ENGINEERING • LLC

PRELIMINARY DRAINAGE REPORT

FOR

VALLEY AVE CONTRACTOR'S YARD

CITY OF PUYALLUP, WASHINGTON

AUGUST 2022

Prepared For:
Neil Walter Company
1940 East D Street, Suite 100
Tacoma, WA 98421

Prepared By:
Joseph Geibel, E.I.T., Design Engineer

Approved By:
Brett M. Allen, P.E., Principal
PO Box 949
Gig Harbor, WA 98332
(253) 857-5454

Project # 21-247

8/15/2022

*I hereby state that this **Preliminary Drainage Report** for the **Valley Ave Contractor's Yard** has been prepared by me or under my supervision and meets the standard of care and expertise that is usual and customary in this community of professional engineers. The analysis has been prepared utilizing procedures and practices specified by the City of Puyallup and within the standard accepted practices of the industry. I understand that the City of Poulsbo does not and will not assume liability for the sufficiency, suitability or performance of drainage facilities prepared by Contour Engineering, LLC.*

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW

Purpose and Scope

This preliminary drainage report accompanies the preliminary site plan review application to construct a new contractors yard in Puyallup, Washington. The contractors yard will consist of a 60,627 SF paved area with associated stormwater infrastructure and landscaping. No structures are proposed as part of this development. The project site is located along Valley Ave on three tax parcels 0420163040, 0420163041 and 0420163042 within the Southwest ¼ of Section 16, Township 20 North, Range 4 East, W.M. See Appendix A for Vicinity Map.

The 2019 Department of Ecology Stormwater Management Manual for Western Washington (Ecology Manual) will establish the methodology and design criteria used for this project.

Project Description

As referenced above, the site is located along Valley Ave NW in the City of Puyallup, Washington. The site consists of three contiguous parcels. When combined, the parcels form an irregular shaped site that measures approximately 240 feet (north to south) by approximately 560 feet (east to west) and encompasses approximately 1.92 acres. The site is bounded by developed industrial sites parcels to the south and west, undeveloped parcels to the north, and Valley Ave NW to the east.

The following is a description of pertinent site information associated with the proposed project:

Parcel #:	0420163040, 0420163041 and 0420163042
Address:	1106, 1042, 1036 Valley Ave NW, Puyallup, WA 98371
Zoning:	Limited Manufacturing (ML)
Lot Size:	1.079 acres (Parcel # 0420163040)
	0.699 acres (Parcel # 0420163041)
	0.146 acres (Parcel # 0420163042)

The project proposed to pave the majority of the site for use as a contractors yard. Additional improvements to the site include stormwater infrastructure and landscaping.

To mitigate the proposed project's stormwater runoff, a water quality device has been proposed for each basin. The water quality devices flow to a singular detention system in order to meet flow control requirements. See Section 6.0 for a summary of the onsite stormwater management. Detailed flow control, water quality, and conveyance capacity calculations will be provided in the Final Drainage Report.

Minimum Requirements Summary

Since the project proposed over 5,000 square feet of new or replaced hard surface area, all applicable minimum requirements (Minimum Requirements #1 through #9) apply and are discussed below.

#1 - Preparation of Stormwater Site Plans

This preliminary drainage report and associated civil engineering plans fulfill this requirement.

#2 - Construction Stormwater Pollution Prevention Plan (SWPPP)

A Construction Stormwater Pollution Prevention Plan will be submitted with the final drainage report.

#3 - Source Control of Pollution

Applicable Source Control BMPs will be submitted during the site development permitting process.

#4 - Preservation of Natural Drainage Systems and Outfalls

The proposed project preserves the existing drainage pattern of the site.

#5 - On-site Stormwater Management

See <u>Section 6.0</u> of this report for a discussion of the onsite storm system.

#6 – Runoff Treatment

Since the proposed improvements include more than 5,000 square feet of pollution generating impervious surface and discharge to fresh waters designated for aquatic life use, enhanced treatment is required for the site. Enhanced treatment will be provided by three Oldcastle BioPod Biofilter's prior to entering a detention vault. Sizing and detailed water quality calculations will be provided in the Final Drainage Report.

#7 – Flow Control

Since the project proposed more than 10,000 square feet of impervious surfaces, flow control is required. Flow control for site will be provided by detention chambers. Sizing and detailed flow control calculations will be provided in the Final Drainage Report.

#8 – Wetlands Protection

There are no known wetlands onsite or adjacent to the project site.

#9 – Operations and Maintenance

An operation and maintenance manual will be included with the final drainage report.

2.0 EXISTING SITE CONDITIONS

Pre-Developed Site Conditions

The project site is mostly pasture, containing an existing structure and access driveway on each parcel.

Topography

According to the soils report prepared by Georesources LLC, "the site slopes down from Valley Avenue to the southwest at about 0 to 3 percent to a wide shallow depression located in the central portion of the site. The western portion of the site then slopes back up to the southwest at about 0 to 3 percent. The total topographic relief across the site is on the order of 6 feet." See Appendix B for a copy of the complete soils report.

Groundcover

Vegetation across the site generally consists of pasture grasses with ornamental trees, plants and shrubs.

Adjacent Land Uses

The project area is surrounded by the following uses and entities:

NORTH:	Industrial Property (Zoned Limited Manufacturing)
SOUTH:	Industrial Property (Zoned Limited Manufacturing)
EAST:	Valley Avenue NW (Public ROW)
WEST:	Industrial Property (Zoned Limited Manufacturing)

Critical and Sensitive Areas

SLOPES

The topography of the project area does not include slopes more than 30%.

LANDSLIDE HAZARD

No potential landslide hazards have been identified on site per Pierce County GIS or from the Geotechnical report.

EROSION HAZARD

No erosion hazards have been identified on the project site.

SEISMIC HAZARD

No seismic hazards have been identified on the project site.

FLOODPLAIN

According to Pierce County GIS, the project site does not fall within the regulated floodplain.

AQUIFER RECHARGE

The project is located in an Aquifer Recharge Area per the Pierce County aquifer recharge map.

Other Existing Site Information
N/A

Provide basic details of of water and dry utility improvements. [2022_08_15 Prelim Drainage Report, Page 6/84]

3.0 PROPOSED SITE CONDITIONS

The project proposes to construct a contractor yard by paving the site with asphalt. No structures are proposed. Additional improvements to the site include water, storm, and other dry utilities.

Stormwater runoff from the proposed paved area will be collected by catch basins. It will then be conveyed to a water quality device before entering detention chambers. After passing though the flow control and water quality systems, stormwater runoff will be conveyed to the existing stormwater system located within Valley Avenue NW.

4.0 INFILTRATION FEASIBILITY ASSESSMENT AND BMP DESIGN

The USDA Natural Resources Conservation (NRCS) Web Soil Survey maps most of the site as being underlain by Briscot Loam (Type 6A) soils.

On December 10, 2021, a field representative from GeoReources visited the site and monitored the drilling of two hollow-stem auger borings to depths of about 16½ feet below the existing ground surface, logged the subsurface conditions encountered in each boring, and obtained representative soil samples. At the locations of their explorations, they encountered relatively uniform subsurface conditions that, in their opinion, generally confirmed the mapped stratigraphy within the site vicinity. In boring B-1, they encountered approximately ½ foot of topsoil overlying grey-brown silty gravelly sand, which they interpreted to be consistent with undocumented fill soils. Underlying the fill, and at the surface of boring B-2, they encountered mottled grey-brown sand with silt interbeds. These soils were encountered to the full depth explored in B-1. Underlying these soils in boring B-2, their exploration encountered black silty sand to the full depth explored. They interpret these soils to be consistent with alluvium.

GeoResources determined that onsite infiltration into the native alluvium deposits is feasible dependent on the type of infiltration BMP. Based on their wet season monitoring, it appears the seasonal high groundwater occurs at about elevation 36.2 to 37.0 feet at the locations monitored, approximately 2.8 to 3.0 feet below the ground surface. Based on separation requirements for infiltration BMP's and the shallow depth to the water table, Georeources does not recommend using a pond or gallery, but state that shallow infiltration facilities such as rain gardens, bioretention, and permeable pavement appear to be feasible. They calculated the preliminary design infiltration rate to be 1 inch per hour after the applied correction factors. A copy of the Geotechnical Engineering Report provided by GeoResources can be found in Appendix B.

5.0 LEVEL 1 DOWNSTREAM ANALYSIS

All available information provided at this time regarding the level 1 downstream analysis study area have been reviewed. Reviewed material includes the NRSC soil map, City of Puyallup GIS Maps, Pierce County GIS Maps and topographic survey data. See Appendix A for appropriate maps and information.

Onsite stormwater runoff in the developed conditions is discharged after water quality treatment and flow control to the stormwater conveyance system within Valley Avenue NW. Stormwater is conveyed northwesterly within an 18-inch pipe for roughly 1,200 feet where it turns westerly on 27th Avenue CT NW, runs for about 1,250 feet, and is discharged to Wapato Creek.

6.0 HYDROLOGIC & HYDRAULIC ANALYSIS

Onsite Stormwater Management

Since the project triggers minimum requirements #1-9, the project must employ stormwater management BMPs in order to infiltrate, disperse, or retain stormwater runoff on-site to the maximum extent feasible without causing flooding or erosion impacts. The project elects to follow the requirements of List #2.

Stormwater runoff from the proposed paved surface will be collected by three Oldcastle BioPod Biofilter surface vaults. These structures will provide enhanced water quality treatment before being conveyed to detention chambers. After passing through the flow control and water quality systems, stormwater runoff will be conveyed to the existing stormwater system located within Valley Ave NW.

<u>Lawn and Landscape Areas</u>

1. *Soil Preservation and amendment BMP (T5.13)*

   The project will employ Ecology BMP T5.13 to preserve undisturbed soils to the greatest extent possible and to restore soils where disturbed by construction activity.

<u>Roofs</u>

No structures are proposed in this project.

<u>Other Hard Surfaces</u>

1. *Full Dispersion BMP (T5.30)*

   This BMP is not feasible due to the lack of available space that can be provided to meet the required native vegetation protection area.

Geotechnical report says that some shallow infiltration, including bioswales, could be feasable. Provide a more robust infeasability criteria or incorporate bioswales into the design. Planning allows cross over between natural stormwater features and required landscaping.[2022_08_15 Prelim Drainage Report, Page 8/84]

2. *Permeable Pavement (BMP T5.15)*

   Due to the expected truck volume on the site, it is expected that permeable pavements can not provide sufficient strength to support the loads.

3. *Bioretention (BMP T7.30)*

   Per the geotechnical report, bioretention is not recommended due to insufficient separation between the bottom of bioretention and the seasonal high groundwater table

4. *Sheet Flow Dispersion (BMP T5.11)*

   The necessary vegetated flowpath lengths cannot be provided for the proposed other hard surfaces The project proposes to centralize flow control and water quality treatment in order to ensure downstream properties are protected.

Flow Control

Because the proposed improvements for the contractor yard include more than 10,000 square feet of impervious surface, flow control is required on site. Flow control will be accomplished using Stormtech MC-3500 detention chambers. The detention system has been sized to match stormwater discharge of existing conditions from 50% of the 2-year peak flow up to the full 50-year peak flow. Below is a summary of the detention system. The proposed detention system was modeled using the 2012 Western Washington Hydrology Model (WWHM2012).

	Pre-Developed	Developed
Roads/ Flat	0	1.51
C, Pasture, Flat	1.51	0
Total Area	1.51	1.51

<u>Detention Chambers Summary</u>

Bottom of System Elevation= 34.64
Design water Surface = 39.14
Top of System Elevation = 40.14
Top of Gravel = 35.39

Design Storage Volume (@39.14) = 35,327 CF

<u>Outlet Control Structure</u>
Rim Elevation = 43.08
Riser Diameter = 18 inch
Restrictor Plate Diameter = 0.625 inch
Orifice #2 Diameter = 0.875 inch

Orifice #2 Height	= 2.8 feet
Orifice #3 Diameter	= 0.75 inch
Orifice #3 Height	= 3.2 feet
Top of Riser	= 4.5 ft

The WWHM outputs of this analysis can be found attached in Appendix C.

Water Quality
A stormwater treatment system is required for all projects which contribute more than 5,000 square feet of effective pollution generating hard surfaces. Since the proposed project exceeds this threshold, water quality treatment is required.

The project proposes to utilize three Biopod surface vaults prior to detention in order to meet enhanced water quality treatment requirements. Each Bipod vault (Model BPS-46IB) can treat up to 0.074 CFS.

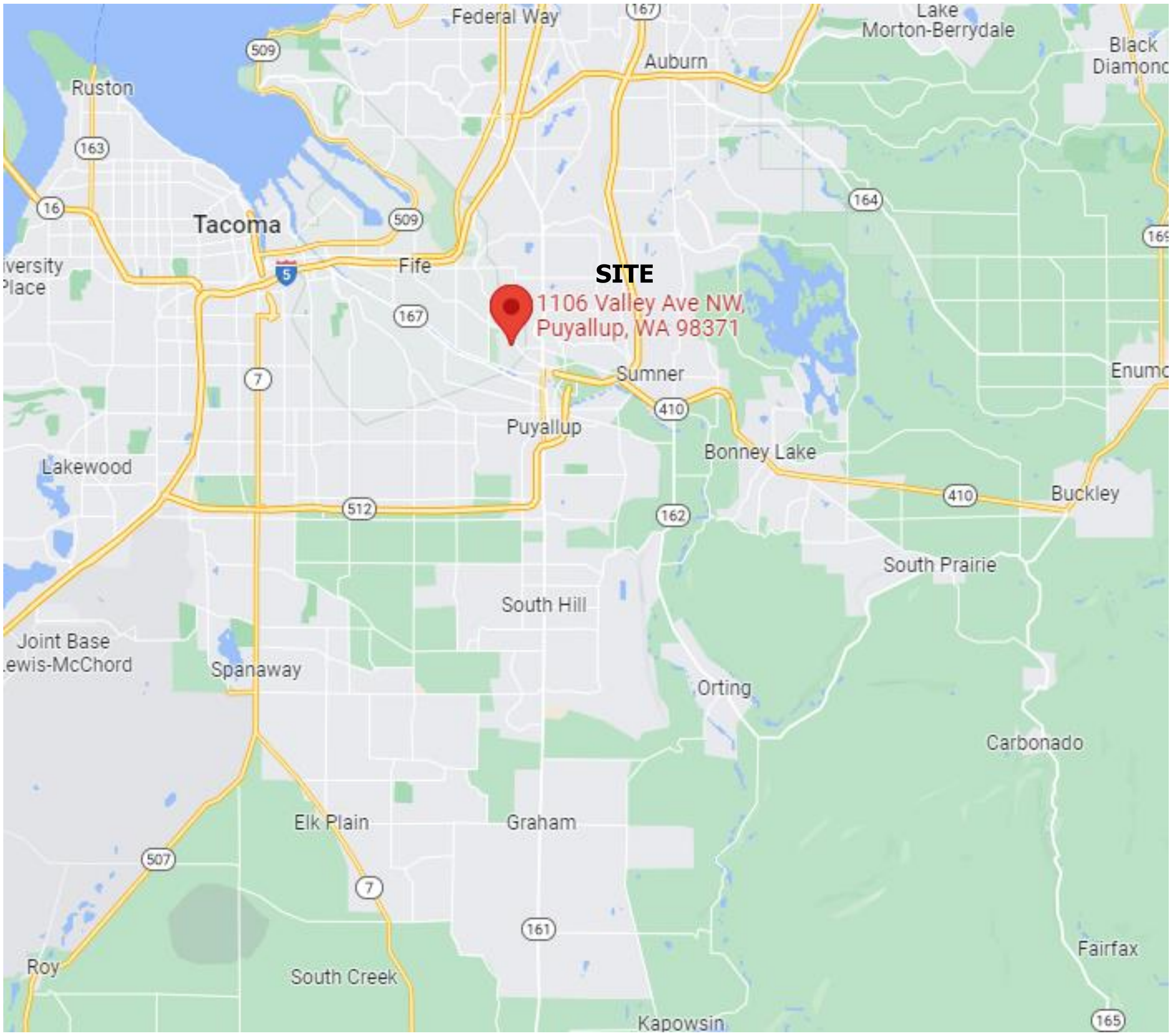
The project can be divided into three basins. The following is a summary of the developed basins and their respective flow rate.

