PRELIMINARY STORMWATER SITE PLAN

Freeman Logistics
22nd Ave NW and 82nd Ave E
Puyallup, WA

Prepared for: Vector Development Company
11411 NE 124th Street, Suite 190
Kirkland, WA 98034

October 14th, 2022
Revised December 1st, 2023
Our Job No. 21585

BENJAMIN H. ELDRIDGE
STATE OF WASHINGTON
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REGISTERED
PROFESSIONAL ENGINEER

12/1/2023

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PROJECT ENGINEER'S CERTIFICATION

"I hereby state that this Preliminary Stormwater Site Plan for Freeman Logistics has been prepared by me or under my supervision and meets the standards of care and expertise that is usual and customary in this community for professional engineers. I understand that the City of Puyallup does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me."

Ben Eldridge, PE, Senior Project Engineer

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Tab 1.0

1.0 ANALYSIS OF THE MINIMUM REQUIREMENTS

1.0 ANALYSIS OF THE MINIMUM REQUIREMENTS

This is a new development project where Minimum Requirements #1 through #9 are applicable. Please see the applicable flow charts to determine the minimum requirements.

Minimum Requirement No. 1: Preparation of Stormwater Site Plan.

Response: This Stormwater Site Plan prepared for the project meets the requirements of Minimum Requirement No. 1.

Minimum Requirement No. 2: Construction Stormwater Pollution Prevention Plan.

Response: A Construction Stormwater Pollution Prevention Plan will be provided during application for construction permits.

Minimum Requirement No. 3: Source Control of Pollution.

Response: Available and reasonable Source Control BMPs will be applied to this project for the type of source control pollution being produced on this project site.

Minimum Requirement No. 4: Preservation of Natural Drainage Systems and Outfalls.

Response: The project site is predominantly flat farmland with very slight gradient. Most of the site drains toward the northwest corner and outfalls through an existing 12” concrete culvert under Freeman Road. The downstream from this point includes approximately 1,500 feet of open channel, followed by several thousand feet of tight-line conveyance to the west toward the Fife oxbow wetland. The proposed development will slightly alter the outfall from the site, bypassing the open channel portion and pumping stormwater directly to the tight-line conveyance located approximately ¼-mile west of the site. Stormwater discharge will remain in the same basin.

Minimum Requirement No. 5: On-Site Stormwater Management.

Response: On-Site Stormwater Management is achieved by collecting storm water through catch basins and routing to one of four underground detention facilities. Stormwater is treated through a Modular Wetland per Enhanced water quality standards. After treatment, stormwater is pumped to the proposed outfall, within an existing structure approximately 1/2 miles from the project site. Please see the Section 5.0 Permanent Stormwater Control Plan for the full narrative describing feasibility of LID BMPs.

Minimum Requirement No. 6: Runoff Treatment.

Response: Runoff treatment is proposed using the enhanced water quality standard, as required for commercial land uses.

Minimum Requirement No. 7: Flow Control.

Response: The proposal uses detention vaults and tanks to store and release stormwater in accordance with the Flow Control Performance Standard. Please see Section 5.0 Permanent Stormwater Control Plan for additional details and calculations.

Minimum Requirement No. 8: Wetlands Protection.

Response: There is a single wetland onsite in the north end. The wetland is only 1,218 square feet in area. Compensatory mitigation is proposed onsite which will allow filling this wetland.

Additionally, there is an adjacent creek and wetlands offsite to the northeast with buffers extending onsite. Proposed mitigation includes buffer enhancement within the impacted site area. Refer to the Critical Areas report by Anchor QEA in Section 6.0.

The City of Fife has requested a hydroperiod protection analysis per the 2019 Department of Ecology Stormwater Manual for Western Washington for the downstream oxbow wetland which receives stormwater runoff from the project. This analysis is underway and will be provided upon completion.

Minimum Requirement No. 9: Operation and Maintenance.

Response: An Operations and Maintenance Manual is provided within this stormwater site plan. See section 9.0 for more details.

MINIMUM REQUIREMENT FLOW CHARTS

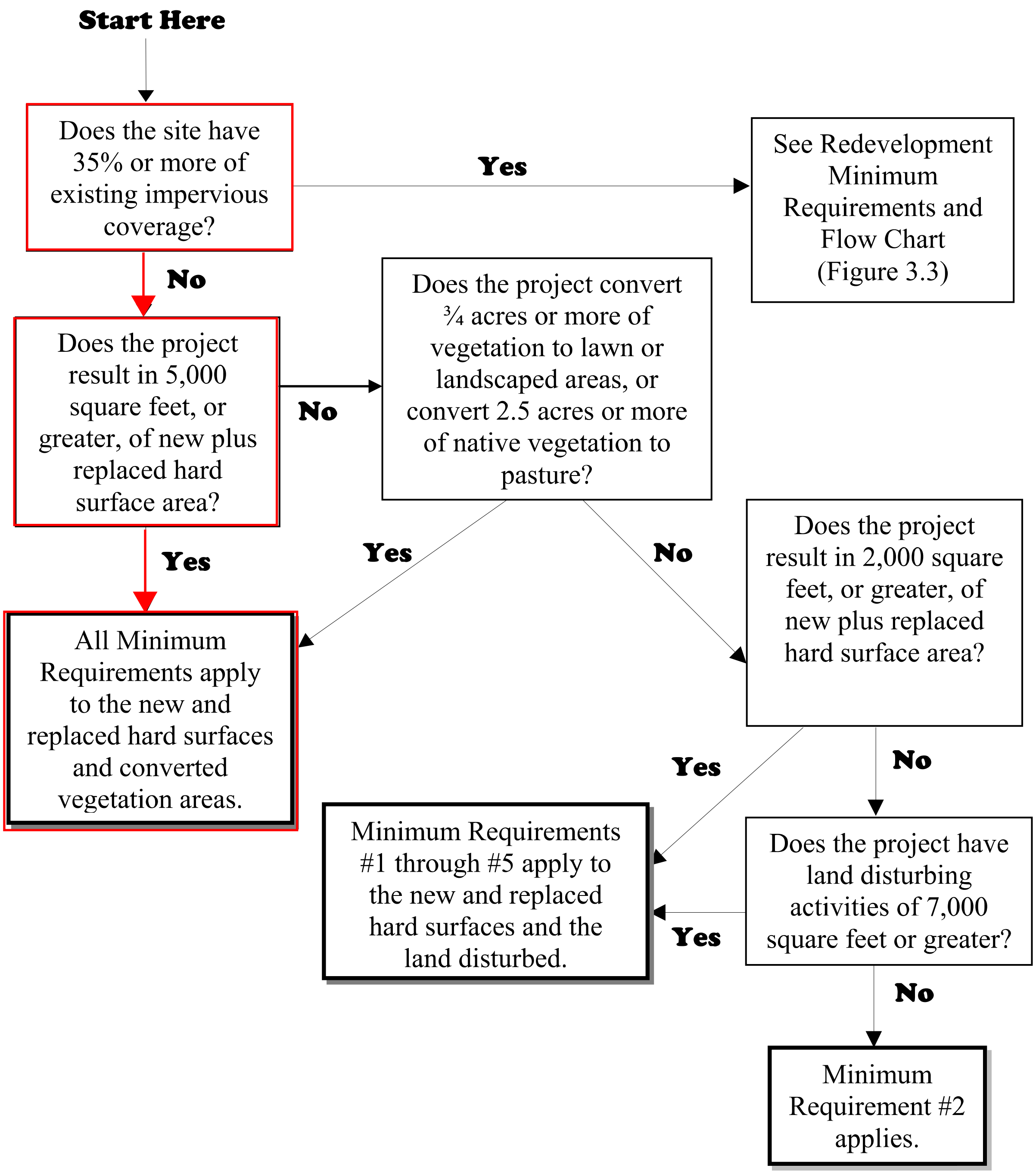


Figure 2.4.1 – Flow Chart for Determining Requirements for New Development

Tab 2.0

2.0 PROJECT OVERVIEW

2.0 PROJECT OVERVIEW

Freeman Logistics is an approximately 24.05-acre development located in the northeast and southeast corners of the 22nd Ave NW and Freeman Road East (also known as 82nd Ave E) intersection, Puyallup, Washington, within a portion of Section 17, Township 20 North, Range 4 East, and a portion of section 20, Township 20 North, Range 4 East, Willamette Meridian, City of Puyallup, Pierce County, Washington. The site is comprised of 15 parcels plus the right-of-way dedication to improve 22nd Ave NW to the east of Freeman Road East. Please see the attached Vicinity Map on the following pages of the report.

Under existing conditions, this site is lightly developed, consisting of farmland and scattered single-family houses. Housing is concentrated in the middle of the site and along the southwestern border. The site is very flat and does not have well defined drainage. No manmade drainage structures exist within the site interior. There exists a shallow 12" concrete culvert in the northwest corner where stormwater is conveyed offsite under Freeman Road to the west. Per the geotechnical report prepared for the project, the soil on site is alluvial type loamy to sandy loam. The soil has minimal infiltration potential. The project site has a high-water table, approximately 2-9 feet below the existing grade, varying with the season and location. Vegetation is predominantly pasture in the north, prior crop use in the south, plus a few scattered trees and lawn adjacent the single-family homes. The frontage roads, Freeman Road East and 22nd Ave NW, are narrow two-lane roads with no curbing. The north end of Freeman Road includes a roadside ditch along the west side which receives drainage from the site via the 12" culvert.

The developed site will include two commercial warehouse-type buildings with dock high loading, associated parking, storm drainage facilities, utilities, and frontage improvements.

Frontage improvements along Freeman Road East and 22nd Ave NW include widening the road pavement and installing a two-way left turn lane, curb & gutter, planter strip, sidewalk, street trees, lighting, and stormwater facilities per city standards. Right-of-way dedication is proposed to create a 35-ft wide half street on the project side.

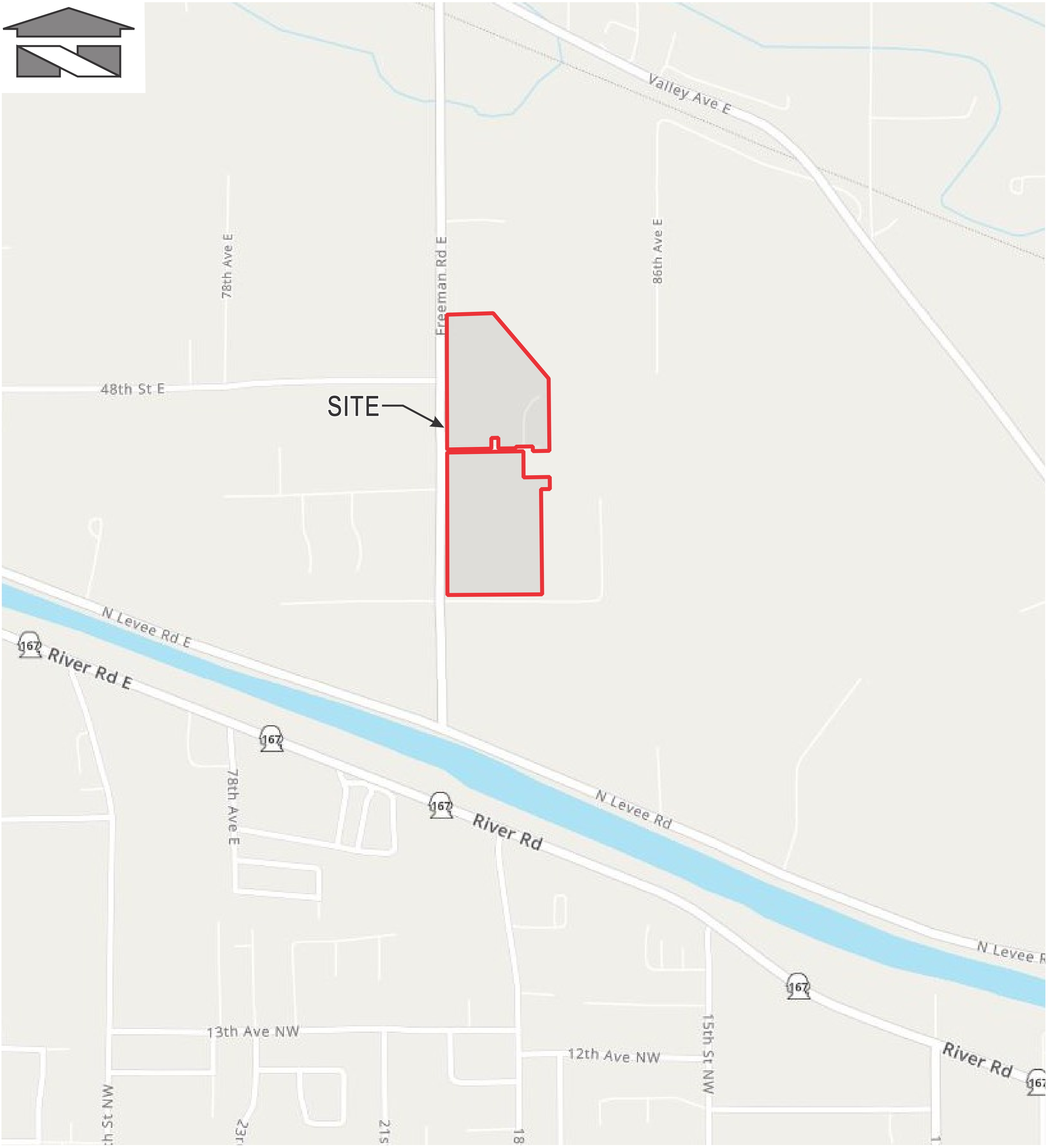
In total the site plus frontage area is 26.69 acres. The impervious coverage after development will be approximately 80%.

Summary of Land Coverage Areas

Land Use Category	Area (square feet)	Area (acres)
New Asphalt/Concrete	458,747	10.53
New buildings	493,003	11.32
New landscape/lawn	211,058	4.84
Total	1,162,808	26.69

This stormwater site plan is prepared in accordance with the 2019 Department of Ecology Stormwater Manual for Western Washington, as adopted by the City of Puyallup. The proposed facilities include catch basins and conveyance pipe which direct storm flows to underground detention facilities. The flow control standard will be achieved for all target surfaces. Stormwater will also be treated by proprietary water quality facilities that provide enhanced treatment. Mitigated flows will be conveyed to a lift station which will pump stormwater to a discharge point offsite to the west. See Section 5.0 for more information.

VICINITY MAP



REFERENCE: MapQuest (2022)

Scale: Horizontal: **N.T.S.** Vertical: **N/A**	For: Freeman Road Logistics Fife, Washington	Job Number 21585
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 **barghausen.com**	Title: VICINITY MAP	DATE: 09/01/22

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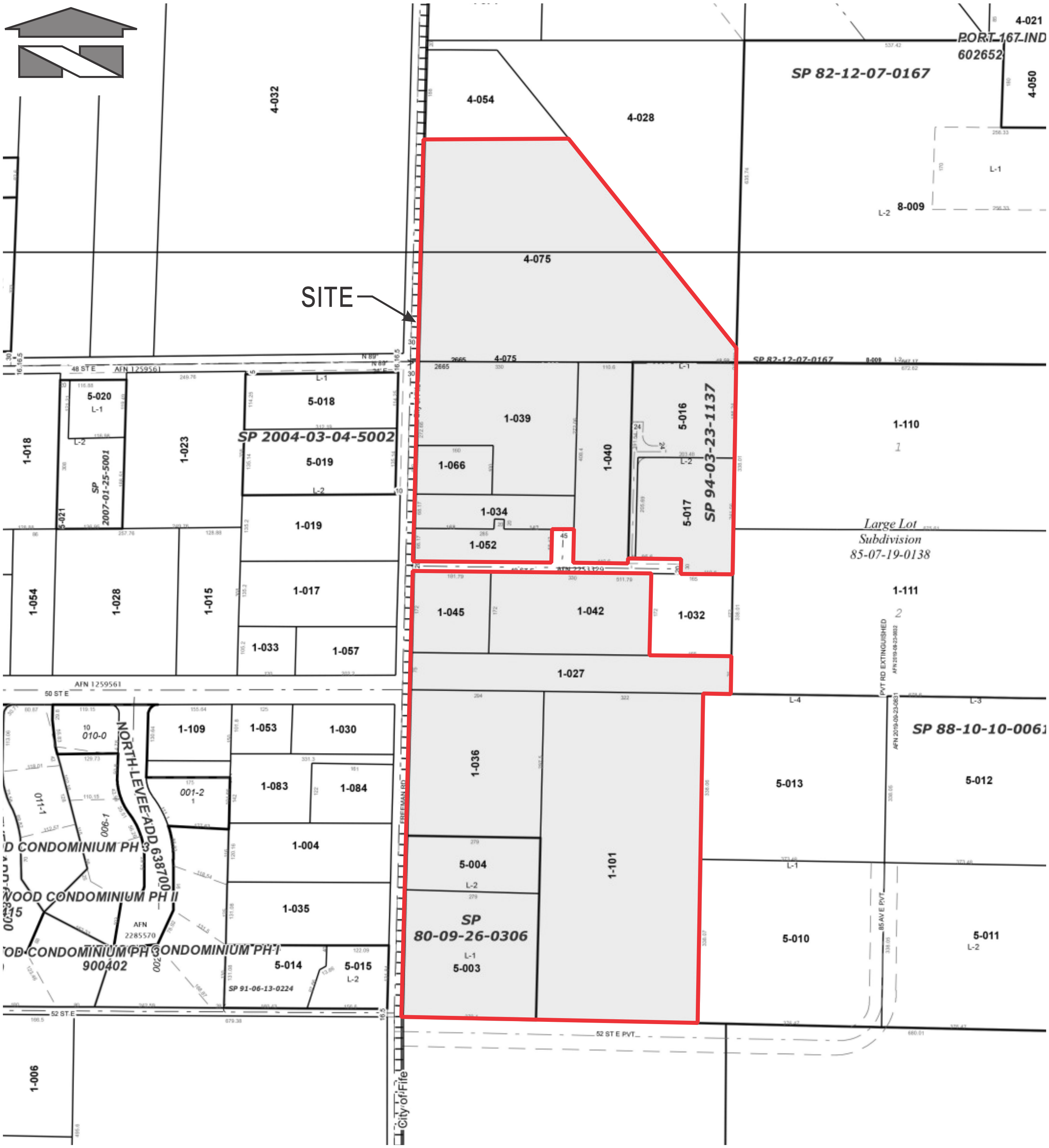
ASSESSOR MAP



REFERENCE: Pierce County Department of Assessments (Feb. 2021)

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Horizontal: **N.T.S.** Vertical: **N/A**

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Freeman Road Logistics
Fife, Washington

Title:

ASSESSOR MAP

Job Number

21585

DATE: 09/01/22

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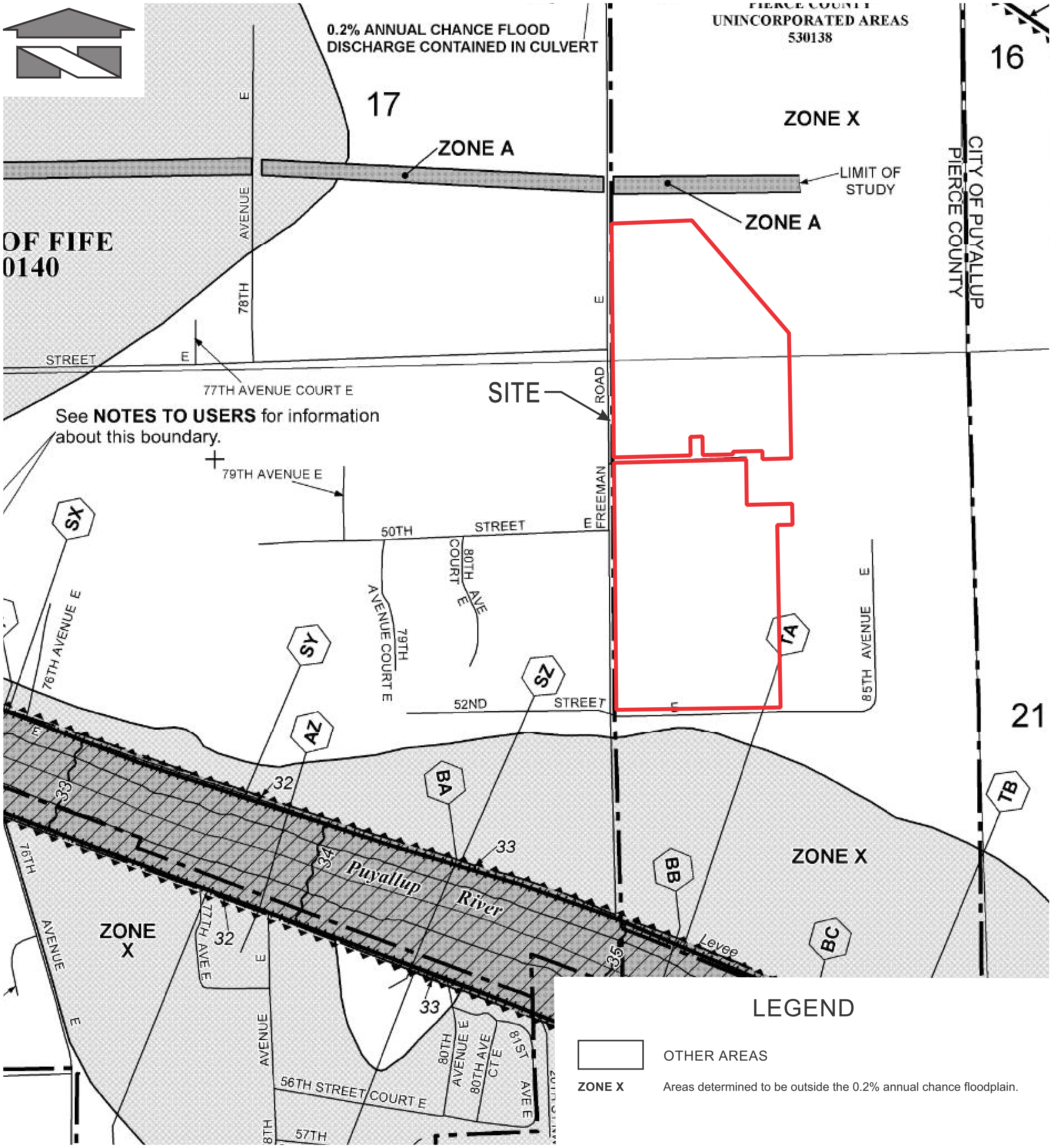
FEMA MAP



LEGEND

OTHER AREAS	
ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.

REFERENCE: Federal Emergency Management Agency (Portion of Map 53053C0329E, March 2017)

Scale:
Horizontal: **N.T.S.** Vertical: **N/A**

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Fife, Washington

Job Number
21585

Title:
FEMA MAP

DATE: 09/01/22

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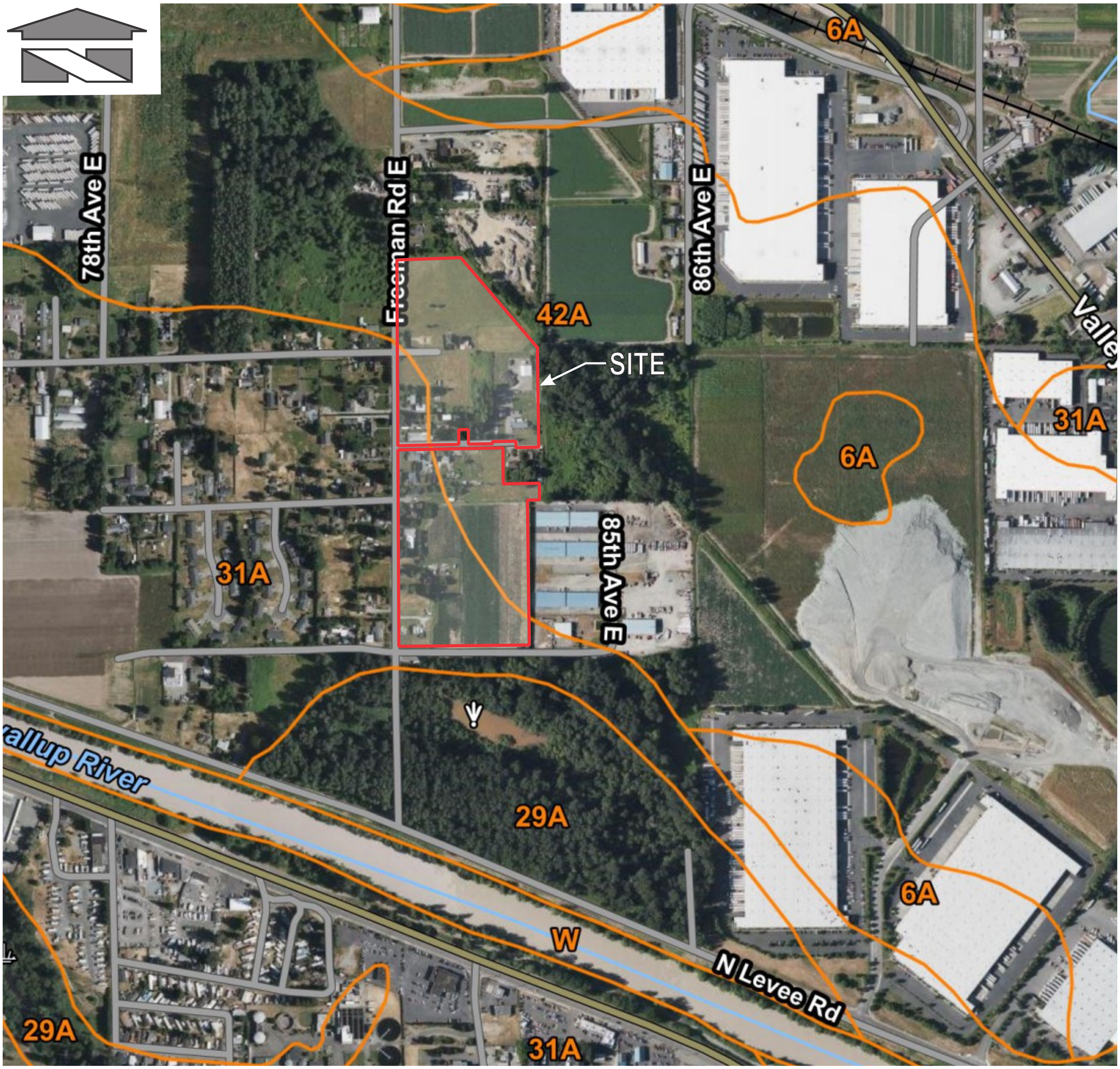
SOILS MAP



REFERENCE: USDA, Natural Resources Conservation Service

LEGEND:	HSG
42A = Sultan silt loam	C/D
31A = Puyallup fine sandy loam	A

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Horizontal: ***N.T.S.*** *Vertical:* ***N/A***

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SOIL SURVEY MAP

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21585

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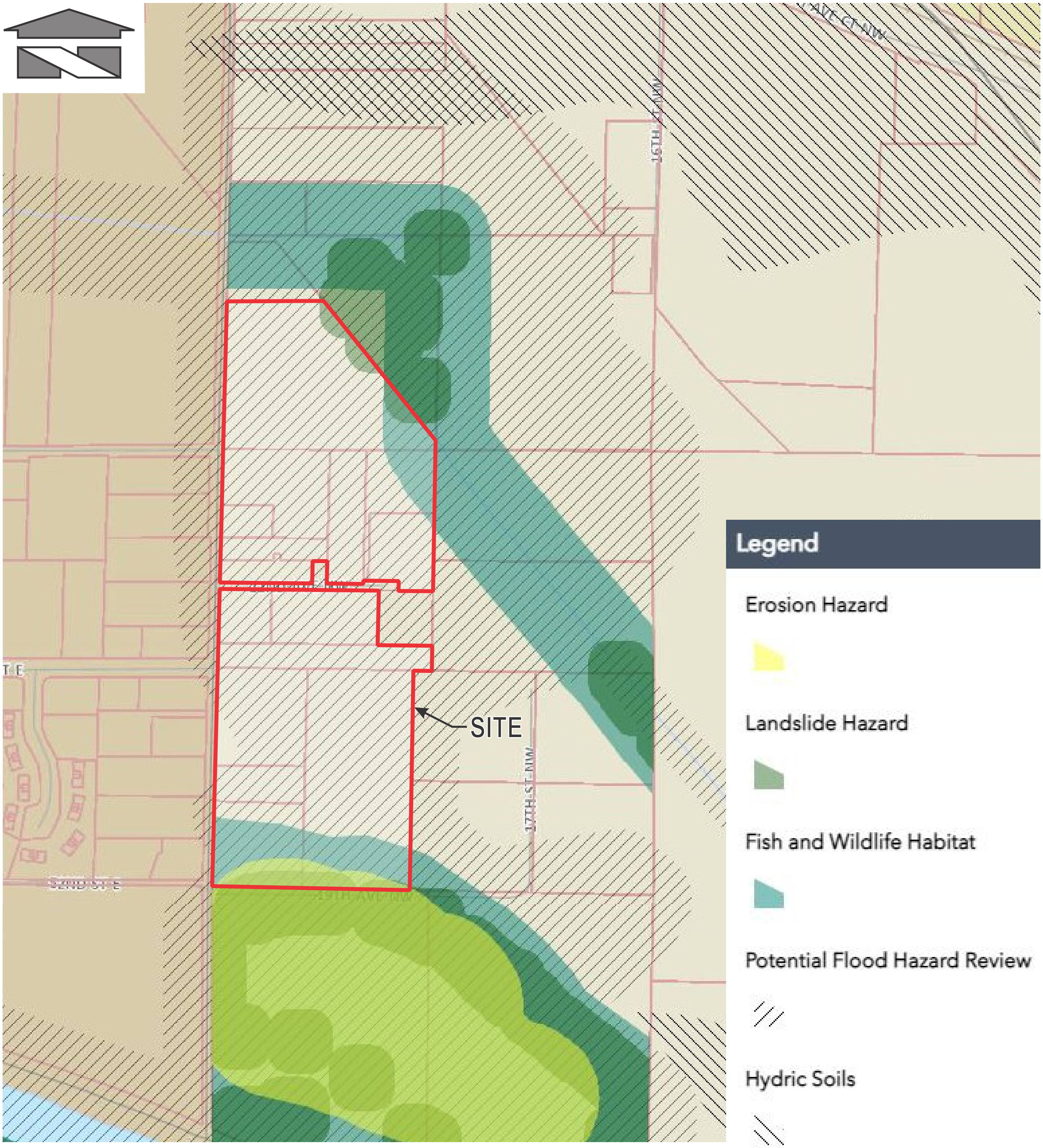
SENSITIVE AREAS MAP



REFERENCE: Pierce County PublicGIS

Scale: *Horizontal:* ***N.T.S.*** *Vertical:* ***N/A***	*For:* Freeman Road Logistics Fife, Washington		Job Number 21585
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Tab 3.0

3.0 EXISTING CONDITIONS SUMMARY

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Under existing conditions, the project site consists of farmland and scattered single-family houses. The Geotechnical report (included as a separate document in this submittal) and Soil Survey Map indicates that the site is mainly comprised of Alluvium. Further discussion of the soils can be found in the soils report prepared for this project. A soils map has also been provided. The site has very little slope and poorly defined drainage. A 12” culvert at the northwest site corner appears to be the primary outlet point for the majority of site runoff. There are no water features onsite. Vegetation is predominantly pasture in the north, prior crop use in the south, plus a few scattered trees and lawn adjacent the single-family homes. A small (±1,200 sf) wetland is located onsite in the northeast. Offsite wetlands are located offsite to the east and south. Refer to the Critical Areas Report prepared for the project for more information, included in Section 6.0 of this report. The existing frontage roads are small two-lane roads with minimal shoulder and no storm conveyance.

EXISTING CONDITIONS MAP

Tab 4.0

4.0 OFF-SITE ANALYSIS REPORT

4.0 OFF-SITE ANALYSIS REPORT

Onsite Description

The project site lies in a very flat section of the valley which has historically been used mostly for agriculture. The soils are fine grained alluvial deposits. Infiltration potential is minimal per the geotechnical engineering report. The topography does not have a consistent gradient, with the southern half generally trending to the northeast, while the north of the site generally slopes to the northwest. There are no drainage devices onsite and all drainage consists of sheet flow and shallow concentrated flow. The outlet point for the majority of runoff from the site is a 12" concrete culvert which crosses under Freeman Road at the northwest property corner. Some runoff appears to drain offsite along the east edge of the property into an adjacent agricultural ditch just offsite. This ditch routes flows north and then west and eventually crosses Freeman Road about 200' north of the project site, where the two downstream paths merge.

Upstream Description

There does not appear to be an upstream basin tributary to the site under typical drainage conditions. The Schenk property (Parcels 042020-5010, -5011, -5012, -5013) to the SE of the site has a private drainage system which collects runoff. The undeveloped properties immediately east and northeast of the site drain to the agricultural ditch which routes flow north and then west away from the subject property. Properties to the north are graded away from the site. Freeman road is higher than surrounding grade and prevents runoff from single family properties to the west. The parcel to the south is located at a lower elevation and separated from the site by 19th Ave NW. The site does not typically receive runoff from surrounding properties.

During heavy winter storm events, the site experiences a small amount of overtopping from the adjacent agricultural ditch to the east. Stormwater which overtops the ditch sheet flows northwest across the north site edge and then leaves the site via the main 12" outlet pipe crossing Freeman Road. This condition appears to be infrequent and does not present a significant flooding or erosion hazard to the site.

Downstream Description

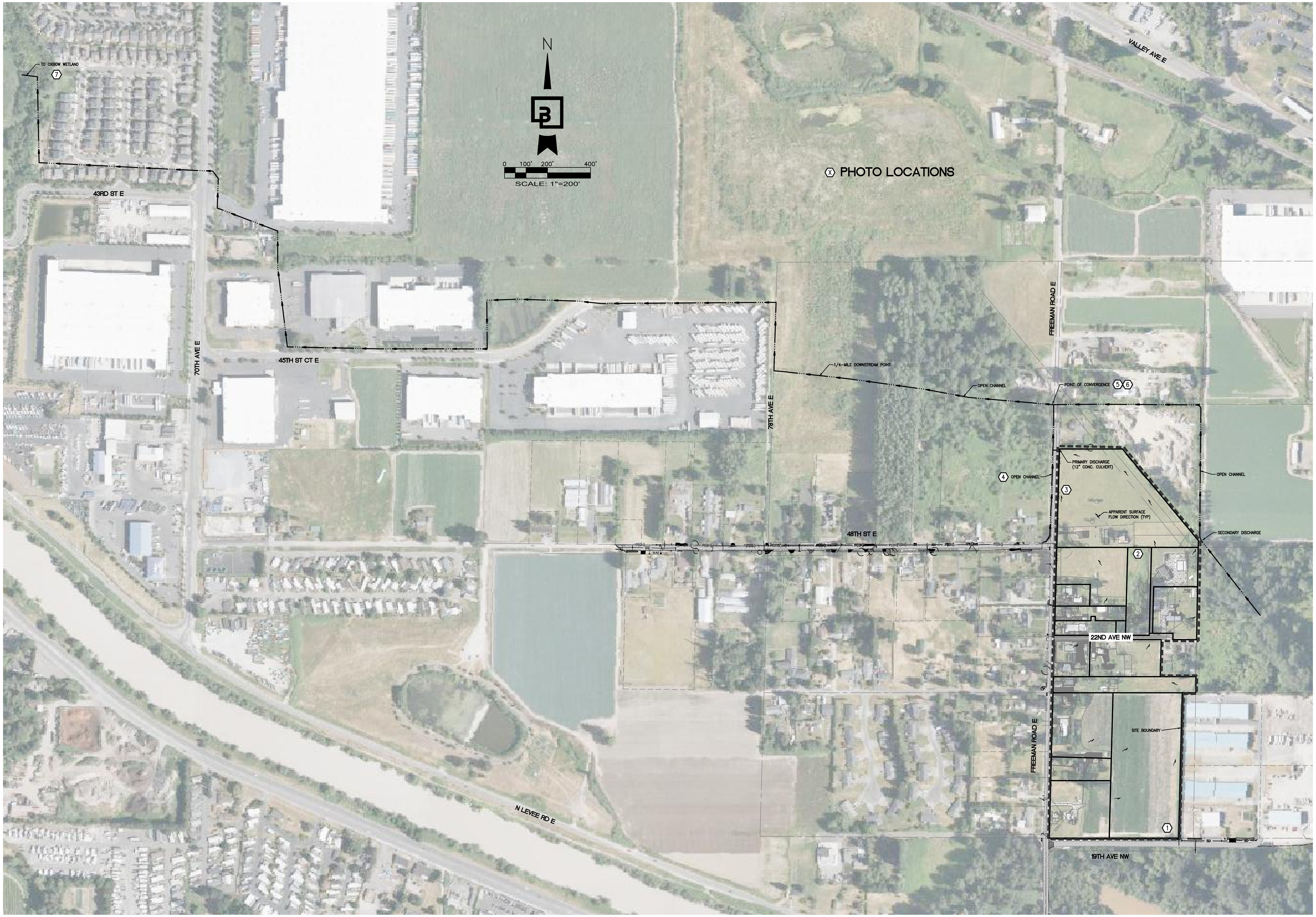
Stormwater runoff from the site initially takes one of two paths. The majority of runoff leaves the NW site corner through a shallow 12" concrete culvert and crosses under Freeman Road to the west. From there, runoff travels in a roadside vegetated ditch along the west side of Freeman Road north for approximately 230 feet. The ditch then joins a larger agricultural ditch which flows to the west through private property. The ag ditch has approximately 3' depth, 3' bottom width, variable side slopes, and relatively smooth bottom. A second runoff path involves sheet flow leaving the site along the east and then entering the same agricultural ditch at a further point upstream. The ditch then travels north and west around neighboring properties and rejoins the main downstream path at the approximate 1/4-mile point. The site is effectively a single threshold discharge area.

After merging in the agricultural ditch on the west side of Freeman Road, runoff from the site continues to the west across private property for 1/4 mile until approximately 78th Ave East. The observable portion of this ditch appears to have relatively consistent characteristics and no obstructions. From 78th Ave, the downstream path meanders through several developed commercial/industrial properties in a general westward progression through manmade conveyance elements. The size and type of the conveyance elements vary along this stretch. Most of the system is tight-lined (36-inch to 48-inch diameter pipe). The commercial properties west of 78th Ave appear to be equipped with onsite detention systems to mitigate stormwater flow rates. The downstream system eventually crosses under 70th Ave East in a 48-inch pipe and then outlets to the oxbow wetland located between 54th Ave E and 70th Ave E. The oxbow is approximately 1.25 miles downstream of the project site.

Oxbow Wetland Analysis

The complete Oxbow wetland analysis is not included in this preliminary report. The full analysis is pending and will be included in future submittals.

OFFSITE ANALYSIS BASIN MAPS



Title: DOWNSTREAM EXHIBIT

No.	Date	By	Ckd.	Appr.	Revision

For:
VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

Scale: Horizontal 1"=200' Vertical N/A

Designed JSM
Drawn
Checked
Approved
Date 10/7/22

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Job Number **21585**

Sheet **1** of **1**

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No.	Date	By	Ckd.	Appr.	Revision

Title: OXBOW DRAINAGE BASIN EXHIBIT

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

Scale: Horizontal 1"=500'
Vertical N/A

Designed JSM
Drawn
Checked
Approved
Date 10/14/22

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Sheet 1 of 1

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OFFSITE ANALYSIS PHOTO EXHIBIT

Photo Exhibit

The following photos are provided with reference to the Downstream Exhibit included at the end of this section.

Photo 1. Looking north from the SE property corner. Existing farmland is flat. There is no concentrated discharge point from this portion of the site.

Photo 2. Looking northwest toward the north, central portion of the site. Stormwater appears to drain in a general NW direction within this part of the site.

Photo 3. Looking north at the NW site corner during heavy rain event. Stormwater collects in this corner and passes under Freeman Rd within a 12-inch concrete culvert.

Photo 4. Looking north along roadside ditch on the west side of Freeman Rd opposite the north end of the site.

Photo 5. Looking west along ditch on the west side of Freeman Rd where the roadside ditch joins the larger agricultural ditch and then heads west.

Photo 6. Photo of the agricultural ditch during dry season.

Photo 7. Portion of oxbow wetland observed during peak rain event at the beginning of March 2022. No flooding of the wetland or related conveyance elements was observed during this period.

Tab 5.0

5.0 PERMANENT STORMWATER CONTROL PLAN

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Part A Existing Site Hydrology

Under existing conditions, the site is an assemblage of parcels which contain single family homes plus minimally developed pasture and farmland. The homes are mostly concentrated in the middle of the site and along the southwestern border. Per the geotechnical report prepared for the project, the soil on site is alluvial type loamy to sandy loam. The soil has minimal infiltration potential. The project site has a high-water table, approximately 2-9 feet below the existing grade, varying with the season and location. Site grades are minimal, however the overall trend is a gradual slope of less than 1% to the north. Vegetation is predominantly pasture in the north, prior crop use in the south, plus a few scattered trees and lawn adjacent the single-family homes. Runoff from the site appears to travel via sheet flow and shallow subsurface interflow toward the northwest corner. There are no existing manmade structures to collect and convey runoff onsite. Freeman Road is higher than the site and causes drainage to pond during heavy rain events and then runs north. There exists a shallow 12” concrete culvert in the northwest site corner where stormwater is conveyed offsite under Freeman Road to the west. See Section 4.0 for a more detailed analysis of the downstream system. The onsite area totals 24.05 acres, which is divided north and south by 22nd Ave NW. An additional 2.81 acres of existing plus proposed public ROW area along the project frontage on Freeman Road East and 22nd Ave NW will receive improvements. The frontage includes approximately 2.03 acres of existing 2-lane road surface which is currently uncollected. The north end of Freeman Road, north of 48th Street, is tributary to a roadside ditch. The onsite plus frontage areas total 26.69 acres and are within the same basin.

A separate offsite area to the south of the parcels, at the Freeman and Levee Road intersection, is also part of the project. Road widening and ROW dedication is proposed at the northwest intersection corner to accommodate truck and trailer traffic to and from the development. The dedication area is contained on a single parcel which is undeveloped and mostly forested. Part of the existing road shoulder to be widened is gravel covered. Road drainage is currently uncollected and is dispersed to the road shoulder. Stormwater is presumed to infiltrate during much of the year. Some runoff across the adjacent parcel to the west and north may occur during the wetter months of the year, although no defined drainage course is known. This offsite area is considered a separate basin. See part B for areas.

Converted surfaces for this project are considered forested in the pre-developed modeling condition for all basins.

Part B Developed Site Hydrology

The developed site will include two commercial warehouse buildings with dock high loading, associated parking and drive aisles, storm drainage facilities, utilities, landscaping and frontage improvements. The impervious coverage after development will be approximately 80%, including frontage improvements. Flow control and water quality facilities are proposed to mitigate stormwater runoff from the new plus replaced impervious surfaces and landscape.

The parcel area and adjacent frontage improvements of the site are contained within a single drainage basin. However, due to the configuration of the site plan, the public ROW of 22nd Ave NW divides the site into two halves, north and south. Stormwater mitigation is handled separately for private versus public runoff. Therefore, the private improvements include separate collection and detention facilities for the north and south buildings. An additional facility is designed to mitigate public stormwater. Mitigated stormwater is then collected to a central lift station and pumped offsite to the west as described in part F of this section.

The frontage improvements along Freeman Road include significant road widening, curb, sidewalk, landscape, pavement overlay and storm drainage system. Stormwater runoff flows will increase due to the increased pavement surface area. The majority of runoff will be collected using curbing to direct flows to catch basins and underground storm pipes, then to a proposed detention vault. The collected surfaces include 43,451 sf existing impervious plus 46,939 sf proposed new impervious area. Approximately 8,637 sf of road surface will continue to discharge to an existing roadside ditch along the northern section of Freeman Road. This configuration avoids detention of excess non-target runoff. The non-mitigated runoff is from both existing and proposed road surfaces. A mitigation trade offsets the bypassed target surface area with existing upstream non-target road surface, such that the duration standard is achieved for the net project area.

The frontage improvements at the intersection of Freeman Road and Levee Road include road widening to install turn pockets, curb, pavement overlay and storm drainage system. Curbs and catch basins are designed to collect runoff and then direct via pipe system to a proposed detention tank. The total of new plus replaced impervious area is 16,165 sf. The area collected for stormwater mitigation includes 5,980 sf existing impervious plus 10,185 sf proposed new impervious area. Approximately 5,811 sf of proposed new impervious road surface will not be collected. This configuration avoids detention of the portion of road which is not being replaced (and is therefore non-target runoff) using a mitigation trade.

The asphalt widening along Levee Road to the east of Freeman Road is not proposed for collection. This area is only ±2,342 sf and is narrow. Dispersion to the north edge of the road in-kind with the existing drainage is the most practical solution for this pavement. Refer to the Offsite Develop Basin Exhibit.

A breakdown of developed site areas is provided in the below table:

DEVELOPED SITE AREAS		(sf)		(ac)
North Parcel				
Building (roof)	234,721		5.39	
Asphalt	145,262		3.33	
Sidewalk	30,386		0.70	
Landscape	59,172		1.36	
South Parcel				
Building (roof)	257,476		5.91	
Asphalt	135,692		3.12	
Sidewalk	39,935		0.92	
Landscape	77,476		1.78	
Frontage ROW				
Asphalt	90,390		2.08	
Sidewalk	13,785		0.32	
Landscape	10,539		0.24	
Offsite ROW				
Asphalt	16,165		0.37	
Total				
Building (roof)	492,197		11.30	
Asphalt	387,509		8.90	
Sidewalk	84,106		1.93	
Landscape	147,187		3.38	

Please refer to the later sections of this report for the sizing calculations for the detention and water quality facilities.

Part C Performance Standards and Goals

This stormwater site plan is prepared in accordance with the 2019 Department of Ecology Stormwater Manual for Western Washington, as adopted by the City of Puyallup. The standard flow control criteria

(50% of the 2-year, up to the full 50-yr duration matching) is applicable. In addition, the proposed conditions will not exceed the existing 100-year peak flow rate. Enhanced water quality treatment is required due to the intended commercial site use. A feasibility analysis is required for implementation of LID BMPs.

Low Impact Development Features

This development triggers all the minimum requirements, including Minimum Requirement #5 – On-site Stormwater Management. To meet this requirement, the LID performance standards will be implemented to the greatest extent feasible. See below for the feasibility analysis.

- <u>Lawn and Landscaped Areas</u>
    - Post-Construction Soil Quality and Depth (BMP T5.13)
        - This BMP is feasible and will be used onsite to the greatest extent possible.
- <u>Roof Areas</u>
    - Full dispersion
        - Full dispersion has been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS.
    - Downspout Full Infiltration
        - Downspout full infiltration has been determined to be infeasible for this project due to the lack of clearance from the seasonal high groundwater table. See the geotechnical report, included as a separate document in this submittal.
    - Bioretention
        - Bioretention has been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS. Furthermore, bioretention facilities would not be able to have sufficient clearance from the seasonal high groundwater table.
    - Downspout Dispersion
        - Downspout dispersion has been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS.
    - Perforated Stub-Out Connections
        - Perforated stub-out connections have been determined to be infeasible for this project due to the lack of clearance from the seasonal high groundwater table.
- <u>Other hard surfaces</u>
    - Full Dispersion
        - Full dispersion has been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS.
    - Permeable Pavement
        - Permeable pavement has been determined to be infeasible due to the lack of sufficient strength to support the anticipated truck traffic.
    - Bioretention
        - Bioretention has been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS. Furthermore, bioretention facilities would not be able to have sufficient clearance from the seasonal high groundwater table.
    - Sheet Flow/Concentrated Dispersion
        - Both sheet flow and concentrated dispersion have been determined to be infeasible for this project due to the project site being within a mapped floodplain, per Pierce County GIS.

Part D Flow Control System

WWHM was used to size four separate flow control facilities to serve the various target surface areas of the project. Two large underground detention vaults are designed for the main north and south building sites, serving the runoff from the private rooftop and parking areas. A third underground detention vault is designed within the ROW of 22nd Ave NW to provide flow control for the public Freeman Road and

22nd Ave frontage improvements, which are treated separately from onsite stormwater. A fourth detention facility is proposed to mitigate flows from the impervious areas added by the project at the Freeman Road East – Levee Road East intersection. This final facility handles only public stormwater, consisting of an underground tank located below pavement in Freeman Road. Catch basins and pipe collect and direct flows to each respective flow control facility. Each facility includes a standard gravity flow control riser. Water quality treatment is designed downstream of each flow control facility. Preliminary dimensions are provided in the below table.

Facility Name	Length (FT)	Width (FT)	Depth (FT)	Volume Provided (CF)	Volume Required per WWHM
Building A Vault	356	100	7.5	231,400	223,463
Building B Vault	385	120	7.5	300,300	228,803
22nd Ave Vault	104	20	7.5	13,520	12,981
Levee Road Tank	390	6 (diameter)	5.5	10,629	10,237

The three vault facilities are located north of 19th Ave NW and are part of the same basin. However, due to topography constraints, a gravity discharge to a downstream drainage course is not feasible. Mitigated flows from the three vaults are designed for conveyance to a central lift station facility where stormwater is pumped via force main to the downstream connection point offsite to the west.

The lift station is designed with a wet well and 2-4 pumps with variable speed controls. The controls allow a wide range of flow adjustment to closely match the discharge rate of stormwater leaving the detention vaults. Typically, the control system includes multiple float switches, a variable frequency drive (VFD), and a pressure transducer to adjust the motor speed and/or turn on additional pumps to keep a consistent water level in the wet well. As a result, during the critical design storm range (50% of the 2-year peak up to the 100-year peak flow), the lift station will allow the control structure of each vault to operate normally via gravity. See attached pump details in this section.

The Levee Road detention tank facility is within a separate basin. The proposed design includes two parallel tanks connected to a common control structure. After release from the detention system, stormwater is treated by a proprietary water quality facility designed for basic treatment and then released to a rock protected pad to the west of the Freeman Road East and North Levee Road East intersection.

Part E Water Quality System

Water quality treatment is designed to treat stormwater from target pollution-generating impervious surfaces. Enhanced treatment is provided for the onsite and adjacent frontage improvements using underground proprietary vaults located downstream of each of the three detention vaults. Basic water quality treatment is designed to mitigate for offsite improvements south of the project site near Levee Road. Each facility is designed using WWHM using the 2-year vault release rate. Final sizing information and details will be provided during the construction permit design phase.

Part F Conveyance System Analysis and Design

A conveyance system analysis, as required in the 2019 SWMM will be included in this report during the final design phase. The conveyance system will be sized for the 25-year storm event without flooding. The rational method will be used to size all conveyance pipes.

Refer to the attached pump calculations at the end of this section. Collected stormwater is routed through the proposed detention vaults and is discharged to water quality facilities providing enhanced treatment. From these facilities, water is conveyed to the pump lift station, located near the southeast corner of building A. The pump lift station houses a duplex system, that conveys water north along the eastern portion of Freeman Road until it turns westerly along 48th St E. The pump discharge line continues west along 48th St E until it turns north and runs along 78th Ave E, which is a private road. Finally, the pump discharge line is proposed to connect to an existing storm manhole, approximately a quarter mile away from the project site. See the civil plans for more details.

STORMWATER TRIBUTARY BASIN MAPS

PREDEVELOPED BASIN - FREEMAN ROAD
FOR
FREEMAN ROAD LOGISTICS

A PORTION OF THE SE¼ OF SEC. 17, TWP. 20 NORTH, RGE. 4 EAST AND
A PORTION OF THE NE¼ OF SEC. 20, TWP. 20 NORTH, RGE. 4 EAST, W.M.
CITY OF FIFE, PIERCE COUNTY, WASHINGTON

811 Know what's below. Call before you dig.

N

0 50' 100' 200'
SCALE: 1"=100'

FREEMAN ROAD PREDEVELOPED BASIN

OFFSITE					
	EX. ASPHALT	88,338	SF	2.03	AC
	FOREST	1,074,470	SF	24.67	AC
TOTAL		1,162,808	SF	26.69	AC

No.	Date	By	Ckd.	Appr.	Revision

Title: **PREDEVELOPED BASIN**
FREEMAN ROAD LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11335 NE 122ND WAY, SUITE 105
KIRKLAND, WA 98034

Scale: Horizontal 1"=100' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved BHE
Date 7/8/21

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
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barghausen.com

Job Number 21585

Sheet 1 of 5

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DEVELOPED BASIN - NORTH
FOR
FREEMAN ROAD LOGISTICS

A PORTION OF THE SE¼ OF SEC. 17, TWP. 20 NORTH, RGE. 4 EAST AND
A PORTION OF THE NE¼ OF SEC. 20, TWP. 20 NORTH, RGE. 4 EAST, W.M.
CITY OF FIFE, PIERCE COUNTY, WASHINGTON

811
Know what's below. Call before you dig.

N

0 25' 50' 100'
SCALE: 1"=50'

FREEMAN ROAD DEVELOPED BASIN - NORTH

NORTH	TRIBUTARY				
	BUILDING	234,721	SF	5.39	AC
	ASPHALT	145,262	SF	3.33	AC
	SIDEWALK	30,386	SF	0.70	AC
	TOTAL PAVEMENT	175,648	SF	4.03	AC
	LANDSCAPE	59,172	SF	1.36	AC
TOTAL		469,541	SF	10.78	AC

Revision
No. Date By Ckd. Appr.

Title: DEVELOPED BASIN - NORTH
FREEMAN ROAD LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11335 NE 122ND WAY, SUITE 105
KIRKLAND, WA 98034

Scale: Horizontal 1"=50' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved BHE
Date 7/8/21

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Sheet 2 of 5

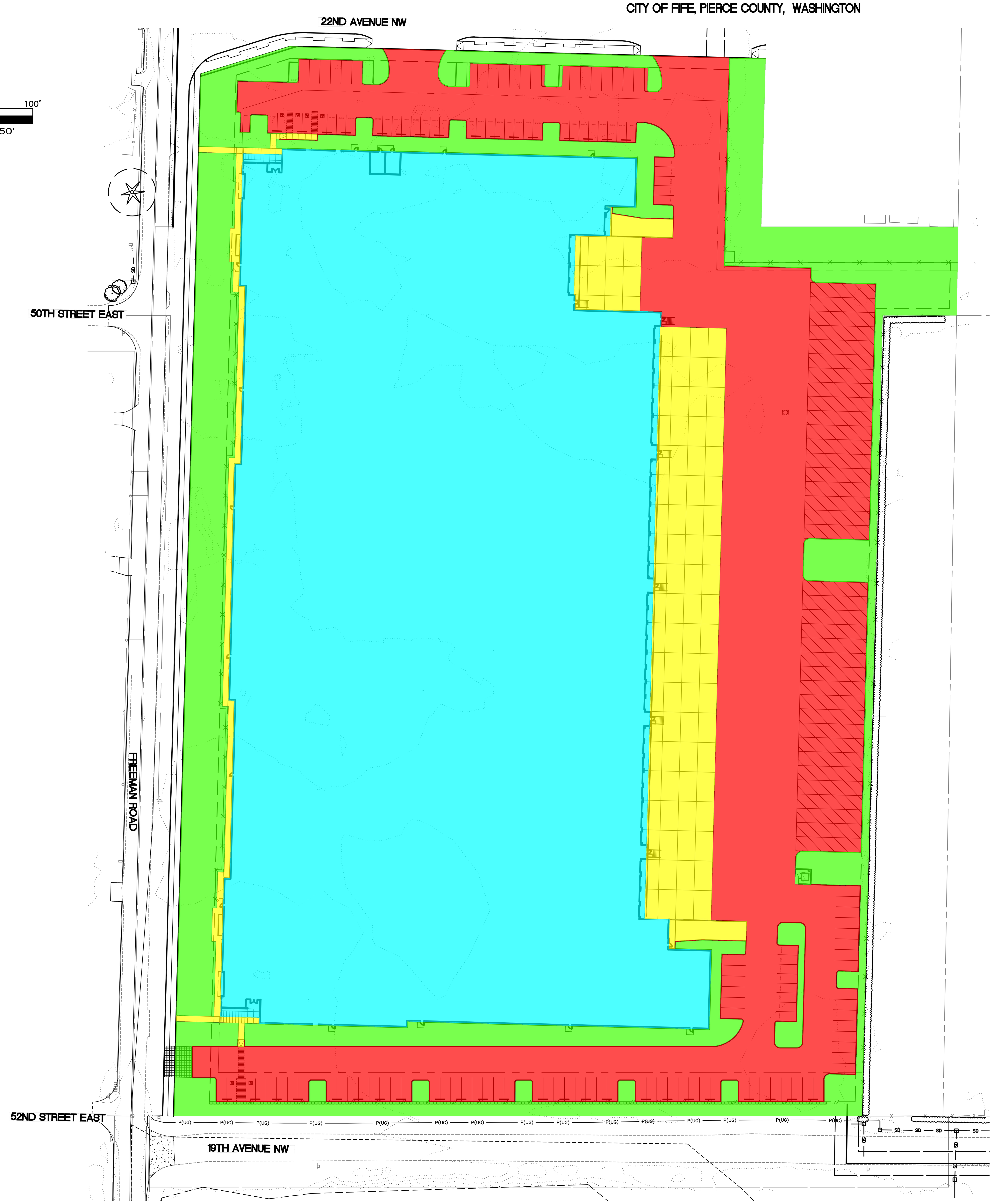
DEVELOPED BASIN - SOUTH
FOR
FREEMAN ROAD LOGISTICS

A PORTION OF THE SE¼ OF SEC. 17, TWP. 20 NORTH, RGE. 4 EAST AND
A PORTION OF THE NE¼ OF SEC. 20, TWP. 20 NORTH, RGE. 4 EAST, W.M.
CITY OF FIFE, PIERCE COUNTY, WASHINGTON

N

SCALE: 1"=50'

Know what's below. Call before you dig.



