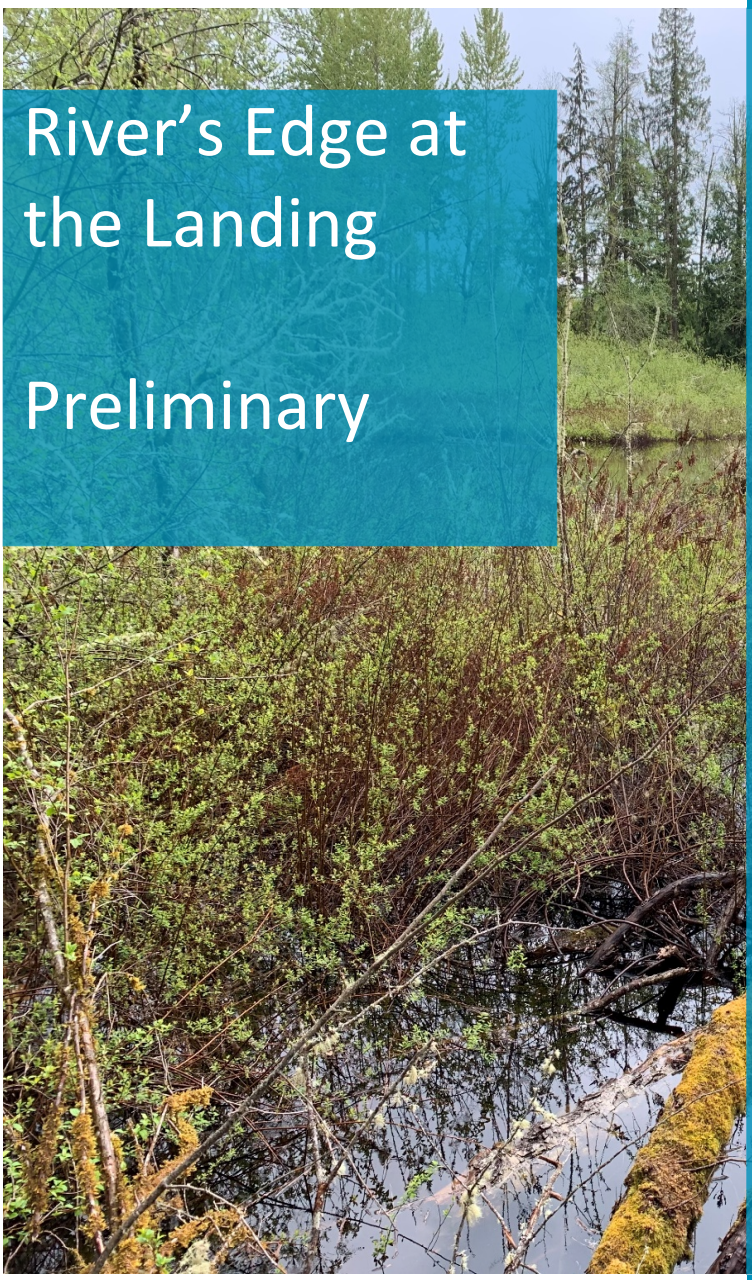
River's Edge at the Landing

Preliminary



Technical Information Report

River's Edge at the Landing

March 26, 2025

PREPARED FOR :
City of Castle Rock
141 A St SW, Castle Rock, WA 98611

CLIENT :
CT6, LLC
Shane Tapani
360-687-1148
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Jurisdiction Project Number : XXXXX

MacKay Sposito
Prepared By : Paton Malley
Project Number : 18591.01

03/26/2025

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Preliminary Technical Information Report (TIR)
River's Edge at Landing on the Cowlitz

Engineer's Certification
March 26, 2025
City of Castle Rock
Project Engineer

"I hereby state this Technical Information Report (TIR) has been prepared under my supervision and meets the standards of care and expertise which is usual and customary in this community for professional engineers. The TIR includes the required information per City of Castle Rock's Storm Drainage Standards and complies with the 1992 Stormwater Management Manual for the Puget Sound Basin. The proposed stormwater design is feasible."

03/26/2025

Taylor Wilson, PE
Project Manager

Table of Contents

Tables

Appendices

1. Project Overview

1.1 Site Information

The proposed project involves the construction of the River's Edge at the Landing Subdivision, including access and circulation roads, public sewer and water systems, stormwater treatment and conveyance systems, private utility connections for each residence, sidewalks and ADA ramps, and landscaping. Access to the subdivision will be provided by a connection to Road B, which will be constructed as part of Phase 1 construction of the Landing on the Cowlitz (LOTC) Master Plan. Water, sewer, and stormwater will all connect to the public utility systems to be constructed during Phase 1 construction. These improvements can be seen in more detail in the plans attached in Appendix D.

Topography

The project site is located in the City of Castle Rock, Cowlitz County, WA. The site is located at Parcel 308640100, as adjusted by BLA #CR-BLA-24-01 (AFN #3762029 and AFN #3763318). Road A, Road B, and Road C/Larsen Ln of the Phase 1 Access & Utilities project bound the residential parcel to the north, east, and south, respectively. Residential properties and the Timberlake Church bound it to the west. Historically, much of this area falls within the FEMA 100-year flood plain elevation of 48.

While the LOTC Phase 1 development has not been constructed at the time of this report, the improvements proposed on those plans are shown as the existing conditions for this phase of the development. By the time this project is constructed, the proposed site will be graded to a pad elevation of 51 feet (above the base flood elevation) and the Phase 1 Roadways and utility systems will be constructed per the grades shown in those plans. With the site raised to an elevation of 51 feet, a maximum slope of 3:1 connects the site to an existing stormwater ditch along the northern property line.

Existing Storm Systems

There are no existing stormwater structures within the site, except for an existing stormwater ditch that captures offsite runoff from the adjacent properties running onto the LOTC development. This ditch drains westerly along the northern property line, turns south for a short stretch, passes under Larsen Lane through a culvert, and into a detention pond tied to the offsite LOTC Outfall system. The Phase 1 roadways surrounding the subdivision parcel drains to the onsite detention pond/ditch and LOTC Outfall system.

Assumptions and Design Parameters

This report is being prepared as a supplement to the Stormwater Master Plan that has been prepared for the full LOTC Development. From this point forward, the proposed onsite storm system for the subdivision will be referred to as the "River's Edge storm system" and the Phase 1 Access and Utilities storm system will be referred to as the "Phase 1 storm system". All proposed residential lots and impervious areas of the River's Edge site will drain to a storm system within the site roadways, while some of the pervious landscaped areas along the northern and western edges of the site will drain to a drainage swale along the property line. The existing swale along that northern property line will need some minor re-grading to ensure that the proposed grading onsite works with all perimeter conditions. However, the redesigned ditch will still follow the same drainage pattern as the existing ditch with the addition of a few area drains and a conveyance pipe. This offsite run-on was analyzed as part of the

LOTC Stormwater Master Plan, and a conveyance analysis of the proposed ditch and pipe will be provided at the time of final design. The River's Edge storm system within the roadway will connect to the Phase 1 storm system at the entrance to the subdivision via a manhole that will be constructed during Phase 1. Therefore, all runoff onsite will eventually be conveyed to the outfall system to the Cowlitz River (whether that be through the onsite of offsite system).

Per the City of castle Rock Design Standards, the stormwater design for this project must conform with the regulations outlined in the 1992 Stormwater Management Manual for the Puget Sound Basin (SWMMPSB). However, this project proposes using mechanical treatment catch basins. Because these facilities are not included in the 1992 SWMMPSB, the design will also need to meet some requirements from the 2024 Stormwater Management Manual for Western Washington (SWMMWW).

As part of the LOTC Stormwater Master Plan, it was assumed that each lot will have a roof area of 1,500 square feet. This assumption was used in all modeling done for the preliminary storm design as well. Adjustments to these assumptions will be made at final engineering, after a builder selects floor plans for the lots.

1.2 Determination of Applicable Minimum Requirements

The stormwater management design of this project is required to comply with Section 5 of the City of Castle Rock Development Policies and Public Works Standards, and the 1992 SWMMPSB. Per Section I-2.4.1 of the 1992 SWMMPSB and Figure I-2.1 'Flowchart for Determining Minimum Requirements,' attached in Appendix B, Minimum Requirements 1-11 will apply to the site development.

The Existing Basin Map attached in Appendix A represents only the proposed development. Analysis of all offsite run-on to the proposed ditch will be included with the LOTC Stormwater Master Plan. A Proposed Basin Map is also attached in Appendix A. Given that this report is being prepared for preliminary engineering and not final design, a conveyance analysis was not completed at this time. However, an emphasis was put on preliminary treatment design to approximate the locations of mechanical filter catch basins and roughly size the filters needed. Therefore, the proposed basin map only provides more detailed information on the areas that have been modeled for treatment (proposed roadways, driveways, private driveway tracts, etc). As previously mentioned, the assumed roof area used in the Stormwater Master Plan is 1,500 square feet per lot. For now, the areas associated with these lots have been omitted from in depth analysis because the roof areas will bypass treatment. This will be achieved by a private storm system within easements on the front of the lots, connecting directly to storm manholes after treatment. This piping and all associated easements are shown in the preliminary plans. A more detailed proposed basin map will be completed at the time of final engineering, along with full conveyance modeling for the River's Edge storm system.

Table 1 - Existing Basins

Basin	Drainage System	Pervious Area (AC)	Impervious Area (AC)	Total Area (AC)
1	Onsite	7.65	0.00	**7.65**
2	Onsite	1.21	0.00	**1.21**
3	Offsite	0.18	0.00	**0.18**
Total		**9.04**	**0.00**	**9.04**

Table 2 – Proposed Basins

Basin	Drainage System	Pervious Area (AC)	Impervious Area (AC)	Total Area (AC)
1	Onsite	0.11	0.22	**0.33**
2	Onsite	0.03	0.07	**0.10**
3	Onsite	0.10	0.25	**0.35**
4	Onsite	0.11	0.21	**0.32**
5	Onsite	0.05	0.13	**0.18**
6	Onsite	0.13	0.25	**0.38**
7	Onsite	0.07	0.12	**0.19**
8	Onsite	0.09	0.17	**0.26**
9	Onsite	0.06	0.08	**0.14**
10	Onsite	0.07	0.17	**0.14**
11	Onsite	0.12	0.27	**0.39**
12	Onsite	0.12	0.10	**0.22**
Lots	Onsite (Bypassing Treatment)	3.29	1.55 (1,500 SF per lot)	**4.84**
13	Offsite	1.10	0	**1.10**
Total		**5.43**	**3.61**	**9.04**

2. Minimum Requirements

2.1 Meeting the Minimum Requirements

The stormwater management design for this project complies with the City of Castle Rock Storm Drainage Standards and the 1992 Stormwater Management Manual for the Puget Sound Basin. All required information is included in this stormwater report and the proposed stormwater facilities are feasible.

I-2.5 Minimum Requirement #1: Erosion and Sediment Control

A Preliminary Erosion Control Plan has been included with the project plans and are attached in Appendixes D. There is an existing SWPPP in place for the Mass Grading and Phase 1 construction onsite. An updated SWPPP will be included for this phase at the time of Final Engineering.

I-2.6 Minimum Requirement #2: Preservation of Natural Drainage Systems

Natural drainage patterns have been mimicked where possible or improved to direct all runoff onsite to the LOTC outfall to the Cowlitz River.

I-2.7 Minimum Requirement #3: Source Control of Pollution

The proposed use of this site is residential, therefore there are no source control BMPs required. However, the following BMPs are proposed:

BMP S2.00 Maintenance of Storm Drainage Facilities

I-2.8 Minimum Requirement #4: Runoff Treatment BMPs

Per Table I-4.2, because Oil/Water Separation, Nutrient Control, and Streambank Erosion Control are not required, Conventional Treatment is all that is required onsite (WADOE, 1992). Runoff onsite will be treated by Contech StormFilter mechanical treatment catch basins. Per Section V-11 Manufactured Treatment Devices as BMPs, the proposed devices are adequate for providing basic treatment (WADOE, 2024). The proposed basins shown in the Proposed Basin Map have been modeled in WWHM to determine their respective water quality flow rates. The combined water quality flow rate for the areas receiving treatment is 137.57 GPM, which equates to eight 27'' PSORB cartridges or eleven 12'' SPORB cartridges. The preliminary WWHM2012 calculations for the sizing of the treatment filters can be found in Appendix B. A more detailed layout of the proposed cartridge locations is included in the preliminary stormwater plan, attached in Appendix D. For more detailed information on the contributing areas to each facility, see the Proposed Basin Map attached in Appendix A.

Because a treatment method from the 2024 SWMMWW has been selected, the Minimum Requirements from the 2024 manual have been reviewed. Per Figure I-3.1 'Flow Chart for Determining Requirements for New Development,' nearly all proposed basins onsite result in over 5,000 square feet of new impervious surface area. All Minimum Requirements apply to those sub basins. For simplicity, every basin will be designed to meet all Minimum Requirements. Per Figure I-3.3 'Flowchart for Determining MR #5 Requirements,' attached in Appendix B, the developer will meet the LID Performance Standards onsite by implementing LID devices where practical. The site is flow control exempt, but perforated pipes within infiltration trenches will reduce the runoff leaving the site. The proposed infiltration trenches will be designed to ensure runoff flows from the site comply with all models done for the LOTC Stormwater Master Plan. More detailed infiltration models will be provided at the time of Final Engineering. BMP T5.13 Post Construction Soil Quality and Depth will also be implemented to all landscaped areas.

I-2.9 Minimum Requirement #5: Streambank Erosion Control

All runoff onsite will outlet to the Cowlitz River, a flow control exempt water body, or will be infiltrated. As discussed above, some infiltration will be conducted onsite to ensure that flows to the LOTC Master Outfall comply with the values used in the Master Stormwater Plan. There is no streambank erosion present in the current condition. The proposed condition will result in no excess runoff to the streams onsite, so streambank erosion is not expected as part of this project. The discussion between the city regarding this issue is detailed in the Stormwater Master Plan.

I-2.10 Minimum Requirement #6: Wetlands

No runoff onsite will be directed to the onsite wetlands in the proposed conditions. Therefore, this minimum requirement is not required.

I-2.11 Minimum Requirement #7: Water Quality Sensitive Areas

There are no water quality sensitive areas that will be affected by this project. Therefore, this minimum requirement is not required.

I-2.12 Minimum Requirement #8: Off-site Analysis and Mitigation

An offsite analysis was conducted a quarter mile downstream from the outlet to the Cowlitz River using the available data. The following items were analyzed for both existing and proposed conditions.

i. Excessive sedimentation: There is no excessive sedimentation present in the current condition. The proposed condition will greatly increase the impervious surface area, resulting in increases to both runoff volume and flow. Sedimentation prevention measures will be implemented both during construction and in the final condition. Measures taken during construction are detailed further in the SWPPP for this project. Stormwater treatment onsite will be provided by bioretention facilities before runoff is conveyed to the site outfall to the Cowlitz River. Further Erosion Control measures are detailed in the associated plan set and storm report for the outfall itself.
ii. Streambank Erosion: There is no streambank erosion present in the current condition. The proposed condition will result in no excess runoff to the streams onsite, so streambank erosion is not expected as part of this project.
iii. Discharges to Groundwater or Recharge Zones: Runoff onsite will outlet directly to the Cowlitz River
iv. Violations of Water Quality Standards: Not present in the current or proposed condition
v. Spills and Discharges of Priority Pollutants: Not present in the current or proposed condition

I-2.13 Minimum Requirement #9: Basin Planning

Basin Planning will not be required to modify any other Minimum Requirements.

I-2.14 Minimum Requirement #10: Operation and Maintenance

The City will take ownership of the public storm drain system upon completion of the construction. A private HOA will be responsible for the operation and maintenance of the proposed private stormwater facilities onsite. Pages from the 1992 SWMMPSB are attached in Appendix E detailing maintenance requirements for applicable components onsite. The site will be inspected for defects and maintained as needed at least once every season, as well as after all major storm events (including an in excess of the 100-year storm event).

I-2.15 Minimum Requirement #11: Financial Liability

A performance bond or other appropriate financial instruments (as approved by the City) shall be provided to ensure compliance with these standards.

2.2 Soil Evaluation

A geotechnical report was conducted by Columbia West for the whole LOTC development, dated March 30, 2023, as well as a follow up exploration in March of 2024. These reports are attached in Appendix C. The soils onsite are categorized as Hydrologic Group A.

Groundwater Data

Groundwater was not encountered in depths up to 13 feet below ground surface (BGS) in test pits 20, 21, and 22 as part of the follow up exploration. Site groundwater was observed between 15 to 35 feet below ground surface (BGS) during boring and was reported from 9 to 35 feet BGS in exploration logs. According to the geotechnical report, perched groundwater may be present in localized areas.

3. Conveyance System

3.1 Conveyance System Analysis and Design

All runoff onsite that does not infiltrate within the proposed infiltration trench will be conveyed to the Phase 1 storm system, and ultimately the onsite and offsite outfall systems. Conveyance models will be included at the time of Final Engineering to ensure that all storm systems onsite are adequately sized for onsite runoff as well as offsite run-on from surrounding areas.

A conveyance model has already been conducted as part of the Stormwater Master Plan to ensure that runoff generated by this development was appropriately factored into the ultimate design. Models will be included to ensure that flows leaving the site comply with all assumptions made in the Stormwater Master Plan.

4. References

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Hinman, Curtis. 2012. *Low Impact Development Technical Guidance Manual for Puget Sound.* PSP 2012-3. Puyallup, WA: Washington State University Extension.

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WADOE. 2006. *Guidance for UIC Wells that Manage Stormwater.* 05-10-067. Olympia, WA: Washington State Department of Ecology.

—. 1992. *Stormwater Management Manual for the Puget Sound Basin.*

—. 2024. *Stormwater Manual for Western Washington.* 24-10-013. Olympia, WA: Washington State Department of Ecology.

Appendix A Maps

Vicinity Map

Aerial Map with Contours

WWHM Soil Group Classification

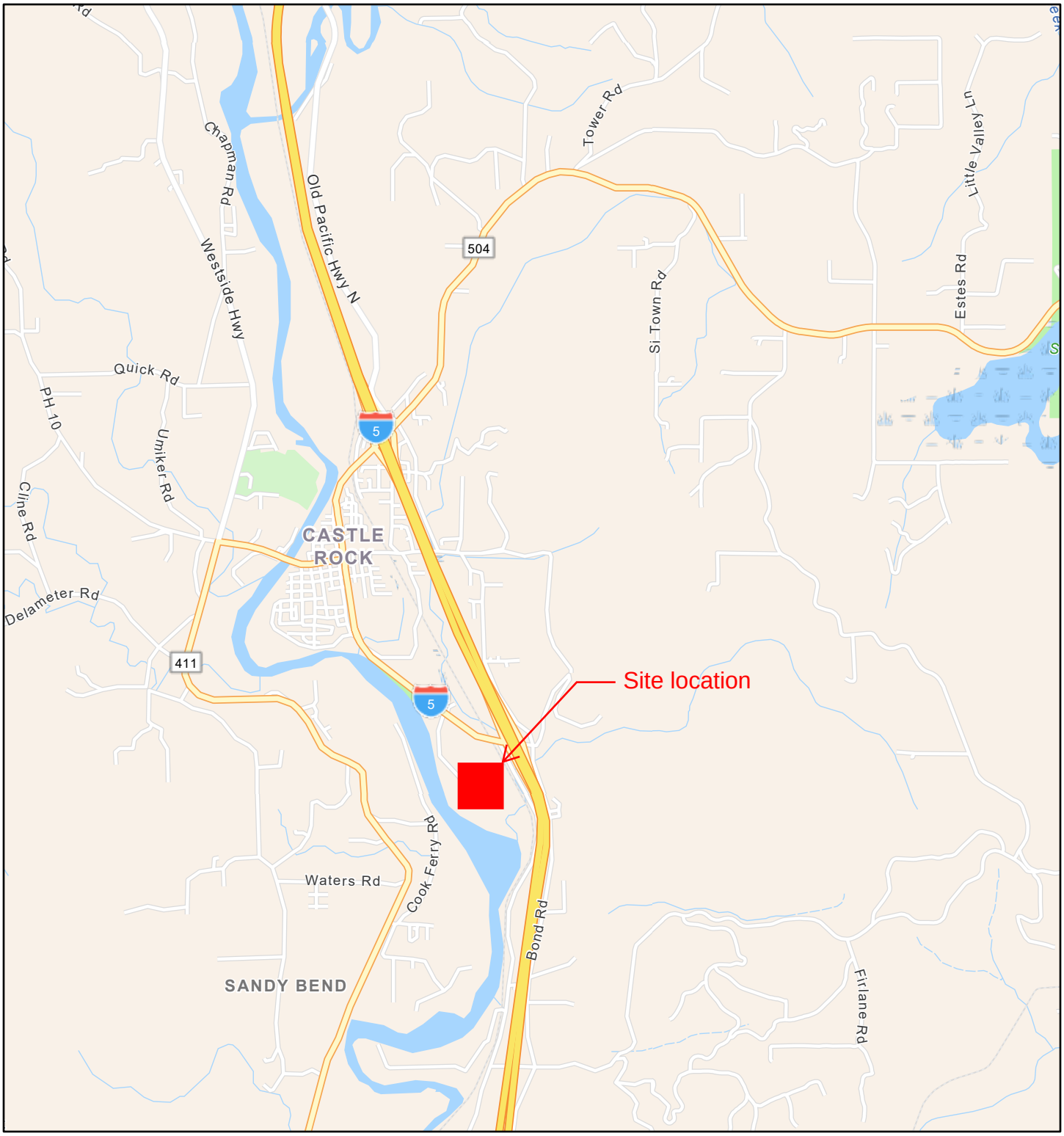
NRCS Soil Map

Isopluvial Maps

Existing Basin Map

Proposed Basin Map

Vicinity Map



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County Boundary

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0 0.42 0.85 1.7 mi

0 0.5 1 2 km

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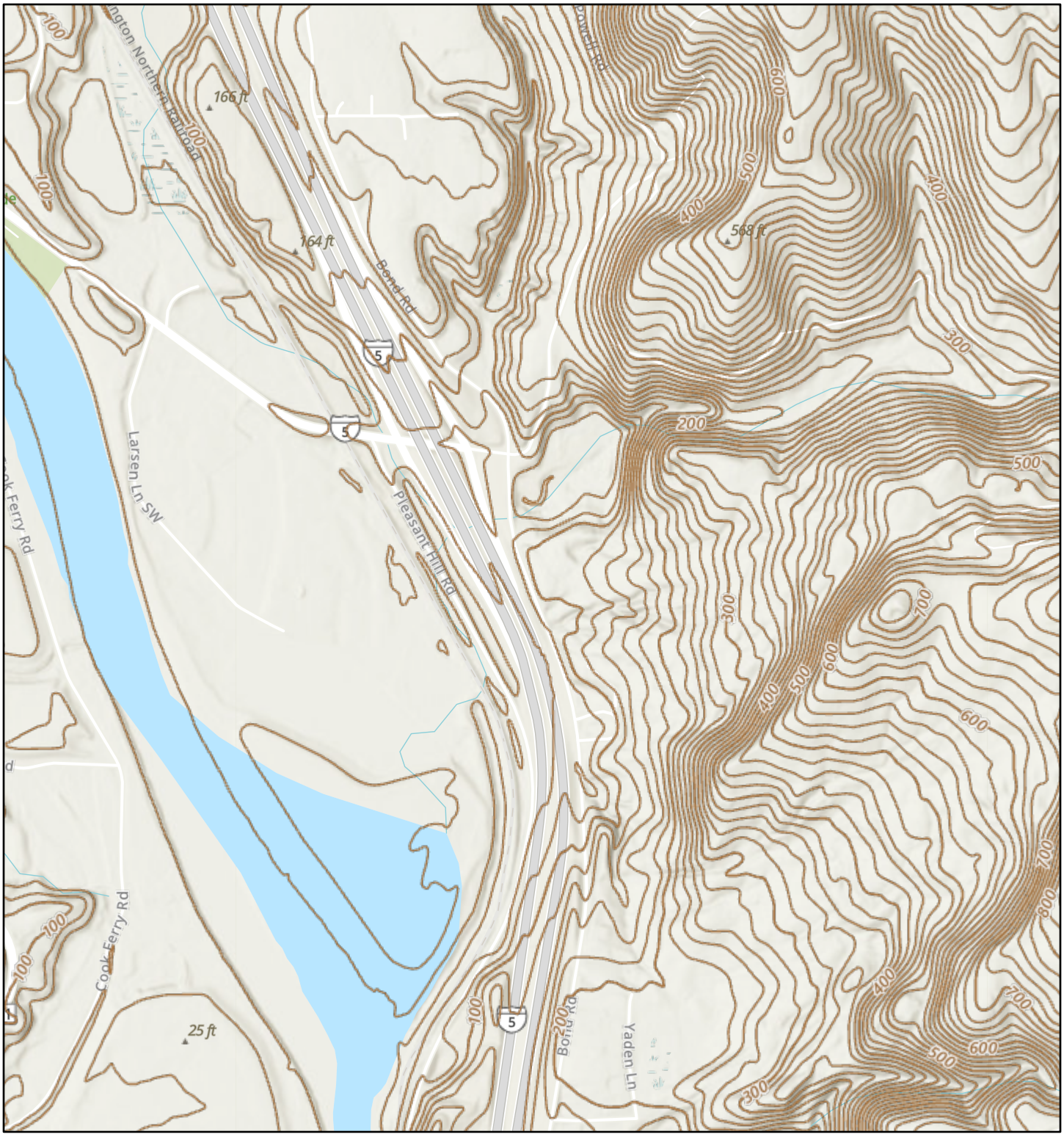
Aerial with Contours



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0 0.15 0.3 0.6 km

County Boundary

Normal Intermediate Contours

Normal Index Contours

USGS The National Map: 3D Elevation Program. Data Refreshed September, 2024., Esri Community Maps Contributors, Oregon State Parks, State of Oregon GEO, WA State Parks GIS, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS, Esri, NASA, NGA, USGS,

APPENDIX AIII-1.1

ISOPLUVIAL MAPS FOR DESIGN STORMS

Included in this appendix are the 2, 10 and 100-year, 24-hour design storm and mean annual precipitation isopluvial maps for the Puget Sound basin. These have been taken from NOAA Atlas 2 "Precipitation - Frequency Atlas of the Western United States, Volume IX, Washington.

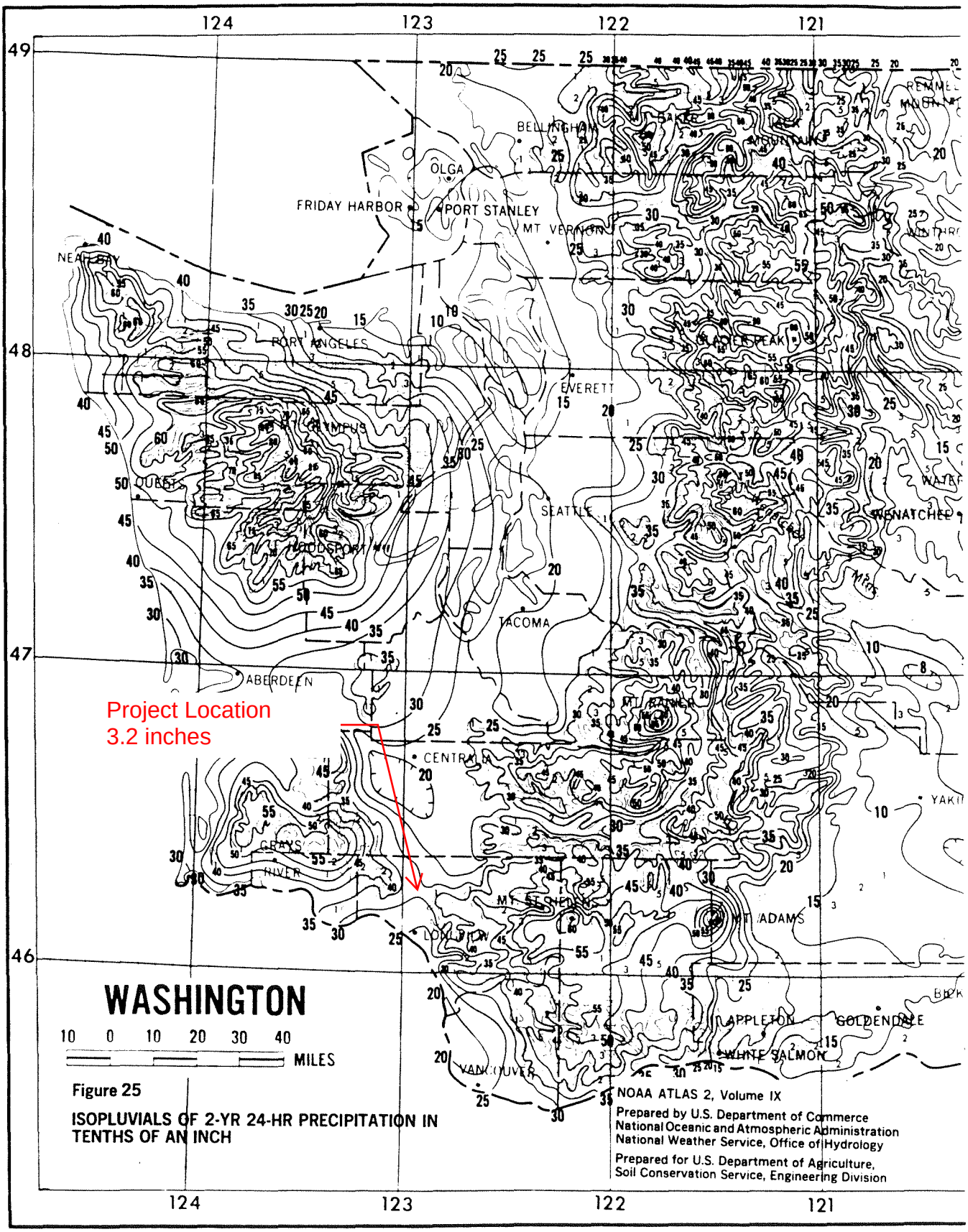


Figure 25

ISOPLUVIALS OF 2-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

NOAA ATLAS 2, Volume IX

Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology

Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division

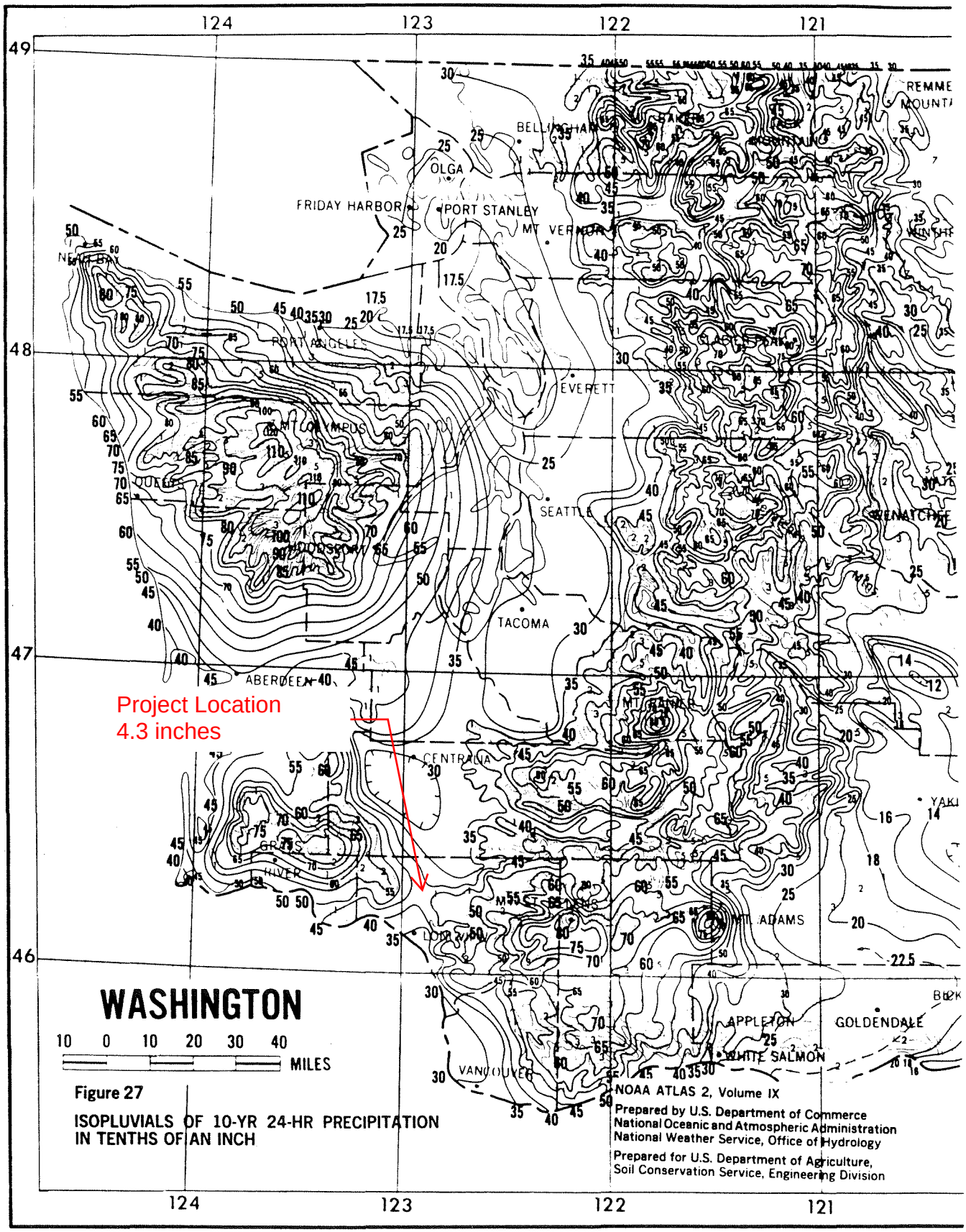


Figure 27

ISOPLUVIALS OF 10-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

NOAA ATLAS 2, Volume IX

Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology

Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division

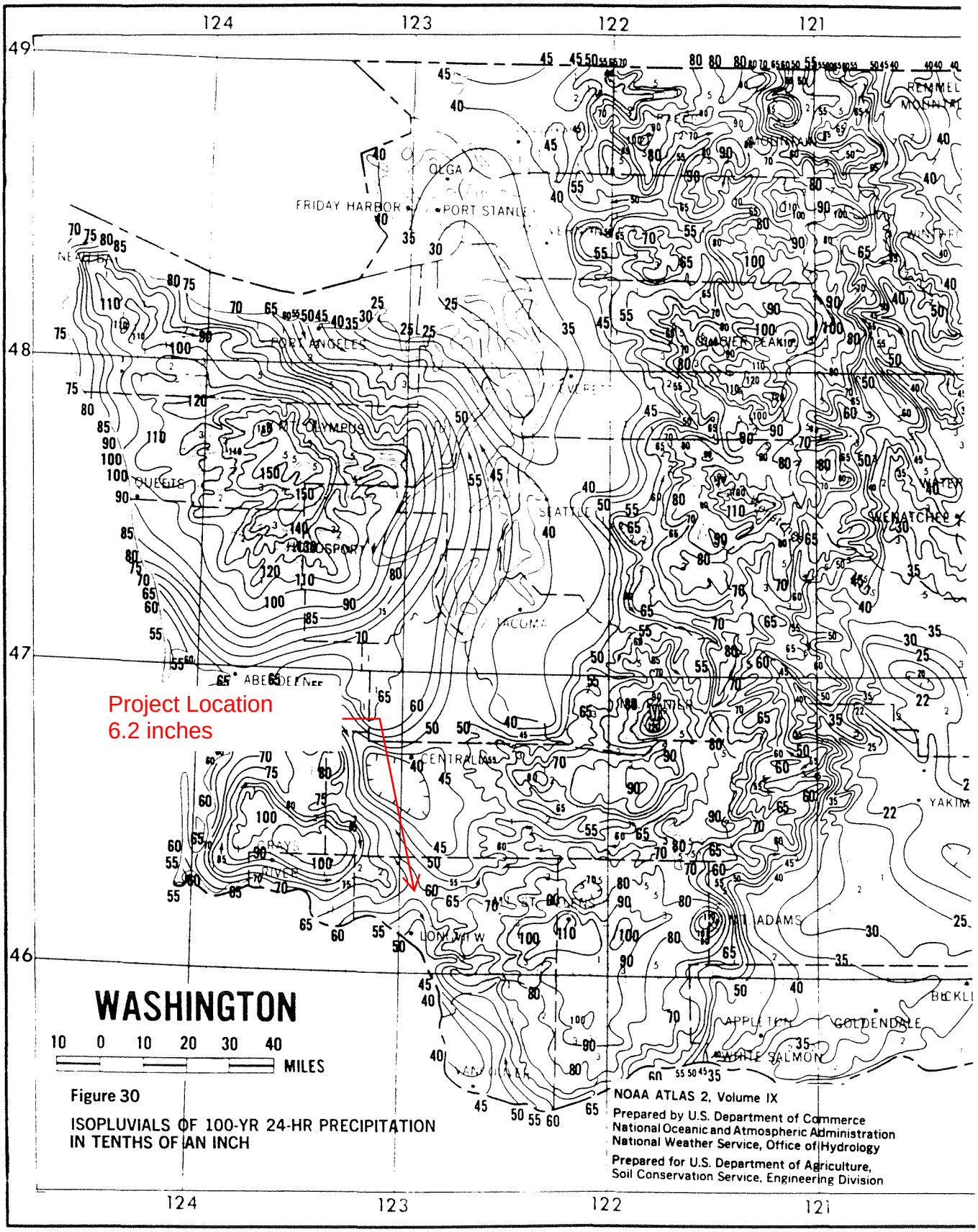


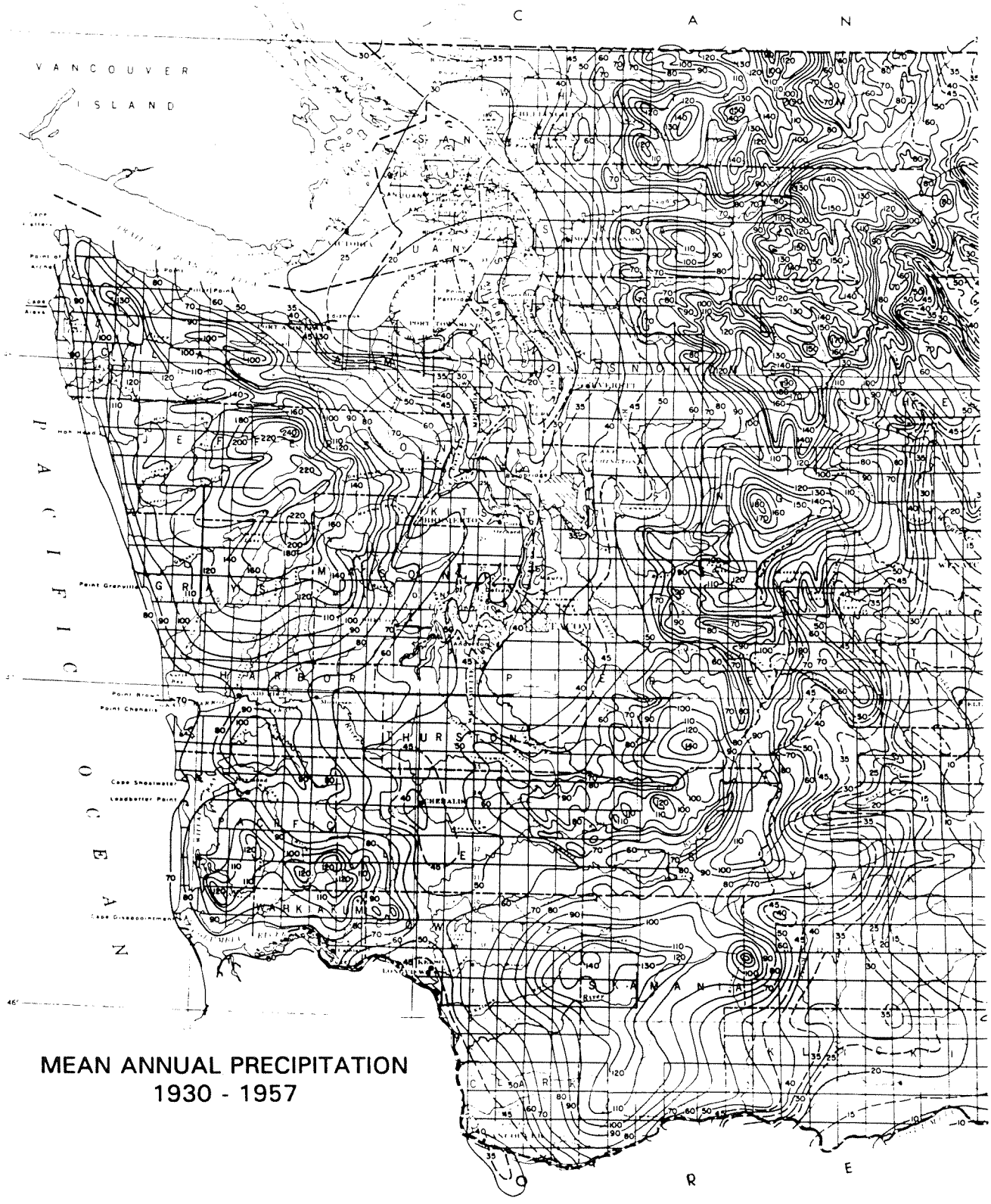
Figure 30

ISOPLUVIALS OF 100-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

NOAA ATLAS 2, Volume IX

Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology

Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division



MEAN ANNUAL PRECIPITATION
1930 - 1957

Soil Map—Cowlitz County, Washington
(Soil Map)

Map Scale: 1:1,690 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

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: Cowlitz County, Washington
Survey Area Data: Version 25, Aug 26, 2024

