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CITY OF MONROE

STORMWATER SITE PLAN

Preliminary Plat of Eaglemont 8

13325 191st Avenue SE
Monroe, Washington 98272

City File No. TBD

Prepared for:
MainVue WA LLC
121 3rd Avenue
Kirkland, WA 98033

April 8, 2022

Our Job No. 22082

BARRY J. TALKINGTON
STATE OF WASHINGTON
41423
REGISTERED
PROFESSIONAL ENGINEER
04/08/22

STORMWATER SITE PLAN

Preliminary Plat of Eaglemont 8

TABLE OF CONTENTS

Tab 1.0

1.0 PROJECT OVERVIEW

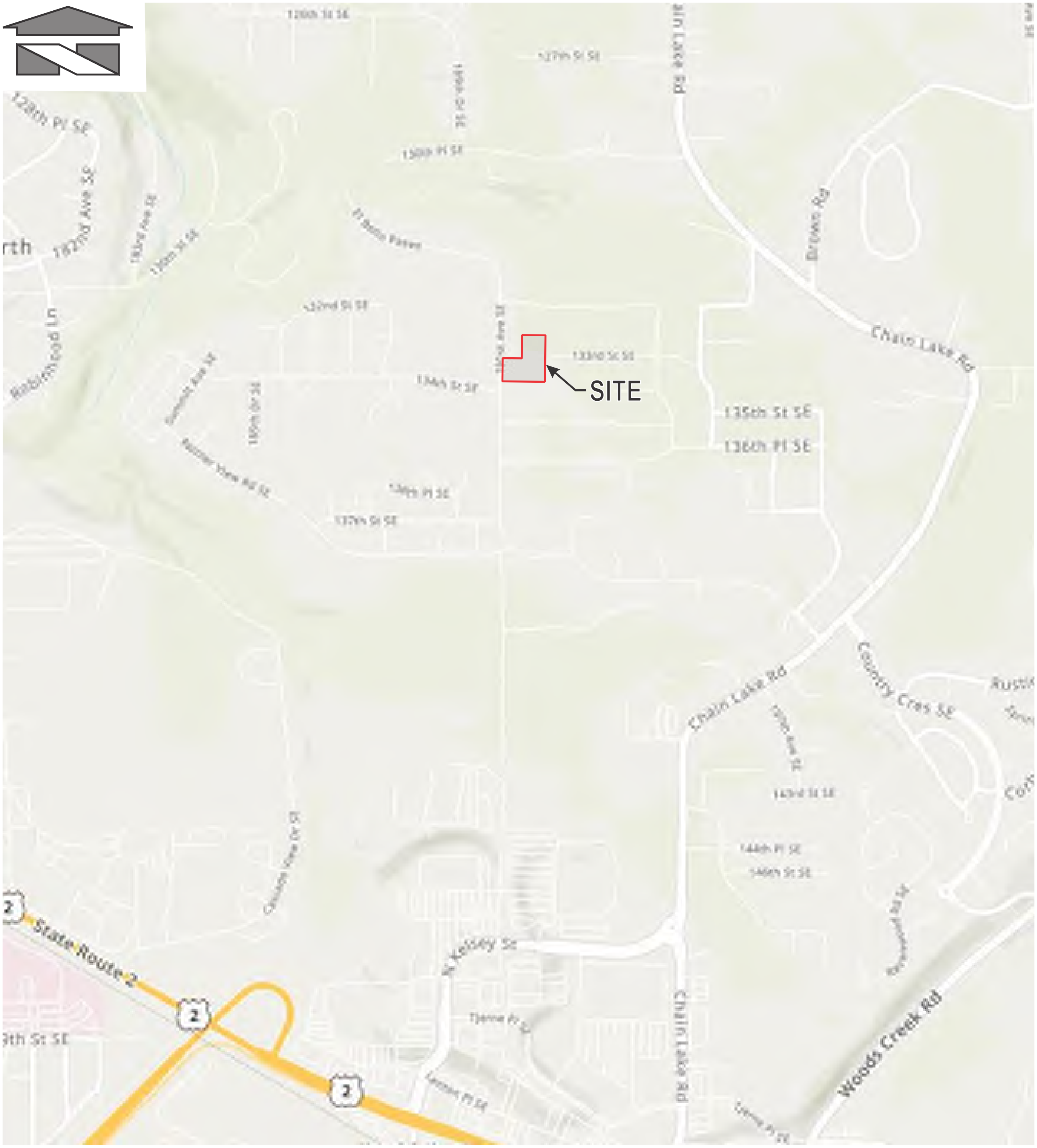
The Plat of Eaglemont 8 project is a proposed single-family residential development project consisting of 1.76 acres of parcel area located at 13325 191st Avenue SE in the City of Monroe and Snohomish County. The proposed development will construct 7 single-family lots with associated roads, tracts, utilities, and stormwater facilities. The project is located in the northeast quarter of Section 36, Township 28 North, Range 6 East, Willamette Meridian and occupies Snohomish County Tax Lot Nos. 28063600100100, 28063600100300, and 28063600100600. A Vicinity Map has been included for reference (see Figure – 1.0.1 - located within this section).

The property consists of a single-family residence with maintained lawn grass and several scattered trees surrounding the residence. The entire site lies within a single drainage basin, with the topography falling moderately to the south. Surface runoff can generally be expected to follow the existing topography, and discharge overland toward the south. Surface runoff from the developed project site will be collected via an underground pipe network and routed to the detention vault located at the southwest corner of the site. After detention, runoff will be treated by a StormFilter vault located immediately downstream of the detention vault. Runoff will be conveyed south through a storm line extension and discharge into the existing ditch along the east side of 191st Avenue SE.

NRCS soil survey identifies the underlying soils as Tokul Gravelly Medial Loam, which is common throughout the region and is generally considered to be a glacially consolidated till. This type of soil is typically characterized as a dense "hardpan" soil, with moderate runoff rates and low permeability. For further reference please refer to the Geotechnical Report by Earth Solutions NW LLC, dated January 4, 2022, located in Section 7.0 of this report.

Site drainage designs are based on the 2012 Stormwater Management Manual for Western Washington (2014 SWMMWW), as Amended in December 2014. Please refer to Section 5.5 of this Stormwater Site Plan for further details regarding the drainage facility design.

Figure 1.0.1



REFERENCE: MapQuest (2022)

Scale: Horizontal: **N.T.S.** Vertical: **N/A**	For: Eaglemont 8 Monroe, Washington	Job Number 22082
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 **barghausen.com**	Title: VICINITY MAP	DATE: 03/30/22

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Tab 2.0

2.0 CONDITIONS AND REQUIREMENTS SUMMARY

This section contains the following information:

2.1 Analysis of the Minimum Requirements

2.1 Analysis of the Minimum Requirements

Minimum Requirements	How Project Has Addressed Requirement
No. 1: Preparation of Stormwater Site Plans	This Minimum Requirement has been fulfilled by the preparation and completion of this Stormwater Site Plan.
No. 2: Construction Stormwater Pollution Prevention (SWPP)	A completed Construction Stormwater Pollution Prevention Plan (SWPPP) will be submitted with this report during Final Engineering Review.
No. 3: Source Control of Pollution	The project is not classified as a high-use site, and no hazardous materials requiring source control BMPs are proposed to be stored on-site.
No. 4: Preservation of Natural Drainage Systems and Outfalls	The existing site topography slopes south at a moderate grade. Surface runoff can generally be expected to follow existing ground topography and discharge towards the south. Runoff from the existing site is collected by the conveyance system within the Eaglemont 4 Plat to the south and is eventually routed to the south along 191st Avenue SE. The project proposes to collect surface runoff and provide flow control via a detention vault located near the southwest corner of the site. Runoff will then be conveyed through a proposed storm line extension along 191st Avenue SE and discharged into the existing ditch located on the east side of the road. Runoff along this ditch eventually converges with the outlet system of the Eaglemont 4 Plat.
No. 5: On-site Stormwater Management	Due to the native soil condition being glacially consolidated till, infiltration is not feasible therefore Low Impact Development (LID) requirements become impractical for the site. The developer has opted not to meet the LID Performance Standard for Flow Control; therefore, the project will be providing the individual lot BMPs. All soil in the lawn and landscaped areas for the site will be amended to meet the Post-Construction Soil Quality and Depth requirement. Each individual lot will have a perforated stub-out connection for rooftops.
No. 6: Runoff Treatment	This project proposes the use of a StormFilter vault to treat the runoff tributary to the developed site.
No. 7: Flow Control	Flow Control for the site is provided by a detention vault which is sized by matching developed discharge durations to forested durations for the range of pre-developed discharge rates from 50 percent of the two-year peak flow up to the full 50-year peak flow, as required by the 2014 SWMMWW.
No. 8: Wetlands Protection	There are no documented wetlands recorded for Eaglemont 8.
No. 9: Operation and Maintenance	The drainage facility for this project will be a public facility, owned and maintained by the City. Operations and Maintenance Manual will be provided during Final Engineering Review.

Tab 3.0

3.0 EXISTING CONDITIONS SUMMARY

The Plat of Eaglemont 8 project is a proposed single-family residential development consisting of 7 lots located on a 1.76 acre site with tax parcel numbers of 28063600100100, 28063600100300, and 28063600100600. An Assessors Map (Figure 3.0.3) has been included within this section of the report for visual reference of the parcels around the site. The project is located in the northeast quarter of Section 36, Township 28 North, Range 6 East, Willamette Meridian in the City of Monroe and Snohomish County. Please reference the Vicinity Map (Figure 1.0.1), located in Section 1.0 of this report for a visualization of the exact location of the project site.

The site consists of a single-family residence and associated infrastructure and residential landscaping. On-site vegetation consists of maintained lawn grass and several scattered trees surrounding the residence. The site is bounded to the west by 191st Avenue SE which contains roadside ditches to convey runoff to the south. The site is bounded to the east by an existing subdivision with conveyance systems in place. There are several homes located to the immediate south of the site. Due to the existing topography of the area and the existing conveyance systems along 191st Avenue SE and the subdivision to the east, no upstream runoff is expected from these areas.

The site is bounded to the northeast by existing homes within the plat of Sky View Ridge. These homes contain an existing conveyance system that routes stormwater runoff to the south along the east boundary of the site, therefore no runoff is expected from this development. There are several existing homes with driveways, lawn areas and forested areas located to the northwest of the project site. Due to existing topography, approximately 1.41 acres of upstream runoff is expected from these areas.

The site slopes in a south manner with grades ranging from 0 to 8 percent and elevations ranging from 414 to 400 feet. On-site soils are mapped as Tokul Gravelly Medial Loam, which is common throughout the region and is generally considered to be a glacially consolidated till. This type of soil is typically characterized as a dense 'hardpan' soil, with moderate runoff rates and low permeability. For further information please reference the Soil Survey Map (Figure 3.0.1) located in this section of the report.

The site is located in Zone X outside of the 500-year floodplain. Please reference the FEMA Map (Figure 3.0.4) located within this section of the report.

Figure 3.0.1

REFERENCE: USDA, Natural Resources Conservation Service

LEGEND:	HSG
72 = Tokul gravelly medial loam, 0-8% slopes	B

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

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

For:
Eaglemont 8
Monroe, Washington

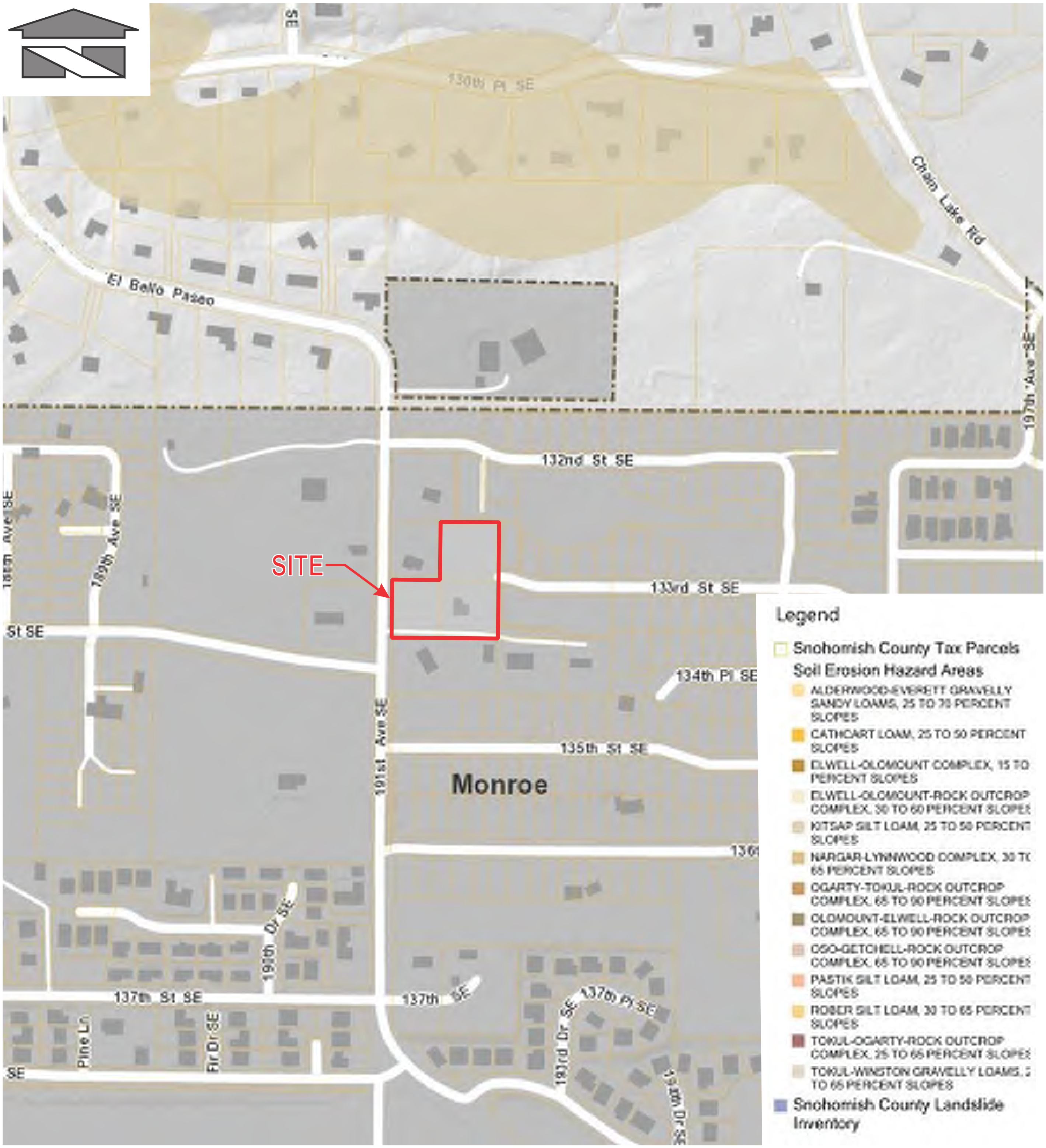
Job Number
22082

Title:
SOIL SURVEY MAP

DATE: 03/30/22

P:\22000s\22082\exhibit\graphics\22082 soil.cdr

Figure 3.0.2



REFERENCE: Snohomish County PDS Map Portal (2022)

Scale: Horizontal: **N.T.S.** Vertical: **N/A**	*For:* Eaglemont 8 Monroe, Washington		Job Number 22082
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 **barghausen.com**	*Title:* SENSITIVE AREAS MAP		DATE: 03/30/22

P:\22000s\22082\exhibit\graphics\22082 sens.cdr

Figure 3.0.3

REFERENCE: Snohomish County Department of Assessments (Feb. 2022)

Scale:

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

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

For:
Eaglemont 8
Monroe, Washington

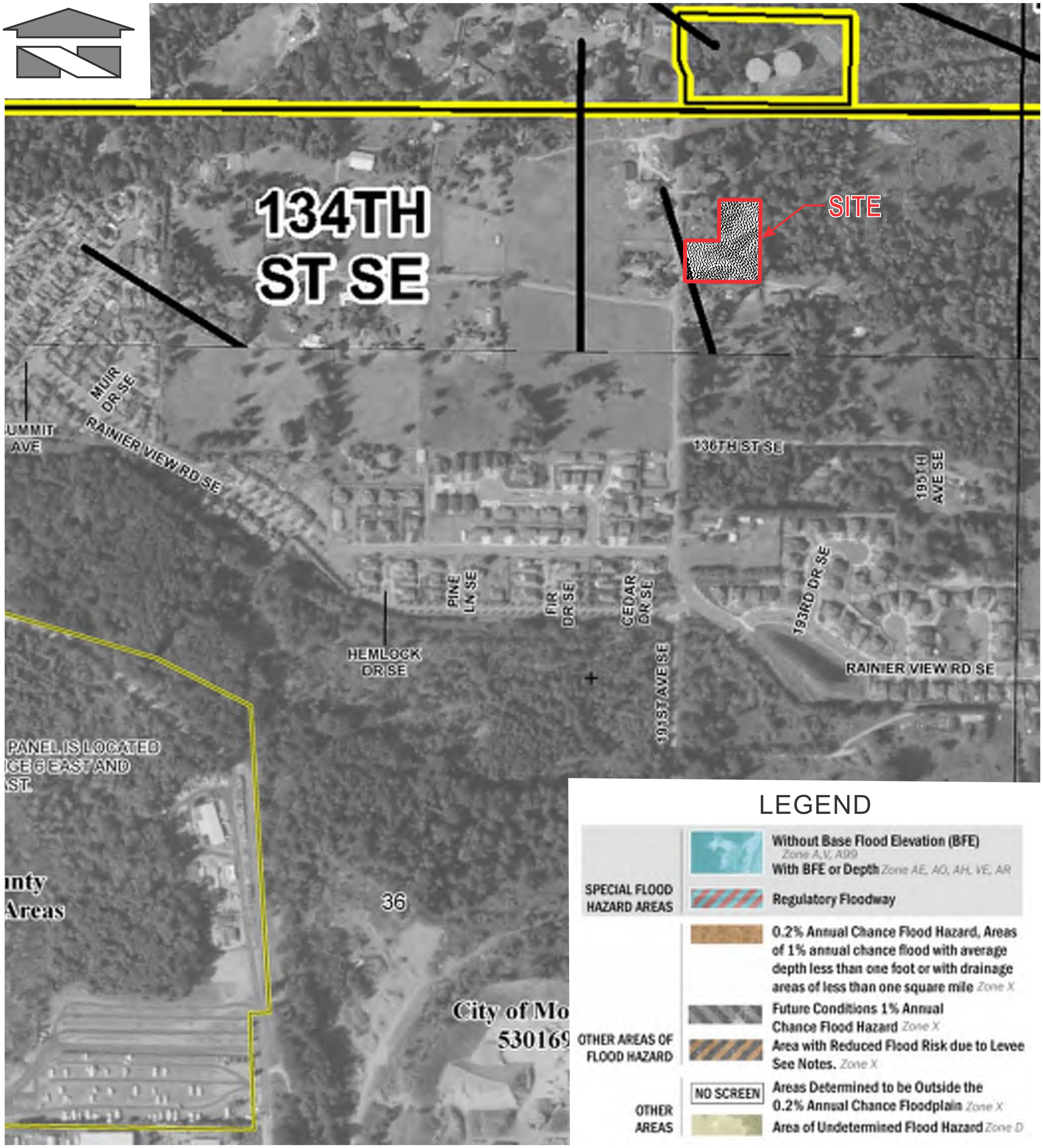
Title:
ASSESSOR MAP

Job Number
22082

DATE: 03/30/22

P:\22000s\22082\exhibit\graphics\22082 amap.cdr

Figure 3.0.4



REFERENCE: Federal Emergency Management Agency (Portion of Map 53061C1100F, June 2020)

Scale: *Horizontal:* **N.T.S.** *Vertical:* **N/A**	*For:* Eaglemont 8 Monroe, Washington	Job Number 22082
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 **barghausen.com**	*Title:* FEMA MAP	DATE: 03/30/22

P:\22000s\22082\exhibit\graphics\22082 fema.cdr

Tab 4.0

4.0 OFF-SITE ANALYSIS REPORT

The project is subject to the provisions of the City of Monroe design and development standards, as well as the 2012 Stormwater Management Manual for Western Washington as amended in 2014, issued by the Washington State Department of Ecology. This report and accompanying plans are intended to satisfy the site plan preparation requirements outlined in the regulatory documents listed above. The DOE Stormwater Manual requires completion of the following four tasks as part of the site plan preparation process:

Task 1: Define and map the study area

The project study area includes the project site itself, as well as a tributary upstream basin, and a downstream flowpath for a distance of one-quarter mile.

Task 2: Review all available information on the study area

- **Critical Drainage Area Map**

  The City of Monroe Stream and Wetlands Map indicates no wetland located within a quarter mile from the downstream path of the project site. See Figure 4.0.3 – City of Monroe Stream and Wetlands Map located in this section of the report.

- **Floodplain/Floodway (FEMA) Map**

  Referencing Figure 3.0.4 - FEMA Map located in Section 3.0 of the report shows that the project site and surrounding area are not shown to be within a flood hazard area.

- **Offsite Analysis Reports**

  The Eaglemont 4 191st Avenue SE Asbuilt Civil Plans were used to identify the existing drainage structures/facilities along the downstream flow path from the project site. See Figure 6.0.2 for further detail.

- **Basin Plans**

  The project site drains to the French Creek watershed. This creek eventually connects to the Snohomish River.

- **Sensitive Area Information**

  There are no sensitive areas located within one-quarter mile downstream of the project site. The National Wetlands Inventory was reviewed and deemed to have no significant wetlands on-site.

- **Drainage Complaints**

  There have not been any drainage complaints near the project site per Vince Bertrand at the City of Monroe.

- **Soils Map**

  NRCS soil survey identifies the underlying soils as Tokul Gravelly Medial Loam, which is common throughout the region and is generally considered to be a glacially consolidated till. This type of soil is typically characterized as a dense "hardpan" soil, with moderate runoff rates and low permeability. For further information please see Figure 3.0.1 - Soil Survey Map provided in Section 3.0.

Task 3: Field inspect the study area

A downstream drainage analysis for the site is presented in this section. The site consists of a single drainage basin that flows into the French Creek Watershed which eventually connects to the Snohomish River. The drainage course from the site was assessed on March 28, 2022, with weather conditions being cloudy.