FREEMAN ROAD DEVELOPED BASIN - SOUTH

SOUTH	TRIBUTARY				
	BUILDING	257,476	SF	5.91	AC
	ASPHALT	135,692	SF	3.12	AC
	SIDEWALK	39,935	SF	0.92	AC
	TOTAL PAVEMENT	175,627	SF	4.03	AC
	LANDSCAPE	77,476	SF	1.78	AC
TOTAL		510,579	SF	11.72	AC

Revision
No. Date By Ckd. Appr.

Title: DEVELOPED BASIN - SOUTH
FREEMAN ROAD LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11335 NE 122ND WAY, SUITE 105
KIRKLAND, WA 98034

Scale: Horizontal 1"=50' Vertical N/A

Designed JSM Drawn DTC Checked JSM Approved BHE Date 7/8/21

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Sheet 3 of 5

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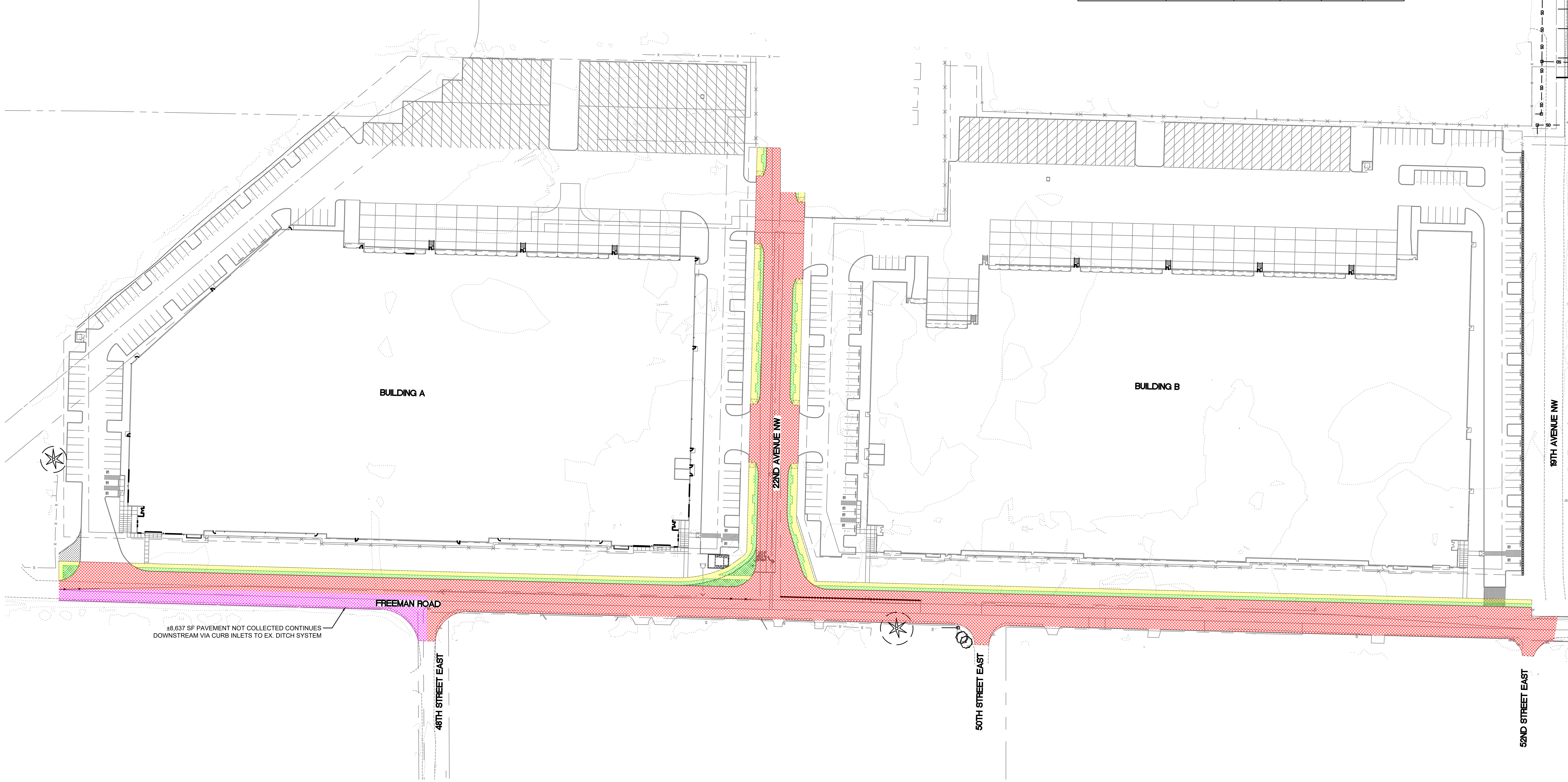
DEVELOPED BASIN - OFFSITE
FOR
FREEMAN ROAD LOGISTICS

A PORTION OF THE SE¼ OF SEC. 17, TWP. 20 NORTH, RGE. 4 EAST AND
A PORTION OF THE NE¼ OF SEC. 20, TWP. 20 NORTH, RGE. 4 EAST, W.M.
CITY OF FIFE, PIERCE COUNTY, WASHINGTON

0 30' 60' 120'
SCALE: 1"=60'

Know what's below. Call before you dig.

NEW FRONTAGE NORTH					
	ASPHALT	90,390	SF	2.08	AC
	SIDEWALK	13,785	SF	0.32	AC
	LAWN	10,539	SF	0.24	AC
TOTAL		114,714	SF	2.63	AC



No. | Date | By | Ckd. | Appr. | Revision

Title: DEVELOPED BASIN - OFFSITE
FREEMAN ROAD LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11335 NE 122ND WAY, SUITE 105
KIRKLAND, WA 98034

Scale: Horizontal 1"=60' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved BHE
Date 7/8/21

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Sheet 4 of 5

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DEVELOPED BASIN - OFFSITE

FOR

FREEMAN ROAD LOGISTICS

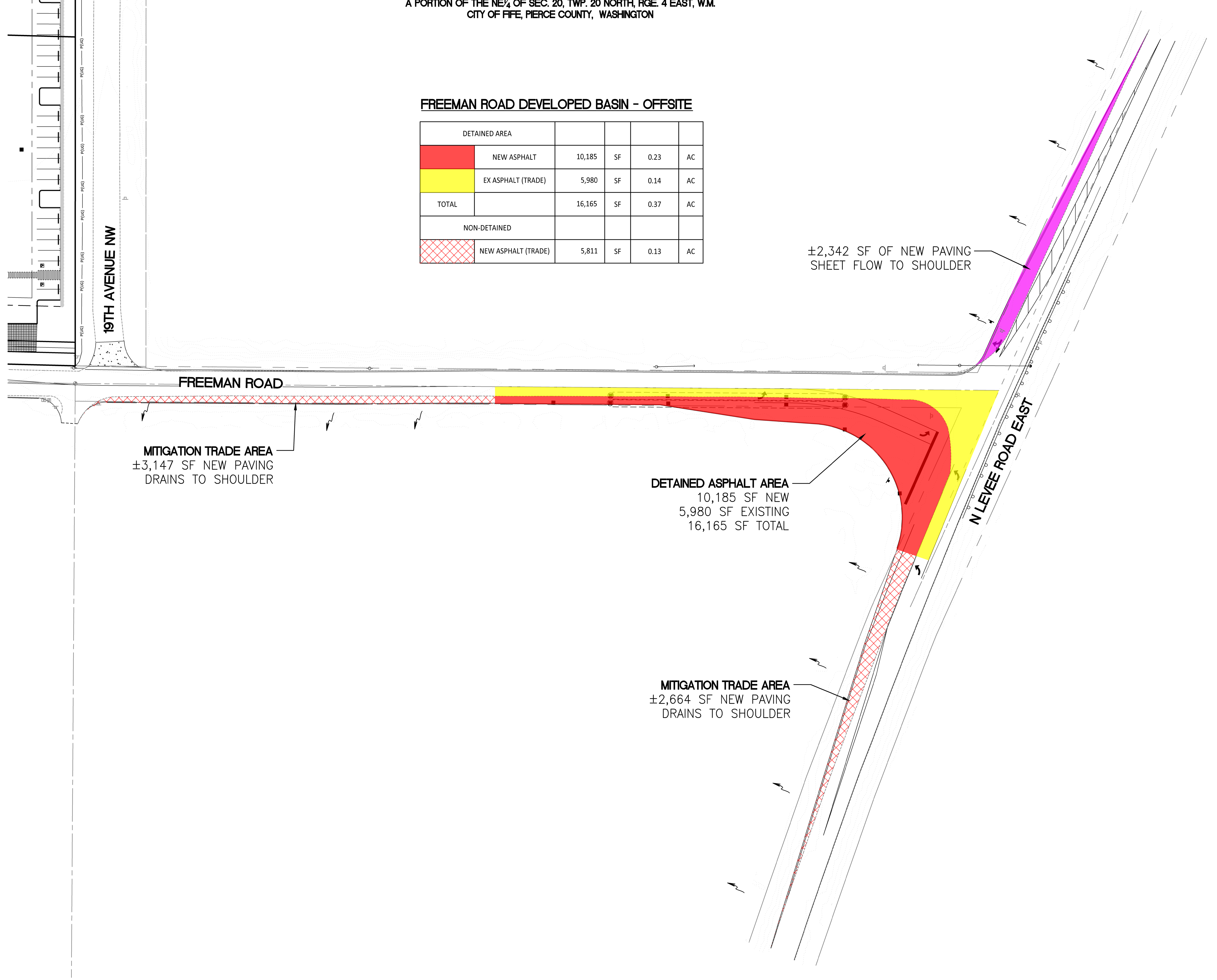
A PORTION OF THE SE¼ OF SEC. 17, TWP. 20 NORTH, RGE. 4 EAST AND
A PORTION OF THE NE¼ OF SEC. 20, TWP. 20 NORTH, RGE. 4 EAST, W.M.
CITY OF FIFE, PIERCE COUNTY, WASHINGTON

SCALE: 1"=40'

Know what's below. Call before you dig.

FREEMAN ROAD DEVELOPED BASIN - OFFSITE

DETAINED AREA					
	NEW ASPHALT	10,185	SF	0.23	AC
	EX ASPHALT (TRADE)	5,980	SF	0.14	AC
TOTAL		16,165	SF	0.37	AC
NON-DETAINED					
	NEW ASPHALT (TRADE)	5,811	SF	0.13	AC



No.	Date	By	Ckd.	Appr.	Revision

Title: DEVELOPED BASIN - OFFSITE
FREEMAN ROAD LOGISTICS

For: VECTOR DEVELOPMENT COMPANY
11335 NE 122ND WAY, SUITE 105
KIRKLAND, WA 98034

Scale: Horizontal 1"=40' Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved BHE
Date 7/8/21

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Job Number 21585

Sheet 5 of 5

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FLOW CONTROL AND WATER QUALITY CALCULATIONS

WWHM2012

PROJECT REPORT

FLOW CONTROL AND WATER
QUALITY CALCULATIONS
NORTHERN ONSITE BASIN
FREEMAN LOGISTICS
BCE JOB #21585

General Model Information

Project Name:	21585-CALC-DRNG-NORTH-DETN-2022-08-16
Site Name:	FREEMAN ROAD LOGISTICS
Site Address:	
City:	PUYALLUP
Report Date:	11/28/2023
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	10.78
Pervious Total	10.78
Impervious Land Use	acre
Impervious Total	0
Basin Total	10.78

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	1.36
Pervious Total	1.36
Impervious Land Use	acre
ROOF TOPS FLAT	5.39
SIDEWALKS FLAT	0.7
PARKING FLAT	3.33
Impervious Total	9.42
Basin Total	10.78

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Mitigated Routing

Vault 1

Width:	100 ft.	
Length:	337 ft.	
Depth:	7.5 ft.	
Discharge Structure		
Riser Height:	6.5 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	1.54 in.	Elevation:0 ft.
Orifice 2 Diameter:	2.31 in.	Elevation:4.43 ft.
Orifice 3 Diameter:	1.99 in.	Elevation:5.17 ft.
Element Flows To:		
Outlet 1	Outlet 2	

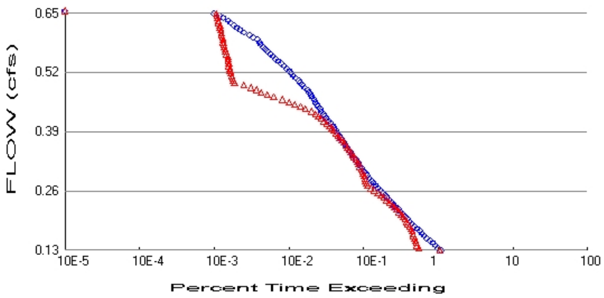
Vault Hydraulic Table

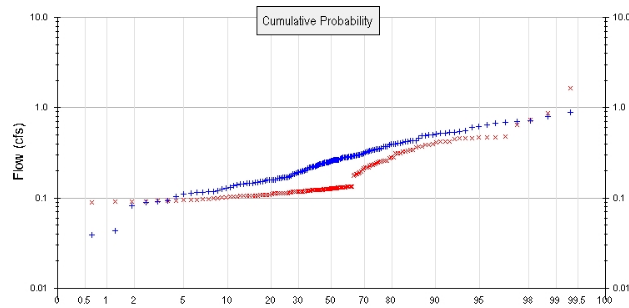
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.773	0.000	0.000	0.000
0.0833	0.773	0.064	0.018	0.000
0.1667	0.773	0.128	0.026	0.000
0.2500	0.773	0.193	0.032	0.000
0.3333	0.773	0.257	0.037	0.000
0.4167	0.773	0.322	0.041	0.000
0.5000	0.773	0.386	0.045	0.000
0.5833	0.773	0.451	0.049	0.000
0.6667	0.773	0.515	0.052	0.000
0.7500	0.773	0.580	0.055	0.000
0.8333	0.773	0.644	0.058	0.000
0.9167	0.773	0.709	0.061	0.000
1.0000	0.773	0.773	0.064	0.000
1.0833	0.773	0.838	0.067	0.000
1.1667	0.773	0.902	0.069	0.000
1.2500	0.773	0.967	0.072	0.000
1.3333	0.773	1.031	0.074	0.000
1.4167	0.773	1.096	0.076	0.000
1.5000	0.773	1.160	0.078	0.000
1.5833	0.773	1.224	0.081	0.000
1.6667	0.773	1.289	0.083	0.000
1.7500	0.773	1.353	0.085	0.000
1.8333	0.773	1.418	0.087	0.000
1.9167	0.773	1.482	0.089	0.000
2.0000	0.773	1.547	0.091	0.000
2.0833	0.773	1.611	0.092	0.000
2.1667	0.773	1.676	0.094	0.000
2.2500	0.773	1.740	0.096	0.000
2.3333	0.773	1.805	0.098	0.000
2.4167	0.773	1.869	0.100	0.000
2.5000	0.773	1.934	0.101	0.000
2.5833	0.773	1.998	0.103	0.000
2.6667	0.773	2.063	0.105	0.000
2.7500	0.773	2.127	0.106	0.000
2.8333	0.773	2.192	0.108	0.000
2.9167	0.773	2.256	0.109	0.000
3.0000	0.773	2.320	0.111	0.000
3.0833	0.773	2.385	0.113	0.000

3.1667	0.773	2.449	0.114	0.000
3.2500	0.773	2.514	0.116	0.000
3.3333	0.773	2.578	0.117	0.000
3.4167	0.773	2.643	0.119	0.000
3.5000	0.773	2.707	0.120	0.000
3.5833	0.773	2.772	0.121	0.000
3.6667	0.773	2.836	0.123	0.000
3.7500	0.773	2.901	0.124	0.000
3.8333	0.773	2.965	0.126	0.000
3.9167	0.773	3.030	0.127	0.000
4.0000	0.773	3.094	0.128	0.000
4.0833	0.773	3.159	0.130	0.000
4.1667	0.773	3.223	0.131	0.000
4.2500	0.773	3.288	0.132	0.000
4.3333	0.773	3.352	0.134	0.000
4.4167	0.773	3.416	0.135	0.000
4.5000	0.773	3.481	0.174	0.000
4.5833	0.773	3.545	0.194	0.000
4.6667	0.773	3.610	0.209	0.000
4.7500	0.773	3.674	0.222	0.000
4.8333	0.773	3.739	0.233	0.000
4.9167	0.773	3.803	0.243	0.000
5.0000	0.773	3.868	0.253	0.000
5.0833	0.773	3.932	0.262	0.000
5.1667	0.773	3.997	0.270	0.000
5.2500	0.773	4.061	0.309	0.000
5.3333	0.773	4.126	0.329	0.000
5.4167	0.773	4.190	0.347	0.000
5.5000	0.773	4.255	0.362	0.000
5.5833	0.773	4.319	0.376	0.000
5.6667	0.773	4.384	0.390	0.000
5.7500	0.773	4.448	0.402	0.000
5.8333	0.773	4.512	0.414	0.000
5.9167	0.773	4.577	0.426	0.000
6.0000	0.773	4.641	0.437	0.000
6.0833	0.773	4.706	0.447	0.000
6.1667	0.773	4.770	0.457	0.000
6.2500	0.773	4.835	0.467	0.000
6.3333	0.773	4.899	0.477	0.000
6.4167	0.773	4.964	0.487	0.000
6.5000	0.773	5.028	0.496	0.000
6.5833	0.773	5.093	0.887	0.000
6.6667	0.773	5.157	1.588	0.000
6.7500	0.773	5.222	2.461	0.000
6.8333	0.773	5.286	3.413	0.000
6.9167	0.773	5.351	4.352	0.000
7.0000	0.773	5.415	5.186	0.000
7.0833	0.773	5.480	5.849	0.000
7.1667	0.773	5.544	6.318	0.000
7.2500	0.773	5.608	6.643	0.000
7.3333	0.773	5.673	7.048	0.000
7.4167	0.773	5.737	7.371	0.000
7.5000	0.773	5.802	7.680	0.000
7.5833	0.773	5.866	7.977	0.000
7.6667	0.000	0.000	8.263	0.000

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 10.78
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.36
Total Impervious Area: 9.42

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.259602
5 year	0.398289
10 year	0.48347
25 year	0.581891
50 year	0.648562
100 year	0.709894

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.152343
5 year	0.255053
10 year	0.351318
25 year	0.514692
50 year	0.673902
100 year	0.872307

WATER QUALITY DESIGN FLOW RATE EQUAL TO 2-YEAR RELEASE DOWNSTREAM OF DETENTION

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.249	0.129
1903	0.159	0.101
1904	0.293	0.119
1905	0.139	0.218
1906	0.082	0.091
1907	0.405	0.125
1908	0.286	0.107
1909	0.278	0.127
1910	0.395	0.128
1911	0.257	0.122

1912	0.894	0.184
1913	0.400	0.310
1914	0.104	0.092
1915	0.178	0.231
1916	0.259	0.117
1917	0.091	0.112
1918	0.267	0.368
1919	0.225	0.119
1920	0.263	0.122
1921	0.288	0.214
1922	0.281	0.125
1923	0.230	0.246
1924	0.114	0.112
1925	0.151	0.109
1926	0.248	0.118
1927	0.205	0.124
1928	0.196	0.131
1929	0.392	0.229
1930	0.253	0.122
1931	0.247	0.128
1932	0.184	0.203
1933	0.217	0.130
1934	0.517	0.459
1935	0.243	0.335
1936	0.234	0.132
1937	0.351	0.119
1938	0.222	0.124
1939	0.024	0.093
1940	0.243	0.219
1941	0.158	0.094
1942	0.368	0.465
1943	0.174	0.128
1944	0.393	0.344
1945	0.293	0.126
1946	0.165	0.105
1947	0.131	0.112
1948	0.545	0.130
1949	0.485	0.374
1950	0.155	0.115
1951	0.199	0.110
1952	0.697	0.386
1953	0.645	0.476
1954	0.236	0.179
1955	0.206	0.103
1956	0.117	0.104
1957	0.342	0.256
1958	0.680	0.867
1959	0.423	0.469
1960	0.119	0.096
1961	0.430	0.473
1962	0.243	0.133
1963	0.114	0.093
1964	0.136	0.106
1965	0.486	0.420
1966	0.149	0.119
1967	0.218	0.106
1968	0.239	0.184
1969	0.221	0.125

1970	0.339	0.131
1971	0.507	0.418
1972	0.333	0.132
1973	0.435	0.312
1974	0.235	0.122
1975	0.528	0.644
1976	0.291	0.129
1977	0.146	0.092
1978	0.464	0.412
1979	0.143	0.114
1980	0.280	0.123
1981	0.267	0.134
1982	0.145	0.094
1983	0.428	0.251
1984	0.200	0.117
1985	0.320	0.119
1986	0.264	0.178
1987	0.496	0.389
1988	0.309	0.259
1989	0.284	0.116
1990	0.334	0.124
1991	0.264	0.131
1992	0.326	0.362
1993	0.346	0.123
1994	0.505	0.133
1995	0.124	0.121
1996	0.552	0.455
1997	0.248	0.108
1998	0.281	0.124
1999	0.039	0.107
2000	0.213	0.188
2001	0.111	0.089
2002	0.374	0.125
2003	0.325	0.132
2004	0.277	0.127
2005	0.535	0.134
2006	0.169	0.117
2007	0.186	0.126
2008	0.282	0.123
2009	0.192	0.118
2010	0.165	0.255
2011	0.151	0.112
2012	0.257	0.117
2013	0.165	0.095
2014	0.118	0.097
2015	0.228	0.112
2016	0.093	0.112
2017	0.373	0.342
2018	0.685	0.731
2019	0.723	0.449
2020	0.217	0.108
2021	0.354	0.284
2022	0.150	0.106
2023	0.298	0.134
2024	0.801	0.122
2025	0.265	0.129
2026	0.425	0.316
2027	0.168	0.113

2028	0.143	0.095
2029	0.283	0.283
2030	0.521	0.242
2031	0.168	0.101
2032	0.116	0.098
2033	0.158	0.103
2034	0.159	0.112
2035	0.609	1.651
2036	0.313	0.196
2037	0.090	0.106
2038	0.263	0.275
2039	0.043	0.085
2040	0.159	0.115
2041	0.188	0.107
2042	0.615	0.460
2043	0.297	0.328
2044	0.387	0.259
2045	0.256	0.235
2046	0.300	0.397
2047	0.224	0.190
2048	0.297	0.123
2049	0.267	0.128
2050	0.193	0.121
2051	0.308	0.130
2052	0.168	0.125
2053	0.287	0.423
2054	0.348	0.329
2055	0.144	0.100
2056	0.129	0.108
2057	0.198	0.132
2058	0.246	0.231
2059	0.411	0.217

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.8944	1.6515
2	0.8013	0.8668
3	0.7232	0.7311
4	0.6971	0.6437
5	0.6846	0.4763
6	0.6798	0.4726
7	0.6446	0.4685
8	0.6147	0.4647
9	0.6093	0.4602
10	0.5521	0.4588
11	0.5453	0.4553
12	0.5349	0.4487
13	0.5284	0.4234
14	0.5207	0.4198
15	0.5169	0.4176
16	0.5075	0.4116
17	0.5054	0.3971
18	0.4957	0.3893
19	0.4860	0.3859
20	0.4854	0.3738
21	0.4642	0.3679
22	0.4350	0.3617

23	0.4302	0.3443
24	0.4283	0.3418
25	0.4248	0.3350
26	0.4232	0.3295
27	0.4106	0.3277
28	0.4054	0.3160
29	0.4003	0.3115
30	0.3948	0.3102
31	0.3927	0.2842
32	0.3925	0.2826
33	0.3872	0.2745
34	0.3743	0.2594
35	0.3729	0.2587
36	0.3684	0.2563
37	0.3541	0.2546
38	0.3508	0.2509
39	0.3484	0.2462
40	0.3463	0.2417
41	0.3421	0.2353
42	0.3392	0.2311
43	0.3345	0.2309
44	0.3333	0.2290
45	0.3261	0.2186
46	0.3251	0.2175
47	0.3203	0.2170
48	0.3129	0.2136
49	0.3086	0.2026
50	0.3082	0.1962
51	0.3000	0.1903
52	0.2977	0.1884
53	0.2973	0.1842
54	0.2971	0.1838
55	0.2928	0.1786
56	0.2926	0.1779
57	0.2906	0.1339
58	0.2884	0.1337
59	0.2868	0.1335
60	0.2857	0.1330
61	0.2836	0.1326
62	0.2832	0.1325
63	0.2817	0.1319
64	0.2810	0.1318
65	0.2808	0.1317
66	0.2797	0.1314
67	0.2778	0.1306
68	0.2774	0.1305
69	0.2672	0.1302
70	0.2667	0.1299
71	0.2666	0.1296
72	0.2654	0.1290
73	0.2640	0.1287
74	0.2636	0.1286
75	0.2632	0.1281
76	0.2630	0.1280
77	0.2591	0.1280
78	0.2571	0.1279
79	0.2568	0.1270
80	0.2556	0.1265

81	0.2525	0.1259
82	0.2490	0.1257
83	0.2485	0.1255
84	0.2477	0.1255
85	0.2470	0.1253
86	0.2462	0.1251
87	0.2428	0.1246
88	0.2427	0.1241
89	0.2426	0.1240
90	0.2387	0.1238
91	0.2360	0.1237
92	0.2348	0.1234
93	0.2344	0.1234
94	0.2299	0.1232
95	0.2278	0.1231
96	0.2250	0.1225
97	0.2244	0.1224
98	0.2218	0.1221
99	0.2214	0.1219
100	0.2184	0.1219
101	0.2175	0.1211
102	0.2168	0.1207
103	0.2132	0.1194
104	0.2055	0.1191
105	0.2050	0.1191
106	0.2003	0.1187
107	0.1992	0.1186
108	0.1977	0.1177
109	0.1955	0.1175
110	0.1933	0.1174
111	0.1919	0.1173
112	0.1880	0.1172
113	0.1855	0.1168
114	0.1845	0.1164
115	0.1777	0.1154
116	0.1738	0.1145
117	0.1686	0.1137
118	0.1682	0.1129
119	0.1680	0.1125
120	0.1676	0.1121
121	0.1650	0.1121
122	0.1646	0.1120
123	0.1645	0.1117
124	0.1594	0.1117
125	0.1592	0.1117
126	0.1586	0.1102
127	0.1578	0.1091
128	0.1576	0.1084
129	0.1554	0.1084
130	0.1515	0.1079
131	0.1506	0.1070
132	0.1499	0.1068
133	0.1487	0.1065
134	0.1461	0.1063
135	0.1451	0.1060
136	0.1445	0.1058
137	0.1431	0.1057
138	0.1428	0.1049

139	0.1387	0.1040
140	0.1359	0.1032
141	0.1309	0.1028
142	0.1289	0.1009
143	0.1242	0.1005
144	0.1189	0.1002
145	0.1181	0.0985
146	0.1166	0.0973
147	0.1160	0.0962
148	0.1139	0.0954
149	0.1138	0.0945
150	0.1105	0.0944
151	0.1037	0.0939
152	0.0932	0.0930
153	0.0909	0.0928
154	0.0895	0.0920
155	0.0822	0.0915
156	0.0434	0.0906
157	0.0388	0.0895
158	0.0245	0.0853

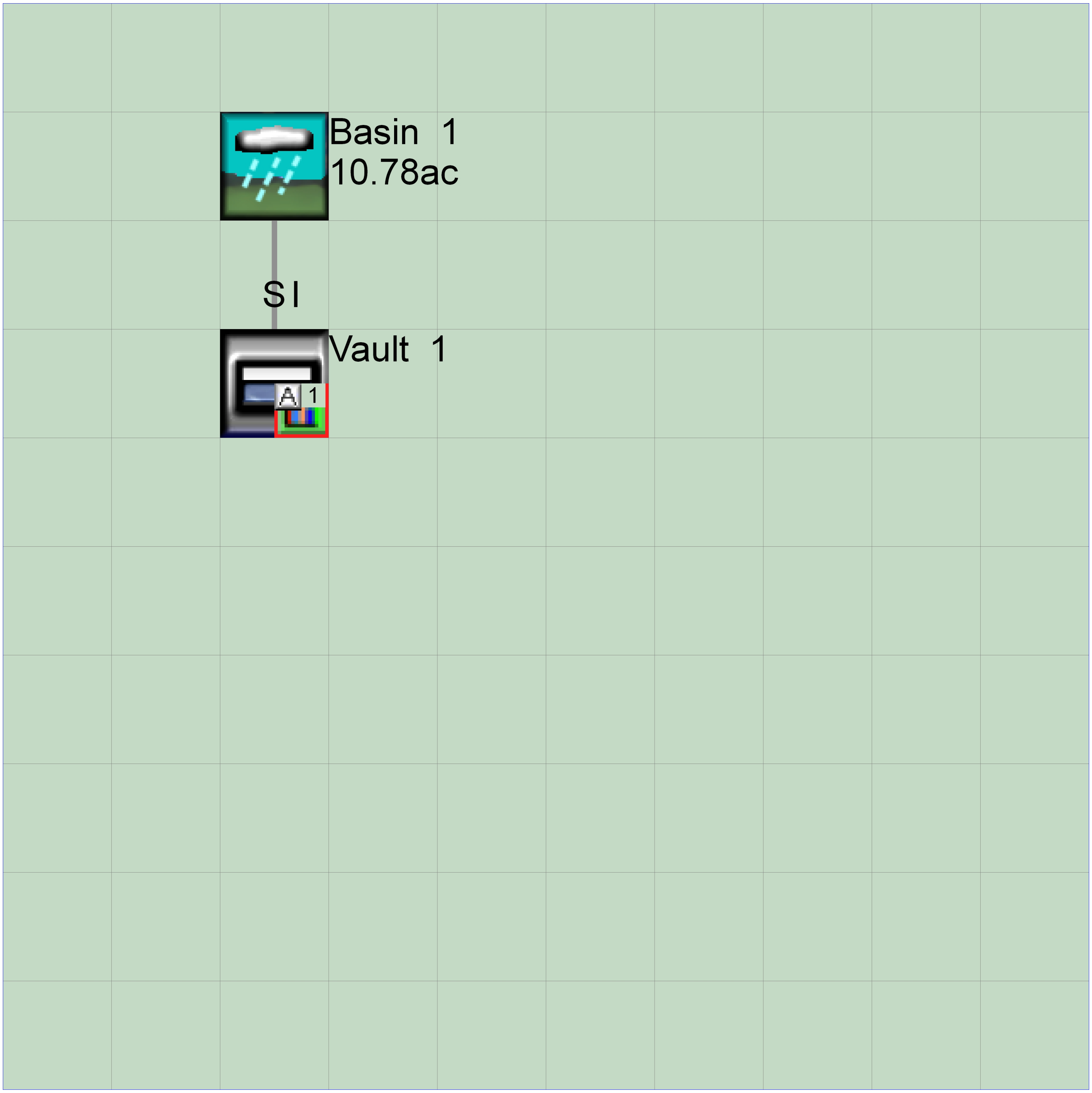
Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1298	60941	58337	95	Pass
0.1350	55063	30432	55	Pass
0.1403	50592	28686	56	Pass
0.1455	46531	27939	60	Pass
0.1508	42841	27296	63	Pass
0.1560	38958	26476	67	Pass
0.1612	36121	25839	71	Pass
0.1665	33517	25274	75	Pass
0.1717	31019	24692	79	Pass
0.1770	28742	24005	83	Pass
0.1822	26398	22748	86	Pass
0.1874	24626	21745	88	Pass
0.1927	22980	20869	90	Pass
0.1979	21490	19961	92	Pass
0.2032	19867	18681	94	Pass
0.2084	18631	17667	94	Pass
0.2136	17374	16609	95	Pass
0.2189	16183	15479	95	Pass
0.2241	14936	14277	95	Pass
0.2294	13972	13224	94	Pass
0.2346	13080	12310	94	Pass
0.2398	12255	11307	92	Pass
0.2451	11324	10266	90	Pass
0.2503	10626	9424	88	Pass
0.2556	9933	8532	85	Pass
0.2608	9280	7773	83	Pass
0.2660	8537	6897	80	Pass
0.2713	7994	6238	78	Pass
0.2765	7468	6050	81	Pass
0.2818	7019	5889	83	Pass
0.2870	6554	5717	87	Pass
0.2922	6221	5573	89	Pass
0.2975	5917	5459	92	Pass
0.3027	5623	5327	94	Pass
0.3080	5319	5169	97	Pass
0.3132	5022	4936	98	Pass
0.3184	4782	4751	99	Pass
0.3237	4553	4564	100	Pass
0.3289	4327	4346	100	Pass
0.3342	4078	4103	100	Pass
0.3394	3874	3913	101	Pass
0.3446	3678	3721	101	Pass
0.3499	3469	3533	101	Pass
0.3551	3286	3325	101	Pass
0.3604	3137	3171	101	Pass
0.3656	2992	3017	100	Pass
0.3708	2845	2838	99	Pass
0.3761	2684	2632	98	Pass
0.3813	2581	2495	96	Pass
0.3866	2461	2323	94	Pass
0.3918	2371	2198	92	Pass
0.3970	2239	2059	91	Pass
0.4023	2143	1933	90	Pass

0.4075	2004	1778	88	Pass
0.4128	1886	1638	86	Pass
0.4180	1757	1487	84	Pass
0.4232	1674	1360	81	Pass
0.4285	1590	1253	78	Pass
0.4337	1514	1117	73	Pass
0.4390	1440	922	64	Pass
0.4442	1356	794	58	Pass
0.4494	1301	656	50	Pass
0.4547	1240	553	44	Pass
0.4599	1194	453	37	Pass
0.4652	1120	346	30	Pass
0.4704	1077	284	26	Pass
0.4756	1029	233	22	Pass
0.4809	980	203	20	Pass
0.4861	896	171	19	Pass
0.4914	839	138	16	Pass
0.4966	786	103	13	Pass
0.5018	744	100	13	Pass
0.5071	678	97	14	Pass
0.5123	632	95	15	Pass
0.5176	590	92	15	Pass
0.5228	559	90	16	Pass
0.5280	510	89	17	Pass
0.5333	475	87	18	Pass
0.5385	436	87	19	Pass
0.5438	396	85	21	Pass
0.5490	367	85	23	Pass
0.5542	341	85	24	Pass
0.5595	310	81	26	Pass
0.5647	286	78	27	Pass
0.5700	267	77	28	Pass
0.5752	247	75	30	Pass
0.5804	234	74	31	Pass
0.5857	222	73	32	Pass
0.5909	208	72	34	Pass
0.5962	183	71	38	Pass
0.6014	163	69	42	Pass
0.6066	139	69	49	Pass
0.6119	122	67	54	Pass
0.6171	110	66	60	Pass
0.6224	102	66	64	Pass
0.6276	92	63	68	Pass
0.6328	85	63	74	Pass
0.6381	73	61	83	Pass
0.6433	64	60	93	Pass
0.6486	55	59	107	Pass

Appendix
Predeveloped Schematic

Mitigated Schematic



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WWHM2012

PROJECT REPORT

FLOW CONTROL AND WATER
QUALITY CALCULATIONS
SOUTHERN ONSITE BASIN
FREEMAN LOGISTICS
BCE JOB #21585

General Model Information

Project Name:	21585-CALC-DRNG-SOUTH-DETN-2022-08-16
Site Name:	FREEMAN ROAD LOGISTICS
Site Address:	
City:	PUYALLUP
Report Date:	11/28/2023
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	11.72
Pervious Total	11.72
Impervious Land Use	acre
Impervious Total	0
Basin Total	11.72

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	1.77
Pervious Total	1.77
Impervious Land Use	acre
ROOF TOPS FLAT	5.91
SIDEWALKS FLAT	0.92
PARKING FLAT	3.12
Impervious Total	9.95
Basin Total	11.72

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Mitigated Routing

Vault 1

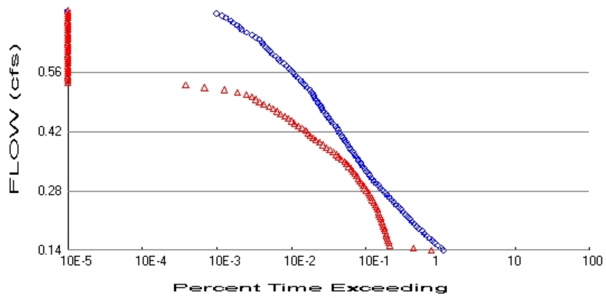
Width:	120 ft.	
Length:	370 ft.	
Depth:	7.5 ft.	
Discharge Structure		
Riser Height:	6.5 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	1.59 in.	Elevation:0 ft.
Orifice 2 Diameter:	3.11 in.	Elevation:4.87 ft.
Orifice 3 Diameter:	1.86 in.	Elevation:5.66 ft.
Element Flows To:		
Outlet 1	Outlet 2	

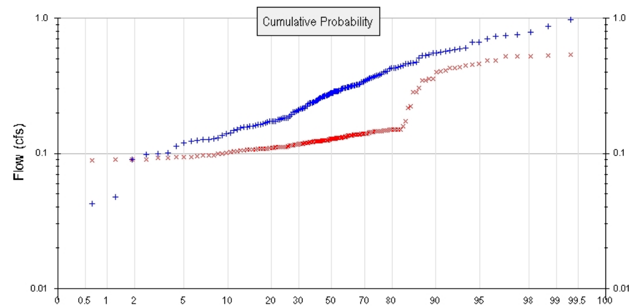
Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	1.019	0.000	0.000	0.000
0.0833	1.019	0.084	0.019	0.000
0.1667	1.019	0.169	0.028	0.000
0.2500	1.019	0.254	0.034	0.000
0.3333	1.019	0.339	0.039	0.000
0.4167	1.019	0.424	0.044	0.000
0.5000	1.019	0.509	0.048	0.000
0.5833	1.019	0.594	0.052	0.000
0.6667	1.019	0.679	0.056	0.000
0.7500	1.019	0.764	0.059	0.000
0.8333	1.019	0.849	0.062	0.000
0.9167	1.019	0.934	0.065	0.000
1.0000	1.019	1.019	0.068	0.000
1.0833	1.019	1.104	0.071	0.000
1.1667	1.019	1.189	0.074	0.000
1.2500	1.019	1.274	0.076	0.000
1.3333	1.019	1.359	0.079	0.000
1.4167	1.019	1.444	0.081	0.000
1.5000	1.019	1.528	0.084	0.000
1.5833	1.019	1.613	0.086	0.000
1.6667	1.019	1.698	0.088	0.000
1.7500	1.019	1.783	0.090	0.000
1.8333	1.019	1.868	0.092	0.000
1.9167	1.019	1.953	0.095	0.000
2.0000	1.019	2.038	0.097	0.000
2.0833	1.019	2.123	0.099	0.000
2.1667	1.019	2.208	0.101	0.000
2.2500	1.019	2.293	0.102	0.000
2.3333	1.019	2.378	0.104	0.000
2.4167	1.019	2.463	0.106	0.000
2.5000	1.019	2.548	0.108	0.000
2.5833	1.019	2.633	0.110	0.000
2.6667	1.019	2.718	0.112	0.000
2.7500	1.019	2.803	0.113	0.000
2.8333	1.019	2.888	0.115	0.000
2.9167	1.019	2.972	0.117	0.000
3.0000	1.019	3.057	0.118	0.000
3.0833	1.019	3.142	0.120	0.000

3.1667	1.019	3.227	0.122	0.000
3.2500	1.019	3.312	0.123	0.000
3.3333	1.019	3.397	0.125	0.000
3.4167	1.019	3.482	0.126	0.000
3.5000	1.019	3.567	0.128	0.000
3.5833	1.019	3.652	0.129	0.000
3.6667	1.019	3.737	0.131	0.000
3.7500	1.019	3.822	0.132	0.000
3.8333	1.019	3.907	0.134	0.000
3.9167	1.019	3.992	0.135	0.000
4.0000	1.019	4.077	0.137	0.000
4.0833	1.019	4.162	0.138	0.000
4.1667	1.019	4.247	0.140	0.000
4.2500	1.019	4.332	0.141	0.000
4.3333	1.019	4.416	0.142	0.000
4.4167	1.019	4.501	0.144	0.000
4.5000	1.019	4.586	0.145	0.000
4.5833	1.019	4.671	0.146	0.000
4.6667	1.019	4.756	0.148	0.000
4.7500	1.019	4.841	0.149	0.000
4.8333	1.019	4.926	0.150	0.000
4.9167	1.019	5.011	0.208	0.000
5.0000	1.019	5.096	0.248	0.000
5.0833	1.019	5.181	0.275	0.000
5.1667	1.019	5.266	0.298	0.000
5.2500	1.019	5.351	0.319	0.000
5.3333	1.019	5.436	0.337	0.000
5.4167	1.019	5.521	0.353	0.000
5.5000	1.019	5.606	0.369	0.000
5.5833	1.019	5.691	0.383	0.000
5.6667	1.019	5.775	0.405	0.000
5.7500	1.019	5.860	0.438	0.000
5.8333	1.019	5.945	0.462	0.000
5.9167	1.019	6.030	0.483	0.000
6.0000	1.019	6.115	0.501	0.000
6.0833	1.019	6.200	0.519	0.000
6.1667	1.019	6.285	0.536	0.000
6.2500	1.019	6.370	0.552	0.000
6.3333	1.019	6.455	0.567	0.000
6.4167	1.019	6.540	0.581	0.000
6.5000	1.019	6.625	0.596	0.000
6.5833	1.019	6.710	0.992	0.000
6.6667	1.019	6.795	1.697	0.000
6.7500	1.019	6.880	2.574	0.000
6.8333	1.019	6.965	3.531	0.000
6.9167	1.019	7.050	4.473	0.000
7.0000	1.019	7.135	5.312	0.000
7.0833	1.019	7.219	5.979	0.000
7.1667	1.019	7.304	6.451	0.000
7.2500	1.019	7.389	6.779	0.000
7.3333	1.019	7.474	7.188	0.000
7.4167	1.019	7.559	7.515	0.000
7.5000	1.019	7.644	7.827	0.000
7.5833	1.019	7.729	8.127	0.000
7.6667	0.000	0.000	8.416	0.000

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 11.72
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.77
Total Impervious Area: 9.95

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.282239
5 year	0.433019
10 year	0.525628
25 year	0.632631
50 year	0.705115
100 year	0.771796

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.135723
5 year	0.207983
10 year	0.272449
25 year	0.377196
50 year	0.475363
100 year	0.593864

WATER QUALITY DESIGN FLOW RATE EQUAL TO 2-YEAR RELEASE DOWNSTREAM OF DETENTION

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.271	0.128
1903	0.172	0.100
1904	0.318	0.120
1905	0.151	0.140
1906	0.089	0.089
1907	0.441	0.122
1908	0.311	0.109
1909	0.302	0.128
1910	0.429	0.124
1911	0.279	0.121

1912	0.972	0.139
1913	0.435	0.159
1914	0.113	0.092
1915	0.193	0.146
1916	0.282	0.119
1917	0.099	0.110
1918	0.290	0.356
1919	0.245	0.116
1920	0.286	0.121
1921	0.314	0.140
1922	0.305	0.125
1923	0.250	0.144
1924	0.124	0.112
1925	0.164	0.109
1926	0.269	0.120
1927	0.223	0.122
1928	0.213	0.133
1929	0.427	0.147
1930	0.275	0.123
1931	0.268	0.130
1932	0.201	0.139
1933	0.236	0.129
1934	0.562	0.522
1935	0.264	0.285
1936	0.255	0.136
1937	0.381	0.121
1938	0.241	0.124
1939	0.027	0.090
1940	0.264	0.140
1941	0.171	0.096
1942	0.400	0.455
1943	0.189	0.128
1944	0.427	0.149
1945	0.318	0.127
1946	0.179	0.106
1947	0.142	0.111
1948	0.593	0.127
1949	0.528	0.283
1950	0.169	0.114
1951	0.217	0.112
1952	0.758	0.216
1953	0.701	0.398
1954	0.257	0.135
1955	0.223	0.104
1956	0.127	0.104
1957	0.372	0.147
1958	0.739	0.524
1959	0.460	0.484
1960	0.129	0.096
1961	0.468	0.413
1962	0.264	0.135
1963	0.124	0.093
1964	0.148	0.107
1965	0.528	0.457
1966	0.162	0.116
1967	0.237	0.105
1968	0.260	0.138
1969	0.241	0.125

1970	0.369	0.130
1971	0.552	0.344
1972	0.362	0.133
1973	0.473	0.151
1974	0.255	0.122
1975	0.575	0.530
1976	0.316	0.130
1977	0.159	0.091
1978	0.505	0.426
1979	0.156	0.114
1980	0.304	0.124
1981	0.291	0.133
1982	0.158	0.094
1983	0.466	0.143
1984	0.218	0.115
1985	0.348	0.116
1986	0.287	0.137
1987	0.539	0.346
1988	0.336	0.173
1989	0.308	0.118
1990	0.364	0.124
1991	0.287	0.135
1992	0.355	0.358
1993	0.376	0.125
1994	0.550	0.132
1995	0.135	0.119
1996	0.600	0.444
1997	0.270	0.109
1998	0.305	0.123
1999	0.042	0.107
2000	0.232	0.139
2001	0.120	0.090
2002	0.407	0.125
2003	0.353	0.132
2004	0.302	0.129
2005	0.582	0.136
2006	0.183	0.119
2007	0.202	0.128
2008	0.306	0.124
2009	0.209	0.118
2010	0.179	0.145
2011	0.165	0.112
2012	0.280	0.119
2013	0.179	0.094
2014	0.128	0.096
2015	0.248	0.112
2016	0.101	0.110
2017	0.405	0.150
2018	0.744	0.538
2019	0.786	0.486
2020	0.236	0.109
2021	0.385	0.305
2022	0.163	0.107
2023	0.324	0.137
2024	0.871	0.123
2025	0.288	0.129
2026	0.462	0.149
2027	0.183	0.111

2028	0.155	0.094
2029	0.308	0.223
2030	0.566	0.145
2031	0.182	0.101
2032	0.126	0.097
2033	0.172	0.103
2034	0.173	0.111
2035	0.662	0.521
2036	0.340	0.138
2037	0.097	0.106
2038	0.286	0.147
2039	0.047	0.082
2040	0.173	0.115
2041	0.204	0.108
2042	0.668	0.405
2043	0.323	0.150
2044	0.421	0.150
2045	0.278	0.143
2046	0.326	0.430
2047	0.244	0.140
2048	0.323	0.123
2049	0.290	0.130
2050	0.210	0.121
2051	0.335	0.128
2052	0.183	0.127
2053	0.312	0.436
2054	0.379	0.150
2055	0.157	0.100
2056	0.140	0.108
2057	0.215	0.134
2058	0.268	0.146
2059	0.446	0.148

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.9723	0.5375
2	0.8712	0.5297
3	0.7862	0.5242
4	0.7579	0.5223
5	0.7443	0.5207
6	0.7391	0.4864
7	0.7008	0.4835
8	0.6683	0.4574
9	0.6625	0.4551
10	0.6002	0.4443
11	0.5928	0.4364
12	0.5816	0.4299
13	0.5745	0.4258
14	0.5661	0.4132
15	0.5620	0.4048
16	0.5517	0.3983
17	0.5495	0.3577
18	0.5389	0.3558
19	0.5284	0.3458
20	0.5278	0.3438
21	0.5047	0.3046
22	0.4730	0.2852

23	0.4677	0.2832
24	0.4657	0.2226
25	0.4619	0.2157
26	0.4601	0.1725
27	0.4464	0.1594
28	0.4408	0.1506
29	0.4352	0.1504
30	0.4292	0.1500
31	0.4269	0.1499
32	0.4267	0.1496
33	0.4210	0.1492
34	0.4070	0.1487
35	0.4054	0.1484
36	0.4005	0.1473
37	0.3850	0.1467
38	0.3814	0.1466
39	0.3788	0.1464
40	0.3765	0.1456
41	0.3720	0.1448
42	0.3687	0.1446
43	0.3637	0.1438
44	0.3624	0.1433
45	0.3546	0.1426
46	0.3534	0.1405
47	0.3483	0.1405
48	0.3401	0.1403
49	0.3355	0.1399
50	0.3351	0.1394
51	0.3262	0.1386
52	0.3237	0.1386
53	0.3232	0.1382
54	0.3230	0.1381
55	0.3184	0.1368
56	0.3181	0.1368
57	0.3160	0.1364
58	0.3135	0.1357
59	0.3118	0.1353
60	0.3106	0.1352
61	0.3083	0.1352
62	0.3079	0.1339
63	0.3063	0.1334
64	0.3055	0.1328
65	0.3053	0.1327
66	0.3041	0.1322
67	0.3021	0.1318
68	0.3015	0.1303
69	0.2906	0.1299
70	0.2900	0.1297
71	0.2898	0.1296
72	0.2885	0.1295
73	0.2870	0.1294
74	0.2866	0.1290
75	0.2862	0.1284
76	0.2860	0.1283
77	0.2817	0.1283
78	0.2795	0.1282
79	0.2792	0.1276
80	0.2779	0.1274

81	0.2745	0.1271
82	0.2708	0.1268
83	0.2701	0.1249
84	0.2693	0.1248
85	0.2685	0.1247
86	0.2677	0.1247
87	0.2640	0.1244
88	0.2639	0.1240
89	0.2638	0.1240
90	0.2596	0.1239
91	0.2566	0.1236
92	0.2553	0.1232
93	0.2549	0.1230
94	0.2500	0.1230
95	0.2477	0.1229
96	0.2446	0.1224
97	0.2440	0.1223
98	0.2411	0.1222
99	0.2407	0.1214
100	0.2375	0.1212
101	0.2364	0.1210
102	0.2357	0.1208
103	0.2318	0.1198
104	0.2234	0.1195
105	0.2229	0.1195
106	0.2178	0.1188
107	0.2166	0.1187
108	0.2150	0.1187
109	0.2126	0.1179
110	0.2102	0.1175
111	0.2087	0.1162
112	0.2044	0.1160
113	0.2017	0.1159
114	0.2006	0.1148
115	0.1932	0.1148
116	0.1889	0.1141
117	0.1832	0.1137
118	0.1829	0.1120
119	0.1826	0.1119
120	0.1822	0.1118
121	0.1794	0.1117
122	0.1790	0.1113
123	0.1789	0.1113
124	0.1733	0.1112
125	0.1731	0.1105
126	0.1725	0.1102
127	0.1716	0.1091
128	0.1713	0.1089
129	0.1690	0.1086
130	0.1647	0.1086
131	0.1637	0.1082
132	0.1630	0.1082
133	0.1616	0.1070
134	0.1588	0.1067
135	0.1578	0.1065
136	0.1571	0.1061
137	0.1555	0.1058
138	0.1552	0.1054

139	0.1508	0.1044
140	0.1478	0.1038
141	0.1423	0.1029
142	0.1402	0.1015
143	0.1350	0.0999
144	0.1293	0.0999
145	0.1284	0.0968
146	0.1267	0.0962
147	0.1261	0.0960
148	0.1239	0.0956
149	0.1237	0.0940
150	0.1201	0.0939
151	0.1128	0.0937
152	0.1013	0.0925
153	0.0988	0.0922
154	0.0973	0.0906
155	0.0893	0.0897
156	0.0472	0.0896
157	0.0422	0.0886
158	0.0266	0.0825

Duration Flows

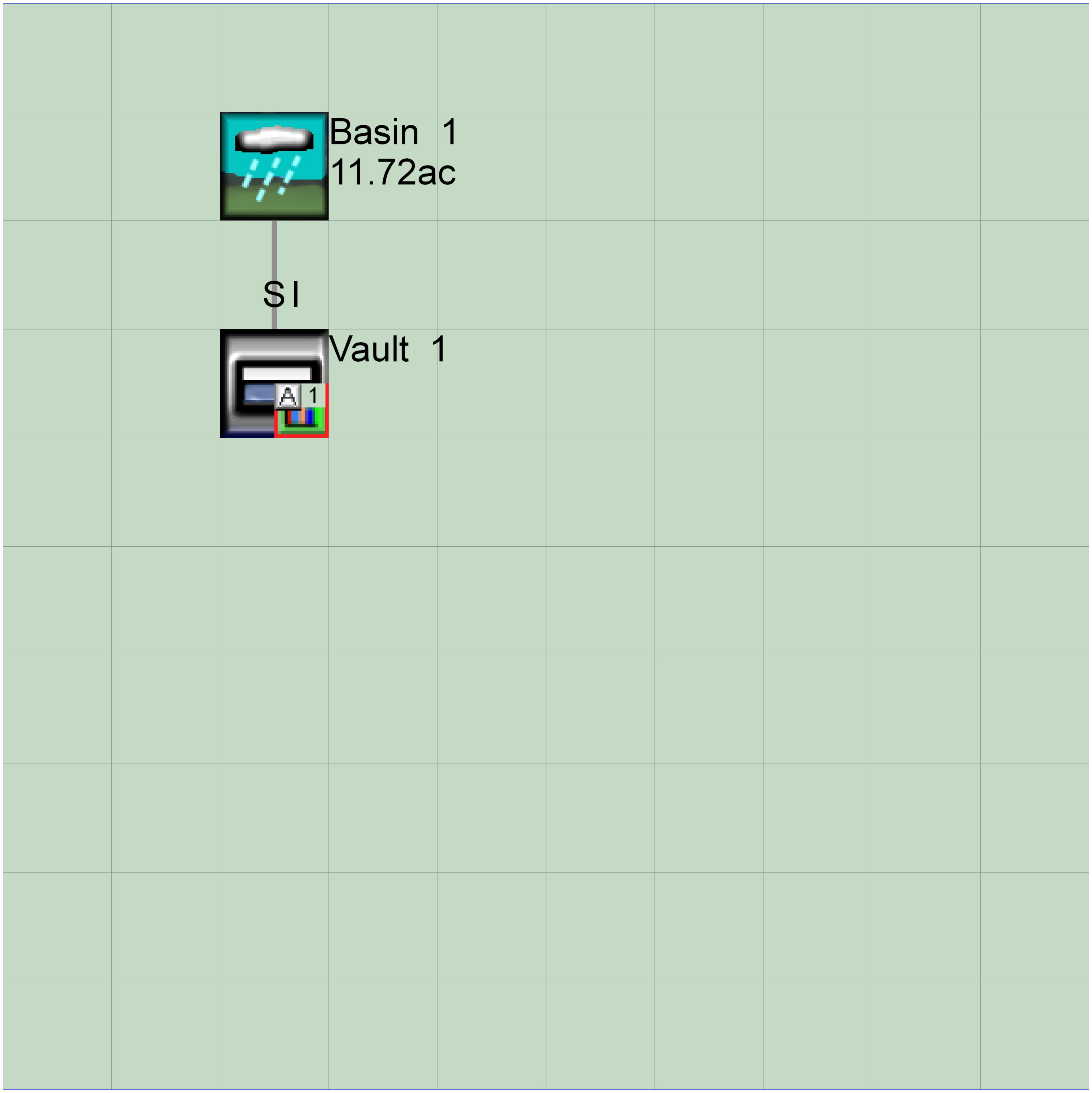
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1411	60220	41357	68	Pass
0.1468	55733	23955	42	Pass
0.1525	50730	11512	22	Pass
0.1582	46309	11219	24	Pass
0.1639	42902	10986	25	Pass
0.1696	39290	10687	27	Pass
0.1753	36138	10460	28	Pass
0.1810	33745	10266	30	Pass
0.1867	30986	10016	32	Pass
0.1924	28476	9762	34	Pass
0.1981	26349	9523	36	Pass
0.2038	24720	9329	37	Pass
0.2095	22903	9097	39	Pass
0.2152	21274	8803	41	Pass
0.2209	20044	8565	42	Pass
0.2266	18664	8316	44	Pass
0.2323	17263	8083	46	Pass
0.2380	16183	7900	48	Pass
0.2437	15030	7673	51	Pass
0.2494	13967	7413	53	Pass
0.2551	12980	7058	54	Pass
0.2608	12238	6775	55	Pass
0.2665	11368	6476	56	Pass
0.2721	10598	6205	58	Pass
0.2778	9955	5983	60	Pass
0.2835	9230	5662	61	Pass
0.2892	8559	5321	62	Pass
0.2949	8055	5106	63	Pass
0.3006	7474	4829	64	Pass
0.3063	6980	4577	65	Pass
0.3120	6554	4351	66	Pass
0.3177	6244	4164	66	Pass
0.3234	5911	3934	66	Pass
0.3291	5584	3703	66	Pass
0.3348	5307	3531	66	Pass
0.3405	5035	3280	65	Pass
0.3462	4777	3045	63	Pass
0.3519	4565	2869	62	Pass
0.3576	4312	2606	60	Pass
0.3633	4083	2373	58	Pass
0.3690	3895	2226	57	Pass
0.3747	3678	2015	54	Pass
0.3804	3453	1819	52	Pass
0.3861	3284	1612	49	Pass
0.3918	3148	1461	46	Pass
0.3975	2987	1321	44	Pass
0.4032	2830	1174	41	Pass
0.4089	2713	1068	39	Pass
0.4146	2587	988	38	Pass
0.4203	2455	919	37	Pass
0.4260	2371	861	36	Pass
0.4317	2246	767	34	Pass
0.4374	2143	685	31	Pass