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

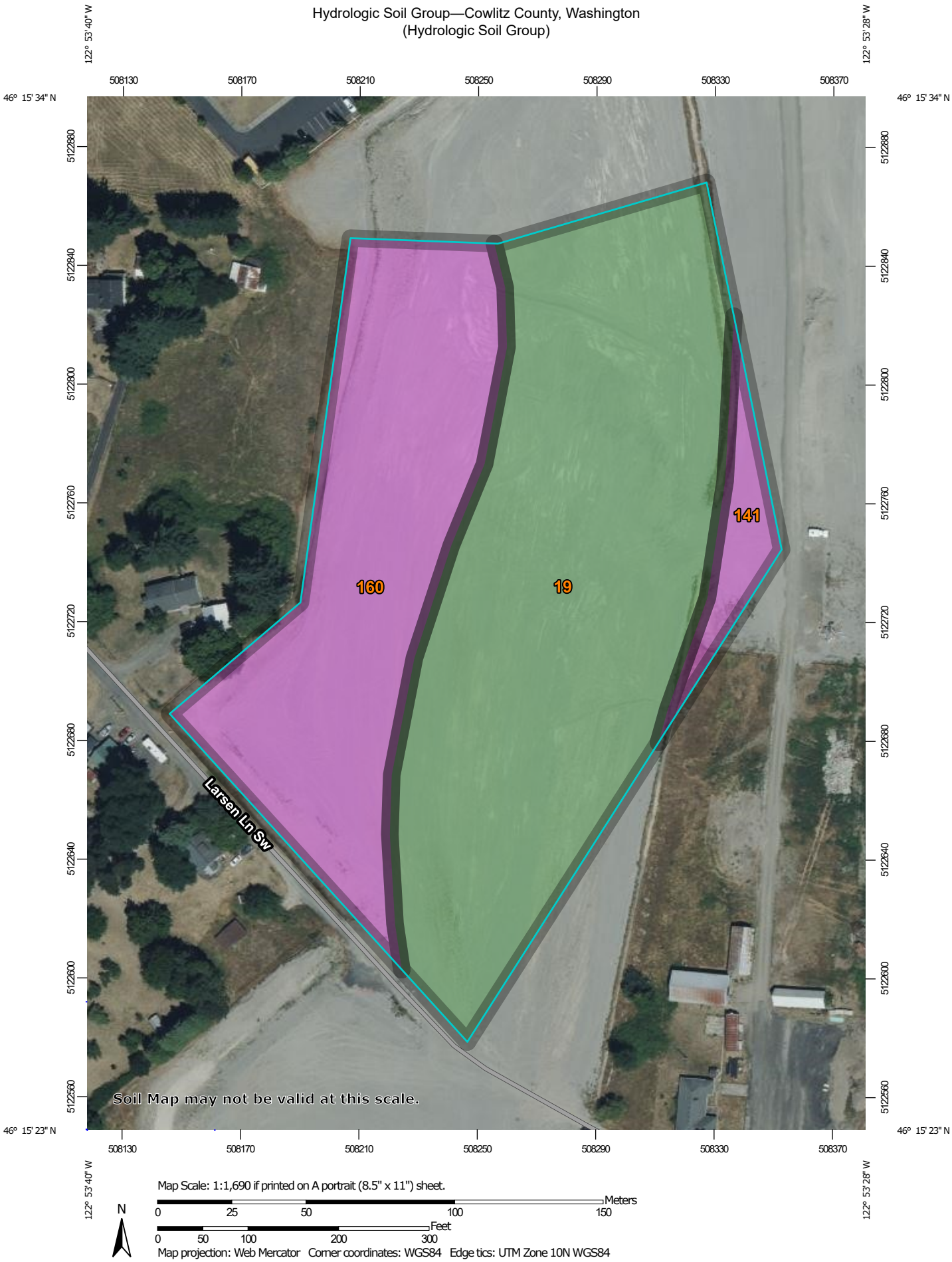
Date(s) aerial images were photographed: May 26, 2023—Aug 14, 2023

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
19	Carrolls loamy sand, 0 to 2 percent slopes	5.0	60.2%
141	Newberg fine sandy loam, 0 to 3 percent slopes	0.4	4.5%
160	Pilchuck loamy fine sand, 0 to 8 percent slopes	3.0	35.4%
Totals for Area of Interest		**8.4**	**100.0%**

Hydrologic Soil Group—Cowlitz County, Washington
(Hydrologic Soil Group)



Map Scale: 1:1,690 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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 Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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)

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

Date(s) aerial images were photographed: May 26, 2023—Aug 14, 2023

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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
19	Carrolls loamy sand, 0 to 2 percent slopes	A/D	5.0	60.2%
141	Newberg fine sandy loam, 0 to 3 percent slopes	A	0.4	4.5%
160	Pilchuck loamy fine sand, 0 to 8 percent slopes	A	3.0	35.4%
Totals for Area of Interest			**8.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

0 120 240

SCALE: 1" = 120'

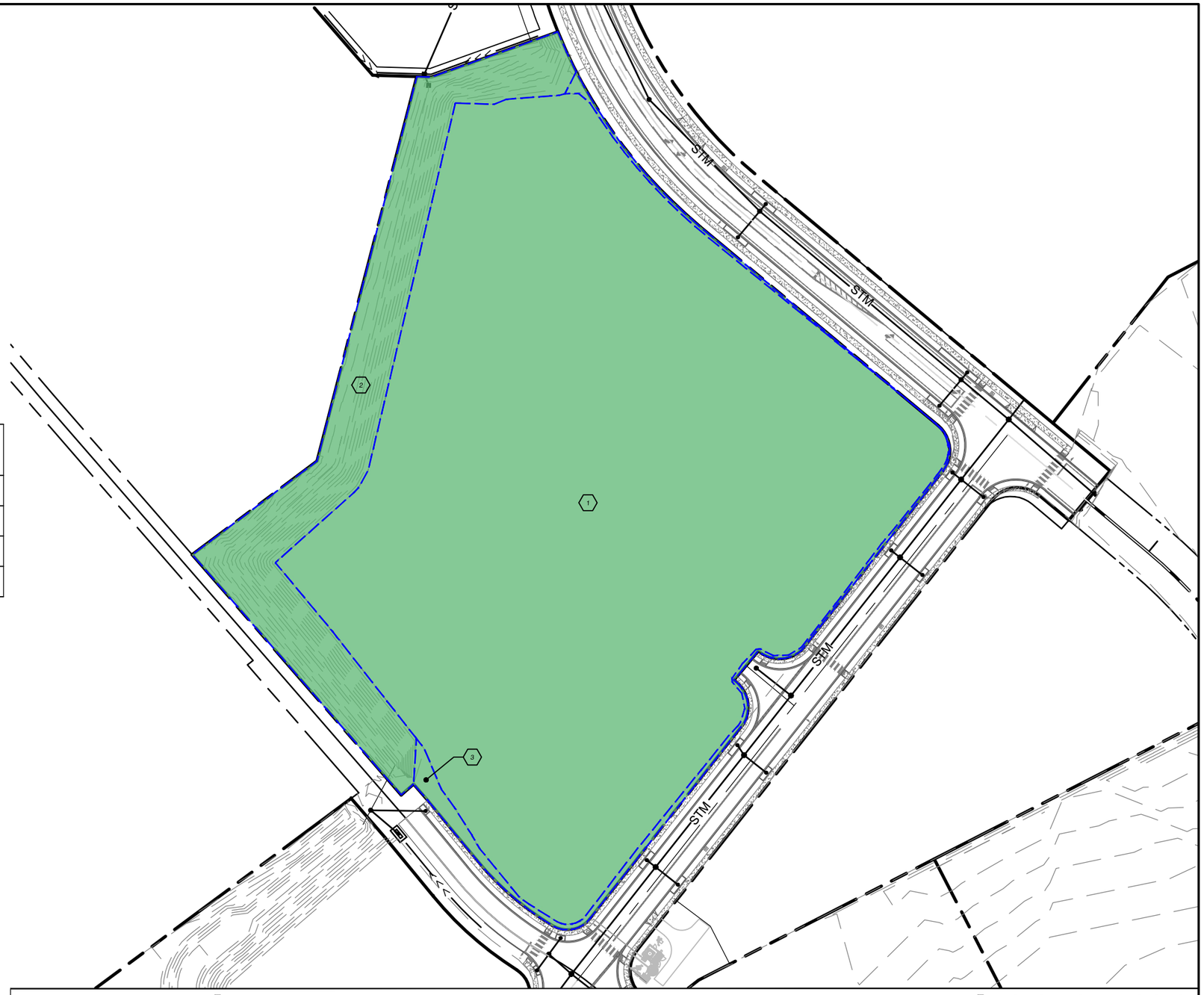
Basin	Impervious Area (SF)	Impervious Area (AC)	Pervious Area (SF)	Pervious Area (AC)	Total (AC)
1	0	0.00	333319	7.65	7.65
2	0	0.00	52512	1.21	1.21
3	0	0.00	7943	0.18	0.18
Total	0	0.00	393774	9.04	9.04

LEGEND

BASIN LINE

IMPERVIOUS AREA

PERVIOUS AREA



MacKay Sposito

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RIVER'S EDGE AT LANDING ON THE COWLITZ

EXISTING BASIN MAP

PROJECT NO.:	18591.01
DRAWN BY:	PJM
CHECKED BY:	TAW
DATE:	3/27/2025
SHEET NO.	A6

FILE: W:\18591 LOTC Phase 1\500 Design\501 Documents\Technical Files\Working Docs\Stormwater\Subdivision\TIR\Preliminary\01 Appendices\Appendix A - Maps\Existing Basin Map.dwg

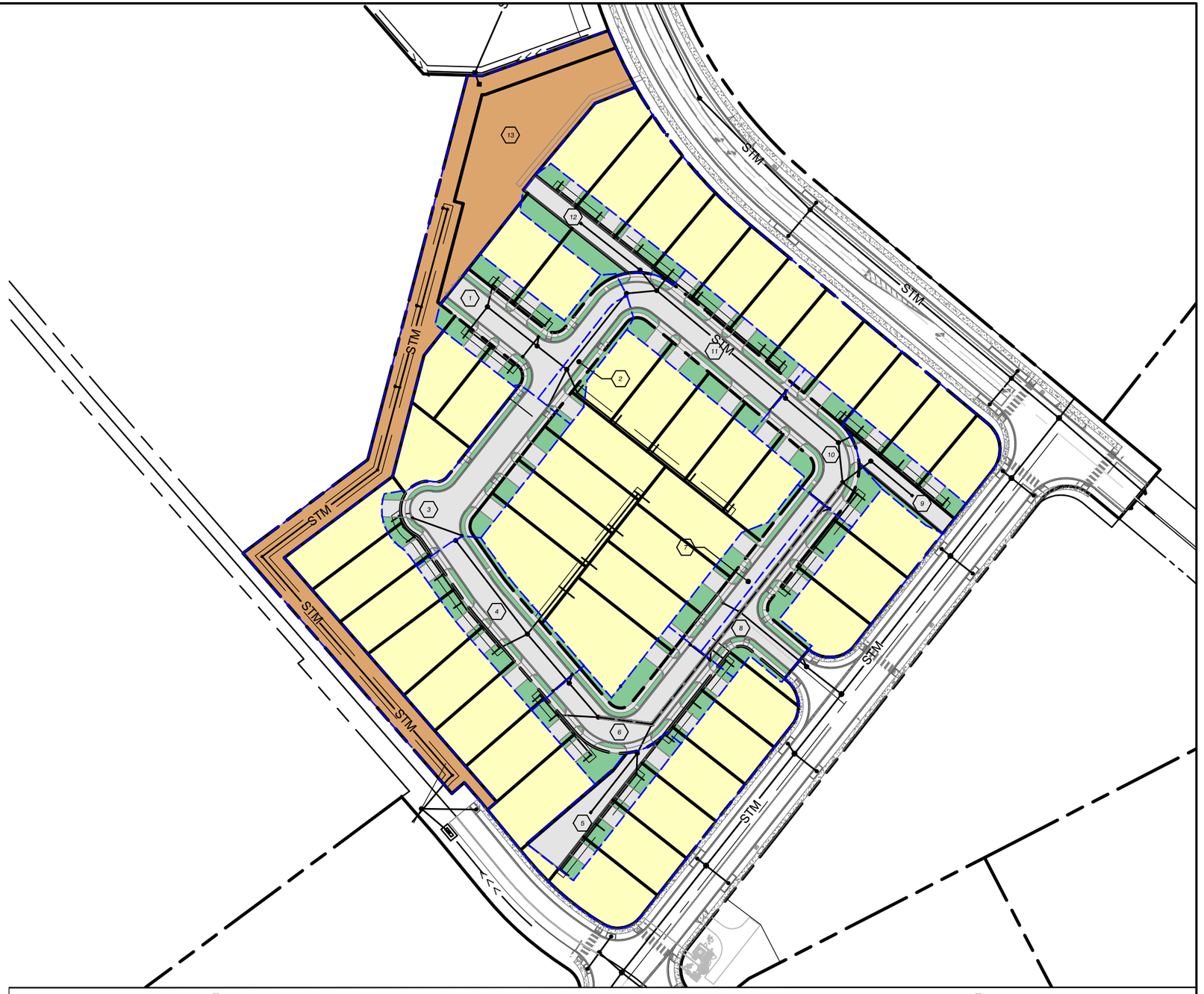
0 120 240

SCALE: 1" = 120'

Basin	Impervious Area (SF)	Impervious Area (AC)	Pervious Area (SF)	Pervious Area (AC)	Total (AC)
1	9791	0.22	4601	0.11	0.33
2	3191	0.07	1270	0.03	0.10
3	11090	0.25	4232	0.10	0.35
4	9284	0.21	4620	0.11	0.32
5	5870	0.13	2278	0.05	0.19
6	10840	0.25	5530	0.13	0.38
7	5041	0.12	2854	0.07	0.18
8	7233	0.17	3892	0.09	0.26
9	3593	0.08	2538	0.06	0.14
10	7598	0.17	3206	0.07	0.25
11	11937	0.27	5438	0.12	0.40
12	4154	0.10	5203	0.12	0.21
13	0	0.00	47814	1.10	1.10
Lots	67500	1.55	143176	3.29	4.84
Total	157122	3.61	236652	5.43	9.04

LEGEND

- BASIN LINE
- IMPERVIOUS AREA
- PERVIOUS AREA
- RESIDENTIAL LOTS (BYPASSING TREATMENT)
- PARK/OPEN SPACE (OFFSITE SYSTEM)



MacKay Sposito

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RIVER'S EDGE AT THE LANDING

PROPOSED BASIN MAP

PROJECT NO.:	18591.01
DRAWN BY:	PJM
CHECKED BY:	TAW
DATE:	3/27/2025
SHEET NO.	A7

FILE: W:\18591 LOTC Phase 1\500 Design\501 Documents\Technical Files\Working Docs\Stormwater\Subdivision\TIR\Preliminary\01 Appendices\Appendix A - Maps\Proposed Basin Map.dwg

Appendix B Hydrologic Exhibits and Calculations

Figure I-2.1 Flowchart for Determining Minimum Requirements (1992 SWMMSWB)

Figure I-3.1 Flowchart for Determining Minimum Requirements for New Development (2024 SWMMWW)

Figure I-3.3 Flowchart for Determining MR #5 Requirements (2024 SWMMWW)

WWHM Water Quality Flow Rate Calculations

Figure I-2.1 Flowchart Demonstrating Minimum Requirements

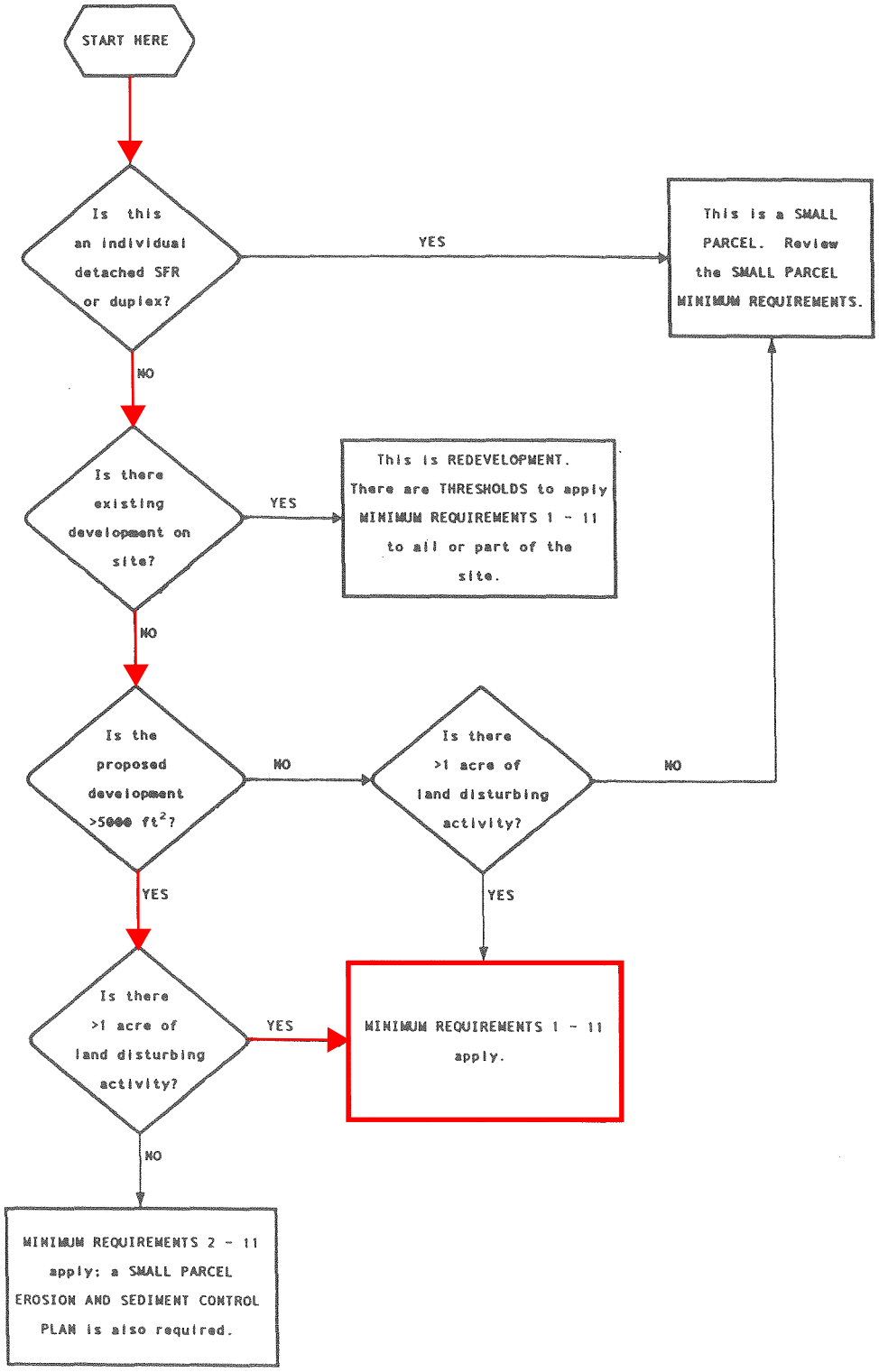


Figure I-3.1: Flow Chart for Determining Requirements for New Development

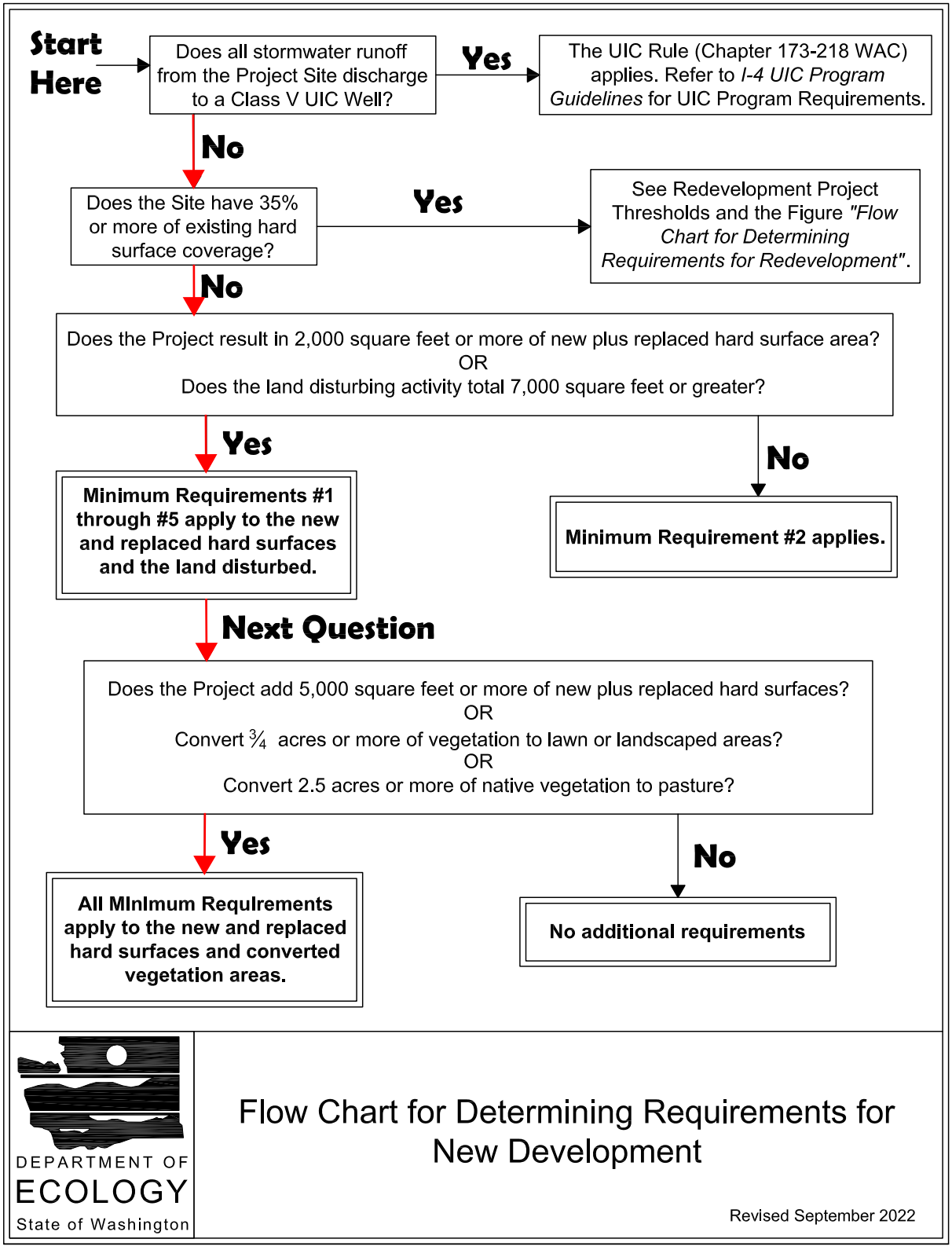
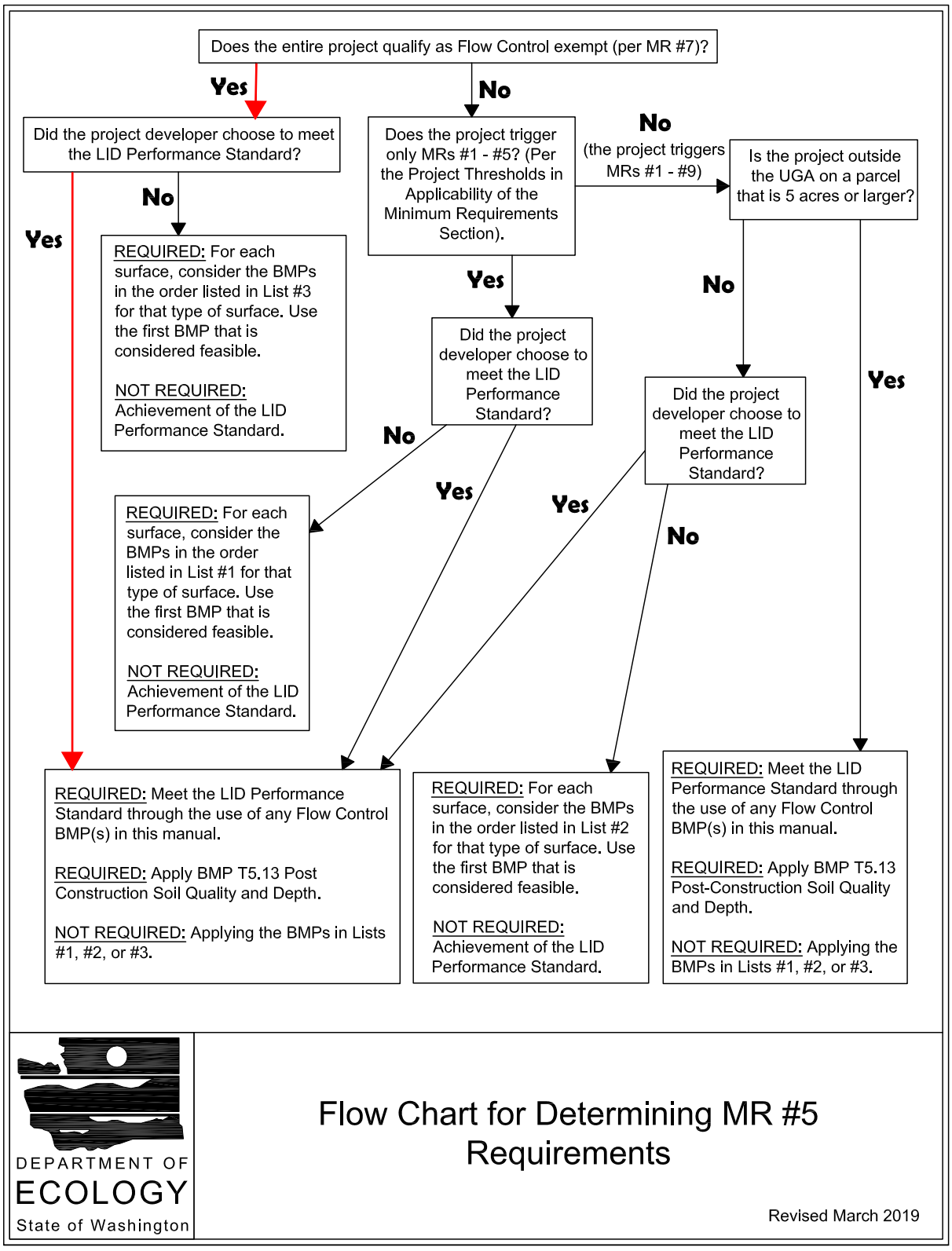


Figure I-3.3: Flow Chart for Determining MR #5 Requirements



WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: 18591.01 - Mechicanial Treatment

Site Name:	LOTC Subdivision
Site Address:	
City:	Castle Rock
Report Date:	3/26/2025
Gage:	Longview
Data Start:	1955/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.429
Version Date:	2024/06/28
Version:	4.3.1

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

A1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Mod	1.44
Pervious Total	1.44
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.44

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
POC 1	POC 1	

Mitigated Land Use

1

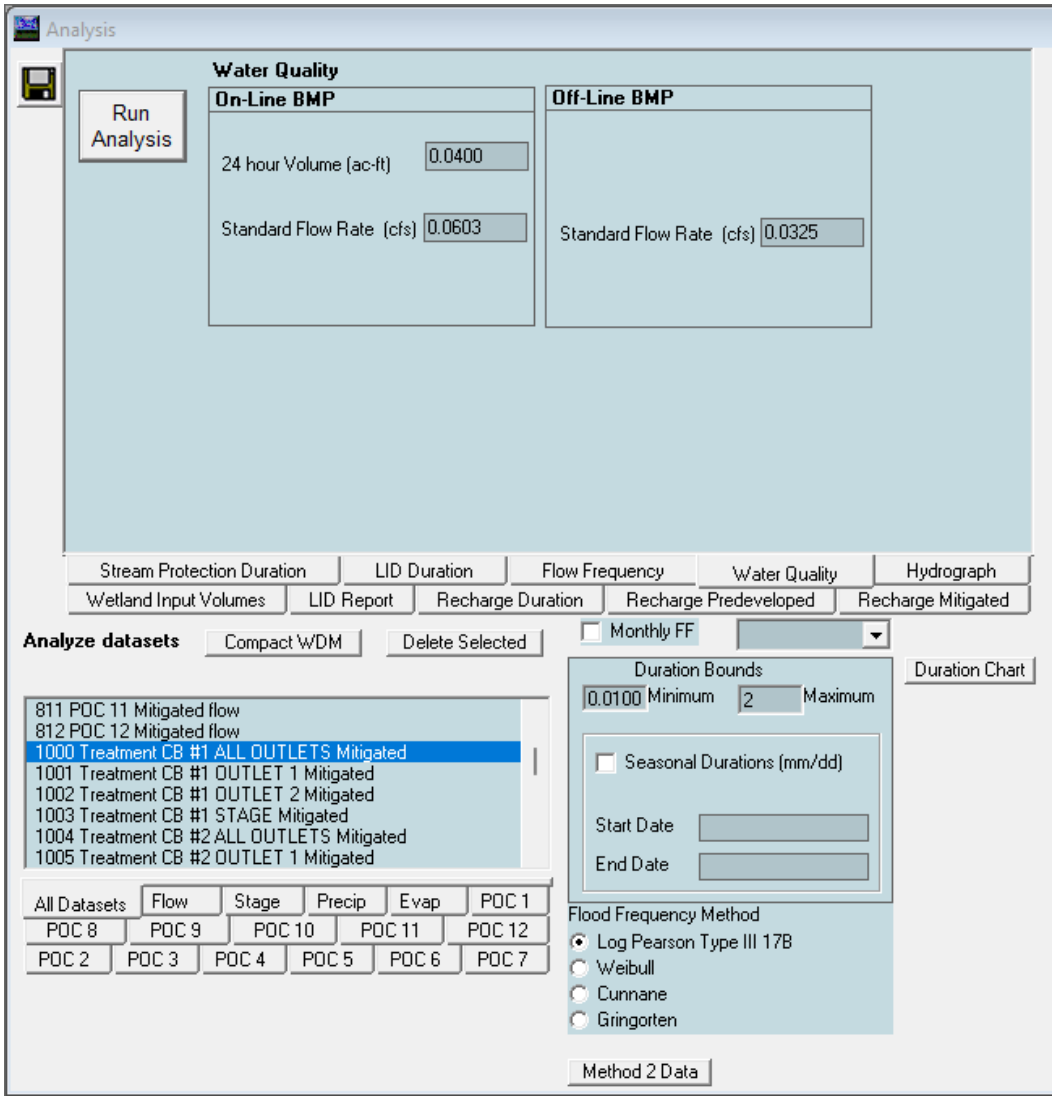
Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.11
Pervious Total	0.11
Impervious Land Use	acre
ROADS FLAT	0.22
Impervious Total	0.22
Basin Total	0.33

Element Flow Componants:

Surface	Interflow	Groundwater

Componant Flows To:

Treatment CB #1	Treatment CB #1

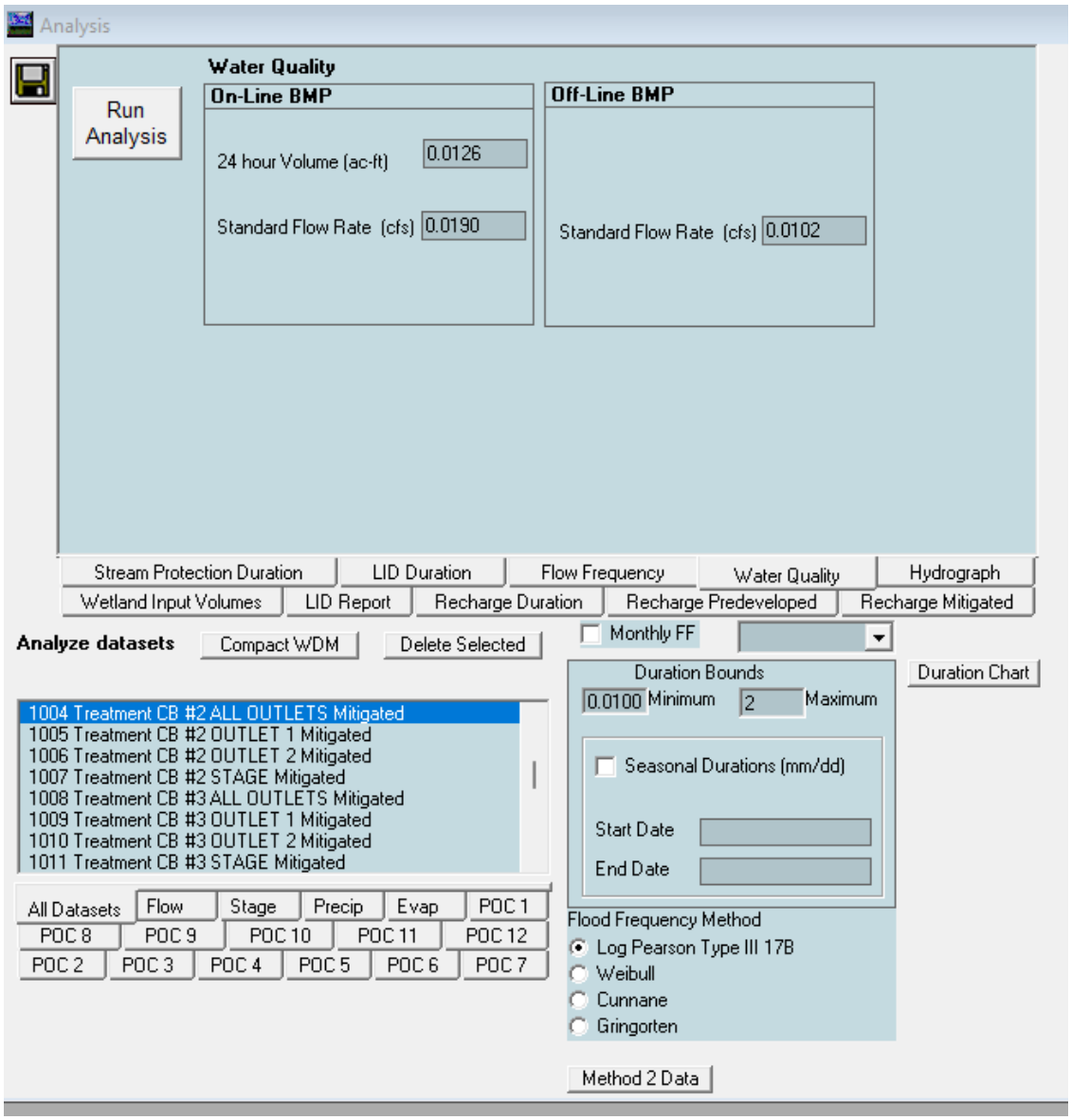


2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.03
Pervious Total	0.03
Impervious Land Use	acre
ROADS FLAT	0.07
Impervious Total	0.07
Basin Total	0.1

Element Flow Componants:

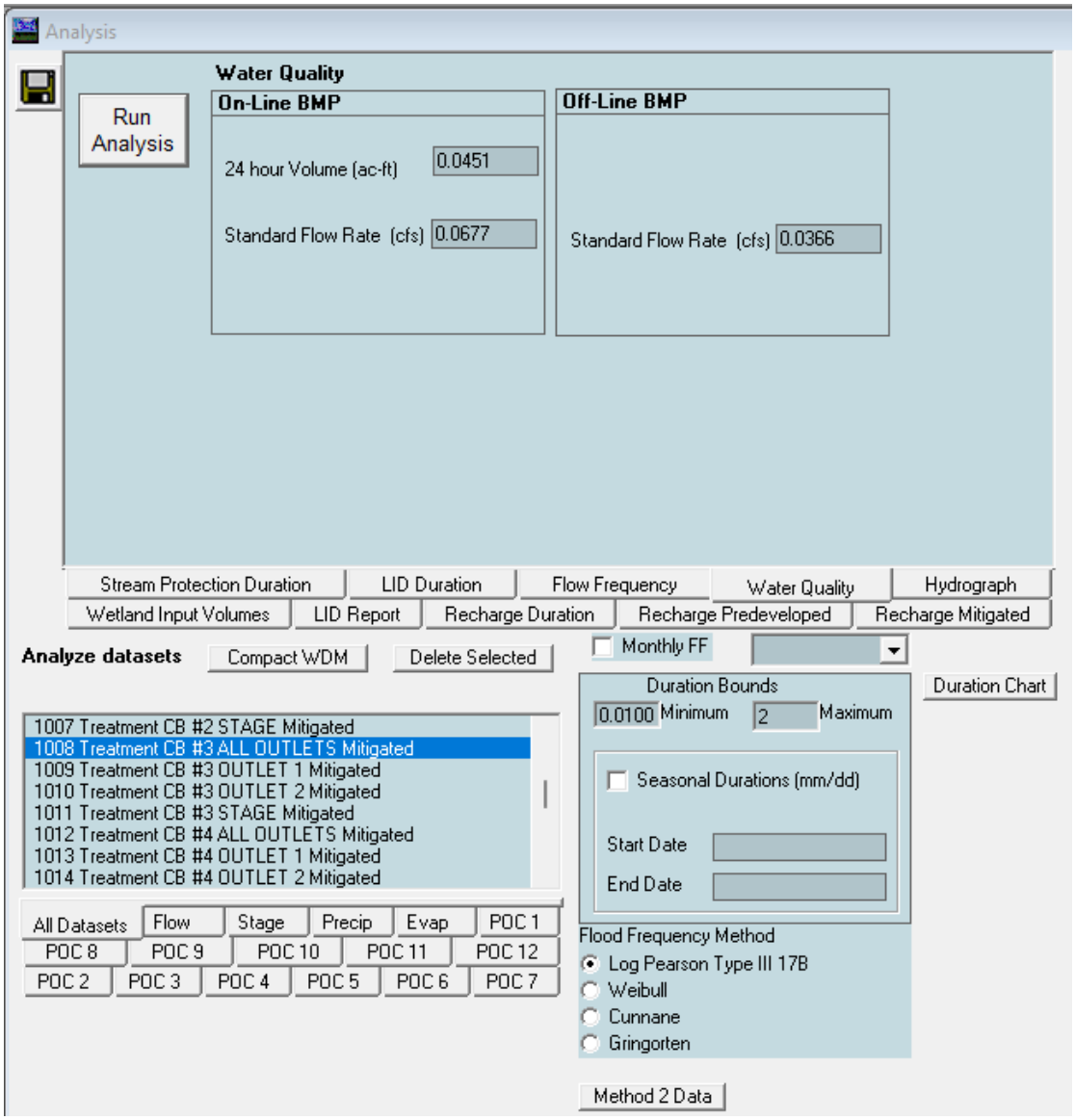
Surface	Interflow	Groundwater
Componant Flows To:		
Treatment CB #2	Treatment CB #2	



3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.1
Pervious Total	0.1
Impervious Land Use	acre
ROADS FLAT	0.25
Impervious Total	0.25
Basin Total	0.35

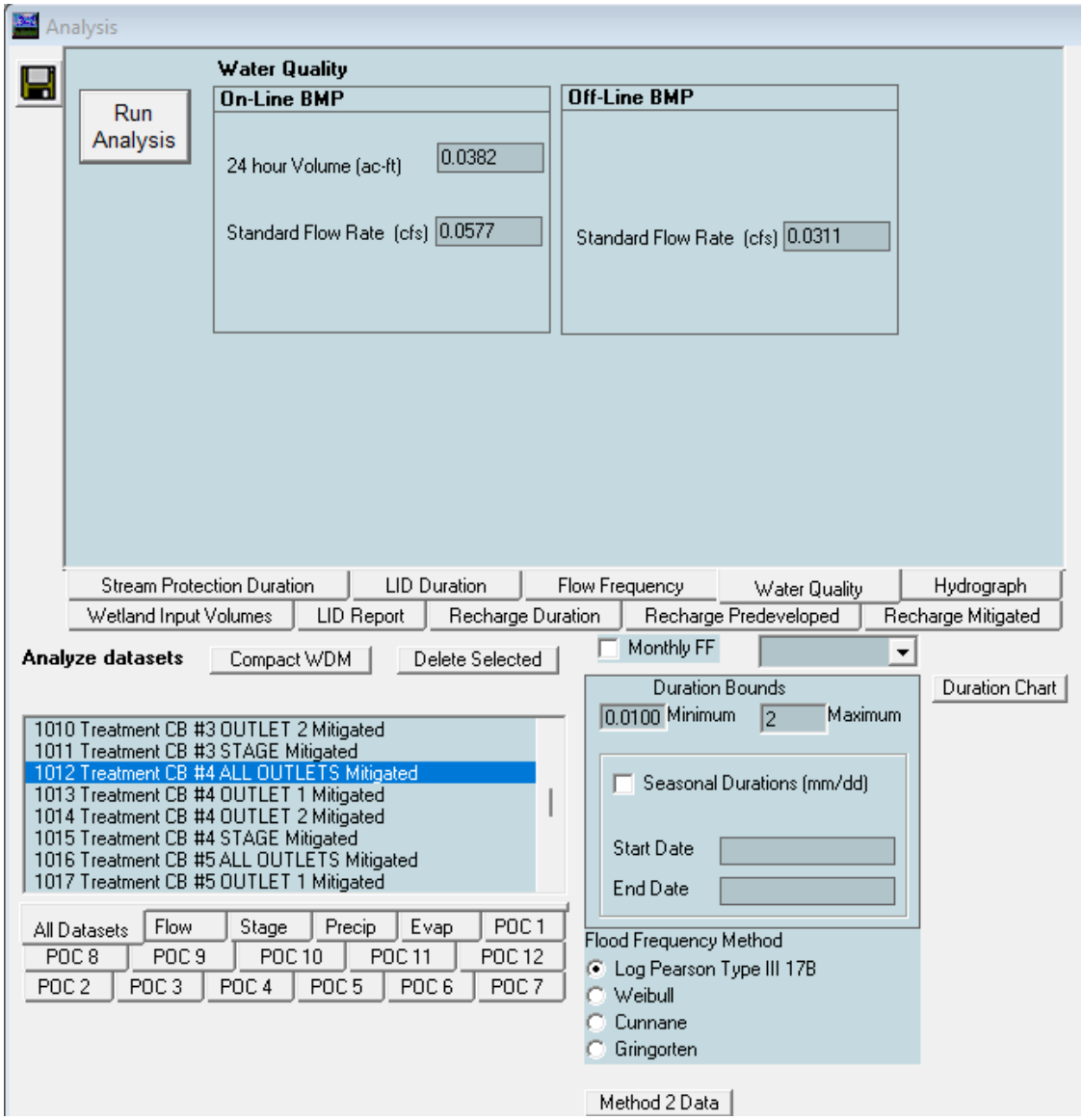
Element Flow Componants:
Surface Interflow Groundwater
Componant Flows To:
Treatment CB #3 Treatment CB #3



4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.11
Pervious Total	0.11
Impervious Land Use	acre
ROADS FLAT	0.21
Impervious Total	0.21
Basin Total	0.32

Element Flow Componants:
Surface Interflow Groundwater
Componant Flows To:
Treatment CB #4 Treatment CB #4

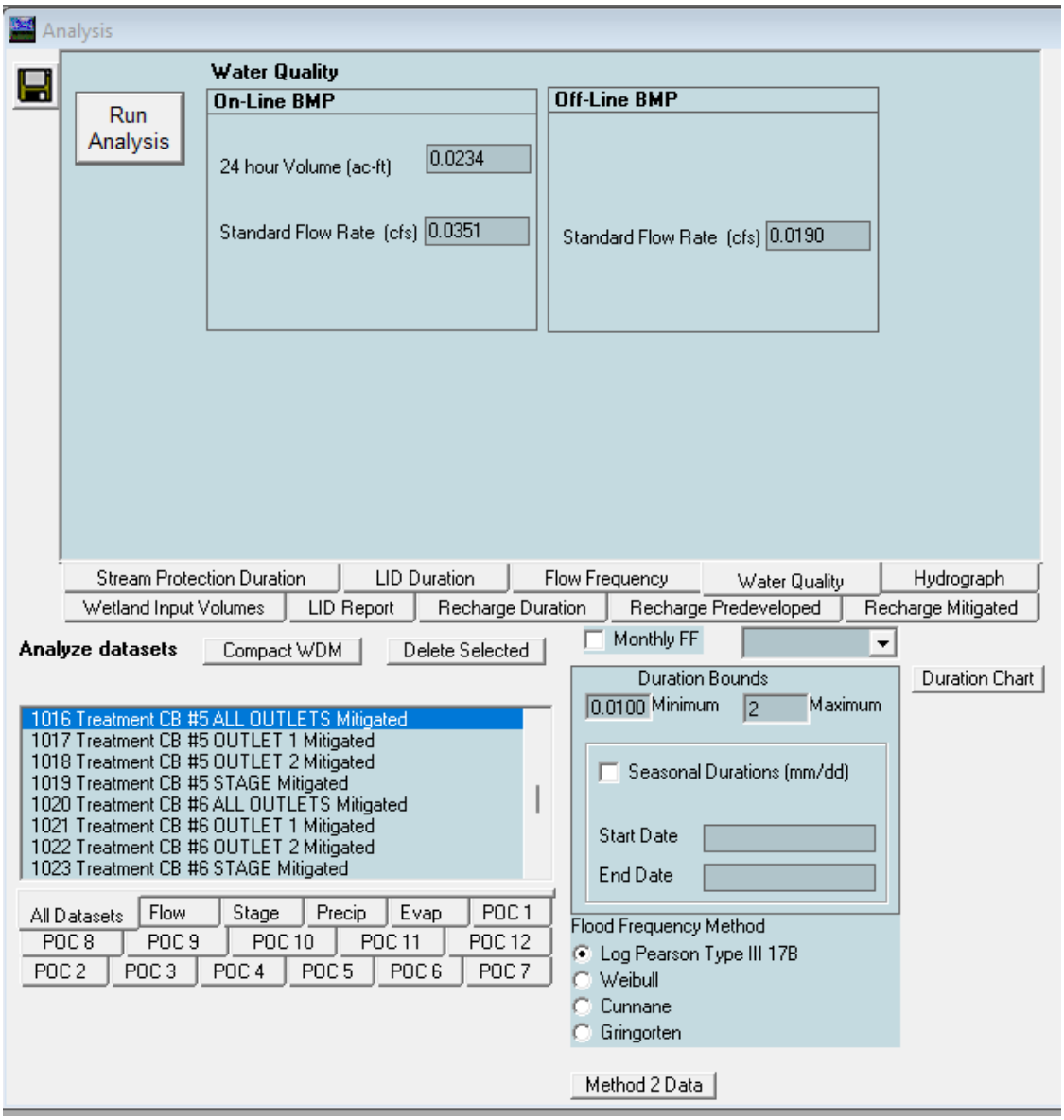


5

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.05
Pervious Total	0.05
Impervious Land Use	acre
ROADS FLAT	0.13
Impervious Total	0.13
Basin Total	0.18

