal marsh restoration project in Puget Sound. Above the Nisqually Delta, the river enjoys a relatively undisturbed corridor of riparian forest along 10 miles of the JBLM military base and the Nisqually Indian Reservation (Western Rivers Conservancy 2023).

In addition to the main channel of the Nisqually River, there are several aquatic resource features within the study area associated with the Nisqually River. These features include river overflow channels that flow under I-5 bridges to the north and south of where the mainstem of the river flows beneath I-5; these are identified as North Overflow Channel and South Overflow Channel. There are a variety of wetland habitats within the study area with permanent or seasonal standing water that are hydrologically connected to the Nisqually River, as shown on Figure D-26 and further described in the draft Wetland and Stream Assessment Report.

Fish species documented in the Nisqually River include ESA-listed fall Chinook salmon, winter steelhead trout, and bull trout. Additional fish species include winter chum salmon, coho salmon, cutthroat trout, sockeye salmon, and pink salmon (NWIFC 2023; WDFW 2023a, 2023b). Fish species documented in the Nisqually River also potentially occur in the North Overflow Channel, the South Overflow Channel, and the river-associated wetland habitats.

The SWIFD Web Map (NWIFC 2023) also identifies documented spawning habitat for fall Chinook salmon, coho salmon, and winter chum salmon in the Nisqually River in the reach within the I-5 corridor. Pink salmon spawning is documented about 0.3 mile (0.5 kilometer) upstream of I-5, and winter steelhead spawning is documented about 1 mile (1.6 kilometers) upstream of I-5.

McAllister (Medicine) Creek

McAllister (Medicine) Creek is known historically by the tribe as Medicine Springs. The mouth of McAllister (Medicine) Creek, which lies within the Refuge, is the site where the Treaty of Medicine Creek was signed in 1854. Since 2016, the tribe has transported up to 1 million Chinook smolts to the springs from its Clear Creek Hatchery (Northwest Treaty Tribes 2023).

The headwaters of McAllister (Medicine) Creek are located about 2.5 miles (4 kilometers) upstream of the study area. Upstream of the study area there are several tributaries and wetlands associated with the creek. The largest tributary is identified on maps as Medicine Creek. The mainstem of McAllister (Medicine) Creek was diverted during the construction of I-5 to flow around the eastern edge of the large embankment at the west end of the Nisqually River valley. Within the study area, in addition to the main channel of McAllister (Medicine) Creek, there is a backwater slough, identified as McAllister (Medicine) Creek Backwater Slough, which appears to have been part of the original channel prior to I-5 construction. McAllister (Medicine) Creek was not directly affected by the Nisqually Delta restoration because the creek had not previously been diked (Ellings et al. 2016).

Fish species documented in McAllister (Medicine) Creek include ESA-listed fall Chinook salmon and winter steelhead trout. Additional fish species include winter chum salmon, coho salmon, cutthroat trout, sockeye salmon, and pink salmon (NWIFC 2023; WDFW 2023a, 2023b). Fish species documented in McAllister (Medicine) Creek, also potentially occur in the McAllister (Medicine) Creek Backwater Slough.

The SWIFD Web Map (NWIFC 2023) also identifies documented spawning habitat for fall Chinook salmon about 0.5 mile(0.8 kilometer) upstream of I-5. Winter chum salmon spawning is documented in McAllister (Medicine) Creek in the reach within the I-5 corridor.

Red Salmon Creek

Red Salmon Creek flows into the Nisqually Delta about 1,000 feet (305 meters) north of I-5. The Red Salmon Creek slough system through the Nisqually Delta was not directly affected by the Nisqually Delta restoration because the creek had not previously been diked (Ellings et al. 2016). Red Salmon Creek flows through culverts beneath Mounts Road SW and the BNSF railroad track berm before entering the Nisqually Delta. The creek flows through the Nisqually Delta slough system to Puget Sound. Upstream of the BNSF railroad track culvert, the creek flows through a large, tidally influenced wetland system. Natural resource maps identify two tributaries of Red Salmon Creek flowing into the tidally influenced wetland habitat, denoted as North Tributary and South Tributary (NWIFC 2023; WDFW 2023a, 2023b) (Figure D-26). The Pierce County critical areas web map identifies a variety of tributaries that branch off the North Tributary and South Tributary (Pierce County 2023b).

Additional drainage to the Red Salmon Creek system is received from culverts that cross beneath I-5 northbound and southbound lanes. These culverts convey water from wetland systems and groundwater seeps in the I-5 median and on the east side of the northbound lanes. These drainages are not identified on natural resource maps, and there are no documented stream systems on the east side of the I-5 northbound lanes (NWIFC 2023; WDFW 2023a, 2023b).

Fish species documented in Red Salmon Creek include ESA-listed fall Chinook salmon and winter steelhead trout. Additional fish species include winter chum salmon, coho salmon, cutthroat trout, sockeye salmon, and pink salmon. Fish species documented in Red Salmon Creek North Tributary include Chinook salmon, winter steelhead trout, winter chum salmon, coho salmon, sockeye salmon, and pink salmon. Winter chum salmon is documented in Red Salmon Creek South Tributary (NWIFC 2023; WDFW 2023a, 2023b). Fish species documented in Red Salmon Creek also potentially occur in the Red Salmon Creek North Tributary and South Tributary. The SWIFD Web Map (NWIFC 2023) also identifies documented spawning habitat for winter chum salmon in Red Salmon Creek and the North Tributary.

ESA-Listed Fish Species

Five ESA-listed fish species occur or potentially occur within the study area, based on information compiled from the USFWS (2023a) and NMFS (2023b). No fish species proposed for ESA listing were identified as potentially occurring in the study area. ESA-listed species status and potential presence in the study area are described in the following subsections. ESA-listed species that may occur in the study area are presented in Table D-50. The analysis of potential impacts to ESA-listed species will be performed as part of the BA after a preferred alternative for the project is identified. The BA will also address potential effects on Essential Fish Habitat as required under the Magnuson-Stevens Fishery Conservation and Management Act.

Table D-50. ESA-Listed Fish Species That May Occur in the Study Area

Common Name	Scientific Name	Federal Status	Critical Habitat
Bull trout	*Salvelinus confluentus*	Threatened	Yes
Chinook salmon (PS ESU)	*Oncorhynchus tshawytscha*	Threatened	Yes
Steelhead (PS DPS)	*O. mykiss*	Threatened	Yes
Bocaccio rockfish (PS/GB DPS)	*Sebastes paucispinis*	Endangered	Yes; does not include study area
Yelloweye rockfish (PS/GB DPS)	*S. ruberrimus*	Threatened	Yes; does not include study area

DPS = distinct population segment; ESU = evolutionarily significant unit; GB = Georgia Basin; PS=Puget Sound

Bull Trout

Bull trout was listed as threatened under the ESA in 1998 (64 FR 58910). Critical habitat was subsequently designated in 2005 (70 FR 56212). The most recent version of critical habitat for bull trout was designated in 2010 (75 FR 63898).

Estuarine and freshwater habitats within the study area provide quality rearing and migratory habitat for bull trout. Bull trout occur in Puget Sound and are documented in the Nisqually Delta and the Nisqually River, as described in Section 3.1.1 (NWIFC 2023;

WDFW 2023a, 2023b). Designated critical habitat for bull trout in the study area includes the marine shoreline of the Nisqually Delta and the freshwater habitat of the Nisqually River (USFWS 2023b).

Chinook Salmon (Puget Sound Evolutionarily Significant Unit)

The Puget Sound Chinook salmon Evolutionarily Significant Unit was listed as threatened under the ESA in 1999 (64 FR 14308), and its threatened status was reaffirmed in 2005 (70 FR 37160). Critical habitat for Puget Sound Chinook salmon was designated in 2005 (70 FR 52629).

Estuarine and freshwater habitats within the study area provide quality rearing and migratory habitat for Chinook salmon. Puget Sound Chinook salmon occur in Puget Sound and are documented in the Nisqually Delta and the freshwater habitat of the Nisqually River, McAllister (Medicine) Creek, and Red Salmon Creek, as described in Section 3.1.1 (NWIFC 2023; WDFW 2023a, 2023b). Spawning habitat for fall Chinook salmon is documented in the Nisqually River in the reach within the I-5 corridor (NWIFC 2023). Documented spawning habitat for fall Chinook salmon in McAllister (Medicine) Creek is located about 0.5 mile (0.8 kilometer) upstream of I-5. Designated critical habitat for Chinook salmon in the study area includes the marine habitat of the Nisqually Delta and the freshwater habitat of the Nisqually River and McAllister (Medicine) Creek (NMFS 2023a).

Steelhead (Puget Sound DPS)

The Puget Sound steelhead DPS was listed as threatened under the ESA in 2007 (72 FR 26722). This listing was subsequently updated and reaffirmed in 2014 (79 FR 20802). Critical habitat was designated for Puget Sound steelhead in 2016 (81 FR 9251).

Estuarine and freshwater habitats within the study area provide quality rearing and migratory habitat for Puget Sound steelhead salmon. Puget Sound steelhead occur in Puget Sound and are present in the Nisqually Delta and the freshwater habitat of the Nisqually River, McAllister (Medicine) Creek, and Red Salmon Creek, as described in Section 3.1.1 (NWIFC 2023; WDFW 2023a, 2023b). Winter steelhead spawning is documented in the Nisqually River about 1 mile (1.6 kilometers) upstream of I-5. Designated critical habitat for Puget Sound steelhead in the study area includes the freshwater habitat of the Nisqually River, McAllister (Medicine) Creek, and Red Salmon Creek (NMFS 2023a).

Bocaccio Rockfish (PS/GB DPS)

The Puget Sound/Georgia Basin Bocaccio rockfish DPS was listed as endangered in 2010 (75 FR 22276). Critical habitat was designated for this species in 2014 (79 FR 68041).

Bocaccio occur in the marine habitat of south Puget Sound. Bocaccio are large, long-lived rockfish that inhabit deep waters, from 160 feet to more than 800 feet (49 meters and 244 meters), ranging as deep as 1,500 feet (457 meters) (NMFS 2017). The larvae are released in the spring and are distributed widely in surface water, floating with tides and currents. Bocaccio rely on shallower habitats as juveniles but move out to deeper waters as they age. They typically remain within home ranges for most of their adult lives (Drake et al. 2010). Rockfish larvae are pelagic and are found in Puget Sound from August through October (Greene and Godersky 2021). Bocaccio and yelloweye rockfish may occur within the shallow and deep-water habitats of Puget Sound but would not occur in the Nisqually Delta estuary or freshwater habitats within the study area. Designated critical habitat includes deepwater and nearshore areas, but does not include the Nisqually Delta. The south side of Anderson Island, more than 2.5 miles from the study area, is designated as deepwater and nearshore critical habitat (USFWS 2023b).

Yelloweye Rockfish (Puget Sound/Georgia Basin DPS)

The Puget Sound/Georgia Basin yelloweye rockfish DPS was listed as endangered in 2010 (75 FR 22276). Critical habitat was designated for this species in 2014 (79 FR 68041).

Yelloweye rockfish occur in the marine habitat of south Puget Sound. Yelloweye rockfish are commonly found associated with rocky, high-relief zones, both as juveniles and adults. Juveniles are typically found in shallower habitats than adults, and adults have a high affiliation with caves and crevices in deepwater habitats. Yelloweye inhabit a wide depth range throughout their lives, with depths recorded between 49 feet and 1,801 feet (15 meters and 549 meters). Rockfish larvae are pelagic and are found in Puget Sound from August through October (Greene and Godersky 2012). Yelloweye rockfish may occur within the shallow and deep-water habitats of Puget Sound, but would not occur in the Nisqually Delta estuary or freshwater habitats within the study area. Designated critical habitat includes deepwater and nearshore areas, but does not include the Nisqually Delta. The south side of Anderson Island, more than 2.5 miles from the study area, is designated as deepwater and nearshore critical habitat (USFWS 2023b).

State and Local Priority Fish Species

This section describes state and local priority fish species present within the study area. Fish species are regulated at the state level under WDFW and at the local level under Pierce County and Thurston County.

WDFW

Information from the WDFW PHS database (WDFW 2023a) on state priority species was referenced to identify state priority fish species that could occur within the study area. In addition, the WDFW Priority Habitat and Species List (WDFW 2022) identifies specific counties in Washington where priority fish species have been documented. Information from the WDFW Priority Habitat and Species List was used to identify priority fish species documented within Pierce County and Thurston County. WDFW priority fish species that are documented or may occur in the study area are presented in Table D-51.

Table D-51. WDFW Priority Fish Species That May Occur in the Study Area

Common Name	Scientific Name	State Status	Federal Status	County Present
Bull trout	*Salvelinus confluentus*	Candidate	Threatened	Pierce, Thurston
Chinook salmon (PS ESU)	*Oncorhynchus tshawytscha*	Priority	Threatened	Pierce, Thurston
Steelhead (PS DPS)	*O. mykiss*	Candidate	Threatened	Pierce, Thurston
Chum salmon (PS ESU)	O. *keta*	Priority	None	Pierce, Thurston
Coho salmon (PS ESU)	*O. kisutch*	Priority	None	Pierce, Thurston
Cutthroat trout	*O. clarkii clarkii*	Priority	None	Pierce, Thurston
Sockeye salmon (PS ESU)	*O. nerka*	Priority	None	Pierce, Thurston
Pink salmon	*O. gorbuscha*	Priority	None	Pierce, Thurston
Pacific herring	*Clupea pallasi*	Priority	None	Pierce, Thurston
Pacific sand lance	*Ammodytes hexapterus*	Priority	None	Pierce, Thurston
Longfin smelt	*Spirinchus thaleichthys*	Priority	None	Pierce, Thurston
Surf smelt	*Hypomesus pretiosus*	Priority	None	Pierce, Thurston
Olympic mudminnow	*Novumbra hubbsi*	Sensitive	None	Pierce
Pacific lamprey	*Lampetra tridentata*	Priority	None	Pierce, Thurston
River lamprey	*Lampetra ayresi*	Candidate	None	Pierce, Thurston
Rainbow trout	*O. mykiss*	Priority	None	Pierce, Thurston
White sturgeon	*Acipenser transmontanus*	Priority	None	Pierce, Thurston

WDFW 2022

PS=Puget Sound; DPS = distinct population segment; ESU = evolutionarily significant unit

WDFW priority fish species that only occur in habitats that are not found in the vicinity of the study area were not included in Table D-51; examples include cod, rockfish, sole, kokanee, and pygmy whitefish. Several of the WDFW priority fish species presented in Table D-51 are documented within the aquatic resources in the study area, as described above in Section 3.3.1. ESA-listed fish species presented in Table D-51 that occur in the study area are described above in Section 3.3.2. The forage fish species Pacific herring, Pacific sand lance, and surf smelt could potentially occur in the estuary habitat of the Nisqually Delta. Forage fish spawning is documented along the Puget Sound shoreline at the mouth of the Nisqually Delta but does not occur within the delta or the study area (WDFW 2023c). While not documented within the study area, many of the freshwater fish species presented in Table D-51 likely or potentially occur in the river and creek systems within the study area described in Section 3.3.1.

Pierce County

Fish species are regulated under PCC 18E.40.20, Fish and Wildlife Habitat Conservation Areas. Per the PCC, fish and wildlife habitat conservation areas that relate to fish and fish habitat include the following:

- Areas that support fish habitat by known point locations of specific species or by habitat.
- Federally and state-listed species and their associated habitats.
- Species of local importance and their associated habitats (Chinook salmon, bull trout, coho salmon, pink salmon, chum salmon, sockeye salmon, cutthroat trout, native/wild rainbow trout/steelhead, lingcod, Pacific whiting, longfin smelt, surf smelt, herring, and Pacific sand lance).
- Habitats of local importance (natural waters and adjacent riparian shoreline areas, all waters bodies classified by the WDNR water typing classification system, all waters that support regulated fish species [areas that have connectivity to fish-bearing waters and may potentially provide habitat given no natural barriers to fish passage], side channels and/or off-channel habitat, estuaries and tidal marshes, connected relic channels and oxbows, marine shoreline critical salmon habitat, and critical saltwater habitats).

As described above in Sections 3.3.1 and 3.3.2, there are a variety of habitats and documented fish species present within the study area that are regulated under PCC.

Thurston County

Similar to Pierce County, fish species are regulated under TCC 24.25, Fish and Wildlife Habitat Conservation Areas. Per TCC, fish and wildlife habitat conservation areas that relate to fish and fish habitat include the following:

- Federally and state-listed species and their associated habitats.
- Habitats and species of local importance (State priority species that occur in Thurston County as identified in Table D-51).
- Habitats of local importance (rivers, streams, riparian habitats, marine habitats, marine riparian habitats)

As described above in Sections 3.3.1 and 3.3.2, there are a variety of habitats and documented fish species present within the study area that are regulated under TCC.

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7 FLOODPLAINS AND SEAL LEVEL RISE

7.1 Introduction

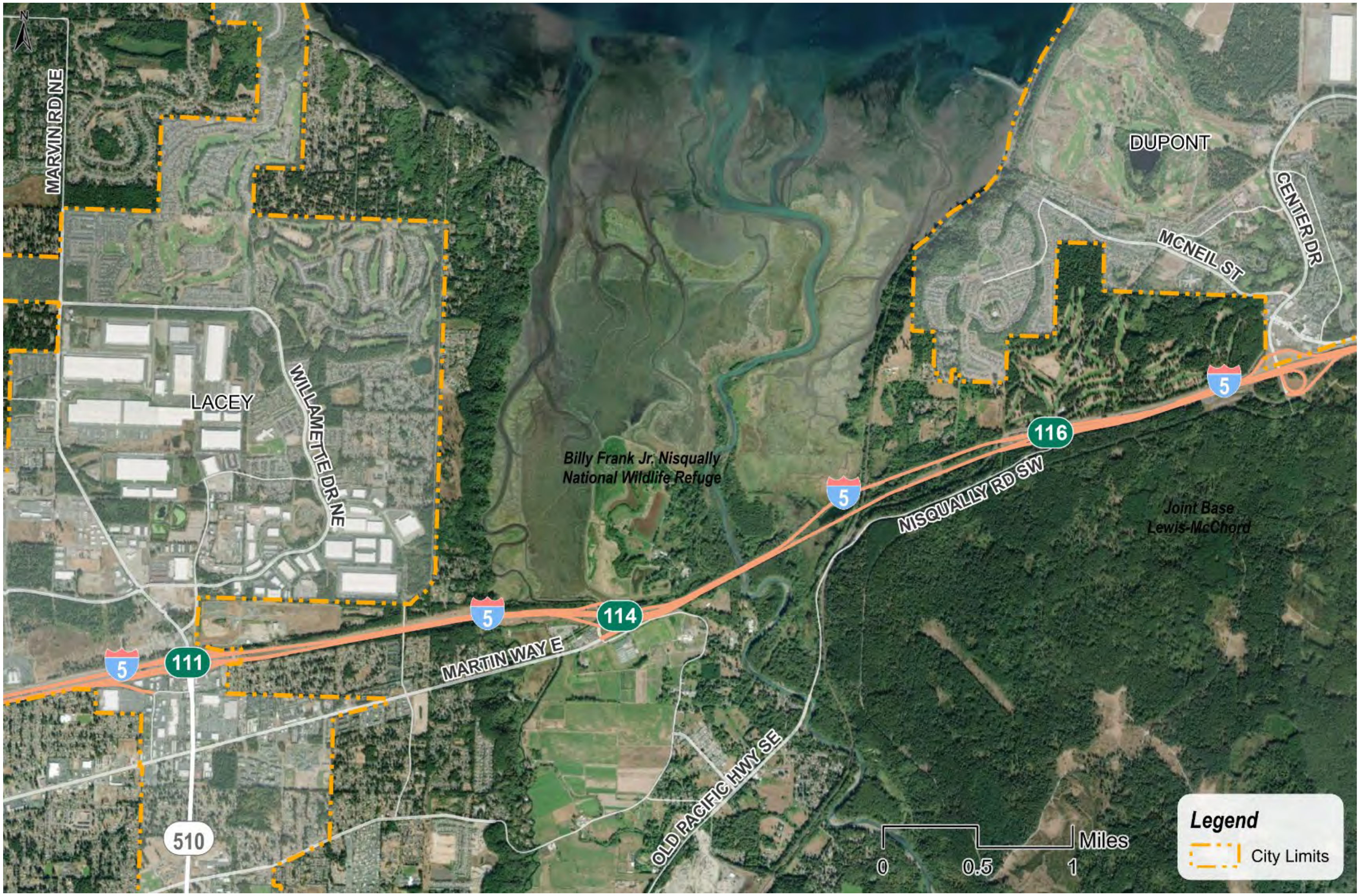
7.1.1 Project Background and Description

In 2020, the Washington State Department of Transportation (WSDOT) completed a corridor study of Interstate 5 (I-5) between State Route (SR) 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This segment of I-5 connects Thurston and Pierce Counties and provides access to JBLM. The roadway travels across the Nisqually River estuary, traditional land of the Nisqually Indian Tribe, and habitat for several federally listed fish and wildlife species.

In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin Road and Mounts Road interchanges through the Nisqually River delta. An initial PEL study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

The current phase, a Focused PEL, is studying I-5 from Marvin Road to Mounts Road (Exit 111 to Exit 116). The Focused PEL considers additional technical analyses and partner input to arrive at a final purpose and need and preferred alternative(s) to advance into NEPA environmental review beginning in 2023. Funding has been provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way (ROW) acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing.

Figure D-27. Project Vicinity Map

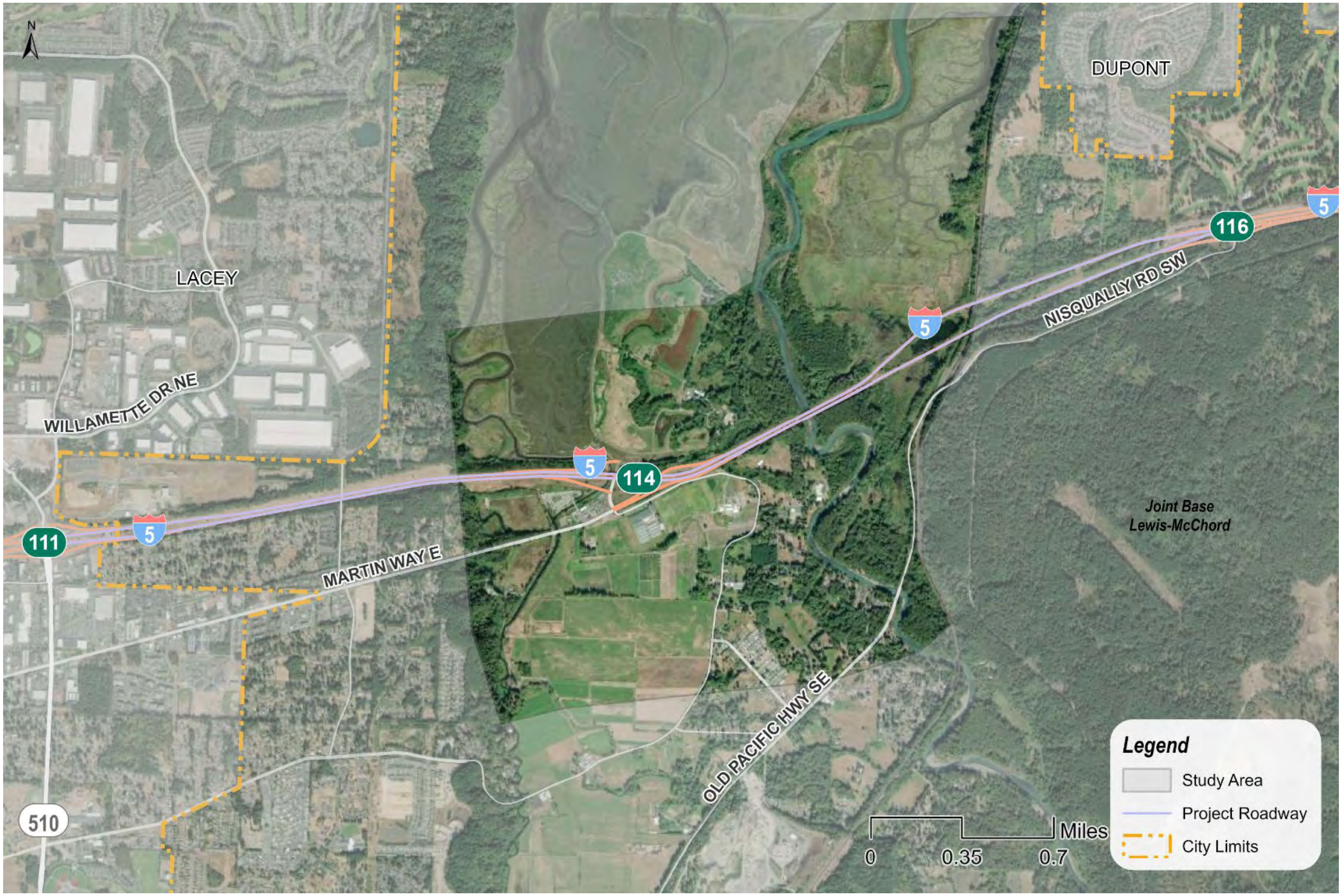


7.2 Methods for Floodplains and Sea Level Rise Analysis

7.2.1 Study Area

The project crosses through the City of Lacey, Thurston County, and Pierce County. Within this area, I-5 is generally oriented east-west. The study area for the floodplains and sea level rise analysis begins at the western edge of the McAllister Creek/Nisqually River Valley and ends at the eastern edge of the valley. It includes any areas where I-5 crosses over channels and their associated floodplains and channel migration zones. The study area has been mapped based on reviews of existing aerial photography, geographic information system (GIS) data, and technical reports from federal, state, county, and local jurisdictions; coordination with these jurisdictions; and field investigation. As concepts are refined and impacts are evaluated in more detail, the study area will also be refined as necessary. A study area map is shown in Figure D-28.

Figure D-28. Floodplains and Sea Level Rise Study Area



7.2.2 Relevant Laws and Regulations

The federal, state, and local regulations applicable to this project that govern flooding, floodplain protection, and consideration of sea level rise are listed below. Local plans and/or policies that guide these topics in the study area are also included. If a regulation, plan, or policy is updated to a newer version than that listed below, the most recent version that is legally applicable to the project will be referenced for the environmental analysis.

Federal

- 42 United States Code (USC) Chapter 55 – National Environmental Policy Act of 1969 (NEPA)
- 16 USC Chapter 35 – Endangered Species Act of 1973 (ESA)
- 16 USC §1451 et seq. – Coastal Zone Management Act
- 42 USC Chapter 50 – National Flood Insurance
- 23 Code of Federal Regulations (CFR) 771, Environmental Impact and Related Procedures
- 23 CFR 650 Subpart A, Location and Hydraulic Design of Encroachments on Flood Plains
- 40 CFR 1500-1508, National Environmental Policy Act Implementing regulations
- 44 CFR 60.3, Floodplain management criteria for flood-prone areas
- Public Law 92 234, 87 Stat. 975, Flood Disaster Protection Act (1973)
- Presidential Executive Order (E.O.) 11988, Floodplain Management (May 24, 1977)
- Federal Highway Administration (FHWA) Technical Advisory T 6640.8A, Guidance for Preparing and Processing Environmental and Section 4(F) Documents (October 1987)
- U.S. Department of Transportation (USDOT) Policy Statement on Climate Change Adaption (2011)
- USDOT Climate Adaption Plan – Ensuring Transportation Infrastructure and System Resilience (2014)
- FHWA Order 5520, Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events (2014)

State

- Revised Code of Washington (RCW) 47.01.260: Authority of WSDOT on State Highway System Design
- RCW 77.55: Construction Projects in State Waters
- RCW 77.57: Fishways, Flow, and Screening
- RCW 86.16: The Flood Control Management Act of 1935
- RCW 86.26: State Participation in Flood Control Maintenance
- Washington Administrative Code (WAC) 173-145: Administration of the Flood Control Assistance Account Program
- WAC 173-158: Flood Plain Management
- WAC 197-11: SEPA Rules
- WAC 220-660: Hydraulic Code Rules
- WAC 468-12: Transportation Commission and Transportation Department State Environmental Policy Rules
- Governor's Directive on Acquisitions of Agricultural Resource Land WDFW Memorandum of Agreement (MOA) for Transportation Activities

Local

Pierce County

- Storm Drainage and Surface Water Management, Title 11 Pierce County Code (PCC)
- Development Regulations – Critical Areas, Title 18E PCC
- Development Policies and Regulations – Shorelines, Title 18S PCC
- Pierce County Stormwater Management and Site Development Manual (2021)

Thurston County

1. Shoreline Master Program, Title 19 Thurston County Code (TCC)
2. Critical Areas, Title 24 TCC (Includes Chapter 24.10 Critical Aquifer Recharge Areas, Chapter 24.20 Frequently Flooded Areas)
3. Thurston County Drainage Design and Erosion Control Manual (2022).

City of Lacey

- Building and Construction, Title 14 Lacey Municipal Code (LMC)
- Shoreline Master Program, Chapter 14.26 LMC
- Flood Hazard Prevention, Chapter 14.34 LMC
- Land Division, Title 15 LMC
- Zoning, Title 16 LMC
- City of Lacey 2022 Stormwater Design Manual (2022)

7.2.3 Data Sources and Data Collection Methods

Available data from the Federal Emergency Management Agency (FEMA), municipal sources, and regulatory agencies applicable to floodplains in the study area will be collected and reviewed to evaluate the affected environment. Also, the floodplain analysts will coordinate with other discipline authors on the environmental team, including those responsible for stormwater and water quality; fish, wildlife, and vegetation; and wetlands analyses.

Surface Waters and Shorelines

Available data from FEMA, municipal sources, and regulatory agencies applicable to floodplains, floodways, and sea level in the study area will be collected and reviewed to evaluate the affected environment. Data sources will include the following:

- U.S. Geological Survey (USGS) National Water Information System
- Stream inventories from local jurisdictions
- Publicly available GIS aerial mapping
- County tax assessor GIS water resources data

Floodplains and Sea Level Rise

Floodplain data sources include FEMA flood insurance documents for Thurston County and Pierce County, Washington, that have been designated by FEMA as currently Effective (authorized by law to be used in making determinations under the National Flood Insurance Program). Information on FEMA floodplains was retrieved using the FEMA National Flood Hazard Layer website (FEMA 2021). FEMA is currently working with the state, counties, tribes, and local communities to update the Nisqually River flood risk mapping (Thurston County 2021). It is currently anticipated that these new maps will be effective in the spring of 2023. When new maps become officially available, they will be used.

Climate change is expected to increase peak flood magnitudes in the Pacific Northwest (Wilhere et al. 2017). Two data sources will be used to analyze the effects of climate change-related increases in peak streamflow. These peak flow changes will be incorporated into the floodplain impact analyses. The first data source is the University of Washington (UW) Climate Impacts Group (CIG) climate mapping tool, which provides data on the expected percent change in the annual maximum streamflow for a future 30-year period compared to 1980-2009 (Chegwidden et al. 2018). The second data source is the Washington Department of Fish and Wildlife (WDFW) Culverts and Climate Change Web App, which utilizes the same climate change models prepared by the UW CIG to estimate percent increases in bankfull flow, bankfull width, and 100-year flood magnitude (Wilhere et al. 2017).

Sea Level Rise in Washington State – A 2018 Assessment provides updated absolute and relative sea level rise (RSLR) projections out to the year 2150 (Miller et al. 2018). These projections are probabilistic, meaning they describe a full range of likelihoods of future sea level changes for a given greenhouse gas scenario over time. These projections also account for the geographic variability in the vertical movement of the land surface across Washington state (hence, *relative* sea level rise) and are designed for direct application to risk management and planning. The 2018 assessment was completed as part of the Washington Coastal Resilience Project (WCRP). Probabilistic sea-level rise projections will be used for WSDOT’s new Climate Impacts Vulnerability Assessment (CIVA), which is a qualitative assessment of risks to the state’s transportation infrastructure from climate change.

Geomorphology

Available data, reports, and studies regarding geology, river channel, floodplains, channel migration zones (CMZ), and sediment regimes and transport will be reviewed. Historic maps from federal, state, and local sources may be used to evaluate historic changes in channel location. Studies developed or under development by USGS that document geomorphology and sediment transport in the Nisqually River Delta will be used to the extent that they are available to the project team.

7.2.4 Impact Evaluation Methods

The impact analysis will assess the potential direct, indirect, and cumulative water resource impacts of the project alternatives, including the No-Build Alternative. The impact analysis will be generally based on regulatory guidance and similar past projects.

Direct Impacts

Potential direct impacts from construction activities will be qualitatively assessed based on the proximity of activities to surface water bodies and associated floodplains. Potential direct impacts to floodplains from project operation will be identified as follows:

- **Shorelines:** Direct impacts on shorelines will be qualitatively discussed based on potential alterations to areas within the designated shoreline area, if applicable.
- **Floodplains:** The project alternatives will be reviewed to determine if any of the alternatives would place or remove fill in the floodplain or floodway and/or alter existing crossings in a manner that would change flood storage volume within the affected reach. Floodplain impact evaluations will also consider how climate-related changes in peak stream flows will affect floodplain elevations and extents in the study area.
- **Channel Migration Zones:** If potential channel migration zones are previously defined or estimated from the data review findings, the project alternatives will be reviewed to determine if they would potentially affect or alter the CMZ by placing fill in the CMZ and/or alter existing facilities located in the CMZ. CMZ impact evaluations will also consider how climate-related changes in peak streamflow will affect channel morphology in the study area.
- **Sea Level Rise:** This analysis will evaluate the potential effects of sea level rise on the proposed project. Higher storm surges in the future will result in more frequent and extensive inundation of low-lying areas (both temporary and permanent). Potential impacts evaluated will include increases in coastal erosion and landslides that may weaken roadbed and bridge footings, damage to stormwater drainage and tide gates, and more frequent detours around flooded coastlines.

Indirect Impacts

Indirect impacts are potential effects related to the project but not part of it, and that may occur separated by distance or time but are still reasonably foreseeable. Indirect impacts to floodplains will be qualitatively evaluated through consideration of each alternative’s potential changes to hydraulics, flows, and floodplains outside of the direct project footprint. For example, if the proposed project were expected to reduce flood stages upstream or downstream of the project footprint by removing floodplain fill compared to the No-Build Alternative, then an indirect impact would be a potential reduction in regulated floodplains.

Cumulative Impacts

The cumulative impacts analysis will consider effects on floodplains and sea level rise from other past, present, and reasonably foreseeable future actions, including other transportation or infrastructure projects, and other land use actions or developments in the study area. When the impacts analysis is performed, a table and map will be created, summarizing reasonably foreseeable future actions.

7.2.5 Mitigation Development

Potential impacts to floodplains will be controlled through project planning, design, and the removal of past floodplain encroachments. Measures to avoid and minimize potential impacts of the alternatives will be incorporated as appropriate. Where impacts cannot be avoided or minimized, mitigation measures will be developed.

The PEL team will coordinate with the design team to identify potential project design elements (for review and approval by WSDOT) that will be implemented to control potential risks to floodplains and protect infrastructure constructed in the floodplain. Design elements will most likely be developed by considering reduced or removed encroachments into the floodplain and CMZ as well as hydraulic modeling that evaluates changes in the location and extent of past, existing, and future channel modification and floodplain encroachment.

Potential mitigation for direct, indirect, and/or cumulative impacts will be identified and evaluated within the study area where adverse effects would occur. The analysis assumes that the proposed project would be expected to be controlled by permit-required floodplain encroachment reduction that meets applicable allowable stage increases and flood water protection measures. Any mitigation, if needed, would be for controls and protection beyond that which would normally be required by applicable regulations and permit conditions. Mitigation strategies will consider combined mitigation identified with other jurisdictions.

Potential impacts from sea level rise will be controlled through project planning and design. Measures to avoid and minimize potential impacts of the alternatives will be incorporated as appropriate. Where impacts cannot be avoided or minimized, mitigation measures will be developed. The PEL team and consultant will identify near-, mid-, and long-term actions for the study area. Measures may range from minor modifications that can be made during scheduled maintenance to local and regional structural and nonstructural adaptation measures, depending on the level of risk identified from sea level rise.

7.3 Existing Conditions

This section provides preliminary descriptions and mapping of existing conditions for floodplains and sea level rise, based on the current understanding of the conceptual alternatives being considered for the PEL study. These conceptual alternatives are still under development; therefore, the potentially affected area may change as the design progresses. In addition, the conceptual design phase will include a detailed geomorphic analysis, which has not yet been performed; therefore, study area geomorphology is not addressed in detail in this section.

7.3.1 Shorelines

Shoreline GIS data from the Washington State Department of Ecology (Ecology) shows that the Marine Shoreline Jurisdiction boundary, defined as the mean higher high tide elevation, extends to the northern toe of the I-5 embankment in the vicinity of McAllister Creek. The creek's entire drainage north of I-5 is tidally influenced, except for the diked portions around the freshwater wetlands and buildings in the Billy Frank, Jr. Nisqually National Wildlife Refuge. Changes to the McAllister Creek alignment and I-5 crossing structure could potentially result in changes to the shoreline location in this area, especially in future sea level rise scenarios. This mapped marine shoreline is shown in Figure D-29.

At the eastern end of the valley, the marine shoreline boundary is several thousand feet north of the Nisqually River crossing of I-5. It is possible that indirect changes to the shoreline may occur over time as the Nisqually River channel migrates. As sea levels rise, the shoreline at the eastern end of the Nisqually River Delta is likely to shift south as regular tidal inundation reaches further inland. See Section 3.4 for additional discussion on sea level rise.

Figure D-29. Department of Ecology Shoreline Boundary

7.3.2 Floodplains and Floodways

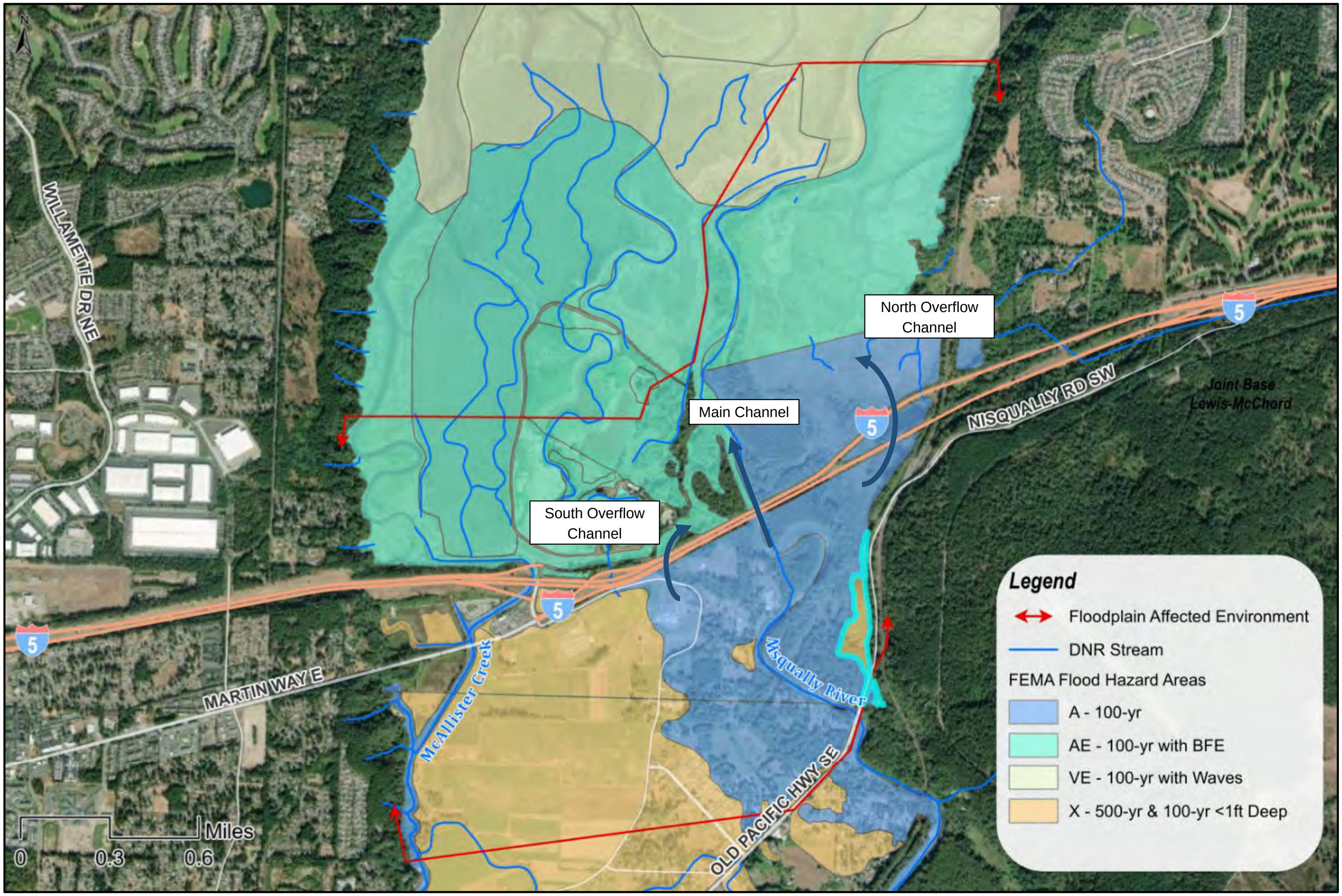
FEMA floodplain designations and county and city flood hazard area designations within the study area were reviewed. Figure D-30 shows the mapped FEMA flood hazards in the study area and the current estimate of existing floodplains. The floodplain hazards shown in Figure D-30 come from four different FEMA flood insurance rate maps (FIRMs): 53067C0215E, 53067C0203F, 53067C0204F, and 53053C0504E. These FIRMs have all been updated between 2012 and 2018. The previous FIRM and flood insurance study (FIS) (530188) from 1999 was also reviewed because it provides detailed floodplain elevations upstream (south) of the I-5 crossing over the Nisqually River, unlike the current FIRMs. The Nisqually River regulatory base flood elevation (BFE) from the 1999 study is 15.7 feet (NAVD88) at the I5 crossing, and 23.0 feet at the Old Pacific Highway crossing (FEMA 1999). As noted in Section 2, new FIRMs are being developed for the study area and will be incorporated into this analysis once they become available.

FIRMs are used by the National Flood Insurance Program (NFIP) for floodplain management, mitigation, and insurance purposes. They are the official source for determining flood risk within a community. The maps identify flood zone designations, which are geographic areas identified as having different levels of flood risk. Special Flood Hazard Areas (SFHAs) are high-risk areas designated by the letters A or V. They are defined as the land area covered by the floodwaters of the base flood (i.e., a flood event with a 1 percent chance of occurring in any given year, often referred to as the 100-year flood). In addition, the letter V indicates that wave and tidal effects are present. In areas designated by the letter X, the risk of flooding still exists, but is lower. Flood zones mapped in the study area include:

1. Zone A (100-year flood): This zone is mapped along the Nisqually River upstream and downstream of the I-5 crossing and includes the overflow channels east and west of the mainstem.
2. Zone AE (100-year flood with BFE): This zone encompasses most of the study area north of I-5, including the developed portions of the wildlife refuge and the McAllister Creek drainage. Base flood elevations in this area range between 12 and 15 feet.
3. Zone VE (100-year flood with waves): This zone is mapped in the northern portion of the delta. It represents the area where flood elevations are affected by both storm events and tidal effects. Base flood elevations in this area range between 12 and 16 feet.
4. Zone X: This zone represents the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. It is mapped south of I-5 and west of the Zone A floodplain associated with the Nisqually River.

Current FEMA floodplain hazard areas are shown in Figure D-30, along with a preliminary indication of the upstream and downstream limits of the floodplain area that could be affected by improvements to I-5. The northern and southern extents of potentially affected

Figure D-30. FEMA Flood Hazard Areas



floodplain areas for both McAllister Creek and the Nisqually River were based on conservative professional judgement of the potential extent of hydraulic changes resulting from changes to the I-5 water crossing structures.

Data on predicted climate change-related increases in peak streamflow were retrieved for the Nisqually River and McAllister Creek from the UW Climate Impacts Group (CIG) website. The UW CIG data provides percent change in the annual maximum streamflow for a future 30-year period compared to 1980-2009. For example, a river or stream with a 20 percent increase means that the annual maximum streamflow will be 20 percent greater than the 1980-2009 average. All streamflow values here are natural flows, and do not include any influence from withdrawals or hydropower projects. This is an important distinction since the Nisqually River has two hydroelectric power plants on it, the Alder and LaGrande Dams (Tacoma Public Utilities 2023). According to Tacoma Public Utilities, these reservoirs are relatively small and do not provide significant flood risk mitigation. For McAllister Creek, annual maximum streamflow is projected to increase by 11 percent in the low emission scenario (RCP 4.5) and by 16 percent in the high emission scenario (RCP 8.5) in the future time period 2060-2089. For the Nisqually River during the same time period, annual maximum streamflow is projected to increase by 21 percent in the RCP 4.5 scenario and by 29 percent in the RCP 8.5 scenario. The projected increase for the 100-year flow was not determined and cannot be determined directly from the estimated percent increases using this model.

Data on climate change-related increases in peak streamflow were retrieved for the Nisqually River and McAllister Creek from the WDFW Culverts and Climate Change Web App. The WDFW Web App uses the same underlying climate modelling process developed by the UW CIG; however, the WDFW Web App results assume an A1B greenhouse gas emission scenario, called the “business as usual” scenario. The A1B emission scenario falls between the previously discussed RCP 4.5 and RCP 8.5 emission scenarios. For McAllister Creek in the 2080s, bankfull flows are expected to increase by 18.6 percent, and the 100-year flood is expected to increase by 32.6 percent. For the Nisqually River in the 2080s, bankfull flows are expected to increase by 16.4 percent, and the 100-year flood is expected to increase by 36.0 percent.

7.3.3 Channel Migration Zones

Channel migration zones (CMZs) are areas in a floodplain where a stream or river channel can be expected to move naturally over time in response to gravity and topography. Water bodies such as rivers and streams gain or release energy as they flow, carrying away or spreading out sediments, building new areas, and supporting a variety of fish, wildlife, and vegetation. Rivers with room to migrate have the highest diversity of aquatic habitats.

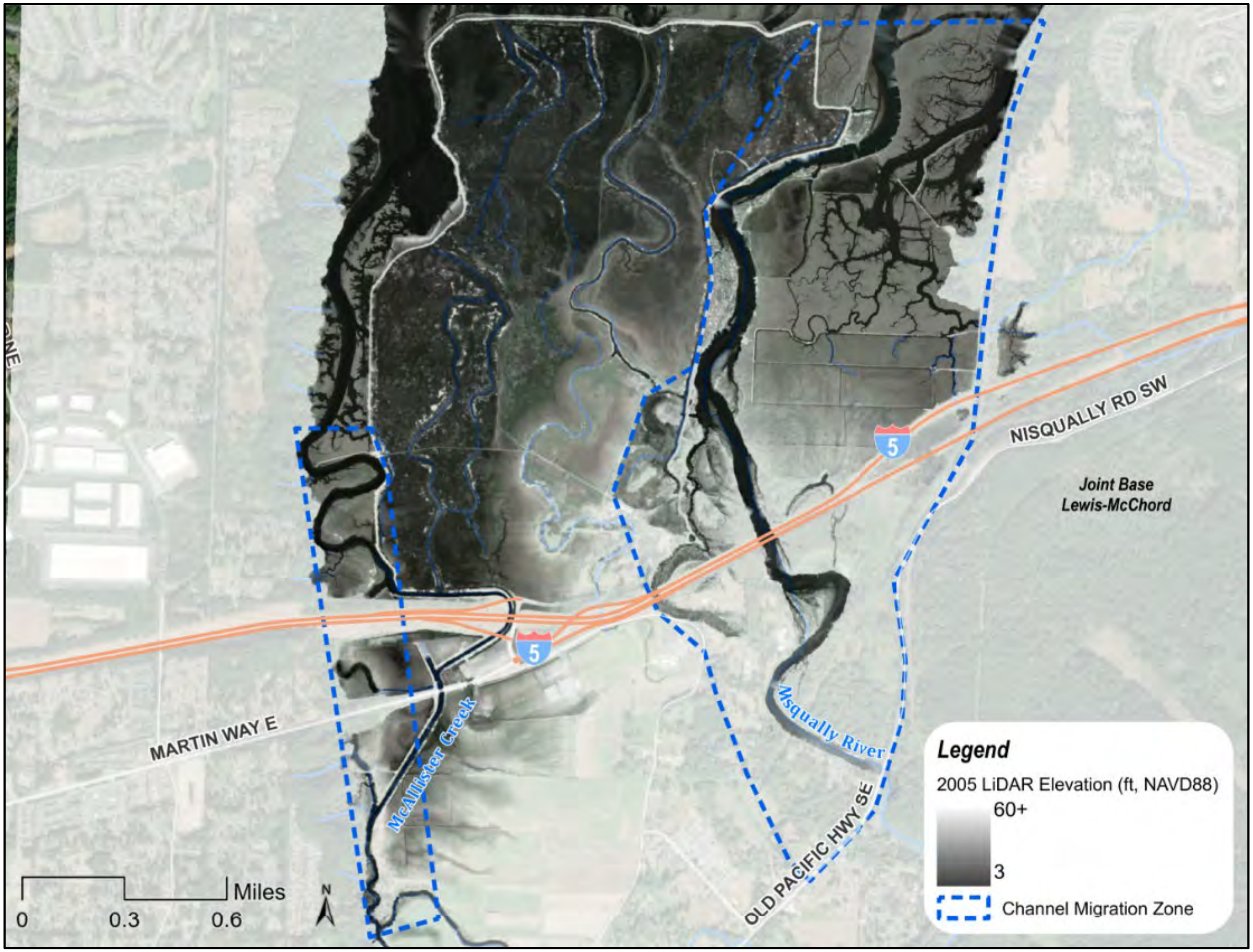
While channel migration is an important natural process, it can pose risks to nearby homes and infrastructure. Channel migration can occur steadily, such as when one stream bank erodes but sediments are deposited along the opposite bank. It can also happen quickly, such as a flood carving a new path for a stream or river. The rate of change depends on an array of factors such as gradient, geology, sediment supply, stream flow, vegetation, natural instability, and human development. Because of the risks posed by channel migration, CMZs are mapped by government agencies to identify land uses and infrastructure that may be affected by changes in the course of a stream.

No identified federal, state, or county CMZs were found within the study area. Ecology maintains a GIS layer that characterizes stream migration potential; this layer does not map CMZs as such, but it does indicate whether a system is considered confined or unconfined and the relative erosion potential of the system. The Nisqually River is considered an unconfined system with moderate erosion potential. McAllister Creek is considered an unconfined system with low erosion potential.

