Preliminary Stormwater Site Plan

PREPARED FOR:

Mr. Don Huber
SPP Manufacturing
PO Box 64160
Tacoma, WA 98465

PROJECT:

Puyallup 2nd Street Apartments
XXX 2nd Street NE
Puyallup, WA
2190606.10

PREPARED BY:

Matt Whittlesey, EIT
Project Engineer

REVIEWED BY:

J. Matthew Weber, PE
Principal

DATE

June 2020
Revised January 2021
Revised October 2021

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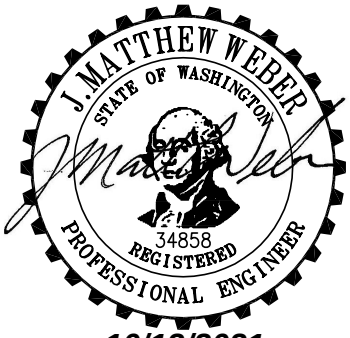

10/12/2021

I hereby state that this Preliminary Stormwater Site Plan for the Puyallup 2nd Street Apartments project 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 for professional engineers. I understand that City of Puyallup does not and will not assume liability for the sufficiency, suitability, or performances of drainage facilities prepared by me.

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1.0 Project Overview

The Puyallup 2nd Street Apartments project proposes to develop 0.77 acre in Puyallup, Washington. The project is located northeast of the intersection of 2nd Street NE and 5th Avenue NE on Tax Parcel 7600200051. Refer to Appendix A-1 for a Vicinity Map.

The project proposes an approximately 9,500-square foot footprint apartment building, consisting of three stories with 29 residential units over one story of covered parking. Other improvements include driveways, site paving, landscaping, and improvements to the adjacent right-of-way. Proposed utilities include storm drainage, a sanitary sewer connection, and a water system.

This Preliminary Stormwater Site Plan describes the design of stormwater facilities for this project. This report accompanies the preliminary civil engineering plans for the project. These preliminary plans and report have been prepared to satisfy all requirements of the Department of Ecology (DOE) 2014 *Stormwater Management Manual for Western Washington (SMMWW)*.

1.1 Existing Conditions

The site currently consists of a single, undeveloped parcel. Ground cover consists of grass. The project is bounded by 2nd Street NE to the west and 5th Avenue NE to the south. Existing improvements along both roads consist of curb, gutter, and paved sidewalk. Existing utilities within 2nd Street NE include storm drainage and water. Existing utilities within 5th Avenue NE include storm drainage, water, and sanitary sewer. The project is bounded to the north by an auto sales lot and a single-family residence, and to the east by a single-family residence and an apartment building.

Existing storm drainage facilities in 2nd Street NE include piped conveyance to the Puyallup river. The project proposes to infiltrate all stormwater runoff from the developed site onsite.

Existing site areas are as tabulated below:

	Square Feet	Acres	% of Site
Impervious	430	0.01	1%
Pervious	33,170	0.76	99%
Total Site Area	**33,600**	**0.77**	**100%**

1.1.1 Critical Areas

The site is mapped within a volcanic hazard area, as identified by Pierce County. A Critical Areas Map is included in Appendix A-6.

To our knowledge, no wetlands are located on or immediately downstream of the site.

The site is not mapped as floodplain per the FEMA FIRM, effective March 7, 2017. Refer to Appendix A-5 for the effective FIRM map.

1.1.2 Site Soils

Soils at the site are mapped by the Natural Resources Conservation Service (NRCS) as predominantly “Puyallup Fine Sandy Loam.” Refer to Appendix A-4 for the NRCS Soils Map.

The onsite soils have been explored and summarized in a report by South Sound Geotechnical Consulting dated August 8, 2019. Native subsurface soils consist of sand and silty sand in a generally loose condition. A corrected long-term design infiltration rate of 1.4 inches per hour was recommended. This rate was used for preliminary sizing of the stormwater facilities.

South Sound Geotechnical Consulting also completed groundwater monitoring through the 2020 winter season. The highest groundwater level recorded was 10 feet 10 inches. This value will be used to determine appropriate vertical setbacks from stormwater infiltration facilities. Refer to Appendix C for the full Geotechnical Engineering Report and the Groundwater Monitoring Report.

1.2 Proposed Conditions

The project proposes an approximately 9,500-square foot footprint apartment building. Other improvements include driveways, site paving, landscaping, and improvements to the adjacent right-of-way. Proposed utilities include storm drainage, a sanitary sewer connection, and a water system.

Proposed site areas are as tabulated below.

	Square Feet	Acres	% of Site
Building Footprint	9,670	0.222	32%
Pavement and Sidewalk	12,960	0.298	42%
Landscape	7,744	0.178	25%
Impervious Encroachment	400	0.010	1%
Total Site (- 2,826 SF ROW Dedication)	**30,774**	**0.708**	**100%**

2.0 Minimum Requirements

The project is considered new development and is subject to Minimum Requirements (MRs) 1 through 9 because it proposes more than 5,000 square feet of new hard surfaces. Below is a discussion of how the project meets each of the requirements.

2.1 MR 1: Preparation of Stormwater Site Plans

This Preliminary Stormwater Site Plan (SSP) and the preliminary civil plans satisfy this requirement. A final SSP and final civil plans will be provided with the site development permit package.

2.2 MR 2: Construction Stormwater Pollution Prevention

A Construction Stormwater Pollution Prevention Plan will be included with the site development permit package.

2.3 MR 3: Source Control of Pollution

The project will comply with all source control requirements of the 2014 *SMMWW*.

2.4 MR 4: Preservation of Natural Drainage Systems and Outfalls

The site is currently several feet lower than the adjacent roads. Runoff is either infiltrated onsite or flows toward the adjacent property to the east. In the developed condition, all runoff will be infiltrated onsite.

2.5 MR 5: Onsite Stormwater Management

This project is to either meet the LID performance standard or use the list approach using List 2. The project proposes to infiltrate all stormwater onsite. Therefore, the project meets the LID performance standard. Refer to Section 4.0 for a detailed discussion of the stormwater facilities.

2.6 MR 6: Runoff Treatment

Runoff treatment will be provided for all pollution generating impervious surfaces (PGIS). See Section 4.4 for treatment information.

2.7 MR 7: Flow Control

The project proposes to infiltrate all stormwater onsite through the use of underground gravel infiltration trenches. This is sufficient for flow control requirements. Refer to Section 4.3 for flow control facility information. In accordance with City of Puyallup requirements, all proposed concrete sidewalks within the right-of-way shall be permeable concrete.

2.8 MR 8: Wetlands Protection

To our knowledge, no wetlands are located on or immediately downstream of the site.

2.9 MR 9: Operations and Maintenance

An Operations and Maintenance Manual will be provided with the final SSP.

3.0 Offsite Analysis

The project proposes to infiltrate all stormwater onsite. No changes to the downstream stormwater network are proposed.

4.0 Permanent Stormwater Control Plan

4.1 Existing Site Hydrology

The only existing drainage improvements on the site are a manhole and pipes that act as a junction from 5th Avenue NE to 2nd Street NE. This line will need to be protected during the development of the project.

In the existing condition, the site groundcover mainly consists of lawn. The site is several feet lower than the adjacent roads and slopes gently to the southeast. It is assumed that runoff is infiltrated onsite or runs off toward the adjacent property to the east.

4.2 Developed Site Hydrology

In the developed condition, all runoff will be collected in the onsite storm network and infiltrated in the gravel infiltration trench. The Western Washington Hydrology Model (WWHM) was used to size the facilities.

4.3 Flow Control System

A gravel infiltration trench is proposed to infiltrate all stormwater from the developed project. The project will infiltrate 100% of the influent WWHM runoff file. Refer to Appendix B-1 for preliminary facility sizing calculations.

4.4 Water Quality System

For sites within one-quarter mile of the Puyallup River, Enhanced Treatment of stormwater is required. Although the site is located exactly one-quarter mile from the river measured in a straight line, after reviewing GIS contours of the area, AHBL believes that the direction of groundwater flow is likely to the northwest. This results in a flow length to the river of more than one-quarter mile, and therefore Basic Treatment is proposed.

The project proposes to meet treatment requirements by implementing a proprietary filter unit with DOE General Use Level Designation (GULD) approval for Basic Treatment. All runoff from the site will be treated by these facilities. The filter unit will have a built-in, high-flow bypass.

Any drainage from the covered parking area will drain directly to an oil/water separator and then to the sanitary sewer system in 5th Avenue NE.

The Western Washington Hydrology Model (WWHM) was used to determine the required treatment flow rate. Refer to Appendix B-1 for preliminary sizing calculations.

4.5 Conveyance System Analysis and Design

The project will include pipes and catch basins to convey stormwater to the treatment units and then to the flow control facility. A conveyance analysis will be provided with the final SSP and final civil plans to prove that the storm network is adequately sized to convey the 25-year storm event without overtopping, per City of Puyallup requirements.

5.0 Construction Stormwater Pollution Prevention Plan

A Construction Stormwater Pollution Prevention Plan (CSWPPP) will be provided with the final SSP and final civil plans.

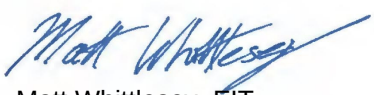
6.0 Special Reports and Studies

A Geotechnical Engineering Report dated August 8, 2019, and a Groundwater Monitoring Report dated April 30, 2020, by South Sound Geotechnical Consulting are included in Appendix C.

7.0 Conclusion

This analysis is based on data and records either supplied to, or obtained by, AHBL. These documents are referenced within the text of the analysis. The analysis has been prepared using procedures and practices within the standard accepted practices of the industry. We conclude that this project, as proposed, will not create any new problems within the existing downstream drainage system. This project will not noticeably aggravate any existing downstream problems due to either water quality or quantity.

AHBL, Inc.



Matt Whittlesey, EIT
Project Engineer

MW\lsk

June 2020
Revised January 2021
Revised October 2021

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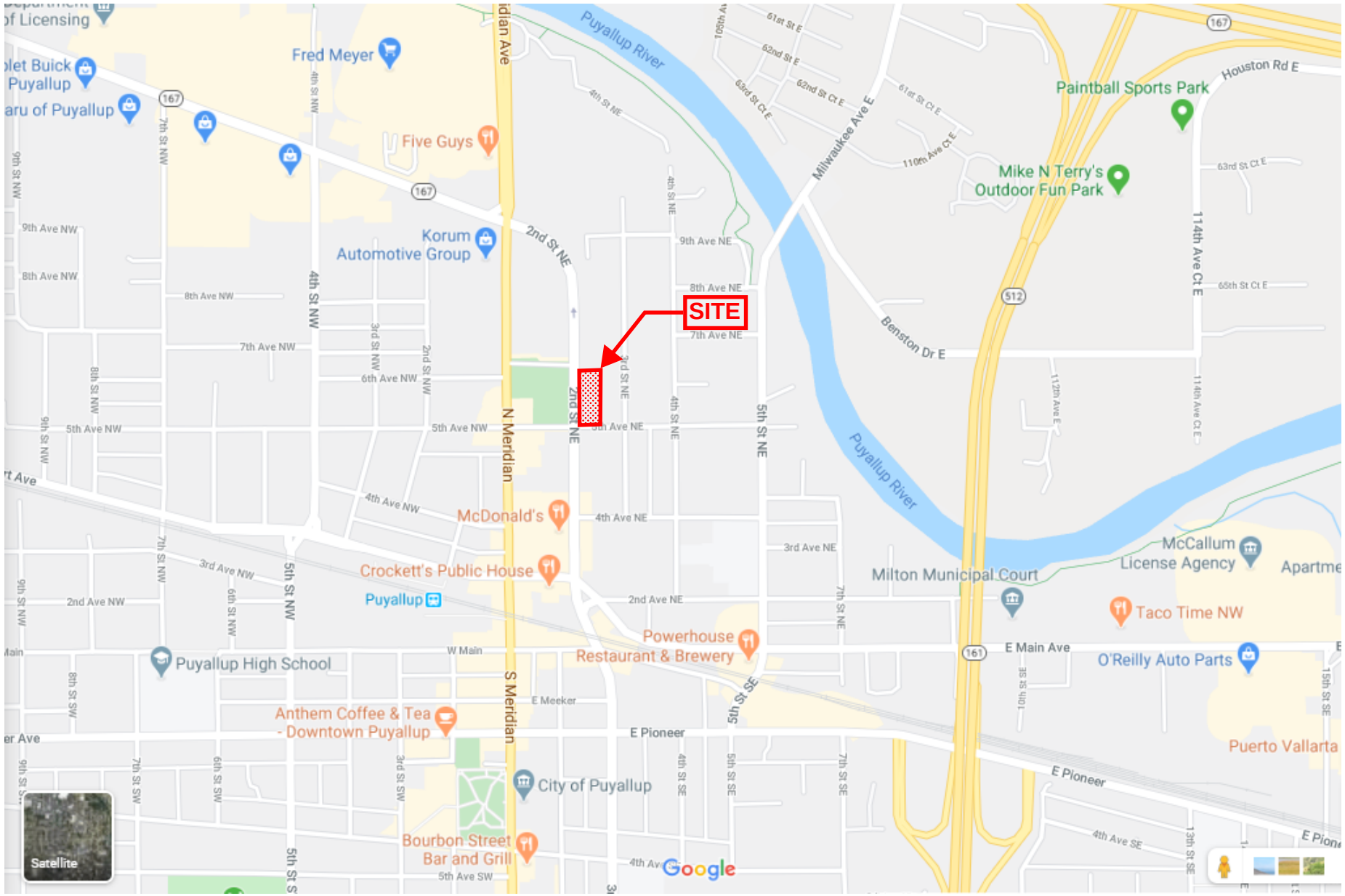
Appendix A

Exhibits



AHBL
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX

PUYALLUP 2ND STREET APARTMENTS
2190606.10

VICINITY MAP

EXHIBIT A-1

SPP MANUFACTURING-PUYALLUP SURVEY

A PORTION OF THE NW 1/4 OF THE NW 1/4 OF SEC. 27, TWN. 20 N., RGE. 04 E. W.M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON.

LEGAL DESCRIPTION

(PER OLD REPUBLIC TITLE, LTD., ORDER NUMBER 5217024093–CB, EFFECTIVE DATE MAY 23, 2018, AT 8:00 A.M.):

PARCEL A:

THAT PORTION OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 27, TOWNSHIP 20 NORTH, RANGE 4 EAST, W.M., DESCRIBED AS FOLLOWS:

BEGINNING ON THE EAST BOUNDARY OF 2ND STREET N.E. IN THE CITY OF PUYALLUP, 149.78 FEET NORTH OF THE SOUTHWEST CORNER OF BLOCK 4, SHUMAN'S ADDITION TO PUYALLUP, PIERCE COUNTY, WASHINGTON, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 5 OF PLATS, PAGE 99, RECORDS OF PIERCE COUNTY, WASHINGTON;

THENCE CONTINUE NORTH ON SAID BOUNDARY, 130.22 FEET;
THENCE EAST PARALLEL WITH THE SOUTH LINE OF SAID BLOCK 4, 120 FEET;
THENCE SOUTH PARALLEL WITH SAID EAST BOUNDARY OF 2ND STREET N.E., 130.22 FEET TO THE NORTH LINE OF SAID BLOCK 4;
THENCE WEST 120 FEET TO THE POINT OF BEGINNING.

PARCEL B:

LOTS 1, 2 AND 3, BLOCK 4, SHUMAN'S SECOND ADDITION TO PUYALLUP, PIERCE COUNTY, WASHINGTON, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 5 OF PLATS, PAGE 99, RECORDS OF PIERCE COUNTY, WASHINGTON.

BOTH SITUATE IN THE COUNTY OF PIERCE, STATE OF WASHINGTON.

VERTICAL DATUM

NAVD 1988 VERTICAL DATUM ON ORTHOMETRICALLY CORRECTED GPS OBSERVATION USING WSRN AND GEOID 2012A.

BASIS OF BEARING

NAD 1983
WASHINGTON STATE PLANE SOUTH PROJECTION, BASED ON GPS OBSERVATIONS USING WSRN AND GEOID 2012A. UNITS OF MEASUREMENT ARE US SURVEY FEET.

UTILITY NOTES

1. SURFACE UTILITY FACILITIES ARE SHOWN HEREON PER FIELD LOCATED VISIBLE EVIDENCE. THERE MAY BE UTILITIES THAT EXIST ON THIS SITE OTHER THAN THOSE GRAPHICALLY DEPICTED HEREON.