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Treatment CB #5	Treatment CB #5	

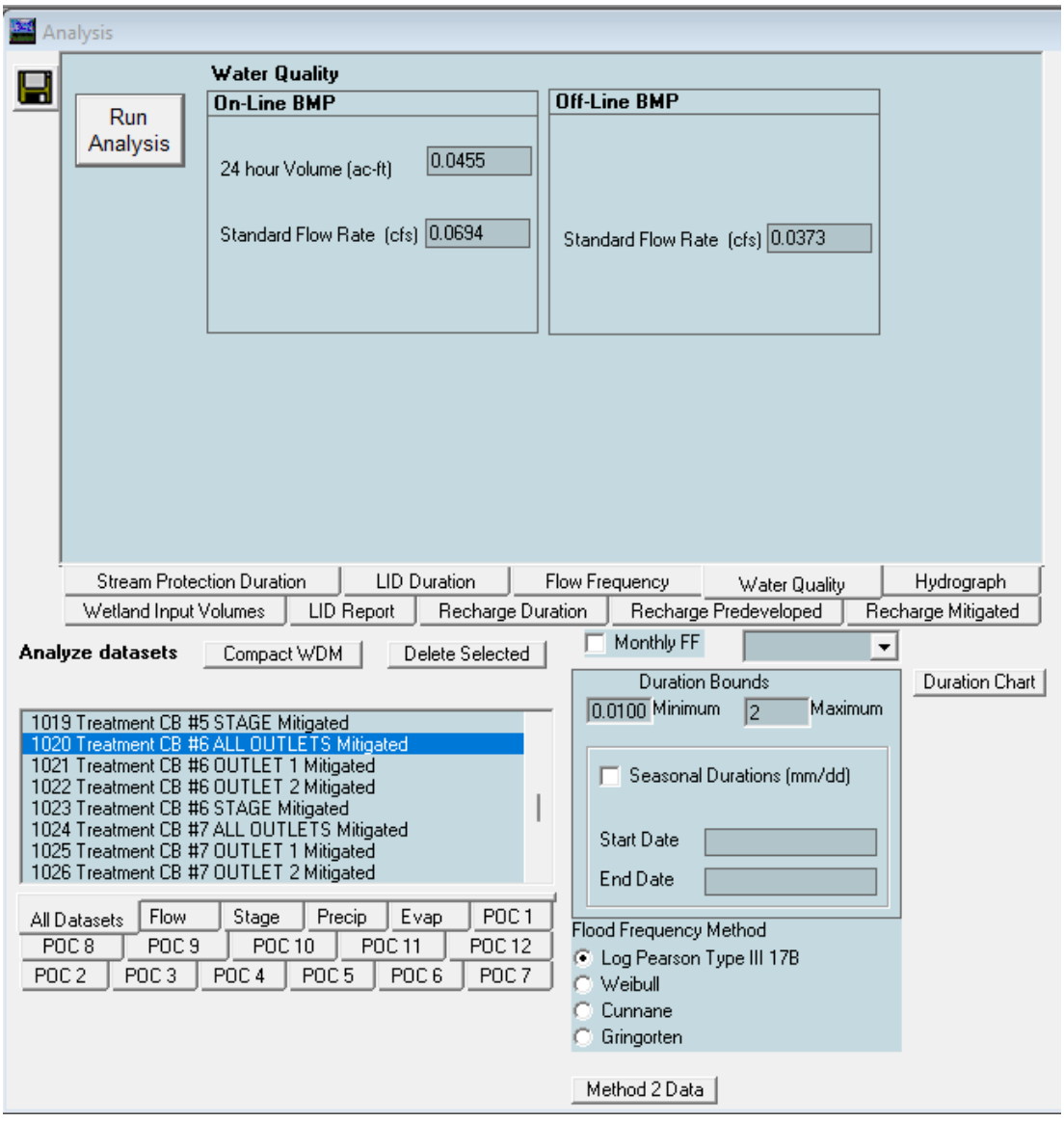


6

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Mod	0.13
Pervious Total	0.13
Impervious Land Use	acre
ROADS FLAT	0.25
Impervious Total	0.25
Basin Total	0.38

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Treatment CB #6	Treatment CB #6	

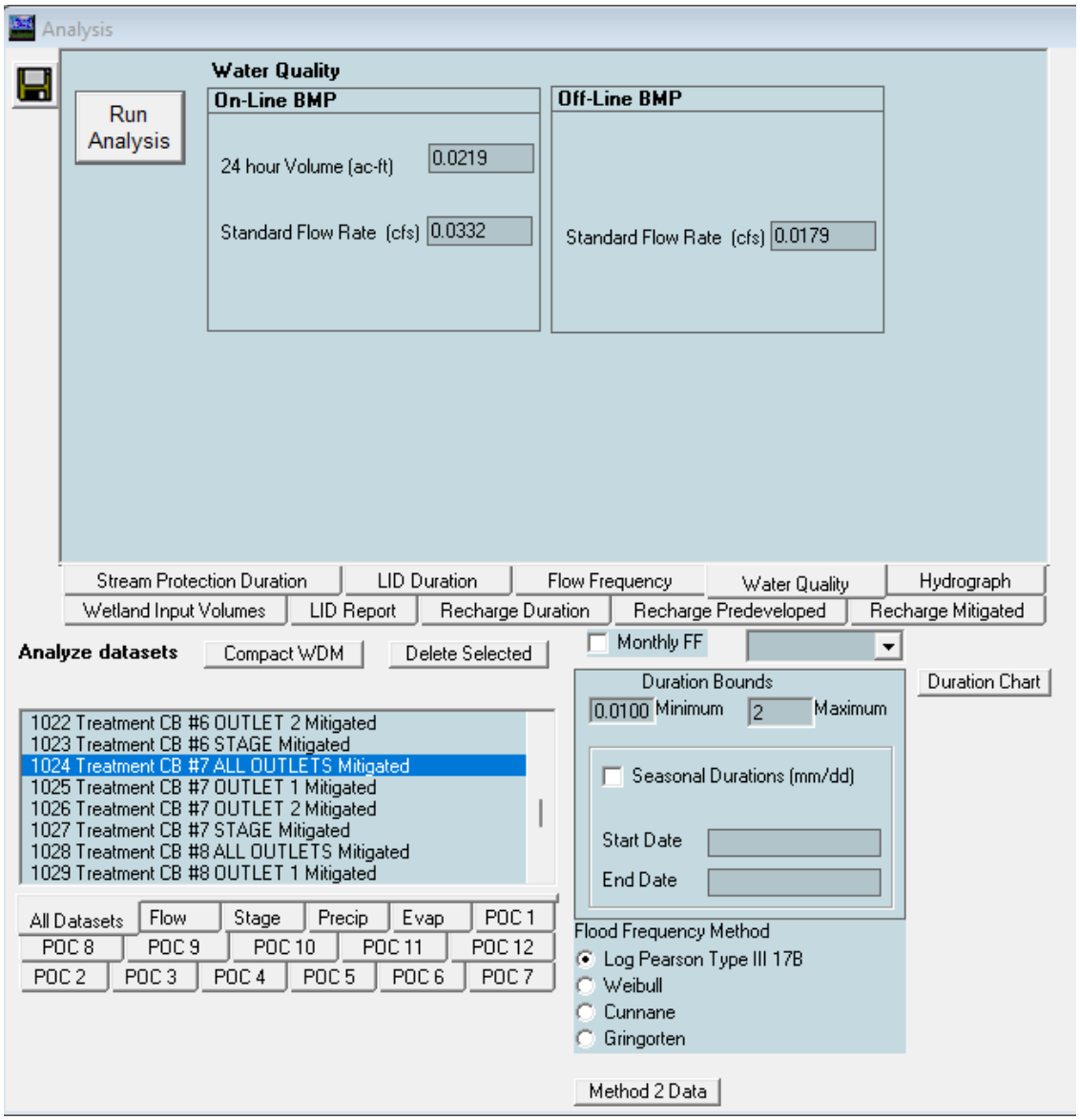


7

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.07
Pervious Total	0.07
Impervious Land Use	acre
ROADS FLAT	0.12
Impervious Total	0.12
Basin Total	0.19

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Treatment CB #7	Treatment CB #7	

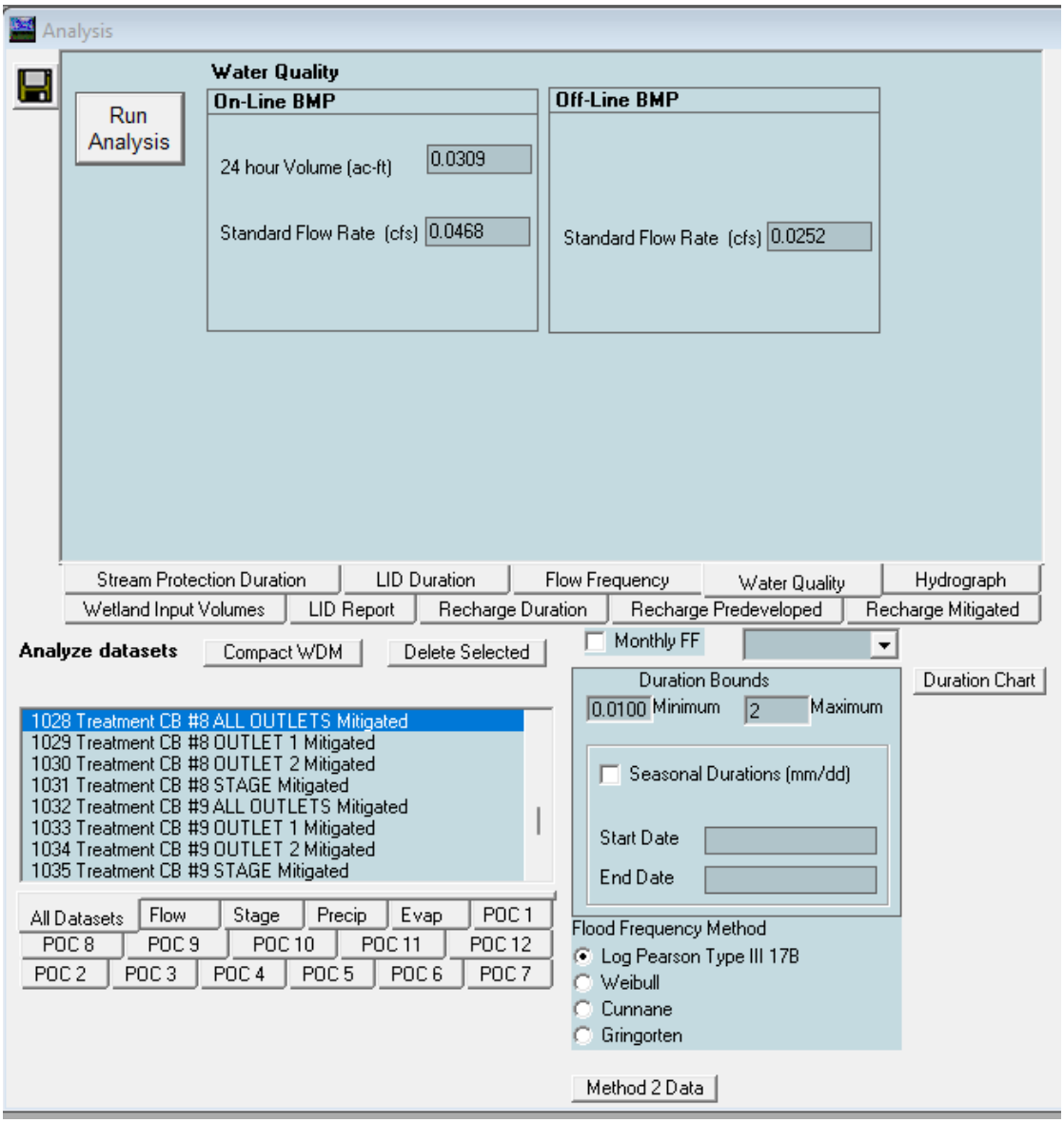


8

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.09
Pervious Total	0.09
Impervious Land Use	acre
ROADS FLAT	0.17
Impervious Total	0.17
Basin Total	0.26

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Treatment CB #8	Treatment CB #8	

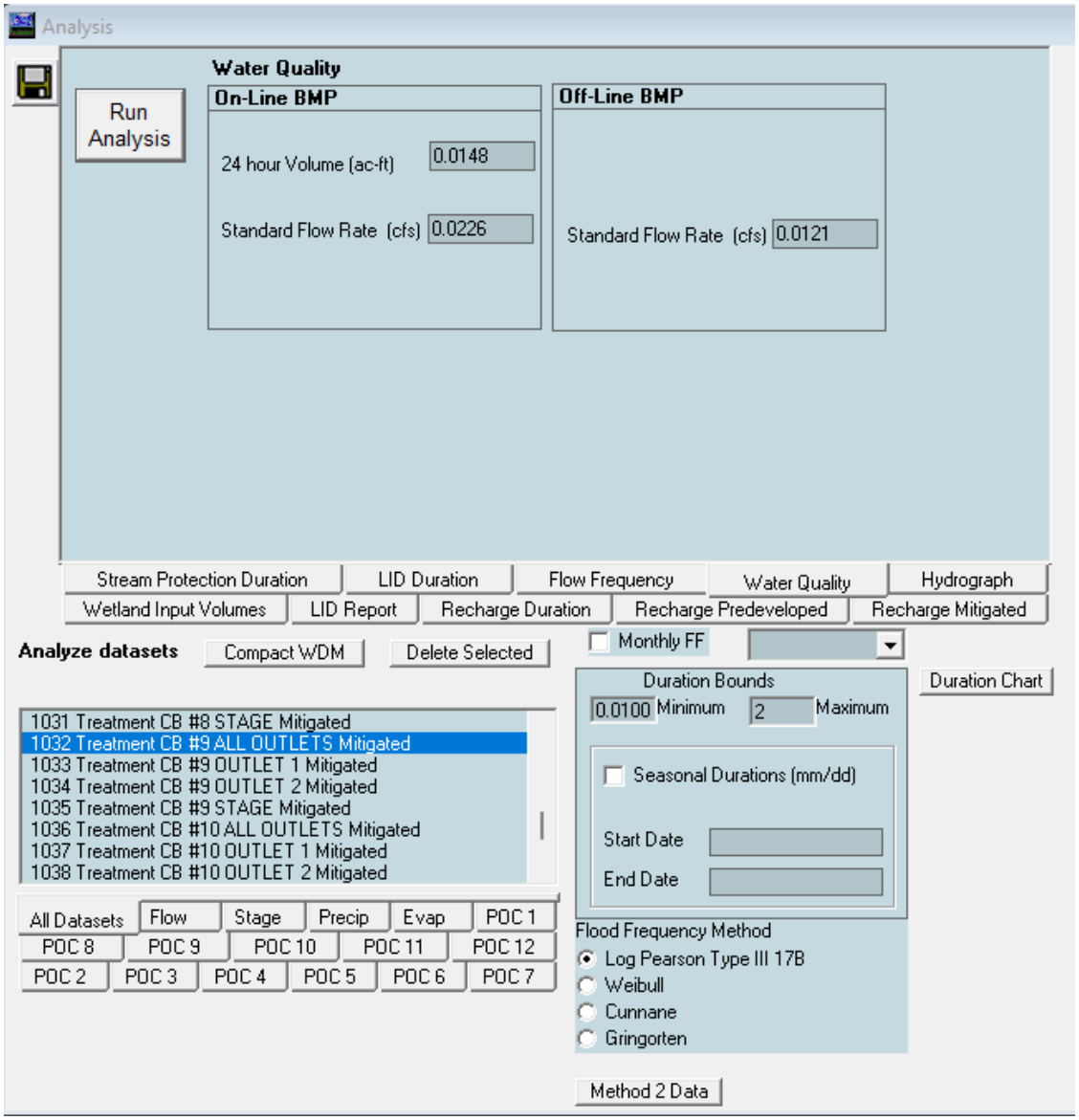


9

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.06
Pervious Total	0.06
Impervious Land Use	acre
ROADS FLAT	0.08
Impervious Total	0.08
Basin Total	0.14

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Treatment CB #9	Treatment CB #9	

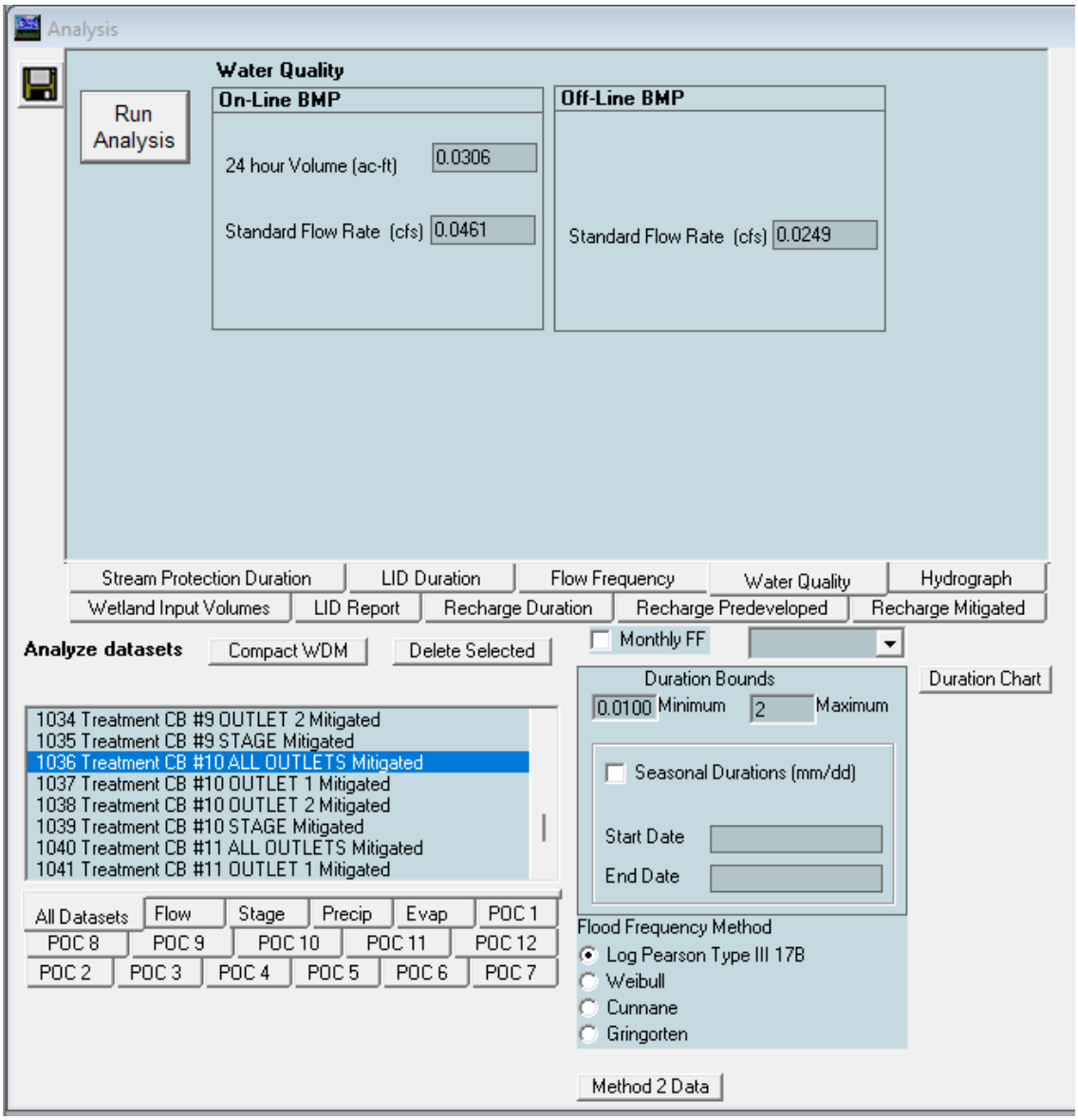


10

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.07
Pervious Total	0.07
Impervious Land Use	acre
ROADS FLAT	0.17
Impervious Total	0.17
Basin Total	0.24

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Treatment CB #10	Treatment CB #10	

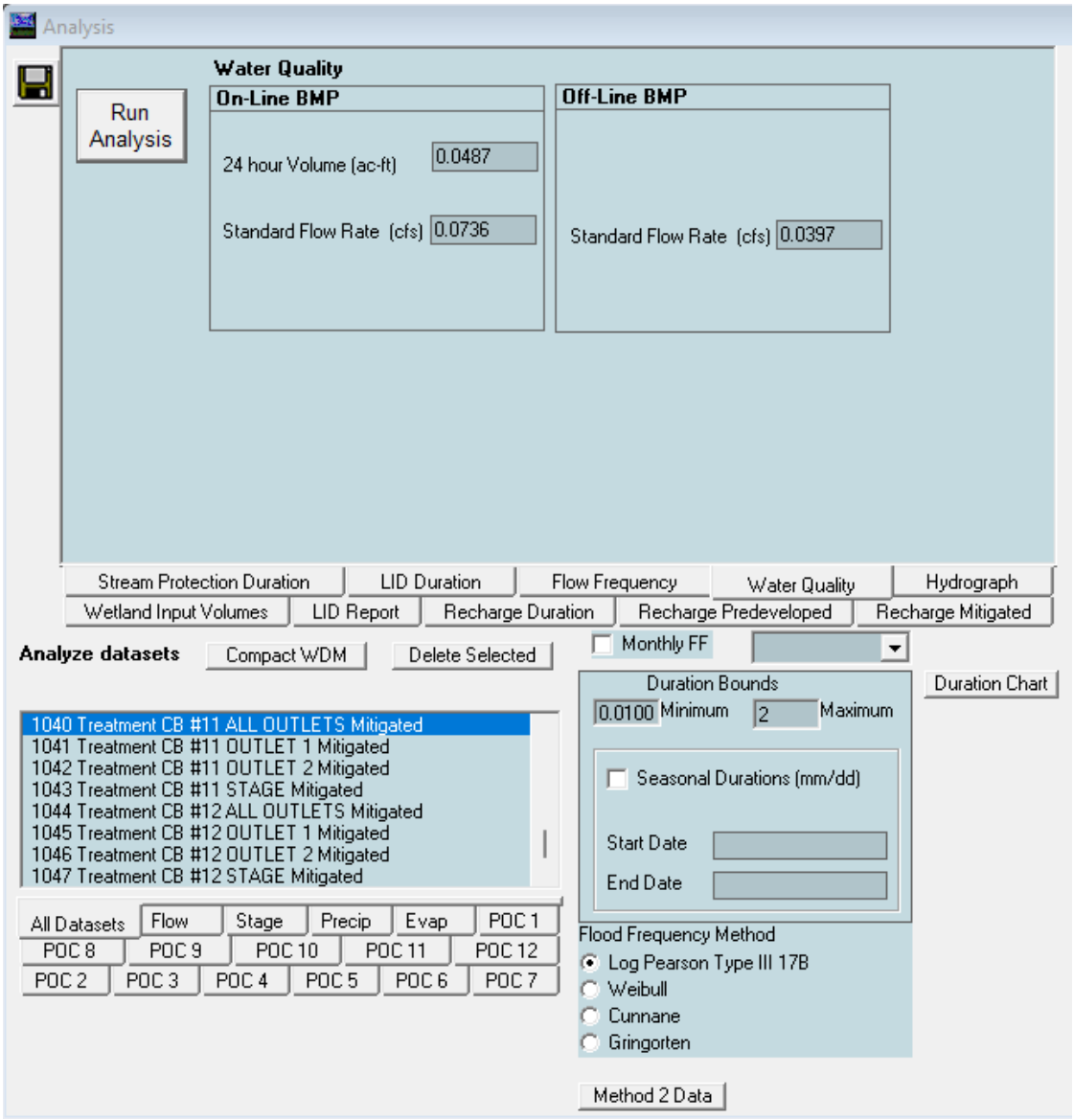


11

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.12
Pervious Total	0.12
Impervious Land Use	acre
ROADS FLAT	0.27
Impervious Total	0.27
Basin Total	0.39

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Treatment CB #11	Treatment CB #11	

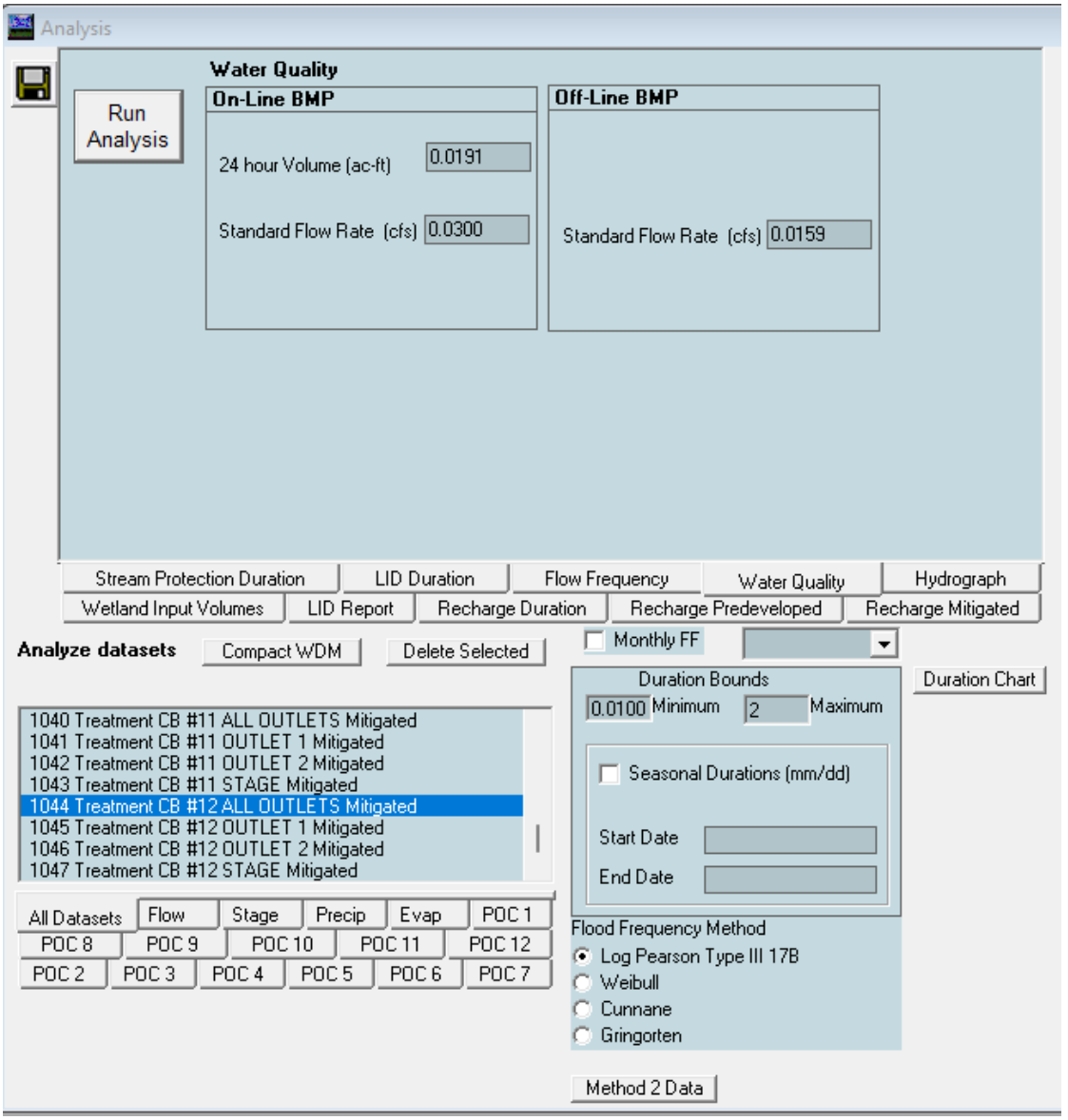


12

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.12
Pervious Total	0.12
Impervious Land Use	acre
ROADS FLAT	0.1
Impervious Total	0.1
Basin Total	0.22

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
Treatment CB #12	Treatment CB #12	



Routing Elements
Predeveloped Routing

Mitigated Routing

Treatment CB #1

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000

5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000
5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #2

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #3

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #4

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #5

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #6

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #7

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #8

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #9

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #10

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #11

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Treatment CB #12

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

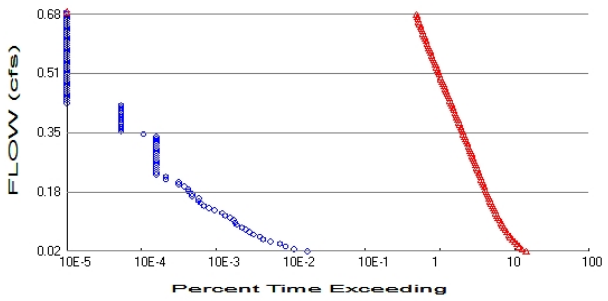
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	2.000	0.000
0.111	0.002	0.000	2.000	0.000
0.222	0.002	0.000	2.000	0.000
0.333	0.002	0.000	2.000	0.000
0.444	0.002	0.001	2.000	0.000
0.555	0.002	0.001	2.000	0.000
0.666	0.002	0.001	2.000	0.000
0.777	0.002	0.001	2.000	0.000
0.888	0.002	0.002	2.000	0.000
1.000	0.002	0.002	2.000	0.000
1.111	0.002	0.002	2.000	0.000
1.222	0.002	0.002	2.000	0.000
1.333	0.002	0.003	2.000	0.000
1.444	0.002	0.003	2.000	0.000
1.555	0.002	0.003	2.000	0.000
1.666	0.002	0.003	2.000	0.000
1.777	0.002	0.004	2.000	0.000
1.888	0.002	0.004	2.000	0.000
2.000	0.002	0.004	2.000	0.000
2.111	0.002	0.004	2.000	0.000
2.222	0.002	0.005	2.000	0.000
2.333	0.002	0.005	2.000	0.000
2.444	0.002	0.005	2.000	0.000
2.555	0.002	0.005	2.000	0.000
2.666	0.002	0.006	2.000	0.000
2.777	0.002	0.006	2.000	0.000
2.888	0.002	0.006	2.000	1000
3.000	0.002	0.006	2.000	1000
3.111	0.002	0.007	2.000	1000
3.222	0.002	0.007	2.000	1000
3.333	0.002	0.007	2.000	1000
3.444	0.002	0.007	2.000	1000
3.555	0.002	0.008	2.000	1000
3.666	0.002	0.008	2.000	1000
3.777	0.002	0.008	2.000	1000
3.888	0.002	0.008	2.000	1000
4.000	0.002	0.009	2.000	1000
4.111	0.002	0.009	2.000	1000
4.222	0.002	0.009	2.000	1000
4.333	0.002	0.009	2.000	1000
4.444	0.002	0.010	2.000	1000
4.555	0.002	0.010	2.000	1000
4.666	0.002	0.010	2.000	1000
4.777	0.002	0.011	2.000	1000
4.888	0.002	0.011	2.000	1000
5.000	0.002	0.011	2.000	1000
5.111	0.002	0.011	2.000	1000

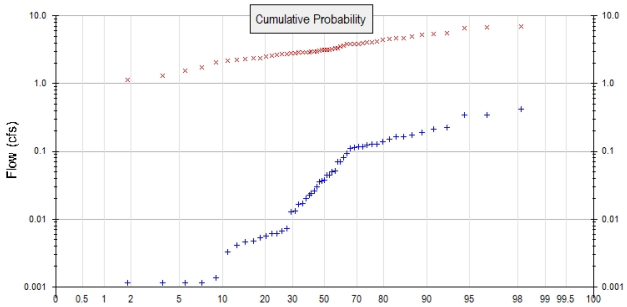
5.222	0.002	0.012	2.000	1000
5.333	0.002	0.012	2.000	1000
5.444	0.002	0.012	2.000	1000
5.555	0.002	0.012	2.000	1000
5.666	0.002	0.013	2.000	1000
5.777	0.002	0.013	2.000	1000
5.888	0.002	0.013	2.000	1000
6.000	0.002	0.013	2.000	1000
6.111	0.002	0.014	2.000	1000
6.222	0.002	0.014	2.000	1000
6.333	0.002	0.014	2.000	1000
6.444	0.002	0.014	2.000	1000
6.555	0.002	0.015	2.000	1000
6.666	0.002	0.015	2.000	1000
6.777	0.002	0.015	2.000	1000
6.888	0.002	0.015	2.000	1000
7.000	0.002	0.016	2.000	1000
7.111	0.002	0.016	2.000	1000
7.222	0.002	0.016	2.000	1000
7.333	0.002	0.016	2.000	1000
7.444	0.002	0.017	2.000	1000
7.555	0.002	0.017	2.000	1000
7.666	0.002	0.017	2.000	1000
7.777	0.002	0.017	2.000	1000
7.888	0.002	0.018	2.000	1000
8.000	0.002	0.018	2.000	1000
8.111	0.002	0.018	2.000	1000
8.222	0.002	0.018	2.000	1000
8.333	0.002	0.019	2.000	1000
8.444	0.002	0.019	2.000	1000
8.555	0.002	0.019	2.000	1000
8.666	0.002	0.019	2.000	1000
8.777	0.002	0.020	2.000	1000
8.888	0.002	0.020	2.000	1000
9.000	0.002	0.020	2.000	1000
9.111	0.002	0.020	2.000	1000
9.222	0.002	0.021	2.000	1000
9.333	0.002	0.021	2.000	1000
9.444	0.002	0.021	2.000	1000
9.555	0.002	0.021	2.000	1000
9.666	0.002	0.022	2.000	1000
9.777	0.002	0.022	2.000	1000
9.888	0.002	0.022	2.000	1000
10.00	0.002	0.023	2.000	1000
10.11	0.002	0.023	2.000	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.44
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.06
Total Impervious Area: 2.04

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.031703
5 year	0.124202
10 year	0.238198
25 year	0.455668
50 year	0.676105
100 year	0.948859

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	3.266628
5 year	4.477324
10 year	5.164345
25 year	5.919529
50 year	6.411893
100 year	6.853152

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.224	4.225
1957	0.023	4.618
1958	0.343	4.690
1959	0.082	3.109
1960	0.341	4.901
1961	0.166	3.842
1962	0.423	4.487
1963	0.125	5.411
1964	0.070	3.366
1965	0.037	3.119

1966	0.005	2.898
1967	0.017	2.346
1968	0.003	2.025
1969	0.017	2.967
1970	0.024	2.240
1971	0.152	3.539
1972	0.113	2.869
1973	0.005	2.200
1974	0.163	4.035
1975	0.175	6.716
1976	0.095	3.900
1977	0.001	2.641
1978	0.190	4.059
1979	0.006	2.303
1980	0.013	2.882
1981	0.020	3.236
1982	0.111	2.829
1983	0.045	3.806
1984	0.138	2.870
1985	0.004	2.930
1986	0.129	3.882
1987	0.007	3.653
1988	0.001	2.733
1989	0.005	1.309
1990	0.050	2.718
1991	0.119	3.351
1992	0.006	2.561
1993	0.030	2.391
1994	0.026	1.738
1995	0.007	4.388
1996	0.215	5.226
1997	0.052	3.128
1998	0.044	6.645
1999	0.006	1.545
2000	0.013	2.940
2001	0.001	0.847
2002	0.036	6.972
2003	0.001	5.579
2004	0.001	1.133
2005	0.001	3.064
2006	0.071	2.776
2007	0.117	3.816
2008	0.036	2.504
2009	0.129	3.110

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.4231	6.9720
2	0.3434	6.7156
3	0.3407	6.6448
4	0.2237	5.5794
5	0.2149	5.4110
6	0.1900	5.2256
7	0.1752	4.9009
8	0.1659	4.6895
9	0.1626	4.6185
10	0.1516	4.4867

11	0.1378	4.3884
12	0.1287	4.2251
13	0.1285	4.0595
14	0.1246	4.0346
15	0.1188	3.9001
16	0.1166	3.8816
17	0.1126	3.8422
18	0.1105	3.8160
19	0.0946	3.8061
20	0.0817	3.6529
21	0.0706	3.5386
22	0.0700	3.3656
23	0.0520	3.3509
24	0.0503	3.2365
25	0.0452	3.1283
26	0.0440	3.1190
27	0.0371	3.1103
28	0.0362	3.1095
29	0.0360	3.0639
30	0.0299	2.9665
31	0.0259	2.9402
32	0.0237	2.9296
33	0.0227	2.8984
34	0.0202	2.8815
35	0.0170	2.8703
36	0.0167	2.8686
37	0.0130	2.8285
38	0.0127	2.7761
39	0.0072	2.7327
40	0.0066	2.7181
41	0.0062	2.6413
42	0.0061	2.5609
43	0.0056	2.5045
44	0.0054	2.3907
45	0.0047	2.3461
46	0.0046	2.3033
47	0.0041	2.2401
48	0.0032	2.2002
49	0.0013	2.0253
50	0.0012	1.7385
51	0.0012	1.5452
52	0.0011	1.3092
53	0.0011	1.1327
54	0.0010	0.8471

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0159	315	270392	85838	Fail
0.0225	209	239718	114697	Fail
0.0292	161	217942	135367	Fail
0.0359	136	202984	149252	Fail
0.0425	101	188688	186819	Fail
0.0492	81	175963	217238	Fail
0.0559	73	166325	227842	Fail
0.0625	60	156934	261556	Fail
0.0692	52	148413	285409	Fail
0.0759	47	142164	302476	Fail
0.0825	42	135215	321940	Fail
0.0892	36	129061	358502	Fail
0.0959	34	124403	365891	Fail
0.1026	32	119310	372843	Fail
0.1092	29	114633	395286	Fail
0.1159	25	110827	443308	Fail
0.1226	23	106737	464073	Fail
0.1292	18	102798	571100	Fail
0.1359	15	99617	664113	Fail
0.1426	13	96095	739192	Fail
0.1492	12	92744	772866	Fail
0.1559	11	90074	818854	Fail
0.1626	11	87025	791136	Fail
0.1692	9	84204	935600	Fail
0.1759	9	81762	908466	Fail
0.1826	8	79148	989350	Fail
0.1893	8	76630	957875	Fail
0.1959	7	74509	1064414	Fail
0.2026	6	72237	1203950	Fail
0.2093	6	70003	1166716	Fail
0.2159	4	68185	1704625	Fail
0.2226	4	66216	1655400	Fail
0.2293	3	64209	2140300	Fail
0.2359	3	62505	2083500	Fail
0.2426	3	60649	2021633	Fail
0.2493	3	58869	1962300	Fail
0.2559	3	57468	1915600	Fail
0.2626	3	55726	1857533	Fail
0.2693	3	54116	1803866	Fail
0.2760	3	52734	1757800	Fail
0.2826	3	51144	1704800	Fail
0.2893	3	49572	1652400	Fail
0.2960	3	48284	1609466	Fail
0.3026	3	46883	1562766	Fail
0.3093	3	45444	1514800	Fail
0.3160	3	44213	1473766	Fail
0.3226	3	42831	1427700	Fail
0.3293	3	41581	1386033	Fail
0.3360	3	40483	1349433	Fail
0.3426	2	39271	1963550	Fail
0.3493	1	38078	3807800	Fail
0.3560	1	37075	3707500	Fail
0.3627	1	35920	3592000	Fail
0.3693	1	34803	3480300	Fail

0.3760	1	33875	3387500	Fail
0.3827	1	32758	3275800	Fail
0.3893	1	31811	3181100	Fail
0.3960	1	30997	3099700	Fail
0.4027	1	30050	3005000	Fail
0.4093	1	29122	2912200	Fail
0.4160	1	28213	2821300	Fail
0.4227	1	27475	2747500	Fail
0.4293	0	26661	n/a	Fail
0.4360	0	25846	n/a	Fail
0.4427	0	25203	n/a	Fail
0.4494	0	24445	n/a	Fail
0.4560	0	23688	n/a	Fail
0.4627	0	23006	n/a	Fail
0.4694	0	22135	n/a	Fail
0.4760	0	21472	n/a	Fail
0.4827	0	20885	n/a	Fail
0.4894	0	20242	n/a	Fail
0.4960	0	19636	n/a	Fail
0.5027	0	19143	n/a	Fail
0.5094	0	18520	n/a	Fail
0.5160	0	17996	n/a	Fail
0.5227	0	17564	n/a	Fail
0.5294	0	17081	n/a	Fail
0.5361	0	16574	n/a	Fail
0.5427	0	16116	n/a	Fail
0.5494	0	15601	n/a	Fail
0.5561	0	15091	n/a	Fail
0.5627	0	14701	n/a	Fail
0.5694	0	14258	n/a	Fail
0.5761	0	13842	n/a	Fail
0.5827	0	13476	n/a	Fail
0.5894	0	13101	n/a	Fail
0.5961	0	12709	n/a	Fail
0.6027	0	12366	n/a	Fail
0.6094	0	11997	n/a	Fail
0.6161	0	11622	n/a	Fail
0.6228	0	11331	n/a	Fail
0.6294	0	11030	n/a	Fail
0.6361	0	10702	n/a	Fail
0.6428	0	10439	n/a	Fail
0.6494	0	10144	n/a	Fail
0.6561	0	9873	n/a	Fail
0.6628	0	9640	n/a	Fail
0.6694	0	9367	n/a	Fail
0.6761	0	9144	n/a	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.04 acre-feet
On-line facility target flow:	0.0603 cfs.
Adjusted for 15 min:	0.0603 cfs.
Off-line facility target flow:	0.0325 cfs.
Adjusted for 15 min:	0.0325 cfs.

POC 2

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 3

POC #3 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 4

POC #4 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 5

POC #5 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 6

POC #6 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 7

POC #7 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 8

POC #8 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 9

POC #9 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 10

POC #10 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 11

POC #11 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 12

POC #12 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 344 changes have been made.