0.4431	1991	608	30	Pass
0.4488	1883	560	29	Pass
0.4545	1761	501	28	Pass
0.4601	1673	450	26	Pass
0.4658	1596	392	24	Pass
0.4715	1511	355	23	Pass
0.4772	1430	315	22	Pass
0.4829	1375	278	20	Pass
0.4886	1302	234	17	Pass
0.4943	1237	205	16	Pass
0.5000	1181	184	15	Pass
0.5057	1123	164	14	Pass
0.5114	1077	137	12	Pass
0.5171	1026	104	10	Pass
0.5228	978	70	7	Pass
0.5285	899	38	4	Pass
0.5342	838	21	2	Pass
0.5399	787	0	0	Pass
0.5456	742	0	0	Pass
0.5513	680	0	0	Pass
0.5570	638	0	0	Pass
0.5627	591	0	0	Pass
0.5684	557	0	0	Pass
0.5741	510	0	0	Pass
0.5798	478	0	0	Pass
0.5855	435	0	0	Pass
0.5912	391	0	0	Pass
0.5969	369	0	0	Pass
0.6026	341	0	0	Pass
0.6083	309	0	0	Pass
0.6140	287	0	0	Pass
0.6197	266	0	0	Pass
0.6254	249	0	0	Pass
0.6311	233	0	0	Pass
0.6368	222	0	0	Pass
0.6424	206	0	0	Pass
0.6481	183	0	0	Pass
0.6538	163	0	0	Pass
0.6595	139	0	0	Pass
0.6652	118	0	0	Pass
0.6709	112	0	0	Pass
0.6766	103	0	0	Pass
0.6823	92	0	0	Pass
0.6880	85	0	0	Pass
0.6937	73	0	0	Pass
0.6994	65	0	0	Pass
0.7051	54	0	0	Pass

Appendix
Predeveloped Schematic

Mitigated Schematic



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WWHM2012

PROJECT REPORT

FLOW CONTROL AND WQ CALCULATIONS
OFFSITE BASIN
FREEMAN LOGISTICS

General Model Information

Project Name:	21585-F-CALC-DRNG-OFFSITE-DETN-N-VLT-2023-11-21
Site Name:	FREEMAN ROAD LOGISTICS
Site Address:	
City:	PUYALLUP
Report Date:	11/22/2023
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	1.57
Pervious Total	1.57
Impervious Land Use	acre
ROADS FLAT	1.06
Impervious Total	1.06
Basin Total	2.63

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No	
GroundWater:	No	
Pervious Land Use	acre	
C, Lawn, Flat	0.23	
Pervious Total	0.23	
Impervious Land Use	acre	
ROADS FLAT	2.08	
SIDEWALKS FLAT	0.32	
Impervious Total	2.4	
Basin Total	2.63	

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Mitigated Routing

Vault 1

Width:	40 ft.	
Length:	50 ft.	
Depth:	7.5 ft.	
Discharge Structure		
Riser Height:	6.5 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	1.92 in.	Elevation:0 ft.
Orifice 2 Diameter:	2.33 in.	Elevation:4.59 ft.
Orifice 3 Diameter:	1.5 in.	Elevation:6.12 ft.
Element Flows To:		
Outlet 1	Outlet 2	

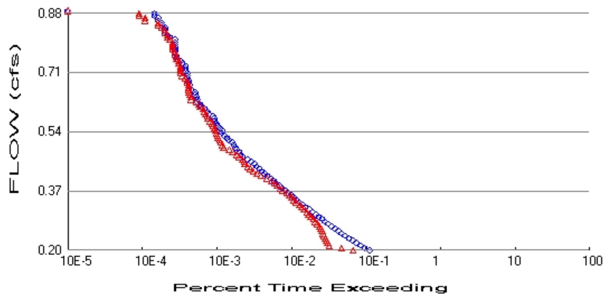
Vault Hydraulic Table

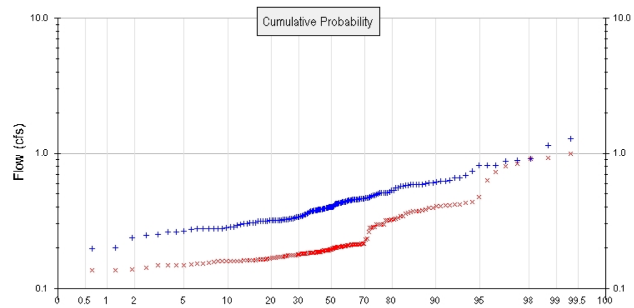
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.045	0.000	0.000	0.000
0.0833	0.045	0.003	0.028	0.000
0.1667	0.045	0.007	0.040	0.000
0.2500	0.045	0.011	0.050	0.000
0.3333	0.045	0.015	0.057	0.000
0.4167	0.045	0.019	0.064	0.000
0.5000	0.045	0.023	0.070	0.000
0.5833	0.045	0.026	0.076	0.000
0.6667	0.045	0.030	0.081	0.000
0.7500	0.045	0.034	0.086	0.000
0.8333	0.045	0.038	0.091	0.000
0.9167	0.045	0.042	0.095	0.000
1.0000	0.045	0.045	0.100	0.000
1.0833	0.045	0.049	0.104	0.000
1.1667	0.045	0.053	0.108	0.000
1.2500	0.045	0.057	0.111	0.000
1.3333	0.045	0.061	0.115	0.000
1.4167	0.045	0.065	0.119	0.000
1.5000	0.045	0.068	0.122	0.000
1.5833	0.045	0.072	0.125	0.000
1.6667	0.045	0.076	0.129	0.000
1.7500	0.045	0.080	0.132	0.000
1.8333	0.045	0.084	0.135	0.000
1.9167	0.045	0.088	0.138	0.000
2.0000	0.045	0.091	0.141	0.000
2.0833	0.045	0.095	0.144	0.000
2.1667	0.045	0.099	0.147	0.000
2.2500	0.045	0.103	0.150	0.000
2.3333	0.045	0.107	0.152	0.000
2.4167	0.045	0.111	0.155	0.000
2.5000	0.045	0.114	0.158	0.000
2.5833	0.045	0.118	0.160	0.000
2.6667	0.045	0.122	0.163	0.000
2.7500	0.045	0.126	0.165	0.000
2.8333	0.045	0.130	0.168	0.000
2.9167	0.045	0.133	0.170	0.000
3.0000	0.045	0.137	0.173	0.000
3.0833	0.045	0.141	0.175	0.000

3.1667	0.045	0.145	0.178	0.000
3.2500	0.045	0.149	0.180	0.000
3.3333	0.045	0.153	0.182	0.000
3.4167	0.045	0.156	0.184	0.000
3.5000	0.045	0.160	0.187	0.000
3.5833	0.045	0.164	0.189	0.000
3.6667	0.045	0.168	0.191	0.000
3.7500	0.045	0.172	0.193	0.000
3.8333	0.045	0.176	0.195	0.000
3.9167	0.045	0.179	0.198	0.000
4.0000	0.045	0.183	0.200	0.000
4.0833	0.045	0.187	0.202	0.000
4.1667	0.045	0.191	0.204	0.000
4.2500	0.045	0.195	0.206	0.000
4.3333	0.045	0.199	0.208	0.000
4.4167	0.045	0.202	0.210	0.000
4.5000	0.045	0.206	0.212	0.000
4.5833	0.045	0.210	0.214	0.000
4.6667	0.045	0.214	0.256	0.000
4.7500	0.045	0.218	0.277	0.000
4.8333	0.045	0.221	0.292	0.000
4.9167	0.045	0.225	0.306	0.000
5.0000	0.045	0.229	0.318	0.000
5.0833	0.045	0.233	0.329	0.000
5.1667	0.045	0.237	0.339	0.000
5.2500	0.045	0.241	0.348	0.000
5.3333	0.045	0.244	0.358	0.000
5.4167	0.045	0.248	0.366	0.000
5.5000	0.045	0.252	0.375	0.000
5.5833	0.045	0.256	0.383	0.000
5.6667	0.045	0.260	0.391	0.000
5.7500	0.045	0.264	0.398	0.000
5.8333	0.045	0.267	0.405	0.000
5.9167	0.045	0.271	0.413	0.000
6.0000	0.045	0.275	0.420	0.000
6.0833	0.045	0.279	0.426	0.000
6.1667	0.045	0.283	0.446	0.000
6.2500	0.045	0.287	0.461	0.000
6.3333	0.045	0.290	0.474	0.000
6.4167	0.045	0.294	0.485	0.000
6.5000	0.045	0.298	0.496	0.000
6.5833	0.045	0.302	0.888	0.000
6.6667	0.045	0.306	1.590	0.000
6.7500	0.045	0.309	2.463	0.000
6.8333	0.045	0.313	3.416	0.000
6.9167	0.045	0.317	4.354	0.000
7.0000	0.045	0.321	5.189	0.000
7.0833	0.045	0.325	5.852	0.000
7.1667	0.045	0.329	6.321	0.000
7.2500	0.045	0.332	6.646	0.000
7.3333	0.045	0.336	7.051	0.000
7.4167	0.045	0.340	7.374	0.000
7.5000	0.045	0.344	7.683	0.000
7.5833	0.045	0.348	7.980	0.000
7.6667	0.000	0.000	8.265	0.000

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.57
Total Impervious Area: 1.06

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.23
Total Impervious Area: 2.4

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.402587
5 year	0.53855
10 year	0.637107
25 year	0.771708
50 year	0.879531
100 year	0.994031

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.212951
5 year	0.311938
10 year	0.395446
25 year	0.524737
50 year	0.64069
100 year	0.775653

WQ DESIGN FLOW RATE
EQUAL TO 2-YEAR RELEASE
DOWNSTREAM OF DETENTION

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.460	0.185
1903	0.508	0.173
1904	0.618	0.207
1905	0.261	0.199
1906	0.285	0.159
1907	0.434	0.373
1908	0.335	0.192
1909	0.393	0.207
1910	0.409	0.324
1911	0.428	0.181

1912	0.811	0.364
1913	0.306	0.193
1914	1.290	0.205
1915	0.278	0.154
1916	0.488	0.202
1917	0.198	0.171
1918	0.390	0.208
1919	0.261	0.152
1920	0.340	0.188
1921	0.313	0.184
1922	0.457	0.212
1923	0.323	0.210
1924	0.556	0.175
1925	0.246	0.164
1926	0.453	0.182
1927	0.387	0.179
1928	0.303	0.166
1929	0.555	0.334
1930	0.575	0.177
1931	0.295	0.199
1932	0.321	0.192
1933	0.325	0.179
1934	0.533	0.359
1935	0.267	0.177
1936	0.371	0.177
1937	0.486	0.368
1938	0.275	0.183
1939	0.319	0.163
1940	0.585	0.211
1941	0.589	0.158
1942	0.462	0.296
1943	0.430	0.191
1944	0.619	0.730
1945	0.467	0.211
1946	0.384	0.168
1947	0.284	0.197
1948	0.391	0.416
1949	0.601	0.476
1950	0.350	0.162
1951	0.519	0.149
1952	0.655	0.927
1953	0.607	0.911
1954	0.337	0.189
1955	0.303	0.169
1956	0.274	0.132
1957	0.321	0.192
1958	0.450	0.437
1959	0.446	0.203
1960	0.314	0.163
1961	0.879	0.374
1962	0.379	0.214
1963	0.278	0.163
1964	0.817	0.185
1965	0.398	0.393
1966	0.317	0.172
1967	0.454	0.159
1968	0.362	0.234
1969	0.344	0.184

1970	0.401	0.212
1971	0.403	0.406
1972	1.150	0.298
1973	0.691	0.341
1974	0.511	0.196
1975	0.582	0.419
1976	0.580	0.284
1977	0.237	0.159
1978	0.454	0.374
1979	0.424	0.160
1980	0.434	0.164
1981	0.401	0.185
1982	0.318	0.152
1983	0.453	0.324
1984	0.440	0.195
1985	0.509	0.205
1986	0.278	0.176
1987	0.443	0.384
1988	0.276	0.204
1989	0.278	0.186
1990	0.346	0.205
1991	0.450	0.213
1992	0.451	0.213
1993	0.505	0.212
1994	0.384	0.393
1995	0.281	0.137
1996	0.395	0.296
1997	0.337	0.184
1998	0.421	0.283
1999	0.427	0.160
2000	0.381	0.183
2001	0.308	0.167
2002	0.590	0.194
2003	0.328	0.209
2004	0.467	0.203
2005	0.910	0.186
2006	0.420	0.149
2007	0.470	0.329
2008	0.394	0.182
2009	0.294	0.180
2010	0.378	0.299
2011	0.373	0.139
2012	0.382	0.427
2013	0.353	0.182
2014	0.344	0.151
2015	0.600	0.213
2016	0.329	0.142
2017	0.567	0.804
2018	0.429	0.413
2019	0.609	0.993
2020	0.439	0.173
2021	0.383	0.281
2022	0.586	0.160
2023	0.733	0.191
2024	0.880	0.321
2025	0.382	0.183
2026	0.494	0.299
2027	0.463	0.186

2028	0.184	0.148
2029	0.326	0.195
2030	0.634	0.411
2031	0.200	0.162
2032	0.319	0.136
2033	0.399	0.149
2034	0.313	0.213
2035	0.458	0.630
2036	0.316	0.208
2037	0.422	0.160
2038	0.438	0.341
2039	0.815	0.162
2040	0.330	0.201
2041	0.400	0.187
2042	0.461	0.836
2043	0.510	0.260
2044	0.356	0.283
2045	0.305	0.181
2046	0.323	0.199
2047	0.387	0.172
2048	0.318	0.321
2049	0.473	0.229
2050	0.370	0.192
2051	0.533	0.408
2052	0.378	0.209
2053	0.318	0.202
2054	0.660	0.379
2055	0.373	0.161
2056	0.509	0.169
2057	0.251	0.177
2058	0.481	0.172
2059	0.587	0.321

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.2901	0.9926
2	1.1501	0.9272
3	0.9103	0.9107
4	0.8802	0.8361
5	0.8795	0.8036
6	0.8175	0.7300
7	0.8145	0.6301
8	0.8107	0.4759
9	0.7332	0.4372
10	0.6910	0.4272
11	0.6596	0.4188
12	0.6551	0.4158
13	0.6339	0.4127
14	0.6193	0.4113
15	0.6179	0.4079
16	0.6094	0.4061
17	0.6068	0.3931
18	0.6005	0.3929
19	0.5996	0.3842
20	0.5900	0.3786
21	0.5892	0.3744
22	0.5872	0.3740

23	0.5863	0.3732
24	0.5848	0.3682
25	0.5817	0.3644
26	0.5795	0.3594
27	0.5745	0.3415
28	0.5674	0.3406
29	0.5561	0.3339
30	0.5545	0.3294
31	0.5334	0.3242
32	0.5330	0.3241
33	0.5186	0.3211
34	0.5113	0.3211
35	0.5105	0.3210
36	0.5093	0.2989
37	0.5090	0.2988
38	0.5077	0.2983
39	0.5048	0.2962
40	0.4940	0.2959
41	0.4878	0.2845
42	0.4863	0.2833
43	0.4811	0.2826
44	0.4728	0.2807
45	0.4705	0.2603
46	0.4669	0.2338
47	0.4669	0.2291
48	0.4632	0.2141
49	0.4616	0.2134
50	0.4605	0.2132
51	0.4600	0.2131
52	0.4576	0.2128
53	0.4573	0.2123
54	0.4536	0.2120
55	0.4536	0.2117
56	0.4534	0.2110
57	0.4532	0.2107
58	0.4507	0.2104
59	0.4503	0.2089
60	0.4500	0.2088
61	0.4460	0.2082
62	0.4432	0.2077
63	0.4401	0.2070
64	0.4388	0.2070
65	0.4381	0.2054
66	0.4341	0.2052
67	0.4340	0.2046
68	0.4303	0.2042
69	0.4290	0.2028
70	0.4281	0.2027
71	0.4265	0.2022
72	0.4239	0.2020
73	0.4216	0.2007
74	0.4214	0.1992
75	0.4195	0.1992
76	0.4090	0.1992
77	0.4026	0.1973
78	0.4007	0.1961
79	0.4006	0.1950
80	0.4001	0.1947

81	0.3994	0.1938
82	0.3983	0.1928
83	0.3950	0.1921
84	0.3942	0.1920
85	0.3926	0.1919
86	0.3915	0.1915
87	0.3901	0.1914
88	0.3872	0.1914
89	0.3871	0.1886
90	0.3837	0.1882
91	0.3836	0.1865
92	0.3826	0.1864
93	0.3825	0.1857
94	0.3822	0.1856
95	0.3806	0.1853
96	0.3788	0.1850
97	0.3785	0.1846
98	0.3783	0.1844
99	0.3728	0.1844
100	0.3726	0.1843
101	0.3713	0.1835
102	0.3697	0.1832
103	0.3625	0.1827
104	0.3556	0.1821
105	0.3532	0.1818
106	0.3502	0.1817
107	0.3463	0.1815
108	0.3436	0.1811
109	0.3436	0.1800
110	0.3403	0.1790
111	0.3370	0.1787
112	0.3366	0.1772
113	0.3349	0.1770
114	0.3305	0.1768
115	0.3289	0.1765
116	0.3282	0.1764
117	0.3257	0.1753
118	0.3248	0.1729
119	0.3234	0.1726
120	0.3233	0.1722
121	0.3208	0.1719
122	0.3205	0.1715
123	0.3189	0.1711
124	0.3187	0.1692
125	0.3184	0.1688
126	0.3179	0.1679
127	0.3178	0.1670
128	0.3167	0.1656
129	0.3161	0.1643
130	0.3145	0.1641
131	0.3132	0.1634
132	0.3129	0.1631
133	0.3075	0.1628
134	0.3057	0.1623
135	0.3053	0.1619
136	0.3034	0.1616
137	0.3031	0.1614
138	0.2955	0.1601

139	0.2935	0.1598
140	0.2850	0.1596
141	0.2843	0.1596
142	0.2813	0.1593
143	0.2781	0.1591
144	0.2779	0.1590
145	0.2776	0.1581
146	0.2775	0.1540
147	0.2763	0.1524
148	0.2755	0.1519
149	0.2740	0.1514
150	0.2669	0.1490
151	0.2605	0.1488
152	0.2605	0.1487
153	0.2507	0.1481
154	0.2460	0.1424
155	0.2365	0.1388
156	0.2003	0.1367
157	0.1982	0.1361
158	0.1844	0.1317

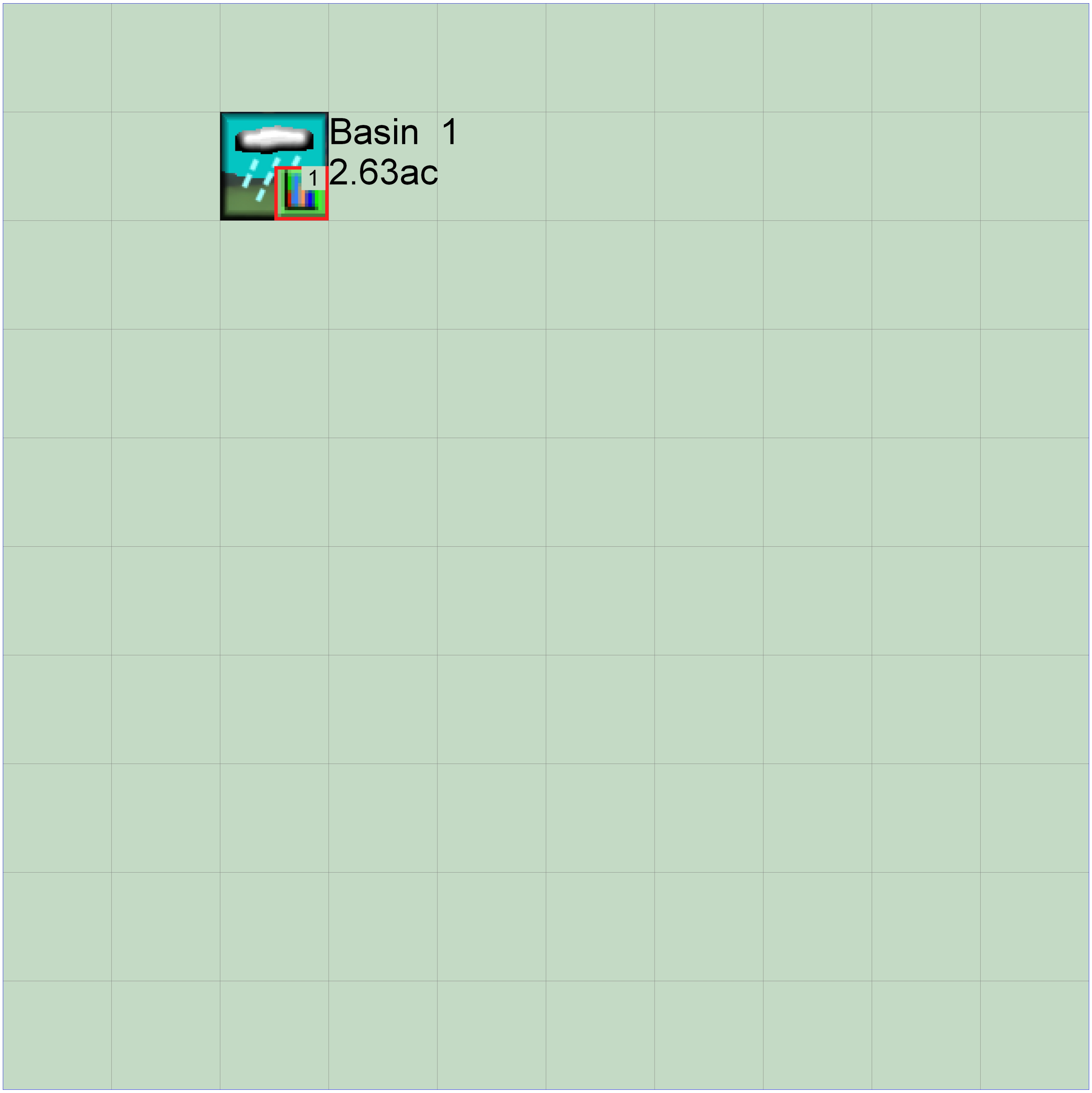
Duration Flows

The Facility PASSED

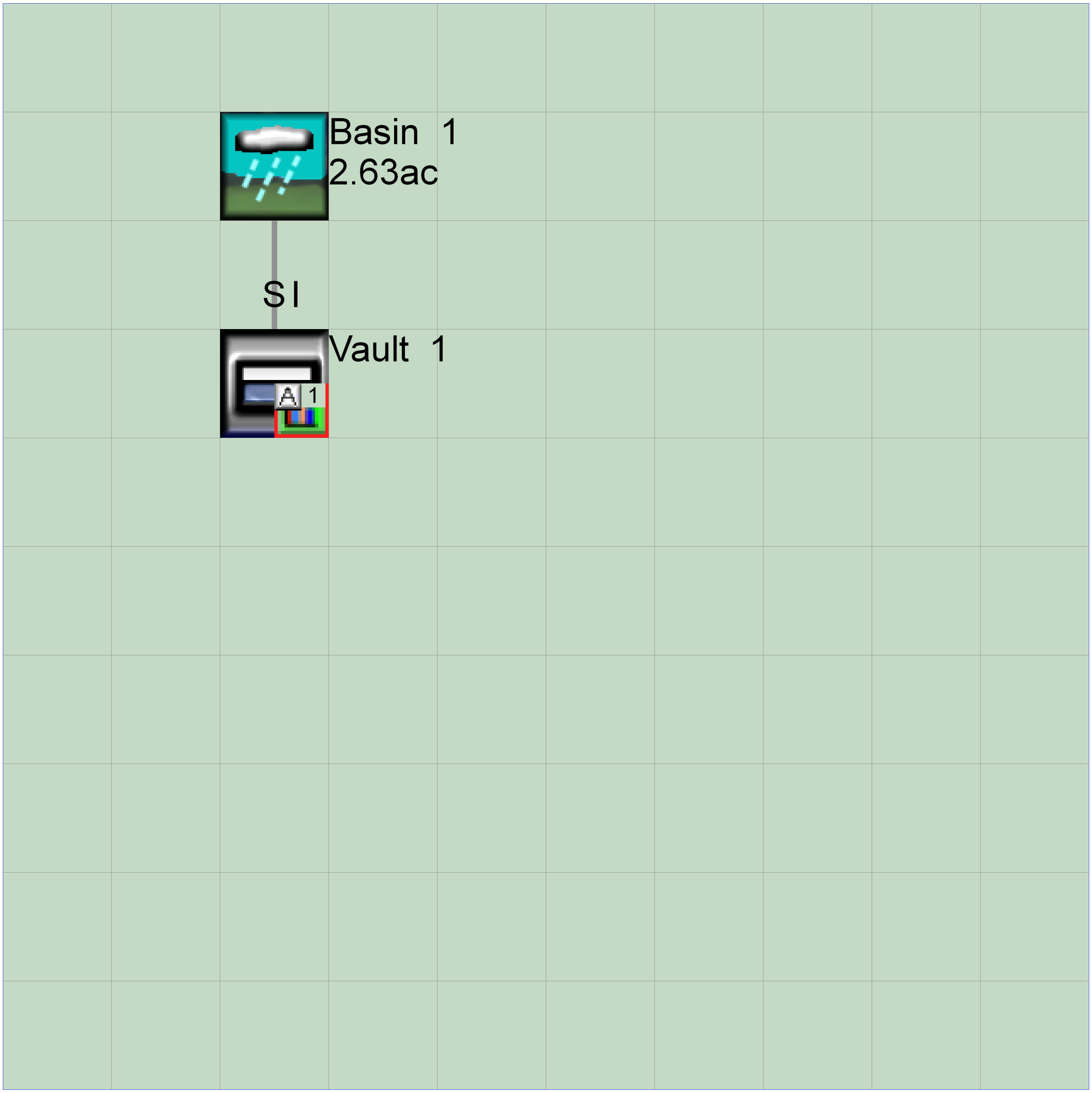
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.2013	6127	3722	60	Pass
0.2081	5302	2593	48	Pass
0.2150	4712	1773	37	Pass
0.2218	4105	1694	41	Pass
0.2287	3654	1631	44	Pass
0.2355	3248	1588	48	Pass
0.2424	2887	1530	52	Pass
0.2492	2579	1479	57	Pass
0.2561	2329	1425	61	Pass
0.2630	2119	1380	65	Pass
0.2698	1903	1313	68	Pass
0.2767	1713	1227	71	Pass
0.2835	1551	1156	74	Pass
0.2904	1418	1093	77	Pass
0.2972	1281	1012	79	Pass
0.3041	1168	944	80	Pass
0.3109	1063	887	83	Pass
0.3178	947	823	86	Pass
0.3246	848	756	89	Pass
0.3315	770	702	91	Pass
0.3383	704	644	91	Pass
0.3452	646	602	93	Pass
0.3520	586	554	94	Pass
0.3589	549	521	94	Pass
0.3657	497	475	95	Pass
0.3726	458	424	92	Pass
0.3794	415	388	93	Pass
0.3863	376	356	94	Pass
0.3931	342	325	95	Pass
0.4000	322	300	93	Pass
0.4068	290	260	89	Pass
0.4137	261	216	82	Pass
0.4205	239	190	79	Pass
0.4274	220	170	77	Pass
0.4342	205	155	75	Pass
0.4411	188	143	76	Pass
0.4479	175	132	75	Pass
0.4548	158	128	81	Pass
0.4616	142	121	85	Pass
0.4685	123	110	89	Pass
0.4753	117	103	88	Pass
0.4822	110	90	81	Pass
0.4890	101	81	80	Pass
0.4959	97	68	70	Pass
0.5027	93	65	69	Pass
0.5096	89	62	69	Pass
0.5164	80	60	75	Pass
0.5233	76	57	75	Pass
0.5301	69	56	81	Pass
0.5370	65	54	83	Pass
0.5438	64	53	82	Pass
0.5507	60	51	85	Pass
0.5575	57	49	85	Pass

0.5644	55	48	87	Pass
0.5712	52	45	86	Pass
0.5781	51	42	82	Pass
0.5849	49	41	83	Pass
0.5918	43	39	90	Pass
0.5986	41	37	90	Pass
0.6055	38	36	94	Pass
0.6123	34	33	97	Pass
0.6192	33	32	96	Pass
0.6260	30	29	96	Pass
0.6329	30	25	83	Pass
0.6398	29	25	86	Pass
0.6466	28	24	85	Pass
0.6535	28	23	82	Pass
0.6603	25	23	92	Pass
0.6672	24	23	95	Pass
0.6740	24	23	95	Pass
0.6809	23	22	95	Pass
0.6877	23	22	95	Pass
0.6946	22	21	95	Pass
0.7014	22	19	86	Pass
0.7083	22	18	81	Pass
0.7151	21	18	85	Pass
0.7220	21	18	85	Pass
0.7288	21	18	85	Pass
0.7357	19	17	89	Pass
0.7425	18	17	94	Pass
0.7494	16	16	100	Pass
0.7562	16	16	100	Pass
0.7631	15	15	100	Pass
0.7699	15	15	100	Pass
0.7768	15	14	93	Pass
0.7836	15	14	93	Pass
0.7905	15	14	93	Pass
0.7973	15	14	93	Pass
0.8042	15	13	86	Pass
0.8110	13	12	92	Pass
0.8179	12	12	100	Pass
0.8247	11	11	100	Pass
0.8316	11	11	100	Pass
0.8384	11	10	90	Pass
0.8453	10	9	90	Pass
0.8521	10	9	90	Pass
0.8590	9	6	66	Pass
0.8658	9	6	66	Pass
0.8727	8	5	62	Pass
0.8795	8	5	62	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



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WWHM2012

PROJECT REPORT

FLOW CONTROL AND WATER QUALITY
CALCULATIONS
OFFSITE FREEMAN AND LEVEE ROAD
FREEMAN LOGISTICS
BCE JOB # 21585

General Model Information

Project Name:	21585-CALC-DRNG-OFFSITE-DETN-2023-11-28
Site Name:	FREEMAN ROAD LOGISTICS
Site Address:	
City:	PUYALLUP
Report Date:	12/1/2023
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.37
Pervious Total	0.37
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.37

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DEV

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.37
Impervious Total	0.37
Basin Total	0.37

Element Flows To:

Surface	Interflow	Groundwater
Tank 1		

Mitigated Routing

Tank 1

Dimensions		
Depth:	6 ft.	
Tank Type:	Circular	
Diameter:	6 ft.	
Length:	370 ft.	
Discharge Structure		
Riser Height:	5.5 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	0.31 in.	Elevation:0.5 ft.
Orifice 2 Diameter:	0.32 in.	Elevation:3.4 ft.
Orifice 3 Diameter:	0.6 in.	Elevation:4 ft.
Element Flows To:		
Outlet 1	Outlet 2	

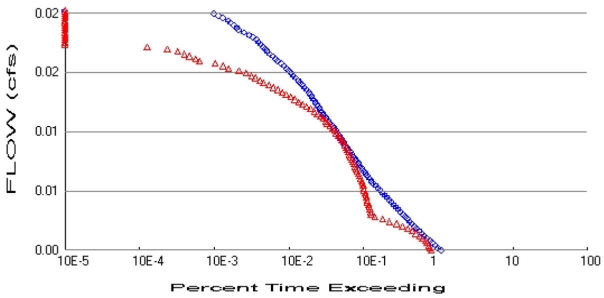
Tank Hydraulic Table

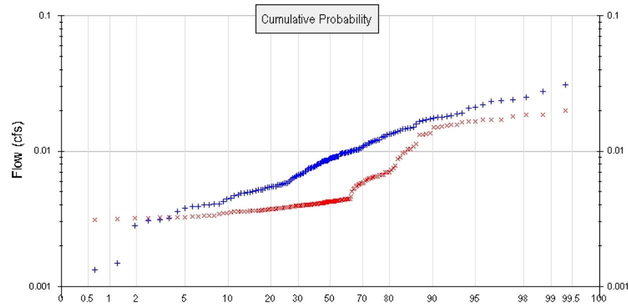
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.000	0.000	0.000	0.000
0.0667	0.010	0.000	0.000	0.000
0.1333	0.015	0.001	0.000	0.000
0.2000	0.018	0.002	0.000	0.000
0.2667	0.021	0.003	0.000	0.000
0.3333	0.023	0.005	0.000	0.000
0.4000	0.025	0.006	0.000	0.000
0.4667	0.027	0.008	0.000	0.000
0.5333	0.029	0.010	0.000	0.000
0.6000	0.030	0.012	0.000	0.000
0.6667	0.032	0.014	0.001	0.000
0.7333	0.033	0.016	0.001	0.000
0.8000	0.034	0.019	0.001	0.000
0.8667	0.035	0.021	0.001	0.000
0.9333	0.036	0.023	0.001	0.000
1.0000	0.038	0.026	0.001	0.000
1.0667	0.039	0.028	0.002	0.000
1.1333	0.039	0.031	0.002	0.000
1.2000	0.040	0.034	0.002	0.000
1.2667	0.041	0.036	0.002	0.000
1.3333	0.042	0.039	0.002	0.000
1.4000	0.043	0.042	0.002	0.000
1.4667	0.043	0.045	0.002	0.000
1.5333	0.044	0.048	0.002	0.000
1.6000	0.045	0.051	0.002	0.000
1.6667	0.045	0.054	0.002	0.000
1.7333	0.046	0.057	0.002	0.000
1.8000	0.046	0.060	0.003	0.000
1.8667	0.047	0.063	0.003	0.000
1.9333	0.047	0.066	0.003	0.000
2.0000	0.048	0.070	0.003	0.000
2.0667	0.048	0.073	0.003	0.000
2.1333	0.048	0.076	0.003	0.000
2.2000	0.049	0.079	0.003	0.000
2.2667	0.049	0.083	0.003	0.000
2.3333	0.049	0.086	0.003	0.000

2.4000	0.049	0.089	0.003	0.000
2.4667	0.050	0.093	0.003	0.000
2.5333	0.050	0.096	0.003	0.000
2.6000	0.050	0.099	0.003	0.000
2.6667	0.050	0.103	0.003	0.000
2.7333	0.050	0.106	0.003	0.000
2.8000	0.050	0.109	0.004	0.000
2.8667	0.050	0.113	0.004	0.000
2.9333	0.051	0.116	0.004	0.000
3.0000	0.051	0.120	0.004	0.000
3.0667	0.051	0.123	0.004	0.000
3.1333	0.050	0.126	0.004	0.000
3.2000	0.050	0.130	0.004	0.000
3.2667	0.050	0.133	0.004	0.000
3.3333	0.050	0.137	0.004	0.000
3.4000	0.050	0.140	0.004	0.000
3.4667	0.050	0.143	0.005	0.000
3.5333	0.050	0.147	0.005	0.000
3.6000	0.049	0.150	0.005	0.000
3.6667	0.049	0.153	0.006	0.000
3.7333	0.049	0.157	0.006	0.000
3.8000	0.049	0.160	0.006	0.000
3.8667	0.048	0.163	0.006	0.000
3.9333	0.048	0.166	0.006	0.000
4.0000	0.048	0.170	0.007	0.000
4.0667	0.047	0.173	0.009	0.000
4.1333	0.047	0.176	0.010	0.000
4.2000	0.046	0.179	0.011	0.000
4.2667	0.046	0.182	0.012	0.000
4.3333	0.045	0.185	0.013	0.000
4.4000	0.045	0.188	0.014	0.000
4.4667	0.044	0.191	0.014	0.000
4.5333	0.043	0.194	0.015	0.000
4.6000	0.043	0.197	0.015	0.000
4.6667	0.042	0.200	0.016	0.000
4.7333	0.041	0.203	0.016	0.000
4.8000	0.040	0.206	0.017	0.000
4.8667	0.039	0.208	0.017	0.000
4.9333	0.039	0.211	0.018	0.000
5.0000	0.038	0.213	0.018	0.000
5.0667	0.036	0.216	0.019	0.000
5.1333	0.035	0.218	0.019	0.000
5.2000	0.034	0.221	0.020	0.000
5.2667	0.033	0.223	0.020	0.000
5.3333	0.032	0.225	0.020	0.000
5.4000	0.030	0.227	0.021	0.000
5.4667	0.029	0.229	0.021	0.000
5.5333	0.027	0.231	0.118	0.000
5.6000	0.025	0.233	0.524	0.000
5.6667	0.023	0.234	1.097	0.000
5.7333	0.021	0.236	1.779	0.000
5.8000	0.018	0.237	2.524	0.000
5.8667	0.015	0.238	3.285	0.000
5.9333	0.010	0.239	4.012	0.000
6.0000	0.000	0.240	4.663	0.000
6.0667	0.000	0.000	5.203	0.000

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.37
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.37

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.00891
5 year	0.01367
10 year	0.016594
25 year	0.019972
50 year	0.02226
100 year	0.024366

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.004914
5 year	0.007793
10 year	0.01038
25 year	0.01461
50 year	0.018596
100 year	0.023428

WATER QUALITY DESIGN FLOW RATE EQUAL TO 2-YEAR RELEASE RATE DOWNSTREAM OF DETENTION

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.009	0.004
1903	0.005	0.003
1904	0.010	0.004
1905	0.005	0.006
1906	0.003	0.003
1907	0.014	0.004
1908	0.010	0.004
1909	0.010	0.004
1910	0.014	0.004
1911	0.009	0.004

1912	0.031	0.005
1913	0.014	0.008
1914	0.004	0.003
1915	0.006	0.006
1916	0.009	0.004
1917	0.003	0.004
1918	0.009	0.013
1919	0.008	0.004
1920	0.009	0.004
1921	0.010	0.006
1922	0.010	0.004
1923	0.008	0.006
1924	0.004	0.004
1925	0.005	0.004
1926	0.009	0.004
1927	0.007	0.004
1928	0.007	0.004
1929	0.013	0.006
1930	0.009	0.004
1931	0.008	0.004
1932	0.006	0.006
1933	0.007	0.004
1934	0.018	0.017
1935	0.008	0.011
1936	0.008	0.005
1937	0.012	0.004
1938	0.008	0.004
1939	0.001	0.003
1940	0.008	0.006
1941	0.005	0.003
1942	0.013	0.016
1943	0.006	0.004
1944	0.013	0.010
1945	0.010	0.004
1946	0.006	0.004
1947	0.004	0.004
1948	0.019	0.004
1949	0.017	0.011
1950	0.005	0.004
1951	0.007	0.004
1952	0.024	0.010
1953	0.022	0.017
1954	0.008	0.004
1955	0.007	0.004
1956	0.004	0.004
1957	0.012	0.007
1958	0.023	0.019
1959	0.015	0.017
1960	0.004	0.003
1961	0.015	0.017
1962	0.008	0.004
1963	0.004	0.003
1964	0.005	0.004
1965	0.017	0.016
1966	0.005	0.004
1967	0.007	0.004
1968	0.008	0.005
1969	0.008	0.004

1970	0.012	0.004
1971	0.017	0.014
1972	0.011	0.004
1973	0.015	0.009
1974	0.008	0.004
1975	0.018	0.019
1976	0.010	0.004
1977	0.005	0.003
1978	0.016	0.015
1979	0.005	0.004
1980	0.010	0.004
1981	0.009	0.004
1982	0.005	0.003
1983	0.015	0.006
1984	0.007	0.004
1985	0.011	0.004
1986	0.009	0.005
1987	0.017	0.013
1988	0.011	0.007
1989	0.010	0.004
1990	0.011	0.004
1991	0.009	0.004
1992	0.011	0.013
1993	0.012	0.004
1994	0.017	0.004
1995	0.004	0.004
1996	0.019	0.016
1997	0.009	0.004
1998	0.010	0.004
1999	0.001	0.004
2000	0.007	0.006
2001	0.004	0.003
2002	0.013	0.004
2003	0.011	0.004
2004	0.010	0.004
2005	0.018	0.004
2006	0.006	0.004
2007	0.006	0.004
2008	0.010	0.004
2009	0.007	0.004
2010	0.006	0.007
2011	0.005	0.004
2012	0.009	0.004
2013	0.006	0.003
2014	0.004	0.003
2015	0.008	0.004
2016	0.003	0.004
2017	0.013	0.010
2018	0.023	0.018
2019	0.025	0.017
2020	0.007	0.004
2021	0.012	0.010
2022	0.005	0.004
2023	0.010	0.005
2024	0.028	0.004
2025	0.009	0.004
2026	0.015	0.007
2027	0.006	0.004

2028	0.005	0.003
2029	0.010	0.007
2030	0.018	0.006
2031	0.006	0.004
2032	0.004	0.003
2033	0.005	0.004
2034	0.005	0.004
2035	0.021	0.020
2036	0.011	0.006
2037	0.003	0.004
2038	0.009	0.008
2039	0.001	0.003
2040	0.005	0.004
2041	0.006	0.004
2042	0.021	0.015
2043	0.010	0.009
2044	0.013	0.007
2045	0.009	0.006
2046	0.010	0.015
2047	0.008	0.006
2048	0.010	0.004
2049	0.009	0.004
2050	0.007	0.004
2051	0.011	0.004
2052	0.006	0.004
2053	0.010	0.015
2054	0.012	0.007
2055	0.005	0.003
2056	0.004	0.004
2057	0.007	0.004
2058	0.008	0.006
2059	0.014	0.007

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0307	0.0198
2	0.0275	0.0187
3	0.0248	0.0186
4	0.0239	0.0181
5	0.0235	0.0170
6	0.0233	0.0170
7	0.0221	0.0170
8	0.0211	0.0166
9	0.0209	0.0165
10	0.0189	0.0162
11	0.0187	0.0157
12	0.0184	0.0156
13	0.0181	0.0153
14	0.0179	0.0152
15	0.0177	0.0151
16	0.0174	0.0149
17	0.0173	0.0136
18	0.0170	0.0133
19	0.0167	0.0132
20	0.0167	0.0131
21	0.0159	0.0113
22	0.0149	0.0108

23	0.0148	0.0104
24	0.0147	0.0103
25	0.0146	0.0098
26	0.0145	0.0097
27	0.0141	0.0089
28	0.0139	0.0087
29	0.0137	0.0078
30	0.0135	0.0075
31	0.0135	0.0072
32	0.0135	0.0070
33	0.0133	0.0070
34	0.0128	0.0069
35	0.0128	0.0067
36	0.0126	0.0067
37	0.0122	0.0066
38	0.0120	0.0065
39	0.0120	0.0065
40	0.0119	0.0065
41	0.0117	0.0064
42	0.0116	0.0063
43	0.0115	0.0063
44	0.0114	0.0062
45	0.0112	0.0061
46	0.0112	0.0061
47	0.0110	0.0059
48	0.0107	0.0058
49	0.0106	0.0058
50	0.0106	0.0057
51	0.0103	0.0056
52	0.0102	0.0055
53	0.0102	0.0054
54	0.0102	0.0054
55	0.0101	0.0053
56	0.0100	0.0050
57	0.0100	0.0046
58	0.0099	0.0044
59	0.0098	0.0044
60	0.0098	0.0044
61	0.0097	0.0044
62	0.0097	0.0044
63	0.0097	0.0044
64	0.0096	0.0044
65	0.0096	0.0044
66	0.0096	0.0044
67	0.0095	0.0044
68	0.0095	0.0043
69	0.0092	0.0043
70	0.0092	0.0043
71	0.0092	0.0043
72	0.0091	0.0043
73	0.0091	0.0043
74	0.0090	0.0043
75	0.0090	0.0043
76	0.0090	0.0043
77	0.0089	0.0043
78	0.0088	0.0042
79	0.0088	0.0042
80	0.0088	0.0042

81	0.0087	0.0042
82	0.0085	0.0042
83	0.0085	0.0042
84	0.0085	0.0042
85	0.0085	0.0042
86	0.0084	0.0042
87	0.0083	0.0041
88	0.0083	0.0041
89	0.0083	0.0041
90	0.0082	0.0041
91	0.0081	0.0041
92	0.0081	0.0041
93	0.0080	0.0041
94	0.0079	0.0041
95	0.0078	0.0041
96	0.0077	0.0041
97	0.0077	0.0041
98	0.0076	0.0041
99	0.0076	0.0041
100	0.0075	0.0040
101	0.0075	0.0040
102	0.0074	0.0040
103	0.0073	0.0040
104	0.0071	0.0040
105	0.0070	0.0040
106	0.0069	0.0040
107	0.0068	0.0040
108	0.0068	0.0040
109	0.0067	0.0040
110	0.0066	0.0040
111	0.0066	0.0039
112	0.0065	0.0039
113	0.0064	0.0039
114	0.0063	0.0039
115	0.0061	0.0039
116	0.0060	0.0038
117	0.0058	0.0038
118	0.0058	0.0038
119	0.0058	0.0038
120	0.0058	0.0038
121	0.0057	0.0038
122	0.0056	0.0038
123	0.0056	0.0038
124	0.0055	0.0038
125	0.0055	0.0038
126	0.0054	0.0037
127	0.0054	0.0037
128	0.0054	0.0037
129	0.0053	0.0037
130	0.0052	0.0037
131	0.0052	0.0036
132	0.0051	0.0036
133	0.0051	0.0036
134	0.0050	0.0036
135	0.0050	0.0036
136	0.0050	0.0036
137	0.0049	0.0036
138	0.0049	0.0036

139	0.0048	0.0036
140	0.0047	0.0036
141	0.0045	0.0035
142	0.0044	0.0035
143	0.0043	0.0035
144	0.0041	0.0034
145	0.0041	0.0034
146	0.0040	0.0033
147	0.0040	0.0033
148	0.0039	0.0033
149	0.0039	0.0033
150	0.0038	0.0033
151	0.0036	0.0033
152	0.0032	0.0032
153	0.0031	0.0032
154	0.0031	0.0032
155	0.0028	0.0032
156	0.0015	0.0032
157	0.0013	0.0031
158	0.0008	0.0030

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0045	60110	44703	74	Pass
0.0046	55052	42636	77	Pass
0.0048	50376	40841	81	Pass
0.0050	46182	39141	84	Pass
0.0052	42343	37445	88	Pass
0.0054	38969	34210	87	Pass
0.0055	35988	31002	86	Pass
0.0057	33274	27711	83	Pass
0.0059	30697	24631	80	Pass
0.0061	28321	21567	76	Pass
0.0063	26326	18448	70	Pass
0.0064	24493	15352	62	Pass
0.0066	22781	12327	54	Pass
0.0068	21235	9955	46	Pass
0.0070	19833	7800	39	Pass
0.0072	18532	7008	37	Pass
0.0073	17213	6864	39	Pass
0.0075	16005	6726	42	Pass
0.0077	14914	6571	44	Pass
0.0079	13900	6432	46	Pass
0.0081	12980	6288	48	Pass
0.0082	12133	6149	50	Pass
0.0084	11318	6011	53	Pass
0.0086	10587	5906	55	Pass
0.0088	9850	5778	58	Pass
0.0090	9174	5656	61	Pass
0.0091	8532	5540	64	Pass
0.0093	7967	5446	68	Pass
0.0095	7429	5349	72	Pass
0.0097	6947	5251	75	Pass
0.0099	6554	5077	77	Pass
0.0100	6199	4888	78	Pass
0.0102	5895	4702	79	Pass
0.0104	5573	4527	81	Pass
0.0106	5285	4391	83	Pass
0.0107	5025	4263	84	Pass
0.0109	4779	4137	86	Pass
0.0111	4535	4006	88	Pass
0.0113	4304	3875	90	Pass
0.0115	4083	3741	91	Pass
0.0116	3869	3612	93	Pass
0.0118	3660	3488	95	Pass
0.0120	3450	3377	97	Pass
0.0122	3290	3246	98	Pass
0.0124	3130	3108	99	Pass
0.0125	2982	2972	99	Pass
0.0127	2832	2828	99	Pass
0.0129	2692	2684	99	Pass
0.0131	2580	2541	98	Pass
0.0133	2453	2399	97	Pass
0.0134	2361	2260	95	Pass
0.0136	2243	2123	94	Pass
0.0138	2142	1972	92	Pass

0.0140	1999	1821	91	Pass
0.0142	1871	1711	91	Pass
0.0143	1759	1593	90	Pass
0.0145	1674	1466	87	Pass
0.0147	1585	1336	84	Pass
0.0149	1507	1208	80	Pass
0.0151	1430	1078	75	Pass
0.0152	1356	957	70	Pass
0.0154	1297	839	64	Pass
0.0156	1236	747	60	Pass
0.0158	1187	665	56	Pass
0.0160	1120	585	52	Pass
0.0161	1074	506	47	Pass
0.0163	1026	448	43	Pass
0.0165	968	391	40	Pass
0.0167	897	340	37	Pass
0.0169	836	298	35	Pass
0.0170	783	250	31	Pass
0.0172	737	226	30	Pass
0.0174	679	197	29	Pass
0.0176	631	176	27	Pass
0.0178	589	147	24	Pass
0.0179	555	118	21	Pass
0.0181	511	86	16	Pass
0.0183	475	73	15	Pass
0.0185	432	57	13	Pass
0.0187	390	35	8	Pass
0.0188	368	31	8	Pass
0.0190	340	26	7	Pass
0.0192	305	22	7	Pass
0.0194	280	18	6	Pass
0.0196	265	13	4	Pass
0.0197	247	7	2	Pass
0.0199	233	0	0	Pass
0.0201	218	0	0	Pass
0.0203	204	0	0	Pass
0.0205	182	0	0	Pass
0.0206	161	0	0	Pass
0.0208	139	0	0	Pass
0.0210	117	0	0	Pass
0.0212	110	0	0	Pass
0.0214	101	0	0	Pass
0.0215	92	0	0	Pass
0.0217	85	0	0	Pass
0.0219	72	0	0	Pass
0.0221	62	0	0	Pass
0.0223	54	0	0	Pass

Appendix
Predeveloped Schematic

Mitigated Schematic

Disclaimer

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STORMWATER PUMP CURVE AND DETAILS

STORM PUMP AND FORCE MAIN CALCULATIONS

Freeman Logistics
22^{nd} Ave NW and 82^{nd} Ave E
Puyallup, WA

Prepared for:
Vector Development Company
11411 NE 124^{th} Street, Suite 190
Kirkland, WA 98034

October 14^{th}, 2022
REVISED: November 2023

Our Job No. 21585

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION/GENERAL INFORMATION

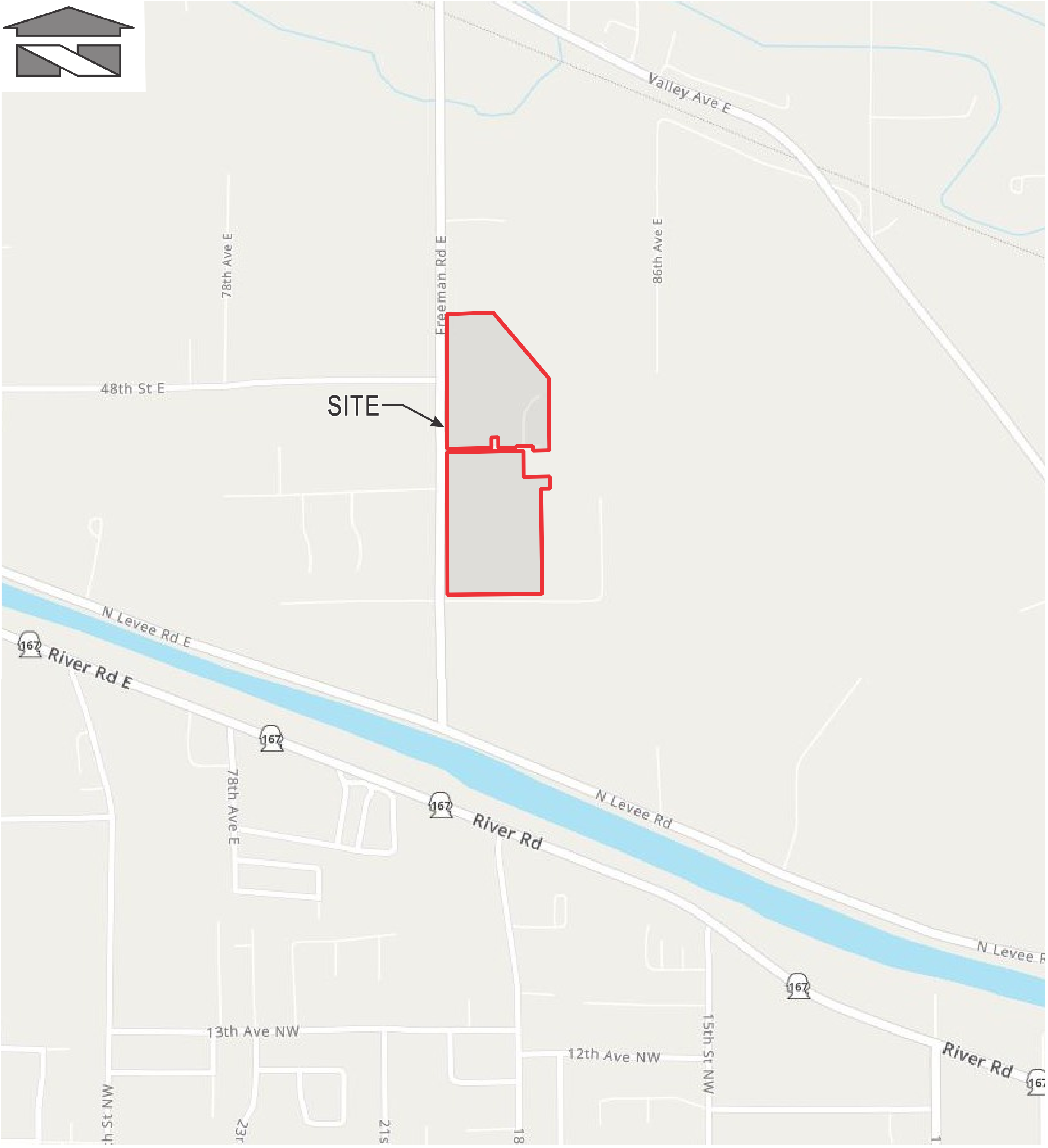
The following pages of this report delineate the criteria followed and the methodology used for sizing the storm pump and force main servicing the Freeman Logistics project.

The project includes 2 warehouse buildings with associated parking and frontage improvements totaling 25.50 acres of total disturbed area. Onsite, two separate detention vaults are proposed. The frontage improvement will be collected and detained separately with a detention tank. These detention facilities will detain and release stormwater in accordance with the Flow Control Standard per the Department of Ecology drainage manual (2019 Department of Ecology manual). The 100-year peak storm release rate of the vaults is 2.242 ft^3/sec. Released stormwater will then be treated for water quality using a DOE-approved proprietary structure. Following treatment, all flows, both onsite and offsite, will be conveyed to a manhole pump station. The pump station will convey flows northwest via a new 6-inch force main and then release further downstream, within an existing structure within the private road 78^{th} Ave E. The new force main will be approximately 2,515 feet in length.

Emergency standby power is proposed using a generator (natural gas or approved alternative). Additional storage volume is not required downstream of the detention vault.

This report also includes buoyancy calculations for the pump manhole due to the shallow seasonal high groundwater elevation on the site.

Figure 1
Vicinity Map



REFERENCE: MapQuest (2022)

Scale: *Horizontal:* ***N.T.S.*** *Vertical:* ***N/A***	*For:* Freeman Road Logistics Fife, Washington	Job Number 21585
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 **barghausen.com**	*Title:* VICINITY MAP	DATE: 09/01/22

P:\21000s\21585\exhibit\graphics\21585 vmap.cdr

Appendix A
Pump Design

STORM PUMP DESIGN

<u>Pump Criteria</u>:

- Design a submersible duplex pump with variable speed which can meet or exceed the 100-year peak release rate of the detention system.