2. UNDERGROUND (BURIED) UTILITIES SHOWN HEREON ARE BASED ON COMBINATIONS OF VISIBLE SURFACE EVIDENCE, UTILITY LOCATOR MARKINGS AND RECORD DATA (SUCH AS AS–BUILT OR UTILITY DESIGN DRAWINGS). ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND, IN SOME CASES, ARE SHOWN AS STRAIGHT LINES BETWEEN FIELD LOCATED SURFACE UTILITY FACILITIES. UNDERGROUND UTILITIES MAY HAVE BENDS, CURVES OR CONNECTIONS WHICH ARE NOT SHOWN.

3. ALTHOUGH LOCATIONS OF UNDERGROUND UTILITIES BASED ON UTILITY LOCATOR MARKINGS AND RECORD DATA (SUCH AS AS–BUILT OR UTILITY DESIGN DRAWINGS) ARE DEEMED RELIABLE, AHBL, INC. ASSUMES NO LIABILITY FOR THE ACCURACY OF SAID DATA.

4. CALL 1–800–424–5555 BEFORE ANY CONSTRUCTION.

RELIANCE NOTE

THIS SURVEY WAS PREPARED AT THE REQUEST OF DON HUBER FOR THE SOLE AND EXCLUSIVE USE OF SPP MANUFACTURING. RIGHTS TO RELY UPON AND, OR USE THIS SURVEY DO NOT EXTEND TO ANY OTHER PARTY EXCEPT THROUGH EXPRESS RECERTIFICATION BY THE PROFESSIONAL LAND SURVEYOR WHOSE STAMP AND SIGNATURE APPEAR HEREON.

EQUIPMENT USED

3" TOTAL STATION UTILIZING STANDARD FIELD TRAVERSE METHODS FOR CONTROL AND STAKING.

SURVEYOR'S CERTIFICATE

I, DAVID C. FOLLANSBEE, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF WASHINGTON, HEREBY CERTIFY THAT THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECT SUPERVISION IN JULY 2018 IN COMPLIANCE WITH THE REQUIREMENTS OF THE SURVEY RECORDING ACT, CHAPTER 58.09 R.C.W. AND 332–130 W.A.C., AT THE REQUEST OF THE SPP MANUFACTURING.

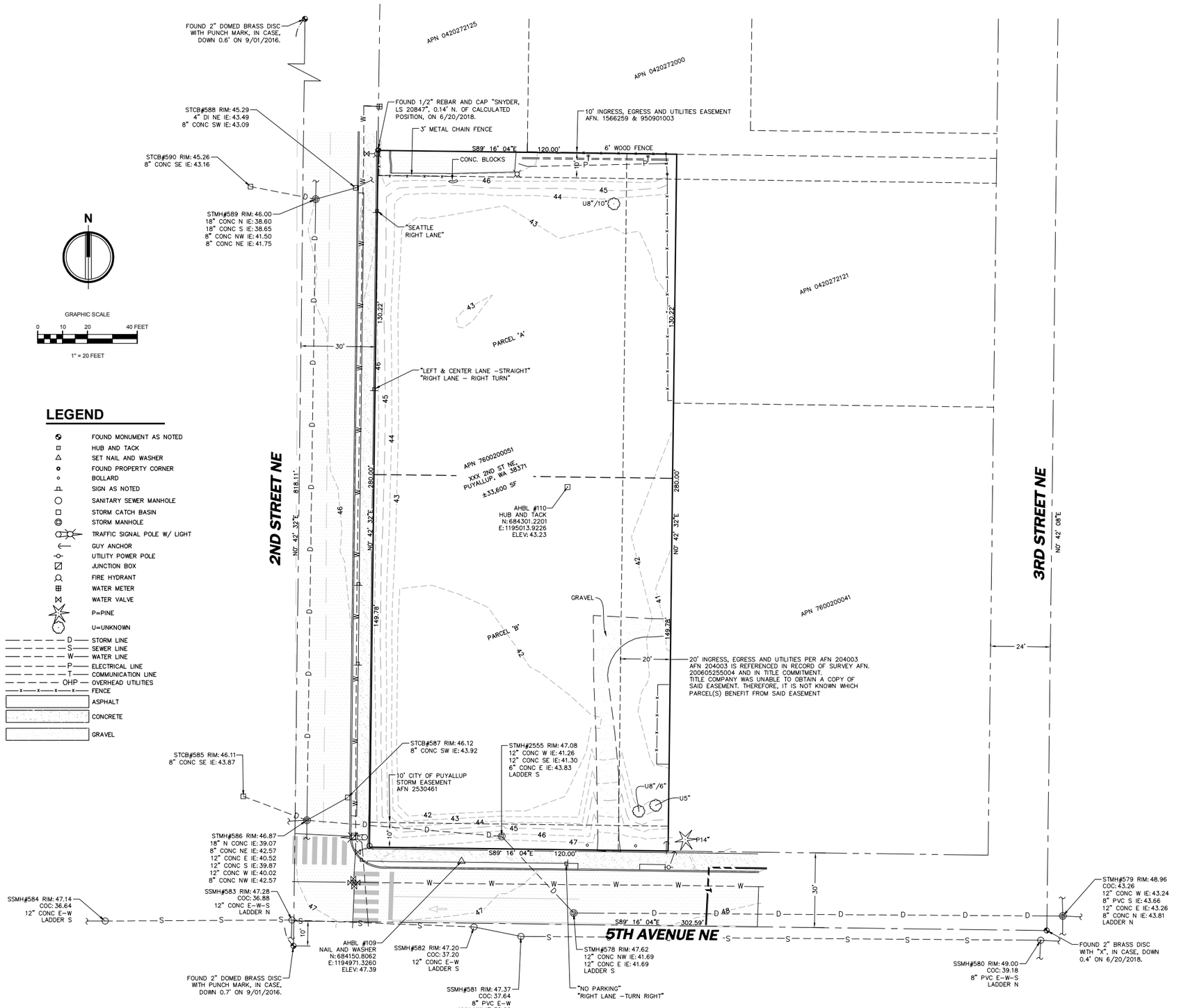
DAVID C. FOLLANSBEE, PLS 45161 DATE

N

GRAPHIC SCALE
0 10 20 40 FEET
1" = 20 FEET

LEGEND

- FOUND MONUMENT AS NOTED
- HUB AND TACK
- SET NAIL AND WASHER
- FOUND PROPERTY CORNER
- BOLLARD
- SIGN AS NOTED
- SANITARY SEWER MANHOLE
- STORM CATCH BASIN
- STORM MANHOLE
- TRAFFIC SIGNAL POLE W/ LIGHT
- GUY ANCHOR
- UTILITY POWER POLE
- JUNCTION BOX
- FIRE HYDRANT
- WATER METER
- WATER VALVE
- P=PINE
- U=UNKNOWN
- D — STORM LINE
- S — SEWER LINE
- W — WATER LINE
- P — ELECTRICAL LINE
- T — COMMUNICATION LINE
- OHP — OVERHEAD UTILITIES
- FENCE
- ASPHALT
- CONCRETE
- GRAVEL



AHBL
TACOMA · SEATTLE · SPOKANE · TRI-CITIES

2215 North 30th Street, Suite 300 Tacoma, WA 98403
253.383.2422 TEL 253.383.2572 FAX www.ahbl.com WEB

Project Title:

SPP MANUFACTURING PUYALLUP SURVEY

Client:
SPP MANUFACTURING

PO BOX 64160
TACOMA, WA 98464

DON HUBER

Job No.
2180463.52

Issue Set & Date:

JULY 24, 2018

DAVID C FOLLANSBEE STATE OF WASHINGTON 45161 REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY

4 _____
3 _____
2 _____
1 _____
Revisions:

Sheet Title:

TOPOGRAPHIC SURVEY

Designed by:	Drawn by:	Checked by:
	AWM	DF

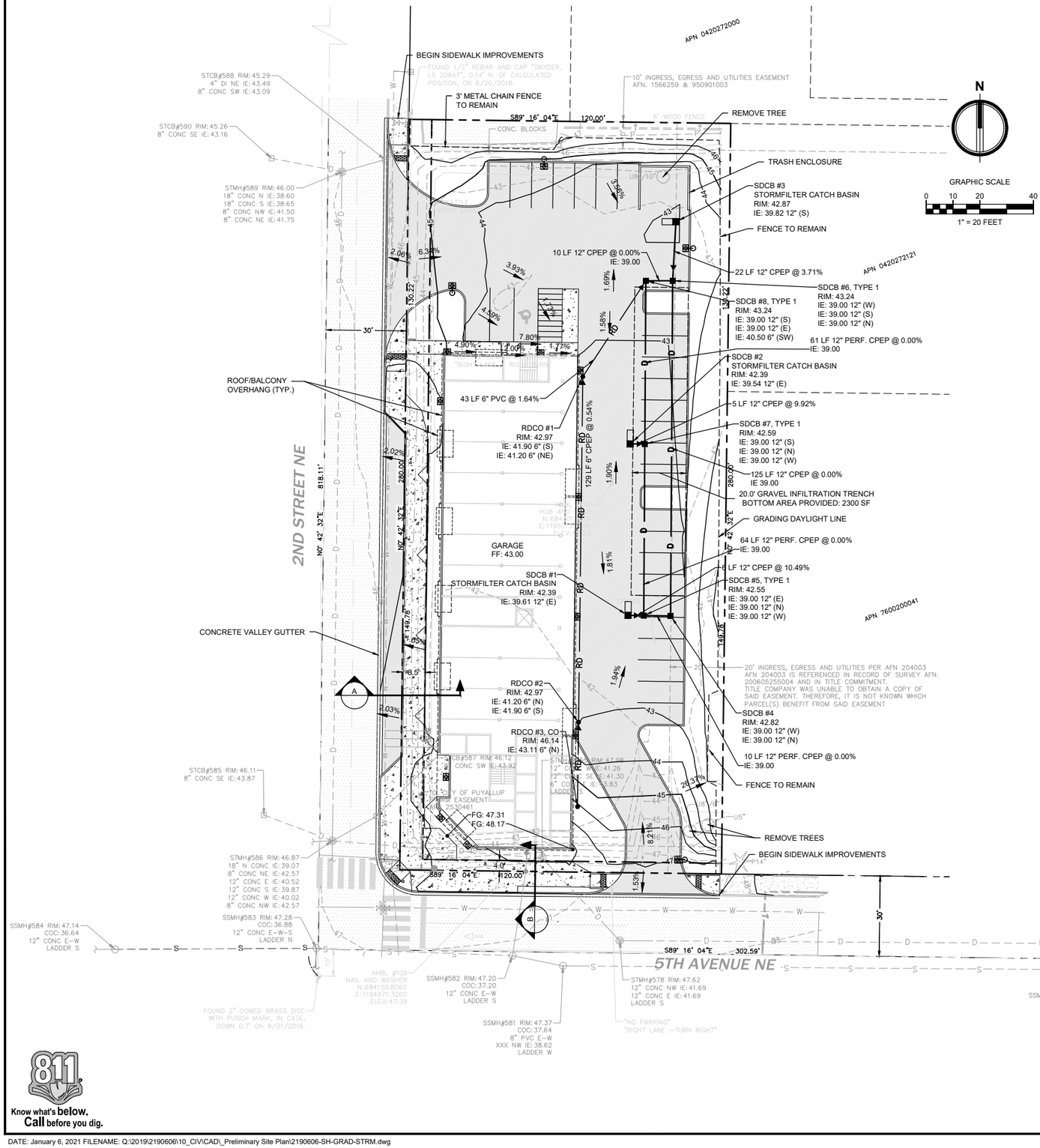
Sheet No.

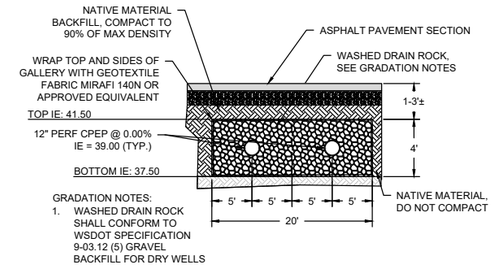
1

1 of 1 Sheets

PUYALLUP 2ND STREET APARTMENTS

A PORTION OF THE NW 1/4 OF THE NW 1/4 OF SEC. 27, TWN. 20 N., RGE. 04 E. W.M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON.



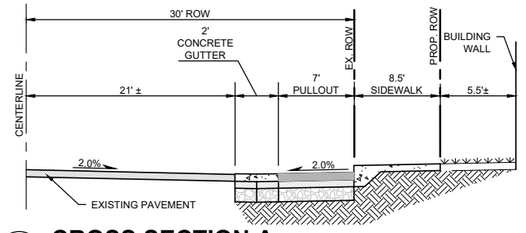


GRADATION NOTES:
1. WASHED DRAIN ROCK SHALL CONFORM TO WSDOT SPECIFICATION 9-03.12 (5) GRAVEL BACKFILL FOR DRY WELLS

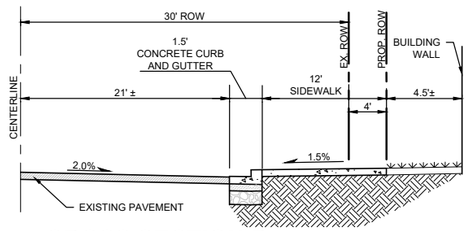
PROTECTION:
EXCAVATE INFILTRATION TRENCHES TO FINAL GRADE ONLY AFTER ALL DISTURBED AREAS IN THE UPGRADIENT PROJECT DRAINAGE AREA HAVE BEEN PERMANENTLY STABILIZED. THE SIDEWALLS AND BOTTOM OF THE INFILTRATION FACILITY EXCAVATION SHALL BE RAKED OR SCARIFIED TO A MINIMUM DEPTH OF 3 INCHES AFTER FINAL EXCAVATION TO RESTORE INFILTRATION RATES.

VERIFICATION:
PRIOR TO BACKFILL OF INFILTRATION TRENCH WITH GRAVEL, CONTRACTOR SHALL COORDINATE INFILTRATION VERIFICATION TESTING WITH GEOTECHNICAL ENGINEER. INFILTRATION VERIFICATION REPORT SHALL BE PROVIDED TO ENGINEER AND CITY OF PUYALLUP. VERIFICATION TESTING FOR INFILTRATION TRENCH SHALL CONSIST OF A MINIMUM OF 1 MODIFIED FALLING-HEAD PERCOLATION TEST. TESTING SHALL BE IN ACCORDANCE WITH ECOLOGY STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON.

INFILTRATION TRENCH DETAIL
NOT TO SCALE



A CROSS SECTION A
NOT TO SCALE



B CROSS SECTION B
NOT TO SCALE

EARTHWORK QUANTITIES

CUT = 300 CUBIC YARDS
FILL = 1,300 CUBIC YARDS
NET = 1,000 CUBIC YARDS (IMPORT)

NOTES:
1. THE ABOVE QUANTITIES ARE ESTIMATES ONLY INTENDED FOR THE PERMITTING PROCESS. DO NOT USE FOR BID PURPOSES. THE QUANTITIES DO NOT HAVE STRIPPING, COMPACTION, OR CUT OR FILL ADJUSTMENT FACTORS APPLIED TO THEM, NOR DO THEY ACCOUNT FOR PAVEMENT, SIDEWALK OR BUILDING SECTIONS.