PERLND Changes

Name	Property	Original	Changed
A/B; Forest; Flat	LZSN	12	5
A/B; Forest; Flat	KVARY	0	0.3
A/B; Forest; Flat	AGWRC	0.96	0.996
A/B; Forest; Flat	UZSN	1.5	0.5
A/B; Forest; Flat	IRC	0.4	0.7
A/B; Forest; Mod	LZSN	12	5
A/B; Forest; Mod	KVARY	0	0.3
A/B; Forest; Mod	AGWRC	0.96	0.996
A/B; Forest; Mod	UZSN	1.5	0.5
A/B; Forest; Mod	IRC	0.4	0.7
A/B; Forest; Steep	LZSN	12	5
A/B; Forest; Steep	KVARY	0	0.3
A/B; Forest; Steep	AGWRC	0.96	0.996
A/B; Forest; Steep	UZSN	1.5	0.5
A/B; Forest; Steep	IRC	0.4	0.7
A/B; Pasture; Flat	LZSN	12	5
A/B; Pasture; Flat	KVARY	0	0.3
A/B; Pasture; Flat	AGWRC	0.96	0.996
A/B; Pasture; Flat	UZSN	1.5	0.5
A/B; Pasture; Flat	IRC	0.4	0.7
A/B; Pasture; Mod	LZSN	12	5
A/B; Pasture; Mod	KVARY	0	0.3
A/B; Pasture; Mod	AGWRC	0.96	0.996
A/B; Pasture; Mod	UZSN	1.5	0.5
A/B; Pasture; Mod	IRC	0.4	0.7
A/B; Pasture; Steep	LZSN	12	5
A/B; Pasture; Steep	KVARY	0	0.3
A/B; Pasture; Steep	AGWRC	0.96	0.996
A/B; Pasture; Steep	UZSN	1.5	0.5
A/B; Pasture; Steep	IRC	0.4	0.7
A/B; Lawn; Flat	LZSN	12	5
A/B; Lawn; Flat	INFILT	1	0.8
A/B; Lawn; Flat	KVARY	0	0.3
A/B; Lawn; Flat	AGWRC	0.96	0.996
A/B; Lawn; Flat	UZSN	1.3	0.5
A/B; Lawn; Flat	IRC	0.4	0.7
A/B; Lawn; Mod	LZSN	12	5
A/B; Lawn; Mod	INFILT	1	0.8
A/B; Lawn; Mod	KVARY	0	0.3
A/B; Lawn; Mod	AGWRC	0.96	0.996
A/B; Lawn; Mod	UZSN	1.3	0.5
A/B; Lawn; Mod	IRC	0.4	0.7
A/B; Lawn; Steep	LZSN	12	5
A/B; Lawn; Steep	INFILT	1	0.8

A/B; Lawn; Steep	KVARY	0	0.3
A/B; Lawn; Steep	AGWRC	0.96	0.996
A/B; Lawn; Steep	UZSN	1.3	0.5
A/B; Lawn; Steep	IRC	0.4	0.7
C; Forest; Flat	LZSN	11	4.5
C; Forest; Flat	INFILT	0.2	0.08
C; Forest; Flat	KVARY	0	0.5
C; Forest; Flat	AGWRC	0.96	0.996
C; Forest; Flat	UZSN	1.4	0.5
C; Forest; Flat	INTFW	1	6
C; Forest; Flat	IRC	0.4	0.5
C; Forest; Mod	LZSN	11	4.5
C; Forest; Mod	INFILT	0.2	0.08
C; Forest; Mod	KVARY	0	0.5
C; Forest; Mod	AGWRC	0.96	0.996
C; Forest; Mod	UZSN	1.4	0.5
C; Forest; Mod	INTFW	1	6
C; Forest; Mod	IRC	0.4	0.5
C; Forest; Steep	LZSN	11	4.5
C; Forest; Steep	INFILT	0.2	0.08
C; Forest; Steep	KVARY	0	0.5
C; Forest; Steep	AGWRC	0.96	0.996
C; Forest; Steep	UZSN	1.4	0.3
C; Forest; Steep	INTFW	1	6
C; Forest; Steep	IRC	0.4	0.3
C; Pasture; Flat	LZSN	11	4.5
C; Pasture; Flat	INFILT	0.15	0.06
C; Pasture; Flat	KVARY	0	0.5
C; Pasture; Flat	AGWRC	0.96	0.996
C; Pasture; Flat	UZSN	1.4	0.4
C; Pasture; Flat	INTFW	1	6
C; Pasture; Flat	IRC	0.4	0.5
C; Pasture; Mod	LZSN	11	4.5
C; Pasture; Mod	INFILT	0.15	0.06
C; Pasture; Mod	KVARY	0	0.5
C; Pasture; Mod	AGWRC	0.96	0.996
C; Pasture; Mod	UZSN	1.4	0.4
C; Pasture; Mod	INTFW	1	6
C; Pasture; Mod	IRC	0.4	0.5
C; Pasture; Steep	LZSN	11	4.5
C; Pasture; Steep	INFILT	0.15	0.06
C; Pasture; Steep	KVARY	0	0.5
C; Pasture; Steep	AGWRC	0.96	0.996
C; Pasture; Steep	UZSN	1.4	0.25
C; Pasture; Steep	INTFW	1	6
C; Pasture; Steep	IRC	0.4	0.3
C; Lawn; Flat	LZSN	11	4.5
C; Lawn; Flat	INFILT	0.1	0.03
C; Lawn; Flat	KVARY	0	0.5
C; Lawn; Flat	AGWRC	0.96	0.996
C; Lawn; Flat	UZSN	1.2	0.25
C; Lawn; Flat	INTFW	1	6

C; Lawn; Flat	IRC	0.4	0.5
C; Lawn; Mod	LZSN	11	4.5
C; Lawn; Mod	INFILT	0.1	0.03
C; Lawn; Mod	KVARY	0	0.5
C; Lawn; Mod	AGWRC	0.96	0.996
C; Lawn; Mod	UZSN	1.2	0.25
C; Lawn; Mod	INTFW	1	6
C; Lawn; Mod	IRC	0.4	0.5
C; Lawn; Steep	LZSN	11	4.5
C; Lawn; Steep	INFILT	0.1	0.03
C; Lawn; Steep	KVARY	0	0.5
C; Lawn; Steep	AGWRC	0.96	0.996
C; Lawn; Steep	UZSN	1.2	0.15
C; Lawn; Steep	INTFW	1	6
C; Lawn; Steep	IRC	0.4	0.3
SAT; Forest; Flat	LZSN	9	4
SAT; Forest; Flat	INFILT	0.08	2
SAT; Forest; Flat	LSUR	400	100
SAT; Forest; Flat	SLSUR	0.05	0.001
SAT; Forest; Flat	KVARY	0	0.5
SAT; Forest; Flat	AGWRC	0.96	0.996
SAT; Forest; Flat	INFEXP	2.5	10
SAT; Forest; Flat	AGWETP	0	0.7
SAT; Forest; Flat	UZSN	1	3
SAT; Forest; Flat	NSUR	0.35	0.5
SAT; Forest; Flat	INTFW	4	1
SAT; Forest; Flat	IRC	0.4	0.7
SAT; Forest; Flat	LZETP	0.7	0.8
SAT; Forest; Mod	LZSN	9	4
SAT; Forest; Mod	INFILT	0.08	2
SAT; Forest; Mod	LSUR	400	100
SAT; Forest; Mod	SLSUR	0.1	0.01
SAT; Forest; Mod	KVARY	0	0.5
SAT; Forest; Mod	AGWRC	0.96	0.996
SAT; Forest; Mod	INFEXP	2.5	10
SAT; Forest; Mod	AGWETP	0	0.7
SAT; Forest; Mod	UZSN	1	3
SAT; Forest; Mod	NSUR	0.35	0.5
SAT; Forest; Mod	INTFW	4	1
SAT; Forest; Mod	IRC	0.4	0.7
SAT; Forest; Mod	LZETP	0.7	0.8
SAT; Forest; Steep	LZSN	9	4
SAT; Forest; Steep	INFILT	0.08	2
SAT; Forest; Steep	LSUR	400	100
SAT; Forest; Steep	SLSUR	0.15	0.1
SAT; Forest; Steep	KVARY	0	0.5
SAT; Forest; Steep	AGWRC	0.96	0.996
SAT; Forest; Steep	INFEXP	2.5	10
SAT; Forest; Steep	AGWETP	0	0.7
SAT; Forest; Steep	UZSN	1	3
SAT; Forest; Steep	NSUR	0.35	0.5

SAT; Forest; Steep	INTFW	4	1
SAT; Forest; Steep	IRC	0.4	0.7
SAT; Forest; Steep	LZETP	0.7	0.8
SAT; Pasture; Flat	LZSN	9	4
SAT; Pasture; Flat	INFILT	0.06	1.8
SAT; Pasture; Flat	LSUR	400	100
SAT; Pasture; Flat	SLSUR	0.05	0.001
SAT; Pasture; Flat	KVARY	0	0.5
SAT; Pasture; Flat	AGWRC	0.96	0.996
SAT; Pasture; Flat	INFEXP	2.5	10
SAT; Pasture; Flat	AGWETP	0	0.5
SAT; Pasture; Flat	UZSN	1	3
SAT; Pasture; Flat	NSUR	0.3	0.5
SAT; Pasture; Flat	INTFW	4	1
SAT; Pasture; Flat	IRC	0.4	0.7
SAT; Pasture; Flat	LZETP	0.4	0.6
SAT; Pasture; Mod	LZSN	9	4
SAT; Pasture; Mod	INFILT	0.06	1.8
SAT; Pasture; Mod	LSUR	400	100
SAT; Pasture; Mod	SLSUR	0.1	0.01
SAT; Pasture; Mod	KVARY	0	0.5
SAT; Pasture; Mod	AGWRC	0.96	0.996
SAT; Pasture; Mod	INFEXP	2.5	10
SAT; Pasture; Mod	AGWETP	0	0.5
SAT; Pasture; Mod	UZSN	1	3
SAT; Pasture; Mod	NSUR	0.3	0.5
SAT; Pasture; Mod	INTFW	4	1
SAT; Pasture; Mod	IRC	0.4	0.7
SAT; Pasture; Mod	LZETP	0.4	0.6
SAT; Pasture; Steep	LZSN	9	4
SAT; Pasture; Steep	INFILT	0.06	1.8
SAT; Pasture; Steep	LSUR	400	100
SAT; Pasture; Steep	SLSUR	0.15	0.1
SAT; Pasture; Steep	KVARY	0	0.5
SAT; Pasture; Steep	AGWRC	0.96	0.996
SAT; Pasture; Steep	INFEXP	2.5	10
SAT; Pasture; Steep	AGWETP	0	0.5
SAT; Pasture; Steep	UZSN	1	3
SAT; Pasture; Steep	NSUR	0.3	0.5
SAT; Pasture; Steep	INTFW	4	1
SAT; Pasture; Steep	IRC	0.4	0.7
SAT; Pasture; Steep	LZETP	0.4	0.6
SAT; Lawn; Flat	LZSN	9	4
SAT; Lawn; Flat	INFILT	0.05	1
SAT; Lawn; Flat	LSUR	400	100
SAT; Lawn; Flat	SLSUR	0.05	0.001
SAT; Lawn; Flat	KVARY	0	0.5
SAT; Lawn; Flat	AGWRC	0.96	0.996
SAT; Lawn; Flat	INFEXP	2.5	10
SAT; Lawn; Flat	AGWETP	0	0.35
SAT; Lawn; Flat	UZSN	0.8	3
SAT; Lawn; Flat	NSUR	0.25	0.5

SAT; Lawn; Flat	INTFW	4	1
SAT; Lawn; Flat	IRC	0.4	0.7
SAT; Lawn; Flat	LZETP	0.25	0.4
SAT; Lawn; Mod	LZSN	9	4
SAT; Lawn; Mod	INFILT	0.05	1
SAT; Lawn; Mod	LSUR	400	100
SAT; Lawn; Mod	SLSUR	0.1	0.01
SAT; Lawn; Mod	KVARY	0	0.5
SAT; Lawn; Mod	AGWRC	0.96	0.996
SAT; Lawn; Mod	INFEXP	2.5	10
SAT; Lawn; Mod	AGWETP	0	0.35
SAT; Lawn; Mod	UZSN	0.8	3
SAT; Lawn; Mod	NSUR	0.25	0.5
SAT; Lawn; Mod	INTFW	4	1
SAT; Lawn; Mod	IRC	0.4	0.7
SAT; Lawn; Mod	LZETP	0.25	0.4
SAT; Lawn; Steep	LZSN	9	4
SAT; Lawn; Steep	INFILT	0.05	1
SAT; Lawn; Steep	LSUR	400	100
SAT; Lawn; Steep	SLSUR	0.15	0.1
SAT; Lawn; Steep	KVARY	0	0.5
SAT; Lawn; Steep	AGWRC	0.96	0.996
SAT; Lawn; Steep	INFEXP	2.5	10
SAT; Lawn; Steep	AGWETP	0	0.35
SAT; Lawn; Steep	UZSN	0.8	3
SAT; Lawn; Steep	NSUR	0.25	0.5
SAT; Lawn; Steep	INTFW	4	1
SAT; Lawn; Steep	IRC	0.4	0.7
SAT; Lawn; Steep	LZETP	0.25	0.4
C/IMP DISP /FLAT	LZSN	6	4.5
C/IMP DISP /FLAT	INFILT	0.04	0.03
C/IMP DISP /FLAT	KVARY	0	0.5
C/IMP DISP /FLAT	AGWRC	0.96	0.996
C/IMP DISP /FLAT	INFEXP	3	2
C/IMP DISP /FLAT	CEPSC	0.2	0.1
C/IMP DISP /FLAT	UZSN	0.4	0.25
C/IMP DISP /FLAT	NSUR	0.35	0.25
C/IMP DISP /FLAT	INTFW	2	6
C/IMP DISP /FLAT	IRC	0.4	0.5
C/IMP DISP /FLAT	LZETP	0.7	0.25
C/IMP DISP /MOD	LZSN	6	4.5
C/IMP DISP /MOD	INFILT	0.04	0.03
C/IMP DISP /MOD	KVARY	0	0.5
C/IMP DISP /MOD	AGWRC	0.96	0.996
C/IMP DISP /MOD	INFEXP	3	2
C/IMP DISP /MOD	CEPSC	0.2	0.1
C/IMP DISP /MOD	UZSN	0.4	0.25
C/IMP DISP /MOD	NSUR	0.35	0.25
C/IMP DISP /MOD	INTFW	2	6
C/IMP DISP /MOD	IRC	0.4	0.5
C/IMP DISP /MOD	LZETP	0.7	0.25
C/IMP DISP /STEE	LZSN	6	4.5

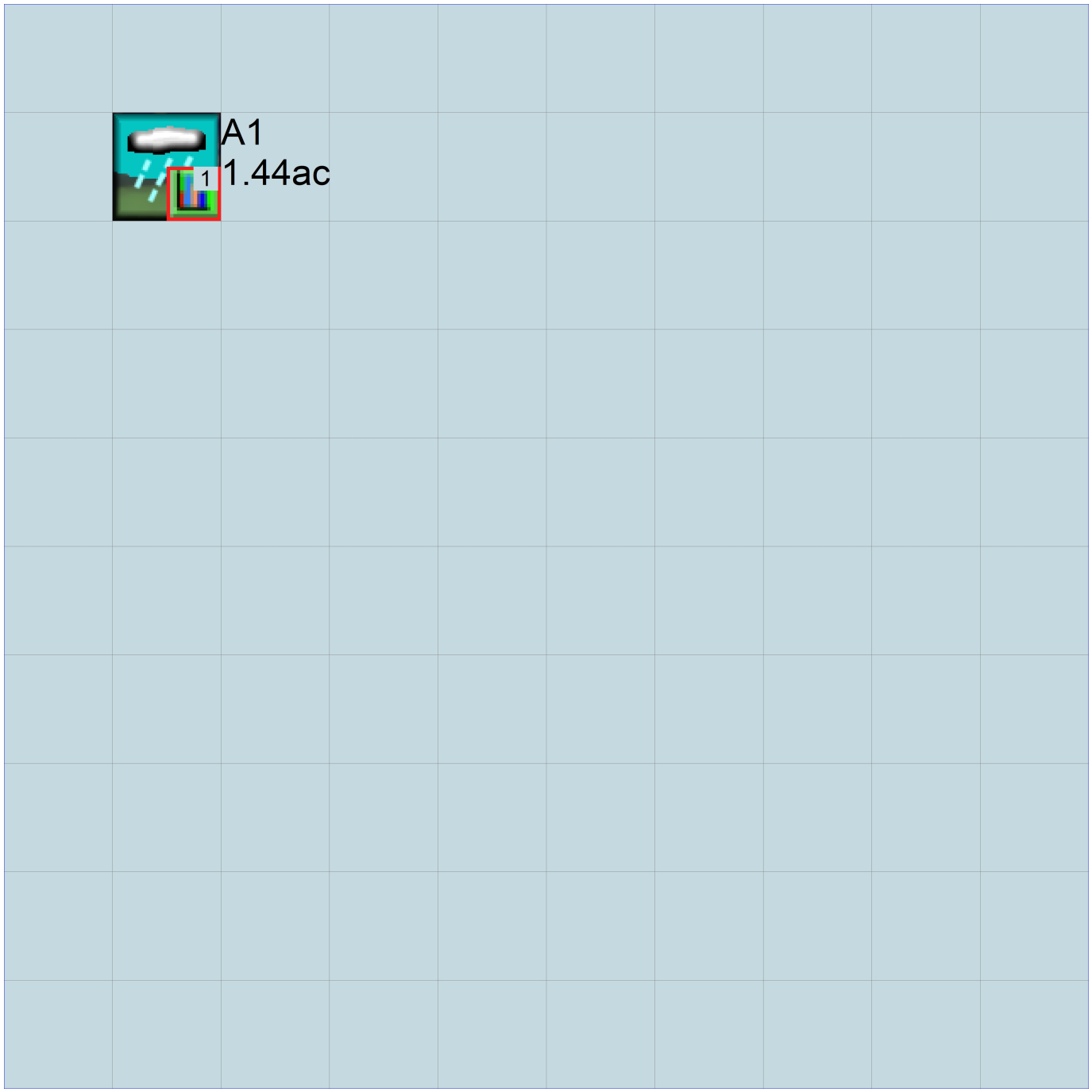
C/IMP DISP /STEE	INFILT	0.04	0.03
C/IMP DISP /STEE	KVARY	0	0.5
C/IMP DISP /STEE	AGWRC	0.96	0.996
C/IMP DISP /STEE	INFEXP	3	2
C/IMP DISP /STEE	CEPSC	0.2	0.1
C/IMP DISP /STEE	UZSN	0.4	0.15
C/IMP DISP /STEE	NSUR	0.35	0.25
C/IMP DISP /STEE	INTFW	2	6
C/IMP DISP /STEE	IRC	0.4	0.3
C/IMP DISP /STEE	LZETP	0.7	0.25
A/B/IMP INF/FLAT	LZSN	6	5
A/B/IMP INF/FLAT	INFILT	0.03	0.8
A/B/IMP INF/FLAT	KVARY	0	0.3
A/B/IMP INF/FLAT	AGWRC	0.96	0.996
A/B/IMP INF/FLAT	INFEXP	3	2
A/B/IMP INF/FLAT	CEPSC	0.15	0.1
A/B/IMP INF/FLAT	UZSN	0.4	0.5
A/B/IMP INF/FLAT	NSUR	0.3	0.25
A/B/IMP INF/FLAT	INTFW	2	0
A/B/IMP INF/FLAT	IRC	0.4	0.7
A/B/IMP INF/FLAT	LZETP	0.4	0.25
A/B/IMP INF/MOD	LZSN	6	5
A/B/IMP INF/MOD	INFILT	0.03	0.8
A/B/IMP INF/MOD	KVARY	0	0.3
A/B/IMP INF/MOD	AGWRC	0.96	0.996
A/B/IMP INF/MOD	INFEXP	3	2
A/B/IMP INF/MOD	CEPSC	0.15	0.1
A/B/IMP INF/MOD	UZSN	0.4	0.5
A/B/IMP INF/MOD	NSUR	0.3	0.25
A/B/IMP INF/MOD	INTFW	2	0
A/B/IMP INF/MOD	IRC	0.4	0.7
A/B/IMP INF/MOD	LZETP	0.4	0.25
A/B/IMP INF/STEE	LZSN	6	5
A/B/IMP INF/STEE	INFILT	0.03	0.8
A/B/IMP INF/STEE	KVARY	0	0.3
A/B/IMP INF/STEE	AGWRC	0.96	0.996
A/B/IMP INF/STEE	INFEXP	3	2
A/B/IMP INF/STEE	CEPSC	0.15	0.1
A/B/IMP INF/STEE	UZSN	0.4	0.5
A/B/IMP INF/STEE	NSUR	0.3	0.25
A/B/IMP INF/STEE	INTFW	2	0
A/B/IMP INF/STEE	IRC	0.4	0.7
A/B/IMP INF/STEE	LZETP	0.4	0.25
SAT/IMP DIS/FLAT	LZSN	6	4
SAT/IMP DIS/FLAT	INFILT	0.02	1
SAT/IMP DIS/FLAT	LSUR	400	100
SAT/IMP DIS/FLAT	SLSUR	0.05	0.001
SAT/IMP DIS/FLAT	KVARY	0	0.5
SAT/IMP DIS/FLAT	AGWRC	0.96	0.996
SAT/IMP DIS/FLAT	INFEXP	3	10
SAT/IMP DIS/FLAT	AGWETP	0	0.35
SAT/IMP DIS/FLAT	UZSN	0.2	3

SAT/IMP DIS/FLAT	NSUR	0.25	0.5
SAT/IMP DIS/FLAT	INTFW	2	1
SAT/IMP DIS/FLAT	IRC	0.4	0.7
SAT/IMP DIS/FLAT	LZETP	0.25	0.4
SAT/IMP DIS/MOD	LZSN	6	4
SAT/IMP DIS/MOD	INFILT	0.02	1
SAT/IMP DIS/MOD	LSUR	400	100
SAT/IMP DIS/MOD	SLSUR	0.1	0.01
SAT/IMP DIS/MOD	KVARY	0	0.5
SAT/IMP DIS/MOD	AGWRC	0.96	0.996
SAT/IMP DIS/MOD	INFEXP	3	10
SAT/IMP DIS/MOD	AGWETP	0	0.35
SAT/IMP DIS/MOD	UZSN	0.2	3
SAT/IMP DIS/MOD	NSUR	0.25	0.5
SAT/IMP DIS/MOD	INTFW	2	1
SAT/IMP DIS/MOD	IRC	0.4	0.7
SAT/IMP DIS/MOD	LZETP	0.25	0.4
SAT/IMP DIS/STEE	LZSN	6	4
SAT/IMP DIS/STEE	INFILT	0.02	1
SAT/IMP DIS/STEE	LSUR	400	100
SAT/IMP DIS/STEE	SLSUR	0.15	0.1
SAT/IMP DIS/STEE	KVARY	0	0.5
SAT/IMP DIS/STEE	AGWRC	0.96	0.996
SAT/IMP DIS/STEE	INFEXP	3	10
SAT/IMP DIS/STEE	AGWETP	0	0.35
SAT/IMP DIS/STEE	UZSN	0.2	3
SAT/IMP DIS/STEE	NSUR	0.25	0.5
SAT/IMP DIS/STEE	INTFW	2	1
SAT/IMP DIS/STEE	IRC	0.4	0.7
SAT/IMP DIS/STEE	LZETP	0.25	0.4
Green/ECO/ROOF	LZSN	6	1
Green/ECO/ROOF	INFILT	0.5	0.05
Green/ECO/ROOF	LSUR	100	50
Green/ECO/ROOF	KVARY	0	0.5
Green/ECO/ROOF	AGWRC	0.96	0.1
Green/ECO/ROOF	INFEXP	10	2
Green/ECO/ROOF	AGWETP	0.7	0.8
Green/ECO/ROOF	CEPSC	0.2	0.1
Green/ECO/ROOF	UZSN	3	0.1
Green/ECO/ROOF	NSUR	0.5	0.55
Green/ECO/ROOF	IRC	0.7	0.1

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   18591.01 - Mechicanial Treatment.wdm
MESSU       25   Pre18591.01 - Mechicanial Treatment.MES
            27   Pre18591.01 - Mechicanial Treatment.L61
            28   Pre18591.01 - Mechicanial Treatment.L62
            30   POC18591.01 - Mechicanial Treatment1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        A1                          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           ***
    2     A/B, Forest, Mod        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 ***
    2         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  *********
    2         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 ***
    2         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
    2               0         5         2       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    2              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    2          0.2       0.5      0.35         0       0.7       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
    2              0         0         0         0         3         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#   ***
A1***
PERLND   2                       1.44     COPY   501     12
PERLND   2                       1.44     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    1.429          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.429          IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

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

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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   18591.01 - Mechicanial Treatment.wdm
MESSU       25   Mit18591.01 - Mechicanial Treatment.MES
            27   Mit18591.01 - Mechicanial Treatment.L61
            28   Mit18591.01 - Mechicanial Treatment.L62
            30   POC18591.01 - Mechicanial Treatment1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       7
      IMPLND       1
      PERLND       8
      RCHRES       1
      RCHRES       2
      RCHRES       3
      RCHRES       4
      RCHRES       5
      RCHRES       6
      RCHRES       7
      RCHRES       8
      RCHRES       9
      RCHRES      10
      RCHRES      11
      RCHRES      12
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Treatment CB #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           ***
    7     A/B, Lawn, Flat         1    1    1    1   27    0
```

```
    8     A/B, Lawn, Mod          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 ***
    7         0    0    1    0    0    0    0    0    0    0    0    0
    8         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  *********
    7         0    0    4    0    0    0    0    0    0    0    0    0    1    9
    8         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 ***
    7         0    0    0    0    0    0    0    0    0    0    0
    8         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
    7              0         5       0.8       400      0.05       0.3     0.996
    8              0         5       0.8       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    7              0         0         2         2         0         0         0
    8              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7          0.1       0.5      0.25         0       0.7      0.25
    8          0.1       0.5      0.25         0       0.7      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
    7              0         0         0         0         3         1         0
    8              0         0         0         0         3         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    4    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#   ***
1***
PERLND   7                        0.11     RCHRES   1      2
PERLND   7                        0.11     RCHRES   1      3
IMPLND   1                        0.22     RCHRES   1      5
2***
PERLND   7                        0.03     RCHRES   2      2
PERLND   7                        0.03     RCHRES   2      3
IMPLND   1                        0.07     RCHRES   2      5
3***
PERLND   7                         0.1     RCHRES   3      2
PERLND   7                         0.1     RCHRES   3      3
IMPLND   1                        0.25     RCHRES   3      5
4***
PERLND   7                        0.11     RCHRES   4      2
PERLND   7                        0.11     RCHRES   4      3
IMPLND   1                        0.21     RCHRES   4      5
5***
PERLND   7                        0.05     RCHRES   5      2
PERLND   7                        0.05     RCHRES   5      3
IMPLND   1                        0.13     RCHRES   5      5
6***
PERLND   8                        0.13     RCHRES   6      2
PERLND   8                        0.13     RCHRES   6      3
IMPLND   1                        0.25     RCHRES   6      5
7***
PERLND   7                        0.07     RCHRES   7      2
PERLND   7                        0.07     RCHRES   7      3
IMPLND   1                        0.12     RCHRES   7      5
8***
PERLND   7                        0.09     RCHRES   8      2
PERLND   7                        0.09     RCHRES   8      3
IMPLND   1                        0.17     RCHRES   8      5
9***
PERLND   7                        0.06     RCHRES   9      2
PERLND   7                        0.06     RCHRES   9      3
```

```
IMPLND   1                      0.08     RCHRES   9      5
10***
PERLND   7                      0.07     RCHRES  10      2
PERLND   7                      0.07     RCHRES  10      3
IMPLND   1                      0.17     RCHRES  10      5
11***
PERLND   7                      0.12     RCHRES  11      2
PERLND   7                      0.12     RCHRES  11      3
IMPLND   1                      0.27     RCHRES  11      5
12***
PERLND   7                      0.12     RCHRES  12      2
PERLND   7                      0.12     RCHRES  12      3
IMPLND   1                       0.1     RCHRES  12      5

******Routing******
PERLND   7                      0.11     COPY     1     12
IMPLND   1                      0.22     COPY     1     15
PERLND   7                      0.11     COPY     1     13
PERLND   7                      0.03     COPY     1     12
IMPLND   1                      0.07     COPY     1     15
PERLND   7                      0.03     COPY     1     13
PERLND   7                       0.1     COPY     1     12
IMPLND   1                      0.25     COPY     1     15
PERLND   7                       0.1     COPY     1     13
PERLND   7                      0.11     COPY     1     12
IMPLND   1                      0.21     COPY     1     15
PERLND   7                      0.11     COPY     1     13
PERLND   7                      0.05     COPY     1     12
IMPLND   1                      0.13     COPY     1     15
PERLND   7                      0.05     COPY     1     13
PERLND   8                      0.13     COPY     1     12
IMPLND   1                      0.25     COPY     1     15
PERLND   8                      0.13     COPY     1     13
PERLND   7                      0.07     COPY     1     12
IMPLND   1                      0.12     COPY     1     15
PERLND   7                      0.07     COPY     1     13
PERLND   7                      0.09     COPY     1     12
IMPLND   1                      0.17     COPY     1     15
PERLND   7                      0.09     COPY     1     13
PERLND   7                      0.06     COPY     1     12
IMPLND   1                      0.08     COPY     1     15
PERLND   7                      0.06     COPY     1     13
PERLND   7                      0.07     COPY     1     12
IMPLND   1                      0.17     COPY     1     15
PERLND   7                      0.07     COPY     1     13
PERLND   7                      0.12     COPY     1     12
IMPLND   1                      0.27     COPY     1     15
PERLND   7                      0.12     COPY     1     13
PERLND   7                      0.12     COPY     1     12
IMPLND   1                       0.1     COPY     1     15
PERLND   7                      0.12     COPY     1     13
RCHRES   1                         1     COPY   501     17
RCHRES   1                         1     COPY   601     17
RCHRES   1                         1     COPY   501     17
RCHRES   1                         1     COPY   601     17
RCHRES   2                         1     COPY   501     17
RCHRES   2                         1     COPY   601     17
RCHRES   2                         1     COPY   501     17
RCHRES   2                         1     COPY   601     17
RCHRES   3                         1     COPY   501     17
RCHRES   3                         1     COPY   601     17
RCHRES   3                         1     COPY   501     17
RCHRES   3                         1     COPY   601     17
RCHRES   4                         1     COPY   501     17
RCHRES   4                         1     COPY   601     17
RCHRES   4                         1     COPY   501     17
RCHRES   4                         1     COPY   601     17
RCHRES   5                         1     COPY   501     17
RCHRES   5                         1     COPY   601     17
RCHRES   5                         1     COPY   501     17
```

```
RCHRES   5                              1     COPY   601     17
RCHRES   6                              1     COPY   501     17
RCHRES   6                              1     COPY   601     17
RCHRES   6                              1     COPY   501     17
RCHRES   6                              1     COPY   601     17
RCHRES   7                              1     COPY   501     17
RCHRES   7                              1     COPY   601     17
RCHRES   7                              1     COPY   501     17
RCHRES   7                              1     COPY   601     17
RCHRES   8                              1     COPY   501     17
RCHRES   8                              1     COPY   601     17
RCHRES   8                              1     COPY   501     17
RCHRES   8                              1     COPY   601     17
RCHRES   9                              1     COPY   501     17
RCHRES   9                              1     COPY   601     17
RCHRES   9                              1     COPY   501     17
RCHRES   9                              1     COPY   601     17
RCHRES  10                              1     COPY   501     17
RCHRES  10                              1     COPY   601     17
RCHRES  10                              1     COPY   501     17
RCHRES  10                              1     COPY   601     17
RCHRES  11                              1     COPY   501     17
RCHRES  11                              1     COPY   601     17
RCHRES  11                              1     COPY   501     17
RCHRES  11                              1     COPY   601     17
RCHRES  12                              1     COPY   501     17
RCHRES  12                              1     COPY   601     17
RCHRES  12                              1     COPY   501     17
RCHRES  12                              1     COPY   601     17
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     Treatment CB #1         2    1    1    1   28    0    1
    2     Treatment CB #2         2    1    1    1   28    0    1
    3     Treatment CB #3         2    1    1    1   28    0    1
    4     Treatment CB #4         2    1    1    1   28    0    1
    5     Treatment CB #5         2    1    1    1   28    0    1
    6     Treatment CB #6         2    1    1    1   28    0    1
    7     Treatment CB #7         2    1    1    1   28    0    1
    8     Treatment CB #8         2    1    1    1   28    0    1
    9     Treatment CB #9         2    1    1    1   28    0    1
   10     Treatment CB #10-079    2    1    1    1   28    0    1
   11     Treatment CB #11-080    2    1    1    1   28    0    1
   12     Treatment CB #12-081    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
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
    4         1    0    0    0    0    0    0    0    0    0
    5         1    0    0    0    0    0    0    0    0    0
```

```
  6         1    0    0    0    0    0    0    0    0    0
  7         1    0    0    0    0    0    0    0    0    0
  8         1    0    0    0    0    0    0    0    0    0
  9         1    0    0    0    0    0    0    0    0    0
 10         1    0    0    0    0    0    0    0    0    0
 11         1    0    0    0    0    0    0    0    0    0
 12         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
  2         4    0    0    0    0    0    0    0    0    0    1    9
  3         4    0    0    0    0    0    0    0    0    0    1    9
  4         4    0    0    0    0    0    0    0    0    0    1    9
  5         4    0    0    0    0    0    0    0    0    0    1    9
  6         4    0    0    0    0    0    0    0    0    0    1    9
  7         4    0    0    0    0    0    0    0    0    0    1    9
  8         4    0    0    0    0    0    0    0    0    0    1    9
  9         4    0    0    0    0    0    0    0    0    0    1    9
 10         4    0    0    0    0    0    0    0    0    0    1    9
 11         4    0    0    0    0    0    0    0    0    0    1    9
 12         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
  2       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  3       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  4       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  5       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  6       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  7       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  8       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  9       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
 10       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
 11       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
 12       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      0.01       0.0       0.0       0.0       0.0
  2              2      0.01       0.0       0.0       0.0       0.0
  3              3      0.01       0.0       0.0       0.0       0.0
  4              4      0.01       0.0       0.0       0.0       0.0
  5              5      0.01       0.0       0.0       0.0       0.0
  6              6      0.01       0.0       0.0       0.0       0.0
  7              7      0.01       0.0       0.0       0.0       0.0
  8              8      0.01       0.0       0.0       0.0       0.0
  9              9      0.01       0.0       0.0       0.0       0.0
 10             10      0.01       0.0       0.0       0.0       0.0
 11             11      0.01       0.0       0.0       0.0       0.0
 12             12      0.01       0.0       0.0       0.0       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
  2            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  3            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  4            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
```

```
    5            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    6            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    7            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    8            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    9            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   10         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   11         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   12         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
   90    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.002296  0.000000  2.000000  0.000000
  0.111111  0.002296  0.000255  2.000000  0.000000
  0.222222  0.002296  0.000510  2.000000  0.000000
  0.333333  0.002296  0.000765  2.000000  0.000000
  0.444444  0.002296  0.001020  2.000000  0.000000
  0.555556  0.002296  0.001275  2.000000  0.000000
  0.666667  0.002296  0.001530  2.000000  11.00000
  0.777778  0.002296  0.001786  2.000000  21.00000
  0.888889  0.002296  0.002041  2.000000  31.00000
  1.000000  0.002296  0.002296  2.000000  41.00000
  1.111111  0.002296  0.002551  2.000000  51.00000
  1.222222  0.002296  0.002806  2.000000  61.00000
  1.333333  0.002296  0.003061  2.000000  71.00000
  1.444444  0.002296  0.003316  2.000000  81.00000
  1.555556  0.002296  0.003571  2.000000  91.00000
  1.666667  0.002296  0.003826  2.000000  101.0000
  1.777778  0.002296  0.004081  2.000000  111.0000
  1.888889  0.002296  0.004336  2.000000  121.0000
  2.000000  0.002296  0.004591  2.000000  131.0000
  2.111111  0.002296  0.004846  2.000000  141.0000
  2.222222  0.002296  0.005102  2.000000  151.0000
  2.333333  0.002296  0.005357  2.000000  161.0000
  2.444444  0.002296  0.005612  2.000000  171.0000
  2.555556  0.002296  0.005867  2.000000  181.0000
  2.666667  0.002296  0.006122  2.000000  191.0000
  2.777778  0.002296  0.006377  2.000000  201.0000
  2.888889  0.002296  0.006632  2.000000  211.0000
  3.000000  0.002296  0.006887  2.000000  221.0000
  3.111111  0.002296  0.007142  2.000000  231.0000
  3.222222  0.002296  0.007397  2.000000  241.0000
  3.333333  0.002296  0.007652  2.000000  251.0000
  3.444444  0.002296  0.007907  2.000000  261.0000
  3.555556  0.002296  0.008162  2.000000  271.0000
  3.666667  0.002296  0.008418  2.000000  281.0000
  3.777778  0.002296  0.008673  2.000000  291.0000
  3.888889  0.002296  0.008928  2.000000  301.0000
  4.000000  0.002296  0.009183  2.000000  311.0000
  4.111111  0.002296  0.009438  2.000000  321.0000
  4.222222  0.002296  0.009693  2.000000  331.0000
  4.333333  0.002296  0.009948  2.000000  341.0000
  4.444444  0.002296  0.010203  2.000000  351.0000
  4.555556  0.002296  0.010458  2.000000  361.0000
  4.666667  0.002296  0.010713  2.000000  371.0000
  4.777778  0.002296  0.010968  2.000000  381.0000
  4.888889  0.002296  0.011223  2.000000  391.0000
  5.000000  0.002296  0.011478  2.000000  401.0000
  5.111111  0.002296  0.011733  2.000000  411.0000
  5.222222  0.002296  0.011989  2.000000  421.0000
  5.333333  0.002296  0.012244  2.000000  431.0000
  5.444444  0.002296  0.012499  2.000000  441.0000
  5.555556  0.002296  0.012754  2.000000  451.0000
  5.666667  0.002296  0.013009  2.000000  461.0000
```

```
5.777778  0.002296  0.013264  2.000000  471.0000
5.888889  0.002296  0.013519  2.000000  481.0000
6.000000  0.002296  0.013774  2.000000  491.0000
6.111111  0.002296  0.014029  2.000000  501.0000
6.222222  0.002296  0.014284  2.000000  511.0000
6.333333  0.002296  0.014539  2.000000  521.0000
6.444444  0.002296  0.014794  2.000000  531.0000
6.555556  0.002296  0.015049  2.000000  541.0000
6.666667  0.002296  0.015305  2.000000  551.0000
6.777778  0.002296  0.015560  2.000000  561.0000
6.888889  0.002296  0.015815  2.000000  571.0000
7.000000  0.002296  0.016070  2.000000  581.0000
7.111111  0.002296  0.016325  2.000000  591.0000
7.222222  0.002296  0.016580  2.000000  601.0000
7.333333  0.002296  0.016835  2.000000  611.0000
7.444444  0.002296  0.017090  2.000000  621.0000
7.555556  0.002296  0.017345  2.000000  631.0000
7.666667  0.002296  0.017600  2.000000  641.0000
7.777778  0.002296  0.017855  2.000000  651.0000
7.888889  0.002296  0.018110  2.000000  661.0000
8.000000  0.002296  0.018365  2.000000  671.0000
8.111111  0.002296  0.018621  2.000000  681.0000
8.222222  0.002296  0.018876  2.000000  691.0000
8.333333  0.002296  0.019131  2.000000  701.0000
8.444444  0.002296  0.019386  2.000000  711.0000
8.555556  0.002296  0.019641  2.000000  721.0000
8.666667  0.002296  0.019896  2.000000  731.0000
8.777778  0.002296  0.020151  2.000000  741.0000
8.888889  0.002296  0.020406  2.000000  751.0000
9.000000  0.002296  0.020661  2.000000  761.0000
9.111111  0.002296  0.020916  2.000000  771.0000
9.222222  0.002296  0.021171  2.000000  781.0000
9.333333  0.002296  0.021426  2.000000  791.0000
9.444444  0.002296  0.021681  2.000000  801.0000
9.555556  0.002296  0.021937  2.000000  811.0000
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE  1
FTABLE      2
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.002296  0.000000  2.000000  0.000000
0.111111  0.002296  0.000255  2.000000  0.000000
0.222222  0.002296  0.000510  2.000000  0.000000
0.333333  0.002296  0.000765  2.000000  0.000000
0.444444  0.002296  0.001020  2.000000  0.000000
0.555556  0.002296  0.001275  2.000000  0.000000
0.666667  0.002296  0.001530  2.000000  11.00000
0.777778  0.002296  0.001786  2.000000  21.00000
0.888889  0.002296  0.002041  2.000000  31.00000
1.000000  0.002296  0.002296  2.000000  41.00000
1.111111  0.002296  0.002551  2.000000  51.00000
1.222222  0.002296  0.002806  2.000000  61.00000
1.333333  0.002296  0.003061  2.000000  71.00000
1.444444  0.002296  0.003316  2.000000  81.00000
1.555556  0.002296  0.003571  2.000000  91.00000
1.666667  0.002296  0.003826  2.000000  101.0000
1.777778  0.002296  0.004081  2.000000  111.0000
1.888889  0.002296  0.004336  2.000000  121.0000
2.000000  0.002296  0.004591  2.000000  131.0000
2.111111  0.002296  0.004846  2.000000  141.0000
2.222222  0.002296  0.005102  2.000000  151.0000
2.333333  0.002296  0.005357  2.000000  161.0000
2.444444  0.002296  0.005612  2.000000  171.0000
2.555556  0.002296  0.005867  2.000000  181.0000
2.666667  0.002296  0.006122  2.000000  191.0000
2.777778  0.002296  0.006377  2.000000  201.0000
2.888889  0.002296  0.006632  2.000000  211.0000
```