In the absence of any agency mapping, preliminary CMZs have been mapped using available aerial photo history, historical topographic maps, and light detection and ranging (LiDAR) data for McAllister Creek and the Nisqually River. The CMZ for the Nisqually River was primarily mapped using LiDAR data to identify low-lying areas that resemble historical channel locations. The location of the western end of the Nisqually River CMZ was aligned with the westernmost active channel meander bends, and what appear to be several historic meander cutoffs near the I-5 crossing. The eastern end of the Nisqually CMZ follows the eastern edge of the Nisqually River valley.

Review of historic USGS topographic maps, and the presence of meandering ponds which resemble cutoff channels along the western edge of the valley, indicate that McAllister Creek historically meandered through this area. The McAllister Creek CMZ was delineated using the current meander belt width north of I-5 as a proxy for the CMZ width south of I-5. The northern and southern termini of both the McAllister Creek and Nisqually River CMZs were based on conservative professional judgement of the potential extent of hydraulic impacts resulting from changes to the I-5 water crossing structures. Figure D-31 shows the preliminary affected CMZs for McAllister Creek and the Nisqually River. These preliminary CMZs may be updated as the project design progresses and as coordination continues with the USGS, project fluvial geomorphologists, and interested parties.

Figure D-31. Channel Migration Zones



A memo prepared by WSDOT in April 2022 documents channel migration in the Nisqually River using historical aerial photographs and Google Satellite images. In 1937, when the older of the two Nisqually River bridges was built, the river had very wide-radius meanders: one upstream of the Nisqually Tribal Village migrating into the left bank, one just downstream of the village moving right, and one at the highway crossing. When the bridge was constructed, timber revetment walls were built along the channel banks to approximately 439 feet upstream of WSDOT’s right of way along the left bank and 225 feet upstream along the right bank. Walls were also added to protect the left bank along the meander upstream of the Nisqually Tribal Village. Over time, the river channel has migrated between these two hardened areas, and now forms a sharper bend approximately 450 feet south of I-5. WSDOT has estimated that, at the observed migration rate of 35.5 feet per year between 1990 and 2022, the meander can be expected to reach the I-5 roadway embankment in approximately 13 years (WSDOT 2022).

In the future, climate change related increases in peak flows will potentially increase the frequency and magnitude of changes in channel morphology. The exact nature of climate related changes to streamflow on channel migration and overall fluvial geomorphology within the study area are highly uncertain. Factors including basin-scale geology, land-use, riparian and hillslope vegetation, sediment supply, and channel form, among others can impact the nature of climate related impacts on channel morphology (Wilhere et al. 2017).

7.3.4 Sea Level Rise

As discussed in section 2.3.2, data from *Sea Level Rise in Washington State – A 2018 Assessment* was evaluated to assess the potential for future sea level rise within the study area. The sea level rise visualization tool developed by the University of Washington Climate Impacts Group was used to retrieve the probabilities of different sea level rise amounts for the year 2100. For the Nisqually River, which is located in Water Resource Inventory Area (WRIA) 11, there is a 50 percent probability of 2.2 feet of sea level rise in the high emission scenario (RCP 8.5), and a 1 percent probability of 5.0 feet of sea level rise (Miller 2018). The low emission scenario (RCP 4.5) predicts a 50 percent probability of 1.8 feet of sea level rise, and a 1 percent probability of 4.3 feet of sea level rise.

The National Oceanic and Atmospheric Administration (NOAA) has publicly available GIS layers that show inundated areas and water depths associated with specific sea level rise amounts, in increments of 1 foot. Figures D-32 and D-33 show the areas that would potentially be impacted at 2.0 and 5.0 feet of sea level rise, respectively (NOAA 2020). The difference between the current Ecology marine shoreline (as described in section 3.1) and the future sea level rise inundation areas provides an initial estimate of how sea level rise could affect existing conditions in the study area.

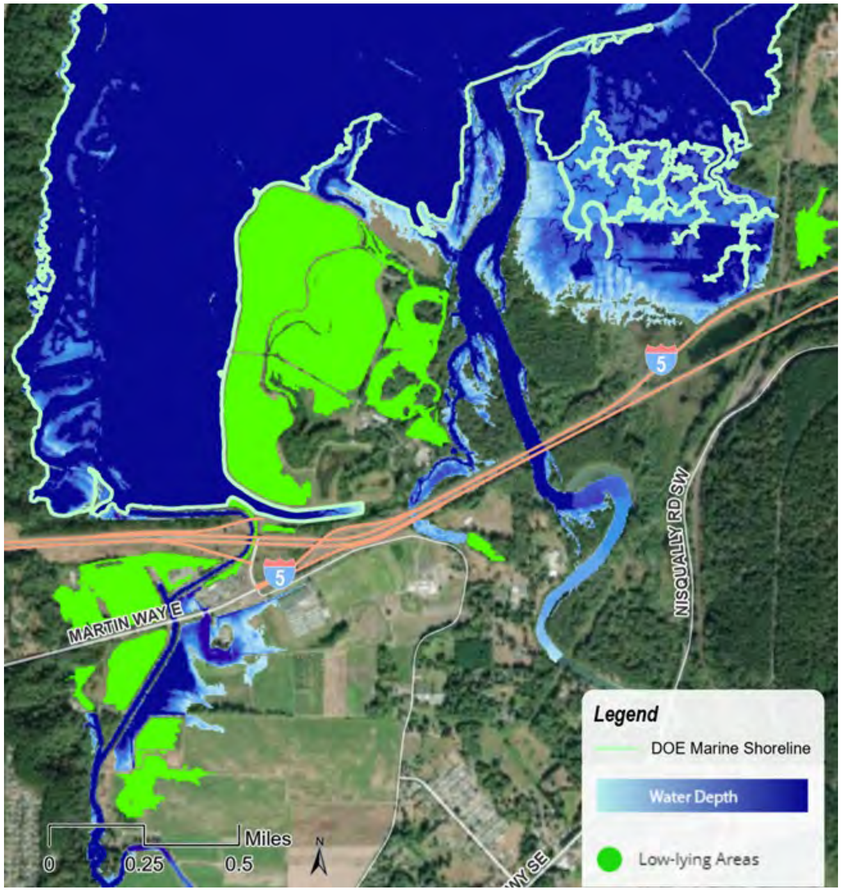


Figure D-32. 2.0-foot Sea Level Rise

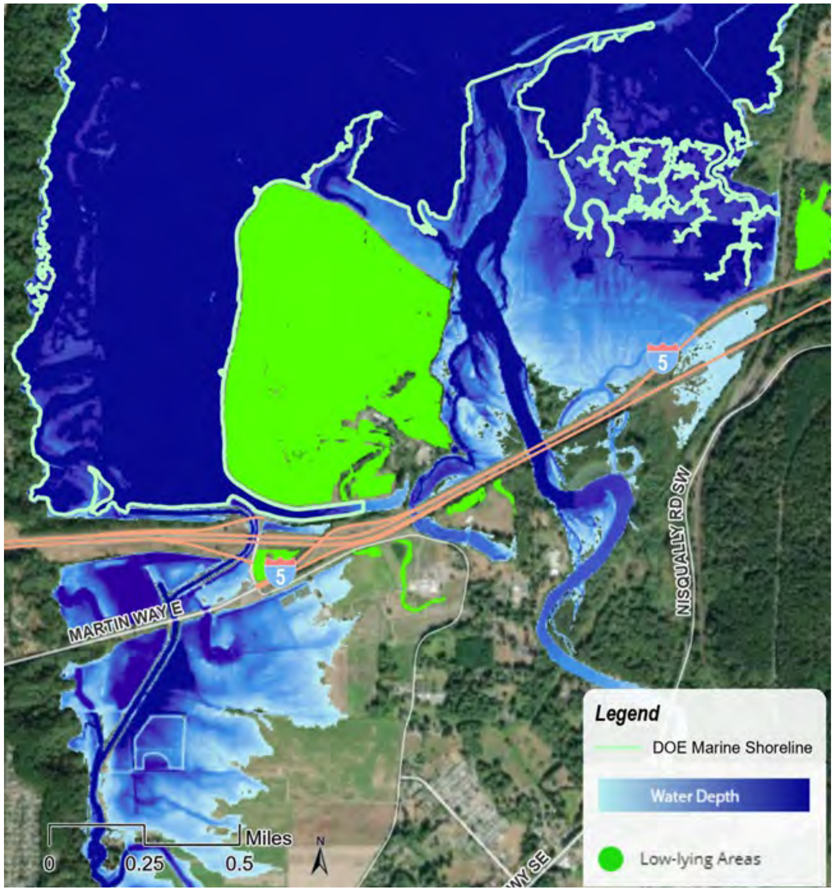


Figure D-33. 5.0-foot Sea Level Rise

1

7.4 References

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8 GEOLOGY AND SOILS

8.1 Introduction

8.1.1 Project Background and Description

In 2020, the Washington State Department of Transportation (WSDOT) completed a corridor study of Interstate 5 (I-5) between State Route (SR) 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This segment of I-5 connects Thurston and Pierce Counties and provides access to JBLM. The roadway travels across the Nisqually River estuary, traditional land of the Nisqually Indian Tribe, and habitat for several federally listed fish and wildlife species.

In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin Road and Mounts Road interchanges through the Nisqually River delta. An initial PEL study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

The current phase, a Focused PEL, is studying I-5 from Marvin Road to Mounts Road (Exit 111 to Exit 116). The Focused PEL considers additional technical analyses and partner input to arrive at a final purpose and need and preferred alternative(s) to advance into NEPA environmental review beginning in 2023. Funding has been provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way (ROW) acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing.

Figure D-34. Project Vicinity

8.2 Methods for Geology and Soils Analysis

This section describes the methods that will be used to support the I-5 Marvin Road to Mounts Road Focused PEL study and the subsequent NEPA documentation. This section includes a description of the study area, relevant laws and regulations, and methods for collecting data, assessing impacts, and evaluating possible mitigation measures. The analysis is designed to comply with the National Environmental Policy Act (NEPA) and relevant federal, state, and local laws.

Relevant data include geologic hazards (steep slope areas, landslides, and earthquake-hazard-prone areas), and soil information. The NEPA analysis will qualitatively evaluate potential operation impacts, including seismic hazards, stability, and settlements. Construction impacts, including excavation, erosion and sediment transport, stability, settlement potential, and vibration will also be evaluated qualitatively.

8.2.1 Study Area

The project study area will extend 100 feet on either side of existing right of way (ROW) along the project corridor, which extends between Exit 111 and Exit 116 on I-5. This corridor is where the majority of improvements will take place and where soil disturbance and foundation work are anticipated.

The study area is located within the complex Nisqually River Delta region, where the Nisqually River and McAllister Creek form a tidal estuary as they meet Puget Sound. This study area contains specific geologic and soil conditions that will affect the design, location, and construction techniques employed in developing the project. Understanding relevant geologic and soil conditions is critical for ensuring the safety of those who will build and use the bridge infrastructure, reducing or eliminating impacts to natural resources, and to minimizing potential schedule delays and cost increases.

8.2.2 Relevant Laws and Regulations

There are not specific regulations addressing geology and geotechnical investigations. However, evaluation of geology and soils is part of required analyses under the National Environmental Policy Act (NEPA) and Washington State Environmental Policy Act (SEPA). In addition, generally accepted industry practice has been established by procedure manuals and guidelines published by the Federal Highway Administration (FHWA) and the Washington Department of Transportation (WSDOT).

The following regulations, procedures and guidelines established by government agencies include measures to protect the public from the effects of geologic hazards and resulting unsafe conditions with respect to transportation facilities:

- United States Code (USC) Chapter 55, National Environmental Policy Act of 1969 (NEPA)
- 23 CFR 771, Environmental Impact and Related Procedures
- 40 CFR 1500-1508, NEPA Implementing Regulations
- WAC 197-11 SEPA Rules
- WAC 468-12 Transportation Commission and Transportation Department State Environmental Policy Act Rules
- FHWA, Checklist and Guidelines for Review of Geotechnical Reports and Preliminary Plans and Specifications. Publication No. FHWA ED-88-053. August 1988, revised February 2003.
- American Association of Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications.
- WSDOT, Bridge Design Manual M23-50.21, June 2022
- WSDOT, Geotechnical Design Manual M46-03, July 2022
- WSDOT, Environmental Manual M31–11.23, June 2022.

8.2.3 Data Sources and Data Collection Methods

This section describes the sources from which relevant data will be obtained, the types of data that will be used, and how the data will be collected to complete the evaluation for the project.

Existing maps and technical reports published by the U.S. Geological Survey, Washington State Department of Natural Resources Division of Geology and Earth Resources, and the Natural Resource Conservation Service will be reviewed for pertinent geologic, seismic, and soils information.

Existing boring logs, geotechnical reports, as-built drawings, and construction records in the project vicinity from WSDOT will be used for the analysis and conceptual level geotechnical evaluation. Existing boring data was obtained during design and construction of existing bridges in the area.

The data required to evaluate operational and construction impacts will be obtained from existing geotechnical reports for the study area, geologic units present within the study area, and one geotechnical boring in the vicinity of McAllister Creek (to be drilled in 2023). Following completion of the Focused PEL, during the project design phase, a field investigation program will be designed to fill gaps in the existing data. These activities will determine if additional drilling is needed, which may necessitate entry agreements, grading or investigation permits, and coordination with government agencies and tribes. The investigations will be designed to address any known or potential landslides, faults, or adverse foundation conditions that may impact the program. The fieldwork will aim to identify geologic hazards (landslides, soft foundation areas, and slope hazards).

Data collected during field investigations will be evaluated to anticipate impacts to various design features of the project (e.g., roadways, navigation, interchanges, bridges, retaining walls, cut slopes, and fills or embankments).

8.2.4 Impact Evaluation Methods

The impacts assessment will consider how the proposed project could affect or be affected by geology and soil conditions in the study area. The design will be based on project-specific seismic design criteria in accordance with WSDOT requirements (WSDOT 2022a). Potential impacts could result from severe ground-shaking and/or liquefaction associated with a seismic event, construction on expansive soils, and landslides or severe support scouring due to flooding. Another important factor will be whether the program design contributes to substantial erosion or causes a stable geologic unit to become unstable. Methods for evaluating the potential for removal or conversion of prime or unique agricultural soils will be discussed in the Land Use Methodology Memorandum.

Long-Term Impacts

Long-term operational impacts will be addressed by evaluating proposed project design alternatives with respect to the results of subsurface investigations conducted in proposed construction areas. The investigation will be conducted in accordance with generally accepted industry practice (see Section 1.3) and will include collection of information to establish the design criteria for built structures. The analysis will consider how new structures proposed as part of the project would perform over the expected lifetime of those structures, including measures incorporated into the design to minimize the effects of geologic hazards. Preliminary screening of liquefaction may be performed during the geotechnical evaluation. Triggering and consequences of liquefaction will be generally discussed in a qualitative manner. A separate geotechnical report will be prepared during the engineering design, which will help to inform and quantify the potential long-term operational impacts of existing geologic conditions on the project.

Short-Term Construction Impacts

Similar to long-term impacts methods described above, short-term impacts will be addressed by evaluating the results of subsurface investigations conducted in proposed construction areas. The types of potential construction activities that could affect geology and soils include earthwork (cuts and fills), excavation and stockpiling of soils, and dewatering. The project geotechnical report (described in Section 2.4.1) will quantify the potential short-term construction impacts of the existing geologic and geotechnical conditions on the project. Ground conditions will be evaluated from soil samples collected during drilling activities.

If excavations are required (e.g., for bridge footings), a preliminary assessment of dewatering needs may be conducted. If large embankments or walls are to be built, the analysis will include a qualitative assessment of slope stability to ensure that stability problems do not impact adjacent facilities or wetlands. If adjacent structures could be impacted by settlement or vibration caused by the new construction, a preliminary assessment of these issues may also need to be conducted. The analysis will also address the potential for erosion and sedimentation from exposed soils. Short-term impacts will be evaluated for the following:

- Geological and geotechnical reconnaissance
- Cut and fill slopes
- Foundations
- Landslides
- Material sources
- Retaining walls
- Subsurface drainage
- Pavements

8.2.5 Mitigation Development

Based on the findings during analysis of previous geologic data from WSDOT, conceptual measures to mitigate potential impacts will be identified in accordance with WSDOT standards. Seismic hazards are unavoidable but will be mitigated by designing according to the WSDOT BDM. Mitigation for other types of geologic impacts could include design adjustments to avoid resources or geologic hazards; compliance with OSHA and other safety requirements during construction; and the use of best management practices to avoid erosion and sedimentation.

8.3 Affected Environment

This section describes the existing environmental resources within the study area for geology and soils.

8.3.1 Topography

The study area encompasses the Nisqually River Valley, which lies close to sea level, and is bordered by steep slopes that rise to approximately 250 feet at the Marvin Road and Mounts Road interchanges. Across the valley, I-5 is raised approximately 10 to 15 feet above the existing grade on a series of structures and embankments. At the western edge of the valley, a wide embankment (approaching 500 feet in some areas) rises west of the McAllister Creek crossing to convey the highway up the slope toward Martin Way.

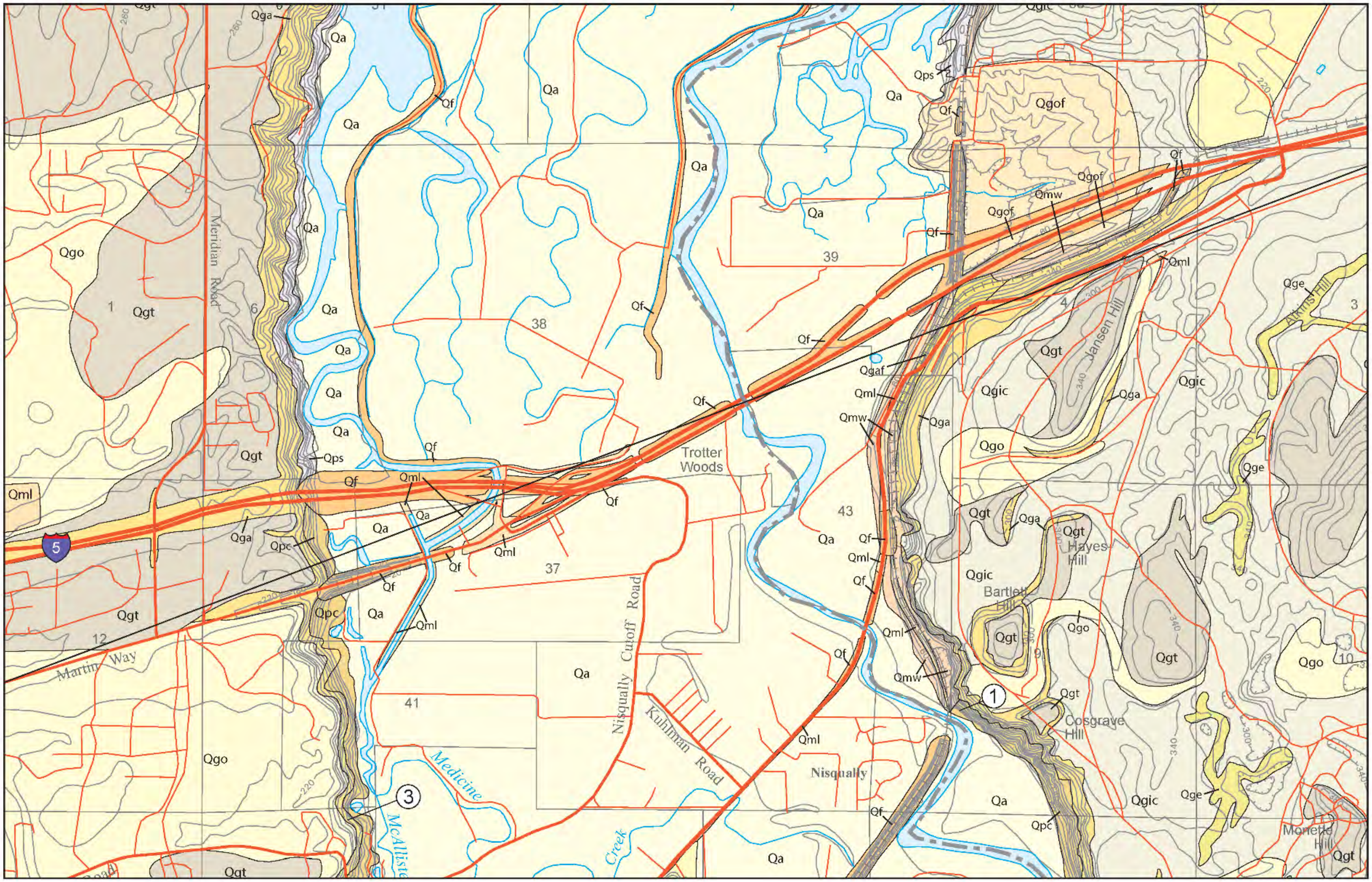
8.3.2 Regional Geology

The geology of the study area was influenced by successive glaciations during the Pleistocene era, most recently the Vashon Stade of the Fraser glaciation, which ended about 13,500 years ago. Pre-Vashon (older) and post-Vashon (younger) deposits are also found in the study area. In the Nisqually River valley, pre-Vashon sediments underlie a thick deposit of post-Vashon deposits of silt, sand, gravel, and peat that are associated with the Nisqually River, the delta, and the tidal estuary. The plateaus bordering the Nisqually River valley are underlain by a sequence of glacially overridden soils that were deposited during the Vashon ice sheet advance and/or directly emplaced by the Vashon ice sheet. As the Vashon ice sheet receded, meltwater streams flowed from the glacier and deposited thick layers of sand and gravel with cobbles and boulders, relatively free of silt and clay, over portions of the study area.

8.3.3 Geologic Units

The geologic units described herein are based on a review of the geologic maps and the historical subsurface information within the study area. Geologic units are interpretive and based on an evaluation of the soil types likely to be encountered during construction. Figure D-35 presents mapped surface geologic units from the *Geologic Map of the Nisqually 7.5-minute Quadrangle, Thurston and Pierce Counties, Washington*, developed by the Washington Department of Natural Resources (Walsh et al., 2003).

Figure D-35. Study Area Soil Types (Walsh et al., 2003)



As shown in the Figure D-36 cross section, the western edge of the valley is on a glacial upland with soil deposits consisting of Vashon till (Qgt) underlain by Vashon advance outwash (Qga), Pre-Vashon sand-size or finer deposits (Qps), and Pre-Vashon gravel (Qpg). East of the Meridian Road overcrossing of I-5, Qga deposits are underlain by Pre-Vashon sediment of Cascade Range source, undifferentiated (Qpc). Qga is exposed along the northern edge of I-5, where a large cut was made into the slope to accommodate the highway.

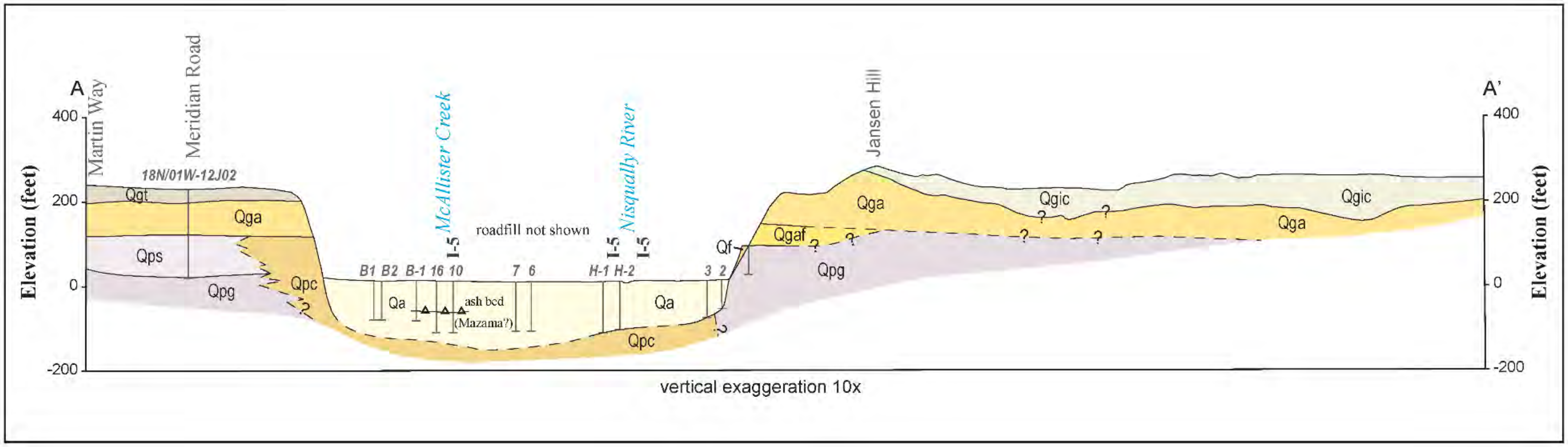


Figure D-36. Cross-Section of Study Area along I-5 (Walsh et al., 2003)

The project traverses the Nisqually Delta, which is a glacial trough, infilled with alluvium (Qa). In this area, the Vashon-age deposits are absent and the modern (i.e., post-glacial) alluvium, directly overlies Pre-Vashon, Qpc deposits.

On the eastern edge of the valley, I-5 climbs onto a glacial upland. The subsurface of the upland in this area consists of colluvium and alluvial fan deposits (Qmw), underlain by Latest Vashon fine-grained sediments (Qgof), Ice-contact deposits (Qgic), Vashon advance outwash (Qga and Qgaf), Pre-Vashon gravel (Qpg), and Qpc deposits (provided in approximate stratigraphic sequence from the surface down).

Within the I-5 roadway prism in the study area, soils consist of fill (Qf) and/or modified land (Qml), which consists of soils that have been placed to modify the topography. Some areas north of I-5 within the valley that were mapped as fill in 2003, including linear features east of McAllister Creek and west of the Nisqually River, have since been removed as part of the Nisqually River Delta restoration.

Table D-52 contains a description and approximate thickness (where available) of each geologic unit.

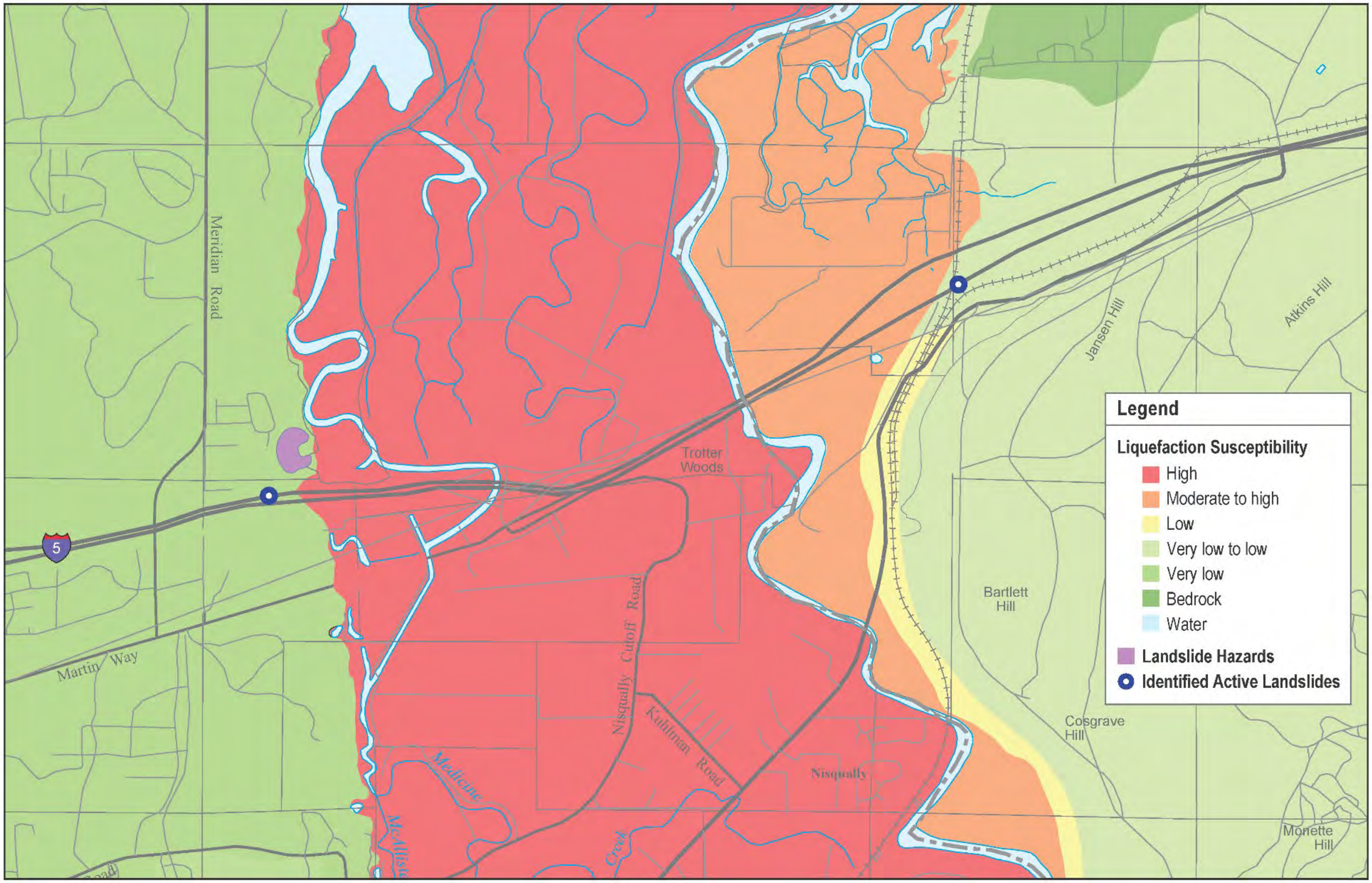
Table D-52. Geologic Unit Descriptions

Geologic Unit	Description
Qf	Clay, silt, sand, gravel, organic matter, shells, rip-rap, and debris. Includes engineered and non-engineered fills.
Qa	Silt, sand, gravel, and peat deposited in stream beds and estuaries. Lacustrine and beach deposits may be encountered as well. Deposited up to 160 feet in thickness.
Qgof	Lacustrine clayey and/or sandy silt with dropstones (isolated fragments of rock in fine-grained sediment, ranging in size from pebbles to boulders, that appear to have been dropped vertically in place). Deposited up to 10 feet in thickness.
Qgt	Highly compacted mixture of clay, silt, and gravel (deposited directly by glacier ice). Cobbles and boulders are commonly encountered in this unit. Ranges from 2 to 10 feet in thickness.
Qgic	Deposits consist of lodgment till, ablation till, subglacial water flow deposits, advance outwash, and recessional outwash. All soil types, cobbles, and boulders could be found in this unit.
Qga	Sand, gravel, lacustrine clay, and silt (deposited during glacial advance). Cobbles can be encountered in this unit. Ranges from 50 to 140 feet in thickness.
Qgaf	Lacustrine silt and clay. Ranges from 40 to 50 feet in thickness.
Qps	Sand interbedded with laminated silt, peat, and gravel. Ranges from 75 to 100 feet in thickness.
Qpg	Gravel and sand.
Qpc	Gravel, sand, silt, clay, peat, and diamicton (sediment composed of clay to boulder clast sizes). Cobbles and large boulders up to 8 feet in diameter can be encountered in this unit.

8.3.4 Geologic Hazards

Potential geologic hazards that may affect the study area include volcanic events, landsliding, erosion, and seismic-related (earthquake) hazards. These hazards are summarized below.

Figure D-37. Study Area Gelogic Hazards (WSDOT, DNR)



8.3.5 Volcanic Hazards

In general, volcanic geologic hazards include tephra (ejected material), lava flows, and lahar flows (volcanic debris and water). The closest active volcano to the study area is Mount Rainer, which is approximately 45 miles southeast of the site. Geologists estimate that eruptive activity last occurred at Mount Rainier about 150 to 200 years ago. The volcanic eruptions led to debris avalanches and lahar flows down the White, Puyallup, and Nisqually rivers. More recent large lahars have occurred in the past 60 years, but the associated hazards have been limited to the immediate Mount Rainier area. Based on the Washington State Interactive Geologic Map, the entire Nisqually River valley within the study area could be affected by lahar flow inundation from volcanic activity at Mount Rainier. Based on the relatively long-recurrence interval for volcanic activity, however, the risk of volcanic-induced geologic hazards at the site is low.

8.3.6 Landslide Hazards

Landslides are movement of a rock and/or soil mass on a slope caused by shear failure within the rock and/or soil. Landslides can occur quickly or progressively over time and can be either deep-seated or shallow. Potential factors that can increase the risk of landslides include increasing water pressure in the rock and/or soil, increasing loading on or above the slope, removing material at the toe of the slope, and movement-induced weakening of glacially overridden clay. Within the study area, the Washington State Interactive Geologic Map identifies areas of previous landslide activity adjacent to the southbound side of I-5 along the slope between McAllister Creek and Martin Way.

The Unstable Slope Management System (USMS) is a database internal WSDOT that is used to inventory and prioritize unstable slopes within the WSDOT right of way for monitoring and/or mitigation. The USMS identifies two active landslides within the study area: USMS slope numbers 1590 and 3012. The approximate locations of these landslides are shown on Figure 3-3 (Geologic Hazard Map).

8.3.7 Erosion Hazards

Erosion hazard areas are those locations where the combination of slope and soil type makes the area susceptible to erosion by wind or water action. Water erosion can occur either by wave action, channel migration of rivers or streams, or surface runoff. The western slope of the Nisqually River valley has been identified as a potential erosion hazard area.

8.3.8 Seismicity/Ground Shaking

The study area is in a moderately active seismic area that has been subjected to numerous earthquakes of low to moderate strength and occasionally to strong shocks during the brief 170-year seismic record in the Pacific Northwest. Some of the largest historical earthquakes in the Puget Sound lowland include the magnitude 7.1 Olympia earthquake of April 13, 1949, the magnitude 6.5 Seattle-Tacoma earthquake of April 29, 1965, and the magnitude 6.8 Nisqually earthquake of February 28, 2001. Geologic evidence indicates that a magnitude 9 earthquake on the Cascadia Subduction Zone occurred approximately three hundred years ago. This zone extends from northern California to the north end of Vancouver Island, where the Juan de Fuca tectonic plate is being subducted by the North American tectonic plate.

8.3.9 Fault-Related Ground Rupture

Based on the U.S. Geological Survey Fault and Folds Database and the Washington State Interactive Geologic Map, no known potentially active faults cross the study area. The closest known faults are the Olympia Structure, located approximately 6 miles southwest of the study area, and the Tacoma Fault Zone, located approximately 20 miles northeast of the study area. Based on the fault locations, the risk of fault-related ground rupture at the site is considered low.

8.3.10 Liquefaction

Liquefaction is a phenomenon in which the strength and stiffness of a saturated soil is reduced by earthquake shaking or other rapid loading. As a result, ground settlement, lateral spreading, and landslides may occur.

Alluvial deposits in the Nisqually delta are susceptible to liquefaction. The Washington State Interactive Geologic Map identifies these soils to have a moderate to high potential for liquefaction (Walsh et al., 2003). Where applicable, site-specific studies may be warranted to evaluate the liquefaction potential of alluvial deposits beyond depths of 80 feet.

8.4 References

Walsh, Timothy J., Logan, Robert A., Polenz, Michael, Schasse, Timothy C. Geologic Map of the Nisqually 7.5-minute Quadrangle, Thurston and Pierce Counties, Washington. Washington Department of Natural Resources, 2003.

WSDOT (Washington State Department of Transportation). 2022a. Bridge Design Manual. June 2022. Available at: < https://www.wsdot.wa.gov/publications/manuals/fulltext/m23-50/bdm.pdf > Accessed November 15, 2022.

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WSDOT (Washington State Department of Transportation). 2022c. Geotechnical Design Manual. July 2022.

9 VISUAL QUALITY

9.1 Introduction

9.1.1 Project Background and Description

In 2020, WSDOT completed a corridor study of Interstate 5 between SR 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This vital segment of I-5 connects Thurston and Pierce counties and provides access to Joint Base Lewis-McChord. The roadway travels through the Nisqually River estuary, traditional land of the Nisqually Indian Tribe, and habitat for federally listed threatened species of Puget Sound Steelhead.

In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin and Mounts Road interchanges through the Nisqually River Delta. The Planning and Environmental Linkages (PEL) study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

This next phase, a Focused PEL, will study I-5 from Marvin to Mounts Road (Exit 111 to Exit 116). The Focused PEL will consider additional technical analyses and input from interested parties to arrive at a final purpose and need and preferred alternative(s), to advance into the National Environmental Policy Act (NEPA) environmental review beginning in 2023.

Funding is provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing. Funding is also provided to construct three roundabouts on SR 507 as the only viable alternative to I-5.

9.2 Methods for Visual Quality Analysis

This section describes the methods used to support the I-5 Marvin to Mounts Road PEL Study and the subsequent National Environmental Policy Act (NEPA) documentation. Included is a description of the study area, relevant laws and regulations, and methods for collecting data, assessing impacts, and evaluating possible mitigation measures. The analysis is designed to comply with NEPA and relevant federal, state, and local laws.

9.2.1 Study Area

The project is located within Thurston and Pierce Counties and the City of Lacey and extends between Exit 111 and Exit 116 on I-5. Consistent with FHWA methodology, the study area for visual resources is known as the area of visual effect (AVE). The AVE encompasses areas from which changes associated with the project would be potentially visible. Given this variety of landscape types within the project area, the AVE will vary by location. For this project, the AVE is considered to consist of areas along both sides of the I-5 corridor that are within approximately 0.5 miles of the project footprint.

Figure D-38 shows the current I-5 Marvin Road to Mounts Road Project primary study area.

9.2.2 Relevant Laws and Regulations

The methodology and terminology used in identifying and assessing visual impacts for this project is based on the 2015 Federal Highway Administration (FHWA) *Guidelines for the Visual Impact Assessment of Highway Projects* (FHWA-HEP-15-029) and Chapter 459 of the *WSDOT Environmental Manual* (July 2022).

The following is a list of federal, state, and local laws, regulations, plans, policies, and guidance documents that guide or inform the assessment of visual quality:

Federal

- National Environmental Policy Act (NEPA) 42 USC 4321-4370 and federal implementing regulations 23 CFR 771 (FHWA) and 40 CFR 1500-1518 (CEQ)
- Highway Beautification Act of 1965 (23 CFR 750-752)
- Department of Transportation Act of 1966 Section 4(f)
- Federal-aid Highway Act of 1970 (23 U.S.C. 109(h))
- Intermodal surface Transportation Efficiency Act of 1991 National Scenic Byways Program (23 U.S.C. 162)
- Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1273)
- National Trails System Act of 1968 (16 U.S.C. 1242)
- National Historic Preservation Act 1966 Section 106 (16 USC 470 et seq.)
- Land and Water Conservation Fund (LWCF) Act Section 6(f) (54 USC 2003 § 200301-200310), implemented by the Washington Recreation and Conservation Office (RCO) (RCW 79A.25)

State

- State Environmental Policy Act (SEPA) and state implementing regulations WAC 197-11 and WAC 468-12
- Highway Beautification Act of 1961 (RCW 47.40.010)
- Open Space Land Preservation (RCW 84.34)
- Aquatic Lands Act (RCW 79.105, WAC 332-30), Department of Natural Resources (DNR)
- Growth Management Act (GMA) (RCW 36.70A), implemented by local jurisdictions and incorporated in Comprehensive Planning process (WAC 365-196)

Local

- Shoreline Management Act (SMA) (RCW 90.58), implemented by local jurisdictions and approved by Ecology

Figure D-38. Project Study Area

9.2.3 Data Sources and Data Collection Methods

Existing conditions will be documented using a combination of GIS mapping, field investigations, photographs, and a review of preliminary engineering plans and past visual quality analyses. This analysis will include a review of the existing zoning codes and comprehensive plans for each of the jurisdictions that would be affected by the project to understand each jurisdiction's future land use plans and urban design goals.

9.3 Impact Evaluation Methods

The Visual Impact Assessment process consists of four phases: establishment, inventory, analysis, and mitigation. In each of the four phases, the methodology considers the relationship between the affected environment (visual resources) and the affected population (viewers). This type of analysis stems from the idea of transactional perception in which perception (visual quality) is the result of the interaction between viewers and the environment, rather than the intrinsic characteristics of each taken in isolation. Figure D-39 illustrates the process for evaluating visual impacts, which is described below.

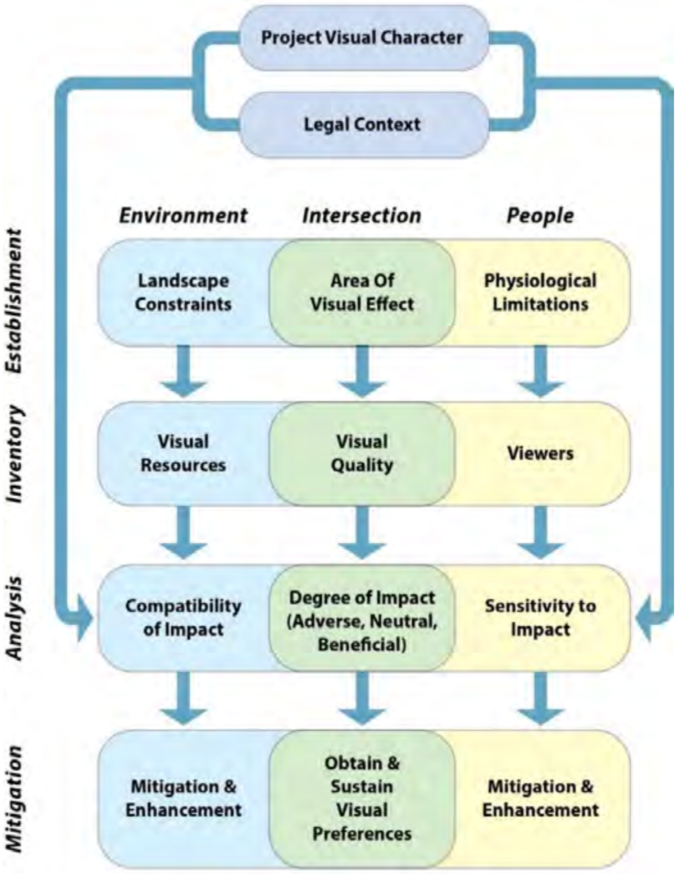
During the ***establishment phase***, the AVE is defined by considering the topography, vegetation, and limits of human sight that constrain the visual environment of the project.

In the ***inventory phase***, the AVE is categorized into distinct landscape units, and viewer types are identified. Representative viewpoints are selected, and the existing visual quality is described based on each viewpoint's natural harmony, cultural order, and project coherence.

In the ***analysis phase***, project effects are evaluated from each viewpoint by analyzing the changes to natural harmony, cultural order, and project coherence that were identified during the inventory phase. These impacts are then categorized as beneficial, adverse, or neutral.

Finally, during the ***mitigation phase***, methods for avoiding, minimizing, or mitigating for adverse impacts are identified, yielding a description of how the project might lessen or eliminate any undesirable visual effects.

Figure D-39. Diagram Illustrating Visual Impact Assessment Process



Source: FHWA *Guidelines for the Visual Impact Assessment of Highway Projects*

9.3.1 Terminology

The terminology below is based upon the 2015 FHWA Guidelines.

- **Landscape Units**: The spatial units typically used for assessing visual impacts. Landscape units are defined areas through which a proposed project would pass, that have similar visual features, homogeneous visual character and frequently, a single viewshed.
- **Viewers**: Viewer categories generally include “neighbors” (people with views to the road) and “travelers” (people with views from the road). The discussion in this document considers neighbors and travelers because both are found within the AVE. Neighbors are found within the Billy Frank Jr. Nisqually National Wildlife Refuge, in adjacent businesses and nearby residential areas. Travelers are found on roads in the area and on I-5. The travelers on this section of I-5 are assumed to be a mix of nearby residents, people visiting the businesses and recreational areas, and people passing through the area.
- **Viewer Responses**: The degree to which viewers are sensitive to changes in the visual character of visual resources. It is the consequence of two factors, viewer exposure and viewer awareness.
- **Viewer Exposure**: Viewer exposure is a measure of proximity (the distance between viewer and the visual resource being viewed), extent (the number of viewers viewing), and duration (the length of time over which visual resources are viewed). The greater the exposure, the more viewers will be concerned about visual impacts. For this document viewer exposure is classified as high, average, or low.
- **Viewer Awareness**: Viewer awareness is a measure of attention (level of observation based on routine and familiarity), focus (level of concentration), and protection (legal and social constraints on the use of visual resources). The greater the awareness, the more viewers will be concerned about visual impacts. For this document, viewer awareness is classified as high, average, or low.
- **Visual Character**: The non-evaluative description of the visible attributes of a scene or object that can use artistic terms such as form, line, color, and texture. Descriptions of visual character can also relate to types of land use and the visual characteristics associated with that land use. For example, single family residential land uses also have a single family residential visual character that most people can visualize. The same can be applied to other land uses such as parks, industrial areas, natural areas, etc. and their influences on visual character.
- **Visual Quality**: What viewers like and dislike about visual resources that compose the visual character of a particular scene. Different viewers may evaluate specific visual resources differently based on their interests in natural harmony, cultural order, and project coherence. Neighbors and travelers may, in particular, have different opinions regarding what they like and dislike about a scene.
    - **Natural Harmony**: What a viewer likes and dislikes about the natural environment. Viewers identify the visual resources of the natural environment as being either harmonious or inharmonious. Harmony is considered desirable;

disharmony is undesirable. For this document, the degree of natural harmony is expressed as high (harmonious), average (neutral), or low (inharmonious).

  - **Cultural Order**: What a viewer likes and dislikes about the cultural environment. Viewers label the visual resources of the cultural environment as being either orderly or disorderly. Order is considered desirable; disorder is undesirable. For this document, the degree of cultural order is expressed as high (orderly), average (neutral), or low (disorderly).
  - **Project Coherence**: What the viewer likes and dislikes about a project's environment. For highway projects, this means what viewers would like or dislike about existing highway features and how a proposed project would change, not change, or be consistent with those features. A highway project's coherence would usually apply only to features within the project footprint and/or within the highway right-of-way, not on lands adjacent to the highway. The viewer labels the visual resources of the project environment as being either coherent or incoherent. Coherence is considered desirable; incoherence is undesirable. For this document, the degree of project coherence is expressed as high (coherent), average (neutral), or low (incoherent).

The 2015 Federal Highway Administration (FHWA) *Guidelines for Visual Impacts Assessment of Highway Projects* (FHWA, 2015) describes impacts to visual quality as being determined by assessing changes to visual resources and the predicted viewer response to changes. The guidelines define impacts as being beneficial, neutral, or adverse. For this analysis, impacts that would reduce visual quality are defined as adverse or slightly adverse impacts. A project would have adverse or slightly adverse impacts if it would degrade visual quality or obstruct or alter views. Beneficial impacts would include enhancing visual resources, blocking undesirable views (such as of traffic on I-5) or creating better views and improving visual quality.

- **Visual Resources**: The FHWA guidelines recognize three types of visual resources:
  - *Natural Visual Resources* include landforms and land cover such as trees, vegetation, and water.
  - *Cultural Visual Resources* include manmade elements such as roadways, embankments, bridges, and buildings.
  - *Project Visual Resources* include the existing highway's geometrics, structures, and fixtures, as well as those that will be placed in the environment as part of a proposed project. For this document, the project visual resources are considered to be project components found within the project footprint.

9.3.2 Mitigation Development

Mitigation for potential visual quality effects would be developed in accordance with the WSDOT Roadside Policy Manual (February 2022).

9.4 Existing Conditions

This section describes the existing Visual resources within the study area.

9.4.1 Establishment Phase

Area of Visual Effect

The AVE for visual resources encompasses areas from which changes associated with the project would be potentially visible. The project area includes landscapes ranging from dense stands of trees which restrict views on portions of the route, to wide-open spaces containing buildings and landscaped areas. Given this variety of landscape types within the project area, the AVE varies by location. For this project, the AVE is considered to consist of areas along both sides of I-5 that are within approximately 0.5 miles of the edge of the freeway.

This section of I-5 is a divided freeway with three lanes in each direction. The landscape is higher on either end of the corridor, and lower through the center section in the Nisqually River valley. The road includes two sets of bridges as I-5 crosses over the Nisqually River and McAllister Creek (also known as Medicine Creek). There are structures that cross over I-5 in this corridor, including Mounts Road/Nisqually Road (exit 116), two train bridges near the northeast end, the southbound offramp and exit 114, Meridian Road, and Marvin Road (exit 111).

Landscape Units

This portion of the project area contains three visually distinct areas, each of which has been identified as a landscape unit. The three landscape units used in the analysis are shown on Figure D-40.

- **Landscape Unit 1 - Lacey**: From approximately 0.5 miles west of the Marvin Road interchange (exit 111) east to Meridian Road.
- **Landscape Unit 2 - Nisqually**: From Meridian Road to the BNSF Railroad tracks.
- **Landscape Unit 3 - JBLM**: From the BNSF Railroad tracks to the Martin Road interchange (Exit 116).

Figure D-40. Landscape Unit 1 - Lacey

Source: Google Maps, 2023

9.4.2 Inventory Phase

The inventory of visual resources in each landscape unit is described by its location relative to I-5 – on the north or south side of the highway. Within each of these components of the landscape unit, the inventory identifies visual resources (natural and cultural, and project), describes the visual character of the component, and evaluates the visual quality of existing views associated with the component. The visual quality was evaluated using the principles of landscape assessment identified in the FHWA's *Guidelines for the Visual Impact Assessment of Highway Projects* (FHWA, 2015). The following variables were taken into account when evaluating the visual quality of each view:

- The view's natural features and degree of natural harmony.
- The view's cultural features and degree of cultural order.
- The relationship of the existing roadway features to the landscape setting in terms of degree of project coherence.