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

DATE: January 6, 2021 FILENAME: Q:\2019\2190606\10_CIV\CAD_Preliminary Site Plan\2190606-SH-GRAD-STRM.dwg

AHBL
TACOMA • SEATTLE • SPOKANE • TRI-CITIES
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PUYALLUP 2ND STREET APARTMENTS

Client:
SPP MANUFACTURING

P.O.BOX 64160
TACOMA, WA 98464

DON HUBER

Project No.
2190606.10

Issue Set & Date:

PRELIMINARY SITE PLAN
1/6/2020

J. MATTHEW WEBER — STATE OF WASHINGTON — 34858 — REGISTERED PROFESSIONAL ENGINEER

4
3
2
1
Revisions:

Sheet Title:

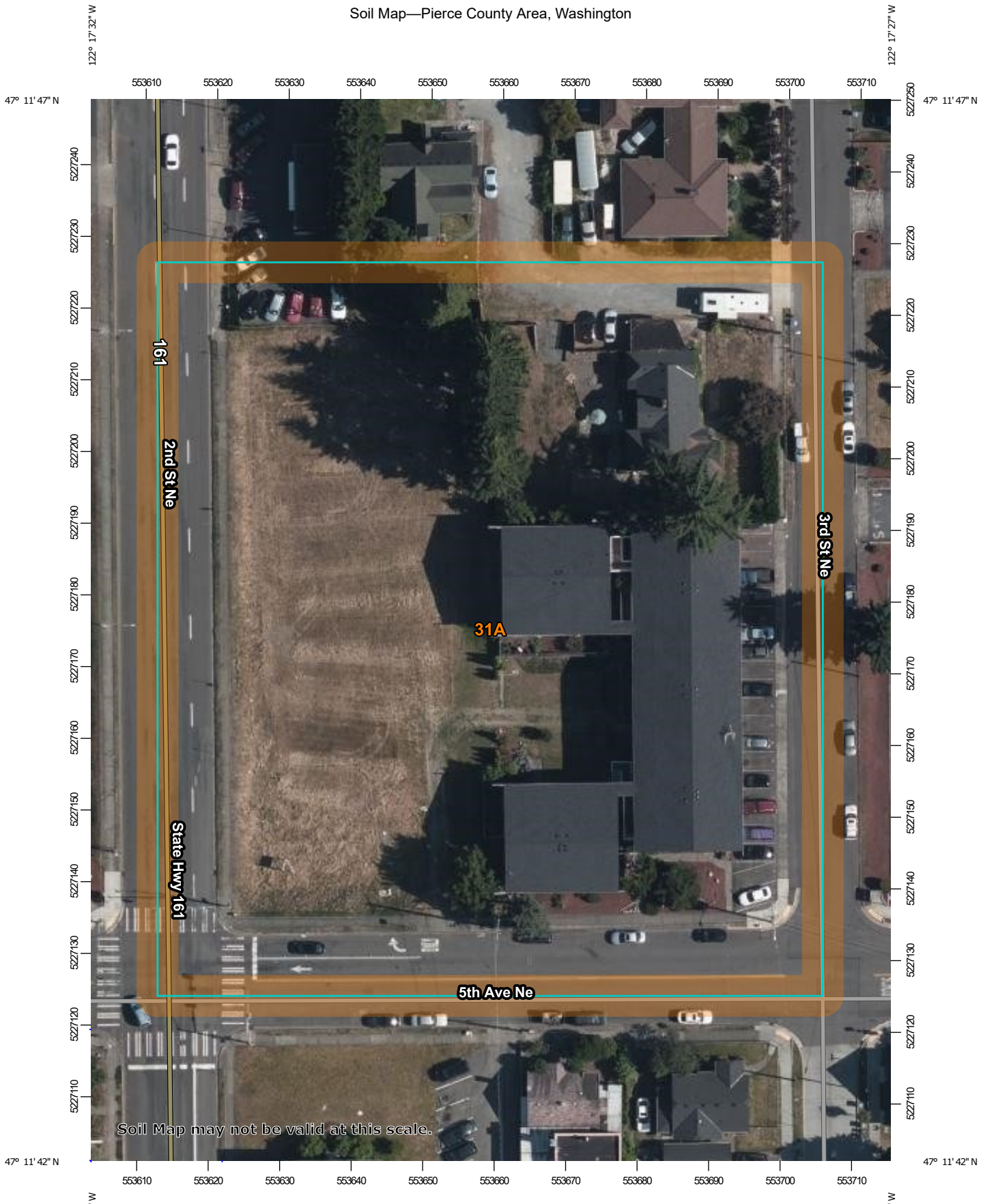
PRELIMINARY GRADING AND DRAINAGE PLAN

Designed by:	Drawn by:	Checked by:
MW	MW	BB

Sheet No.

SPR2

1 of 2 Sheets



Map Scale: 1:721 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

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 15, Sep 16, 2019

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

Date(s) aerial images were photographed: Jul 29, 2018—Jul 22, 2019

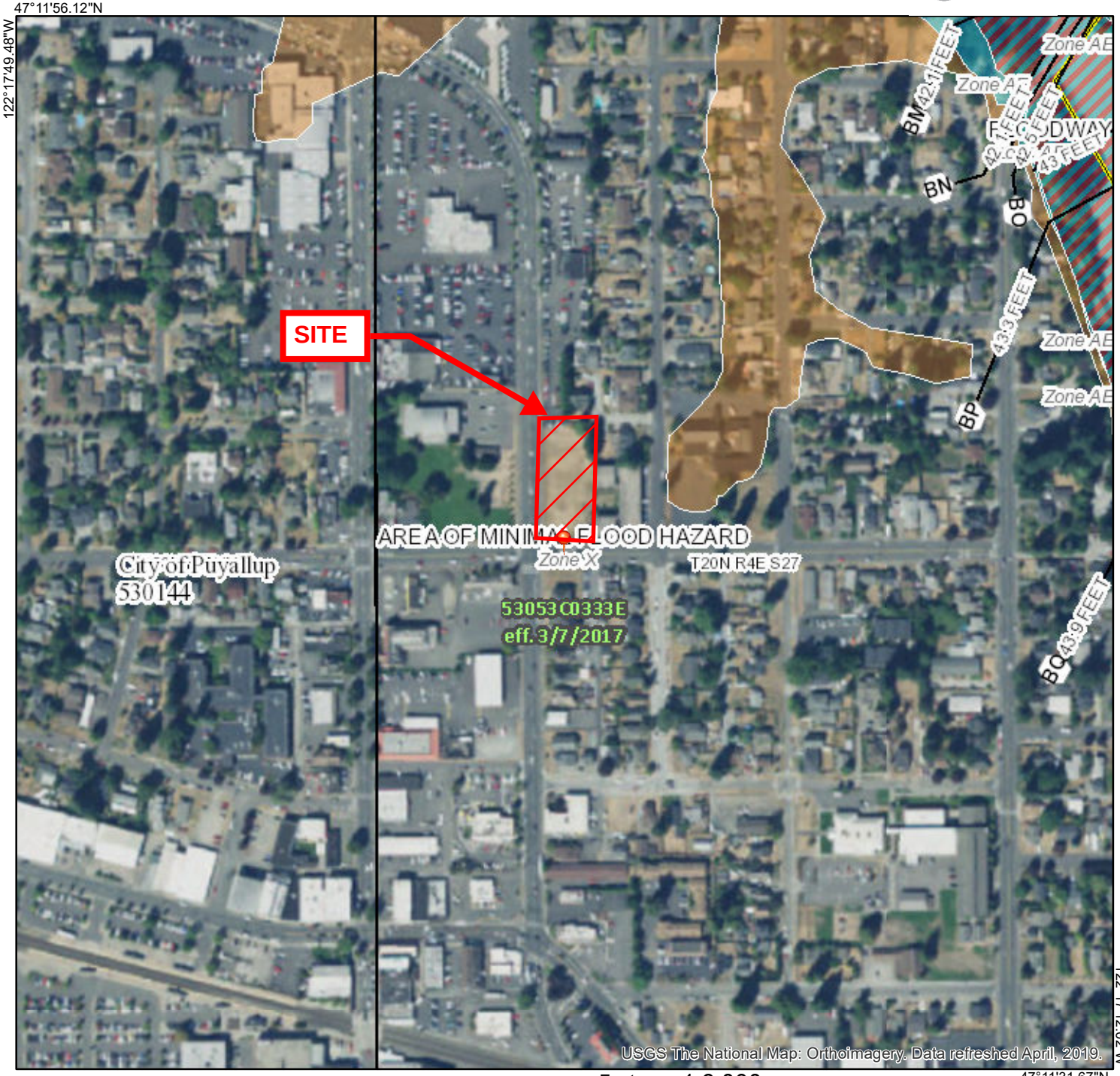
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
31A	Puyallup fine sandy loam	2.4	100.0%
Totals for Area of Interest		**2.4**	**100.0%**

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

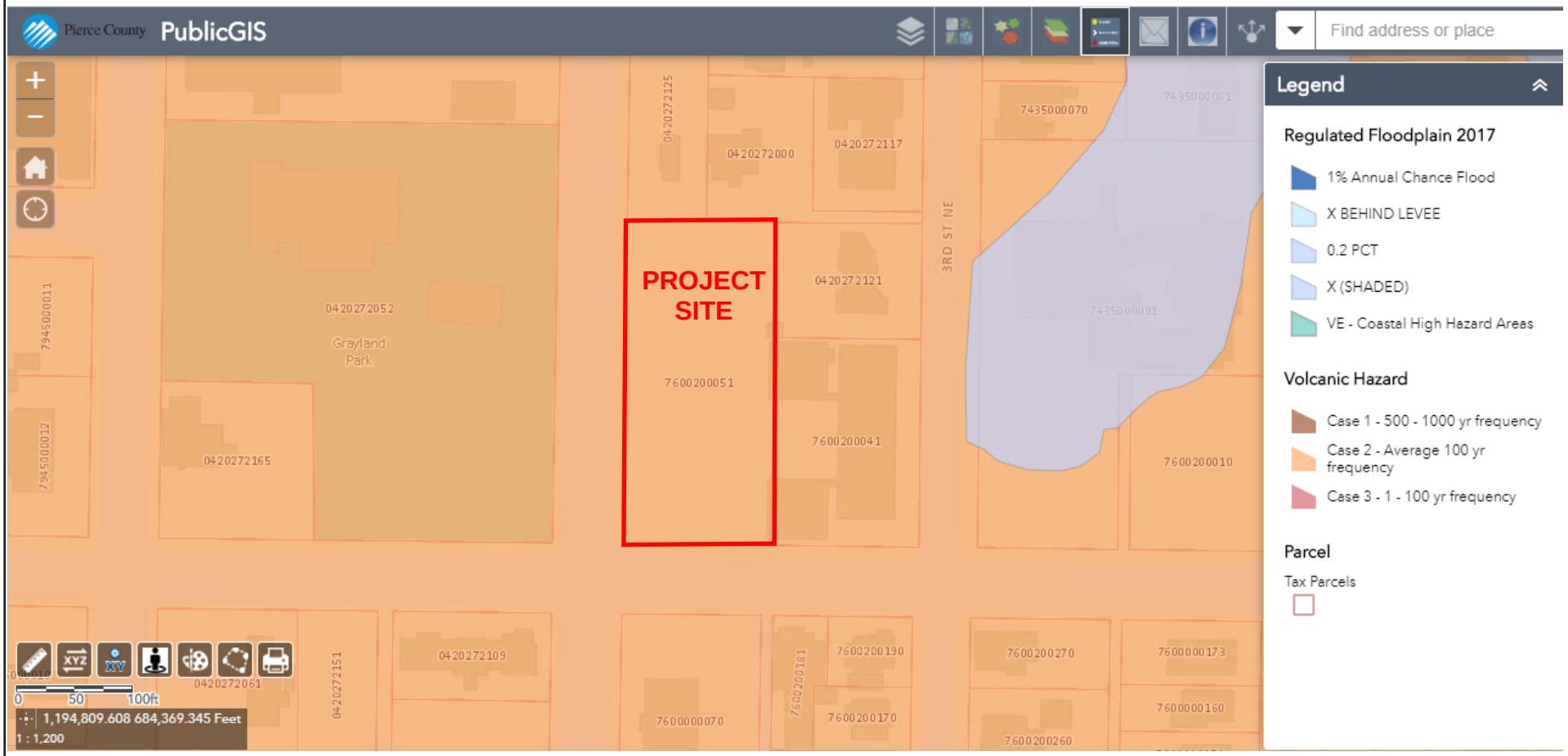
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/19/2020 at 1:12:59 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



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2215 North 30th Street
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Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX

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CRITICAL AREAS MAP

EXHIBIT A-6

Appendix A-7
Flowchart for Determining Minimum Requirements for New Development from the city's NPDES Phase II permit

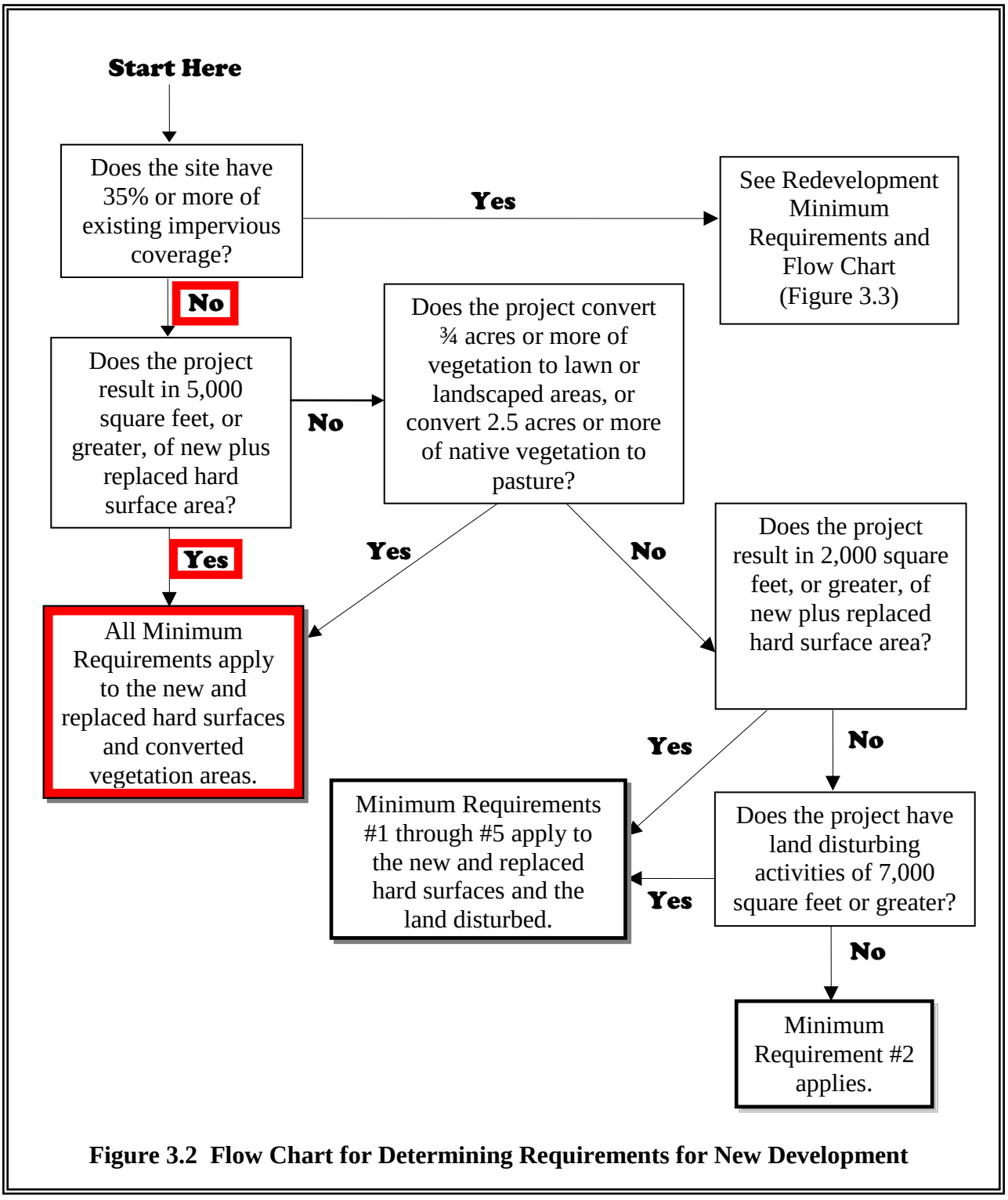
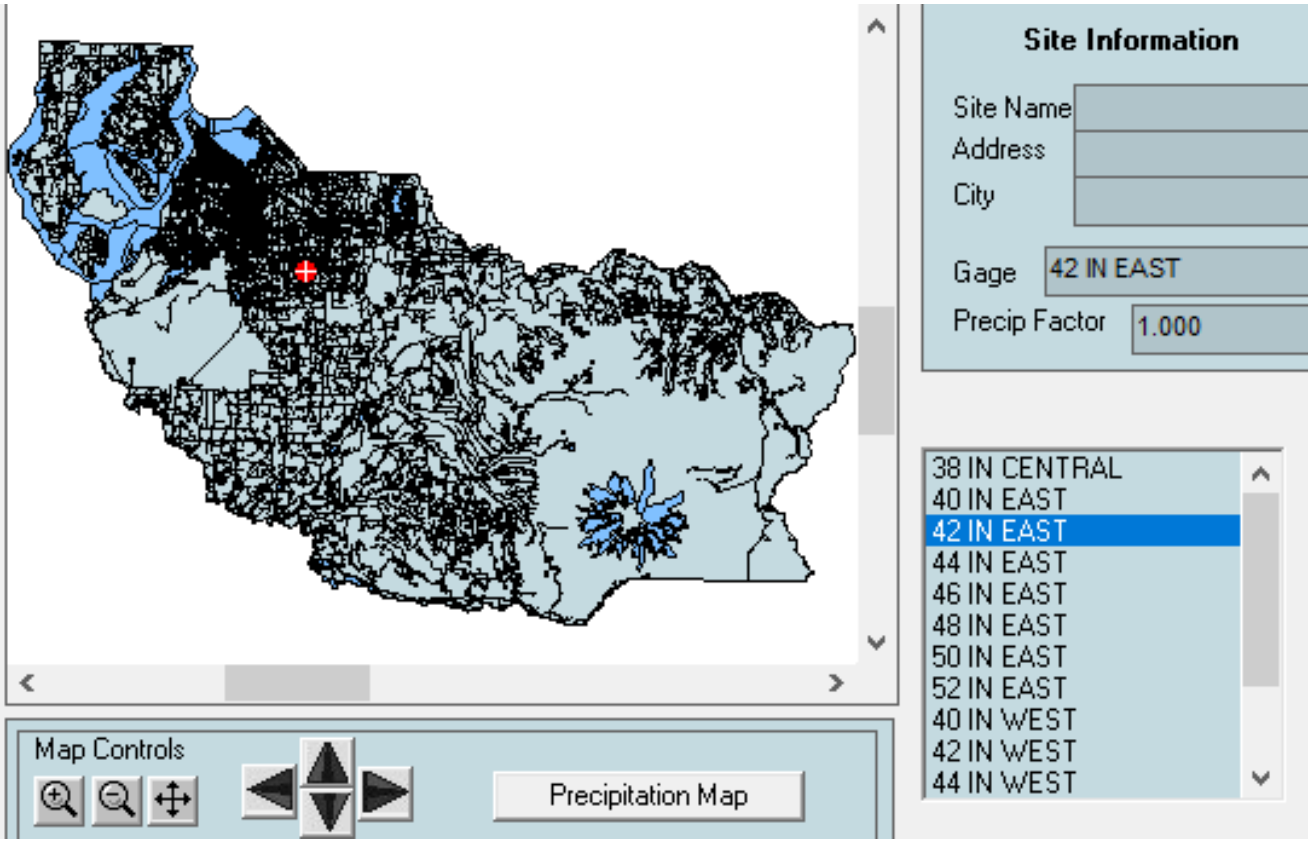