```
3.000000  0.002296  0.006887  2.000000  221.0000
3.111111  0.002296  0.007142  2.000000  231.0000
3.222222  0.002296  0.007397  2.000000  241.0000
3.333333  0.002296  0.007652  2.000000  251.0000
3.444444  0.002296  0.007907  2.000000  261.0000
3.555556  0.002296  0.008162  2.000000  271.0000
3.666667  0.002296  0.008418  2.000000  281.0000
3.777778  0.002296  0.008673  2.000000  291.0000
3.888889  0.002296  0.008928  2.000000  301.0000
4.000000  0.002296  0.009183  2.000000  311.0000
4.111111  0.002296  0.009438  2.000000  321.0000
4.222222  0.002296  0.009693  2.000000  331.0000
4.333333  0.002296  0.009948  2.000000  341.0000
4.444444  0.002296  0.010203  2.000000  351.0000
4.555556  0.002296  0.010458  2.000000  361.0000
4.666667  0.002296  0.010713  2.000000  371.0000
4.777778  0.002296  0.010968  2.000000  381.0000
4.888889  0.002296  0.011223  2.000000  391.0000
5.000000  0.002296  0.011478  2.000000  401.0000
5.111111  0.002296  0.011733  2.000000  411.0000
5.222222  0.002296  0.011989  2.000000  421.0000
5.333333  0.002296  0.012244  2.000000  431.0000
5.444444  0.002296  0.012499  2.000000  441.0000
5.555556  0.002296  0.012754  2.000000  451.0000
5.666667  0.002296  0.013009  2.000000  461.0000
5.777778  0.002296  0.013264  2.000000  471.0000
5.888889  0.002296  0.013519  2.000000  481.0000
6.000000  0.002296  0.013774  2.000000  491.0000
6.111111  0.002296  0.014029  2.000000  501.0000
6.222222  0.002296  0.014284  2.000000  511.0000
6.333333  0.002296  0.014539  2.000000  521.0000
6.444444  0.002296  0.014794  2.000000  531.0000
6.555556  0.002296  0.015049  2.000000  541.0000
6.666667  0.002296  0.015305  2.000000  551.0000
6.777778  0.002296  0.015560  2.000000  561.0000
6.888889  0.002296  0.015815  2.000000  571.0000
7.000000  0.002296  0.016070  2.000000  581.0000
7.111111  0.002296  0.016325  2.000000  591.0000
7.222222  0.002296  0.016580  2.000000  601.0000
7.333333  0.002296  0.016835  2.000000  611.0000
7.444444  0.002296  0.017090  2.000000  621.0000
7.555556  0.002296  0.017345  2.000000  631.0000
7.666667  0.002296  0.017600  2.000000  641.0000
7.777778  0.002296  0.017855  2.000000  651.0000
7.888889  0.002296  0.018110  2.000000  661.0000
8.000000  0.002296  0.018365  2.000000  671.0000
8.111111  0.002296  0.018621  2.000000  681.0000
8.222222  0.002296  0.018876  2.000000  691.0000
8.333333  0.002296  0.019131  2.000000  701.0000
8.444444  0.002296  0.019386  2.000000  711.0000
8.555556  0.002296  0.019641  2.000000  721.0000
8.666667  0.002296  0.019896  2.000000  731.0000
8.777778  0.002296  0.020151  2.000000  741.0000
8.888889  0.002296  0.020406  2.000000  751.0000
9.000000  0.002296  0.020661  2.000000  761.0000
9.111111  0.002296  0.020916  2.000000  771.0000
9.222222  0.002296  0.021171  2.000000  781.0000
9.333333  0.002296  0.021426  2.000000  791.0000
9.444444  0.002296  0.021681  2.000000  801.0000
9.555556  0.002296  0.021937  2.000000  811.0000
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE  2
FTABLE      3
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.002296  0.000000  2.000000  0.000000
0.111111  0.002296  0.000255  2.000000  0.000000
```

0.222222	0.002296	0.000510	2.000000	0.000000
0.333333	0.002296	0.000765	2.000000	0.000000
0.444444	0.002296	0.001020	2.000000	0.000000
0.555556	0.002296	0.001275	2.000000	0.000000
0.666667	0.002296	0.001530	2.000000	11.00000
0.777778	0.002296	0.001786	2.000000	21.00000
0.888889	0.002296	0.002041	2.000000	31.00000
1.000000	0.002296	0.002296	2.000000	41.00000
1.111111	0.002296	0.002551	2.000000	51.00000
1.222222	0.002296	0.002806	2.000000	61.00000
1.333333	0.002296	0.003061	2.000000	71.00000
1.444444	0.002296	0.003316	2.000000	81.00000
1.555556	0.002296	0.003571	2.000000	91.00000
1.666667	0.002296	0.003826	2.000000	101.0000
1.777778	0.002296	0.004081	2.000000	111.0000
1.888889	0.002296	0.004336	2.000000	121.0000
2.000000	0.002296	0.004591	2.000000	131.0000
2.111111	0.002296	0.004846	2.000000	141.0000
2.222222	0.002296	0.005102	2.000000	151.0000
2.333333	0.002296	0.005357	2.000000	161.0000
2.444444	0.002296	0.005612	2.000000	171.0000
2.555556	0.002296	0.005867	2.000000	181.0000
2.666667	0.002296	0.006122	2.000000	191.0000
2.777778	0.002296	0.006377	2.000000	201.0000
2.888889	0.002296	0.006632	2.000000	211.0000
3.000000	0.002296	0.006887	2.000000	221.0000
3.111111	0.002296	0.007142	2.000000	231.0000
3.222222	0.002296	0.007397	2.000000	241.0000
3.333333	0.002296	0.007652	2.000000	251.0000
3.444444	0.002296	0.007907	2.000000	261.0000
3.555556	0.002296	0.008162	2.000000	271.0000
3.666667	0.002296	0.008418	2.000000	281.0000
3.777778	0.002296	0.008673	2.000000	291.0000
3.888889	0.002296	0.008928	2.000000	301.0000
4.000000	0.002296	0.009183	2.000000	311.0000
4.111111	0.002296	0.009438	2.000000	321.0000
4.222222	0.002296	0.009693	2.000000	331.0000
4.333333	0.002296	0.009948	2.000000	341.0000
4.444444	0.002296	0.010203	2.000000	351.0000
4.555556	0.002296	0.010458	2.000000	361.0000
4.666667	0.002296	0.010713	2.000000	371.0000
4.777778	0.002296	0.010968	2.000000	381.0000
4.888889	0.002296	0.011223	2.000000	391.0000
5.000000	0.002296	0.011478	2.000000	401.0000
5.111111	0.002296	0.011733	2.000000	411.0000
5.222222	0.002296	0.011989	2.000000	421.0000
5.333333	0.002296	0.012244	2.000000	431.0000
5.444444	0.002296	0.012499	2.000000	441.0000
5.555556	0.002296	0.012754	2.000000	451.0000
5.666667	0.002296	0.013009	2.000000	461.0000
5.777778	0.002296	0.013264	2.000000	471.0000
5.888889	0.002296	0.013519	2.000000	481.0000
6.000000	0.002296	0.013774	2.000000	491.0000
6.111111	0.002296	0.014029	2.000000	501.0000
6.222222	0.002296	0.014284	2.000000	511.0000
6.333333	0.002296	0.014539	2.000000	521.0000
6.444444	0.002296	0.014794	2.000000	531.0000
6.555556	0.002296	0.015049	2.000000	541.0000
6.666667	0.002296	0.015305	2.000000	551.0000
6.777778	0.002296	0.015560	2.000000	561.0000
6.888889	0.002296	0.015815	2.000000	571.0000
7.000000	0.002296	0.016070	2.000000	581.0000
7.111111	0.002296	0.016325	2.000000	591.0000
7.222222	0.002296	0.016580	2.000000	601.0000
7.333333	0.002296	0.016835	2.000000	611.0000
7.444444	0.002296	0.017090	2.000000	621.0000
7.555556	0.002296	0.017345	2.000000	631.0000
7.666667	0.002296	0.017600	2.000000	641.0000
7.777778	0.002296	0.017855	2.000000	651.0000
7.888889	0.002296	0.018110	2.000000	661.0000

```
8.000000  0.002296  0.018365  2.000000  671.0000
8.111111  0.002296  0.018621  2.000000  681.0000
8.222222  0.002296  0.018876  2.000000  691.0000
8.333333  0.002296  0.019131  2.000000  701.0000
8.444444  0.002296  0.019386  2.000000  711.0000
8.555556  0.002296  0.019641  2.000000  721.0000
8.666667  0.002296  0.019896  2.000000  731.0000
8.777778  0.002296  0.020151  2.000000  741.0000
8.888889  0.002296  0.020406  2.000000  751.0000
9.000000  0.002296  0.020661  2.000000  761.0000
9.111111  0.002296  0.020916  2.000000  771.0000
9.222222  0.002296  0.021171  2.000000  781.0000
9.333333  0.002296  0.021426  2.000000  791.0000
9.444444  0.002296  0.021681  2.000000  801.0000
9.555556  0.002296  0.021937  2.000000  811.0000
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE  3
FTABLE      4
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.002296  0.000000  2.000000  0.000000
0.111111  0.002296  0.000255  2.000000  0.000000
0.222222  0.002296  0.000510  2.000000  0.000000
0.333333  0.002296  0.000765  2.000000  0.000000
0.444444  0.002296  0.001020  2.000000  0.000000
0.555556  0.002296  0.001275  2.000000  0.000000
0.666667  0.002296  0.001530  2.000000  11.00000
0.777778  0.002296  0.001786  2.000000  21.00000
0.888889  0.002296  0.002041  2.000000  31.00000
1.000000  0.002296  0.002296  2.000000  41.00000
1.111111  0.002296  0.002551  2.000000  51.00000
1.222222  0.002296  0.002806  2.000000  61.00000
1.333333  0.002296  0.003061  2.000000  71.00000
1.444444  0.002296  0.003316  2.000000  81.00000
1.555556  0.002296  0.003571  2.000000  91.00000
1.666667  0.002296  0.003826  2.000000  101.0000
1.777778  0.002296  0.004081  2.000000  111.0000
1.888889  0.002296  0.004336  2.000000  121.0000
2.000000  0.002296  0.004591  2.000000  131.0000
2.111111  0.002296  0.004846  2.000000  141.0000
2.222222  0.002296  0.005102  2.000000  151.0000
2.333333  0.002296  0.005357  2.000000  161.0000
2.444444  0.002296  0.005612  2.000000  171.0000
2.555556  0.002296  0.005867  2.000000  181.0000
2.666667  0.002296  0.006122  2.000000  191.0000
2.777778  0.002296  0.006377  2.000000  201.0000
2.888889  0.002296  0.006632  2.000000  211.0000
3.000000  0.002296  0.006887  2.000000  221.0000
3.111111  0.002296  0.007142  2.000000  231.0000
3.222222  0.002296  0.007397  2.000000  241.0000
3.333333  0.002296  0.007652  2.000000  251.0000
3.444444  0.002296  0.007907  2.000000  261.0000
3.555556  0.002296  0.008162  2.000000  271.0000
3.666667  0.002296  0.008418  2.000000  281.0000
3.777778  0.002296  0.008673  2.000000  291.0000
3.888889  0.002296  0.008928  2.000000  301.0000
4.000000  0.002296  0.009183  2.000000  311.0000
4.111111  0.002296  0.009438  2.000000  321.0000
4.222222  0.002296  0.009693  2.000000  331.0000
4.333333  0.002296  0.009948  2.000000  341.0000
4.444444  0.002296  0.010203  2.000000  351.0000
4.555556  0.002296  0.010458  2.000000  361.0000
4.666667  0.002296  0.010713  2.000000  371.0000
4.777778  0.002296  0.010968  2.000000  381.0000
4.888889  0.002296  0.011223  2.000000  391.0000
5.000000  0.002296  0.011478  2.000000  401.0000
5.111111  0.002296  0.011733  2.000000  411.0000
```

```
5.222222  0.002296  0.011989  2.000000  421.0000
5.333333  0.002296  0.012244  2.000000  431.0000
5.444444  0.002296  0.012499  2.000000  441.0000
5.555556  0.002296  0.012754  2.000000  451.0000
5.666667  0.002296  0.013009  2.000000  461.0000
5.777778  0.002296  0.013264  2.000000  471.0000
5.888889  0.002296  0.013519  2.000000  481.0000
6.000000  0.002296  0.013774  2.000000  491.0000
6.111111  0.002296  0.014029  2.000000  501.0000
6.222222  0.002296  0.014284  2.000000  511.0000
6.333333  0.002296  0.014539  2.000000  521.0000
6.444444  0.002296  0.014794  2.000000  531.0000
6.555556  0.002296  0.015049  2.000000  541.0000
6.666667  0.002296  0.015305  2.000000  551.0000
6.777778  0.002296  0.015560  2.000000  561.0000
6.888889  0.002296  0.015815  2.000000  571.0000
7.000000  0.002296  0.016070  2.000000  581.0000
7.111111  0.002296  0.016325  2.000000  591.0000
7.222222  0.002296  0.016580  2.000000  601.0000
7.333333  0.002296  0.016835  2.000000  611.0000
7.444444  0.002296  0.017090  2.000000  621.0000
7.555556  0.002296  0.017345  2.000000  631.0000
7.666667  0.002296  0.017600  2.000000  641.0000
7.777778  0.002296  0.017855  2.000000  651.0000
7.888889  0.002296  0.018110  2.000000  661.0000
8.000000  0.002296  0.018365  2.000000  671.0000
8.111111  0.002296  0.018621  2.000000  681.0000
8.222222  0.002296  0.018876  2.000000  691.0000
8.333333  0.002296  0.019131  2.000000  701.0000
8.444444  0.002296  0.019386  2.000000  711.0000
8.555556  0.002296  0.019641  2.000000  721.0000
8.666667  0.002296  0.019896  2.000000  731.0000
8.777778  0.002296  0.020151  2.000000  741.0000
8.888889  0.002296  0.020406  2.000000  751.0000
9.000000  0.002296  0.020661  2.000000  761.0000
9.111111  0.002296  0.020916  2.000000  771.0000
9.222222  0.002296  0.021171  2.000000  781.0000
9.333333  0.002296  0.021426  2.000000  791.0000
9.444444  0.002296  0.021681  2.000000  801.0000
9.555556  0.002296  0.021937  2.000000  811.0000
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE  4
FTABLE      5
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.002296  0.000000  2.000000  0.000000
0.111111  0.002296  0.000255  2.000000  0.000000
0.222222  0.002296  0.000510  2.000000  0.000000
0.333333  0.002296  0.000765  2.000000  0.000000
0.444444  0.002296  0.001020  2.000000  0.000000
0.555556  0.002296  0.001275  2.000000  0.000000
0.666667  0.002296  0.001530  2.000000  11.00000
0.777778  0.002296  0.001786  2.000000  21.00000
0.888889  0.002296  0.002041  2.000000  31.00000
1.000000  0.002296  0.002296  2.000000  41.00000
1.111111  0.002296  0.002551  2.000000  51.00000
1.222222  0.002296  0.002806  2.000000  61.00000
1.333333  0.002296  0.003061  2.000000  71.00000
1.444444  0.002296  0.003316  2.000000  81.00000
1.555556  0.002296  0.003571  2.000000  91.00000
1.666667  0.002296  0.003826  2.000000  101.0000
1.777778  0.002296  0.004081  2.000000  111.0000
1.888889  0.002296  0.004336  2.000000  121.0000
2.000000  0.002296  0.004591  2.000000  131.0000
2.111111  0.002296  0.004846  2.000000  141.0000
2.222222  0.002296  0.005102  2.000000  151.0000
2.333333  0.002296  0.005357  2.000000  161.0000
```

```
2.444444  0.002296  0.005612  2.000000  171.0000
2.555556  0.002296  0.005867  2.000000  181.0000
2.666667  0.002296  0.006122  2.000000  191.0000
2.777778  0.002296  0.006377  2.000000  201.0000
2.888889  0.002296  0.006632  2.000000  211.0000
3.000000  0.002296  0.006887  2.000000  221.0000
3.111111  0.002296  0.007142  2.000000  231.0000
3.222222  0.002296  0.007397  2.000000  241.0000
3.333333  0.002296  0.007652  2.000000  251.0000
3.444444  0.002296  0.007907  2.000000  261.0000
3.555556  0.002296  0.008162  2.000000  271.0000
3.666667  0.002296  0.008418  2.000000  281.0000
3.777778  0.002296  0.008673  2.000000  291.0000
3.888889  0.002296  0.008928  2.000000  301.0000
4.000000  0.002296  0.009183  2.000000  311.0000
4.111111  0.002296  0.009438  2.000000  321.0000
4.222222  0.002296  0.009693  2.000000  331.0000
4.333333  0.002296  0.009948  2.000000  341.0000
4.444444  0.002296  0.010203  2.000000  351.0000
4.555556  0.002296  0.010458  2.000000  361.0000
4.666667  0.002296  0.010713  2.000000  371.0000
4.777778  0.002296  0.010968  2.000000  381.0000
4.888889  0.002296  0.011223  2.000000  391.0000
5.000000  0.002296  0.011478  2.000000  401.0000
5.111111  0.002296  0.011733  2.000000  411.0000
5.222222  0.002296  0.011989  2.000000  421.0000
5.333333  0.002296  0.012244  2.000000  431.0000
5.444444  0.002296  0.012499  2.000000  441.0000
5.555556  0.002296  0.012754  2.000000  451.0000
5.666667  0.002296  0.013009  2.000000  461.0000
5.777778  0.002296  0.013264  2.000000  471.0000
5.888889  0.002296  0.013519  2.000000  481.0000
6.000000  0.002296  0.013774  2.000000  491.0000
6.111111  0.002296  0.014029  2.000000  501.0000
6.222222  0.002296  0.014284  2.000000  511.0000
6.333333  0.002296  0.014539  2.000000  521.0000
6.444444  0.002296  0.014794  2.000000  531.0000
6.555556  0.002296  0.015049  2.000000  541.0000
6.666667  0.002296  0.015305  2.000000  551.0000
6.777778  0.002296  0.015560  2.000000  561.0000
6.888889  0.002296  0.015815  2.000000  571.0000
7.000000  0.002296  0.016070  2.000000  581.0000
7.111111  0.002296  0.016325  2.000000  591.0000
7.222222  0.002296  0.016580  2.000000  601.0000
7.333333  0.002296  0.016835  2.000000  611.0000
7.444444  0.002296  0.017090  2.000000  621.0000
7.555556  0.002296  0.017345  2.000000  631.0000
7.666667  0.002296  0.017600  2.000000  641.0000
7.777778  0.002296  0.017855  2.000000  651.0000
7.888889  0.002296  0.018110  2.000000  661.0000
8.000000  0.002296  0.018365  2.000000  671.0000
8.111111  0.002296  0.018621  2.000000  681.0000
8.222222  0.002296  0.018876  2.000000  691.0000
8.333333  0.002296  0.019131  2.000000  701.0000
8.444444  0.002296  0.019386  2.000000  711.0000
8.555556  0.002296  0.019641  2.000000  721.0000
8.666667  0.002296  0.019896  2.000000  731.0000
8.777778  0.002296  0.020151  2.000000  741.0000
8.888889  0.002296  0.020406  2.000000  751.0000
9.000000  0.002296  0.020661  2.000000  761.0000
9.111111  0.002296  0.020916  2.000000  771.0000
9.222222  0.002296  0.021171  2.000000  781.0000
9.333333  0.002296  0.021426  2.000000  791.0000
9.444444  0.002296  0.021681  2.000000  801.0000
9.555556  0.002296  0.021937  2.000000  811.0000
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE  5
FTABLE      6
```

90 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.002296	0.000000	2.000000	0.000000		
0.111111	0.002296	0.000255	2.000000	0.000000		
0.222222	0.002296	0.000510	2.000000	0.000000		
0.333333	0.002296	0.000765	2.000000	0.000000		
0.444444	0.002296	0.001020	2.000000	0.000000		
0.555556	0.002296	0.001275	2.000000	0.000000		
0.666667	0.002296	0.001530	2.000000	11.00000		
0.777778	0.002296	0.001786	2.000000	21.00000		
0.888889	0.002296	0.002041	2.000000	31.00000		
1.000000	0.002296	0.002296	2.000000	41.00000		
1.111111	0.002296	0.002551	2.000000	51.00000		
1.222222	0.002296	0.002806	2.000000	61.00000		
1.333333	0.002296	0.003061	2.000000	71.00000		
1.444444	0.002296	0.003316	2.000000	81.00000		
1.555556	0.002296	0.003571	2.000000	91.00000		
1.666667	0.002296	0.003826	2.000000	101.0000		
1.777778	0.002296	0.004081	2.000000	111.0000		
1.888889	0.002296	0.004336	2.000000	121.0000		
2.000000	0.002296	0.004591	2.000000	131.0000		
2.111111	0.002296	0.004846	2.000000	141.0000		
2.222222	0.002296	0.005102	2.000000	151.0000		
2.333333	0.002296	0.005357	2.000000	161.0000		
2.444444	0.002296	0.005612	2.000000	171.0000		
2.555556	0.002296	0.005867	2.000000	181.0000		
2.666667	0.002296	0.006122	2.000000	191.0000		
2.777778	0.002296	0.006377	2.000000	201.0000		
2.888889	0.002296	0.006632	2.000000	211.0000		
3.000000	0.002296	0.006887	2.000000	221.0000		
3.111111	0.002296	0.007142	2.000000	231.0000		
3.222222	0.002296	0.007397	2.000000	241.0000		
3.333333	0.002296	0.007652	2.000000	251.0000		
3.444444	0.002296	0.007907	2.000000	261.0000		
3.555556	0.002296	0.008162	2.000000	271.0000		
3.666667	0.002296	0.008418	2.000000	281.0000		
3.777778	0.002296	0.008673	2.000000	291.0000		
3.888889	0.002296	0.008928	2.000000	301.0000		
4.000000	0.002296	0.009183	2.000000	311.0000		
4.111111	0.002296	0.009438	2.000000	321.0000		
4.222222	0.002296	0.009693	2.000000	331.0000		
4.333333	0.002296	0.009948	2.000000	341.0000		
4.444444	0.002296	0.010203	2.000000	351.0000		
4.555556	0.002296	0.010458	2.000000	361.0000		
4.666667	0.002296	0.010713	2.000000	371.0000		
4.777778	0.002296	0.010968	2.000000	381.0000		
4.888889	0.002296	0.011223	2.000000	391.0000		
5.000000	0.002296	0.011478	2.000000	401.0000		
5.111111	0.002296	0.011733	2.000000	411.0000		
5.222222	0.002296	0.011989	2.000000	421.0000		
5.333333	0.002296	0.012244	2.000000	431.0000		
5.444444	0.002296	0.012499	2.000000	441.0000		
5.555556	0.002296	0.012754	2.000000	451.0000		
5.666667	0.002296	0.013009	2.000000	461.0000		
5.777778	0.002296	0.013264	2.000000	471.0000		
5.888889	0.002296	0.013519	2.000000	481.0000		
6.000000	0.002296	0.013774	2.000000	491.0000		
6.111111	0.002296	0.014029	2.000000	501.0000		
6.222222	0.002296	0.014284	2.000000	511.0000		
6.333333	0.002296	0.014539	2.000000	521.0000		
6.444444	0.002296	0.014794	2.000000	531.0000		
6.555556	0.002296	0.015049	2.000000	541.0000		
6.666667	0.002296	0.015305	2.000000	551.0000		
6.777778	0.002296	0.015560	2.000000	561.0000		
6.888889	0.002296	0.015815	2.000000	571.0000		
7.000000	0.002296	0.016070	2.000000	581.0000		
7.111111	0.002296	0.016325	2.000000	591.0000		
7.222222	0.002296	0.016580	2.000000	601.0000		
7.333333	0.002296	0.016835	2.000000	611.0000		

```
7.444444  0.002296  0.017090  2.000000  621.0000
7.555556  0.002296  0.017345  2.000000  631.0000
7.666667  0.002296  0.017600  2.000000  641.0000
7.777778  0.002296  0.017855  2.000000  651.0000
7.888889  0.002296  0.018110  2.000000  661.0000
8.000000  0.002296  0.018365  2.000000  671.0000
8.111111  0.002296  0.018621  2.000000  681.0000
8.222222  0.002296  0.018876  2.000000  691.0000
8.333333  0.002296  0.019131  2.000000  701.0000
8.444444  0.002296  0.019386  2.000000  711.0000
8.555556  0.002296  0.019641  2.000000  721.0000
8.666667  0.002296  0.019896  2.000000  731.0000
8.777778  0.002296  0.020151  2.000000  741.0000
8.888889  0.002296  0.020406  2.000000  751.0000
9.000000  0.002296  0.020661  2.000000  761.0000
9.111111  0.002296  0.020916  2.000000  771.0000
9.222222  0.002296  0.021171  2.000000  781.0000
9.333333  0.002296  0.021426  2.000000  791.0000
9.444444  0.002296  0.021681  2.000000  801.0000
9.555556  0.002296  0.021937  2.000000  811.0000
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE  6
FTABLE      7
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.002296  0.000000  2.000000  0.000000
0.111111  0.002296  0.000255  2.000000  0.000000
0.222222  0.002296  0.000510  2.000000  0.000000
0.333333  0.002296  0.000765  2.000000  0.000000
0.444444  0.002296  0.001020  2.000000  0.000000
0.555556  0.002296  0.001275  2.000000  0.000000
0.666667  0.002296  0.001530  2.000000  11.00000
0.777778  0.002296  0.001786  2.000000  21.00000
0.888889  0.002296  0.002041  2.000000  31.00000
1.000000  0.002296  0.002296  2.000000  41.00000
1.111111  0.002296  0.002551  2.000000  51.00000
1.222222  0.002296  0.002806  2.000000  61.00000
1.333333  0.002296  0.003061  2.000000  71.00000
1.444444  0.002296  0.003316  2.000000  81.00000
1.555556  0.002296  0.003571  2.000000  91.00000
1.666667  0.002296  0.003826  2.000000  101.0000
1.777778  0.002296  0.004081  2.000000  111.0000
1.888889  0.002296  0.004336  2.000000  121.0000
2.000000  0.002296  0.004591  2.000000  131.0000
2.111111  0.002296  0.004846  2.000000  141.0000
2.222222  0.002296  0.005102  2.000000  151.0000
2.333333  0.002296  0.005357  2.000000  161.0000
2.444444  0.002296  0.005612  2.000000  171.0000
2.555556  0.002296  0.005867  2.000000  181.0000
2.666667  0.002296  0.006122  2.000000  191.0000
2.777778  0.002296  0.006377  2.000000  201.0000
2.888889  0.002296  0.006632  2.000000  211.0000
3.000000  0.002296  0.006887  2.000000  221.0000
3.111111  0.002296  0.007142  2.000000  231.0000
3.222222  0.002296  0.007397  2.000000  241.0000
3.333333  0.002296  0.007652  2.000000  251.0000
3.444444  0.002296  0.007907  2.000000  261.0000
3.555556  0.002296  0.008162  2.000000  271.0000
3.666667  0.002296  0.008418  2.000000  281.0000
3.777778  0.002296  0.008673  2.000000  291.0000
3.888889  0.002296  0.008928  2.000000  301.0000
4.000000  0.002296  0.009183  2.000000  311.0000
4.111111  0.002296  0.009438  2.000000  321.0000
4.222222  0.002296  0.009693  2.000000  331.0000
4.333333  0.002296  0.009948  2.000000  341.0000
4.444444  0.002296  0.010203  2.000000  351.0000
4.555556  0.002296  0.010458  2.000000  361.0000
```

```
4.666667  0.002296  0.010713  2.000000  371.0000
4.777778  0.002296  0.010968  2.000000  381.0000
4.888889  0.002296  0.011223  2.000000  391.0000
5.000000  0.002296  0.011478  2.000000  401.0000
5.111111  0.002296  0.011733  2.000000  411.0000
5.222222  0.002296  0.011989  2.000000  421.0000
5.333333  0.002296  0.012244  2.000000  431.0000
5.444444  0.002296  0.012499  2.000000  441.0000
5.555556  0.002296  0.012754  2.000000  451.0000
5.666667  0.002296  0.013009  2.000000  461.0000
5.777778  0.002296  0.013264  2.000000  471.0000
5.888889  0.002296  0.013519  2.000000  481.0000
6.000000  0.002296  0.013774  2.000000  491.0000
6.111111  0.002296  0.014029  2.000000  501.0000
6.222222  0.002296  0.014284  2.000000  511.0000
6.333333  0.002296  0.014539  2.000000  521.0000
6.444444  0.002296  0.014794  2.000000  531.0000
6.555556  0.002296  0.015049  2.000000  541.0000
6.666667  0.002296  0.015305  2.000000  551.0000
6.777778  0.002296  0.015560  2.000000  561.0000
6.888889  0.002296  0.015815  2.000000  571.0000
7.000000  0.002296  0.016070  2.000000  581.0000
7.111111  0.002296  0.016325  2.000000  591.0000
7.222222  0.002296  0.016580  2.000000  601.0000
7.333333  0.002296  0.016835  2.000000  611.0000
7.444444  0.002296  0.017090  2.000000  621.0000
7.555556  0.002296  0.017345  2.000000  631.0000
7.666667  0.002296  0.017600  2.000000  641.0000
7.777778  0.002296  0.017855  2.000000  651.0000
7.888889  0.002296  0.018110  2.000000  661.0000
8.000000  0.002296  0.018365  2.000000  671.0000
8.111111  0.002296  0.018621  2.000000  681.0000
8.222222  0.002296  0.018876  2.000000  691.0000
8.333333  0.002296  0.019131  2.000000  701.0000
8.444444  0.002296  0.019386  2.000000  711.0000
8.555556  0.002296  0.019641  2.000000  721.0000
8.666667  0.002296  0.019896  2.000000  731.0000
8.777778  0.002296  0.020151  2.000000  741.0000
8.888889  0.002296  0.020406  2.000000  751.0000
9.000000  0.002296  0.020661  2.000000  761.0000
9.111111  0.002296  0.020916  2.000000  771.0000
9.222222  0.002296  0.021171  2.000000  781.0000
9.333333  0.002296  0.021426  2.000000  791.0000
9.444444  0.002296  0.021681  2.000000  801.0000
9.555556  0.002296  0.021937  2.000000  811.0000
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE  7
FTABLE      8
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.002296  0.000000  2.000000  0.000000
0.111111  0.002296  0.000255  2.000000  0.000000
0.222222  0.002296  0.000510  2.000000  0.000000
0.333333  0.002296  0.000765  2.000000  0.000000
0.444444  0.002296  0.001020  2.000000  0.000000
0.555556  0.002296  0.001275  2.000000  0.000000
0.666667  0.002296  0.001530  2.000000  11.00000
0.777778  0.002296  0.001786  2.000000  21.00000
0.888889  0.002296  0.002041  2.000000  31.00000
1.000000  0.002296  0.002296  2.000000  41.00000
1.111111  0.002296  0.002551  2.000000  51.00000
1.222222  0.002296  0.002806  2.000000  61.00000
1.333333  0.002296  0.003061  2.000000  71.00000
1.444444  0.002296  0.003316  2.000000  81.00000
1.555556  0.002296  0.003571  2.000000  91.00000
1.666667  0.002296  0.003826  2.000000  101.0000
1.777778  0.002296  0.004081  2.000000  111.0000
```

1.888889	0.002296	0.004336	2.000000	121.0000
2.000000	0.002296	0.004591	2.000000	131.0000
2.111111	0.002296	0.004846	2.000000	141.0000
2.222222	0.002296	0.005102	2.000000	151.0000
2.333333	0.002296	0.005357	2.000000	161.0000
2.444444	0.002296	0.005612	2.000000	171.0000
2.555556	0.002296	0.005867	2.000000	181.0000
2.666667	0.002296	0.006122	2.000000	191.0000
2.777778	0.002296	0.006377	2.000000	201.0000
2.888889	0.002296	0.006632	2.000000	211.0000
3.000000	0.002296	0.006887	2.000000	221.0000
3.111111	0.002296	0.007142	2.000000	231.0000
3.222222	0.002296	0.007397	2.000000	241.0000
3.333333	0.002296	0.007652	2.000000	251.0000
3.444444	0.002296	0.007907	2.000000	261.0000
3.555556	0.002296	0.008162	2.000000	271.0000
3.666667	0.002296	0.008418	2.000000	281.0000
3.777778	0.002296	0.008673	2.000000	291.0000
3.888889	0.002296	0.008928	2.000000	301.0000
4.000000	0.002296	0.009183	2.000000	311.0000
4.111111	0.002296	0.009438	2.000000	321.0000
4.222222	0.002296	0.009693	2.000000	331.0000
4.333333	0.002296	0.009948	2.000000	341.0000
4.444444	0.002296	0.010203	2.000000	351.0000
4.555556	0.002296	0.010458	2.000000	361.0000
4.666667	0.002296	0.010713	2.000000	371.0000
4.777778	0.002296	0.010968	2.000000	381.0000
4.888889	0.002296	0.011223	2.000000	391.0000
5.000000	0.002296	0.011478	2.000000	401.0000
5.111111	0.002296	0.011733	2.000000	411.0000
5.222222	0.002296	0.011989	2.000000	421.0000
5.333333	0.002296	0.012244	2.000000	431.0000
5.444444	0.002296	0.012499	2.000000	441.0000
5.555556	0.002296	0.012754	2.000000	451.0000
5.666667	0.002296	0.013009	2.000000	461.0000
5.777778	0.002296	0.013264	2.000000	471.0000
5.888889	0.002296	0.013519	2.000000	481.0000
6.000000	0.002296	0.013774	2.000000	491.0000
6.111111	0.002296	0.014029	2.000000	501.0000
6.222222	0.002296	0.014284	2.000000	511.0000
6.333333	0.002296	0.014539	2.000000	521.0000
6.444444	0.002296	0.014794	2.000000	531.0000
6.555556	0.002296	0.015049	2.000000	541.0000
6.666667	0.002296	0.015305	2.000000	551.0000
6.777778	0.002296	0.015560	2.000000	561.0000
6.888889	0.002296	0.015815	2.000000	571.0000
7.000000	0.002296	0.016070	2.000000	581.0000
7.111111	0.002296	0.016325	2.000000	591.0000
7.222222	0.002296	0.016580	2.000000	601.0000
7.333333	0.002296	0.016835	2.000000	611.0000
7.444444	0.002296	0.017090	2.000000	621.0000
7.555556	0.002296	0.017345	2.000000	631.0000
7.666667	0.002296	0.017600	2.000000	641.0000
7.777778	0.002296	0.017855	2.000000	651.0000
7.888889	0.002296	0.018110	2.000000	661.0000
8.000000	0.002296	0.018365	2.000000	671.0000
8.111111	0.002296	0.018621	2.000000	681.0000
8.222222	0.002296	0.018876	2.000000	691.0000
8.333333	0.002296	0.019131	2.000000	701.0000
8.444444	0.002296	0.019386	2.000000	711.0000
8.555556	0.002296	0.019641	2.000000	721.0000
8.666667	0.002296	0.019896	2.000000	731.0000
8.777778	0.002296	0.020151	2.000000	741.0000
8.888889	0.002296	0.020406	2.000000	751.0000
9.000000	0.002296	0.020661	2.000000	761.0000
9.111111	0.002296	0.020916	2.000000	771.0000
9.222222	0.002296	0.021171	2.000000	781.0000
9.333333	0.002296	0.021426	2.000000	791.0000
9.444444	0.002296	0.021681	2.000000	801.0000
9.555556	0.002296	0.021937	2.000000	811.0000

```
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE  8
FTABLE      9
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.002296  0.000000  2.000000  0.000000
0.111111  0.002296  0.000255  2.000000  0.000000
0.222222  0.002296  0.000510  2.000000  0.000000
0.333333  0.002296  0.000765  2.000000  0.000000
0.444444  0.002296  0.001020  2.000000  0.000000
0.555556  0.002296  0.001275  2.000000  0.000000
0.666667  0.002296  0.001530  2.000000  11.00000
0.777778  0.002296  0.001786  2.000000  21.00000
0.888889  0.002296  0.002041  2.000000  31.00000
1.000000  0.002296  0.002296  2.000000  41.00000
1.111111  0.002296  0.002551  2.000000  51.00000
1.222222  0.002296  0.002806  2.000000  61.00000
1.333333  0.002296  0.003061  2.000000  71.00000
1.444444  0.002296  0.003316  2.000000  81.00000
1.555556  0.002296  0.003571  2.000000  91.00000
1.666667  0.002296  0.003826  2.000000  101.0000
1.777778  0.002296  0.004081  2.000000  111.0000
1.888889  0.002296  0.004336  2.000000  121.0000
2.000000  0.002296  0.004591  2.000000  131.0000
2.111111  0.002296  0.004846  2.000000  141.0000
2.222222  0.002296  0.005102  2.000000  151.0000
2.333333  0.002296  0.005357  2.000000  161.0000
2.444444  0.002296  0.005612  2.000000  171.0000
2.555556  0.002296  0.005867  2.000000  181.0000
2.666667  0.002296  0.006122  2.000000  191.0000
2.777778  0.002296  0.006377  2.000000  201.0000
2.888889  0.002296  0.006632  2.000000  211.0000
3.000000  0.002296  0.006887  2.000000  221.0000
3.111111  0.002296  0.007142  2.000000  231.0000
3.222222  0.002296  0.007397  2.000000  241.0000
3.333333  0.002296  0.007652  2.000000  251.0000
3.444444  0.002296  0.007907  2.000000  261.0000
3.555556  0.002296  0.008162  2.000000  271.0000
3.666667  0.002296  0.008418  2.000000  281.0000
3.777778  0.002296  0.008673  2.000000  291.0000
3.888889  0.002296  0.008928  2.000000  301.0000
4.000000  0.002296  0.009183  2.000000  311.0000
4.111111  0.002296  0.009438  2.000000  321.0000
4.222222  0.002296  0.009693  2.000000  331.0000
4.333333  0.002296  0.009948  2.000000  341.0000
4.444444  0.002296  0.010203  2.000000  351.0000
4.555556  0.002296  0.010458  2.000000  361.0000
4.666667  0.002296  0.010713  2.000000  371.0000
4.777778  0.002296  0.010968  2.000000  381.0000
4.888889  0.002296  0.011223  2.000000  391.0000
5.000000  0.002296  0.011478  2.000000  401.0000
5.111111  0.002296  0.011733  2.000000  411.0000
5.222222  0.002296  0.011989  2.000000  421.0000
5.333333  0.002296  0.012244  2.000000  431.0000
5.444444  0.002296  0.012499  2.000000  441.0000
5.555556  0.002296  0.012754  2.000000  451.0000
5.666667  0.002296  0.013009  2.000000  461.0000
5.777778  0.002296  0.013264  2.000000  471.0000
5.888889  0.002296  0.013519  2.000000  481.0000
6.000000  0.002296  0.013774  2.000000  491.0000
6.111111  0.002296  0.014029  2.000000  501.0000
6.222222  0.002296  0.014284  2.000000  511.0000
6.333333  0.002296  0.014539  2.000000  521.0000
6.444444  0.002296  0.014794  2.000000  531.0000
6.555556  0.002296  0.015049  2.000000  541.0000
6.666667  0.002296  0.015305  2.000000  551.0000
6.777778  0.002296  0.015560  2.000000  561.0000
```

```
6.888889  0.002296  0.015815  2.000000  571.0000
7.000000  0.002296  0.016070  2.000000  581.0000
7.111111  0.002296  0.016325  2.000000  591.0000
7.222222  0.002296  0.016580  2.000000  601.0000
7.333333  0.002296  0.016835  2.000000  611.0000
7.444444  0.002296  0.017090  2.000000  621.0000
7.555556  0.002296  0.017345  2.000000  631.0000
7.666667  0.002296  0.017600  2.000000  641.0000
7.777778  0.002296  0.017855  2.000000  651.0000
7.888889  0.002296  0.018110  2.000000  661.0000
8.000000  0.002296  0.018365  2.000000  671.0000
8.111111  0.002296  0.018621  2.000000  681.0000
8.222222  0.002296  0.018876  2.000000  691.0000
8.333333  0.002296  0.019131  2.000000  701.0000
8.444444  0.002296  0.019386  2.000000  711.0000
8.555556  0.002296  0.019641  2.000000  721.0000
8.666667  0.002296  0.019896  2.000000  731.0000
8.777778  0.002296  0.020151  2.000000  741.0000
8.888889  0.002296  0.020406  2.000000  751.0000
9.000000  0.002296  0.020661  2.000000  761.0000
9.111111  0.002296  0.020916  2.000000  771.0000
9.222222  0.002296  0.021171  2.000000  781.0000
9.333333  0.002296  0.021426  2.000000  791.0000
9.444444  0.002296  0.021681  2.000000  801.0000
9.555556  0.002296  0.021937  2.000000  811.0000
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE  9
FTABLE     10
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.002296  0.000000  2.000000  0.000000
0.111111  0.002296  0.000255  2.000000  0.000000
0.222222  0.002296  0.000510  2.000000  0.000000
0.333333  0.002296  0.000765  2.000000  0.000000
0.444444  0.002296  0.001020  2.000000  0.000000
0.555556  0.002296  0.001275  2.000000  0.000000
0.666667  0.002296  0.001530  2.000000  11.00000
0.777778  0.002296  0.001786  2.000000  21.00000
0.888889  0.002296  0.002041  2.000000  31.00000
1.000000  0.002296  0.002296  2.000000  41.00000
1.111111  0.002296  0.002551  2.000000  51.00000
1.222222  0.002296  0.002806  2.000000  61.00000
1.333333  0.002296  0.003061  2.000000  71.00000
1.444444  0.002296  0.003316  2.000000  81.00000
1.555556  0.002296  0.003571  2.000000  91.00000
1.666667  0.002296  0.003826  2.000000  101.0000
1.777778  0.002296  0.004081  2.000000  111.0000
1.888889  0.002296  0.004336  2.000000  121.0000
2.000000  0.002296  0.004591  2.000000  131.0000
2.111111  0.002296  0.004846  2.000000  141.0000
2.222222  0.002296  0.005102  2.000000  151.0000
2.333333  0.002296  0.005357  2.000000  161.0000
2.444444  0.002296  0.005612  2.000000  171.0000
2.555556  0.002296  0.005867  2.000000  181.0000
2.666667  0.002296  0.006122  2.000000  191.0000
2.777778  0.002296  0.006377  2.000000  201.0000
2.888889  0.002296  0.006632  2.000000  211.0000
3.000000  0.002296  0.006887  2.000000  221.0000
3.111111  0.002296  0.007142  2.000000  231.0000
3.222222  0.002296  0.007397  2.000000  241.0000
3.333333  0.002296  0.007652  2.000000  251.0000
3.444444  0.002296  0.007907  2.000000  261.0000
3.555556  0.002296  0.008162  2.000000  271.0000
3.666667  0.002296  0.008418  2.000000  281.0000
3.777778  0.002296  0.008673  2.000000  291.0000
3.888889  0.002296  0.008928  2.000000  301.0000
4.000000  0.002296  0.009183  2.000000  311.0000
```