Developed			
	Basin 1	Basin 2	Basin 3
Concrete/Pavement	0.205 ac	0.608 ac	0.591 ac
Runoff (CFS)	0.018	0.0535	0.0520

Because each basin has a flow rate than 0.074 CFS, the selected treatment vaults are feasible. WWHM printouts and a diagram of the treatment vault and specification document can be found in Appendix D.

APPENDIX A

General Exhibits



Vicinity Map

Soil Map—Pierce County Area, Washington

Map Scale: 1:6,940 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 100, 200, 400, 600

Feet: 0, 300, 600, 1200, 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 17, Aug 31, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 18, 2020—Aug 2, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Briscot loam	92.4	43.0%
30A	Puget silty clay loam	3.2	1.5%
31A	Puyallup fine sandy loam	27.4	12.8%
42A	Sultan silt loam	91.6	42.7%
Totals for Area of Interest		**214.6**	**100.0%**

APPENDIX B

Geotechnical Report

July 13, 2022

Neil Walter Company
1940 East D Street, Suite 100
Tacoma, Washington 98421

Attn: Kermit Jorgensen
(253) 779-8400
kjorgensen@neilwalter.com

Updated Stormwater Feasibility Soils Report
Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3042, -3041, & -3040
Doc ID: NWC.ValleyAveNW.SRu

INTRODUCTION

This *Updated Soils Report* addresses the feasibility of the site soils to support the infiltration of stormwater runoff generated by the proposed contractor's yard to be constructed at 1036 – 1106 Valley Ave NW in Puyallup, Washington. The location of the project site is shown on the attached Site Location Map, Figure 1.

Our understanding of the project is based on our conversations with you; our review of the provided *Site Survey* prepared by Contour Engineering; our December 10, 2021 site visit and subsurface explorations; our understanding of the City of Puyallup (the City) development requirements; and our experience in the site area. The site consists of three adjacent tax parcels, each of which is currently developed with an existing single-family residence, driveway, and associated utilities. We understand that you propose to demolish the existing structures and develop the site as a contractor's yard. We were not provided with a site plan prior to the preparation of this document, but a copy of the recent survey prepared by Contour Engineering is attached as Figure 2.

PURPOSE & SCOPE

The purpose of our services was to evaluate the surface and subsurface conditions at the site as a basis for providing our opinion on the feasibility of infiltration of stormwater and monitoring the groundwater levels during the wet season to observe if infiltration is feasible at the site for the proposed development in order to satisfy the City of Puyallup requirements. Specifically, our scope of services for the project included the following:

1. Reviewing the available geologic, hydrogeologic, and geotechnical data for the site area;
2. Exploring the surface and subsurface conditions by reconnoitering the site and monitoring the drilling of two hollow-stem auger borings to depths of 16.5 feet each, completed as groundwater observation wells;
3. Describing surface and subsurface conditions, including soil type, depth to groundwater, if encountered, and an estimate of seasonal high groundwater levels;

4. Providing our opinion about the feasibility of onsite stormwater infiltration in accordance with the 2014 SWMMWW, including a preliminary design infiltration rate based on grain size analysis; and,
5. Preparing this *Soils Report* that satisfies the 2014 SWMMWW requirements and summarizes our site observations and conclusions, our geotechnical recommendations and design criteria, along with the supporting data.

The above scope of work was completed in accordance with our *Proposal for Services* dated November 28, 2021. We received written notice to proceed on December 3, 2021.

SITE CONDITIONS

Surface Conditions

The site consists of three adjacent tax parcels located at 1036 – 1106 Valley Avenue NW in Puyallup, Washington, within an area of existing commercial development. The parcels, when combined, form an irregular shaped site that generally measures about 80 to 315 feet wide (northwest to southeast), by about 80 to 450 feet long (northeast to southwest), and encompass approximately 1.93 acres. The site is bounded by existing warehouse and light industrial development to the north, west, and south, and by Valley Avenue NW to the east.

The site is located in the Puyallup River valley and is generally flat. According to topographic information obtained from the Pierce County Public GIS website and as generally confirmed in the field, the site slopes down from Valley Avenue to the southwest at about 0 to 3 percent to a wide shallow depression located in the central portion of the site. The western portion of the site then slopes back up to the southwest at about 0 to 3 percent. The total topographic relief across the site is on the order of 6 feet. The existing site configuration and topography is shown on the attached Site & Exploration Map, Figure 3.

Vegetation across the site generally consists of pasture grasses with ornamental trees, plants, and shrubs surrounding the residence. No evidence of seeps, springs, or soil erosion was observed at the time of our site visit. However, standing water was observed in the stormwater pond located on the adjacent property near the southwest corner of the site.

Site Soils

The Natural Resources Conservation Survey (NRCS) Web Soil Survey maps the site as Briscot loam (6A) soils. An NRCS soils map for the site area is included as Figure 4.

- *Briscot Loam (6A):* These soils are derived from alluvium and form on slopes of 0 to 2 percent. The Briscot Loam soils have a "slight" erosion hazard when exposed and are included in hydrologic soils group B/D.

Site Geology

The draft *Geologic Map of the Puyallup 7.5-minute Quadrangle, Pierce County, Washington* (Troost et al, in review) maps the site as being underlain by alluvium (Qal). No geologic formations or deposits that could potentially adversely affect the development of the site such as landslides, areas of mass wasting, or alluvial fans are mapped within 300 feet of the site. An excerpt of the above referenced map is included as Figure 5.

- *Alluvium (Qal):* Alluvium generally consists of fluvial sediments deposited during the late Pleistocene to Holocene epochs, and typically consists of loose and stratified, fluvial silt, sand, and gravel, and is typically well rounded and well sorted and locally includes sandy to silty estuarine deposits. Because the alluvium was not overridden by the continental ice mass, it is considered normally consolidated. The infiltration potential of alluvium is highly variable, depending on the grain size distribution of the soil.

Subsurface Explorations

On December 10, 2021, we visited the site and monitored the drilling of two hollow-stem auger borings to depths of about 16½ feet below the existing ground surface, logged the subsurface conditions encountered in each boring, and obtained representative soil samples. The borings were drilled using a small track-mounted drill rig operated by a licensed drilling contractor working for GeoResources. Table 1, below, summarizes the approximate functional locations, surface elevations, and termination depths of our test pits explorations.

TABLE 1:
APPROXIMATE LOCATIONS, ELEVATIONS, AND DEPTHS OF EXPLORATIONS

Boring Number	Functional Location	Surface Elevation (feet)	Termination Depth (feet)	Termination Elevation[1] (feet)
B-1/MW-1	End of driveway at 1106 Valley Ave NW	40.23	16.5	23.7
B-2/MW-2	Field in front of 1106 Valley Ave NW	38.77	16.5	22.3

Notes:
1 = Surface elevation estimated from the *Site Survey* prepared by Contour Engineering (NAVD 88)

The specific locations, and depths of our borings were selected based on the configuration of the proposed development and were adjusted in the field based on considerations for underground utilities, existing site conditions, site access limitations, and encountered stratigraphy. Representative soil samples obtained from the borings were placed in sealed plastic bags and then taken to our laboratory for further examination and testing as deemed necessary. The borings were completed as groundwater monitoring wells per WA State regulations.

During drilling, soil samples were obtained at 2½ and 5 foot depth intervals in accordance with Standard Penetration Test (SPT) as per the test method outlined by ASTM D1586. The SPT method consists of driving a standard 2 inch-diameter split-spoon sampler 18 inches into the soil with a 140-pound hammer. The number of blows required to drive the sampler through each 6-inch interval is counted, and the total number of blows struck during the final 12 inches is recorded as the Standard Penetration Resistance, or "SPT blow count". If a total of 50 blows for any 6-inch interval is reached, refusal is called and the blow counts are recorded as 50 for the actual depth driven. The resulting Standard Penetration Resistance values indicate the relative density of granular soils and the relative consistency of cohesive soils.

The subsurface explorations completed as part of this evaluation indicates the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site.

Furthermore, the nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun.

The approximate locations and numbers of our borings/wells are shown on the attached Site Survey, Figure 2 and the Site & Exploration Map, Figure 3. The indicated locations were determined by taping or pacing from existing site features and reference points; as such, the locations should only be considered as accurate as implied by the measurement method. The soils encountered were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D2488. The USCS is included in Appendix A as Figure A-1, while the descriptive logs of our borings are included as Figures A-2 and A-3.

Subsurface Conditions

At the locations of our explorations we encountered relatively uniform subsurface conditions that, in our opinion, generally confirmed the mapped stratigraphy within the site vicinity. Boring B-1 encountered about ½ foot of dark brown topsoil in a loose, moist to wet condition overlying grey-brown silty gravelly sand in a loose to medium dense, moist condition. We interpret these soils to be consistent with undocumented fill soils. Underlying the fill in boring B-1 and at the surface of boring B-2, our explorations encountered mottled grey-brown sand with silt interbeds in a very loose to loose, moist to wet condition. These soils were encountered to the full depth explored in boring B-1. Underlying these soils in boring B-2, our exploration encountered black silty sand in a loose to medium dense, wet condition to the full depth explored. We interpret these soils encountered in our borings to be consistent with alluvium. Table 2 below summarizes the soils encountered in our borings.

TABLE 2:
APPROXIMATE THICKNESS, DEPTHS, AND ELEVATION OF ENCOUNTERESOIL TYPES

Boring Number	Thickness of Topsoil (Feet)	Thickness of Fill (feet)	Thickness of Loose Silt SAND (feet)	Depth to Loose SAND (feet)	Elevation[1] of Loose SAND (feet)
B-1/MW-1	0.5	1.5	8.0	10.0	30.2
B-2/MW-2	0.5	0.0	9.8	10.3	28.5

Notes:
1 = Surface elevation estimated from the *Site Survey* prepared by Contour Engineering (NAVD 88)

Laboratory Testing

Geotechnical laboratory tests were performed on select samples retrieved from the test pits to estimate index engineering properties of the soils encountered. Laboratory testing included visual soil classification per ASTM D2488 and ASTM D2487, moisture content determinations per ASTM D2216, and grain size analyses per ASTM D6913 standard procedures.

We returned to the site on May 27, 2022 to collect shallow subsurface samples adjacent to each boring exploration. Cat-ion exchange capacity (CEC) and organic content testing were performed by an independent laboratory to evaluate the treatment capacity of the shallow onsite soils for LID methods. The results of the laboratory tests are summarized below in Table 3 and graphical outputs are included in Appendix B.

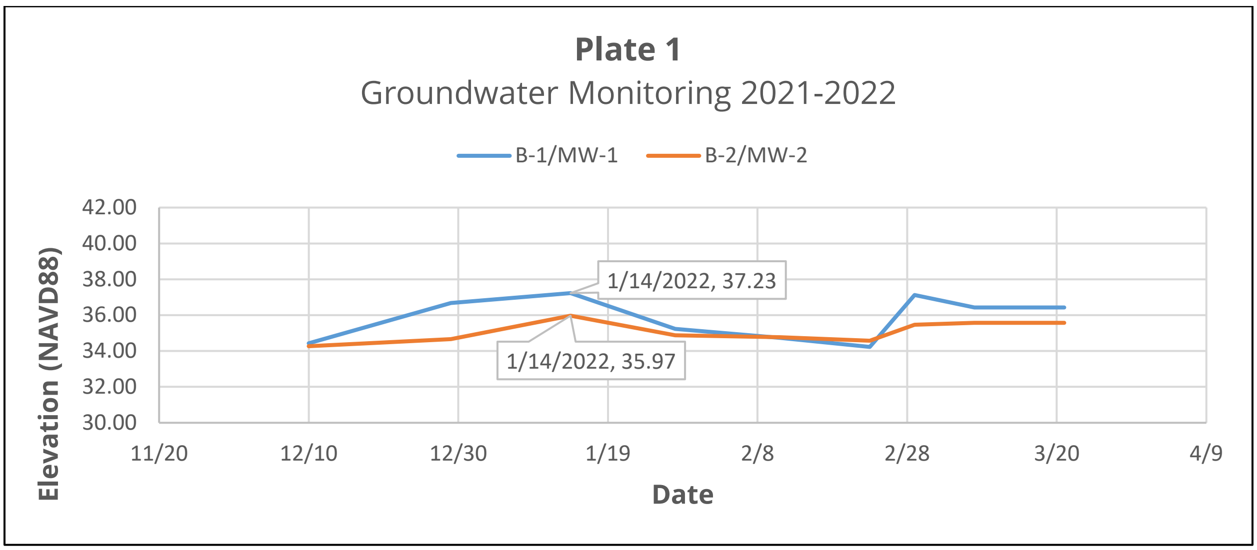
TABLE 3:
LABORATORY TEST RESULTS FOR ON-SITE SOILS

Sample	Soil Type	Lab ID	Gravel Content (percent)	Sand Content (percent)	Silt/Clay Content (percent)	D10 Ratio (mm)
B-1, S-1a, 2½'	SM	102783	0.1	87.8	12.1	>0.075
B-2, S-1, 2'	SM	102784	0.0	52.4	47.6	>0.075

Groundwater Conditions

Groundwater monitoring wells were installed at the site on December 10, 2021. The locations of the observation wells are shown on the Site & Exploration Map, Figure 2. At the time of drilling, groundwater was encountered at about 4.5 to 5.8 feet below the ground surface (Elevation 34.3 to 34.4 feet). Groundwater readings for the observation wells were manually measured on a bi-monthly basis from December 10, 2021 to March 21, 2022.

Based on our wet season monitoring, it appears that seasonal high groundwater occurs at about Elevation 35.97 to 37.23 feet (NAVD 88) at the locations monitored, approximately 2.80 to 3.00 feet below the ground surface. These levels were recorded on January 14, 2022. Plate 1, below, summarizes the groundwater levels recorded as part of our groundwater monitoring program during our monitoring period.