The downstream conveyance system is described below and illustrated in Figure 4.0.1 – Downstream Drainage Course.

Upstream Drainage Analysis

The project is bounded to the east by the Eaglemont 6 subdivision with conveyance systems in place, therefore no runoff is expected from this development. The site is also bounded to the west by 191st Avenue SE which contains roadside ditches to convey road runoff to the south. Due to the topography around the site sloping in a south manner, there is approximately 1.41 acres of upstream runoff expected from multiple properties to the northwest of the project site consisting of single-family residences, driveways and lawn areas. In the developed condition, this runoff will be collected and routed to the on-site detention vault.

Runoff from the two existing lots of Skyview Ridge Plat along the eastern portion of the north site boundary will be collected by yard drains and routed to the south through an existing drainage easement along the east site boundary. Please refer to Figure 5.1.1 – Predeveloped Drainage Basin Map for further detail.

On-site Drainage

The topography of the site slopes moderately to the south. Surface runoff can generally be expected to follow the existing topography, and discharge overland toward the south.

Downstream Drainage Course (See Figure 4.0.1 – Downstream Drainage Course)

A detailed downstream drainage analysis was conducted by Barghausen Consulting Engineers, Inc. on March 28, 2022. The time was around 10:30 am and conditions were moderately cloudy with no rainfall occurring in the last 24 hours.

Photo #1 – Looking South

Photo #2 – Looking South

The photo to the left shows the existing roadside ditch located along the east side of 191st Avenue SE directly south of the project site. Once stormwater runoff leaves the site, it will be routed to the south along 191st Avenue SE through a closed conveyance system before discharging into the existing ditch near the location shown in Photo #2 above. Runoff continues to flow south once entering the culvert shown in Photo #2.

Photo #3 – Looking South

Photo #4 – Looking South

After entering the existing culvert, runoff will flow through the existing bypass conveyance system along 191st Avenue SE constructed as part of the Eaglemont 4 Plat shown above. Runoff continues to flow south along 191st Avenue SE.

Photo #5 – Looking Southeast

Photo #6 – Looking South

After approximately 770 feet of flow path, runoff enters the catch basin shown in Photo #5 above located on the east side of 191st Avenue SE. At this point, runoff crosses 191st Avenue SE in a southwest manner and enters the catch basin shown in Photo #6 approximately 170 feet downstream. At the intersection of Rainer View Road SE and 191st Avenue SE, approximately 272 feet south from the runoff convergence point, the runoff will flow southwest for approximately 49 feet and continue again south along 191st Avenue SE for approximately 315 feet before reaching the quarter mile point from the discharge location.

Photo #11 – Looking South

Photo #12 – Looking South

After reaching the catch basin shown in Photo #10, runoff continues to flow south through 191st Avenue SE before reaching one-quarter mile downstream of the project site. Approximately 150 feet downstream of the one-quarter mile point, runoff discharges into the existing ditch on the east side of 191st Avenue SE through a 30-inch pipe as shown in photo #12 above. Runoff continues to flow south before entering the Arena Creek, which flows in a westward manner.

After conducting a thorough downstream investigation, it can be confidently determined, that the development of this project will not negatively impact the downstream system. The existing conveyance system shows an ability to convey the stormwater runoff from the developed site. Any impacts are further mitigated by the proposed detention facility because the discharge is designed to match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50 percent of the two-year peak flow up to the full 50-year peak flow.

Task 4: Describe the drainage system and its existing and predicted problems

Downstream Drainage Complaints

Per Vince Bertrand from the City of Monroe, there have not been any drainage complaints within one-quarter mile downstream of the project site.

DOWNSTREAM BASIN MAP
OF
EAGLEMONT 8

Figure 4.0.1

A PORTION OF THE NE 1/4 OF SECTION 36, TOWNSHIP 28 N., RANGE 06 E., W.M.
CITY OF MONROE, SNOHOMISH COUNTY, WASHINGTON

N

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

FLOWPATH LEGEND

PIPE AND CATCH BASIN CONVEYANCE SYSTEM

DITCH CONVEYANCE SYSTEM

SPECIAL NOTES

CATCH BASIN AND PIPE LOCATIONS WERE APPROXIMATED USING THE EAGLEMONT 4 DRAINAGE REPORT AND ASBUILT CIVIL PLANS.

OUTFALL OF EX. 30" PIPE INTO EX. DITCH

1/4 MILE DOWNSTREAM FROM SITE

Please explain the logic behind what appears to be an unnecessarily circuitous pipe layout. (Same comment on the civil design plans.)

No.	Date	By	Ckd.	Appr.	Revision

Title: DOWNSTREAM BASIN MAP FOR EAGLEMONT 8

For: MAINVUE WA LLC
121 3RD AVENUE
KIRKLAND WA, 98033

PRELIMINARY

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

Designed JSK
Drawn JSK
Checked BJT
Approved BJT
Date 4/7/22

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

Job Number 22082

Sheet 1 of 1

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ASBUILT 191ST AVE. SE ROAD AND STORM DRAINAGE PLAN AND PROFILE

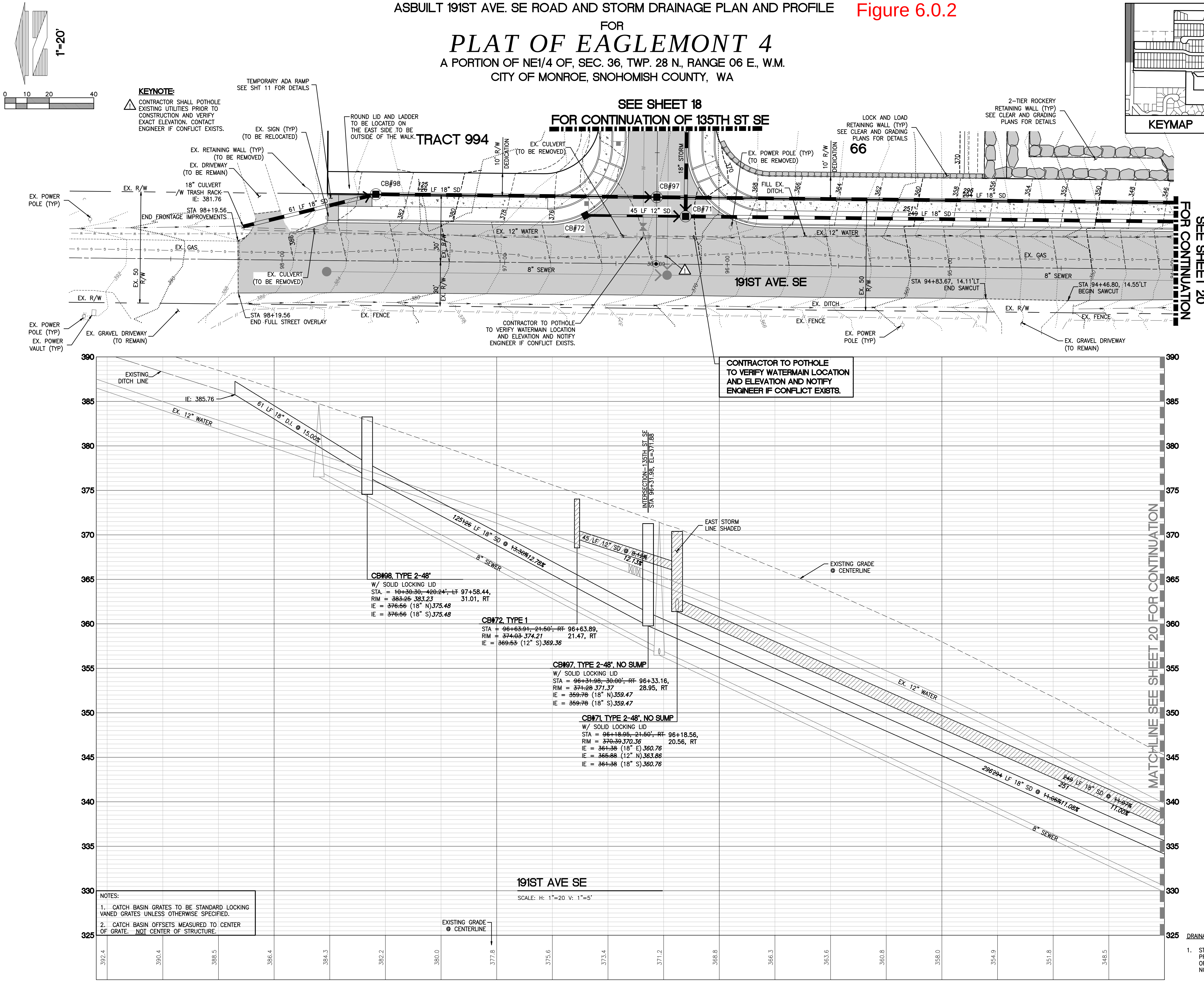
FOR

PLAT OF EAGLEMONT 4

A PORTION OF NE1/4 OF, SEC. 36, TWP. 28 N., RANGE 06 E., W.M.

CITY OF MONROE, SNOHOMISH COUNTY, WA

Figure 6.0.2



0 10 20 40 HORIZONTAL

0 2.5 5 10 VERTICAL

DRAINAGE NOTES:

1. STORM DRAIN (SD) SHALL BE ONE OF THE PRE-APPROVED PIPE MATERIALS BY THE CITY OF MONROE, LOCATED ON SHEET 12, UNLESS NOTED OTHERWISE.

No.	Date	By	Ckd.	Appr.	Revision
1	6/29/18	VV	BJT	BJT	PHASE 4A ASBUILTS
1	8/1/18	VV	BJT	BJT	REVISED PER CITY COMMENT
2	5/6/19	VV	VV	BJT	PHASE 4B ASBUILTS
2	8/6/19	VV	VV	BJT	REVISED PER CITY COMMENT

Title: RECORD DRAWING ASBUILT 191ST AVE SE ROAD AND STORM DRAINAGE PLAN AND PROFILE FOR PLAT AND PRD OF EAGLEMONT 4A

For: MAINVUE WA LLC. 1100 112TH AVE NE, SUITE 202 BELLEVUE, WA 98004 CONTACT: LISA CAVELL (425) 646-4022

BARRY J. TALKINGTON, STATE OF WASHINGTON, 41423, REGISTERED PROFESSIONAL ENGINEER, 8/6/19

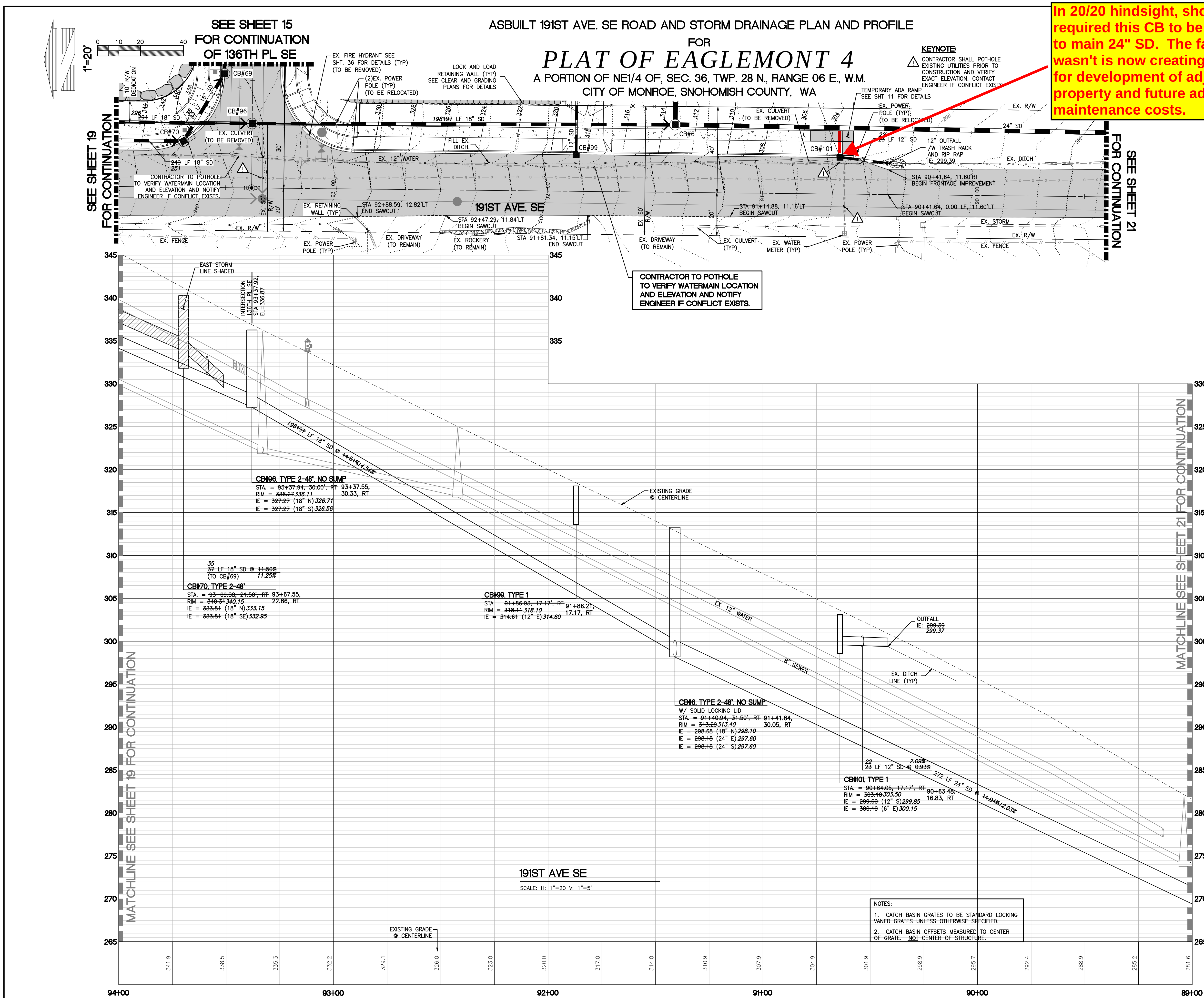
Scale: Horizontal 1"=20' Vertical 1"=5'

Designed TJS | Drawn TJS | Checked BJT | Approved BJT | Date 8/6/19

BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
(425)251-8782 FAX
CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES

Job Number 17841

Sheet 19 of 49



In 20/20 hindsight, should have required this CB to be connected to main 24" SD. The fact that it wasn't is now creating problems for development of adjacent property and future additional City maintenance costs.

NOTES:
1. CATCH BASIN GRATES TO BE STANDARD LOCKING VANED GRATES UNLESS OTHERWISE SPECIFIED.
2. CATCH BASIN OFFSETS MEASURED TO CENTER OF GRATE. NOT CENTER OF STRUCTURE.

HORIZONTAL 0 10 20 40
VERTICAL 0 2.5 5 10

DRAINAGE NOTES:
1. STORM DRAIN (SD) SHALL BE ONE OF THE PRE-APPROVED PIPE MATERIALS BY THE CITY OF MONROE, LOCATED ON SHEET 12, UNLESS NOTED OTHERWISE.

No.	Date	By	Ckd.	Appr.	Revision
2	8/6/19	VV	VV	BJT	REVISED PER CITY COMMENT PHASE 4B ASBUILTS
2	5/6/19	VV	VV	BJT	REVISED PER CITY COMMENT
1	8/1/18	VV	BJT	BJT	PHASE 4B ASBUILTS
1	6/29/18	BJT	VV	BJT	PHASE 4A ASBUILTS

Title: RECORD DRAWING
ASBUILT 191ST AVE SE ROAD AND STORM DRAINAGE PLAN AND PROFILE FOR PLAT AND PRD OF EAGLEMONT 4A

For: MAINVUE WA LLC.
11100 112TH AVE NE, SUITE 202
BELLEVUE, WA 98004
CONTACT: LISA CAVELL (425) 646-4022

BARRY J. TALKINGTON, STATE OF WASHINGTON, 41423, REGISTERED PROFESSIONAL ENGINEER, 8/6/19

Scale: Horizontal 1"=20' Vertical 1"=5'
Designed TJS Drawn TJS Checked BJT Approved BJT Date 8/6/19

BARGHAUSEN CONSULTING ENGINEERS, INC.
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KENT, WA 98032
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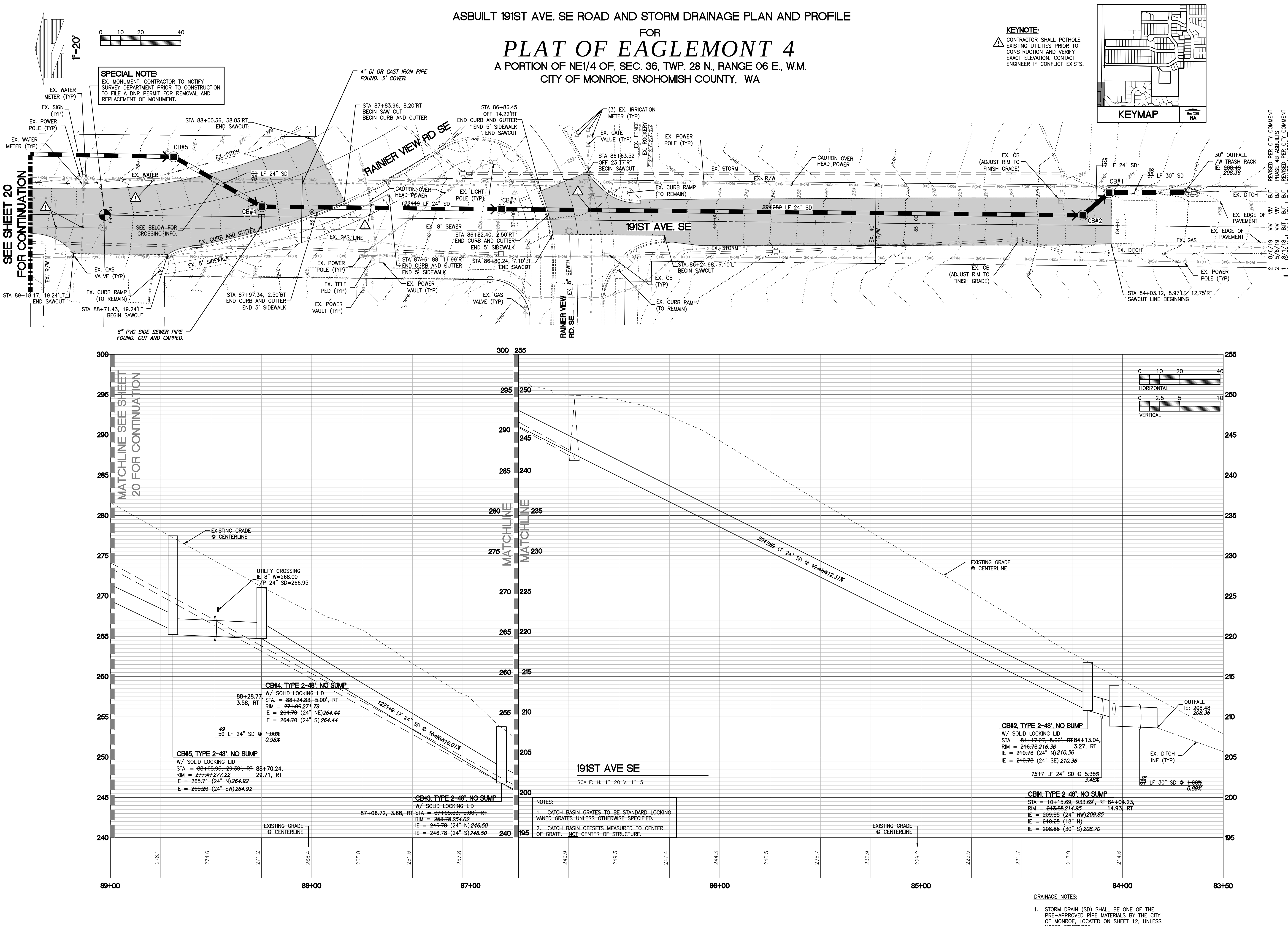
(425)251-8782 FAX
CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES

Job Number 17841
Sheet 20 of 49



Title: RECORD DRAWING
ASBUILT 191ST AVE SE ROAD ANDSTORM DRAINAGE PLAN AND PROFILE FOR PLAT AND PRD OF EAGLEMONT 4A

No.	Date	By	Ckd.	Appr.	Revision
1	6/29/18	BJT	VIV	VIV	PHASE 4A ASBUILTS
2	8/1/18	BJT	VIV	VIV	REVISED PER CITY COMMENT
3	5/6/19	BJT	VIV	VIV	PHASE 4B ASBUILTS
4	8/6/19	BJT	VIV	VIV	REVISED PER CITY COMMENT

For: MAINVUE WA LLC.
1100 112TH AVE NE, SUITE 202
BELLEVUE, WA 98004
CONTACT: LISA CAVELL (425) 646-4022

BARRY J. TALKINGTON, STATE OF WASHINGTON, 41423, REGISTERED PROFESSIONAL ENGINEER, 8/6/19

Scale: Horizontal 1"=20' Vertical 1"=5'

Designed TJS | Drawn TJS | Checked BJT | Approved BJT | Date 8/6/19

BARGHAUSEN CONSULTING ENGINEERS, INC.
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Job Number 17841
Sheet 21 of 49

Figure 4.0.3

City of Monroe

MONROE WASHINGTON

Stream & Wetlands

STREAMS

- Type 1
- Type 3
- Type 3u*
- Type 4
- Type 5
- Unclassifed Stream
- # Stream Inventory No.

*Unless determined an artifical waterway

WETLANDS

- Cat I
- Cat II
- Cat III
- Cat IV
- Unclassified Wetlands
- # Wetland Inventory No.