```
4.111111  0.002296  0.009438  2.000000  321.0000
4.222222  0.002296  0.009693  2.000000  331.0000
4.333333  0.002296  0.009948  2.000000  341.0000
4.444444  0.002296  0.010203  2.000000  351.0000
4.555556  0.002296  0.010458  2.000000  361.0000
4.666667  0.002296  0.010713  2.000000  371.0000
4.777778  0.002296  0.010968  2.000000  381.0000
4.888889  0.002296  0.011223  2.000000  391.0000
5.000000  0.002296  0.011478  2.000000  401.0000
5.111111  0.002296  0.011733  2.000000  411.0000
5.222222  0.002296  0.011989  2.000000  421.0000
5.333333  0.002296  0.012244  2.000000  431.0000
5.444444  0.002296  0.012499  2.000000  441.0000
5.555556  0.002296  0.012754  2.000000  451.0000
5.666667  0.002296  0.013009  2.000000  461.0000
5.777778  0.002296  0.013264  2.000000  471.0000
5.888889  0.002296  0.013519  2.000000  481.0000
6.000000  0.002296  0.013774  2.000000  491.0000
6.111111  0.002296  0.014029  2.000000  501.0000
6.222222  0.002296  0.014284  2.000000  511.0000
6.333333  0.002296  0.014539  2.000000  521.0000
6.444444  0.002296  0.014794  2.000000  531.0000
6.555556  0.002296  0.015049  2.000000  541.0000
6.666667  0.002296  0.015305  2.000000  551.0000
6.777778  0.002296  0.015560  2.000000  561.0000
6.888889  0.002296  0.015815  2.000000  571.0000
7.000000  0.002296  0.016070  2.000000  581.0000
7.111111  0.002296  0.016325  2.000000  591.0000
7.222222  0.002296  0.016580  2.000000  601.0000
7.333333  0.002296  0.016835  2.000000  611.0000
7.444444  0.002296  0.017090  2.000000  621.0000
7.555556  0.002296  0.017345  2.000000  631.0000
7.666667  0.002296  0.017600  2.000000  641.0000
7.777778  0.002296  0.017855  2.000000  651.0000
7.888889  0.002296  0.018110  2.000000  661.0000
8.000000  0.002296  0.018365  2.000000  671.0000
8.111111  0.002296  0.018621  2.000000  681.0000
8.222222  0.002296  0.018876  2.000000  691.0000
8.333333  0.002296  0.019131  2.000000  701.0000
8.444444  0.002296  0.019386  2.000000  711.0000
8.555556  0.002296  0.019641  2.000000  721.0000
8.666667  0.002296  0.019896  2.000000  731.0000
8.777778  0.002296  0.020151  2.000000  741.0000
8.888889  0.002296  0.020406  2.000000  751.0000
9.000000  0.002296  0.020661  2.000000  761.0000
9.111111  0.002296  0.020916  2.000000  771.0000
9.222222  0.002296  0.021171  2.000000  781.0000
9.333333  0.002296  0.021426  2.000000  791.0000
9.444444  0.002296  0.021681  2.000000  801.0000
9.555556  0.002296  0.021937  2.000000  811.0000
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE 10
FTABLE     11
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.002296  0.000000  2.000000  0.000000
0.111111  0.002296  0.000255  2.000000  0.000000
0.222222  0.002296  0.000510  2.000000  0.000000
0.333333  0.002296  0.000765  2.000000  0.000000
0.444444  0.002296  0.001020  2.000000  0.000000
0.555556  0.002296  0.001275  2.000000  0.000000
0.666667  0.002296  0.001530  2.000000  11.00000
0.777778  0.002296  0.001786  2.000000  21.00000
0.888889  0.002296  0.002041  2.000000  31.00000
1.000000  0.002296  0.002296  2.000000  41.00000
1.111111  0.002296  0.002551  2.000000  51.00000
1.222222  0.002296  0.002806  2.000000  61.00000
```

1.333333	0.002296	0.003061	2.000000	71.00000
1.444444	0.002296	0.003316	2.000000	81.00000
1.555556	0.002296	0.003571	2.000000	91.00000
1.666667	0.002296	0.003826	2.000000	101.0000
1.777778	0.002296	0.004081	2.000000	111.0000
1.888889	0.002296	0.004336	2.000000	121.0000
2.000000	0.002296	0.004591	2.000000	131.0000
2.111111	0.002296	0.004846	2.000000	141.0000
2.222222	0.002296	0.005102	2.000000	151.0000
2.333333	0.002296	0.005357	2.000000	161.0000
2.444444	0.002296	0.005612	2.000000	171.0000
2.555556	0.002296	0.005867	2.000000	181.0000
2.666667	0.002296	0.006122	2.000000	191.0000
2.777778	0.002296	0.006377	2.000000	201.0000
2.888889	0.002296	0.006632	2.000000	211.0000
3.000000	0.002296	0.006887	2.000000	221.0000
3.111111	0.002296	0.007142	2.000000	231.0000
3.222222	0.002296	0.007397	2.000000	241.0000
3.333333	0.002296	0.007652	2.000000	251.0000
3.444444	0.002296	0.007907	2.000000	261.0000
3.555556	0.002296	0.008162	2.000000	271.0000
3.666667	0.002296	0.008418	2.000000	281.0000
3.777778	0.002296	0.008673	2.000000	291.0000
3.888889	0.002296	0.008928	2.000000	301.0000
4.000000	0.002296	0.009183	2.000000	311.0000
4.111111	0.002296	0.009438	2.000000	321.0000
4.222222	0.002296	0.009693	2.000000	331.0000
4.333333	0.002296	0.009948	2.000000	341.0000
4.444444	0.002296	0.010203	2.000000	351.0000
4.555556	0.002296	0.010458	2.000000	361.0000
4.666667	0.002296	0.010713	2.000000	371.0000
4.777778	0.002296	0.010968	2.000000	381.0000
4.888889	0.002296	0.011223	2.000000	391.0000
5.000000	0.002296	0.011478	2.000000	401.0000
5.111111	0.002296	0.011733	2.000000	411.0000
5.222222	0.002296	0.011989	2.000000	421.0000
5.333333	0.002296	0.012244	2.000000	431.0000
5.444444	0.002296	0.012499	2.000000	441.0000
5.555556	0.002296	0.012754	2.000000	451.0000
5.666667	0.002296	0.013009	2.000000	461.0000
5.777778	0.002296	0.013264	2.000000	471.0000
5.888889	0.002296	0.013519	2.000000	481.0000
6.000000	0.002296	0.013774	2.000000	491.0000
6.111111	0.002296	0.014029	2.000000	501.0000
6.222222	0.002296	0.014284	2.000000	511.0000
6.333333	0.002296	0.014539	2.000000	521.0000
6.444444	0.002296	0.014794	2.000000	531.0000
6.555556	0.002296	0.015049	2.000000	541.0000
6.666667	0.002296	0.015305	2.000000	551.0000
6.777778	0.002296	0.015560	2.000000	561.0000
6.888889	0.002296	0.015815	2.000000	571.0000
7.000000	0.002296	0.016070	2.000000	581.0000
7.111111	0.002296	0.016325	2.000000	591.0000
7.222222	0.002296	0.016580	2.000000	601.0000
7.333333	0.002296	0.016835	2.000000	611.0000
7.444444	0.002296	0.017090	2.000000	621.0000
7.555556	0.002296	0.017345	2.000000	631.0000
7.666667	0.002296	0.017600	2.000000	641.0000
7.777778	0.002296	0.017855	2.000000	651.0000
7.888889	0.002296	0.018110	2.000000	661.0000
8.000000	0.002296	0.018365	2.000000	671.0000
8.111111	0.002296	0.018621	2.000000	681.0000
8.222222	0.002296	0.018876	2.000000	691.0000
8.333333	0.002296	0.019131	2.000000	701.0000
8.444444	0.002296	0.019386	2.000000	711.0000
8.555556	0.002296	0.019641	2.000000	721.0000
8.666667	0.002296	0.019896	2.000000	731.0000
8.777778	0.002296	0.020151	2.000000	741.0000
8.888889	0.002296	0.020406	2.000000	751.0000
9.000000	0.002296	0.020661	2.000000	761.0000

```
9.111111  0.002296  0.020916  2.000000  771.0000
9.222222  0.002296  0.021171  2.000000  781.0000
9.333333  0.002296  0.021426  2.000000  791.0000
9.444444  0.002296  0.021681  2.000000  801.0000
9.555556  0.002296  0.021937  2.000000  811.0000
9.666667  0.002296  0.022192  2.000000  821.0000
9.777778  0.002296  0.022447  2.000000  831.0000
9.888889  0.002296  0.022702  2.000000  841.0000
END FTABLE 11
FTABLE     12
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.002296  0.000000  2.000000  0.000000
0.111111  0.002296  0.000255  2.000000  0.000000
0.222222  0.002296  0.000510  2.000000  0.000000
0.333333  0.002296  0.000765  2.000000  0.000000
0.444444  0.002296  0.001020  2.000000  0.000000
0.555556  0.002296  0.001275  2.000000  0.000000
0.666667  0.002296  0.001530  2.000000  11.00000
0.777778  0.002296  0.001786  2.000000  21.00000
0.888889  0.002296  0.002041  2.000000  31.00000
1.000000  0.002296  0.002296  2.000000  41.00000
1.111111  0.002296  0.002551  2.000000  51.00000
1.222222  0.002296  0.002806  2.000000  61.00000
1.333333  0.002296  0.003061  2.000000  71.00000
1.444444  0.002296  0.003316  2.000000  81.00000
1.555556  0.002296  0.003571  2.000000  91.00000
1.666667  0.002296  0.003826  2.000000  101.0000
1.777778  0.002296  0.004081  2.000000  111.0000
1.888889  0.002296  0.004336  2.000000  121.0000
2.000000  0.002296  0.004591  2.000000  131.0000
2.111111  0.002296  0.004846  2.000000  141.0000
2.222222  0.002296  0.005102  2.000000  151.0000
2.333333  0.002296  0.005357  2.000000  161.0000
2.444444  0.002296  0.005612  2.000000  171.0000
2.555556  0.002296  0.005867  2.000000  181.0000
2.666667  0.002296  0.006122  2.000000  191.0000
2.777778  0.002296  0.006377  2.000000  201.0000
2.888889  0.002296  0.006632  2.000000  211.0000
3.000000  0.002296  0.006887  2.000000  221.0000
3.111111  0.002296  0.007142  2.000000  231.0000
3.222222  0.002296  0.007397  2.000000  241.0000
3.333333  0.002296  0.007652  2.000000  251.0000
3.444444  0.002296  0.007907  2.000000  261.0000
3.555556  0.002296  0.008162  2.000000  271.0000
3.666667  0.002296  0.008418  2.000000  281.0000
3.777778  0.002296  0.008673  2.000000  291.0000
3.888889  0.002296  0.008928  2.000000  301.0000
4.000000  0.002296  0.009183  2.000000  311.0000
4.111111  0.002296  0.009438  2.000000  321.0000
4.222222  0.002296  0.009693  2.000000  331.0000
4.333333  0.002296  0.009948  2.000000  341.0000
4.444444  0.002296  0.010203  2.000000  351.0000
4.555556  0.002296  0.010458  2.000000  361.0000
4.666667  0.002296  0.010713  2.000000  371.0000
4.777778  0.002296  0.010968  2.000000  381.0000
4.888889  0.002296  0.011223  2.000000  391.0000
5.000000  0.002296  0.011478  2.000000  401.0000
5.111111  0.002296  0.011733  2.000000  411.0000
5.222222  0.002296  0.011989  2.000000  421.0000
5.333333  0.002296  0.012244  2.000000  431.0000
5.444444  0.002296  0.012499  2.000000  441.0000
5.555556  0.002296  0.012754  2.000000  451.0000
5.666667  0.002296  0.013009  2.000000  461.0000
5.777778  0.002296  0.013264  2.000000  471.0000
5.888889  0.002296  0.013519  2.000000  481.0000
6.000000  0.002296  0.013774  2.000000  491.0000
6.111111  0.002296  0.014029  2.000000  501.0000
6.222222  0.002296  0.014284  2.000000  511.0000
```

```
  6.333333  0.002296  0.014539  2.000000  521.0000
  6.444444  0.002296  0.014794  2.000000  531.0000
  6.555556  0.002296  0.015049  2.000000  541.0000
  6.666667  0.002296  0.015305  2.000000  551.0000
  6.777778  0.002296  0.015560  2.000000  561.0000
  6.888889  0.002296  0.015815  2.000000  571.0000
  7.000000  0.002296  0.016070  2.000000  581.0000
  7.111111  0.002296  0.016325  2.000000  591.0000
  7.222222  0.002296  0.016580  2.000000  601.0000
  7.333333  0.002296  0.016835  2.000000  611.0000
  7.444444  0.002296  0.017090  2.000000  621.0000
  7.555556  0.002296  0.017345  2.000000  631.0000
  7.666667  0.002296  0.017600  2.000000  641.0000
  7.777778  0.002296  0.017855  2.000000  651.0000
  7.888889  0.002296  0.018110  2.000000  661.0000
  8.000000  0.002296  0.018365  2.000000  671.0000
  8.111111  0.002296  0.018621  2.000000  681.0000
  8.222222  0.002296  0.018876  2.000000  691.0000
  8.333333  0.002296  0.019131  2.000000  701.0000
  8.444444  0.002296  0.019386  2.000000  711.0000
  8.555556  0.002296  0.019641  2.000000  721.0000
  8.666667  0.002296  0.019896  2.000000  731.0000
  8.777778  0.002296  0.020151  2.000000  741.0000
  8.888889  0.002296  0.020406  2.000000  751.0000
  9.000000  0.002296  0.020661  2.000000  761.0000
  9.111111  0.002296  0.020916  2.000000  771.0000
  9.222222  0.002296  0.021171  2.000000  781.0000
  9.333333  0.002296  0.021426  2.000000  791.0000
  9.444444  0.002296  0.021681  2.000000  801.0000
  9.555556  0.002296  0.021937  2.000000  811.0000
  9.666667  0.002296  0.022192  2.000000  821.0000
  9.777778  0.002296  0.022447  2.000000  831.0000
  9.888889  0.002296  0.022702  2.000000  841.0000
  END FTABLE 12
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    1.429          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.429          IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 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
RCHRES   2 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1006 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1007 STAG     ENGL      REPL
RCHRES   3 HYDR   RO     1 1        1      WDM   1008 FLOW     ENGL      REPL
RCHRES   3 HYDR   O      1 1        1      WDM   1009 FLOW     ENGL      REPL
RCHRES   3 HYDR   O      2 1        1      WDM   1010 FLOW     ENGL      REPL
RCHRES   3 HYDR   STAGE  1 1        1      WDM   1011 STAG     ENGL      REPL
RCHRES   4 HYDR   RO     1 1        1      WDM   1012 FLOW     ENGL      REPL
RCHRES   4 HYDR   O      1 1        1      WDM   1013 FLOW     ENGL      REPL
RCHRES   4 HYDR   O      2 1        1      WDM   1014 FLOW     ENGL      REPL
RCHRES   4 HYDR   STAGE  1 1        1      WDM   1015 STAG     ENGL      REPL
RCHRES   5 HYDR   RO     1 1        1      WDM   1016 FLOW     ENGL      REPL
RCHRES   5 HYDR   O      1 1        1      WDM   1017 FLOW     ENGL      REPL
RCHRES   5 HYDR   O      2 1        1      WDM   1018 FLOW     ENGL      REPL
```

```
RCHRES   5 HYDR   STAGE  1 1         1      WDM   1019 STAG     ENGL      REPL
RCHRES   6 HYDR   RO     1 1         1      WDM   1020 FLOW     ENGL      REPL
RCHRES   6 HYDR   O      1 1         1      WDM   1021 FLOW     ENGL      REPL
RCHRES   6 HYDR   O      2 1         1      WDM   1022 FLOW     ENGL      REPL
RCHRES   6 HYDR   STAGE  1 1         1      WDM   1023 STAG     ENGL      REPL
RCHRES   7 HYDR   RO     1 1         1      WDM   1024 FLOW     ENGL      REPL
RCHRES   7 HYDR   O      1 1         1      WDM   1025 FLOW     ENGL      REPL
RCHRES   7 HYDR   O      2 1         1      WDM   1026 FLOW     ENGL      REPL
RCHRES   7 HYDR   STAGE  1 1         1      WDM   1027 STAG     ENGL      REPL
RCHRES   8 HYDR   RO     1 1         1      WDM   1028 FLOW     ENGL      REPL
RCHRES   8 HYDR   O      1 1         1      WDM   1029 FLOW     ENGL      REPL
RCHRES   8 HYDR   O      2 1         1      WDM   1030 FLOW     ENGL      REPL
RCHRES   8 HYDR   STAGE  1 1         1      WDM   1031 STAG     ENGL      REPL
RCHRES   9 HYDR   RO     1 1         1      WDM   1032 FLOW     ENGL      REPL
RCHRES   9 HYDR   O      1 1         1      WDM   1033 FLOW     ENGL      REPL
RCHRES   9 HYDR   O      2 1         1      WDM   1034 FLOW     ENGL      REPL
RCHRES   9 HYDR   STAGE  1 1         1      WDM   1035 STAG     ENGL      REPL
RCHRES  10 HYDR   RO     1 1         1      WDM   1036 FLOW     ENGL      REPL
RCHRES  10 HYDR   O      1 1         1      WDM   1037 FLOW     ENGL      REPL
RCHRES  10 HYDR   O      2 1         1      WDM   1038 FLOW     ENGL      REPL
RCHRES  10 HYDR   STAGE  1 1         1      WDM   1039 STAG     ENGL      REPL
RCHRES  11 HYDR   RO     1 1         1      WDM   1040 FLOW     ENGL      REPL
RCHRES  11 HYDR   O      1 1         1      WDM   1041 FLOW     ENGL      REPL
RCHRES  11 HYDR   O      2 1         1      WDM   1042 FLOW     ENGL      REPL
RCHRES  11 HYDR   STAGE  1 1         1      WDM   1043 STAG     ENGL      REPL
RCHRES  12 HYDR   RO     1 1         1      WDM   1044 FLOW     ENGL      REPL
RCHRES  12 HYDR   O      1 1         1      WDM   1045 FLOW     ENGL      REPL
RCHRES  12 HYDR   O      2 1         1      WDM   1046 FLOW     ENGL      REPL
RCHRES  12 HYDR   STAGE  1 1         1      WDM   1047 STAG     ENGL      REPL
END EXT TARGETS

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

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

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

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

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

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

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17

  MASS-LINK       18
RCHRES     OFLOW  OVOL   2                 COPY           INPUT  MEAN
  END MASS-LINK   18


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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Local (360)943-0304

www.clearcreeksolutions.com

Appendix C Geotechnical Report

Columbia West Geotechnical Report

Follow Up Explorations

Geotechnical Site Investigation

Landing on the Cowlitz

Castle Rock, Washington

March 30, 2023

Geotechnical ■ Environmental ■ Special Inspections

Columbia West

Engineering, Inc

11917 NE 95th Street
Vancouver, Washington
98682
Phone: 360-823-2900

www.columbiawestengineering.com

Geotechnical ■ Environmental ■ Special Inspections
Columbia West Engineering, Inc

GEOTECHNICAL SITE INVESTIGATION
LANDING ON THE COWLITZ
CASTLE ROCK, WASHINGTON

Prepared For:

CT6, LLC
Attn: Janette Pipkin
PO Box 1419
Battle Ground, Washington 98604

Site Location:

2542 SW Larson Lane
Parcel Nos. 3092824, 3040258, 3040259, 3040322, 3014867, & 3045031
Castle Rock, Washington

Prepared By:

Columbia West Engineering, Inc.
11917 NE 95th Street
Vancouver, Washington 98682
Phone: 360-823-2900

Date Prepared:

March 30, 2023

EXECUTIVE SUMMARY

This executive summary presents the primary geotechnical considerations associated with the proposed Landing on the Cowlitz project located in Castle Rock, Washington. Our conclusions and recommendations are based upon the subsurface information presented in this report and proposed development information provided by the design team. Detailed discussion of the geotechnical considerations summarized here is presented in respective sections of the report.

- Based on subsurface exploration and testing, liquefiable soil is present at the site. Maximum total liquefaction settlement is estimated to range from approximately 4 to 7 inches. Differential settlement is estimated to be approximately one-half of the total over a 50-foot span. Detailed discussion of site liquefaction potential is presented in Section 6.1, *Liquefaction*.
- Review of *Table 12.13-3* of *ASCE 7-16* indicates that anticipated seismic differential settlement will be near the upper bound, tolerable limit for typical structures that may be proposed on the site. Provided that proposed structures can tolerate the estimated seismic settlement, the buildings can be supported on conventional spread footings bearing on firm native soil or engineered structural fill. Shallow foundations, if proposed, will require foundations ties if differential settlement exceeds one-quarter of the thresholds presented in *Table 12.13-3*. Ground improvement or deep foundations may be necessary if buildings cannot tolerate the estimated seismic settlement or if project stakeholders desire to minimize risk of building damage following a seismic event.
- Groundwater was observed in site explorations at depths ranging from 9 to 35 feet below ground surface (bgs). The shallow depth to groundwater may impact site cuts for foundations, utilities, pump stations, and stormwater detention ponds. Dewatering should be assumed where proposed excavations extend more than a few feet below existing grade. Significant excavation depths for the proposed pump station and potential for rapid groundwater flow through permeable sand and gravel deposits will dictate the need for a robust dewatering plan designed by a licensed professional engineer.
- Based on groundwater conditions and expected site grading, cut off drains may be required to intercept water in areas of significant cut. Our experience indicates that installation of cut-off drains prior to site grading activity will assist in dewatering during site construction, particularly during the wet-weather season.
- Perimeter building foundation drains can reduce the potential for water intrusion below structures. Perimeter footing drains are recommended for shallow foundations constructed 5 or more feet below existing site grades. Foundations constructed less than 5 feet below existing grades do not require drains, however,

it may be prudent to install foundations drains to collect incidental or perched water. The final decision for foundations drains should be made by the owner and architect.

- Moisture conditioning will be required to use onsite soil as structural fill. If moisture conditioning is not feasible due to weather conditions or other factors, soils may require cement-amendment to be used as structural fill.
- Near-surface native soils will be sensitive to disturbance and softening when at a moisture content that is above optimum. Haul roads and staging areas will be necessary to minimize damage to exposed subgrade soils during construction. Subgrade protection is discussed in Section 8.2, *Construction Traffic and Staging*.
- Design and construction of proposed stormwater management facilities should account for shallow groundwater conditions observed at the site.
- This report has been prepared to provide general recommendations for overall site development. We recommend additional explorations and geotechnical reports be completed for specific developments/structures prior to design and construction.

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GEOTECHNICAL SITE INVESTIGATION
LANDING ON THE COWLITZ
CASTLE ROCK, WASHINGTON

1.0 INTRODUCTION

Columbia West Engineering, Inc. (Columbia West) was retained by CT6, LLC to conduct a geotechnical site investigation for the proposed Landing on the Cowlitz master development project located in Castle Rock, Washington. The purpose of the investigation was to provide geotechnical engineering recommendations for use during design and construction of the proposed development. This report summarizes the investigation and provides field assessment documentation. This report is subject to the limitations expressed in Section 9.0, *Conclusion and Limitations*, and Appendix D, *Report Limitations and Important Information*.

1.1 General Site Information

As indicated on Figures 1 and 2, the subject site is located at 2542 Larson Lane in Castle Rock, Washington. The site is comprised of tax parcels 3092824, 3040258, 3040259, 3040322, 3014867, and 3045031 totaling approximately 118.2 acres. The approximate latitude and longitude are N 45° 15' 25" and W 122° 53' 30", and the legal description includes portions of the SE ¼ of Section 14, the NE ¼ of Section 23, and the NW ¼ of Section 24, T9N, R2W, Willamette Meridian. The regulatory jurisdictional agency is the City of Castle Rock.

1.2 Project Understanding

Based on client correspondence and review of the preliminary master development plan shown on Figure 3, Columbia West understands that proposed development consists of a mixed-use district with approximately 7.8 acres of residential zoning, 9.5 acres of commercial zoning, 18.3 acres of recreational zoning, and 55.9 acres of light industrial and office space zoning. Proposed development also includes public roadway construction, installation of underground utilities, and stormwater management facilities. A sanitary sewer pump station is also proposed approximately 35 feet below ground surface. The *Phase 1 Rough Grading Plan*, presented on Figure 4, includes cuts and fills up to 10 feet.

Lot- and zoning-specific building plans were not available at the time this report was prepared. In general, buildings on the site are expected to be lightly-loaded and less than three stories in height. We anticipate that commercial, recreational, and light industrial areas will include concrete tilt-up or metal-framed buildings. Residential structures will likely be of wood-framed construction. We should be contacted to revise our recommendations if the assumptions stated above are incorrect.

1.3 Site Background Information

Columbia West was retained by CT6, LLC in October, 2022 to provide on-call geotechnical construction monitoring and material testing services during Phase I rough grading as shown

on Figure 4. On-call geotechnical services conducted between October, 2022 and January, 2023 included organic stripping observations, moisture-density testing of structural fill, proof-roll observations, bearing probe analysis, and laboratory testing. Field reports documenting Phase I grading activity were submitted to project team members under separate cover. Columbia West also prepared preliminary grading recommendations for the Phase I rough grading plan which is presented in a technical memorandum dated November 8, 2022 (Columbia West, 2022). At the time this report was prepared, Phase I rough grading was in progress with expected completion in summer of 2023.

To characterize site groundwater conditions and facilitate stormwater management design by others, Columbia West oversaw five borings at the site with piezometer installations (BP-1 through BP-5) on January 31, February 1, and February 2, 2023. Piezometers extended up to 35 feet below existing grade, were backfilled with silica sand, sealed with bentonite, and completed with flush mount monuments. Monitoring of the piezometers commenced in February, 2023 and continues on a bi-weekly basis at the direction of the design team. Piezometer monitoring results are discussed in greater detail in Section 5.2.2, *Groundwater*.

Prior to Phase I rough grading, a geotechnical due-diligence study of the site was conducted by others in 2020. Field exploration and testing conducted as part of the due-diligence study included six test pits (TP-1 through TP-6), two borings (B-1 and B-2), and five cone penetration tests (CPT-1 through CPT-5) extending to a maximum depth of 81.5 feet bgs. Exploration locations are shown on Figure 2. Exploration logs and CPT soundings are presented in Appendix C, *Pertinent Subsurface Information Collected by Others*. Subsurface conditions observed by others during the due-diligence study are discussed in Section 5.2.1, *Soil Type Description*.

2.0 SCOPE OF SERVICES

Columbia West's scope of services was outlined in a proposal dated November 8, 2022. In accordance with our proposal, we performed the following geotechnical services:

- Reviewed information available in our files from previous geological and geotechnical studies conducted at and in the vicinity of the site. Our review included the following site explorations conducted by others and presented in Appendix C, *Pertinent Subsurface Information Collected by Others*:
    - Five CPT soundings explored to a maximum depth of 35.43 feet bgs.
    - Two borings explored to a maximum depth of 81.5 feet bgs.
    - Six test pits explored to a maximum depth of 13 feet bgs.
- Reviewed the preliminary master development plan, the Phase I rough grading plan, and a conceptual stormwater management plan provided by the design team.
- Conducted subsurface exploration at the site, to include:
    - Drilled five borings to a maximum depth of 45 feet bgs and installed piezometers in each borehole.
- Classified and logged observed soil and groundwater conditions.

- Prepared this geotechnical site investigation report for the proposed development, which includes:
  - Summary of soil index properties, regional geology, soil conditions, and observed groundwater conditions
  - Summary of geologic and seismic literature research used to evaluate relevant seismic risks, including locations of faults, earthquake magnitudes, and seismic factors from the *2018 IBC* and *ASCE 7-16*
  - Liquefaction analysis, predicted seismic settlement, and mitigation discussion
  - Foundation settlement potential
  - Geotechnical design and construction recommendations for:
    - Shallow foundations
    - Slab subgrade preparation
    - Retaining walls, including drainage, backfill, and lateral earth pressures
    - Site preparation and grading, organic stripping, fill placement and compaction, over-excavation, wet/dry weather earthwork, and construction monitoring and testing
    - Structural fill materials, onsite soil suitability, and import aggregate specifications
    - Utility trench excavation and backfill
    - Drainage and management of groundwater conditions
    - Asphaltic concrete pavement construction for private access roads and parking lots, including section thicknesses for base aggregate and asphalt layers
    - Portland cement concrete pavement construction for loading docks, including section thicknesses for base aggregate and PCC layers
    - Code-based seismic design parameters in accordance with *ASCE 7-16*

3.0 REGIONAL GEOLOGY AND SOIL CONDITIONS

The subject site lies within the Cowlitz River drainage basin, a physiographic river valley flanked to the east and west by mountainous foothills of the western Cascade Range. The site is located along the east bank of the Cowlitz River, approximately 11 miles north of the confluence with the Columbia River in Longview, Washington.

According to the *Geologic Map of the Mount St. Helens Quadrangle, Washington and Oregon* (Phillips, USGS Open File Report 87-4, 1987), near-surface soils are expected to consist of Quaternary-aged alluvium of silt, sand, and gravel deposited by the Cowlitz River. The Cowlitz Formation is mapped below the alluvium and consists of Eocene-aged sandstone, siltstone, and shale with interbeds of basalt and conglomerate.

In areas proposed for development, the *Web Soil Survey* (USDA, NRCS, 2023 Website) identifies various loamy sands, fine sandy loams, and gravelly sands of the Newberg, Carrolls, Pilchuck, Panamaker, and Cowlitz soil series. The mapped soils generally consist of silts, sands, and gravels with moderately rapid to rapid permeability, low to moderate

water capacity, and low shrink-swell potential. These soils exhibit a slight to severe erosion hazard based primarily on slope grade. As discussed in Section 1.3, *Site Background Information*, surface soils at the site have been disturbed, moved, or manipulated as part of Phase I rough grading activity and may no longer be representative of the NRCS soil survey mapping.

4.0 REGIONAL SEISMOLOGY

Recent research and subsurface mapping investigations within the Pacific Northwest appear to suggest the historic potential risk for a large earthquake event with strong localized ground movement may be underestimated. Past earthquakes in the Pacific Northwest appear to have caused landslides and ground subsidence, in addition to severe flooding near coastal areas. Earthquakes may also induce soil liquefaction, which occurs when elevated horizontal ground acceleration and velocity cause soil particles to interact as a fluid as opposed to a solid. Liquefaction of soil can result in lateral spreading and temporary loss of bearing capacity and shear strength. Liquefaction is discussed later in Section 5.9, *Liquefaction*.

Three scenario earthquakes are possible with the local seismic setting. Two of the possible earthquake sources are associated with the CSZ, and the third event is a shallow, local crustal earthquake that could occur in the North American Plate. The three earthquake scenarios are discussed below.

Cascadia Subduction Zone

The Cascadia Subduction Zone is a potential source of strong earthquake activity in the Portland/Vancouver Basin. This phenomenon is the result of the earth's large tectonic plate movement. Geologic evidence indicates that volcanic ocean floor activity along the Juan de Fuca ridge in the Pacific Ocean causes the Juan de Fuca Plate to perpetually move east and subduct under the North American Continental Plate. The subduction zone results in historic volcanic and potential earthquake activity in proximity to the plate interface, believed to lie approximately 20 to 50 miles west of the general location of the Oregon and Washington coast (Geomatrix Consultants, 1995).

Evidence suggests that this subduction zone has generated eight great earthquakes in the last 4,000 years, with the most recent event occurring approximately 300 years ago (Weaver and Shedlock, 1991).

Two types of subduction zone earthquakes are possible and considered in this report:

1. An interface event earthquake on the seismogenic part of the interface between the Juan de Fuca Plate and the North American Plate on the CSZ. This source is capable of generating earthquakes with a moment magnitude of 9.0.
2. A deep intraplate earthquake on the seismogenic part of the subducting Juan de Fuca Plate. These events typically occur at depths of between 30 and 60 km. This source is capable of generating an event with a moment magnitude of up to 8.0.

Crustal Events

An earthquake could also occur on a local fault within the North American Plate. The nearest mapped crustal faults are more than 40 miles from the site, and based on deaggregation at the anticipated fundamental period of planned structures, contribute less than one percent of the overall seismic hazard at the site. Therefore, significant ground shaking as a result of crustal faults is anticipated to be minimal.

5.0 GEOTECHNICAL AND GEOLOGIC FIELD INVESTIGATION

This geotechnical site investigation is based upon five borings drilled by Columbia West (BP-1 through BP-5), visual site reconnaissance, construction monitoring observations as previously described, and review of pertinent subsurface information collected by others. Borings BP-1 through BP-5 were explored with a track-mounted drill rig on January 31, February 1, and February 2, 2023. Subsurface soil profiles were logged in accordance with Unified Soil Classification System (USCS) specifications. Disturbed soil samples were collected at representative depth intervals. Exploration locations are shown on Figure 2. Subsurface exploration logs are presented in Appendix A, *Subsurface Exploration Logs*. Soil descriptions and classification information are provided in Appendix B, *Soil Classification Information*.

Subsurface information collected by others and reviewed as part of this investigation included six test pit logs (TP-1 through TP-6), two boring logs (B-1 and B-2), and results from five cone penetrations tests (CPT-1 through CPT-5). As reported on the logs provided in Appendix C, *Pertinent Subsurface Information Collected by Others*, test pits TP-1 through TP-6 were explored with a mini-excavator on January 14, 2020. Borings B-1 and B-2 were explored with a truck-mounted, mud-rotary drill rig on February 13 and 14, 2020. CPT-1 through CPT-5 were explored on January 13 and 14, 2020 with a cone penetrometer rig.

5.1 Surface Investigation and Site Description

The approximate 108.2-acre subject site consists of six tax parcels located at 2542 Larson Lane in Castle Rock, Washington. The site is generally flat to gently rolling and situated on an alluvial plain between the Cowlitz River and Interstate 5. As discussed in Section 1.3, *Site Background Information*, the site is currently under construction and being actively graded per the Phase I rough grading plan shown on Figure 4.

Surface conditions in large portions of the site consist of exposed sand and gravel associated with recent cuts and fills throughout the property. Other areas of the site remain unstripped and covered with grass. Observed trees on the site were generally limited to the site perimeter or wetland area. In the central portion of the site, a single-family residential structure and several agricultural outbuildings were observed. Stockpiles of soil, organic material, and demolition debris were observed in the vicinity of the existing structures.

As indicated on Figures 3 and 4, the proposed stormwater conveyance channel along the southern and eastern portion of the site is currently under construction. Surface water flow was observed in the channel during drilling of BP-1 through BP-5. Surface water flow appeared to trend east and north towards a temporary sediment pond located adjacent to

the wetland. Standing water was observed within the pond cells at the time of drilling. Stockpiles of organic material and disturbed soil were also observed near the temporary ponds.

5.2 Subsurface Conditions

Borings were advanced to a maximum depth of 81.5 feet bgs. CPTs were advanced to a maximum depth of 35.43 feet bgs. Test pits were advanced to a maximum depth of 13 feet bgs. Exploration locations are shown on Figure 2. Field logs and observed stratigraphy for encountered materials are presented in Appendix A, *Subsurface Exploration Logs* and Appendix C*, Pertinent Subsurface Information Collected by Others*.

5.2.1 Soil Type Description

As previously described, large portions of the site have been stripped of vegetation as part of Phase I rough grading activity. Boring BP-1 was explored through fill material consisting of sand with gravel. Borings BP-2, BP-3, and BP-5 were explored through apparent native soil consisting of sand with gravel. Boring BP-4 was explored through grass and a three-inch-thick root zone underlain by approximately 12 inches of topsoil. Below surface soil, fill material, and the topsoil layer, alluvial silt, sand, and gravel was observed to an approximate depth 45 feet. Review of boring logs B-1 and B-2 indicates that the alluvium extends up to 81.5 feet bgs. Subsurface lithology may generally be described by the soil units identified in the following text.

Topsoil

Topsoil below the vegetation root zone generally consists of silty sand with a low organic content. Review of test pits logs TP-1 through TP-6 indicates that organic topsoil may extend up to 36 inches below existing grade in unstripped portions of the site.

Structural Fill

Structural fill associated with Phase I rough grading is present on the site and generally consists of dense sand with gravel. The depth of fill is variable and actively changing during site improvements construction. Upon completion of Phase I rough grading, fill thickness, site topography, and finished grade elevations may be represented by the contours shown on Figure 4. As the on-call construction monitoring and material testing firm for the project, Columbia West has conducted moisture-density testing, proof-roll observations, and third-party oversight during Phase I rough grading. Observed and tested fill materials meet typical specifications for engineering structural fill and were placed in general conformance with the recommendations outlined in Columbia West's preliminary grading memorandum (Columbia West, 2022).

Upper Sand

Underlying surface soils, topsoil layers, and structural fill, loose to medium dense sand was encountered and extended to approximate depths of 17 to 35 feet bgs. The sand is moist to wet and contains interbedded layers and lenses of silt and clay. The silt and clay interbeds range from very soft to medium stiff in consistency.

Upper Gravel

The upper sand layer is underlain by medium dense to very dense gravel with varying proportions of sand, silt, and clay. The gravel is wet and rounded to sub-rounded. Review of boring logs B-1 and B-2 indicate that the gravel layer is approximately 20 to 25 feet thick and extends to depths of 38 to 40 feet bgs in the drilled locations. Cone penetration tests CPT-1 through CPT-5 encountered practical refusal on the upper gravel unit.

Lower Sand and Gravel

The upper gravel layer is underlain by medium dense to dense sand with gravel and trace silt. The sand is fine-textured and wet and extends to depths of 66 and 55.5 feet bgs respectively in borings B-1 and B-2. The sand is underlain by dense to very dense gravel with sand and trace silt. The gravel extends to the maximum explored depth of 81.5 feet bgs in B-1 and to a depth of 63.5 feet bgs in B-2.

Silt

Underlying the lower gravel layer in B-2, medium stiff to very stiff silt was encountered and extended to the maximum explored depth of 81.5 feet bgs. The silt is wet with trace clay and organic debris.

5.2.2 Groundwater

Groundwater was encountered in borings BP-1 through BP-5 at depths ranging from 15 to 35 feet bgs. Groundwater was reported at depths between 9 and 15 feet bgs on the exploration logs prepared by others and presented in Appendix C, *Pertinent Subsurface Information Collected by Others*. As discussed in Section 1.3, *Site Background Information*, Columbia West installed open standpipe piezometers in BP-1 through BP-5 to further characterize site groundwater conditions. Monitoring of the piezometers commenced in February, 2023 and continues on a bi-weekly basis at the direction of the design team. Groundwater monitoring results collected to date are presented in Table 1. Groundwater elevations are based upon piezometer rim survey data provided by Mackay Sposito. Upon completion of groundwater monitoring, the piezometers should be decommissioned by a licensed contractor in accordance with Washington Department of Ecology regulations.

Table 1. Piezometer Monitoring Data

Location	Measurement Date			
	2-13-23	2-20-23	3-2-23	3-20-23
BP-1	18.8 ft bgs Elev. 27.6 ft	18.1 ft bgs Elev. 28.3 ft	18.0 ft bgs Elev. 28.4 ft	18.0 ft bgs Elev. 28.4 ft
BP-2	36.5 ft bgs Elev. 28.1 ft	36.6 ft bgs Elev. 28.0 ft	36.6 ft bgs Elev. 28.0 ft	37.7 ft bgs Elev. 26.9 ft
BP-3	12.3 ft bgs Elev. 28.4 ft	12.4 ft bgs Elev. 28.3 ft	12.3 ft bgs Elev. 28.4 ft	12.2 ft bgs Elev. 28.5 ft

BP-4	12.1 ft bgs Elev. 29.3 ft	12.3 ft bgs Elev. 29.1 ft	12.5 ft bgs Elev. 28.9 ft	12.5 ft bgs Elev. 28.9 ft
BP-5	18.8 ft bgs Elev. 27.4 ft	17.3 ft bgs Elev. 28.9 ft	16.3 ft bgs Elev. 29.9 ft	17.3 ft bgs Elev. 28.9 ft

Note that groundwater levels are subject to seasonal variance and may rise during extended periods of increased precipitation. Groundwater elevations may also be influenced by fluctuations of the adjacent Cowlitz River. Perched groundwater may also be present in localized areas. Seeps and springs may become evident during site grading, primarily along slopes or in areas cut below existing grade. Structures, pavements, and drainage design should be planned accordingly.

6.0 SEISMIC HAZARDS

6.1 Liquefaction

Liquefaction is caused by a rapid increase in pore water pressure that reduces the effective stress between soil particles to near zero. Granular soil, which relies on interparticle friction for strength, is susceptible to liquefaction until the excess pore pressures can dissipate. In general, loose, saturated sand with low silt and clay content is most susceptible to liquefaction. Silty soil with low plasticity is moderately susceptible to liquefaction under relatively higher levels of ground shaking.

Liquefaction analysis at the site was performed by evaluating CPT data in the upper sand layer and standard penetration test (SPT) data in the lower sand layer. Results were combined to estimate the total anticipated seismic settlement. Analysis was conducted using methods developed by Boulanger and Idriss (2014) and Robertson (2009) with application of the depth weighting method published by Cetin (2009). A static groundwater level of 9 feet bgs was used in the liquefaction analysis.

Liquefaction analysis indicates that the upper sand layer and portions of the lower sand layer are susceptible to liquefaction under design levels of ground shaking. Total estimated seismic settlement at ground surface in the locations of CPT-1 through CPT-3 and CPT-5 is 4 to 5 inches. Total estimated seismic settlement at the location of CPT-4 is 7 inches. Differential settlement is estimated to be approximately one-half of the total settlement over a 50-foot span. Most of the seismic settlement is in the upper sand layer with the lower sand layer contributing approximately 0.5 to 1.0 inch to the total estimate. Note that the increased magnitude of settlement at CPT-4 reflects that the upper sand layer was observed to be approximately 10 to 15 feet thicker than elsewhere on the site.

Total seismic settlement estimates are likely near the upper bound tolerable limit for typical buildings that may be proposed on the site. Differential settlement thresholds for various building types and risk categories are provided in *Table 12.13-3* of *ASCE 7-16*. The thresholds presented in *Table 12.13-3* are code-specified minimum requirements and buildings may remain susceptible to damage if designed near the upper limits. Structural engineers on the project should calculate the allowable settlement tolerance and expected

performance based upon the specific building types proposed. Provided a building can tolerate the seismic settlement presented above, the structure may be supported by conventional spread footings bearing on firm native soil or engineered structural fill. Shallow foundations, if proposed, will require foundation ties if differential seismic settlement exceeds one-quarter of the thresholds presented in *Table 12.13-3*.

6.1.1 Liquefaction Mitigation

If proposed buildings cannot tolerate the estimated seismic settlement or project stakeholders desire to minimize risk of building damage, the upper sand layer may be improved to reduce the total seismic settlement. Rammed aggregate piers (RAPs) that extend to, and bear on the upper gravel layer are a viable option for ground improvement. RAPs are proprietary technology that are designed and constructed by design-build specialty contractors. The RAPs would need to be at least 17 to 35 feet long to penetrate through the upper sand layer and bear on the upper gravel unit. Additionally, the design-build contractor should provide analysis that shows rammed aggregate piers will support the structures when surrounding soil strength is reduced as a result of liquefaction. A design-build contractor should be contacted to provide the actual RAP configurations based on building serviceability and performance requirements. We anticipate that a RAP foundation system can be installed to meet the settlement criteria for site buildings. Installation of driven grout piles or standard steel or concrete piles may also be considered to mitigate seismic settlement at the site.

Soil improvements may reduce potential seismic settlement to an acceptable level of risk. If ground improvement utilizing RAPs is selected, additional in-situ testing and liquefaction analysis should be conducted following installation to determine the level of improvement achieved. Improved seismic settlement in the upper sand layer should be combined with results from the unimproved lower sand layer to determine the total seismic settlement following mitigation.

Selection of an appropriate mitigation plan may depend upon site planning, architectural, and structural engineering factors in addition to geotechnical concerns. All parties involved should work closely together to develop a suitable improvement plan with a clear understanding of the risks.

6.2 Lateral Spreading

Lateral spreading is a liquefaction-related seismic hazard that occurs on gently sloping or flat sites underlain by liquefiable sediment adjacent to an open face, such as a riverbank. Liquefied soil adjacent to an open face can flow toward the open face, resulting in lateral ground displacement.

Due to the presence of liquefiable soils at the site, lateral spreading is possible near the Cowlitz River. The magnitude of lateral spreading will be based on the depth of the river channel and distance between proposed structural improvements and the river. Tolerable lateral spread limits for shallow foundations in specific risk categories are presented in *ASCE 7-16, Table 12.13-2*. Lateral spreading is not anticipated to be a design consideration within approximately 300 feet of the riverbank because structures are not proposed in this

area. If structures are planned within 300 feet of the riverbank, Columbia West should be contacted to conduct additional analysis.

7.0 DESIGN RECOMMENDATIONS

The geotechnical site investigation suggests the proposed development is generally compatible with surface and subsurface soils, provided the recommendations presented in this report are incorporated in design and implemented during construction. The primary geotechnical considerations for the project were summarized previously in the *Executive Summary*. Specific design and construction recommendations are presented in the following sections.

7.1 Shallow Foundation Support

As discussed in Section 1.2, *Project Understanding*, lot- and zoning-specific building plans were not available at the time this report was prepared. We anticipate that future buildings will be lightly-loaded, less than three stories in height, and will consist of metal-framed, wood-framed, or concrete tilt-up construction. Provided that proposed buildings can tolerate the seismic settlement estimates presented in Section 6.1, *Liquefaction*, structures may be supported by shallow foundations bearing on firm native soil or engineered structural fill.

We anticipate maximum column and wall loads for future buildings will be less than 200 kips and 5 kips per foot, respectively. Floor slab loading is expected to be less than 200 psf. If actual loading exceeds anticipated loading, additional analysis should be conducted for the specific load conditions and proposed footing dimensions.

Foundations should not be supported by topsoil, agricultural till zones, or undocumented fill material. If encountered, these materials should be improved or removed and replaced with structural fill. If footings are constructed during wet-weather conditions or when footing subgrade soils are above their optimum moisture content, we recommend that a minimum of 6 inches of compacted aggregate be placed over exposed subgrade soils. The aggregate pad should extend 6 inches beyond the edge of the foundations and consist of imported granular material as described in Section 8.1.1, *Structural Fill*. Columbia West should observe exposed subgrade conditions prior to placement of crushed aggregate to verify adequate subgrade support.