  100-year peak release rate of combined facilities = 2.24 cfs = 1,006 gpm

- **Suggested pump size = dual 600 gpm at ±75-feet TDH**

<u>Pump Cycles</u>

- To meet the desired discharge characteristics for matching the flow control standard, the pump controls include a VFD (Variable Frequency Drive) and level sensor which allow a wide range of pump speed to match the outflow rate from the control structure on the vault. The pumps can be controlled down to a flow rate of approximately 90 gpm. Assuming the pump starts at the lowest speed, the cycle time would be:

  Wet well storage = Pump On - Pump Off x 118.96 gallons per linear feet of MH = 13.94 – 11.44 x 118.96 = 446 gallons

  Cycle time = 446 gal / 45 gpm = 9.91 minutes

  Cycles per hour = 6.05

Appendix B
Force Main Sizing

STORM FORCE MAIN DESIGN

Pump System

Force main design for proposed force main:

- Design flow in the force main = 600 gpm = 1.34 cfs

- Use 6-inch force main
    - Velocity = 1.34 cfs/0.196 sf = 6.84 fps
    - 6.84 fps < 8 fps OK

Static Head = Invert at downstream end of force main - Pump Off Elevation

Invert elevation at tie-in structure = 27.73

Pump off elevation = 10.50

Static Head = 27.73 – 10.50 = ±17.5 feet

Total Dynamic Head = based on pump configuration and force main (to be verified by pump manufacturer)

Force Main is HDPE (Sch. 40 Pipe)

New 6" Force Main Pipe Length = 2,515 feet

Friction loss in 6-inch main = 2,515/100 x 2.19 = 55.1 feet

Fitting losses in equivalent length of 6" straight pipe (From Friction Loss chart)

Elbows and valves: 90 deg = 15.2
45 deg = 8.1
Ball & check valve = 4

Head loss = (15.2+(2)(8.1)+4)/100 x 1 = 0.35 feet

Total Head = Static Head + Friction Loss = 17.5 + 55.1 feet + 0.35 feet = 72.95 feet

Pump System

Pump Station Control Panel Specification

Primary power shall be from the proposed recreational building. Contractor is to verify available power source and sizing prior to ordering the pump station. Each pump system shall have its own control panel.

The control panel for each sanitary pump station shall include:

- Control for a duplex pump system (controls to be hard wired)
- VFD control for each pump
- Enclosure for installation outside (installation to be near the pump station)
- Visual alarm – flashing light
- Display at control panel to monitor station performance
- 12-hour battery backup for control panel
- Manual and remote reset for alarms
- Alarms for:
  - Pump failure
  - Seal failure
  - High temperature
  - Low water
  - High water
  - Low battery
  - Power failure
- Duplex cycle counter
- Duplex elapsed run time meter
- Surge protection
- Dial up to 8 phone numbers during an alarm condition
- Minimum 1 year warranty

Table A.2 Friction Loss Data for PVC Pipe. Data courtesy IPEX Inc.

GPM	cu ft / sec	Velocity (ft/s)	Friction Head Loss (ft water / 100 ft)	Friction Pressure (psi / 100 ft)	Velocity (ft/s)	Friction Head Loss (ft water / 100 ft)	Friction Pressure (psi / 100 ft)	Velocity (ft/s)	Friction Head Loss (ft water / 100 ft)	Friction Pressure (psi / 100 ft)	Velocity (ft/s)	Friction Head Loss (ft water / 100 ft)	Friction Pressure (psi / 100 ft)
			1/2"										
1	0.002	1.13	1.16	0.50		3/4"							
2	0.004	2.26	4.19	1.81	1.26	1.03	0.44		1"			1 1/4"	
5	0.011	5.64	22.88	9.90	3.16	5.60	2.42	1.93	1.69	0.73	1.10	0.43	0.19
7	0.016	7.89	42.66	18.47	4.43	10.44	4.52	2.70	3.14	1.36	1.55	0.81	0.35
10	0.022				6.32	20.21	8.75	3.86	6.08	2.63	2.21	1.57	0.68
12	0.027				7.59	28.33	12.26	4.63	8.53	3.69	2.65	2.20	0.95
15	0.033				9.48	42.82	18.54	5.79	12.89	5.58	3.31	3.32	1.44
20	0.045							7.72	21.96	9.51	4.42	5.65	2.45
25	0.056							9.65	33.20	14.37	5.52	8.55	3.70
30	0.067							11.58	46.54	20.15	6.63	11.98	5.19
35	0.078										7.73	15.94	6.90
40	0.089		4"								8.84	20.41	8.84
45	0.100	1.15	0.13	0.06							9.94	25.39	10.99
50	0.111	1.28	0.16	0.07							11.05	30.86	13.36
55	0.123	1.41	0.19	0.08									
60	0.134	1.53	0.23	0.10									
65	0.145	1.66	0.26	0.11		5"							
70	0.156	1.79	0.30	0.13	1.14	0.10	0.04						
75	0.167	1.92	0.34	0.15	1.22	0.11	0.05						
80	0.178	2.05	0.39	0.17	1.30	0.13	0.06						
90	0.201	2.30	0.48	0.21	1.46	0.16	0.07		6"				
100	0.223	2.56	0.59	0.25	1.62	0.19	0.08	1.12	0.08	0.03			
125	0.279	3.20	0.89	0.38	2.03	0.29	0.13	1.40	0.12	0.05			
150	0.334	3.84	1.24	0.54	2.44	0.41	0.18	1.69	0.17	0.07			
175	0.390	4.47	1.65	0.72	2.84	0.55	0.24	1.97	0.22	0.10		8"	
200	0.446	5.11	2.12	0.92	3.25	0.70	0.30	2.25	0.29	0.12	1.30	0.08	0.03
250	0.557	6.39	3.20	1.39	4.06	1.06	0.46	2.81	0.43	0.19	1.62	0.11	0.05
300	0.668	7.67	4.49	1.94	4.87	1.49	0.64	3.37	0.61	0.26	1.94	0.16	0.07
350	0.780	8.95	5.97	2.58	5.69	1.98	0.86	3.93	0.81	0.35	2.27	0.21	0.09
400	0.891	10.23	7.64	3.31	6.50	2.54	1.10	4.49	1.03	0.45	2.59	0.27	0.12
450	1.003				7.31	3.15	1.36	5.06	1.29	0.56	2.92	0.34	0.15
500	1.114				8.12	3.83	1.66	5.62	1.56	0.68	3.24	0.41	0.18
600	1.337				9.75	5.37	2.33	6.74	2.19	0.95	3.89	0.57	0.25
700	1.560				11.37	7.15	3.09	7.87	2.92	1.26	4.54	0.76	0.33
800	1.782		18"					8.99	3.73	1.62	5.18	0.98	0.42
900	2.005	1.30	0.03	0.01				10.11	4.64	2.01	5.83	1.22	0.53
1000	2.228	1.45	0.04	0.02							6.48	1.48	0.64
1250	2.785	1.81	0.06	0.03		20"					8.10	2.24	0.97
1500	3.342	2.17	0.08	0.04	1.75	0.05	0.02				9.72	3.14	1.36
2000	4.456	2.89	0.14	0.06	2.33	0.08	0.04		24"				
2500	5.570	3.62	0.21	0.09	2.91	0.12	0.05	2.01	0.05	0.02			
3000	6.684	4.34	0.29	0.13	3.49	0.17	0.08	2.41	0.07	0.03			
3500	7.798	5.06	0.39	0.17	4.07	0.23	0.10	2.81	0.09	0.04			
4000	8.912	5.79	0.50	0.22	4.65	0.30	0.13	3.22	0.12	0.05			
4500	10.026	6.51	0.62	0.27	5.24	0.37	0.16	3.62	0.15	0.06			
5000	11.140	7.23	0.76	0.33	5.82	0.45	0.19	4.02	0.18	0.08			
5500	12.254	7.96	0.91	0.39	6.40	0.53	0.23	4.42	0.22	0.09			
6000	13.368	8.68	1.06	0.46	6.98	0.63	0.27	4.83	0.25	0.11			
6500	14.482	9.40	1.23	0.53	7.56	0.73	0.31	5.23	0.30	0.13			
7000	15.596	10.13	1.42	0.61	8.14	0.83	0.36	5.63	0.34	0.15			
7500	16.710				8.73	0.95	0.41	6.03	0.39	0.17			
8000	17.824				9.31	1.07	0.46	6.43	0.43	0.19			
8500	18.938				9.89	1.19	0.52	6.84	0.49	0.21			
9000	20.052				10.47	1.33	0.57	7.24	0.54	0.23			
9500	21.166							7.64	0.60	0.26			
10000	22.280							8.04	0.66	0.28			

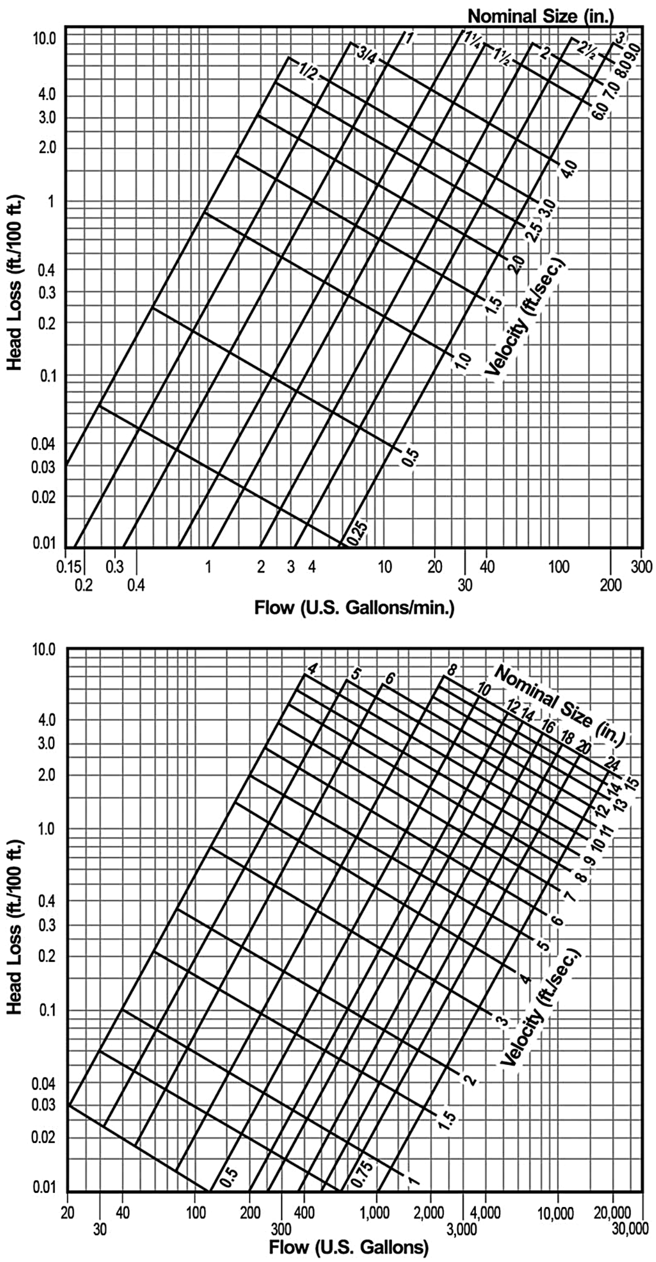


Figure A.1 Graphical depiction of friction loss through PVC pipe. Data courtesy IPEX Inc.

Table A.3 Friction Loss Through Fittings in Equivalent Footage of Pipe. Data Courtesy IPEX Inc.

	FITTINGS			
Size (in.)	**Tee Run**	**Tee Branch**	**90° Elbow**	**45° Elbow**
½	1.0	3.8	1.5	0.8
¾	1.4	4.9	2.0	1.1
1	1.7	6.0	2.5	1.4
1 ¼	2.3	7.3	3.8	1.8
1 ½	2.7	8.4	4.0	2.1
2	4.0	12.0	5.7	2.6
2 ½	4.9	14.7	6.9	3.1
3	6.1	16.4	7.9	4.0
4	7.9	22.0	11.4	5.1
6	12.3	32.7	16.7	8.0
8	14.0	49.0	21.0	10.6
10	17.5	57.0	26.0	13.5
12	20.0	67.0	32.0	15.5
14	25.0	78.0	37.0	18.0
16	27.0	88.0	43.0	20.0
18	32.0	107.0	53.0	23.0
20	35.0	118.0	58.0	25.0
24	42.0	137.0	67.0	30.0

Appendix C Buoyancy Calculations

FREEMAN STORM BUOYANCY CALCULATIONS

- **SD Pump Manhole, Type 2 - 54 inches**
  Rim: 32.64
  Inside Bottom = 8.10
  Outside Bottom = 7.43

- **Weight of Manhole**

  Top Slab = ~2,600 lbs
  Barrell = 1,100 lb/lf x (32.64 -0.67- 12.43) = 21,494 lbs
  Bottom 5' base = 7,600 lbs
  Total (manhole) = 31,694 lbs
  $P_{Manhole}$ = 31.7 Kip↓

- **Water Weight**

  Max groundwater height (~5' bge) = 27.64 feet
  Manhole displacement = (27.64 – 7.43) x πr^2 = 20.21 π $(2.625)^2$ = 437.3 CF
  Water unit weight = 62.4 lb/ft^3
  P_{Water} = 437.3 x 62.4 = 27,285 lb = 27.3 Kip↑

- **Buoyancy**

  $\sum_F = P_{Manhole} - P_{Buoyancy}$ = 31.7K↓ - 27.3K↑ = 4.4 K↓

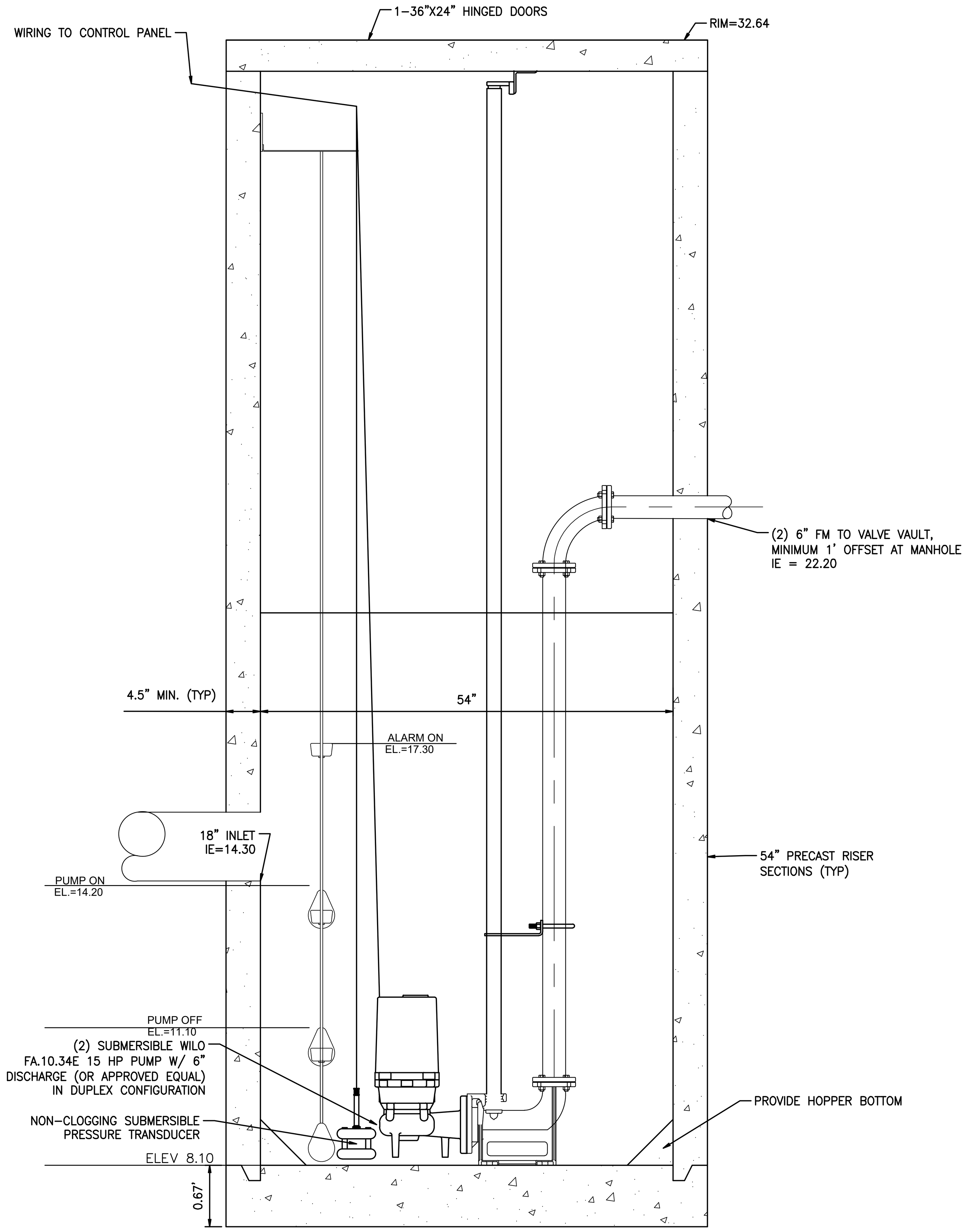
  $FS = \frac{31.7}{27.3}$ = 1.16

PRELIMINARY STORM PUMP DETAILS

OF

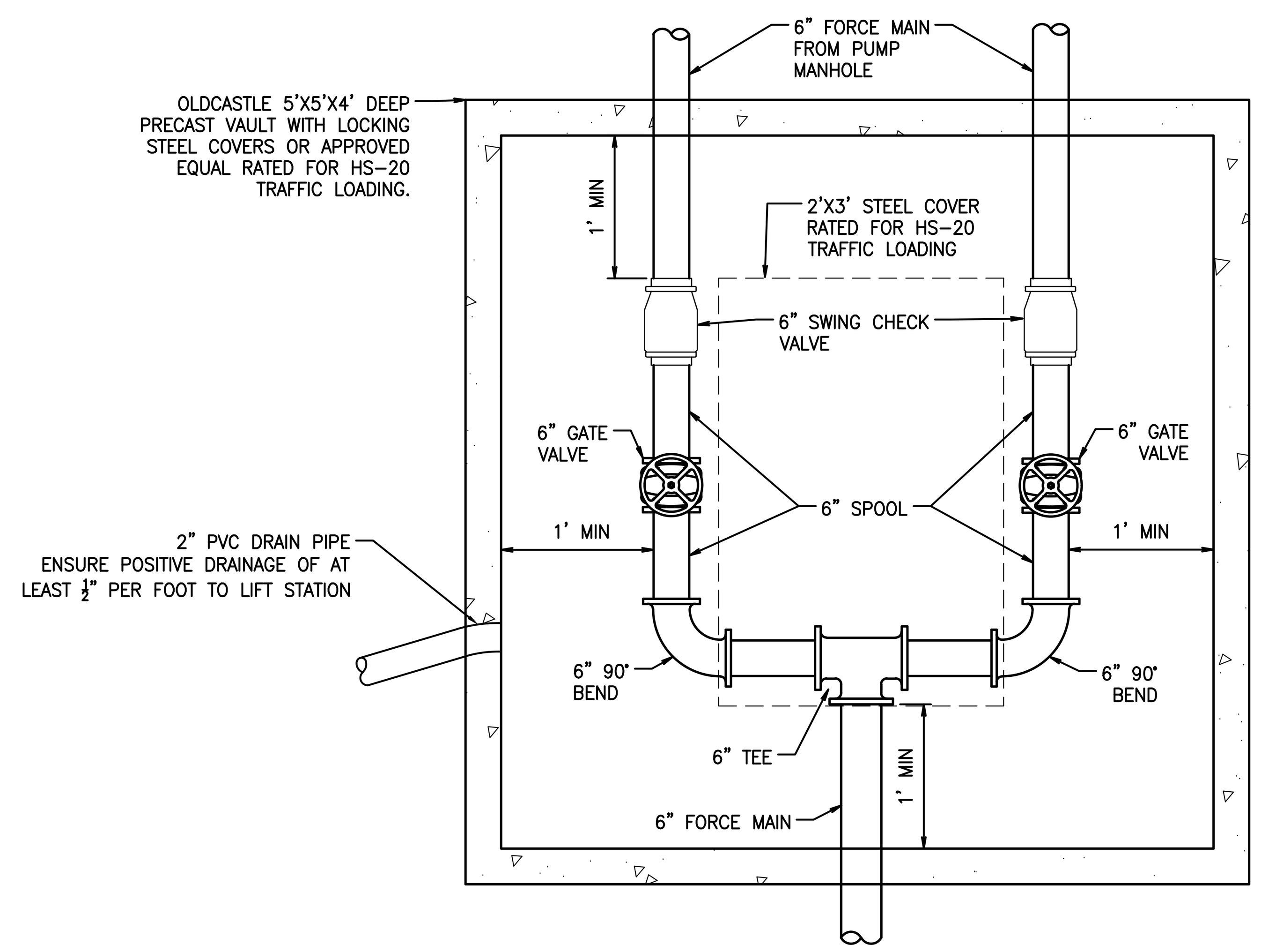
FREEMAN LOGISTICS

PTNS. OF THE SE1/4, OF SEC. 17, TWP. 20 N., RGE 4 EAST, W. M.
AND PTNS. OF THE NE1/4, OF SEC. 20, TWP. 20 N., RGE 4 EAST, W. M.
PIERCE COUNTY, WASHINGTON



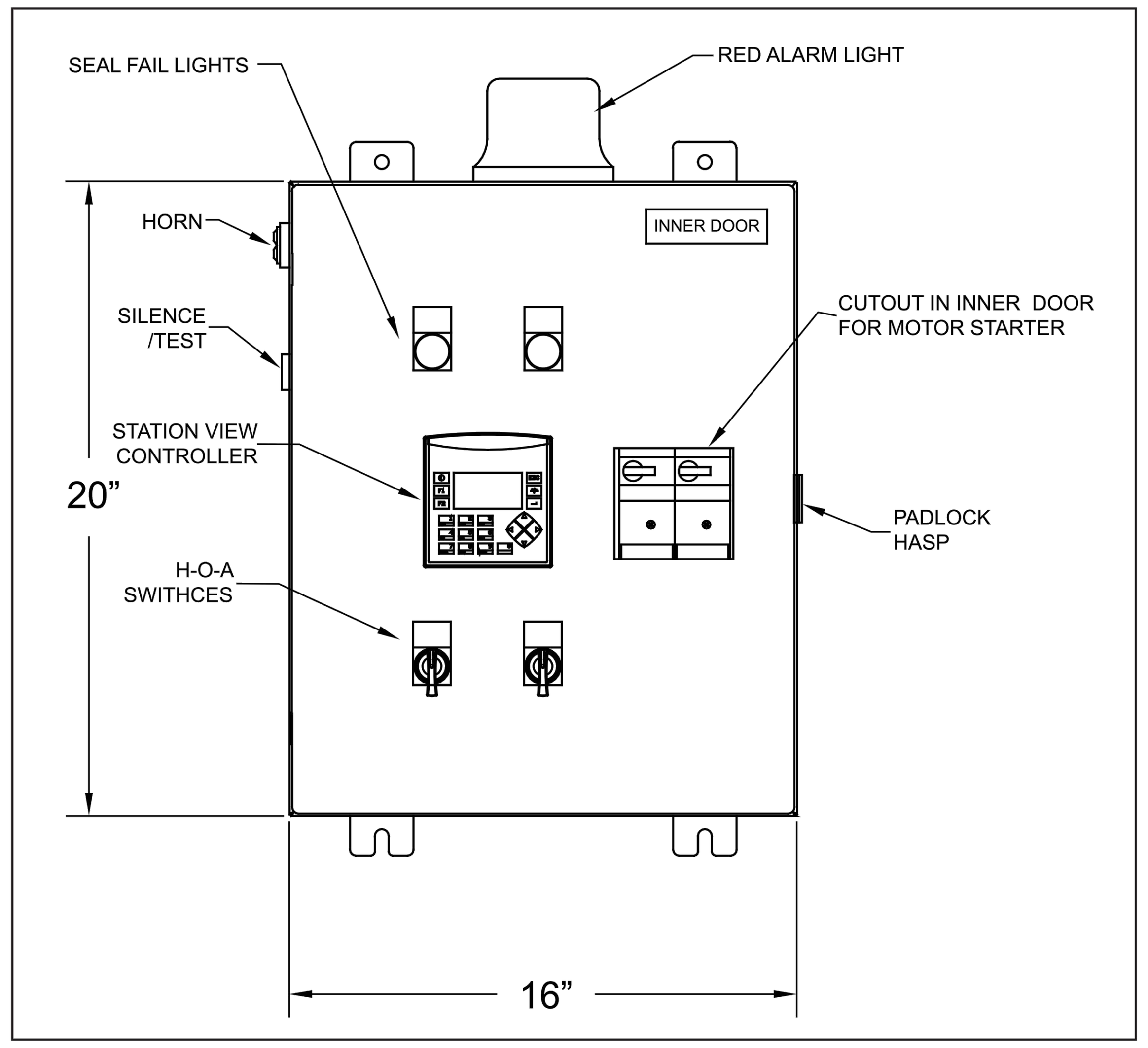
STORM PUMP MANHOLE DETAIL

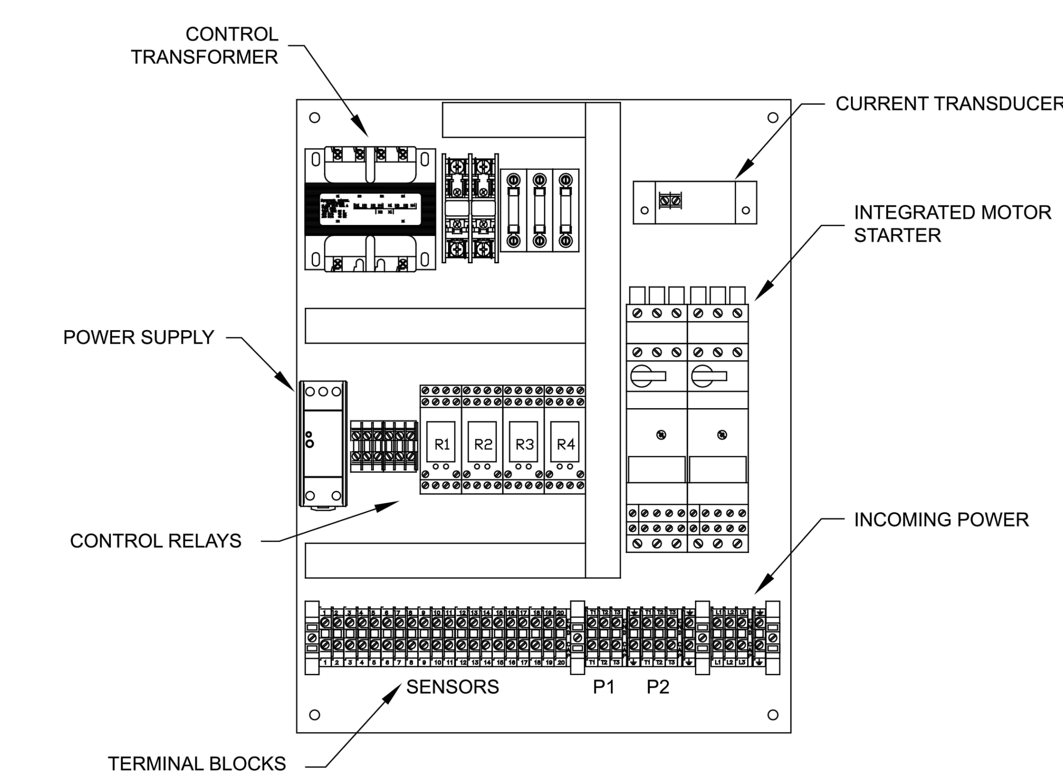
SCALE: HOR. 1"=2' VER. 1"=1'



STORM VALVE VAULT DETAIL

SCALE: NTS





EXAMPLE THREE PHASE DUPLEX LIFT STATION CONTROL PANEL

SCALE: NTS

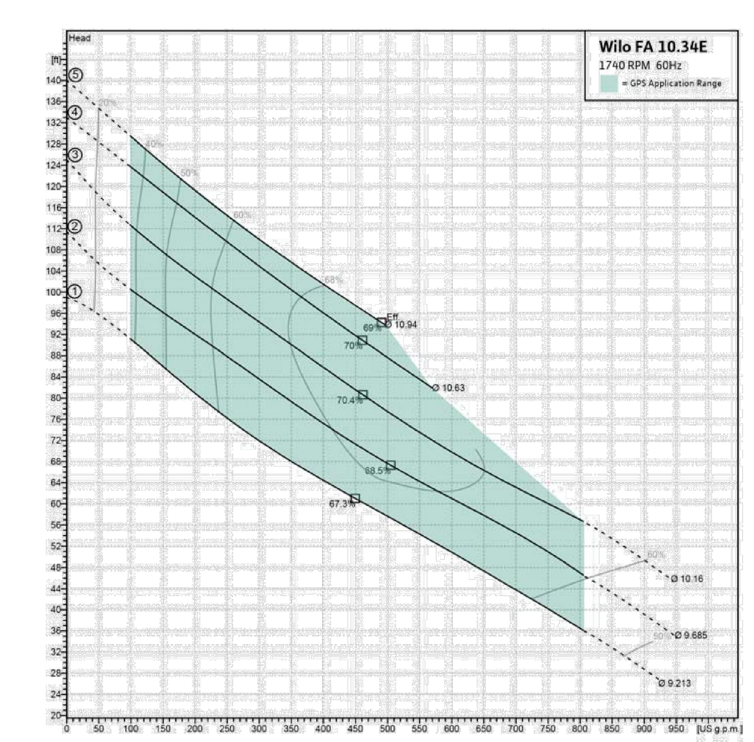
NOTES:

1. EMERGENCY BACKUP GENERATOR TO BE PROVIDED BY CONTRACTOR. SIZING TO BE DETERMINED BASED ON FINAL PUMP SELECTION. GENERATOR TO BE SIZED TO ACCOMMODATE BOTH PUMPS OPERATING. CONTROL PANEL TO BE EQUIPPED WITH AUTOMATIC TRANSFER SWITCH. SEE SITE PLAN FOR SUGGESTED GENERATOR LOCATION.
2. CONTROL PANEL TO BE EQUIPPED WITH VARIABLE FREQUENCY DRIVES (VFD) FOR BOTH PUMPS.

Wilo Quick Ship Equipment Submittal

wilo®

FA 10.34E - 4 pole, 1740 RPM, Non-clog Vane Type



Installation Type	
Installation Type	Wet Pit
	Dry Pit
Voltage	230v
	460v
Suction Size	4"
Discharge Size	4"

Impeller Number	Impeller Diameter in	Impeller Diameter mm	Motor HP
1	9.213	234	15.5
2	9.685	246	15.5
3	10.16	258	25
4	10.63	270	25
5	10.94	278	25

Materials of Construction	
Volute	ASTM A48 Class 35 Cast Iron
Impeller	ASTM A48 Class 35 Cast Iron
Volute Wear Ring	AISI 304 Stainless Steel
Impeller Wear Ring	AISI 329 Duplex Stainless Steel

WILO USA LLC
86 Genesis Parkway
Thomasville, GA 31792
T + 888-945-6872
F + 888-945-6873
www.wilo-usa.com

STORM PUMP CURVE

APPROVED

BY ______________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ______________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

Revision | No. | Date | By | Ckd. | Appr.

Title: **PRELIMINARY STORM PUMP DETAILS FOR FREEMAN LOGISTICS**

For: VECTOR DEVELOPMENT COMPANY
11411 NE 124TH STREET
SUITE 190
KIRKLAND, WA 98034

BENJAMIN H. ELDRIDGE
STATE OF WASHINGTON
42766
REGISTERED PROFESSIONAL ENGINEER
11/27/23

Scale: Horizontal AS SHOWN Vertical N/A

Designed JSM
Drawn DTC
Checked JSM
Approved BHE
Date 11/27/23

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 21585

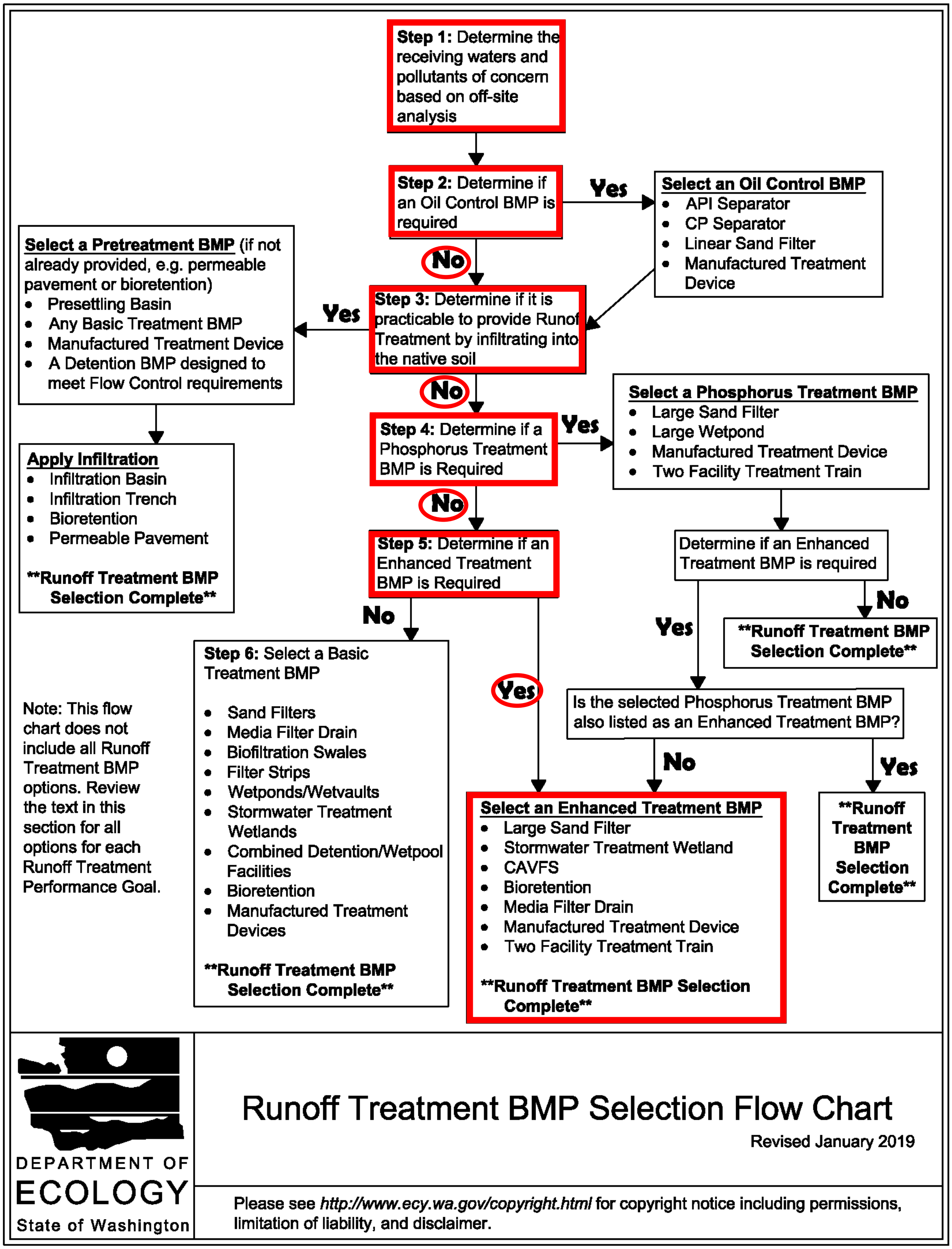
Sheet C42 of 47

\\Apollo-VM\Projects\21000s\21585\engineering\SEPA SET\21585-D.dwg 11/22/2023 3:42 PM DCASEY

RUNOFF TREATMENT BMP SELECTION FLOW CHART

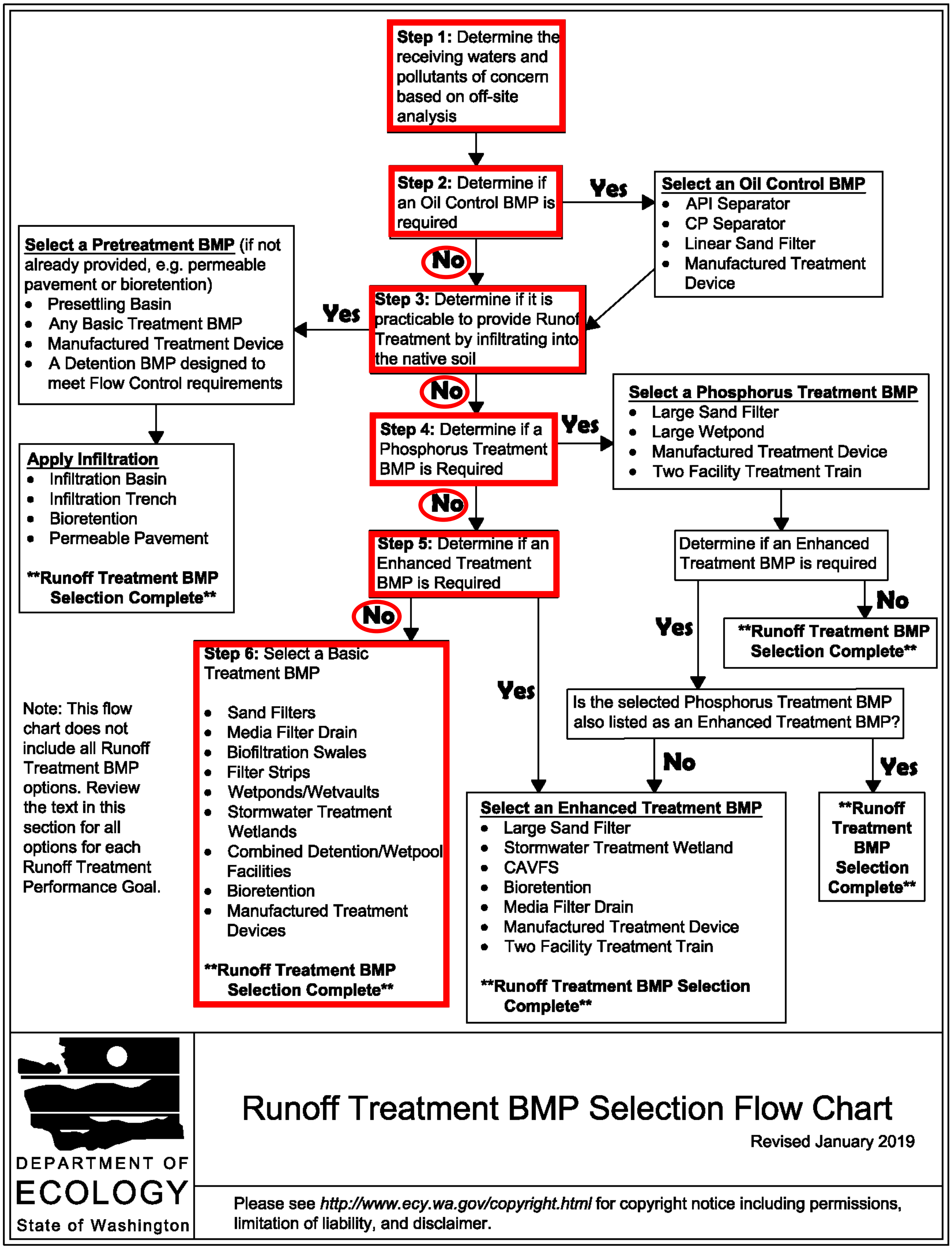
ONSITE

Figure III-1.1: Runoff Treatment BMP Selection Flow Chart



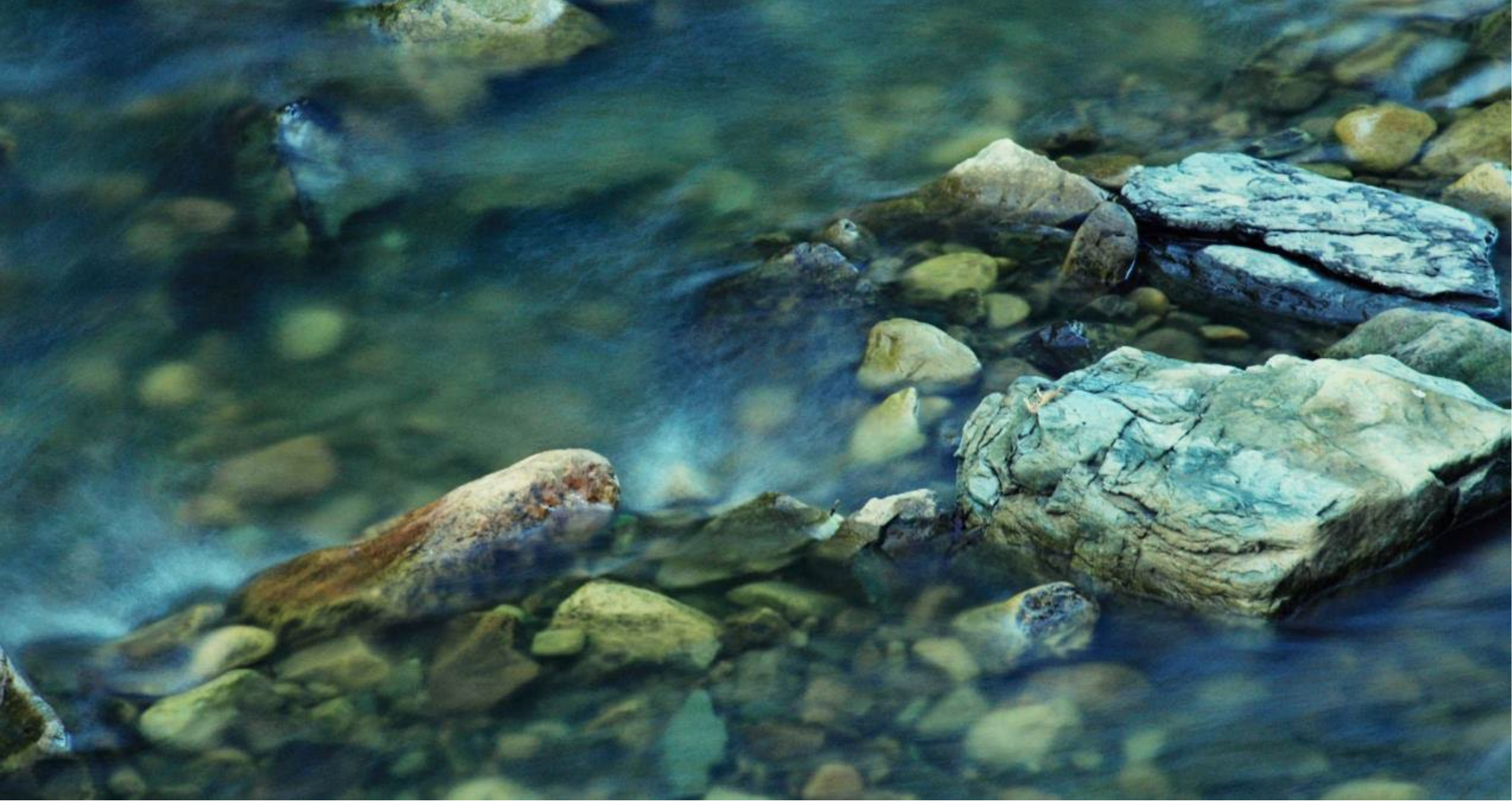
OFFSITE

Figure III-1.1: Runoff Treatment BMP Selection Flow Chart



Tab 6.0

6.0 SPECIAL REPORTS AND STUDIES



November 2023
Freeman Road Logistics

Critical Areas Report

Prepared for Vector Development Company

November 2023
Freeman Road Logistics

Critical Areas Report

Prepared for
Vector Development Company
11411 NE 124th Street
Kirkland, Washington 98034

Prepared by
Anchor QEA, LLC
1201 3rd Avenue, Suite 2600
Seattle, Washington 98101

Project Number: 212141-02.01

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TABLES

FIGURES

APPENDICES

ABBREVIATIONS

2010 Regional Supplement	*Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*
BFE	base flood elevation
BMP	best management practice
CAR	Critical Areas Report
City	City of Puyallup
DP	data plot
EC	Employment Center zoning designation
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
FRO	Freeman Road Overlay
HGM	hydrogeomorphic
I-5	Interstate 5
LM/W	Light Manufacturing/Warehousing zoning designation
NAVD88	North American Vertical Datum of 1988
NMFS	National Marine Fisheries Service
NRCS	National Resources Conservation Service
NWSA	Northwest Seaport Alliance
OBL	obligate wetland
OHWM	ordinary high water mark
PEM	palustrine emergent
PFO	palustrine forested
PHS	Priority Habitats and Species
PMC	Puyallup Municipal Code
Port	Port of Tacoma
Project	Freeman Road Logistics project
PSS	palustrine scrub-shrub
redox	redoximorphic
Third-Party Report	Third-Party Review of Critical Areas Report
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation

1 Introduction

Vector Development Company is proposing construction of two new warehouse buildings as part of the Freeman Road Logistics Project (Project), east of Freeman Road East and west of the future Washington State Department of Transportation (WSDOT) State Route 167 Completion Project. The Project includes redevelopment of 15 adjacent parcels, henceforth referred to as the Main Development Area (parcels 0420174075, 0420201040, 0420201039, 0420201045, 0420201066, 0420201101, 0420205003, 0420205017, 0420201027, 0420201052, 0420201034, 0420201036, 0420201042, 0420205004, 0420205016) in Puyallup, Washington. Five other parcels will support the development through transportation or utility improvements (0420201104, 0420201008, 0420201114, 0420201115, and 0420174032), henceforth referred to as the Transportation and Utility parcels. A vicinity map is shown in Figure 1, and an aerial photograph of existing conditions at the Study Area, which includes the WSDOT-owned parcels and Transportation and Utility parcels is shown in Figure 2.

The proposed development would include two warehouses, associated utilities, vehicle and truck parking and maneuvering space, widening of access roads, stormwater management, landscaping, and improvements along Freeman Road East (Appendix A). The Project has been designed to be consistent with local regulations.

This Critical Areas Report (CAR) has been prepared by Anchor QEA, LLC, scientists to support the local permitting and land use review of the Project. The CAR evaluates the presence of critical areas within the Main Development Area and potential impacts to existing critical areas and associated regulated buffers, as defined in the City of Puyallup (City) Municipal Code (PMC) Chapter 21 (City of Puyallup 2023a). The format of this CAR has been prepared consistent with PMC 21.06. Critical areas regulated under PMC Chapter 21 include wetlands, streams, fish and wildlife habitat conservation areas, frequently flooded areas, and minor lakes.

Anchor QEA scientists gathered and reviewed existing information consistent with PMC Chapter 21 to identify and assess existing critical areas. To support this review, Anchor QEA biologists performed critical areas site visits to the Study Area on April 1 and September 28, 2021; March 11, 2022; and May 19, 2023. The information provided in this CAR has been prepared by professional biologists using the best available science to provide an accurate evaluation of critical areas and potential impacts.

1.1 Review of Existing Information

As part of the analysis to identify critical areas, Anchor QEA biologists reviewed the following sources of information to support field observations:

- PMC (City of Puyallup 2023a)

- City of Puyallup GIS Portal Wetland and Stream Maps (City of Puyallup 2023b)
- Fife Municipal Code (City of Fife 2023)
- Pierce County PublicGIS Interactive Mapping Tool (Pierce County 2023a)
- U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey (USDA 2023)
- National Marine Fisheries Service (NMFS) Endangered Species Act (ESA) status reviews and listing information (NMFS 2023)
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory Wetlands Mapper (USFWS 2023a)
- USFWS ESA Status Reviews and Listing Information (USFWS 2023b)
- Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) Maps (WDFW 2023a)
- WDFW SalmonScape Mapping System (WDFW 2023b)
- Aerial photographs publicly available
- Third-Party Review of Critical Areas Report (Third-Party Report) produced by Confluence Environmental Group (2022)

1.2 Qualifications

This CAR was prepared following site visits conducted by Anchor QEA on the following dates:

- April 1, 2021
- September 28, 2021
- March 11, 2022
- May 19, 2023

Personnel who contributed to the surveys and preparation of this CAR are listed as follows:

- Calvin Douglas: Former Anchor QEA Wetland Scientist, now working as a Senior Ecologist at Confluence Environmental Company. Responsible for 2021 and 2022 field investigations and reporting; BS Wildlife Biology, University of Washington; Pierce County Certified Wetland Scientist and Wildlife Biologist; Qualified Senior Writer for Biological Assessment, WSDOT, through 2024.
- Laura Caron: Former Anchor QEA Natural Resource Scientist now working as a Fisheries and Wetlands Biologist at WSDOT. Responsible for 2021 and 2022 field investigations and reporting; BA Environmental Studies and Geology, University of Colorado; MNRS Natural Resource Management and Ecological Restoration, Colorado State University; Certified Wetland Delineator, USACE; Certified Wetland Rater, Washington State Department of Ecology (Ecology); Qualified Junior Author for Biological Assessment, WSDOT, through 2028; Qualified Biologist for Preliminary Hydraulic Stream Design and Restoration, WSDOT.

- Jakob Rowny: Anchor QEA Senior Wetland Biologist and Environmental Scientist responsible for 2023 field investigation and reporting; BS Ecology and Evolutionary Biology, University of California; MS Environmental Sciences and Engineering, University of North Carolina; Pierce County Certified Wetland Scientist, 8 years of wetland delineation, categorization, and critical area assessment and reporting experience in Washington State and Oregon.
- Hannah Fotherby: Anchor QEA Wetland Biologist supporting 2023 field investigation and reporting; BA Environmental Studies, University of Washington; MS Restoration Ecology, University of Washington, Pierce County Certified Wetland Scientist.
- Josh Jensen: Anchor QEA Senior Managing Planner responsible for field oversight and code compliance; BS Economics and Environmental Studies, Western Washington University; MEM, Duke University.
- Dan Berlin, PWS: Anchor QEA Principal Scientist responsible for directing and reviewing all field work and documentation; BA Biology, Kalamazoo College; MEM Wetland Science, Duke University.

2 Project Purpose and Need

2.1 Project Purpose

The overall purpose of the Project is to provide 490,000 square feet of warehouse capacity and logistical support for receiving and distribution. The Project is intended to use existing and planned transportation infrastructure, including the WSDOT State Route 167 Completion Project, a portion of which is located just east of the Main Development Area, and includes construction of 4 miles of new highway between Meridian Avenue and I-5 and several new interchanges. The State Route 167 Completion Project will provide east-west linkages between the Port of Tacoma (Port) and manufacturing and industrial areas in Pierce County and will improve overall regional mobility by reducing congestion on surrounding local roads and highways.

The Project is also intended to use the nearby Pierce County Canyon Road Regional Connection Project that will extend Canyon Road East from Pioneer Way East to 70th Avenue East in Fife by constructing a new bridge across the Puyallup River. This Project will also improve regional mobility by providing freight haulers and other traffic faster, safer, and more direct access to State Route 167, I-5, and Port facilities.

The Project is situated in an area that was recently rezoned to support the planned receiving and distribution use by the City, as documented in the Freeman Road Comprehensive Plan Map Amendment, Case Number L-20-0001, and the Freeman Road Overlay (FRO), which was adopted by City Ordinance No 3278, passed June 27, 2023. The Freeman Road Comprehensive Plan Map Amendment and FRO annexed and provided Light Manufacturing/Warehousing (LM/W) zoning for 11 previously unincorporated parcels east of Freeman Road East and west of the WSDOT State Route 167 Completion Project. The proposed Project layout satisfies City requirements and achieves the applicant's purpose of providing additional warehouse capacity and logistical support in an area zoned for those uses and will be consistent with current and anticipated future land uses of the surrounding areas.

In the context of Pierce County and WSDOT projects—and the City's goals of bolstering a vibrant local economy by supporting land supply for business opportunities, and providing a safe, livable, and healthy community—the Project purpose provides an appropriate land use solution. The Project will create safer neighborhoods by separating truck activity away from residential uses, support the local economy by providing well-paying jobs, and protect and enhance environmental functions and values as part of the Project.

2.2 Project Need

The overall need of the Project is to address an existing shortage of receiving and distribution facilities east of Tacoma, which is expected to be more significant considering projected growth in the region and associated shipping though the Port and other regional ports. The Northwest Seaport Alliance (NWSA), which includes Port shipping activities, is one of the largest marine cargo gateways in the United States. More than 3.7 million 20-foot equivalent units carrying 26.1 million metric tons of containerized cargo were handled at NWSA facilities (NWSA 2019). Shipping at the Port is anticipated to increase above pre-pandemic tonnages and will continue to be a primary driver of the regional economy (Pierce County 2023b). To support this growing demand for shipping and distribution, the U.S. Army Corps of Engineers (USACE) and NWSA plan to deepen the Port's Blair Waterway, which will allow extra-large container ships access to the Port. The Port is also planning future redevelopment to support economic growth, job creation, and trade, including several cleanup projects, completion of habitat and wetland mitigation bank projects, and ongoing maintenance and improvements to stormwater systems and Port-specific infrastructure such as dock, pier, and fender system upgrades (Port 2023).

The Freeman Road Logistics Project is designed to provide needed warehouse capacity and logistical receiving and distribution support in an area that is regionally important to continued economic growth and resiliency. The rezone of the properties within the Main Development Area acknowledges the need for more warehouse and logistical projects within the City, as described in the City's Freeman Road Comprehensive Plan Map Amendment and FRO. The design elements and standards included in the Freeman Road Comprehensive Plan Map Amendment and FRO were developed through a multiyear, multi-stakeholder planning process to achieve appropriate land use zoning for the area, provide high-quality amenities, support regional transportation, water, sewer, and stormwater infrastructure, and include reasonable setbacks for the neighborhood residents to retain the aesthetic character of the area and improve the safety of residents and visitors.

While meeting the specific purpose and need of the Project by supplying improved warehousing capacity and logistical support in the area, the Project is expected to result in no net loss of ecological function to the critical areas evaluated in this report. The Project will comply with federal, state, and local regulations that require mitigation for unavoidable net adverse impacts to fish and wildlife species that rely on highly functioning shoreline, stream, and wetland areas.

3 Study Area Description

The Study Area of this CAR encompasses 92.26 acres and is composed of the following sections (Figure 2):

- The Main Development Area, which is made up of the 15 adjacent parcels where the Project is located and encompasses 24.04 acres
- The Transportation and Utility parcels, which are the two undeveloped parcels located south of the Main Development Area in the City of Puyallup (parcels 0420201008 and 0420201114) and the two parcels located west of the Main Development Area and Freeman Road East and in the City of Fife (parcels 0420201104 and 0420174032) that encompass 47.74 acres
- The WSDOT-owned parcels located east of the Main Development Area (parcels 0420178009, 0420201110 and 0420201111) that encompass 20.48 acres

The Main Development Area is currently developed for residential and agricultural uses and consists of open lawn areas, residential housing, agricultural fields, and paved and gravel roadways. Many of the residential buildings were demolished and removed prior to Anchor QEA's May 2023 site visit. An agricultural drainage ditch is located off site on WSDOT properties, adjacent to the undeveloped northeast corner of the Main Development Area. The west boundary of the Main Development Area is bounded by Freeman Road East. Photographs of the Study Area are included in Appendix B. One wetland, Wetland A, was identified off site and one wetland, Wetland B, was identified on site. WSDOT and WDFW have provided a preliminary jurisdictional determination for the agricultural ditch, and WSDOT has provided boundary delineations and categorizations for wetlands located on their property off site to the east. Regulated buffers associated with the off-site ditch and wetland areas partially extend into the Main Development Area (per PMC 21.06). An area mapped as unverified wetland by the City of Puyallup located at Transportation and Utility parcel 0420201104 was investigated by Anchor QEA biologists in May 2023 and was determined to be an upland area.

3.1 Soils

Natural Resources Conservation Service (NRCS)-mapped soils are shown in Figure 3. The underlying soils in the Study Area consist of Sultan silt loam and Puyallup fine sandy loam, with Pilchuck fine sand mapped at the Transportation and Utility parcels to the south (USDA 2023). The NRCS Web Soil Survey (Figure 3; USDA 2023) identifies the following soil series in the vicinity of the Study Area:

- Pilchuck fine sand: This soil is very deep, excessively drained, and formed in recent sandy and gravelly alluvium on floodplains and moderate hill slopes. Pilchuck fine sand is not listed as hydric (USDA 2023b). Permeability is very fast, and it has very low water table. Typically, the surface layer to 10 inches is very dark gray fine sand and the subsurface layer to 60 inches is black and very dark gray gravelly sand.

- Puyallup fine sandy loam: This soil is very deep, well drained with high saturated hydraulic conductivity and formed in mixed recent alluvium on floodplains and low stream terraces. Puyallup fine sandy loam is not listed as hydric (USDA 2023b). Permeability is fast and it has a low water table. Typically, the surface layer to 10 inches is dark brown fine sandy loam and the subsurface layer to 60 inches is very dark grayish brown gravelly sand.
- Sultan silt loam: This soil is very deep, moderately well drained formed in recent alluvium on floodplains. Sultan silt loam is not listed as hydric (USDA 2023b). Permeability is moderately slow, and it has a moderately high water table. Typically, the surface layer to 10 inches is very dark grayish brown silt loam and the subsurface layer to 60 inches is olive gray very fine sandy loam stratified with light gray medium sand.

Table 1 summarizes the soil mapping information for the Study Area. Puyallup silt loam, Puyallup fine sandy loam, and Sultan silt loam are not classified as hydric soils. but all three include minor hydric soil inclusions.