We anticipate fluctuations in the local groundwater levels will occur in response to precipitation patterns, off site construction activities, and site utilization and will in general be similar to the water surface elevation of the adjacent river. As such, water level observations made at the time of our field investigation may vary from those encountered during the construction phase. Analysis or modeling of anticipated groundwater levels during construction is beyond the scope of this report.

CONCLUSIONS

Based on the results of our site reconnaissance and subsurface explorations, it is our opinion that conventional infiltration using a pond or gallery is likely not feasible given the shallow depth to groundwater, but the use of low-impact development (LID) Best Management Practices (BMPs) per the Puyallup stormwater manual does appear feasible.

Infiltration Recommendations

Based on our subsurface explorations and groundwater monitoring, it is our opinion that stormwater infiltration via a shallow trench or basin type system, and permeable pavement is feasible at the site, provided the bottom of the facility is located above elevation 37 feet (NAVD88). This elevation is based on the results of our winter season groundwater monitoring and topographic information obtained from the Pierce County Public GIS and should be surveyed in the field.

Per Volume III Section 3.1.1 of the 2014 SWMMWW, downspout infiltration is considered feasible if there is at least 1 foot of clearance from the expected bottom elevation of the infiltration facility to the seasonal high ground water table. Infiltration facilities for flow control and treatment, Volume III Section 3.3.7 *Site Suitability Criteria (SSC) 5 Depth to Bedrock, Water Table, or Impermeable Layer*, requires that the base of all infiltration basins or trench system be greater than or equal to 5 feet above the seasonal high water mark, bedrock (or hardpan), or other low permeability layer. The vertical separation may be reduced to 3 feet as recommended by the site professional. For the purposes of this infiltration feasibility evaluation, we have assumed that, at a minimum, the standard infiltration trench section (6 inches of topsoil over a 2 foot deep trench) would be used. Based on the above, there is not sufficient separation from seasonal high groundwater to the bottom of an infiltration trench.

Volume III Section 3.4.2 of the 2014 SWMMWW requires at least 1 foot of separation from the bottoms of rain gardens and permeable pavement to seasonal high groundwater. A 1 foot or 3 foot minimum separation from the bottom of bioretention is required depending upon the drainage area. For the purposes of this evaluation, a standard permeable pavement section (6 inches of pavement over 6 inches of storage course) would be used. Based on the above, shallow infiltration facilities such as rain gardens, bioretention, and permeable pavement appear to be feasible. Deeper trenches and thicker storage courses may be designed by a civil engineer where the vertical separation requirements can be met.

Infiltration Rate

We completed soil gradation analyses on two representative soil samples from the site per the 2014 SWMMWW, Volume III, Section 3.3.6, Method 3 (Massman, 2003) and in accordance with ASTM D6913. Based on our gradation analyses, we recommend a preliminary design infiltration rate of 1 inch per hour be used for the alluvium soils encountered at the site. Appropriate correction factors have been applied to these values in accordance with the 2014 SWMMWW, Volume III, Section 3.3.6, Table 3.3.1, including correction factors for site variability ($F_{variability}$), testing method ($F_{testing}$) and maintenance for situation biofouling ($F_{maintenance}$). Our calculations are included in Appendix C.

All proposed infiltration facilities should be designed and constructed in accordance with the 2014 SWMMWW. All minimum separations, setback requirements, and infeasibility criteria per 2014 SWMMWW should be considered prior to the selection, design and location of any stormwater facility for the proposed development.

Feasibility of the Native Soils for Water Quality Treatment

Volume III, Section 3.3.7 SSC-6 *Soil Physical and Chemical Suitability for Treatment* of the 2014 SWMMWW requires treatment soils to have at least 5mEq/100g of cation exchange capacity (CEC) and 1 percent by weight organic content. Cation exchange capacity and organic content testing was performed by a third party independent laboratory. The organic content of the site soils were determined to be about 1.12 to 11.1 percent per ASTM D2974-13, with a cation exchange capacity of 15.4 to 16.7 milliequivalents per 100 grams as determined by SW-846 Test Method 9081. Based on the results of the soil testing, the soils meet the minimum requirements for water quality treatment via infiltration; therefore, the subgrade soils should provide adequate treatment of stormwater runoff generated by the proposed pollution generating impervious surface.

Construction Considerations

Appropriate design, construction and maintenance measures will be required to ensure the infiltration rate can be effectively maintained over time. Stormwater Best Management Practices (BMPs) in accordance with the 2014 SWMMWW should be included in the project plans and specifications to minimize the potential for fines contamination of Low Impact Development BMPs utilized at the site.

We recommend that a representative from our firm be onsite at the time of excavation of the proposed infiltration facilities to verify that the soils encountered during construction are consistent with the soils observed in our subsurface explorations. In-situ infiltration testing should be performed at the time of construction to verify the recommended infiltration rate and to determine if a different site specific infiltration rate would be more appropriate for the site.

Suspended solids could clog the underlying soil and reduce the infiltration rate of the facilities. To reduce potential clogging of the infiltration systems, the infiltration system should not be connected to the stormwater runoff system until after construction is complete and the site area is landscaped, paved or otherwise protected. Temporary systems may be utilized throughout construction. Periodic sweeping of the paved areas will help extend the life of the infiltration system.

Additional measures may also be taken during construction to minimize the potential of fines contamination of the proposed infiltration system, such as utilizing an alternative storm water management location during construction or leaving the bottom of the permanent systems 1 to 2 feet high, and subsequently excavating to the finished grade once the site soils have been stabilized. All contractors working on the site (builders and subcontractors) should divert sediment laden stormwater away from proposed infiltration facilities during construction and landscaping activities. No concrete trucks should be washed or cleaned, and washout areas should not be within the vicinity of the proposed infiltration facilities. After construction activities have been completed, periodic sweeping of the paved areas will help extend the life of the infiltration system.

LIMITATIONS

We have prepared this report for use by Neil Walter Company and members of the design team, for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, published geologic information, and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We have appreciated the opportunity to be of service to you on this project. If you have any questions or comments, please do not hesitate to call at your earliest convenience.

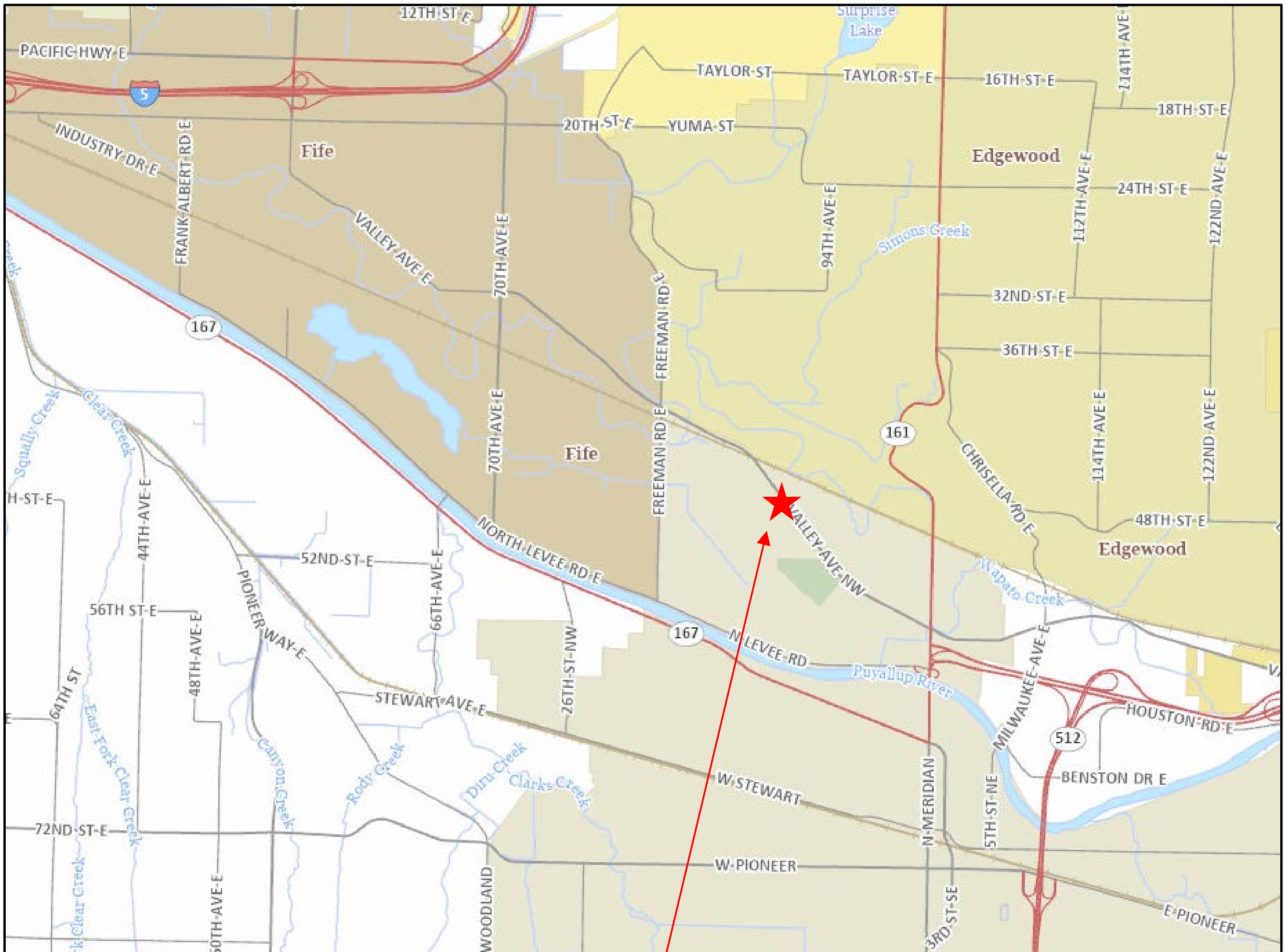
Respectfully submitted,
GeoResources, LLC

Jordan L. Kovash, LG
Project Geologist

Keith S. Schembs, LEG
Principal

Eric W. Heller, PE, LG
Senior Geotechnical Engineer

JLK:KSS:EWH/jlk
Doc ID: NWC.ValleyAveNW.SR
Attachments:
- Figure 1: Site Location Map
- Figure 2: Site Survey
- Figure 3: Site & Exploration Map
- Figure 4: NRCS Soils Map
- Figure 5: Geologic Map
- Appendix A – Subsurface Explorations
- Appendix B – Laboratory Test Results
- Appendix C – Massman Calculations



Approximate Site Location

Map created from Pierce County WA GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

N
W E
S

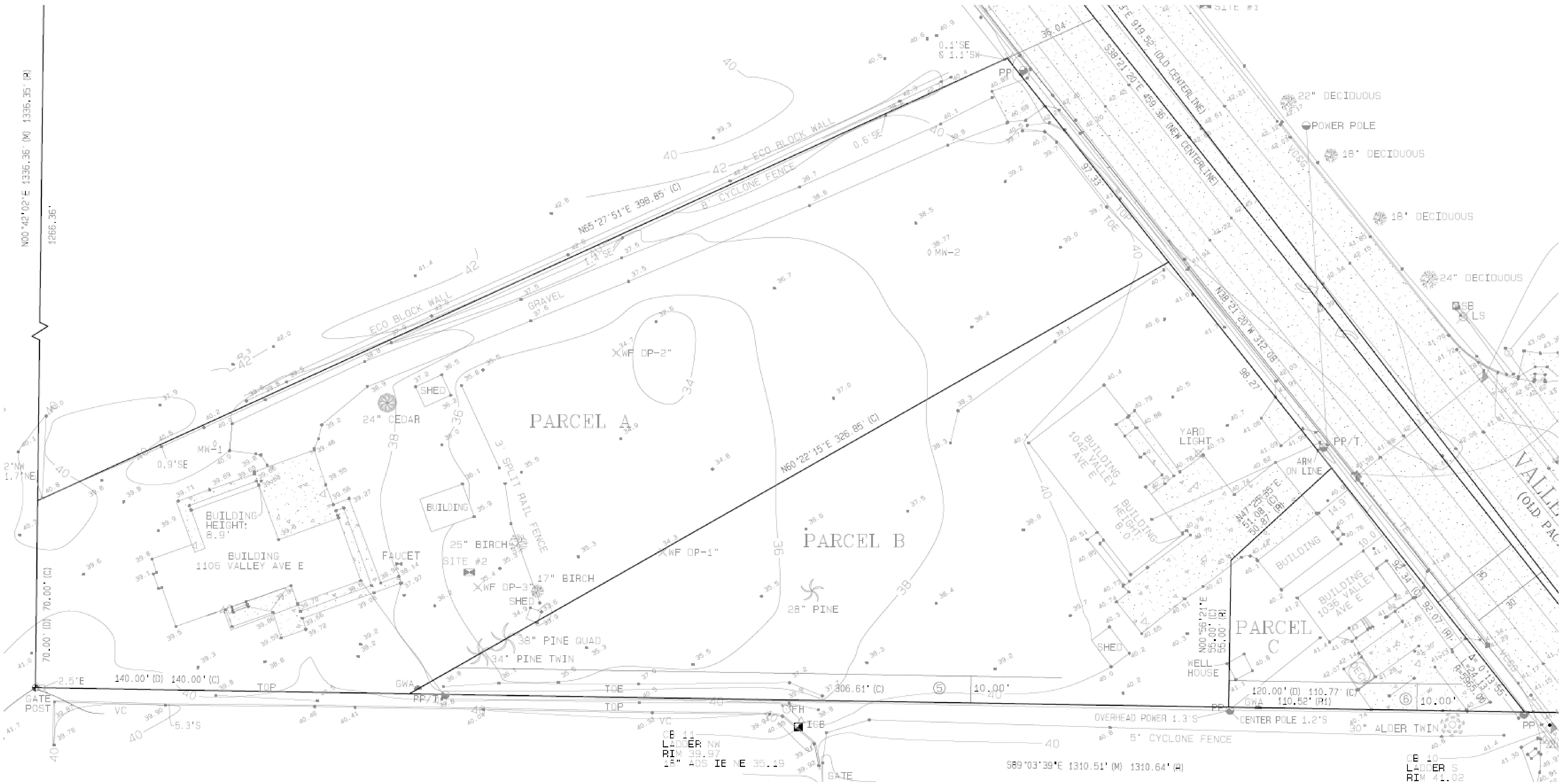
Not to Scale

GEORESOURCES
earth science & geotechnical engineering
4809 Pacific Hwy. E. | Fife, WA 98424 | 253.896.1011 | www. georesources.rocks

Site Location Map

Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3040, 3041, 3042

Doc ID: NWC.ValleyAve.Fu	July 2022	Figure 1



Notes:
Site Survey prepared by Contour Engineering
Not to Scale

GEORESOURCES
earth science & geotechnical engineering
4809 Pacific Hwy. E. | Fife, WA 98424 | 253.896.1011 | www. georesources.rocks

Site Survey Map
Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3040, 3041, 3042

Doc ID: NWC.ValleyAve.F2	July 2022	Figure 2

Approximate Site Location

Map created from Pierce County WA GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