Perimeter foundation drains are recommended for shallow foundations constructed five or more feet below existing site grades. Foundation drainage is discussed later in Section 7.5, *Drainage*.

7.1.1 Footing Dimensions and Bearing Capacity

Continuous perimeter wall and isolated spread footings should have minimum width dimensions of 18 and 24 inches, respectively. The base of exterior footings should bear at least 18 inches below the lowest adjacent exterior grade. The base of interior footings should bear at least 12 inches below the base of the floor slab.

Footings bearing on subgrade prepared as recommended above should be sized based on an allowable bearing pressure of 2,500 psf. As the allowable bearing pressure is a net bearing pressure, the weight of the footing and associated backfill may be ignored when

calculating footing sizes. The recommended allowable bearing pressure applies to the total of dead plus long-term live loads and may be increased by 50 percent for transient lateral forces such as seismic or wind.

7.1.2 Shallow Foundation Settlement

Foundation settlement is a significant structural design consideration. Provided subgrade soils are prepared as described in Section 8.1, *Site Preparation and Grading*, we anticipate that total post-construction static foundation settlement will be less than approximately 1 inch. Differential settlement between comparably-loaded footing elements is not expected to exceed approximately 0.5 inch over a span of 50 feet.

Estimated post-construction settlement assumes that settlement will occur after site grading and slab construction and before establishing structural connections between the building roof and foundation elements. In areas of large column spacing (greater than 50 feet) or where building footprints span significant differences in cut and fill, the potential for differential settlement exceeding the predicted settlement should be understood.

As discussed in Section 6.1, *Liquefaction*, site soils are also susceptible to settlement during a seismic event. Total seismic settlement at the analyzed locations is expected to range from 4 to 7 inches. Differential settlement is estimated to be approximately one-half the total settlement over a 50-foot span. If shallow foundations are proposed and meet the differential settlement thresholds of ASCE 7-16, project stakeholders and the structural engineer should discuss risk associated with seismic settlement and be willing to accept the potential for building damage during a seismic event. If the risk of damage cannot be accepted, liquefaction mitigation through soil improvements or deep foundations will be required.

7.1.3 Resistance to Sliding

Lateral foundation loads can be resisted by passive earth pressure on the sides of the footing and by friction at the base of the footings. Recommended passive earth pressure for footings confined by native soil or engineered structural fill is 350 pcf. The upper 12 inches of soil should be neglected when calculating passive pressure resistance. Adjacent floor slabs and pavement, if present, should also be neglected from the analysis. The recommended passive pressure resistance assumes that a minimum horizontal clearance of 10 feet is maintained between the footing face and adjacent downgradient slopes.

The estimated coefficient of friction between in situ native soil or engineered structural fill and in-place poured concrete is 0.35. The estimated coefficient of friction between compacted crushed aggregate and in-place poured concrete is 0.4.

7.1.4 Subgrade Observation

Footing and floor slab subgrade soils should be evaluated by Columbia West prior to placing forms or reinforcing bar to verify subgrade support conditions are as anticipated in this report. Subgrade observation should confirm that all disturbed material, organic debris, unsuitable fill, remnant topsoil zones, and softened subgrades (if present) have been removed. Over-excavation of footing subgrade soils may be required to remove deleterious material, particularly if footings are constructed during wet-weather conditions.

7.1.5 Floor Slabs

Floor slabs can be supported on firm, competent, native soil or engineered structural fill prepared as described in this report. Disturbed soils and unsuitable fills in proposed slab locations, if encountered, should be removed and replaced with structural fill.

To reduce slab shifting and moisture transmission, slabs should be underlain by at least 6 inches of compacted crushed aggregate. Geotextile may be used below the crushed aggregate layer to increase subgrade support. Recommendations for floor slab base aggregate and subgrade geotextile are discussed in Section 8.6, *Materials*.

Elevated soil moisture was observed within near-surface soil at the time of exploration. In areas where moisture-sensitive flooring will be installed, slab waterproofing or a vapor barrier should be installed according to the flooring manufacturers' recommendations. In our experience, 10- to 15-mil vapor barriers are often required by flooring manufacturers to maintain product warranties. Selection and design of an appropriate vapor barrier should be determined by architectural and structural design team members.

Slab thickness and reinforcement should be designed by an experienced structural engineer in accordance with anticipated loads. Load-bearing concrete slabs with maximum loading of 200 psf may be designed assuming a modulus of subgrade reaction, k, of 150 pci. If slab subgrade soil is cement-amended to a minimum depth of 12 inches, the modulus of subgrade reaction can be increased to 200 pci.

7.2 Seismic Design Considerations

Seismic design for proposed structures is prescribed by *ASCE 7-16.* Based upon site-specific test results, site soils meet the criteria for Site Class E. Seismic design parameters for Site Class E are presented in Table 2.

Table 2. ASCE 7-16 Seismic Design Parameters[1]

	Short Period (T_s = 0.2 s)	1 Second Period (T_1 = 1.0 s)
MCE Spectral Acceleration	0.84	0.40
Site Class	E[2]	
Site Coefficient	Fa = 1.3	Fv = 2.4
Adjusted Spectral Response Acceleration	S_{MS} = 1.1	S_{M1} = 0.96
Design Spectral Response Acceleration	S_{DS} = 0.73	S_{D1} = 0.64

1. The structural engineer should evaluate *ASCE 7-16* code requirements and exceptions to determine if these parameters are valid for design.
2. Seismic site class, site coefficients, and spectral acceleration parameters assume that the fundamental period for proposed structures will be less than 0.5 second.

For Site Class E sites with mapped maximum considered earthquake spectral response acceleration parameter S_S greater than or equal to 1.0 or S_1 greater than or equal to 0.2, a ground motion hazard analysis may be required according to *ASCE 7-16, Section 11.4.8* unless exemption criteria are met. According to *ASCE 7-16, Section 11.4.8 Exception 3,* a ground

motion hazard analysis is not required for Site Class E sites with S_1 greater than or equal to 0.2, provided that T is less than or equal to T_S, where T is the fundamental period of the structure and T_S is equal to the design spectral response acceleration parameter at a one second period (SD_1) divided by the design spectral response acceleration parameter at short periods (SD_S).

Columbia West recommends that structural engineers on the project evaluate code requirements and exceptions to determine if a site-specific ground motion hazard evaluation will be required for proposed structures.

Due to the presence of liquefiable soils at the site and potential for bearing capacity loss at ground surface, Site Class F criteria may be met if the fundamental period of vibration for proposed structures is greater than 0.5 second. If Site Class F criteria is met, a site-specific ground motion response analysis is required in accordance with *Section 21.1* of *ASCE 7-16*. If structures have a fundamental period of less than 0.5 second, seismic design parameters may be determined using the pre-liquefaction seismic site class. In our experience, conventional structures less than three-stories in height will likely have a fundamental period less than 0.5 second, and seismic design parameters may be based on the pre-liquefaction site class designation as provided in Table 2.

7.3 Retaining Structures

Lateral earth pressures should be considered during design of retaining walls and below-grade structures. Hydrostatic pressure and additional surcharge loading should also be considered. Wall foundation construction and bearing capacity should adhere to specifications provided previously in Section 7.1, *Shallow Foundation Support*.

Permanent retaining walls that are not restrained from rotation should be designed for active earth pressures using an equivalent fluid pressure of 35 pcf. Walls that are restrained from rotation should be designed for an at-rest, equivalent fluid pressure of 55 pcf. The recommended earth pressures assume a maximum wall height of 10 feet with well-drained, level backfill. These values also assume that adequate drainage is provided behind retaining walls to prevent hydrostatic pressures from developing. Lateral earth pressures induced by surcharge loads may be estimated using the criteria presented on Figure 5.

Seismic forces may be calculated by superimposing a uniform lateral force of $7H^2$ pounds per lineal foot of wall, where H is the total wall height in feet. The force should be applied as a distributed load with the resultant located at 0.6H from the base of the wall.

7.3.1 Wall Drainage and Backfill

A minimum 6-inch-diameter, perforated collector pipe should be placed at the base of retaining walls. The pipe should be embedded in a minimum 2-foot-wide zone of angular drain rock that is wrapped in a drainage geotextile fabric and extends up the back of the wall to within 1 foot of finished grade. The drain rock and geotextile drainage fabric should meet the specifications provided in Section 8.6, *Materials*. The perforated collector pipes should discharge at an appropriate location away from the base of the wall. The discharge pipe(s) should not be tied directly into stormwater drainage systems, unless measures are taken to prevent backflow into the drainage system of the wall.

Backfill material placed behind the walls and extending a horizontal distance of ½ H, where H is the height of the retaining wall, should consist of select granular material placed and compacted as described in Section 8.6.1, *Structural Fill.*

Settlement of up to 1 percent of the wall height commonly occurs immediately adjacent to the wall as the wall rotates and develops active lateral earth pressures. Consequently, we recommend that construction of flatwork adjacent to retaining walls be delayed at least four weeks after placement of wall backfill, unless survey data indicates that settlement is complete prior to that time.

7.4 Pavement Design

7.4.1 Design Parameters and Traffic

Private asphalt concrete access drives and parking areas may be proposed on individual lots within the master development. Columbia West recommends adherence to City of Castle Rock roadway standards for street improvements in the public right-of-way. Pavement should be installed on firm, competent native subgrade soil or engineered structural fill prepared as described in this report. Our recommendations for private pavement are based on the following design parameters and assumptions:

- 12 inches of subgrade soil directly below the pavement sections are compacted to at least 95 percent of maximum dry density, as determined by *ASTM D1557*.
- Resilient moduli for subgrade soil and aggregate base materials were assumed to be 4,500 psi and 20,000 psi, respectively.
- Pavement design life of 20 years with no expected traffic growth.
- Initial and terminal serviceability indices of 4.2 and 2.5, respectively.
- Reliability of 85 percent and standard deviation of 0.4.
- Pavement may be exposed to a fire apparatus load of 75,000 pounds on an infrequent basis.

The specific type and frequency of traffic was not available at the time we prepared this report. Based on experience, we assume that heavy truck traffic will consist of approximately 40 percent FHWA Class Group 7 type trucks (4-axle, single unit) and 60 percent FHWA Class Group 8 type trucks (tractor/trailer 2- to 3-axle). Lightly-loaded drive aisles and parking stalls are expected to service typical passenger vehicle traffic.

7.4.2 Asphaltic Concrete (AC) Pavement Design Sections

Design recommendations for private pavement across a range of traffic conditions and loading scenarios are presented in Table 3. Material properties and compaction recommendations for asphalt surfacing and crushed aggregate base layers are presented in Section 8.6, *Materials*.

Table 3. Recommended AC Pavement Sections Constructed over Native Soil or Engineered Fill

Traffic	Trucks Per Day	Equivalent Single-Axle Loads (ESALs)	AC Thickness (in)	Base Aggregate Thickness (in)
Passenger Vehicle Parking	0	10,000	2.5	8
Passenger Vehicle Drive Aisles	0	20,000	3	9
Heavy Truck Areas	10	92,000	4	10.5
	25	229,000	4.5	12.5
	50	458,000	5	14
	100	916,000	5.5	16.5

Pavement sections may be reduced in areas where subgrade soils are cement-amended to a minimum depth of 12 inches with a minimum of 6 percent cement by weight. Provided the cement-amended subgrade soil achieves a seven-day unconfined compressive strength of 100 psi, AC pavement sections may be constructed as presented in Table 4.

Table 4. Recommended AC Pavement Sections Constructed over Cement-Amended Subgrade Soil

Traffic	Trucks Per Day	Equivalent Single-Axle Loads (ESALs)	AC Thickness (in)	Base Aggregate Thickness (in)	Cement-Amendment Thickness (in)
Passenger Vehicle Parking	0	10,000	2.5	4	**12**
Passenger Vehicle Drive Aisles	0	20,000	3	4	
Heavy Truck Areas	10	92,000	4	4	
	25	229,000	4.5	4	
	50	458,000	5	4.5	
	100	916,000	5.5	6.5	

7.4.3 Portland Cement Concrete (PCC) Pavement Design Sections

Portland cement concrete pavements may be proposed in future loading dock areas. Loading docks are expected to primarily service heavy truck traffic. Material properties and recommendations for PCC, base aggregate, and cement-amended subgrade layers are presented in Section 8.6, *Materials*. Pavement design recommendations for PCC loading docks constructed over firm native soil or engineered structural fill are presented in Table 5.

Table 5. Recommended PCC Pavement Sections Constructed over Native Soil or Engineered Fill

Traffic	Trucks Per Day	PCC Thickness (in)	Base Aggregate Thickness (in)
Loading Dock Areas	Up to 25	6.5	7
	Up to 50	7	8
	Up to 100	7.5	8

Recommended PCC pavement sections constructed over cement-amended soil meeting the treatment depth, cement content, and strength requirements outlined above are presented in Table 6.

Table 6. Recommended PCC Pavement Sections Constructed over Cement-Amended Subgrade Soil

Traffic	Trucks Per Day	PCC Thickness (in)	Base Aggregate Thickness (in)	Cement-Amendment Thickness (in)
Loading Dock Areas	Up to 25	6.5	4	**12**
	Up to 50	7	4	
	Up to 100	7.5	4	

7.4.4 General Pavement Recommendations

Recommended pavement section thicknesses are intended to be minimum acceptable values and do not include construction traffic loading. The recommendations assume that pavement construction will be completed during an extended period of warm, dry weather. Wet weather construction may require an increased thickness of base aggregate as discussed later in Section 8.2, *Construction Traffic and Staging*.

Cement-amended soil should be allowed to cure for at least four days prior to aggregate base placement or exposure to construction traffic. Prior to construction traffic access, the cement-amended subgrade should be protected by a minimum 4-inch-thick layer of compacted crushed aggregate. Construction traffic should be limited to dedicated haul roads or non-structural, unpaved portions of the site. Construction traffic should not be permitted on new pavement, unless accounted for in the pavement design section. Base aggregate and cement-amended soils supporting pavement are also not intended for construction traffic. Haul roads and staging areas supporting construction traffic are discussed later in Section 8.2, *Construction Traffic and Staging*.

Asphalt paving is generally not recommended during cold weather conditions where ambient air temperatures are less than 40 degrees Fahrenheit. Compacting asphalt in low-temperature conditions can result in low relative density of the asphalt layer and premature pavement distress.

Asphalt mix designs have a recommended compaction temperature range that is specific to the AC binder used. In low-temperature conditions, maintaining the temperature of the AC mix is difficult as heat can be lost during transport, placement, and compaction. The ambient air temperature during paving should be at least 40 degrees Fahrenheit for a lift thickness greater than 2.5 inches and at least 50 degrees Fahrenheit for a lift thickness between 2 and 2.5 inches. If AC paving must take place during cold-weather construction as defined in this section, the contractor and design team should discuss options for minimizing risk to pavement serviceability.

7.5 Drainage

At a minimum, site drainage should include surface water collection and conveyance to properly designed stormwater management structures and facilities. Drainage design in

general should conform to City of Castle Rock regulations. Finished site grading should be conducted with positive drainage away from structures at a minimum 2 percent slope for a distance of at least 10 feet. Depressions or shallow areas that may retain ponding water should be avoided.

Recommendations for foundation drains, subdrains, and drainage mats are presented in the following sections. Drain rock and geotextile drainage fabric should meet the requirements presented in Section 8.6, *Materials*. Drains should be closely monitored after construction to assess their effectiveness. If additional surface or shallow subsurface seeps become evident, the drainage provisions may require modification or additional drains. We should be consulted to provide appropriate recommendations.

7.5.1 Foundation Drains

Roof drains are recommended for all structures. Perimeter building foundation drains can reduce the potential for water intrusion below structures. Perimeter footing drains are recommended for shallow foundations constructed 5 or more feet below existing site grades. Foundations constructed less than 5 feet below existing grades do not require drains, however, it may be prudent to install foundations drains to collect incidental or perched water. The final decision for foundations drains should be made by the owner and architect.

Foundation and roof drains, where installed, should consist of separate systems that gravity flow away from foundations to an approved discharge location. Perimeter foundation drains, where installed, should consist of 4-inch perforated PVC pipe surrounded by a minimum 2-foot-wide zone of clean, washed drain rock wrapped with geotextile drainage fabric. The wrapped drain rock zone should extend up the sides of embedded walls to within 12 inches of proposed finished grade. Foundation drains should be constructed with a minimum slope of ½ percent. The drainpipe's invert elevation should be at least 18 inches below the elevation of the floor slab. Figure 6 presents a typical foundation drain detail.

7.5.2 Subdrains

Subdrains should be considered if portions of the site are cut below surrounding grades. Shallow groundwater, springs, or seeps should be conveyed via drainage channel or perforated pipe into an approved discharge. Recommendations for design and installation of perforated drainage pipe may be performed on a case-by-case basis by Columbia West during construction. Failure to provide adequate surface and sub-surface drainage may result in soil slumping or unanticipated settlement of structures exceeding tolerable limits. A typical perforated drainpipe trench detail is presented in Figure 7.

7.5.3 Drainage Mat

Site improvements construction in some areas may occur at or near the shallow groundwater table, particularly if work is conducted during wet-weather conditions. Dewatering may be necessary, and a drainage mat may be required to achieve sufficient elevation for fill placement. A typical drainage mat is shown on Figure 8. Columbia West should determine drainage mat location, extent, and thickness when subsurface conditions are exposed.

Drainage mats may need to be constructed in conjunction with subdrains to convey captured water to an approved discharge location.

8.0 CONSTRUCTION RECOMMENDATIONS

8.1 Site Preparation and Grading

Vegetation, organic material, unsuitable fill, and deleterious material that may be encountered should be cleared from areas identified for structures and site grading. Vegetation, root zones, organic material, and debris should be removed from the site. Stripped topsoil should also be removed, or used only as landscape fill in nonstructural areas with slopes less than 25 percent. The stripping depth for sod and highly organic topsoil is anticipated to be approximately 4 inches. Following removal of surface vegetation and topsoil, underlying low-organic till zone soils, if present, may be acceptable for stockpiling and reuse as structural fill. Actual stripping depths and suitability of till zone soil for reuse should be determined based upon visual observations made during construction when soil conditions are exposed. The post-construction maximum depth of landscape fill placed or spread at any location onsite should not exceed one foot.

Previously disturbed soil, debris, or undocumented fill encountered during grading or construction activities should be removed completely and thoroughly from structural areas. This includes old remnant foundations, basement walls, utilities, associated soft soils, and debris. Excavation areas should be backfilled with engineered structural fill.

Trees, stumps, and associated roots should also be removed from structural areas, individually and carefully. Resulting cavities and excavation areas should be backfilled with engineered structural fill.

Site grading activities should be performed in accordance with requirements specified in the *2018 International Building Code* (IBC), Chapter 18 and Appendix J, with exceptions noted in the text herein. Site preparation, soil stripping, and grading activities should be observed and documented by Columbia West.

8.1.1 Subgrade Evaluation

Upon completion of stripping and prior to the placement of structural fill or pavement improvements, exposed subgrade soil should be evaluated by proof rolling with a fully-loaded dump truck or similar heavy, rubber tire construction equipment. When the subgrade is too wet for proof rolling, a foundation probe may be used to identify areas of soft, loose, or unsuitable soil. Subgrade evaluation should be performed by Columbia West. If soft or yielding subgrade areas are identified during evaluation, we recommend the subgrade be over-excavated and backfilled with compacted imported granular fill.

8.2 Construction Traffic and Staging

Near-surface silty soil will be easily disturbed during construction. If not carefully executed, site preparation, excavation, and grading can create extensive soft areas resulting in significant repair costs. Earthwork planning should include considerations for minimizing subgrade disturbance, particularly during wet-weather conditions.

If construction occurs during wet-weather conditions, or if the moisture content of the surficial soil is more than a few percentage points above optimum, site stripping and cutting may need to be accomplished using track-mounted equipment. Under these conditions, granular haul roads and staging areas will also be necessary provide a firm support base and sustain construction equipment.

The recommended base aggregate thickness for pavement sections is intended to support post-construction design traffic loads and will not provide adequate support for construction traffic. Staging areas and haul roads will require an increased base thickness during wet weather conditions. The configuration of staging and haul road areas, as well as the required thickness of granular material, will vary with the contractor's means and methods. Therefore, design and construction of staging areas and haul roads should be the responsibility of the contractor. Based on our experience, between 12 and 18 inches of imported granular material is generally required in staging areas and between 18 and 24 inches in haul road areas. In areas of heavy construction traffic, geotextile separation fabric may be placed between the subgrade soil and imported granular material to increase subgrade support and minimize silt migration into the base aggregate layer.

As an alternative to thickened aggregate sections, haul roads and staging areas may be constructed using a combination of cement-amended subgrade and crushed aggregate surfacing. If cement-amendment is used, the base aggregate thickness for staging areas and haul roads can typically be reduced to between 6 and 9 inches, respectively. This recommendation is based on a minimum seven-day unconfined compressive strength of 100 psi for the cement-amended soil with a treatment depth of 12 to 16 inches. Based on experience, 6 to 7 percent cement by weight is typically required to achieve the indicated compressive strength.

Project stakeholders should understand that wet weather construction is risky and costly. Proper construction methods and techniques are critical to overall project integrity and should be observed and documented by Columbia West.

8.3 Cut and Fill Slopes

Fill slopes should consist of structural fill material as discussed in Section 8.1.1, *Structural Fill*. Fill placed on existing grades steeper than 5H:1V should be horizontally benched at least 10 feet into the slope. Fill slopes greater than six feet in height should be vertically keyed into existing subsurface soil. A typical fill slope cross-section is shown in Figure 9. Drainage implementations, including subdrains or perforated drainpipe trenches, may also be necessary in proximity to cut and fill slopes if seeps or springs are encountered. Drainage design may be performed on a case-by-case basis. Extent, depth, and location of drainage may be determined in the field by Columbia West during construction when soil conditions are exposed. Failure to provide adequate drainage may result in soil sloughing, settlement, or erosion.

Final cut or fill slopes at the site should not exceed 2H:1V or 20 feet in height without individual slope stability analysis. The values above assume a minimum horizontal setback for loads of 10 feet from top of cut or fill slope face or overall slope height divided by three

(H/3), whichever is greater. A minimum slope setback detail for structures is presented in Figure 10.

Concentrated drainage or water flow over the face of slopes should be prohibited, and adequate protection against erosion is required. Fill slopes should be overbuilt, compacted, and trimmed at least two feet horizontally to provide adequate compaction of the outer slope face. Proper cut and fill slope construction is critical to overall project stability and should be observed and documented by Columbia West.

8.4 Excavation

The site was explored by Columbia West and others to a maximum depth of 81.5 feet with a drill rig. Conventional earthmoving equipment in proper working condition should be capable of making necessary site excavations.

Groundwater was encountered at depths ranging from 9 and 35 feet bgs in site explorations. Perched groundwater at shallower depths may also be present. Recommendations as described in Section 8.5, *Dewatering,* should be considered where subsurface construction activities intersect the shallow groundwater table.

Excavations in near-surface sandy soil will likely slough and cave, even at shallow depths. Open-cut excavation techniques may be used to excavate trenches between 4 and 8 feet deep, provided the walls of the excavation are cut at a maximum slope of 1H:1V and groundwater seepage is not present. Excavation slopes should be reduced to 1.5H:1V or 2H:1V if excessive sloughing or raveling occurs.

Shoring may be required if open-cut excavations are infeasible or if excavations are proposed adjacent to existing infrastructure. Typical methods for stabilizing excavations consist of solider piles and timber lagging, sheet pile walls, tiebacks and shotcrete, or pre-fabricated hydraulic shoring. As a wide variety of shoring and dewatering systems are available, we recommend that the contractor be responsible for selecting the appropriate shoring and dewatering systems.

The contractor should be held responsible for site safety, sloping, and shoring. All excavation activity should be conducted in accordance with applicable OSHA requirements. Columbia West is not responsible for contractor activities and in no case should excavation be conducted in excess of applicable local, state, and federal laws.

8.5 Dewatering

Based on site observations and piezometer monitoring data, groundwater will likely be encountered in utility trenches, pump station excavations, and in areas of significant cut. Generalized recommendations for temporary construction dewatering are presented in the following section.

8.5.1 Construction Dewatering

The contractor should be responsible for temporary drainage of surface water, perched water, and groundwater. Dewatering should be performed to the extent necessary to prevent standing water and/or erosion of exposed site soils. During rough and finished grading of

building pad areas, the contractor should keep all footing excavations and slab subgrade soils free of standing water.

The contractor's proposed dewatering plan should be capable of maintaining groundwater levels at least two feet below the base of proposed excavations. Without adequate excavation dewatering, running soil, caving, and sloughing will increase backfill volumes and may result in damage to adjacent structures or utilities. Significant pumping and dewatering may be required to temporarily reduce the groundwater elevation to the recommended depth. Dewatering via a sump within excavation zones may be insufficient to control groundwater and provide excavation side slope stability. Dewatering may be more feasibly conducted by installing a system of temporary well points and pumps around proposed excavation areas or utility trenches.

As indicated previously, a sanitary sewer pump station is proposed up to 35 feet below existing grade. Due to the significant depth of excavation and potential for rapid groundwater flow through permeable sand and gravel deposits, the contractor should be required to prepare and present a detailed dewatering plan. The contractor should consult with a licensed professional engineer to provide an adequate dewatering plan for site conditions. If additional subsurface information not provided in this geotechnical report is necessary to complete the dewatering plan, the contractor shall be responsible for securing all the required information necessary for the design of the system.

If groundwater is present at the base of excavations, we recommend placing 18 to 24 inches of stabilization material at the base of the excavation. Subgrade geotextile placed directly over trench subgrade soils may reduce the required thickness of the stabilization material. The actual thickness of stabilization material should be determined at the time of construction based on observed field conditions. The stabilization material should be placed in one lift and compacted until well keyed. Stabilization material and geotextile fabric should meet the requirements presented in Section 8.6, *Materials*.

8.6 Materials

8.6.1 Structural Fill

Areas proposed for fill placement should be appropriately prepared as described in Section 8.1, *Site Preparation and Grading*. Engineered fill placement should be observed by Columbia West. Compaction of engineered structural fill should be verified by nuclear gauge field compaction testing performed in accordance with *ASTM D6938*. Field compaction testing should be performed for each vertical foot of engineered fill placed.

Various materials may be acceptable for use as structural fill. Structural fill should be free of organic material or other unsuitable material and meet specifications provided in the following sections. Representative samples of proposed engineered structural fill should be submitted for laboratory analysis and approval by Columbia West prior to placement.

8.6.1.1 Onsite Soil

Most onsite native soil (silt, sand, and gravel) will be suitable for use as structural fill if adequately dried or moisture-conditioned to achieve recommended compaction

specifications. Moisture conditioning will likely be necessary to achieve the optimum moisture content required for compaction. In addition, near-surface silty soil will be moisture sensitive and difficult to compact during wet weather conditions. Therefore, structural fill placement using onsite soil should be performed during dry summer months if possible. Onsite soil may also require addition of moisture during extended periods of dry weather.

Onsite soil used as structural fill should be placed in loose lifts not exceeding 8 inches in depth and compacted using standard conventional compaction equipment. The soil moisture content should be within a few percentage points of optimum conditions. The soil should be compacted to at least 95 percent of maximum dry density as determined by the modified Proctor moisture-density relationship test *(ASTM D1557).* Compacted onsite fill soils should be covered shortly after placement.

Onsite soil will likely expand during excavation and transport and consolidate during compaction. Development of site-specific expansion and consolidation factors is beyond the scope of this investigation. We can provide site-specific factors upon request.

8.6.1.2 Imported Granular Material

Imported granular material should consist of pit- or quarry-run rock, crushed rock, or crushed gravel and sand meeting *WSDOT 9-03.14(1)* specifications for *Gravel Borrow*. Imported granular material should be placed in loose lifts not exceeding 12 inches in depth and compacted to at least 95 percent of maximum dry density as determined by the modified Proctor moisture-density relationship test *(ASTM D1557).* During wet-weather conditions or where wet subgrade conditions are present, the initial loose lift of granular fill should be approximately 18 inches thick and should be compacted with a smooth-drum roller operating in static mode.

8.6.1.3 Stabilization Material

Stabilization material should consist of durable, 4- or 6-inch-minus pit- or quarry-run rock, crushed rock, or crushed gravel and sand that is free of organics and other deleterious material. The material should have a maximum particle size of 6 inches with less than 5 percent by dry weight passing the U.S. Standard No. 4 sieve. The material should have at least two mechanically-fractured faces.

Stabilization material should be placed in loose lifts between 12 and 24 inches thick and be compacted to a firm, unyielding condition. Equipment with vibratory action should not be used when compacting stabilization material over wet, fine-textured soils. If stabilization material is used to stabilize soft subgrade below pavement or construction haul roads, a subgrade geotextile should be placed as a separation barrier between the soil subgrade and the stabilization material.

8.6.1.4 Trench Backfill

Trench backfill placed below, adjacent to, and up to at least 12 inches above utility lines (i.e., the pipe zone) should consist of well-graded granular material meeting *WSDOT 9-03.12(3)* specifications for *Gravel Backfill for Pipe Zone Bedding.* Pipe zone backfill should be compacted to at least 90 percent of maximum dry density, as determined by the modified

Proctor moisture-density relationship test *(ASTM D1557),* or as required by the local jurisdictional agency or pipe manufacturer.

Within structural areas (below pavement and building pads), trench backfill above the pipe zone should consist of *WSDOT 9-03.19 Bank Run Gravel for Trench Backfill* or *WSDOT 9-03.14(2) Select Borrow* with a maximum particle size of 2 ½-inches. Trench backfill material within 18 inches of the top of utility pipes should be hand compacted (i.e., no heavy compaction equipment). Remaining trench backfill should be compacted to at least 95 percent of the maximum dry density as determined by the modified Proctor moisture-density relationship test *(ASTM D1557),* or as required by the local jurisdictional agency or pipe manufacturer.

Outside of structural areas, trench backfill placed above the pipe zone should be compacted to at least 90 percent of the maximum dry density as determined by the modified Proctor moisture-density relationship test *(ASTM D1557),* or as required by the local jurisdictional agency or pipe manufacturer.

8.6.1.5 Floor Slab Base Aggregate

Base aggregate for building floor slabs should consist of 1 ¼"-minus crushed aggregate meeting *WSDOT 9-03.9(3)* specifications for *Crushed Surfacing*. Slab base aggregate should be compacted to at least at least 95 percent of the maximum dry density as determined by the modified Proctor moisture-density relationship test *(ASTM D1557).*

8.6.1.6 Pavement Base Aggregate

Base aggregate for pavement should consist of 1 ¼"-minus crushed aggregate meeting *WSDOT 9-03.9(3)* specifications for *Crushed Surfacing*. Pavement base aggregate should be compacted to at least at least 95 percent of the maximum dry density as determined by the modified Proctor moisture-density relationship test *(ASTM D1557).*

8.6.1.7 Retaining Wall Backfill

Backfill material placed behind retaining walls and extending a horizontal distance of ½ H, where H is the height of the retaining wall, should consist of free-draining granular material meeting *WSDOT 9-03.12(2)* specifications for *Gravel Backfill for Walls*. The wall backfill should be separated from structural fill, native soil, and/or topsoil using a geotextile fabric that meets the specifications provided below for drainage geotextiles.

Wall backfill located within a horizontal distance of 3 feet from the face of a retaining wall should be compacted to 90 percent of the maximum dry density, as determined by *ASTM D1557*. Backfill placed within 3 feet of the wall should be compacted in loose lifts less than 6 inches thick using hand-operated tamping equipment (such as a jumping jack or vibratory plate compactor). Remaining wall backfill should be compacted to at least 95 percent of the maximum dry density, as determined by *ASTM D1557*.

8.6.1.8 Retaining Wall Leveling Pad

Crushed aggregate used as a leveling pad for retaining wall footings should consist of 1 ¼"-minus crushed aggregate meeting *WSDOT 9-03.9(3)* specifications for *Crushed Surfacing*. The leveling pad material should be compacted to at least 95 percent of the

maximum dry density as determined by the modified Proctor moisture-density relationship test *(ASTM D1557).*

8.6.1.9 Drain Rock

Drain rock should consist of open-graded, angular aggregate meeting WSDOT 9-03.12(4), *Gravel Backfill for Drains*. Drain rock should be free of roots, organic debris, and other unsuitable material and should have at least two mechanically-fractured faces. Drain rock should be compacted to a firm, unyielding condition. Drain rock should be completely wrapped in a geotextile drainage fabric meeting the requirements presented below.

8.6.2 Geotextile Fabric

8.6.2.1 Subgrade Geotextile

Subgrade geotextile should meet the specifications provided in *WSDOT 9-33.2(1), Table 3, Geotextile for Separation or Soil Stabilization*. The geotextile should be installed in accordance with the manufacturer's recommendations. A minimum initial aggregate base lift of 6 inches is required over geotextiles. All stabilization material should be underlain by a subgrade geotextile.

8.6.2.2 Drainage Geotextile

Subgrade geotextile should meet the specifications provided in *WSDOT 9-33.2(1), Table 2, Geotextile for Underground Drainage Filtration Properties*. The AOS should be between the No. 70 and No. 100 sieve. The water permittivity should be greater than 1.5/sec. The geotextile should be installed in accordance with the manufacturer's recommendations. A minimum initial aggregate base lift of 6 inches is required over geotextiles.

8.6.3 Soil Amendment with Cement

The on-site soil can be amended with Portland cement to obtain suitable properties for use as wet-weather structural fill or subbase for pavement. The effectiveness of soil amendment is highly dependent on proper mixing techniques, soil moisture conditioning, and the quantity of cement. The quantity of cement applied during amendment should be based on an assumed dry unit weight of 100 pcf for site soil.

8.6.3.1 Subbase Stabilization

Specific recommendations for soil amendment should be based on exposed site conditions at the time of construction. For preliminary design purposes, we recommend cement-amended subgrade for building pads and pavement subbase (below the base aggregate layer) achieve a target strength of 100 psi. The quantity of cement required to achieve the target strength will vary with moisture content and soil type. Laboratory testing of cement-amended soil should be used to confirm design expectations.

Based on our experience, near-surface silt and sand will require approximately 6 to 7 percent cement by weight to achieve the target strength of 100 psi. This cement percentage assumes that the soil moisture content does not exceed 20 percent at the time of amendment. If the soil moisture content is in the range of 25 to 35 percent, 7 to 8 percent cement by weight may be required to achieve the target strength. The amount of cement

added to the soil at the time of construction should be based on observed field conditions and subgrade performance. During extended periods of dry weather, water may need to be applied during the amendment and tilling process to achieve the optimum moisture content required for compaction.

Cement-amendment equipment should have balloon tires to minimize softening, rutting, and disturbance of fine-grained site soil. A sheepsfoot or segmented pad roller with a minimum static weight of 40,000 pounds should be used for initial compaction. Rollers with vibratory action should not be used to compact fine-grained, cement-amended soil. Final compaction should be conducted with a smooth-drum roller with a minimum applied linear force of 700 pounds per inch. The amended soil should be compacted to at least 95 percent of the maximum dry density as determined by *ASTM D558*.

Following cement amendment, a minimum curing time of four days is required prior to exposure to construction traffic. Construction traffic should not be allowed on unprotected, cement-amended subgrade. To protect cement-amended areas from damage, the finished surface should be covered with 4 to 6 inches of imported granular material. The protective layer of crushed rock often becomes contaminated with soil during construction, particularly in staging and haul road areas. Contaminated aggregate, where present, should be removed and replaced with clean crushed aggregate prior to construction of pavement or other permanent site improvements supported by base aggregate.

Cement amendment should not be attempted during moderate to heavy precipitation or when the ambient air temperature is below 40 degrees Fahrenheit. Cement should not be placed in areas of standing water or where saturated subgrade conditions exist.

8.6.3.2 Cement-Amended Structural Fill

If adequate compaction is not achievable with onsite soil due to moisture or weather conditions, the soil may be cement-amended and placed as general structural fill. Prior to placement of cement-amended fill, subgrade soils should be prepared as described in Section 8.1, *Site Preparation and Grading*. Where multiple lifts of cement-amended fill are necessary to meet finished grade, consecutive lifts may be placed immediately following amendment and compaction of the underlying lift. However, where the final lift of cement-amended fill will serve as building pad or pavement subbase material, the four-day cure period as discussed above is recommended.

8.6.3.3 QA/QC Testing and Inspection

Cement-amendment of site soils should be observed and tested by Columbia West to document conformance with design recommendations. Cement spread rate should be verified with a pan sample test conducted at one random location per lift per 20,000 square-feet of cement-amended fill. Treatment depth should be verified through excavation of a small test pit and measurement at one random location per lift of cement-amended fill. Adequate compaction and moisture content should be verified by conducting nuclear gauge density testing at a frequency of approximately one test per 5,000 square feet of cement-amended fill in accordance with ASTM D6938. At least one representative sample should be collected per day of cement-amendment, cured for 7 days, and tested for

unconfined compressive strength in accordance with ASTM D1633. The tested samples should have a minimum 7-day, unconfined compressive strength of 100 psi.

8.6.3.4 Drainage Considerations

Cement-amended soil will be poorly-drained and will not be suitable for planting areas. The material may also be difficult to excavate with light-duty landscaping equipment. Proposed landscape areas should not be cement-amended unless accommodations are made for drainage and planting.

Cement-amendment within building pad areas should consider the potential for trapped water below the floor slab. Columbia West should be consulted to provide appropriate recommendations if cement-amendment is proposed within building pad areas.

8.6.4 Pavement

8.6.4.1 Asphaltic Concrete

Asphaltic concrete should consist of HMA Class ½" adhering to *WSDOT 9-03.8(6), HMA Proportions of Materials*. The asphalt binder should consist of PG 58-22 meeting *WSDOT 9-02.1(4), Performance Graded (PG) Asphalt Binder*. Asphalt should be compacted to 91 percent of the theoretical maximum density as determined by *ASTM D2041*. Minimum and maximum asphalt lift thicknesses should be 2 and 3 inches, respectively. Nuclear gauge density testing should be conducted to verify adherence to recommended specifications. Testing frequency should be in accordance with WSDOT and City of Castle Rock specifications.

8.6.4.2 Portland Cement Concrete

Portland cement concrete should meet *WSDOT 5-05, Cement Concrete Pavement* with a minimum 28-day compressive strength of 4,000 psi and an air content between 3 and 7 percent. PCC should be placed in general accordance with *WSDOT 5-05.3(7), Placing, Spreading, and Compacting Concrete*. Dowel bars and placement should adhere to *WSDOT 5-05.3(10), Tie Bars and Corrosion Resistant Dowel Bars*. Joints should be constructed in general accordance with *WSDOT 5-05.3(8), Joints* with a maximum transverse joint spacing of 15 feet. The length-to-width ratio for any PCC panel should be between 0.80 and 1.25.

Concrete should be tested during installation in accordance with ASTM C171, C138, C231, C143, C1064, and C31. This includes casting of cylinder specimen at a frequency of four cylinders per 100 cubic yards of poured concrete. Recommended field concrete testing includes slump, air entrainment, temperature, and unit weight.

8.7 Erosion Control Measures

Soil at this site is susceptible to erosion by wind and water; therefore, erosion control measures should be carefully planned and installed. Surface water runoff should be collected and directed away from sloped areas to prevent water from running down the slope face. Measures that can be employed to reduce erosion include the use of silt fences, hay bales, buffer zones of natural growth, sedimentation ponds, and granular haul roads. All erosion control methods should be in accordance with local jurisdiction standards.

9.0 CONCLUSION AND LIMITATIONS

This geotechnical site investigation report was prepared in accordance with accepted standard conventional principles and practices of geotechnical engineering. This investigation pertains only to material tested and observed as of the date of this report and is based upon proposed site development as described in the text herein. This report is a professional opinion containing recommendations established by engineering interpretations of subsurface soils based upon conditions observed during site exploration. Soil conditions may differ between tested locations or over time. Slight variations may produce impacts to the performance of structural facilities if not adequately addressed. This underscores the importance of diligent QA/QC construction observation and testing to verify soil conditions are as anticipated in this report.

Therefore, this report contains several recommendations for field observation and testing by Columbia West personnel during construction activities. Columbia West cannot accept responsibility for deviations from recommendations described in this report. Future performance of structural facilities is often related to the degree of construction observation by qualified personnel. These services should be performed to the full extent recommended.

This report is not an environmental assessment and should not be construed as a representative warranty of site subsurface conditions. The discovery of adverse environmental conditions, or subsurface soils that deviate from those described in this report, should immediately prompt further investigation. The above statements are in lieu of all other statements expressed or implied.

This report was prepared solely for the client and is not to be reproduced without prior authorization from Columbia West. Final engineering plans and specifications for the project should be reviewed and approved by Columbia West as they relate to geotechnical and grading issues prior to final design approval. Columbia West is not responsible for independent conclusions or recommendations made by other parties based upon information presented in this report. Unless a particular service was expressly included in the scope, it was not performed and there should be no assumptions based upon services not provided. Additional report limitations and important information about this document are presented in Appendix D, *Report Limitations and Important Information*. This information should be carefully read and understood by the client and other parties reviewing this document.

Sincerely,

COLUMBIA WEST ENGINEERING, Inc.