Table 1
Soils Mapped Within the Study Area by the NRCS Web Soil Survey

Map Unit	Soil Type Name	Drainage Class	Hydrologic Soil Group[1]	Hydric Soil Rating[2]	Hydric Inclusions[3]	Approx. % of Study Area
29A	Pilchuck silt loam	Excessively drained	A	No	Yes	45%
31A	Puyallup fine sandy loam	Well drained	A	No	Yes	25%
42A	Sultan silt loam	Moderately well drained	C/D	No	Yes	30%

Notes:
1. Hydrologic soil groups are based on runoff potential according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.
   i. Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They chiefly consist of deep, well- to excessively drained sands or gravels and have a high rate of water transmission.
   ii. Group B soils have moderately low runoff potential when thoroughly wet, and water transmission through the soil is unimpeded.
   iii. Group C soils have slow infiltration rates when thoroughly wet, caused by either an underlying layer that impedes the downward movement of water or soils of moderately fine or fine texture.
   iv. Group D soils have a very slow infiltration rate (high runoff potential) when thoroughly wet and include soils consisting of clays with high shrink-swell potential, soils that have a high water table, soils that have a clay or claypan layer at or near the surface, and soils that are shallow over nearly impervious material.
2. Hydric soil rating indicates the components of soil map units that meet the criteria for hydric soils.
3. Non-hydric soils may have inclusions of hydric soil in the lower positions on the landform.

3.2 Hydrology

The Study Area is located within Water Resource Inventory Area 10, the Puyallup-White Watershed, in the Puyallup subbasin (Hydrologic Unit Code [HUC] 17110014); the Lower Puyallup River

Watershed (HUC 1711001405); and the Puyallup River Subwatershed (HUC 171100140502; Ecology 2023). Hydrologic characteristics within the property are influenced primarily by local precipitation, surface water runoff, and a high groundwater table, the areas that drain to the Puyallup River, which originates on Mount Rainier, and Wapato Creek, which is located several thousand feet to the north.

No stream channels or seeps were identified within the Study Area. One wetland, Wetland A was identified to the south of the Main Development Area at parcels 0420201008 and 0420201114. During our March 2022 field investigation, a small, disturbed area containing ponded water approximately 3 inches deep was identified at the east side of parcel 0420174075. This area has since been delineated and categorized as a Category III wetland (Wetland B; Section 4.2.2). WDFW PHS and SalmonScape data do not identify any freshwater surface stream channels to the Puyallup River or Wapato Creek within the Study Area (WDFW 2023a, 2023b).

3.3 Plant Communities

Some undisturbed native vegetation communities are located within the Study Area, but most of the vegetation is composed of open lawn areas, residential homes, grazing pastures, and paved and gravel roads, with small patches of planted native and ornamental trees and shrubs. The majority of the plantings are shrubs and ground cover species, which appear to receive regular maintenance. Areas of native vegetation are present within the southern portion of the Study Area. Photographs of the Study Area are included in Appendix B. Existing plant species within the Study Area are described in Section 3.4.1.

The Pierce County critical area maps (Figure 4; Pierce County 2023a), USFWS National Wetlands Inventory Wetlands Mapper (Figure 5; USFWS 2023a), and City wetland and stream maps (Figure 5; City of Puyallup 2023b) do not identify any freshwater wetland habitat within the Main Development Area (see Figures 5, 6, and 7). Anchor QEA biologists did not identify any freshwater wetlands in the Main Development Area during the field investigation in October 2021. During our March 2022 field investigation, Anchor QEA biologists identified and delineated Wetland B in a disturbed area at the east side of parcel 0420174075. Wetland B has since been rated as a Category III emergent, depressional wetland. Additional wetlands information is provided in Section 4.2. Buffers in association with the off-site wetlands and ditch in the WSDOT right-of-way are depicted in Figure 6.

4 Critical Areas Assessment

This section describes and assesses critical areas within and near the Study Area as defined per PMC Chapter 21 (City of Puyallup 2023a) including wetlands, streams, fish and wildlife habitat conservation areas, and frequently flooded areas.

4.1 Methods

To document and describe wetlands, streams, fish and wildlife habitat conservation areas, and frequently flooded areas within the Study Area, Anchor QEA reviewed existing information (Section 1.1) and performed an aerial photograph assessment. Anchor QEA biologists performed critical areas site visits to the Study Area on April 1 and September 28, 2021, March 11, 2022, and May 19, 2023, as part of the analysis for the Project. The entire Study Area was accessible during the investigation. During the site visits, Anchor QEA biologists documented general information regarding habitats and dominant plant species and communities. Potential wetland features were evaluated according to methods presented in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987); the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (2010 Regional Supplement; USACE 2010); and *Field Indicators of Hydric Soils in the United States: A Guide for Identifying and Delineating Hydric Soils, Version 8.1, 2017* (USDA and NRCS 2016). Soil colors were classified by their numerical description as identified on a *Munsell Soil Color Chart* (Munsell 2000).

The ordinary high water mark (OHWM) of the agricultural ditches—located outside of the Study Area to the east—was not delineated during the site visits. Additional information about the off-site ditches was provided by WSDOT consultants (Herrera 2022). All wildlife species, tracks, and other signs observed during the site visits were documented. These observations were qualitative; no quantitative wildlife surveys were performed. Photographs taken to document vegetation and habitat conditions are included in Appendix B.

This CAR evaluates terrestrial and aquatic habitats and plant communities based on physical observations. Existing information described in WDFW-documented species and priority habitats and ESA-listed species and critical habitats, within and near the Study Area, are also evaluated.

4.2 Wetlands

4.2.1 Main Development Area

One on-site wetland (Wetland B) was identified by Anchor QEA biologists at the east side of parcel 0420174075 and within the Main Development Area during the September 2021 and March 2022 site visits and categorized following the May 2023 site visit. Wetland data sheets for three data plots (DPs) explored during the September 2021 and March 2022 site visits are provided in Appendix C. At

DP-9, located at the center and at the lowest elevation of Wetland B, hydric soil and wetland hydrology were identified, but the area had no vegetation. However, during Anchor QEA's May 2023 site visit, it was observed that the previously unvegetated area had been recolonized by typical pasture grasses and other locally common emergent species.

Wetland conditions in this area are not documented by the City sensitive areas maps (City of Puyallup 2023b), Pierce County critical area maps (Figure 4; Pierce County 2023a), USFWS National Wetlands Inventory data (Figure 5; USFWS 2023a), or WDFW PHS data (WDFW 2023a), and do not identify wetland areas within at least 1,500 feet of the Study Area, except to the south of 19th Avenue Northwest at parcels 0420201008 and 0420201114.

Wetland B was previously thought to be regulated as an artificial wetland, based on excavation conducted by the previous landowner prior to the sale in November 2021. While the excavation was intentional, the creation of wetland conditions was not intentional. Ecology has determined that Wetland B will not be treated as an artificial wetland and is therefore regulated by state and local protections. A jurisdictional determination request has been made to USACE. The decision is pending, but the wetland is not expected to be jurisdictional under the Clean Water Act because it has no surface water connection to other known waters of the United States, meaning no permit from USACE is required to fill Wetland B.

4.2.2 Transportation and Utility Parcels 0420201008 and 0420201114

Transportation and Utility parcels 0420201008 and 0420201114 located south of 19th Avenue Northwest and east of Freeman Road East contain Wetland A and associated buffers (Figure 7. These buffers do not extend onto the Main Development Area north of 19th Avenue Northwest or west of Freeman Road East, because the buffer area is interrupted by the existing 19th Avenue Northwest and Freeman Road East roadways. Regulatory buffers only occur on the same side of an existing roadway as the wetland and do not extend to the opposite side from the sensitive area. However, sewer and water lines will be installed in an easement just south of 19th Avenue Northwest that extends to the east to Freeman Road East. During the March 2022 and May 2023 site investigations, Anchor QEA conducted additional wetland delineation work at Wetland A located south of 19th Avenue Northwest to confirm the utility easement would not extend into the wetland or buffer area. Anchor QEA findings were recorded in six Wetland Determination Data Forms, and a preliminary rating is provided in Appendix C. The wetland delineation is depicted in Figure 7. Off-site Wetland A buffers will be avoided during construction of sewer and water utilities.

4.2.3 Transportation and Utility Parcel 0420201104

During the May 2023 site investigation, the full extent of Transportation and Utility parcel 040201104 was walked by Anchor QEA biologists, and wetland conditions were not observed. Vegetation at Transportation and Utility parcel 040201104 is dominated by black cottonwood (*Populus* *balsamifera*), common snowberry (*Symphoricarpos albus*), osoberry (*Oemleria cerasiformis*), stinging nettle (*Urtica dioica*), Himalayan blackberry (*Rubus armeniacus*), and Japanese knotweed (*Reynoutria japonica*). Although the City of Fife maps no wetlands on this parcel, the City maps a small low-lying portion near the southwest corner of parcel 040201104 as an unverified wetland (City of Puyallup 2023b). Anchor QEA biologists established a DP at this location and determined that hydrophytic vegetation was present, but that hydric soils and wetland hydrology were absent, and that the area is not a wetland. A Wetland Determination Data Form for this location is included in Appendix C, and Site Photography is provided in Appendix B.

4.2.4 Transportation and Utility Parcel 0420174032

The Third-Party Report also indicates an additional off-site wetland located to the northwest of the Main Development Area on the western edge of Freeman Road East at parcel 0420174032. Because Anchor QEA did not have permission to access the property, no delineation or rating information is provided in this report. A review of historical aerial imagery and observations from Freeman Road East made during the March 2022 and May 2023 site investigations support the likely presence of wetlands at this location. The wetlands may cover much of the central portion of the parcel, and it likely has PM1C and PSS1C Cowardin components. Any wetland buffers associated with this wetland are interrupted by Freeman Road East, which lies between the off-site wetland and the Main Development Area.

4.2.5 WSDOT-Owned Parcels 0420178009, 0420201110, and 0420201111

WSDOT provided documentation that show three off-site wetlands, identified as Wetland 87, Wetland 89 and Wetland 93, located to the east and northeast of the Main Development Area at parcels 0420178009, 0420201110, and 0420201111 and within the WSDOT right-of-way (Herrera 2022; Figure 6). Wetland 87 is located east of Main Development Area parcel 0420205016 on WSDOT-owned parcel 0420201110. Wetland 89 is located on WSDOT-owned parcel 0420201111 and is about 300 feet directly east of Main Development Area parcel 0420201027. Wetland 93 is an emergent wetland within an agricultural field located northeast of Main Development Area parcel 0420174075 and covers much of WSDOT-owned parcel 0420178009. Preliminary rating and buffer information for Wetlands 87, 89, and 93 is provided in Section 5.2.3.

4.3 Streams

No streams, drainage channels, seeps, or associated riparian habitats were observed by Anchor QEA biologists within the Main Development Area during the 2021, 2022, and 2023 site visits. Additionally, WDFW PHS data (WDFW 2023a), SalmonScape data (WDFW 2023b), and City sensitive areas maps (City of Puyallup 2023b) do not identify any stream channels within 2,000 feet of the Study Area. Pierce County critical area maps (Pierce County 2023a) identify Wapato Creek north of the Study Area and the Puyallup River south of the Main Development Area, but they are not located within the Study Area and will not be affected by the Project.

Two streams (Streams 14 and 15) are located adjacent to the Main Development Area. They appear to be artificially created linear features that join off site to the east of parcel 0420174075. Our review of the preliminary WSDOT State Route 167 Completion Project critical area assessment indicates that Streams 14 and 15 will be regulated as Type III streams protected by 50-foot-wide buffers, per PMC Chapter 21 (City of Puyallup 2023a), which will partially project onto parcel 0420174075 and 0420205016. For the purposes of this assessment, a 50-foot-wide stream buffer has been applied to the off-site Streams 14 and 15.

The City indicated in previous comments that a potential stream or ditch was present along the west side of Freeman Road on or adjacent to parcel 0420174032. During the May 2023 site visit, Anchor QEA biologists inspected this area and found no evidence of an OHWM or other indicators that suggested the presence of flowing water along the road. The area includes a narrow swale at lower elevation, but this does not qualify as a stream.

4.4 Fish and Wildlife Habitat Conservation Areas

Per PMC 21.06.210 fish and wildlife habitat conservation areas are areas that serve a critical role in sustaining needed habitats and species for the functional integrity of the ecosystem, and which, if altered, may reduce the likelihood that the species will persist over the long term. These areas may include, but are not limited to, rare or vulnerable ecological systems, communities, and habitat or habitat elements including seasonal ranges, breeding habitat, winter range, and movement corridors, and areas with high relative population density or species richness. These areas also include locally important habitats and species as determined by the City. These areas do not include such artificial features or constructs as irrigation delivery systems, irrigation infrastructure, irrigation canals, or drainage ditches that lie within the boundaries of and are maintained by a port district or an irrigation district, unless these features are documented as being used by salmonids for habitat.

4.4.1 Streams

Streams 14 and 15 are located outside of the Main Development Area off site to the north, east, and southeast of parcel 0420174075. The preliminary WSDOT State Route 167 Completion Project critical area assessment indicates that Streams 14 and 15 are degraded ditches with poor riparian buffer conditions that convey water through off-site WSDOT-owned parcels 0420201111, 0420201110, and 0420178009 from the southeast to the northwest. Instream conditions in Streams 14 and 15 are poor with a lack of channel complexity and substrate dominated by mud and silt. WDFW fish passage data indicates that a culvert crossing beneath Freeman Road East about 650 feet downstream of Streams 14 and 15 prevents fish passage onto the WSDOT-owned parcels in the vicinity of the Study Area (Herrera 2022, WDFW 2021). The preliminary WSDOT State Route 167 Completion Project critical area assessment indicates that Streams 14 and 15 are Type III and are protected by a standard 50-foot-wide buffer per PMC 21.06.1050. A 3,447-square-foot portion of Stream 14 and 15 buffers extends onto the Main Development Area parcel 0420174075 and 0420205016.

4.4.2 Vegetation

Some undisturbed native vegetation communities are located within the Study Area. Areas of native vegetation occur east and south of the Main Development Area. Native plant species observed include black cottonwood (*Populus balsamifera*), red alder (*Alnus rubra*), red osier dogwood (*Cornus sericea*), Oregon ash (*Fraxinus latifolia*), Pacific crabapple (*Malus fusca*), common snowberry (*Symphoricarpos albus*), Nootka rose (*Rosa nutkana*), salal (*Gaultheria shallon*), northern bracken fern (*Pteridium aquilinum*), and field horsetail (*Equisetum arvense*). Many invasive species or noxious weeds were also noted as present, including include English ivy (*Hedera helix*), English holly *(Ilex aquifolium*), Himalayan blackberry (*Rubus armeniacus*), evergreen blackberry (*Rubus laciniatus*), Canada thistle (*Cirsium arvense*), and reed canary grass *(Phalarais arundinacea*).

Areas located west of the fence line in the agricultural pastures included varieties of *Agrostis* and *Fescue* grasses, which appeared to be regularly mowed or were previously grazed by sheep and llamas. Photographs of vegetation in the Study Area are included in Appendix B.

4.4.3 Wildlife and Habitat

The majority of the Study Area includes a managed landscape with mowed grass and ornamental vegetation. Potential habitat is limited to the small patches of native vegetation along the eastern and southern property boundaries. Wildlife use of the terrestrial habitat is likely dominated by disturbance-tolerant species typical of urban areas. Habitat surrounding the Study Area includes fragmented and disturbed areas associated with residential and industrial development. Wildlife species observed during the site visits included bird species common in urban areas of Pierce County, including crows (*Corvus brachyrhynchos*), house sparrows (*Passer domesticus*), and gull species (*Larus* spp.). No amphibian, reptile, or mammal species; tracks or other signs were observed during the site visits.

The Study Area hydrology provides limited habitat for aquatic species. The habitat within Wetland B and Streams 14 and 15 located on the WSDOT-owned parcels east of the Main Development Area are dominated by shallow standing water with little to no noticeable flow and degraded riparian areas and do not provide habitat for salmonid species due to a downstream culvert crossing at Freeman Road East that blocks fish passage further upstream.

Streams 14 and 15 are regulated as Type III streams because they are not used by anadromous fish (no fish species have been documented in the streams; Herrera 2022; WDFW 2021) and it is wider than 2 feet. According to PMC 21.06.1050, Type III, streams require buffers 50 feet.

4.4.4 Priority Species and Habitats

The WDFW PHS data (WDFW 2023a) do not document occurrences of any terrestrial species or priority habitats in the Study Area. No fish species have been documented in off-site Streams 14 and 15 according to the WDFW PHS and SalmonScape (WDFW 2023b) websites.

4.4.4.1 ESA-Listed Species and Critical Habitat

The assessment for ESA-listed species and critical habitats for this Project was performed based on data provided for the Study Area. The following subsections describe ESA-listed species and critical habitats that may occur in the vicinity of the Study Area.

ESA-listed species and critical habitats under NMFS and USFWS jurisdiction in Western Washington are referenced on the agencies' websites. NMFS identifies ESA-listed species that occur or may occur within a broad geographic area, such as an evolutionarily significant unit or a distinct population segment, rather than a project-specific location (NMFS 2023). The USFWS identifies ESA-listed species that occur or may occur within a specific location where a project is proposed (USFWS 2023b).

4.4.4.2 Federally Listed Species That May Occur in the Study Area

The September 2023 status of federally listed species and critical habitats protected under the ESA that occur or may occur within the Study Area is presented in Table 2. As shown in Table 2, three ESA-listed bird species occur or may occur within the Study Area. One ESA candidate insect species is identified as potentially occurring within the Study Area. Four ESA-listed fish species are present in the nearby Puyallup River: steelhead trout (*Oncorhynchus mykiss*), Chinook salmon (*O. tshawytscha*), bull trout (*Salvelinus confluentus*), and Dolly Varden (*S. malma*). All four have designated critical habitat in the Puyallup River. However, these species do not occur or are very unlikely to occur in the Study Area based on the species' life history and habitat requirements. No ESA-listed plant or mammal species are identified as potentially occurring within the Study Area. Fish species listed in Table 2 are located within the Puyallup River but not in off-site Streams 14 and 15. These species would not be susceptible to impacts related to construction, as no in-water work is proposed, but they are relevant considering the Project is located within the Puyallup River floodplain.

Table 2
Federally Listed Species That May Occur in Study Area

Species	Status	Agency	Critical Habitat
Birds			
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	USFWS	Designated (does not include Study Area)
Streaked horned lark (*Eremophila alpestris strigata*)	Threatened	USFWS	Designated (does not include Study Area)
Yellow-billed cuckoo (*Cocczyus americanus*)	Threatened	USFWS	Designated (does not include Study Area)
Insects			
Monarch butterfly (*Danaus plexippus*)	Candidate	USFWS	Not designated
Fish			
Steelhead trout (*Oncorhynchus mykiss*)	Threatened	NMFS	Designated – Puyallup River
Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	NMFS	Designated – Puyallup River
Bull trout (*Salvelinus malma/S. confluentus*)	Threatened	USFWS	Designated – Puyallup River
Dolly Varden (*S. malma/S. confluentus*)	Threatened	USFWS	Designated – Puyallup River

Marbled murrelets are more commonly associated with marine habitat instead of the freshwater habitat in the Study Area. The urbanized and industrial areas within the Study Area are unfavorable to marbled murrelets, streaked horned larks, and yellow-billed cuckoos.

4.5 Special Flood Hazard Areas

The Puyallup River flows approximately 1,200 feet south of the Main Development Area, south of North Levee Road East. The Study Area is located within the 100-year floodplain of the Puyallup River within FEMA Flood Zone AE (FEMA 1999). The base flood elevation (BFE) for the Puyallup River is 33 feet North American Vertical Datum of 1988 (NAVD88); however, the levee along North Levee Road East is not officially certified, meaning the floodplain is mapped as extending onto the Study Area. Per PMC 21.07, the floodplain within the Study Area is a special flood hazard area and a habitat assessment has been prepared by a qualified professional to evaluate the effects and/or indirect effects of the proposed development (during both construction and operation) on floodplain functions. Section 6.3 of this report includes this assessment and documents that the proposed development will not result in impacts to any species listed as threatened or endangered under the ESA.

5 Wetland Delineation

Anchor QEA wetland scientists performed wetland delineation field work on March 11, 2022, and May 19, 2023. One wetland was delineated off-site: Wetland A, a Category III emergent, scrub-shrub and forested depressional wetland located to the south of 19th Avenue Northwest. One wetland was delineated on site: Wetland B, a Category III emergent depressional wetland located on the eastern portion of parcel 0420174075. Following our review of the Third-Party Report, we also identified four other off-site wetlands, with three delineated on the WSDOT-owned properties to the east and one possible, unstudied wetland located to the west of Freeman Road East. Figure 6 provides a preliminary depiction of the off-site wetlands and how their anticipated buffers may extend onto the eastern side of the Study Area. The possible wetland located to the west of Freeman Road East is not discussed further because it has not been delineated or categorized, and because any associated buffer is interrupted by the existing Freeman Road East roadway.

The following sections describe the methodology and results of the wetland delineation. Critical areas figures are attached to this CAR, including wetland delineation results in Figures 6 and 7. Site photos are included in Appendix B, wetland determination data forms and wetland rating forms are provided in Appendix C.

5.1 Methodology

This section describes the methodology used to perform the wetland delineation, including a review of existing information and field investigation procedures. These methods are consistent with current federal and state agency requirements, as well as local jurisdiction requirements, for performing wetland delineations and identifying protective wetland buffer widths.

Field work was conducted according to methods presented in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987); 2010 Regional Supplement (USACE 2010); and *Field Indicators of Hydric Soils in the United States: A Guide for Identifying and Delineating Hydric Soils, Version 8.1, 2017* (USDA and NRCS 2016). Soil colors were classified by their numerical description as identified on a *Munsell Soil Color Chart* (Munsell 2000).

The U.S. Army Corps of Engineers defines wetlands as follows:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. (Environmental Laboratory 1987)

The method for delineating wetlands is based on the presence of three parameters: hydrophytic vegetation, hydric soils, and wetland hydrology. Hydrophytic vegetation is "the macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present" (Environmental Laboratory 1987). Hydric soils are "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Environmental Laboratory 1987). Wetland hydrology "encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface for a sufficient duration during the growing season" (Ecology 1997). Data collection methods for each of these parameters are described in the following subsections.

A total of 13 DPs were sampled and recorded. Vegetation, soils, and hydrology information were collected at each of the plots and recorded on field data sheets (Appendix C). Wetland boundaries were determined based upon plot data and visual observations of the wetland. The wetland location, wetland boundary, and DP locations were flagged and recorded by Anchor QEA wetland scientists using a Trimble Geo7x GPS unit.

5.1.1 Vegetation

Plant species occurring in each plot were recorded on field data forms, with one data form per plot. Percent cover for each plant species was estimated in the plot, and dominant plant species were identified. At each plot, trees within a 30-foot radius, shrubs and saplings within a 15-foot radius, and herb and forb species within a 5-foot radius from the center of the plot were identified and recorded. Plant indicator status was determined using the National Wetland Plant List: 2016 Wetland Ratings (Lichvar et al. 2016), and a determination was made as to whether the vegetation in the plot was hydrophytic. To meet the hydrophytic parameter, more than 50% of the dominant species, with 20% or greater cover, must have an indicator of obligate wetland (OBL), facultative wetland (FACW), or facultative (FAC). Table 3 shows the definitions for each wetland indicator status category.

Table 3
Wetland Plant Indicator Status Definitions

Indicator Status	Description
Obligate Wetland (OBL)	Plant species occur almost always in wetlands (estimated probability greater than 99%) under natural conditions.
Facultative Wetland (FACW)	Plant species usually occur in wetlands (estimated probability 67% to 99%) but are occasionally found in non-wetlands.
Facultative (FAC)	Plant species are equally likely to occur in wetlands or non-wetlands (estimated probability 34% to 66%).
Facultative Upland (FACU)	Plant species usually occur in non-wetlands (estimated probability 67% to 99%) but are occasionally found in wetlands.

Indicator Status	Description
Obligate Upland (UPL)	Plant species occur almost always in non-wetlands (estimated probability greater than 99%) under natural conditions.

Source: Reed 1988

5.1.2 Soils

Soils were sampled in each plot and evaluated for hydric soil indicators. Soil pits were dug to a depth of 18 inches, unless a restrictive layer was present. Hydric soil indicators include low soil matrix chroma, gleying, and redoximorphic (redox) features. Redox features are spots of contrasting color that occur within the soil matrix (the predominant soil color). Gleyed soils are predominantly bluish, greenish, or grayish in color.

5.1.3 Hydrology

Wetland hydrology was evaluated at each plot to determine whether it "encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface for a sufficient duration during the growing season" (Ecology 1997). Field observations of saturation, inundation, and other indicators of wetland hydrology, such as water-stained leaves and drainage patterns in wetlands, were recorded.

5.1.4 Wetland Community Types

Wetland community types are discussed according to the USFWS classification developed by Cowardin et al. (1979) for use in the National Wetlands Inventory (Cowardin system). This system, published in 1979 by a team of USFWS scientists led by L.M. Cowardin, bases the classification of wetlands on their physical characteristics, such as the general type of vegetation in the wetland (e.g., trees, shrubs, grass) and how much, and where, water is present in the wetland. The Cowardin system provides a classification for every known wetland type that occurs throughout the United States, and under this system a wetland can be classified as having one or more wetland community types. The community types found during this investigation included the following:

- **Palustrine emergent (PEM):** These wetlands have erect, rooted, herbaceous vegetation present for most of the growing season in most years.
- **Palustrine scrub-shrub (PSS):** These wetlands have 30% cover of woody vegetation that is less than 20 feet high.
- **Palustrine forested (PFO):** These wetlands have at least 30% cover of woody vegetation that is at least 20 feet high.

5.1.5 *Wetland Ratings*

Wetland ratings were determined using the most current version of the *Washington State Wetland Rating System for Western Washington: 2014 Update* (Washington rating system; Hruby 2014) and according to the City wetland rating criteria, as defined in the PMC. The Washington rating system was updated by Ecology as of January 1, 2015.

The system developed by Ecology is used to differentiate wetlands based on their sensitivity to disturbance, their significance in the watershed, their rarity, our ability to replace them, and the beneficial functions they provide to society. The Washington rating system requires the user to collect specific information about the wetland in a step-by-step process. Three major functions are analyzed: water quality improvement, hydrologic functions, and wildlife habitat. Ratings are based on a point system, where points are given if a wetland meets specific criteria related to the wetland's potential and opportunity to provide certain benefits.

Per the Washington rating system, wetlands are categorized according to the following criteria and associated point system where points are awarded to three functional value categories (water quality improvement, hydrologic functions, and habitat):

- **Category I wetlands** (23 or more points) represent a unique or rare wetland type, are more sensitive to disturbance, or are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime.
- **Category II wetlands** (20 to 22 points) are difficult, though not impossible, to replace and provide high levels of some functions.
- **Category III wetlands** (16 to 19 points) have moderate levels of functions. They have been disturbed in some ways and are often less diverse or more isolated from other natural resources in the landscape than Category II wetlands.
- **Category IV wetlands** (less than 16 points) have the lowest levels of functions and are often heavily disturbed.

PMC classifies wetlands into four categories (categories I, II, III, and IV) based on the Washington rating system.

5.1.6 *Wetlands Function Assessment*

The functions of wetlands were rated according to the Washington rating system. Using this system, wetlands were rated based on points awarded to three categories of functions: water quality, hydrologic functions, and wildlife habitat. Detailed scoring, based on Washington wetland rating forms, is provided in Appendix C.

5.1.7 State Hydrogeomorphic Classification System

Scientists have come to understand that wetlands can perform functions in different ways. The way a wetland functions depends to a large degree on hydrologic and geomorphic conditions. To recognize these differences among wetlands, a way to group or classify them has been developed. This classification system, called the hydrogeomorphic (HGM) classification, groups wetlands into categories based on the geomorphic and hydrologic characteristics that control many functions.

The Washington rating system incorporates the HGM classification as part of the questionnaire for characterizing a wetland's functions. The Washington rating system uses only the highest grouping in the HGM classification: wetland class. Wetland classes are based on geomorphic settings, such as riverine, slope, lake fringe, or depressional. A classification key is provided within the rating form to help identify which of the following HGM classifications apply to the wetland: riverine, depressional, slope, lake fringe, tidal fringe, or flats.

5.2 Results

Anchor QEA wetland scientists delineated one wetland (Wetland A; off site) and one wetland (Wetland B; on site) within the Study Area (Figure 7). These wetlands are summarized in Tables 4 and 5 and described in more detail in the following subsections. Site photographs showing these features are included in Appendix B. Wetland determination data forms and wetland rating forms are provided in Appendix C.

Table 4
Wetlands Delineated Within the Study Area

Wetland	Cowardin Class[1]	HGM Class	Category	Total Wetland Area	
				Square Feet	Acres
A	PEM1C, PSS1C PFO1C	Depressional	III	468,674	10.76
B	PEM1C	Depressional	III	1,218	0.03

Note

1. PEM1C: palustrine, emergent, persistent, seasonally flooded; PSS1: palustrine, scrub-shrub, persistent, seasonally flooded: PFO1C: palustrine, forested, persistent, seasonally flooded

For the Washington rating system, a low, moderate, or high rating is based on three functions: improving water quality, hydrologic, and habitat. Within each of these three functions are three subfunction categories: site potential, landscape potential, and value. Each of these subfunction categories is rated as low, moderate, or high. Wetland functions and scores for Wetland A and Wetland B using the Washington rating system are shown in Table 5. The Washington wetland rating forms are provided in Appendix C.

Table 5
Summary of Scores for Wetland Functions and Values

Wetland and Function	Improving Water Quality	Hydrologic	Habitat	Total Functions Score[1]	Washington State Rating	Puyallup Rating
Off-Site Wetland A						
Site Potential	Moderate	Moderate	Moderate	--	--	--
Landscape Potential	Moderate	High	Low	--	--	--
Value	Moderate	Moderate	Low	--	--	--
Score Based on Rating[1]	6	7	4	17	III	III
On-Site Wetland B						
Site Potential	Moderate	Moderate	Low	--	--	--
Landscape Potential	Moderate	Moderate	Low	--	--	--
Value	High	High	High	--	--	--
Score Based on Rating[1]	7	7	5	19	III	III

Notes
Potential total score per function is 9, for a potential total score of 27.

The following sections describe the wetlands identified during our field investigations and wetland delineation. The wetland is classified and rated according to the Cowardin system and the Washington rating system.

5.2.1 Wetland A

Wetland A is 10.76 acres (468,674 square feet) with PEM, PSS, and PFO vegetation classes and has a depressional HGM classification. The approximate wetland position is mapped on Pierce County's PublicGIS wetland inventory (Figure 4; Pierce County 2023a). In March 2022, Anchor QEA biologists provided an additional delineation along the northern and eastern boundaries of Wetland A (Figure 7). In May 2023, Anchor QEA biologists provided an additional delineation along the western and southern boundaries and the current extent was confirmed.

5.2.1.1 Vegetation

Wetland A is dominated by forest vegetation species such as black cottonwood (*Populus trichocarpa*; FAC), red alder (*Alnus rubra*; FAC), Oregon ash (*Fraxinus latifolia*; FACW), and red osier dogwood (*cornus sericea*; FACW), interspersed with a few patches of Himalayan blackberry (*Rubus armeniacus*; FAC). Other species found along the edge of the wetland include Sitka spruce (*Picea sitchensis*; FAC), osoberry (*Oemleria cerasiformis;* FACU), snowberry (*Symphoricarpos albus*; FACU), red current (*Ribes* *sanguineum*; FACU), salmonberry (*Rubus spectabilis*; FAC), and common ivy (*Hedera helix*; FACU). Wetland A Cowardin vegetation classes are presented in Appendix C.

Overall, the vegetation in Wetland A meets the dominance test hydrophytic vegetation indicator and satisfies the hydrophytic vegetation criteria of the 2010 Regional Supplement (USACE 2010).

5.2.1.2 Soils

Soils in Wetland A are mapped as Pilchuck fine sand, a soil type that is classified as hydric. The soils observed in Wetland A were generally dark at the surface, with a depleted matrix below and redoximorphic features increasing with depth. Upon inspection, the predominant textures were confirmed to be silt loam and sandy loam.

Overall, soil samples met the Depleted Below Dark Surface (A11) hydric soil indicator, satisfying the hydric soil criteria of the 2010 Regional Supplement.

5.2.1.3 Hydrology

Wetland hydrology was confirmed in Wetland A at two data points by surface water (A1), high water table (A2), saturation (A3), inundation visible on aerial imagery (B7), sparsely vegetated concave surface (B8), and water-stained leaves (B9). The primary water regimes of Wetland A were determined to be permanently flooded, seasonally flooded, and saturated.

5.2.1.4 Boundary Determination

The wetland and upland boundaries of Wetland A were determined by an abrupt change in topography and the presence of hydric soils, wetland hydrology, and hydrophytic vegetation. To confirm the current Wetland A extent, Anchor QEA biologists delineated the northern and eastern wetland boundaries in March 2022 and the southern and western boundaries of Wetland A were delineated in May 2023.

5.2.1.5 Wetland Functions Scores and Rating

Wetland A is rated as a Category III wetland, with a score of six for water quality functions, a score of seven for hydrologic functions, and a score of four for habitat functions. The ratings are discussed in more detail in the following sections, and the wetland rating form for Wetland A is provided in Appendix C.

5.2.1.5.1 Water Quality Functions

Wetland A has moderate functions for improving water quality based on the Washington rating system for all three components: site potential, landscape potential, and value. Contributing factors to this functional rating include that the wetland is in a depression with no surface water leaving it (no outlet), persistent ungrazed plants covering more than 50% of the wetland, the absence of septic systems within 150 feet, and the presence of a 303(d)-listed aquatic resource within the subbasin.

5.2.1.5.2 Hydrologic Functions

Wetland A has moderate, high, and moderate hydrologic functions based on the Washington rating system for site potential, landscape potential, and value, respectively. Factors that contribute to this functional rating include marks of ponding greater than 3 feet deep, intensive land uses within the subbasin, stormwater discharging directly into the wetland, and surface flooding problems in a subbasin further down-gradient from the wetland.

5.2.1.5.3 Habitat Functions

Wetland A has moderate, low, and low habitat functions based on the Washington rating system for site potential, landscape potential, and value, respectively. Factors that contribute to this functional rating include: the presence of three Cowardin plant classes and three hydroperiods; large, downed woody debris; standing snags; stable steep banks of fine material; thin-stemmed persistent plants for amphibian habitat; adjacent high land use intensity; and the lack of nearby undisturbed habitat.

5.2.2 Wetland B

Wetland B is 0.03 acre (1,218 square feet) with PEM vegetation and has a depressional HGM classification (Figure 7). The approximate wetland position is not mapped on Pierce County's PublicGIS wetland inventory (Pierce County 2023a or on the USFWS NWI (Figure 5; USFWS 2023). In May 2023, Anchor QEA biologists provided an additional delineation and confirmed the current wetland extent.

5.2.2.1 Vegetation

Wetland B is dominated by emergent vegetation species including pasture grasses (*Agrostis and Fescue species*; assumed FAC).

Overall, the vegetation in Wetland A meets the dominance test hydrophytic vegetation indicator and satisfies the hydrophytic vegetation criteria of the 2010 Regional Supplement (USACE 2010).

5.2.2.2 Soils

Soils in Wetland B are mapped as Sultan silt loam, a soil type that is not classified as hydric. The soils observed in Wetland B were found to have a depleted matrix below and redoximorphic features increasing with depth. Upon inspection, the predominant textures were confirmed to be silt loam.

Overall, soil samples met the depleted matrix (F3) hydric soil indicator, satisfying the hydric soil criteria of the 2010 Regional Supplement.

5.2.2.3 Hydrology

Wetland hydrology was confirmed in Wetland B at one data point by surface water (A1), and saturation (A3). The primary water regimes of Wetland B were determined to be seasonally flooded, and saturated. Wetland B shares no permanent or continuous connection to other surface water features.

5.2.2.4 Boundary Determination

The wetland and upland boundaries of Wetland B were determined the presence of hydric soils, wetland hydrology, and hydrophytic vegetation.

5.2.2.5 Wetland Functions Scores and Rating

Wetland B is rated as a Category III wetland, with a score of seven for water quality functions, a score of seven for hydrologic functions, and a score of five for habitat functions. The ratings are discussed in more detail in the following sections, and the wetland rating form for Wetland B is provided in Appendix C.

5.2.2.5.1 Water Quality Functions

Wetland B has moderate, moderate, and high water quality functions based on the Washington rating system for site potential, landscape potential, and value, respectively. Contributing factors to this functional rating the wetland's position within a depression with no surface water leaving it (no outlet), persistent ungrazed plants covering more than 50% of the wetland, the absence of septic systems within 150 feet, and the presence of a 303(d)-listed aquatic resources within the subbasin.

5.2.2.5.2 Hydrologic Functions

Wetland B has moderate, moderate, and high hydrologic functions based on the Washington rating system for site potential, landscape potential, and value, respectively. Factors that contribute to this functional rating include marks of ponding less than 6 inches deep, the relatively small size of the contributing basin, a lack of stormwater discharging directly into the wetland, and surface flooding problems in a subbasin immediately down-gradient from the wetland.

5.2.2.5.3 Habitat Functions

Wetland B has low, low, and high habitat functions based on the Washington rating system for site potential, landscape potential, and value, respectively. Factors that contribute to this functional rating include: the presence of a single Cowardin plant classes and two hydroperiods; the absence of downed woody debris, standing snags, stable steep banks of fine material and thin-stemmed persistent plants for amphibian habitat; low richness of plant species and interspersion of habitat, adjacent high land use intensity; and the lack of nearby undisturbed habitat.

5.2.3 WSDOT-Owned Parcel Wetlands

Three wetlands, identified as Wetland 87, Wetland 89, and Wetland 93 were delineated by WSDOT consultants on the WSDOT-owned parcels (Herrera 2022). Wetland 87 is located southwest of the confluence of Stream 14 and Stream 15 at the northeast portion of parcel 0420201110. WSDOT consultants provided Wetland 87 with a Category III rating with a habitat score of six points. Wetland 89 is located at parcel 0420201111 directly north of 17th Street Northwest. WSDOT consultants provided Wetland 89 with a Category II rating with a habitat score of five points. Wetland 93 is located north of Stream 14 and east of Stream 15 covers much of parcel 0420178009. WSDOT consultants provided Wetland 93 with a Category III rating with a habitat score of four points. Table 6 provides a summary of the off-site WSDOT wetland information.

Table 6
Off-Site WSDOT Wetlands

Wetland	Cowardin Class[1]	HGM Class	Category	Total Wetland Area	
				Square Feet	Acres
WL87	PSS, PFO	Depressional	III	2,745	0.63
WL89	PSS	Depressional	II	5,645	0.13
WL93	PEM	Depressional	III	293,494	6.74

Note:
1. PEM: palustrine, emergent wetland; PSS: palustrine, scrub-shrub wetland; PFO: palustrine, forested wetland.

For the Washington rating system, a low, moderate, or high rating is based on three functions: improving water quality, hydrologic, and habitat. Within each of these three functions are three subfunction categories: site potential, landscape potential, and value. Each of these subfunction categories is rated as low, moderate, or high. Wetland functions and scores for Wetlands 87, 89 and 93 using the Washington rating system are shown in Table 7. The Washington wetland rating forms provided by WSDOT consultants are included in Appendix C.

Table 7
Summary of Scores for WSDOT Wetland Functions and Values

Wetland and Function	Improving Water Quality	Hydrologic	Habitat	Total Functions Score[1]	Washington State Rating	Puyallup Rating
Wetland 87						
Site Potential	Moderate	Moderate	Moderate	--	--	--
Landscape Potential	Moderate	Moderate	Low	--	--	--
Value	High	Moderate	High	--	--	--
Score Based on Rating[1]	7	7	6	19	III	III
Wetland 89						
Site Potential	Moderate	Moderate	Low	--	--	--

Wetland and Function	**Improving Water Quality**	**Hydrologic**	**Habitat**	**Total Functions Score[1]**	**Washington State Rating**	**Puyallup Rating**
Landscape Potential	High	High	Low	--	--	--
Value	High	Moderate	High	--	--	--
Score Based on Rating[1]	8	7	5	20	II	II
Wetland 93						
Site Potential	Low	Moderate	Low			
Landscape Potential	High	High	Low			
Value	High	Moderate	Moderate			
Score Based on Rating[1]	7	7	4	18	III	III

Note:
Potential total score per function is 9, for a potential total score of 27.

5.3 Puyallup Wetland Buffer Guidance

Required wetland buffers have been identified according to the current PMC. PMC 21.06.930 identifies minimum protective buffer widths for wetlands based on the Ecology habitat rating score, per the Washington rating system, level of function for habitat and water quality improvement, and land use intensity.

Per PMC 21.06.930 2 (C), the minimum proposed buffer width for a Category II wetland with a high land use intensity on the upland side of the buffer, low level for habitat function (less than six points) and high level of function for water quality improvement (eight to nine points) is 100 feet, measured from the wetland boundary as delineated in the field. Therefore, the proposed buffer width for Wetland 89 is 100 feet. The Wetland 89 buffer does not project onto the Main Development Area (Figure 6).

Per PMC 21.06.930 2 (D), the minimum proposed buffer width for a Category III wetland with a habitat score of less than six points and high land use intensity on the upland side of the buffer is 80 feet, measured from the wetland boundary as delineated in the field. Therefore, the proposed buffer width for Wetland A, Wetland B, and Wetland 93 is 80 feet. However, any Wetland A buffer that may project onto the Main Development Area is interrupted by an existing roadway (19th Avenue Northwest) that lies between Wetland A and the Main Development Area. The Wetland 93 buffer partially projects onto the Main Development Area and is not interrupted by a roadway or other existing development (Figure 6).

Per PMC 21.06.930 2 (D), the minimum proposed buffer width for a Category III wetland with a moderate habitat score of six to seven points, and high land use intensity on the upland side of the buffer is 150 feet. Therefore, the proposed buffer width for Wetland 87 is 80 feet. The Wetland 87 buffer partially projects onto the Main Development Area and is not interrupted by a roadway or other existing development (Figure 6).

Table 8 provides a summary of wetland functional ratings and proposed wetland buffer widths.

Table 8
Proposed Wetland Buffer Widths

Wetland	Improving Water Quality	Habitat	Category	Buffer Width (feet)
On-Site Wetlands				
Wetland B	7	5	III	80
Off-Site Wetlands				
Wetland A	6	4	III	80
WL87	7	6	III	150
WL89	8	5	II	100
WL93	7	4	III	80

6 Critical Areas Impact Assessment

This section provides a summary of potential impacts to wetlands and to fish and wildlife habitat conservation areas.

Project construction activities will not occur in stream areas but will occur in regulated wetland and wetland buffer areas. The Project will not have measurable short-term or long-term impacts on wildlife species. Noise associated with construction activities could result in avoidance behavior by some wildlife species if they are present. However, the Main Development Area is an agricultural and residential area that experiences ongoing human disturbance. Noise levels associated with operation of the Project after construction are expected to be consistent with current ambient noise levels.

6.1 On-Site Wetlands and Off-Site Wetland Impacts

6.1.1 On-Site Wetland B Impacts

The Project proposes the total fill (1,218 square feet) of on-site Wetland B, which offers poor water quality, hydrologic, and habitat functions. No practicable alternatives exist that could avoid filling the wetland due to the size, shape, location, and extent of the wetland and the required warehouse and parking capacity, building code requirements, zoning, and other factors supporting the Project purpose and need (Section 2). A detailed description of Project screening criteria and avoidance and minimization measures are provided in Section 7. The Project proposes to provide compensatory mitigation for impacts to Wetland B through on-site stream and wetland buffer enhancement, pending further review by the City and Ecology. The Project may also qualify to purchase wetland mitigation credits from the Port of Tacoma Upper Clear Creek Mitigation Bank, which is in the same subbasin as the Main Development Area and proposed impact, pending Port review.

6.1.2 Off-Site Wetland A

Water, sewer, and natural gas line improvements are proposed to be installed outside of the Wetland A buffer along the existing 19th Avenue Northwest private drive. The design has been modified to avoid any temporary or permanent impacts to the Wetland A buffer. The proposed water line includes a 40-foot-wide public easement. The proposed sewer line includes a 20-foot-wide private easement. The proposed Puget Sound Energy gas line will have a public easement that is yet to be determined (approximately 10 feet in width). The easements will overlap such that the total utility corridor will be 40 feet wide. The easement begins near the southeast property corner on 19th Avenue Northwest, extending to the east on parcels 0420201008 and 0420201114 for about 790 feet and south for about 300 feet until it meets the O'Reilly Auto Parts property. The total Main Development Area utility easement area measures 42,513 square feet. Temporary impacts to forested areas outside of the Wetland A buffer will result from removal of black cottonwood and red alder trees, along with removal of Himalayan blackberry and a few native and red osier dogwood shrubs. Large trees within the 40-foot easement will be avoided, to the extent feasible. The easement area will be restored with a native grass seed mix.

6.1.3 Off-Site Road-Widening on Parcels 0420201104 and 0420201008

Road-widening is expected at the intersection of Freeman Road East and North Levee Road East. The intersection is planned to be widened on both the east side (parcel 0420201008) and west side of Freeman Road East (parcel 0420201104). The proposed road-widening is all well beyond the 80-foot buffer associated with Wetland A. During the May 2023 site visit, no other wetlands or wetland buffers are present within the road-widening area on parcel 0420201008. Similarly, no wetlands or wetland buffers were identified on parcel 0420201104 to the west of Freeman Road East. Therefore, no critical area impacts will occur as a result of that widening. This road-widening area is within the shoreline zone of the Puyallup River. During Project permitting, two memoranda will be prepared that describe how the proposed work is consistent with shoreline regulations, one for the City and one for the City of Fife.

6.1.4 Off-Site Road-Widening on Parcel 0420174032

Widening and improvement of off-site segments of Freeman Road East are anticipated to be required by the City north of 48th Street East, where road-widening may impact a swale along Tribal trust land. This area was assessed during the May 2023 field investigation. No OHWM was observed within the ditch, and this swale area is not a regulated stream.

6.1.5 Off-Site Wetland 87 and Wetland 93 Impacts

Approximately 1,827 square feet of the buffer for off-site Wetland 87 and 1,170 square feet of the buffer for off-site Wetland 93 extend onto Main Development Area parcel 0420205016. The two buffers partially overlap on the eastern edge of the Main Development Area. In addition, most of the on-site buffer for Wetland 93 and a portion of the on-site buffer for Wetland 87 overlap with buffers that also extend onto Main Development parcel 0420205016 from Streams 14 and 15 (Figure 6).

The on-site 1,827-square-foot portion of the buffer for Wetland 87 located at parcel 0420205016 is proposed to be averaged and relocated to the on-site area within buffers for Wetland 93 and Streams 14 and 15 located at parcel 0420174075. The entire portion of the on-site buffer for Wetland 93 and Streams 14 and 15 will also be enhanced to offset fill for Wetland B and the buffer averaging for Wetland 87. This stream and wetland buffer enhancement will consist of invasive species removal and installation of native species to improve the buffer function for off-site streams and wetlands. The proposed development has been reduced to avoid impacts to the Wetland 93 buffer, as shown in the Preliminary Site Plan Set included in Appendix A.

6.1.6 *Off-Site Wetlands 89 Impact*

No impacts to Wetland 89 or associated wetland buffers are proposed.

6.1.7 *Puyallup Oxbow Wetland and Downstream Conveyance Impacts*

The Project stormwater management design, including routing and conveyance, has not yet been selected. If stormwater is conveyed to the Puyallup Oxbow wetland, located about 1 mile west of the Main Development Area, a revised CAR will be provided. The revised CAR will incorporate additional information and an assessment of potential impacts to wetland hydroperiods, habitat, and vegetation as a result of routing stormwater from the proposed development to the Puyallup Oxbow wetland and any impacts anticipated by the final design of the stormwater conveyance channels.

6.2 On-Site Stream Buffer

Off-site Streams 14 and 15 are regulated as Type III streams and protected by 50-foot buffers, per PMC Chapter 21 (City of Puyallup 2023a), which will partially project onto parcels 0420174075 and 0420205016. A 50-foot buffer projected onto the Main Development Area results in an approximately 3,447-square-foot buffer area, with 2,5414 square feet on parcel 0420174075 and 933 square feet on parcel 0420205016. The stream buffers overlap with wetland buffers that extend onto the Main Development Area from Wetland 93 and partially from Wetland 87. Enhancement of the on-site portion of buffers from Streams 14 and 15, as well as the Wetland 93 buffer and the averaged portion of the Wetland 87 buffer, will consist of invasive species removal and installation of native species. The proposed development has been reduced to avoid impacts to this stream buffer, as shown in the Preliminary Plan Set included in Appendix A.

6.3 Special Flood Hazard Areas Habitat Assessment

The Main Development Area is located within the 100-year floodplain of the Puyallup River and within a Pierce County designated special flood hazard area. As discussed in Section 3.5, the Puyallup River flows approximately 1,200 feet south of the Main Development Area, south of North Levee Road East. The proposed Project includes construction activities within the 100-year floodplain (Appendix A). The Project will be constructed within the footprint of current low-density residential lots and agricultural fields that experience ongoing human use and disturbance from automobiles, livestock, and agricultural activities.

The BFE varies across the Main Development Area between 32 and 33.7 feet NAVD88, and the two warehouse buildings will be elevated so that the finished floor is elevated approximately 1 foot above the BFE. This will place all electrical and other equipment at least 1 foot above the BFE as well. These design features will avoid or minimize potential impacts to the floodplain, reduce the potential for inundation during flood events, and meet City requirements. The orientation of the proposed warehouses will be situated in line with one another (the northern warehouse will be within the hydraulic shadow of the southern building to align with anticipated flood flows through the property when they occur). This design is intended to minimize potential impacts on floodwater velocity.

To construct the proposed structures, a net cut of material will be achieved within the floodplain through proposed final grades and by the use of compensatory storage west of the northern building (Building A). The proposed grading will result in an increase of local floodwater storage volume. Material removed from the floodplain will be located within the same floodplain cross section and perpendicular to the flow. These mitigation measures are anticipated to result in zero net fill and will not cause any rise to the BFE within the floodplain, consistent with PMC 21.07.

The federal habitat assessment guidelines require an analysis of other potential impacts to the floodplain environment. The following includes an analysis of habitat assessment elements per the minimum habitat assessment standards:

- **Project and action area description, maps, and site plans have been provided.** See Preliminary Plan Set in Appendix A.
- **Methods of work are described.** See Preliminary Plan Set in Appendix A.
- **Projects in the Protected Area are designed to inherently avoid detrimental impacts without mitigation.** The Project is located within the footprint of residential and agricultural fields that experience ongoing human use and disturbance. The Project is designed to avoid or minimize potential detrimental impacts through the orientation of the buildings relative to flood flows, stormwater facilities, and removal of soils from other properties within the floodplain.
- **Direct and indirect impacts.** Direct impacts include minor impacts to the floodplain from construction as described in this CAR. Long-term impacts include the presence of structures within the floodplain in an area previously used for residences and agriculture. The long-term environmental benefits from the Project, including improved water quality from runoff, are anticipated to offset any potential short-term impacts from construction and operation of the facility. Indirect impacts from the Project may include improved downstream water quality in the Puyallup River and reductions in nutrient loads to the Puyallup River from runoff and during flood events.
- **Interrelated and interdependent activities.** All development impacts associated with this Project are described in this CAR. No other projects are known that would result in interrelated and interdependent activities.
- **Cumulative impacts.** Cumulative impacts are those that could result in the combination of effects from individual Project actions occurring over time. If left unmitigated, the cumulative or incremental effects of these actions have the potential to result in significant environmental impacts. The Project is located within an area characterized by residences, agricultural fields and associated structures, and industrial buildings, such as warehouses. At the time of

publication, there are no nearby projects that are anticipated to contribute to cumulative impacts. However, it is anticipated that future projects in the area would be required to conduct a separate, Project-specific environmental review, as appropriate. It is anticipated that mitigation measures implemented for each project would decrease the potential for cumulative adverse effects on the environment.

- **Other habitat assessment elements include the following:**
  - **Water quantity and quality.** As described previously, the Project is anticipated to result in a net improvement to water quality from runoff and during flood events due to the construction of stormwater facilities. During construction, stormwater control measures will be implemented to avoid or minimize potential short-term construction impacts on water quality to be shown in a Stormwater Pollution Prevention Plan and Temporary Erosion and Soil Control Plan. A Stormwater Site Plan will also be prepared, describing the stormwater control best management practices (BMPs) incorporated into the Project to meet the requirements of the City stormwater regulations. The Project will have no impact on water quantity.
  - **Flood velocities and volumes.** As described previously, the Project has been designed to accommodate flood velocities through orientation of the structures (with the north warehouse designed to be within the hydraulic shadow of south warehouse) and to align them with floodwaters. The Project will not create any rapid water runoff conditions and therefore will not impact flood flows downstream. The Project will have a negligible impact on flood volumes.
  - **Flood storage capacity.** Earthwork cuts and fills will be balanced at the site to the extent possible. The construction of improvements at the proposed stormwater facilities will provide no net loss to flood storage capacity.
  - **Riparian vegetation.** The Project is located over 1,200 feet from the Puyallup River and associated riparian buffers. No riparian vegetation will be impacted by the Project.
  - **Measures to preserve habitat forming processes.** No in-water work is proposed, and no impacts to habitat forming processes will occur from the Project; therefore, no measures to preserve habitat forming processes are proposed.
  - **Refuge from higher velocity floodwaters is provided.** The presence of the structures within the floodplain may provide limited refuge from higher velocity floodwaters. No additional measures are proposed.
  - **Spawning substrate is provided or protected.** No in-water work or work in the vicinity of salmonid spawning habitat is proposed, and no impacts to spawning substrate will occur from the Project; therefore, no spawning substrate needs to be provided by the Project.

- **No adverse effects from habitat isolation, bank armoring, channel straightening, construction effects (transport of sediment from the work area, noise, etc.), or direct effects.** No habitat isolation, bank armoring, or channel straightening is proposed as part of the Project. To avoid or minimize potential construction effects from the Project, stormwater control measures will be implemented to avoid or minimize potential construction impacts on water quality and will be shown in the Stormwater Pollution Prevention Plan and Temporary Erosion and Soil Control Plan. As described above, a Stormwater Site Plan will also be prepared describing the stormwater control BMPs incorporated into the Project to meet the requirements of the City stormwater regulations. Overall, the long-term environmental benefits from the Project, including improved water quality from runoff, are anticipated to offset any potential short-term impacts from construction and operation of the facility.

For the reasons stated above, the proposed Project may affect, but is not likely to adversely affect, listed fish NMFS species, as evaluated per the NMFS Biological Opinion for the National Flood Insurance Program (NMFS 2008), or listed USFWS species.

7 Site Selection Screening and Alternatives Analysis

7.1 Site Selection Screening Criteria

To meet the Project purpose and need described in Section 2), site selection criteria were developed to evaluate potential alternatives. The primary criterion is a site large enough to accommodate the stated purpose and need for development of a 490,000-square-foot commercial warehouse with employee parking, truck loading bays, truck parking and area for truck maneuvering within proximity to the Port and transportation infrastructure linkages. This area was selected in accordance with market demand for this product (i.e., very large commercial warehouse vacancy is low) and Pierce County's Comprehensive Plan.

In order to accommodate such a development, the property must be between 20 and 30 acres to accommodate the 490,000-square-foot warehouse building capacity and car and trailer parking to meet local codes for setbacks, off-street parking, landscaping and screening, truck movements, fire access, and trailer parking, and it must be zoned LM/W. Other site requirements include the presence of well-developed infrastructure (e.g., road network, utility systems) and a highly qualified regional labor pool to support the land use. The site must also be within 5 miles of the Port and I-5 to support efficient movement of goods with easy access via State Route 167 Completion Project or the Canyon Road Regional Connection Project. This parameter is important due to the nature of the Project. Logistics centers are intended to efficiently receive and distribute goods, and the Project location will support the applicant's intention to minimize or avoid issues with traffic concurrency and impacts to local road conditions from the added truck traffic. In addition, the site should make efficient use of lands designated for LM/W development within the City Freeman Road Comprehensive Plan Map Amendment and FRO, maximize the use of existing infrastructure, and provide jobs in the growing City and greater Pierce County area.

The Project's need to impact wetlands is related to the location of wetlands on the Main Development Area, as well as requirements for warehouse capacity, existing roads, access roads, and other infrastructure improvements required to support the proposed Project. Placement of material into wetlands is needed to facilitate the expansion and improvement of existing roadways and sidewalks; installation of stormwater, sewer and water utilities; and construction of the warehouses and associated parking and vehicle movement areas, including emergency vehicle ingress and egress.

Three sets of screening criteria were selected to evaluate potential alternatives to the proposed Project:

1. Whether or not the alternative would meet the stated Project purpose and need
2. The extent to which the alternative would avoid and minimize impacts to regulated wetlands and other waters

3. The extent to which the alternative is practicable for use for typical warehouse and/or distribution users

Each criterion is further described in the following sections.

7.2 Achievement of Project Purpose and Need

Alternatives were analyzed based on their ability to achieve the stated purpose and need for development of 490,000-square-foot warehouse capacity with employee parking, truck loading bays, and truck parking within 5 miles of the Port and I-5.

In order to achieve this purpose and need, alternative sites must meet the following screening criteria:

- Be zoned for LM/W use, or Employment Center (EC), which is the equivalent zoning designation in use by Pierce County.
- Be within 5 miles of the Port and I-5 with easy access via State Route 167 Completion Project or the Canyon Road Regional Connection Project.
- Be located in an area with a well-developed utility infrastructure, or where necessary improvements could be reasonably afforded.
- Be located in an area that can provide a highly qualified regional labor pool.
- Be able to maximize the use of lands zoned as LM/W of EC.
- Address the regional shortage of 490,000-square-foot warehouse capacity.
- Support traded-sector investments that create high-wage jobs and tax base in the City or another portion of Pierce County.