B/MW — Exploration number and approximate location (GeoResources 2021)

N W E S

Not to Scale

GEORESOURCES
earth science & geotechnical engineering
4809 Pacific Hwy. E. | Fife, WA 98424 | 253.896.1011 | www. georesources.rocks

Site & Exploration Map

Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3040, 3041, 3042

Doc ID: NWC.ValleyAve.Fu	July 2022	Figure 3

Approximate Site Location

Map created from Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Soil Type	Soil Name	Parent Material	Slopes	Erosion Hazard	Hydrologic Soils Group
6A	Briscot Loam	Alluvium	0 to 2	Slight	B/D
30A	Puget silty clay loam	Alluvium	0 to 2	None	C/D
31A	Puyallup fine sandy loam	Alluvium	0 to 3	Slight	A
42A	Sultan silt loam	Alluvium	0 to 2	Slight	C/D

N
W E
S

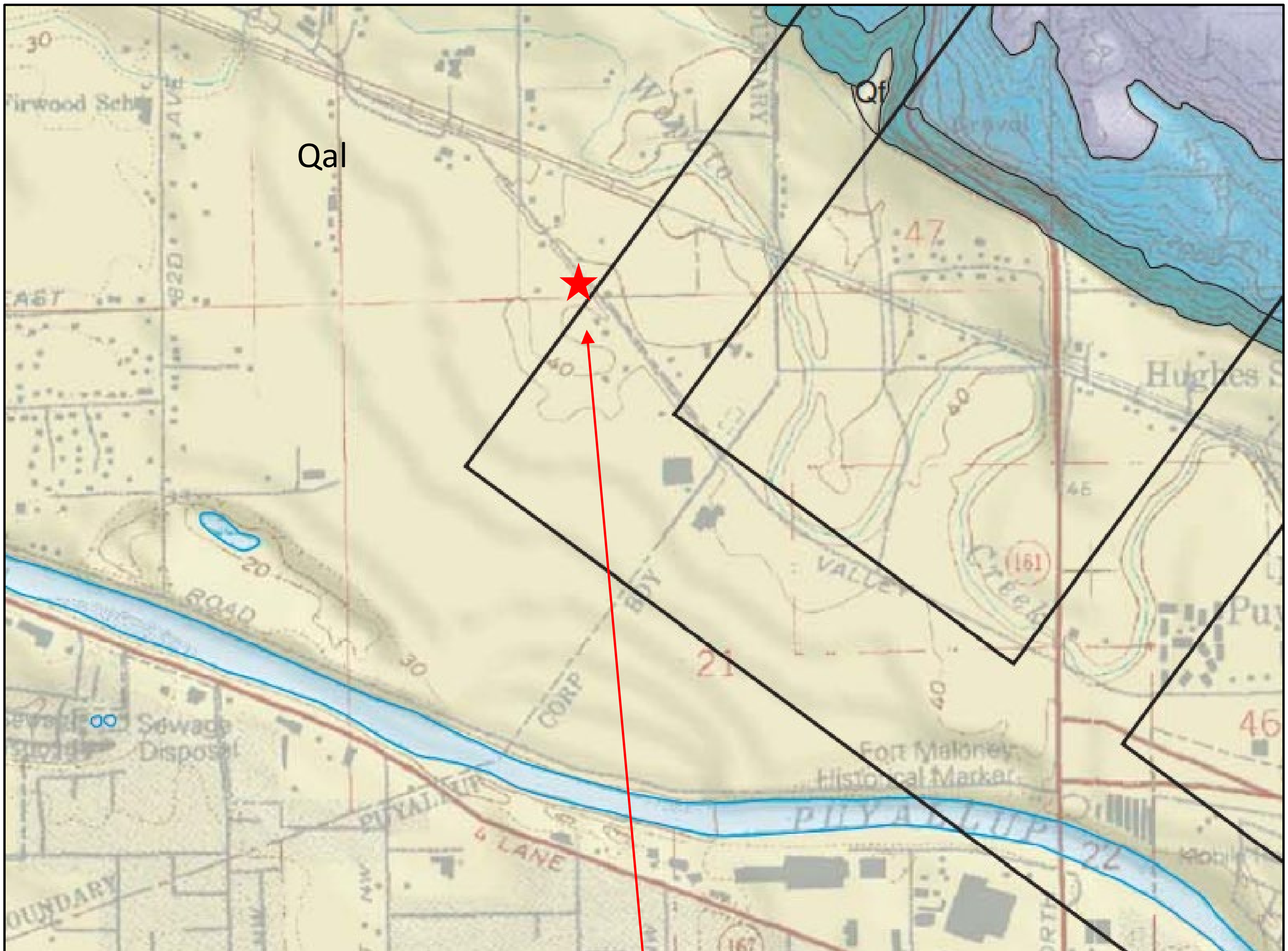
Not to Scale

GEORESOURCES
earth science & geotechnical engineering
4809 Pacific Hwy. E. | Fife, WA 98424 | 253.896.1011 | www. georesources.rocks

NRCS Soils Map

Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3040, 3041, 3042

Doc ID: NWC.ValleyAve.Fu	July 2022	Figure 4



Approximate Site Location

An excerpt from the draft *Geologic Map of the Puyallup 7.5-minute Quadrangle, Pierce County, Washington* by Troost et. al.

Qal	Alluvium

N
W E
S

Not to Scale

GEORESOURCES
earth science & geotechnical engineering

4809 Pacific Hwy. E. | Fife, WA 98424 | 253.896.1011 | www. georesources.rocks

Geologic Map

Proposed Industrial Development
25491 WA -3
Mason County, Washington
PN: 12321-1400040, 14-00041, 75-00030

Doc ID: NWC.ValleyAve.Fu	July 2022	Figure 5

Appendix A
Subsurface Explorations

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

GEORESOURCES
earth science & geotechnical engineering
4809 Pacific Hwy. E. | Fife, WA 98424 | 253.896.1011 | www. georesources.rocks

Unified Soils Classification System

Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3040, 3041, 3042

Doc ID: NWC.ValleyAve.Fu	July 2022	Figure A-1

LOG OF BORING B-1/MW-1

GEORESOURCES
earth science & geotechnical engineering

Proposed Contractor's Yard
1106 - 1036 Valley Ave NW
Puyallup, Washington

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Boretec 1, Inc.	**Logged By:**	JLK
Drilling Method:	HSA	**Drilling Date:**	12/10/2021
Drilling Rig:	EC 95 Track Drill	**Datum:**	NAVD88
Sampler Type:	split spoon	**Elevation:**	40
Hammer Type:	cat head	**Termination Depth:**	16.5
Hammer Weight:	140 lbs	**Latitude:**	
		Longitude:	

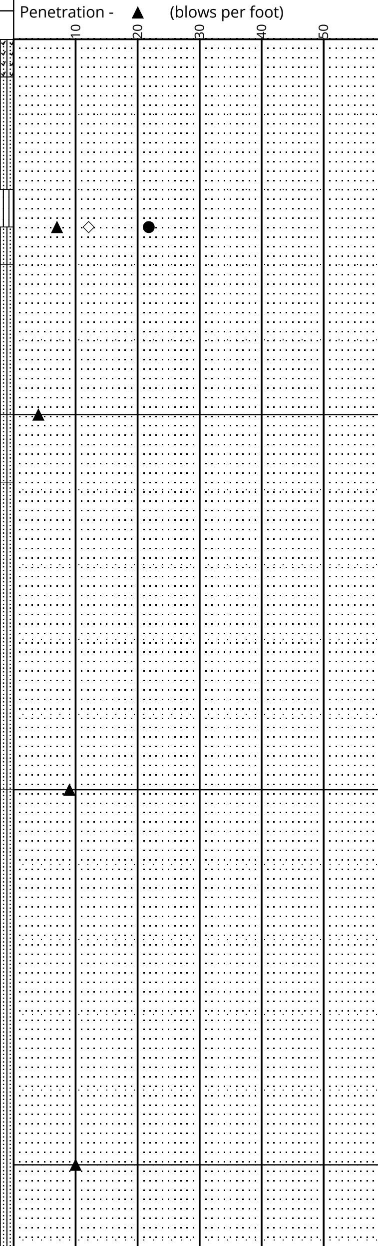
Notes: End of driveway, just north of house at 1106 Valley Ave NW

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts	Sampler	Symbol	Groundwater
0	40		Dark brown silty SAND (loose to medium dense, moist) (Topsoil) (SM)				
			Grey-brown silty SAND with gravel (loose to medium dense, moist) (Fill) (SM)				
			Mottled grey-brown sandy SILT (medium stiff, moist) (Alluvium) (ML)				
2.5	37.5		Grey-brown silty SAND (loose, moist) (SM)	3 3 4			
			Brown silty SAND (loose, moist) (SM)				
5	35		(very loose, wet)	1 2 2			ATD
			Mottled grey-brown silty SAND, small rootlets/organics (very loose, moist to wet) (SM)				
7.5	32.5						
10	30		Grey-brown silty SAND with silt interbeds (loose, wet) (Alluvium) (SM)	2 4 5			
12.5	27.5						
15	25			2 4 6			

Test Results

Plastic Limit ├──┤ Liquid Limit
% Fines (<0.075mm) ◇
% Water Content ●

Penetration - ▲ (blows per foot)



Description not given for: "0T" | Silty sand | Silt

LOG OF BORING B-1/MW-1

Proposed Contractor's Yard
1106 - 1036 Valley Ave NW
Puyallup, Washington

GEORESOURCES
earth science & geotechnical engineering

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company: Boretec 1, Inc.
Drilling Method: HSA
Drilling Rig: EC 95 Track Drill
Sampler Type: split spoon
Hammer Type: cat head
Hammer Weight: 140 lbs

Logged By: JLK
Drilling Date: 12/10/2021
Datum: NAVD88
Elevation: 40
Termination Depth: 16.5
Latitude:
Longitude:

Notes: End of driveway, just north of house at 1106 Valley Ave NW

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts	Sampler	Symbol	Test Results: Plastic Limit / Liquid Limit; % Fines (<0.075mm) ◇; % Water Content ●; Penetration - ▲ (blows per foot) 10 20 30 40 50	Groundwater
			(Termination Depth - 12/10/2021)					
17.5	22.5							
20	20							
22.5	17.5							
25	15							
27.5	12.5							
30	10							

Description not given for: "0T" Silty sand Silt

LOG OF BORING B-2/MW-2

GEORESOURCES
earth science & geotechnical engineering

Proposed Contractor's Yard
1106 - 1036 Valley Ave NW
Puyallup, Washington

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Boretec 1, Inc.	**Logged By:**	JLK
Drilling Method:	HSA	**Drilling Date:**	12/10/2021
Drilling Rig:	EC 95 Track Drill	**Datum:**	NAVD88
Sampler Type:	split spoon	**Elevation:**	39
Hammer Type:	cat head	**Termination Depth:**	16.5
Hammer Weight:	140 lbs	**Latitude:**	
		Longitude:	

Notes: Field in front of 1106 Valley Ave NW

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts	Sampler	Symbol	Test Results	Groundwater
0			Mottled grey-brown silty SAND (loose, moist) (Alluvium) (SM)					
	37.5							
2.5				1 3 5				
	35							ATD
5			(very loose, wet)	1 1 1				
	32.5							
7.5								
	30							
10				4 4 4				
			Black SAND (loose, wet) (Alluvium) (SP)					
	27.5							
12.5								
	25							
15			(medium dense, wet)	2 5 6				

Test Results: Plastic Limit ├──┤ Liquid Limit; % Fines (<0.075mm) ◇; % Water Content ●

Penetration - ▲ (blows per foot) 10 20 30 40 50

Description not given for: "0T" | Silty sand | Silt | Poorly graded sand

GEORESOURCES
earth science & geotechnical engineering

LOG OF BORING B-2/MW-2

Proposed Contractor's Yard
1106 - 1036 Valley Ave NW
Puyallup, Washington

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company: Boretec 1, Inc.
Drilling Method: HSA
Drilling Rig: EC 95 Track Drill
Sampler Type: split spoon
Hammer Type: cat head
Hammer Weight: 140 lbs

Logged By: JLK
Drilling Date: 12/10/2021
Datum: NAVD88
Elevation: 39
Termination Depth: 16.5
Latitude:
Longitude:

Notes: Field in front of 1106 Valley Ave NW

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts	Sampler	Symbol	Test Results	Groundwater
	22.5		*(Termination Depth - 12/10/2021)*					
17.5								
	20							
20								
	17.5							
22.5								
	15							
25								
	12.5							
27.5								
	10							
30								
	7.5							

Test Results: Plastic Limit ├──┤ Liquid Limit; % Fines (<0.075mm) ◇; % Water Content ●

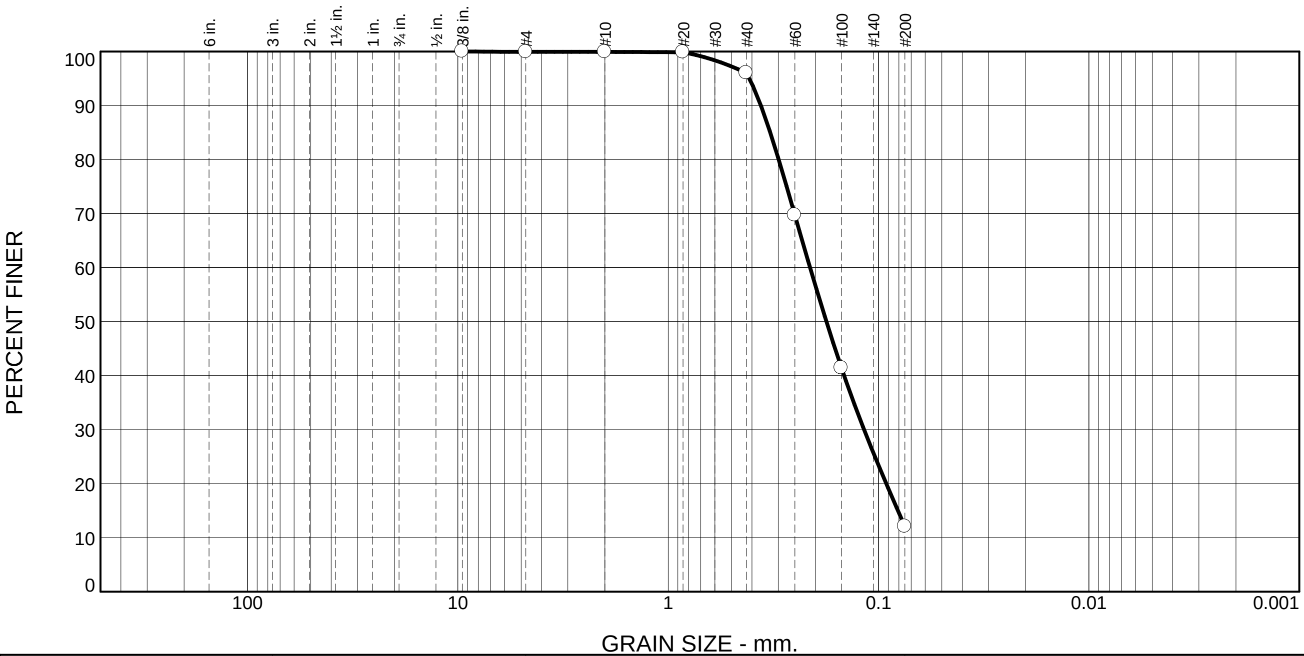
Penetration - ▲ (blows per foot): 10, 20, 30, 40, 50