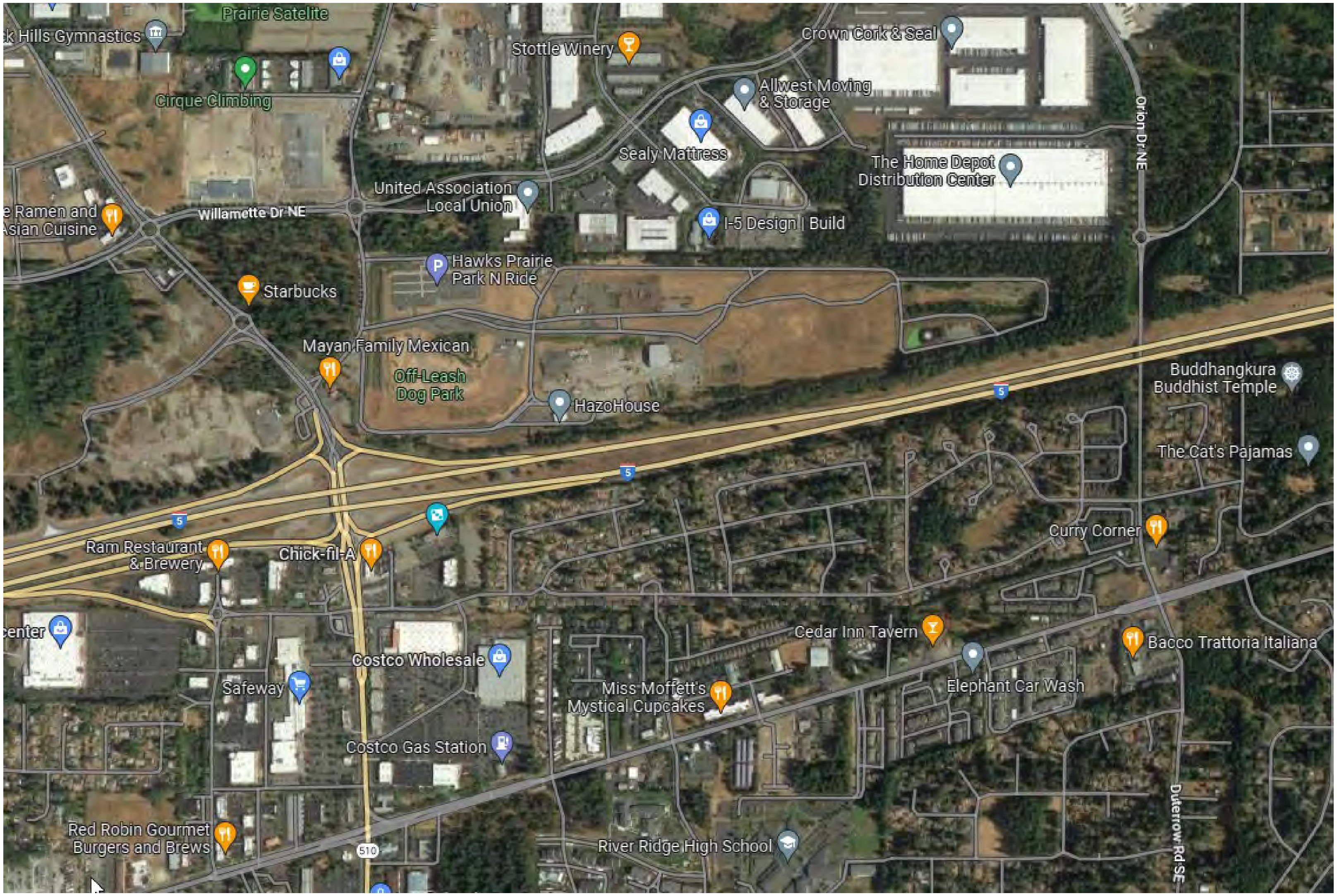
The inventory of viewers in each landscape unit is described for people (neighbors) on each side of the highway as well as people (travelers) on I-5 looking at each side of the highway and along the I-5 right-of-way. The exposures, awareness, and sensitivity of the viewers are also described.

Landscape Unit 1 – Lacey

Visual Resources

Figure D-41 shows an aerial view of Landscape Unit 1 – Lacey, which starts approximately 0.5-mile west of the Marvin Road interchange east to Meridian Road.

Figure D-41. Landscape Unit 1 - Lacey



Source: Google Maps, 2023

South of I-5 and west of Marvin Road in Landscape Unit 1 – Lacey is the Tanglewilde Thompson Place neighborhood; south of I-5 and east of Marvin Road is the Meadows neighborhood. Cultural features here include a mix of commercial uses centered around Marvin Road that range from small, single-story office and retail buildings to big-box stores with large parking areas. There is little vegetation in this area with the exception of some landscape plantings, mostly in and around the parking lots. Further east and west of the interchange, the visual character transition to residential neighborhoods. The density of buildings in this area block views of I-5 for all except those nearest the interchange. There is an existing noise wall and row of vegetation, including tall conifers, both east and west of the interchange, that block the views to and from I-5 and the residential areas. The vegetated strip between I-5 and the residential properties to the south gets wider the further away it is from the interchange.


Northbound I-5 looking SE. A Noise wall and trees separate I-5 from the neighboring residences


Views toward I-5, looking south from the Off-leash Dog Park

The area north of I-5 is known as the Hawks Prairie neighborhood. This area has an industrial/commercial visual character. East of Marvin Road includes development such as the Thurston County Waste and Recovery Center, an off-leash dog park, a park and ride lot, a restaurant, and warehouses. There are small stands of forested areas between businesses that break up the stark industrial character of the landscape here. Even the dog park has an industrial character as it sits on an old landfill site and is surrounded by methane collection piping. West of Marvin Road is land owned and managed by the Nisqually Indian Tribe, including one retail smoke shop. The rest of that site is mostly undeveloped with a sparce stand of conifers near the border with I-5 and another on the north side of the parcel. Little of the I-5 roadway is visible from the properties to the north due to the grade change and the roadside vegetation. Likewise, with I-5 sitting at a lower elevation than the properties to the north, views of those uses are mostly blocked by trees and bushes.

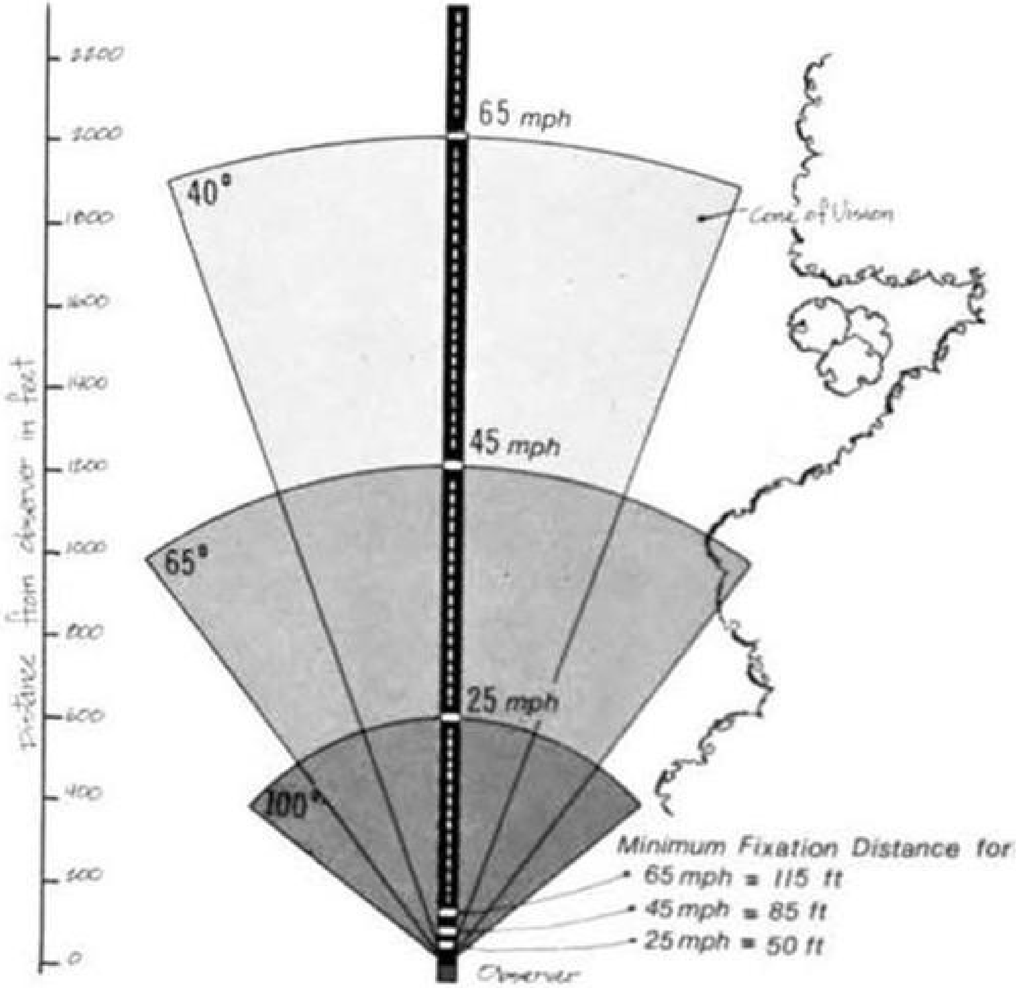
Viewers


Views toward I-5, from southeast of the Marvin Road interchange

The viewers in Landscape Unit 1 that have the highest degree of viewer exposure and awareness are businesses closest to the Marvin Road interchange (exit 111), south of I-5. The closest viewers are the businesses directly adjacent to the northbound I-5 off-ramp and on-ramp. These businesses include the Harley Davidson motorcycle shop, several restaurants, a hotel, and a casino. Most of the buildings near I-5 are oriented away from the highway (the backs and sides of the buildings generally face I-5). Due to that orientation, Marvin Road and the interchange crossing over I-5 are more visible and prominent than the I-5 mainline roadway; however, with the nearest building being less than 100 feet from the off-ramp, there is a high degree of potential exposure for those businesses, but a medium to low degree of viewer awareness. Although they are slightly further away from I-5 and at a higher elevation, the viewers who have the highest probability to notice changes to I-5 are those at the Off-leash Dog Park due to being outside, rather than in a building. They have a high degree of viewer exposure and a medium degree of viewer awareness. The viewers in the remainder of Landscape Unit 1 would have a low degree of viewer exposure and awareness.

Most viewers (travelers) driving on I-5 in Landscape Unit 1 are focused on the roadway. Because of the speed at which they are traveling (50-60 mph), drivers are restricted to a 40-degree viewing angle (Figure D-42), which requires them to focus on the highway in front of them and results in a low to average degree of viewer exposure. Due to the speed of travel and the lack of notable visual features seen from I-5 in this part of Landscape Unit 1, the viewer awareness of travelers is low.

Figure D-42. Viewing Angle and Speed



Source: Bureau of Land Management, Visual Resource Management Program (Course 8400-05)

Landscape Unit 2 – Nisqually Valley

Visual Resources


Northbound I-5 at the west end of Landscape Unit 2

Landscape Unit 2 – Nisqually Valley starts at Meridian Road and goes northeast through the Nisqually River valley to the BNSF railroad tracks (Figure D-43). From Meridian Road, east and down the hill into the valley, this unit transitions from the more developed areas in Landscape Unit 1 into a more rural, natural environment.

The features on the west end of Landscape Unit 2, on both sides of I-5, include areas of single-family residences, churches and small businesses separated from the highway by groves of conifers. The nearest buildings in this area are more than 200 feet from the roadway. In addition to being separated by vegetation, I-5 is at a lower elevation, so the roadway and adjacent buildings are not visible to or from each other. With generally larger lot sizes and more native vegetation, this portion of Landscape Unit 2 has a natural character with some cultural elements.


View from I-5, looking south toward the Nisqually Valley agricultural areas

From McAllister Creek to the Nisqually River, the terrain flattens out with trees mostly along the water. There are a few businesses directly south of the Nisqually interchange (exit 114) that include restaurants, automotive, and a gas station. The Nisqually Commercial Park is used for both long- and short-term RV camping. Between Brown Farm Road and the Nisqually River are two large agricultural businesses – a commercial nursery and the Schilter Family Farm – a few more rural residences, and another small commercial area. The Wa-He-Lute Indian School sites on the west bank of the river in this area. Most of the areas south of Martin Way are in active agriculture production. Most of the buildings near I-5 are oriented away from the highway (the backs and sides of the buildings generally toward I-5), with their focus more toward the waterways and agricultural fields. Even with the commercial areas, this Landscape Unit has a natural visual character. I-5 is slightly elevated above the valley floor in this area, which allows good views from the roadway toward the fields and beyond. On clear days, viewers traveling north can see the top of Mt. Rainier from I-5 in this area.

Figure D-43. Landscape Unit 2 – Nisqually Valley

Source: Google Maps

The remainder of Landscape Unit 2 north of I-5 is within the Billy Frank Jr. Nisqually National Wildlife Refuge, which serves as both a conservation area and a major recreation site for the region. As I-5 drops down into the valley, from either end, the landscape opens up and affords views out to the mouth of the delta. From the roadway, the view north is of the Nisqually River delta, including both McAllister Creek (also known as Medicine Creek), the Nisqually River, and both fresh and saltwater habitats. At the northern edge of the I-5 right-of-way, where McAllister Creek crosses I-5, is the location of the Medicine Creek Treaty National Memorial site. For people passing on I-5, there are little to no cultural features visible. The views from I-5 have very natural characteristics.

Views from I-5 toward the Billy Frank Jr. Nisqually National Wildlife Refuge

View of the Nisqually Commercial Park RV facility from I-5

Viewers

The viewers in Landscape Unit 2 that have the highest degree of viewer exposure and awareness are the visitors and residents at the Nisqually Commercial Park RV facility. This area of I-5 is elevated above the RV park and approximately 400 feet away. With little vegetation between the RVs and the roadway, as well as the stationary nature of the park users, they have a high degree of exposure and awareness.

Visitors to the Billy Frank Jr. Nisqually National Wildlife Refuge, north of I-5, are mostly pedestrians. Their exposure to views of I-5 is much longer than that of viewers in vehicles. The trails through the refuge are located at varying distances from I-5 and are generally at the same or slightly lower elevation; however, there is vegetation between the trails and I-5 that block most views. Due to the amount of I-5 that can be seen in comparison to the vast views of the delta within the refuge, those viewers have a low degree of viewer exposure and a low degree of viewer awareness. The viewers in the remainder of Landscape Unit 2, from south of I-5, would have a low degree of viewer exposure and awareness due to limited views and exposure.

Views toward I-5 from the Billy Frank Jr. Nisqually National Wildlife Refuge

Most viewers (travelers) driving on I-5 in Landscape Unit 2 are focused on the roadway. Because of the speed at which they are traveling (50-60 mph), drivers are restricted to a 40-degree viewing angle (Figure D-44), which requires them to focus on the highway in front of them and results in a low to average degree of viewer exposure. The Billy Frank Jr. Nisqually National Wildlife Refuge and the agricultural areas in Landscape Unit 2 are notable visual features seen from I-5. Although the drivers' views are limited due to the speeds of travel, their viewer awareness is high.

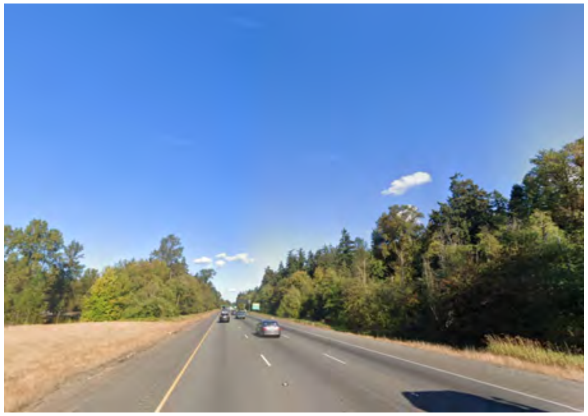
Landscape Unit 3 – JBLM

Visual Resources

Landscape Unit 3 – JBLM starts at the BNSF railroad tracks and continues to the Mounts Road interchange (Exit 116) (Figure 41).

The Landscape Unit 3 features north of I-5 include an area of rural residences and the Eagle's Pride Golf Course. Most structures are separated by mature vegetation and cannot be seen from I-5. The exceptions are two residences that are less than 100 feet from the roadway, and portions of the golf course. I-5 is at a slightly higher elevation than the residences, and at a lower elevation than the golf course. With generally large residential lot sizes and dense stands of vegetation, this portion of Landscape Unit 3 has a natural character with some cultural elements.


One of the residences in Landscape Unit 3, visible from I-5 southbound


Northbound I-5 and dense vegetation on JBLM land

All of the land south of I-5 in Landscape Unit 3 is owned by the Department of Defense – Joint Base Lewis McChord (JBLM) and is mostly undeveloped. There is one public frontage road, Nisqually Rd SW, and a few JBLM access roads. The rest of the land is densely vegetated with mature forest. This area is elevated slightly above the roadway. There are no views of I-5 from the south, except at the Mounts Rd interchange. This portion of Landscape Unit 3 has a natural character.

Figure D-44. Landscape Unit 3 – JBLM

Source: Google Maps, 2023

Viewers

The viewers in Landscape Unit 3 that have the highest degree of viewer exposure and awareness are the residents in the homes closest to the roadway, north of I-5. Views of I-5 from those residences are partially blocked by vegetation and the roadway embankment; however, due to the proximity and highly disparate nature of I-5 and the rural neighborhood, viewer exposure and awareness of residents is high.

Most viewers driving on I-5 in Landscape Unit 3 are focused on the roadway. Because of the speed at which they are traveling (50-60 mph), drivers are restricted to a 40-degree viewing angle (Figure D-44), which requires them to focus on the highway in front of them and results in a low to average degree of viewer exposure. Both northbound and southbound travelers in this area see mainly trees. Due to the speed of travel and the lack of notable visual features seen from I-5 in Landscape Unit 3, the viewer awareness of travelers is low.

9.5 References

Federal Highway Administration (FHWA), 2015. *Guidelines for the Visual Impact Assessment of Highway Projects* (FHWA-HEP-15-029). Retrieved from: *https://www.environment.fhwa.dot.gov/env_topics/other_topics/VIA_Guidelines_for_Highway_Projects.pdf*

Google Maps. 2023. Interstate 5 and surrounding areas. Accessed March 2023. Retrieved from: *https://www.google.com/maps/@47.07197,-122.7112071,5832m/data=!3m1!1e3*.

Washington State Department of Transportation (WSDOT), 2022. *Roadside Policy Manual* (M 3110.04). Retrieved from: *https://www.wsdot.wa.gov/publications/manuals/fulltext/M3110/RPM.pdf*

Washington State Department of Transportation (WSDOT), 2022. *WSDOT Environmental Manual*. June 23, 2022. Retrieved from: *https://wsdot.wa.gov/engineering-standards/all-manuals-and-standards/manuals/environmental-manual*.

10 AIR QUALITY, GREENHOUSE GASES, AND ENERGY

10.1 Introduction

10.1.1 Project Background and Description

In 2020, WSDOT completed a corridor study of Interstate 5 between SR 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This vital segment of I-5 connects Thurston and Pierce counties and provides access to Joint Base Lewis-McChord. The roadway travels through the Nisqually River estuary, traditional land of the Nisqually Indian Tribe, and habitat for federally listed threatened species of Puget Sound Steelhead.

In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin and Mounts Road interchanges through the Nisqually River Delta. The Planning and Environmental Linkages (PEL) study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

This next phase, a Focused PEL, will study I-5 from Marvin to Mounts Road (Exit 111 to Exit 116). The Focused PEL will consider additional technical analyses and interested party input to arrive at a final purpose and need and preferred alternative(s), to advance into the National Environmental Policy Act (NEPA) environmental review beginning in 2023.

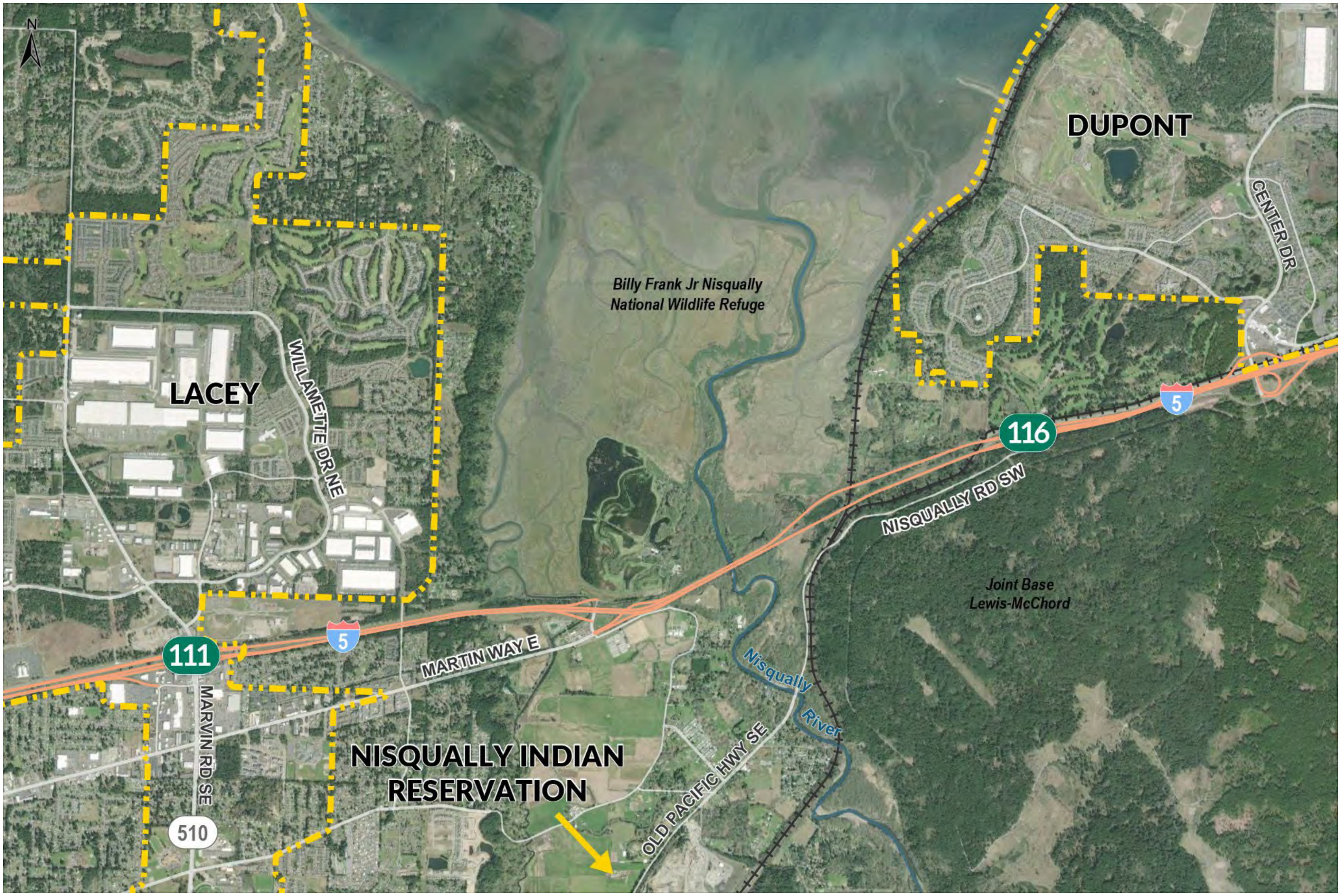
Funding is provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing. Funding is also provided to construct three roundabouts on SR 507 as the only viable alternative to I-5.

10.1.2 Project Vicinity

The project is located within Thurston and Pierce Counties and the City of Lacey. It lies between the City of Dupont to the east, the City of Lacey to the west, the Nisqually Indian Reservation and Joint Base Lewis-McChord to the south. The segment of I-5 that is part of the project passes through the Nisqually River and Billy Frank Jr Nisqually National Wildlife Refuge.

Figure D-45 shows the project vicinity and the current I-5 Marvin Road to Mounts Road Project primary study area along I-5 between Exit 111 and Exit 116.

Figure D-45. Project Vicinity



10.2 Methods for Air Quality Analysis

10.2.1 Study Area

The study area will include all areas within 0.5-mile of the project corridor, which extends between Exit 111 and Exit 116 on I-5 (see Figure D-45 above), as well as any other roadway links impacted by the project alternatives.

10.2.2 Relevant Laws and Regulations

The following is a list of federal, state, and local laws, regulations, plans, policies, and guidance documents that guide or inform the assessment of air quality:

Federal

- National Environmental Policy Act (NEPA) 42 USC 4321-4370 and federal implementing regulations 23 CFR 771 (FHWA) and 40 CFR 1500-1518 (CEQ).
- Clean Air Act (CAA) 42 USC 7401-7431 et seq. and Clean Air Act and Amendments (CAAA) of 1990.
- 40 CFR 93 Federal conformity regulations, including exempt projects in 40 CFR 93.126.
- 23 CFR 450 FHWA regulations for statewide and metropolitan transportation planning and programming are defined in Planning Assistance and Standards
- FHWA Technical Advisory T 6640.8A for NEPA documents, Section 8 for Air Quality and Section 22 for Energy.
- President’s Executive Order 13423 Strengthening Federal Environmental, Energy, and Transportation Management.
- U.S. Department of Transportation Guidance on Fuel Consumption and Air Pollution, including USDOT Order 5610.1C and Energy Requirements for Transportation Systems

State

- State Environmental Policy Act (SEPA) and state implementing regulations WAC 197-11 and WAC 468-12.
- Washington Clean Air Act, RCW 70A.15.
- WAC 173-420 state conformity regulations, including exempt projects in WAC 173-420-110 and WAC 173-420-120.
- WAC 173-400-040(9) state fugitive dust regulations.
- RCW 39.35D requires that new “major facility projects” achieve the Leadership in Energy and Environmental Design (LEED) silver building rating standard.
- RCW 70A.45.20 establishes the emissions reductions to be achieved by the state.
- RCW 47.01.440 specifies the requirements for meeting statewide goals to reduce per capita annual vehicle miles traveled.

Local

Appendix A. Memorandum of Agreement on Fugitive Dust from Construction Projects (1999) between WSDOT and the Puget Sound Clean Air Agency (PSCAA).

Appendix B. Guide to Handling Fugitive Dust from Construction Projects (1997) from Construction Projects by the Associated General Contractors (AGC) of Washington.

10.2.3 Data Sources and Data Collection Methods

The following is a list of the data that will be used to determine and describe air quality resources/existing conditions. It includes data that will used if or when a quantitative analysis is necessary.

Appendix A. Project Traffic Engineers analysis and data
Appendix B. Washington State Department of Transportation traffic data
Appendix C. Puget Sound Clean Air Agency air pollutant monitor data
Appendix D. MSAT emissions trends presented in FHWA's Interim Guidance
Appendix E. Washington State Department of Ecology data
Appendix F. EPA Motor Vehicle Emission Simulator (MOVES) input files

10.2.4 Impact Evaluation Methods

Long-Term Impacts

The project area is designated by EPA as in attainment for all NAAQS and does not require a detailed project-level analysis to demonstrate that there would be no exceedance of the NAAQS. A summary of concentration levels at nearby pollutant monitoring sites will be presented in the report. While an emissions burden for criteria pollutants is no longer required, as per WSDOT's *Guidance on Addressing Air Quality, Greenhouse Gas Emissions, and Energy for WSDOT Projects*, one will be produced if determined appropriate for the project, as may well be the case as the project transverses sensitive and nationally significant wetlands and salmon spawning habitat.

It is expected that in accordance with FHWA guidance, a quantitative analysis of MSATs will be required, as future AADT will likely exceed 140,000.

The project's impact on GHGs over the long-term will be evaluated quantitatively by comparing existing emissions to the projected emissions with or without the project at several future years.

If or when an EIS is required, a quantitative analysis of operational energy use and emissions of criteria pollutants (if needed), GHGs, and MSATs will be presented in accordance with WSDOT guidance. This will be conducted using EPA MOVES and traffic data provided by the project engineers. Induced traffic from the project will be indicated by an increase in VMT in the future Build scenarios relative to the future No Build scenarios. The emissions of criteria pollutants, GHGs, and MSATs due to induced demand will be reflected in the emissions burden produced for the future Build years.

Criteria Pollutants

Mobile Source Air Toxics

Greenhouse Gas Emissions

Energy

Short-Term Construction Impacts

The analysis of direct short-term air quality impacts that would occur during Project construction will consist of a qualitative discussion of typical sources of pollutant emissions from the types of construction activities needed to implement the Project. If or when an EIS is required, a quantitative analysis using the FHWA ICE model, of energy use and GHG emissions from construction will be provided.

Greenhouse Gas Emissions

Energy

10.2.5 Mitigation Development

Short-term impacts to air quality from construction will be minimized by taking the measures stipulated in the 2003 Record of Decision and by compliance with WSDOT's Environmental Manual M31-11 and the Memorandum of Agreement entered into by WSDOT and the Puget Sound Clean Air Agency for controlling fugitive dust. Close attention will be paid to the minimizing of pollutant deposition into wetlands and streams.

10.3 Affected Environment

10.3.1 Environmental Concerns

The I-5 Marvin to Mounts Road project passes through the Nisqually River Valley, the traditional home of the Nisqually Indian Tribe and an environmentally sensitive area and important habitat for endangered Chinook salmon and steelhead.

The Nisqually River delta was determined by Washington Department of Ecology (DOE) to be impaired by pollutants and is included on the state 303(d) list as among the waters prioritized for clean-up and requiring a Total Maximum Daily Load (TMDL) plan. The project is also adjacent to the Billy Frank Jr. Nisqually National Wildlife Refuge and has a high ecological stewardship priority rank.

Currently, a bend in the Nisqually River is moving towards I-5 and is expected to reach the interstate within 17 to 30 years. This, combined with the expectation of more frequent extreme storm events, rising sea levels, and higher stream flows due to climate change, make the impact of greenhouse gas (GHG) emissions a particular concern.

10.3.2 Air Quality

The air quality in the project area is monitored by the Washington Department of Ecology (DOE), the Puget Sound Clean Air Agency (PSCAA) and the Olympic Region Clean Air Agency (ORCAA).

DOE, PSCAA, and ORCAA operate air quality monitoring stations to obtain data on actual ambient air quality concentrations. Information from these stations determines whether the region meets the National Ambient Air Quality Standards (NAAQS) and assists in providing background level concentrations in the project vicinity.

Areas of the country exceeding the NAAQS for a given pollutant are classified as “non-attainment” areas. From 1992 to 1995, Pierce County was designated as a non-attainment area for carbon monoxide and ozone. Based upon monitoring results, which showed no exceedances for several years, the EPA in 1996 re-designated the entire Puget Sound area as a “maintenance” area for these pollutants. In 1992, portions of the industrial areas of Pierce and Thurston Counties were declared to be PM10 non-attainment areas but were redesignated as “maintenance” areas in 2001 and 2000 respectively. Former non-attainment areas that have been re-designated as maintenance areas are required to continue to maintain air quality by adhering to a “maintenance plan” developed as part of the re-designation process. Transportation projects must demonstrate “conformity” with the control measures specified in the Washington State Implementation Plan (SIP) adopted as part of this re-designation process.

The I-5 Mounts to Marvin Road project lies within an area that is in attainment for all the priority pollutants. At the nearest point, it is located approximately 3.5 miles from the monitoring station operated by the ORCAA located at Lacey-College Street. The built environment of the monitoring station area is dissimilar to most of the project site and therefore, its data does not represent project area conditions.

10.4 References

Federal Highway Administration. 2023. Updated Interim Guidance on Mobile Source Air Toxic (MSAT) Analysis in National Environmental Policy Act (NEPA) Documents. January 2023. Available at: *https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm*. Accessed April 11, 2023.

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WSDOT (Washington Department of Transportation). 2022. Interstate 5 Tumwater to Mounts Road Planning and Environmental Linkages Study. March 2022. Available at: *https://wsdot.wa.gov/sites/default/files/2022-03/I-5-study-tumwater-mounts-rd-PEL.pdf*. Accessed February 7, 2023.

11 CULTURAL RESOURCES AND HISTORIC BRIDGES

11.1 Introduction

11.1.1 Project Background and Description

In 2020, WSDOT completed a corridor study of Interstate 5 between SR 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This vital segment of I-5 connects Thurston and Pierce counties and provides access to Joint Base Lewis-McChord. The roadway travels through the Nisqually River estuary, traditional land of the Nisqually Indian Tribe, and habitat for federally listed threatened species of Puget Sound Steelhead.

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This next phase, a focused PEL, will study I-5 from Marvin to Mounts Road (Exit 111 to Exit 116). The PEL Study will consider additional technical analyses and interested party input to arrive at a final purpose and need and preferred alternative(s), to advance into the National Environmental Policy Act (NEPA) environmental review beginning in 2023.

Funding is provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing. Funding is also provided to construct three roundabouts on SR 507 as the only viable alternative to I-5.

11.2 Methods for Cultural and Historic Resources Analysis

This section describes the methods used to support the I-5 Marvin to Mounts Road PEL Study and the subsequent NEPA documentation. This section includes a description of the study area, relevant laws and regulations, and methods for collecting data on inventoried resources, assessing impacts, and evaluating possible mitigation measures. The information methods and analysis in this document is provided to inform alternatives development and support development of future analysis under NEPA and relevant federal, state, and local laws.

11.2.1 Study Area

The project is located within Thurston and Pierce Counties and the City of Lacey. The study area for the PEL will include all areas within 600 feet of existing highway centerlines between Exit 111 and Exit 116 on I-5. The PEL study area is for screening and alternatives evaluation purposes to identify planning-level cultural resources considerations within the corridor where the majority of improvements are anticipated to take place and where the project is most likely to have direct effects on recorded and unrecorded cultural resources. Future refinements to the study area may be required as the project is further developed and reviewed during subsequent NEPA documentation.

Figure D-46 shows the current I-5 Marvin Road to Mounts Road Project primary study area.

11.2.2 Relevant Laws and Regulations

The project may be subject to review under multiple laws and regulations. Anticipated federal funding and permitting will require project review under Section 106 of the National Historic Preservation Act of 1966, as amended (Section 106; 54 USC §300101 et seq.). The WSDOT Environmental Manual identifies the following four-step process for State and Federal cultural resources reviews for projects: “(1) Define the Area of Potential Effects, (2) Initiate consultation with interested and affected parties, (3) identify cultural resources in the project area, and determine project impacts, and (4) work with consulting parties to avoid, minimize or mitigate adverse impacts to cultural resources” (WSDOT 2022: 456-2). Laws and policies applicable to project review include:

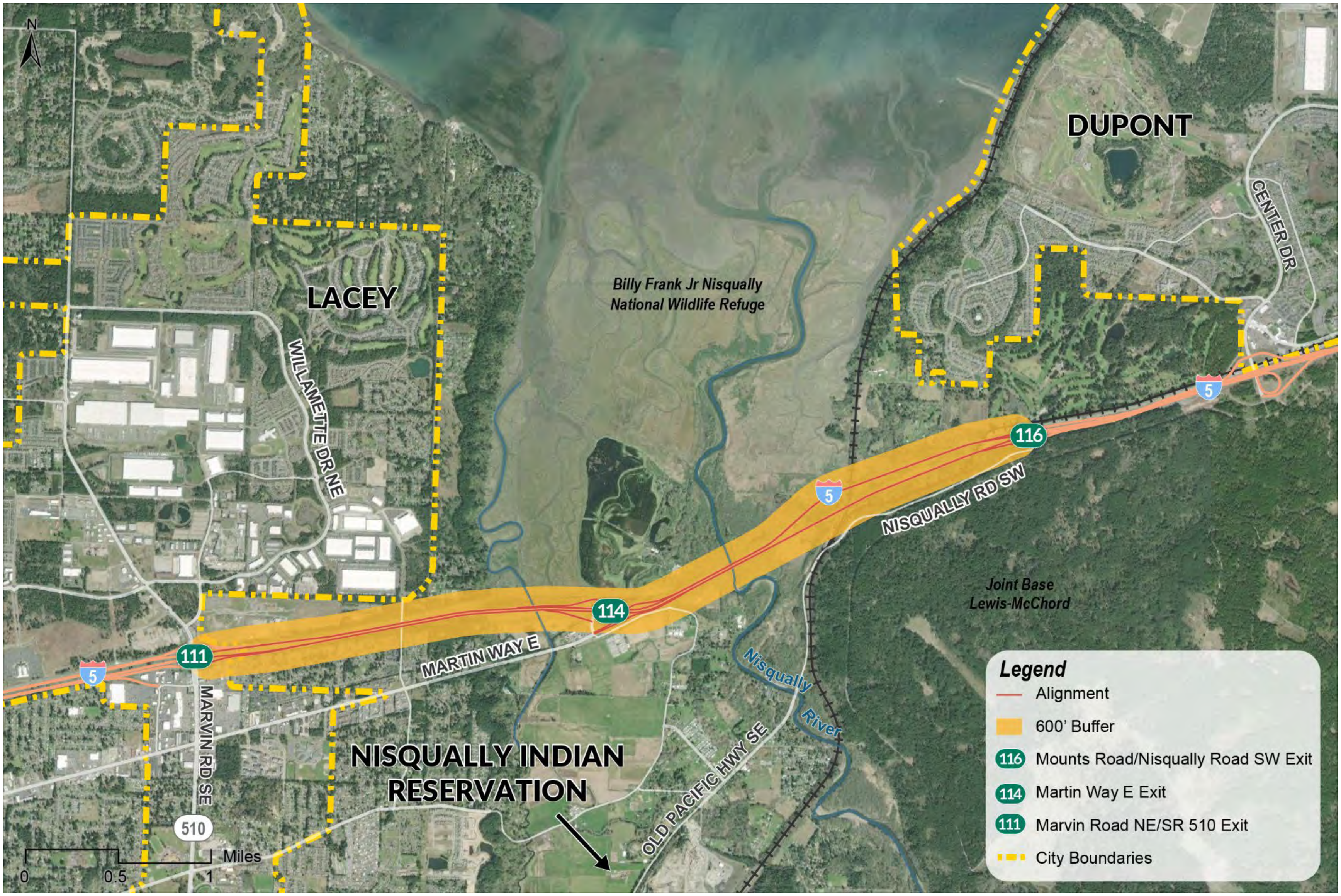
Federal Laws and Regulations

- Section 106
- Section 4(f) of the Department of Transportation Act (49 USC 303)
- National Environmental Policy Act of 1969 (42 USC §4321 et seq.)

State Laws and Regulations

- Centennial Accord
- State Environmental Policy Act (RCW 43.21C; WAC 197-11 and WAC 468-12)

Figure D-46. Project Study Area



Additional laws may apply to the treatment and handling of resources, including the following:

- Archaeological Sites and Resources Act (RCW 27.53)

- Indian Graves and Records Act (RCW 27.44)
- Abandoned and Historic Cemeteries and Historic Graves Act (RCW 68.60)
- Archaeological Resources Protection Act (43 CFR 7.6-7.11)
- Curation of Federally Owned and Administered Archaeological Collections (36 CFR 79)

11.2.3 Data Sources and Data Collection Methods

Existing literature was used to identify recorded cultural resources and previous efforts to identify and study cultural resources within the study area. The Washington State Department of Archaeology and Historic Preservation (DAHP) maintains WISAARD, an online system hosting prior cultural resources investigations and recorded historical and archaeological sites. Prior investigations and recorded sites were tabulated (included below) and their locations relative to the study area were reviewed. Reports were reviewed for findings and recommendations relevant to the Focused PEL.

11.2.4 Impact Evaluation Methods

This PEL reviewed recorded cultural resources, including recorded archaeological resources and known historic resources and assess the potential risk for additional cultural resources to be present within the study area as well as the potential for recorded or presently unrecorded sites to influence further project development. Risk classifications are not defined by WSDOT guidance. The following rankings will be applied to recorded cultural resources:

- **No Impact**: These sites are within the study area, however, prior investigation has demonstrated the site to have no historic significance.
- **High Impact**: These sites are within the study area and the results of prior investigation and the geographic extents suggest that intensive study to consider historic significance or consultation to resolve adverse effects will be required.
- **Unknown Impact:** These sites or potential sensitive locations, both horizontal and vertical, require further project development and either in-field data collection or other measures to determine potential impacts.

The assessment of cultural and historic resources completed for the Focused PEL does not provide recommendations for effect or resource eligibility determinations under Section 106 of the National Historic Preservation Act, as amended (Section 106) found within 36 CFR 800. Such determinations will be informed by future reconnaissance and intensive survey of the project alternatives that are advanced for further consideration under NEPA. Next steps will include review of geologic and cultural contexts, including recorded properties and prior investigations, allowing for recommendations for survey needs and methodologies, such as adequacy of pedestrian survey and traditional shovel probing, techniques to be employed to consider deeply buried sites, and research questions to be answered by a potential geoarchaeological study.

11.2.5 Mitigation Development

Mitigation, or resolution of adverse effects to cultural resources is determined during federal agency review pursuant to Section 106, in consultation with DAHP, affected tribes and consulting parties. Procedures and mitigation options are briefly discussed by WSDOT (2022).

11.3 Existing Conditions

This section describes the existing environmental resources within the study area for Cultural and Historic Resources. Information provided below includes the resources recorded with DAHP based on prior studies. The number of recorded cultural resources in a given study area does not always correspond to a full inventory of cultural resources. Additional resources may be present that are either presently unknown or unrecorded. Even where previous surveys exist, methods are often narrowly focused on potential project impacts which may be insufficient for identifying or observing resources for other proposed projects. For management purposes during Section 106 review, pursuant to 36CFR800, cultural resources are often discussed in terms of eligibility for listing on the National Register of Historic Places (NRHP).

11.3.1 Historic Resources

Historic Resources in Study Area

Seven recorded historic resources have been identified within the study area (Table D-53). Of these, five have completed Historic Property Inventory (HPI) forms recorded with DAHP, including four transportation related structures (HPI 85120, 85127 and 85128) or landscaping feature (HPI 680372) and one residential property (HPI 480912). Another recorded resource is a National Heritage Area, a generally defined area of Washington’s coastline with a commemorative purpose (Maritime Heritage Area, no HPI). Importantly, National Heritage Areas do not involve federal regulatory authority as a historic resource. The final resource is the actual Medicine Creek Treaty signing location (National Memorial, no HPI) which is memorialized elsewhere near the study area.

Table D-53. Recorded Historic Resources within Study Area by Impact Potential

HPI No.	Name	Location	Management Finding and Date	Within 600ft of Existing Centerlines?
HIGH IMPACT POTENTIAL				
N/A	**Medicine Creek Treaty National Monument**	North of existing SB I-5*	No prior inventory or evaluation	**Yes**
NO IMPACT POTENTIAL				
N/A	**Maritime Heritage Area**	Generalized throughout coastal Washington	N/A	**Yes**
680372	**Road of Remembrance (1929)**	XXXX I-5, Lakewood, WA	Determined Not Eligible for NRHP (DAHP: 2015)	**Yes**
480912	**Residence (1969)**	8436 Queets Dr NE	Determined Not Eligible for NRHP (DAHP: 2023)	**Yes**
UNKNOWN IMPACT POTENTIAL				
85120	**Old Nisqually Road UC Bridge (1960)**	Mounts Road, vicinity of Lakewood, WA	Determined Not Eligible for NRHP (DAHP: 2010, currently requires update)	**Yes**
85127	**Bridge 5/405E (1967)**	Interstate 5 (I-5), Lakewood, WA	Determined Not Eligible for NRHP (DAHP: 2010, currently requires update)	**Yes**
85128	**Burlington Northern Railway Fort Lewis Spur Bridge (1936)**	Interstate 5 (I-5), Lakewood, WA	Determined Not Eligible for NRHP (DAHP: 2010, currently requires update)	**Yes**

Sources: Washington State Department of Archaeology and Historic Preservation, US Fish & Wildlife Service.

** Information identifying the location of archaeological sites, historic sites, artifacts, or the site of traditional ceremonial, or social uses and activities of Indian Tribes are exempt from disclosure by RCW 42.56.300.*

NRHP Eligible and Listed Historic Properties

The five properties that are recorded with HPIs were also found not eligible for listing in the NRHP. DAHP requires that HPIs that are more than 10 years old need to be revisited with a new determination provided by the lead agency. At least three recorded properties will need new evaluations to assess the potential impact to any alternative. The Medicine Creek Treaty National Monument site is unrecorded. Due to the historical significance of the site and the protection within the Billy Frank Jr. Nisqually National Wildlife Refuge, it is likely to be a key consideration in alternatives and design selection, although the site remains unrecorded and unevaluated.

11.3.2 Archaeological Resources

Archaeological Resources in Study Area

Six archaeological sites are recorded within the study area (Table D-54). The known sites represent recent historic land use and Native use of the study area prior to Euroamerican settlement. All sites have been identified within 1.5 feet of the ground surface using traditional archaeological methods of pedestrian survey and shallow subsurface testing. DAHP's statewide predictive model classifies the study area as high to very high risk to contain archaeological resources. Archaeological investigations reported in

WISAARD have surveyed approximately 5% of the study area to varying degrees and it is possible that further survey will identify additional archaeological resources.

Table D-54. Recorded Archaeological Resources within Study Area by Impact Potential

Site No.	Name	Site Type	Management Finding and Date	Within 600ft of Existing Centerlines?
NO IMPACT POTENTIAL				
45PI540	**Grover McAllister Farmstead**	Historic Artifact Scatter	Determined Not Eligible for NRHP	**Yes**
UNKNOWN IMPACT POTENTIAL				
45PI1263	**N/A**	Pre-contact Lithic Isolate	N/A	**Yes**
45PI1405	**JBLM Apple Orchard**	Historic Orchard	Unevaluated	**Yes**
45TN57	**N/A**	Historic Farmhouse	Unevaluated	**Yes**
45TN58	**N/A**	Historic Artifact Scatter	Unevaluated	**Yes**
45TN346	**Shilter Farm Site**	Pre-contact Camp	Unevaluated	**Yes**

Source: Washington State Department of Archaeology and Historic Preservation.
Note: Information identifying the location of archaeological sites, historic sites, artifacts, or the site of traditional ceremonial, or social uses and activities of Indian Tribes are exempt from disclosure by RCW 42.56.300.

NRHP-Eligible and Listed Archaeological Resources

Only one of the six recorded archaeological sites has been subject to formal determination of eligibility; 45PI540 was determined not eligible for listing in the NRHP in 2011. Site 45PI1263 is an isolated pre-contact artifact, observed within a small number of shovel probes. Isolates are not typically considered eligible for listing in the NRHP, however, isolates indicate past use of an area and may represent past activity that extended beyond a previous survey area. The remaining four sites are unevaluated and formal determination will be necessary which may require additional investigation if within an alternative footprint.

11.4 References

WSDOT (Washington Department of Transportation). 2022b. Environmental Manual. July 2022. Available at: <https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-11/em.pdf> Accessed November 15, 2022.

12 NOISE

12.1 Introduction

12.1.1 Noise Study Area

The study area for traffic noise studies must be large enough to identify all potential noise impacts at noise sensitive properties related to the Project. For this Project, the preliminary study area includes noise sensitive properties within 500 feet of the project roadway construction along I-5 from the Marvin NE Road ramps to just north of the Mounts SW Road ramps. The preliminary 500-foot distance should be sufficient to make sure all project related noise impacts are identified. In addition to the north-south limits, the study area also includes noise sensitive uses east and west of the Project corridor.

Project construction will take place in the cities of Olympia, Lacey, and Dupont and includes a mix of state, city, federal, and Nisqually Indian Tribe owned land.

The preliminary Project boundary and noise analysis area are provided in Figures D-47 through D-51.

12.2 Existing Conditions

This section provides an overview of the FHWA land use categories and summarizes the land use in the project area, including planned and permitted developments and project related displacements. Due to the length of the corridor, and varying land use, several graphics were prepared to aid in the understanding of the project and the noise analysis. Figures D-47 through D-51 provide an overview of the project corridor, showing the project elements, landmarks and notable sensitive land uses and noise monitoring sites.

12.2.1 Existing Land Uses

Land uses are categorized by the FHWA along with the noise abatement criteria in 23 CFR 772. Table D-55 provides a summary of the FHWA land use categories that are used throughout this memorandum.

Table D-55. FHWA Land Use Categories

Land Use Type	Land use Description
A	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	Residential (single and multi-family units)
C	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A–D or F
F	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	Undeveloped lands that are not permitted

The Project corridor has a full range of land uses, including residences (Cat B), parks, natural areas, recreation facilities, a school and places of worship (all Cat C), hotels (Cat E), some sensitive commercial properties (also Cat E), industrial and commercial facilities and the Amtrak rail line (Cat F), and undeveloped lands (Cat G). Areas included in this analysis include all areas that could have noise impacts related to the construction and operation of the Project based on the project construction limits. Most commercial and all industrial land uses in the corridor are FHWA Category F and G, and therefore do not have an impact criterion and were not included in the study (see Table D-55). Land uses in the study area are summarized below by FHWA land use type and are shown on Figures D-47 through D-51.

Residences, a school and religious facility, and hotel-uses (FHWA Category B, C, and E) are located in mixed-use areas of Lacey, East Olympia, and Dupont along with high- and low-density commercial properties, parks and recreation areas, agricultural uses, and railway alignments.

The south end of the Project, which includes East Olympia and Lacey, at the I-5 and Marvin Road NE ramps, is predominantly a mix of high-density commercial and residential uses as well as some hotels. Days Inn and Best Western are the only hotels in the Project, both located south of I-5. East of the hotels is a dense housing development that runs along the south side of I-5 from Marvin Road NE to Meridian Rd NE. The majority are single-family residences with some multi-family apartments and townhomes near

Meridian Road NE. Residences in the area are located along a bluff over I-5 with many residences shielded by an existing noise wall. The noise wall ends just east of where Quinault Loop NE ends. The remaining houses are shielded by a berm.

East of Meridian Road NE to Brown Farm Road NE is predominantly single-family residences with some agricultural and commercial uses. Residences are both north and south of I-5 just east of Meridian Road NE. Most of these residences are found within dense housing developments. However, there are some low-density residences south of I-5. The Buddhangkura Buddhist Temple, located south of I-5, is the only place of worship found within the project area. West of Brown Farm Road NE is the Nisqually Commercial Park, LLC, an RV park. The Wa-He-Lute Indian School is located south of I-5. However, while the school’s main building is outside the Project study area, there is an outdoor learning space within the study area.

East of the Nisqually River to the Mounts Road SW ramps there are very few residential uses. All residences are located north of I-5 and west of the I-5-Mounts Road SW ramps. South of I-5 is a railway alignment and undeveloped lands owned by Joint Base Lewis McCord (JBLM).

Parks, recreation facilities, and natural area-uses (FHWA Category C) are also located within mixed used areas of Lacey, East Olympia, and Dupont near some low- and high-density commercial and industrial properties, residences, agricultural uses, and railway alignments.

North of I-5 from Marvin Road NE to Meridian Road NE is primarily industrial and commercial. There are some commercial uses owned by the Nisqually Indian Tribe west of Marvin Road NE and Thurston County owns most of the land east of Marvin Road NE to Meridian Road NE, operating the Thurston County Waste and Recovery Center.

The Billy Frank Jr Nisqually National Wildlife Refuge is located north of I-5 and extends west of the I-5-Brown Farm Road NE ramps to the east of the Nisqually River. The refuge consists of wetlands, forests, marshes and grasslands and is an important habitat for migratory birds and fish. The park uses within the Project area include walking trails, the Treaty of Medicine Creek National Memorial, and sensitive wildlife habitats including waterways and forests. The refuge is open year-round and is owned by both the federal government and the Nisqually Indian Tribe. East and west of Mounts Road SW and north of I-5 is the Eagles Pride Golf Course and Grill. Both the golf course and outdoor restaurant seating are within the Project study area. The golf course and grill are owned by JBLM.