7.3 Avoidance and Minimization of Impacts

Alternatives were also analyzed based on the capacity for a viable site design to avoid and minimize impacts to any wetlands that specifically provide high ecological and societal functions. Wetlands with any of the following characteristics were considered priorities for avoidance and impact minimization:

- Wetland areas with a "high" potential and associated "high" value scores, as determined from the Washington State Wetlands Rating System – Western Washington: 2014 Update (Hruby 2014)
- Palustrine forested or scrub-shrub wetlands; mitigation for these wetlands entails a higher temporal loss of functions and values than occurs for emergent wetlands
- Riverine or slope wetlands, which are more difficult to replace in-kind than depressional wetlands
- Wetlands connected to streams or other waterways that provide habitat to native fish, ESA-listed fish, or other ESA species

- Wetlands containing special characteristics (Hruby 2014)
- Wetlands characterized by predominately native vegetation species
- Wetlands designated as locally “significant” in Pierce County code or plans
- Wetlands that provide connectivity between, or provide buffer functions to, other valuable upland or wetland habitats, either on or off site
- Any wetlands of high conservation value (WDNR 2023)
- Any designated Priority Habitat Area (WDFW 2023a)

Agriculturally degraded or artificially created wetlands were considered more easily replaced through mitigation with no issues associated with temporal loss. In situations where the quality or origin of a wetland or other water was unknown, avoidance and minimization were kept as the higher priority.

7.4 Practicability

Alternatives were analyzed based on their practicability for use by typical warehouse and logistical users. Factors considered in assessing practicability to the end user included the following general and site-specific criteria.

7.4.1 General Practicability Criteria:

- Short timeline to facility construction, with sites available for construction within 12 months being most practicable
- Readily available for warehouse development (e.g., not earmarked or restricted by designated use/zoning)
- Geometry of building shapes (i.e., rectangular, irregular, square): rectangular building shapes generally preferred for efficient interior layout
- Topography of the site (e.g., flat, rolling, sloped) and presence of natural resource constraints (e.g., wetlands or streams): flat sites without wetlands or stream constraints are generally preferred due to a limited ability to incorporate changes in finished floor elevations in warehouse facilities

7.4.2 Site-Specific Practicability Criteria

- Percent building coverage of site: building coverage of between 30% and 50% is targeted for warehouse/distribution facilities depending on the size of the lot
- Ratio of parking spaces to site size and resultant number of parking spaces: minimum “market” parking requirements of 1.0 employee parking space per 3,000 square feet of building and an equal number of truck parking stalls as truck bays are desired by warehouse/distribution facilities

- Capacity of site to support loading, service, and storage requirements of typical warehouse/distribution facility users: warehouse/distribution typically requires access by large trucks

7.5 Alternatives Analysis

Four potential alternatives were identified for the proposed warehouse and logistics development including a “no action” option. Each of these alternatives is discussed in the following sections.

7.5.1 Alternative 1: No Action

Under this alternative, the proposed Main Development Area would not be developed for warehouse and logistical uses and would continue to exist as vacant and disused grassy lots. The Project purpose and need would not be achieved with this alternative.

7.5.2 Alternative 2: Off-Site Alternatives

Under this alternative, a different site or sites would be used for the proposed Project. Potential alternative sites were evaluated through an informal parcel analysis completed by Vector Development Company using the purpose and need criteria provided in Section 2 of this CAR. Parcels were also reviewed to select potential sites that were not encumbered or characterized by any of the following:

- Ownership by a city or county division unless known to be surplus and for sale
- Ownership by a land trust or private club/organization with a mission to protect or preserve the land as open space or for public or private recreation
- Special tax status granted by enrollment in a state authorized program for open space, agriculture, or timber land

No qualifying parcels that were for sale or may potentially be for sale were identified that met the listed criteria and the purpose and need criteria.

7.5.3 Alternative 3: North-South Building Layout No 1

Alternative 3 is an on-site design that involves developing the proposed Freeman Road Logistics Main Development Area using a north-south building layout. Under this alternative, the build-out design would be adjusted so that the footprint of the northern building and associated paved parking areas would be decreased to avoid all impacts to on-site Wetland B and Wetland B buffers. The footprint would also be reduced to avoid impacts to buffers from off-site Streams 14 and 15 and Wetland 93.

Reducing the footprint to avoid impacts to buffers from off-site Streams 14 and 15 and Wetland 93 is feasible. However, total elimination of impacts to Wetland B and its buffer would require reducing the size of the north building footprint by approximately 119,955 square feet in order to retain required Freeman Road East improvements and buffer setbacks under the FRO, achieve necessary truck parking and maneuvering space, and provide required emergency vehicle ingress and egress. Alternative 3 consists of a north building footprint of approximately 119,955 square feet and a south building footprint of approximately 256,102 square feet, resulting in a total Project warehouse capacity of an approximate 376,057-square-foot warehouse capacity, which is well below the minimum 490,000-square-foot warehouse capacity threshold required to meet the applicant's purpose and need.

7.5.4 Alternative 4: North-South Building Layout No 2

Alternative 4 is an on-site design that involves developing the proposed Freeman Road Logistics Main Development Area using a north-south building layout and total fill of Wetland B. Under this alternative, the build-out design of the northern building would use the Main Development Area while retaining required Freeman Road East improvements and buffer setbacks under the FRO, achieving necessary truck parking and maneuvering space, and providing required emergency ingress and egress.

Alternative 4 would involve fill to on-site Wetland B due to the construction of the north warehouse and associated paved parking areas. This alternative would consist of a north building footprint of approximately 234,901 square feet and a south building footprint of approximately 256,102 square feet, resulting in a total Project warehouse capacity of 493,003 square feet, which is above the minimum 490,000-square-foot warehouse capacity threshold required to meet the applicant's purpose and need. Additionally, the Alternative 4 layout would meet the Project purpose by making efficient use of lands designated for LM/W uses, maximizing the use of existing infrastructure, providing additional transportation and other infrastructure improvements, and providing high-wage jobs in the growing City and Pierce County areas within 5 miles of the Port and I-5. The north-south building layout is expected to address important market demand for very large commercial warehouses and would provide one parking space for every 3,000 square feet of building, providing the parking space ratio needed for warehouse/distribution facilities of this kind.

Alternative 4 would directly impact 1,218 square feet of Wetland B, a Category III depressional wetland that contains highly degraded PEM habitat. This alternative would achieve no net loss of wetland function and would achieve a net benefit in habitat quality through the enhancement of on-site buffers for Streams 14 and 15 and Wetland 93, along with the averaged portion of the Wetland 87 buffer. Mitigation may also involve purchase of wetland mitigation credits from the nearby Port of Tacoma Upper Clear Creek Mitigation Bank, pending further discussion with regulatory agencies. The current condition of Wetland B is poor, with low native species diversity and low to moderate functions and values. These functions would be mitigated through enhancement of higher-value wetland and stream buffers on site.

7.6 Site Selection Screening and Alternatives Analysis Conclusions

Based on the alternatives analysis, Alternative 4, the north-south building layout with on-site compensatory mitigation, potentially supplemented by purchase of wetland credits from the Port of Tacoma Upper Clear Creek Mitigation Bank, would best meet the Project purpose and need. It would meet the minimum of 490,000 square feet of warehouse capacity within 5 miles of the Port and I-5 via State Route 167. Alternative 3 would not achieve a minimum 490,0000-square-foot warehouse capacity, would not maximize the appropriately zoned use of the property, and would not include any enhancements to improve habitat function on the property in place of the degraded functions associated with Wetland B. Alternative 4 would achieve a net improvement in habitat quality through the enhancement of 0.12 acre of buffer that extends onto the Main Development Area.

8 Avoidance, Minimization, and Mitigation Measures

The results of the critical area assessment identified on-site Wetland B (Category III), four off-site wetlands, (Wetland A [Category III], Wetland 87 [Category III], Wetland 89 [Category II], and Wetland 93 [Category III]), and two off-site streams (Streams 14 and 15) within the Study Area. The Project proposes the total fill (1,218 square feet) of on-site Wetland B, which offers poor water quality, hydrologic and habitat functions. The Project also proposes to complete buffer averaging for 1,827 square feet of off-site Wetland 87 buffer that extends onto the Main Development Area parcels (Section 6.1.5). The Project proposes to offset the wetland fill and the buffer averaging by providing buffer enhancement to improve wetland and stream buffer functions in 5,426 square feet of off-site Wetland 87, Wetland 93, Stream 14, and Stream 15 buffers. Mitigation may also involve the purchase of wetland mitigation credits from the nearby Port of Tacoma Upper Clear Creek Mitigation Bank, pending further discussion with regulatory agencies. Lost Wetland B functions would be mitigated through enhancement of higher-value wetland and stream buffers on site.

8.1 Mitigation Sequencing

The proposed Project requires the necessary and unavoidable fill of on-site Wetland B, located centrally on parcel 420174075. Per PMC 21.06.610, projects should first attempt to avoid impacts all together by not taking certain actions. If actions cannot be eliminated, impacts should be minimized by restraining the magnitude of an action, using different technology, or taking steps to reduce impacts. For impacts that cannot be avoided or minimized, compensation or rectification for the impact should be provided by replacing, enhancing, or providing substitute resources or environments, followed by monitoring and reduction of the impact over time. Mitigation sequencing, outlined under PMC 21.06.210(84), for impacts to critical areas, is as follows:

1. Avoiding an impact altogether by not taking a certain action or parts of actions
2. Minimizing impacts by limiting the degree or magnitude of an action and its implementation
3. Rectifying impacts by repairing, rehabilitating, or restoring the affected environment
4. Reducing or eliminating an impact over time by preservation and maintenance operations during the life of the action
5. Compensating for an impact by replacing or providing substitute resources or environments
6. Monitoring the mitigation and taking remedial action when necessary

As discussed in Section 7, no practicable alternatives could avoid the Wetland B impacts and still meet the Project purpose and need due to the size, shape, location, and extent of the wetland and the required warehouse and parking capacity, building code requirements, zoning, and other factors. Project avoidance, minimization, and mitigation measures included site selection screening criteria (Section 7.1), alternatives analysis (Section 7.5), and avoidance and design and construction measures (Sections 8.2 and 8.3, respectively). The Project proposes to provide compensatory mitigation for all impacts to Wetland B by enhancing on-site buffers for Streams 14 and 15 and Wetland 93, along with the averaged portion of the Wetland 87 buffer. Wetland B functions would be mitigated through enhancement of higher-value wetland and stream buffers on site. About 0.08 acre of buffer enhancement will be provided to compensate for 0.0275 acre of Wetland B impacts, corresponding to an approximate 3:1 mitigation ratio (Figure 8). Additional mitigation for Wetland B impacts may also involve purchase of wetland mitigation credits from the nearby Port of Tacoma Upper Clear Creek Mitigation Bank, pending further discussion with regulatory agencies.

8.2 Avoidance and Minimization Design Measures

The Project includes unavoidable permanent adverse impacts to all of Wetland B located on the northeast portion of parcel 0420174075 within the Main Development Area. The Project has been designed to avoid impacts to off-site Stream 14 and 15 buffers, avoid impacts to off-site Wetland 93 and associated buffers, and minimize impacts to the on-site portion of Wetland 87 buffers through buffer averaging to the extent practicable while meeting City building and zoning code requirements and meeting the criteria of the Project's stated purpose and need. Further discussion of avoidance and minimization is included in Section 7.

8.3 Avoidance and Minimization Construction Measures

Other measures to avoid and minimize impacts include the implementation of the following BMPs during construction:

- All work will be performed according to the requirements and conditions of the Project permits.
- Impacts to off-site wetlands, off-site streams, and on-site stream and wetland buffers will be minimized during construction through the use of temporary erosion and sediment control BMPs. The contractor will prepare and implement a Temporary Erosion and Sediment Control Plan and a Spill Prevention, Control, and Countermeasures Plan.
- All wash water and concrete-laden water associated with construction will be treated to meet State of Washington surface water quality standards (Chapter 173-201A Washington Administrative Code) prior to discharge into surface waterbodies. Concrete-laden water may also be removed from the site.
- All concrete will be poured in dry conditions, or within confined areas not connected to surface waters, and shall be sufficiently cured prior to contact with surface waters.
- Excess or waste materials will not be disposed of or abandoned within the wetland boundary or waterward of the OHWM or allowed to enter waters of the State.
- No petroleum products, chemicals, or other toxic or deleterious materials will be allowed to enter the wetland or surface waters.

- The contractor will be required to properly maintain construction equipment and vehicles to prevent them from leaking fuel or lubricants; if there is evidence of leakage, the further use of such equipment will be suspended until the deficiency has been corrected.
- The Project will be constructed consistent with the stormwater management design criteria outlined in the Ecology *Stormwater Management Manual for Western Washington* (2019) and the Pierce County *Stormwater Management and Site Development Manual* (2021) to reduce and control surface runoff.

8.4 Wetland 87 Buffer Averaging

PMC 21.06.970 requires that all impacts to wetland buffers be mitigated at a minimum 1:1 ratio. Additionally, PMC 21.06.930 stipulates that the standard wetland buffer widths may be averaged so long as the following criteria are met:

- The total area contained in the buffer area after averaging is no less than that which would be contained within the standard buffer.
- The buffer averaging does not reduce the functions or values of the wetland.
- The portion of the buffer subject to buffer averaging is less than 20% of the total buffer length.
- The wetland contains variations in sensitivity due to existing physical characteristics or the character of the buffer varies in slope, soils, or vegetation.
- The buffer width for Category I and II wetlands is not reduced by more than 25% of the standard width, and the buffer width of a Category III or IV wetland with moderate habitat functions (six to seven points for habitat) may be reduced by no more than 33% of the standard buffer width.
- In any case where a reduced buffer width is applied consistent with the previous subsections, the buffer shall be composed of a dense native plant community; if the buffer area contains over 20% coverage by invasive plant species, the applicant shall provide a vegetation management plan to remove those invasive plants, supplement the buffer area with native trees and shrubs, and monitor the buffer area for a period of no less than 3 years to ensure eradication of invasive plants and establishment of new native plants from the buffer area.

In order to fully utilize the Main Development Area and provide improved functions to the on-site portions of the Wetland 87, Wetland 93, and Streams 14 and 15 buffer, the Project proposes to reduce the current Wetland 87 buffer boundary to the property line that divides parcels 0420205016 and 0420201110. The reduced 1,827-square-foot Wetland 87 buffer will be averaged onto the area where the Wetland 93 and Streams 14 and 15 buffers project onto parcel 0420174075 and 0420205016 within the Main Development Area (Figure 8). This area, henceforth referred to as the On-Site Mitigation Area, will be enhanced with native plantings and removal of invasive species.

The On-Site Mitigation Area will meet the criteria of PMC 21.06.930 because of the following factors:

- The total area contained within the averaged Wetland 87 buffer will remain 102,437 square feet and be no less than that which would be contained within the standard buffer.
- The buffer averaging will increase the functions and values of the Wetlands 87 and 93 by improving native species diversity and habitat complexity and by reducing invasive species like reed canary grass and Himalayan blackberry.
- The portion of the Wetland 87 buffer perimeter subject to buffer averaging is approximately 251 linear feet, which is less than 20% of the Wetland 87 total buffer perimeter length of 1,370 linear feet.
- Wetland 87 contains variations in sensitivity due to existing physical characteristics of the buffer vegetation. The existing Wetland 87 buffer to be averaged into the On-Site Mitigation Area consists of a poor quality and degraded vegetation community dominated by field grasses. Wetland 87 sensitivities will be improved by enhancement in the On-Site Mitigation Area.
- Wetland 87 is a Category III wetland with moderate habitat functions (scoring six points for habitat) and is afforded a 150-foot-wide buffer. The portion of the buffer to be reduced measures approximately 20 feet, which is less than 50 feet and no more than 33% of the standard buffer width.
- The buffer area within the On-Site Mitigation Area will be composed of a dense native plant community. If the On-Site Mitigation Area is found to contain over 20% coverage by invasive plant species, the Project will provide a vegetation management plan to remove those invasive plants, in addition to providing supplemental plantings of native trees and shrubs. The On-Site Mitigation Area will be monitored for a period of no less than 3 years to ensure eradication of invasive plants and establishment of new native plants within the buffer area.

8.5 Compensatory Mitigation Measures

The proposed compensatory mitigation for unavoidable adverse impacts to on-site Wetland B is planned to consist of enhancement of on-site buffers for Streams 14 and 15 and Wetlands 87 and 93 at the On-Site Mitigation Area described in Section 8.4. Buffer enhancement will consist of invasive species removal and installation of native species. Approximately 0.08 acre of buffer enhancement will be provided to compensate for 0.0275 acre of Wetland B impacts, corresponding to an approximate 3:1 mitigation ratio (Figure 8). Mitigation may also involve purchase of wetland mitigation credits from the nearby Port of Tacoma Upper Clear Creek Mitigation Bank, pending further discussion with regulatory agencies. Wetland B functions lost because of site development would be mitigated through enhancement of higher-value wetland and stream buffers on site.

8.6 Conceptual Mitigation Plan

Goals describe the overall intent of mitigation efforts, and objectives describe individual components of the mitigation site in detail. Performance measures and success standards describe specific on-site characteristics that indicate a function is being provided. Performance measures are used to guide management of the mitigation site. Success standards are thresholds to be measured during the final year of the monitoring period that demonstrate that the site has complied with regulatory requirements and is providing intended functions. The wetland mitigation site will be monitored to demonstrate that intended wetland functions have been achieved. Monitoring will take place for 5 years. Contingency plans describe what actions can be taken to correct site deficiencies.

8.6.1 General Mitigation Goals

The goals for the On-Site Mitigation Area include the following:

- Enhance wetland buffer areas.
- Establish native tree, shrub, and/or groundcover vegetation communities in the wetland buffer areas.

8.6.2 Objectives and Standards of Success for Wetland Buffer Mitigation

- **Objective 1:** Plant communities will be restored by installing native trees, shrubs, and emergent species.
  - **Performance Standard 1:** Average survival of planted trees will be at least 100% at the end of Year 1, 90% by Year 2, 80% by Year 3, and 70% by Year 5.
  - **Performance Standard 2:** Within planted areas, native riparian vegetation species cover will be at least 20% by Year 1, 30% by Year 2, 40% by Year 3, and at least 50% by Year 5.
  - **Performance Standard 3:** Invasive, non-native vegetation is maintained at levels below 20% total cover within planted buffer areas for all years during the monitoring period.

Survival of planted trees and shrubs is shown in Table 9 and will be monitored and reported throughout the 5-year monitoring program.

Table 9
Performance Standards for Installed Native Plants

Rated Item	Year 1	Year 2	Year 3	Year 5
Installed plant survival (%)	100	90	80	70
Tree and shrub canopy (% areal) cover	20	30	40	50

8.6.3 Monitoring Plan

To ensure success of the mitigation plan, monitoring will be completed to determine the success of the wetland buffer mitigation. Monitoring will occur for a minimum of 5 years following completion of construction. An as-built report will be completed after plant installation and submitted to the City for use as a reference document during the monitoring period. Monitoring reports will be submitted to the City during Years 1, 2, 3, and 5. Data on the number and species of plants (as a measure of diversity), survival rates, canopy (aerial percentage) cover, stem density, and plant heights will be measured and recorded during each monitoring period. Permanent sample plots and photography stations will also be established at control points to document existing conditions during each monitoring period.

Monitoring of the planted buffer areas will occur near the end of the peak growing season in summer or early fall in each of the monitoring years after installation. If the percentage of non-native invasive shrub species exceeds 20% within the setback in any monitoring period, appropriate control procedures will be implemented according to a custom-designed maintenance plan for the Project. Plant community success within the planting area will be evaluated during the monitoring periods. In an effort to assess plant diversity, the assessment will include installed plant survival and vegetation percent cover. If installed plant survival or tree and shrub canopy cover performance standards are not met, additional supplemental planting will be provided.

8.6.4 Mitigation Site Management

The On-Site Mitigation Area will be actively managed for a minimum of 5 years following completion of construction. This will include at least one management or maintenance visit per year for a minimum of 5 years following implementation of the plan. Site management visits will occur during the growing season in May through July. Non-native weedy and invasive shrub species growing in the On-Site Mitigation Area will be physically removed (hand-pulling or cutting). Volunteer species of native woody plants, such as Oregon ash and black cottonwood, are to be encouraged. The following tasks will be completed during these visits:

- During Years 1 and 2, the planting area will be weeded by hand to remove any new shoots of non-native and/or invasive vegetation within a 2-foot radius of each installed plant.
- During Year 1, installed plantings in the wetland buffer area must receive a minimum of 1 inch of water each week from June to September from the temporary irrigation system or natural rainfall.
- During the Year 2 management visit, tree stakes will be removed.
- Additional management visits may also be required to respond to other monitoring recommendations.

Following completion of the prescribed monitoring and site management periods, the mitigation sites will be protected from development or other alteration in perpetuity.

8.6.5 Contingency Plan

All contingencies cannot be anticipated. The contingency plan is flexible so that modifications can be made to subsequent years' construction if portions of the previous year's construction do not produce the desired results. Problems or potential problems will be evaluated by a qualified biologist and coordinated with the City. Specific contingency actions will be developed, agreed to by consensus, and implemented based on all scientifically and economically feasible recommendations. Contingencies may include the following:

- Evaluating invasive shrub species removal/maintenance techniques
- Considering species suitability for site conditions, providing replanting recommendations with same or alternate plants, and potentially adjusting planting locations
- Additional monitoring or unscheduled monitoring

If, during the monitoring program, other maintenance needs are identified as necessary to ensure the success of the mitigation project, they will be implemented, unless impacts are generated by third parties or acts of nature.

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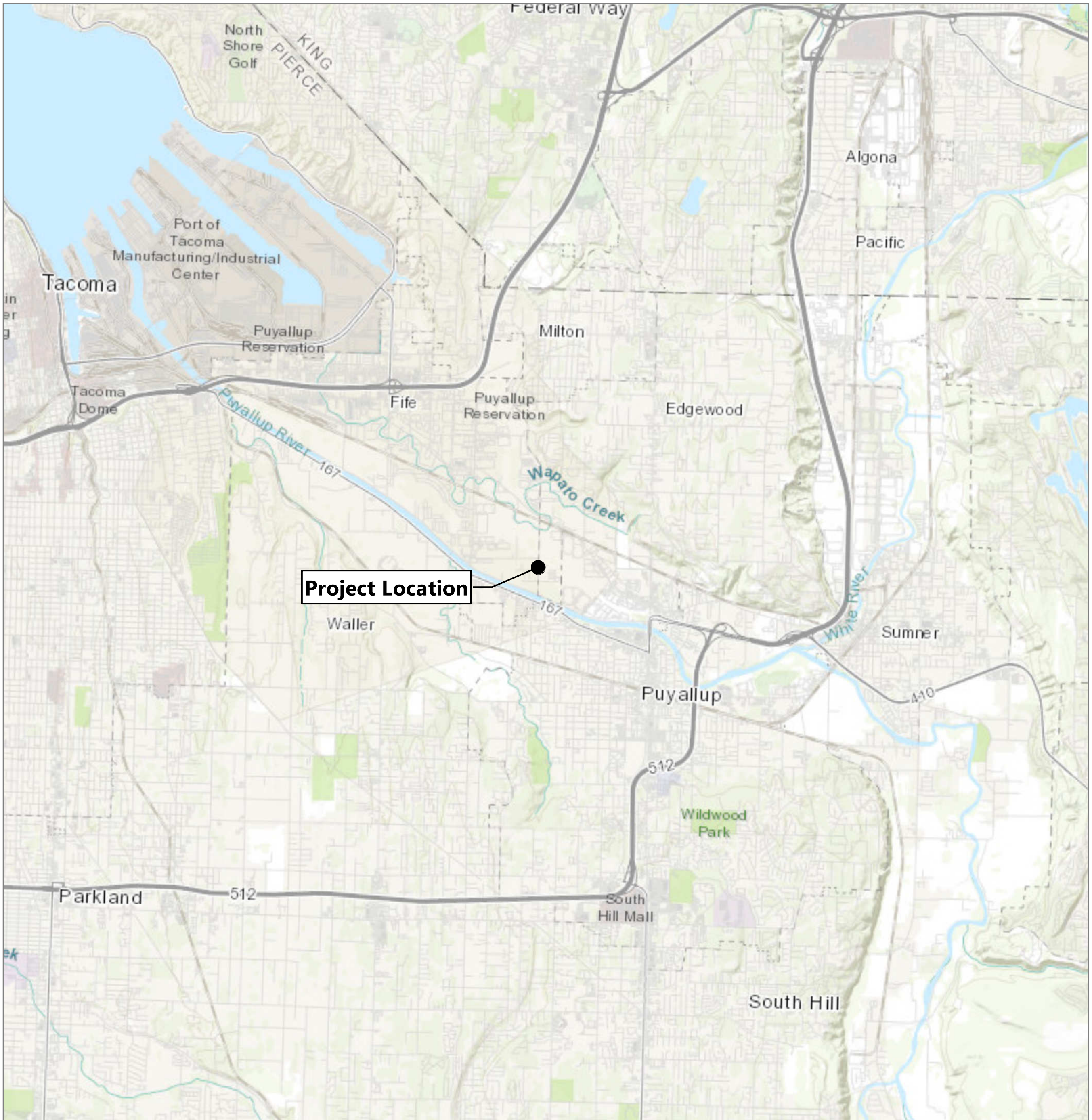
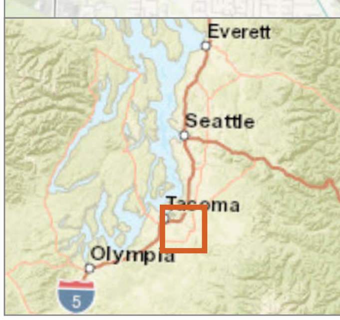
Figures





NOTES:
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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Miles

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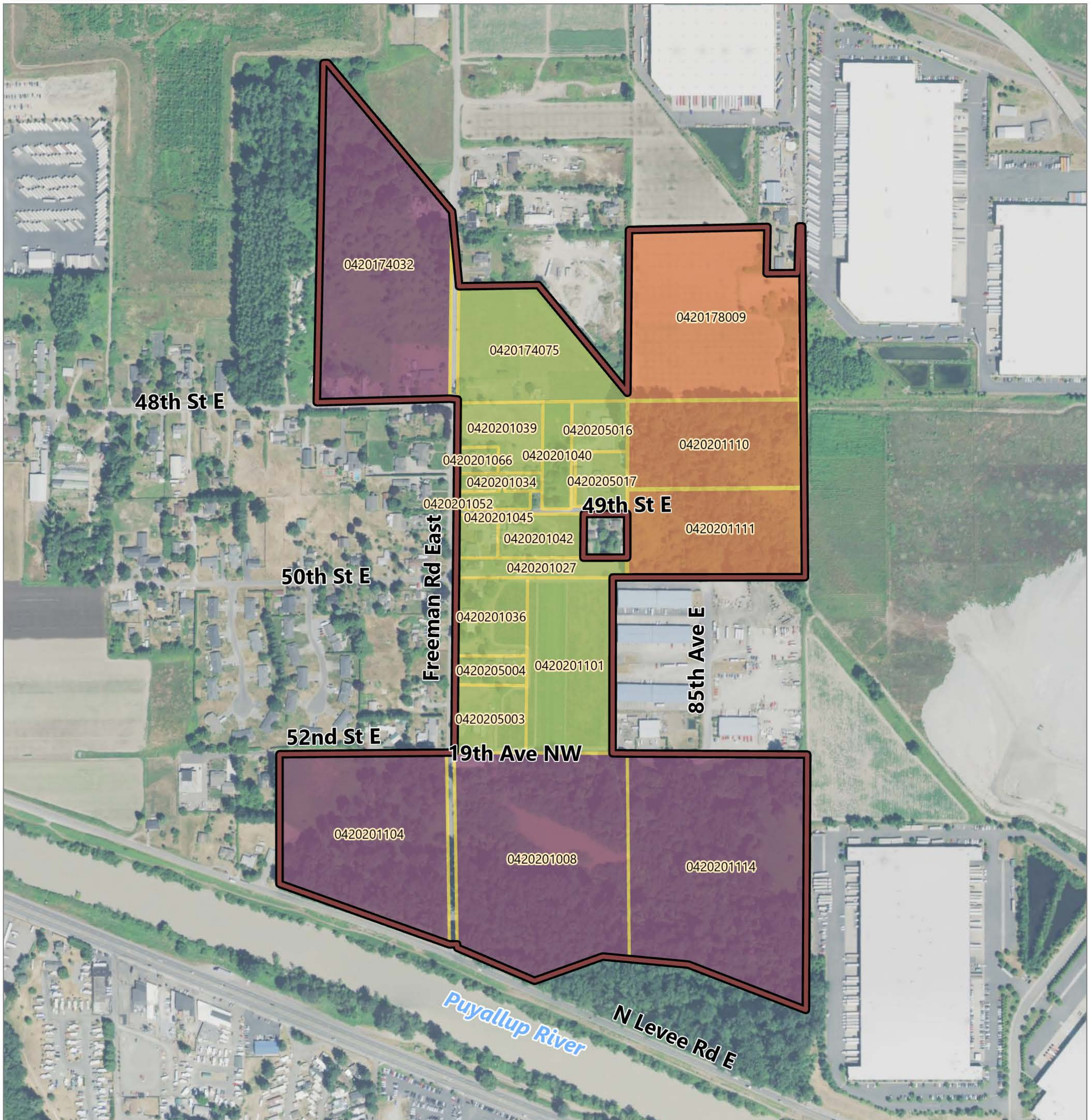
ANCHOR QEA

Figure 1
Vicinity Map
Critical Areas Report
Freeman Road Logistics



LEGEND:

Study Area

Tax Parcel Ownership

Main Development Area

Transportation and Utility

WSDOT

SOURCES:
1. Aerial imagery: USDA (2019)
2. Parcel: Pierce County (2023)

NOTES:
1. USDA: United States Department of Agriculture

0 600
Feet

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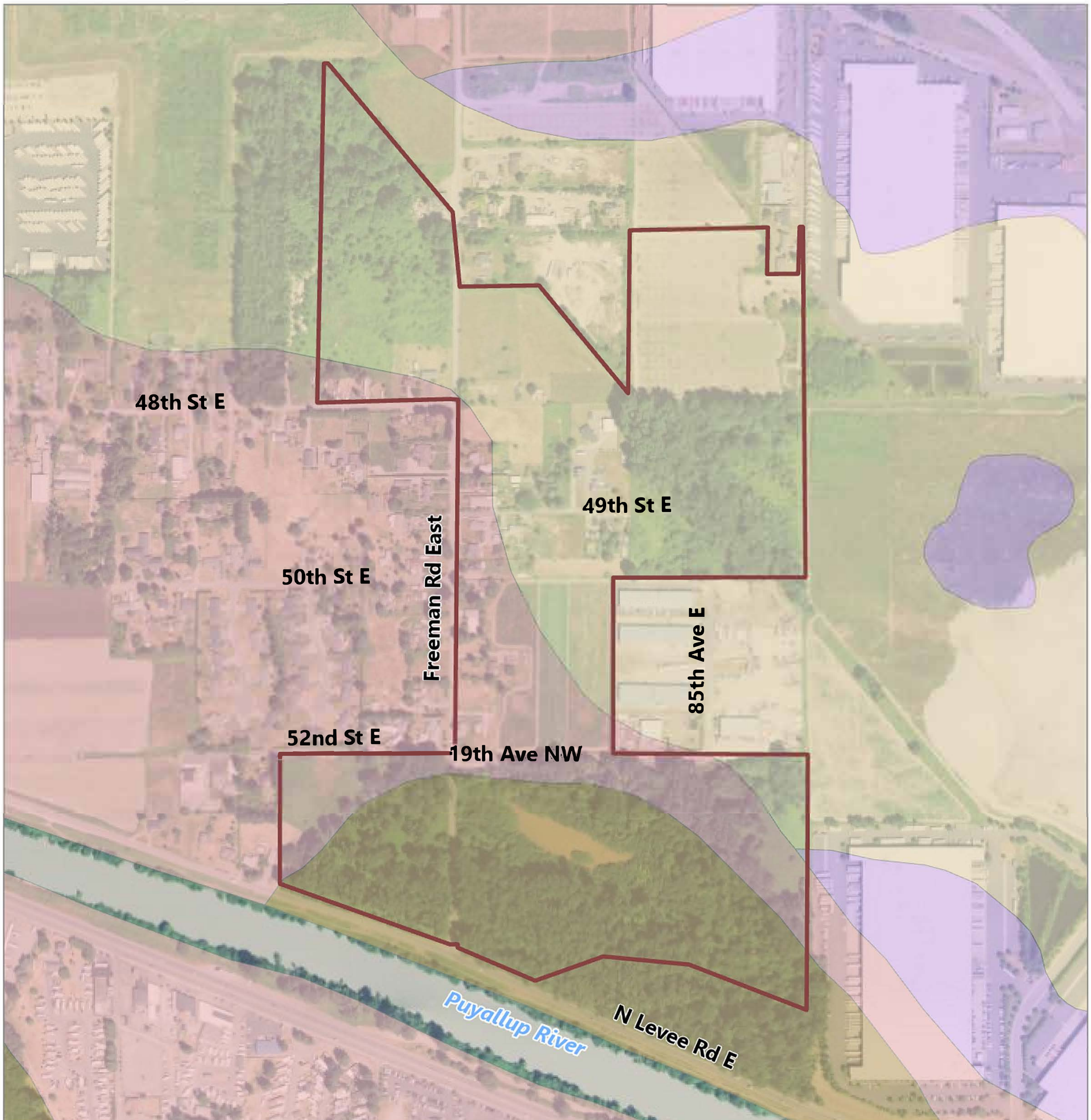
ANCHOR QEA

Figure 2
Study Area and Existing Conditions

Critical Areas Report
Freeman Road Logistics



LEGEND:

Study Area

NRCS Soils

Briscot loam

Pilchuck fine sand

Puyallup fine sandy loam

Sultan silt loam

SOURCES:
1. Soil: USDA (2023)
2. Aerial imagery: USDA (2019)

NOTES:
1. NRCS: Natural Resources Conservation Service
2. USDA: United States Department of Agriculture

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Publish Date: 2023/09/27, 10:33 PM | User: jlarson
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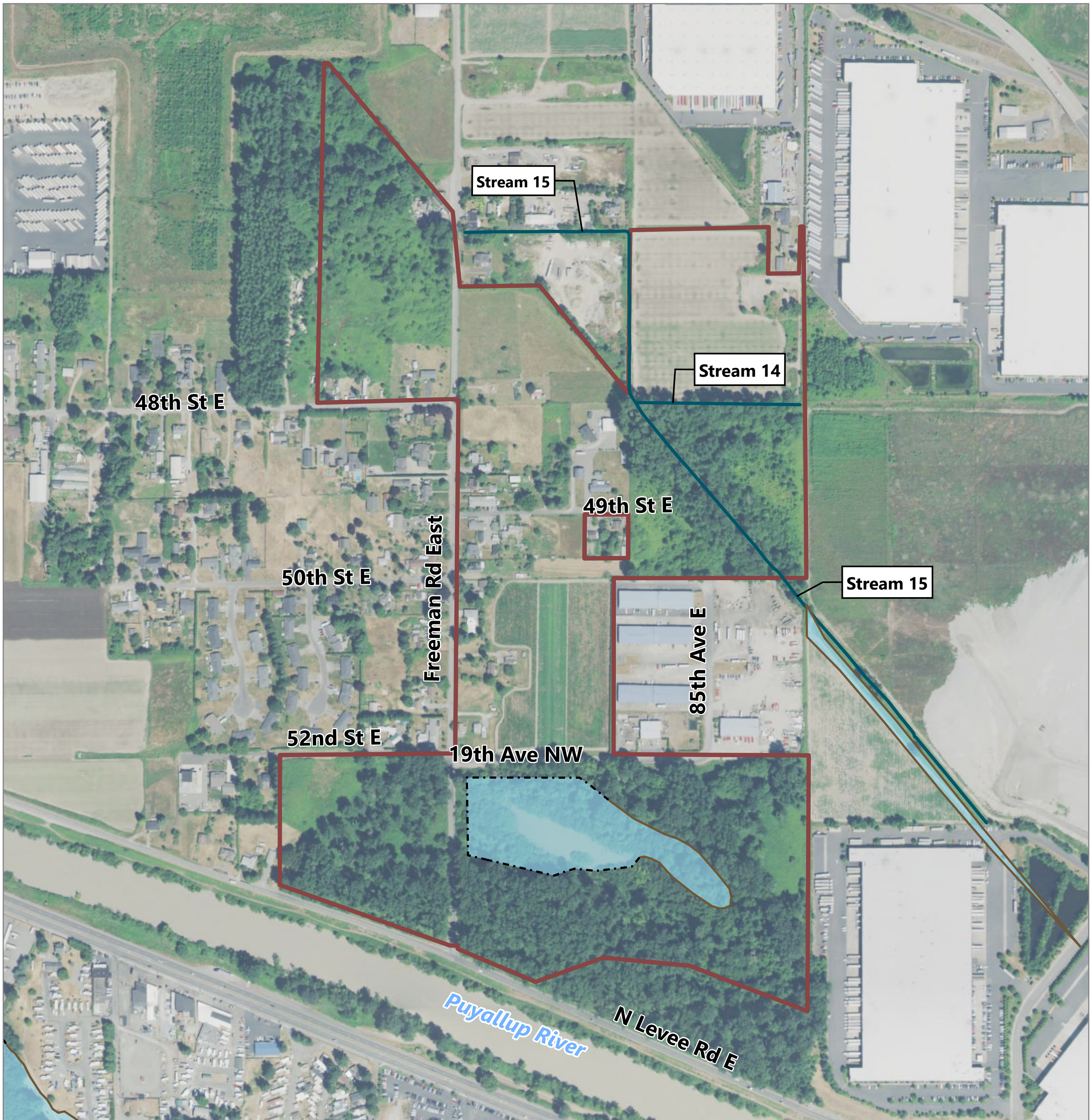
ANCHOR QEA

Figure 3
NRCS Soils Map
Critical Areas Report
Freeman Road Logistics



LEGEND:

CWI Wetlands

Unconfirmed

Verified

Unverified

Stream

Study Area

SOURCES:
1. CWI - Pierce County (2023)
2. Stream - Pierce County (2023)
3. Aerial imagery - USDA (2019)

NOTE:
CWI: County Wetland Inventory

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Feet

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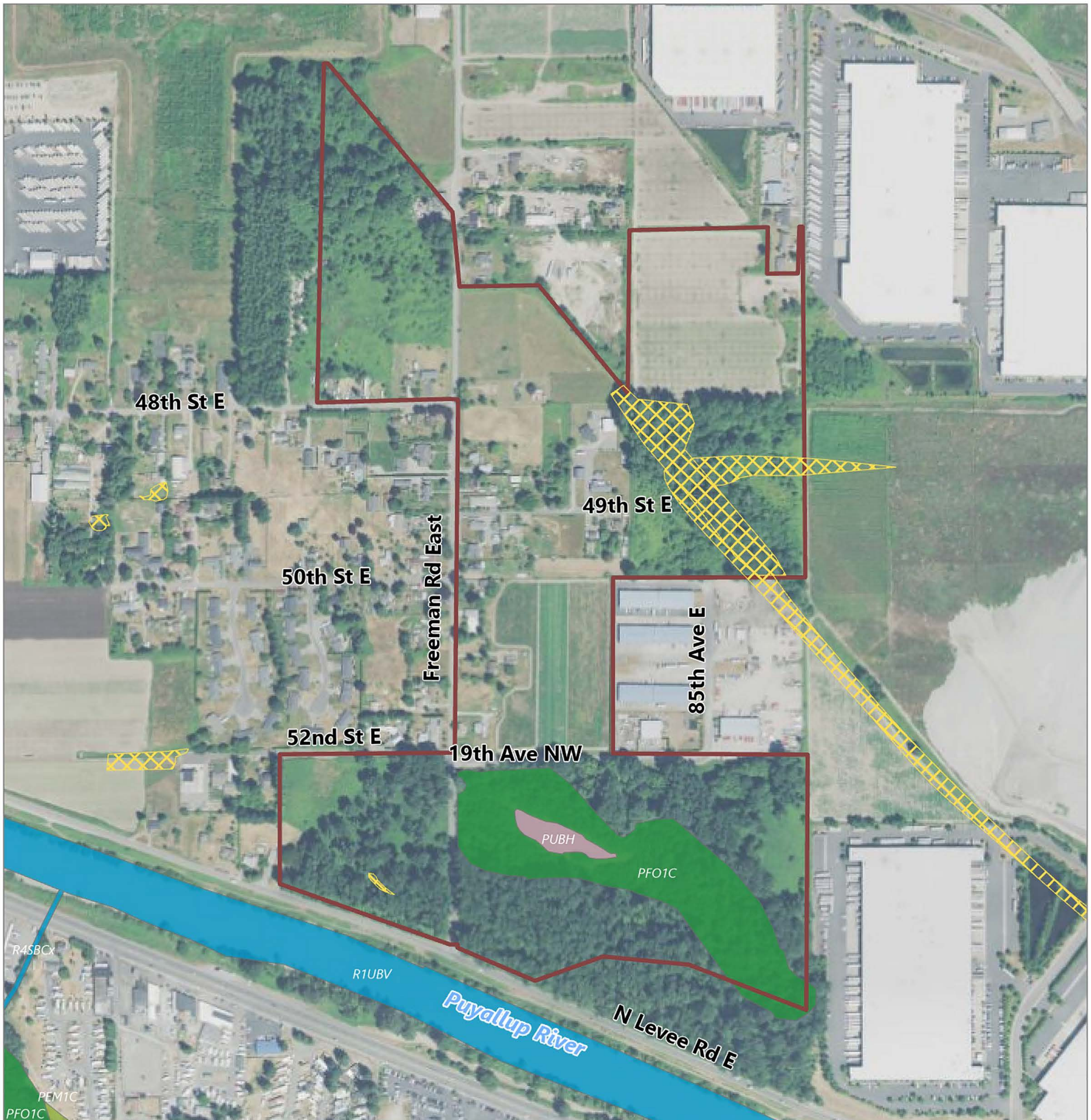
ANCHOR QEA

Figure 4
Pierce County Wetlands Inventory Map
Critical Areas Report
Freeman Road Logistics



LEGEND:

Study Area

NWI Wetlands

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Riverine

City of Puyallup Wetland (Unverified)

SOURCES:
1. NWI - USFWS (2023)
2. Aerial imagery - USDA (2019)

NOTES:
1. NWI: National Wetland Inventory
2. USFWS: United States Fish and Wildlife Service

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Feet

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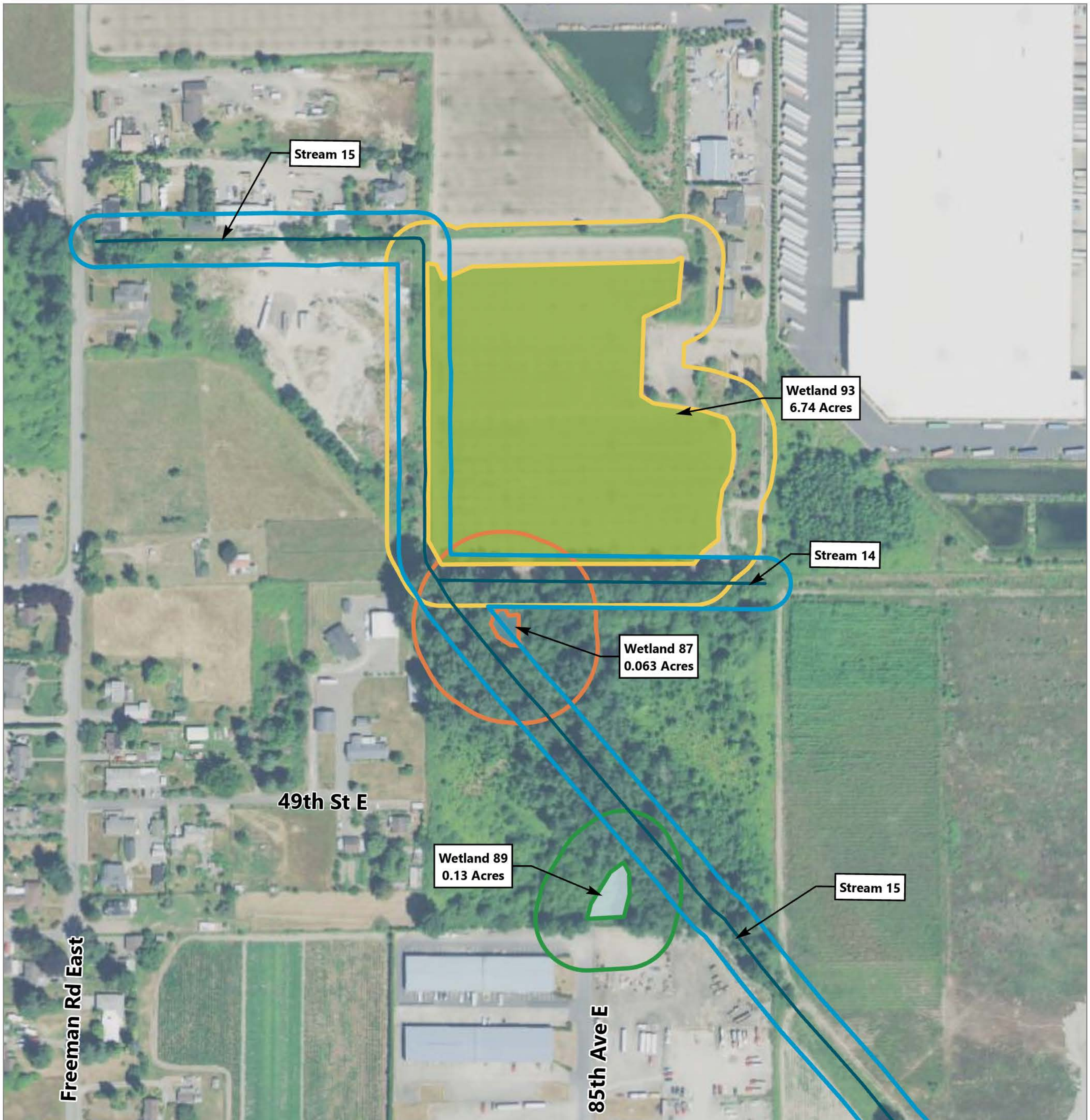
ANCHOR QEA

Figure 5
National Wetlands Inventory Map

Critical Areas Report
Freeman Road Logistics



LEGEND:

- Stream
- Wetland 87, Category 3
- Wetland 89, Cateogory 2
- Wetland 93, Category 3
- Category 2 - 100' Wetland Buffer
- Category 3 - 80' Wetland Buffer
- Category 3 - 150' Wetland Buffer
- Category 3 - 50' Riparian Buffer

SOURCES:
1. Stream - Pierce County (2023)
2. Parcel - Pierce County (2023)
3. Aerial image - USDA (2019)

NOTE:
USDA: U.S. Department of Agriculture

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Feet

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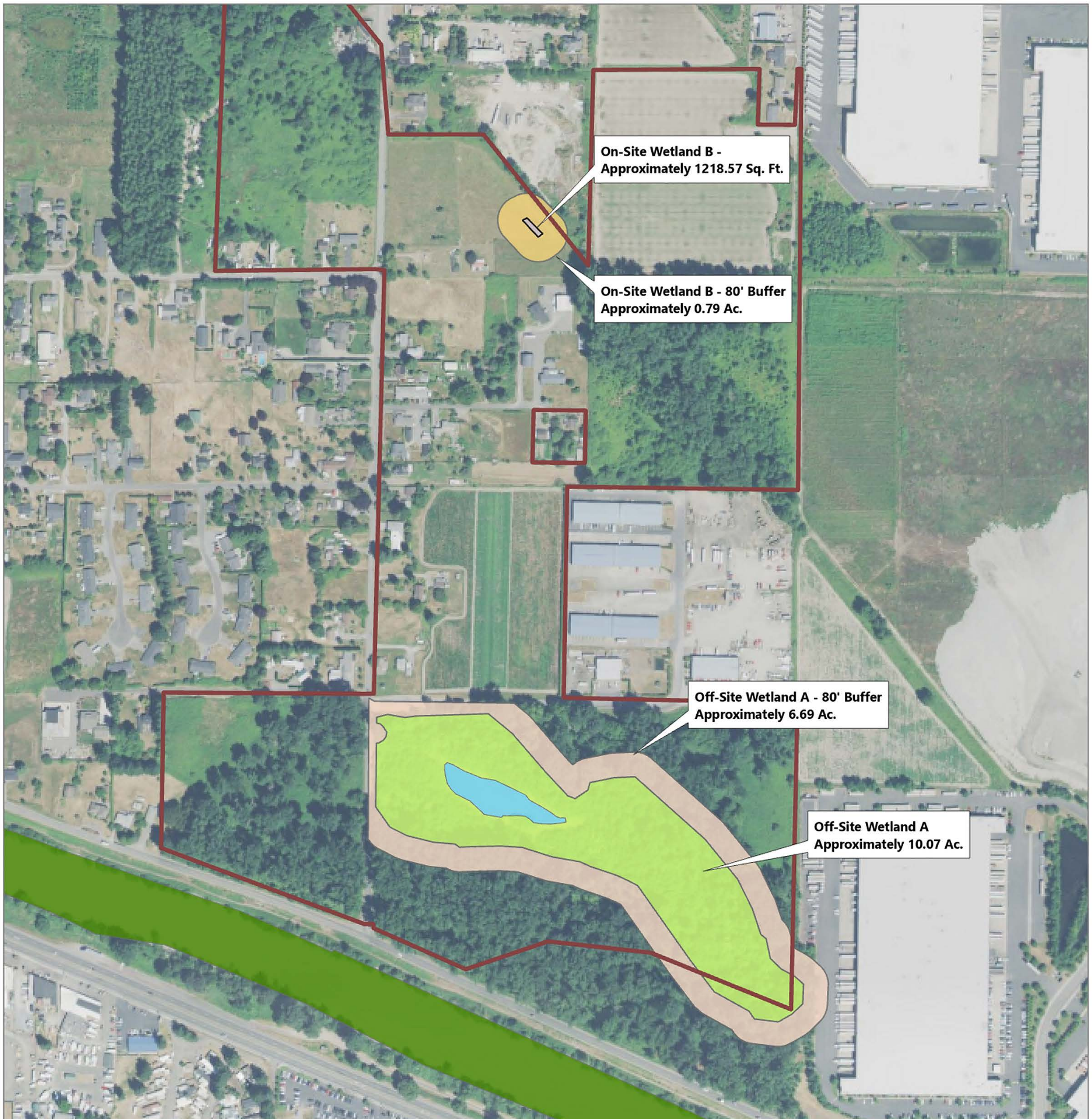
ANCHOR QEA

Figure 6
Off-Site WSDOT Parcels Critical Areas and Buffers

Critical Areas Report
Freeman Road Logistics



LEGEND:

Study Area

NWI Wetlands

Freshwater Forested/Shrub Wetland

Freshwater Pond

Riverine

Wetland A - 80' Buffer

Wetland B - 80' Buffer

On-Site Wetland B

SOURCES:
1. Aerial image - USDA (2019)
2. NWI - USFWS (2023)

NOTES:
1. NWI: National Wetland Inventory
2. USFWS: United States Fish and Wildlife Service

0 500

Feet

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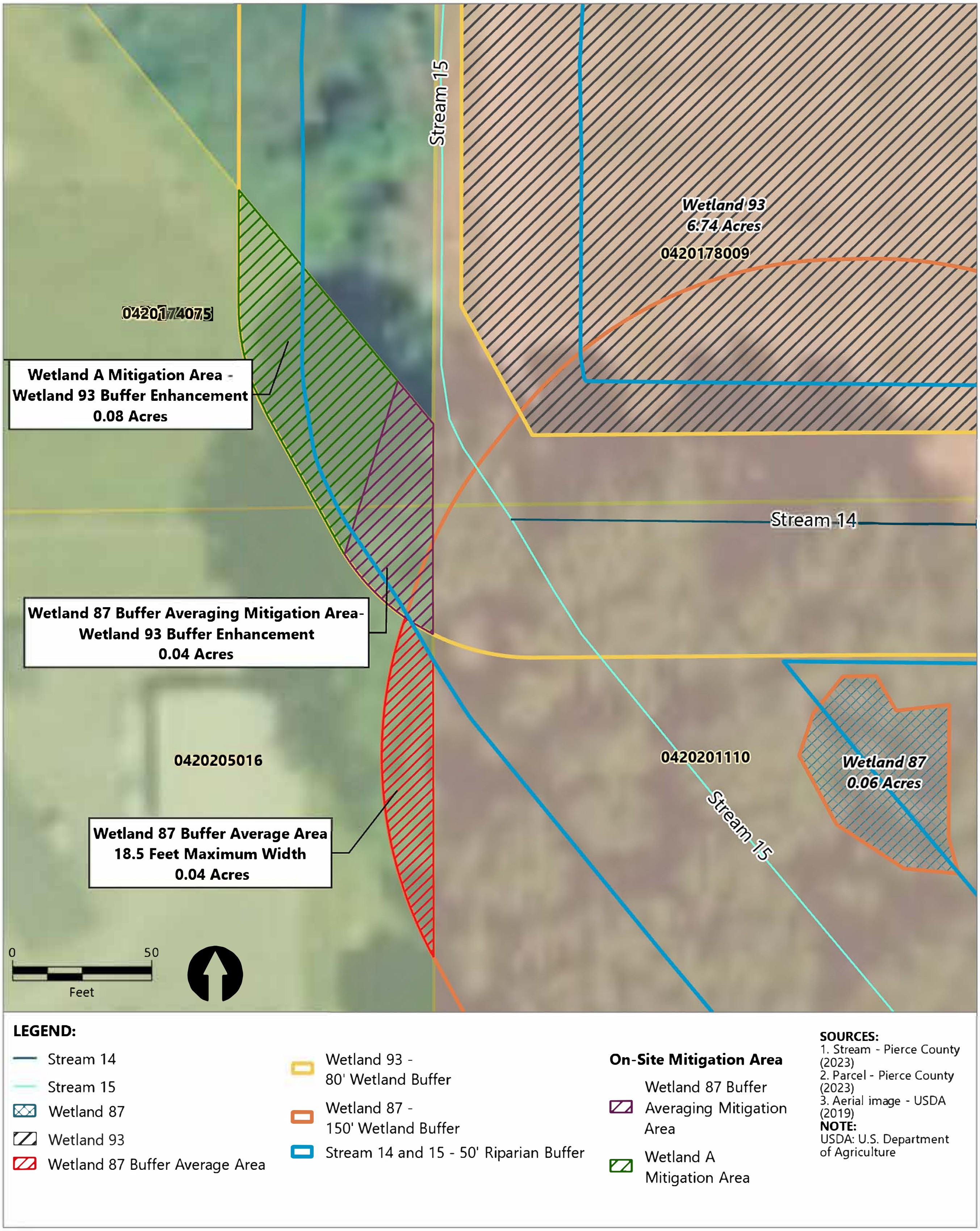
ANCHOR QEA

Figure 7
Wetland Delineation Results

Critical Areas Report
Freeman Road Logistics



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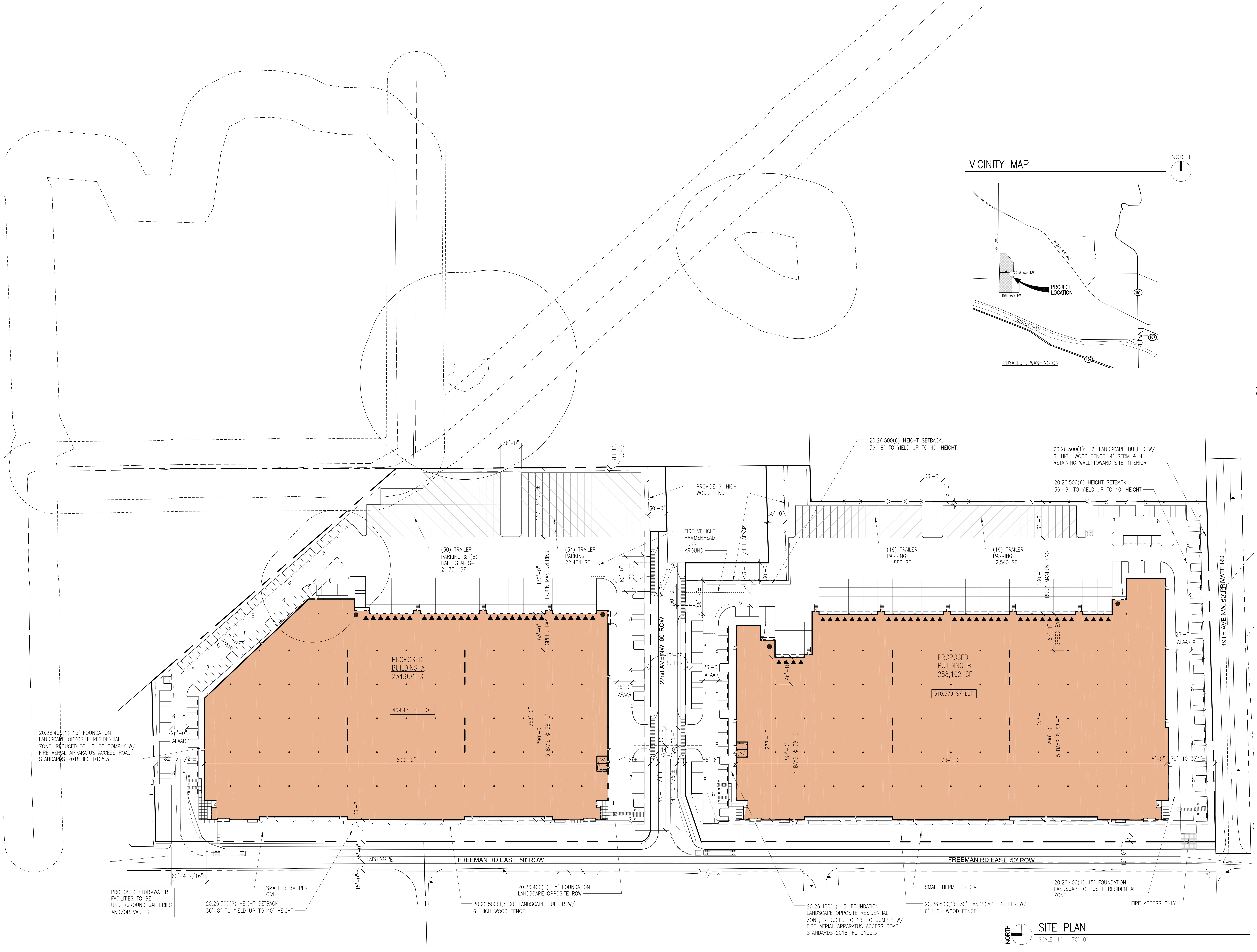
ANCHOR QEA