Figure 3.2 Flow Chart for Determining Requirements for New Development

Appendix B

Exhibits

WATER QUALITY



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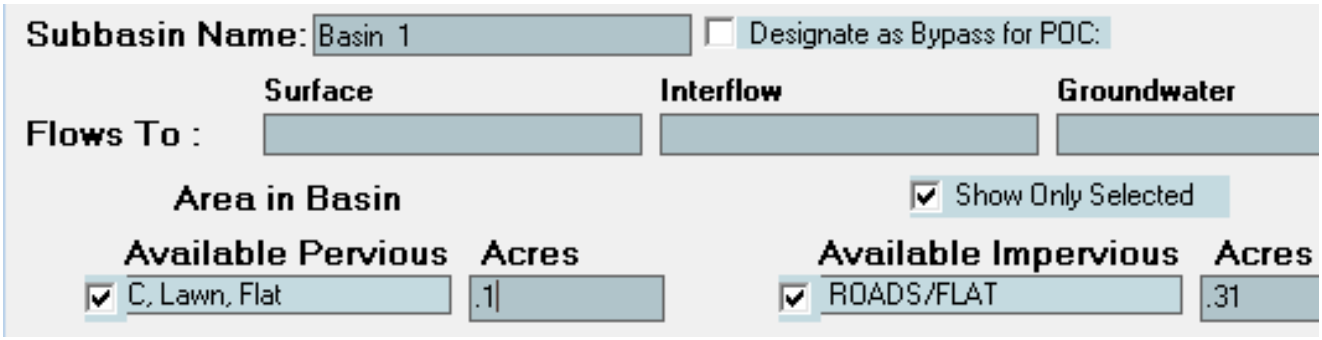
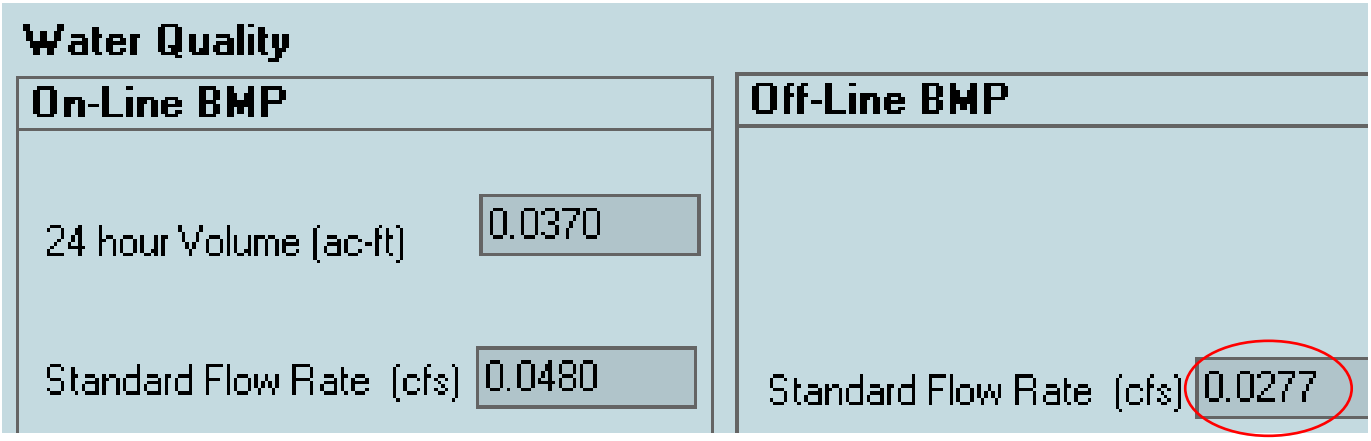
WATER QUALITY & QUANTITY FACILITY CALCULATIONS

EXHIBIT B-1

WATER QUALITY

NOTE: THE TREATMENT SYSTEM CONSISTS OF THREE CONTECH STORMFILTER CATCH BASINS. FOR THIS PRELIMINARY SUBMITTAL, THE WATER QUALITY FLOW RATE FOR THE ENTIRE SITE BASIN WAS CALCULATED. IN THE FINAL ENGINEERING SUBMITTAL, THE CONTRIBUTING BASIN FOR EACH FILTER WILL BE CONSIDERED.

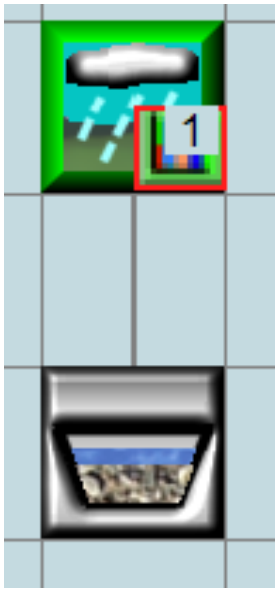





```
Flow Frequency
Flow(cfs)  0801 15m
2 Year   =    0.1185
5 Year   =    0.1605
10 Year  =    0.1913
25 Year  =    0.2337
50 Year  =    0.2680
100 Year =    0.3045
```

WQ FLOW RATE (OFFLINE): 0.0277 CFS
CARTRIDGE FLOW RATE: 11.25 GPM
CARTRIDGES REQUIRED: 1.64
CARTRIDGES PROVIDED: 3

WATER QUANTITY



Subbasin Name: Basin 1 ☐ Designate as Bypass for POC:

Flows To :	Surface	Interflow	Groundwater
	Gravel Trench Bed 1	Gravel Trench Bed 1	

Area in Basin ☑ Show Only Selected

Available Pervious	Acres	Available Impervious	Acres
☑ C, Lawn, Flat	.1	☑ ROADS/FLAT	.53

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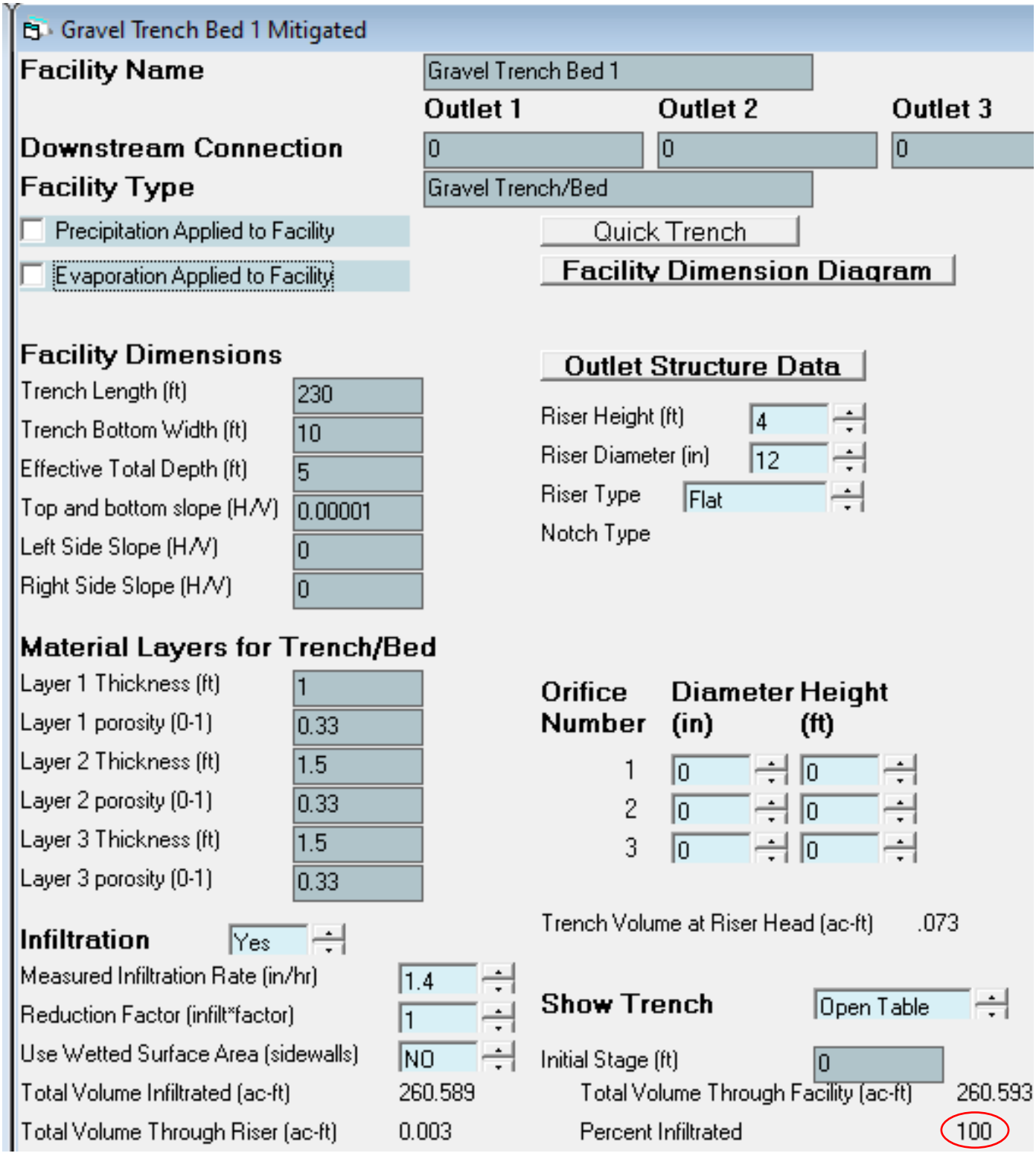
WATER QUANTITY



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WATER QUALITY & QUANTITY FACILITY CALCULATIONS

EXHIBIT B-1

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Infiltration Trench
Site Name:	
Site Address:	
City:	
Report Date:	1/7/2021
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	0.000 (adjusted)
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	0.1
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.53
Impervious Total	0
Basin Total	0

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 1	Gravel Trench Bed 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Gravel Trench Bed 1

Bottom Length:	230.00 ft.
Bottom Width:	10.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	1
Pour Space of material for first layer:	0.33
Material thickness of second layer:	1.5
Pour Space of material for second layer:	0.33
Material thickness of third layer:	1.5
Pour Space of material for third layer:	0.33
Infiltration On	
Infiltration rate:	1.4
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	260.589
Total Volume Through Riser (ac-ft.):	0.003
Total Volume Through Facility (ac-ft.):	0
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	4 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.052	0.000	0.000	0.000
0.0556	0.052	0.001	0.000	0.074
0.1111	0.052	0.001	0.000	0.074
0.1667	0.052	0.002	0.000	0.074
0.2222	0.052	0.003	0.000	0.074
0.2778	0.052	0.004	0.000	0.074
0.3333	0.052	0.005	0.000	0.074
0.3889	0.052	0.006	0.000	0.074
0.4444	0.052	0.007	0.000	0.074
0.5000	0.052	0.008	0.000	0.074
0.5556	0.052	0.009	0.000	0.074
0.6111	0.052	0.010	0.000	0.074
0.6667	0.052	0.011	0.000	0.074
0.7222	0.052	0.012	0.000	0.074
0.7778	0.052	0.013	0.000	0.074
0.8333	0.052	0.014	0.000	0.074
0.8889	0.052	0.015	0.000	0.074
0.9444	0.052	0.016	0.000	0.074
1.0000	0.052	0.017	0.000	0.074
1.0556	0.052	0.018	0.000	0.074
1.1111	0.052	0.019	0.000	0.074
1.1667	0.052	0.020	0.000	0.074
1.2222	0.052	0.021	0.000	0.074
1.2778	0.052	0.022	0.000	0.074

1.3333	0.052	0.023	0.000	0.074
1.3889	0.052	0.024	0.000	0.074
1.4444	0.052	0.025	0.000	0.074
1.5000	0.052	0.026	0.000	0.074
1.5556	0.052	0.027	0.000	0.074
1.6111	0.052	0.028	0.000	0.074
1.6667	0.052	0.029	0.000	0.074
1.7222	0.052	0.030	0.000	0.074
1.7778	0.052	0.031	0.000	0.074
1.8333	0.052	0.031	0.000	0.074
1.8889	0.052	0.032	0.000	0.074
1.9444	0.052	0.033	0.000	0.074
2.0000	0.052	0.034	0.000	0.074
2.0556	0.052	0.035	0.000	0.074
2.1111	0.052	0.036	0.000	0.074
2.1667	0.052	0.037	0.000	0.074
2.2222	0.052	0.038	0.000	0.074
2.2778	0.052	0.039	0.000	0.074
2.3333	0.052	0.040	0.000	0.074
2.3889	0.052	0.041	0.000	0.074
2.4444	0.052	0.042	0.000	0.074
2.5000	0.052	0.043	0.000	0.074
2.5556	0.052	0.044	0.000	0.074
2.6111	0.052	0.045	0.000	0.074
2.6667	0.052	0.046	0.000	0.074
2.7222	0.052	0.047	0.000	0.074
2.7778	0.052	0.048	0.000	0.074
2.8333	0.052	0.049	0.000	0.074
2.8889	0.052	0.050	0.000	0.074
2.9444	0.052	0.051	0.000	0.074
3.0000	0.052	0.052	0.000	0.074
3.0556	0.052	0.053	0.000	0.074
3.1111	0.052	0.054	0.000	0.074
3.1667	0.052	0.055	0.000	0.074
3.2222	0.052	0.056	0.000	0.074
3.2778	0.052	0.057	0.000	0.074
3.3333	0.052	0.058	0.000	0.074
3.3889	0.052	0.059	0.000	0.074
3.4444	0.052	0.060	0.000	0.074
3.5000	0.052	0.061	0.000	0.074
3.5556	0.052	0.062	0.000	0.074
3.6111	0.052	0.062	0.000	0.074
3.6667	0.052	0.063	0.000	0.074
3.7222	0.052	0.064	0.000	0.074
3.7778	0.052	0.065	0.000	0.074
3.8333	0.052	0.066	0.000	0.074
3.8889	0.052	0.067	0.000	0.074
3.9444	0.052	0.068	0.000	0.074
4.0000	0.052	0.069	0.000	0.074
4.0556	0.052	0.072	0.138	0.074
4.1111	0.052	0.075	0.389	0.074
4.1667	0.052	0.078	0.703	0.074
4.2222	0.052	0.081	1.046	0.074
4.2778	0.052	0.084	1.383	0.074
4.3333	0.052	0.087	1.683	0.074
4.3889	0.052	0.090	1.921	0.074
4.4444	0.052	0.093	2.088	0.074
4.5000	0.052	0.096	2.203	0.074

4.5556	0.052	0.099	2.347	0.074
4.6111	0.052	0.102	2.462	0.074
4.6667	0.052	0.104	2.571	0.074
4.7222	0.052	0.107	2.676	0.074
4.7778	0.052	0.110	2.777	0.074
4.8333	0.052	0.113	2.875	0.074
4.8889	0.052	0.116	2.969	0.074
4.9444	0.052	0.119	3.060	0.074
5.0000	0.052	0.122	3.149	0.074