BOUNDARIES

- Urban Growth Area
- Monroe City Limits
- Shoreline Boundary

BUFFERS*

- Combined Critcal Areas Buffers

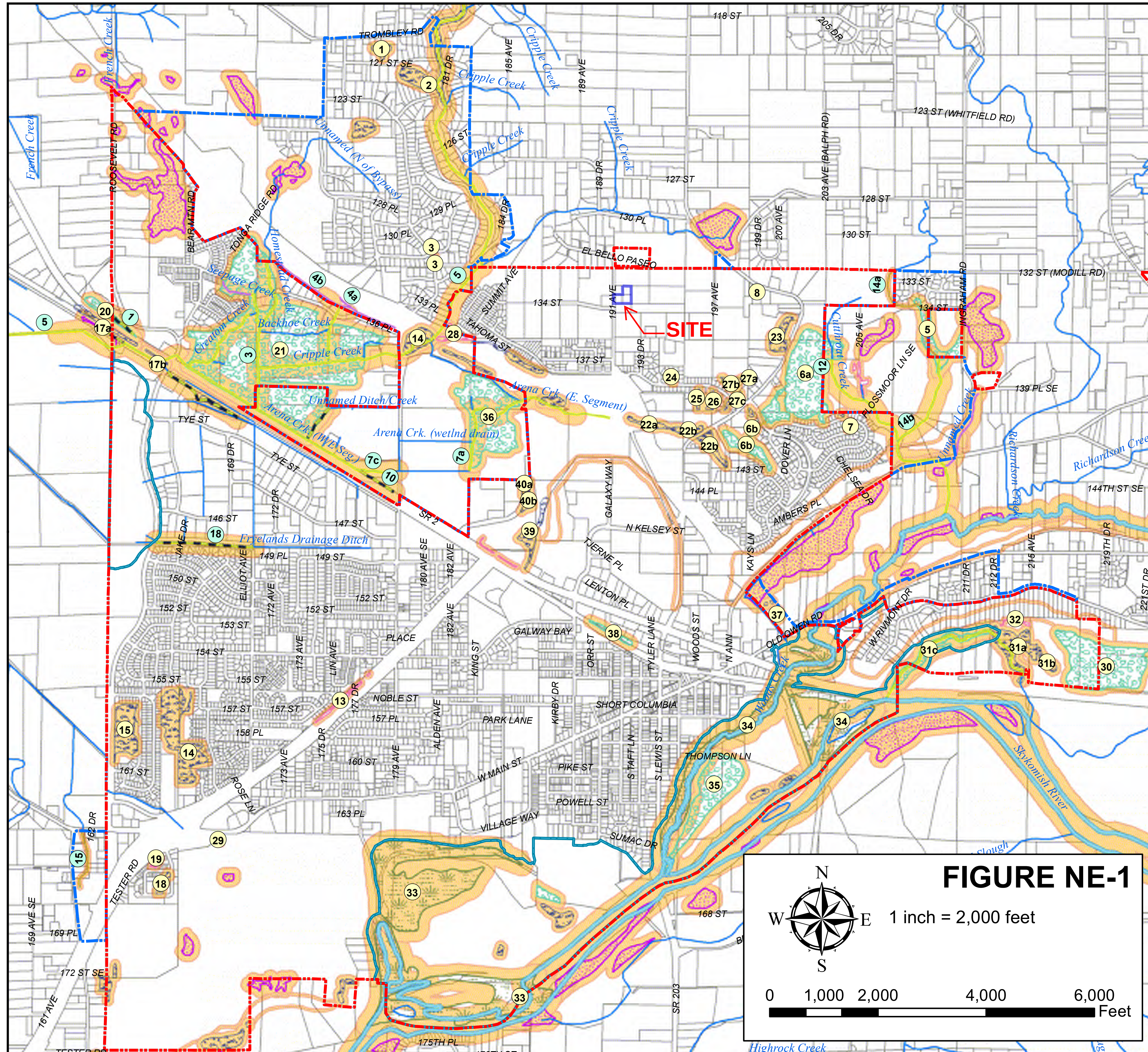
* Type 4 stream buffer shown as 150 ft on each side of the channel., Type 4 streams, beyond a quarter mile of a stream with salmonids, have a buffer of 75 ft on each side of the channel. See MMC 20.05 for specific buffers.

Notes:
1) The locations decpicted are approximate boundaries for critical areas within the city limits. This maps provides only approximate boundaries of known features and is not a substitute for more detailed maps and/or studies to identify the exact locations of known features or additional critical area features not illustrated on the map.
2) The points where streams change classification are approximate and subject to confirmation and refinement.
3) Classifications are subject to refinement based upon on additional or updated fish use and seasonality of water flow information.

Map data shown is the property of the sources listed below. Inaccuracies may exist, and the City of Monroe implies no warranties or guarantees regarding any aspect of data depiction. This map is not an actual survey of individually noted critical areas. Streams have been categorized using the water typing system defined in Monroe Municipal Code Chapter 20.05 (equivalent to WAC 222-16-031). Wetlands were classified using the Washington Department of Ecology's Washington State Wetland Rating system for Western Washington. Wetland size, shape and location are approximate based on a reconnaissance level evaluation. The City of Monroe and the Urban Growth Area may contain additional critical areas not identified on this map. Therefore this map is to be used for reference purposes only.

Source: City of Monroe GIS, 2008;
The Watershed Company;
Snohomish County GIS, 2007

Project: Streams & Wetlands 11x17
Location: Y:\GIS\Departments\CD\Comprehensive Plan\Comp Plan 2013\For_Commerce
Revised: 10-08-13
Author: M. Sartorius



Tab 5.0

5.0 PERMANENT STORMWATER CONTROL PLAN

This section contains the following information:

5.1 Existing Site Hydrology

5.2 Developed Site Hydrology

5.3 Performance Standards and Goals

5.4 Low Impact Development Features

5.5 Flow Control System

5.6 Water Quality System

5.7 Conveyance System Analysis and Design

5.1 Existing Site Hydrology

The existing drainage basin for the project site consists of 1.64 acres of area and was modeled as forested till soil. Due to the topography of the area surrounding the site, approximately 1.41 acres of upstream runoff is expected from the property to the north. This area was included in this analysis as it will be collected and routed to the on-site detention vault in the developed condition. Stormwater runoff from the existing site flows in a south manner and is collected by an existing conveyance system within the Eaglemont 4 Plat directly south of the project site. This conveyance system eventually routes the runoff to the south along the east side of 191st Avenue SE. For further detail on this information, please see the Figure 5.1.1 – Predeveloped Drainage Basin of this report.

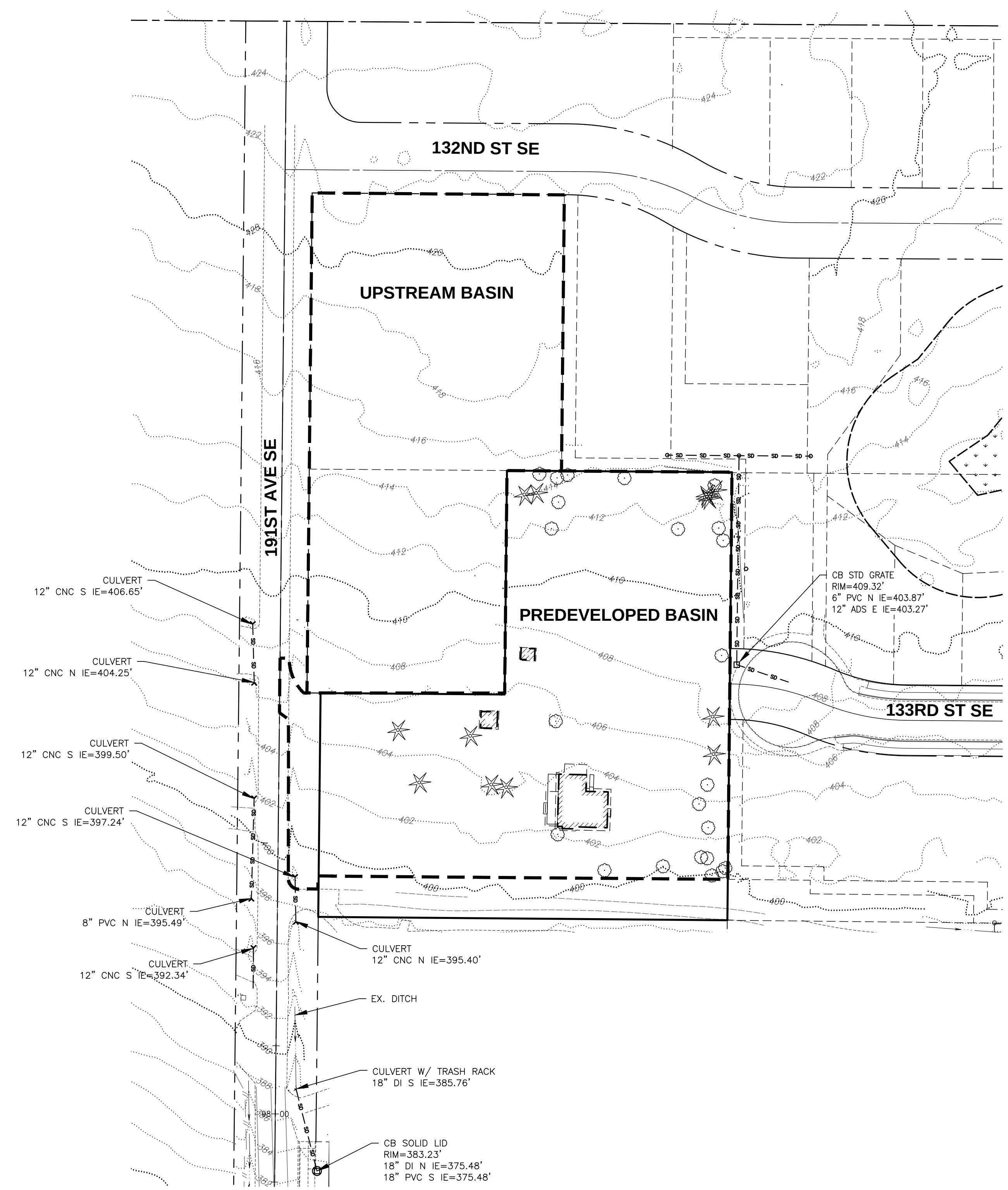
Figure 5.1.1

PREDEVELOPED BASIN MAP
OF
EAGLEMONT 8

A PORTION OF THE NE 1/4 OF SECTION 36, TOWNSHIP 28 N., RANGE 06 E., W.M.
CITY OF MONROE, SNOHOMISH COUNTY, WASHINGTON

N

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



PREDEVELOPED BASIN

TOTAL BASIN AREA = 3.05 AC
TOTAL ONSITE AREA = 1.64 AC
TOTAL UPSTREAM AREA = 1.41 AC

No.	Date	By	Ckd.	Appr.	Revision

Title: PREDEVELOPED BASIN MAP FOR EAGLEMONT 8

For: MAINVUE WA LLC
121 3RD AVENUE
KIRKLAND WA, 98033

PRELIMINARY

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

Designed JSK
Drawn JSK
Checked BJT
Approved BJT
Date 4/7/22

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425.251.6222
barghausen.com

Job Number 22082

Sheet 1 of 1

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5.2 Developed Site Hydrology

The Plat of Eaglemont 8 will consist of 7 new single-family residences. New impervious surfaces include roads sidewalk, driveways, and roof areas. The drainage facility serving this development will be located near the southwest corner of the site.

A conveyance system consisting of catch basins and storm pipes will be constructed in the roadways to collect drainage from impervious surfaces and lots and route them to the drainage facility located in Tract 999.

Water quality for the project will be provided by a StormFilter vault (or approved equal) located immediately downstream of the detention vault. For further information on water quality treatment and sizing, please reference Section 5.6 of this report.

This detention vault has been sized using WWHM2012 stormwater program. Discharges are designed to match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50 percent of the 2-year peak flow up to the full 50-year peak flow.

Upstream Basin

As mentioned earlier in this report, an existing upstream basin consisting of homes, driveways, lawn areas and forested areas is located directly to the northwest of the project site. The approximate areas of each of these land types was approximated using available Google Earth data. A breakdown of these areas is shown in the table below:

Impervious Driveway	Impervious Roof	Pervious Lawn	Pervious Forest	Total Area
0.11 Ac	0.13 Ac	0.60 Ac	0.57 Ac	1.41 Ac

As outlined in the 2014 SWMMWW, runoff tributary to the Upstream Basin is allowed to flow into the on-site drainage facility provided the existing 100-year peak flow rate of the upstream basin is less than 50% pf the 100-year peak flow rate (undetained) of the project site. Using the area breakdown table shown above, the Upstream Basin was modeled in the WWHM2012 program, and the 100-year peak flow rate was calculated as 0.83 cfs. See Figure 5.5.1 Upstream Basin Calculations for further detail. As shown in this figure, the undetained 100-year peak flow rate for the developed site was calculated as 1.79 cfs. Because 50 percent of this flow (0.89 cfs) is greater than the 100-year Upstream Basin peak flow rate, runoff from the Upstream Basin is allowed to flow into the proposed detention facility.

Drainage Basin

The detention vault has been sized to accommodate the drainage basin tributary to the site and the upstream basin as mentioned above. For purposes of sizing the vault, we assumed the maximum on-site impervious coverage as follows: newly constructed lot areas were assumed to be 50 percent impervious, new right-of-way area onsite and frontage improvements are assumed to be 100 percent impervious. Please note that Tract 998 as shown in Figure 5.2.1 is not included in the basin area because it will not be disturbed in the developed site condition. The developed drainage basin tributary to the detention vault can be broken down as follows:

Impervious	Pervious	Impervious Road Bypass	Pervious Bypass	Upstream Basin	Total Area
0.93 Ac(1)	0.67 Ac(2)	0.02 Ac	0.02 Ac	1.41 Ac	3.05 Ac

Notes:

1. Onsite Roads and Sidewalks (100% of ROW) = 0.38 Ac
   Lot Area @ 50% impervious = 0.55 Ac
2. Modeled as till lawn

As shown in the table above, there is a small area of the developed site where runoff could not be routed back to the detention vault due to the relative elevations. The area consists of 0.04 acres of frontage improvements with 0.02 acres of impervious and 0.02 acres of pervious coverage. After reviewing the SWMMWW, below is a list of considerations that were met to incorporate the bypass area to the detention vault design:

1. Runoff from both the bypass area and the flow control facility converges within a quarter mile downstream of the project site discharge point.

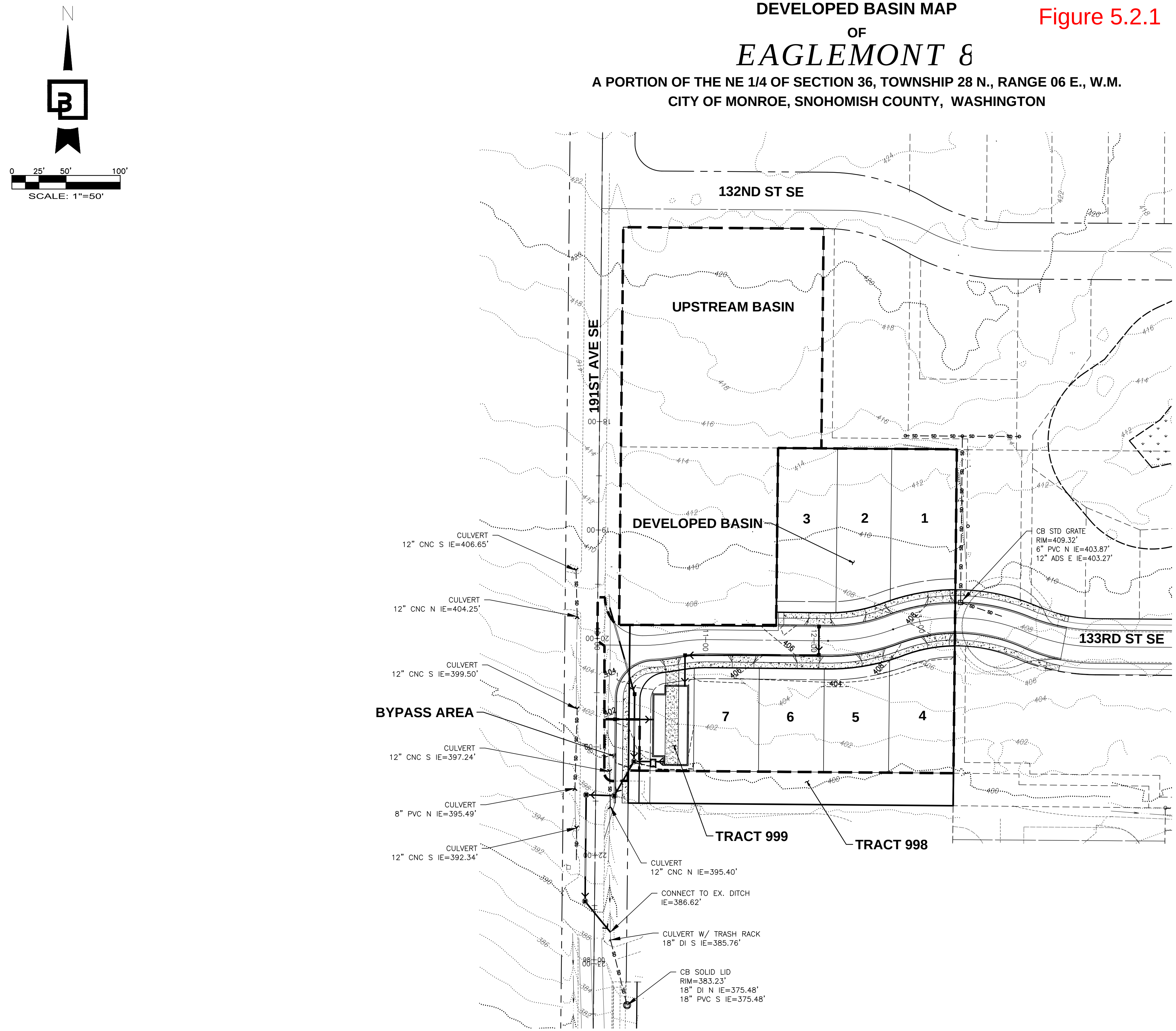
2. The total area that will remain untreated is less than 5,000 square feet.

The bypass areas described above were included in the sizing of the proposed detention vault. Please see the Developed Drainage Basin included as Figure 5.2.1 for further detail on the Developed Basin. Per the WWHM2012 calculations included in Section 5.5, the detention volume required for the detention vault is 22,000 cubic feet. For further design detail and WWHM calculations please refer to Section 5.5 of this report.

DEVELOPED BASIN MAP
OF
EAGLEMONT 8

Figure 5.2.1

A PORTION OF THE NE 1/4 OF SECTION 36, TOWNSHIP 28 N., RANGE 06 E., W.M.
CITY OF MONROE, SNOHOMISH COUNTY, WASHINGTON



DEVELOPED BASIN

TOTAL BASIN AREA = 1.64 AC

TOTAL IMPERVIOUS SURFACE AREA = 0.93 AC
- ROADS AND SIDEWALKS (R/W) = 0.36 AC
- ACCESS ROAD = 0.02 AC
- LOTS @ 50% IMPERVIOUS = 0.55 AC

TOTAL PERVIOUS SURFACE AREA = 0.67 AC
- LOTS @ 50% PERVIOUS LAWN (TILL GRASS) = 0.55 AC
- LANDSCAPE LAWN (TILL GRASS) = 0.04 AC
- DRAINAGE FACILITY (TRACT 999) = 0.08 AC

TOTAL BYPASS AREA = 0.04 AC
- PERVIOUS AREA = 0.02 AC
- IMPERVIOUS AREA = 0.02 AC

UPSTREAM BASIN

TOTAL BASIN AREA = 1.41 AC

TOTAL IMPERVIOUS SURFACE AREA = 0.24 AC
- DRIVEWAYS = 0.11 AC
- BUILDING ROOF TOPS = 0.13 AC

TOTAL PERVIOUS SURFACE AREA = 1.17 AC
- FOREST = 0.57 AC
- LANDSCAPE LAWN (TILL FOREST) = 0.60 AC

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

Title: DEVELOPED BASIN MAP FOR EAGLEMONT 8

For: MAINVUE WA LLC
121 3RD AVENUE
KIRKLAND WA, 98033

PRELIMINARY

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

Designed JSK
Drawn JSK
Checked BJT
Approved BJT
Date 4/7/22

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

Job Number 22082

Sheet 1 of 1

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5.3 Performance Standards and Goals

The project is subject to the provisions of the City of Monroe's design standards and guidelines, as well as the 2012 Stormwater Management Manual for Western Washington (2014 SWMMWW), as Amended in December 2014 by the Washington State Department of Ecology. This report, along with the accompanying plans, are intended to satisfy the Stormwater Site Plan preparation requirements outlined in the regulatory documents listed above.

Hydrologic modeling was performed using the 2012 Western Washington Hydrology Model hence forth referred to as WWHM2012. WWHM2012 is a locally calibrated continuous simulation model developed by the Washington State Department of Ecology. The model evaluates several decades of hydrologic data to derive peak flow rate and duration information per Figure 5.3.1 Treatment Facility Selection Flow Chart. Please reference, Section 5.5 of this report for further information.

Water quality treatment will be provided via a StormFilter vault (or approved equal). Please reference Section 5.6 of this report for further information.

This project has opted to use the List #2 per the Flow Chart for Determining LID MR #5 Requirements (Figure 5.3.2), located within this section of the report. In order to meet the requirements for List #2, all individual on-site lots will have the following BMPs on top of the 50% maximum impervious surface coverage per lot. All soil in the lawn and landscaped areas for the site will be amended to meet the post-Construction Soil Quality and Depth requirement. Each individual lot will have a perforated stub-out connection for rooftops. Due to lot configurations and size, Full Dispersion, Downspout Dispersion Systems for rooftop runoff and Bioretention Systems are not feasible. For more information on the LID Features for the project please reference Section 5.4 of this report.