Figure D-47. Land Use and Monitoring Locations

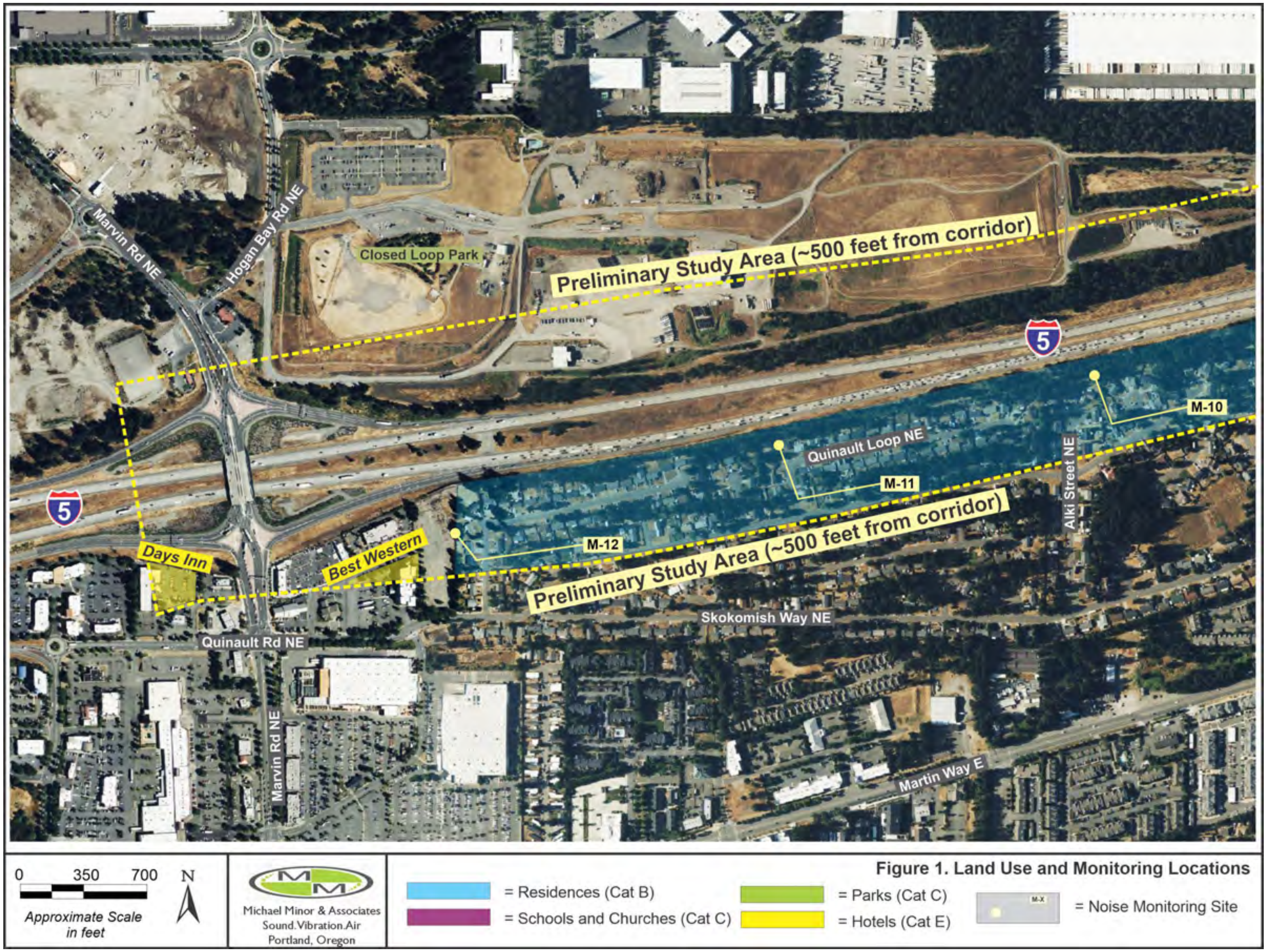


Figure D-48. Land Use and Monitoring Locations

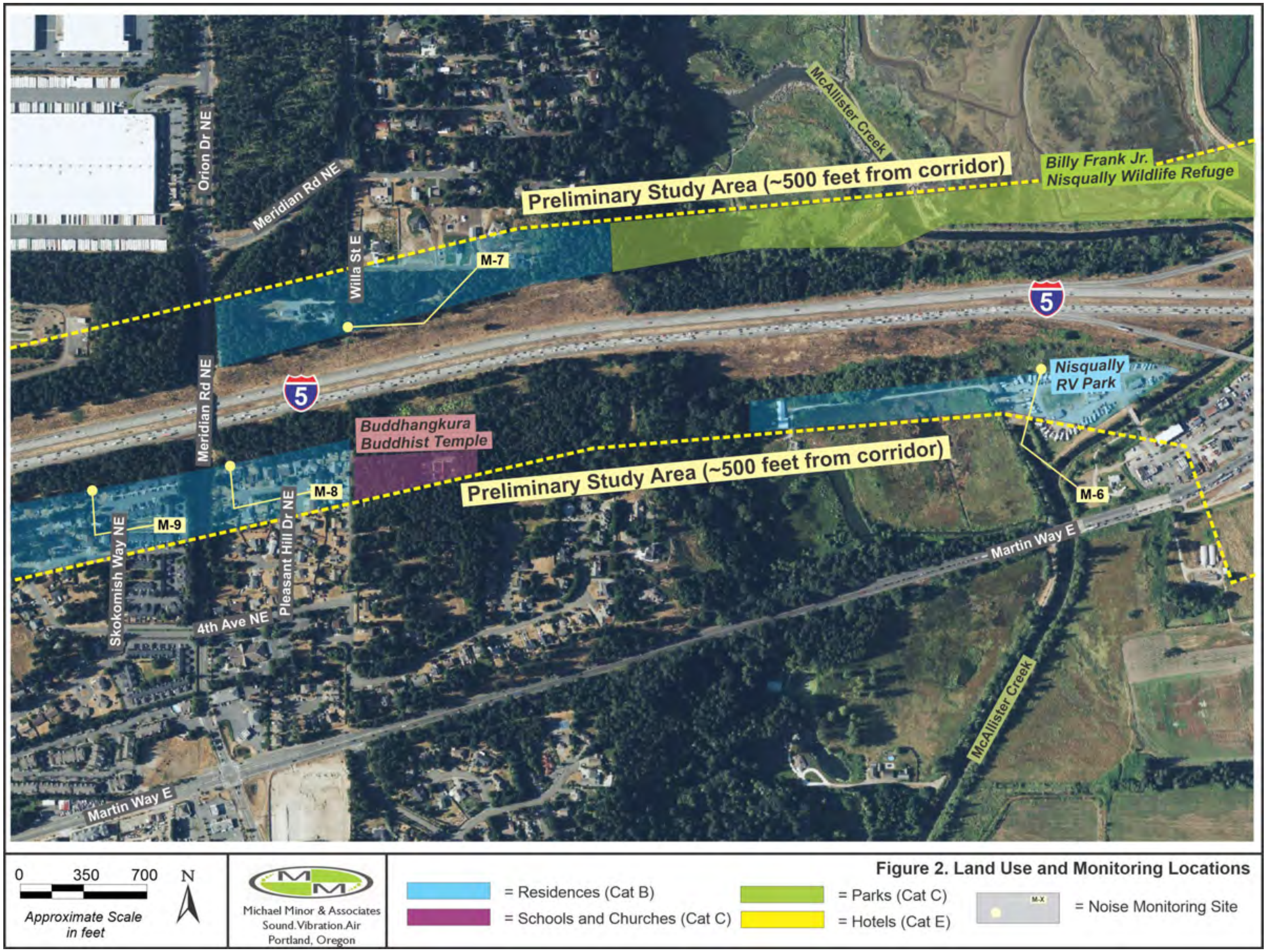


Figure D-49. Land Use and Monitoring Locations

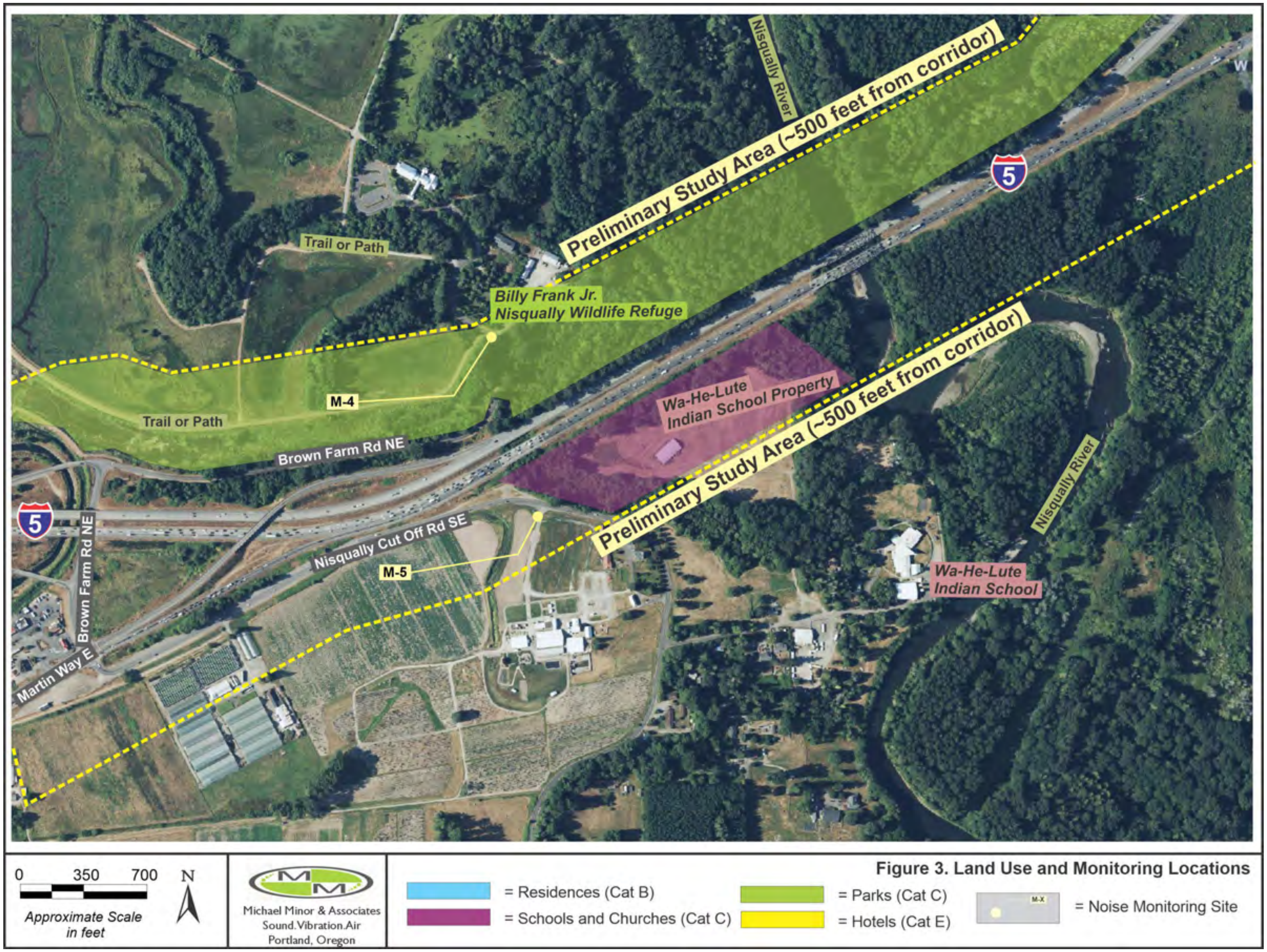


Figure D-50. Land Use and Monitoring Locations

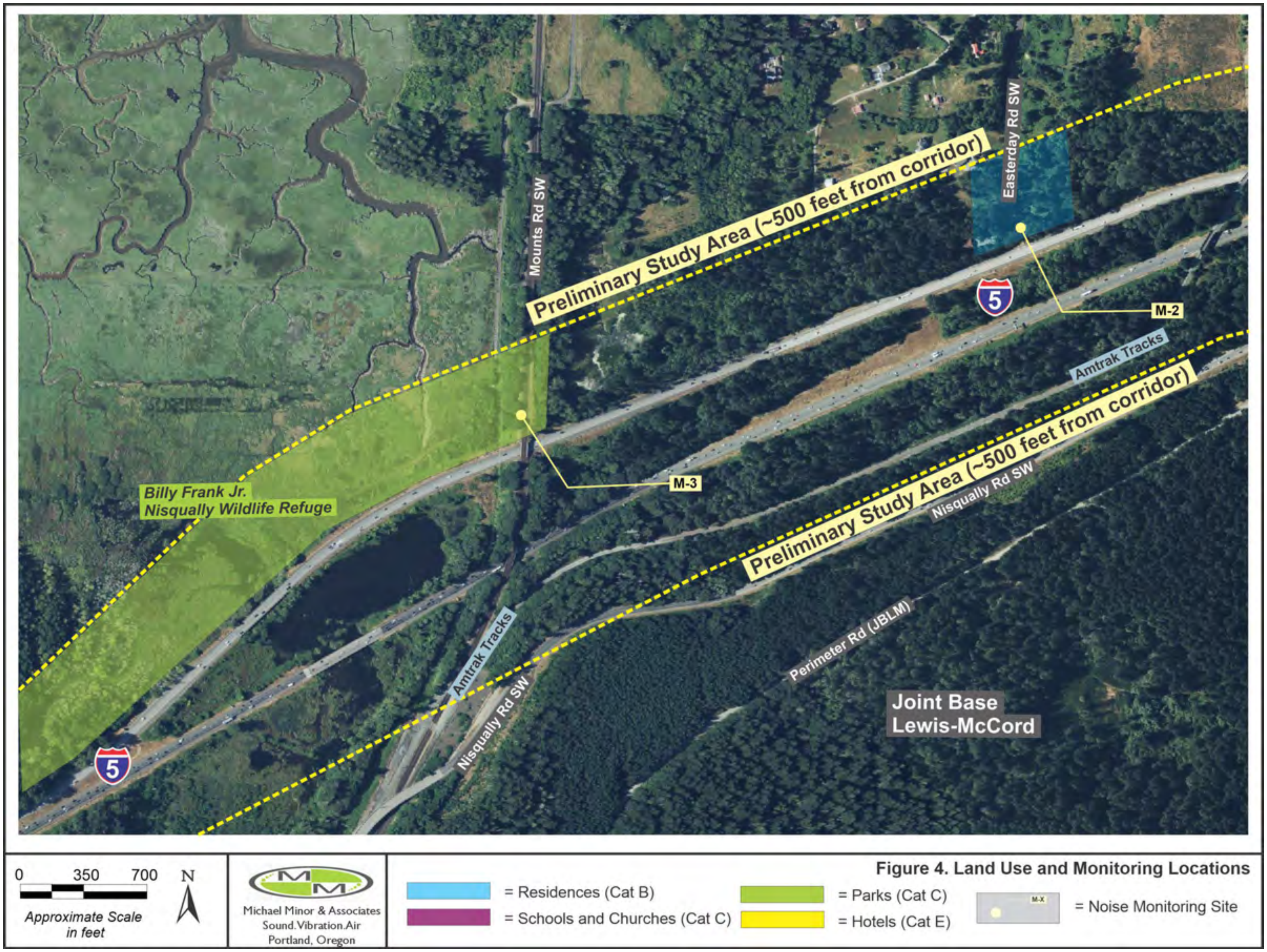
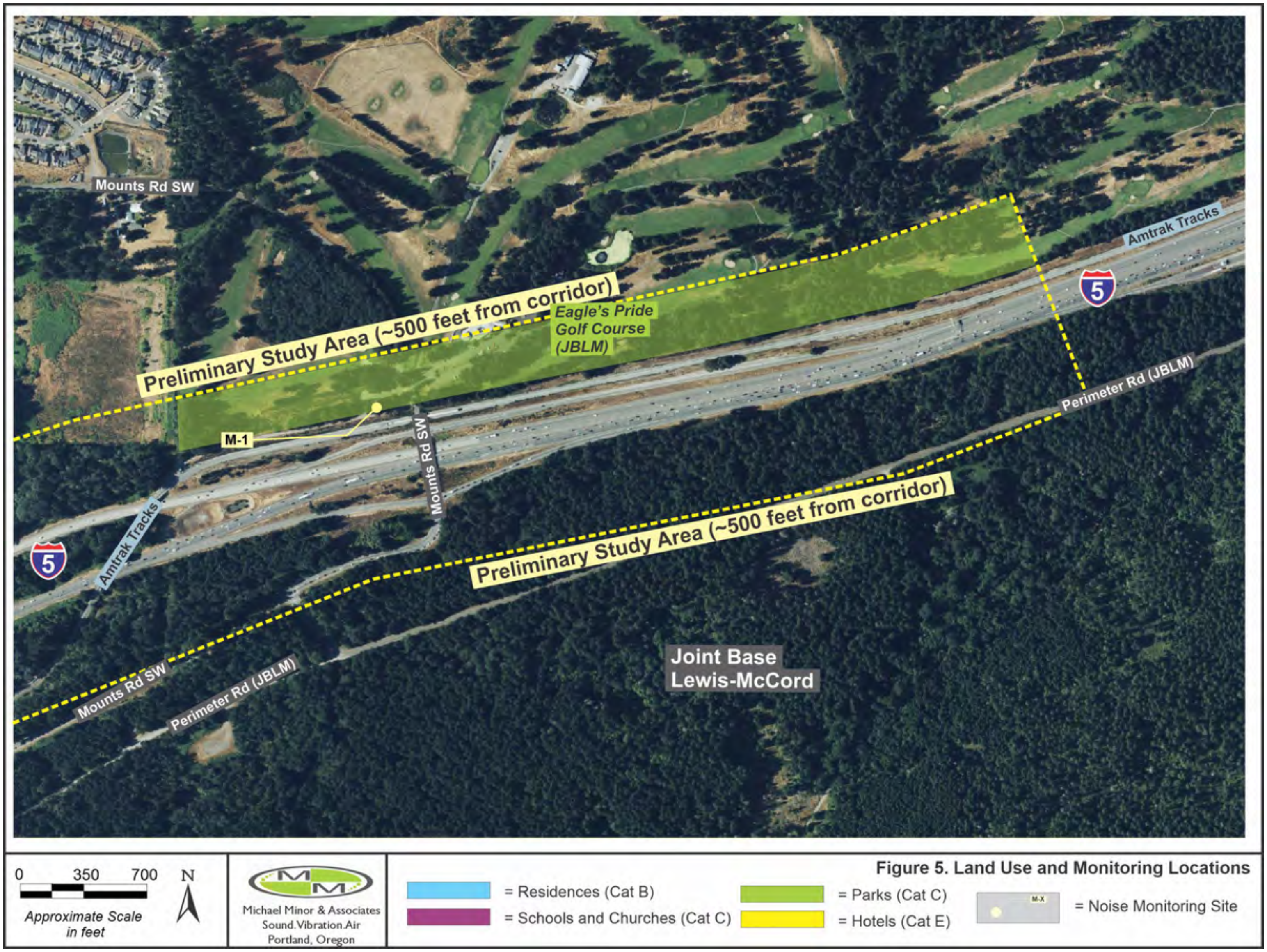


Figure D-51. Land Use and Monitoring Locations



12.2.2 Zoning and Comprehensive Land Use Plan Design

A study of the Project area indicated that the area is a mix of high density to low density residential, parks, a school and temple, and commercial and undeveloped lands. There are currently no planned or approved land use changes that would affect this noise study.

12.2.3 Planned and Permitted Projects

There are currently no planned or permitted projects that would affect this noise study.

12.2.4 Structure Removal Due to Project Construction

There are no displacements planned that would affect the transmission of noise, noise impacts, or noise abatement measures.

12.3 Noise Monitoring

On-site noise monitoring and concurrent traffic counts were performed at 12 locations in the Project study area. These sites were selected to provide traffic noise modeling validation and to aid in the understanding of existing noise levels along the corridor. Figures D-47 through D-51 provide an overview of the monitoring locations denoted M-1 through M-12. The noise monitoring was performed on March 17, 2023, and April 14, 2023.

Noise measurements were taken in accordance with methods provided in the 2020 WSDOT Policy and in accordance with the American National Standards Institute (ANSI) procedures for community noise measurements (ANSI/ANA S12.9-2013/Part1). The equipment used for noise monitoring were Bruel & Kjaer Type 2238 Sound Level Meters. All meters were calibrated prior to and after the measurement period using a Bruel & Kjaer Type 4231 Sound Level Calibrator. Complete system calibration is performed on an annual basis by an accredited instrument calibration laboratory. System calibration is traceable to the National Institute of Standards and Testing (NIST). The system meets or exceeds the requirements for an ANSI Type 1 noise measurement system.

12.3.1 Measurement Results

Noise monitoring sites were located within residential yards or the public right-of-way with clear line of sight to the roadway, when possible, in order to take concurrent traffic counts with the noise measurements. For locations where traffic could not be counted, synchronized terminals were installed and matched with traffic counts taken at a nearby location over the same time period.

Additionally, two locations were chosen to establish the noise behind the existing noise wall south (east) of I-5 between Marvin Road NE and Meridian Road NE. Overall, the noise levels ranged from 64.4 to 74.5 dBA Leq.

Traffic along I-5 was the primary noise source at most of the monitoring locations. Secondary noise sources included local road traffic (Martin Way, Nisqually Cut Off Road NE, Nisqually Road NE, and ramps to and from I-5), along with typical neighborhood activities. The highest traffic noise measurement of 74.5 dBA Leq occurred at M-2, located north of I-5 near the Nisqually Refuge. The lowest noise measurement of 64.4 dBA Leq was recorded at M-4, located within the Nisqually Refuge near the maintenance facility. The two measurements taken near the existing noise wall were 64.9 dBA Leq near the Best Western where the wall begins, and 69.3 dBA Leq behind the west end of the noise wall on Quinault Loop NE. Table D-56 provides a summary of the measured noise levels. A discussion of the measurements for specific areas follows the table.

Table D-56. Noise Monitoring Results

Site[1]	**Site Description**[1]	**Noise Level**[2]
M-1	Eagle’s Pride Golf Course, south of overfill parking lot	67.8
M-2	South end of Easterday Road SW	74.5
M-3	South end of Mounts Road SW, east of the Nisqually Refuge	68.0
M-4	Near the Nisqually Refuge maintenance facility	64.4
M-5	Schilter Family Farm along Nisqually Cut Off Road SE	70.2
M-6	Nisqually RV Park	66.9
M-7	South end of Willa Street NE	66.0
M-8	North end of Pleasant Hill Drive NE	67.2
M-9	North end Skokomish Way NE	70.6
M-10	North end of Alki Street NE, east of where the existing noise wall ends	72.6
M-11	East end of Quinault Loop NE, behind existing noise wall	69.3
M-12	East of the Best Western, partially behind existing noise wall	64.9

Notes:

Monitoring sites are shown in Figures D-47 through D-51.

All data is presented as an hourly Leq.

13 HAZARDOUS MATERIALS

13.1 Introduction

13.1.1 Project Background and Description

In 2020, WSDOT completed a corridor study of Interstate 5 between SR 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This vital segment of I-5 connects Thurston and Pierce counties and provides access to Joint Base Lewis-McChord. The roadway travels through the Nisqually River estuary, traditional land of the Nisqually Indian Tribe, and habitat for federally listed threatened species of Puget Sound Steelhead.

In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin and Mounts Road interchanges through the Nisqually River Delta. The Planning and Environmental Linkages (PEL) study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

This next phase, a Focused PEL, will study I-5 from Marvin to Mounts Road (Exit 111 to Exit 116). The Focused PEL will consider additional technical analyses and interested party input to arrive at a final purpose and need and preferred alternative(s), to advance into the National Environmental Policy Act (NEPA) environmental review beginning in 2023. Potential property purchases and any associated impacts will be evaluated in a future phase of the project.

Funding is provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing. Funding is also provided to construct three roundabouts on SR 507 as the only viable alternative to I-5.

13.1.2 Project Vicinity

The project is located within Thurston and Pierce Counties and the City of Lacey. The project corridor extends between Exit 111 (Marvin Road) and Exit 116 (Mounts Road) on I-5. Figure D-52 shows the current I-5 Marvin Road to Mounts Road Project vicinity.

Figure D-52. Project Vicinity Map

13.2 Methods for Hazardous Materials Analysis

This section describes the methods used to support the I-5 Marvin to Mounts Road Focused PEL study and the subsequent National Environmental Policy Act (NEPA) documentation. It includes a description of the study area, relevant laws and regulations, and methods for collecting data, assessing impacts, and evaluating possible mitigation measures. The analysis is designed to comply with the NEPA and relevant federal, state, and local laws.

13.2.1 Study Area

The study area includes all areas within 1.0-mile of the project corridor, which extends between Exit 111 and Exit 116 on I-5. This corridor is where the majority of improvements will take place and where the project is most likely to impact or be impacted by hazardous materials. The 1.0-mile study area was defined based on WSDOT's *Guidance & Standard Methodology for WSDOT Hazardous Materials Discipline Reports* (WSDOT, 2021), which follows the regulatory record search radius standards defined in ASTM 1527, Section 8.2.1. These standards identify a 1.0-mile search radius for Federal Superfund sites and a 0.5-mile search radius for State-identified hazardous waste and cleanup sites.

Figure D-53 [map to be provided] shows the current I-5 Marvin Road to Mounts Road Project primary hazardous materials study area.

13.2.2 Relevant Laws and Regulations

Federal Laws and Regulations

- Toxic Substances Control Act (15 USC 2601)
- Clean Air Act (42 USC 7401 et seq.)
- National Emission Standards for Hazardous Air Pollutants (40 CFR Parts 61 to 71), EPA
- Oil Pollution Prevention (40 CFR Part 112)
- All Appropriate Inquiries (40 CFR Part 312)
- Occupational Safety and Health Act (29 USC 651 et seq.)
- Clean Water Act (33 USC 1251 et seq.)
- Safe Drinking Water Act (42 USC 300f et seq.)
- Solid Waste Disposal Act (42 USC 3251 et seq.)
- Resource Conservation and Recovery Act (42 USC 6901 et seq.)
- Comprehensive Environmental Response, Compensation, and Liability Act (42 USC 9601 et seq.)

- National Environmental Policy Act (NEPA) of 1969 (42 USC § 4321 et seq.), Federal Highway Administration (FHWA)

State Laws and Regulations

- Water Quality Standards for Groundwaters of the State of Washington (Chapter 173-200 WAC)
- Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC)
- Sediment Management Standards (Chapter 173-204 WAC)
- Dangerous Waste Regulations (Chapter 173-303 WAC)
- Model Toxics Control Act (Chapter 173-340 WAC)
- Underground Storage Tank Regulations (Chapter 173-360 WAC)
- General Occupational Health Standards (Chapter 296-62 WAC)
- Washington Well Construction Act (Chapter 18.104 RCW)
- Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC)
- Labor and Industries Safety Standards for Construction Work (Chapter 296-155 WAC)
- Washington State Environmental Policy Act (SEPA) of 1971 (43.21C RCW), implemented by the Washington Department of Ecology (Ecology)

13.2.3 Data Sources and Data Collection Methods

Ecology's Facility/Site database was used primarily to identify any known sources of hazardous materials within the study area, and EPA's National Priorities List (NPL) was used to identify any Superfund sites in the project vicinity. As noted in Section 2.1, WSDOT's *Guidance & Standard Methodology for WSDOT Hazardous Materials Discipline Reports* (WSDOT, 2021) identifies a 1.0-mile search radius for Superfund sites and a 0.5-mile search radius for State-identified hazardous waste and cleanup sites. A list of known sites was compiled and will be carried forward into the preliminary design phase of the project to determine whether any further investigation is warranted. In addition, a windshield survey was performed on January 27, 2023 from public right-of-ways or accessible public properties, to record the physical settings and conditions at ground surface as they may relate to environmental contamination, illegal dumping or disposal activities, and/or improper storage of hazardous or regulated materials. Historical aerial photographs and topographic maps were also reviewed along with existing documentation of previous environmental investigations in the project study area.

13.2.4 Impact Evaluation Methods

A Risk Analysis was performed, based on the conceptual project description and list of known sites, to determine the need for avoidance, remediation, and/or mitigation.

Sites identified within areas of potential influence to the project were categorized based on their potential risk to the project using a risk category system based on WSDOT's *Guidance & Standard Methodology for WSDOT Hazardous Materials Discipline Reports* (WSDOT, 2021). The following risk categories rank properties based on relative risk of adverse impacts to the study area.

- **No Impact:** These sites were eliminated from further consideration due to the nature or status of the database listing (e.g., no reported or suspected releases), media affected, direction of groundwater flow or waste migration, or the distance and/or location of the property relative to the study area.
- **Low Impact:** These sites have a low likelihood to impact the study area because there was no evidence to suggest that groundwater from the site of concern is impacted, or offsite migration of the contamination is not expected to impact the study area during construction.
- **Moderate Impact:** These sites have a moderate likelihood to impact the study area because of the type or extent of contaminant, and/or groundwater from the site of concern is impacted and has a reasonable potential to migrate to, and impact the study area, but there is no conclusive evidence.
- **High Impact:** These sites may be substantially contaminated and could create a major liability for WSDOT/FHWA either during construction or by acquiring all or a portion of the site. If the site has undergone a detailed investigation and a feasibility study, the impacts and remediation costs may be predicted. Nonetheless, the site is identified as a high impact site because of its potentially substantial impact or liability. In general, high impact sites are properties that may have large volumes of contaminated soil, groundwater, or sediment, or may have multiple, complex types of contaminants that require special handling and disposal that is expensive to manage.

13.2.5 Mitigation Development

The Risk Evaluation assesses the level of complexity of potential mitigation that could be required based on the potential for contamination. There are two levels of mitigation complexity defined in the WSDOT guidance:

Straightforward: Small to medium in size sites where the potential contaminants are not extremely toxic or difficult to treat, remediate or dispose of.

Complicated: Sites with widespread contamination or with potential contaminants that are difficult to treat and can require long term monitoring. Complicated sites will typically involve additional research, investigation and regulatory involvement.

13.3 Existing Conditions

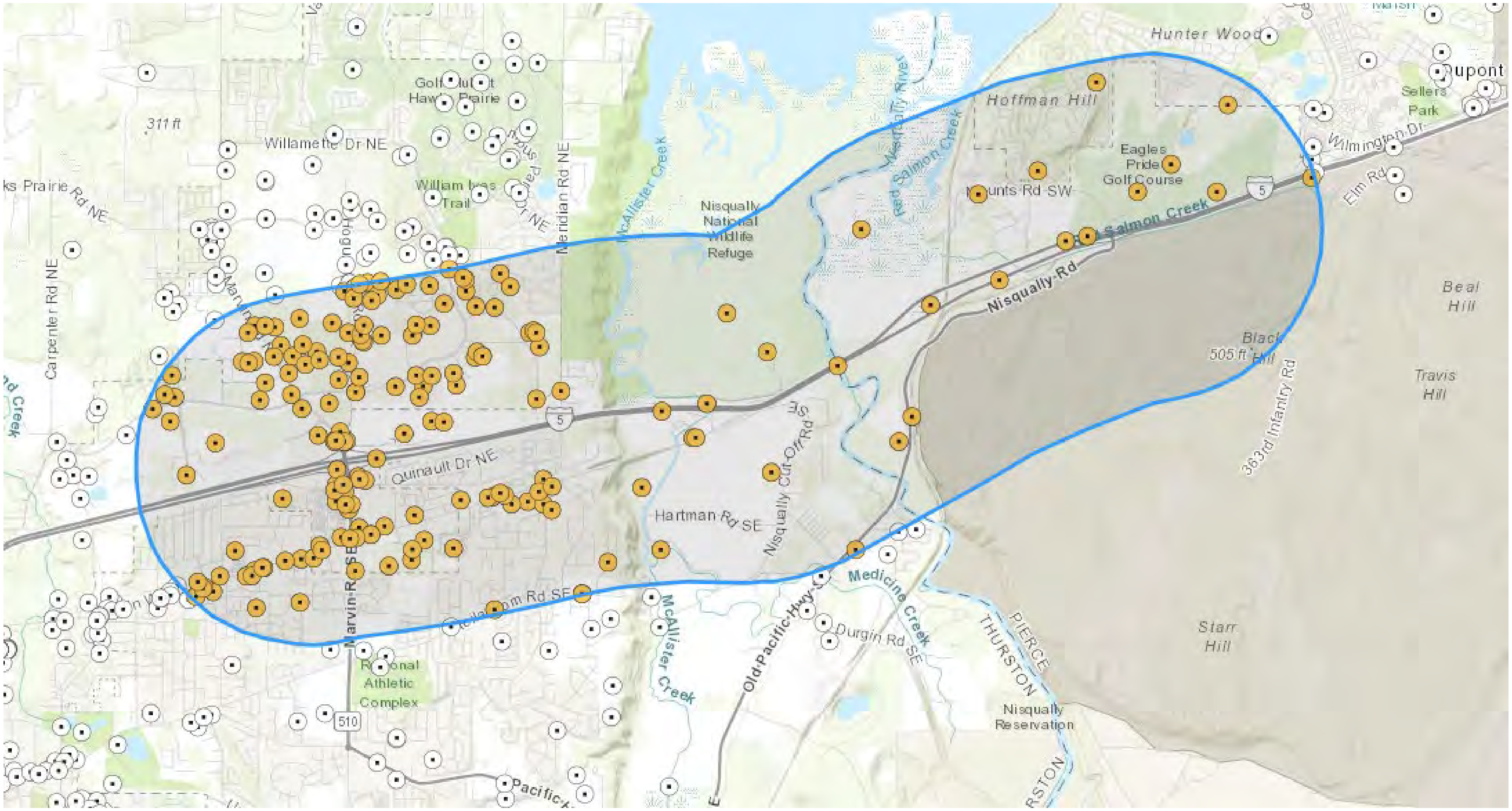
This section describes the existing conditions within the study area for hazardous materials. Hazardous materials are those items or agents that can potentially cause harm to humans, animals, or the environment. When performing construction activities where potentially hazardous materials are present, there is a risk of spreading the contamination if proper construction procedures are not followed. Assessment for the potential of contamination is necessary to ensure that proper measures are taken during construction to prevent further contamination, and that contaminated materials are properly handled and disposed.

13.3.1 Active Hazardous Materials Sites

The area located within one mile of the project corridor was evaluated for active hazardous materials sites. The federal and state contaminated site databases (EPA and Ecology) were consulted to identify potentially contaminated sites near the project. No EPA Superfund sites were identified in the study area. Within one mile of the project corridor, 109 active potential hazardous waste sites were identified in Ecology records. These sites have been further differentiated by relative risk of adverse impact, as described in Section 2.4 above, and as shown in **Figure D-54 [to be replaced with GIS-produced map]**. A complete list of these sites is included in Table D-57 and can be used by WSDOT once design plans are advanced to confirm likelihood of encountering contamination.

No high impact sites were identified in the study area. Fifty-seven sites within the study area were identified as having a moderate impact risk due to their potential for contamination of soils and/or groundwater, with the remaining 52 sites identified as low impact. Much of the study area falls within the Tacoma Smelter Plume, increasing the potential for encountering arsenic and lead contamination in surface soil. The Tacoma Smelter Plume was included among the moderate impact sites in the study area and is discussed further in Section 3.2 below.

Figure D-54. Active Hazardous Materials Sites in the Project Study Area



Source: WA Dept. of Ecology Facility/Site Database

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Table D-57. Active Hazardous Materials Sites within the Study Area by Impact Potential

	Facility/Site Name	Location	Interaction(s)	Within 0.5 Mile of Project Corridor?
	MODERATE IMPACT POTENTIAL			
1	**Tacoma Smelter Plume**	Generalized over entire study area	n/a; potential for lead and arsenic in study area soils	**Yes**
2	**7-Eleven Store 2361**	2425 Marvin Rd NE	Underground Storage Tank	**Yes**
3	**Ameron International Concrete & Steel**	2910 Hogum Bay Rd NE	Emergency/Haz Chem Rpt Tier 2; Recycling; Industrial SW GP	No
4	**Amtrak Derailment Site**	I-5 Railroad Bridge	State Cleanup Site (Cleanup Started)	**Yes**
5	**Blue Line Foodservice Distribution**	3130 Hogum Bay Rd NE Ste E	Emergency/Haz Chem Rpt Tier 2	No
6	**Cabelas**	1600 Gateway Blvd NE	Emergency/Haz Chem Rpt Tier 2; Hazardous Waste Generator	No
7	**Chevron Store 99975**	1601 Marvin Rd NE	Underground Storage Tank; Hazardous Waste Generator	**Yes**
8	**Circle K Store 5496**	1105 Marvin Rd NE	Leaking Underground Storage Tank Facility; Underground Storage Tank; Voluntary Cleanup Site	**Yes**
9	**City of Lacey Odor Control Facility 11**	800 Torden Ln SE	Emergency/Haz Chem Rpt Tier 2	No
10	**City of Lacey Odor Control Facility 2**	9165 31st Ave NE	Emergency/Haz Chem Rpt Tier 2	No
11	**Costco Wholesale 740**	1470 Marvin Rd NE	Emergency/Haz Chem Rpt Tier 2; Underground Storage Tank; Hazardous Waste Generator	**Yes**
12	**Dart Container Corp**	9045 Polaris Ln NE Ste 1	Emergency/Haz Chem Rpt Tier 2	**Yes**
13	**Day & Night Grocery**	7637 Martin Way	Underground Storage Tank	No
14	**DHL Supply Chain**	9045 Polaris Ln NE	Emergency/Haz Chem Rpt Tier 2	**Yes**
15	**Evergreen Sportsman Club**	2301 Marvin Rd NE	State Cleanup Site (Cleanup Started); Construction SW GP	**Yes**
16	**Fast Track / Jim's Market**	9335 Martin Way NW	Underground Storage Tank	**Yes**
17	**Fastenal Co**	9190 Orion Dr NE	Emergency/Haz Chem Rpt Tier 2; Industrial SW GP	**Yes**
18	**Ferrellgas Propane**	8270 28th Ct NE	Emergency/Haz Chem Rpt Tier 2	No
19	**Gale Contractor Services**	8535 Commerce Place Dr NE	Emergency/Haz Chem Rpt Tier 2; Construction SW GP	No
20	**Home Depot Store 4742**	1450 Marvin Rd NE	Emergency/Haz Chem Rpt Tier 2; Hazardous Waste Generator; Hazardous Waste Planner	**Yes**

Facility/Site Name	Location	Interaction(s)	Within 0.5 Mile of Project Corridor?
21 Jiffy Lube Store 2065	1475 Marvin Rd NE	Emergency/Haz Chem Rpt Tier 2	**Yes**
22 Karlo Apartments	8811 31st Ave NE	State Cleanup Site (Cleanup Started); Voluntary Cleanup Site; Construction SW GP	No
23 Lacey Urban Center	7239 Martin Way NE	Hazardous Waste Generator	No
24 Lakeside Industries	2416 Hogum Bay Rd NE	Underground Storage Tank; Landfill; Recycling; Sand and Gravel GP; State Cleanup Site (No Further Action)	**Yes**
25 Marvin Road Drums	SE Corner of Marvin Rd & Quinault Dr	Hazardous Waste Generator	**Yes**
26 Meridian Corner Gas & Deli	9410 Martin Way E	Underground Storage Tank	**Yes**
27 Mutual Materials Paver Plant	8760 Commerce Place Dr NE	Emergency/Haz Chem Rpt Tier 2	**Yes**
28 Nisqually Automotive & Towing	10246 Martin Way E	Leaking Underground Storage Tank Facility; Underground Storage Tank; Voluntary Cleanup Site	**Yes**
29 Nisqually Texaco AM/PM	10222 Martin Way E	Emergency/Haz Chem Rpt Tier 2; Underground Storage Tank	**Yes**
30 Olympic Arms/Nisqually DNR Building	624 Oly Pacific Hwy SE	Hazardous Waste Generator	No
31 Pacific Disposal / Waste Connections	2910 Hogum Bay Rd NE	Emergency/Haz Chem Rpt Tier 2	No
32 Pacific Pride Gas Station	2135 Marvin Rd NE	Underground Storage Tank; State Cleanup Site (Cleanup Started)	**Yes**
33 Penske Truck Leasing Co	7647 Betti Ln	Hazardous Waste Generator	No
34 Penske Truck Spill	2527 Marvin Rd NE	State Cleanup Site (Awaiting Cleanup)	**Yes**
35 Petco Store 1280	1210 Marvin Rd NE	Hazardous Waste Generator	**Yes**
36 Proposed System Three Bldg	8517 Commerce Place Dr NE	Hazardous Waste Generator; State Cleanup Site (No Further Action); Construction SW GP	No
37 Ram Auto & Truck Recycling	8048 Martin Way E	Leaking Underground Storage Tank Facility; Voluntary Cleanup Site	**Yes**
38 Rite Aid Store 5280	8230 Martin Way E	Hazardous Waste Generator	**Yes**
39 Safeway Store 1173	1243 Marvin Rd NE	Underground Storage Tank; Hazardous Waste Generator	**Yes**
40 Seasoft Scuba Gear	8294 28th Ct NE	Hazardous Waste Generator; State Cleanup Site (No Further Action); Revised Site Visit Program	No

Facility/Site Name	Location	Interaction(s)	Within 0.5 Mile of Project Corridor?
41 Shell Store 402	8300 Martin Way E	Emergency/Haz Chem Rpt Tier 2; Underground Storage Tank	**Yes**
42 Shell Station 120701 / Jacksons	1545 Marvin Rd NE	Underground Storage Tank	**Yes**
43 Sunbelt Rentals	7851 29th Ave NE	Emergency/Haz Chem Rpt Tier 2	No
44 Tanglewilde Chevron	7291 Martin Way E	Leaking Underground Storage Tank Facility; Underground Storage Tank; Voluntary Cleanup Site; Enforcement Final (Water Quality)	No
45 Temper Sealy Intl	2626 Willamette Dr NE	Emergency/Haz Chem Rpt Tier 2; Hazardous Waste Generator; Industrial SW GP	**Yes**
46 Thurston County Waste and Recovery Center	2418 Hogum Bay Rd NE	Solid Waste Storage and Handling; Moderate Risk Waste	**Yes**
47 Thurston County Waste and Recovery Center	2420 Hogum Bay Rd NE	Hazardous Waste Generator	**Yes**
48 Tom Martin Construction	2750 Hogum Bay Rd NE	Underground Storage Tank	**Yes**
49 Union Pacific Railroad Diesel Spill	Nisqually MP 24.6 Lines 1 & 2	State Cleanup Site (Cleanup Started); Voluntary Cleanup Site; Enforcement Final (Spills)	**Yes**
50 Unocal Store 6405	2110 Marvin Rd NE	Underground Storage Tank	**Yes**
51 Venus Laboratories Inc dba Earth Friendly Products	8735 Commerce Place Dr NE Ste A	Emergency/Haz Chem Rpt Tier 2	**Yes**
52 Verizon Wireless Nisqually	2526 Willa St NE	Emergency/Haz Chem Rpt Tier 2	**Yes**
53 Verizon Wireless Marvin Rd	8033 Martin Way E	Emergency/Haz Chem Rpt Tier 2	No
54 VSPOne Optical Technology Centers	8719 Commerce Place Dr NE Ste D	Hazardous Waste Planner; Industrial SW GP	**Yes**
55 Wal Mart Store 3531	1401 Galaxy Dr NE	Hazardous Waste Generator; Hazardous Waste Planner	**Yes**
56 Willamette Apartments	3100 Willamette Dr NE	State Cleanup Site (Cleanup Started); Voluntary Cleanup Site	No
LOW IMPACT POTENTIAL			
57 2020 Lacey Street Overlay	Generalized throughout study area	Construction SW GP	**Yes**
58 9106 Martin Way Development	9106 Martin Way E	State Cleanup Site (No Further Action); Voluntary Cleanup Site	**Yes**

Facility/Site Name	Location	Interaction(s)	Within 0.5 Mile of Project Corridor?
59 Affinity at Lacey	6950 Birdseye Ave	Construction SW GP	No
60 Arbor Center II	9329 Martin Way E	Construction SW GP	**Yes**
61 Bridge Point Lacey 130	8438 31st Ave NE	Construction SW GP	No
62 Britton Parkway Fill Permit	2535 Marvin Rd NE	Construction SW GP	No
63 D2K Motors	7326 Martin Way E	State Cleanup Site (No Further Action); Construction SW GP	No
64 Fastenal KHUB Distribution Center	9160 Orion Drive NE	Construction SW GP	No
65 Fedex Express OLM	7820 29th Ave NE	Haz Waste Management Activity; Industrial SW GP	No
66 Gateway Apartments	6955 Birdseye Ave NE	Construction SW GP	No
67 Gateway Division 1 Lots 1-28	Britton Pkwy NE & NE Gateway Blvd	Construction SW GP	No
68 Hawks Hub	7940 29th Ave NE	Construction SW GP	No
69 Hawks Prairie Industrial Park Lot 11	7921 29th Ave NE	Construction SW GP	No
70 Hawks Prairie Marvin Rd Drums	Marvin Rd & Hawks Prairie Rd south of I-5	Construction SW GP	**Yes**
71 Hoffman Hills	3500 Hoffman Hill Rd	Construction SW GP	**Yes**
72 Hogum Bay Archdiocese	3105-3145 Hogum Bay Rd NE	State Cleanup Site (No Further Action); Voluntary Cleanup Site	No
73 Hogum Bay Town Center	2555 Hogum Bay Rd NE	Construction SW GP; Underground Injection Control (Water Quality)	**Yes**
74 Homes on Martin	9124 Martin Way E	Construction SW GP	**Yes**
75 I-5 Design & Manufacture	8751 Commerce Place Dr NE	Revised Site Visit Program	**Yes**
76 I-5 Design & Manufacture	9000 Orion Dr NE	Construction SW GP	No
77 Lacey Gateway Parcel A	Britton Pkwy NE & Callison Rd NE	Voluntary Cleanup Site	No
78 Lacey Logistics Phase 1	3130 Hogum Bay Rd NE	Construction SW GP	No
79 Lacey Multi-Family & Lacey Senior Living	8501 Martin Way E	Construction SW GP	No
80 Lacey Self Storage	2621 Hogum Bay Rd	State Cleanup Site (No Further Action)	**Yes**

Facility/Site Name	Location	Interaction(s)	Within 0.5 Mile of Project Corridor?
81 Lacey Special Care Community LLC	8570 Martin Way E	Construction SW GP	**Yes**
82 LOTT Clean Water Alliance	3001 Hogum Bay Rd NE	Underground Injection Control (Water Quality)	No
83 Martin Way II Apartments	333 Hoh St SE	Construction SW GP	**Yes**
84 Marvin Road Commercial	170 Marvin Rd SE	Construction SW GP	No
85 Mounts Easterday Rd	Mounts Rd & Easterday Rd	Haz Waste Management Activity	**Yes**
86 NC Machinery	8411 31st Ave NE	Construction SW GP	No
87 Nisqually Auto Wrecking	9319 Martin Way E	Revised Site Visit Program; Industrial SW GP	**Yes**
88 Nutrium	3145 Hogum Bay Rd NE	Voluntary Cleanup Site	No
89 Olympia Behavioral Health	8007 31st Avenue NE	Construction SW GP	No
90 Patriot’s Landing Memory Care	1000 Marshall Circle	Construction SW GP	No
91 PKMM Inc	7869 29th Ave NE	Revised Site Visit Program	No
92 Puget Meadows East	8955 31st Dr NE	State Cleanup Site (No Further Action); Voluntary Cleanup Site	No
93 Quick Serve Restaurant Project Development	8306 Quinault Dr NE	Construction SW GP	**Yes**
94 Revel Lacey	211 Hoh St E	Underground Injection Control (Water Quality)	No
95 River Ridge High School	350 River Ridge Dr SE	Construction SW GP	No
96 Sorrento Lactalis, Inc. Olympia Plant	3145 Hogum Bay Rd NE	Toxics Release Inventory	No
97 Steilacoom Ridge	Steilacoom Ridge Dr SE	Construction SW GP	No
98 Swift Transportation Corp	I-5 MP 114	Enforcement Final (Spills)	**Yes**
99 Tanglewilde Dev Corp	204 Ranger Dr SE	Enforcement Final (Water Quality)	No
100 Tanglewilde Multi-Family	7635 3rd Way SE	Construction SW GP	No
101 TEC Equipment	2800 Marvin Road NE	Construction SW GP	No
102 The Marq on Martin	8515 Litt Dr SE	Underground Injection Control (Water Quality)	No
103 Trestlewood Residential	SE corner of Martin Way E & Duterrow Rd SE	Construction SW GP	**Yes**

Facility/Site Name	Location	Interaction(s)	Within 0.5 Mile of Project Corridor?
104 US Army JBLM Eagles Pride Golf Course Septic	1529 Mounts Rd SW	Underground Injection Control (Water Quality)	**Yes**
105 WA DOT I-5 Southbound at Mounts Rd	Southbound I-5 at Mounts Rd	State Cleanup Site (No Further Action)	**Yes**
106 Washington Tractor	204 Ranger Dr SE	Construction SW GP	No
107 Willamette Apartments 3200	3200 Willamette Dr NE	Construction SW GP	No
108 Willows Pond Dental Center	1401 Marvin Rd N, Ste 302	Revised Site Visit Program	**Yes**
109 WinCo Foods	7540 Martin Way E	Underground Injection Control (Water Quality)	No

Sources: WA Dept. of Ecology Facility/Site Database; WA Dept. of Ecology “What’s In My Neighborhood?” Cleanup Database; WA Dept. of Ecology “Dirt Alert” Database

13.3.2 Sites of Potential Concern

Based on WSDOT’s *Guidance & Standard Methodology for WSDOT Hazardous Materials Discipline Reports* (WSDOT, 2021), sites with moderate impact risk located in close proximity of the project corridor (within 0.5 mile) were identified as sites of potential concern, and therefore warrant further investigation to confirm the potential for the project to encounter contamination. Sites located greater than 0.5 mile from the project corridor are not recommended for further investigation, as the likelihood of contamination migrating from this distance to the project corridor in concentrations exceeding cleanup levels is low. The 37 sites of potential concern are listed in Table D-58 and are further described below.

Tacoma Smelter Plume

The Tacoma Smelter Plume (generalized over the entire study area; site not mapped) is associated with the former Asarco copper smelter that operated near Tacoma for approximately 100 years. Large quantities of contaminants were emitted in the form of air pollution during operations. Particles in the air settled in surface soils in an area stretching north to Seattle and south to Lacey. Review of the available mapping indicates for undisturbed native soils, there may be a moderate risk of contaminated soil based on the nearest recorded concentrations of arsenic, which range between 20 and 100 ppm within the study area.