Analysis Results

POC 1

POC #1 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

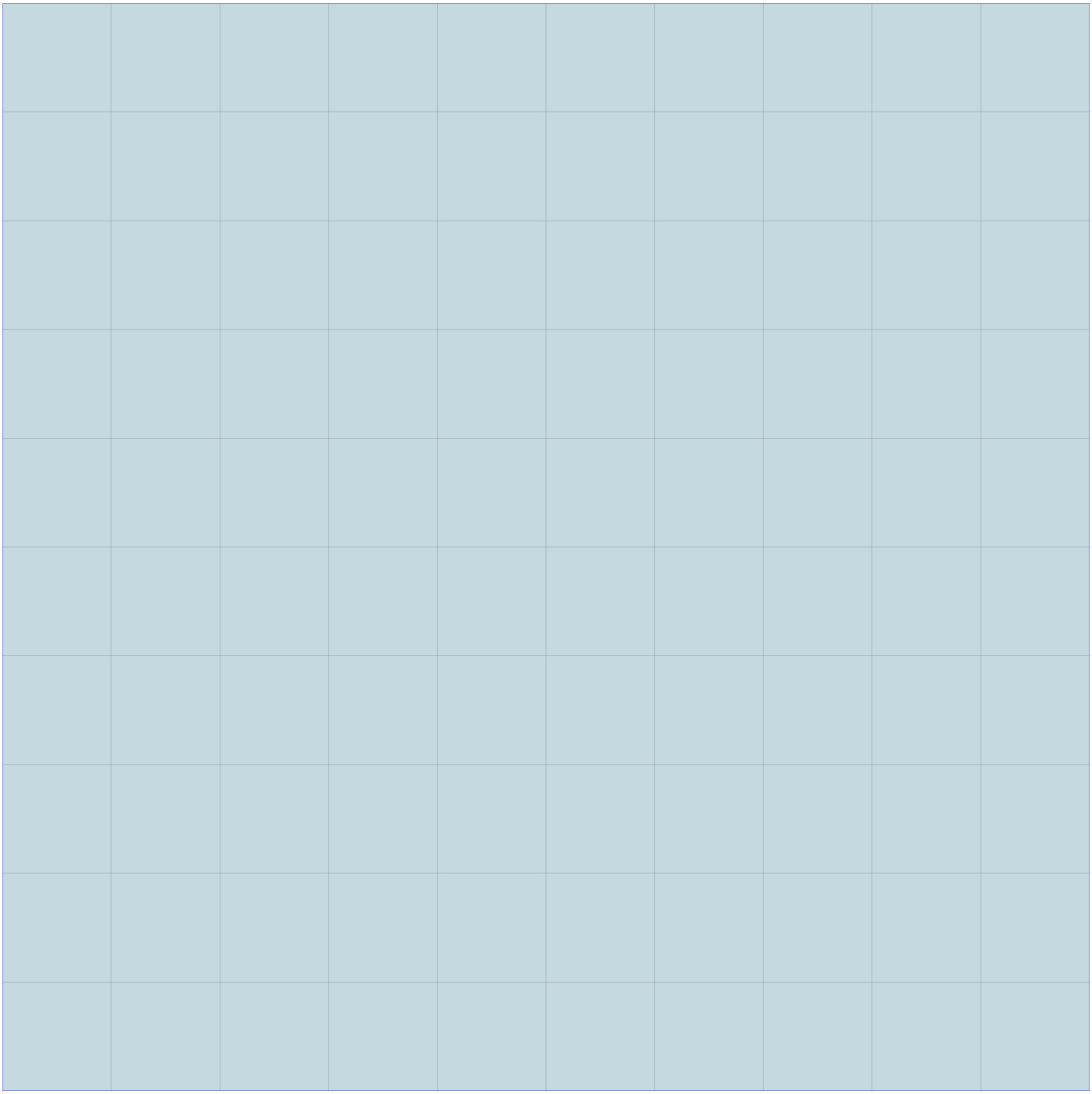
PERLND Changes

No PERLND changes have been made.

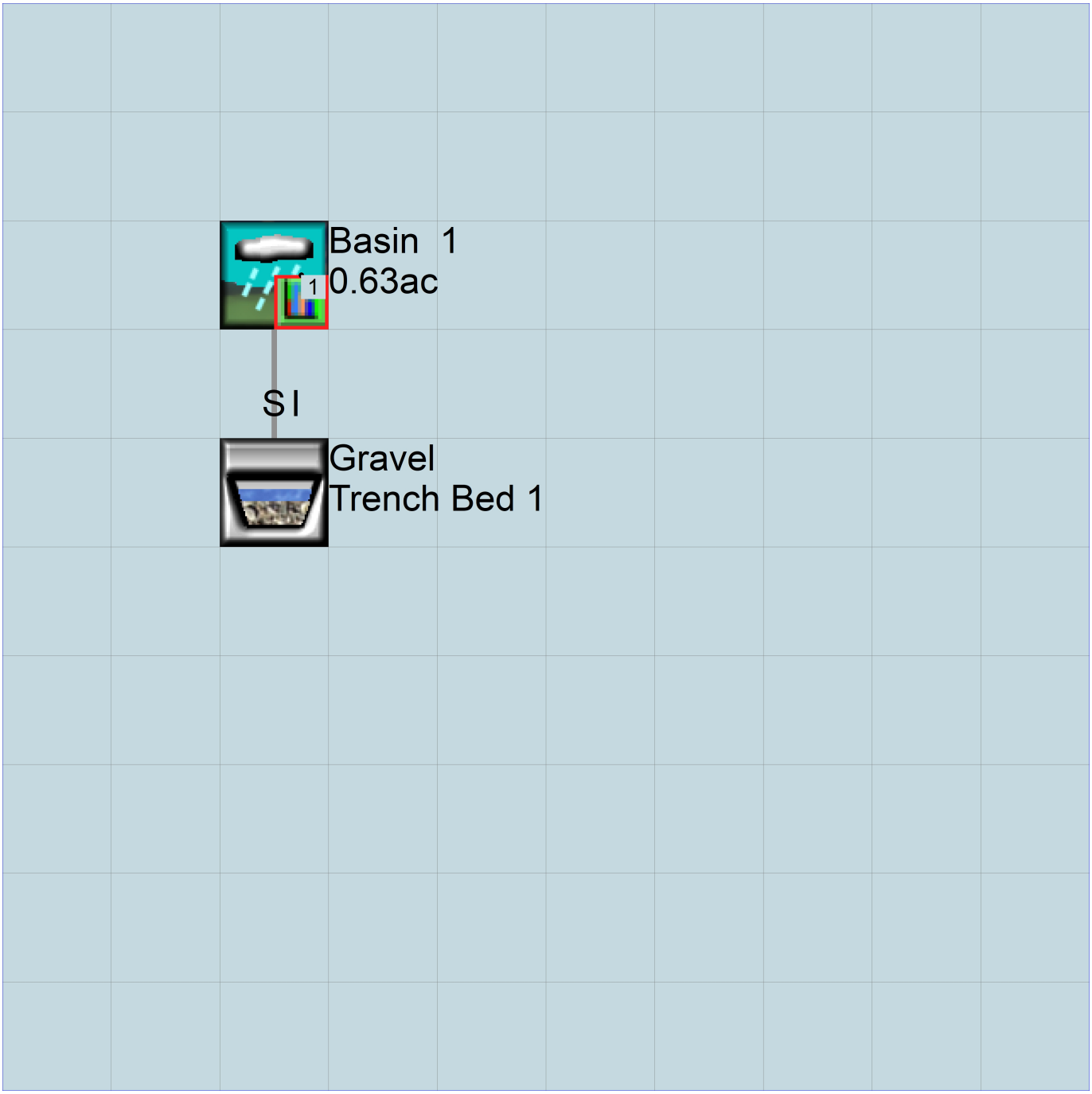
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

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   Infiltration Trench.wdm
MESSU       25   MitInfiltration Trench.MES
            27   MitInfiltration Trench.L61
            28   MitInfiltration Trench.L62
            30   POCInfiltration Trench1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      16
      IMPLND       1
      RCHRES       1
      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           ***
   16     C, Lawn, Flat           1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