Description not given for: "0T"   Silty sand   Silt   Poorly graded sand

JOB: NeilWalterCompany.ValleyAveNW
FIG. A-3

Appendix B
Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	3.9	83.9	12.1	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375	100.0		
#4	99.9		
#10	99.9		
#20	99.9		
#40	96.0		
#60	69.7		
#100	41.4		
#200	12.1		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.3626	D_{85}= 0.3273	D_{60}= 0.2116
D_{50}= 0.1770	D_{30}= 0.1172	D_{15}= 0.0809
D_{10}=	C_u=	C_c=

Remarks

Natural Moisture: 21.8%

Date Received: 12/10/21 **Date Tested:** 12/21/21

Tested By: MAW

Checked By: KSS

Title: PM

Source of Sample: B-1/MW-1 **Depth:** 2.5 **Date Sampled:** 12/10/21

Sample Number: 1a

GeoResources, LLC

Fife, WA

Client: Neil Walter Company

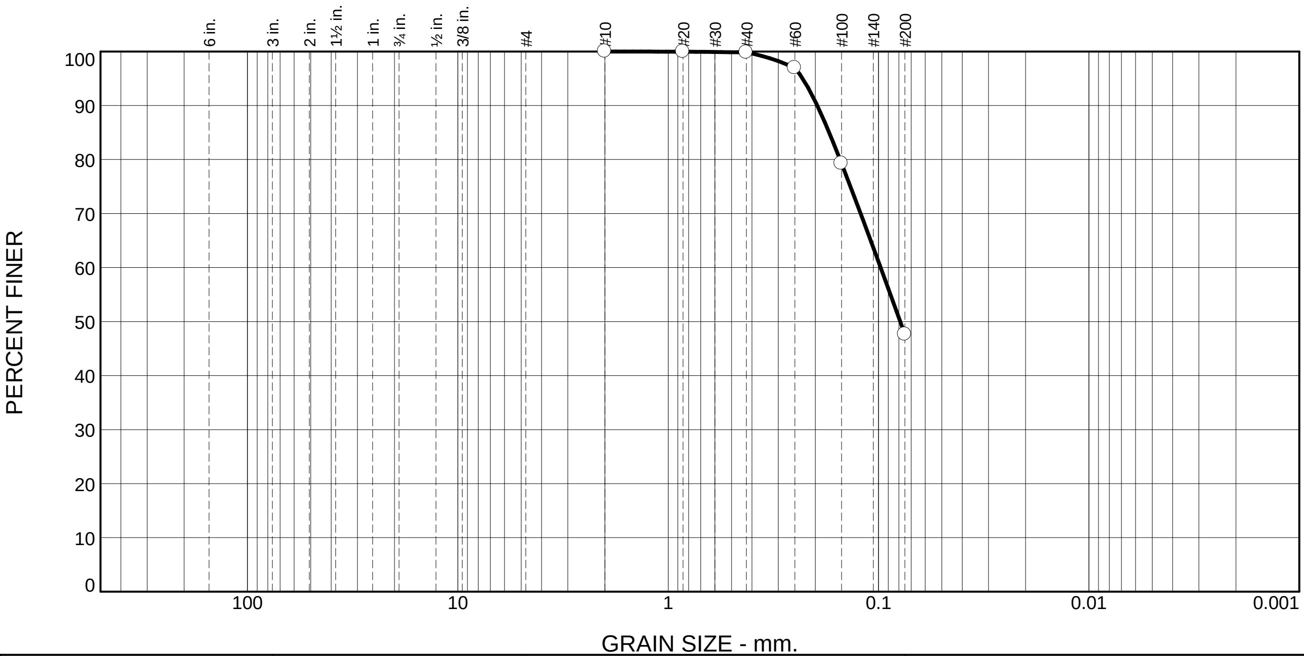
Project: Proposed Contractor's Yard

Project No: NeilWalterCompany.ValleyAveNW **Figure** B-1

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: ____________________ **Checked By:** ____________________

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	52.2	47.6	

Test Results (ASTM D 6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.8		
#60	97.0		
#100	79.3		
#200	47.6		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.1956 D_{85}= 0.1718 D_{60}= 0.0978
D_{50}= 0.0789 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 27.6%

Date Received: 12/10/21 **Date Tested:** 12/21/21

Tested By: MAW

Checked By: KSS

Title: PM

Source of Sample: B-2/MW-2 **Depth:** 2.5 **Date Sampled:** 12/10/21

Sample Number: 1

GeoResources, LLC

Fife, WA

Client: Neil Walter Company

Project: Proposed Contractor's Yard

Project No: NeilWalterCompany.ValleyAveNW **Figure** B-2

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: ______________ **Checked By:** ______________

SPECTRA Laboratories ...Where experience matters

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838 • www.spectra-lab.com

Analytical Report

Geo Resources, LLC
4809 Pacific Hwy E
Fife, WA 98424

Project NWC.Valley Ave
PO Number
Date Received 05/27/2022

Client ID: 103272 (HA-1, S-1) **Lab No: 302271-01** **Sample Date: 05/27/22 12:30**

Analyte	Method	Result	Units	PQL	Qualifiers	Analysis Date	Analyst
Cation Echange Capcity	SW 9081	16.7	Na, mEq/100g	---	---	6/29/2022	KLH
Organic Matter	ASTM D-2974-13	1.12	wt. % Dry	0.005	---	6/23/2022	KLH

Client ID: 103273 (HA-2, S-2) **Lab No: 302271-02** **Sample Date: 05/27/22 12:45**

Analyte	Method	Result	Units	PQL	Qualifiers	Analysis Date	Analyst
Organic Matter	ASTM D-2974-13	11.1	wt. % Dry	0.005	---	6/23/2022	KLH
Cation Echange Capcity	SW 9081	15.4	Na, mEq/100g	---	---	6/29/2022	KLH

Lab Qualifiers Comments:

Appendix C
Massman Calculations

City of Puyallup - 2014 SWMMWW

NeilWalterCompany.ValleyAveNW

Puyallup, Washington

Massman Calculation Sheet

Soil Grain Size Analysis Method

Procudure based on 2014 SWMMWW, Volume III

$K_{sat} = 10^{(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})}$ (provides Ksat in cm/s)

$K_{sat} = [10^{(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})}]*1417$ (provides Ksat in in/hr)

Sample Information				Sieve Data				Unfactored Rate	
I.D.	Test Pit	Depth (ft)	Layer Thickness (ft)	D_{10}	D_{60}	D_{90}	F_{fines}	Individual K_{sat} (cm/s)	Equivalent K_{sat} (in/hr)
102783	B-1	2.5'	15'+	0.07	0.2116	0.3626	0.121	0.020	28.917
102784	B-2	2.5'	15'+	0.030	0.0978	0.1956	0.476	0.003	4.438

Effective Average Hydraulic Conductivity, K_{equiv}

Based on either:

1) Average K_{sat} determined using harmonic mean
2) Lowest conductive layer, if within 5ft of bottom of pond

k_{equiv}=	16.678	Average
	4.438	Lowest
	4.438	To Use

Site Variability & number of location tested (CF_v)

	0.33 to 1.0

Factor to use for calculations: 0.75

Test Method (CF_t)

	0.4 to 0.75
Large-scale PIT	0.75
Small-scale PIT	0.5
Other small-scale (e.g. Double ring, falling head)	0.4
Grain Size Method	0.4

Factor to use for calculations: 0.4

Degree of influent control to prevent siltation and bio-buildup (CF_m)

	0.90

Factor to use for calculations: 0.9

$I_{design} = I_{measured} * F_{testing} * F_{geometry} * F_{plugging}$ **1.20** in/hr

Design Value **1.00** in/hr

GEORESOURCES
earth science & geotechnical engineering
4809 Pacific Hwy. E. | Fife, WA 98424 | 253.896.1011 | www. georesources.rocks

Infiltration Analysis

Proposed Contractor's Yard

1036-1106 Valley Avenue NW

Puyallup, Washington

PN: 042016-3042, -3041, & -3040

DocID: NWC.ValleyAveNW | April 2022 | Figure C-1

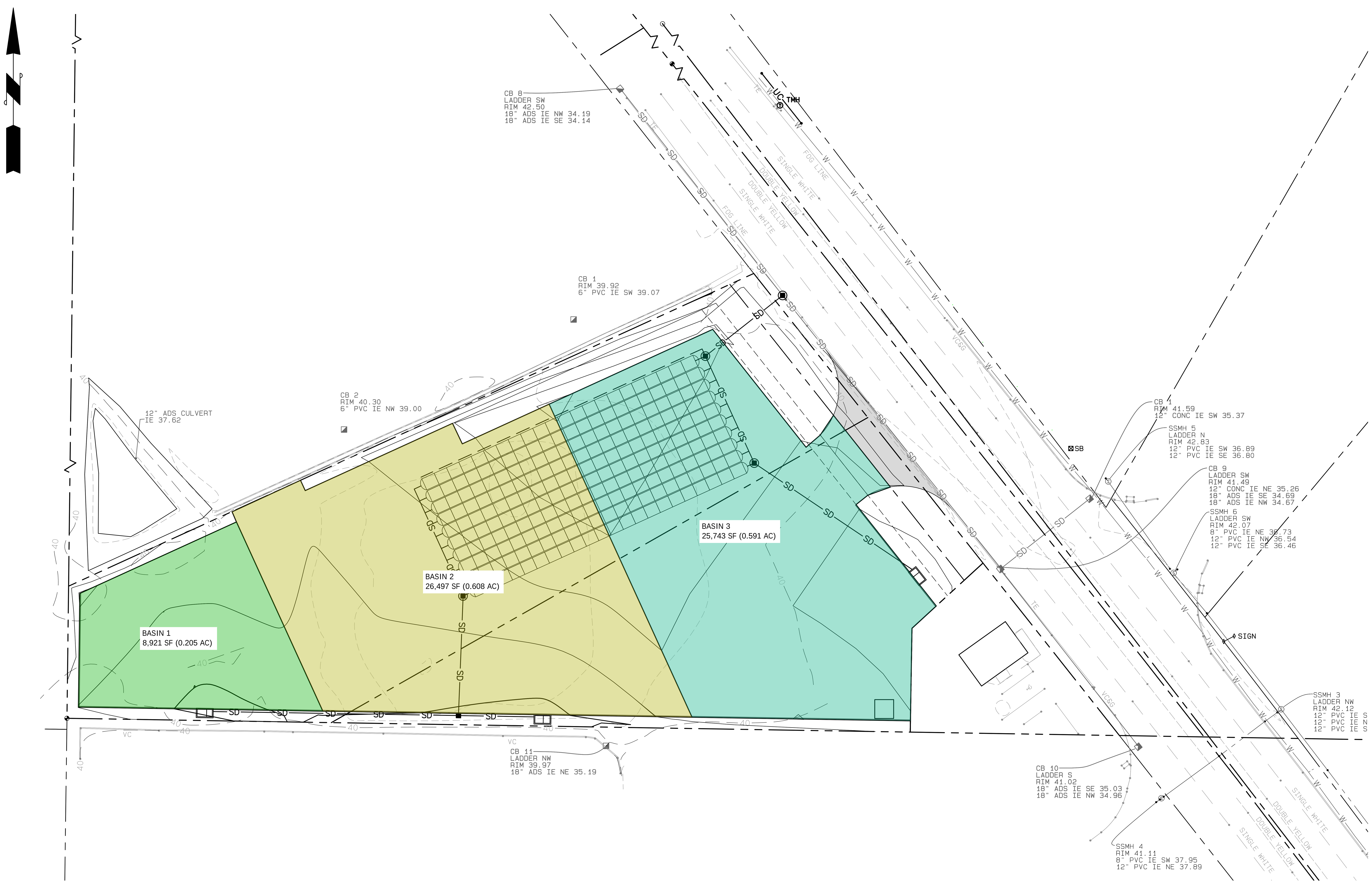
APPENDIX C

Flow Control

VALLEY AVE CONTRACTOR YARD

A PORTION OF SECTION 16, TOWNSHIP 20N, RANGE 04E, W.M.,
CITY OF PUYALLUP, WASHINGTON
BASIN MAP

GRAPHIC SCALE
0 30 60
1 INCH = 30 FEET (22"x34")
1 INCH = 60 FEET (11"x17")



VICINITY MAP
NOT TO SCALE

VERIFICATION NOTE

ALL EXISTING UTILITIES IN THE CONSTRUCTION AREA SHALL BE IDENTIFIED AND VERIFIED FOR DEPTH AND LOCATION PRIOR TO ANY CONSTRUCTION ACTIVITIES SO TO IDENTIFY ANY POTENTIAL CONFLICTS WITH PROPOSED CONSTRUCTION. CONTACT PROJECT ENGINEER IMMEDIATELY IF ANY CONFLICTS ARE IDENTIFIED.

PRIOR TO ANY CONSTRUCTION ACTIVITIES, VERIFY EXISTING TOPOGRAPHY IS CONSISTENT WITH WHAT IS SHOWN ON PLANS AND IF THERE ARE ANY POTENTIAL CONFLICTS WITH PROPOSED CONSTRUCTION ACTIVITIES. CONTACT PROJECT ENGINEER IMMEDIATELY IF ANY CONFLICTS ARE IDENTIFIED.

CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG

REVISION	DESCRIPTION	DATE	BY

CONTOUR ENGINEERING • LLC
CIVIL ENGINEERS ~ SURVEYORS ~ LAND PLANNERS
Phone: 253-857-5454 ~ Fax: 253-509-0044 ~ info@contourpllc.com
Mailing Address: P.O. Box 949, Gig Harbor, WA 98335
Physical Address: 4706 97th Street NW, Suite 100, Gig Harbor, WA 98332

PRELIMINARY

SHEET TITLE: BASIN MAP

CLIENT: NEIL WALTER COMPANY
550 S MICHIGAN ST
SEATTLE, WA 98108

CONTACT: KERMIT JORGENSEN PHONE: (206)787-1475

DESIGNER: J. GEIBEL
ENGINEER: K. MAUREN
DRAWN: J. GEIBEL
S16 T 20 N R 04E WM
DATE: 8/12/2022
REVISED:

PROJECT: 21-247
DWG NAME: 21-247-C

SHEET	REV.
C1 1 OF 1	△

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	detention
Site Name:	
Site Address:	
City:	
Report Date:	8/15/2022
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

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

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	1.51
Pervious Total	1.51
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.51

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	1.51
Impervious Total	1.51
Basin Total	1.51

Element Flows To:

Surface	Interflow	Groundwater
StormTech 1	StormTech 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

StormTech 1

Chamber Model:	3500	
Dimensions		
Max Row Length:	150	
Number of Chambers:	220	
Number of Endcaps:	22	
Top Stone Depth:	12	
Bottom Stone Depth:	9	
Discharge Structure		
Riser Height:	4.5 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	0.625 in.	Elevation:0 ft.
Orifice 2 Diameter:	0.875 in.	Elevation:2.8 ft.
Orifice 3 Diameter:	0.75 in.	Elevation:3.2 ft.
Element Flows To:		
Outlet 1	Outlet 2	

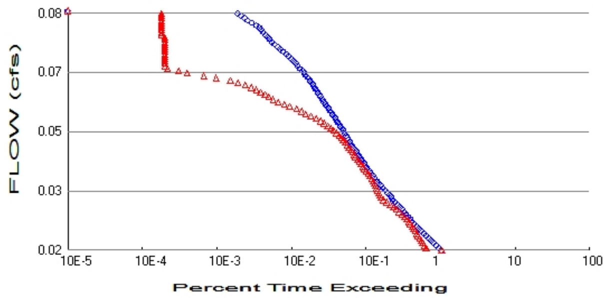
StormTech Hydraulic Table

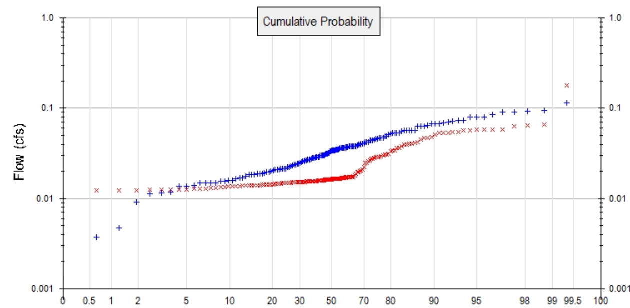
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.267	0.000	0.000	0.000
0.0833	0.267	0.008	0.003	0.000
0.1667	0.267	0.017	0.004	0.000
0.2500	0.267	0.026	0.005	0.000
0.3333	0.267	0.035	0.006	0.000
0.4167	0.267	0.044	0.006	0.000
0.5000	0.267	0.053	0.007	0.000
0.5833	0.267	0.062	0.008	0.000
0.6667	0.267	0.071	0.008	0.000
0.7500	0.267	0.080	0.009	0.000
0.8333	0.267	0.100	0.009	0.000
0.9167	0.267	0.119	0.010	0.000
1.0000	0.267	0.139	0.010	0.000
1.0833	0.267	0.158	0.011	0.000
1.1667	0.267	0.178	0.011	0.000
1.2500	0.267	0.197	0.011	0.000
1.3333	0.267	0.216	0.012	0.000
1.4167	0.267	0.236	0.012	0.000
1.5000	0.267	0.255	0.013	0.000
1.5833	0.267	0.274	0.013	0.000
1.6667	0.267	0.293	0.013	0.000
1.7500	0.267	0.312	0.014	0.000
1.8333	0.267	0.330	0.014	0.000
1.9167	0.267	0.349	0.014	0.000
2.0000	0.267	0.368	0.015	0.000
2.0833	0.267	0.386	0.015	0.000
2.1667	0.267	0.404	0.015	0.000
2.2500	0.267	0.423	0.015	0.000
2.3333	0.267	0.441	0.016	0.000
2.4167	0.267	0.459	0.016	0.000
2.5000	0.267	0.476	0.016	0.000
2.5833	0.267	0.494	0.017	0.000
2.6667	0.267	0.511	0.017	0.000
2.7500	0.267	0.529	0.017	0.000

2.8333	0.267	0.546	0.021	0.000
2.9167	0.267	0.563	0.025	0.000
3.0000	0.267	0.579	0.027	0.000
3.0833	0.267	0.596	0.029	0.000
3.1667	0.267	0.612	0.031	0.000
3.2500	0.267	0.628	0.036	0.000
3.3333	0.267	0.644	0.040	0.000
3.4167	0.267	0.659	0.043	0.000
3.5000	0.267	0.674	0.045	0.000
3.5833	0.267	0.689	0.047	0.000
3.6667	0.267	0.704	0.050	0.000
3.7500	0.267	0.718	0.052	0.000
3.8333	0.267	0.732	0.054	0.000
3.9167	0.267	0.745	0.055	0.000
4.0000	0.267	0.758	0.057	0.000
4.0833	0.267	0.770	0.059	0.000
4.1667	0.267	0.781	0.060	0.000
4.2500	0.267	0.791	0.062	0.000
4.3333	0.267	0.801	0.064	0.000
4.4167	0.267	0.810	0.065	0.000
4.5000	0.267	0.819	0.067	0.000
4.5833	0.267	0.829	0.450	0.000
4.6667	0.267	0.838	1.144	0.000
4.7500	0.267	0.847	2.009	0.000
4.8333	0.267	0.855	2.955	0.000
4.9167	0.267	0.864	3.886	0.000
5.0000	0.267	0.873	4.714	0.000
5.0833	0.267	0.882	5.370	0.000
5.1667	0.267	0.891	5.832	0.000
5.2500	0.267	0.900	6.150	0.000
5.3333	0.267	0.909	6.549	0.000
5.4167	0.267	0.918	6.866	0.000
5.5000	0.267	0.927	7.168	0.000

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.51
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 1.51

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.034118
5 year	0.052494
10 year	0.063115
25 year	0.07462
50 year	0.082021
100 year	0.088442

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.019118
5 year	0.030443
10 year	0.040648
25 year	0.057381
50 year	0.073187
100 year	0.092387

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.028	0.017
1903	0.021	0.013
1904	0.036	0.015
1905	0.017	0.027
1906	0.009	0.013
1907	0.053	0.016
1908	0.038	0.014
1909	0.037	0.017
1910	0.053	0.017
1911	0.034	0.016

1912	0.115	0.019
1913	0.053	0.037
1914	0.014	0.013
1915	0.022	0.029
1916	0.034	0.015
1917	0.012	0.015
1918	0.036	0.048
1919	0.028	0.015
1920	0.035	0.016
1921	0.038	0.021
1922	0.038	0.016
1923	0.030	0.027
1924	0.015	0.015
1925	0.019	0.014
1926	0.033	0.016
1927	0.024	0.016
1928	0.026	0.017
1929	0.053	0.028
1930	0.034	0.016
1931	0.032	0.016
1932	0.025	0.020
1933	0.027	0.017
1934	0.070	0.059
1935	0.032	0.041
1936	0.029	0.020
1937	0.046	0.015
1938	0.028	0.016
1939	0.002	0.013
1940	0.031	0.021
1941	0.019	0.012
1942	0.047	0.056
1943	0.024	0.016
1944	0.049	0.038
1945	0.038	0.016
1946	0.022	0.014
1947	0.016	0.015
1948	0.073	0.016
1949	0.063	0.042
1950	0.018	0.015
1951	0.024	0.014
1952	0.094	0.040
1953	0.085	0.058
1954	0.030	0.017
1955	0.026	0.014
1956	0.014	0.014
1957	0.045	0.029
1958	0.091	0.065
1959	0.057	0.058
1960	0.017	0.013
1961	0.057	0.057
1962	0.031	0.017
1963	0.015	0.012
1964	0.016	0.014
1965	0.064	0.053
1966	0.019	0.016
1967	0.029	0.014
1968	0.030	0.018
1969	0.028	0.016

1970	0.044	0.017
1971	0.067	0.045
1972	0.044	0.017
1973	0.057	0.036
1974	0.032	0.016
1975	0.071	0.063
1976	0.038	0.016
1977	0.017	0.012
1978	0.063	0.054
1979	0.018	0.015
1980	0.037	0.016
1981	0.033	0.017
1982	0.016	0.012
1983	0.057	0.029
1984	0.026	0.015
1985	0.041	0.015
1986	0.034	0.017
1987	0.065	0.047
1988	0.041	0.034
1989	0.037	0.015
1990	0.043	0.016
1991	0.034	0.017
1992	0.044	0.047
1993	0.046	0.016
1994	0.067	0.017
1995	0.015	0.015
1996	0.074	0.054
1997	0.030	0.014
1998	0.036	0.016
1999	0.004	0.014
2000	0.027	0.020
2001	0.015	0.012
2002	0.049	0.016
2003	0.042	0.017
2004	0.037	0.017
2005	0.068	0.017
2006	0.022	0.016
2007	0.023	0.017
2008	0.036	0.016
2009	0.024	0.015
2010	0.021	0.030
2011	0.019	0.015
2012	0.029	0.015
2013	0.021	0.013
2014	0.015	0.013
2015	0.029	0.015
2016	0.012	0.015
2017	0.052	0.041
2018	0.093	0.064
2019	0.092	0.058
2020	0.029	0.014
2021	0.047	0.040
2022	0.019	0.014
2023	0.039	0.017
2024	0.079	0.016
2025	0.035	0.016
2026	0.056	0.031
2027	0.021	0.015

2028	0.018	0.013
2029	0.038	0.034
2030	0.070	0.026
2031	0.023	0.014
2032	0.014	0.013
2033	0.021	0.014
2034	0.021	0.015
2035	0.080	0.179
2036	0.042	0.022
2037	0.011	0.014
2038	0.035	0.034
2039	0.005	0.011
2040	0.020	0.015
2041	0.027	0.014
2042	0.080	0.053
2043	0.039	0.040
2044	0.051	0.030
2045	0.035	0.025
2046	0.040	0.051
2047	0.030	0.025
2048	0.040	0.016
2049	0.035	0.017
2050	0.025	0.016
2051	0.036	0.017
2052	0.021	0.016
2053	0.038	0.055
2054	0.047	0.031
2055	0.019	0.013
2056	0.017	0.014
2057	0.026	0.017
2058	0.032	0.028
2059	0.056	0.030

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1147	0.1793
2	0.0940	0.0654
3	0.0926	0.0644
4	0.0915	0.0630
5	0.0908	0.0587
6	0.0853	0.0580
7	0.0805	0.0579
8	0.0797	0.0576
9	0.0793	0.0572
10	0.0736	0.0564
11	0.0726	0.0546
12	0.0713	0.0545
13	0.0699	0.0538
14	0.0696	0.0535
15	0.0675	0.0531
16	0.0674	0.0514
17	0.0672	0.0477
18	0.0650	0.0469
19	0.0638	0.0467
20	0.0631	0.0454
21	0.0627	0.0420
22	0.0572	0.0409

23	0.0569	0.0405
24	0.0568	0.0403
25	0.0568	0.0397
26	0.0563	0.0397
27	0.0555	0.0381
28	0.0534	0.0365
29	0.0529	0.0362
30	0.0528	0.0344
31	0.0528	0.0343
32	0.0518	0.0335
33	0.0513	0.0311
34	0.0490	0.0307
35	0.0486	0.0305
36	0.0472	0.0303
37	0.0470	0.0296
38	0.0469	0.0289
39	0.0461	0.0288
40	0.0459	0.0287
41	0.0452	0.0281
42	0.0445	0.0278
43	0.0441	0.0273
44	0.0439	0.0265
45	0.0426	0.0260
46	0.0424	0.0249
47	0.0419	0.0249
48	0.0407	0.0223
49	0.0406	0.0209
50	0.0402	0.0206
51	0.0395	0.0200
52	0.0394	0.0197
53	0.0385	0.0196
54	0.0382	0.0187
55	0.0382	0.0179
56	0.0381	0.0174
57	0.0381	0.0174
58	0.0378	0.0173
59	0.0378	0.0173
60	0.0377	0.0173
61	0.0374	0.0172
62	0.0373	0.0171
63	0.0370	0.0171
64	0.0366	0.0170
65	0.0364	0.0169
66	0.0364	0.0168
67	0.0363	0.0167
68	0.0360	0.0167
69	0.0360	0.0167
70	0.0354	0.0166
71	0.0352	0.0166
72	0.0350	0.0166
73	0.0347	0.0166
74	0.0346	0.0166
75	0.0343	0.0165
76	0.0342	0.0165
77	0.0340	0.0165
78	0.0339	0.0164
79	0.0338	0.0163
80	0.0334	0.0163

81	0.0331	0.0163
82	0.0321	0.0162
83	0.0320	0.0162
84	0.0315	0.0162
85	0.0315	0.0162
86	0.0312	0.0161
87	0.0308	0.0161
88	0.0303	0.0160
89	0.0303	0.0160
90	0.0301	0.0159
91	0.0300	0.0159
92	0.0298	0.0158
93	0.0291	0.0157
94	0.0289	0.0157
95	0.0289	0.0157
96	0.0286	0.0157
97	0.0286	0.0157
98	0.0284	0.0156
99	0.0284	0.0156
100	0.0283	0.0156
101	0.0277	0.0156
102	0.0272	0.0156
103	0.0271	0.0155
104	0.0267	0.0155
105	0.0265	0.0154
106	0.0264	0.0153
107	0.0260	0.0153
108	0.0258	0.0153
109	0.0252	0.0153
110	0.0245	0.0153
111	0.0242	0.0153
112	0.0241	0.0152
113	0.0238	0.0152
114	0.0238	0.0152
115	0.0231	0.0151
116	0.0227	0.0150
117	0.0223	0.0149
118	0.0223	0.0149
119	0.0215	0.0149
120	0.0214	0.0148
121	0.0214	0.0148
122	0.0213	0.0146
123	0.0210	0.0146
124	0.0210	0.0146
125	0.0209	0.0145
126	0.0206	0.0144
127	0.0200	0.0143
128	0.0195	0.0143
129	0.0194	0.0142
130	0.0191	0.0142
131	0.0190	0.0141
132	0.0186	0.0141
133	0.0186	0.0140
134	0.0185	0.0140
135	0.0184	0.0139
136	0.0183	0.0139
137	0.0175	0.0139
138	0.0170	0.0138

139	0.0169	0.0138
140	0.0167	0.0138
141	0.0160	0.0137
142	0.0157	0.0136
143	0.0156	0.0132
144	0.0154	0.0132
145	0.0150	0.0132
146	0.0149	0.0130
147	0.0148	0.0127
148	0.0148	0.0127
149	0.0140	0.0127
150	0.0137	0.0126
151	0.0136	0.0126
152	0.0119	0.0126
153	0.0116	0.0125
154	0.0113	0.0125
155	0.0091	0.0124
156	0.0047	0.0123
157	0.0037	0.0122
158	0.0024	0.0114