Table D-58. Sites of Potential Concern within the Study Area

Facility/Site Name	Location	Interaction(s)	Straightforward Mitigation?
1 Tacoma Smelter Plume	Generalized over entire study area	n/a; potential for lead and arsenic in study area soils	Yes
2 7-Eleven Store 2361	2425 Marvin Rd NE	Underground Storage Tank	Yes
4 Amtrak Derailment Site	I-5 Railroad Bridge	State Cleanup Site (Cleanup Started)	Yes
7 Chevron Store 99975	1601 Marvin Rd NE	Underground Storage Tank; Hazardous Waste Generator	Yes
8 Circle K Store 5496	1105 Marvin Rd NE	Leaking Underground Storage Tank Facility; Underground Storage Tank; Voluntary Cleanup Site	Yes
11 Costco Wholesale 740	1470 Marvin Rd NE	Emergency/Haz Chem Rpt Tier 2; Underground Storage Tank; Hazardous Waste Generator	Yes
12 Dart Container Corp	9045 Polaris Ln NE Ste 1	Emergency/Haz Chem Rpt Tier 2	Yes
14 DHL Supply Chain	9045 Polaris Ln NE	Emergency/Haz Chem Rpt Tier 2	Yes
15 Evergreen Sportsman Club	2301 Marvin Rd NE	State Cleanup Site (Cleanup Started); Construction SW GP	Yes
16 Fast Track / Jim's Market	9335 Martin Way NW	Underground Storage Tank	Yes
17 Fastenal Co	9190 Orion Dr NE	Emergency/Haz Chem Rpt Tier 2; Industrial SW GP	Yes
20 Home Depot Store 4742	1450 Marvin Rd NE	Emergency/Haz Chem Rpt Tier 2; Hazardous Waste Generator; Hazardous Waste Planner	Yes
21 Jiffy Lube Store 2065	1475 Marvin Rd NE	Emergency/Haz Chem Rpt Tier 2	Yes
24 Lakeside Industries	2416 Hogum Bay Rd NE	Underground Storage Tank; Landfill; Recycling; Sand and Gravel GP; State Cleanup Site (No Further Action)	Yes
25 Marvin Road Drums	SE Corner of Marvin Rd & Quinault Dr	Hazardous Waste Generator	Yes
26 Meridian Corner Gas & Deli	9410 Martin Way E	Underground Storage Tank	Yes
27 Mutual Materials Paver Plant	8760 Commerce Place Dr NE	Emergency/Haz Chem Rpt Tier 2	Yes
28 Nisqually Automotive & Towing	10246 Martin Way E	Leaking Underground Storage Tank Facility; Underground Storage Tank; Voluntary Cleanup Site	Yes
29 Nisqually Texaco AM/PM	10222 Martin Way E	Emergency/Haz Chem Rpt Tier 2; Underground Storage Tank	Yes
32 Pacific Pride Gas Station	2135 Marvin Rd NE	Underground Storage Tank; State Cleanup Site (Cleanup Started)	Yes
34 Penske Truck Spill	2527 Marvin Rd NE	State Cleanup Site (Awaiting Cleanup)	Yes
35 Petco Store 1280	1210 Marvin Rd NE	Hazardous Waste Generator	Yes

Facility/Site Name	Location	Interaction(s)	Straightforward Mitigation?
37 Ram Auto & Truck Recycling	8048 Martin Way E	Leaking Underground Storage Tank Facility; Voluntary Cleanup Site	Yes
38 Rite Aid Store 5280	8230 Martin Way E	Hazardous Waste Generator	Yes
39 Safeway Store 1173	1243 Marvin Rd NE	Underground Storage Tank; Hazardous Waste Generator	Yes
41 Shell Store 402	8300 Martin Way E	Emergency/Haz Chem Rpt Tier 2; Underground Storage Tank	Yes
42 Shell Station 120701 / Jacksons	1545 Marvin Rd NE	Underground Storage Tank	Yes
45 Temper Sealy Intl	2626 Willamette Dr NE	Emergency/Haz Chem Rpt Tier 2; Hazardous Waste Generator; Industrial SW GP	Yes
46 Thurston County Waste and Recovery Center	2418 Hogum Bay Rd NE	Solid Waste Storage and Handling; Moderate Risk Waste	Yes
47 Thurston County Waste and Recovery Center	2420 Hogum Bay Rd NE	Hazardous Waste Generator	Yes
48 Tom Martin Construction	2750 Hogum Bay Rd NE	Underground Storage Tank	Yes
49 Union Pacific Railroad Diesel Spill	Nisqually MP 24.6 Lines 1 & 2	State Cleanup Site (Cleanup Started); Voluntary Cleanup Site; Enforcement Final (Spills)	Yes
50 Unocal Store 6405	2110 Marvin Rd NE	Underground Storage Tank	Yes
51 Venus Laboratories Inc dba Earth Friendly Products	8735 Commerce Place Dr NE Ste A	Emergency/Haz Chem Rpt Tier 2	Yes
52 Verizon Wireless Nisqually	2526 Willa St NE	Emergency/Haz Chem Rpt Tier 2	Yes
54 VSPOne Optical Technology Centers	8719 Commerce Place Dr NE Ste D	Hazardous Waste Planner; Industrial SW GP	Yes
55 Wal Mart Store 3531	1401 Galaxy Dr NE	Hazardous Waste Generator; Hazardous Waste Planner	Yes

Emergency/Hazardous Chemical Tier II Reporting Sites

Tier II reporting is used by the EPA to track and enforce rules related to the storage of hazardous materials. Businesses that store 10,000 pounds or more of a hazardous chemical, or 500 pounds or less of an extremely hazardous chemical, on site at any one time must report annually. Reports are sent to the State Emergency Response Commission, Local Emergency Planning Committees, and local fire departments for emergency planning.

There are 12 sites with Tier II hazardous chemical reporting requirements within 0.5 mile of the project corridor:

- Costco Wholesale 740, 1470 Marvin Rd NE
- Dart Container Corp, 9045 Polaris Ln NE Ste 1
- DHL Supply Chain, 9045 Polaris Ln NE
- Home Depot Store 4742, 1450 Marvin Rd NE
- Fastenal Co, 9190 Orion Dr NE
- Jiffy Lube Store 2065, 1475 Marvin Rd NE
- Mutual Materials Paver Plant, 8760 Commerce Place Dr NE
- Nisqually Texaco AM/PM, 10222 Martin Way E
- Shell Store 402, 8300 Martin Way E
- Temper Sealy Intl, 2626 Willamette Dr NE
- Venus Laboratories Inc dba Earth Friendly Products, 8735 Commerce Place Dr NE Ste A
- Verizon Wireless Nisqually, 2526 Willa St NE

Underground Storage Tank (UST) Sites

Underground storage tanks (USTs) are one or a combination of tanks used to contain regulated substances, including any underground piping connected to the tank(s), with at least ten percent of its combined volume beneath the surface of the ground. This term does not include any of the exempt UST systems specified in WAC 173-360A-0110(1).

The greatest potential hazard from a UST is that if it starts to leak, the petroleum or other hazardous substances stored in the UST can seep into the soil, contaminating groundwater. A leaking UST can present other health and environmental risks as well, including the potential for fire and explosion. Because there are several fuel stations located at the I-5 interchanges in the project area, there are numerous UST sites within 0.5 mile of the project corridor, including:

- 7-Eleven Store 2361, 2425 Marvin Rd NE
- Chevron Store 99975, 1601 Marvin Rd NE
- Fast Track / Jim’s Market, 9335 Martin Way NW
- Lakeside Industries, 2416 Hogum Bay Rd NE

- Meridian Corner Gas & Deli, 9410 Martin Way E
- Nisqually Automotive & Towing, 10246 Martin Way E
- Nisqually Texaco AM/PM, 10222 Martin Way E
- Pacific Pride Gas Station, 2135 Marvin Rd NE
- Safeway Store 1173, 1243 Marvin Rd NE
- Shell Store 402, 8300 Martin Way E
- Shell Station 120701 / Jacksons, 1545 Marvin Rd NE
- Tom Martin Construction, 2750 Hogum Bay Rd NE
- Unocal Store 6405, 2110 Marvin Rd NE

Leaking Underground Storage Tank (LUST) Facility Sites

A handful of UST sites in the project area are leaking underground storage tank (LUST) facilities, meaning a known release related to a regulated leaking underground storage tank system is associated with the site. There are three LUST facilities within 0.5 mile of the project corridor:

- Circle K Store 5496, 1105 Marvin Rd NE
- Nisqually Automotive & Towing, 10246 Martin Way E
- Ram Auto & Truck Recycling, 8048 Martin Way E

Hazardous Waste Planner Sites

Facilities that generate more than 2,640 pounds of hazardous waste per year must prepare Pollution Prevention Plans, as regulated under Chapter 173-307 WAC. There are three hazardous waste planner sites within 0.5 mile of the project corridor:

- Home Depot Store 4742, 1450 Marvin Rd NE
- VSPOne Optical Technology Centers, 8719 Commerce Place Dr NE Ste D
- Wal Mart Store 3531, 1401 Galaxy Dr NE

Hazardous Waste Generator Sites

Hazardous waste generators are facilities that generate any quantity of a dangerous waste. These sites must comply with the regulations set forth in Chapter 173-303 WAC. There are 10 hazardous waste generator sites within 0.5 mile of the project corridor:

- Chevron Store 99975, 1601 Marvin Rd NE
- Circle K Store 5496, 1105 Marvin Rd NE
- Home Depot Store 4742, 1450 Marvin Rd NE
- Marvin Road Drums, SE Corner of Marvin Rd & Quinault Dr
- Petco Store 1280, 1210 Marvin Rd NE
- Rite Aid Store 5280, 8230 Martin Way E
- Safeway Store 1173, 1243 Marvin Rd NE
- Temper Sealy Intl, 2626 Willamette Dr NE
- Thurston County Waste and Recovery Center, 2420 Hogum Bay Rd NE
- Wal Mart Store 3531, 1401 Galaxy Dr NE

Solid Waste Storage and Handling Sites

Facilities that handle solid waste on an interim basis are identified as solid waste storage and handling sites. These sites include piles of solid waste, surface impoundments holding liquids, drop boxes where solid waste is collected for future transportation, areas storing over 800 tires, and transfer stations where solid waste is collected, compacted, sorted and loaded for transport to a recycling facility or final disposal at a landfill or incineration.

The only solid waste storage and handling site within 0.5 mile of the project corridor is the Thurston County Waste and Recovery Center, located at 2418-2420 Hogum Bay Rd. This site includes a HazoHouse, a drive-through facility for disposal of dangerous household products and materials.

Landfill/Recycling Sites

Landfills are facilities at which solid waste is placed in or on land for permanent disposal, while recycling facilities are those that transform or remanufacture waste materials into usable or marketable materials for use other than landfill disposal. There is one landfill and recycling site within 0.5 mile of the project corridor: the site operated by Lakeside Industries at 2416 Hogum Bay Rd as part of the Thurston County Waste and Recovery Center.

State Cleanup Sites

State cleanup sites are known to be contaminated or under threat of contamination by hazardous substances, and are being cleaned up under state regulations (including the Model Toxics Control Act or its predecessors). Under the Model Toxics Control Act (MTCA), the cleanup should be as permanent as possible. Cleanup efforts are paid for by the polluter and monitored by Ecology. Active state cleanup sites within 0.5 mile of the project corridor – those that have either started or are awaiting cleanup – include:

- Amtrak Derailment Site at the I-5 railroad bridge
- Evergreen Sportsman Club, 2301 Marvin Rd NE
- Pacific Pride Gas Station, 2135 Marvin Rd NE
- Penske Truck Spill, 2527 Marvin Rd NE
- Union Pacific Railroad Diesel Spill at Nisqually MP 24.6 Lines 1 & 2

13.4 References

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14 LAND USE, FARMLANDS, AND SECTION 6(F)

14.1 Introduction

14.1.1 Project Background and Description

In 2020, WSDOT completed a corridor study of Interstate 5 between SR 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This vital segment of I-5 connects Thurston and Pierce counties and provides access to Joint Base Lewis-McChord. The roadway travels through the Nisqually River estuary, traditional land of the Nisqually Indian Tribe, and habitat for federally listed threatened species of Puget Sound Steelhead.

In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin and Mounts Road interchanges through the Nisqually River Delta. The Planning and Environmental Linkages (PEL) study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

This next phase, a focused PEL, will study I-5 from Marvin to Mounts Road (Exit 111 to Exit 116). The PEL will consider additional technical analyses and interested party input to arrive at a final purpose and need and preferred alternative(s), to advance into the National Environmental Policy Act (NEPA) environmental review beginning in 2023.

Funding is provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing. Funding is also provided to construct three roundabouts on SR 507 as the only viable alternative to I-5.

14.2 Methods for Land Use, Farmlands and Section 6(f) Analysis

14.2.1 Study Area

The project is located within Thurston and Pierce Counties and the City of Lacey. The Land Use, Farmlands and Section 6(f) study area generally includes all areas within 0.5-mile of the project corridor, which extends between Exit 111 and Exit 116 on I-5 (Figure D-55). This corridor is where the majority of improvements will take place and where the project is most likely to have effects on existing land uses. As the project moves from the planning phase into design, the study area may be amended, and the analysis refined as needed.

14.2.2 Relevant Laws and Regulations

Land Use in the study area is regulated by both federal and state statutes.

Federal Laws and Regulations

1) Section 10 of the Rivers and Harbors Act (33 USC 410 et seq.), US Army Corps of Engineers (Corps)
2) National Environmental Policy Act (NEPA) of 1969 (42 USC § 4321 et seq.), Federal Highway Administration (FHWA)
3) Environmental consequences (40 CFR 1502.16(a)(5)), implemented by the federal lead agency in the NEPA documentation
4) Farmland Protection Policy Act (FPPA) of 1981 –7 USC 73 § 4201-4209, Natural Resources Conservation Service (NRCS)
5) National Trails System Act (16 USC 1241-1251), National Park Service (NPS)
6) Wilderness Act (16 USC 1131-1136), US Fish and Wildlife Service (USFWS)

Section 6(f) of the Land and Water Conservation Fund (LWCF) Act (54 USC 2003 § 200301-200310), implemented by the Washington Recreation and Conservation Office (RCO) (RCW 79A.25).

State Laws and Regulations

- Aquatic Lands Act (RCW 79.105, WAC 332-30), Department of Natural Resources (DNR)
- Washington State Environmental Policy Act (SEPA) of 1971 (43.21C RCW), implemented by the Washington Department of Ecology (Ecology)
- Growth Management Act (GMA) (RCW 36.70A), implemented by local jurisdictions and incorporated in Comprehensive Planning process (WAC 365-196)
- Shoreline Management Act (SMA) (RCW 90.58), implemented by local jurisdictions and approved by Ecology
- Farmland Preservation – Executive Order 80-01
- Environmental Mitigation in Highway Construction Projects (RCW 47.01.305)
- Forest Practices (RCW 76.09)
- Farmland and Forest Preservation MOU between Washington State Conservation Commission and WSDOT (1982)

Figure D-55. Project Vicinity Map

14.2.3 Data Sources and Data Collection Methods

Land Use

Information on existing land use will be compiled using existing documents, maps, aerial photographs, and Geographic Information System (GIS) data. Land use and zoning designations and critical areas regulations will be obtained from Thurston and Pierce Counties and the City of Lacey. A reconnaissance-level site inspection of the project study area will be conducted to verify existing land uses. Findings will then be compared to current regional, county, municipal, and neighborhood subarea zoning and comprehensive land planning of record.

A review of plans will be conducted to ensure that the proposed project will support, and is in compliance with, established plans and policies. There are several adopted documents that address planning issues for the project area. Comprehensive plans include separate elements that address land use, zoning, and transportation issues. In addition, studies previously prepared by WSDOT for the project corridor will be reviewed and updated as necessary. Documents to be reviewed include:

- Thurston County and Pierce County Comprehensive Plans
- Thurston County and Pierce County Countywide Planning Policies
- Thurston County and Pierce County Municipal Codes
- City of Lacey Comprehensive Plan
- City of Lacey Municipal Code
- Puget Sound Regional Council (PSRC) Vision 2050 and Regional Transportation Plan (RTP)
- WSDOT I-5 Tumwater to Mounts Road Corridor Planning and Environmental Linkages Study
- WSDOT I-5 Tumwater to Mounts Road Mid- and Long-Range Strategies

Coordination with agencies and potentially affected jurisdictions may consist of contacting entities for information, data, and other input. These may include, but are not limited to, county and city Community Development Departments, Public Works Departments, and Assessor's Offices, and the Puget Sound Regional Council.

Farmlands

The viability of land in long-term agricultural use and the importance of individual farms are the focus of the State of Washington's various farmland protection actions. The NRCS web-based Web Soil Survey will be used to determine soil types within the study area and identify Farmland that falls into one of three distinct categories:

- **Prime farmland** is land of exceptional physical and chemical soil characteristics that can be used in agriculture with minimum user input of nutrients, labor, etc. The land must also not be in or committed to urban development or water storage.
- **Unique farmland** is lower quality than prime farmland but is able to produce high-value food or grain products.
- **Farmland of Statewide or Local Importance** is farmland that meets Washington State and USDA guidelines but is not protected within the other two groups.

Land that falls within these categories will be overlain with current land use and other GIS data (e.g., critical areas) to help determine whether there are areas within the project study area that should be evaluated for impacts to Farmlands.

Section 6(f)

The LWCF is a federal grant program which helps pay for the acquisition of outdoor recreation sites and facilities. Property within the study area that has used funds from the federal LWCF will be identified by examining the National Park Service (NPS) database of Section 6(f) investments. In addition, RCO and other local agencies and tribes will be contacted to determine if Section 6(f) resources have been used in the area.

14.2.4 Impact Evaluation Methods

Long-Term Impacts

Land Use

A substantial effect on land use could occur if an alternative prevents or limits the ability to use property for an existing or allowed land use. A substantial effect could also occur if an alternative is not consistent with relevant plans and regulations, including critical areas regulations, or if the alternative induced land use not compatible with existing plans. The four key areas that will be documented include:

- The underlying assumptions (such as growth rates) and an explanation of how those assumptions were made.
- The methods used to develop land use forecasting results, including the inherent advantages and limitations in the analysis process and data sources.
- The land use analysis results, including an explanation of patterns in the data, causal relationships, and anomalous or unexpected results.
- A systematically review of all assumptions, data, and results to ensure internal consistency across related disciplines (noise, air quality, visual quality, and social) and to make sure they do not contradict the land use analysis results.

Farmlands

The FPPA makes sure the effects of federal projects on prime, unique and farmlands of statewide or local importance are minimized. Farmland subject to FPPA requirements does not have to be actively used for agriculture purposes. If there are farmlands subject to the FPPA in the study area and have the potential to be converted to a transportation or other non-farm use as a result of the project, WSDOT will work with the NRCS to define the impact. A Farmland Conversion Impact Rating Form will be used to determine if the project impacts exceed recommended allowable levels. Lands that are exempt from the FPPA requirements include: soils not suitable for crops (such as sand dunes), farmland within urbanized areas including the adopted Urban Growth Area, land that has already been converted to industrial, commercial, residential, or recreational use, and farmland within existing right of way purchased on or before August 4, 1984.

If farmland is identified within the project limits may be impacted, documentation will include, at a minimum, the following:

- A summary of the results of early consultation with the NRCS and, as appropriate, State and local agriculture agencies where farmland could be directly or indirectly impacted by any alternative under consideration.
- A map showing the location of all farmlands in the project impact area.
- A discussion of the impacts from each alternative.
- Measures to avoid or reduce potential impacts.
- Review with the WSDOT subject matter expert.

Section 6(f)

Section 6(f) of the LWCF Act prohibits the conversion of property to non-recreational uses if the property was acquired or developed with LWCF grants without the approval of RCO. Depending on how LWCF funds are invested in a property, not all of the property may be considered a Section 6(f) resource.

Short-Term Construction Impacts

Similar to long-term impacts, short-term impacts will be identified and evaluated based on planned construction activities. Temporary impacts are usually a result of activities such as required access for construction equipment. Project plans and construction methods will be evaluated to determine if the project will result in short-term impacts to land use, farmlands or Section 6(f) resources.

14.2.5 Mitigation Development

Land Use

If impacts to land use are identified, potential mitigation measures will be developed in accordance with local and state standards. Short-term impacts from construction, such as disruptions to access, will be mitigated by restoring the site to pre-construction conditions or better after completion of the project.

Farmlands

Short-term impacts from construction, such as temporary use of agricultural land, will be mitigated by restoring the site to pre-construction conditions or better after completion of the project. If the project requires the permanent conversion of prime, unique or farmlands of statewide or local importance to a non-farm use, WSDOT will coordinate with the NRCS to determine appropriate mitigation.

Section 6(f)

Short-term impacts from construction, such as temporary use of recreational lands, will be mitigated by restoring the site to pre-construction conditions or better after completion of the project. If permanent impacts to a Section 6(f) property are identified, all practical alternatives to conversion will be examined and procedures found in RCO Manual 7 will be followed for coordination with the property owner, RCO and NPS to ensure:

1) All practical alternatives to property conversion have been evaluated and no reasonable alternative exists to the conversion that would meet the project’s purpose and need.
2) A mutually acceptable replacement property is found.
3) The replacement property has an equal or greater fair market value than the original property.
4) Public notice has been given of the proposed conversion, for a minimum of 30 days, with an opportunity to comment on the change and all comments have been considered and addressed.
5) The replacement property is not existing recreation land owned by another public agency.
6) A partial conversion will not adversely affect the recreational function of the remaining recreational use. If the remainder is not viable, the whole parcel must be replaced.
7) NEPA, ESA, Section 106, Section 4(f) and all other Federal approval requirements have been satisfactorily completed for the project.

14.3 Existing Conditions

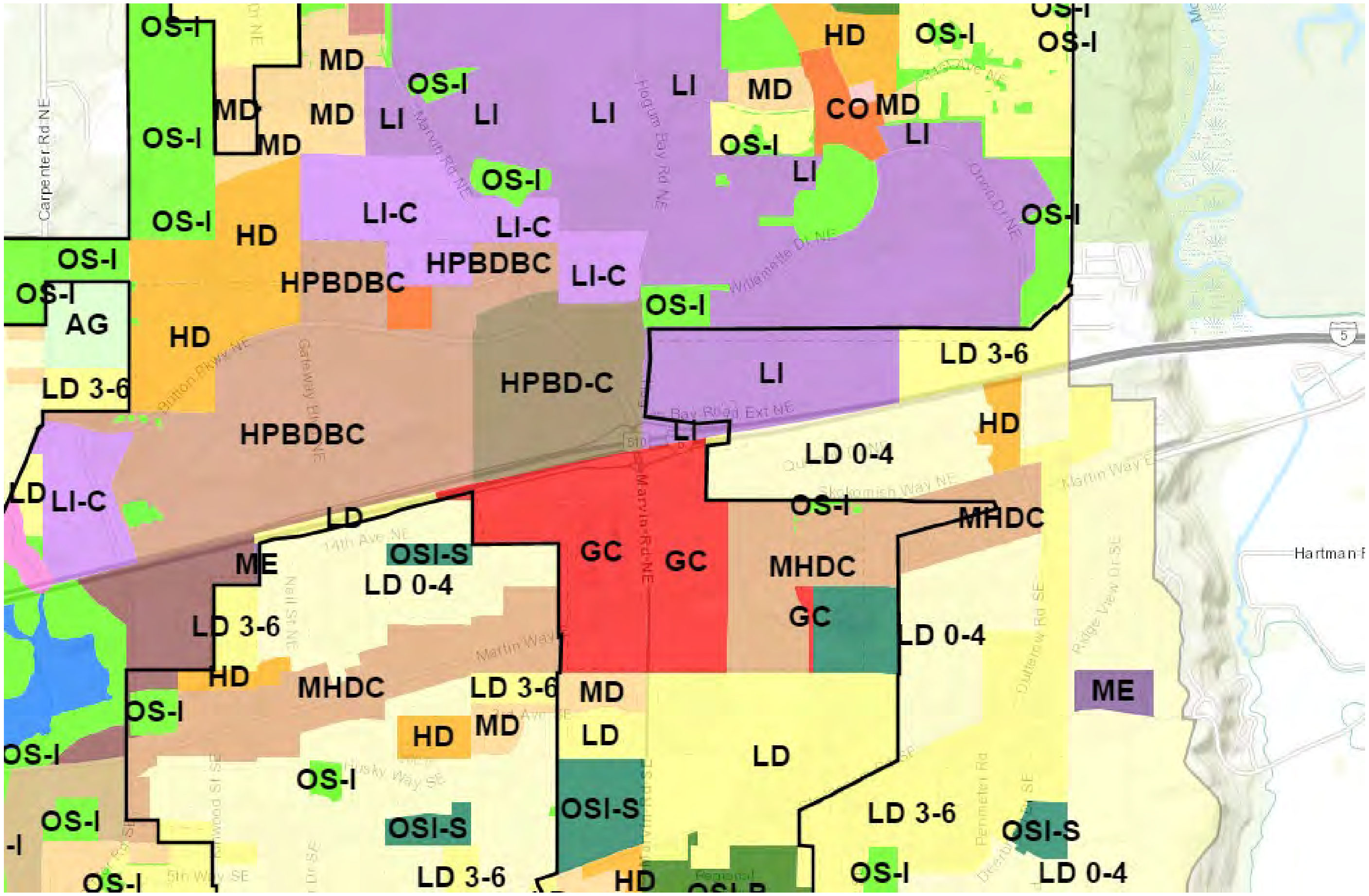
14.3.1 Land Use

Broad patterns of land use are established by the local jurisdictions planning under the GMA. The jurisdictions regulate land use and development using long-range planning documents, such comprehensive plans and municipal development (zoning) codes. The I-5 corridor evaluated for this PEL Study is located within the jurisdictions of Thurston County, Pierce County and the City of Lacey. This section describes the existing conditions of the corridor with respect to the current land use patterns and zoning regulations.

City of Lacey

The Marvin Road interchange (exit 111) at the southern end of the alignment lies within the City of Lacey. The current City of Lacey zoning designations are shown in Figure D-56. The areas immediately surrounding the Marvin Road interchange include commercial, residential, and light industrial uses. There is a mix of commercial on the south side that includes big box and other retail stores, restaurants, offices, hotels, and offices centered around Marvin Road. Further east and west of the interchange, the land uses

Figure D-56. City of Lacey Zoning Map



LD 0-4 - Low Density Residential (County)
LD 3-6 - Low Density Residential (County)
LD - Low Density Residential
MD - Moderate Density Residential
HD - High Density Residential
MHDC - Mixed Use High Density Corridor
HPBD-BC - Quiemuth Village (Business/Comm.)
HPBD-C - Quiemuth Village (Commercial)

NC - Neighborhood Commercial
CO - Community Office
GC - General Commercial
LI-C - Light Industrial Commercial
LI - Light Industrial
ME - Mineral Extraction
AG - Agriculture
OS-I - Open Space Institutional

OSI-P - Open Space Park
OSI-S - Open Space School
NATURL - Natural

transition to low-, medium-, and high-density residential neighborhoods within the city's urban growth area (UGA). South of I-5 and west of Marvin Road is the Tanglewilde Thompson Place neighborhood; south of I-5 and east of Marvin Road is the Meadows neighborhood. The area north of I-5 is known as the Hawks Prairie neighborhood. It is a mix of industrial and commercial uses, such as the Thurston County Waste and Recovery Center, an off-leash dog park, a restaurant, a Home Depot Distribution Center, and land owned and managed by the Nisqually Indian Tribe. The Waste and Recovery Center and dog park are not within the city limits but are included in the UGA.

Thurston County

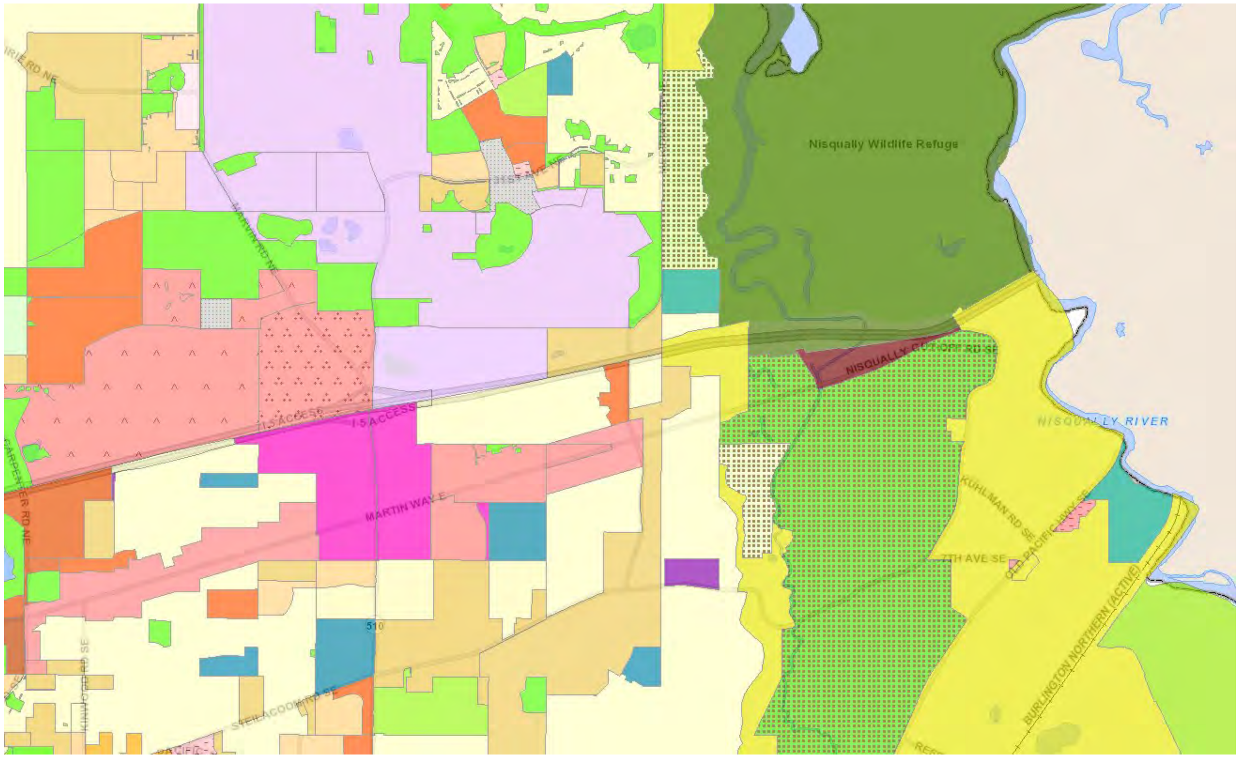
The majority of the study area lies within Thurston County, from the eastern end of the Marvin Road interchange to the Nisqually River. The current Thurston County zoning designations are shown in Figure D-57. Just east of the Lacey city limits, the landscape transitions into the Nisqually River valley.

On the south side of I-5, the western end of the corridor crosses McAllister Creek (also known as Medicine Creek) and into mostly agricultural fields where the terrain drops to the valley floor. There is a mix of other uses bordering I-5 and the Nisqually River, such as the Nisqually Commercial RV Park, restaurants, a nursery, the Wa-He-Lute Indian School, and farmhouses. North of I-5, at the western Thurston County boundary, is a small single-family residential neighborhood. The remainder of the area north of I-5 is within the Billy Frank Jr. Nisqually National Wildlife Refuge, which serves as both a conservation area and a major recreation site for the region.

Pierce County

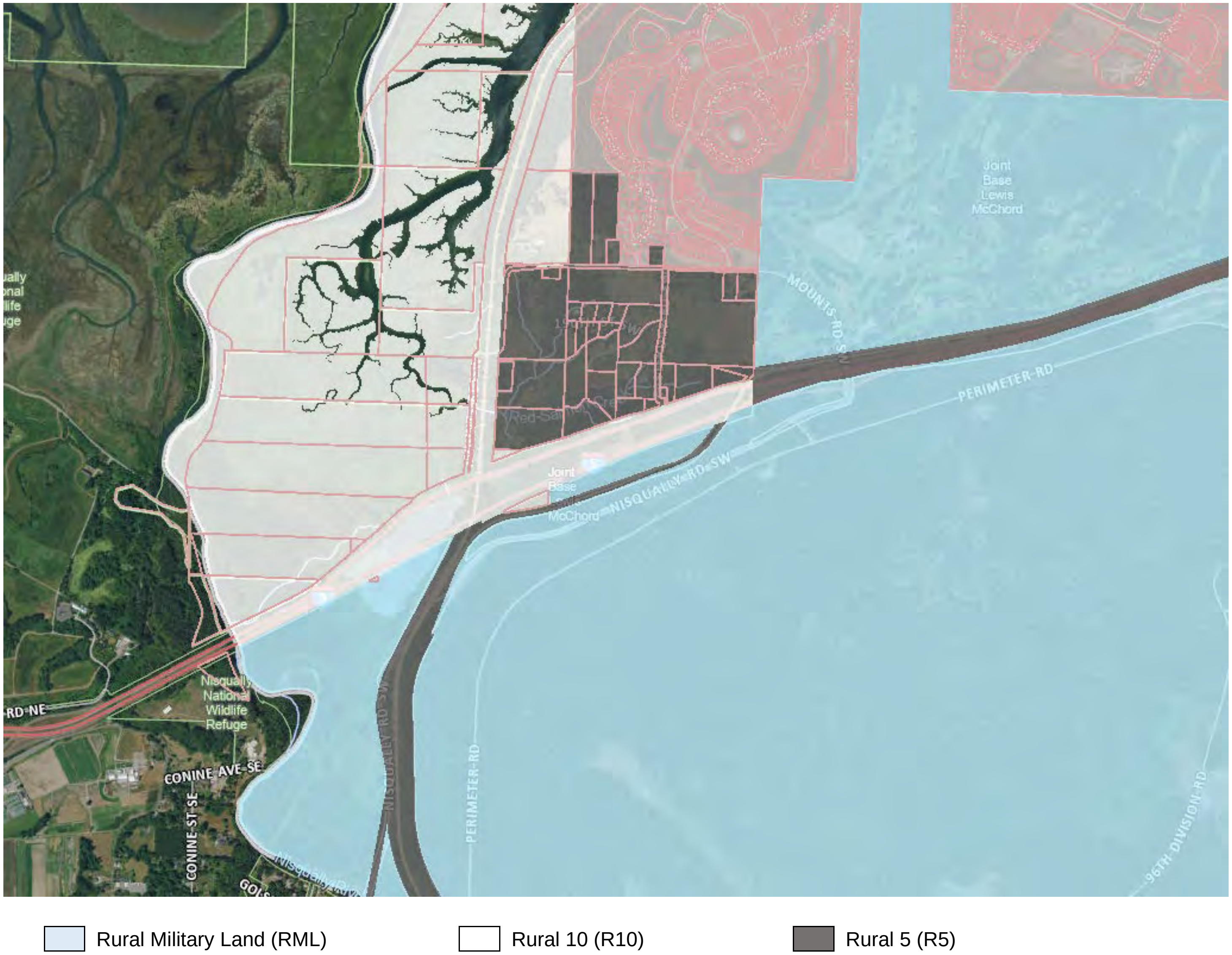
The western boundary of Pierce County starts at the Nisqually River. The current Pierce County zoning designations are shown in Figure D-58. All of the land from the river to the eastern end of the PEL Study corridor and south of I-5 is owned by the Department of Defense – Joint Base Lewis McChord (JBLM) and is mostly undeveloped. The north side of I-5, from the Nisqually River to Mounts Road, is part of the Billy Frank Jr. Nisqually National Wildlife Refuge. This area transitions to rural residential as I-5 climbs out of the valley. Immediately north of the I-5/Mounts Road interchange is the Eagle's Pride Golf Course, which is owned and operated by JBLM. The area north of the residential neighborhood and golf course lies within the City of DuPont.

Figure D-57. Thurston County Zoning Map



🟫 CBD 7 - Central Business District 7
⬜ CCD - Community Commercial
▨ CO - Community Office
🟪 GC & GC6 - General Commercial
🟫 HC - Highway Commercial
🟧 HD - High Density Residential
🟥 HPBD-C - Quiemuth Village-Commercial
🟥 HPBDBC - Quiemuth Village - Business/Commercial
🟨 LD 0-4 - Low Density Residential 0-4
🟨 LD 3-6 - Low Density Residential 3-6
🟪 LI & LI2 - Light Industrial
🟩 LTA - Long Term Agriculture
🟪 ME - Mineral Extraction
🟥 MHDC - Mixed Use High Density
▨ NA - Nisqually Agriculture
🟦 NATURL - Natural
🟥 NC & NC2 - Neighborhood Commercial
🟥 NC - Neighborhood Convenience Commercial
🟩 OS-I - Open Space Institutional
🟦 OSI-S - Open Space School
🟩 PP - Public Parks Trails And Preserves
▨ R 1/20 - Rural 1/20
▨ R-6 - Moderate Density Residential
🟩 RL2/1 - Residential LAMIRD 2/1
🟨 RR1/5 - Rural Residential 1/5

Figure D-58. Pierce County Zoning Map



14.3.2 Farmlands

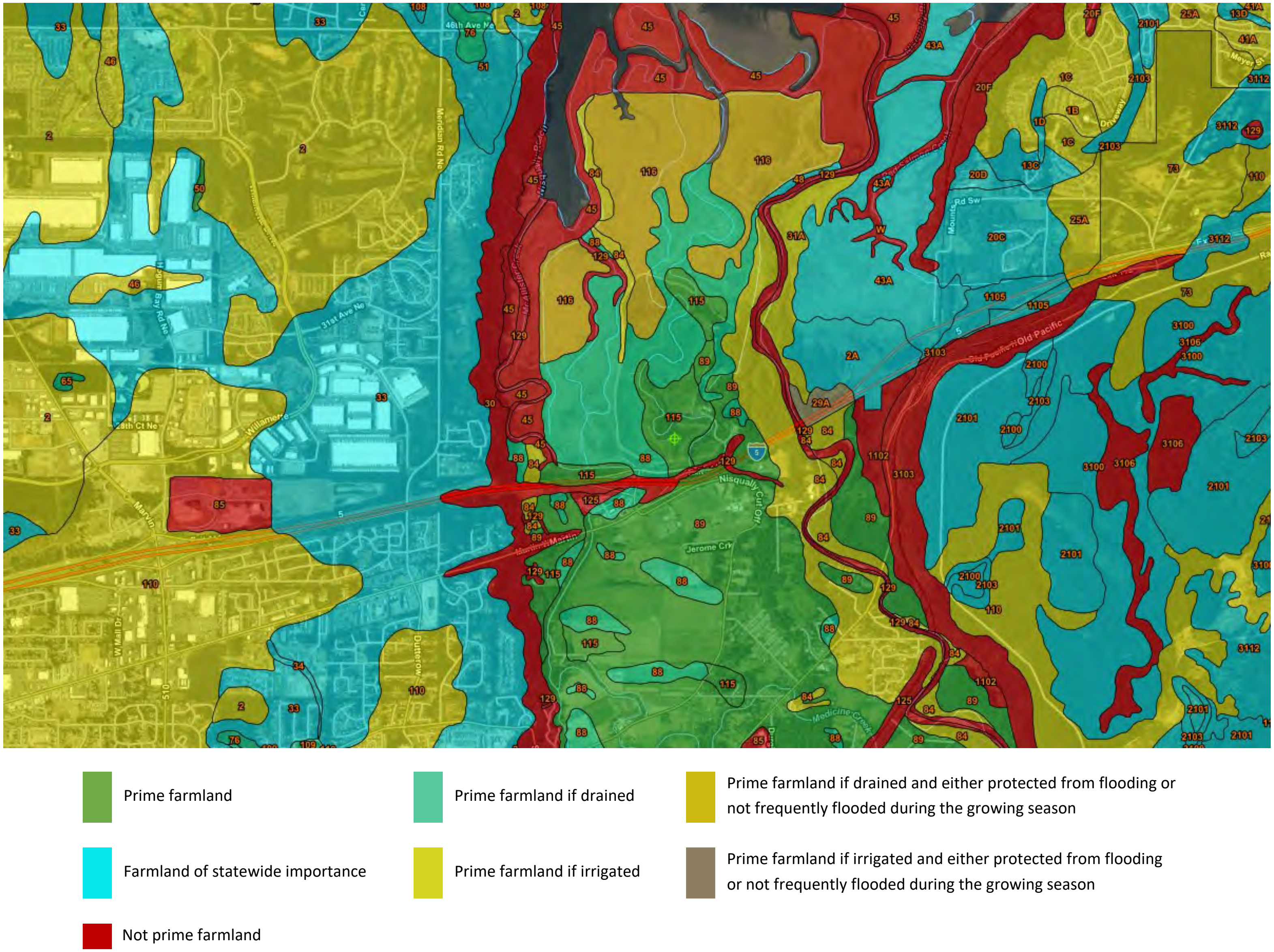
As described in Section 2.3.2 above, the viability of land in long-term agricultural use and the importance of individual farms are protected in Washington through EO 80-01 and an MOU between Washington State Conservation Commission and WSDOT. An evaluation of the NRCS web-based Web Soil Survey shows that much of the project corridor lies within, or directly adjacent to, prime farmland, unique farmland, or farmland of statewide or local importance, as shown on Figure D-59.

Much of the area designated as prime farmland south of I-5 is actively farmed. The prime farmland and farmland of statewide importance north of I-5 is within the Billy Frank Jr. Nisqually National Wildlife Refuge. The prime farmland (if irrigated) on the east and west ends of the project study area have been mostly developed and not used for agricultural in recent years.

14.3.3 Section 6(f) Resources

Based on a search of the RCO project database, there are no projects within the study area that were acquired or developed with LWCF grants. Portions of the Billy Frank Jr. Nisqually National Wildlife Refuge were acquired with LWCF funds from 1966 through 1970. Three separate acquisitions totaling approximately 471 acres by the U.S. Department of Fish and Wildlife were part of the original establishment of the refuge. None of those areas overlap with the I-5 Marvin to Mounts Road PEL study area.

Figure D-59. Farmland Classifications



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15 SECTION 4(F)

15.1 Introduction

15.1.1 Project Background and Description

In 2020, WSDOT completed a corridor study of Interstate 5 between SR 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This vital segment of I-5 connects Thurston and Pierce counties and provides access to Joint Base Lewis-McChord. The roadway travels through the Nisqually River estuary, traditional land of the Nisqually Indian Tribe, and habitat for federally listed threatened species of Puget Sound Steelhead.

In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin and Mounts Road interchanges through the Nisqually River Delta. The Planning and Environmental Linkages (PEL) study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

This next phase, a Focused PEL, will study I-5 from Marvin to Mounts Road (Exit 111 to Exit 116). The Focused PEL will consider additional technical analyses and interested party input to arrive at a final purpose and need and preferred alternative(s), to advance into the National Environmental Policy Act (NEPA) environmental review beginning in 2023.

Funding is provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing. Funding is also provided to construct three roundabouts on SR 507 as the only viable alternative to I-5.

15.2 Methods for Section 4(f) Analysis

This section includes a description of the study area, relevant laws and regulations, and methods for collecting data, assessing impacts, and evaluating possible mitigation measures. The analysis is designed to comply with the NEPA and relevant federal, state, and local laws.

15.2.1 Study Area

The project is located within Thurston and Pierce Counties and the City of Lacey. The study area will include all areas within 0.5-mile of the project corridor, which extends between Exit 111 and Exit 116 on I-5 (Figure D-60).

15.2.2 Relevant Laws and Regulations

Section 4(f) of the Department of Transportation Act of 1966 applies to historic sites of significance, significant publicly owned parks and recreation areas, wildlife and waterfowl refuges, as well as historic sites of nation, state, or local significance. Other relevant regulations and laws include:

- Section 4(f) of the Department of Transportation Act 1966
    - Preservation of Parkland (23 USC 138)
    - Policy on lands, wildlife and waterfowl refuges, and historic sites (49 USC 303)
    - Parks, Recreation Areas, Wildlife and Waterfowl Refuges, and Historic Sites implementing regulations (23 CFR 774)
- National Environmental Policy Act (NEPA) of 1969 (42 USC § 4321 et seq.), Federal Highway Administration (FHWA)
- Section 106 of the National Historic Preservation Act 1966 (16 USC 470 et seq.)
- Section 6(f) of the Land and Water Conservation Fund Act 1965 (Public Law 88-578)

Figure D-60. Project Vicinity Map

15.2.3 Data Sources and Data Collection Methods

The Federal Highway Administration (FHWA) provides guidance on Section 4(f) evaluations through the Environmental Review Toolkit, including the Section 4(f) Policy Paper (FHWA, 2012). In addition, the WSDOT Environmental Manual Chapter 457 and WSDOT Environmental Guidance website also provide guidance. For properties that are not clearly defined by the Section 4(f) designation of publicly owned parks, recreation areas, refuges, or historic sites, FHWA provides information for determining Section 4(f) applicability for these types of properties:

1) Wildlife Management Areas
2) School Playgrounds
3) Fairgrounds
4) Public Multiple-Use Land Holdings
5) Wild & Scenic Rivers
6) Bodies of Water
7) Planned Facilities
8) Bikeways
9) Trails
10) Scenic Byways

Information on existing facilities was compiled using existing documents, maps, aerial photographs, and Geographic Information System (GIS) data obtained from federal and state agencies, Thurston and Pierce Counties, the City of Lacey, and the Nisqually Indian Tribe. A reconnaissance-level site inspection of the project study area was conducted on January 27, 2023 to verify existing facilities and resources. The Cultural Resources Assessment prepared for the project was also reviewed to determine the presence of historic resources that could be classified at Section 4(f) properties.

15.2.4 Impact Evaluation Methods

Once Section 4(f) properties have been identified in the study area, potential use of the resource will be determined. “Use” in the Section 4(f) context is defined in 23 CFR 774.17 (Definitions) and can be one of three forms: permanent conversion to transportation use, temporary occupancy (whole or in part), or constructive use. FHWA's Section 4(f) Policy Paper states that "A constructive use occurs when the proximity impacts of a proposed project adjacent to, or nearby, a Section 4(f) property result in substantial impairment to the property's activities, features, or attributes that qualify the property for protection under Section 4(f)" (FHWA, 2012).

If FHWA determines that the project may use Section 4(f) property, the evaluation will include either:

- Preparing a *de minimis* impact determination, where there is either a Section 106 finding of no adverse effect or no historic properties affected on a historic property, or a determination that the project would not adversely affect the activities, features, or attributes qualifying a park, recreation area, or refuge for protection under Section 4(f).
- Applying one of five programmatic Section 4(f) evaluations, where a specific set of criteria, based upon common experience, allows the standardization of avoidance alternatives.
- Preparing an individual Section 4(f) evaluation, where the project results in a use of Section 4(f) property and options 1 and 2 do not apply.

15.2.5 Mitigation Development

All prudent measures will be considered to avoid or minimize harm and provide necessary mitigation measures to Section 4(f) resources. If required, the form of mitigation will be negotiated between WSDOT, FHWA and the official with jurisdiction.

If an individual Section 4(f) analysis is required and concludes that there is no feasible and prudent avoidance alternative, then the alternative that causes the least overall harm to the Section 4(f) property must be chosen. A list of factors to consider in making this determination is presented in 23 CFR 774.3(c), including "the ability to mitigate adverse impacts to Section 4(f) property; the relative severity of remaining harm, after mitigation, to Section 4(f) property; and the relative significance of each Section 4(f) property."

15.3 Existing Conditions

15.3.1 Recreational Facilities

To be considered a Section 4(f) resource, a recreational facility must be open to the public. Most publicly owned facilities, such as parks and trails, are considered significant resources. The recreational facilities within the study area are described below.

Hawk’s Prairie Off-Leash Dog Park

Located at 2418 Hogum Bay Road, the off-leash dog park is co-located with the Thurston County Waste and Recovery Center (WARC). The two fenced-in areas, for large and small dogs, sit on a former landfill site where methane recovery is taking place. There is a large parking area shared with the Closed Loop Park (see below). The dog park is open from 7:00 AM to dusk, seven days a week.

Closed Loop Park Demonstration Garden

The Closed Loop Park Demonstration Garden is co-managed by the Thurston County Solid Waste Division and Washington State University (WSU) Thurston County Extension, at 2418 Hogum Bay Road. It is a two-acre site developed through the Master Gardeners and Master Recycler Composters as a demonstration area for composting and native gardening. There is a walking path through the gardens, a gazebo, and a picnic area. The park is located on a former landfill site and is open from dawn to dusk, seven days a week.

Eagle’s Pride Golf Course

Eagle’s Pride Golf Course is owned and operated by Joint Base Lewis-McChord (JBLM), located at 1529 Mounts Road SW. The golf course is open year-round to the public, has 27 holes, a driving range, pro shop and retail center, and a restaurant.

15.3.2 Wildlife and Waterfowl Refuges

FHWA considers all refuges that are part of the National Wildlife Refuge System Administration Act as significant Section 4(f) resources. In addition, all publicly owned lands and waters where the primary function is the conservation, restoration, or management of wildlife and waterfowl resources, are considered wildlife and waterfowl refuges for the purpose of Section 4(f).

Billy Frank Jr. National Wildlife Refuge

The Billy Frank Jr. National Wildlife Refuge is located at the mouth of the Nisqually River, at 100 Brown Farm Road. The Wildlife Refuge was established in 1974 and is managed by the US Fish and Wildlife Service (USFWS) for wildlife and habitat conservation. There are over four miles of trails with overlooks, kiosks and viewing platforms with informational materials. Other activities available at the Refuge include fishing, boating, and waterfowl hunting. USFWS provides educational field trips to approximately 10,000 students and educators each year to explore the diverse habitats and wildlife. The Wildlife Refuge facilities include the Norm Dicks Visitor Center, the Environmental Education Center, the Nisqually Reach Nature Center, and the Luhr Beach Boat Ramp, along with restrooms and parking. The Wildlife Refuge is open year-round from sunrise to sunset.

15.3.3 Historic Resources

Historic sites are considered significant Section 4(f) resources if they are currently on, or eligible for listing on, the National Register of Historic Places (NRHP), pursuant to the National Historic Preservation Act (NHPA).

Medicine Creek Treaty National Memorial and Treaty Tree

The Medicine Creek Treaty National Memorial, located within the Billy Frank Jr. National Wildlife Refuge, commemorates the location of the signing of the Medicine Creek Treaty of 1854 between the US government and the Muckleshoot Indian Tribe, Nisqually Indian Tribe, Puyallup Tribe of Indians, and Squaxin Island Tribe of Indians. The Memorial site is only accessible by boat and no landing is permitted. This site is not currently listed on the NRHP; however, it has not been fully evaluated to date. The site will be evaluated and a recommendation made to the State Historic Preservation Office during the NEPA phase of the I-5 Marvin to Mounts Road project. For the purposes of this PEL study and Section 4(f) existing conditions, it is assumed the Medicine Creek Treaty National Memorial site will be eligible for listing on the NRHP.