Figure 8
Conceptual Mitigation Plan

Critical Areas Report
Freeman Road Logistics

Appendix A
Preliminary Plan Set



SITE PLAN
SCALE: 1" = 70'-0"

SYNTHESIS PLLC
THE FUSION OF ARCHITECTURE, DESIGN TECHNOLOGY & PEOPLE
12503 Bel-Red Road, Suite 100
Bellevue, WA 98005
p 425 646 1818 f 425 646 4141

VECTOR
Development Company
11411 NE 124th Street
Suite 190
Kirkland, WA 98034

PROJECT DATA

SITE AREA	980,050	SF
BUILDING AREA	493,003	SF
COVERAGE	50.3%	
BUILDING A PARKING REQUIRED	108.3	
10,000 SF OFFICE @ 1:300	33.3	
224,901 SF WHSE @ 1:3000	75.0	
PARKING PROVIDED		129
BUILDING B PARKING REQUIRED	116.0	
10,000 SF OFFICE @ 1:300	33.3	
248,102 SF WHSE @ 1:3000	82.7	
PARKING PROVIDED		137
▲ 9'x10' DOCK DOOR		69
● 12'x14' GRADE ACCESS DOOR		4

REVISIONS

ISSUE NO.	DATE	ITEM
1	10 14 22	SEPA RESUBMITTAL
D	10 19 21	DESIGN REVIEW APPLICATION
C	09 15 21	PRELIMINARY BID
B	03 19 21	SEPA APPLICATION
A	01 05 21	PRE-APPLICATION

PROFESSIONAL STAMP

PROGRESS PRINTING
September 12, 2023

NOT FOR CONSTRUCTION

PROJECT INFORMATION

FREEMAN ROAD LOGISTICS
Puyallup, WA – 98371

SHEET INFORMATION

RELEASE FOR: SEPA RESUBMITTAL
TITLE: SITE PLAN

DESIGNED BY:
DRAWN BY:
REVIEWED BY:
APPROVED BY:
DATE: 01 05 21
SHEET NO: A1.1
PROJECT NO: 201401.13.031

Appendix B
Study Area Photographs

Appendix B
Study Area Photographs

Photograph 1
Parcels 0420174075 and 0420205016

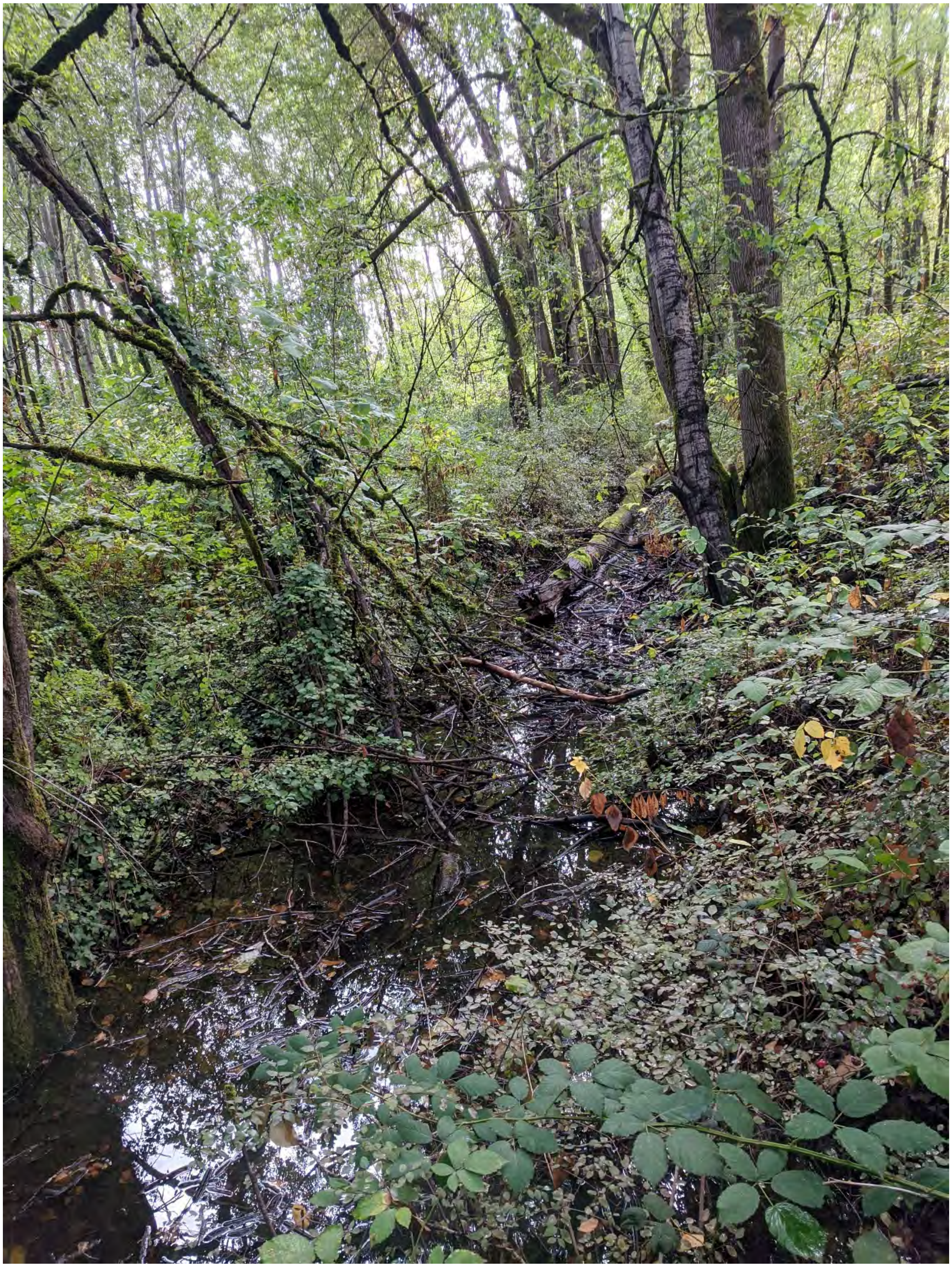
Photograph 2
Agricultural Ditch

Photograph 3
Agricultural Ditch and Adjacent Agricultural Field

Photograph 4
Adjacent Agricultural Fields

Photograph 5
View of DP1

Photograph 6
Agricultural Ditch South



Photograph 7
East Edge of Parcel 0420205016

Photograph 8
Active Grazing in Parcel 0420174075

Photograph 9
Grazing in Parcel 0420174075

Photograph 10
Ditch

Photograph 11
Field Adjacent to DP2

Photograph 12
Landscape View of DP3

Photograph 13
View of DP2

Photograph 14
View of DP3

Photograph 15
Area Near DP3

Photograph 16
Wetlands Mapped South of 52nd Street East

Photograph 17
Wetlands Mapped South of 52nd Street East

Photograph 18
Vegetation in Wetlands Mapped South of 52nd Street East

Photograph 19
Wetland B on Parcel 0420174075 (March 11, 2022)

Photograph 20
Wetland B on Parcel 0420174075 (March 11, 2022)

Photograph 21
Wetland B on Parcel 0420174075 (March 11, 2022)

Appendix C
Wetland Forms and Figures

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022

Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet A DP1 W

Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N

Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5

Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83

Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Populus balsamifera ssp. Trichocarpa*	70	Yes	FAC
2.			
3.			
4.			
5.			
50%= 35 20%= 14 Total Cover:	70		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Cornus sericea*	85	Yes	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Symphoricarpos albus*	20	No	FACU
4.			
5.			
50%= 62.5 20%= 25 Total Cover:	125		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**2**	(A)
Total Number of Dominant Species Across All Strata:	**2**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**100%**	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x1 = **0**
FACW species	**85**	x2 = **170**
FAC species	**90**	x3 = **270**
FACU species	**20**	x4 = **80**
UPL species	**0**	x5 = **0**
Column Totals:	**195** (A)	**520** (B)

Prevalence Index = B/A = **2.7**

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- **X** 2 - Dominance Test is >50%
- **X** 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: 100% FAC vegetation

SOIL

Sampling Point: Wet A DP1 W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	10YR 3/1	100					SiL	
4-9	10YR 3/1	90	10YR 5/4	10	D	M	SL	
9-18	10YR 2/1	95	10YR 4/1	5	D	M	LS	w/gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ______

Remarks: 1 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- x Inundation Visible on Aerial Imagery (B7)
- x Sparsely Vegetated Concave Surface (B8)
- x Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- x Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes x	No ___	Depth (inches):	1 inch
Water table Present?	Yes x	No ___	Depth (inches):	at surface
Saturation Present? (includes capillary fringe)	Yes x	No ___	Depth (inches):	at surface

Wetland Hydrology Present? **Yes** X **No** ______

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water >1 ft deep 10 ft from DP

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022

Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet A DP2 Up

Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N

Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5

Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83

Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?	X	

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: ___)			
1. *Populus balsamifera ssp. Trichocarpa*	80	Yes	FAC
2. *Picea sitchensis*	10	No	FAC
3.			
4.			
5.			
50%= 45 20%= 18 Total Cover:	**90**		
Sapling/Shrub Stratum (Plot size: ___)			
1. *Cornus sericea*	30	No	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Symphoricarpos albus*	90	Yes	FACU
4. *Ribes sanguineum*	20	No	FACU
5.			
50%= 80 20%= 32 Total Cover:	**160**		
Herb Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	**0**		
Woody Vine Stratum (Plot size: ___)			
1. *Hedera helix*	20		FACU
2.			
Total Cover:	**20**		

% Bare Ground in Herb Stratum **100** % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)

Total Number of Dominant Species Across All Strata: **2** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **50%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x1 = **0**
FACW species	**30**	x2 = **60**
FAC species	**110**	x3 = **330**
FACU species	**110**	x4 = **440**
UPL species	**0**	x5 = **0**
Column Totals:	**250** (A)	**830** (B)

Prevalence Index = B/A = **3.3**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: 50% FAC vegetation

SOIL

Sampling Point: Wet A DP2 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	100					SiL	w/gravel
8-18	10YR 4/2	100					SL	w/gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ____
Depth (inches): ____

Hydric Soil Present? **Yes** ____ **No** X

Remarks: 2 chroma with no redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____	
Water table Present?	Yes ____	No ____	Depth (inches): ____	
Saturation Present? (includes capillary fringe)	Yes x	No ____	Depth (inches): 10 inches	

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Saturation 10 inches deep, no other hydric indicators

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet A DP3 W
Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N
Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **X** No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes **X** No ____		
Wetland Hydrology Present?	Yes **X** No ____		

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Populus balsamifera ssp. Trichocarpa*	60	Yes	FAC
2.			
3.			
4.			
5.			
50%= 30 20%= 12 Total Cover:	**60**		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Cornus sericea*	80	Yes	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Rubus spectabilis*	30	Yes	FAC
4.			
5.			
50%= 65 20%= 26 Total Cover:	**130**		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	**0**		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	**0**		
% Bare Ground in Herb Stratum **100** % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **3** (A)
Total Number of Dominant Species Across All Strata: **3** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x1 = **0**
FACW species	**80**	x2 = **160**
FAC species	**110**	x3 = **330**
FACU species	**0**	x4 = **0**
UPL species	**0**	x5 = **0**
Column Totals:	**190** (A)	**490** (B)

Prevalence Index = B/A = **2.6**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤ 3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: 100% FAC vegetation

SOIL

Sampling Point: Wet A DP3 W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/1	100					SiL	
5-18	10YR 4/1	85	10YR 5/4	15	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks: 1 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- ___ Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- x Inundation Visible on Aerial Imagery (B7)
- x Sparsely Vegetated Concave Surface (B8)
- x Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- x Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- x Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No x	Depth (inches): ___
Water table Present?	Yes x	No ___	Depth (inches): at surface
Saturation Present? (includes capillary fringe)	Yes x	No ___	Depth (inches): at surface

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water >1 ft deep 3 ft from DP

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022

Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet A DP4 Up

Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N

Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5

Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83

Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?	X	
Is the Sampled Area within a Wetland?		X

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: ___)			
1. *Populus balsamifera ssp. Trichocarpa*	80	Yes	FAC
2. *Picea sitchensis*	10	No	FAC
3.			
4.			
5.			
50%= 45 20%= 18 Total Cover:	**90**		
Sapling/Shrub Stratum (Plot size: ___)			
1. *Cornus sericea*	30	No	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Symphoricarpos albus*	90	Yes	FACU
4. *Ribes sanguineum*	20	No	FACU
5.			
50%= 80 20%= 32 Total Cover:	**160**		
Herb Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	**0**		
Woody Vine Stratum (Plot size: ___)			
1. *Hedera helix*	20		FACU
2.			
Total Cover:	**20**		
% Bare Ground in Herb Stratum **100** % Cover of Biotic Crust ___			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**1**	(A)
Total Number of Dominant Species Across All Strata:	**2**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**50%**	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x1 = **0**
FACW species	**30**	x2 = **60**
FAC species	**110**	x3 = **330**
FACU species	**110**	x4 = **440**
UPL species	**0**	x5 = **0**
Column Totals:	**250** (A)	**830** (B)

Prevalence Index = B/A = **3.3**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: 50% FAC vegetation

SOIL

Sampling Point: Wet A DP4 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	100					SiL	w/gravel
8-18	10YR 4/2	100					SL	w/gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: 2 chroma with no redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes x No ___ Depth (inches): 10 inches

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Saturation 10 inches deep, no other hydric indicators

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet A DP5 W
Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N
Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Populus balsamifera ssp. Trichocarpa*	70	Yes	FAC
2.			
3.			
4.			
5.			
50%= 35 20%= 14 Total Cover:	70		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Cornus sericea*	85	Yes	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Symphoricarpos albus*	20	No	FACU
4.			
5.			
50%= 62.5 20%= 25 Total Cover:	125		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**85**	x2 =	**170**
FAC species	**90**	x3 =	**270**
FACU species	**20**	x4 =	**80**
UPL species	**0**	x5 =	**0**
Column Totals:	**195** (A)		**520** (B)

Prevalence Index = B/A = **2.7**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: 100% FAC vegetation

SOIL

Sampling Point: Wet A DP5 W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					SiL	
4-9	10YR 3/1	90	10YR 5/4	10	D	M	SL	
9-18	10YR 2/1	95	10YR 4/1	5	D	M	LS	w/gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks: 1 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- x Inundation Visible on Aerial Imagery (B7)
- x Sparsely Vegetated Concave Surface (B8)
- x Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- x Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?	x		1 inch
Water table Present?	x		at surface
Saturation Present? (includes capillary fringe)	x		at surface

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water >1 ft deep 10 ft from DP

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet A DP6 Up
Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N
Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: ____)			
1. *Alnus rubra*	10	No	FAC
2. *Populus balsamifera ssp. Trichocarpa*	60	Yes	FAC
3.			
4.			
5.			
50%= 35 20%= 14 Total Cover:	70		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Oemleria cerasiformis*	30	Yes	FACU
2. *Rubus armeniacus*	70	Yes	FAC
3.			
4.			
5.			
50%= 50 20%= 20 Total Cover:	100		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size: ____)			
1. *Hedera helix*	30		FACU
2.			
Total Cover:	30		
% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **3** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **67%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**140**	x3 =	**420**
FACU species	**30**	x4 =	**120**
UPL species	**0**	x5 =	**0**
Column Totals:	**170** (A)		**540** (B)

Prevalence Index = B/A = **3.2**

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- **X** 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: 67% FAC vegetation

SOIL

Sampling Point: Wet A DP6 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/3	100					SiL	w/gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: 3 chroma with no redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___
Water table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No hydric indicators

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet A DP7 W
Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N
Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Populus balsamifera ssp. Trichocarpa*	60	Yes	FAC
2.			
3.			
4.			
5.			
50%= 30 20%= 12 Total Cover:	60		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Cornus sericea*	80	Yes	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Rubus spectabilis*	30	Yes	FAC
4.			
5.			
50%= 65 20%= 26 Total Cover:	130		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum **100** % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL species	0	x1 =	0	
FACW species	80	x2 =	160	
FAC species	110	x3 =	330	
FACU species	0	x4 =	0	
UPL species	0	x5 =	0	
Column Totals:	190	(A)	490	(B)

Prevalence Index = B/A = **2.6**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: 100% FAC vegetation

SOIL

Sampling Point: Wet A DP7 W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/1	100					SiL	
5-18	10YR 4/1	85	10YR 5/4	15	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks: 1 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- ___ Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- x Inundation Visible on Aerial Imagery (B7)
- x Sparsely Vegetated Concave Surface (B8)
- x Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- x Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- x Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water table Present?	x		at surface
Saturation Present? (includes capillary fringe)	x		at surface

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water >1 ft deep 3 ft from DP

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet A DP8 Up
Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N
Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		X

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: ____)			
1. *Alnus rubra*	60	Yes	FAC
2. *Populus balsamifera ssp. Trichocarpa*	80	Yes	FAC
3.			
4.			
5.			
50%= 70 20%= 28 Total Cover:	140		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Oemleria cerasiformis*	50	Yes	FACU
2. *Rubus armeniacus*	10	No	FAC
3. *Rubus spectabilis*	20	No	FAC
4. *Symphoricarpos albus*	70	Yes	FACU
5.			
50%= 75 20%= 30 Total Cover:	150		
Herb Stratum (Plot size: ____)			
1. *Polystichum munitum*	20	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 10 20%= 4 Total Cover:	20		
Woody Vine Stratum (Plot size: ____)			
1. *Hedera helix*	20		FACU
2.			
Total Cover:	20		
% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**2**	(A)
Total Number of Dominant Species Across All Strata:	**5**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**40%**	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**170**	x3 =	**510**
FACU species	**140**	x4 =	**560**
UPL species	**0**	x5 =	**0**
Column Totals:	**310** (A)		**1070** (B)

Prevalence Index = B/A = **3.5**

Hydrophytic Vegetation Indicators:
- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks: 40% FAC vegetation

SOIL

Sampling Point: Wet A DP8 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/3	100					L	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? **Yes** ___ **No** X

Remarks: 3 chroma with no redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___
Water table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No hydric indicators

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet A DP9 W
Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 & 20 R4E T20N
Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes X No ____**

Remarks: Delineated northern and eastern boundary of large wetland system to identify potential buffer impacts for utility line construction

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Alnus rubra*	70	Yes	FAC
2. *Populus balsamifera ssp. Trichocarpa*	20	Yes	FAC
3.			
4.			
5.			
50%= 45 20%= 18 Total Cover:	90		
Sapling/Shrub Stratum (Plot size: ____)			
1. *Cornus sericea*	70	Yes	FACW
2. *Rubus armeniacus*	20	No	FAC
3. *Rubus spectabilis*	20	No	FAC
4. *Ribes sanguineum*	5	No	FACU
5. *Symphoricarpos albus*	5	No	FACU
50%= 60 20%= 24 Total Cover:	120		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **3** (A)
Total Number of Dominant Species Across All Strata: **3** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**70**	x2 =	**140**
FAC species	**130**	x3 =	**390**
FACU species	**10**	x4 =	**40**
UPL species	**0**	x5 =	**0**
Column Totals:	**210** (A)		**570** (B)

Prevalence Index = B/A = **2.7**

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: 100% FAC vegetation

SOIL

Sampling Point: Wet A DP9 W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					SiL	
4-18	10YR 4/1	80	10YR 5/4	20	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- x Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks: 1 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- x Inundation Visible on Aerial Imagery (B7)
- x Sparsely Vegetated Concave Surface (B8)
- x Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- x Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- x Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?	x		1 inch
Water table Present?	x		at surface
Saturation Present? (includes capillary fringe)	x		at surface

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water >1 ft deep 2 ft from DP

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022

Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet B DP10 Up

Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 R4E T20N

Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5

Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83

Soil Map Unit Name: Sultan silt loam NWI Classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?	X	

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks: Confirming upland conditions in suspect area identified as SP 13 in Confluence Report

VEGETATION

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Populus balsamifera ssp. Trichocarpa*	70	Yes	FAC
2.			
3.			
4.			
5.			
50%= 35 20%= 14 Total Cover:	**70**		
Sapling/Shrub Stratum (Plot size: ___)			
1. *Oemleria cerasiformis*	20	Yes	FACU
2. *Symphoricarpos albus*	80	Yes	FACU
3.			
4.			
5.			
50%= 50 20%= 20 Total Cover:	**100**		
Herb Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	**0**		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
Total Cover:	**0**		
% Bare Ground in Herb Stratum **100** % Cover of Biotic Crust ___			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **33%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**70**	x3 =	**210**
FACU species	**100**	x4 =	**400**
UPL species	**0**	x5 =	**0**
Column Totals:	**170** (A)		**610** (B)

Prevalence Index = B/A = **3.6**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: 33% FAC vegetation

SOIL

Sampling Point: Wet B DP10 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/3	100					SL	gravel below 8 inches

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: 3 chroma with no redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

x Surface Water (A1)
x High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes x No ___ Depth (inches): 6 inches
Water table Present? Yes x No ___ Depth (inches): at surface
Saturation Present? (includes capillary fringe) Yes x No ___ Depth (inches): at surface

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water in depression area that appears to have been excavated

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet B DP11 W
Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 R4E T20N
Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)
Are Vegetation x , Soil x , or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____
Are Vegetation ____ , Soil ____ , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No
Hydric Soil Present?	Yes X	No
Wetland Hydrology Present?	Yes X	No

Is the Sampled Area within a Wetland? **Yes** X **No**

Remarks: Suspect area identified as SP 12 in Confluence Report. Depression area within grass pasture, ground is cleared of vegetation, grass vegetation surrounds standing water.

VEGETATION

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status?
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	0		
Woody Vine Stratum (Plot size:)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**0**	(A)
Total Number of Dominant Species Across All Strata:	**0**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**0%**	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**0**	x3 =	**0**
FACU species	**0**	x4 =	**0**
UPL species	**0**	x5 =	**0**
Column Totals:	**0** (A)		**0** (B)

Prevalence Index = B/A = **0.0**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No**

Remarks: No vegetation in standing water depression within grass pasture

SOIL

Sampling Point: Wet B DP11 W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 5/2	90	10YR 5/4	10	D	M	SiL	
8-18	10YR 5/1	70	7.5YR 4/4	30	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks: 1 and 2 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

x Surface Water (A1)
___ High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes x No ___ Depth (inches): 3 inches
Water table Present? Yes ___ No x Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes x No ___ Depth (inches): at surface

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Standing water a few inches deep in depression. No water table, surface water flowed into data plot hole.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Freeman Road Logistics City/County: Puyallup/Pierce County Sampling Date: 3/11/2022
Applicant/Owner: Vector Development Company State: WA Sampling Point: Wet B DP12 Up
Investigator(s): C. Douglas, M. Curran Section, Township, Range: S17 R4E T20N
Landform (hillslope, terrace, etc.): Forested Local relief (concave, convex, none): concave Slope: 1-5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.12'33 Long: 122.19'03 Datum: NAD83
Soil Map Unit Name: Pilchuck fine sand NWI Classification: PFO, PSS, POW
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes x No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Suspect area identified as SP 12 in Confluence Report. Depression area within grass pasture, ground is cleared of vegetation, grass vegetation surrounds standing water

VEGETATION

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status?
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: ____)			
1. *Agrostis capillaris*	30	Yes	FAC
2. *Festuca rubra*	70	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x1 = 0
FACW species	0	x2 = 0
FAC species	100	x3 = 300
FACU species	0	x4 = 0
UPL species	0	x5 = 0
Column Totals:	100 (A)	300 (B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: 100% FAC vegetation, mowed grass pasture

SOIL

Sampling Point: Wet B DP12 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/3	99	10YR 5/4	1	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: 3 chroma with redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No x	Depth (inches):		
Water table Present?	Yes ___	No x	Depth (inches):		
Saturation Present? (includes capillary fringe)	Yes x	No ___	Depth (inches): 14 inches		

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Saturation at 14 inches

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Western Mountains, Valleys, and Coast Region
See ERDC/EL TR-10-3; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Freeman Road - Parcel 0420201104 City/County: Fife/Pierce Sampling Date: 5/20/23
Applicant/Owner: Vector Development State: WA Sampling Point: DP-13 Up
Investigator(s): Hannah Fotherby and Jakob Rowny Section, Township, Range: S20, T20N, R04E
Landform (hillside, terrace, etc.): Ditch/trench bottom Local relief (concave, convex, none): concave Slope (%): 0
Subregion (LRR): LRR A, MLRA 2 Lat: 47.208359 Long: -122.321114 Datum: WGS84
Soil Map Unit Name: Pilchuck fine sand NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		X

Remarks:
Data point located in a low area in the northeast portion of the parcel, within a small trench/ditch about 3 feet deep.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus balsamifera*	75	Yes	FAC
2. *Acer macrophyllum*	15	No	FACU
3.			
4.			
	90	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1. *Symphoricarpos albus*	40	Yes	FACU
2. *Corylus cornuta*	30	Yes	FACU
3. *Fraxinus latifolia*	30	Yes	FACW
4. *Rubus armeniacus*	15	No	FAC
5.			
	115	=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Ranunculus repens*	10	Yes	FAC
2. *Rubus ursinus*	5	Yes	FACU
3. Unknown grass sp.	5	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20	=Total Cover	
Woody Vine Stratum (Plot size: 15)			
1.			
2.			
		=Total Cover	

% Bare Ground in Herb Stratum 80

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 7 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 57.1% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	30	x 2 =	60
FAC species	105	x 3 =	315
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	225 (A)		735 (B)

Prevalence Index = B/A = 3.27

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: DP-13 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/3	100					Sandy	sandy loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ 1 cm Muck (A9) **(LRR D, G)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(LRR A, E)**
___ Iron-Manganese Masses (F12) **(LRR D)**
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: none
Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks:
No redoximorphic features present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Soil lightly moist at around 10 inches deep but no saturation or other hydrology indicators present.

Wetland name or number A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: 3/11/22

Rated by C. Douglas Trained by Ecology? ☒ Yes ☐ No Date of training 2007

HGM Class used for rating Depressional Wetland has multiple HGM classes? ☐ Y ☒ N

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.
Source of base aerial photo/map ____________________

OVERALL WETLAND CATEGORY III (based on functions ☒ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

_______ **Category I** – Total score = 23 - 27

_______ **Category II** – Total score = 20 - 22

x **Category III** – Total score = 16 - 19

_______ **Category IV** – Total score = 9 - 15

FUNCTION	**Improving Water Quality**	**Hydrologic**	**Habitat**	
			Circle the appropriate ratings	
Site Potential	H M L	H M L	H M L	
Landscape Potential	H M L	H M L	H M L	
Value	H M L	H M L	H M L	**TOTAL**
Score Based on Ratings	6	7	4	**17**

Score for each function based on three ratings
(order of ratings is not important)

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	**CATEGORY**
Estuarine	I II
Wetland of High Conservation Value	I
Bog	I
Mature Forest	I
Old Growth Forest	I
Coastal Lagoon	I II
Interdunal	I II III IV
None of the above	X

Wetland name or number A

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	
Hydroperiods	D 1.4, H 1.2	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number A

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

(●) NO – go to 2 ( ) **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

( ) **NO – Saltwater Tidal Fringe (Estuarine)** ( ) **YES – Freshwater Tidal Fringe**

If your wetland can be classified as a Freshwater Tidal Fringe use the forms for ***Riverine*** *wetlands. If it is Saltwater Tidal Fringe it is an* ***Estuarine*** *wetland and is not scored. This method* ***cannot*** *be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

(●) NO – go to 3 ( ) **YES** – The wetland class is **Flats**

If your wetland can be classified as a Flats wetland, use the form for ***Depressional*** *wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
   - [ ] The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
   - [ ] At least 30% of the open water area is deeper than 6.6 ft (2 m).

(●) NO – go to 4 ( ) **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   - [ ] The wetland is on a slope (*slope can be very gradual*),
   - [ ] The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
   - [ ] The water leaves the wetland **without being impounded**.

(●) NO – go to 5 ( ) **YES –** The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
   - [ ] The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   - [ ] The overbank flooding occurs at least once every 2 years.

Wetland name or number A

◉ NO – go to 6 ○ **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

○ NO – go to 7 ◉ **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

◉ NO – go to 8 ○ **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number A

DEPRESSIONAL AND FLATS WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions)*. Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^{1}/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^{1}/_{10}$ of area points = 0	3
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	2
Total for D 1 Add the points in the boxes above	**8**

Rating of Site Potential If score is: ☐ **12-16 = H** ☒ **6-11 = M** ☐ **0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source_______________ Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	**2**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☒ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	0
Total for D 3 Add the points in the boxes above	**1**

Rating of Value If score is: ☐ **2-4 = H** ☒ **1 = M** ☐ **0 = L** *Record the rating on the first page*

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outletpoints = 2 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	7
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	0
Total for D 4 Add the points in the boxes above	**11**

Rating of Site Potential If score is: ☐ **12-16 = H** ☒ **6-11 = M** ☐ **0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	1
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	1
Total for D 5 Add the points in the boxes above	**3**

Rating of Landscape Potential If score is: ☒ **3 = H** ☐ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): ≠ Flooding occurs in a sub-basin that is immediately down-gradient of unit. points = 2 ≠ Surface flooding problems are in a sub-basin farther down-gradient. points = 1 Flooding from groundwater is an issue in the sub-basin. points = 1 The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* ______________ points = 0 There are no problems with flooding downstream of the wetland. points = 0	1
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	**1**

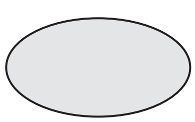
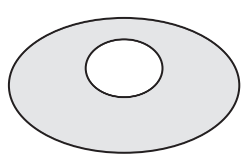
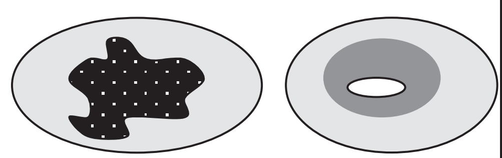
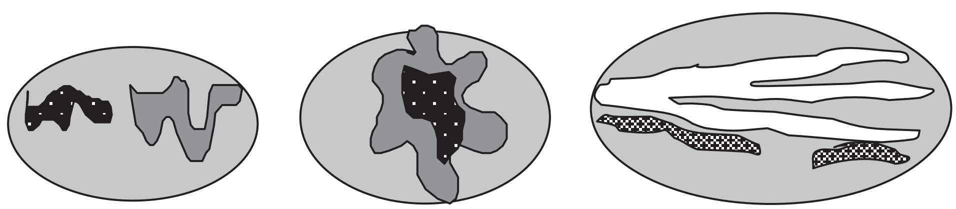
Rating of Value If score is: ☐ **2-4 = H** ☒ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number A

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ____Aquatic bed — 4 structures or more: points = 4 __X__Emergent — 3 structures: points = 2 __X__Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 __X__Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	2
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). __X__Permanently flooded or inundated — 4 or more types present: points = 3 __X__Seasonally flooded or inundated — 3 types present: points = 2 ____Occasionally flooded or inundated — 2 types present: points = 1 __X__Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland ____Seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	2
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3points 	2

Wetland name or number A

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* _X_Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). _X_Standing snags (dbh > 4 in) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) _X_Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* _X_At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	4
Total for H 1 — Add the points in the boxes above	**11**

Rating of Site Potential If score is: ☐ **15-18 = H** ☒ **7-14 = M** ☐ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?

H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat _5_ + [(% moderate and low intensity land uses)/2] _0_ = _5_% If total accessible habitat is: > $^1/_3$ (33.3%) of 1 km Polygon — points = 3 20-33% of 1 km Polygon — points = 2 10-19% of 1 km Polygon — points = 1 < 10% of 1 km Polygon — points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat _10_ + [(% moderate and low intensity land uses)/2] _10_ = _20_% Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10-50% and in 1-3 patches — points = 2 Undisturbed habitat 10-50% and > 3 patches — points = 1 Undisturbed habitat < 10% of 1 km Polygon — points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use — points = (- 2) ≤ 50% of 1 km Polygon is high intensity — points = 0	-2
Total for H 2 — Add the points in the boxes above	**-1**

Rating of Landscape Potential If score is: ☐ **4-6 = H** ☐ **1-3 = M** ☒ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?

H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: — points = 2 - It has 3 or more priority habitats within 100 m (see next page) - It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) - It is mapped as a location for an individual WDFW priority species - It is a Wetland of High Conservation Value as determined by the Department of Natural Resources - It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) within 100 m — points = 1 Site does not meet any of the criteria above — points = 0	**0**

Rating of Value If score is: ☐ **2 = H** ☐ **1 = M** ☒ **0 = L** *Record the rating on the first page*

Wetland name or number A

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.
- ☐ **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.
- ☐ **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).
- ☐ **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.
- ☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*
- ☐ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☒ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

Wetland name or number A

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	Category
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? ℵ The dominant water regime is tidal, ℵ Vegetated, and ℵ With a salinity greater than 0.5 ppt ○ Yes –Go to **SC 1.1** ● No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ○ Yes = **Category I** ○ No - Go to **SC 1.2**	○ **Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ℵ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) ℵ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ℵ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ○ Yes = **Category I** ○ No = **Category II**	○ **Cat. I** ○ **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ○ Yes **–** Go to **SC 2.2** ○ No **–** Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ○ Yes **= Category I** ● No **= Not a WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ○ Yes **– Contact WNHP/WDNR and go to SC 2.4** ○ No **= Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ○ Yes **= Category I** ○ No **= Not a WHCV**	○ **Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ○ Yes – Go to **SC 3.3** ○ No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ○ Yes – Go to **SC 3.3** ○ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ○ Yes = **Is a Category I bog** ○ No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? ○ Yes = **Is a Category I bog** ● No = **Is not a bog**	○ **Cat. I**

Wetland name or number A

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

- **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.
- **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

○ Yes = **Category I** ◉ No **= Not a forested wetland for this section**

○ **Cat. I**

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

- The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks
- The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)*

○ Yes – Go to **SC 5.1** ◉ No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

- The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).
- At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.
- The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2)

○ Yes = **Category I** ◉ No = **Category II**

○ **Cat. I**

○ **Cat. II**

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

- Long Beach Peninsula: Lands west of SR 103
- Grayland-Westport: Lands west of SR 105
- Ocean Shores-Copalis: Lands west of SR 115 and SR 109

○ Yes – Go to **SC 6.1** ◉ No = **not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? ○ Yes = **Category I** ○ No – Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? ○ Yes = **Category II** ○ No – Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? ○ Yes = **Category III** ○ No = **Category IV**

○ **Cat I**

○ **Cat. II**

○ **Cat. III**

○ **Cat. IV**

Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	NA

Figures

LEGEND:

NWI Wetland
- Freshwater Forested/ Shrub Wetland
- Freshwater Pond
- Riverine

City of Puyallup Wetlands Inventory
- Unverified

- 150 Foot Buffer of Wetland A
- Pollutant Generating Area
- Wetland Test Plot Location

0 350
Feet

Sources:
1. Aerial imagery: USDA (2019)
2. NWI: USFWS (2023)

Notes:
1. USDA: United States Department of Agriculture
2. NWI: National Wetland Inventory
3. USFWS: United States Fish and Wildlife Service
4. May 2023 field observations indicate upland conditions at DP-13 and unverified wetland area.

Publish Date: 2023/09/29, 2:08 PM | User: nwagner
Filepath: \\orcas\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 1
Wetland A - Cowardin Vegetation Classes and 150-foot Wetland Offset
Wetland Rating Form - Wetland A
Freeman Road Logistics

LEGEND:

Hydroperiod

Permanently Flooded

Saturated

NOTE:
1. Aerial image provided by Esri Online Services.

0 350
Feet

Publish Date: 2023/07/06, 2:18 PM | User: jlarson
Filepath: \\orcas\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 2
Wetland A - Hydroperiods
Wetland Rating Form - Wetland A
Freeman Road Logistics

LEGEND:

Wetland A

Contributing Basin

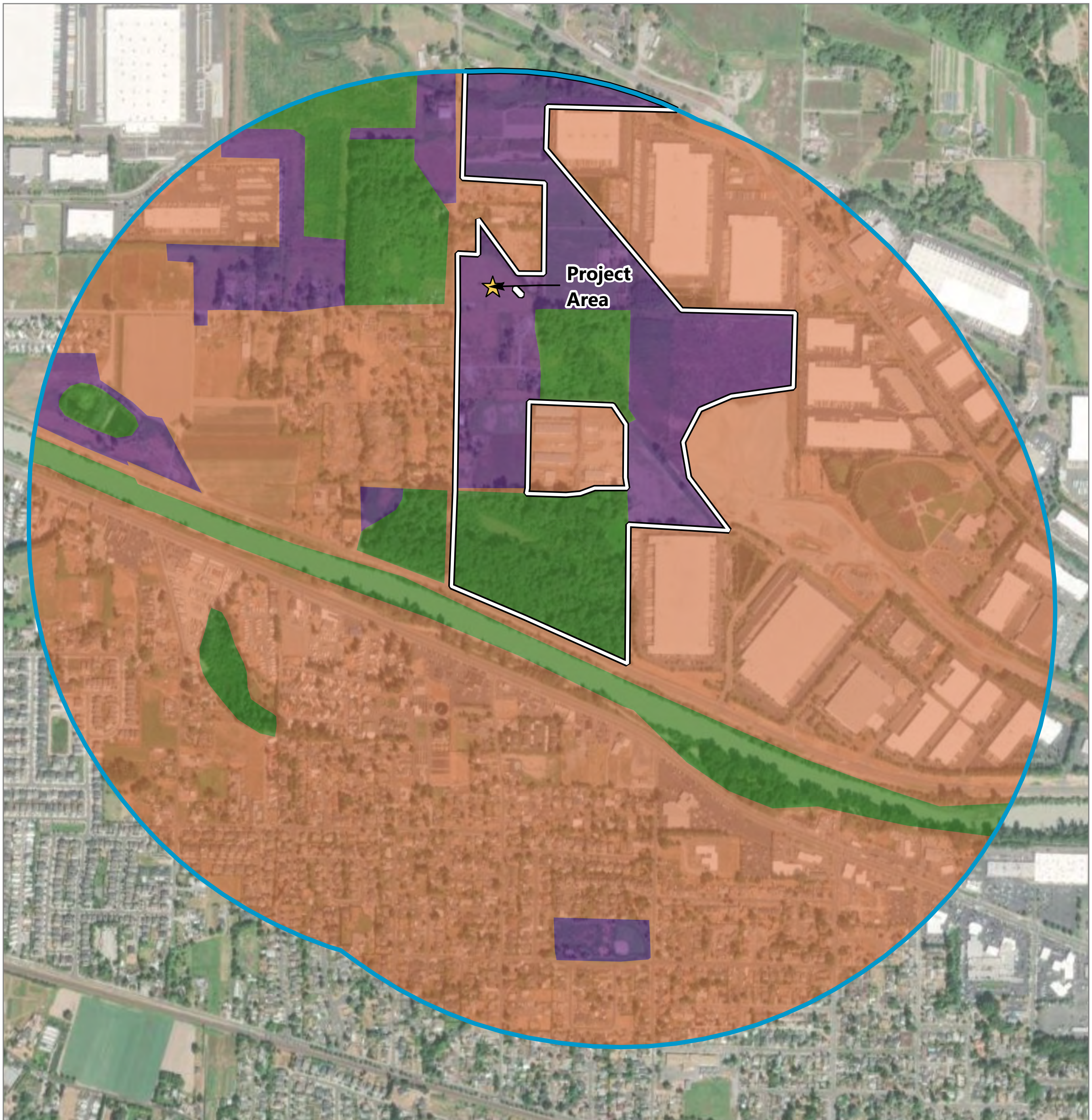
NOTE:
1. Aerial image provided by Esri Online Services.

0 600
Feet

Publish Date: 2023/07/06, 2:27 PM | User: jlarson
Filepath: \\orcas\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 3
Wetland A - Map of the Contributing Basin
Wetland Rating Form - Wetland A
Freeman Road Logistics



LEGEND:

- ☆ Project Area
- 1-km Radius of Wetland A
- Acessible Habitat

Land Use Type

- High Intensity
- Low/Moderate Intensity
- Relatively Undisturbed

NOTE:
1. Aerial image provided by Esri Online Services.

0 1,200
Feet

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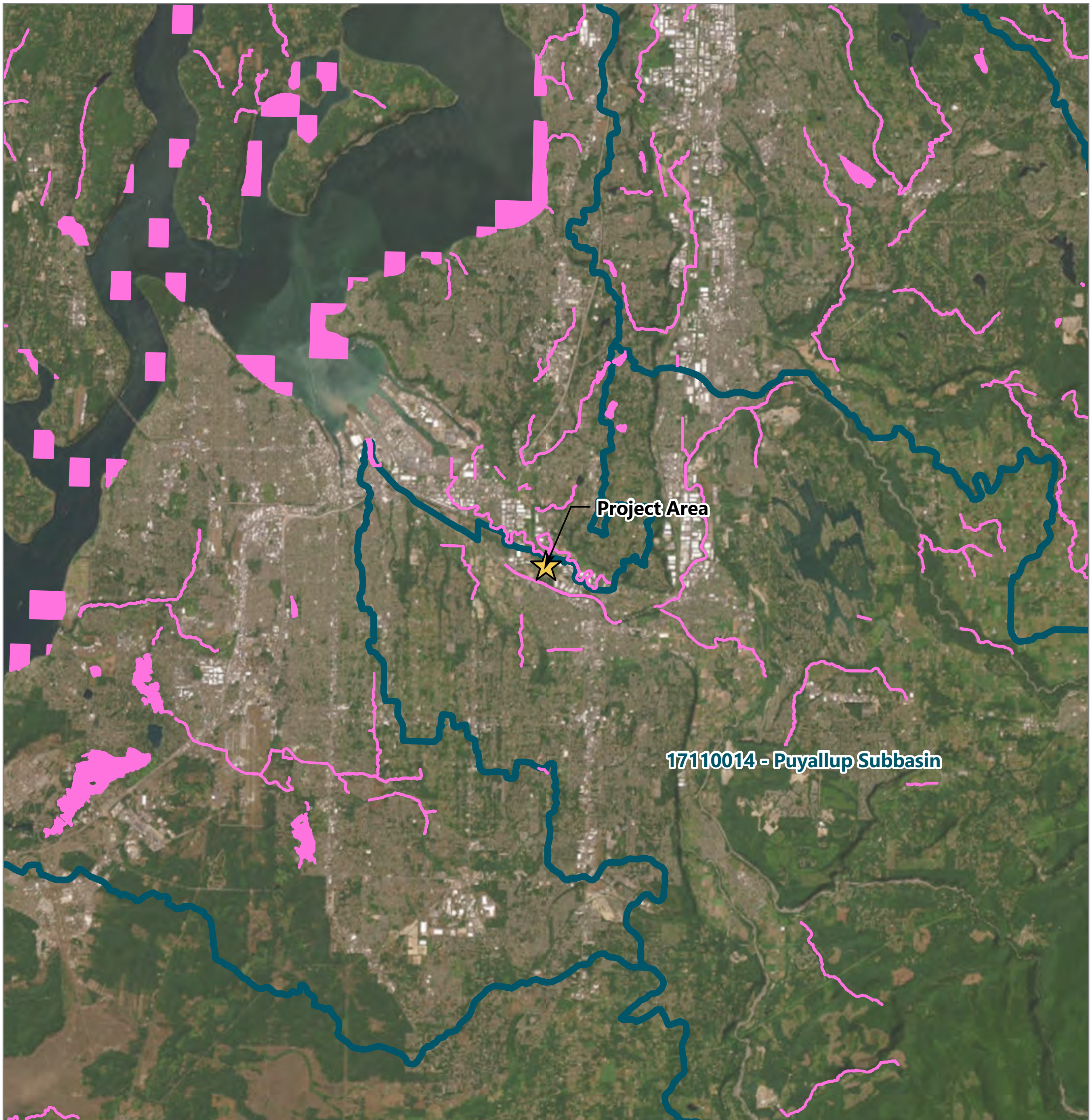
Filepath: \\orcas\GIS\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\CAR\FreemanRoad_CAR.aprx

ANCHOR QEA

Figure 4
Land Use Intensity within 1-km of the Wetland
Wetland Rating Form - Wetland A
Freeman Road Logistics



LEGEND:

Project Area

303(d) Listed Water

HUC8 Watershed

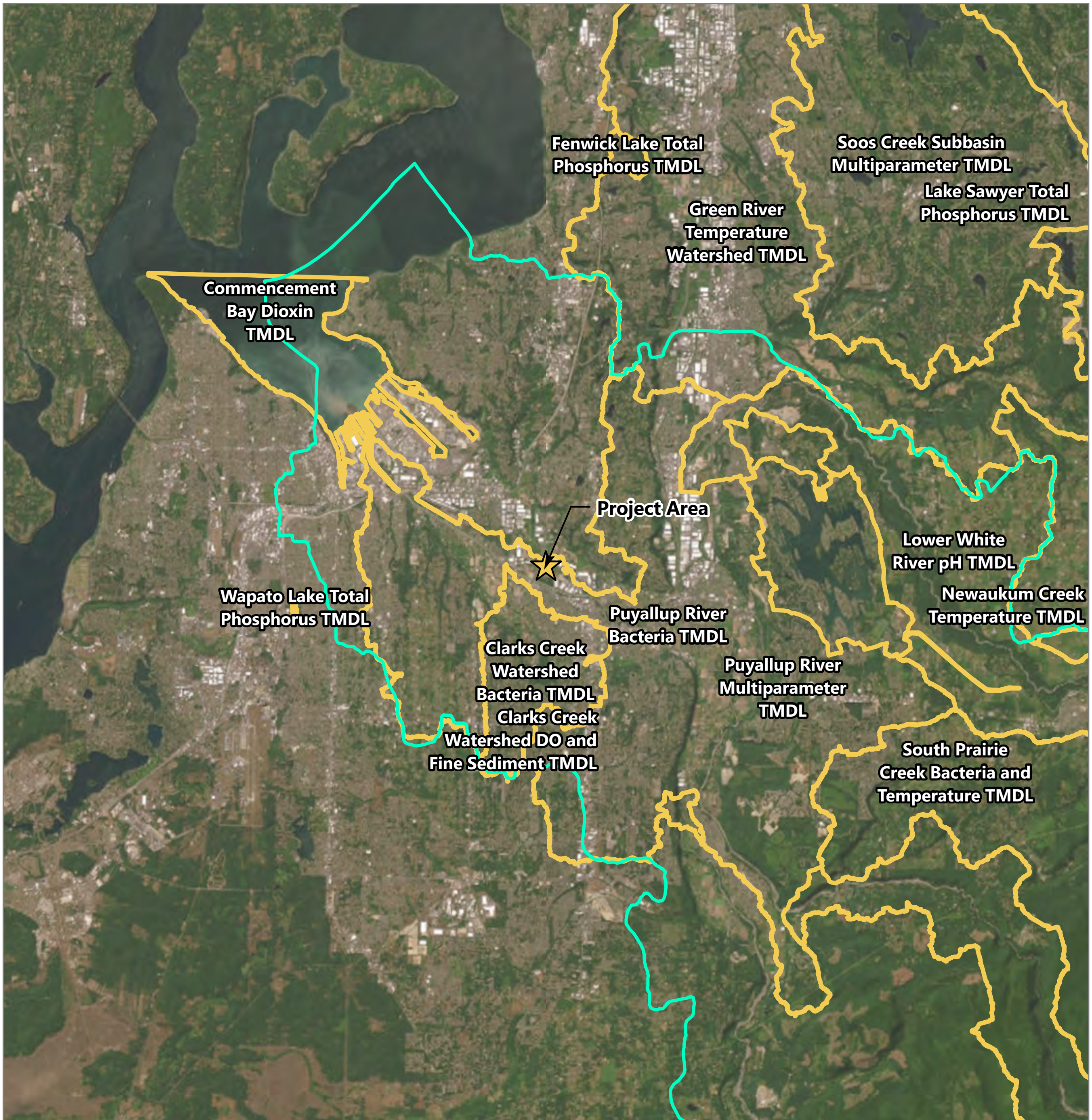
NOTES:
1. Aerial image provided by Esri Online Services.
2. 303(d) lised waters and HUC8 Watershed boundary from Washington State Ecology.

0 4
Miles

Publish Date: 2023/05/25, 10:52 AM | User: alesueur
Filepath: \\orcas\gis\Jobs\Vector_Development_Company_2141\Freeman_Road\Maps\Wetlands\Ratings_WetlandB\WetlandB_Ratings.aprx

ANCHOR QEA

Figure 5
303(d) Listed Waters
Wetland Rating Form - Wetland A
Freeman Road Logistics



LEGEND:

- Project Area
- WRIA 10 - Puyallup - White
- TMDL

NOTES:

1. Aerial image provided by Esri Online Services.
2. WRIA 10 and TMDL boundaries are from Washington State Ecology.

0 4
Miles

Publish Date: 2023/05/25, 10:51 AM | User: alesueur
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ANCHOR QEA

Figure 6
List of TMDLs for WRIA 10 - Puyallup - White
Wetland Rating Form - Wetland A
Freeman Road Logistics

Wetland name or number B

RATING SUMMARY – Western Washington

Name of wetland (or ID #): On-site Wetland B Date of site visit: 5/20/23

Rated by Hannah Fotherby, Jakob Rowny Trained by Ecology? X Yes ___No Date of training 12/8/22

HGM Class used for rating Depressional Wetland has multiple HGM classes?___Y X N

NOTE: Form is not complete without the figures requested *(figures can be combined)*.
Source of base aerial photo/map ESRI

OVERALL WETLAND CATEGORY III (based on functions X or special characteristics___)

1. Category of wetland based on FUNCTIONS

_______ **Category I** – Total score = 23 - 27

_______ **Category II** – Total score = 20 - 22

X **Category III** – Total score = 16 - 19

_______ **Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality			Hydrologic			Habitat			
							Circle the appropriate ratings			
Site Potential	H	M	L	H	M	L	H	M	L	
Landscape Potential	H	M	L	H	M	L	H	M	L	
Value	H	M	L	H	M	L	H	M	L	**TOTAL**
Score Based on Ratings	7			7			5			19

Score for each function based on three ratings
(order of ratings is not important)

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	I II
Wetland of High Conservation Value	I
Bog	I
Mature Forest	I
Old Growth Forest	I
Coastal Lagoon	I II
Interdunal	I II III IV
None of the above	X

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	Figure 1
Hydroperiods	D 1.4, H 1.2	Figure 2
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	Figure 2
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	Figure 1
Map of the contributing basin	D 4.3, D 5.3	Figure 3
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	Figure 4
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	Figure 5
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	Figure 6

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**

If your wetland can be classified as a Freshwater Tidal Fringe use the forms for ***Riverine*** *wetlands. If it is Saltwater Tidal Fringe it is an* ***Estuarine*** *wetland and is not scored. This method* ***cannot*** *be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

NO – go to 3 **YES** – The wetland class is **Flats**

If your wetland can be classified as a Flats wetland, use the form for ***Depressional*** *wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?

__The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;

__At least 30% of the open water area is deeper than 6.6 ft (2 m).

NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?

___The wetland is on a slope (*slope can be very gradual*),

___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,

___The water leaves the wetland **without being impounded**.

NO – go to 5 **YES –** The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?

___The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,

___The overbank flooding occurs at least once every 2 years.

Wetland name or number B

NO – go to 6 **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions)*. Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^1/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^1/_{10}$ of area points = 0	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	2
Total for D 1 Add the points in the boxes above	10

Rating of Site Potential If score is: ___ **12-16 = H** _X_ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? houses are gone but septic may still be leaching Yes = 1 No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source_______________ Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3 or 4 = H** _X_ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: _X_ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number B

DEPRESSIONAL AND FLATS WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and stream degradation	
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet points = 2 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	0
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	5
Total for D 4 Add the points in the boxes above	9

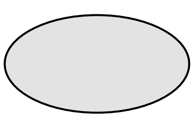
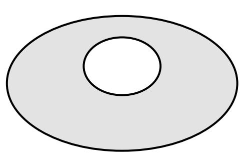
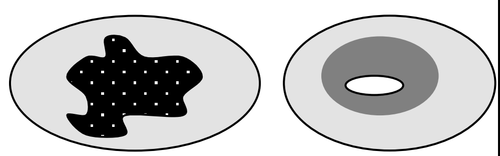
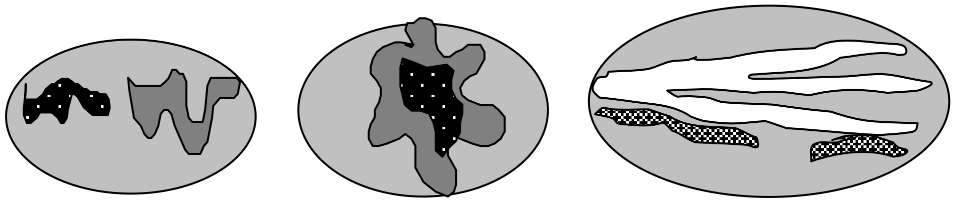
Rating of Site Potential If score is:___**12-16 = H** _X_**6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	0
Total for D 5 Add the points in the boxes above	1

Rating of Landscape Potential If score is:___**3 = H** _X_**1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately down-gradient of unit. points = 2 • Surface flooding problems are in a sub-basin farther down-gradient. points = 1 Flooding from groundwater is an issue in the sub-basin. points = 1 The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* ______________ points = 0 There are no problems with flooding downstream of the wetland. points = 0	2
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	2

Rating of Value If score is:_X_**2-4 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	
H 1.0. Does the site have the potential to provide habitat?	
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ____Aquatic bed — 4 structures or more: points = 4 _X__Emergent — 3 structures: points = 2 ____Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 ____Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	0
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). ____Permanently flooded or inundated — 4 or more types present: points = 3 _X__Seasonally flooded or inundated — 3 types present: points = 2 ____Occasionally flooded or inundated — 2 types present: points = 1 _X__Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland ____Seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	1
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0 *Alopecurus pratensis, Ranunculus repens, Trifolium repens, Juncus effusus*	0
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points  All three diagrams in this row are **HIGH** = 3points	0

Wetland name or number B

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ____Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). ____Standing snags (dbh > 4 in) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* ____At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* _X_Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	1
Total for H 1 Add the points in the boxes above	2

Rating of Site Potential If score is:___**15-18 = H** ___**7-14 = M** _X_**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat _6_ **+** [(% moderate and low intensity land uses)/2] _6_ **=** _12_% If total accessible habitat is: > $^{1}/_{3}$ (33.3%) of 1 km Polygon — points = 3 20-33% of 1 km Polygon — points = 2 10-19% of 1 km Polygon — points = 1 < 10% of 1 km Polygon — points = 0	1
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat _18_ **+** [(% moderate and low intensity land uses)/2] _12_ **=** _30_% Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10-50% and in 1-3 patches — points = 2 Undisturbed habitat 10-50% and > 3 patches — points = 1 Undisturbed habitat < 10% of 1 km Polygon — points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use — points = (- 2) ≤ 50% of 1 km Polygon is high intensity — points = 0	-2
Total for H 2 Add the points in the boxes above	0

Rating of Landscape Potential If score is:___**4-6 = H** ___**1-3 = M** _X_**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: — points = 2 _X_ It has 3 or more priority habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW priority species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) within 100 m — points = 1 Site does not meet any of the criteria above — points = 0	2

Rating of Value If score is:_X_**2 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number B

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

___ **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

___ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

___ **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

___ **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

___ **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

_X_ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

___ **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

_X_ **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

___ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

___ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

___ **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

___ **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

_X_ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? — The dominant water regime is tidal, — Vegetated, and — With a salinity greater than 0.5 ppt Yes –Go to **SC 1.1** No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? Yes = **Category I** No - Go to **SC 1.2**	**Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? Yes **– Go to SC 2.2** No **–** Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? Yes **= Category I** No **= Not a WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf Yes **– Contact WNHP/WDNR and go to SC 2.4** No **= Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below. **If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? Yes – Go to **SC 3.3** No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? Yes – Go to **SC 3.3** No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? Yes = **Is a Category I bog** No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? Yes = **Is a Category I bog** No **= Is not a bog**	**Cat. I**

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.*** — **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more. — **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm). Yes = **Category I** No = **Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks — The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon** SC 5.1. Does the wetland meet all of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100). — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal Wetlands Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.*** In practical terms that means the following geographic areas: — Long Beach Peninsula: Lands west of SR 103 — Grayland-Westport: Lands west of SR 105 — Ocean Shores-Copalis: Lands west of SR 115 and SR 109 Yes – Go to **SC 6.1** No = **not an interdunal wetland for rating** SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? Yes = **Category I** No – Go to **SC 6.2** SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? Yes = **Category II** No – Go to **SC 6.3** SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	N/A

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Figures

LEGEND:

Wetland Test Plot Location

150-foot Buffer of Wetland B

Pollutant Generating Area

Cowardin Class

Palustrine Emergent

SOURCE:
1. Aerial imagery: USDA (2019)

NOTE:
1. USDA: United States Department of Agriculture

0 100
Feet

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ANCHOR QEA

Figure 1
Cowardin Plant Classes and Area Within 150 feet of the Wetland
Wetland Rating Form - Wetland B
Freeman Road Logistics

LEGEND:

Wetland B

Hydroperiods

Saturated

Seasonally Flooded

NOTES:
1. Aerial image provided by Esri Online Services.