Figure 5.3.1

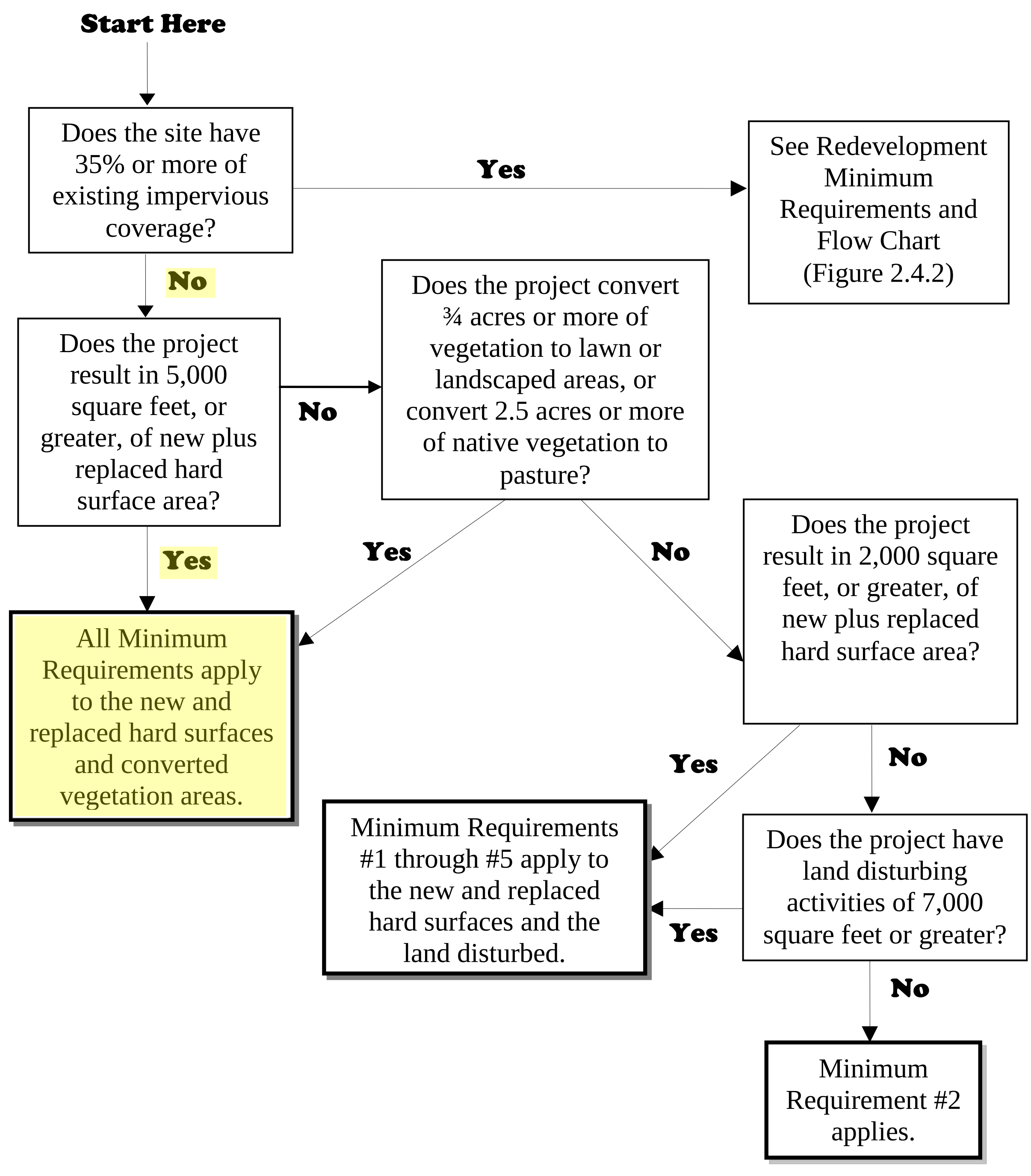
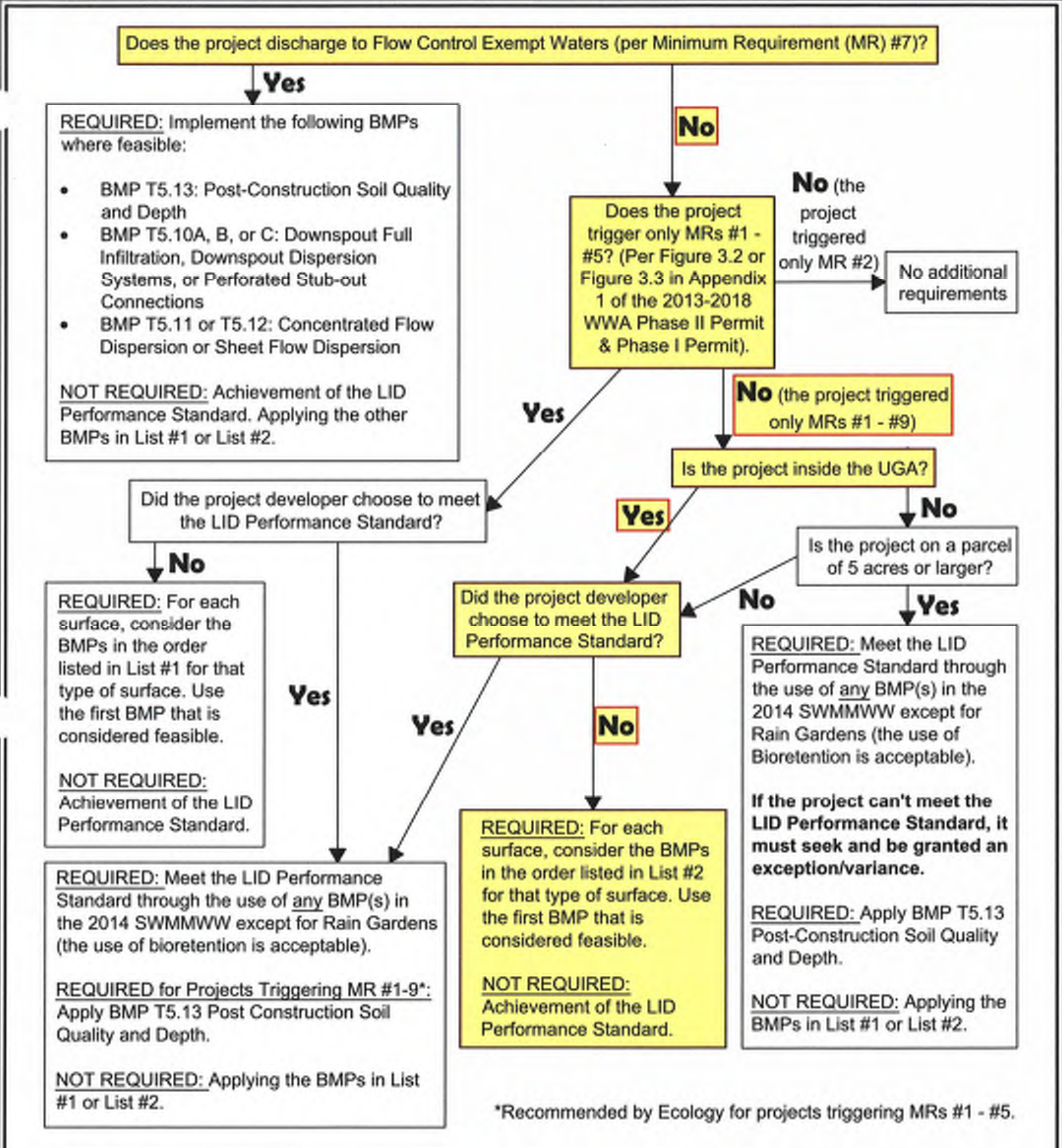


Figure 2.4.1 – Flow Chart for Determining Requirements for New Development

Figure 5.3.2



DEPARTMENT OF ECOLOGY
State of Washington

Figure I-2.5.1
Flow Chart for Determining LID MR #5 Requirements

Revised June 2015

5.4 Low Impact Development Features

Eaglemont 8 is subject to Low Impact Development performance standard requiring the analysis of List #1 and #2 per the 2014 SWMMWW. List #1 requires matching developed discharged durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year peak flow to 50% of the 2-year peak flow. Eaglemont 8 has opted to use List #2 per the Flow Chart for Determining LID Requirements (Figure 5.3.2), located within Section 5.3 of this report. In order to meet the requirements for List #2 all individual on-site lots will have the following BMPs on top of the 50 percent maximum impervious surface coverage per lot. All soil in the lawn and landscaped areas for the site will be amended to meet BMP T5.13 Post-Construction Soil Quality and Depth.

Additionally, each individual lot will have a Perforated Stub-Out Connection in compliance with BMP T5.10C, for all rooftop areas. Due to lot configurations and size, Full Dispersion, Downspout Dispersion Systems for rooftop runoff and Bioretention Systems are not feasible. Infiltration is not feasible for this site as the existing soil conditions consists of glacially consolidated till. Please see the Geotechnical Report by Earth Solutions NW LLC, dated January 4, 2022, in Section 7.0 of this report for further details.

Flow Control for the detention vault is provided by matching developed discharge durations to forested durations for the range of pre-developed discharge rates from 50 percent of the two-year peak flow up to the full 50-year peak flow. For details on the sizing of the detention vault please reference Section 5.5 of this report.

5.5 Flow Control System

Surface runoff from the site will be routed to the detention vault located in Tract 999. A detailed breakdown of the basin areas can be located in Section 5.2 of this report. This facility has been sized using the WWHM2012 stormwater program. Discharges are designed to match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50 percent of the 2-year peak flow up to the full 50-year peak flow. The volume required for the detention vault is 22,000 cubic feet. These design calculations are provided within this section of the report.

Figure 5.5.1

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Upstream Basin
Site Name:	
Site Address:	
City:	
Report Date:	4/7/2022
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.200
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year
Low Flow Threshold for POC2:	50 Percent of the 2 Year
High Flow Threshold for POC2:	50 Year

Mitigated Land Use

Developed Basin

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	0.69
Pervious Total	0.69
Impervious Land Use	acre
ROADS FLAT	0.4
ROOF TOPS FLAT	0.55
Impervious Total	0.95
Basin Total	1.64

Element Flows To:

Surface	Interflow	Groundwater

Upstream Basin

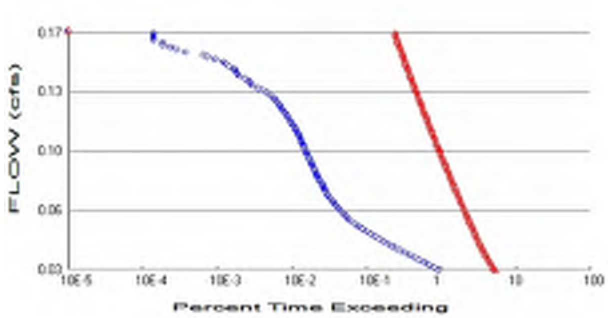
Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.57
C, Lawn, Flat	0.6
Pervious Total	1.17
Impervious Land Use	acre
ROADS FLAT	0.11
ROOF TOPS FLAT	0.13
Impervious Total	0.24
Basin Total	1.41

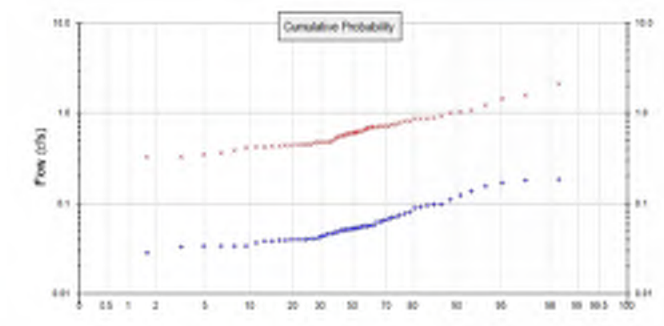
Element Flows To:

Surface	Interflow	Groundwater

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.64
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.69
Total Impervious Area: 0.95

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.055105
5 year	0.084532
10 year	0.107228
25 year	0.139698
50 year	0.166741
100 year	0.196316

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.594832
5 year	0.847143
10 year	1.039084
25 year	1.311614
50 year	1.537546
100 year	1.784085

Unmitigated 100-year peak flow. 50% of flow is 0.89 cfs

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.055	0.709
1950	0.056	0.775
1951	0.050	0.630
1952	0.040	0.544
1953	0.033	0.750
1954	0.180	1.031
1955	0.071	0.713
1956	0.063	0.304
1957	0.078	0.605
1958	0.056	1.584

1959	0.056	0.523
1960	0.052	0.599
1961	0.098	2.111
1962	0.048	0.587
1963	0.080	0.869
1964	0.057	0.416
1965	0.048	0.443
1966	0.028	0.479
1967	0.057	1.016
1968	0.069	0.617
1969	0.168	1.458
1970	0.040	0.446
1971	0.063	0.700
1972	0.046	0.920
1973	0.044	0.711
1974	0.094	0.894
1975	0.038	0.709
1976	0.040	0.450
1977	0.033	0.428
1978	0.040	0.324
1979	0.110	0.866
1980	0.052	0.450
1981	0.040	0.453
1982	0.053	0.425
1983	0.090	0.686
1984	0.054	0.571
1985	0.065	0.751
1986	0.154	0.862
1987	0.073	0.715
1988	0.038	0.552
1989	0.039	0.612
1990	0.051	0.438
1991	0.053	0.487
1992	0.040	0.569
1993	0.033	0.424
1994	0.037	0.428
1995	0.054	0.385
1996	0.092	0.613
1997	0.183	0.821
1998	0.034	0.814
1999	0.044	0.325
2000	0.033	1.219
2001	0.013	0.360
2002	0.050	0.348
2003	0.039	0.470
2004	0.066	1.074
2005	0.046	0.477
2006	0.122	0.670
2007	0.097	0.648
2008	0.136	0.481
2009	0.041	0.483

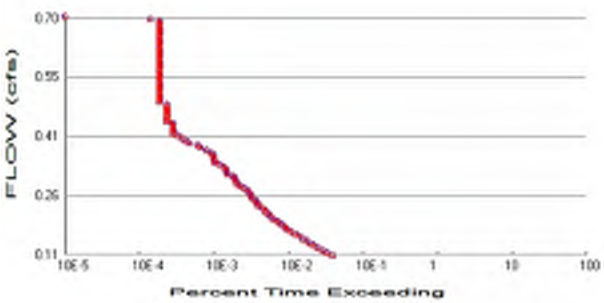
Ranked Annual Peaks

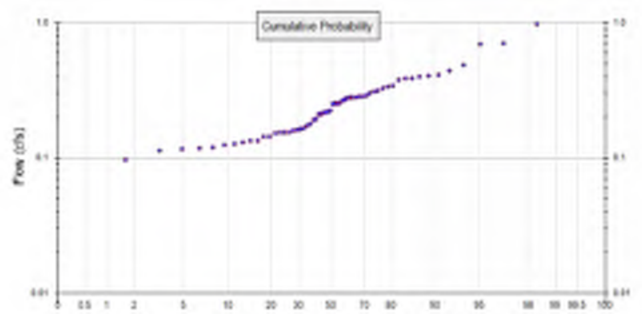
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.1825	2.1111
2	0.1800	1.5839
3	0.1680	1.4582

4	0.1539	1.2190
5	0.1357	1.0742
6	0.1222	1.0314
7	0.1102	1.0163
8	0.0979	0.9202
9	0.0967	0.8941
10	0.0945	0.8694
11	0.0918	0.8659
12	0.0895	0.8623
13	0.0796	0.8215
14	0.0776	0.8136
15	0.0734	0.7749
16	0.0709	0.7505
17	0.0691	0.7498
18	0.0659	0.7155
19	0.0654	0.7133
20	0.0626	0.7112
21	0.0625	0.7095
22	0.0573	0.7090
23	0.0568	0.7002
24	0.0563	0.6864
25	0.0561	0.6701
26	0.0556	0.6480
27	0.0551	0.6301
28	0.0540	0.6170
29	0.0538	0.6133
30	0.0529	0.6121
31	0.0525	0.6054
32	0.0518	0.5989
33	0.0517	0.5870
34	0.0514	0.5713
35	0.0503	0.5686
36	0.0500	0.5518
37	0.0483	0.5440
38	0.0478	0.5232
39	0.0461	0.4871
40	0.0459	0.4828
41	0.0439	0.4814
42	0.0437	0.4791
43	0.0413	0.4772
44	0.0405	0.4703
45	0.0403	0.4530
46	0.0397	0.4502
47	0.0396	0.4498
48	0.0396	0.4462
49	0.0396	0.4426
50	0.0392	0.4384
51	0.0387	0.4280
52	0.0385	0.4278
53	0.0380	0.4253
54	0.0367	0.4238
55	0.0336	0.4160
56	0.0334	0.3849
57	0.0334	0.3603
58	0.0333	0.3476
59	0.0330	0.3253
60	0.0280	0.3239
61	0.0132	0.3041

POC 2





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 1.17
Total Impervious Area: 0.24

Mitigated Landuse Totals for POC #2
Total Pervious Area: 1.17
Total Impervious Area: 0.24

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	Flow(cfs)
2 year	0.223519
5 year	0.347272
10 year	0.443631
25 year	0.582531
50 year	0.698963
100 year	0.82694

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	Flow(cfs)
2 year	0.223519
5 year	0.347272
10 year	0.443631
25 year	0.582531
50 year	0.698963
100 year	0.82694

100-year upstream basin peak flow. Less than 50% of the 100-year peak unmitigated flow of developed site (0.89 cfs)

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #2

Year	Predeveloped	Mitigated
1949	0.302	0.302
1950	0.335	0.335
1951	0.161	0.161
1952	0.216	0.216
1953	0.284	0.284
1954	0.487	0.487
1955	0.313	0.313
1956	0.125	0.125
1957	0.282	0.282
1958	0.695	0.695
1959	0.190	0.190

1960	0.252	0.252
1961	0.974	0.974
1962	0.224	0.224
1963	0.398	0.398
1964	0.166	0.166
1965	0.113	0.113
1966	0.144	0.144
1967	0.277	0.277
1968	0.219	0.219
1969	0.703	0.703
1970	0.159	0.159
1971	0.281	0.281
1972	0.375	0.375
1973	0.267	0.267
1974	0.341	0.341
1975	0.286	0.286
1976	0.154	0.154
1977	0.127	0.127
1978	0.117	0.117
1979	0.404	0.404
1980	0.177	0.177
1981	0.154	0.154
1982	0.145	0.145
1983	0.280	0.280
1984	0.211	0.211
1985	0.253	0.253
1986	0.390	0.390
1987	0.264	0.264
1988	0.193	0.193
1989	0.252	0.252
1990	0.154	0.154
1991	0.133	0.133
1992	0.216	0.216
1993	0.151	0.151
1994	0.131	0.131
1995	0.133	0.133
1996	0.255	0.255
1997	0.438	0.438
1998	0.326	0.326
1999	0.117	0.117
2000	0.413	0.413
2001	0.096	0.096
2002	0.091	0.091
2003	0.119	0.119
2004	0.387	0.387
2005	0.164	0.164
2006	0.309	0.309
2007	0.289	0.289
2008	0.212	0.212
2009	0.173	0.173

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	0.9739	0.9739
2	0.7033	0.7033
3	0.6947	0.6947
4	0.4871	0.4871

5	0.4378	0.4378
6	0.4131	0.4131
7	0.4037	0.4037
8	0.3976	0.3976
9	0.3904	0.3904
10	0.3872	0.3872
11	0.3745	0.3745
12	0.3408	0.3408
13	0.3350	0.3350
14	0.3264	0.3264
15	0.3126	0.3126
16	0.3089	0.3089
17	0.3022	0.3022
18	0.2891	0.2891
19	0.2859	0.2859
20	0.2840	0.2840
21	0.2818	0.2818
22	0.2814	0.2814
23	0.2798	0.2798
24	0.2765	0.2765
25	0.2675	0.2675
26	0.2639	0.2639
27	0.2551	0.2551
28	0.2526	0.2526
29	0.2524	0.2524
30	0.2515	0.2515
31	0.2244	0.2244
32	0.2194	0.2194
33	0.2158	0.2158
34	0.2158	0.2158
35	0.2122	0.2122
36	0.2108	0.2108
37	0.1926	0.1926
38	0.1904	0.1904
39	0.1770	0.1770
40	0.1729	0.1729
41	0.1660	0.1660
42	0.1639	0.1639
43	0.1613	0.1613
44	0.1589	0.1589
45	0.1538	0.1538
46	0.1537	0.1537
47	0.1536	0.1536
48	0.1514	0.1514
49	0.1446	0.1446
50	0.1443	0.1443
51	0.1335	0.1335
52	0.1331	0.1331
53	0.1308	0.1308
54	0.1269	0.1269
55	0.1255	0.1255
56	0.1189	0.1189
57	0.1172	0.1172
58	0.1167	0.1167
59	0.1130	0.1130
60	0.0960	0.0960
61	0.0911	0.0911

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

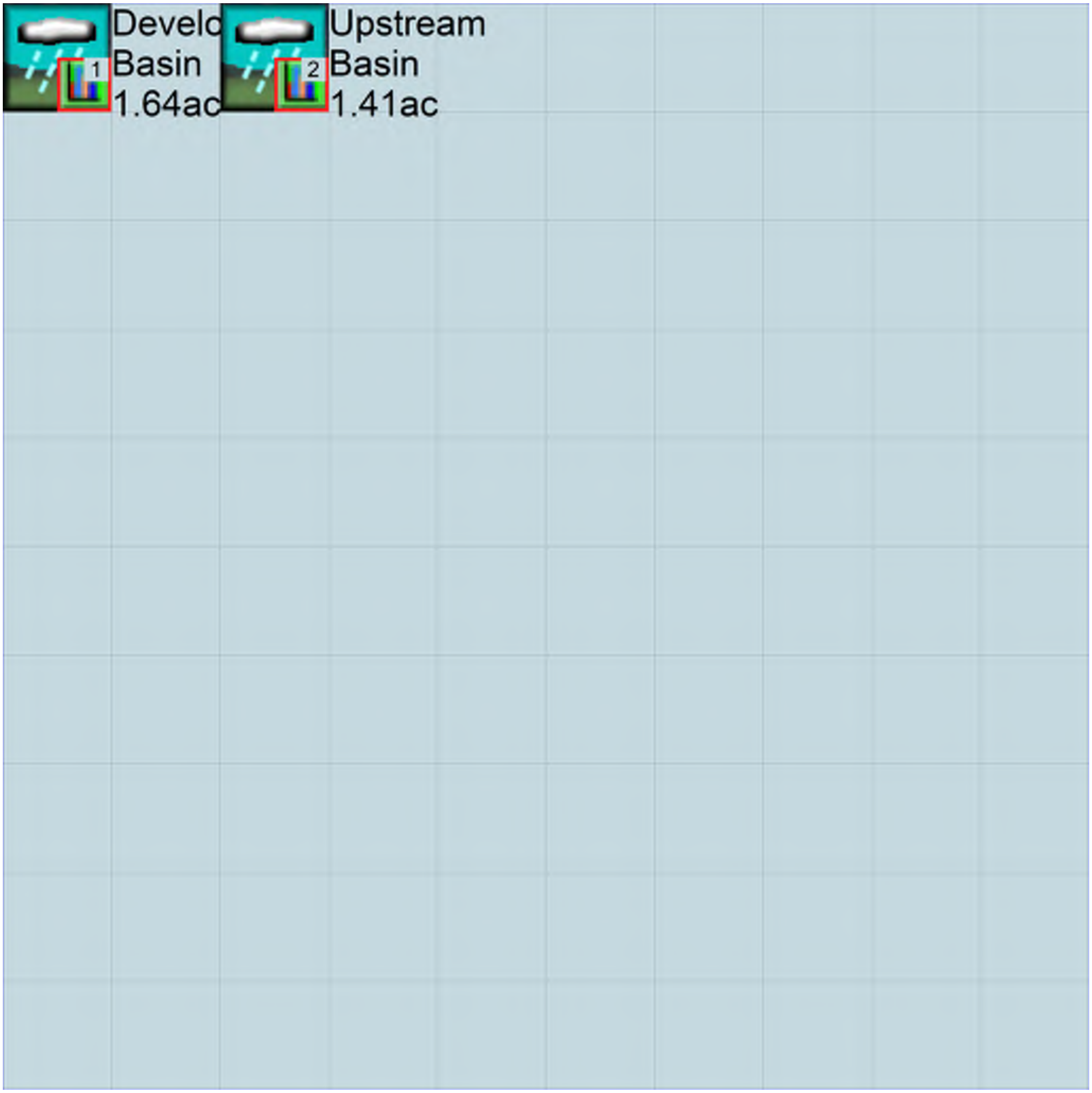
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic



Mitigated UCI File

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RUN

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  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

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MESSU      25   MitUpstream Basin.MES
           27   MitUpstream Basin.L61
           28   MitUpstream Basin.L62
           30   POCUpstream Basin1.dat
           31   POCUpstream Basin2.dat
END FILES

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      IMPLND       1
      IMPLND       4
      PERLND      10
      COPY       501
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      DISPLY       2
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END OPN SEQUENCE
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  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
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    2        Basin  2                    MAX                      1    2   31    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
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  502        1    1
  END TIMESERIES
END COPY
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  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                         in  out           ***
   16      C, Lawn, Flat          1    1    1    1   27    0
   10      C, Forest, Flat        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
```

```
  16         0    0    1    0    0    0    0    0    0    0    0    0
  10         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
  16         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
  16         0    0    0    0    0    0    0    0    0    0    0
  10         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  16             0       4.5      0.03       400      0.05       0.5     0.996
  10             0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  16             0         0         2         2         0         0         0
  10             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  16           0.1      0.25      0.25         6       0.5      0.25
  10           0.2       0.5      0.35         6       0.5       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
  16             0         0         0         0       2.5         1         0
  10             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
    1      ROADS/FLAT             1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1        0    0    1    0    0    0
    4        0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   *********
    1        0    0    4    0    0    0    1    9
    4        0    0    4    0    0    0    1    9
```

```
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    4         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  16                        0.69     COPY   501     12
PERLND  16                        0.69     COPY   501     13
IMPLND   1                         0.4     COPY   501     15
IMPLND   4                        0.55     COPY   501     15
Basin  2***
PERLND  10                        0.57     COPY   502     12
PERLND  10                        0.57     COPY   502     13
PERLND  16                         0.6     COPY   502     12
PERLND  16                         0.6     COPY   502     13
IMPLND   1                        0.11     COPY   502     15
IMPLND   4                        0.13     COPY   502     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     INPUT  TIMSER 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                           in  out                           ***
  END GEN-INFO
  *** Section RCHRES***
```

```
  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                       ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *        *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC      ENGL    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC      ENGL    1.2            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP      ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP      ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY     2 OUTPUT MEAN   1 1     48.4      WDM    702 FLOW     ENGL      REPL
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    802 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15
```

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Local (360)943-0304

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Figure 5.5.2

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Detention Vault
Site Name:	
Site Address:	
City:	
Report Date:	4/7/2022
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.200
Version Date:	2019/09/13
Version:	4.2.17

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	1.64
Pervious Total	1.64
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.64

Element Flows To:

Surface	Interflow	Groundwater

Upstream Basin

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.57
C, Lawn, Flat	0.6
Pervious Total	1.17
Impervious Land Use	acre
ROADS FLAT	0.11
ROOF TOPS FLAT	0.13
Impervious Total	0.24
Basin Total	1.41

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	0.67
Pervious Total	0.67
Impervious Land Use	acre
ROADS FLAT	0.38
ROOF TOPS FLAT	0.55
Impervious Total	0.93
Basin Total	1.6

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Basin 2

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	0.02
Pervious Total	0.02
Impervious Land Use	acre
ROADS FLAT	0.02
Impervious Total	0.02
Basin Total	0.04

Element Flows To:

Surface	Interflow	Groundwater

Upstream Basin

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.57
C, Lawn, Flat	0.6
Pervious Total	1.17
Impervious Land Use	acre
ROADS FLAT	0.11
ROOF TOPS FLAT	0.13
Impervious Total	0.24
Basin Total	1.41

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Mitigated Routing

Vault 1

Width:	45 ft.	
Length:	44.5 ft.	
Depth:	11.5 ft.	
Discharge Structure		
Riser Height:	11 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	1.55 in.	Elevation:0 ft.
Orifice 2 Diameter:	0.9 in.	Elevation:4.1 ft.
Orifice 3 Diameter:	1.4 in.	Elevation:8 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Volume Required = 22,000 CF

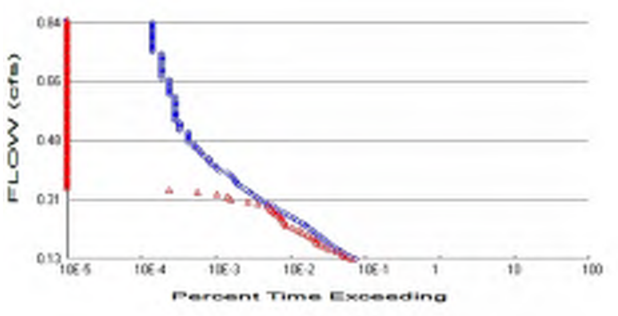
Vault Hydraulic Table

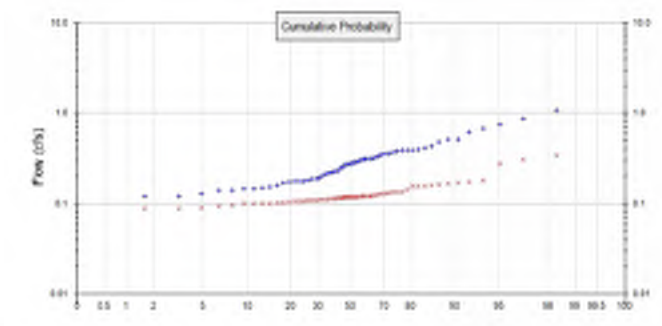
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.046	0.000	0.000	0.000
0.1278	0.046	0.005	0.023	0.000
0.2556	0.046	0.011	0.033	0.000
0.3833	0.046	0.017	0.040	0.000
0.5111	0.046	0.023	0.046	0.000
0.6389	0.046	0.029	0.052	0.000
0.7667	0.046	0.035	0.057	0.000
0.8944	0.046	0.041	0.061	0.000
1.0222	0.046	0.047	0.065	0.000
1.1500	0.046	0.052	0.069	0.000
1.2778	0.046	0.058	0.073	0.000
1.4056	0.046	0.064	0.077	0.000
1.5333	0.046	0.070	0.080	0.000
1.6611	0.046	0.076	0.084	0.000
1.7889	0.046	0.082	0.087	0.000
1.9167	0.046	0.088	0.090	0.000
2.0444	0.046	0.094	0.093	0.000
2.1722	0.046	0.099	0.096	0.000
2.3000	0.046	0.105	0.098	0.000
2.4278	0.046	0.111	0.101	0.000
2.5556	0.046	0.117	0.104	0.000
2.6833	0.046	0.123	0.106	0.000
2.8111	0.046	0.129	0.109	0.000
2.9389	0.046	0.135	0.111	0.000
3.0667	0.046	0.141	0.114	0.000
3.1944	0.046	0.146	0.116	0.000
3.3222	0.046	0.152	0.118	0.000
3.4500	0.046	0.158	0.121	0.000
3.5778	0.046	0.164	0.123	0.000
3.7056	0.046	0.170	0.125	0.000
3.8333	0.046	0.176	0.127	0.000
3.9611	0.046	0.182	0.129	0.000
4.0889	0.046	0.188	0.131	0.000
4.2167	0.046	0.193	0.141	0.000
4.3444	0.046	0.199	0.146	0.000
4.4722	0.046	0.205	0.151	0.000
4.6000	0.046	0.211	0.155	0.000
4.7278	0.046	0.217	0.159	0.000

4.8556	0.046	0.223	0.162	0.000
4.9833	0.046	0.229	0.166	0.000
5.1111	0.046	0.235	0.169	0.000
5.2389	0.046	0.240	0.172	0.000
5.3667	0.046	0.246	0.175	0.000
5.4944	0.046	0.252	0.178	0.000
5.6222	0.046	0.258	0.181	0.000
5.7500	0.046	0.264	0.184	0.000
5.8778	0.046	0.270	0.187	0.000
6.0056	0.046	0.276	0.190	0.000
6.1333	0.046	0.282	0.192	0.000
6.2611	0.046	0.287	0.195	0.000
6.3889	0.046	0.293	0.198	0.000
6.5167	0.046	0.299	0.200	0.000
6.6444	0.046	0.305	0.203	0.000
6.7722	0.046	0.311	0.205	0.000
6.9000	0.046	0.317	0.208	0.000
7.0278	0.046	0.323	0.210	0.000
7.1556	0.046	0.328	0.212	0.000
7.2833	0.046	0.334	0.215	0.000
7.4111	0.046	0.340	0.217	0.000
7.5389	0.046	0.346	0.219	0.000
7.6667	0.046	0.352	0.222	0.000
7.7944	0.046	0.358	0.224	0.000
7.9222	0.046	0.364	0.226	0.000
8.0500	0.046	0.370	0.240	0.000
8.1778	0.046	0.375	0.253	0.000
8.3056	0.046	0.381	0.262	0.000
8.4333	0.046	0.387	0.270	0.000
8.5611	0.046	0.393	0.277	0.000
8.6889	0.046	0.399	0.283	0.000
8.8167	0.046	0.405	0.289	0.000
8.9444	0.046	0.411	0.295	0.000
9.0722	0.046	0.417	0.300	0.000
9.2000	0.046	0.422	0.305	0.000
9.3278	0.046	0.428	0.310	0.000
9.4556	0.046	0.434	0.315	0.000
9.5833	0.046	0.440	0.320	0.000
9.7111	0.046	0.446	0.324	0.000
9.8389	0.046	0.452	0.329	0.000
9.9667	0.046	0.458	0.333	0.000
10.094	0.046	0.464	0.337	0.000
10.222	0.046	0.469	0.342	0.000
10.350	0.046	0.475	0.346	0.000
10.478	0.046	0.481	0.350	0.000
10.606	0.046	0.487	0.354	0.000
10.733	0.046	0.493	0.358	0.000
10.861	0.046	0.499	0.362	0.000
10.989	0.046	0.505	0.365	0.000
11.117	0.046	0.511	1.001	0.000
11.244	0.046	0.516	2.250	0.000
11.372	0.046	0.522	3.700	0.000
11.500	0.046	0.528	5.019	0.000
11.628	0.084	0.856	5.946	0.000

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.81
Total Impervious Area: 0.24

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.86
Total Impervious Area: 1.19

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.261814
5 year	0.410298
10 year	0.526668
25 year	0.69527
50 year	0.837221
100 year	0.993784

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.119484
5 year	0.153052
10 year	0.178019
25 year	0.212769
50 year	0.241067
100 year	0.271513

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.357	0.110
1950	0.391	0.117
1951	0.204	0.109
1952	0.256	0.098
1953	0.311	0.092
1954	0.667	0.115
1955	0.372	0.132
1956	0.181	0.129
1957	0.359	0.154
1958	0.751	0.141

1959	0.219	0.118
1960	0.296	0.130
1961	1.072	0.154
1962	0.272	0.116
1963	0.477	0.122
1964	0.223	0.111
1965	0.120	0.113
1966	0.146	0.088
1967	0.277	0.119
1968	0.279	0.159
1969	0.871	0.107
1970	0.189	0.096
1971	0.314	0.116
1972	0.400	0.133
1973	0.288	0.102
1974	0.376	0.105
1975	0.322	0.099
1976	0.171	0.121
1977	0.139	0.102
1978	0.157	0.089
1979	0.514	0.156
1980	0.229	0.106
1981	0.189	0.107
1982	0.178	0.166
1983	0.315	0.112
1984	0.229	0.129
1985	0.306	0.133
1986	0.509	0.275
1987	0.271	0.172
1988	0.213	0.117
1989	0.290	0.088
1990	0.176	0.118
1991	0.150	0.120
1992	0.246	0.100
1993	0.176	0.100
1994	0.138	0.114
1995	0.147	0.126
1996	0.347	0.162
1997	0.620	0.339
1998	0.335	0.109
1999	0.150	0.114
2000	0.414	0.121
2001	0.097	0.084
2002	0.129	0.116
2003	0.119	0.104
2004	0.388	0.170
2005	0.170	0.119
2006	0.431	0.179
2007	0.386	0.118
2008	0.307	0.308
2009	0.193	0.108

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	1.0717	0.3386
2	0.8713	0.3084
3	0.7508	0.2749

4	0.6671	0.1785
5	0.6203	0.1724
6	0.5140	0.1700
7	0.5094	0.1662
8	0.4772	0.1621
9	0.4310	0.1589
10	0.4137	0.1559
11	0.4001	0.1543
12	0.3913	0.1537
13	0.3878	0.1411
14	0.3858	0.1331
15	0.3755	0.1327
16	0.3722	0.1325
17	0.3594	0.1303
18	0.3573	0.1294
19	0.3469	0.1293
20	0.3350	0.1257
21	0.3220	0.1221
22	0.3152	0.1210
23	0.3137	0.1210
24	0.3114	0.1203
25	0.3066	0.1192
26	0.3065	0.1190
27	0.2960	0.1179
28	0.2902	0.1177
29	0.2882	0.1176
30	0.2786	0.1167
31	0.2766	0.1166
32	0.2719	0.1165
33	0.2711	0.1164
34	0.2556	0.1161
35	0.2459	0.1151
36	0.2294	0.1140
37	0.2286	0.1138
38	0.2232	0.1130
39	0.2194	0.1116
40	0.2128	0.1111
41	0.2036	0.1100
42	0.1930	0.1092
43	0.1892	0.1091
44	0.1887	0.1080
45	0.1812	0.1074
46	0.1777	0.1066
47	0.1765	0.1057
48	0.1756	0.1052
49	0.1707	0.1038
50	0.1701	0.1022
51	0.1568	0.1018
52	0.1505	0.1002
53	0.1501	0.1001
54	0.1467	0.0988
55	0.1458	0.0984
56	0.1393	0.0958
57	0.1383	0.0922
58	0.1286	0.0893
59	0.1199	0.0880
60	0.1190	0.0877
61	0.0975	0.0835

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1309	1579	1398	88	Pass
0.1380	1320	1144	86	Pass
0.1452	1147	1032	89	Pass
0.1523	1012	896	88	Pass
0.1594	892	727	81	Pass
0.1666	794	616	77	Pass
0.1737	724	529	73	Pass
0.1808	657	476	72	Pass
0.1880	598	440	73	Pass
0.1951	539	403	74	Pass
0.2023	493	365	74	Pass
0.2094	450	310	68	Pass
0.2165	417	271	64	Pass
0.2237	369	226	61	Pass
0.2308	338	186	55	Pass
0.2379	307	178	57	Pass
0.2451	261	168	64	Pass
0.2522	231	158	68	Pass
0.2593	198	150	75	Pass
0.2665	180	134	74	Pass
0.2736	153	124	81	Pass
0.2807	133	115	86	Pass
0.2879	121	103	85	Pass
0.2950	104	78	75	Pass
0.3021	94	57	60	Pass
0.3093	82	34	41	Pass
0.3164	76	30	39	Pass
0.3235	66	22	33	Pass
0.3307	60	12	20	Pass
0.3378	53	5	9	Pass
0.3449	48	0	0	Pass
0.3521	42	0	0	Pass
0.3592	40	0	0	Pass
0.3663	38	0	0	Pass
0.3735	36	0	0	Pass
0.3806	34	0	0	Pass
0.3877	30	0	0	Pass
0.3949	24	0	0	Pass
0.4020	22	0	0	Pass
0.4092	21	0	0	Pass
0.4163	18	0	0	Pass
0.4234	17	0	0	Pass
0.4306	17	0	0	Pass
0.4377	15	0	0	Pass
0.4448	14	0	0	Pass
0.4520	13	0	0	Pass
0.4591	12	0	0	Pass
0.4662	11	0	0	Pass
0.4734	11	0	0	Pass
0.4805	9	0	0	Pass
0.4876	9	0	0	Pass
0.4948	9	0	0	Pass
0.5019	9	0	0	Pass

0.5090	9	0	0	Pass
0.5162	7	0	0	Pass
0.5233	7	0	0	Pass
0.5304	7	0	0	Pass
0.5376	7	0	0	Pass
0.5447	6	0	0	Pass
0.5518	6	0	0	Pass
0.5590	6	0	0	Pass
0.5661	6	0	0	Pass
0.5732	6	0	0	Pass
0.5804	6	0	0	Pass
0.5875	6	0	0	Pass
0.5946	6	0	0	Pass
0.6018	6	0	0	Pass
0.6089	6	0	0	Pass
0.6161	6	0	0	Pass
0.6232	5	0	0	Pass
0.6303	5	0	0	Pass
0.6375	5	0	0	Pass
0.6446	5	0	0	Pass
0.6517	5	0	0	Pass
0.6589	5	0	0	Pass
0.6660	5	0	0	Pass
0.6731	4	0	0	Pass
0.6803	4	0	0	Pass
0.6874	4	0	0	Pass
0.6945	4	0	0	Pass
0.7017	4	0	0	Pass
0.7088	4	0	0	Pass
0.7159	4	0	0	Pass
0.7231	4	0	0	Pass
0.7302	4	0	0	Pass
0.7373	4	0	0	Pass
0.7445	4	0	0	Pass
0.7516	3	0	0	Pass
0.7587	3	0	0	Pass
0.7659	3	0	0	Pass
0.7730	3	0	0	Pass
0.7801	3	0	0	Pass
0.7873	3	0	0	Pass
0.7944	3	0	0	Pass
0.8015	3	0	0	Pass
0.8087	3	0	0	Pass
0.8158	3	0	0	Pass
0.8230	3	0	0	Pass
0.8301	3	0	0	Pass
0.8372	3	0	0	Pass

Model Default Modifications

Total of 0 changes have been made.

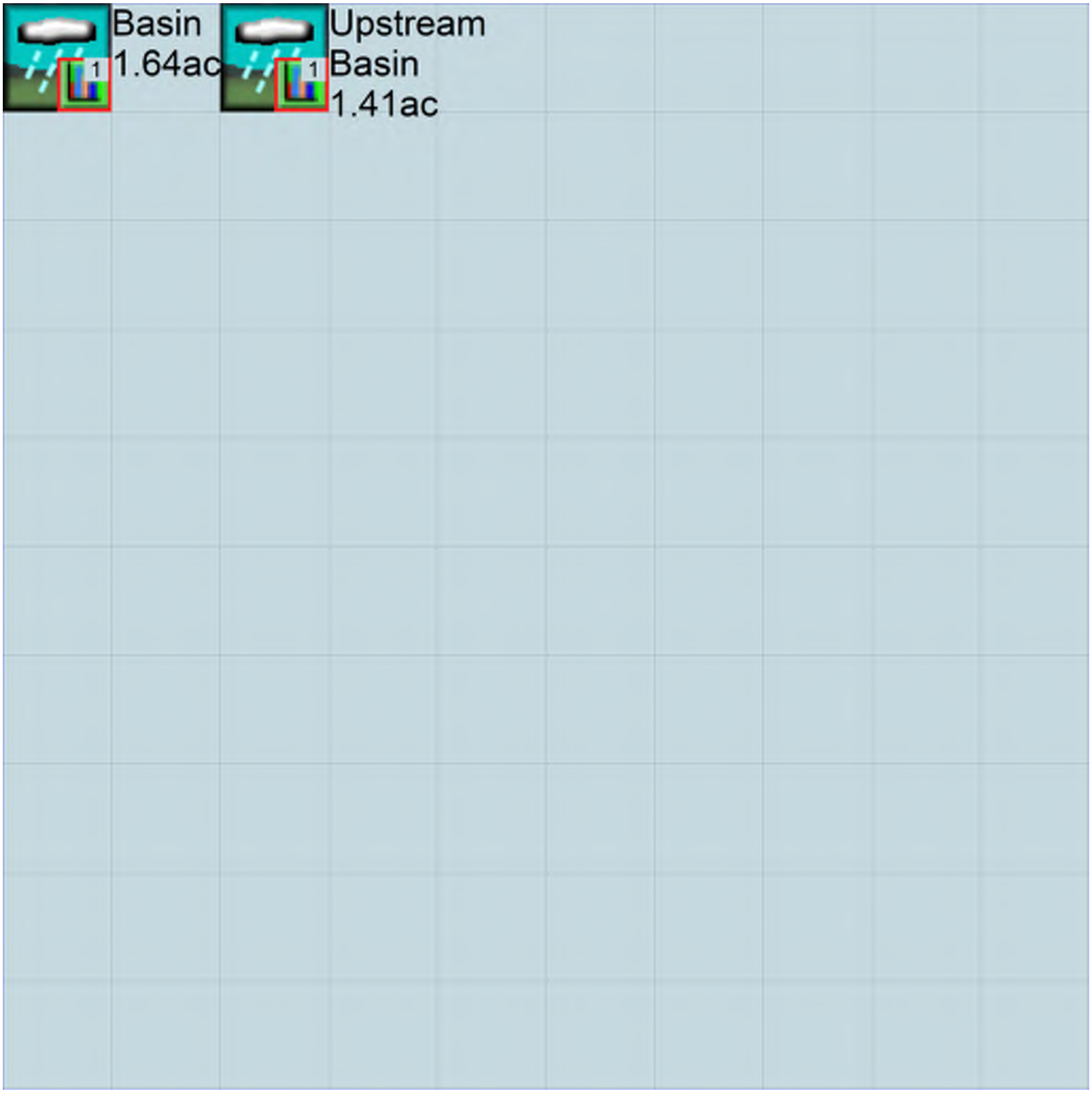
PERLND Changes

No PERLND changes have been made.

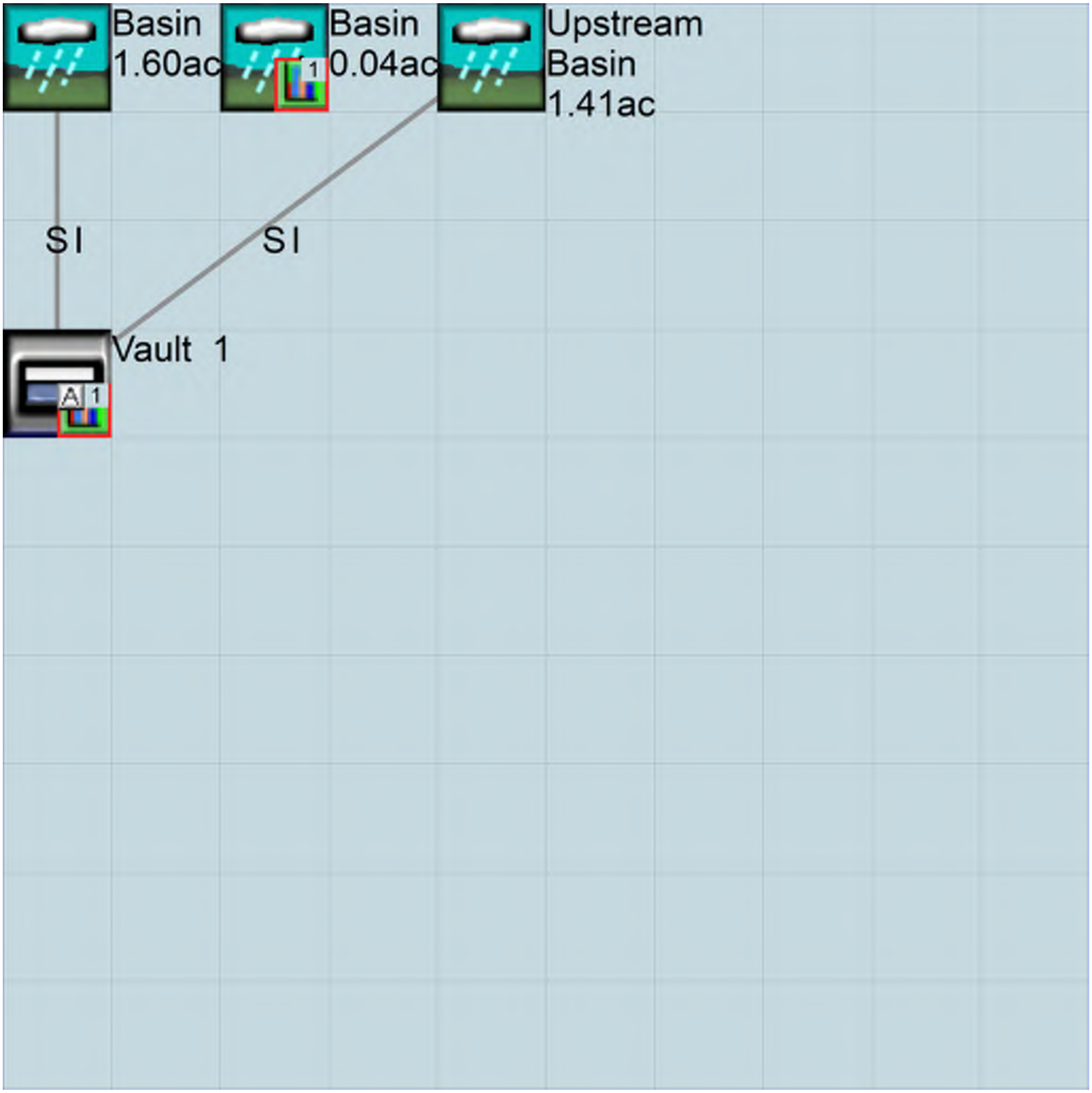
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   Detention Vault.wdm
MESSU      25   PreDetention Vault.MES
           27   PreDetention Vault.L61
           28   PreDetention Vault.L62
           30   POCDetention Vault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      10
      PERLND      16
      IMPLND       1
      IMPLND       4
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
   10     C, Forest, Flat         1    1    1    1   27    0
   16     C, Lawn, Flat           1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   10         0    0    1    0    0    0    0    0    0    0    0    0
   16         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
```

```
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   16         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   10         0    0    0    0    0    0    0    0    0    0    0
   16         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   10              0       4.5      0.08       400      0.05       0.5     0.996
   16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   10              0         0         2         2         0         0         0
   16              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   10            0.2       0.5      0.35         6       0.5       0.7
   16            0.1      0.25      0.25         6       0.5      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   10              0         0         0         0       2.5         1         0
   16              0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                       in  out           ***
    1      ROADS/FLAT            1    1    1   27    0
    4      ROOF TOPS/FLAT        1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    4         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
```

```
    1         0    0    0    0    0
    4         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  10                        1.64     COPY   501     12
PERLND  10                        1.64     COPY   501     13
Upstream Basin***
PERLND  10                        0.57     COPY   501     12
PERLND  10                        0.57     COPY   501     13
PERLND  16                         0.6     COPY   501     12
PERLND  16                         0.6     COPY   501     13
IMPLND   1                        0.11     COPY   501     15
IMPLND   4                        0.13     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                                   in  out                   ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
```

```
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                       ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *     *  *  *  *  *        *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50        ***
  <------><--------><--------><--------><--------><--------><-------->        ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   Detention Vault.wdm
MESSU      25   MitDetention Vault.MES
           27   MitDetention Vault.L61
           28   MitDetention Vault.L62
           30   POCDetention Vault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND       1
      IMPLND       4
      PERLND      10
      RCHRES       1
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  1                    MAX                      1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   16      C, Lawn, Flat           1    1    1    1   27    0
   10      C, Forest, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   16         0    0    1    0    0    0    0    0    0    0    0    0
```

```
 10         0    0    1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags ***************************** PIVL  PYR
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
 16         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

PWAT-PARM1
  <PLS >  PWATER variable monthly parameter value flags  ***
  # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 16         0    0    0    0    0    0    0    0    0    0    0
 10         0    0    0    0    0    0    0    0    0    0    0
END PWAT-PARM1

PWAT-PARM2
  <PLS >      PWATER input info: Part 2         ***
  # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
 16              0       4.5      0.03       400      0.05       0.5     0.996
 10              0       4.5      0.08       400      0.05       0.5     0.996
END PWAT-PARM2

PWAT-PARM3
  <PLS >      PWATER input info: Part 3         ***
  # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 16              0         0         2         2         0         0         0
 10              0         0         2         2         0         0         0
END PWAT-PARM3
PWAT-PARM4
  <PLS >     PWATER input info: Part 4                               ***
  # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 16            0.1      0.25      0.25         6       0.5      0.25
 10            0.2       0.5      0.35         6       0.5       0.7
END PWAT-PARM4

PWAT-STATE1
  <PLS > *** Initial conditions at start of simulation
           ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
  # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
 16              0         0         0         0       2.5         1         0
 10              0         0         0         0       2.5         1         0
END PWAT-STATE1

END PERLND

IMPLND
GEN-INFO
  <PLS ><-------Name------->   Unit-systems   Printer ***
  # -  #                     User  t-series Engl Metr ***
                                    in  out           ***
  1      ROADS/FLAT             1    1    1   27    0
  4      ROOF TOPS/FLAT         1    1    1   27    0
END GEN-INFO
*** Section IWATER***

ACTIVITY
  <PLS > ************* Active Sections *****************************
  # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  1         0    0    1    0    0    0
  4         0    0    1    0    0    0
END ACTIVITY

PRINT-INFO
  <ILS > ******** Print-flags ******** PIVL  PYR
  # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  1         0    0    4    0    0    0    1    9
  4         0    0    4    0    0    0    1    9
END PRINT-INFO
```

```
  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    4         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  16                        0.67     RCHRES   1      2
PERLND  16                        0.67     RCHRES   1      3
IMPLND   1                        0.38     RCHRES   1      5
IMPLND   4                        0.55     RCHRES   1      5
Upstream Basin***
PERLND  10                        0.57     RCHRES   1      2
PERLND  10                        0.57     RCHRES   1      3
PERLND  16                         0.6     RCHRES   1      2
PERLND  16                         0.6     RCHRES   1      3
IMPLND   1                        0.11     RCHRES   1      5
IMPLND   4                        0.13     RCHRES   1      5
Basin  2***
PERLND  16                        0.02     COPY   501     12
PERLND  16                        0.02     COPY   601     12
PERLND  16                        0.02     COPY   501     13
PERLND  16                        0.02     COPY   601     13
IMPLND   1                        0.02     COPY   501     15
IMPLND   1                        0.02     COPY   601     15

******Routing******
PERLND  16                        0.67     COPY     1     12
IMPLND   1                        0.38     COPY     1     15
IMPLND   4                        0.55     COPY     1     15
PERLND  16                        0.67     COPY     1     13
PERLND  10                        0.57     COPY     1     12
PERLND  16                         0.6     COPY     1     12
IMPLND   1                        0.11     COPY     1     15
IMPLND   4                        0.13     COPY     1     15
PERLND  10                        0.57     COPY     1     13
PERLND  16                         0.6     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
```

```
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                  ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG             ***
                                          in  out                             ***
    1     Vault  1                1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1        1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1        4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                       ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50        ***
  <------><--------><--------><--------><--------><--------><-------->        ***
    1             1      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1          0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.045971  0.000000  0.000000
  0.127778  0.045971  0.005874  0.023305
  0.255556  0.045971  0.011748  0.032958
  0.383333  0.045971  0.017622  0.040366
  0.511111  0.045971  0.023496  0.046610
  0.638889  0.045971  0.029370  0.052112
  0.766667  0.045971  0.035244  0.057085
  0.894444  0.045971  0.041119  0.061659
  1.022222  0.045971  0.046993  0.065917
  1.150000  0.045971  0.052867  0.069915
  1.277778  0.045971  0.058741  0.073697
```