Other Historic Sites

There are no other historic sites either on or determined to be eligible for listing on the NRHP within the study area. Several sites that were previously determined as not eligible will be re-evaluated during the NEPA phase of the project, as per state requirements.[1] If re-evaluation determines that any of those sites are now eligible, or new sites are found during cultural resource surveys performed for the project, those sites will be included in the Section 4(f) analysis.

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[1] *The Washington Department of Historic Preservation requires that Historic Property Inventory forms that are more than 10 years old be re-evaluated with a new determination provided by the lead agency.*

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16 SOCIOECONOMIC IMPACTS AND ENVIRONMENTAL JUSTICE

16.1 Introduction

16.1.1 Project Background and Description

In 2020, WSDOT completed a corridor study of Interstate 5 between SR 121 in Tumwater (Exit 99) and Mounts Road near DuPont (Exit 116) to develop initial strategies for improving the regional transportation system. This vital segment of I-5 connects Thurston and Pierce counties and provides access to Joint Base Lewis-McChord. The roadway travels through the Nisqually River delta, traditional land of the Nisqually Indian Tribe, and habitat for federally listed threatened species of Puget Sound Steelhead.

In 2021, the Washington State Legislature provided funding to accelerate plans along I-5 for congestion relief and environmental improvements between the Marvin and Mounts Road interchanges through the Nisqually River Delta. The Planning and Environmental Linkages (PEL) study completed in 2022 further refined the corridor study strategies to address peak-period commute traffic congestion and weaving occurring in hot spots in the study area.

This next phase, a PEL, will study I-5 from Marvin to Mounts Road (Exit 111 to Exit 116). The PEL will consider additional technical analyses and interested party input to arrive at a final purpose and need and preferred alternative(s), to advance into the National Environmental Policy Act (NEPA) environmental review beginning in 2023.

Funding is provided to accelerate work along I-5 through the Nisqually River Delta for preliminary engineering, design and right of way acquisition to address flood risk, improve mobility through the corridor between Mounts and Marvin Roads, and enhance the ecosystem at the I-5 Nisqually Delta crossing.

16.1.2 Project Vicinity

The project is located within Thurston and Pierce Counties and the City of Lacey. The project corridor extends between Exit 111 (Marvin Road) and Exit 116 (Mounts Road) on I-5. Figure D-61 shows the current I-5 Marvin Road to Mounts Road Project vicinity.

Figure D-61. Project Vicinity Map

16.2 Methods for Socioeconomic Impacts and Environmental Justice Analysis

This section describes the methods used to support the I-5 Marvin to Mounts Road PEL study and the subsequent National Environmental Policy Act (NEPA) documentation. It includes a description of the study area, relevant laws and regulations, and methods for collecting data, assessing impacts, and evaluating possible mitigation measures. The analysis is designed to comply with the NEPA and relevant federal, state, and local laws.[2]

16.2.1 Study Area

The study area includes all areas within 1.0-mile of the project corridor, which extends between Exit 111 and Exit 116 on I-5. This corridor is where the majority of improvements will take place and where the project is most likely to have effects on socioeconomics and environmental justice (EJ).

Figure D-62 shows the current I-5 Marvin Road to Mounts Road Project primary socioeconomic impacts and environmental justice study area.

16.2.2 Relevant Laws and Regulations

Title VI of the Civil Rights Act of 1964 (42 USC 2000d – 2000d-7) and the Civil Rights Restoration Act of 1987 prohibit discrimination on the grounds of race, color, national origin, age, or disability.

In addition to these federal laws, the following statues, regulations, and guidance relate to environmental justice:

Federal Laws and Regulations

1) Title VI implementing regulations for the US Department of Justice (DOJ) (28 C.F.R. § 42.101 et seq.)
2) Environmental Justice Presidential Executive Order (EO) 12898

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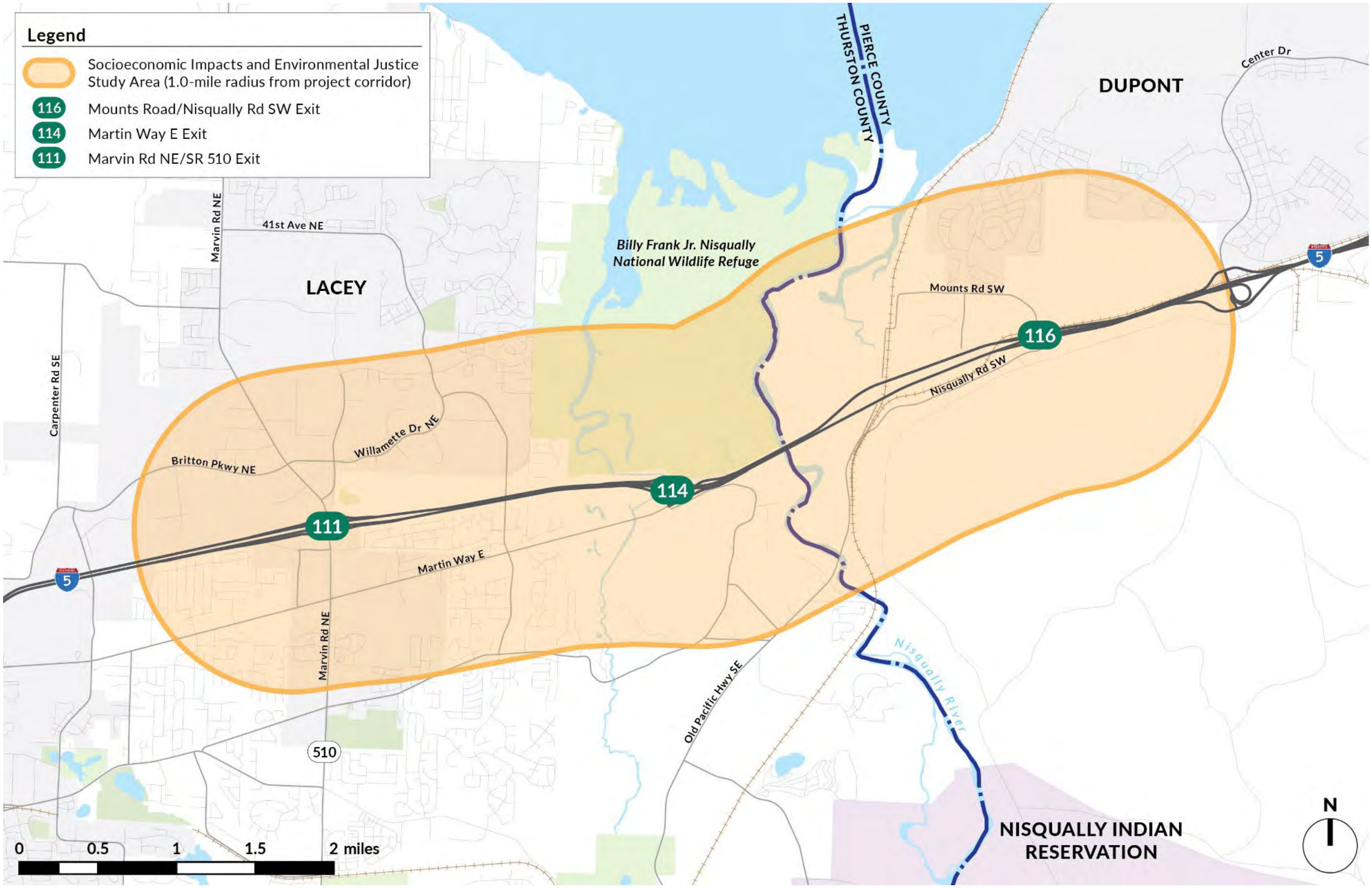
[2] *Note: This methodology will be updated to reflect compliance with the Environmental Justice Assessment once WSDOT specific guidance is available to meet the requirements in RCW 70A.02.60.*

Figure D-62. Socioeconomic Effects and Environmental Justice Study Area



- Limited English Proficiency Presidential EO 13166

- Section 504 of the Rehabilitation Act of 1973
- Title II of the Americans with Disabilities Act (ADA) of 1990 (42 USC 126)
- Department of Transportation (DOT) (Order 5610.2(a)), Final DOT Environmental Justice Order, issued May 2, 2012
- Advancing Racial Equity and Support for Underserved Communities Through the Federal Government EO 13985 issued January 20, 2021
- Tackling the Climate Crisis at Home and Abroad Presidential EO 14008
- Consultation and Coordination with Indian Tribal Governments Presidential EO 13175
- National Environmental Policy Act (NEPA) of 1969 (42 USC § 4321 et seq.), Federal Highway Administration (FHWA)
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (49 USC 24)

State Laws and Regulations

- Environmental Justice, also referred to as the Healthy Environment for All (HEAL) Act (RCW 70A.02)
- Environmental Policy Statement Secretary's EO E 1018
- Affirming Commitment to Diversity and Equity in the Service Delivery and the Communities of the State Governor's EO 93-07
- Title VI Policy Secretary's EO E 1087
- Relocation Assistance – Real Property Acquisition Policy (RCW 8.26)
- Uniform Relocation Assistance and Real Property Acquisition (WAC 468-100)
- Transportation System Policy Goals (RCW 47.04.280)

The new Washington State requirements to comply with RCW 70A.02 will take effect on July 1, 2023, which is within the timeline for this project. An Environmental Justice Assessment will be prepared separately from and in support of the Socioeconomic and Environmental Justice Discipline Report during the NEPA phase of the project as supporting documentation for the NEPA process. All relevant laws and regulations will be incorporated in the Discipline Report at that time.

16.2.3 Data Sources and Data Collection Methods

Demographic information was gathered for areas within approximately one mile of the project corridor. Demographic information on Limited English Proficiency (LEP), race and ethnicity, and low-income was collected from the U.S. Census Bureau and the Washington State Office of the Superintendent of Public Education (OSPI). Information on health disparities was collected from the Washington Environmental Health Disparities (EHD) Map and other resources as identified through the EJ Assessment guidance.

During the NEPA phase of the project, an extensive public outreach effort will be completed for the I-5 Marvin to Mounts Road PEL and NEPA processes. Information gathered during community and interested party engagement will augment the existing conditions data described in this memo to inform the Socioeconomic Impacts and Environmental Justice analysis through the collection of first-hand information from the people who live and work in the project area. See also the *Community Engagement Plan* (WSDOT and PRR, 2022) and *Tribal Coordination Plan* (WSDOT and Confluence Environmental, 2022) prepared for the project.

16.2.4 Impact Evaluation Methods

Title VI of the Civil Rights Act of 1964 ensures that no person shall, on the grounds of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination in any way, under federally funded programs. This memorandum provides documentation of WSDOT's process for ensuring compliance with Title VI and all other laws and regulations pertaining to anti-discrimination.

WSDOT Environmental Manual Chapters 458 and 460 were followed to determine the presence of EJ populations and overburdened communities within the project area, identifying the potential for social and environmental impacts to those populations, and the process for evaluating the project's effects (benefits and burdens) on the people within the study area.

During the NEPA phase of the project, the existing conditions data described in this memo will inform the analysis of the project's impact on the people within the study area. This analysis will focus on socioeconomic, economic, and relocation impacts, and will also incorporate the findings of other analyses prepared for the project, such as Air Quality, Noise, Transportation, Hazardous Materials, Visual Impacts, and others. See also the Socioeconomic Impacts and Environmental Justice Methodology Memorandum (SCJ Alliance, 2023) prepared for the project.

16.2.5 Mitigation Development

This memo identifies the existing socioeconomic and environmental justice conditions within the study area, including potentially overburdened communities. During the NEPA phase of the project, both long- and short-term impacts will be considered for all of the alternatives including the no-build. These impacts may include relocation or in place accommodation of utility lines, service outages, or delayed response time of emergency services due to detours. If an EJ population has been identified in the study area, access to public services and utilities will be included in the determination of “disproportionately high and adverse impacts”.

Information on the project’s potential impacts will be evaluated further to determine whether the project will have a disproportionately high and adverse effect, as defined by FHWA Implementing Order 6640.23, to Environmental Justice populations in the project area by:

- Identifying potential benefits and impacts of the proposed project to communities, social resources and environmental justice populations
    - How will project construction and operation adversely affect community resources and populations
    - How will construction and operation benefit community resources and populations
- The following criteria will be applied to determine whether an effect will disproportionately impact low-income and/or minority populations.
    - Minority, LEP, and/or low-income populations bear a disproportionately high and adverse impact
    - The severity of the impact is appreciably greater for protected populations than for non-protected populations
- The analysis will consider the following:
    - Are there reasonable measures to avoid or minimize adverse disproportionate effects?
    - Are there project benefits for LEP, low-income or minority populations?
    - Was the project designed and/or modified to avoid or minimize disproportionate impacts?

Using the same information gathered for the EJ disproportionate analysis, a Title VI disparate impact analysis will be calculated as the ratio of the % least to % most negatively impacted populations (by race), following WSDOT Guidance in *Determining Project Effect on EJ Populations* (April 2020).

Mitigation for short term effects will be developed in consultation with the affected parties. The design intent is to avoid or minimize permanent impacts. If long term impacts are identified, mitigation measures will be developed in consultation with the affected parties. A general overview of Uniform Relocation Assistance and Real Property Acquisition Policies will be described if displacements are identified.

Impacts to local businesses associated with the project during construction and after completion of the project will be presented. If measurable impacts are identified, potential mitigation will be discussed with WSDOT staff and included in the technical memo.

A project may still be approved even with a finding of “disproportionate high and adverse” if it can be shown that the project serves a significant regional need. In this case, further analysis must demonstrate that avoidance, minimization, mitigation and enhancement measures are not practicable.

16.3 Existing Conditions

This section describes the existing conditions within the study area for socioeconomic impacts and environmental justice (EJ). The assessment of socioeconomic impacts and EJ for the project addresses potential adverse impacts or benefits to the human environment, such as housing, social resources, community resources, and aesthetics. A project’s potential social, economic, and environmental justice effects likely extend beyond its physical limits. The study area encompasses school districts, neighborhoods, and commercial areas along I-5, and areas with potential noise, visual, traffic, and other environmental effects.

16.3.1 Demographics

The demographics assessment identifies EJ populations (minority and low-income[3] populations) within the study area, which will be used to analyze disparate and disproportionate impacts during the NEPA phase of the project. It also identifies limited English proficiency (LEP) populations[4] within the study area for the purposes of project outreach and communications. Census data for the study area was gathered from EPA’s Environmental Justice Screening and Mapping Tool (EJScreen). Using official U.S. Census Bureau 2016-2020 American Community Survey (ACS) 5-Year Estimates provided at the block group[5] level, the EJScreen tool distills the census data to reflect only the population within the study area.

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[3] *The U.S. Department of Health and Human Services (HHS) identified the January 11, 2020 poverty guidelines for a four-person household equaling $26,500 per year. Because the Census data provides income information in ranges of $5,000, this evaluation defines a low-income household as one with a household income of less than $25,000 per year.*

[4] *LEP populations include people over five years old who self-report they speak a language other than English and speak English less than well.*

[5] *Block groups are geographic units used for data collection by the U.S. Census Bureau. A block group generally has a population of 600 to 3,000 and is the smallest geographic unit for which the Census Bureau publishes sample data.*

To substantiate the census demographic data for the study area, it was compared with school district demographic data provided by the Washington Office of the Superintendent of Public Instruction (OSPI). The elementary school closest to the study area is Olympic View Elementary, part of the North Thurston Public Schools district.

Minority Populations

Minority populations include racial and/or ethnic minority groups that have been historically marginalized and can therefore be socially and economically disadvantaged. The minority racial and ethnic groups defined by the U.S. Office of Management and Budget (OMB) are American Indian or Alaska Native, Asian, Black or African American, Latino or Hispanic, and Native Hawaiian or Other Pacific Islander. As shown in Table D-59, all of these minority populations are present in the study area. Minority populations make up approximately 33% of the total study area population.

To substantiate the census data, a breakdown of race/ethnicity at Olympic View Elementary is shown in Table D-60. Most of the minority populations are present at Olympic View in percentages similar to those in the study area, although those identifying as Hispanic or Two or More Races are present at higher percentages than those in the study area. Minority populations make up approximately 60% of the total school population, which is considerably higher than the 33% minority population identified in the study area census data. However, because the study area encompasses only a small portion of the school district (and also contains portions of other school districts), these differences are likely due, at least in part, to a difference in geographical boundaries.

Table D-59. Race/Ethnicity within the Study Area

Race/Ethnicity	Number of Persons	Percent of Total
Total population	15,955	-
White alone	10,811	67%
Black or African American alone	1,004	6%
American Indian and Alaska Native alone	285	2%
Asian alone	1,659	10%
Native Hawaiian and Other Pacific Islander alone	139	1%
Some other race alone	343	2%
Two or more races	1,714	11%
Hispanic	2,158	14%
Total minority population	5,144	33%

Source: U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates; EPA EJ Screen Report attached.

Table D-60. Race/Ethnicity at Olympic View Elementary

Race/Ethnicity	Number of Students	Percent of Total
Total enrollment	615	-
White alone	246	40.0%
Black or African American alone	37	6.0%
American Indian and Alaska Native alone	6	1.0%
Asian alone	53	8.6%
Native Hawaiian and Other Pacific Islander alone	14	2.3%
Two or more races	109	17.7%
Hispanic	150	24.4%
Total minority population	5,144	60.0%

Source: U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates; EPA EJ Screen Report attached.

Low-Income Populations

The U.S. Department of Health and Human Services (HHS) identified the poverty guideline figure for a four-person household in 2020 to be $26,500 per year. Because the Census data provides income information in ranges of $5,000, this evaluation defines a low-income household as one with a household income of less than $25,000 per year. As shown in Table D-61, 14% of households within the study area can be characterized as low-income.

To substantiate the census data, the percentage of Olympic View Elementary students identified as low-income is shown in Table D-62. Low-income students comprise 44.7% of Olympic View's total enrollment, which is considerably higher than the 14% low-income population identified in the study area census data. However, school programs use different criteria to identify low-income students – for example, USDA sets eligibility for free and reduced price lunch programs at 130% of the poverty line. Additionally, because the study area encompasses only a small portion of the school district (and also contains portions of other school districts), these differences are likely due, at least in part, to a difference in geographical boundaries.

Table D-61. Low-Income Households within the Study Area

Household Income Level	Number of Households	Percent of Total
Total households	6,313	-
Less than $15,000	300	5%
$15,000-$25,000	572	9%
$25,000-$50,000	1,029	16%
$50,000-$75,000	1,253	20%
$75,000 or more	3,158	50%
Total low-income households (<$25,000)	872	14%

Source: U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates; EPA EJ Screen Report attached.

Table D-62. Low-Income Students at Olympic View Elementary

Enrollment	Number of Students	Percent of Total
Total enrollment	615	-
Low-income	275	44.7%

Source: OSPI School Report Card for Olympic View Elementary; OSPI report attached

LEP Populations

Limited English proficiency (LEP) populations include people over five years old who speak a language other than English and speak English “less than very well,” as self-identified in the census data. Project information must be provided in languages other than English when an LEP population of five percent or greater has been identified in a project area. As shown in Table 5, 6.7% of the study area population can be considered to have limited English proficiency.

To substantiate the census data, the percentage of Olympic View Elementary students identified as English Language Learners is shown in Table D-63. Of the 615 students at Olympic View, 7.5% are identified as English Language Learners, which is comparable to the 6.7% LEP population identified in the study area census data.

Table D-63. LEP Population within the Study Area

Population by Ability to Speak English	Number of Persons	Percent of Total
Total population > 5 years old	14,664	-
Speak only English	12,412	84.6%
Speak English "very well"	1,271	8.7%
Speak English "well"	499	3.4%
Speak English "not well"	469	3.2%
Speak English "not at all"	14	0.0%
Total population speaking English “less than very well” (“well” + “not well” + “not at all”)	982	6.7%

Source: U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates; EPA EJ Screen Report attached.

Table D-64. English Language Learners at Olympic View Elementary

	Number of Students	Percent of Total
Total enrollment	615	-
English Language Learners	46	7.5%

Source: OSPI School Report Card for Olympic View Elementary; OSPI report attached

According to the census data, approximately 85% of the population within the study area speaks only English at home; the remaining 15% primarily speak another language in the home. For project outreach and communication purposes, languages spoken in the study area by those who primarily speak a non-English language in the home are listed in Table D-65.

Table D-65. Population by Non-English Language Spoken at Home

	Population (>5 Years Old) Speaking a Language Other than English in the Home	
Language	Number of Persons	% of Total Population
Spanish	703	4.4%
French, Haitian, or Cajun	72	0.5%
German or other West Germanic	140	0.9%
Russian, Polish, or Other Slavic	26	0.2%
Other Indo-European	11	0.1%
Korean	504	3.2%
Chinese (including Mandarin, Cantonese)	72	0.5%
Vietnamese	28	0.2%
Tagalog (including Filipino)	290	1.8%
Other Asian and Pacific Island	214	1.3%
Other and Unspecified	7	0.0%

Source: U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates; EPA EJ Screen Report attached.

16.3.2 Other Socioeconomic Indicators

In addition to the EJ populations identified in the previous section, a number of other socioeconomic indicators help us understand more about the community. The prevalence of these socioeconomic indicators within the study area is shown in Table D-66, and is compared to that of Pierce County, Thurston County, and Washington State as a whole.

- **Home Ownership**: The rate of home ownership in the study area is low compared to those of the surrounding counties and the state as a whole – 54% in the study area as compared to 63% in both Pierce County and Washington and 66% in Thurston County. This indicates the study area may have a larger percentage of people who cannot afford to purchase a house, or a lack of affordable housing.
- **Internet Access**: Many households in the study area have low or limited internet access (17%). While this percentage is similar to those of the comparison communities, it is important to consider the community’s access to the Internet particularly during the outreach components of this project.

- **Unemployment Rate**: At 6%, unemployment in the study area is higher than that of both Pierce County and Washington State.
- **Elderly Populations**: The study area has a smaller percentage of those age 65 and older (10%) than do the comparison communities.
- **Disabled Populations**: Eleven percent of the population within the study area has some form of disability.
- **Transit-Dependent Populations**: About 6% of households within the study area do not have a vehicle; this portion of the population can be considered transit-dependent.

Table D-66. Socioeconomic Indicators

	Study Area	Pierce County	Thurston County	Washington State
Home Ownership				
Own	**54%**	63%	66%	63%
Rent	**46%**	37%	34%	37%
Internet Access				
Without internet access	**10%**	10%	10%	10%
Cellular data plan as the only internet subscription	**7%**	9%	8%	9%
Unemployment Rate	**6%**	5%	6%	5%
Elderly Population (Age 65+)	**10%**	14%	17%	15%
Disability				
All	**11%**	14%	16%	13%
Hearing difficulty	**3%**	4%	5%	4%
Vision difficulty	**2%**	2%	3%	2%
Cognitive difficulty	**3%**	6%	7%	6%
Ambulatory difficulty	**5%**	6%	7%	6%
Self-care difficulty	**2%**	3%	2%	2%
Independent living difficulty	**4%**	6%	7%	6%
Households Without Vehicles	**6%**	5%	5%	7%

Source: U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates; EPA EJ Screen Report attached

16.3.3 Health Disparities

The Washington Environmental Health Disparities (EHD) Map is an interactive mapping tool that evaluates environmental health risk factors in communities and compares communities across the state for environmental health disparities. It estimates a cumulative environmental health impact score for each census tract reflecting pollutant exposures and factors that affect people’s vulnerability to environmental pollution. The model takes into account both threat (represented by indicators that account for pollution burden) and vulnerability (represented by indicators of socioeconomic factors and sensitive populations) to help compare health and social factors that may contribute to disparities in a community.

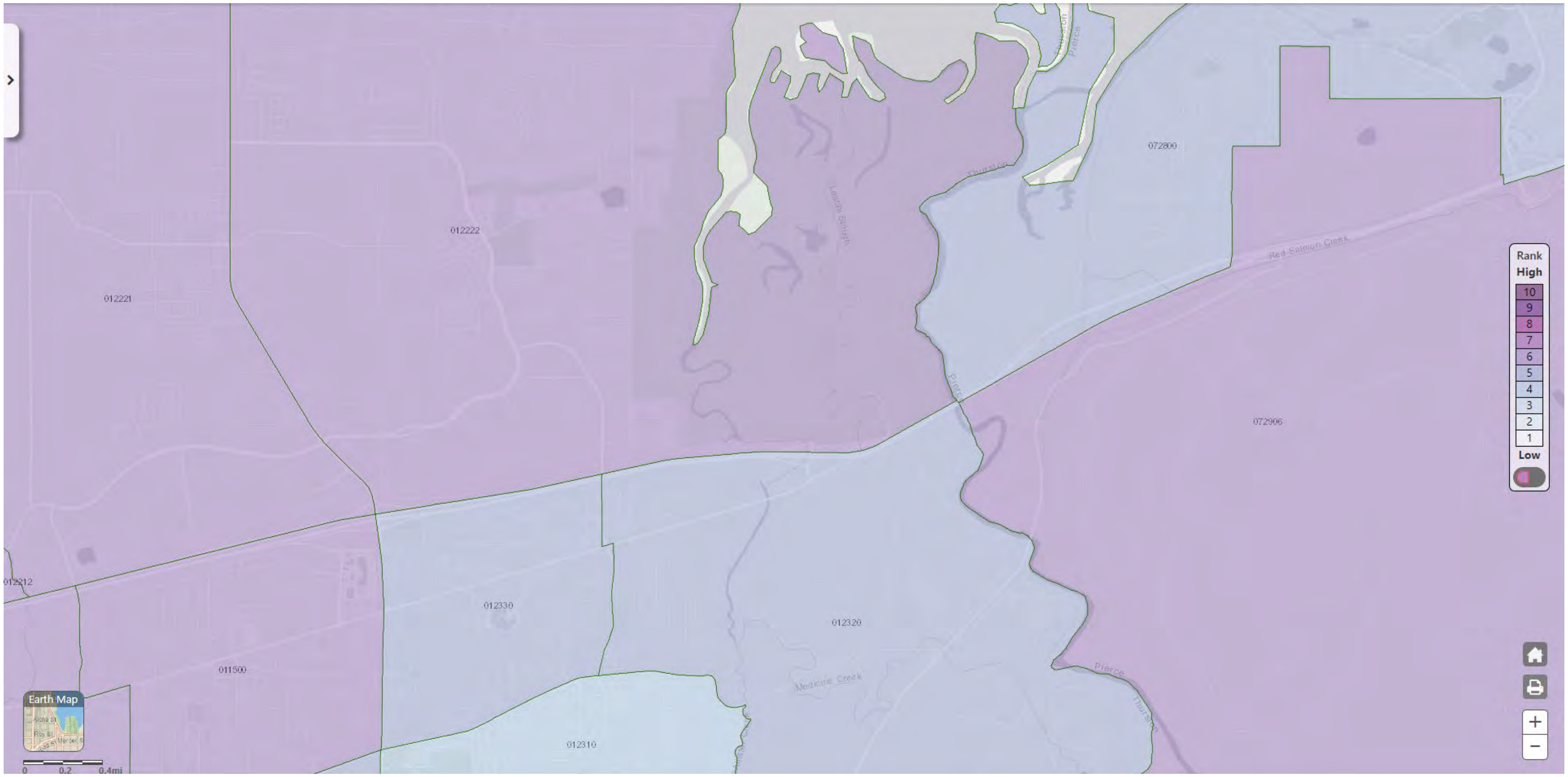
The mapping tool shows pollution measures such as diesel emissions and ozone, as well as measures like poverty and cardiovascular disease. Looking at these factors in combination shows that living in areas with more environmental hazards and population vulnerabilities is associated with a shorter lifespan. The population in census tracts with the lowest environmental health disparities (rank 1) on average lived 5.3 years longer than those in census tracts with the highest environmental health disparities (rank 10). The sections below discuss health risks and disparities in the study area, including environmental exposures, socioeconomic factors, and health outcomes.

Environmental Exposures

Figure D-63 shows the risk of environmental exposures in the study area. Factors considered in the environmental exposures map include diesel exhaust PM2.5 emissions, ozone concentration, PM2.5 concentration, proximity to heavy traffic roadways, and toxic releases from facilities.

Census blocks within the study area rank between 4 and 6, indicating an overall medium risk of environmental exposures in the study area.

Figure D-63. Environmental Exposures in the Project Study Area



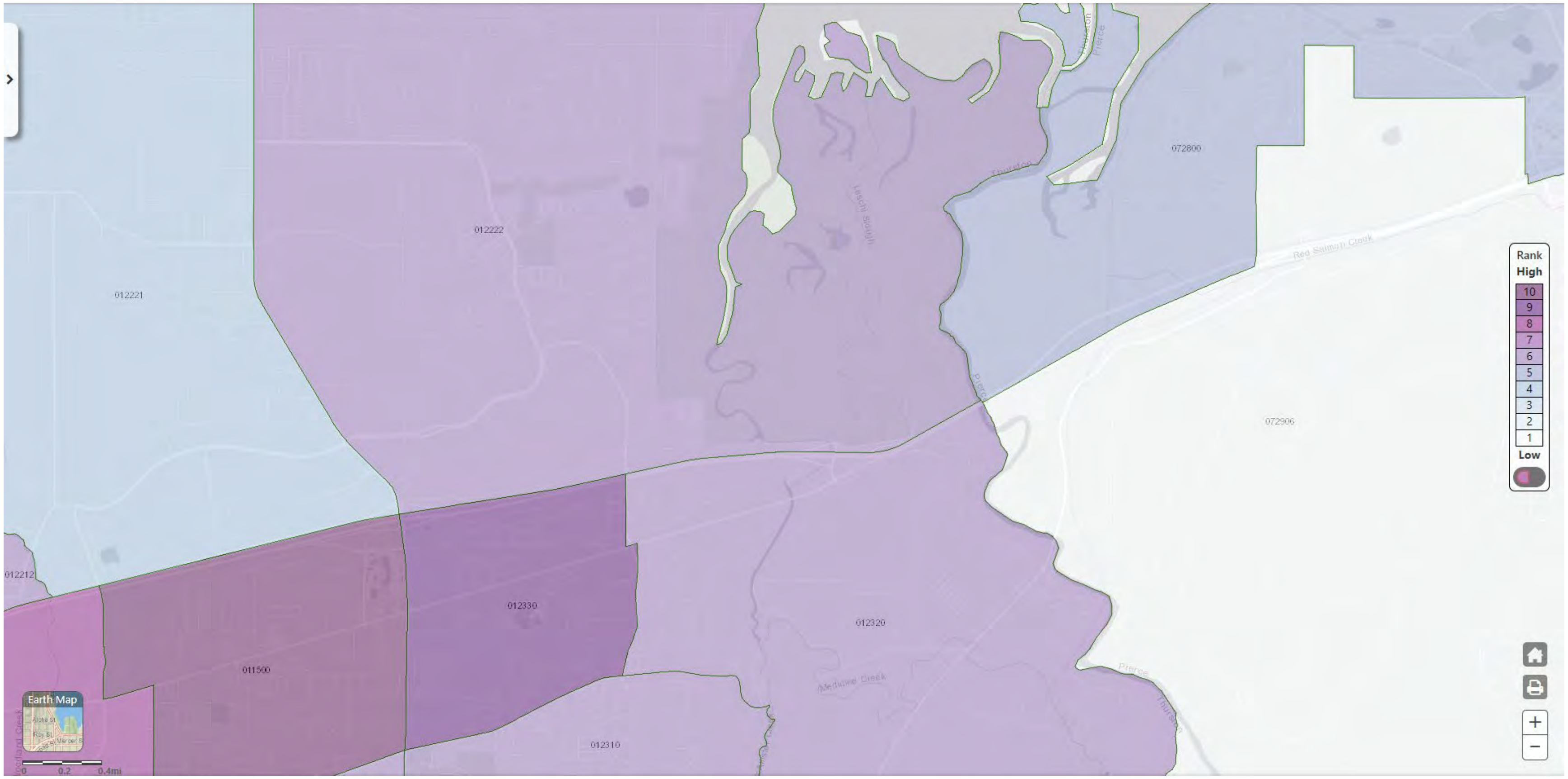
Source: WA Dept. of Health Environmental Health Disparities (EHD) Database

Socioeconomic Vulnerability

Socioeconomic vulnerability in the study area is illustrated in Figure D-64. Factors considered in the socioeconomic vulnerability map include LEP census data, high school diploma attainment, people of color, population living in poverty, transportation expense, housing affordability, and unemployment.

Much of the study area ranks between 6 and 10, indicating socioeconomic vulnerability is high in those areas.

Figure D-64. Socioeconomic Vulnerability in the Project Study Area



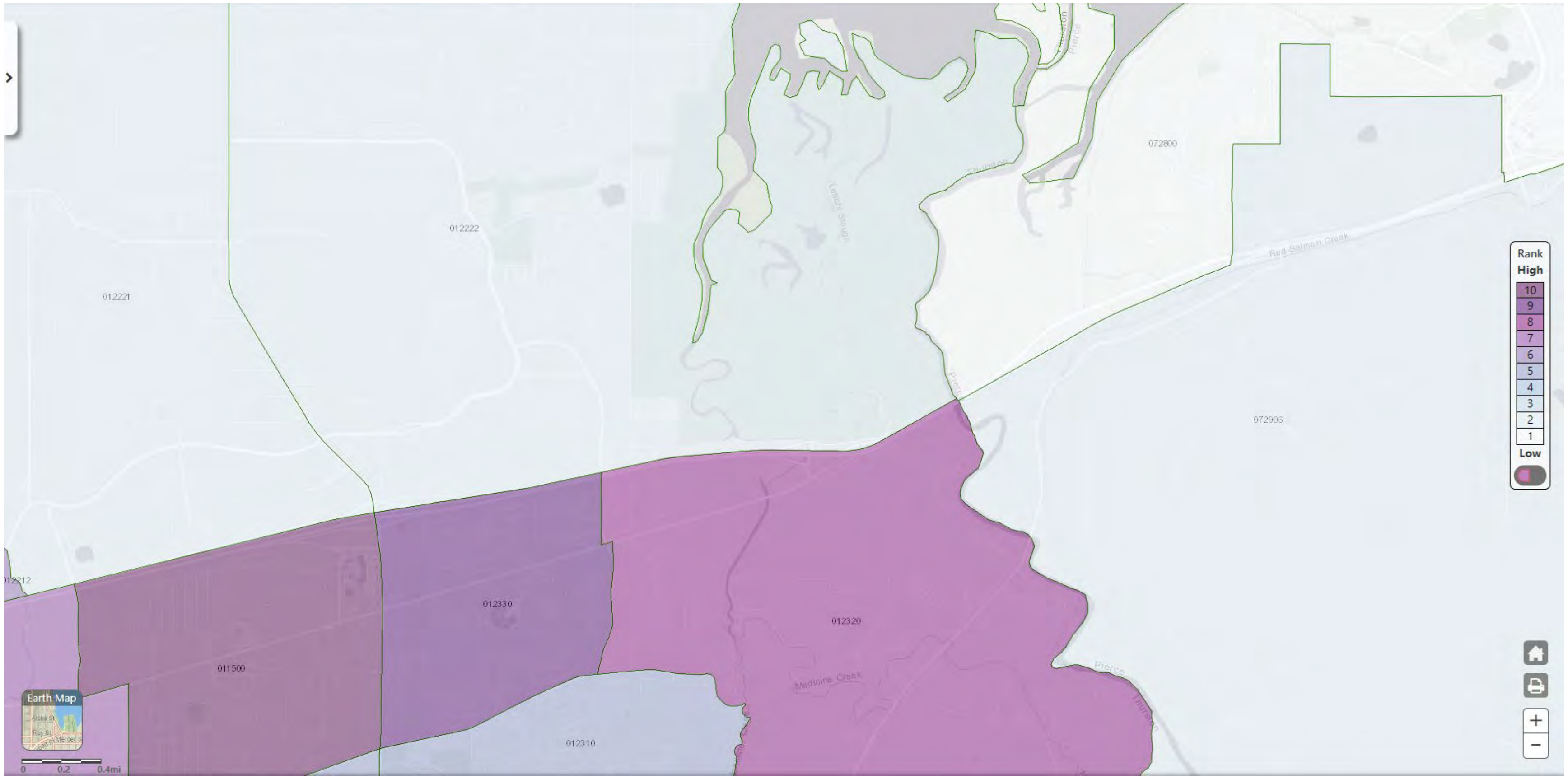
Source: WA Dept. of Health Environmental Health Disparities (EHD) Database

Health Outcomes

Health outcomes in the study area are shown in Figure D-65. Factors considered in the health outcomes map include body mass index (BMI), cancer deaths, cardiovascular disease deaths, premature deaths, low birth weight, and percentage of population with no health insurance.

Census blocks in the central-southern portion of the study area rank from 8-10, indicating the risk of poor health outcomes are high in those areas.

Figure D-65. Health Outcomes in the Project Study Area



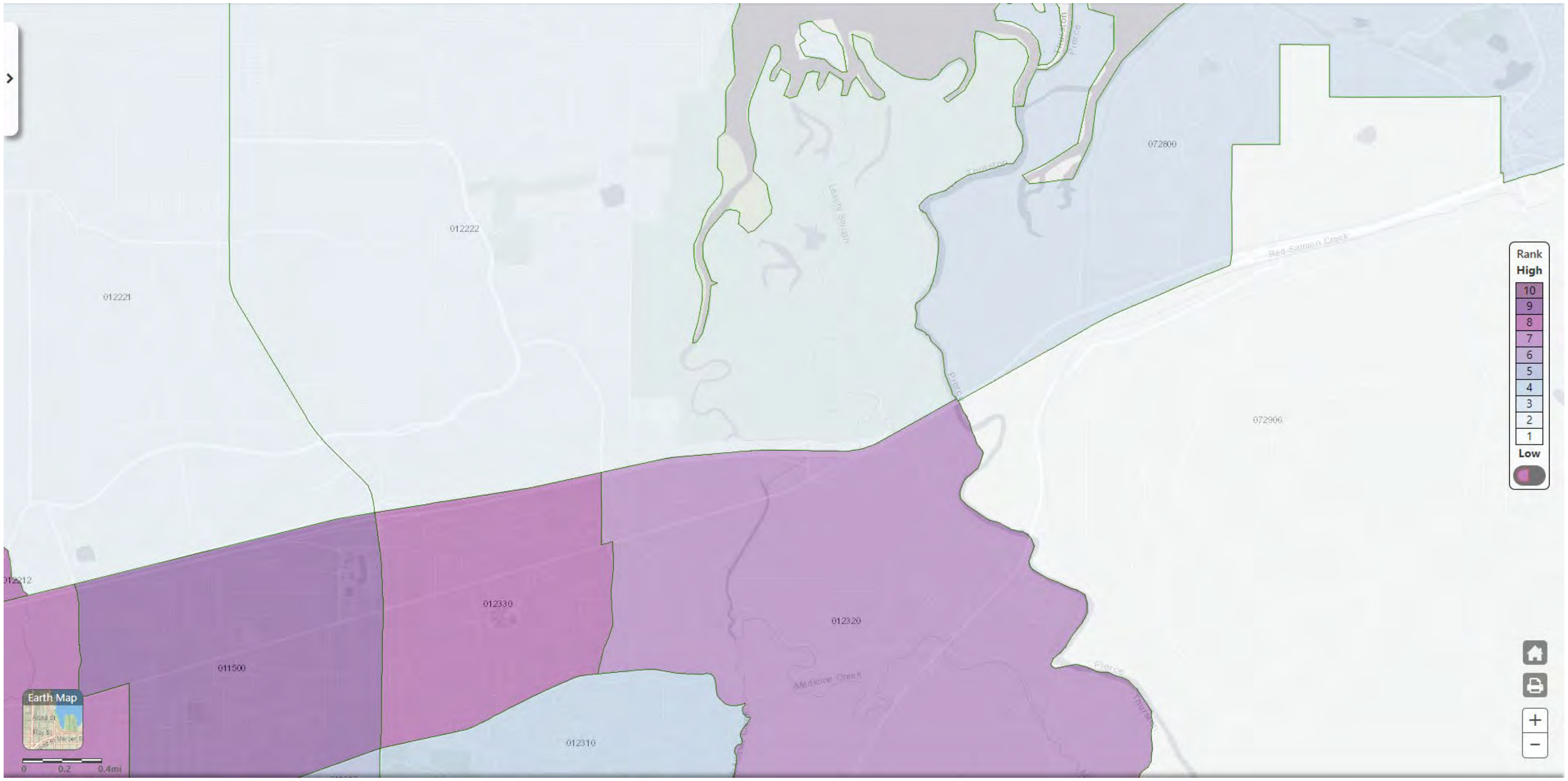
Source: WA Dept. of Health Environmental Health Disparities (EHD) Database

Health Disparities

Figure D-66 illustrates health disparities in the study area. Factors considered in the health disparities map include social determinants, economic determinants, and poor health outcomes (as compared to those of other census blocks throughout the state).

Census blocks in the central-southern portion of the study area rank from 7 to 9, indicating health disparities are moderately high in those areas.

Figure D-66. Health Disparities in the Project Study Area



Source: WA Dept. of Health Environmental Health Disparities (EHD) Database

16.3.4 Key Community Members

Nisqually Indian Tribe

The Nisqually Indian Reservation is situated on about 5,000 acres of land on the Nisqually River, about two miles upriver (southeast) from the project corridor. The tribe is known for its environmental stewardship programs and frequently works with other local, regional, and federal agencies to protect and enhance the natural environment. In particular, the tribe works with the U.S. Fish and

Wildlife Service to help steward the lands of the Billy Frank Jr. Nisqually National Wildlife Refuge, located in the study area where the Nisqually River flows into Puget Sound.

Tribal Enterprise Businesses

The tribe has grown to become one of the largest employers in Thurston County and operates a number of businesses through its Medicine Creek Enterprise Corporation. While many of these are situated on tribal lands located farther south on SR 510, a few are located within the project study area, including:

- Medicine Creek Cafe – 10322 Martin Way E, Olympia, WA 98516; https://www.medicinecreekcafe.com/
- Nisqually Express Espresso and Tobacco – 10324 Martin Way E, Olympia, WA 98516; http://www.nisquallymarkets.com/locations/express/
- Nisqually Tobacco Outlet – 2107 Marvin Rd NE, Lacey, WA 98516; http://www.nisquallymarkets.com/locations/nisqually-tobacco-outlet/

Community-Based Organizations and Services

Community-based organizations include schools, places of worship, and social services organizations that serve the population within the study area. These organizations provide support for community members and often play crucial roles in community building and development. The community-based organizations and services that support the study area population are listed below.

Schools

There are three schools within the 1.0-mile study area:

- Olympic View Elementary School, North Thurston School District – 1330 Horne St NE, Lacey, WA 98516
- River Ridge High School, North Thurston School District – 350 River Ridge Dr SE, Olympia, WA 98513
- Wa He Lut Indian School (K-8) – 11110 Conine Ave SE, Olympia, WA 98513, https://wahelutindianschool.org/

Other nearby schools that may serve the study area population include:

- Lydia Hawk Elementary School, North Thurston School District – 7600 5th Ave SE, Lacey, WA 98503
- Nisqually Middle School, North Thurston School District – 8100 Steilacoom Rd SE, Lacey, WA 98503
- Faith Lutheran School (Private) – 7075 Pacific Ave SE, Lacey, WA 98503, http://www.flschool.org/
- Meadows Elementary School, North Thurston School District – 836 Deerbrush Dr SE, Lacey, WA 98513

- Salish Middle School, North Thurston School District – 8605 Campus Glen Dr NE, Lacey, WA 98516
- Chloe Clark Elementary School, Steilacoom Historical School District – 1700 Palisade Blvd, DuPont, WA 98327
- Pioneer Middle School, Steilacoom Historical School District – 1750 Bobs Hollow Ln, DuPont, WA 98327

Places of Worship

There is one place of worship within the 1.0-mile study area: First Church of Lacey, located at 9323 Martin Way E, Lacey, WA 98516 (firstchurchnw.com).

Other nearby churches, mosques, and synagogues that may serve the study area population include:

- Turning Point Church – 3525 Marvin Rd NE, Lacey, WA 98516, http://www.turningpointolympia.com/
- Grace Bible Church – 3211 Eagle Dr NE, Lacey, WA 98516, https://www.gracebibleolympia.org/
- Lacey Bible Church – 6646 Pacific Ave SE, Lacey, WA 98503, https://laceybiblechurch.org/
- Faith Lutheran Church – 7075 Pacific Ave SE, Lacey, WA 98503, https://www.faithlutheranlacey.org/
- New Life Baptist Church – 7838 Pacific Ave SE, Lacey, WA 98503, http://www.nlbclacey.com/
- Real Hope Community Church – 8004 Pacific Ave SE, Lacey, WA 98503, http://realhopelacey.org/
- The Roots Community Church – 7945 Steilacoom Rd SE, Olympia, WA 98503, http://therootscommunity.com/
- Community Presbyterian Church of DuPont – 502 Barksdale Ave, DuPont, WA 98327, https://www.dupontpresbyterian.org/
- Grace Baptist Church – 300 Barksdale Ave, DuPont, WA 98327, http://gbcdupont.com/
- The GraceWorks Church – 1700 Palisade Blvd, DuPont, WA 98327, http://www.thegraceworks.com/
- Masjid Feidul-Islam Olympia Lacey Islamic Center – 7945 Pacific Ave SE, Lacey, WA 98503, http://masjidfeidulislam.com/
- Islamic Center of Olympia – 4324 20th Ln NE, Olympia, WA 98516, http://islamiccenterofolympia.org/
- Temple Beth Hatfiloh – 201 8th Ave SE, Olympia, WA 98501, http://www.bethhatfiloh.com/

Community and Social Services

The following organizations provide community and social services to support the population living in the study area:

- Community Youth Services – Empowers at-risk youth and their families to meet their goals for safety, stability, belonging, and success by providing a continuum of individualized services and advocacy; https://communityyouthservices.org/
- Goodwill Olympics and Rainier Region – Works to help people reach their fullest potential through education, job placement, and career pathway services; https://goodwillwa.org/
- Housing Authority of Thurston County – Provides safe, decent, and affordable housing and services to persons with disabilities, low income and at-risk individuals and families; https://hatc.org/
- Kokua Services – Provides a variety of both residential and community support services to adults with disabilities in Thurston County; https://www.kokuaservices.org/
- Mi Centro Pierce County – Community-based non-profit that works with the Latino and Indigenous native families through educational programs, crisis intervention, family outreach services, arts and culture programming, and advocacy efforts; https://micentrowa.org/
- Multicultural Child & Family Hope Center – Provides culturally relevant support services to children and families through daycare, ECEAP, and DSHS contracted services; https://mcfhc.org/
- Sound Outreach Pierce County – Helps Pierce County residents experiencing low and/or fixed-incomes build financial security through financial coaching, job training, and other connected services; https://soundoutreach.org/
- The Tacoma-Pierce County Black Collective – A community of Black people dedicated to civic engagement through volunteer service; https://theblackcollective.org/
- Thurston County Food Bank – Works to eliminate hunger within the Thurston County community with two food pantry locations, including one in the study area at 7027 Martin Way E; https://thurstoncountyfoodbank.org/
- United Way Thurston County – Advocates for the health, education and financial stability of every person in the community; https://www.unitedway-thurston.org/
- Yelm Community Services Food Bank – A nonprofit, community development organization that provides social and economic programs to enhance the quality of life in our community; http://yelmcommunityservices.com/

16.4 References

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Washington State Department of Health (DOH), 2023. Washington Environmental Health Disparities Map web mapping and database search. Available at: https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/washington-environmental-health-disparities-map. Accessed March 2023.

Washington State Department of Transportation (WSDOT), 2022. *Environmental Manual*. Available at: https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-11/em.pdf. Accessed March 2023.

17 TRANSPORTATION

17.1 Background

An Interstate 5: Tumwater to Mounts Road corridor planning study conducted from 2018-2020 concluded that three sections within this portion of I-5 experience recurring peak-period congestion due to high traffic volumes and weaving between interchanges. One of these sections is near the Nisqually River bridges between Marvin Road (SR 510) and Mounts Road. A Planning and Environmental Linkages (PEL) process was used from 2020-2022 to refine the information provided by the corridor planning study.

The study area for the PEL was I-5 from Tumwater (Exit 99) to Mounts Road (Exit 116). The corridor PEL identified strategies for regional congestion management, logical sections of the corridor to study further, and a strategic plan for the Nisqually River bridges that considers ecosystem benefits to the Nisqually River estuary for salmon productivity and flood control.

WSDOT is preparing a Federal Planning and Environmental Linkages (PEL) study focused on the Nisqually River Delta area of I-5 identified in the previous PEL process. The focused PEL is being prepared to document a more detailed alternatives development and evaluation process for the Marvin Road (Exit 111) to Mounts Road (Exit 116) section. After completing the focused PEL, this section will move directly into the NEPA environmental documentation phase to implement the I-5 capacity and Nisqually Delta environmental habitat restoration improvements.

This document describes the corridor conditions and existing transportation system within the focused PEL study area ((I-5 from Marvin Road/SR 510 interchange (Exit 111) to Mounts Road interchange (Exit 116)).

17.2 Land Use and Planned Development

17.2.1 Land Use

The study area is located primarily in Thurston County at the southern end of the Puget Sound with the eastern portion in southern Pierce County near DuPont and part of JBLM. At 736 square miles, Thurston County is the eighth smallest county in Washington. Thurston County is a mostly rural county but has several urban and suburban areas. About 13 percent of the land area is incorporated or unincorporated urban area, 70 percent is rural, one percent is tribal reservation and 16 percent is state or federal forest land. Lacey, Olympia, and Tumwater are the largest cities in Thurston County and together form the north urban area. In southern Thurston County are the cities of Rainier, Tenino, and Yelm, the Town of Bucoda, and unincorporated Grand Mound. There are two tribal reservations: the Confederated Tribes of the Chehalis Reservation and the Nisqually Indian Tribe Reservation.

Population

According to Thurston Regional Planning Council's (TRPC) report, *The Profile*[6], Thurston County's population was approximately 252,000 as of the 2010 census, with most people living in unincorporated areas. Since then, the county's population has grown and the balance has shifted towards urban areas. Thurston County's population was 281,700 in 2018. It is one of the fastest growing counties in Washington State. 63 percent of Thurston County's population lives in the Lacey–Olympia–Tumwater urban area, 6 percent in the south county communities of Bucoda, Rainier, Tenino, Yelm, and Grand Mound, 0.3 percent in a tribal reservation, and the remaining 31 percent in rural unincorporated areas.