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ANCHOR QEA

Figure 2
Hydroperiods
Wetland Rating Form - Wetland B
Freeman Road Logistics

LEGEND:

Wetland B

Contributing Basin

NOTES:
1. Aerial image provided by Esri Online Services.
2. Hillshade background from Washington Department of Natural Resources, Pierce County Lidar, 2020.

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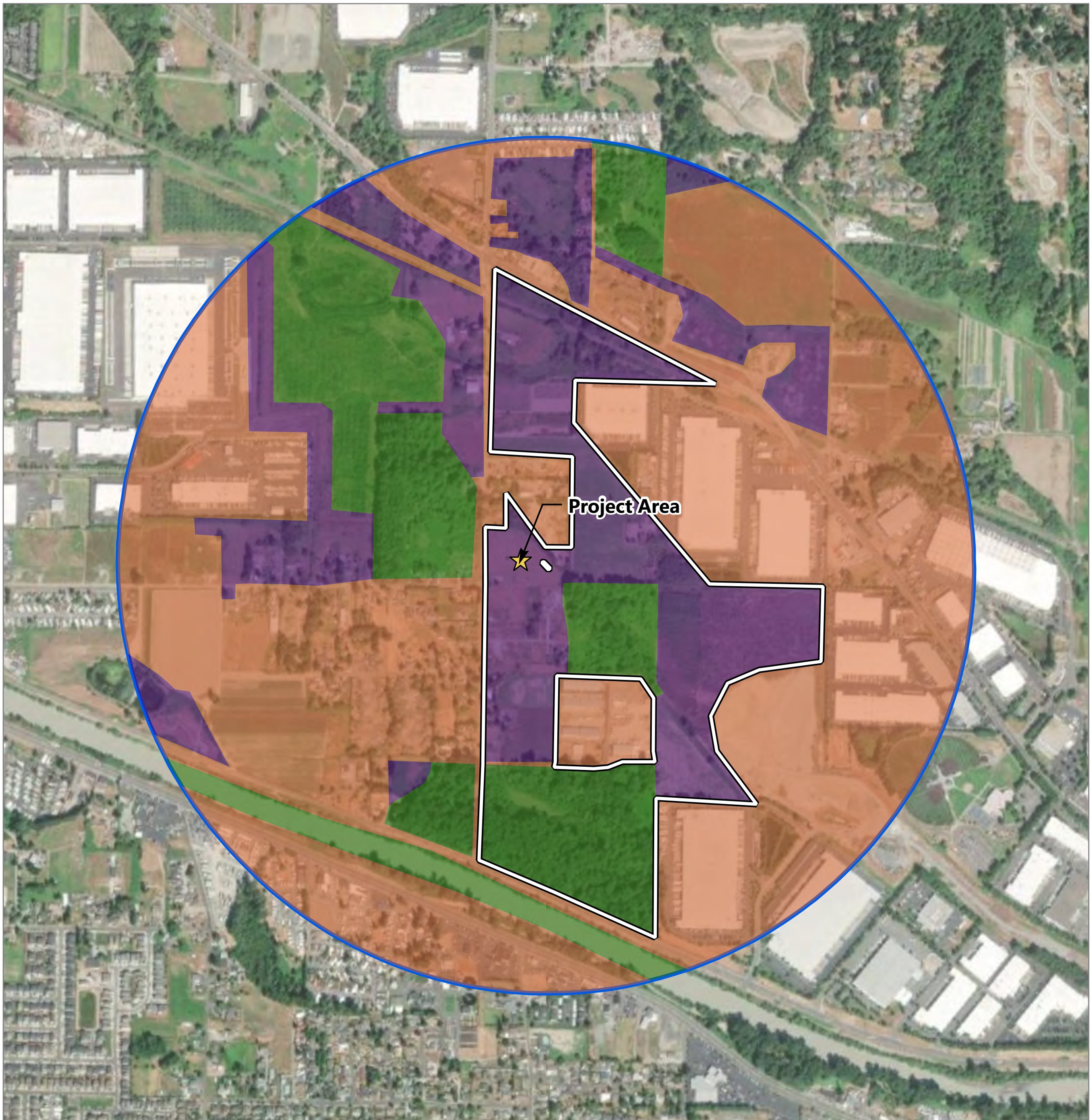
ANCHOR QEA

Figure 3
Contributing Basin
Wetland Rating Form - Wetland B
Freeman Road Logistics



LEGEND:

Project Area

1-km Radius of Wetland B

Accessible Habitat

Land Use Type

High Intensity

Low/Moderate Intensity

Relatively Undisturbed

NOTES:
1. Aerial image provided by Esri Online Services.

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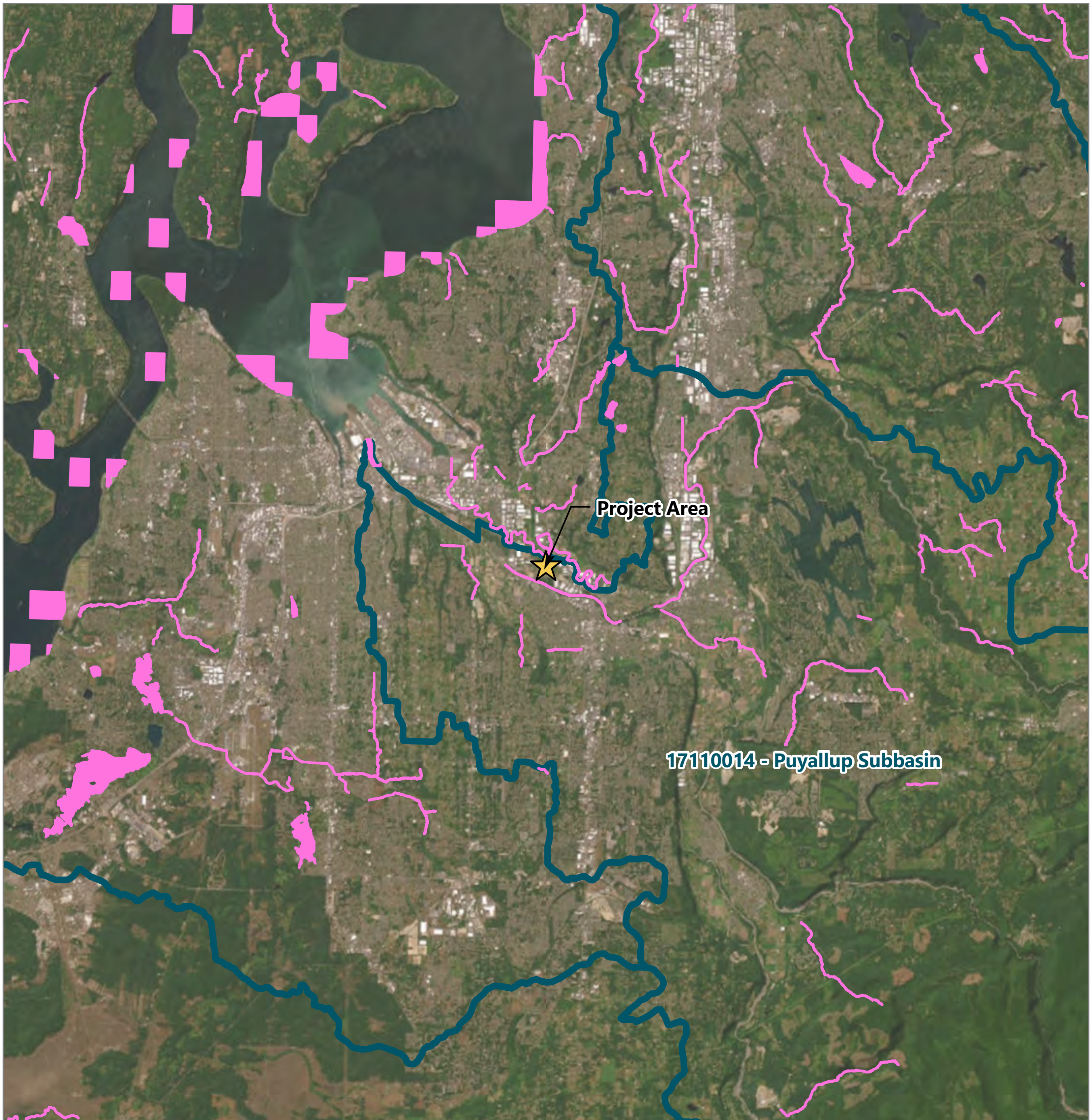
Figure 4
Land Use Intensity within 1-km of the Wetland
Wetland Rating Form - Wetland B
Freeman Road Logistics



LEGEND:

Project Area

303(d) Listed Water

HUC8 Watershed

NOTES:
1. Aerial image provided by Esri Online Services.
2. 303(d) lised waters and HUC8 Watershed boundary from Washington State Ecology.

0 4
Miles

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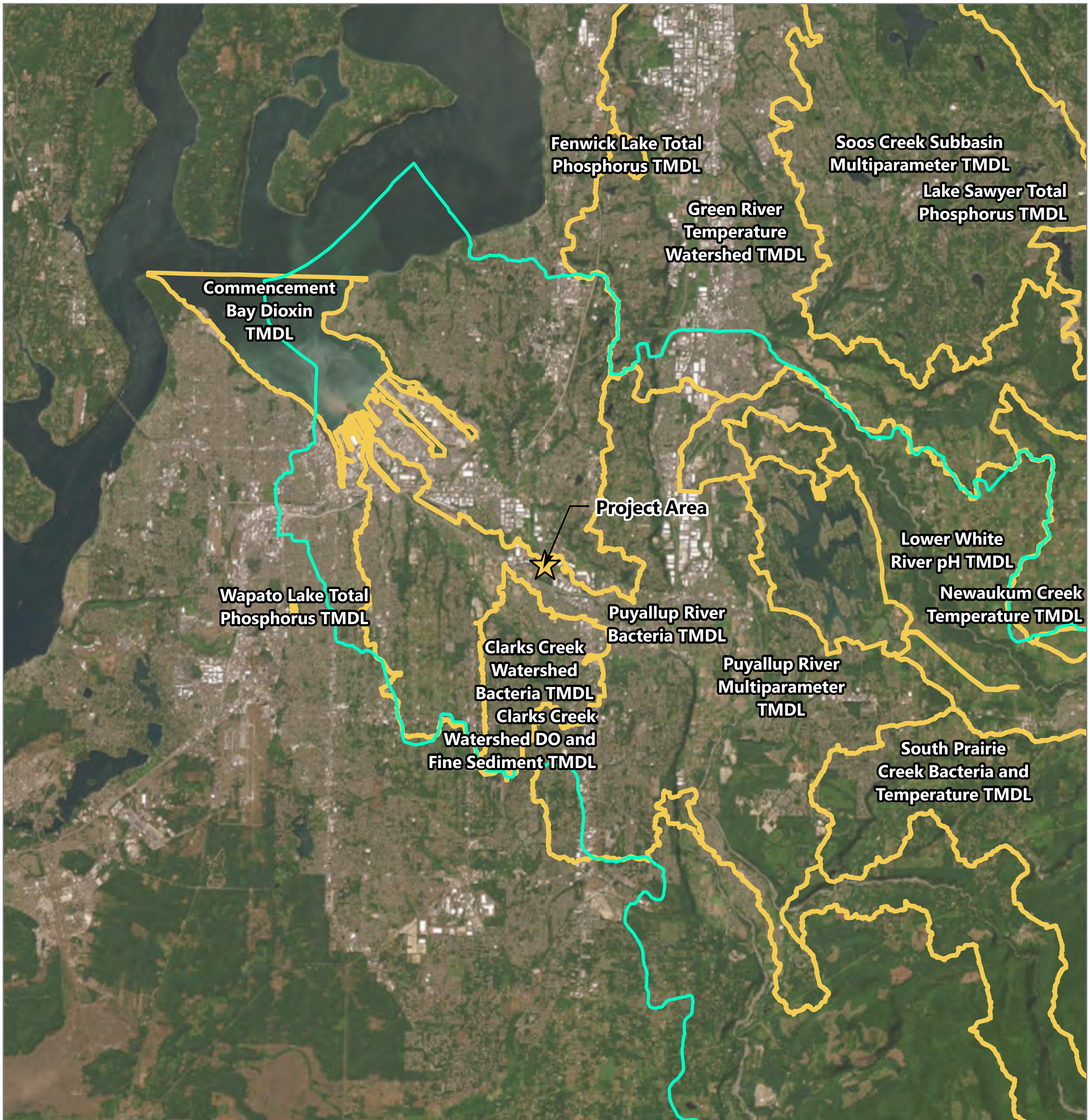
ANCHOR QEA

Figure 5
303(d) Listed Waters
Wetland Rating Form - Wetland B
Freeman Road Logistics



LEGEND:

Project Area

WRIA 10 - Puyallup - White

TMDL

NOTES:

1. Aerial image provided by Esri Online Services.
2. WRIA 10 and TMDL boundaries are from Washington State Ecology.

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Figure 6
List of TMDLs for WRIA 10 - Puyallup - White
Wetland Rating Form - Wetland B
Freeman Road Logistics

Tab 7.0

7.0 OTHER PERMITS

7.0 OTHER PERMITS

Other permits for this project site include:

- NPDES General Permit from the Department of Ecology
- Site Development Permit from the City of Puyallup
- Grade and Fill Permit from the City of Puyallup
- Right of Way Permits from the City of Puyallup and Fife

Tab 8.0

8.0 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

A complete Construction Stormwater Pollution Prevention Plan will be included during future construction submittals.

Tab 9.0

9.0 OPERATIONS AND MAINTENANCE MANUAL

9.0 OPERATION AND MAINTENANCE MANUAL

See below for operation and maintenance requirements for flow control facilities, water quality facilities, and conveyance systems from the DOE SWMM. This section shall be updated as needed to reflect all chosen BMPs.

-

NO. 3 – DETENTION TANKS AND VAULTS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash and debris	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Tank or Vault Storage Area	Trash and debris	Any trash and debris accumulated in vault or tank (includes floatables and non-floatables).	No trash or debris in vault.
	Sediment accumulation	Accumulated sediment depth exceeds 10% of the diameter of the storage area for ½ length of storage vault or any point depth exceeds 15% of diameter. Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than ½ length of tank.	All sediment removed from storage area.
Tank Structure	Plugged air vent	Any blockage of the vent.	Tank or vault freely vents.
	Tank bent out of shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape.	Tank repaired or replaced to design.
	Gaps between sections, damaged joints or cracks or tears in wall	A gap wider than ½-inch at the joint of any tank sections or any evidence of soil particles entering the tank at a joint or through a wall.	No water or soil entering tank through joints or walls.
Vault Structure	Damage to wall, frame, bottom, and/or top slab	Cracks wider than ½-inch, any evidence of soil entering the structure through cracks or qualified inspection personnel determines that the vault is not structurally sound.	Vault is sealed and structurally sound.
Inlet/Outlet Pipes	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.

NO. 3 – DETENTION TANKS AND VAULTS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Access Manhole	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open manhole requires immediate maintenance.**	Manhole access covered.
	Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs of lift.	Cover/lid can be removed and reinstalled by one maintenance person.
	Ladder rungs unsafe	Missing rungs, misalignment, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Large access doors/plate	Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment.	Replace or repair access door so it can opened as designed.
	Gaps, doesn't cover completely	Large access doors not flat and/or access opening not completely covered.	Doors close flat; covers access opening completely.
	Lifting Rings missing, rusted	Lifting rings not capable of lifting weight of door or plate.	Lifting rings sufficient to lift or remove door or plate.

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NO. 5 – CATCH BASINS AND MANHOLES

Maintenance Component	**Defect or Problem**	**Condition When Maintenance is Needed**	**Results Expected When Maintenance is Performed**
Structure	Sediment	Sediment exceeds 60% of the depth from the bottom of the catch basin to the invert of the lowest pipe into or out of the catch basin or is within 6 inches of the invert of the lowest pipe into or out of the catch basin.	Sump of catch basin contains no sediment.
	Trash and debris	Trash or debris of more than ½ cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the catch basin by more than 10%.	No Trash or debris blocking or potentially blocking entrance to catch basin.
		Trash or debris in the catch basin that exceeds $^1/_3$ the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the catch basin.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within catch basin.
		Deposits of garbage exceeding 1 cubic foot in volume.	No condition present which would attract or support the breeding of insects or rodents.
	Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (If applicable).	Frame is even with curb.
		Top slab has holes larger than 2 square inches or cracks wider than ¼ inch.	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab.	Frame is sitting flush on top slab.
	Cracks in walls or bottom	Cracks wider than ½ inch and longer than 3 feet, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that catch basin is unsound.	Catch basin is sealed and is structurally sound.
		Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	No cracks more than $^1/_4$ inch wide at the joint of inlet/outlet pipe.
	Settlement/ misalignment	Catch basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the catch basin at the joint of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.

	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.

NO. 5 – CATCH BASINS AND MANHOLES

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Metal Grates (Catch Basins)	Unsafe grate opening	Grate with opening wider than $^7/_8$ inch.	Grate opening meets design standards.
	Trash and debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris. footnote to guidelines for disposal
	Damaged or missing	Grate missing or broken member(s) of the grate. **Any open structure requires urgent maintenance**.	Grate is in place and meets design standards.
Manhole Cover/Lid	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open structure requires urgent maintenance**.	Cover/lid protects opening to structure.
	Locking mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to Remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift.	Cover/lid can be removed and reinstalled by one maintenance person.

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NO. 6 – CONVEYANCE PIPES AND DITCHES

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Pipes	Sediment & debris accumulation	Accumulated sediment or debris that exceeds 20% of the diameter of the pipe.	Water flows freely through pipes.
	Vegetation/roots	Vegetation/roots that reduce free movement of water through pipes.	Water flows freely through pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damage to protective coating or corrosion	Protective coating is damaged; rust or corrosion is weakening the structural integrity of any part of pipe.	Pipe repaired or replaced.
	Damaged	Any dent that decreases the cross section area of pipe by more than 20% or is determined to have weakened structural integrity of the pipe.	Pipe repaired or replaced.
Ditches	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment accumulation	Accumulated sediment that exceeds 20% of the design depth.	Ditch cleaned/flushed of all sediment and debris so that it matches design.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion damage to slopes	Any erosion observed on a ditch slope.	Slopes are not eroding.
	Rock lining out of place or missing (If Applicable)	One layer or less of rock exists above native soil area 5 square feet or more, any exposed native soil.	Replace rocks to design standards.

-

NO. 8 – ENERGY DISSIPATERS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed.
Site	Trash and debris	Trash and/or debris accumulation.	Dissipater clear of trash and/or debris.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
Rock Pad	Missing or moved Rock	Only one layer of rock exists above native soil in area five square feet or larger or any exposure of native soil.	Rock pad prevents erosion.
Dispersion Trench	Pipe plugged with sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not discharging water properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench).	Water discharges from feature by sheet flow.
	Perforations plugged.	Over 1/4 of perforations in pipe are plugged with debris or sediment.	Perforations freely discharge flow.
	Water flows out top of "distributor" catch basin.	Water flows out of distributor catch basin during any storm less than the design storm.	No flow discharges from distributor catch basin.
	Receiving area over-saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Gabions	Damaged mesh	Mesh of gabion broken, twisted or deformed so structure is weakened or rock may fall out.	Mesh is intact, no rock missing.
	Corrosion	Gabion mesh shows corrosion through more than ¼ of its gage.	All gabion mesh capable of containing rock and retaining designed form.
	Collapsed or deformed baskets	Gabion basket shape deformed due to any cause.	All gabion baskets intact, structure stands as designed.
	Missing rock	Any rock missing that could cause gabion to loose structural integrity.	No rock missing.
Manhole/Chamber	Worn or damaged post, baffles or side of chamber	Structure dissipating flow deteriorates to ½ or original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure is in no danger of failing.
	Damage to wall, frame, bottom, and/or top slab	Cracks wider than ½-inch or any evidence of soil entering the structure through cracks, or maintenance inspection personnel determines that the structure is not structurally sound.	Manhole/chamber is sealed and structurally sound.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the structure at the joint of the inlet/outlet pipes.	No soil or water enters and no water discharges at the joint of inlet/outlet pipes.

NO. 9 – FENCING

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Erosion or holes under fence	Erosion or holes more than 4 inches high and 12-18 inches wide permitting access through an opening under a fence.	No access under the fence.
Wood Posts, Boards and Cross Members	Missing or damaged parts	Missing or broken boards, post out of plumb by more than 6 inches or cross members broken	No gaps on fence due to missing or broken boards, post plumb to within 1½ inches, cross members sound.
	Weakened by rotting or insects	Any part showing structural deterioration due to rotting or insect damage	All parts of fence are structurally sound.
	Damaged or failed post foundation	Concrete or metal attachments deteriorated or unable to support posts.	Post foundation capable of supporting posts even in strong wind.
Metal Posts, Rails and Fabric	Damaged parts	Post out of plumb more than 6 inches.	Post plumb to within 1½ inches.
		Top rails bent more than 6 inches.	Top rail free of bends greater than 1 inch.
		Any part of fence (including post, top rails, and fabric) more than 1 foot out of design alignment.	Fence is aligned and meets design standards.
		Missing or loose tension wire.	Tension wire in place and holding fabric.
	Deteriorated paint or protective coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.	Structurally adequate posts or parts with a uniform protective coating.
	Openings in fabric	Openings in fabric are such that an 8-inch diameter ball could fit through.	Fabric mesh openings within 50% of grid size.

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NO. 10 – GATES/BOLLARDS/ACCESS BARRIERS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Chain Link Fencing Gate	Damaged or missing members	Missing gate.	Gates in place.
		Broken or missing hinges such that gate cannot be easily opened and closed by a maintenance person.	Hinges intact and lubed. Gate is working freely.
		Gate is out of plumb more than 6 inches and more than 1 foot out of design alignment.	Gate is aligned and vertical.
		Missing stretcher bar, stretcher bands, and ties.	Stretcher bar, bands, and ties in place.
	Locking mechanism does not lock gate	Locking device missing, no-functioning or does not link to all parts.	Locking mechanism prevents opening of gate.
	Openings in fabric	Openings in fabric are such that an 8-inch diameter ball could fit through.	Fabric mesh openings within 50% of grid size.
Bar Gate	Damaged or missing cross bar	Cross bar does not swing open or closed, is missing or is bent to where it does not prevent vehicle access.	Cross bar swings fully open and closed and prevents vehicle access.
	Locking mechanism does not lock gate	Locking device missing, no-functioning or does not link to all parts.	Locking mechanism prevents opening of gate.
	Support post damaged	Support post does not hold cross bar up.	Cross bar held up preventing vehicle access into facility.
Bollards	Damaged or missing	Bollard broken, missing, does not fit into support hole or hinge broken or missing.	No access for motorized vehicles to get into facility.
	Does not lock	Locking assembly or lock missing or cannot be attached to lock bollard in place.	No access for motorized vehicles to get into facility.
Boulders	Dislodged	Boulders not located to prevent motorized vehicle access.	No access for motorized vehicles to get into facility.
	Circumvented	Motorized vehicles going around or between boulders.	No access for motorized vehicles to get into facility.

NO. 11 – GROUNDS (LANDSCAPING)

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash or litter	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Trees and Shrubs	Hazard	Any tree or limb of a tree identified as having a potential to fall and cause property damage or threaten human life. **A hazard tree identified by a qualified arborist must be removed as soon as possible.**	No hazard trees in facility.
	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	No blown down vegetation or knocked over vegetation. Trees or shrubs free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; dead or diseased trees removed.

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NO. 12 – ACCESS ROADS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet (i.e., trash and debris would fill up one standards size garbage can).	Roadway drivable by maintenance vehicles.
		Debris which could damage vehicle tires or prohibit use of road.	Roadway drivable by maintenance vehicles.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Blocked roadway	Any obstruction which reduces clearance above road surface to less than 14 feet.	Roadway overhead clear to 14 feet high.
		Any obstruction restricting the access to a 10- to 12 foot width for a distance of more than 12 feet or any point restricting access to less than a 10 foot width.	At least 12-foot of width on access road.
Road Surface	Erosion, settlement, potholes, soft spots, ruts	Any surface defect which hinders or prevents maintenance access.	Road drivable by maintenance vehicles.
	Vegetation on road surface	Trees or other vegetation prevent access to facility by maintenance vehicles.	Maintenance vehicles can access facility.
Shoulders and Ditches	Erosion	Erosion within 1 foot of the roadway more than 8 inches wide and 6 inches deep.	Shoulder free of erosion and matching the surrounding road.
	Weeds and brush	Weeds and brush exceed 18 inches in height or hinder maintenance access.	Weeds and brush cut to 2 inches in height or cleared in such a way as to allow maintenance access.
Modular Grid Pavement	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damaged or missing	Access surface compacted because of broken on missing modular block.	Access road surface restored so road infiltrates.

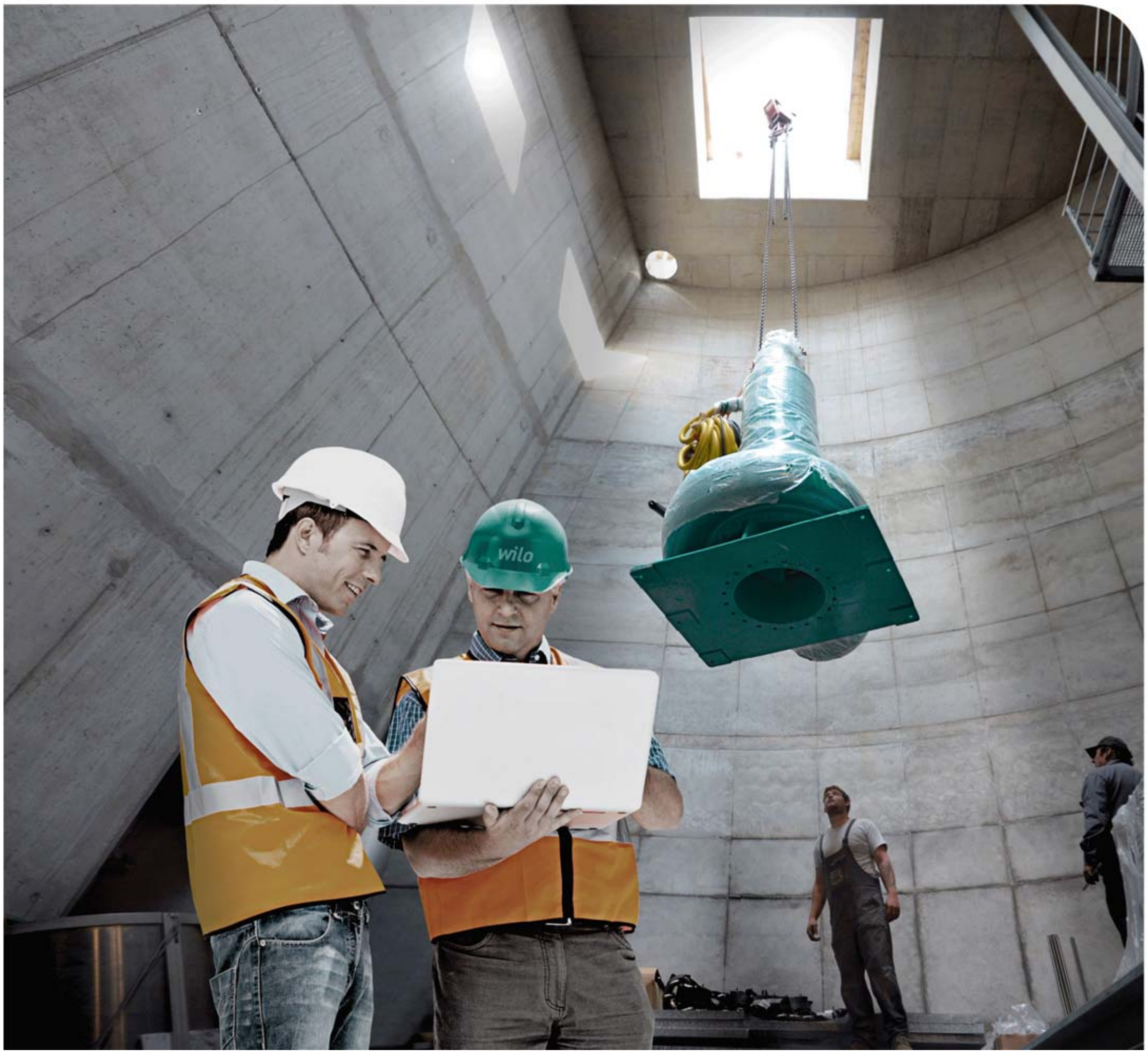
Wilo Quick Ship
Equipment Submittal

Submersible Pump Model FA10.34E with 4 Pole, 1740 RPM Motor and Single Vane Impeller

Project Name: ____

Project Manager: Chris Harnevious, Order Management

Prepared By: Ray Herndon, Order Management



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Thomasville, GA 31792

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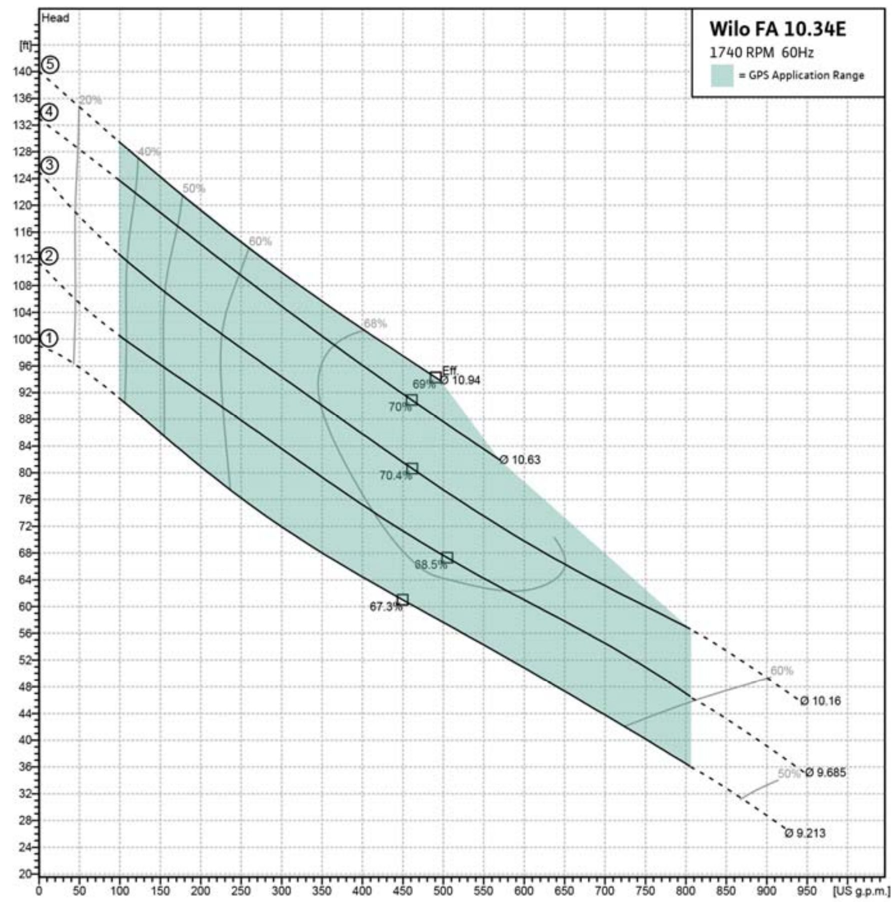
F + 888-945-6873
www.wilo-usa.com

FA 10.34E - 4 pole, 1740 RPM, Non-clog Vane Type

GERMAN QUALITY since 1872.

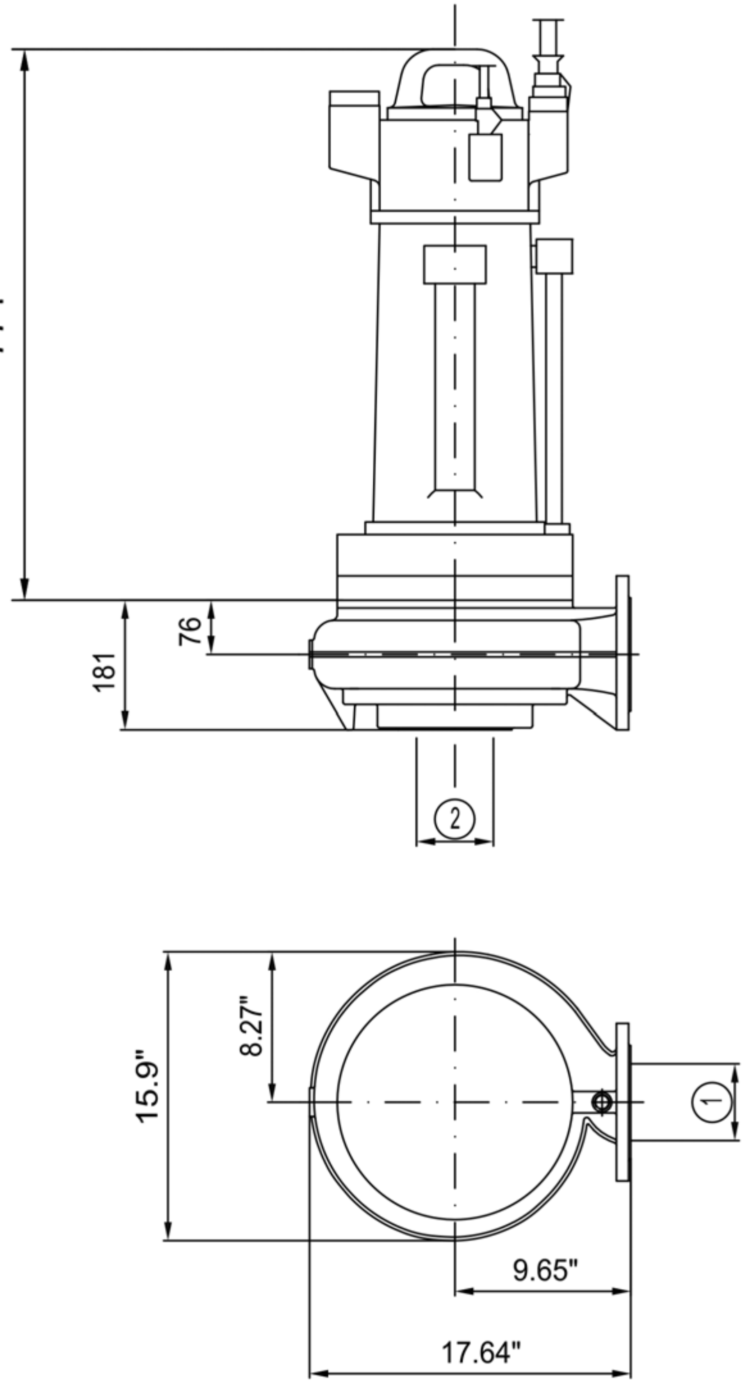


Installation Type	
Installation Type	Wet Pit
	Dry Pit
Voltage	230v
	460v
Suction Size	4"
Discharge Size	4"

Impeller Number	Impeller Diameter		Motor HP
	in	mm	
1	9.213	234	15.5
2	9.685	246	15.5
3	10.16	258	25
4	10.63	270	25
5	10.94	278	25

Materials of Construction	
Volute	ASTM A48 Class 35 Cast Iron
Impeller	ASTM A48 Class 35 Cast Iron
Volute Wear Ring	AISI 304 Stainless Steel
Impeller Wear Ring	AISI 329 Duplex Stainless Steel

FA 10.34 E, FK202-4/17K



1. DN 100, PN 10 / ANSI B16.1, Class 125, Size 4
2. DN 100, PN 10

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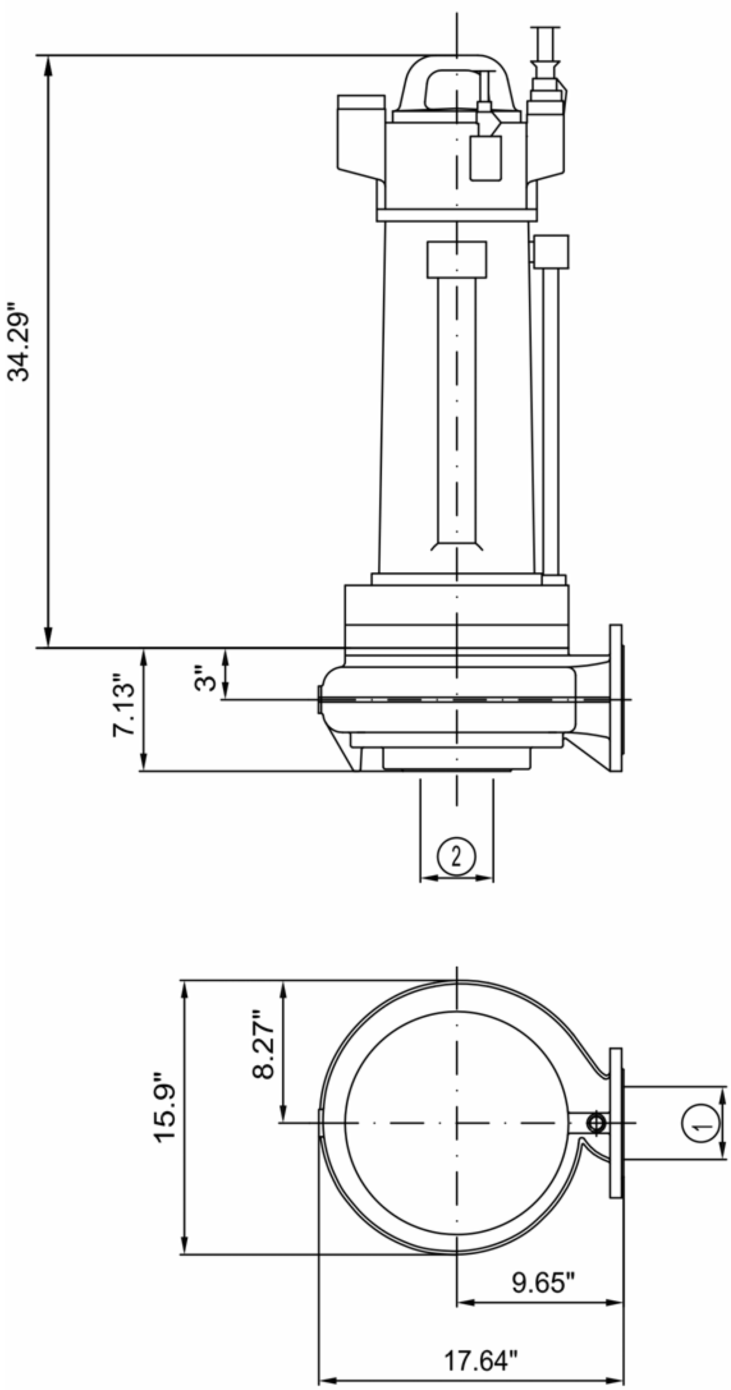
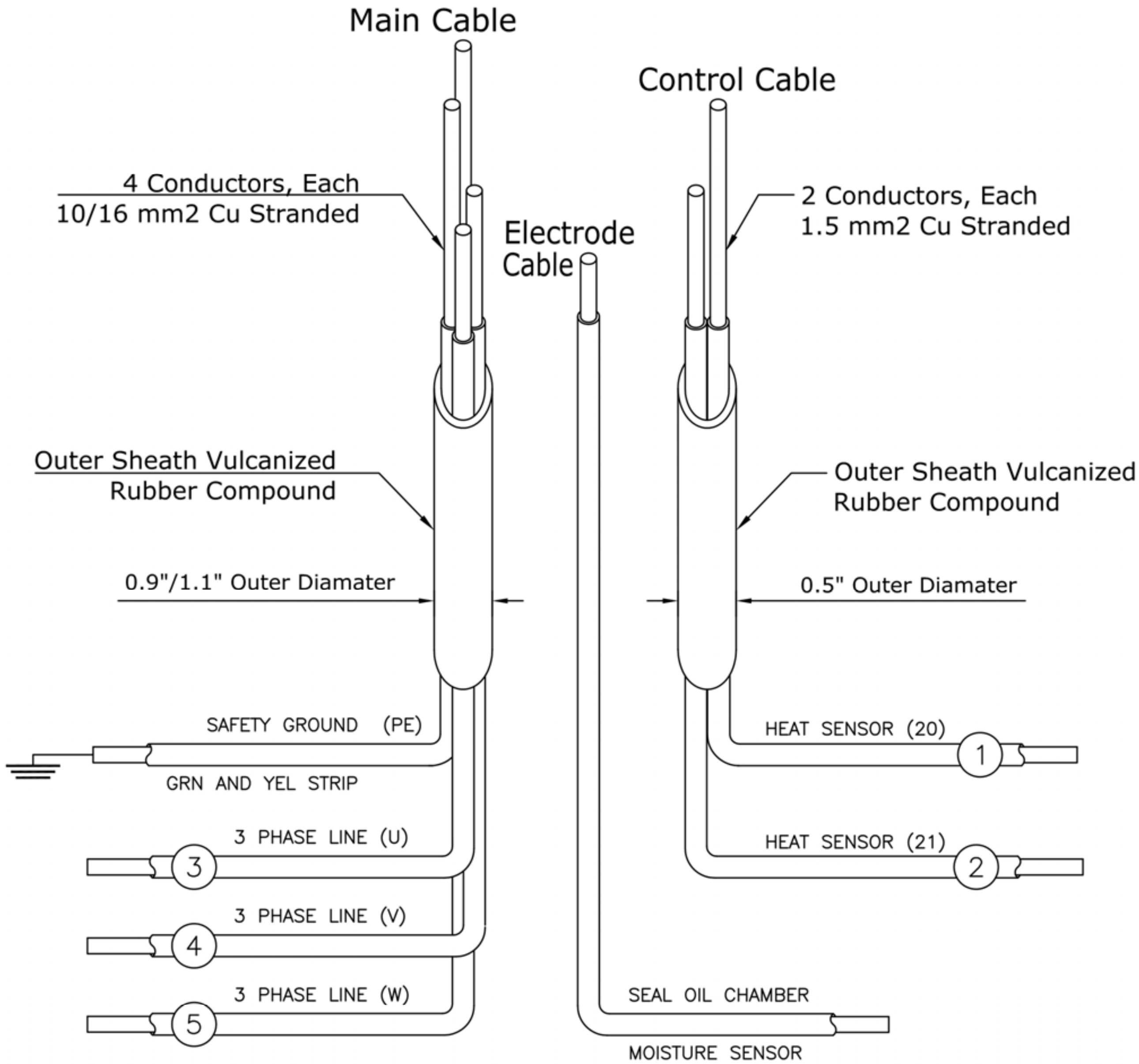
FA 10.34E, FK202-4/27K



1. DN 100, PN 10 / ANSI B16.1, Class 125, Size 4
2. DN 100, PN 10

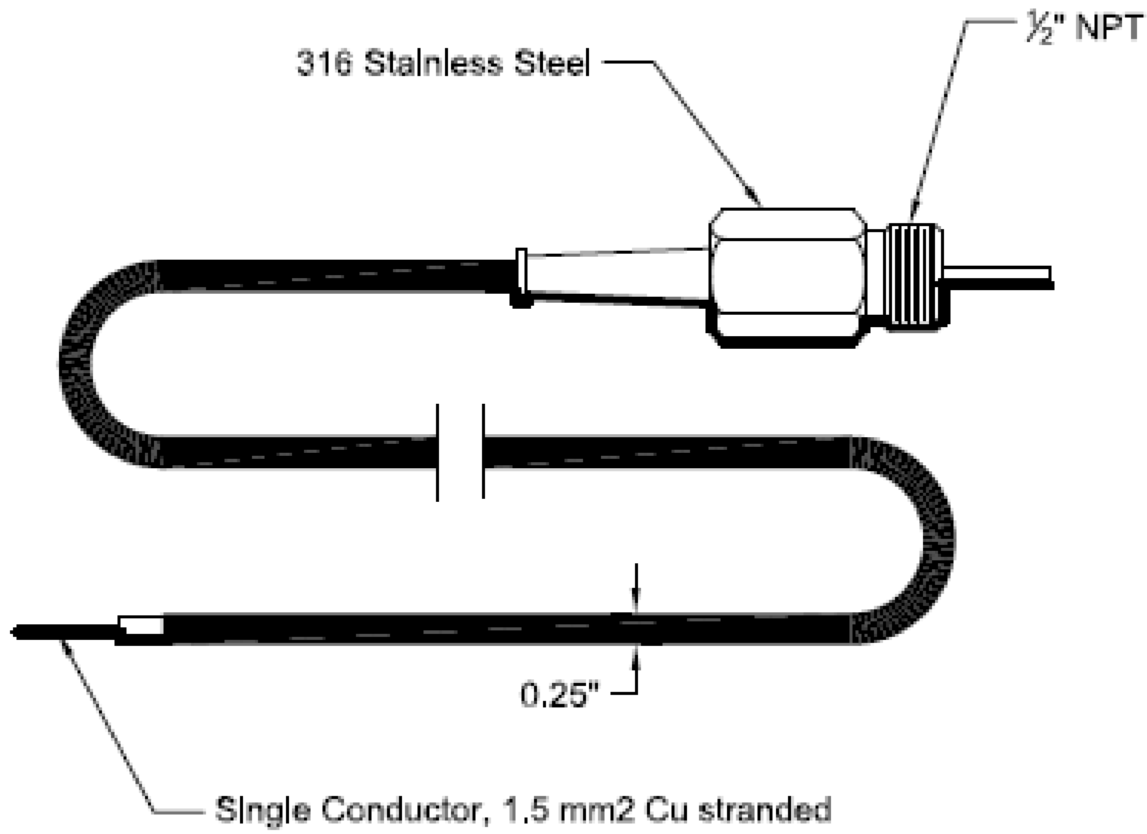
Pump Electrical Cables

Model 10.34E with FK2024-17 or FK202-4/27 motor



Motor	Cable
FK202–4/17	4x10 + 2x1.5
FK202–4/27	4x16 + 2x1.5

Moisture Sensor Pencil Electrode



Notes:

1. Maximum 18 amps; actual 0.005 Amps
2. Maximum 1000V: actual <20V
3. Dedicated relay required for proper operation.
4. Dedicated conduit recommended for moisture probe cable.
5. Optional lengths available.
6. refer to the following sheets for additional technical data.

product data carboline®

Carboguard® 890

Selection & Specification Data

Generic Type Cycloaliphatic Amine Epoxy TE
test

Description Highly chemical resistant epoxy mastic coating with exceptionally versatile uses in all industrial markets. Self-priming and suitable for application over most existing coatings, and tightly adherent to rust. Serves as stand-alone system for a variety of chemical environments and is also designed for various immersion conditions.

Features
- Excellent chemical resistance
- Surface tolerant characteristics
- Conventional and low-temperature versions
- Self-priming and primer/finish capabilities
- Very good abrasion resistance
- VOC compliant to current AIM regulations
- Suitable for use in USDA inspected facilities

Color Refer to Carboline Color Guide. Certain colors may require multiple coats for hiding. Note: The low temperature formulation will cause most colors to yellow or discolor more than normal in a short period of time.

Finish Gloss

Primers Self-priming.

Topcoats May be coated with Acrylics, Epoxies, or Polyurethanes depending on exposure and need.

Dry Film Thickness
0.0 - 10.0 mils (0.0 - 254 microns) per coat
4.0 - 6.0 mils (102 - 152 microns) per coat

6.0-8.0 mils (150-200 microns) over light rust and for uniform gloss over inorganic zincs. Don't exceed 10 mils (250 microns) in a single coat. Excessive film thickness over inorganic zincs may increase damage during shipping or erection.

Solids Content By Volume 75% +/- 2%

Theoretical Coverage Rate
1203 ft^2 at 1 mil (30 m^2/l at 25 microns)
301 ft^2 at 4 mils (7 m^2/l at 100 microns)
120 ft^2 at 10 mils (3 m^2/l at 250 microns)

Allow for loss in mixing and application.

VOC Values
Thinner 2 13oz/gal=2.2lbs/gal (271g/l)
Thinner 2 7oz/gal=2.0lbs/gal (250g/l)
Thinner 33 16oz/gal=2.3lbs/gal (285g/l)
Thinner 33 7oz/gal=2.0lbs/gal (250g/l)
As Supplied 1.7lbs/gal (214 g/l)

*Use Thinner #76 up to 8 oz/gal for 890 where non-photochemically reactive solvents are required.

Dry Temp. Resistance
Continuous: 250 °F (121 °C)
Non-Continuous: 300 °F (149 °C)

Discoloration and loss of gloss is observed above 200°F(93°C)

Limitations Do not apply over latex coatings. For immersion projects use only factory made material in special colors. Consult Technical Service for specifics.

Substrates & Surface Preparation

General Surfaces must be clean and dry. Remove dirt, dust, oil and all other contaminant.

Steel
Immersion: SSPC-SP10
Non-immersion: SSPC-SP6
1.5-3.0 mils (38-75 microns) *SSPC-SP2 or SP3 are suitable cleaning methods for mild environments.*

Galvanized Steel Prime with specific Carboline primers as recommended by your Carboline Sales Representative. Refer to the specific primer's Product Data Sheet for requirements.

Concrete or CMU Concrete must be cured 28 days at 75°F (24°C) and 50% relative humidity or equivalent. Prepare surfaces in accordance with ASTM D4258 Surface Cleaning of Concrete and ASTM D4259 Abrading Concrete. Voids in concrete may require surfacing. Mortar joints should be cured a min of 15 days.

Drywall & Plaster Joint compound and plaster should be fully cured prior to coating application.

Previously Painted Surfaces Lightly sand or abrade to roughen surface and degloss the surface. Existing paint must attain a minimum 3B rating in accordance with ASTM D3359 "X-Scribe" adhesion test.

Performance Data

Test Method	System	Results
ASTM B 117 Salt Fog	Blasted Steel 2 cts. 890	No effect on plane, rust in scribe. 1/16" undercutting at scribe after 2000 hours
ASTM B117 Salt Fog	Blasted Steel 1 ct. IOZ 1 ct 890	No effect on plane, no rust in scribe and no undercutting after 4000 hours
ASTM D 4060 Abrasion	Blasted Steel 1 ct Epoxy Pr. 1 ct 890	85 mg. loss after 1000 cycles, CS17 wheel 1000 gm. load
ASTM D1735 Water Fog	Blasted Steel 1 ct. Epoxy Pr. 1 ct. 890	No blistering, rusting or delamination after 2800 hours
ASTM D2486 Scrub Resistance	Blasted Steel 1 ct. 890	93% gloss retained after 10,000 cycles w/ liquid scrub medium
ASTM D3359 Adhesion	Blasted Steel 1 ct 890	5A
ASTM D3363 Pencil Hardness	Blasted Steel 2 cts 890	Greater than 8H
ASTM E84 Flame and Smoke	2 ct 890	5 Flame 5 Smoke Class A

Test reports and additional data available upon written request.

For the current Warranty information, visit www.wilo-usa.com

As of 1/2015:

WILO WATER MANAGEMENT
LIMITED WARRANTY FOR WILO FA PUMPS
ONE-YEAR WARRANTY FOR CERTAIN ANCILLARY EQUIPMENT

EXCEPT AS EXPRESSLY PROVIDED HEREIN, WILO USA LLC MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY PRODUCTS, PARTS OR SERVICES PROVIDED BY WILO USA LLC INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, APPLICATION OR USE.

LENGTH AND SCOPE OF WARRANTY

WILO USA LLC offers the below limited Warranty against defects in materials and workmanship, for WILO FA Model pumps used in permanent installations in accordance with and subject to all requirements of WILO installation and operation instructions, when such installations are operated under normal conditions pumping wastewater at ambient temperature. Normal conditions specifically include a maximum of 15 equipment starts per hour on constant speed installations or unlimited pump starts per hour on soft start or variable speed installations. Pumps that handle abrasive and/or corrosive liquids are not covered by this warranty unless specifically agreed to, and approved in writing by WILO USA LLC. FA pumps are warranted only for the original application and specific hydraulic conditions.

Motors, electrical control boxes and all other items other than WILO pumps furnished by WILO USA LLC are covered by a Limited Warranty for a period of one (1) year from date of commissioning, or six (6) months after shipment, and are subject to all of the conditions, limitations, and requirements stated herein.

The warranty period starts at either commissioning or six (6) months after shipment, whichever comes first. Commissioning is defined to be the day that the unit is put into service and start up is completed.

OBLIGATIONS OF WILO

WILO USA LLC's sole obligation shall be to either repair, modify or replace, at its sole discretion, (a) a defective municipal use FA pump which is received by WILO within five (5) years or a defective industrial use FA pump which is received by WILO within two (2) years after the start of the warranty period that (b) has been inspected by WILO to confirm the existence of a defect.

Municipal and industrial use pumps received within one (1) year of the start of the warranty period shall be repaired at no charge. Municipal pumps received in years two through five (2-5), and Industrial use pumps received in year two (2) of the warranty period shall be repaired at no charge, excluding labor.

FA pumps shipped to WILO for warranty service must be shipped prepaid to WILO, or a WILO Authorized Service Center. Repaired pumps shall be returned to the purchaser freight collect. Electrical Schematics and start-up reports satisfactory to WILO are required from purchaser prior to consideration of any claim under this Limited Warranty.

Commissioning and initial start-up of WILO Model FA Pumps shall be performed by WILO or a WILO Authorized Service Center, and a written start-up report shall be generated by WILO. A copy of the start-up report shall be made available to the purchaser. Should a WILO Model FA Pump require a repair during the warranty period, WILO, or a WILO Authorized Service Center, shall provide re-commissioning of the repaired pump at no charge to the purchaser and issue a new start-up report. Operation of a WILO Model FA pump without an approved start-up shall make any warranty from WILO null and void without written permission from an officer of the company of WILO.

OBLIGATIONS OF PURCHASER

The purchaser is responsible for all freight and rigging charges for removing pumps from service and delivery of the pumps to and from a WILO Authorized Service Center. The purchaser is responsible for all repair costs that are deemed to be outside of the scope of WILO's warranty. The purchaser should inspect all shipments/deliveries upon receipt. Damaged products should not be accepted, or signed for as "damaged" on the original bill of lading. WILO must be notified immediately of any shipments which were damaged. Upon receipt of delivery from WILO you have a period of 48hrs to declare any missing material listed on the BOL but not received. After this period WILO USA cannot be responsible for claims of missing items after this time.

The purchaser shall connect all WILO provided motor sensors to the control system. Motor sensor control circuitry must be operational at start-up, and at all times. WILO requires any application using variable frequency drives to use load side filters where power cable lengths are in excess of 50 feet.

EXCLUSIONS AND EXCEPTIONS

This Limited Warranty excludes damage or wear to products caused by misapplication of product, improper maintenance, accident, abuse, unauthorized alteration or repair, Acts of God, or installation or operation that is non-compliant with WILO installation and operation instructions.

This Limited Warranty excludes normal wear and tear of wear rings, impellers, volutes and heat exchangers and other consumable parts and does not cover any failure caused by lightning, single-phasing, incorrect voltage, other defects or interruptions in the power supply or by splicing the electrical cable between the pump control panel and the pumps.

This Limited Warranty shall only apply to the type of WILO pumps described above, and shall not apply to any WILO pumps, electrical control equipment, or other items furnished which have been repaired by anyone other than WILO or a WILO Authorized Service Center.

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WARRANTY CARD

PROJECT

Project Name: ____

Location: ____

Engineer: ____

Purchaser: ____

Purchase Order Number: ____

OWNER

Owner: ____

Contact: ____________________ Phone: ____________________

Jobsite Address: ____

City: ____________________ State: ____________ Zip: __________

WILO USE ONLY

Wilo Project Number(s): ____

Equipment: ______ FA Pumps ______ TR Mixers ______ RZP ______ Well Pumps ________ Other

Equipment Model Numbers: ____

Serial Numbers: ____

Official Date of Start-up: ____________________ Warranty: ____________________

Notes: ____

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