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0171	56896	57450	100	Pass
0.0177	52442	35163	67	Pass
0.0184	48359	33456	69	Pass
0.0190	44647	31872	71	Pass
0.0197	41224	30382	73	Pass
0.0203	38271	29041	75	Pass
0.0210	35495	27861	78	Pass
0.0217	32958	26592	80	Pass
0.0223	30542	25357	83	Pass
0.0230	28443	24182	85	Pass
0.0236	26493	23008	86	Pass
0.0243	24759	21900	88	Pass
0.0249	23135	20869	90	Pass
0.0256	21689	19584	90	Pass
0.0262	20332	18116	89	Pass
0.0269	19063	16703	87	Pass
0.0276	17861	15451	86	Pass
0.0282	16720	14072	84	Pass
0.0289	15606	12820	82	Pass
0.0295	14626	11678	79	Pass
0.0302	13717	10510	76	Pass
0.0308	12886	9540	74	Pass
0.0315	12099	8798	72	Pass
0.0322	11379	8504	74	Pass
0.0328	10665	8233	77	Pass
0.0335	9989	7922	79	Pass
0.0341	9363	7645	81	Pass
0.0348	8753	7385	84	Pass
0.0354	8199	7152	87	Pass
0.0361	7728	6892	89	Pass
0.0367	7241	6582	90	Pass
0.0374	6787	6238	91	Pass
0.0381	6421	5906	91	Pass
0.0387	6111	5557	90	Pass
0.0394	5834	5303	90	Pass
0.0400	5557	5036	90	Pass
0.0407	5265	4733	89	Pass
0.0413	5006	4496	89	Pass
0.0420	4782	4242	88	Pass
0.0427	4531	4029	88	Pass
0.0433	4339	3849	88	Pass
0.0440	4154	3663	88	Pass
0.0446	3937	3462	87	Pass
0.0453	3713	3276	88	Pass
0.0459	3536	3097	87	Pass
0.0466	3364	2927	87	Pass
0.0472	3227	2739	84	Pass
0.0479	3088	2578	83	Pass
0.0486	2966	2411	81	Pass
0.0492	2850	2238	78	Pass
0.0499	2738	2045	74	Pass
0.0505	2600	1858	71	Pass
0.0512	2476	1689	68	Pass

0.0518	2357	1521	64	Pass
0.0525	2264	1372	60	Pass
0.0531	2159	1186	54	Pass
0.0538	2056	1006	48	Pass
0.0545	1946	859	44	Pass
0.0551	1837	753	40	Pass
0.0558	1748	648	37	Pass
0.0564	1659	522	31	Pass
0.0571	1577	445	28	Pass
0.0577	1510	368	24	Pass
0.0584	1442	314	21	Pass
0.0591	1367	276	20	Pass
0.0597	1296	245	18	Pass
0.0604	1241	213	17	Pass
0.0610	1182	188	15	Pass
0.0617	1129	159	14	Pass
0.0623	1079	133	12	Pass
0.0630	1026	106	10	Pass
0.0636	979	84	8	Pass
0.0643	922	54	5	Pass
0.0650	871	37	4	Pass
0.0656	819	22	2	Pass
0.0663	771	17	2	Pass
0.0669	717	12	1	Pass
0.0676	668	11	1	Pass
0.0682	629	11	1	Pass
0.0689	588	11	1	Pass
0.0696	549	11	2	Pass
0.0702	507	11	2	Pass
0.0709	472	11	2	Pass
0.0715	427	11	2	Pass
0.0722	392	11	2	Pass
0.0728	363	11	3	Pass
0.0735	329	11	3	Pass
0.0741	300	11	3	Pass
0.0748	281	11	3	Pass
0.0755	264	11	4	Pass
0.0761	248	10	4	Pass
0.0768	233	10	4	Pass
0.0774	218	10	4	Pass
0.0781	205	10	4	Pass
0.0787	186	10	5	Pass
0.0794	162	10	6	Pass
0.0801	142	10	7	Pass
0.0807	129	10	7	Pass
0.0814	117	10	8	Pass
0.0820	105	10	9	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.1651 acre-feet
On-line facility target flow:	0.2291 cfs.
Adjusted for 15 min:	0.2291 cfs.
Off-line facility target flow:	0.133 cfs.
Adjusted for 15 min:	0.133 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
StormTech 1 POC	☐	587.56			☐	0.00			
Total Volume Infiltrated		587.56	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

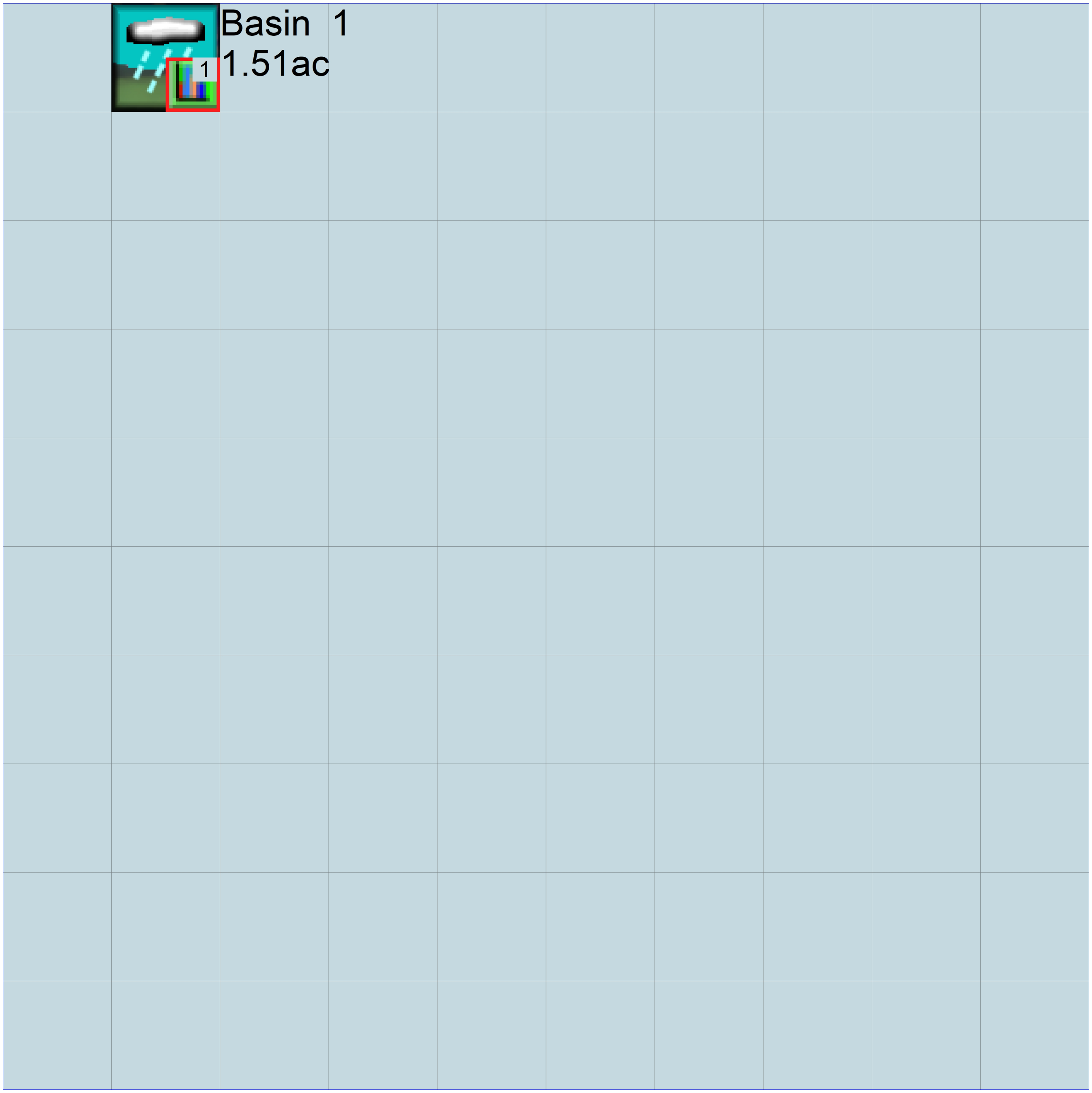
PERLND Changes

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       1901 10 01        END    2059 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.wdm
MESSU      25   Predetention.MES
           27   Predetention.L61
           28   Predetention.L62
           30   POCdetention1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      10
      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
  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
  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
  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
  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
  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
  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
  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
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
  END GEN-INFO
  *** Section IWATER***

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

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

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

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

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

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

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  10                        1.51     COPY   501     12
PERLND  10                        1.51     COPY   501     13

******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              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    1               PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1               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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 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.wdm
MESSU      25   Mitdetention.MES
           27   Mitdetention.L61
           28   Mitdetention.L62
           30   POCdetention1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       1
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        StormTech  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           ***
  END GEN-INFO
  *** Section PWATER***

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

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

  PWAT-PARM1
```

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

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  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
  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
  END GEN-INFO
  *** Section IWATER***

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         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
  END IWAT-PARM2

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

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

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
IMPLND   1                        1.51     RCHRES   1      5

******Routing******
IMPLND   1                        1.51     COPY     1     15
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     StormTech  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      0.03       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
66 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.267906	0.000000	0.000000		
0.083333	0.267906	0.008928	0.003060		
0.166667	0.267906	0.017859	0.004328		
0.250000	0.267906	0.026789	0.005300		
0.333333	0.267906	0.035721	0.006120		
0.416667	0.267906	0.044649	0.006842		
0.500000	0.267906	0.053579	0.007496		
0.583333	0.267906	0.062510	0.008096		
0.666667	0.267906	0.071438	0.008655		
0.750000	0.267906	0.080370	0.009180		
0.833333	0.267906	0.100104	0.009677		
0.916667	0.267906	0.119742	0.010149		
1.000000	0.267906	0.139315	0.010600		
1.083333	0.267906	0.158826	0.011033		
1.166667	0.267906	0.178266	0.011450		
1.250000	0.267906	0.197626	0.011852		
1.333333	0.267906	0.216938	0.012240		
1.416667	0.267906	0.236152	0.012617		
1.500000	0.267906	0.255292	0.012983		
1.583333	0.267906	0.274343	0.013338		
1.666667	0.267906	0.293303	0.013685		
1.750000	0.267906	0.312172	0.014023		
1.833333	0.267906	0.330939	0.014353		
1.916667	0.267906	0.349603	0.014675		
2.000000	0.267906	0.368155	0.014991		
2.083333	0.267906	0.386597	0.015300		
2.166667	0.267906	0.404909	0.015603		
2.250000	0.267906	0.423093	0.015900		
2.333333	0.267906	0.441148	0.016192		
2.416667	0.267906	0.459058	0.016479		
2.500000	0.267906	0.476820	0.016761		
2.583333	0.267906	0.494421	0.017038		
2.666667	0.267906	0.511857	0.017310		
2.750000	0.267906	0.529122	0.017579		
2.833333	0.267906	0.546201	0.021636		
2.916667	0.267906	0.563089	0.025200		
3.000000	0.267906	0.579773	0.027652		
3.083333	0.267906	0.596234	0.029673		
3.166667	0.267906	0.612482	0.031444		
3.250000	0.267906	0.628488	0.036461		
3.333333	0.267906	0.644240	0.040100		
3.416667	0.267906	0.659694	0.043015		
3.500000	0.267906	0.674880	0.045575		
3.583333	0.267906	0.689749	0.047905		
3.666667	0.267906	0.704281	0.050068		
3.750000	0.267906	0.718417	0.052098		
3.833333	0.267906	0.732164	0.054022		
3.916667	0.267906	0.745448	0.055856		
4.000000	0.267906	0.758203	0.057613		
4.083333	0.267906	0.770259	0.059303		
4.166667	0.267906	0.781298	0.060934		
4.250000	0.267906	0.791473	0.062513		
4.333333	0.267906	0.801302	0.064044		
4.416667	0.267906	0.810827	0.065532		
4.500000	0.267906	0.819939	0.066980		
4.583333	0.267906	0.829152	0.450684		
4.666667	0.267906	0.838081	1.144041		
4.750000	0.267906	0.847014	2.009550		
4.833333	0.267906	0.855942	2.954958		
4.916667	0.267906	0.864872	3.886351		
5.000000	0.267906	0.873802	4.714091		
5.083333	0.267906	0.882730	5.370186		
5.166667	0.267906	0.891663	5.831958		
5.250000	0.267906	0.900591	6.150341		
5.333333	0.267906	0.909522	6.549057		

```
  5.416667  0.267906  0.918451  6.865973
  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              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              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
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  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
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1908/ 8/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-0.00178     0.00000  0.0000E+00     0.00000  -3.456E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1913/ 7/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-4.579E-02     0.00000  0.0000E+00     0.00000  -1.301E-09

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
```

DATE/TIME: 1923/ 8/31 24: 0

RCHRES : 1

```
RELERR       STORS        STOR       MATIN      MATDIF
-3.043E-03     0.00000  0.0000E+00     0.00000  -2.051E-08
```

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1974/ 8/31 24: 0

RCHRES : 1

```
RELERR       STORS        STOR       MATIN      MATDIF
-5.313E-02     0.00000  0.0000E+00     0.00000  -1.112E-09
```

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1980/ 8/31 24: 0

RCHRES : 1

```
RELERR       STORS        STOR       MATIN      MATDIF
-1.288E-01     0.00000  0.0000E+00     0.00000  -2.298E-10
```

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.

```
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
The count for the WARNING printed above has reached its maximum.