TRPC forecasts the population will continue to grow to roughly 371,000 by 2040, an increase of 119,000 or 47 percent. Furthermore, TRPC forecasts the balance of population will continue to concentrate in incorporated cities and urban growth areas between 2018 and 2040 (70,000 people). Other urban areas are also expected to absorb a significant amount of growth. Yelm's population is projected to add 20,000 residents, an increase of 4.1 percent per year.

17.2.2 Employment

Roughly 145,600 people work in Thurston County. State government is the largest employment sector with over 24,000 employees. Education, health, and social services, professional and business services, and retail trade are the next largest sectors. Over 37,000 new jobs have been added since 2000, an increase of 1.7 percent per year.

Like population, employment is expected to increase about 50 percent from 129,000 to 194,000. As employment grows, the balance of job types are expected to change. The education, health, and social services sector is projected to overtake state government within the next 25 years. Additionally, Joint Base Lewis McChord is located on the eastern end of the study corridor in Pierce County and is the largest single employment site in Washington state with roughly 52,000 military personnel and civilian worker jobs on site.

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[6] Thurston Regional Planning Council; The Profile webpage; https://www.trpc. org/391/The-Profile-Thurston-County-Statistics-D

17.2.3 Commuting Patterns

I-5 connects the study area to Tacoma and Seattle to the north and Centralia to the south. Over 121,000 trips cross the Thurston-Pierce border on I-5 each day. US-101 and US-12 also serve as important connections to Aberdeen, Hoquiam, and the Olympic Peninsula. Most Thurston County residents (72 percent) work in the county. However, a significant number commute out of county, primarily to Pierce and King Counties. TRPC estimates that by 2045 these outbound commuters will increase to 54,100, up from 35,300 in 2015.

Commute modes and timing, like population, are also changing albeit more slowly. People are leaving earlier and experiencing longer commutes. At the same time, the COVID-19 pandemic led to an increase in telework. During the pandemic, for example, many Washington State employees used telework options offered by employers. Following the pandemic, some employers plan to continue allowing remote work opportunities. For example, the WSDOT post pandemic goal is to have 40% of eligible staff teleworking on any given day. Because of the increase in telework, TRPC added five percent teleworking to the 2030 traffic model and nine percent teleworking to the 2045 traffic model. This was applied as a reduction in total vehicle trips.

Other travel modes, including biking, walking, transit, and carpooling have remained relatively stable in terms of the proportion of commuters but are all growing in terms of total number. Electric bikes (Ebikes) are gaining popularity as a transportation and commuting mode. According to the market research firm NPD Group, sales of bicycles in 2020 increased 65 percent from 2019 to 2020, and sales of e-bikes grew 145 percent in 2020 compared to 2019. During the pandemic, many considered Ebikes a safer way to travel than taking transit.

17.3 Travel patterns

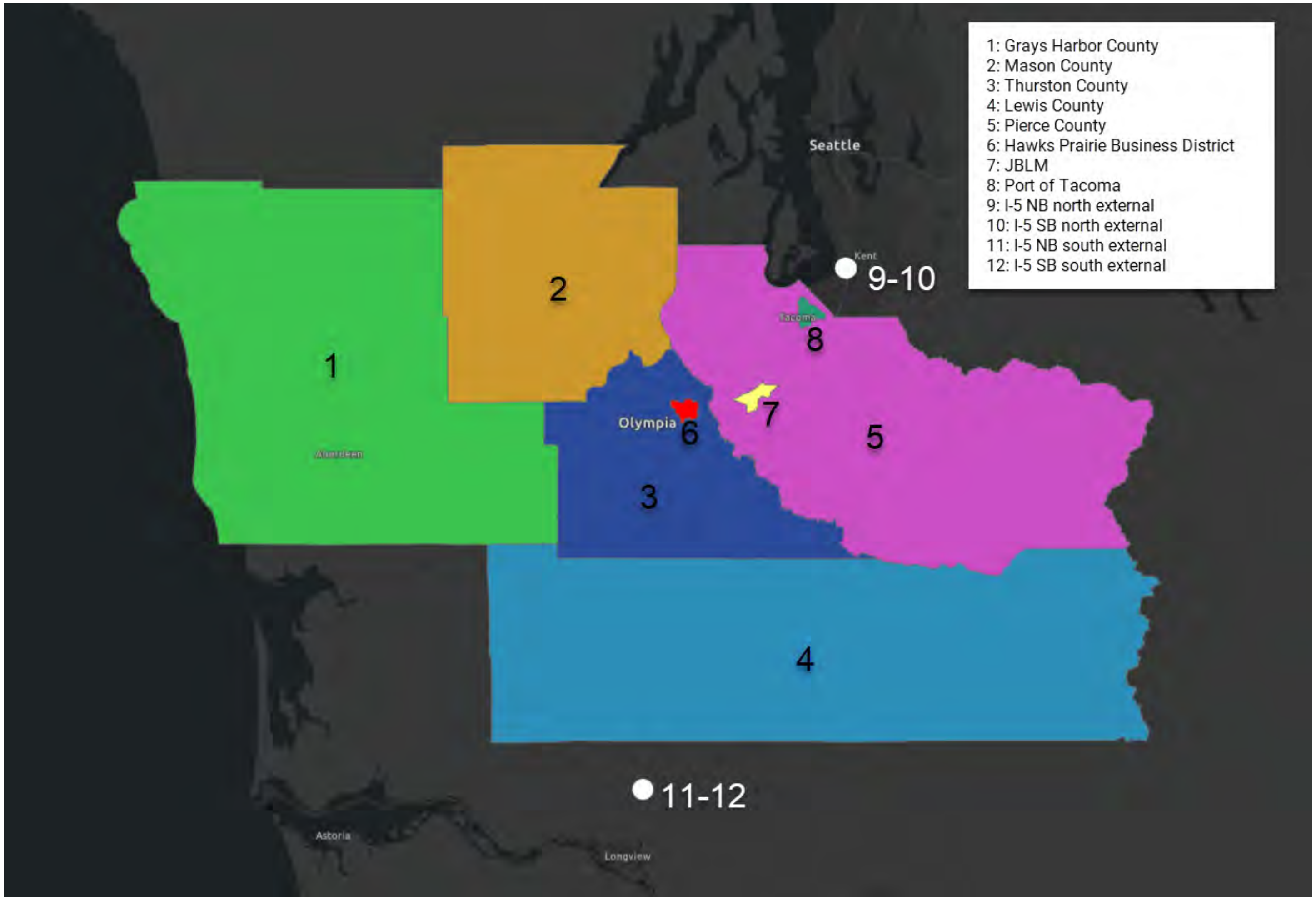
This chapter highlights a relatively new data source, StreetLight Data, that can summarize the travel patterns of people who travel along, across, and within the I-5 corridor study area. These travel patterns offer insights about the types of trips in the corridor (longer or shorter), the trip purpose (commuting, freight, home to other locations), and the mode of travel (private auto, truck trips, bus, pedestrian, or bicycle).

17.3.1 Streetlight Data

StreetLight Data is a type of “Big Data” service that is collected from a large number of “anonymized devices,” notably smart phones, internet-connected vehicles, in-vehicle global positioning system (GPS) services, and fleet management systems. The data are collected in a way that there is no personally identifiable information, and it is blended and transformed into travel patterns for cars, trucks, bus, and active (pedestrian and bicycle) modes. The data may not accurately represent the overall population or travel behavior. While that does not make the data invalid, it does mean that the user should look at overall trends and general information from the data rather than portray individual numbers as an absolute truth. It should be used in conjunction with other information such as regularly collected count data and any available user surveys (e.g. household or on-board surveys) to better understand travel behavior. WSDOT utilized StreetLight Data to understand vehicle/truck travel patterns, home and work locations, and multimodal activity of people within the study area. Appendix ## provides a complete methodology and summary of how StreetLight was used for the I-5 Focused PEL Study.

The StreetLight analysis centered on trips that use I-5 at the Nisqually Delta, identifying where all I-5 users begin or end their trips. Origins and destinations were categorized into 13 subareas, as illustrated in Figure D-67. JBLM, Quiemuth Village, and the Tacoma Tideflats Manufacturing and Industrial Center (MIC) were identified as areas of interest. Special polygons were created to capture these areas. These areas, though they sit within counties, do not overlap county subareas. This means that data for Thurston County and Quiemuth Village, for example, are exclusive of one another. To get a total number of trips for all of Thurston County, the information for Thurston County and Quiemuth Village would need to be combined. Cordons were also created along I-5 on the northern and southern boundaries of the subscription region that was available for performing the analysis to capture trips coming and going outside of the region. All analyses were conducted for February through April of 2019 and 2022. Analysis results below are for average weekdays during this period in 2022. Very little variation in overall patterns were found between the two years though total volumes vary with 2022 being slightly higher than 2019 for all day travel across the I-5 bridge in both directions. Unless otherwise noted, the am peak is considered to be 6 am – 9 am and the pm peak is considered to be 4 pm – 7 pm. The commute hours for JBLM are shifted one hour earlier for each time period to account for the earlier reporting schedule, morning commute is 5 am – 8 am and the evening commute is 3 pm – 6 pm.

Figure D-67. Map of Subareas and Cordons used in Street Light Analysis



17.3.2 General Non-Freight Travel Patterns

JBLM was identified as a key subarea, as it is currently the largest single employer site in Washington State, with roughly 52,000 military personnel and civilian jobs on site, generating 106,000 off-site vehicle trips per day[7]. Additionally, the travel patterns across the Nisqually Road bridge and the travel patterns to/from the I-5/ Mounts Road interchange were also evaluated, as the Nisqually Road SW, the only nearby alternative crossing of the Nisqually River, ends at the Mounts Road interchange.

Table D-67 details the 2022 northbound weekday travel patterns (origins and destinations) for users in each of the I-5 subareas and Table D-68 details the 2022 southbound travel patterns. The largest share of trips using the I-5 Bridge at the Nisqually Delta are

- between Thurston and Pierce County
- between Thurston County and JBLM specifically
- to/from north or south of the study area depending on direction of travel, via the I-5 cordons
- between Quiemuth Village and locations in Pierce County

Table D-69 details the 2022 weekday travel patterns for trips that cross the Nisqually Road bridge in both directions. This segment was not able to split trips by direction. The patterns are similar to that of the I-5 bridge but with notably fewer trips between Pierce County and the Quiemuth Village and Pierce County and the I-5 cordons on the edge of the study area. The largest share of trips using the Nisqually Road bridge are

- between Thurston and Pierce County
- between Thurston County and JBLM specifically
- between Thurston County and the I-5 cordons

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[7] South Sound Military & Communities Partnership (SSMPC), 2022. *2022 Joint Base Lewis-McChord (JBLM) Growth Coordination Plan*. Lakewood, WA, April 2022. *https://cityoflakewood.us/2022-jblm-growth-coordination-plan/*.

Table D-67. Northbound: Origin and destination patterns for trips that cross the I-5 bridge at the Nisqually Delta – All Day 2022

	Destinations													
Origins	Fort Lewis/JBLM	Port of Tacoma	Hawks Prairie Business District	Grays Harbor County	Lewis County	Mason County	Pierce County	Thurston County	SR 18	I-5 NB north external	I-5 NB south external	I-5 SB north external	I-5 SB south external	Grand Total
Fort Lewis/JBLM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Port of Tacoma	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Hawks Prairie Business District	3%	0%	0%	0%	0%	0%	11%	0%	0%	2%	0%	0%	0%	17%
Grays Harbor County	0%	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%	0%	0%	4%
Lewis County	0%	1%	0%	0%	0%	0%	5%	0%	0%	3%	0%	0%	0%	9%
Mason County	0%	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%	0%	0%	4%
Pierce County	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	1%
Thurston County	6%	1%	0%	0%	0%	0%	34%	1%	1%	10%	0%	0%	0%	54%
SR 18	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 NB north external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 NB south external	0%	1%	0%	0%	0%	0%	5%	0%	0%	5%	0%	0%	0%	11%
I-5 SB north external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 SB south external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Grand Total	9%	3%	1%	0%	0%	0%	61%	2%	2%	21%	0%	0%	0%	54,061

Table D-68. Southbound: Origin and destination patterns for trips that cross the I-5 bridge at the Nisqually Delta – All Day 2022

Destinations

Origins

	Fort Lewis/JBLM	Port of Tacoma	Hawks Prairie Business District	Grays Harbor County	Lewis County	Mason County	Pierce County	Thurston County	SR 18	I-5 NB north external	I-5 NB south external	I-5 SB north external	I-5 SB south external	Grand Total
Fort Lewis/JBLM	0%	0%	4%	0%	0%	0%	0%	5%	0%	0%	0%	0%	0%	10%
Port of Tacoma	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%	1%	3%
Hawks Prairie Business District	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Grays Harbor County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lewis County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mason County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pierce County	0%	0%	12%	2%	4%	2%	1%	35%	0%	0%	0%	0%	5%	62%
Thurston County	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	2%
SR 18	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	2%
I-5 NB north external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 NB south external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 SB north external	0%	0%	2%	1%	3%	1%	0%	10%	0%	0%	0%	0%	4%	20%
I-5 SB south external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Grand Total	0%	0%	19%	4%	8%	4%	1%	54%	0%	0%	0%	0%	10%	53,029

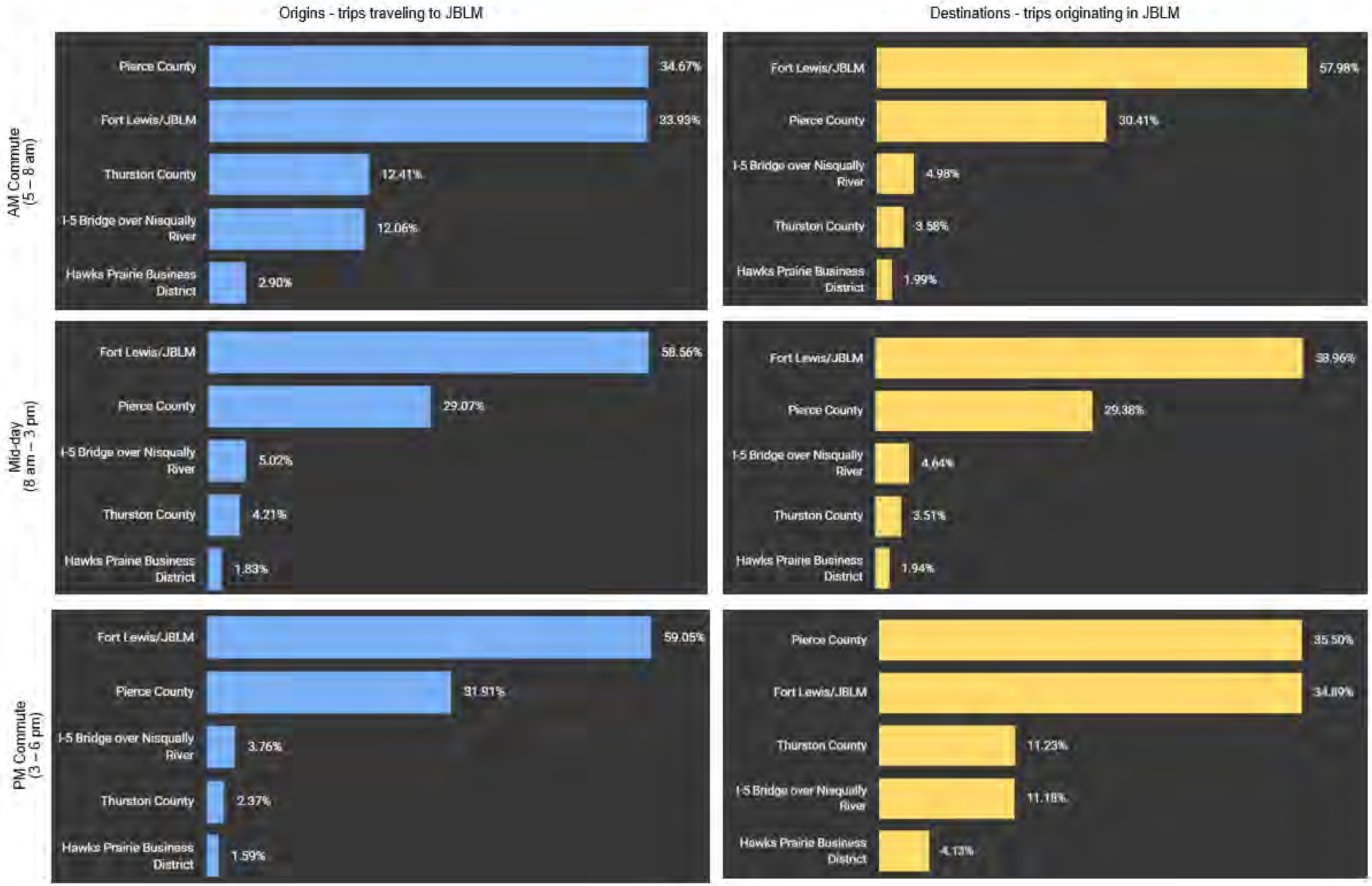
Table D-69. Both Directions: Origin and destination patterns for trips that cross the Nisqually Road Bridge – All Day 2022

Destinations

Origins	Fort Lewis/JBLM	Port of Tacoma	Hawks Prairie Business District	Grays Harbor County	Lewis County	Mason County	Pierce County	Thurston County	SR 18	I-5 NB north external	I-5 NB south external	I-5 SB north external	I-5 SB south external	Grand Total
Fort Lewis/JBLM	0%	0%	0%	0%	0%	0%	0%	8%	0%	0%	0%	0%	0%	9%
Port of Tacoma	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	1%
Hawks Prairie Business District	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Grays Harbor County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lewis County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mason County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pierce County	0%	0%	1%	0%	0%	0%	2%	31%	0%	0%	0%	0%	0%	34%
Thurston County	8%	1%	0%	0%	0%	0%	32%	2%	1%	6%	0%	0%	0%	49%
SR 18	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	1%
I-5 NB north external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 NB south external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 SB north external	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	0%	0%	0%	6%
I-5 SB south external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Grand Total	8%	1%	1%	0%	0%	0%	34%	49%	1%	6%	0%	0%	0%	11,199

Additionally, 2022 commute and non-commute travel patterns for JBLM were evaluated as shown in Figure D-68. Despite the time of day, JBLM has many trips which circulate within the subarea. In the mid-day, this represents the largest share of trips, suggesting that many workers may take trips throughout the base. In the morning commute, Pierce County makes up the largest share of trips heading to JBLM. In the evening commute it is also the destination with the largest share of trips leaving JBLM. Thurston County, the I-5 bridge at the Nisqually Delta, and the Quiemuth Village make up the rest of the top 5 origins and destinations throughout all time periods.

Figure D-68. Top 5 origins and destinations to and from JBLM during commute and mid-day periods, 2022



17.3.3 Freight Travel Patterns

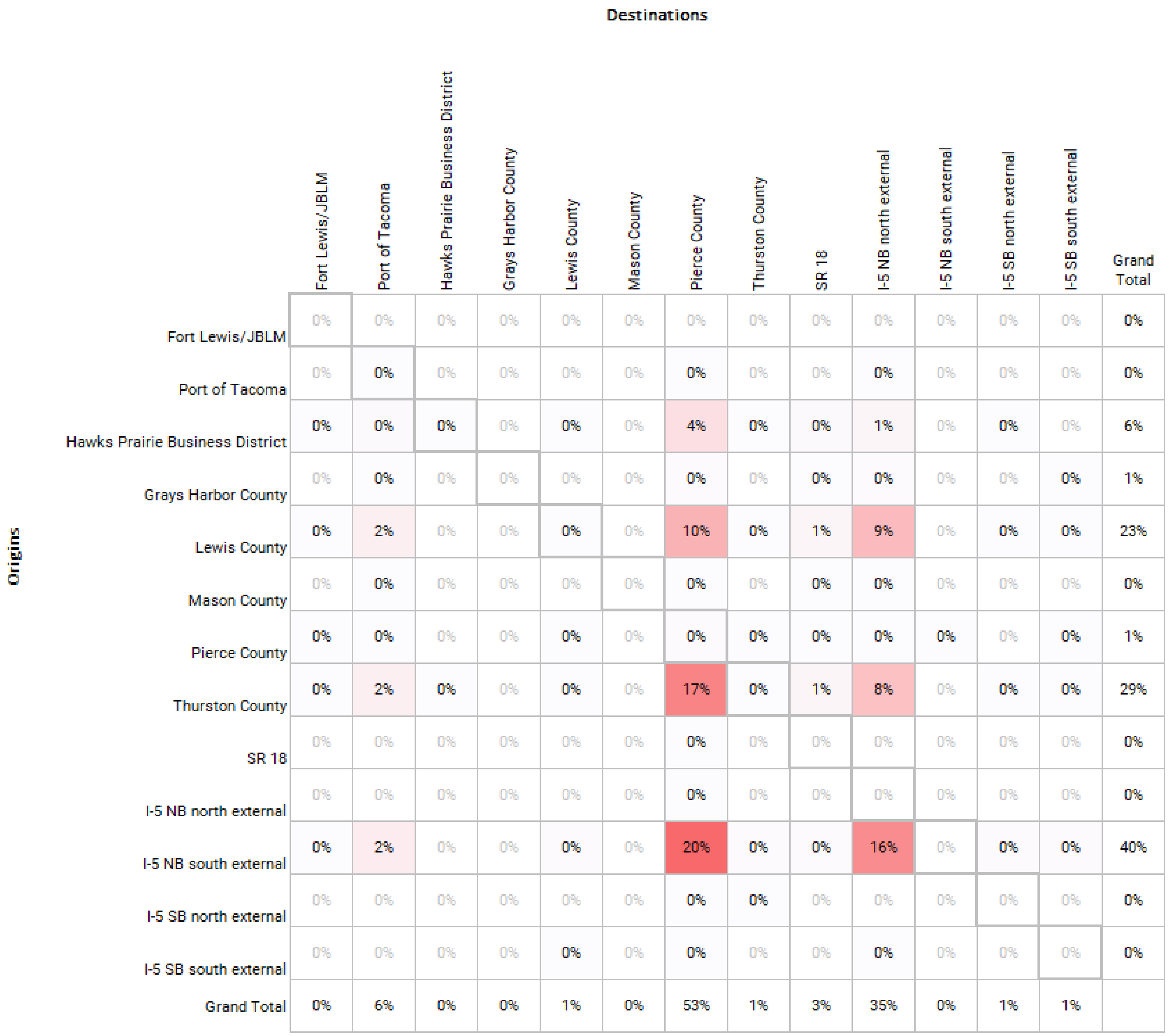
WSDOT designated I-5 as a Truck Freight Economic Corridor, recognizing it as the state's most important north-south interstate corridor for the role it plays in linking Washington's trade with the rest of the United States, Canada, Mexico and Asia via Washington Ports. I-5 also connects marine and air cargo port complexes with essential state warehouse districts, industrial lands, intermodal transportation hubs, and major population centers. More than 10 million tons of freight move through Thurston County on I-5 each year. The traffic increase in the study area has been influenced both by population and employment growth in the south Puget Sound region, and by increased economic activity at the state level, fostering a rapid rise in freight movement.

The Quiemuth Village and the Tacoma Tideflats MIC were included as subareas when evaluating freight travel patterns. The Quiemuth Village is an emerging freight generator and logistics hub—with a major travel nexus to Tacoma Tideflats MIC and rail hubs in Pierce and King counties.

Truck travel patterns differ from private vehicles and are detailed in Table D-70 (2022 northbound) and Table D-71 (2022 southbound) .The largest share of truck trips using the I-5 Bridge at the Nisqually Delta are

- between Thurston and Pierce County
- between Pierce County and the I-5 cordons
- between Pierce County and Lewis County
- to/from north or south of the study area depending on direction of travel, via the I-5 cordons

Table D-70. Northbound Trucks: Origin and destination patterns for trips that cross the I-5 bridge at the Nisqually Delta – All Day 2022



Destinations

Origins

	Fort Lewis/JBLM	Port of Tacoma	Hawks Prairie Business District	Grays Harbor County	Lewis County	Mason County	Pierce County	Thurston County	SR 18	I-5 NB north external	I-5 NB south external	I-5 SB north external	I-5 SB south external	Grand Total
Fort Lewis/JBLM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Port of Tacoma	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Hawks Prairie Business District	0%	0%	0%	0%	0%	0%	4%	0%	0%	1%	0%	0%	0%	6%
Grays Harbor County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Lewis County	0%	2%	0%	0%	0%	0%	10%	0%	1%	9%	0%	0%	0%	23%
Mason County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pierce County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Thurston County	0%	2%	0%	0%	0%	0%	17%	0%	1%	8%	0%	0%	0%	29%
SR 18	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 NB north external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 NB south external	0%	2%	0%	0%	0%	0%	20%	0%	0%	16%	0%	0%	0%	40%
I-5 SB north external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 SB south external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Grand Total	0%	6%	0%	0%	1%	0%	53%	1%	3%	35%	0%	1%	1%	

Table D-71. Southbound Trucks: Origin and destination patterns for trips that cross the I-5 bridge at the Nisqually Delta – All Day 2022

Destinations

Origins	Fort Lewis/JBLM	Port of Tacoma	Hawks Prairie Business District	Grays Harbor County	Lewis County	Mason County	Pierce County	Thurston County	SR 18	I-5 NB north external	I-5 NB south external	I-5 SB north external	I-5 SB south external	Grand Total
Fort Lewis/JBLM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Port of Tacoma	0%	0%	0%	0%	2%	0%	0%	2%	0%	0%	0%	0%	2%	7%
Hawks Prairie Business District	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Grays Harbor County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lewis County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Mason County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pierce County	0%	0%	4%	1%	10%	0%	0%	17%	0%	0%	0%	0%	21%	55%
Thurston County	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
SR 18	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	3%
I-5 NB north external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I-5 NB south external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
I-5 SB north external	0%	0%	1%	0%	9%	0%	0%	10%	0%	0%	0%	0%	12%	32%
I-5 SB south external	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Grand Total	0%	0%	6%	1%	23%	1%	1%	31%	0%	0%	0%	0%	37%	

17.3.4 Home and Work Locations

Information from StreetLight Data was analyzed to infer the home and work locations of I-5 users that cross the Nisqually Delta. This type of StreetLight analysis that identifies home and work locations is different than the origin and destination analysis and does not split up data into the subareas. The figures below show 2022 data by metropolitan area and the maps display data as a grid. Approximately 45% of I-5 regional users' home locations are to the north of the Nisqually Delta and about 55% of regional I-5 users' homes are to the south, Figure D-69. The highest concentration of home location are in Olympia-Lacey-Tumwater, closely followed by Seattle-Tacoma-Bellevue. Seattle-Tacoma-Bellevue and Bremerton-Silverdale-Port Orchard are the northern metropolitan areas while all others in the region are southern.

Patterns of home and work locations closely follow the direction of travel across the I-5 bridge at the Nisqually Delta. The majority of home locations for users that travel during the AM peak are south of the bridge and the majority of work locations are north of the bridge while the opposite is true of users that travel during the PM peak. This suggests that the I-5 bridge at the Nisqually Delta is an important commute path for many regional workers. Figure D-70 displays home locations by direction of travel and AM and PM peaks. Work location data is not available at the metropolitan area geographies but is displayed in grids on a regional map. See Figure D-71 through Figure D-74 for maps of home and work locations during the AM peak.

Figure D-69. Both Directions: Home locations of regional users of the I-5 bridge at the Nisqually Delta – All Day 2022

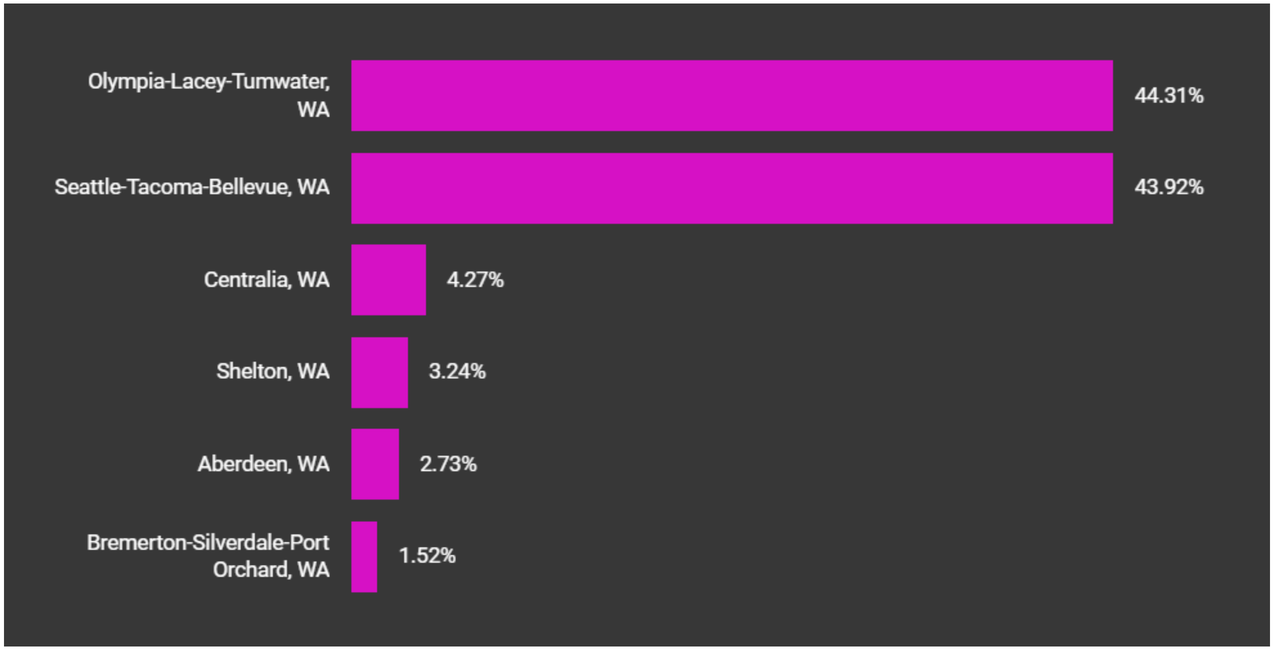


Figure D-70. Directional & Peak: Home locations of regional users of the I-5 bridge at the Nisqually Delta 2022

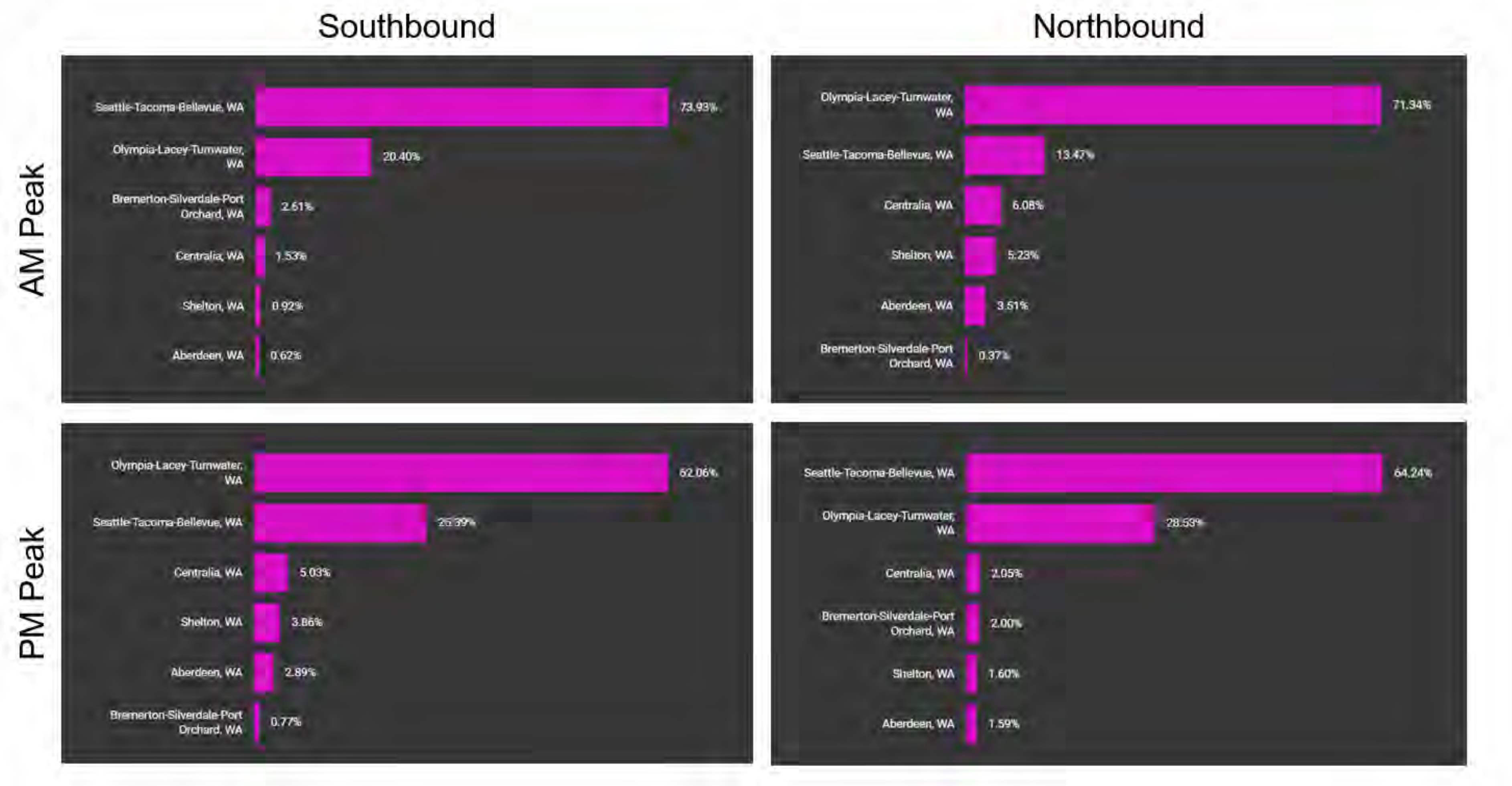


Figure D-71. Northbound: Home locations of regional users of the I-5 bridge at the Nisqually Delta – AM Peak 2022

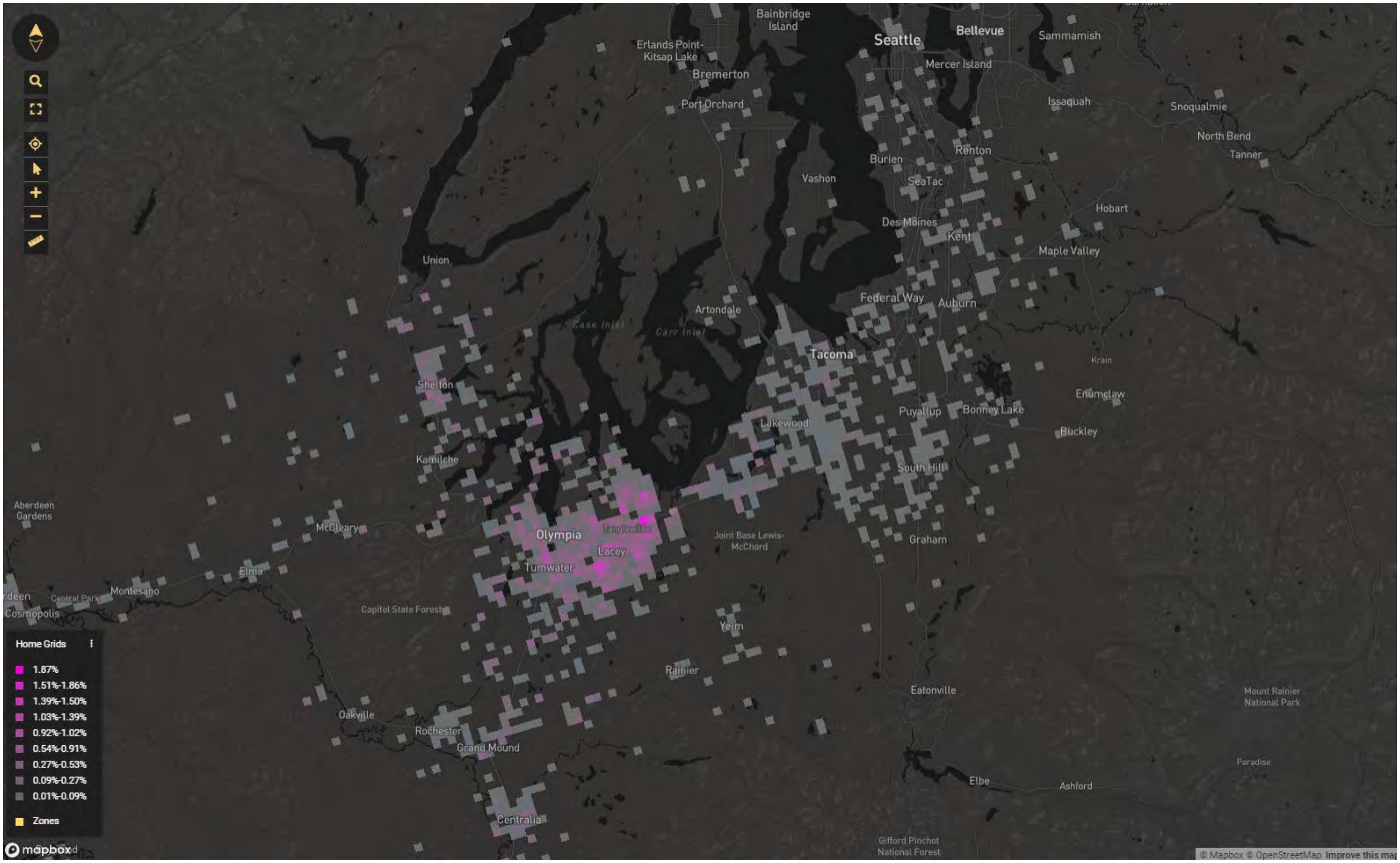


Figure D-72. Northbound: Work locations of regional users of the I-5 bridge at the Nisqually Delta – AM Peak 2022

Figure D-73. Southbound: Home locations of regional users of the I-5 bridge at the Nisqually Delta – AM Peak 2022

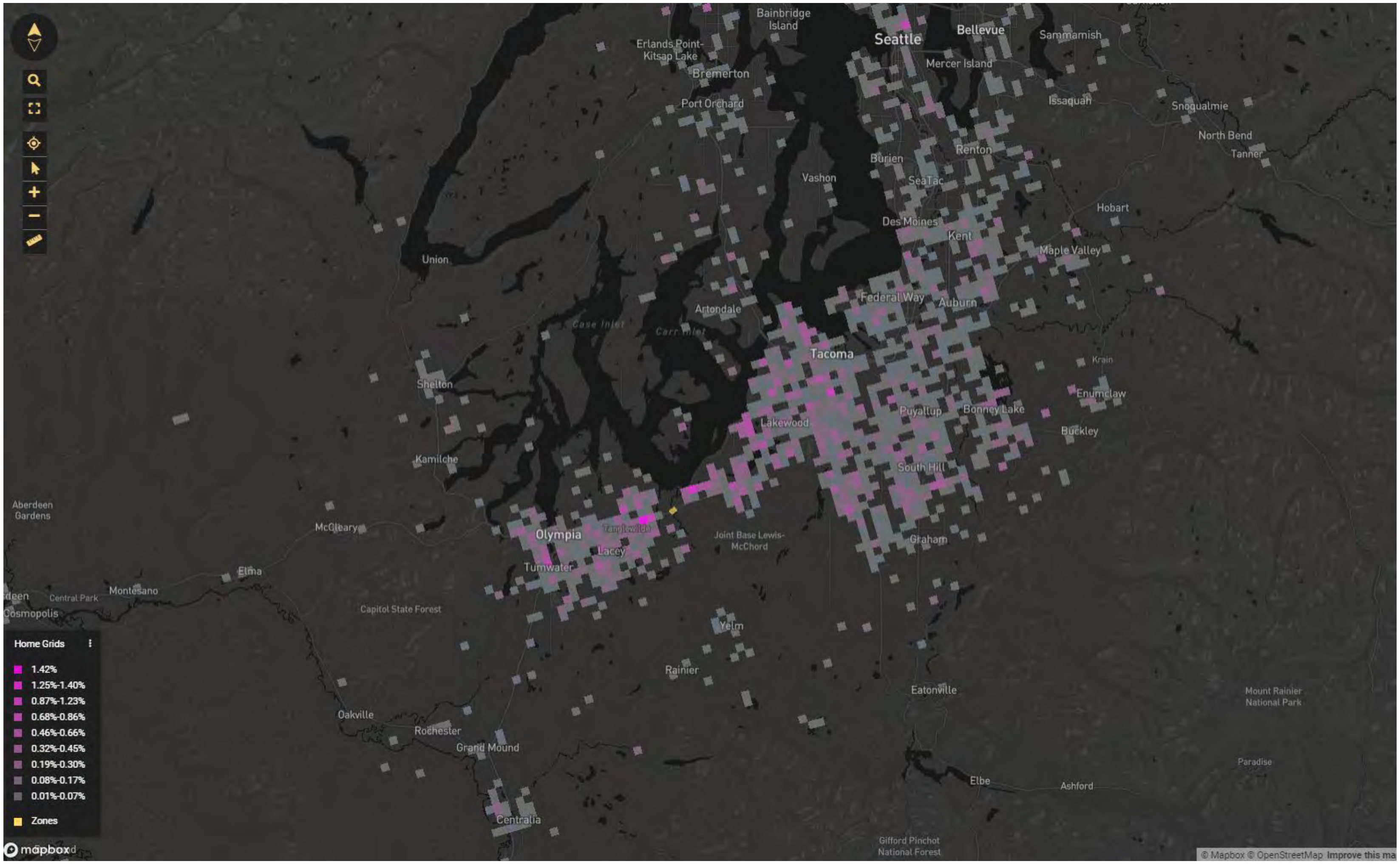
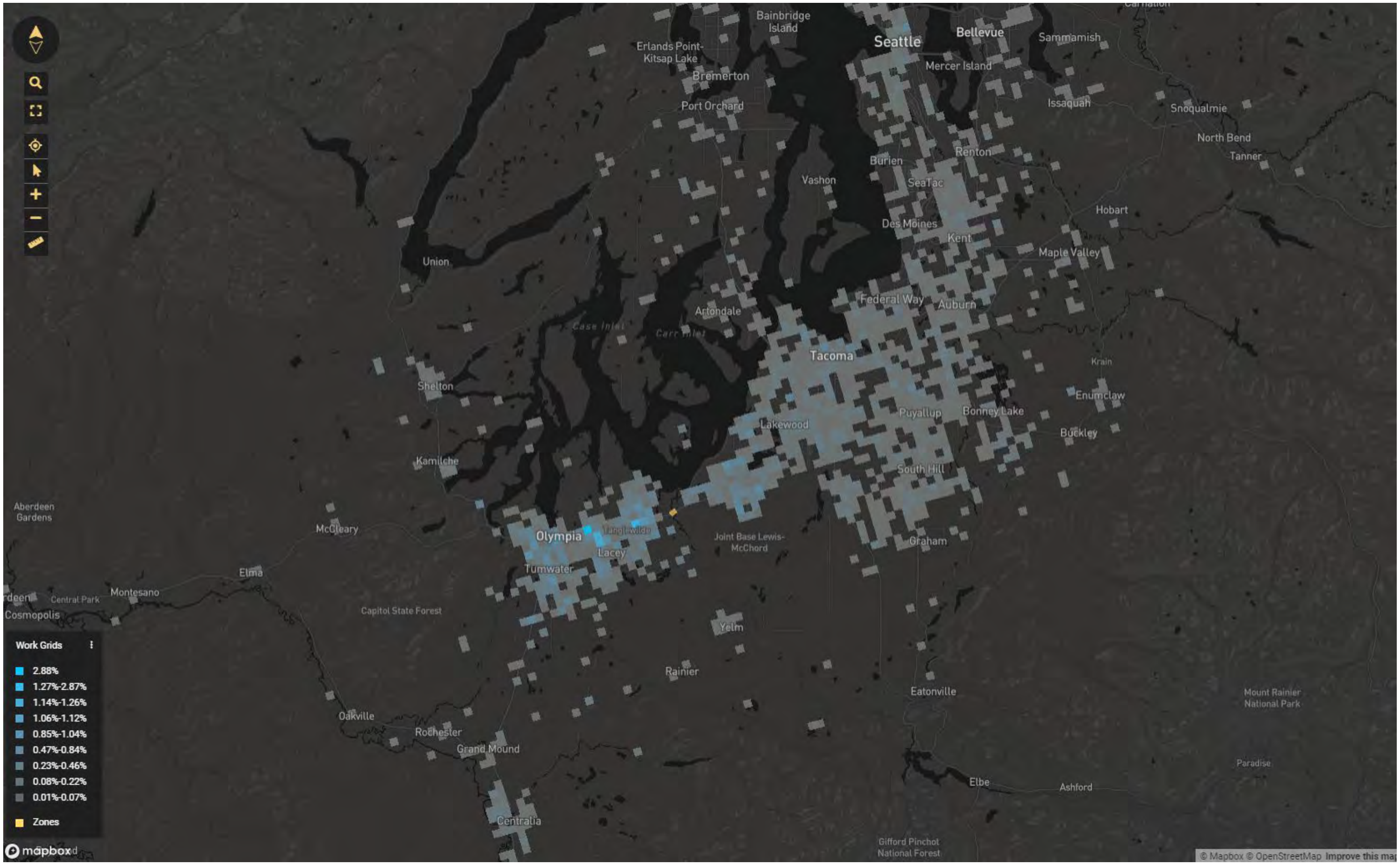


Figure D-74. Southbound: Work locations of regional users of the I-5 bridge at the Nisqually Delta – AM Peak 2022



17.4 Roadway network

17.4.1 Mainline I-5

I-5 is an important freight and commuter corridor for the south Puget Sound. It is designated as an interstate freeway and is a part of the National Highway System. Between the Marvin Road and Mounts Road interchanges, the 4.7-mile stretch of I-5 mainline has three general purpose traffic lanes in each direction and a posted speed limit of 60 miles per hour (mph). Shoulder widths for this section of I-5 range from 6 feet to 10 feet wide. There are three interchanges in the study area: Marvin Road NE, Brown Farm Road NE/Nisqually Cut Off Road SE and Mounts Road/Nisqually Road SW. The Marvin Road NE interchange is located the furthest west in the study area and is a diverging diamond interchange (DDI). The Brown Farm Road NE/Nisqually Cut Off Road SE is located near the center of the study area and is similar to a typical diamond interchange. The Mounts Road/Nisqually Road SW interchange is located furthest east in the study area and is a diamond interchange. Currently I-5 is three lanes in each direction between Mounts Road and Marvin Road.

17.4.2 Regional Network

While I-5 is the primary highway through the study area, a network of other state highways and local roads serve residents, travelers, and businesses from in and outside the region. According to TRPC's 2040 Regional Transportation Plan, there are approximately 2,400 centerline miles of roads in Thurston County (including I-5)[8]. In addition, there are a few hundred more centerline miles of roadway in areas near the northern end of the study corridor in Pierce County. While the network of local roads and state highways is extensive, there are some notable things about how it is laid out and its effect on travel patterns in the region.

First, very few local roads provide alternate paths to I-5 between Marvin Road NE and Mounts Road. Martin Way E runs parallel to I-5 from Marvin Road NE to Brown Farm Road NE/Nisqually Cut Off Road SE but does not extend over the Nisqually River to Mounts Road. To travel between Marvin Road NE and Mounts Road without accessing I-5, vehicles would travel via SR 510 and Old Pacific Highway SE which is almost twice the distance than traveling on I-5.

Within the study area, there are only a few locations to cross I-5: Marvin Road NE, Orion Drive NE/Meridian Road NE and Mounts Road/Nisqually Road SW. Two of the crossings are interchanges and one is a local road crossing. Because of the lack of I-5

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[8] TRPC Regional Transportation Plan – What Moves You, Appendix D, P.5; https://www.trpc.org/DocumentCenter/View/2787/Appendix-D--Inventory-of-Facilities

crossings, traffic concentrates on certain local roads and encourages the use of I-5. This also has implications for active transportation users as it lengthens trips that need to cross the highway, reducing the likelihood of people using active modes.

17.4.3 Future Planned Improvements

There are several planned and funded capacity improvements that are expected to be in place by the year 2045, as detailed in local agency Transportation Improvement Programs (TIPs) and WSDOT's State Transportation Improvement Plan (STIP).

Planned corridor improvements along I-5 include WSDOT's *I-5 – Mounts Road to Thorne Lane Interchange – Corridor Improvements* project. This is a major project that is funded through the Connecting Washington transportation revenue package over a 10-year period from 2015 to 2025. Currently, southbound I-5 drops from four lanes to three at the Mounts Road interchange with the right lane being an exit only lane for the interchange. After improvements are completed through the JBLM area[9] which will widen the highway, add some new frontage road connections, and improve interchange operations, the highway will neck down from five lanes to three lanes, with one lane dropping as an exit only lane and another merging right before the Mounts Road bridge.

Other WSDOT and local agency capacity projects planned to be in place by the year 2045 are shown in Table D-72.

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[9] WSDOT JBLM Area Improvements website - https://www.wsdot.wa.gov/Projects/I5/JBLMImprovements/default.htm

Table D-72. Future Background Projects

Number	Area/Jurisdiction	Location	Extent/Limits	Improvement
Operational Improvements				
1	WSDOT	I5 Southbound ramp meters	Henderson/14th Ave, Pacific Ave, Sleater-Kinney Rd, Martin Way and Marvin Rd	Add ramp meters
2	WSDOT	Mounts Road Interchange	Mounts Road Interchange	Revise southbound off-ramp from to be all-way stop
3	WSDOT	Near Nisqually Interchange	Martin Way at Nisqually Cut Off Rd SE	Two through lanes on north side of Martin Way through the intersection.
Travel Demand Management				
4	TRPC/Olympia	Capitol Campus Telework and Flexible Hours	Capitol Campus	Assumption that 25% of state workers on Capital Campus will telework one day a week -spread evenly over work days.
5	Intercity Transit	Capital Mall to Martin Way Park-and-ride	Express (bus rapid transit light)	Add express (bus rapid transit light) route
Capacity Projects				
6	Lacey	Hogum Bay Truck Route	Marvin Road NE to between 31st Ave and Hawks Prairie Road	Widen to 2/3 lanes with roundabout at Willamette Drive
7	Lacey	Marvin Road Widening	Britton Parkway NE to Columbia Way NE	Widen to 4 lanes with median treatment. Roundabout at Hawks Prairie and Marvin. Three lane section north of the roundabout.
8	Lacey	Marvin Road I-5 Interchange Improvements	Marvin Road at I-5	Reconstruct Freeway Interchange to diverging diamond design
9	WSDOT	I-5 Corridor Improvements	Steilacoom-Dupont Road to Thorne Lane Interchange	Add one lane in each direction; Auxiliary lanes NB between Berkeley St to Gravelly Lake Dr, SB between Gravelly Lake Dr to Thorne Lane, and from Berkeley St to JBLM Main Gate.