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

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

```
  END PRINT-INFO

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

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

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

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   16             0         0         0         0       2.5         1         0
  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***
PERLND  16                        0.1     RCHRES   1      2
PERLND  16                        0.1     RCHRES   1      3
IMPLND   1                       0.53     RCHRES   1      5
Basin  1***
PERLND  16                        0.1     COPY   501     12
PERLND  16                        0.1     COPY   501     13
IMPLND   1                       0.53     COPY   501     15

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

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                       in  out                              ***
    1     Gravel Trench Be-004    2    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  5  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      0.04       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  5.0  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
   92    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.052801  0.000000  0.000000  0.000000
  0.055556  0.052801  0.000968  0.000000  0.074537
  0.111111  0.052801  0.001936  0.000000  0.074537
  0.166667  0.052801  0.002904  0.000000  0.074537
  0.222222  0.052801  0.003872  0.000000  0.074537
  0.277778  0.052801  0.004840  0.000000  0.074537
  0.333333  0.052801  0.005808  0.000000  0.074537
  0.388889  0.052801  0.006776  0.000000  0.074537
  0.444444  0.052801  0.007744  0.000000  0.074537
  0.500000  0.052801  0.008712  0.000000  0.074537
  0.555556  0.052801  0.009680  0.000000  0.074537
  0.611111  0.052801  0.010648  0.000000  0.074537
  0.666667  0.052801  0.011616  0.000000  0.074537
  0.722222  0.052801  0.012584  0.000000  0.074537
  0.777778  0.052801  0.013552  0.000000  0.074537
  0.833333  0.052801  0.014520  0.000000  0.074537
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END FTABLES

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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
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<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
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COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

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  END MASS-LINK    2

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

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

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
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PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

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


END MASS-LINK

END RUN
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Predeveloped HSPF Message File

Mitigated HSPF Message File

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Appendix C

Geotechnical Engineering Report

Groundwater Monitoring Report

South Sound Geotechnical Consulting

August 8, 2019

Doec, LLC
11192 – 25th Avenue East
Tacoma, Washington 98445

Attention: Mr. Don Huber

Subject: Geotechnical Engineering Report
2nd Street NE Apartments
Puyallup, Washington
SSGC Project No. 19055

Mr. Huber,

South Sound Geotechnical Consulting (SSGC) has prepared this geotechnical engineering report regarding the planned apartment development on 2nd Street NE at 5th Avenue NE in Puyallup, Washington. Our services have been completed in general conformance with our proposal P19059 (dated June 21, 2019) and authorized per signature of our agreement for services. The purpose of our services was to assess subgrade soils to provide geotechnical recommendations for the apartment building. Our scope of services included drilling two borings, excavation of 2 test pits, and completion of one infiltration test, laboratory testing, engineering analyses, and preparation of this report.

PROJECT DESCRIPTION

The project property is in the northeast corner of the intersection of 2nd Street NE and 5th Avenue NE in Puyallup, Washington. It encompasses about 0.75 (+/-) acres and is currently vacant. Development plans include construction of a 4-story apartment building, with the ground floor used for parking.

SURFACE CONDITIONS

The property is on the order of 5 to 6 feet lower than street grade (2nd Street NE and 5th Avenue NE) and is principally covered with grass. Overall the site is level with slopes rising along the boundaries with the streets. Several trees are in the northeast corner.

SUBSURFACE CONDITIONS

Subsurface conditions were explored by drilling two borings, two test pits, and one infiltration test hole on July 15, 2019. Borings were advanced to depths of 76.5 and 16.5 feet below surface grades, with test pits extending between 7 and 8 feet. Approximate locations of the explorations are shown on Figure 1, Exploration Plan. A summary description of observed subgrade soils is provided below, with logs of the borings and test pits provided in Appendix A. Please note subsurface conditions can vary across the site from those observed at the exploration locations.

Soil Conditions

Fill was observed below the surface in test pit TP-2 and extended to a depth of about 3 feet. Fill consisted of mixed silt, sand, and debris and was in a loose condition. Topsoil was observed at the surface of the other explorations and extended to about 1 foot. It should be expected that fill thickness may vary across this site.

Native soils below the fill or topsoil consisted of an upper silty sand in a loose condition extending to 2 to 6 feet. Sand with trace silt and gravel was below the upper silty sand. This soil was in a generally loose condition and extended to about 33 feet in boring B-1. Sandy silt to silt with sand and variable clay was below the loose sand and extended to the termination depth of the boring. It was in a soft to medium stiff condition, grading to very stiff at about 65 feet.

Groundwater

Groundwater was observed in borings B-1 and B-2 at a depth of about 14 feet at the time of drilling. Groundwater was not observed in the test pits completed at shallower depths. A piezometer was installed in boring B-2 to monitor groundwater levels through the 2019 – 2020 winter season.

Geologic Setting

Geology of this area is depicted on the "Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington" issued in 2015. Soils mapped on the site are labeled as Holocene Alluvium. These soils are described as "Loose, stratified to massively bedded silt, sand, and gravel." Soils observed in the test pits and borings appear to conform to the mapped soil types.

The site is in a "Potential Liquefaction and/or Dynamic Settlement Hazard Area" per the Potential Seismic Hazard Areas Map by the Pierce County Department of Planning and Land Services, dated March, 2005.

GEOTECHNICAL DESIGN CONSIDERATIONS

Subgrade conditions at this site include upper loose sand over generally soft to medium stiff silt alluvial deposits. These soils are considered highly susceptible to liquefaction during an earthquake. Mitigation of liquefaction utilizing piles or ground improvement methods (e.g. stone columns) will be required for support of the apartment building. We recommend foundations and floor slabs are supported on piles with grade beams, or on a zone of structural fill over stone columns (or other ground improvement methods). .

Recommendations presented in the following sections are based upon the subsurface conditions observed in the test pits and borings and our current understanding of project plans. Our recommendations assume finish site grades will be similar to existing grades. It should be noted subsurface conditions across the site may vary from those depicted on the exploration logs and can change with time. Therefore, proper site preparation will depend upon the weather and soil conditions encountered at the time of construction. We recommend that SSGC review final plans to verify that plans and specifications conform to the recommendations of this report.

Site Preparation

Preparation for site grading and earthwork should include procedures intended to drain ponded water and control surface water runoff. Grading the site without adequate drainage control measures may negatively impact site soils, resulting in increased export of impacted soil and import of fill materials, potentially increasing the cost of the earthwork and subgrade preparation phases of the project.

Site grading should include removal (stripping) of topsoil and fill in building and pavement areas. Stripping depths will vary across the site, but should average between about 1 to 3 feet. Localized deeper fill may be encountered. Final stripping depths can only be determined at the time of construction.

The contractor is responsible for designing and constructing stable, temporary excavations (including utility trenches) as required to maintain the stability of both the excavation sides and bottoms. Excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards. The upper loose sand may require shoring of excavations deeper than several feet at this site. Temporary excavation cuts should be sloped at inclinations of 2H:1V (Horizontal:Vertical) or flatter, unless the contractor can demonstrate the safety of steeper inclinations.

Subgrade Preparation

Exposed subgrades should consist of undisturbed native soils following stripping. We recommend that exposed subgrades in the building footprint are covered with a layer of coarse gravel, spalls, or shot-rock to provide a working surface and protect the loose subgrades from being disturbed during installation of piles or stone columns.

Native subgrades in pavement areas should be proofrolled using a large roller, loaded dump truck, or other mechanical equipment to assess subgrade conditions following stripping. Proofrolling efforts should result in the upper 1 foot of subgrade soils achieving a compaction level of at least 95 percent of the maximum dry density (MDD) per the ASTM D1557 test method. Wet, loose, or soft subgrades that cannot achieve this compaction level should be removed (over-excavated) and replaced with structural fill. The depth of over-excavation should be based on soil conditions at the time of construction. A representative of SSGC should be present to assess subgrade conditions during proofrolling.
Native subgrades in pavement areas should be proofrolled

Structural Fill

The suitability of soil for use as structural fill depends primarily on the gradation and moisture content of the soil when it is placed. As the amount of fines (soil fraction passing the U.S. No. 200 sieve) increases, soils can become increasingly sensitive to small changes in moisture content. It is often difficult to achieve adequate compaction if soil moisture is outside of optimum condition for soils that contain more

than 5 percent fines. In general, optimum moisture is within about +/- 2 percent of the moisture content required to achieve the maximum density per the ASTM D-1557 test method.

Site Soils: Fill is not considered suitable for structural fill due to overall unknown types and presence of debris. Upper native soils consist of silty sand which can be moisture sensitive during wetter seasons of the year or during extensive precipitation. They potentially could be used during the drier seasons provided they can be moisture conditioned to within optimum moisture content range. Optimum moisture is considered within about +/- 2 percent of the moisture content required to achieve the maximum dry density (MDD) per the ASTM D-1557 test method. If moisture content is higher or lower than optimum, soils would need to be dried or wetted prior to placement as structural fill.

Import Structural Fill Materials: We recommend import structural fill placed during dry weather periods consist of material which meets the specifications for *Gravel Borrow* as described in Section 9-03.14(1) of the 2018 Washington State Department of Transportation (WSDOT) Specifications for Road, Bridge, and Municipal Construction (Publication M 41-10). Gravel Borrow should be protected from disturbance if exposed to wet conditions after placement.

During wet weather, or for backfill on wet subgrades, import soil suitable for compaction in wetter conditions should be provided. Imported fill for use in wet conditions should generally conform to specifications for *Select Borrow* as described in Section 9-03.14(2), or *Crushed Surfacing* per Section 9-03.9(3) of the 2018 WSDOT M-41 manual, with the modification that a maximum of 5 percent by weight shall pass the U.S. No. 200 sieve for these soil types.

It should be noted that structural fill placement and compaction is weather-dependent. Delays due to inclement weather are common, even when using select granular fill. We recommend site grading and earthwork be scheduled for the drier months of the year. Structural fill should not consist of frozen material.

Structural Fill Placement: We recommend structural fill is placed in lifts not exceeding 10 inches in loose measure. It may be necessary to adjust lift thickness based on site and fill conditions during placement and compaction. Finer grained soil used as structural fill and/or lighter weight compaction equipment may require significantly thinner lifts to attain required compaction levels. Coarser granular soil with lower fines contents could potentially be placed in thicker lifts if they can be adequately compacted. Structural fill should be compacted to attain the recommended levels presented in Table 1, Compaction Criteria.

Table 1. Compaction Criteria

Fill Application	Compaction Criteria*
Footing areas (below structures and retaining walls)	95 %
Upper 2 feet in pavement areas, slabs and sidewalks, and utility trenches	95 %
Below 2 feet in pavement areas, slabs and sidewalks, and utility trenches	92 %
Utility trenches or general fill in non-paved or -building areas	90 %

*Per the ASTM D 1557 test method.