If the condition is encountered again the message will not be repeated.
```

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages.

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

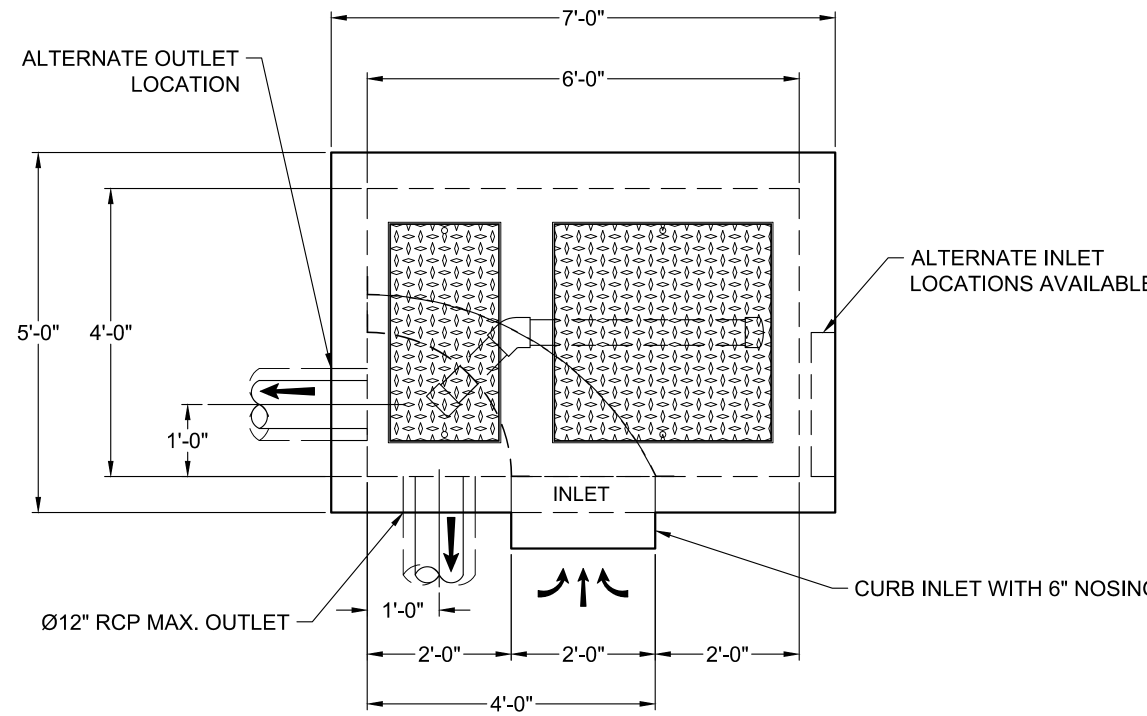
APPENDIX D

Water Quality

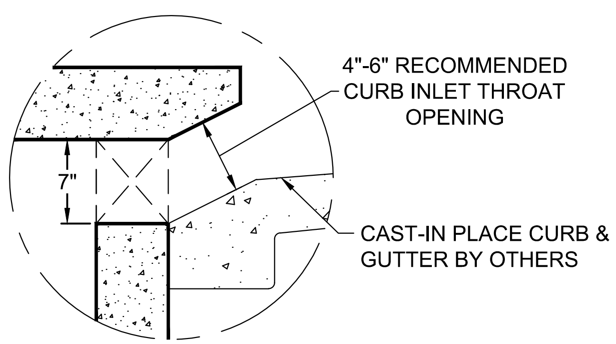
SITE SPECIFIC DATA				
Structure ID				ID
Treatment Flow Rate (cfs)				-
Peak Flow Rate (cfs)				-
Rim Elevation				-
Pipe Data	Pipe Location	Pipe Size	Pipe Type	Invert Elevation
Outlet	-	-	-	-
Notes:				

PERFORMANCE SPECIFICATIONS	
Treatment Flow Capacities:	
NJDEP 80% Removal, 75 micron	0.083 cfs
WA Ecology GULD - Basic, Enhanced & Phosphorus	0.074 cfs
Bypass Capacity	2.0 cfs

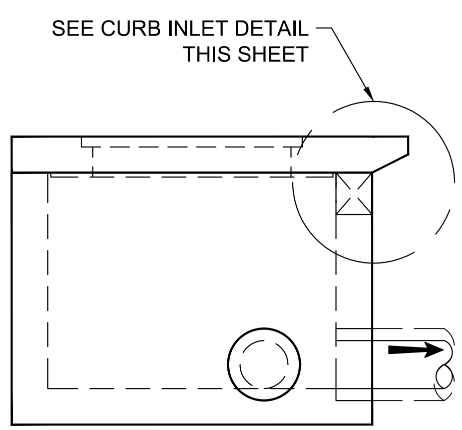
*Contact Oldcastle for alternative treatment flow capacities.



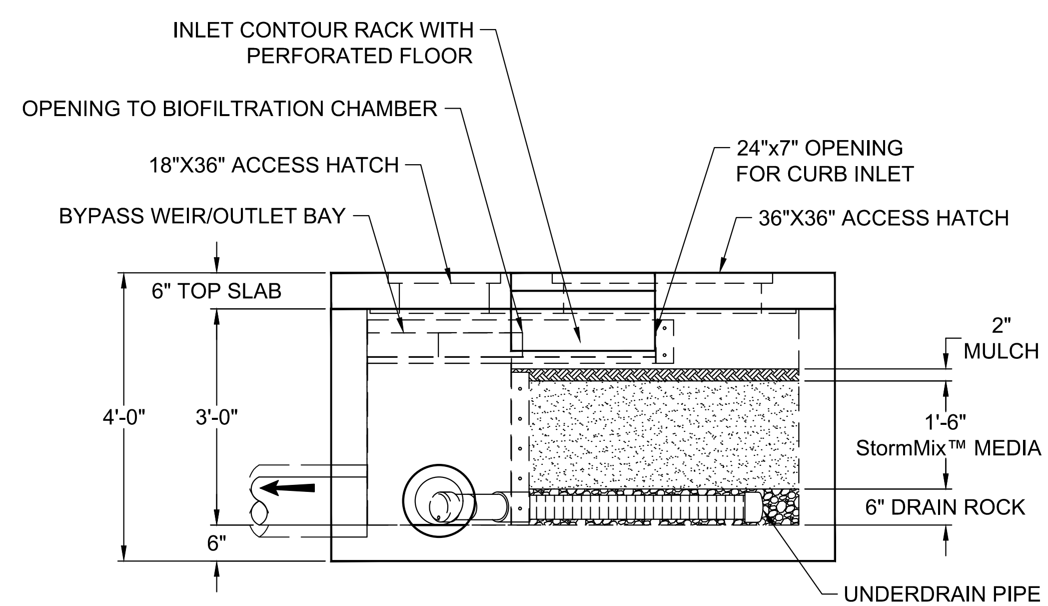
PLAN VIEW



CURB INLET DETAIL



LEFT END VIEW



ELEVATION VIEW

NOTES:

1. DESIGN LOADINGS:
   A. 300 PSF PEDESTRIAN LOADING
   B. DESIGN SOIL COVER: 0' MAXIMUM
   C. ASSUMED WATER TABLE: BELOW BASE OF PRECAST (ENGINEER-OF-RECORD TO CONFIRM SITE WATER TABLE ELEVATION)
   D. LATERAL EARTH PRESSURE: 45 PCF (DRAINED)
   E. LATERAL LIVE LOAD SURCHARGE: 80 PSF (APPLIED TO 8'-0" BELOW GRADE)
   F. NO LATERAL SURCHARGE FROM ADJACENT BUILDINGS, WALLS, PIERS, OR FOUNDATIONS.
2. CONCRETE 28-DAY MINIMUM COMPRESSIVE STRENGTH: 5,000 PSI MINIMUM.
3. REINFORCING: REBAR, ASTM A615/A706, GRADE 60
4. CEMENT: ASTM C150
5. REQUIRED ALLOWABLE SOIL BEARING CAPACITY: 2,500 PSF
6. REFERENCE STANDARD:
   A. ASTM C890
   B. ASTM C913
   C. ACI 318-14
7. THIS STRUCTURE IS DESIGNED TO THE PARAMETERS NOTED HEREIN. ENGINEER-OF-RECORD SHALL VERIFY THAT NOTED PARAMETERS MEET OR EXCEED PROJECT REQUIREMENTS. IF DESIGN PARAMETERS ARE INCORRECT, REVIEWING ENGINEER/AUTHORITY SHALL NOTIFY OLDCASTLE INFRASTRUCTURE UPON REVIEW.
8. INLET AND OUTLET HOLES WILL BE FACTORY CORED/CAST PER PLANS AND CUSTOMER REQUIREMENTS. INLET AND OUTLET LOCATIONS CAN BE MIRRORED.
9. CONTRACTOR RESPONSIBLE TO VERIFY ALL SIZES, LOCATIONS, AND ELEVATIONS OF OPENINGS.
10. CONTRACTOR RESPONSIBLE TO ENSURE ADEQUATE BEARING SURFACE IS PROVIDED (I.E. COMPACTED AND LEVEL PER PROJECT SPECIFICATIONS).
11. SECTION HEIGHTS, SLAB/WALL THICKNESSES, AND KEYWAYS ARE SUBJECT TO CHANGE AS REQUIRED FOR SITE REQUIREMENTS AND/OR DUE TO PRODUCT AVAILABILITY AND PRODUCTION FACILITY CONSTRAINTS.
12. MAXIMUM PICK WEIGHTS*:
   A. TOP: XX,XXX LBS
   B. BASE: XX,XXX LBS*
   (* COMBINED WEIGHT OF BASE INCLUDES BYPASS WEIR, DIVIDER WALL, ROCK & MEDIA)
13. INTERNALS SHALL CONSIST OF UNDERDRAIN PIPE, ROCK, STORMMIX™ MEDIA, MULCH, AND INLET CONTOUR RACK.

Bioretention/ Biofiltration

Oldcastle Infrastructure™ A CRH COMPANY

Ph: 800.579.8819 | www.oldcastleinfrastructure.com/stormwater

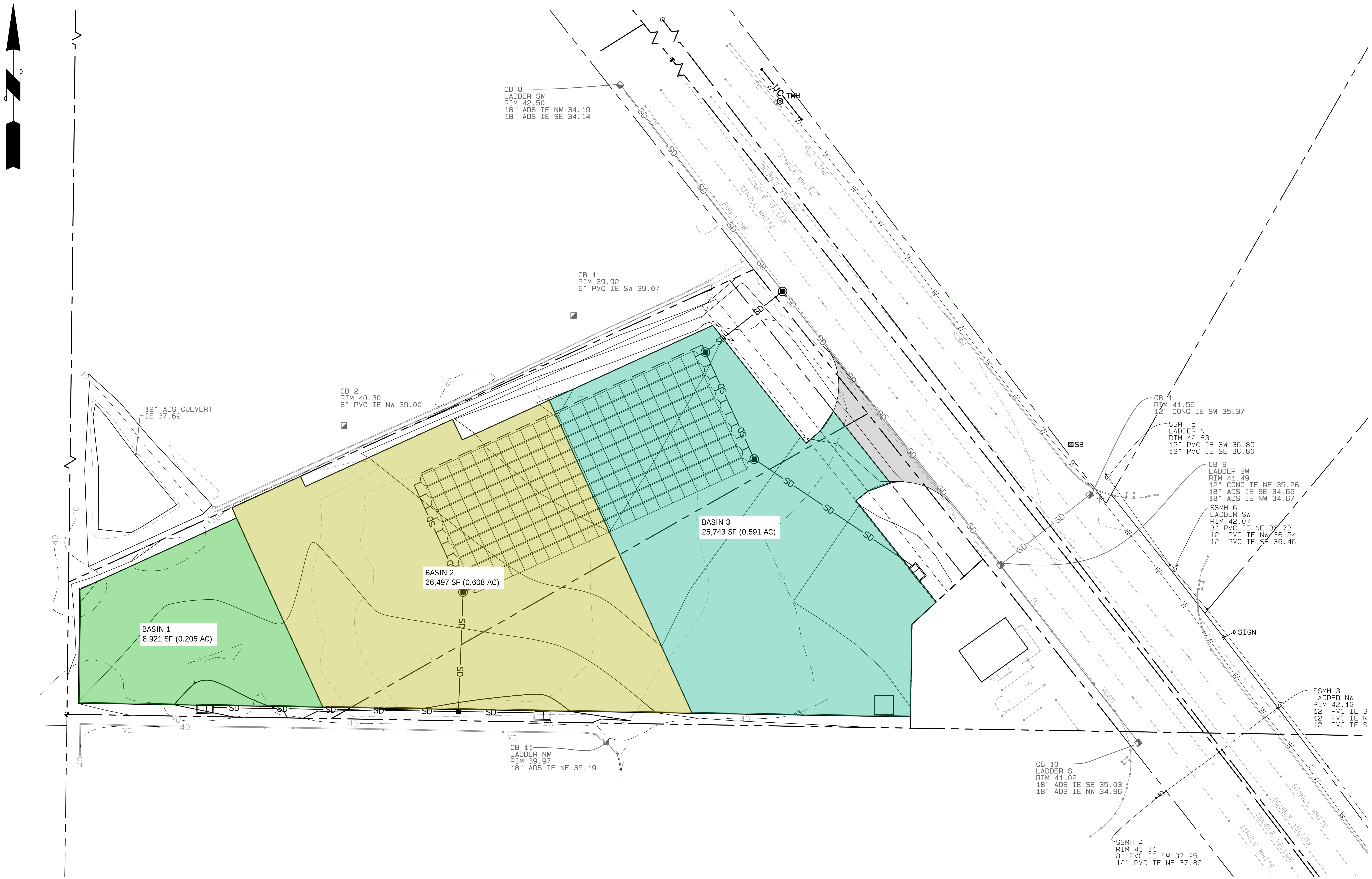
BioPod™ Biofilter System (STANDARD)
Surface Vault with Internal Bypass

CUSTOMER		
-		
PROJECT NAME		
-		
SHEET NAME	REVISION	SHEET
Specifier Drawing BPS-46IB	- REV DATE -	1 OF 1

VALLEY AVE CONTRACTOR YARD

A PORTION OF SECTION 16, TOWNSHIP 20N, RANGE 04E, W.M.,
CITY OF PUYALLUP, WASHINGTON
BASIN MAP

GRAPHIC SCALE
0 30 60
1 INCH = 30 FEET (22"x34")
1 INCH = 60 FEET (11"x17")



VICINITY MAP
NOT TO SCALE

VERIFICATION NOTE

ALL EXISTING UTILITIES IN THE CONSTRUCTION AREA SHALL BE IDENTIFIED AND VERIFIED FOR DEPTH AND LOCATION PRIOR TO ANY CONSTRUCTION ACTIVITIES SO TO IDENTIFY ANY POTENTIAL CONFLICTS WITH PROPOSED CONSTRUCTION. CONTACT PROJECT ENGINEER IMMEDIATELY IF ANY CONFLICTS ARE IDENTIFIED.

PRIOR TO ANY CONSTRUCTION ACTIVITIES, VERIFY EXISTING TOPOGRAPHY IS CONSISTENT WITH WHAT IS SHOWN ON PLANS AND IF THERE ARE ANY POTENTIAL CONFLICTS WITH PROPOSED CONSTRUCTION ACTIVITIES. CONTACT PROJECT ENGINEER IMMEDIATELY IF ANY CONFLICTS ARE IDENTIFIED.

CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG

REVISION	DESCRIPTION	DATE	BY

CONTOUR
ENGINEERING • LLC
CIVIL ENGINEERS ~ SURVEYORS ~ LAND PLANNERS
Phone: 253-857-5454 ~ Fax: 253-509-0044 ~ info@contourpllc.com
Mailing Address: P.O. Box 949, Gig Harbor, WA 98335
Physical Address: 4706 97th Street NW, Suite 100, Gig Harbor, WA 98332

PRELIMINARY

SHEET TITLE: BASIN MAP

CLIENT: NEIL WALTER COMPANY
550 S MICHIGAN ST
SEATTLE, WA 98108

CONTACT: KERMIT JORGENSEN
PHONE: (206)787-1475

DESIGNER: J. GEIBEL
ENGINEER: K. MAUREN
DRAWN: J. GEIBEL
S16 T 20 N R 04E WM
DATE: 8/12/2022
REVISED:

PROJECT: 21-247
DWG NAME: 21-247-C

SHEET	REV.
C1	△
1 OF 1	

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.0224 acre-feet
On-line facility target flow:	0.0311 cfs.
Adjusted for 15 min:	0.0311 cfs.
Off-line facility target flow:	0.018 cfs.
Adjusted for 15 min:	0.018 cfs.

Water Quality

Water Quality BMP Flow and Volume for POC #2

On-line facility volume:	0.0664 acre-feet
On-line facility target flow:	0.0922 cfs.
Adjusted for 15 min:	0.0922 cfs.
Off-line facility target flow:	0.0535 cfs.
Adjusted for 15 min:	0.0535 cfs.

Water Quality

Water Quality BMP Flow and Volume for POC #3

On-line facility volume:	0.0646 acre-feet
On-line facility target flow:	0.0896 cfs.
Adjusted for 15 min:	0.0896 cfs.
Off-line facility target flow:	0.052 cfs.
Adjusted for 15 min:	0.052 cfs.