1.405556	0.045971	0.064615	0.077294
1.533333	0.045971	0.070489	0.080731
1.661111	0.045971	0.076363	0.084028
1.788889	0.045971	0.082237	0.087199
1.916667	0.045971	0.088111	0.090260
2.044444	0.045971	0.093985	0.093220
2.172222	0.045971	0.099859	0.096089
2.300000	0.045971	0.105733	0.098875
2.427778	0.045971	0.111608	0.101584
2.555556	0.045971	0.117482	0.104223
2.683333	0.045971	0.123356	0.106797
2.811111	0.045971	0.129230	0.109310
2.938889	0.045971	0.135104	0.111767
3.066667	0.045971	0.140978	0.114171
3.194444	0.045971	0.146852	0.116525
3.322222	0.045971	0.152726	0.118833
3.450000	0.045971	0.158600	0.121097
3.577778	0.045971	0.164474	0.123319
3.705556	0.045971	0.170348	0.125501
3.833333	0.045971	0.176222	0.127647
3.961111	0.045971	0.182097	0.129757
4.088889	0.045971	0.187971	0.131833
4.216667	0.045971	0.193845	0.141385
4.344444	0.045971	0.199719	0.146758
4.472222	0.045971	0.205593	0.151285
4.600000	0.045971	0.211467	0.155373
4.727778	0.045971	0.217341	0.159175
4.855556	0.045971	0.223215	0.162768
4.983333	0.045971	0.229089	0.166199
5.111111	0.045971	0.234963	0.169497
5.238889	0.045971	0.240837	0.172683
5.366667	0.045971	0.246711	0.175772
5.494444	0.045971	0.252586	0.178778
5.622222	0.045971	0.258460	0.181708
5.750000	0.045971	0.264334	0.184570
5.877778	0.045971	0.270208	0.187370
6.005556	0.045971	0.276082	0.190114
6.133333	0.045971	0.281956	0.192806
6.261111	0.045971	0.287830	0.195449
6.388889	0.045971	0.293704	0.198046
6.516667	0.045971	0.299578	0.200602
6.644444	0.045971	0.305452	0.203117
6.772222	0.045971	0.311326	0.205595
6.900000	0.045971	0.317200	0.208037
7.027778	0.045971	0.323074	0.210446
7.155556	0.045971	0.328949	0.212822
7.283333	0.045971	0.334823	0.215167
7.411111	0.045971	0.340697	0.217483
7.538889	0.045971	0.346571	0.219771
7.666667	0.045971	0.352445	0.222032
7.794444	0.045971	0.358319	0.224267
7.922222	0.045971	0.364193	0.226478
8.050000	0.045971	0.370067	0.240557
8.177778	0.045971	0.375941	0.253253
8.305556	0.045971	0.381815	0.262369
8.433333	0.045971	0.387689	0.270100
8.561111	0.045971	0.393563	0.277028
8.688889	0.045971	0.399438	0.283411
8.816667	0.045971	0.405312	0.289390
8.944444	0.045971	0.411186	0.295053
9.072222	0.045971	0.417060	0.300461
9.200000	0.045971	0.422934	0.305654
9.327778	0.045971	0.428808	0.310664
9.455556	0.045971	0.434682	0.315515
9.583333	0.045971	0.440556	0.320226
9.711111	0.045971	0.446430	0.324811
9.838889	0.045971	0.452304	0.329284
9.966667	0.045971	0.458178	0.333655
10.09444	0.045971	0.464052	0.337931
10.22222	0.045971	0.469927	0.342122

```
  10.35000  0.045971  0.475801  0.346233
  10.47778  0.045971  0.481675  0.350270
  10.60556  0.045971  0.487549  0.354238
  10.73333  0.045971  0.493423  0.358141
  10.86111  0.045971  0.499297  0.361983
  10.98889  0.045971  0.505171  0.365768
  11.11667  0.045971  0.511045  1.001718
  11.24444  0.045971  0.516919  2.250487
  11.37222  0.045971  0.522793  3.700831
  11.50000  0.045971  0.528667  5.019483
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC      ENGL    1.2           PERLND   1 999 EXTNL  PREC
WDM      2 PREC      ENGL    1.2           IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP      ENGL    0.76          PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP      ENGL    0.76          IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Disclaimer

Legal Notice

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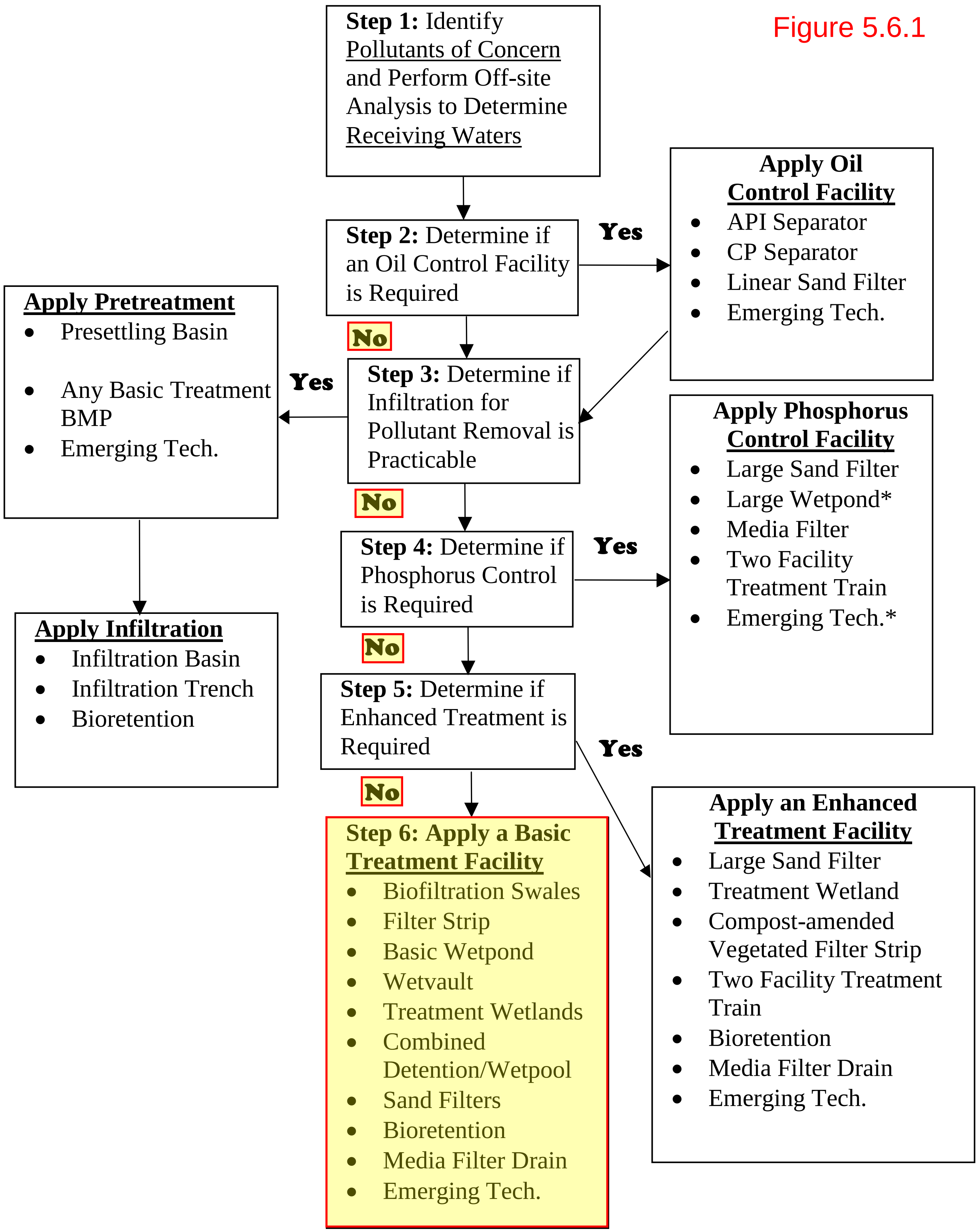
5.6 Water Quality System

Runoff treatment for the drainage basin will be provided by a StormFilter vault (or approved equal). The treatment vault will be located immediately downstream of the detention vault; therefore, it will be designed to treat the 2-year mitigated release rate. The StormFilter sizing calculations and details will be provided during Final Engineering.



*When **Phosphorous Control and Enhanced** treatment are required, the Large Wetpond and certain types of emerging technologies will not meet both types of treatment requirements. A different or an additional treatment facility will be required to meet Enhanced treatment.

Figure 2.1.1 – Treatment Facility Selection Flow Chart

5.7 Conveyance System Analysis and Design

The on-site conveyance system will be sized in final engineering using the rational method and Manning's formula for the 25-year storm event. The conveyance system calculations will be provided during Final Engineering Review.

Tab 6.0

6.0 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

The following is a list of the thirteen SWPPP elements and how they will be addressed for this project:

Element #1 - Preserve Vegetation / Mark Clearing Limits: Clearing Limits will be delineated on the engineering plans and will be flagged in the field.

Element #2 - Establish Construction Access: A stabilized gravel construction entrance will be shown on the engineering plans.

Element #3 - Control Flow Rates: A temporary sediment pond will be shown on the engineering plans. Once the permanent detention facilities are constructed the temporary sediment pond can be removed. The permanent facilities can be used throughout the remainder of construction.

Element #4 - Install Sediment Controls: Silt fence will be shown on the engineering plans for perimeter protection. In addition, temporary ditches to divert runoff to the sediment pond will be shown on the engineering plans.

Element #5 - Stabilize Soils: Cover measures will be addressed in the TESC notes on the engineering plans.

Element #6 - Protect Slopes: There are no significant slopes onsite, existing or proposed that require additional measures beyond the soil stabilization measures to be shown on the engineering plans.

Element #7 - Protect Permanent Drain Inlets: A detail for catch basin inserts will be shown on the final engineering plans along with a note specifying that they be installed once the permanent storm system is completed. A note will also be included that the contractor shall keep public roadways clear of dirt and debris.

Element #8 - Stabilize Channels and Outlets: Notes regarding outfall protection will be shown on the engineering plans. Temporary ditches shall be armored with rip rap for slopes greater than 5%.

Element #9 - Control Pollutants: A note will be added to the engineering plans that the contractor shall dispose of all pollutants and waste materials in a safe and timely manner.

Element #10 - Control Dewatering: Notes will be added to the engineering plans stating that water in underground utility trenches or low spots are to be routed to the temporary sediment pond via temporary ditches or perforated rock drains.

Element #11 - Maintain Best Management Practices: Once the engineering plans are completed the contractor shall maintain all erosion control measures in accordance with Snohomish County Standards and manufactures recommendations. In addition, the contractor shall maintain a stockpile of erosion control materials onsite.

Element #12 - Manage the Project: Once the engineering plans are completed, the clearing, grading, and seasonal work shall be performed in accordance with City of Monroe Code. The contractor shall inspect, maintain, and repair all BMPs as needed to assure continued performance of their intended function. In addition to the engineering plans, the contractor will be required to follow and maintain the Construction SWPPP which will be prepared according to Department of Ecology NPDES requirements. The completed SWPPP and TESC Plans will be provided during Final Engineering Review.

Element #13 - Protect Low Impact Development BMPs: Contractor shall keep all heavy equipment off existing soils under LID facilities, i.e., Perforated Stub-Out Connections, that have been excavated to final grade to retain the infiltration rate of the soils.

Tab 7.0

7.0 SPECIAL REPORTS AND STUDIES

This section contains the following information:

7.1 Geotechnical Engineering Study by Earth Solutions NW, LLC, dated January 4, 2022

Earth Solutions NW LLC

Geotechnical Engineering
Construction Observation/Testing
Environmental Services

GEOTECHNICAL ENGINEERING STUDY
PROPOSED EAGLEMONT 8 SHORT PLAT
13325 – 191ST AVENUE SOUTHEAST
MONROE, WASHINGTON

ES-5228.03

15365 N.E. 90th Street, Suite 100 Redmond, WA 98052
(425) 449-4704 Fax (425) 449-4711
www.earthsolutionsnw.com

PREPARED FOR

MAINVUE WA, LLC

January 4, 2022

Kyler T. Kelly, L.G.
Senior Staff Geologist

01/04/2022

Keven D. Hoffmann, P.E.
Associate Principal Engineer

GEOTECHNICAL ENGINEERING STUDY
PROPOSED EAGLEMONT 8 SHORT PLAT
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15365 Northeast 90th Street, Suite 100
Redmond, Washington 98052
Phone: 425-449-4704 | Fax: 425-449-4711
www.earthsolutionsnw.com

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL
BUSINESS
ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Earth Solutions NW LLC

Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

January 4, 2022
ES-5228.03

MainVue WA, LLC
1110 – 112th Avenue Northeast, Suite 202
Bellevue, Washington 98004

Attention: Ms. Allison Rothstein

Dear Ms. Rothstein:

Earth Solutions NW, LLC (ESNW) is pleased to present this geotechnical engineering study to support the subject project. Based on the results of our study, the proposed residential development is feasible from a geotechnical standpoint. Our study indicates the site is underlain primarily by glacial till deposits.

In our opinion, the proposed residential structures can be constructed on conventional continuous and spread footing foundations bearing upon competent native soil, recompacted native soil, or new structural fill. Competent native soil suitable for support of foundations will likely be encountered beginning at depths of about two to three feet below existing grades. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soil to the specifications of structural fill or overexcavation and replacement with suitable structural fill will likely be necessary.

We presume stormwater runoff will be managed by a detention vault. Construction of a stormwater detention vault is feasible from a geotechnical standpoint, as grade cuts would likely expose competent glacial deposits at depth. ESNW should be retained to ensure adequate geotechnical considerations have been included in the final facility design, particularly when considering the recommended temporary slope inclinations. Special attention should be paid to the placement of a vault and how the excavation relates to the surrounding structures, roadways, and property boundaries. Failure to properly site the vault when considering open cuts could result in a necessity for temporary shoring. The contractor should also be prepared to manage groundwater conditions exposed within the vault and other underground utility installations.

In our opinion, the native glacial till deposits should be considered unsuitable for infiltration purposes from a geotechnical standpoint, given the appreciable fines contents and dense in-situ condition.

The opportunity to be of service to you is appreciated. If you have any questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Kyler T. Kelly, L.G.
Senior Staff Geologist

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ES-5228.03

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Cont'd

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GEOTECHNICAL ENGINEERING STUDY
PROPOSED EAGLEMONT 8 SHORT PLAT
13325 – 191ST AVENUE SOUTHEAST
MONROE, WASHINGTON

ES-5228.03

INTRODUCTION

General

This geotechnical engineering study (study) was prepared for the proposed short plat to be constructed at 13325 – 191st Avenue Southeast, in Monroe, Washington. To complete this study, ESNW performed the following:

- Subsurface exploration to characterize soil and groundwater conditions.
- Laboratory testing of soil samples collected at the test pit locations.
- Engineering analyses.
- Preparation of this report.

The following documents and resources were reviewed as part of our report preparation:

- Preliminary Site Plan, prepared by Barghausen Consulting Engineers, Inc., dated November 8, 2021.
- Geologic Map of the Lake Roesiger 7.5-minute Quadrangle, Snohomish County, Washington, compiled by Joe D. Dragovich et al, October 2015.
- Web Soil Survey (WSS), online resource maintained by the Natural Resources Conservation Service under the United States Department of Agriculture (USDA).
- Monroe Municipal Code (MMC).
- Snohomish County Liquefaction Susceptibility, endorsed by the Washington State Department of Natural Resources, dated October 2009.

Project Description

Based on the referenced plans, the site will be subdivided into seven single-family residential lots including an access roadway and associated improvements. Access to the plat will be provided by 191st Avenue Southeast and 133rd Street Southeast. Preliminary plans show stormwater will be conveyed to a vault structure in the southwest corner of the site. The southern edge of the subject site will remain a shared access road.

Based on our experience with similar projects, the proposed residential structures will likely be two to three stories and constructed utilizing relatively lightly loaded wood framing supported on conventional foundations. Perimeter footing loads will likely be 1 to 2 kips per linear foot. Slab-on-grade loading is anticipated to be approximately 150 pounds per square foot (psf).

Grading plans were not provided for review at the time of this report; however, we anticipate grading activities will include cuts and fills of up to about seven feet to establish building pad and roadway alignments. Based on the referenced preliminary plans, retaining walls of up to eight feet may be constructed to accommodate grade changes.

If the above design assumptions either change or are incorrect, ESNW should be contacted to review the recommendations provided in this report. ESNW should review the final design to verify the geotechnical recommendations and conclusions provided in this report have been incorporated into the plans.

SITE CONDITIONS

Surface

The subject site is located along the east side of 191st Avenue Southeast, approximately 90 feet north of the intersection with 134th Street Southeast, in Monroe, Washington, as illustrated on the Vicinity Map (Plate 1). The site consists of three residential tax parcels (Snohomish County parcel numbers 280636-001-001-00, -003-00, and -006-00) totaling approximately 1.77 acres of land. The site is currently occupied by one single-family residence and associated improvements. Remaining portions of the site consist of grass landscaping areas with scattered trees. The existing topography gently descends from north to south, with about 16 feet of total elevation change across the site.

Subsurface

An ESNW representative observed, logged, and sampled four test pits on December 7, 2021. The test pits were excavated within accessible portions of the property, using a trackhoe and operator retained by our firm. The test pits were completed to evaluate and classify soil and groundwater conditions within the proposed development. The approximate locations of the test pits are depicted on Plate 2 (Test Pit Location Plan). Please refer to the test pit logs provided in Appendix A for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were evaluated in general accordance with both Unified Soil Classification System (USCS) and USDA methods and procedures.