Trench backfill within about 2 feet of utility lines should not be over-compacted to reduce the risk of damage to the line. In some instances the top of the utility line may be within 2 feet of the surface. Backfill in these circumstances should be compacted to a firm and unyielding condition.

We recommend all fill procedures include maintaining grades that promote drainage and do not allow for ponding of water within the fill area. The contractor should protect compacted fill subgrades from disturbance during wet weather. In the event of rain during structural fill placement, the exposed fill surface should be allowed to dry prior to placement of additional fill. Alternatively, the wet soil can be removed. Structural fill should not consist of frozen material.

Foundations

Mitigation of seismic settlement potential will require soil improvement of the saturated, loose (soft) native soils or pile support of the building. Stone column piers have been successfully used for similar soil conditions in this area of Sumner.

Soil improvement systems consisting of stone columns can be used to improve the strength and support characteristics of thick zones of saturated, loose or soft soils. These stone columns can also reduce static and seismic induced settlements. The design of these columns is typically completed by the pier contractor. On a preliminary basis we anticipate that these piers would average on the order of 20 to 30 feet deep, although deeper piers may be necessary. A layer of compacted structural fill, at least 18 inches thick, should be placed between the bottom of the footings (or floor slab) and the top of the stone columns to provide a uniform base.

Depending on the depth, size, and spacing of these columns, allowable bearing pressures of 3,000 psf or higher are expected. Static total and differential settlements would be less than 1-inch and ½-inch, respectively. Seismic settlements could be substantially reduced. We are available to assist in working with local stone column contractors in the design. We are also available to assist in the design of a pile-supported structure, if requested.

Conventional spread footing foundations can be placed on a structural fill zone above the stone columns. The following recommendations have been prepared for conventional spread footing foundations on a properly prepared subgrade.

Bearing Capacity (net allowable):	3,000 pounds per square foot (psf) for footings supported on a structural fill zone (at least 12 inches thick) over stone columns.
Footing Width (Minimum):	18 inches (Strip) 24 inches (Column)
Embedment Depth (Minimum):	18 inches (Exterior) 12 inches (Interior)
Settlement:	Total: < 1 inch Differential: < 1/2 inch (over 40 feet)
Allowable Lateral Passive Resistance:	325 psf/ft* (below 18 inches)
Allowable Coefficient of Friction:	0.35*

*These values include a factor of safety of approximately 1.5

The net allowable bearing pressures presented above may be increased by one-third to resist transient, dynamic loads such as wind or seismic forces. Lateral resistance to footings should be ignored in the upper 12-inches from exterior finish grade.

Foundation Construction Considerations

All foundation subgrades should be free of water and loose soil prior to placing concrete, and should be prepared as recommended in this report. Concrete should be placed soon after excavating and compaction to reduce disturbance to bearing soils. Should soils at foundation level become excessively dry, disturbed, saturated, or frozen, the affected soil should be removed prior to placing concrete. We recommend that SSGC observe all foundation subgrades prior to placement of concrete.

Foundation Drainage

We recommend footing drains are installed around building foundations. Footing drains should include a minimum 4-inch diameter perforated rigid plastic or metal drain line installed at the base of the footing. The perforated drain lines should be connected to a tight line pipe that discharges to an approved storm drain receptor. The drain line should be surrounded by a zone of clean, free-draining granular material having less than 5 percent passing the No. 200 sieve or meeting the requirements of section 9-03.12(2) “Gravel Backfill for Walls” in the 2010 WSDOT Standard Specifications for Road, Bridge, and Municipal Construction manual (M41-10). The free-draining aggregate zone should be at least 12 inches wide and wrapped in filer fabric. The granular fill should extend to

within 6 inches of final grade where it should be capped with compacted fill containing sufficient fines to reduce infiltration of surface water into the footing drains. Cleanouts are recommended for maintenance of the drain system.

Floor Slabs

Post-construction floor slab settlement should be anticipated to be similar to stone column supported foundation settlements provided subgrades have been prepared as discussed in this report. We recommend a vertical subgrade soil modulus value of 250 kips per cubic foot (kcf) for structural fill compacted as described in this report. Soil modulus of stone column supported slabs with other types of fill should be supplied by the stone column designer.

We recommend a minimum 4 inches of free-draining granular material be placed under the slab to serve as a capillary break. The fines content of the capillary break material should be limited to 3 percent or less, by weight, and at least 50 percent of the capillary break material should be retained on the No. 4 sieve

Seismic Considerations

Recommended seismic parameters and values presented in Table 2 are based on the 2015 International Building Code (IBC).

Table 2. Seismic Parameters

PARAMETER	VALUE
2015 International Building Code (IBC) Site Classification[1]	E
S_s Spectral Acceleration for a Short Period	1.253g
S_1 Spectral Acceleration for a 1-Second Period	0.482
F_a Site Coefficient for a Short Period	0.9
F_v Site Coefficient for a 1-Second Period	2.4

[1] Note: In general accordance with *2012 International Building Code*, Section 1613.3.2 for risk categories I,II,III. IBC Site Class is based on the estimated characteristics of the upper 100 feet of the subsurface profile. S_s, S_1, F_a, and F_v values based on the OSHPD Seismic Design Maps website.

Liquefaction

Soil liquefaction is a condition where loose, typically granular soils located below the groundwater surface lose strength during ground shaking, and is often associated with earthquakes. Native soils observed in the test pits consist of loose sand with variable silt. Groundwater was observed at a depth of 14 feet in the borings at the time of drilling, and is expected to be at shallower depth during the wetter seasons of the year. Loose clean sand extended to depths of about 33 feet. The condition of the soils and groundwater level suggest that

these soils are highly susceptible to liquefaction during a design level earthquake. We estimate differential ground deformations over 6 inches could occur during a design level earthquake based on our analyses of subgrade conditions in the borings. Pile support or ground improvements (stone columns) are recommended to reduce the potential seismic settlement to levels similar to static conditions.

Infiltration Characteristics

Assessment of infiltration characteristics of the upper native silty sand was completed per the Washington State Department of Ecology (DOE) 2012 Stormwater Management Manual for Western Washington. One small-scale Pilot Infiltration Test (PIT) was completed on the site. Result of the infiltration test is provided in Table 3.

Table 3. Infiltration Rates

Test Site and Depth (ft)	Soil Type	Field Infiltration Rate (in/hr)	Corrected Infiltration Rate (in/hr)	Correction Factors* (CFv/CFt/CFm)
PIT-1, 3 ft	Silty Sand (Alluvium)	3.5	1.4	(0.9/0.5/0.9)

*Correction Factors from the DOE 2012 Stormwater Management Manual for Western Washington.

Calculated and corrected infiltration rate is considered appropriate for the soil tested, and similar to test results completed in the area with similar soils. We recommend a design infiltration rate of 1.4 inches per hour (in/hr) for infiltration facilities located in the upper 4 feet of native soils on the site

Groundwater was encountered at about 14 feet below the surface at the time of our field evaluation. No evidence of heavy soil mottling was observed in the test pits or borings (indicative of significantly higher groundwater levels). A piezometer was installed in boring B-2 to monitor groundwater levels through the 2019 – 2020 winter season.

Cation Exchange Capacity (CEC) and organic content test were completed on a sample from the base of the PIT-1 site. Test results are summarized in the table below.

Table 4. CEC and Organic Content Results

Test Location, Sample Number, and Depth	CEC Results (milliequivalents)	CEC Required* (milliequivalents)	Organic Content Results (%)	Organic Content Required* (%)
PIT-1, S-1, 3 ft	7.5	≥ 5	1.75	≥1.0

*Per the 2012 DOE Stormwater Management Manual for Western Washington

Test results indicate CEC and organic content values satisfies DOE requirements.

Conventional Pavement Sections

Subgrades for conventional pavement areas should be prepared as described in the "*Subgrade Preparation*" section of this report. Subgrades below pavement sections should be graded or crowned to promote drainage and not allow for ponding of water beneath the section. If drainage is not provided and ponding occurs, the subgrade soils could become saturated, lose strength, and result in premature distress to the pavement. In addition, the pavement surfacing should also be graded to promote drainage and reduce the potential for ponding of water on the pavement surface.

Minimum recommended pavement sections for conventional pavements are presented in Table 5. Pavement sections in public right-of-ways should conform to City of Puyallup requirements for the road designation.

Table 5. Preliminary Pavement Sections

Traffic Area	Minimum Recommended Pavement Section Thickness (inches)			
	Asphalt Concrete Surface[1]	Portland Cement Concrete[2]	Aggregate Base Course[3,4]	Subbase Aggregate[5]
Access Drives	3	6	6	12
Parking	2	5	4	12

[1] 1/2 –inch nominal aggregate hot-mix asphalt (HMA) per WSDOT 9-03.8(1)

[2] A 28 day minimum compressive strength of 4,000 psi and an allowable flexural strength of at least 250 psi

[3] Crushed Surfacing Base Course per WSDOT 9-03.9(3)

[4] Although not required for structural support under concrete pavements, a minimum four-inch thick base course layer is recommended to help reduce potentials for slab curl, shrinkage cracking, and subgrade "pumping" through joints

[5] Native granular soils compacted to 95% of the ASTM D1557 test method, or Gravel Borrow per WSDOT 9-03.14(1) or Crushed Surfacing Base Course WSDOT 9-03.9(3)

Conventional Pavement Maintenance

The performance and lifespan of pavements can be significantly impacted by future maintenance. The above pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be completed. Proper maintenance will slow the rate of pavement deterioration, and will improve pavement performance and life. Preventative maintenance consists of both localized maintenance (crack and joint sealing and patching) and global maintenance (surface sealing).

REPORT CONDITIONS

This report has been prepared for the exclusive use of Doec, LLC for specific application to the project as discussed and has been prepared in accordance with generally accepted geotechnical engineering practices in the area. No warranties, either express or implied, are intended or made. Site safety and earthwork construction procedures are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless SSGC reviews the changes and either verifies or modifies the conclusions of this report in writing.

The analysis and recommendations presented in this report are based upon the data obtained from the explorations completed at the indicated locations and from other information as discussed. This report does not reflect variations that may occur between explorations, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

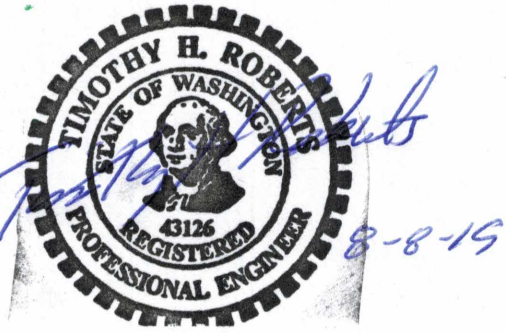
This report was prepared for the planned type of development of the site as discussed herein. It is not valid for third party entities or alternate types of development on the site without the express written consent of SSGC. If development plans change we should be notified to review those changes and modify our recommendations as necessary.

The scope of services for this project does not include environmental or biological assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. Specific environmental studies should be performed if the owner is concerned about the potential for contamination or pollution.

We appreciate the opportunity to work with you on this project. Please contact us if additional information is required or we can be of further assistance.

Respectfully,

South Sound Geotechnical Consulting

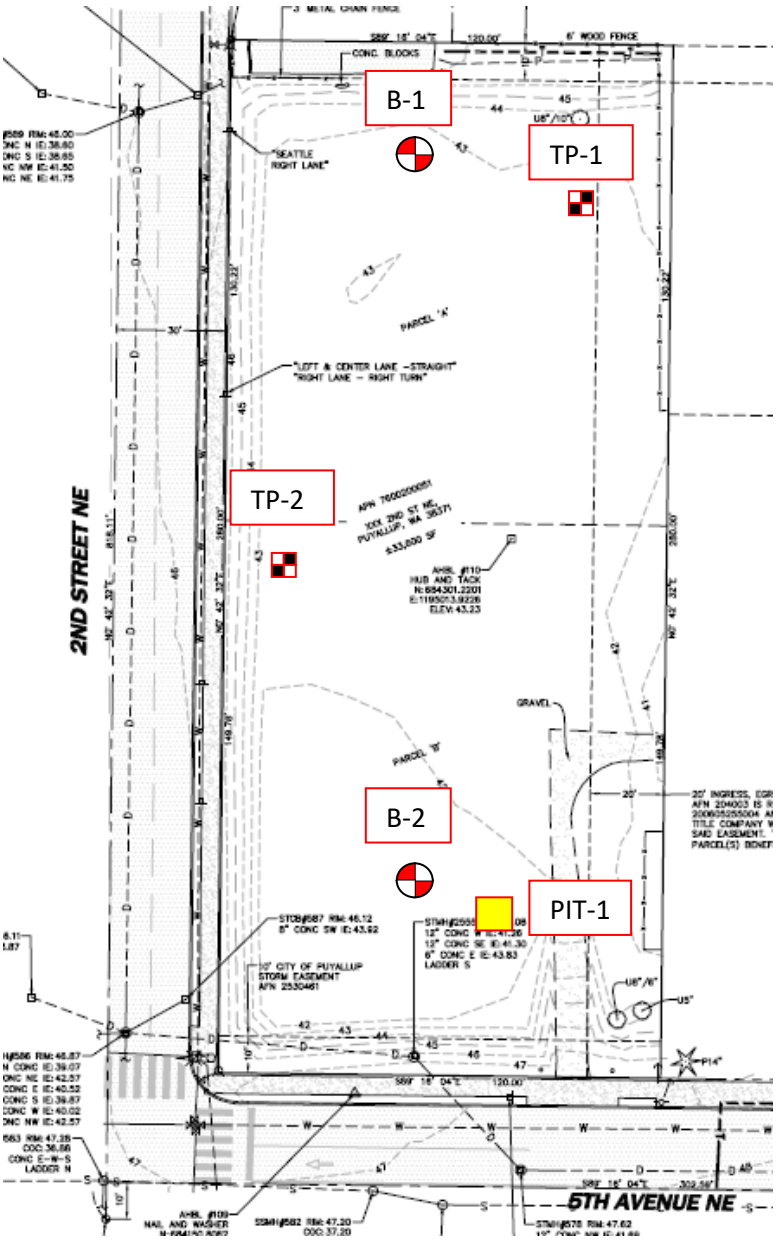


8-8-19

Timothy H. Roberts, P.E.
Member/Geotechnical Engineer

Attachments: Figure 1, Exploration Plan
Appendix A: Exploration Procedures and Boring Logs
Appendix B: Laboratory Testing and Results
Unified Soil Classification System

N



Legend

B - 1

Approximate Boring Location

TP - 1

Approximate Test Pit Location

PIT - 1

Approximate Infiltration Test Location

Scale: NTS

Base map from drawing titled "SPP Manufacturing Puyallup Survey", by AHBL, dated July 24, 2018

South Sound Geotechnical Consulting
P.O. Box 39500
Lakewood, WA 98496
(253) 973-0515

Figure 1 – Exploration Plan

2nd Street NE Apartments
Puyallup, WA

SSGC Project #19055

Appendix A

Subsurface Exploration Procedures and Boring Logs

Field Exploration Procedures

Our field exploration for this project included two borings, two test pits and one Pilot Infiltration Test completed on July 15, 2019. The exploration locations were determined by measuring distances from existing site features. Ground surface elevation was estimated from drawing "SPP Manufacturing Puyallup Survey", by AHBL, dated July 24, 2018. The referenced elevations should be considered accurate only to the degree implied by the means and methods used.