17.5 Freight

17.5.1 Existing Freight Conditions

Trucks transporting goods throughout the region contribute to and are impacted by traffic congestion. Freight vehicles emit higher levels of greenhouse gas emissions and other harmful pollutants. Growing congestion within the I-5 corridor, as well as the rest of the region, directly impacts freight movement and increases travel time, costs, and the environmental impact of transporting goods. State, local, and regional agencies actively partner in building and maintaining an efficient freight transportation network through the Freight and Goods Transportation System (FGTS).

The Freight and Goods Transportation System (FGTS) is a Washington-specific freight designation system and classifies the state's freight corridors based on annual freight tonnage moved. I-5 is classified as a T-1 truck freight corridor, which means that more than 10 million tons are moved per year. This segment of I-5 in particular is an important freight corridor, providing the only high-speed, north-south interstate corridor on the west side of the Cascade Mountains for trucks serving major seaports in Seattle, Tacoma, and Vancouver B.C., Seattle-Tacoma International Airport and Joint Base Lewis McChord (JBLM).

There is a weigh station north of the study area for I-5 northbound freight. Under the current condition, WSDOT Bridge Engineers have restricted weight on the northbound Nisqually River bridge to 21,500 pounds to maintain its structural integrity. Because of this restriction, freight overloads must use the center lane going northbound on that I-5 bridge

Trucks on this section of I-5 make up about 10.4% of all traffic. Approximately 14,000 trucks use this section of I-5 daily, the third-highest daily truck volume across the state.[10] Freight traffic has been increasing. Figure D-75 summarizes the total monthly truck volumes on mainline I-5 from January to May 2019 and January to May 2022. Freight volumes have increased on this section of I-5, on average, by 9.5% between 2019 and 2022. Truck volumes on I-5 at the border between Pierce County and Thurston County are some of the highest in the state.[11]

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[10] WSDOT Freight and Goods data layer - https://wsdot.maps.arcgis.com/home/ item.html?id=09185bbba7c94253a26961489bb8ad20

[11] Washington State Department of Transportation (WSDOT), Federal Highway Administration (FHWA), 2021. I-5 JBLM Vicinity Congestion Relief Project – South Study Area. Olympia, WA. Available at: *https://wsdot.wa.gov/sites/default/files/2021-11/I-5-JBLM-SEA-2021-0701.pdf*.

Figures D-76 and D-77 summarize the average weekday volume and truck percentage in 2022 on southbound I-5 and northbound I-5 respectively. The truck percentage is highest during the overnight hours, after the evening commute period and before the morning commute period.

Figure D-75. Average Monthly Mainline I-5 Truck Volumes

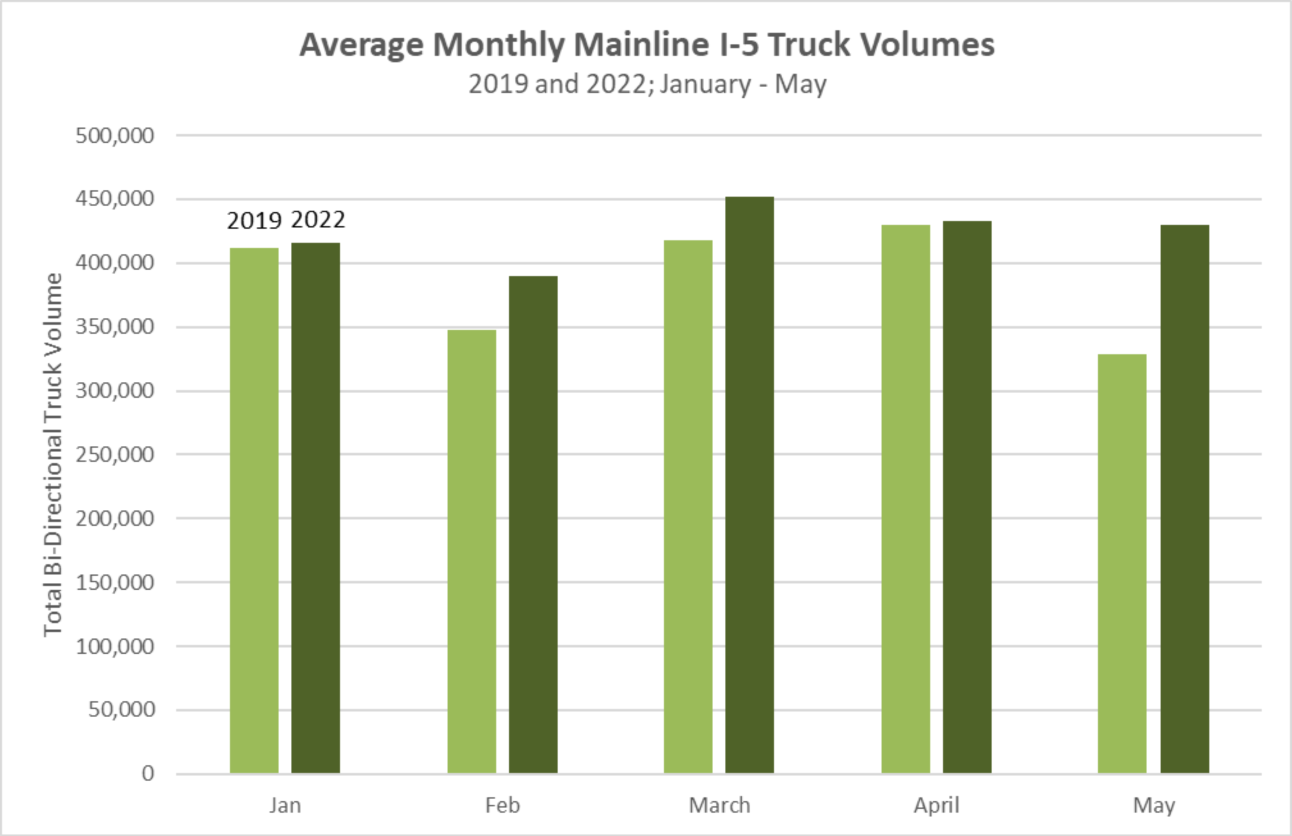


Figure D-76. Average Weekday Volumes and Truck Percentage on Southbound I-5

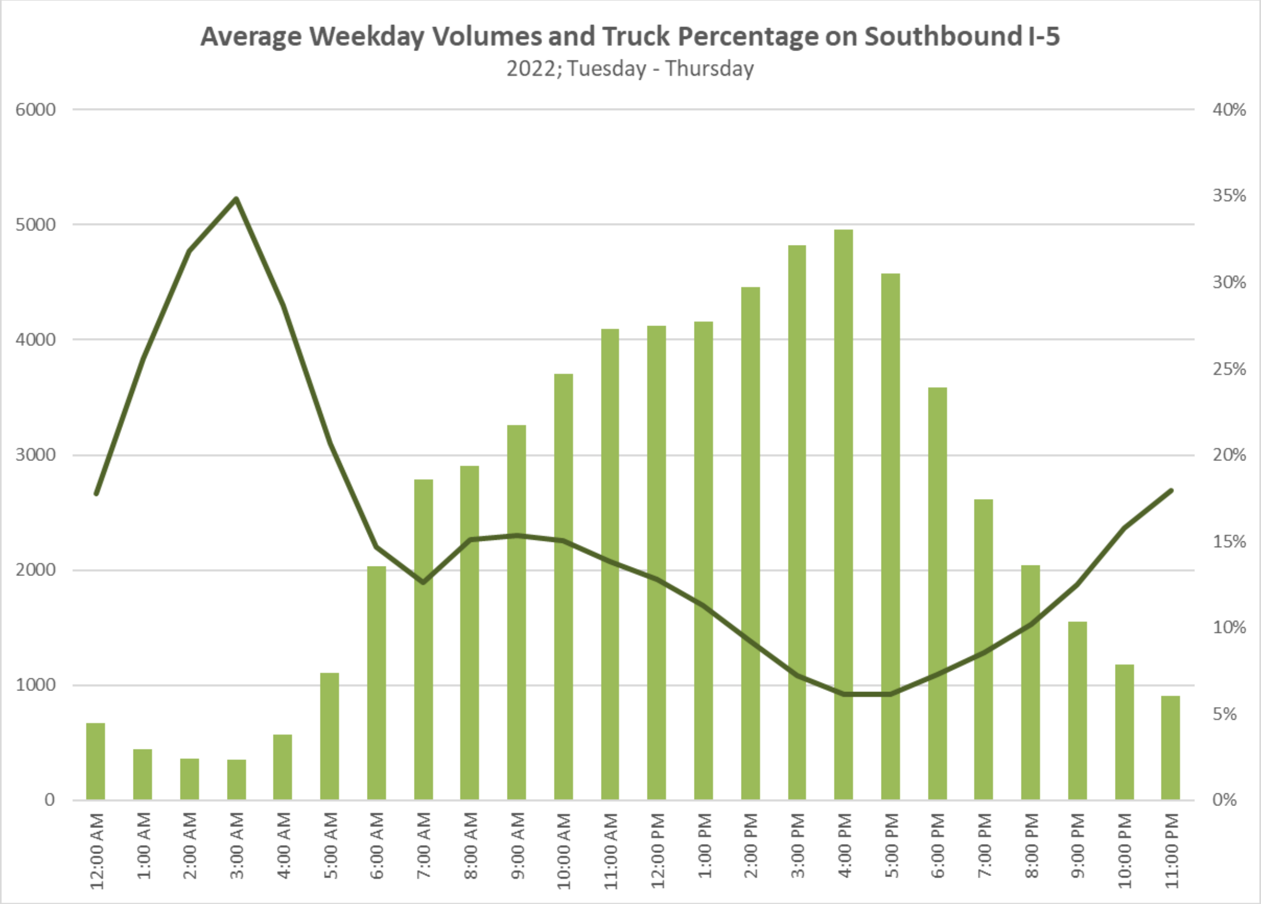
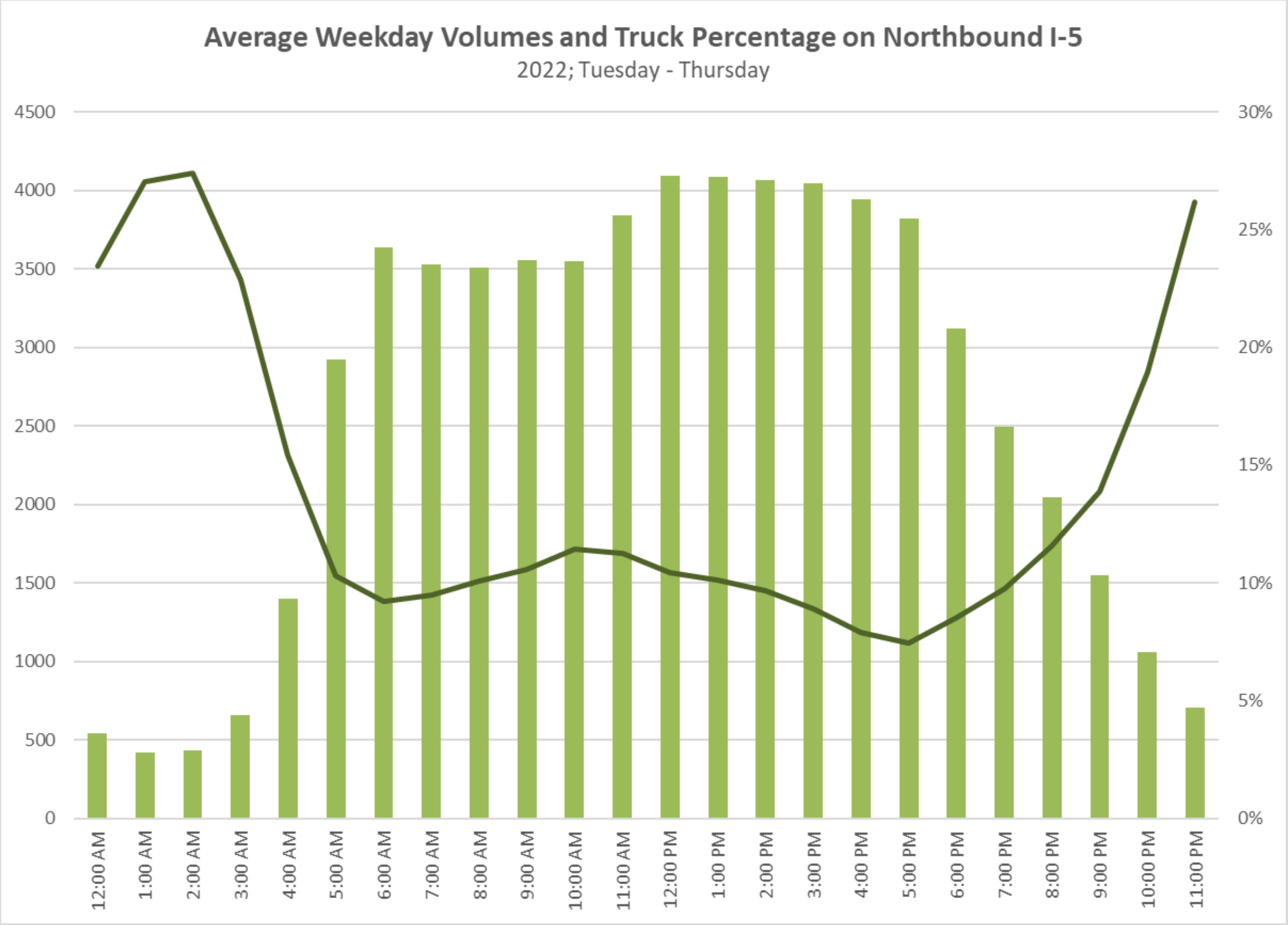


Figure D-77. Average Weekday Volumes and Truck Percentage on Northbound I-5



17.5.2 2045 Freight Conditions

Washington is one of the most trade-dependent states; therefore, an efficient freight transportation system will continue playing a pivotal role in fostering economic vitality and competitiveness in regional and global markets.[12] The Freight Analysis Framework (FAF), a national annual freight commodity flow database, projects growth in total annual truck freight flow of 58 to 67% in the State between 2020 and 2050.

Daily traffic volumes are expected to increase along the corridor, with year 2045 weekday volumes expected to be 20 to 30 percent higher than today. The amount of freight moved by truck is expected to increase 55% by the year 2050 The amount of freight moved by truck is expected to increase 55% by the year 2050[13].

17.6 Bicycle and Pedestrian

Based on TRPC's 2017 Regional Household Travel Survey, 8 percent of daily trips in the study area are walk trips and about 1.5 percent of daily trips are bike trips. Local agencies are committed to developing facilities that encourage alternative modes of transportation and there is current dedicated infrastructure for walking and biking.

There is a wide variety of active transportation infrastructure (facilities that support walking, rolling, and biking) in the corridor in terms of availability of facilities and facility types. There are currently over 100 miles of bike infrastructure in Thurston County, such as marked bike lanes and bike boulevards, and a large interconnected system of sidewalks. Shared-use trails spanning 59 miles provide regional connections for biking and walking, but there are currently no dedicated bicycle or pedestrian facilities between Thurston and Pierce counties. Because I-5 is the most direct route between Dupont and Lacey, part of the study area on I-5 is open to bicycle use. However, only bicyclists in the "highly confident" category are likely to use sections of I-5, but it is likely considered too dangerous by most users[9].

Some new facilities, such as a connection between Gravelly Lake Drive SW and Thorne Lane SW, are under construction, and will be completed within the span of time this study is considering. For example, WSDOT is constructing a connection between Gravelly Lake Drive SW and Thorne Lane SW that will facilitate walking and biking in the Lakewood/Tillicum area. Local partners are also

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[12] *2017 Washington State Freight System Plan https://wsdot.wa.gov/publications/fulltext/freight/FreightPlan-2017SystemPlan.pdf*

13 *https://wsdot.wa.gov/construction-planning/statewide-plans/freight-rail-plans/freight-system-plan*

[14] Federal Highway Administration; Bikeway Selection Guide; P. 13 https://safety. fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf#page=15

working on a shared-use path between Yelm in Thurston County and Roy in Pierce County but this project is currently in the planning stages and construction is not funded.

Because there are bike facilities within and north of the study area, there is a definite need to continue this connectivity by providing and improving bike travel within the study area.

17.7 Transit

17.7.1 Existing Transit

Based on the TRPC’s 2017 Regional Household Travel Survey, about 1.9 percent of daily trips are transit trips. The study area is served by InterCity Transit and Amtrak. InterCity Transit provides bus service between north Thurston County urban areas and Yelm. InterCity Transit operations one bus route, Route 620, runs between the Olympia Transit Center and Lakewood Transit Center via I-5 at approximately 60-minute headways. Bus service does not currently provide a travel time benefit compared to single occupancy vehicle (SOV) trips due to the lack of HOV lanes on I-5 through this area. There are limited transit connections between Thurston and Pierce counties.

Transit connections to the Seattle area are available through transfers from InterCity bus service to Sound Transit bus service and Sounder Commuter Rail in Lakewood and Tacoma. Sound Transit has a planned expansion of Sounder Commuter Rail service to Dupont by 2045.

Amtrak provides passenger rail service from Centennial Station in unincorporated Thurston County, near Lacey. Centennial Station is served by InterCity Transit bus routes 64 and 94. The passenger rail service schedules do not align peak commuting travel times in the study area and only provide a travel time benefit compared to SOV trips when there is significant congestion on I-5.

17.7.2 2045 Baseline Transit

In 2022, the Thurston Regional Planning Council (TRPC) received funding to examine options for multimodal high-capacity transportation (HCT) to serve travelers on the I-5 corridor between central Thurston and Pierce counties.[15] The study is expected to be complete in 2024 and is intended to help determine the feasibility, costs, and timeframes of different high-capacity transportation options. No high-capacity transit projects are currently planned or funded.

17.8 Safety

Crash data was summarized for the five-year period between 2017 and 2021. A total of 1,440 crashes occurred on mainline I-5 and ramps within the study area. Table D-73 summarizes the total crashes by year and provides a percent change year-over-year in crashes. Between 2019 and 2020, there was a 30 percent decrease in total crashes. Between 2020 and 2021, there was a 63 percent increase in total crashes.

Table D-73. Total Crashes per Year (2017 – 2021)

	2017	2018	2019	2020	2021
Total Crashes	365	266	284	200	325
Percent Change	-	-27%	7%	-30%	63%

There were 39 types of primary contributing factors for the crashes that occurred in the study area. The most common primary contributing factor was following too closely, which accounted for 412 crashes, or about 23 percent of total crashes. Table D-74 provides the top 13 primary contributing factors. The remaining 26 primary contributing factors accounted for less than one percent of all crashes.

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[15] SB (Senate Bill) 5689. 2022. Supplemental Transportation Budget. Engrossed March 25, 2022. Washington State Senate, 67th Legislature, Regular Session, Olympia, WA. Available at: *https://lawfilesext.leg.wa.gov/biennium/2021-22/Pdf/Bills/Session%20Laws/Senate/5689-S.SL.pdf*.

Table D-74. Crashes by Primary Contributing Factor (2017-2021)

Primary Contributing Factor	Count	Percent
Follow Too Closely	412	23.3%
Exceeding Reas. Safe Speed	305	17.2%
Inattention	254	14.3%
Did Not Grant RW to Vehicle	145	8.2%
None	138	7.8%
Other Contributing Circ Not Listed	122	6.9%
Under Influence of Alcohol	62	3.5%
Improper Turn/Merge	51	2.9%
Apparently Asleep or Fatigued	45	2.5%
Unknown Distraction	43	2.4%
Operating Defective Equipment	40	2.3%
Improper Passing	20	1.1%
Distractions Outside Vehicle	17	1.0%

There were two crashes resulting in fatalities and 12 crashes resulting in serious injuries. Fatal and serious injury crashes accounted for less than one percent of total crashes in the study area in the five-year period. Most crashes, or about 78 percent of crashes, resulted in property damage only. Table D-75 summarizes the number of crashes by severity.

Table D-75. Number of Crashes by Severity (2017-2021)

Fatal		Suspected Serious Injury		Suspected Minor Injury		Possible Injury		Property Damage Only		
Count	**Percent**	**Count**	**Percent**	**Count**	**Percent**	**Count**	**Percent**	**Count**	**Percent**	**Total**
2	0.1%	12	0.8%	75	5.2%	231	16.0%	1120	77.8%	1440

17.9 System performance

WSDOT has documented several performance issues within the study area. These issues can be understood in two basic categories: 1) recurring performance issues; and 2) non-recurring performance issues. Recurring performance issues happen on a regular and predictable basis such as congestion during the weekday morning or evening rush hours. Non-recurring performance issues do not occur regularly or predictably, such as congestion due to inclement weather or special events.

This chapter describes recurring and non-recurring congestion that occurs on I-5, reflecting both pre- and post-pandemic conditions. WSDOT collected traffic data on state highways between March 2020 and July 2021 to monitor changes in the transportation system resulting from the COVID pandemic. Pre- and post-pandemic data was compared to evaluate post-pandemic trends along I-5.

17.9.1 Recurring Congestion

Recurring performance issues on the study corridor has been previously documented in WSDOT agency publications like the annual Corridor Capacity Report (published annually from 2007 through 2018) and the Multimodal Mobility Dashboard (MMD), which has replaced the annual Corridor Capacity Report. Data on these performance gaps from previous WSDOT publications include:

- According to WSDOT’s 2021 MMD, in 2021 this segment of I-5 experienced:
    - Twelve minutes of routine congestion (average travel time minus travel time at posted speed) during the evening commute on southbound I-5 from Lakewood approaching Lacey,
    - Increased vehicle delay on southbound I-5 between milepost 119 and 125 during the evening commute period,
    - Reduced vehicle throughput (vehicles per hour) on northbound I-5 near JBLM during midday and the evening commute peak down to roughly 83 percent of maximum throughput, and
    - Reduced vehicle throughput (vehicles per hour) on southbound I-5 near JBLM throughout the day down to between 70 and 89 percent of maximum throughput.

WSDOT also analyzed data available through the National Performance Measurement Research Dataset[16] which supplies information on traffic speed for the entire National Highway System. Average travel speeds and 15th percentile travel speeds for 2018

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[16] *Federal Highway Administration Operations Performance Measurement webpage; https://ops.fhwa.dot.gov/perf_measurement/index.htm*

and 2022 were aggregated and averaged in ten-minute increments throughout a typical weekday (Tuesday through Thursday). Essentially these represent speeds during typical and “bad” days, respectively.

Figure D-78 shows the average weekday speed on southbound I-5 at the Nisqually River bridges between exits 114 and 116 for 2018 and 2022. The maximum throughput speed is the speed at which a highway segment has the most vehicle throughput. The maximum throughput speed range is between 70 percent to 85 percent of the posted speed limit, which is between 42 and 51 mph for a posted speed limit of 60 mph. Average speeds on southbound I-5 were below the maximum throughput speed ranges in the afternoon and evening for both 2018 and 2022. Figure D-79 shows average weekday speed on northbound I-5 near the Nisqually River bridges between exits 114 and 116 for 2018 and 2022. In both figures, the average weekday speeds in 2022 are higher than the average weekday speeds in 2018. So while maximum throughput has improved in post-COVID conditions, I-5 is still operating under congested conditions.

Figures D-78 and D-79 illustrate locations where drivers encounter congested conditions on a typical weekday commute. Another thing to note about the graphs below is the difference between the average speeds (the solid lines) and the 15th percentile speeds (the dashed lines). The wider the gap, the greater the difference between typical conditions and a “bad day”. A good example is I-5 northbound at the Nisqually River bridges in the evening. In 2018, average speeds do not fall below maximum throughput but the 15th percentile falls well below, indicating that while the segment generally operates well in the evening throughout the year it can experience significant slowdowns.

Figure D-78. Average Weekday and 15th Percentile Speeds on Southbound I-5

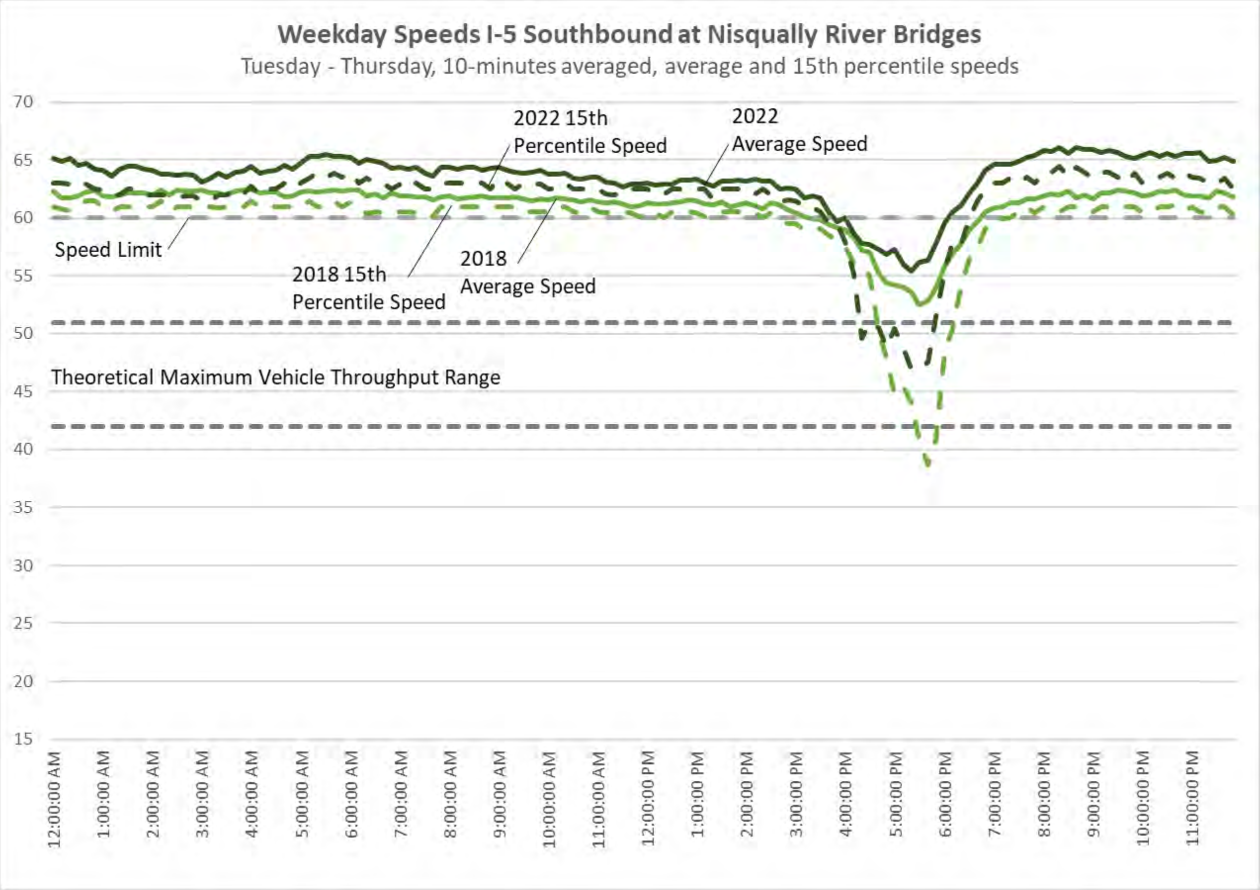
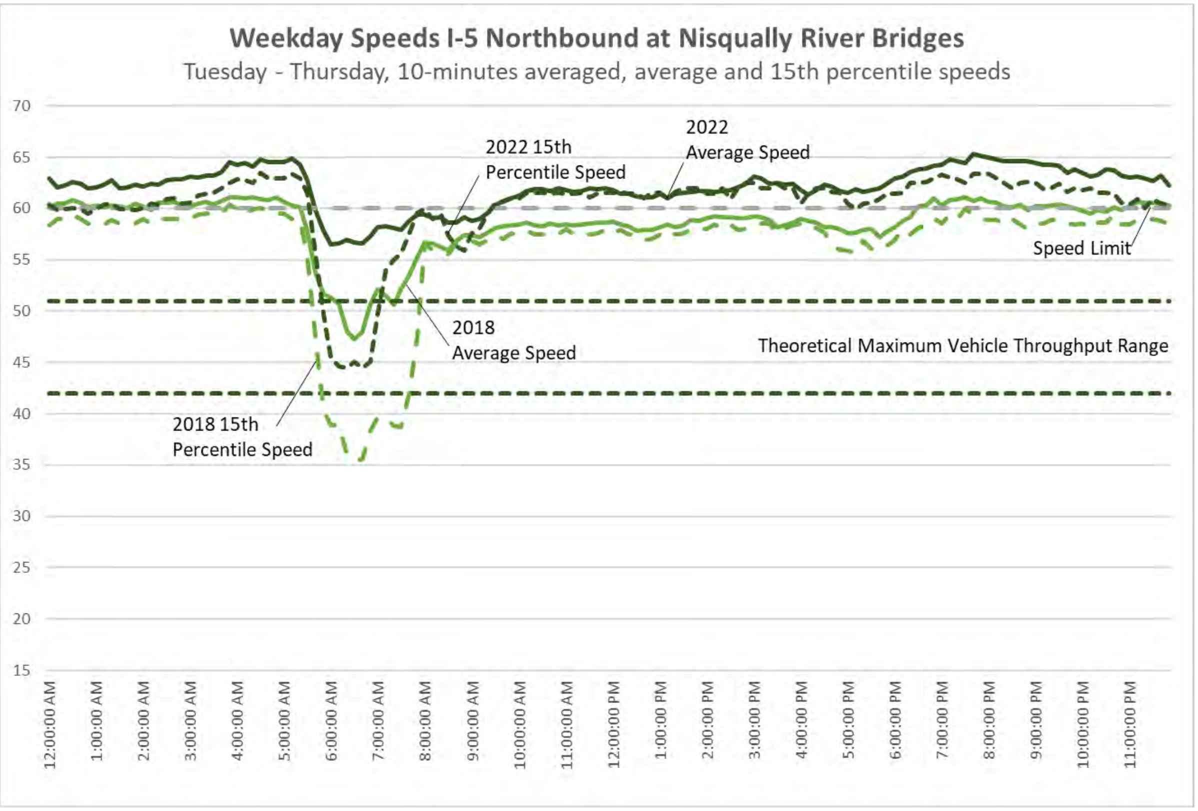
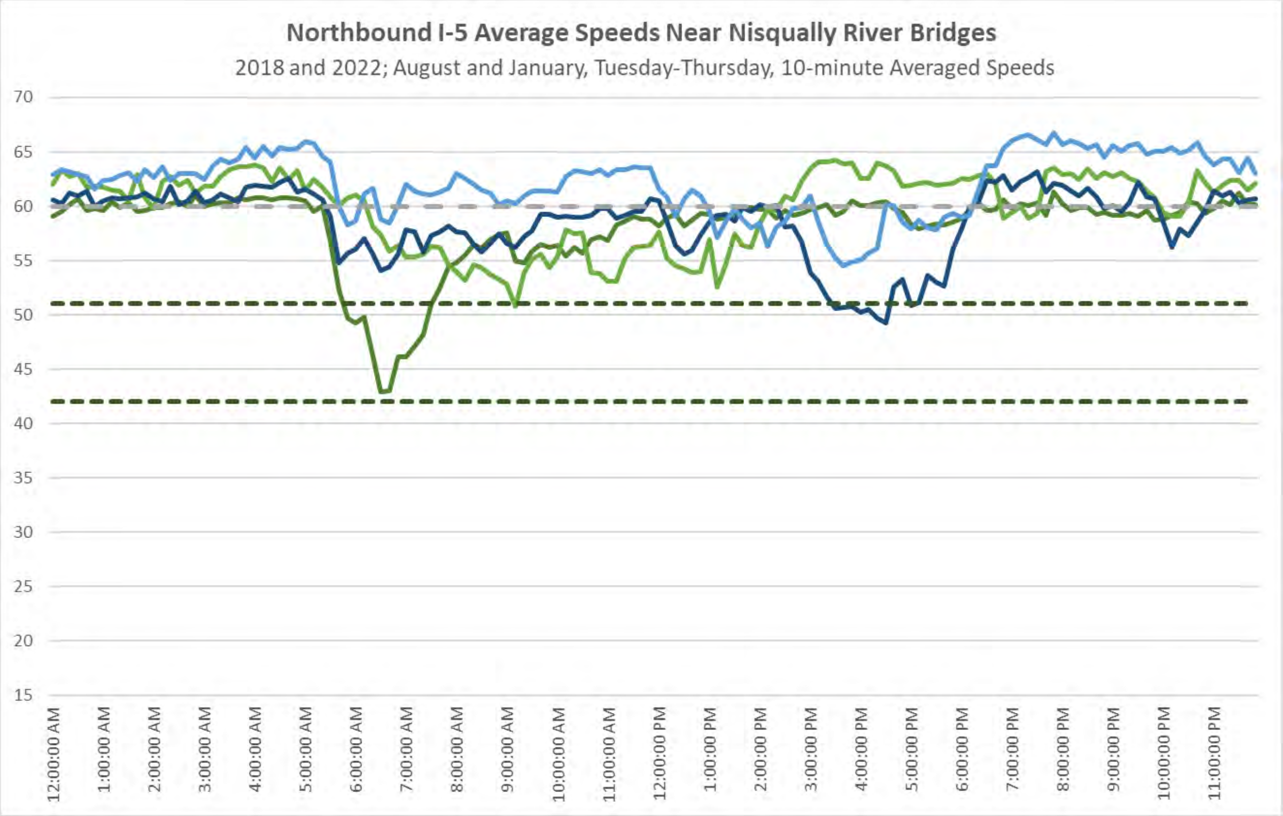


Figure D-79. Average Weekday and 15th Percentile Speeds on Northbound I-5



Northbound I-5 at the Nisqually River bridges, like many parts of the transportation system, experiences seasonal changes in traffic performance. Figure D-80 shows the average weekday speeds in January and August 2018 and in January and August 2022 on northbound I-5 near the Nisqually River Bridges. As shown in Figure D-80, average speeds in August at the height of the summer travel season dip well below those from other times of year in the afternoon. This is consistent for both the years 2018 and 2022, although speeds in 2022 are higher than those recorded in 2018. WSDOT analyzed variation in potential contributing factors including traffic volume and incidents. The agency found that seasonal changes in traffic volumes mirrored changes in traffic speeds. August, in addition to experiencing the slowest speeds had about 21-23% higher average daily traffic volume than January.

Figure D-80. Average Weekday Speeds on Northbound I-5 by Month and Year



Figures D-81 and D-82 show the total bi-directional average hourly volumes on mainline I-5 by day of the week in 2019 and 2022, respectively. Volume data in Figures D-81 through D-85 was obtained from PTR location R119 on I-5, north of the Mounts Road/Nisqually Road SW interchange. The figures show noticeable increases in traffic volumes during the morning and evening weekday commute periods. Both figures also show a later mid-morning peak in traffic volumes during the weekend.

Figure D-81. 2019 Average Hourly Volumes by Weekday on I-5

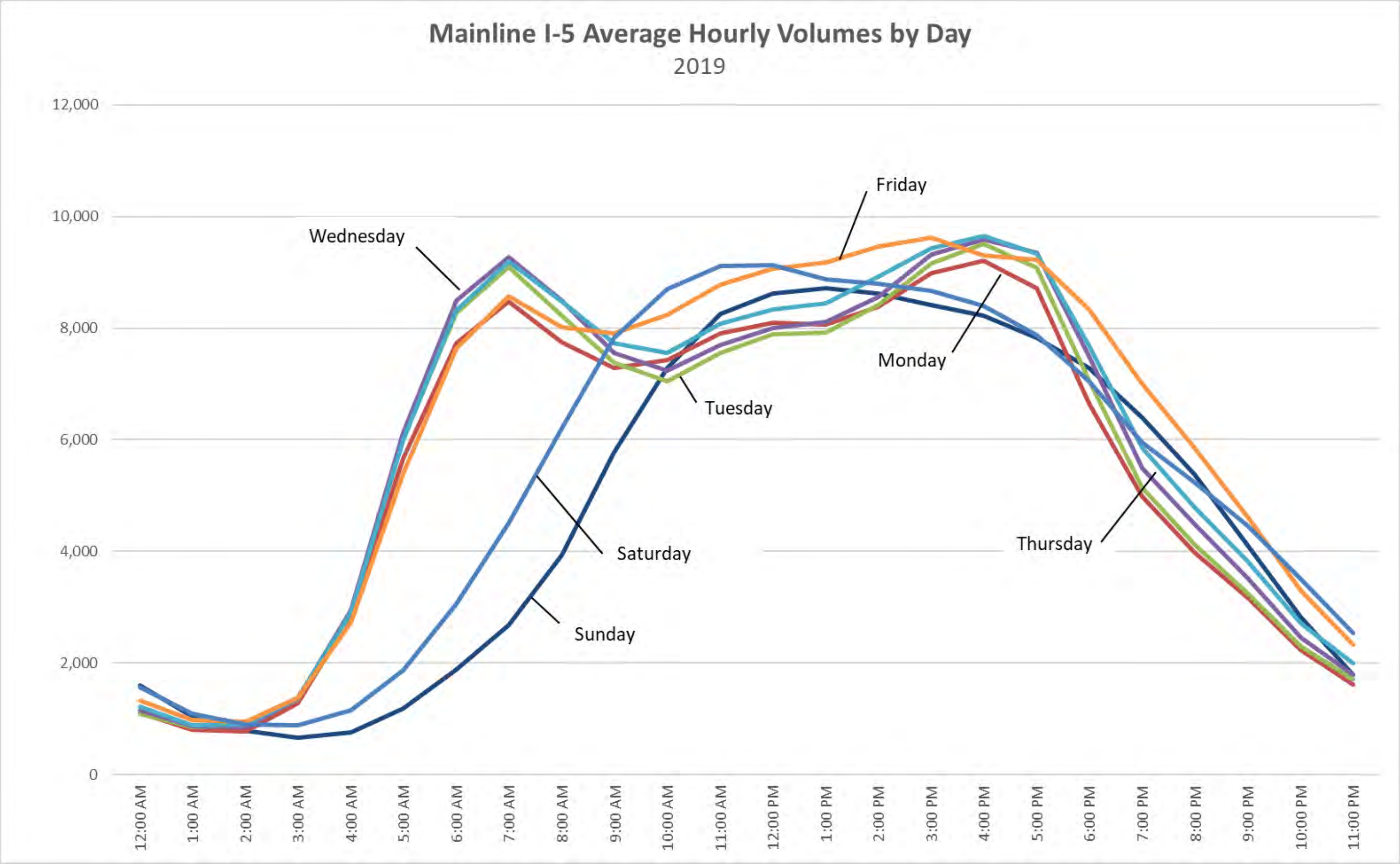


Figure D-82. 2022 Average Hourly Volumes by Weekday on I-5

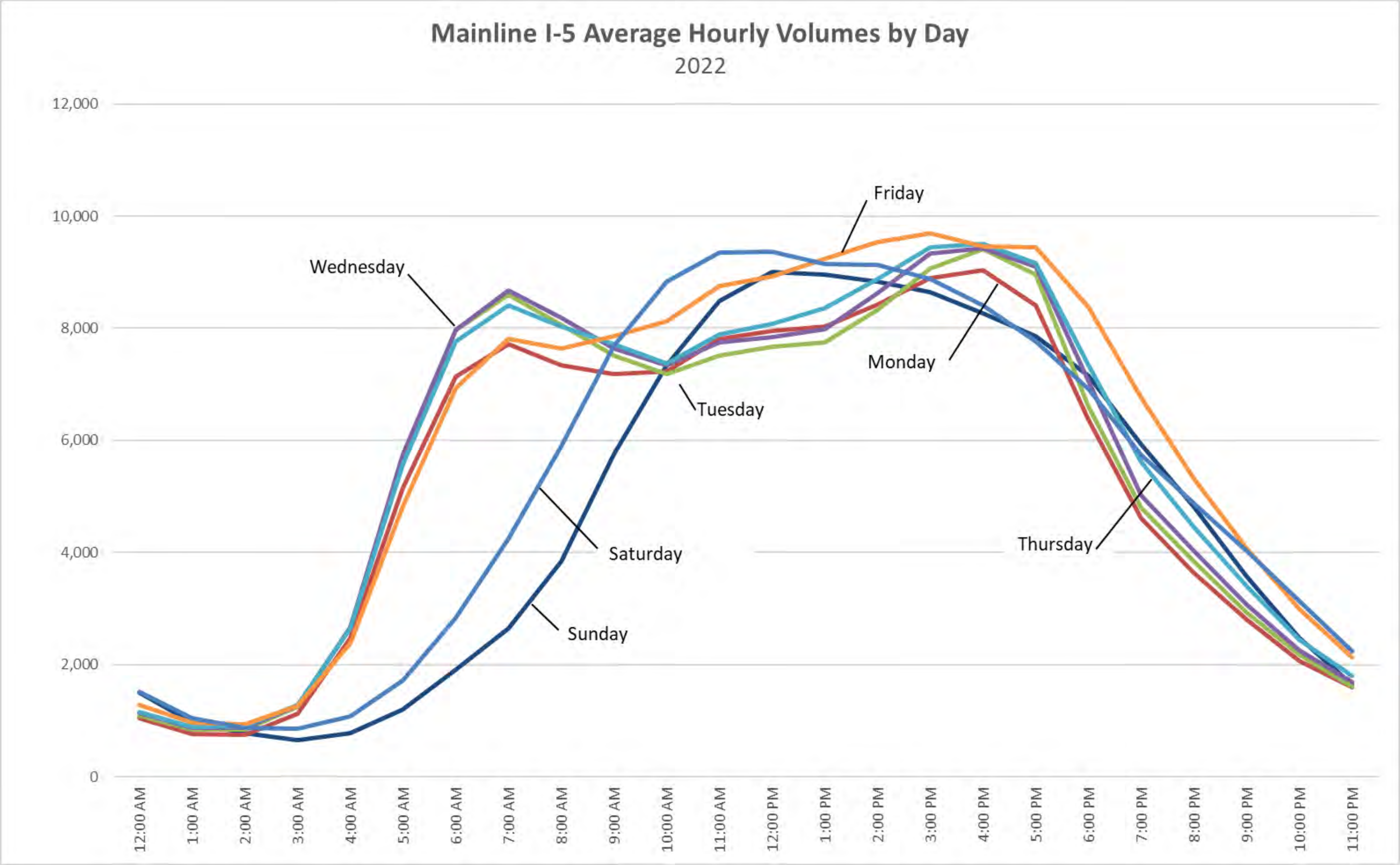


Figure D-83 compares the historical AADT on mainline I-5 from January through May in 2019 and 2022. Historical AADT data by month was not available for the entire year. The AADT in 2022 was generally lower than 2019 for four of the five months shown.

Figure D-83. Historical AADT by Month and Year

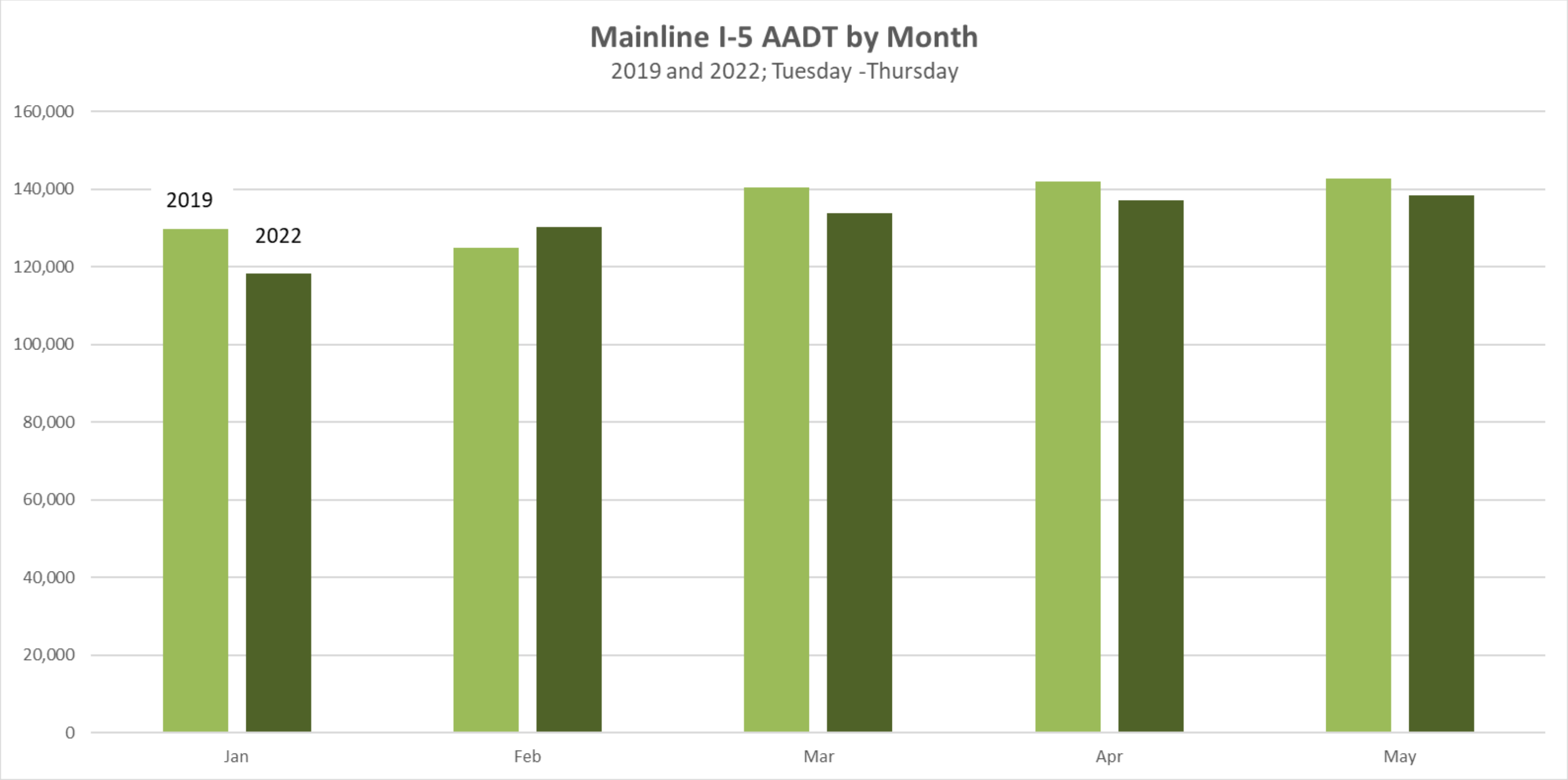
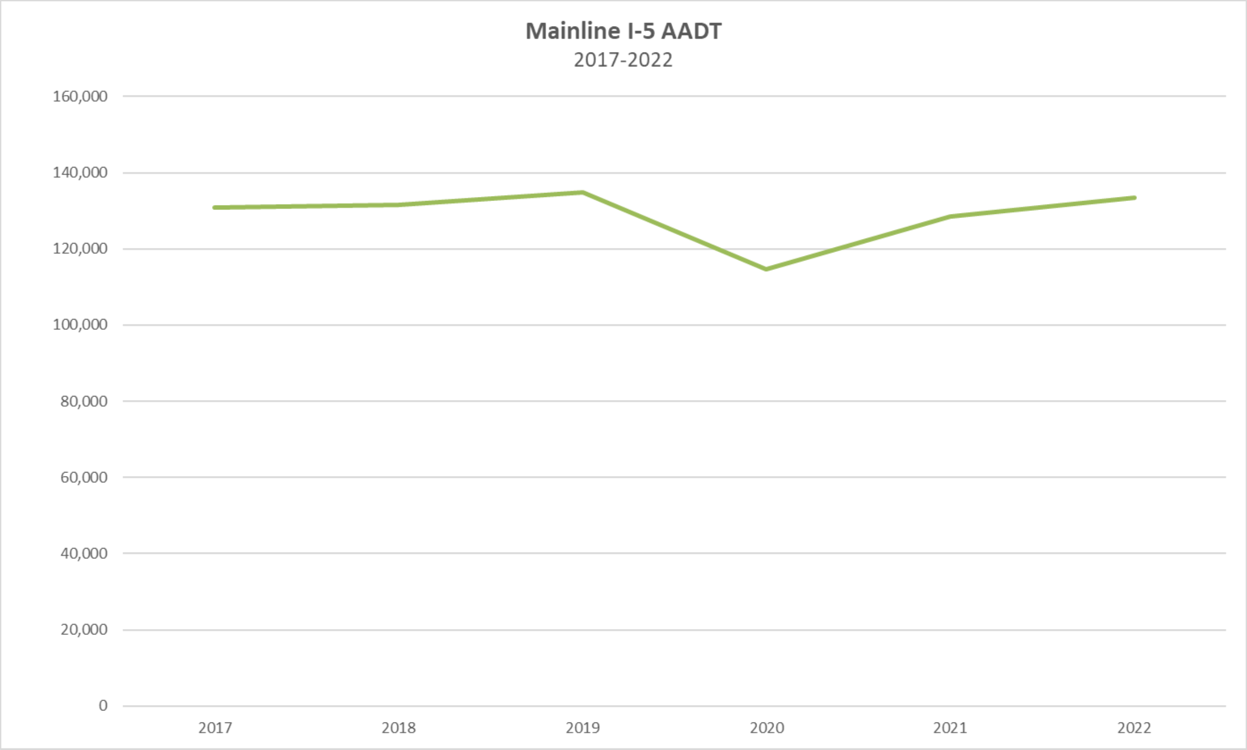


Figure D-84 shows the historical AADT on mainline I-5 from 2017 through 2022. The AADT was the highest in 2019 and dipped in 2020, corresponding to the decrease in traffic volumes during the COVID-19 pandemic. Since 2020, AADT has increased and is almost back to the pre-COVID volumes seen in 2019.

Figure D-84. Historical AADT from 2017 through 2022



17.9.2 Non-recurring Congestion

Non-recurring congestion does not occur regularly or predictably, such as congestion due to inclement weather, special events or crashes. According to the Federal Highway Administration, non-recurring congestion accounts for roughly half of all congestion[17] with the top three causes being 1) incidents ranging from a disabled vehicle with a flat tire to an overturned semi-truck (25 percent), 2) inclement weather conditions (15 percent), and 3) work zones (10 percent). Events like these can reduce how many vehicles the roadway can move at a given time, called the effective capacity.

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[17] "Reducing Non-Recurring Congestion", https://ops.fhwa.dot.gov/program_areas/reduce-non-cong.htm

Figure D-85 shows the total crashes between 2017 and 2021 by time of day and day of the week. The occurrence of crashes roughly correlated with the most active times of the day for driving, such as the peak commute periods during the weekdays and mid-day during the weekends. The peak evening commute period on Fridays and peak morning commute period on Thursdays experienced the highest number of crashes.

Figure D-85. Total Crashes on I-5 by Time of Day and Day of the Week