Topsoil and Fill

Topsoil was observed extending to depths of approximately six to eight inches below the existing ground surface (bgs). The topsoil thickness was variable, with vegetation roots extending below the topsoil zone and into the underlying weathered native soil. The topsoil was characterized by dark brown color and the presence of fine organic material.

Fill was not encountered at the test locations during the subsurface exploration. However, fill soils should be anticipated surrounding the existing structures and associated improvements.

Native Soil

Native soil encountered at the test pit locations consisted primarily of medium dense to very dense silty sand with gravel and sandy silt (USCS: SM and ML, respectively). Native soil relative density generally increased with depth and became dense and weakly cemented beginning at depths of roughly two to two and one-half feet bgs. Native soil was generally encountered in a moist to wet condition.

Geologic Setting

The referenced geologic map identifies lodgment till (Qgt_v) across the site and surrounding areas. According to the geologic map resource, lodgment till is comprised of a nonsorted mixture of clay, silt, sand, pebbles, and cobbles in varying amounts. The material typically becomes very dense and cemented near-surface, resulting from glacial overburden.

The referenced WSS resource identifies Tokul gravelly medial loam as the primary soil unit underlying the site and surrounding areas. The Tokul series was formed in hillslopes and till plains and is derived from volcanic ash mixed with loess over glacial till.

Based on our field observations, the native soil is generally consistent with the locally mapped geologic setting of lodgment till and Tokul series soil.

Groundwater

Perched groundwater seepage was encountered within all test pit locations ranging from depths of approximately one and one-half to three and one-half feet bgs. Zones of perched groundwater seepage are common within glacial till deposits, and in our opinion, seepage zones should be anticipated depending on the time of year earthwork activities occur. Groundwater seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the winter, spring, and early summer months.

Geologically Hazardous Areas Review

To evaluate the presence of geologically hazardous areas, ESNW reviewed City of Monroe mapping and Chapter 22.80.130 of the Monroe Municipal Code (MMC), which focuses on designations, definitions, and regulations of geologically hazardous areas. Geologically hazardous areas recognized in MMC 22.80.130 include erosion, landslide, and seismic hazard areas, as well as “other geological events” such as tsunamis, mass wasting, debris flows, rock falls, and differential settlement. Based on our review, the subject site is not mapped within, or adjacent to, any geologically hazardous areas. Based on the fieldwork performed at the subject site and our site-specific observations, it is our opinion the site does not contain geologically hazardous areas recognized by the MMC.

DISCUSSION AND RECOMMENDATIONS

General

Based on our investigation, construction of the proposed short plat is feasible from a geotechnical standpoint. The primary geotechnical considerations for the proposal are associated with structural fill placement and compaction, utility trench support and backfill, drainage, foundation support, and temporary excavation support.

The proposed structures can be supported on conventional spread and continuous foundations bearing on undisturbed, competent native soil, recompacted native soil, or new structural fill. Competent native soil suitable for support of the foundations will likely be encountered beginning at depths of about two to three feet bgs. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soil to the specifications of structural fill or overexcavation and replacement with suitable structural fill will likely be necessary.

Site Preparation and Earthwork

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and performing clearing and site stripping. Subsequent earthwork activities will involve mass site grading and related infrastructure improvements. If earthwork activities occur during wet weather, additional drainage measures, cement treatment of native soil (where allowed by the presiding jurisdiction), and the use of select fill material will likely be necessary during construction.

Temporary Erosion Control

The following temporary erosion and sediment control Best Management Practices (TESC BMPs) should be considered:

- Temporary construction entrances and drive lanes, consisting of at least six inches of quarry spalls, should be considered to both minimize off-site soil tracking and provide a stable access entrance surface. Placing geotextile fabric underneath the quarry spalls will provide greater stability, if needed.
- Silt fencing should be placed around the site perimeter.
- When not in use, soil stockpiles should be covered or otherwise protected to reduce the potential for soil erosion, especially during periods of wet weather.
- Temporary measures for controlling surface water runoff, such as interceptor trenches, sumps, or interceptor swales, should be installed prior to beginning earthwork activities.
- Dry soils disturbed during construction should be wetted to minimize dust and airborne soil erosion.
- When appropriate, permanent planting or hydroseeding will help to stabilize site soils.

Additional TESC BMPs, as specified by the project civil engineer and indicated on the plans and/or as required by the permitting jurisdiction, should be incorporated into construction activities. Temporary erosion control measures may be modified during construction as site conditions require and as recommended by the site erosion control lead.

Stripping

Topsoil was encountered within the upper six to eight inches at the test locations, and root intrusions generally extended below the topsoil and into the upper weathered soil horizon. The organic-rich topsoil should be stripped and segregated into a stockpile for later use on site or to haul off site. The material remaining immediately below the topsoil may have some root zones and will likely be variable in composition, density, and/or moisture content. The material exposed after initial stripping may not be suitable for direct structural support and may need to either be compacted in place or stripped and stockpiled for reuse as fill. Depending on the time of year stripping occurs, the soil exposed below the topsoil may be too wet to compact and may need to be aerated or treated.

ESNW should observe initial stripping activities to provide recommendations regarding stripping depths and material suitability.

In-situ and Imported Soils

Based on the conditions observed during our subsurface exploration, the on-site soil is highly moisture sensitive. Successful use of the on-site soil as structural fill will largely be dictated by the moisture content at the time of placement and compaction. Given the limited site area, on-site remediation efforts (such as aeration) may not be practicable. If the on-site soil cannot be successfully compacted, the use of an imported soil may be necessary. In our opinion, a contingency should be provided in the project budget for export of soil that cannot be successfully compacted as structural fill, particularly if structural backfill take place during periods of extended rainfall activity. In general, soils with fines contents greater than 5 percent typically degrade rapidly when exposed to periods of rainfall.

Imported structural fill should consist of a well-graded, granular soil that is capable of achieving a suitable working moisture content. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Structural Fill

Structural fill placed and compacted during site grading activities should meet the following specifications and guidelines:

- Structural fill material — Granular soil
- Moisture content — At or slightly above optimum
- Relative compaction (minimum) — 95 percent (Modified Proctor)
- Loose lift thickness (maximum) — 12 inches

The existing soil may not be suitable for use as structural fill unless the material is at (or slightly above) the optimum moisture content at the time of placement of and compaction. Soil shall not be placed dry of the optimum moisture content and should be evaluated by ESNW during construction. A minimum relative compaction of 90 percent may be feasible for certain areas of mass grading from a geotechnical standpoint but should be evaluated by ESNW at the time of construction and confirmed with the permitting jurisdiction.

With respect to underground utility installations and backfill, local jurisdictions may dictate the soil type(s) and compaction requirements. Unsuitable material or debris must be removed from structural areas, if encountered.

Wet-Season Grading

If earthwork activities occur during wet weather, additional drainage measures, cement treatment of native soil, and/or the use of select fill material will likely be necessary. Additionally, measures to protect structural subgrades should be considered if exposed during wet weather. Site-specific recommendations can be provided at the time of construction and may include leaving cut areas several inches above design subgrade elevations, covering working surfaces with crushed rock, protecting structural fill soil from adverse moisture conditions, and additional TESC recommendations. ESNW can assist in obtaining a wet-season grading permit if required by the governing jurisdiction.

Excavations and Slopes

Based on the soil conditions observed at the test pit locations, the following allowable temporary slope inclinations, as a function of horizontal to vertical (H:V) inclination, may be used. The applicable Federal Occupation Safety and Health Administration and Washington Industrial Safety and Health Act soil classifications are also provided:

- Areas exposing groundwater seepage — 1.5H:1V (Type C)
- Loose soil — 1.5H:1V (Type C)
- Medium dense soil — 1H:1V (Type B)
- Dense to very dense soil (hardpan) — 0.75H:1V (Type A)

The presence of perched groundwater may cause localized sloughing of temporary slopes. An ESNW representative should observe temporary and permanent slopes to confirm the slope inclinations are suitable for the exposed soil conditions and to provide additional excavation and slope recommendations, as necessary. If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations. Permanent slopes should be planted with vegetation to enhance stability and to minimize erosion and should maintain a gradient of 2H:1V or flatter.

Foundations

The proposed residential structures can be constructed on conventional continuous and spread foundations supported on competent native soil, recompacted native soil, or new structural fill placed directly on competent native soil. Competent native soil suitable for support of foundations will likely be encountered between depths of about two to three feet bgs. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soil to the specifications of structural fill or overexcavation and replacement with suitable structural fill will be necessary.

Provided the structures will be supported as described above, the following parameters can be used for design of the new foundations:

- Allowable soil bearing capacity 2,500 psf
- Passive earth pressure 300 pcf (equivalent fluid)
- Coefficient of friction 0.40

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The above passive earth pressure and coefficient of friction values include a factor-of-safety of 1.5. With structural loading as expected, total settlement in the range of one inch and differential settlement of about one-half inch is anticipated. Most settlement should occur during construction when dead loads are applied.

Seismic Design

The 2018 International Building Code (2018 IBC) recognizes the most recent edition of the Minimum Design Loads for Buildings and Other Structures manual (ASCE 7-16) for seismic design, specifically with respect to earthquake loads. Based on the soil conditions encountered at the test pit locations, the parameters and values provided below are recommended for seismic design per the 2018 IBC.

Parameter	**Value**
Site Class	C*
Mapped short period spectral response acceleration, S_S (g)	1.138
Mapped 1-second period spectral response acceleration, S_1 (g)	0.400
Short period site coefficient, F_a	1.2
Long period site coefficient, F_v	1.5
Adjusted short period spectral response acceleration, S_{MS} (g)	1.366
Adjusted 1-second period spectral response acceleration, S_{M1} (g)	0.601
Design short period spectral response acceleration, S_{DS} (g)	0.911
Design 1-second period spectral response acceleration, S_{D1} (g)	0.400

* *Assumes dense to very dense soil conditions (at depth), encountered to a maximum depth of nine feet bgs during the December 2021 field exploration, remain very dense to at least 100 feet bgs. Based on our experience in the Puget Sound region, the native soil and geologic setting is likely consistent with this assumption.*

Slab-On-Grade Floors

Slab-on-grade floors for the proposed residential structures should be supported on well-compacted, firm, and unyielding subgrades. Where feasible, the native soil exposed at the slab-on-grade subgrade levels can likely be compacted in situ to the specifications of structural fill if groundwater seepage does not interfere with compaction activities. Unstable or yielding subgrade areas should be recompacted or overexcavated and replaced with suitable structural fill prior to slab construction.

A capillary break consisting of at least four inches of free-draining crushed rock or gravel should be placed below the slabs. The free-draining material should have a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction). In areas where slab moisture is undesirable, installation of vapor barriers below the slabs should be considered. If a vapor barrier is to be utilized, it should be a material specifically intended for use as a vapor barrier and should be installed per the specifications of the manufacturer.

Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters may be used for design:

• Active earth pressure (unrestrained condition)	35 pcf (equivalent fluid)
• At-rest earth pressure (restrained condition)	55 pcf
• Traffic surcharge* (passenger vehicles)	70 psf (rectangular distribution)
• Passive earth pressure	300 pcf (equivalent fluid)
• Coefficient of friction	0.40
• Seismic surcharge	8H psf†

* *Where applicable.*
† *Where H equals the retained height (in feet).*

The passive earth pressure and coefficient of friction values include a safety factor of 1.5. The above design parameters are based on a level backfill condition and level grade at the wall toe. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other relevant loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along the height of the wall and a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of a less permeable soil, if desired. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3. If drainage is not provided, hydrostatic pressures should be included in the wall design.