An independent drilling contractor working under subcontract to SSGC drilled the borings and installed the monitoring well (piezometer). Borings were continuously observed by a representative of SSGC who logged observed subgrade conditions and collected representative soil samples. Soil samples were stored in moisture tight containers for further visual identification. The driller was responsible for backfilling borings in accordance with Washington State Department of Ecology regulations.

Test pits and the infiltration test hole were excavated by a private excavation company subcontracted to SSGC. Test holes were backfilled with cuttings and tamped following excavation. Note that backfill material may settle with time and require remedial measures at the time of construction.

The exploration logs indicate the observed lithology of soils and other materials observed. Where a soil contact was observed to be gradational, our log indicates the average contact depth. The logs also show the approximate depth of groundwater, when observed. Classification of the soils indicated on the logs is in general accordance with the Unified Soil Classification System.

PROJECT: 2nd Street Apartments | **JOB NO.** 19055 | **BORING** B-1 | **PAGE 1 OF** 4

Location: Puyallup, WA | **Approximate Elevation:** 42 feet

Depth (ft)	Soil Description	Sample Interval	Sample Number	Ground Water	Penetration Resistance (▲ Standard, △ Other; Blows per foot)	N-values	Testing
	Silty Fine SAND: Very loose, moist, dark brown.						
			S-1		▲	2	
5	**SAND with trace silt and gravel:** Loose, moist, dark gray.						
			S-2		▲	5	Grad
			S-3		▲	9	
10							
			S-4		▲	8	
	Grades wet			ATD			
15							
			S-5		▲	2	Grad
20							
			S-6		▲	9	
25							

0 10 20 30 40 50

Explanation

- 2-inch O.D. split spoon sample
- 3-inch I.D Shelby tube sample
- ⊗ No Recovery
- ▼ ATD — Groundwater level at time of drilling or date of measurement

Monitoring Well Key

- Clean Sand
- Cuttings
- Bentonite
- Grout
- Screened Casing

Moisture Content

Plastic Limit — Natural — Liquid Limit

South Sound Geotechnical Consulting	**BORING LOG**	**Boring B-1**
	Date Drilled: 7/15/19	**Logged By: THR**

PROJECT: 2nd Street Apartments | **JOB NO.** 19055 | **BORING** B-1 | **PAGE 2 OF** 4

Location: Puyallup, WA | **Approximate Elevation:** 42 feet

Depth (ft)	Soil Description	Sample Interval	Sample Number	Ground Water	Penetration Resistance (Standard ▲ / Other △; Blows per foot: 0 10 20 30 40 50)	N-values	Testing
	SAND with trace silt and gravel: Loose to medium dense, wet, dark gray.		S-7		▲	17	
30			S-8		▲	7	
	Sandy SILT: Soft to medium stiff, wet, dark gray.						
35			S-9		▲	6	Grad
40			S-10		▲	3	
45			S-11		▲	4	
50							

Explanation

- 2-inch O.D. split spoon sample
- 3-inch I.D Shelby tube sample
- No Recovery
- ATD — Groundwater level at time of drilling or date of measurement

Monitoring Well Key

- Clean Sand
- Cuttings
- Bentonite
- Grout
- Screened Casing

Moisture Content

Plastic Limit — Natural — Liquid Limit

South Sound Geotechnical Consulting	BORING LOG	Boring B-1
	Date Drilled: 7/15/19	Logged By: THR

PROJECT: 2nd Street Apartments **JOB NO.** 19055 **BORING** B-1

Location: Puyallup, WA **Approximate Elevation:** 42 feet

Depth (ft)	Soil Description	Sample Type	Sample Number	Ground Water	Penetration Resistance (▲ Standard, △ Other; Blows per foot; 0 10 20 30 40 50)	N-values	Testing
	SILT with some fine sand: Soft to medium stiff, wet, gray.		S-12			2	
55			S-13			5	
60			S-14			8	
65	Grades very stiff		S-15			28	grad
70			S-16			22	
75							

Explanation

- 2-inch O.D. split spoon sample
- 3-inch I.D Shelby tube sample
- No Recovery
- ATD — Groundwater level at time of drilling or date of measurement

Monitoring Well Key

- Clean Sand
- Cuttings
- Bentonite
- Grout
- Screened Casing

Moisture Content

Plastic Limit — Natural — Liquid Limit

South Sound Geotechnical Consulting	BORING LOG	Boring B-1
	Date Drilled: 7/15/19	Logged By: THR

PROJECT: 2nd Street Apartments | **JOB NO.** 19055 | **BORING** B-1 | **PAGE 4 OF 4**

Location: Puyallup, WA | **Approximate Elevation:** 42 feet

Depth (ft)	Soil Description	Sample Type	Sample Number	Ground Water	Penetration Resistance (▲ Standard, △ Other; Blows per foot; 0 10 20 30 40 50)	N-values	Testing
	Sandy SILT: Stiff to very stiff**,** wet, gray.	I	S-17		▲	17	
	Boring completed at approximately 76.5 feet on 7/15/19. Groundwater observed at about 14 feet at time of drilling.						
80							
85							
90							
95							
100							

Explanation

- I — 2-inch O.D. split spoon sample
- II — 3-inch I.D Shelby tube sample
- ⊗ — No Recovery
- ▼ ATD — Groundwater level at time of drilling or date of measurement

Monitoring Well Key

- Clean Sand
- Cuttings
- Bentonite
- Grout
- Screened Casing

Moisture Content

Plastic Limit — Natural — Liquid Limit

Zipper Zeman Associates, Inc. Geotechnical & Environmental Consultants	BORING LOG	Boring B-1
	Date Drilled: 7/15/19	Logged By: THR

PROJECT: 2nd Street Apartments | **JOB NO.** 19055 | **BORING** B-2 | **PAGE 1 OF** 1

Location: Puyallup, WA | **Approximate Elevation:** 42 feet

Depth (ft)	Soil Description	Sample Interval	Sample Number	Ground Water	Penetration Resistance (▲ Standard, △ Other; Blows per foot)	N-values	Testing
	Silty Fine SAND: Very loose, moist, brown.						
			S-1			9	
5							
			S-2			13	
	SAND with trace silt and gravel: Loose, moist, dark gray.						
			S-3			9	
10							
			S-4			8	
	Grades wet			▼ ATD			
15							
			S-5			7	
	Boring completed at approximately 16.5 feet on 7/15/19. Groundwater observed at about 14 feet at time of drilling. Observation well installed in boring.						
20							
25							

0 10 20 30 40 50

Explanation

- 2-inch O.D. split spoon sample
- 3-inch I.D Shelby tube sample
- ⊗ No Recovery
- ▼ ATD — Groundwater level at time of drilling or date of measurement

Monitoring Well Key

- Clean Sand
- Cuttings
- Bentonite
- Grout
- Screened Casing

Moisture Content

Plastic Limit — Natural — Liquid Limit

South Sound Geotechnical Consulting	**BORING LOG**	**Boring B-2**
	Date Drilled: 7/15/19	**Logged By: THR**

Test Pit TP-1

Depth (feet)	Material Description
0 – 1	**Topsoil**
1 – 2	Silty SAND: Loose, damp, brown.
2 – 5.5	SAND with trace to some silt: Loose, moist, gray.
5.5 - 7	SAND with trace to some silt and occasional gravel: Loose, moist, dark gray.
	Test pit completed at approximately 7 feet on 7/15/19. Groundwater not observed at time of excavation. Approximate surface elevation: 43 feet

Test Pit TP-2

Depth (feet)	Material Description
0 – 3	**Fill:** Silt, sand, with minor debris (wire, brick): Loose, damp, brown to gray.
3 – 3.5	Silty SAND: Loose, damp, grayish brown.
3.5 - 8	SAND with trace to some silt: Loose, moist, gray. (Sample S-1 @ 4 feet; Sample S-2 @ 8 feet)
	Test pit completed at approximately 8 feet on 7/15/19. Groundwater not observed at time of excavation. Approximate surface elevation: 43 feet

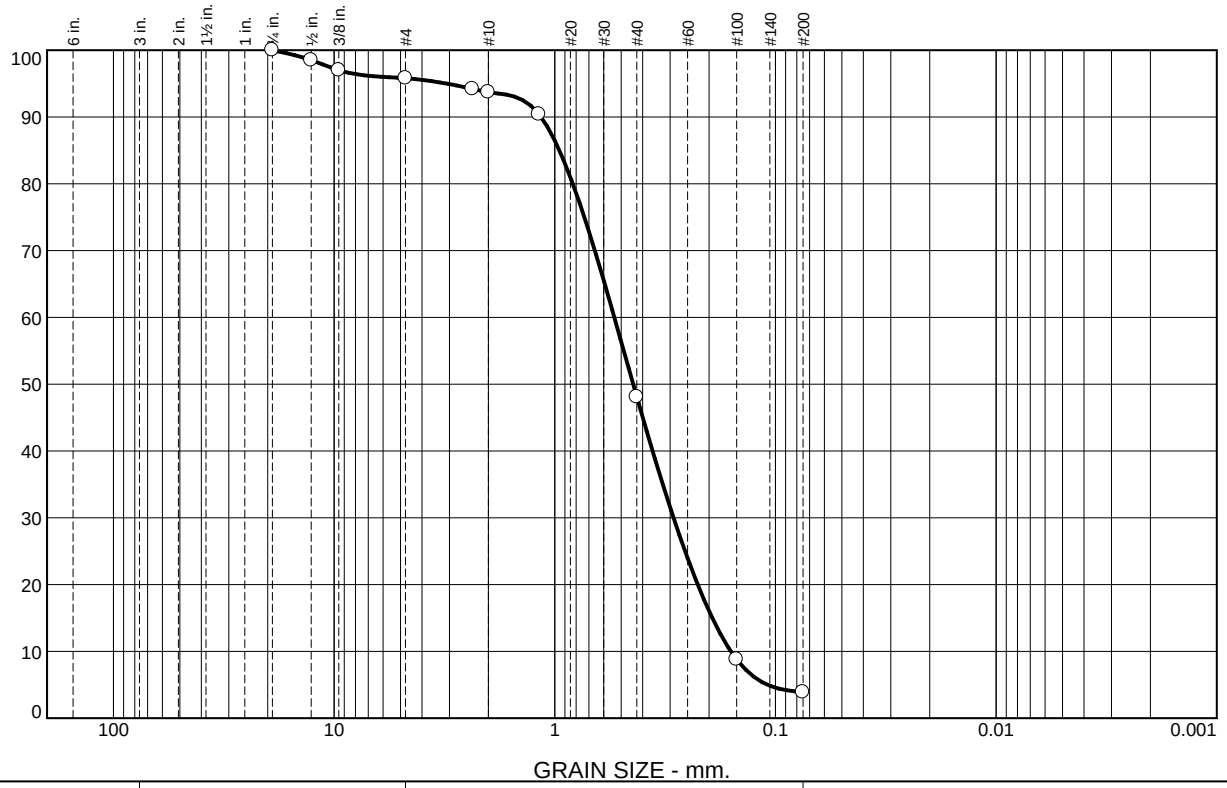
Appendix B

Laboratory Testing and Results

Laboratory Testing

Select soil samples were tested for grain size distribution (gradation) by Construction Testing Laboratories (CTL) of Puyallup, Washington. Cation Exchange Capacity (CEC) and organic content tests were completed by Northwest Agricultural Consultants of Kennewick, Washington. Results of the laboratory testing are included in this appendix.

Particle Size Distribution Report ASTM C-117,C136



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	4	2	46	44	4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
1/2"	98		
3/8"	97		
#4	96		
#8	94		
#10	94		
#16	90		
#40	48		
#100	9		
#200	3.9		

* (no specification provided)

Material Description

Grab Sample, S-2

Atterberg Limits

PL= LL= PI=

Classification

USCS= SP AASHTO=

Remarks

Report: #01

Sampled by: Client

Source of Sample: B-1
Sample Number: 19-1040

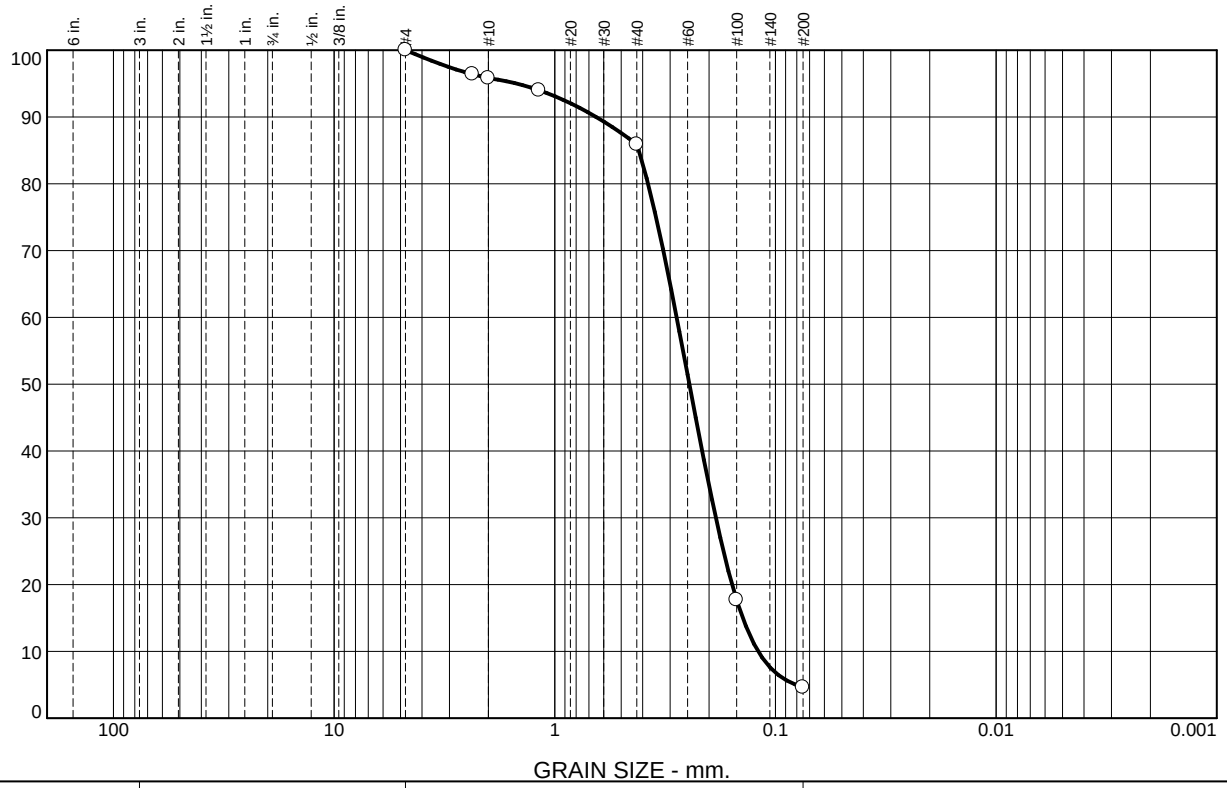
Date: 07-15-19

Construction Testing Laboratories
400 Valley Ave. NE, Suite #102
Puyallup WA, 98372 Tel. (253) 383-8778

Client: South Sound Geotechnical
Project: 2nd Street Apartments
19055
Project No: 7940 **Figure**

Tested By: M Armstrong **Checked By:** C Pedersen

Particle Size Distribution Report ASTM C-117,C136



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	4	10	81	5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	96		
#10	96		
#16	94		
#40	86		
#100	18		
#200	4.6		

* (no specification provided)

Material Description

Grab Sample, S-5

Atterberg Limits

PL= LL= PI=

Classification

USCS= SP AASHTO=

Remarks

Report: #03

Sampled by: Client

Source of Sample: B-1
Sample Number: 19-1042

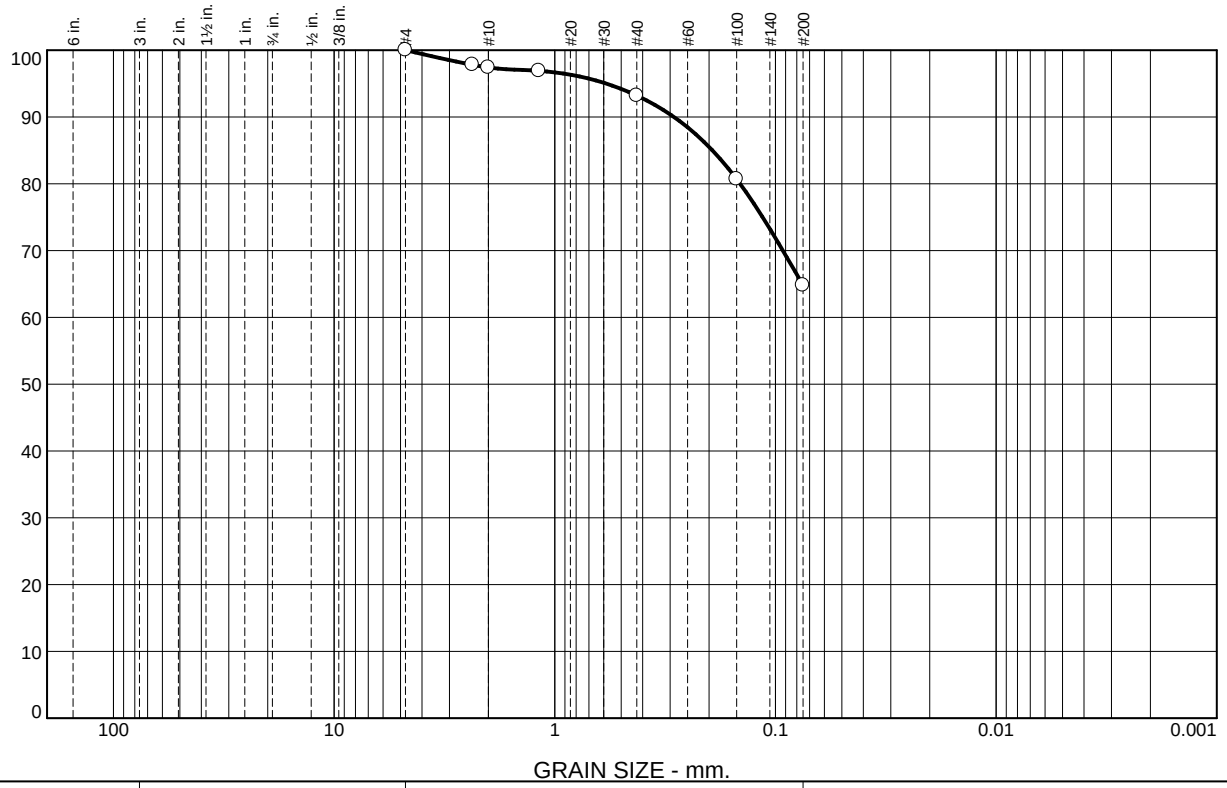
Date: 07-15-19

Construction Testing Laboratories
400 Valley Ave. NE, Suite #102
Puyallup WA, 98372 Tel. (253) 383-8778

Client: South Sound Geotechnical
Project: 2nd Street Apartments
19055
Project No: 7940 **Figure**

Tested By: M Armstrong **Checked By:** C Pedersen

Particle Size Distribution Report ASTM C-117,C136



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	3	4	28	65	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	98		
#10	97		
#16	97		
#40	93		
#100	81		
#200	65		

* (no specification provided)

Material Description

Grab Sample, S-9

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Remarks

Report: #04

Sampled by: Client

Source of Sample: B-1
Sample Number: 19-1043

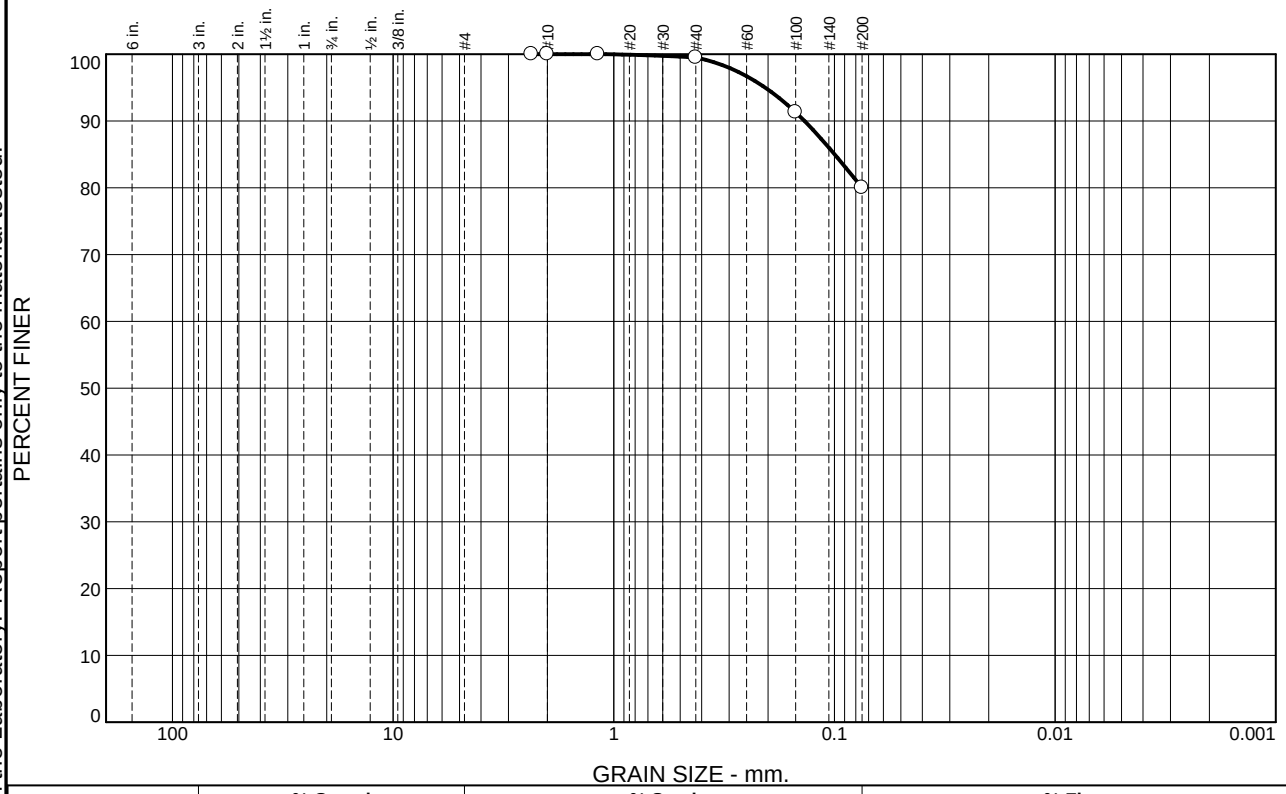
Date: 07-15-19

Construction Testing Laboratories
400 Valley Ave. NE, Suite #102
Puyallup WA, 98372 Tel. (253) 383-8778

Client: South Sound Geotechnical
Project: 2nd Street Apartments
19055
Project No: 7940 **Figure**

Tested By: M Armstrong **Checked By:** C Pedersen

Particle Size Distribution Report ASTM C-117,C136



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	20	80	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100		
#10	100		
#16	100		
#40	100		
#100	91		
#200	80		

* (no specification provided)

Material Description

Grab Sample, S-15

Atterberg Limits

PL= LL= PI=

Classification

USCS= AASHTO=

Remarks

Report: #02

Sampled by: Client

Source of Sample: B-1
Sample Number: 19-1041

Date: 07-15-19

Construction Testing Laboratories
400 Valley Ave. NE, Suite #102
Puyallup WA, 98372 Tel. (253) 383-8778

Client: South Sound Geotechnical
Project: 2nd Street Apartments
19055
Project No: 7940 **Figure**

Tested By: M Armstrong **Checked By:** C Pedersen

Northwest Agricultural Consultants

2545 W Falls Avenue
Kennewick, WA 99336
509.783.7450
www.nwag.com
lab@nwag.com

PAP-Accredited
NAPT

South Sound Geotechnical Consulting
PO Box 39500
Lakewood, WA 98496

Report: 48534-1
Date: July 22, 2019
Project No: 19055
Project Name: 2nd St. Apartments

Sample ID	Organic Matter	Cation Exchange Capacity
PIT-1, S-1	1.75%	7.5 meq/100g
Method	**ASTM D2974**	**EPA 9081**

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]					Soil Classification	
					Group Symbol	Group Name[B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]		GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]		GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH		GM	Silty gravel[F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]		SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]		SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH		SM	Silty sand[G,H,I]
			Fines Classify as CL or CH		SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]		CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]		ML	Silt[K,L,M]
		organic	Liquid limit - oven dried	< 0.75	OL	Organic clay[K,L,M,N]
			Liquid limit - not dried			Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line		CH	Fat clay[K,L,M]
			PI plots below "A" line		MH	Elastic Silt[K,L,M]
		organic	Liquid limit - oven dried	< 0.75	OH	Organic clay[K,L,M,P]
			Liquid limit - not dried			Organic silt[K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

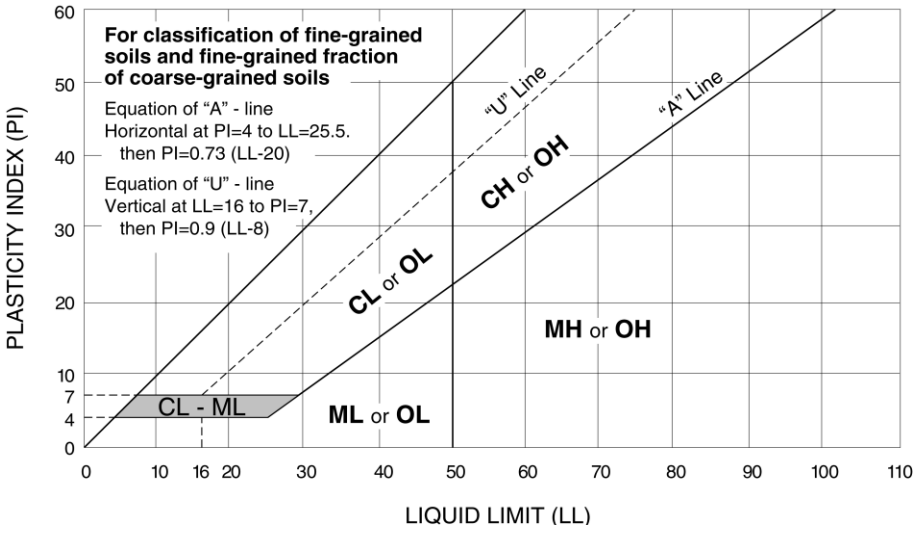
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



South Sound Geotechnical Consulting

April 30, 2020

Doec, LLC
11192 – 25th Avenue East
Tacoma, Washington 98445

Attention: Mr. Don Huber

Subject: Groundwater Monitoring (Winter 2019 – 2020)
2nd Street NE Apartments
Puyallup, Washington
SSGC Project No. 19055

Mr. Huber,

South Sound Geotechnical Consulting (SSGC) has completed monitoring of groundwater levels through the 2020 winter season (2020) at the 2nd Street Apartment project in Puyallup, Washington. One groundwater monitoring well was installed (in Boring B-2) on the property in July 2019 as part of our geotechnical evaluation of the site (report dated August 8, 2019). Approximate location of the boring with the well is shown on Figure 1, Exploration Plan. Groundwater levels measured from the original drilling date of the boring/monitoring well to early April 2020 are presented in the table below.

Boring	Date	Groundwater Level (Below Surface)
B-2	7/15/19	14’
	10/27/19	14’ 5”
	12/4/19	13’ 9”
	1/18/20	12’ 2”
	2/12/20	10’ 10”
	3/8/20	11’ 2”
	4/7/20	12’ 1”

Groundwater levels in the well demonstrate seasonal precipitation variation over the winter season. February 2020 was an abnormally wet month historically with February and March demonstrating the highest groundwater levels. We recommend the February level is used in design of stormwater control facilities for this site.

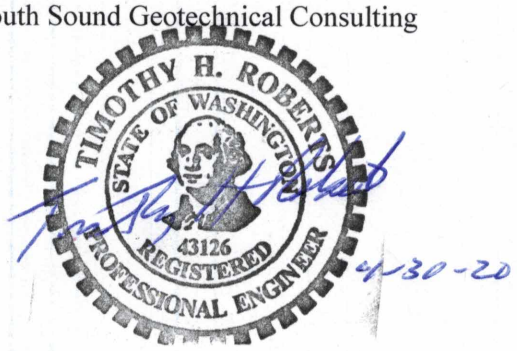
REPORT CONDITIONS

This report has been prepared for the exclusive use of Doec, LLC for specific application to the project discussed, and has been prepared in accordance with generally accepted geotechnical engineering practices in the area. No warranties, either express or implied, are intended or made of future groundwater conditions.

We appreciate the opportunity to work with you on this project. Please contact us if additional information is required or we can be of further assistance.

Respectfully,

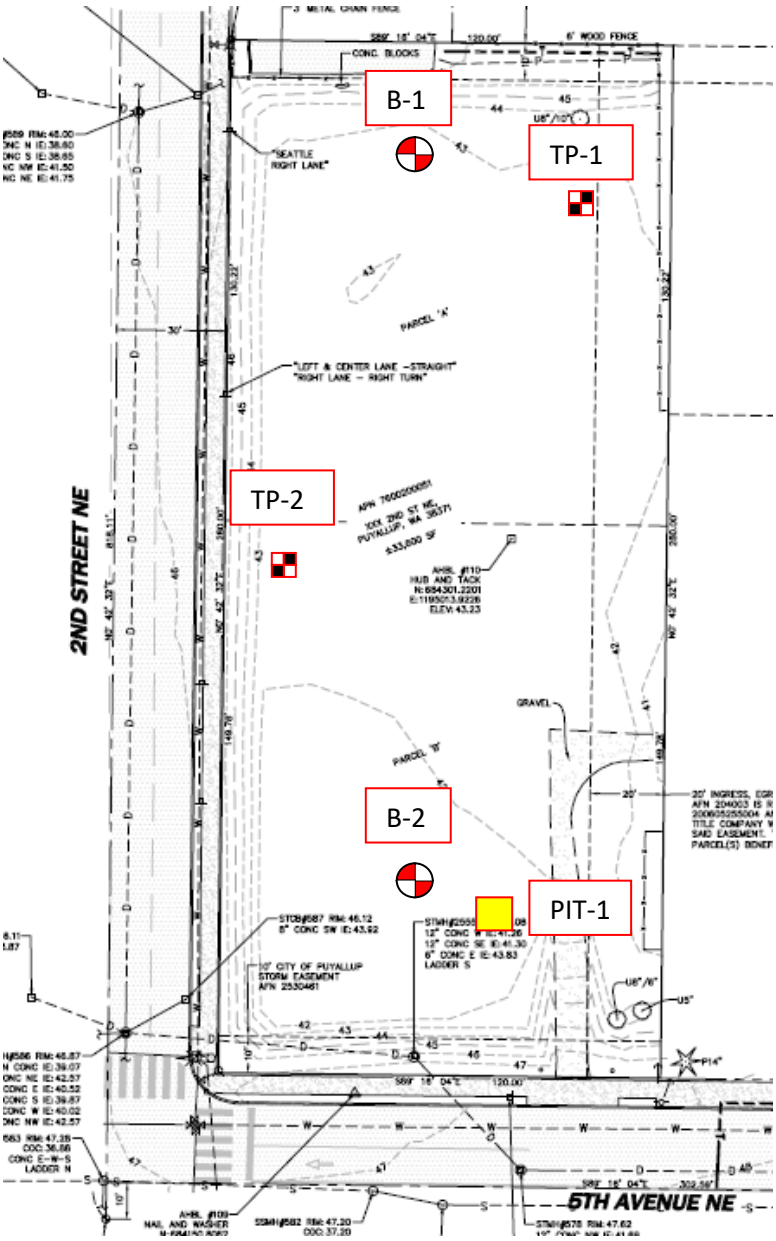
South Sound Geotechnical Consulting



Timothy H. Roberts, P.E.
Member/Geotechnical Engineer

Attachments: Figure 1 – Exploration Plan

cc: AHBL, Inc. – Mr. Ken Leland, P.E.



Legend

B - 1

Approximate Boring Location

TP - 1

Approximate Test Pit Location

PIT - 1

Approximate Infiltration Test Location

Scale: NTS

Base map from drawing titled "SPP Manufacturing Puyallup Survey", by AHBL, dated July 24, 2018

South Sound Geotechnical Consulting
P.O. Box 39500
Lakewood, WA 98496
(253) 973-0515

Figure 1 – Exploration Plan

2nd Street NE Apartments
Puyallup, WA

SSGC Project #19055