Drainage

Zones of perched groundwater seepage should be anticipated in site excavations depending on the time of year grading operations take place. Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches, interceptor swales, and sumps. ESNW should be consulted during preliminary grading to both identify areas of seepage and provide recommendations to reduce the potential for seepage-related instability.

Finish grades must be designed to direct surface drain water away from the structure and slopes. Water must not be allowed to pond adjacent to the structure or slopes. Grades adjacent to the building should be sloped away from the building at a gradient of either at least 2 percent for a horizontal distance of 10 feet or the maximum allowed by adjacent structures. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4.

Infiltration Feasibility

As indicated in the *Subsurface* section of this report, glacial till was encountered across the site during the fieldwork. Given the high fines contents of the tested soil and dense in-situ condition, it is our opinion that infiltration is infeasible from a geotechnical standpoint. The in-situ condition of the native soil would likely impede the long-term performance and intended function of infiltration devices on site.

Preliminary Stormwater Vault Design

We understand a stormwater detention vault is proposed in the southwest corner of the site for stormwater management. Vault foundations should be supported on competent native soil or crushed rock placed on competent native soil. We anticipate dense to very dense native soil will be exposed at the anticipated vault subgrade elevation. Final storm vault designs must incorporate adequate buffer space from property boundaries such that temporary excavations to construct the vault structure can be successfully completed. Perimeter drains should be installed around the vault and conveyed to an approved discharge point. The presence of perched groundwater seepage should be anticipated during excavation activities for the vault; however, the groundwater seepage zones observed during the December 2021 fieldwork did not present with sufficient flows such that buoyant forces need be considered in the vault design.

The following preliminary parameters may be used for stormwater vault design:

- Allowable soil bearing capacity 5,000 psf (dense native soil)
- Active earth pressure (unrestrained) 35 pcf
- Active earth pressure (unrestrained, hydrostatic) 80 pcf
- At-rest earth pressure (restrained) 55 pcf
- At-rest earth pressure (restrained, hydrostatic) 100 pcf
- Coefficient of friction 0.40
- Passive earth pressure 350 pcf
- Seismic surcharge 8H psf*

* *Where H equals the retained height.*

Vault retaining walls should be backfilled with free-draining material or suitable sheet drainage that extends along the height of the walls. The upper one foot of the wall backfill may consist of a less permeable soil, if desired. Perforated drainpipes should be placed along the bases of the walls and connected to an appropriate discharge location. If the elevation of the vault bottom is such that gravity flow to an outlet is not possible, the portion of the vault below the drain should be designed to include hydrostatic pressure.

ESNW should be contacted to observe grading operations for the vault and subgrade conditions prior to concrete forming and pouring. If the soil conditions encountered during construction differ from those anticipated, supplementary recommendations may be provided. Should overexcavation(s) be necessary at the vault foundation subgrade elevation, as evaluated by ESNW at the time of construction, quarry spalls should be used for grade restoration. ESNW should be contacted to review the final vault design to confirm that appropriate geotechnical parameters have been incorporated. As previously mentioned, the contractor should be prepared to manage groundwater conditions exposed within the vault and other underground utility installations.

Utility Support and Trench Backfill

The native soil should generally be suitable for utility support. However, remedial measures may be necessary in some areas to provide support for utilities, such as overexcavation and replacement with structural fill and/or placement of geotextile fabric. Groundwater seepage may be encountered within utility excavations, and caving of trench walls may occur where groundwater is encountered. Active dewatering of perched seepage zones may be necessary during utility excavation and installation.

The on-site soil may not be suitable for use as structural backfill throughout utility trench excavations unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction. If utility installation occurs during the wet season, site soils will likely be saturated and therefore difficult to use as utility backfill without treatment or aeration. Each section of the utility lines must be adequately supported in the bedding material. Utility trench backfill should be placed and compacted to the specifications of structural fill, as previously detailed in this report, or to the applicable specifications of the presiding jurisdiction.

Preliminary Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To ensure adequate pavement performance, the subgrade should be in a firm and unyielding condition when subjected to proofrolling with a loaded dump truck. Structural fill in pavement areas should be compacted to the specifications previously detailed in this report. Soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas containing unsuitable or yielding subgrade conditions will require remedial measures, such as overexcavation and replacement with crushed rock or structural fill, prior to pavement.

For lightly loaded pavement areas subjected primarily to passenger vehicles, the following preliminary pavement sections may be considered:

- A minimum of two inches of hot-mix asphalt (HMA) placed over four inches of crushed rock base (CRB).

- A minimum of two inches of HMA placed over three inches of asphalt-treated base (ATB).

For relatively high volume, heavily loaded pavements areas subjected to occasional truck traffic, the following preliminary pavement sections may be considered:

- A minimum of three inches of HMA placed over six inches of CRB.
- A minimum of three inches of HMA placed over four and one-half inches of ATB.

The HMA, ATB, and CRB materials should conform to WSDOT and/or City of Monroe specifications. All soil base material should be compacted to at least 95 percent of the maximum dry density. Final pavement design recommendations can be provided once final traffic loading has been determined. City of Monroe standards may supersede the recommendations provided in this report.

Additional sub-pavement drainage should be considered where inverted crown roadways are used, such as lateral drains connecting to catch basins, given the low permeability of the native soil.

LIMITATIONS

This study has been prepared for the exclusive use of MainVue WA, LLC and its representatives. The recommendations and conclusions provided in this geotechnical engineering study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is not expressed or implied. Variations in the soil and groundwater conditions observed at the test locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions provided in this geotechnical engineering study if variations are encountered.

Additional Services

ESNW should have an opportunity to review the final design with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction.

Reference:
Snohomish County, Washington
OpenStreetMap.org

NORTH

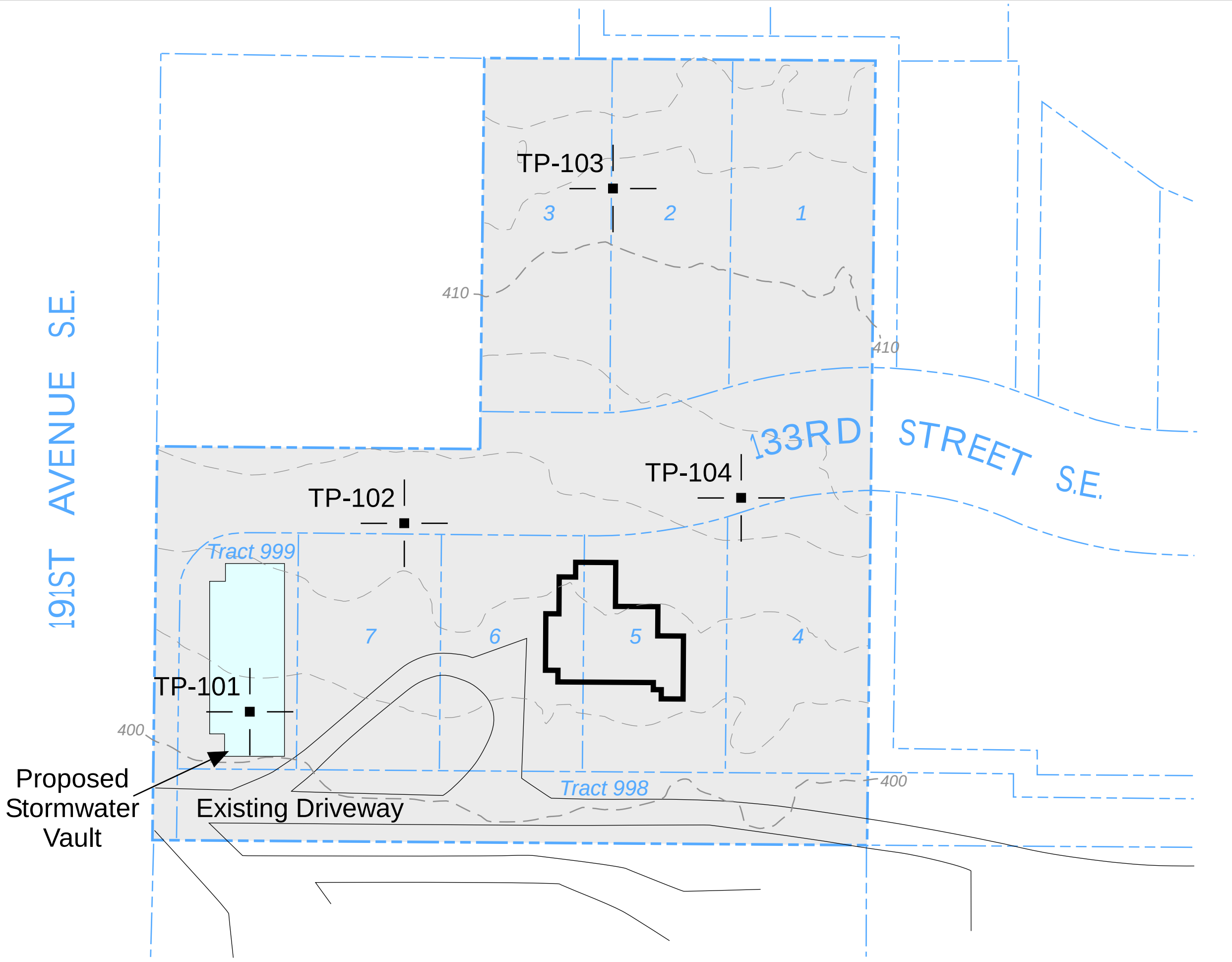
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
Eaglemont 8
Monroe, Washington

Drwn. CAM	Date 12/29/2021	Proj. No. 5228.03
Checked KTK	Date Dec. 2021	Plate 1



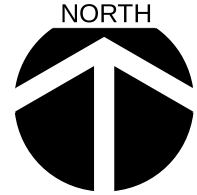
LEGEND

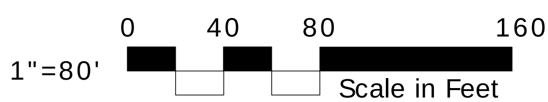
TP-101 — Approximate Location of ESNW Test Pit, Proj. No. ES-5228.03, Dec. 2021

Subject Site

Existing Building

5 — Proposed Lot Number





NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

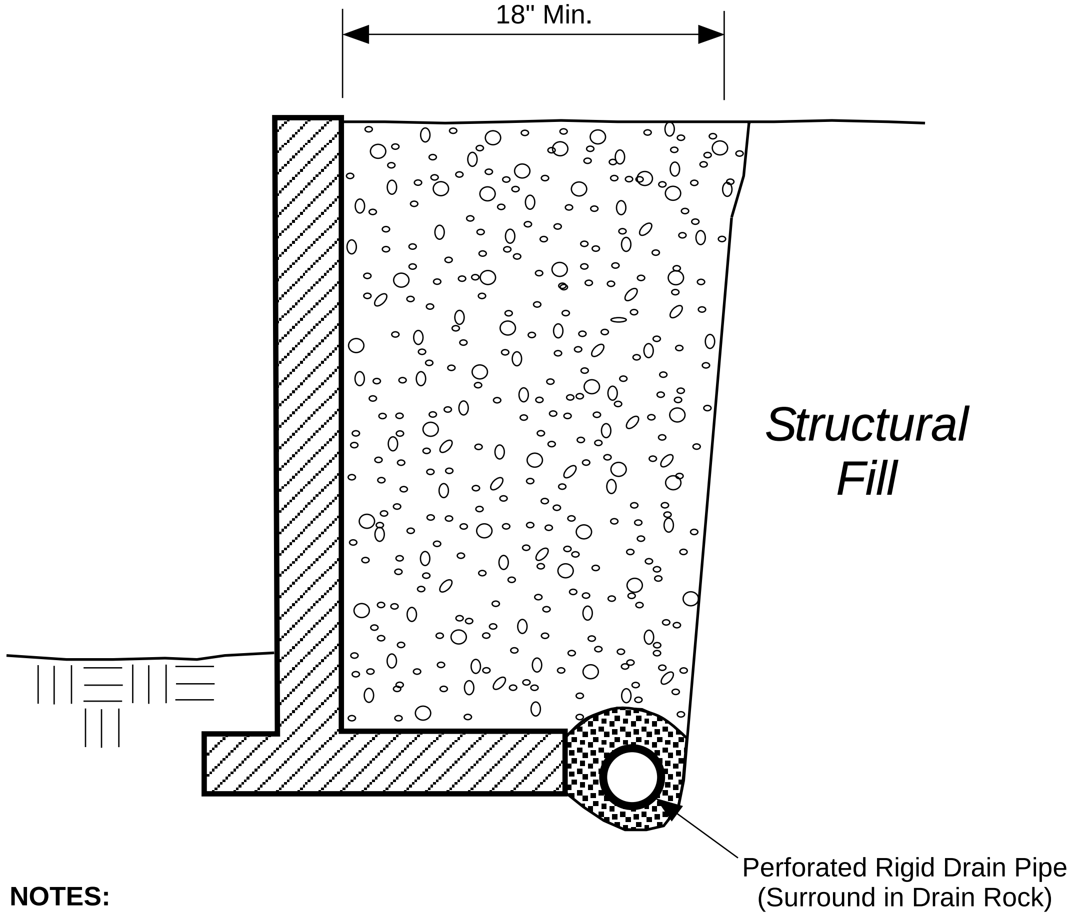
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NWLLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Test Pit Location Plan
Eaglemont 8
Monroe, Washington

Drwn. CAM	Date 12/29/2021	Proj. No. 5228.03
Checked KTK	Date Dec. 2021	Plate 2



NOTES:

- Free-draining Backfill should consist of soil having less than 5 percent fines. Percent passing No. 4 sieve should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free-draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1-inch Drain Rock.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

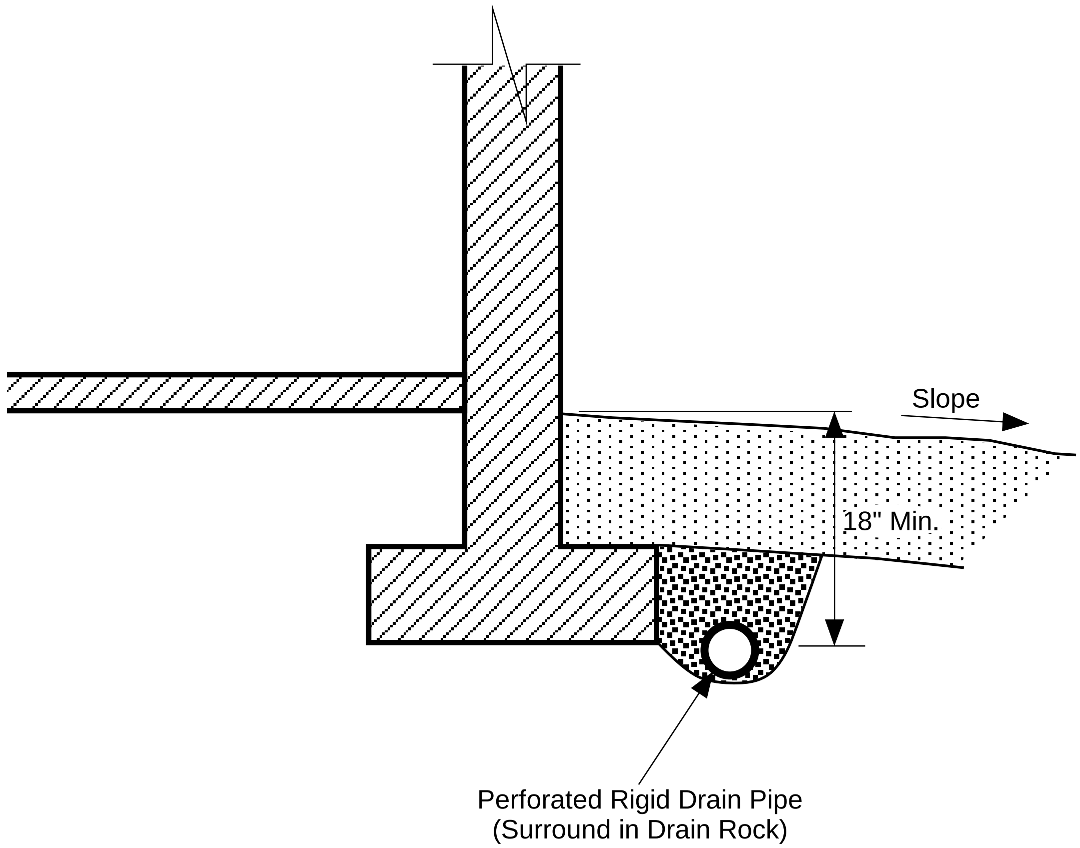
Free-draining Structural Backfill

1-inch Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Retaining Wall Drainage Detail
Eaglemont 8
Monroe, Washington

Drwn. CAM	Date 12/29/2021	Proj. No. 5228.03
Checked KTK	Date Dec. 2021	Plate 3



NOTES:

- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

Surface Seal: native soil or other low-permeability material.

1-inch Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Footing Drain Detail
Eaglemont 8
Monroe, Washington

Drwn. CAM	Date 12/29/2021	Proj. No. 5228.03
Checked KTK	Date Dec. 2021	Plate 4

Appendix A

Subsurface Exploration
Test Pit Logs

ES-5228.03

The subsurface conditions at the site were explored on December 7, 2021. Four test pits were excavated using a mini-trackhoe and operator retained by our firm. The approximate locations of the test pits are illustrated on Plate 2 of this study. The test pit logs are provided in this Appendix. The test pits were advanced to a maximum depth of approximately nine feet bgs.

The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

Earth Solutions NW LLC

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

Earth Solutions NW, LLC
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TEST PIT NUMBER TP-101

PROJECT NUMBER ES-5228.03
PROJECT NAME Eaglemont 8
DATE STARTED 12/7/21 **COMPLETED** 12/7/21
GROUND ELEVATION 401 ft
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.87596 **LONGITUDE** -121.9745
EXCAVATION METHOD
GROUND WATER LEVEL:
LOGGED BY KTK **CHECKED BY** KDH
∇ **AT TIME OF EXCAVATION**
NOTES Depth of Topsoil & Sod 6": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL	0.5	Dark brown TOPSOIL, trace roots to 2'	400.5
			SM		Brown silty SAND with gravel, medium dense, moist to wet	
		MC = 37.2%				
					-light groundwater seepage, slight caving	
		MC = 11.5%			-becomes gray, dense, weakly cemented	
					-increased gravel content	
5						
					-becomes dense to very dense	
		MC = 14.7%				
		MC = 12.9% Fines = 35.2%		9.0	[USDA Classification: gravelly sandy LOAM]	392.0

Test pit terminated at 9.0 feet below existing grade. Groundwater seepage encountered at 2.0 feet during excavation. Caving observed at 2.0 feet.

Earth Solutions NW, LLC
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TEST PIT NUMBER TP-102

PROJECT NUMBER ES-5228.03 **PROJECT NAME** Eaglemont 8
DATE STARTED 12/7/21 **COMPLETED** 12/7/21 **GROUND ELEVATION** 405 ft
EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.87617 **LONGITUDE** -121.97424
EXCAVATION METHOD **GROUND WATER LEVEL:**
LOGGED BY KTK **CHECKED BY** KDH ∇ **AT TIME OF EXCAVATION**
NOTES Depth of Topsoil & Sod 6"-8": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL	0.7	Dark brown TOPSOIL, trace roots to 2.5'	404.3
		MC = 16.5% Fines = 26.4%	SM		Brown silty SAND, medium dense, moist [USDA Classification: gravelly coarse sandy LOAM] -light groundwater seepage, slight caving -becomes gray, dense, weakly cemented	
5		MC = 13.5%			-light groundwater seepage -becomes dense to very dense	
		MC = 10.0%		7.5		397.5

Test pit terminated at 7.5 feet below existing grade. Groundwater seepage encountered at 2.0 and 4.0 feet during excavation. Caving observed at 2.0 feet.

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TEST PIT NUMBER TP-103

PROJECT NUMBER ES-5228.03
PROJECT NAME Eaglemont 8
DATE STARTED 12/7/21 **COMPLETED** 12/7/21
GROUND ELEVATION 411 ft
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.87652 **LONGITUDE** -121.97378
EXCAVATION METHOD
GROUND WATER LEVEL:
LOGGED BY KTK **CHECKED BY** KDH
AT TIME OF EXCAVATION
NOTES Depth of Topsoil & Sod 6": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION	
0			TPSL		0.5	Dark brown TOPSOIL, trace roots to 2'	410.5
		MC = 55.9%	ML		2.0	Brown sandy SILT, medium dense, moist to wet -light to moderate groundwater seepage, slight caving	409.0
5		MC = 14.5% MC = 10.4%	SM		7.5	Gray silty SAND with gravel, dense, moist -weakly cemented at 2' -boulders, becomes dense to very dense	403.5

Test pit terminated at 7.5 feet below existing grade. Groundwater seepage encountered at 1.5 feet during excavation. Caving observed at 1.5 feet.

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TEST PIT NUMBER TP-104

PROJECT NUMBER ES-5228.03 **PROJECT NAME** Eaglemont 8
DATE STARTED 12/7/21 **COMPLETED** 12/7/21 **GROUND ELEVATION** 407 ft
EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.8761 **LONGITUDE** -121.97364
EXCAVATION METHOD **GROUND WATER LEVEL:**
LOGGED BY KTK **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**
NOTES Depth of Topsoil & Sod 6"-8": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL	0.7	Dark brown TOPSOIL	406.3
		MC = 47.3% Fines = 58.7%	ML	2.5	Brown sandy SILT, medium dense, moist to wet [USDA Classification: gravelly LOAM] -light groundwater seepage, slight caving	404.5
5		MC = 12.7% MC = 10.0%	SM	7.0	Gray silty SAND with gravel, dense, moist -weakly cemented at 2.5' -light groundwater seepage -boulders and cobbles to BOH	400.0

Test pit terminated at 7.0 feet below existing grade. Groundwater seepage encountered at 2.0 and 3.5 feet during excavation. Caving observed at 2.0 feet.

Appendix B

Laboratory Test Results

ES-5228.03

Earth Solutions NW, LLC
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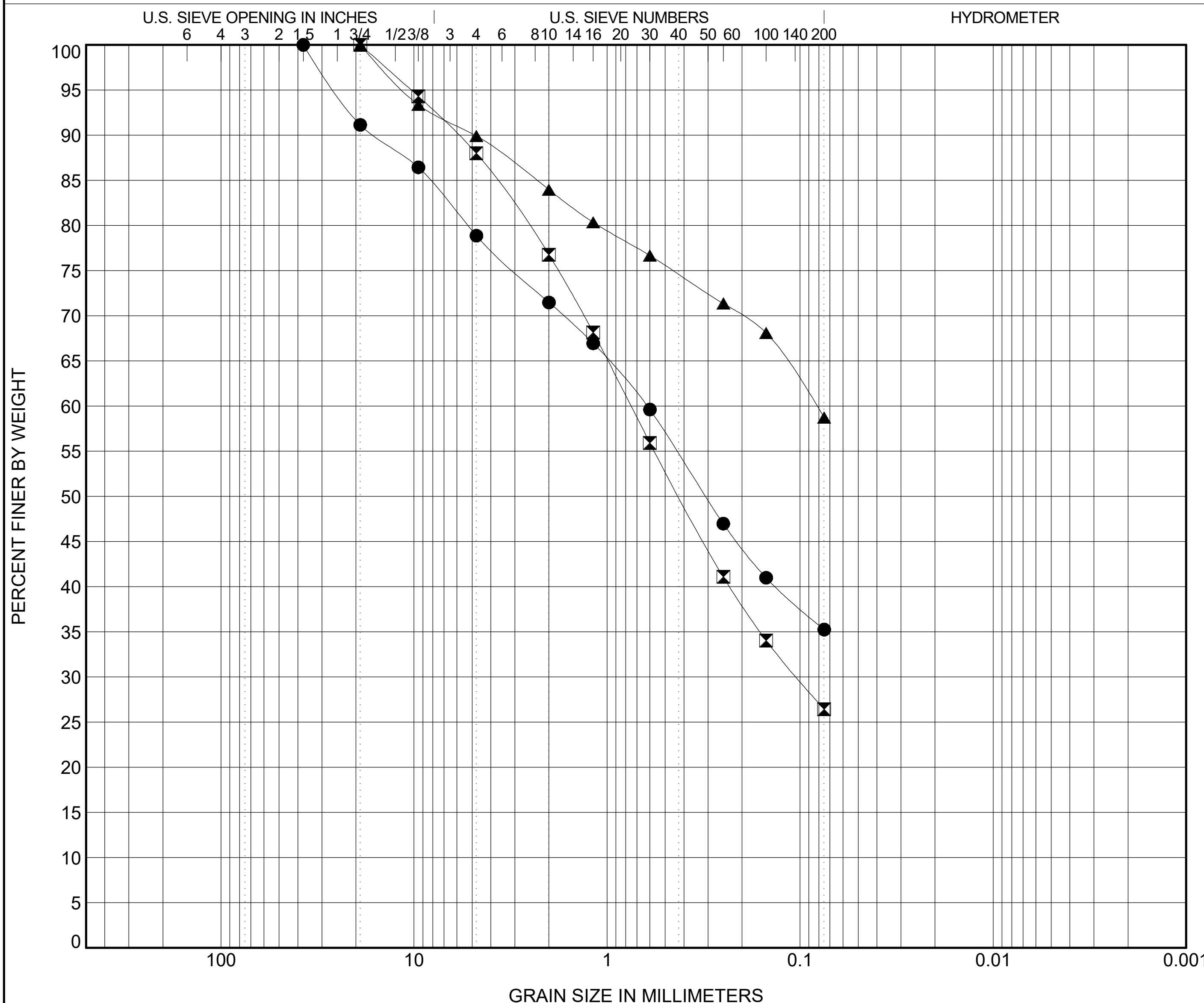
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-5228.03 **PROJECT NAME** Eaglemont 8



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	Cc	Cu
●	TP-101	9.00ft.	**USDA: Gray Gravelly Sandy Loam. USCS: SM with Gravel.**		
⧗	TP-102	2.50ft.	**USDA: Gray Gravelly Coarse Sandy Loam. USCS: SM.**		
▲	TP-104	2.00ft.	**USDA: Brown Gravelly Loam. USCS: Sandy ML.**		

	Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	**TP-101**	**9.0ft.**	**37.5**	**0.622**						**35.2**	
⧗	**TP-102**	**2.5ft.**	**19**	**0.752**	**0.104**					**26.4**	
▲	**TP-104**	**2.0ft.**	**19**	**0.082**						**58.7**	

Report Distribution

ES-5228.03

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Attention: Mr. Tom Barghausen, P.E.
Mr. Barry Talkington, P.E.
Mr. George Newman
Ms. Margi Fosdick

Tab 8.0

8.0 OTHER PERMITS

Other permits required for this project will be addressed during Final Engineering Review.

Tab 9.0

9.0 OPERATIONS AND MAINTENANCE MANUAL

An Operations and Maintenance Manual will be provided in this section during Final Engineering Review.

Tab 10.0

10.0 BOND QUANTITIES WORKSHEET

A bond quantities worksheet will be provided in this section during Final Engineering Review.