Lance V. Lehto, PE, GE
President

LANCE V. LEHTO
STATE OF WASHINGTON
36301
REGISTERED
PROFESSIONAL ENGINEER

3-30-2023

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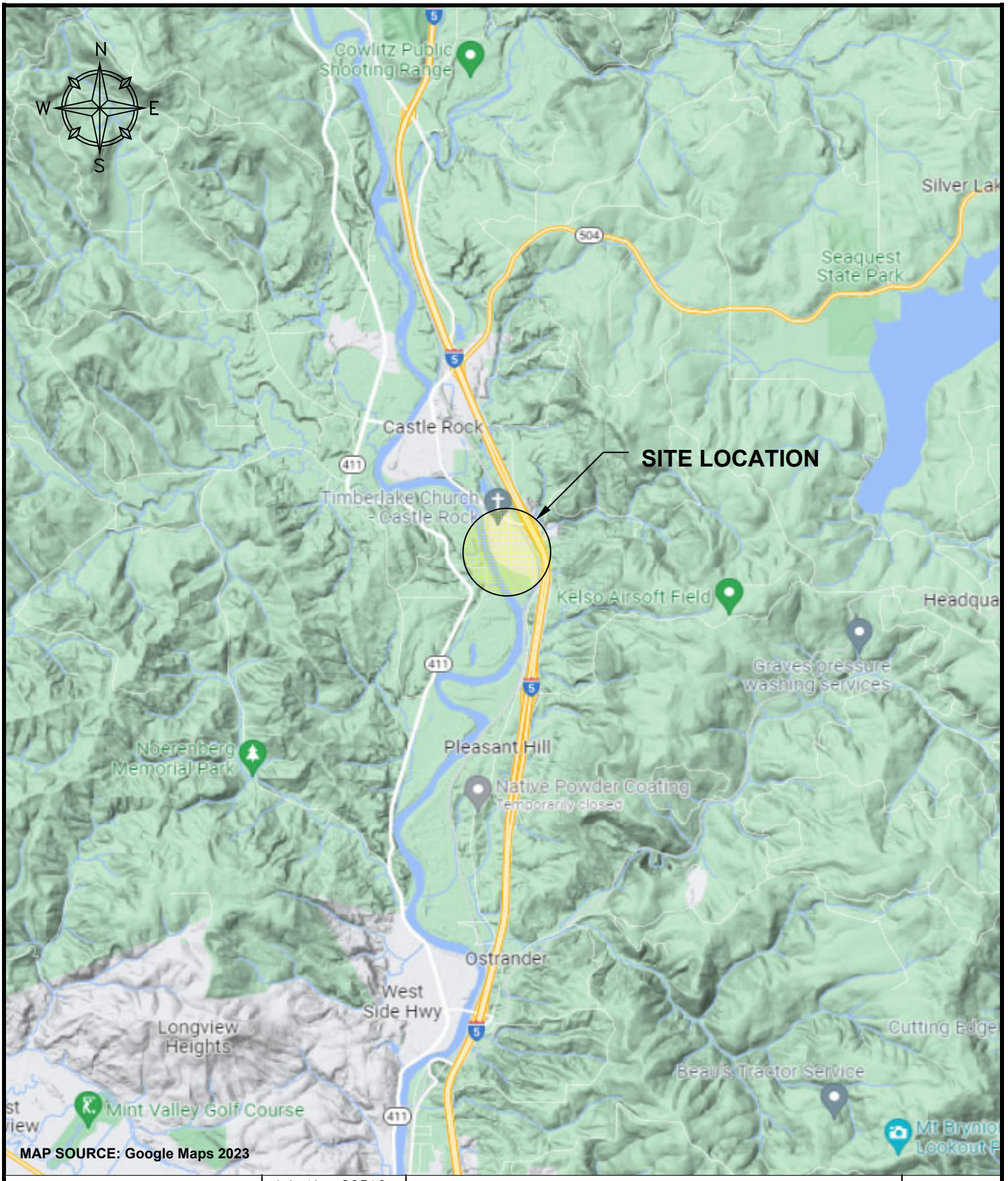
FIGURES



MAP SOURCE: Google Maps 2023

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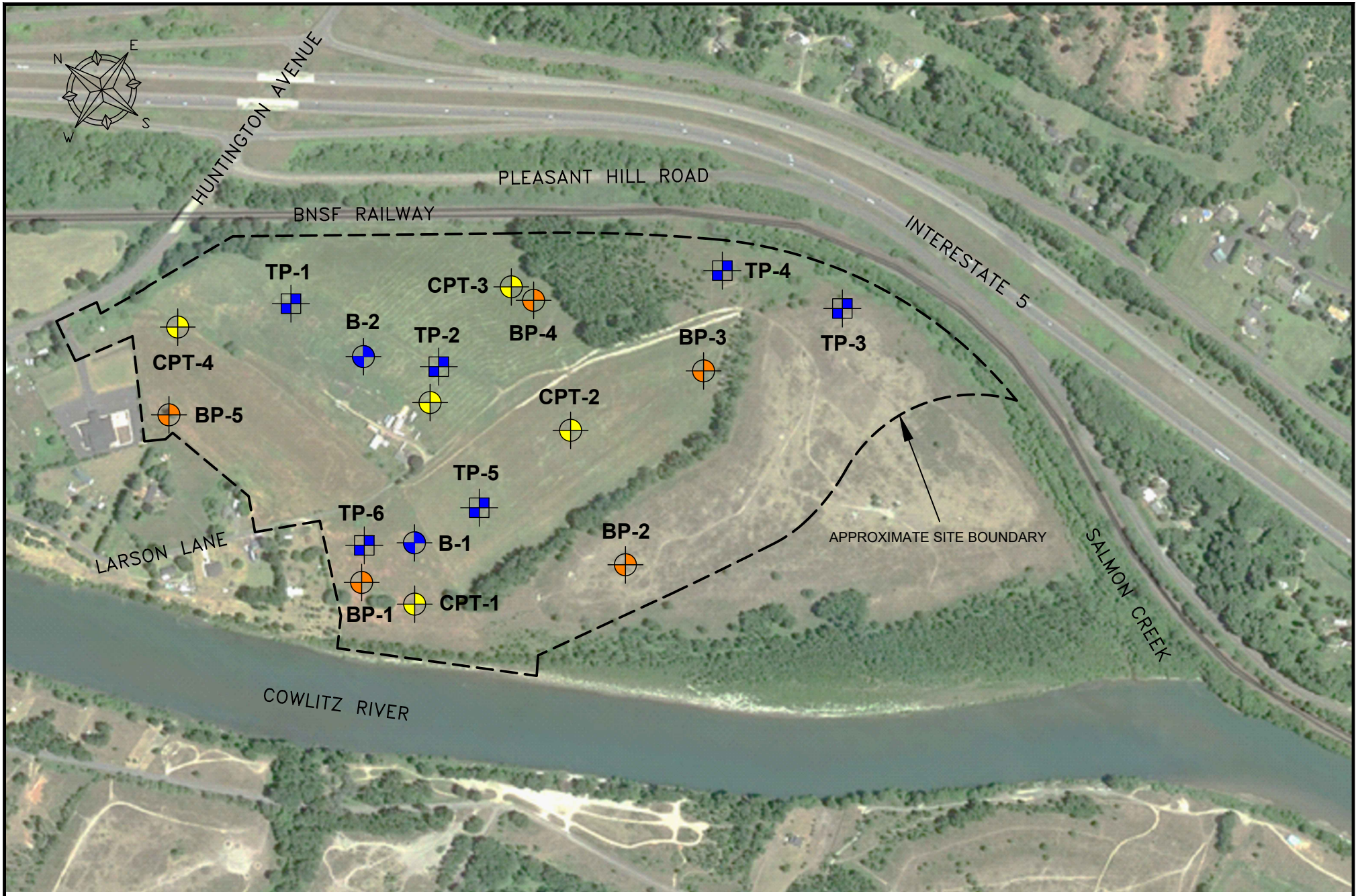
Job No: 22310
Date: 03/17/23
Drawn: GLW
Checked: LVL

SITE LOCATION MAP
LANDING ON THE COWLITZ
CASTLE ROCK, WASHINGTON

FIGURE
1



BORING AND PIEZOMETER (COLUMBIA WEST, 2023) | BORING (BY OTHERS, 2020) | CONE PENETRATION TEST (BY OTHERS, 2020) | TEST PIT (BY OTHERS, 2020)

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Columbia West Engineering, Inc

Project: 22310
Date: 03/17/23
Drawn: GLW
Checked: LVL

EXPLORATION LOCATION MAP
LANDING ON THE COWLITZ

NOTES:
1. SITE LOCATION: 2542 SW LARSON LANE, CASTLE ROCK, WASHINGTON.
2. SITE CONSISTS OF PORTIONS OF TAX PARCEL NOS. 3092824, 3040258, 3040259, 3040322, 3014867, & 3045031 TOTALING APPROXIMATELY 118.2 ACRES.
3. DRAWING IS NOT TO SCALE.
4. BASE MAP OBTAINED FROM GOOGLE EARTH, 2023.
5. EXPLORATION LOCATIONS ARE APPROXIMATE AND NOT SURVEYED.
6. BORINGS BP-1 THROUGH BP-5 COMPLETED WITH PIEZOMETER INSTALLATIONS AND FLUSH MOUNT MONUMENTS ON JANUARY 31, FEBRUARY 1, AND FEBRUARY 2, 2023.

FIGURE
2

LEGEND

- RECREATIONAL
- RESIDENTIAL
- COMMERCIAL
- EMPLOYMENT
- FLEX (COM/IND)
- COMMERCIAL OVERLAY
- OPEN SPACE
- DRAINAGE/UTILITIES
- WETLAND BUFFER
- WETLAND
- DEVELOPMENT BOUNDARY
- D.N.R. PROPERTY BOUNDARY
- PROPOSED LOT LINE
- ORDINARY HIGH WATER MARK
- ORDINARY HIGH WATER MARK BUFFER
- CRITICAL AREAS BUFFER

LAND USE SYNOPSIS

	COMMERCIAL	EMPLOYMENT	RES	FLEX	REC	DRAIN	ROW	TOTAL
TOTAL ACREAGE	9.0 - 9.5	46.4	7.8	9.5	18.3			
# OF LOTS	N/A	13	1	4	N/A	N/A	N/A	

LANDING ON THE COWLITZ - DYNAMIC MASTER PLAN

OCTOBER 2022

MacKay Sposito

ENERGY PUBLIC WORKS LAND DEVELOPMENT

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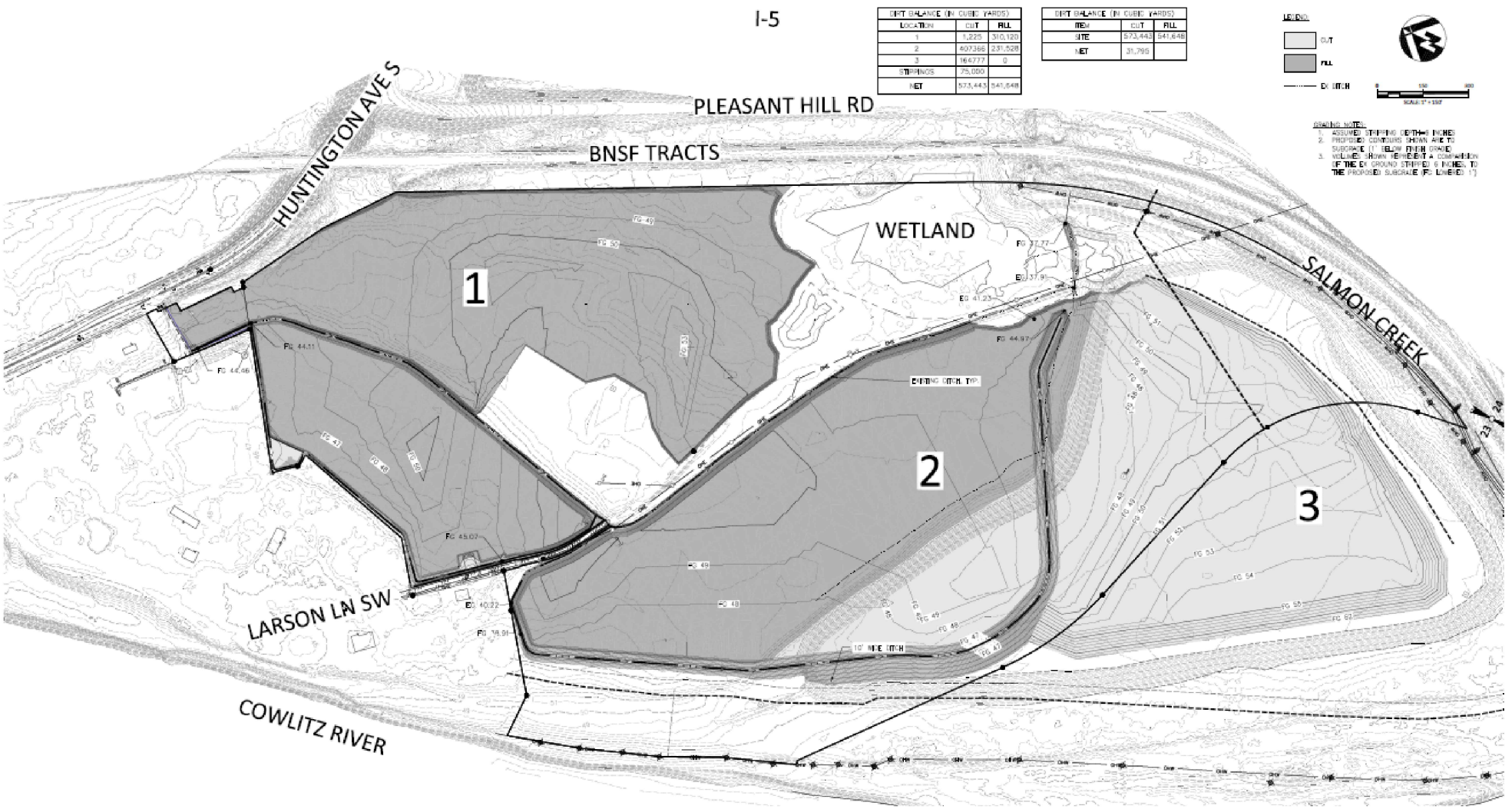
Project: 22310
Date: 03/20/23
Drawn: GLW
Checked: LVL

PRELIMINARY MASTER DEVELOPMENT PLAN
LANDING ON THE COWLITZ

NOTES:
1. SITE LOCATION: 2542 SW LARSON LANE, CASTLE ROCK, WASHINGTON.
2. SITE CONSISTS OF PORTIONS OF TAX PARCEL NOS. 3092824, 3040258, 3040259, 3040322, 3014867, & 3045031 TOTALING APPROXIMATELY 118.2 ACRES.
3. DRAWING IS NOT TO SCALE.
4. BASE MAP PROVIDED BY CLIENT.

FIGURE
3



CASTLE ROCK LANDING ON THE COWLITZ - PHASE 1 ROUGH GRADING PLAN

MacKay Sposito

ENERGY PUBLIC WORKS LAND DEVELOPMENT

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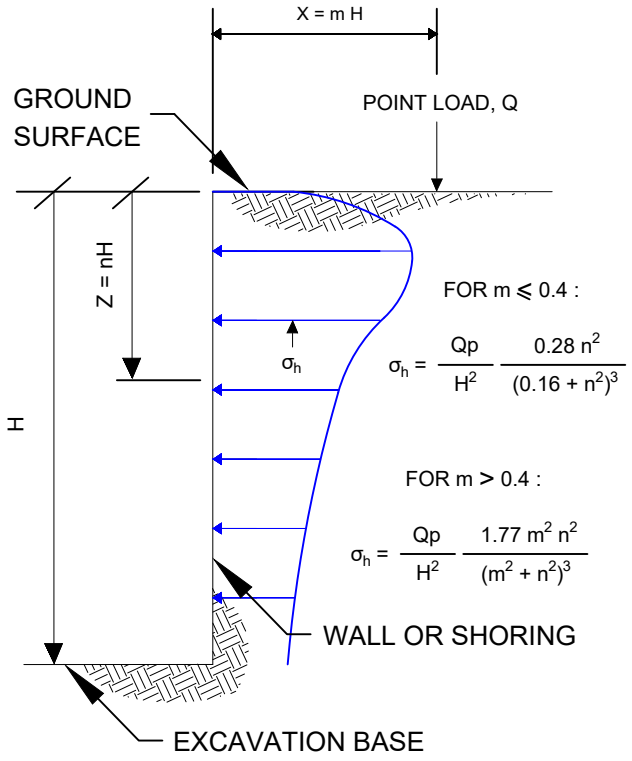
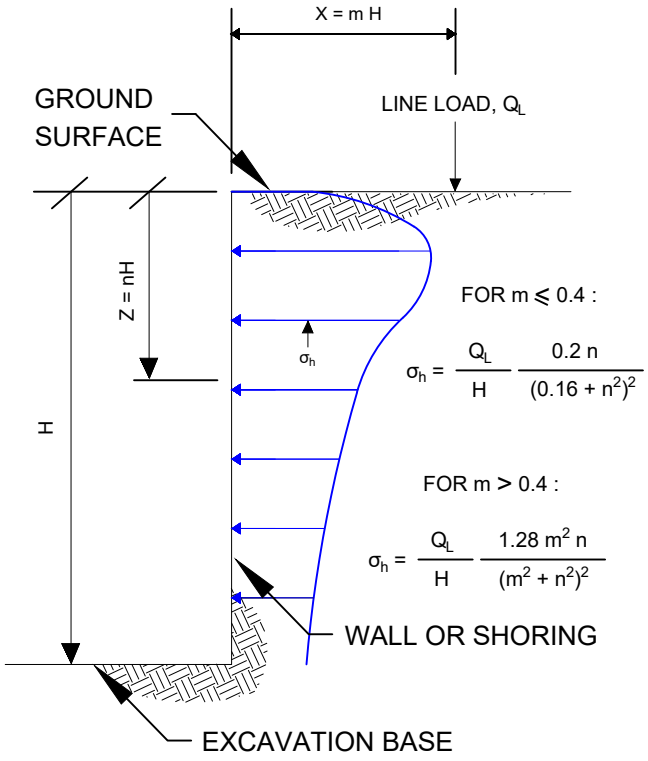
Geotechnical ▪ Environmental ▪ Special Inspections Columbia West Engineering, Inc	Project: 22310 Date: 03/23/23 Drawn: GLW Checked: LVL	PHASE I ROUGH GRADING PLAN LANDING ON THE COWLITZ	NOTES: 1. SITE LOCATION: 2542 SW LARSON LANE, CASTLE ROCK, WASHINGTON. 2. SITE CONSISTS OF PORTIONS OF TAX PARCEL NOS. 3092824, 3040258, 3040259, 3040322, 3014867, & 3045031 TOTALING APPROXIMATELY 118.2 ACRES. 3. DRAWING IS NOT TO SCALE. 4. BASE MAP PROVIDED BY CLIENT.	FIGURE 4

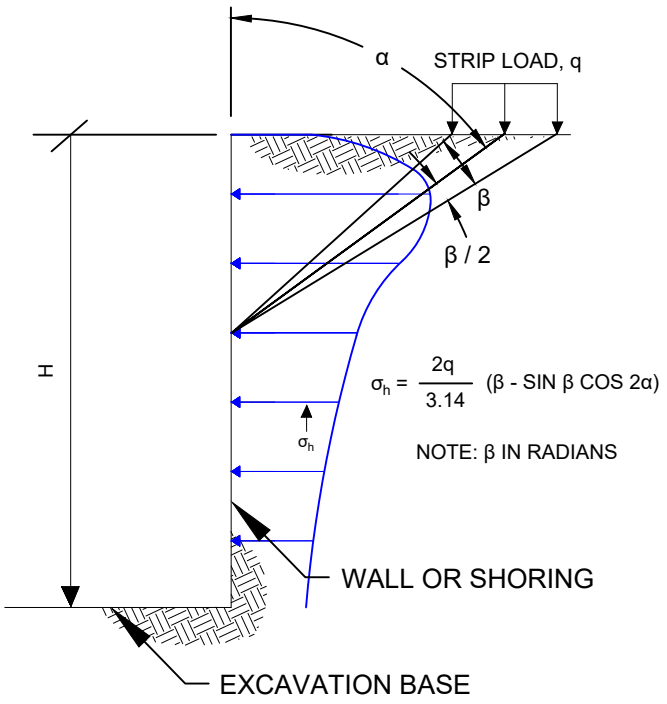
VERTICAL POINT LOAD



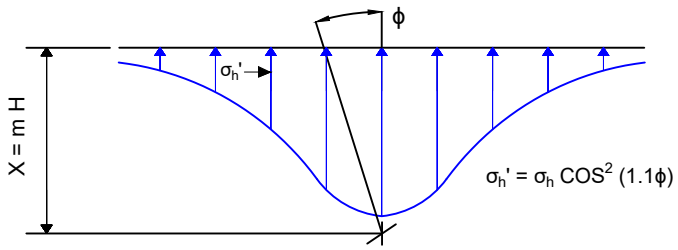
LINE LOAD PARALLEL TO WALL



STRIP LOAD PARALLEL TO WALL

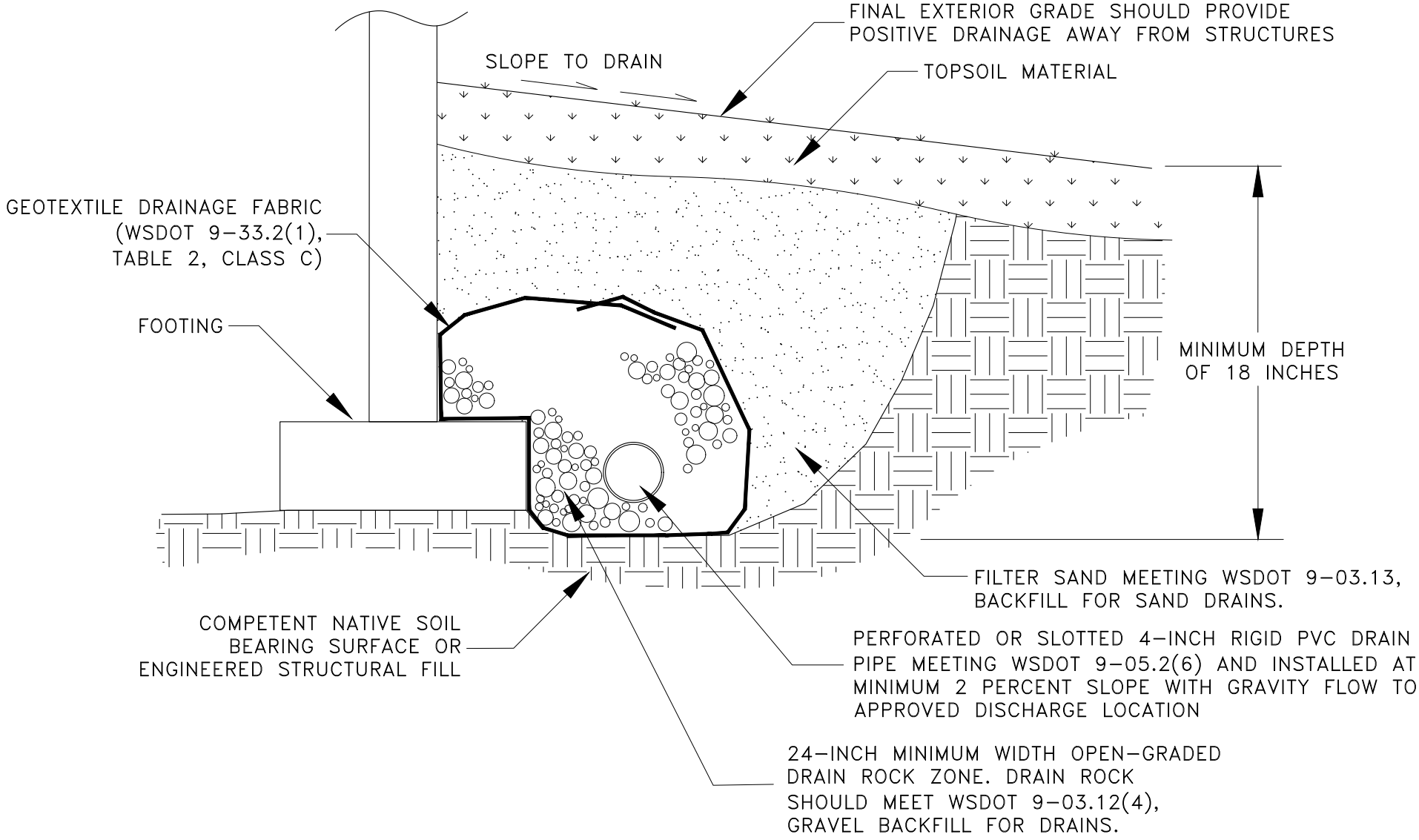


VERTICAL POINT LOAD HORIZONTAL PRESSURE DISTRIBUTION



NOTES:

1. FIGURE SHOULD BE USED JOINTLY WITH RECOMMENDATIONS PRESENTED IN THE REPORT TEXT.
2. LATERAL EARTH PRESSURES ASSUME RIGID WALLS WITH BACKFILL MATERIALS HAVING A POISSON'S RATIO OF 0.5.
3. TOTAL LATERAL EARTH PRESSURES RESULTING FROM COMBINED LOADS MAY BE CALCULATED USING SUPERPOSITION.
4. DRAWING IS NOT TO SCALE.



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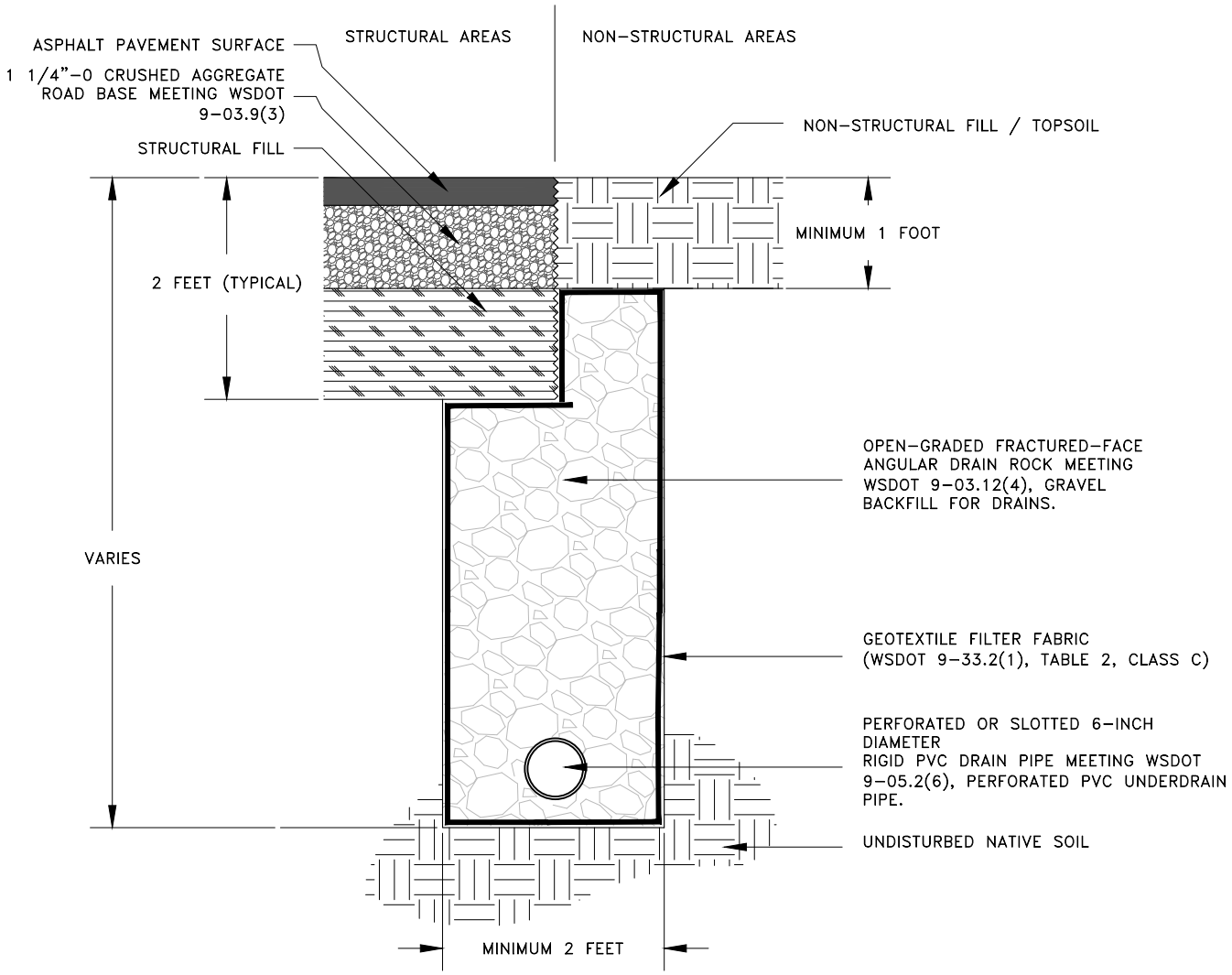
TYPICAL PERIMETER FOOTING DRAIN DETAIL

NOTES:
1. DRAWING IS NOT TO SCALE.
2. DRAWING REPRESENTS TYPICAL PERIMETER FOOTING DRAIN DETAIL AND MAY NOT BE SITE-SPECIFIC.

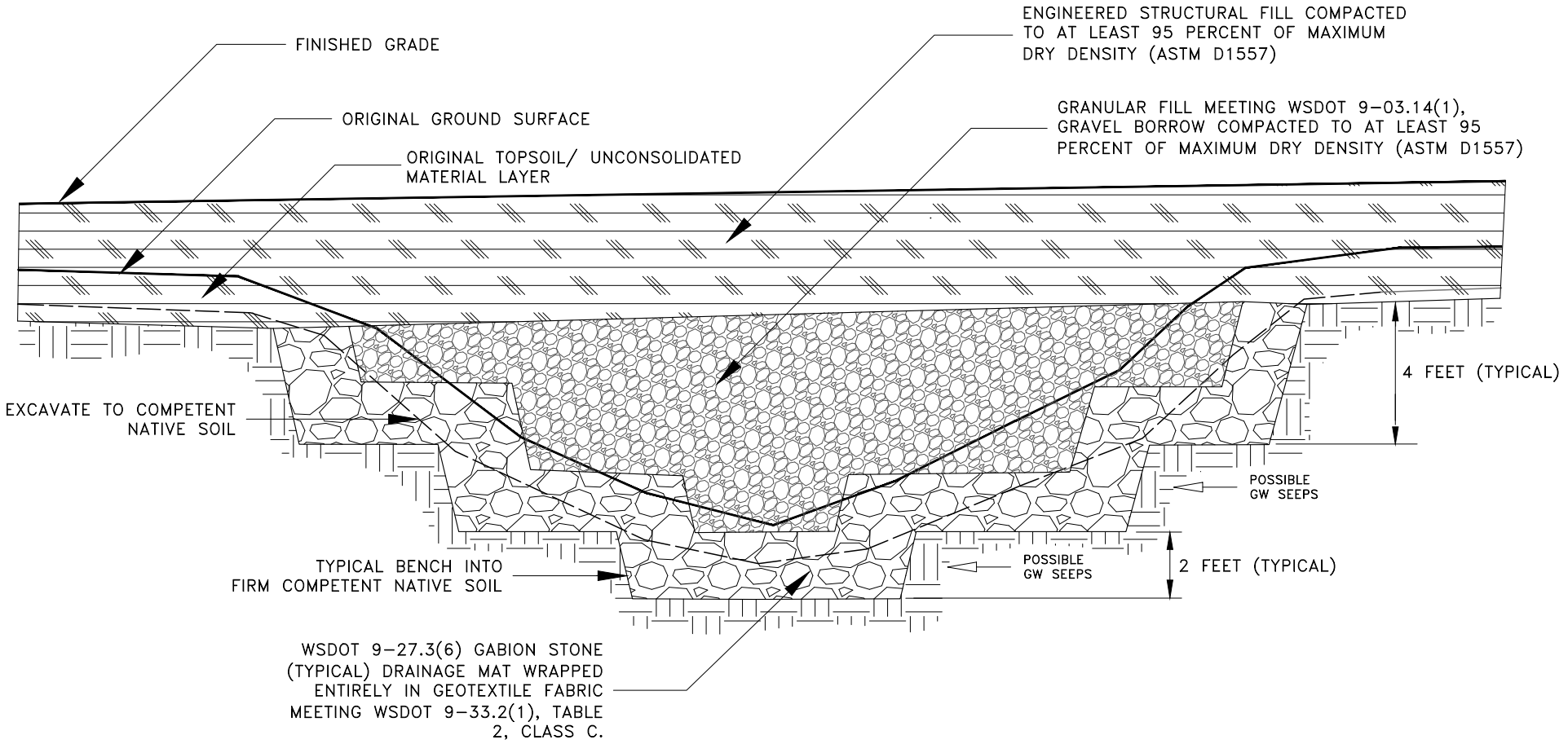
FIGURE 6



NOTE: LOCATION, INVERT ELEVATION, DEPTH OF TRENCH, AND EXTENT OF PERFORATED PIPE REQUIRED MAY BE MODIFIED BY THE GEOTECHNICAL ENGINEER DURING CONSTRUCTION BASED UPON FIELD OBSERVATION AND SITE-SPECIFIC SOIL CONDITIONS.

Geotechnical ▪ Environmental ▪ Special Inspections Columbia West Engineering, Inc	TYPICAL PERFORATED DRAINPIPE TRENCH DETAIL	NOTES: 1. DRAWING IS NOT TO SCALE. 2. DRAWING REPRESENTS TYPICAL PERFORATED DRAIN PIPE TRENCH DETAIL AND MAY NOT BE SITE-SPECIFIC.	FIGURE 7

TYPICAL DRAINAGE MAT CROSS-SECTION



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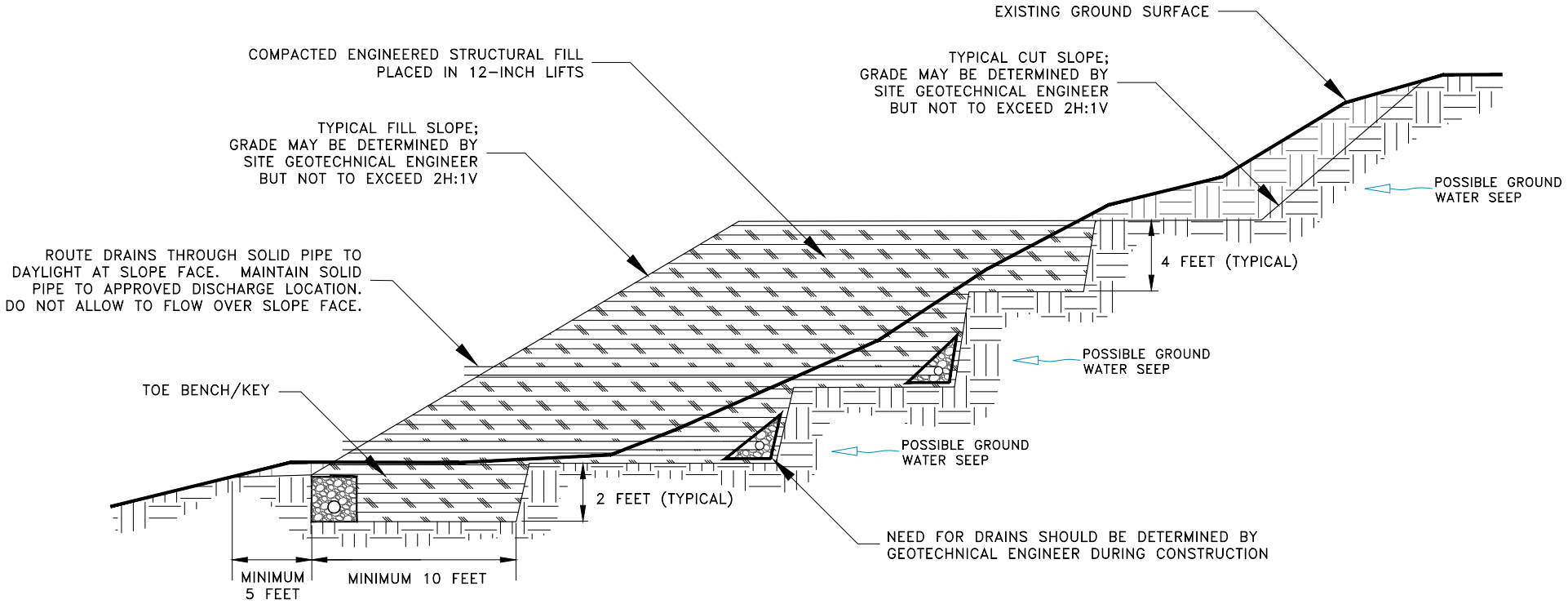
TYPICAL DRAINAGE MAT CROSS SECTION

NOTES:
1. DRAWING IS NOT TO SCALE.
2. DRAWING REPRESENTS TYPICAL DRAINAGE MAT SECTION AND MAY NOT BE SITE-SPECIFIC.

FIGURE 8



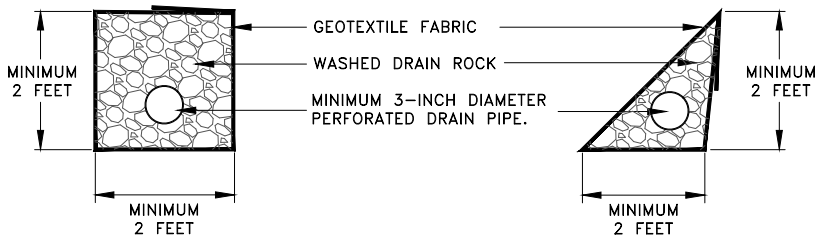
DRAIN SPECIFICATIONS

GEOTEXTILE FABRIC SHALL MEET WSDOT 9–33.2(1), TABLE 2, CLASS C.

WASHED DRAIN ROCK SHALL BE OPEN–GRADED ANGULAR DRAIN ROCK MEETING WSDOT 9–03.12(4), GRAVEL BACKFILL FOR DRAINS.

DRAIN PIPE SHOULD MEET WSDOT 9–05.2(6), PERFORATED PVC UNDERDRAIN PIPE.

TYPICAL DRAIN SECTION DETAIL



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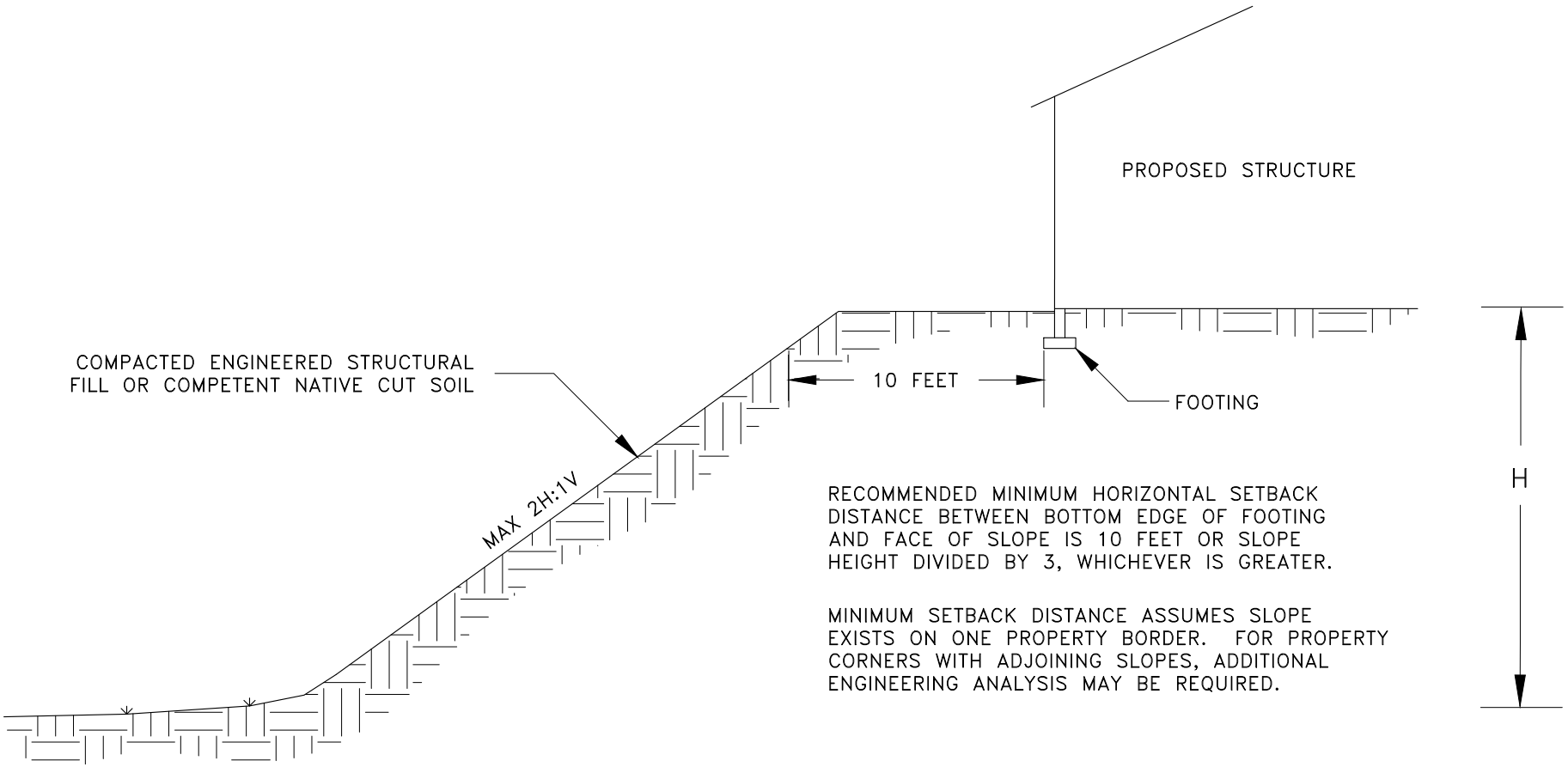
TYPICAL CUT AND FILL SLOPE CROSS SECTION

NOTES:
1. DRAWING IS NOT TO SCALE.
2. DRAWING REPRESENTS TYPICAL CUT AND FILL SLOPE CROSS SECTION AND MAY NOT BE SITE–SPECIFIC.

FIGURE 9



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TYPICAL MINIMUM FOUNDATION SLOPE SETBACK DETAIL

NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE APPROXIMATE.
3. DRAWING REPRESENTS TYPICAL FOUNDATION SETBACK DETAIL AND MAY NOT BE SITE-SPECIFIC.

FIGURE 10

APPENDIX A
SUBSURFACE EXPLORATION LOGS

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BORING LOG

PROJECT NAME	CLIENT		PROJECT NO.	BORING NO.
Landing on the Cowlitz	CT6, LLC		22310	BP-1
PROJECT LOCATION	**DRILLING CONTRACTOR**	**DRILL RIG**	**TECHNICIAN**	**PAGE NO.**
Castle Rock, Washington	Western States	CME Track	MAC	1 of 1
BORING LOCATION	**DRILLING METHOD**	**SAMPLING METHOD**	**START DATE**	**START TIME**
See Figure 2	HSA	SPT	1/31/23	0900
REMARKS	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**FINISH DATE**	**FINISH TIME**
None	Not surveyed	20 feet bgs on 1/31/23	1/31/23	1030

Depth (ft)	Field ID + Sample Type	SPT N-value (uncorrected) 0 20 40 60 80	USCS Soil Type	AASHTO Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Wet Density (PCF)	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index
0			SP-SM			Fill. Gray poorly-graded SAND with silt and trace gravel, moist, fine-textured.					
6	SPT BP1.1	5	SP-SM			Brown poorly-graded SAND with silt, loose, moist, fine-textured.					
10	SPT BP1.2	4				Becomes very loose.					
16	SPT BP1.3	9				Becomes loose.					
20	SPT BP1.4	16				Becomes medium dense, wet.					
30						Bottom of boring at 30 feet bgs. Groundwater encountered at 20 feet bgs on 1/31/23. Piezometer installed at 30 feet and completed with flush mount monument on 1/31/23.					

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PROJECT NAME	CLIENT		PROJECT NO.	BORING NO.
Landing on the Cowlitz	CT6, LLC		22310	BP-2
PROJECT LOCATION	**DRILLING CONTRACTOR**	**DRILL RIG**	**TECHNICIAN**	**PAGE NO.**
Castle Rock, Washington	Western States	CME Track	MAC	1 of 1
BORING LOCATION	**DRILLING METHOD**	**SAMPLING METHOD**	**START DATE**	**START TIME**
See Figure 2	HSA	SPT	1/31/23	1200
REMARKS	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**FINISH DATE**	**FINISH TIME**
None	Not surveyed	35 feet bgs on 1/31/23	1/31/23	1600

Depth (ft)	Field ID + Sample Type	SPT N-value (uncorrected) 0 20 40 60 80	USCS Soil Type	AASHTO Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Wet Density (PCF)	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index
0			SP-SM			Brown poorly-graded SAND with silt, moist, fine-textured.					
20	SPT BP2.1	57				Becomes very dense with reduced silt content and trace to some gravel.					
26	SPT BP2.2	11				Becomes medium dense, very moist.					
30	SPT BP2.3	10									
35			GP-GM			Gray to reddish gray poorly-graded GRAVEL with silt and sand, medium dense, wet.					
36	SPT BP2.4	30									
40	SPT BP2.5	REFUSAL 50(3")				Becomes very dense.					
45						Bottom of soil boring at 45 feet bgs. Groundwater encountered at 35 feet bgs on 1/31/23. Piezometer installed at 45 feet and completed with flush mount monument on 1/31/23.					

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BORING LOG

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PROJECT NAME	CLIENT		PROJECT NO.	BORING NO.
Landing on the Cowlitz	CT6, LLC		22310	BP-3
PROJECT LOCATION	**DRILLING CONTRACTOR**	**DRILL RIG**	**TECHNICIAN**	**PAGE NO.**
Castle Rock, Washington	Western States	CME Track	MAC	1 of 1
BORING LOCATION	**DRILLING METHOD**	**SAMPLING METHOD**	**START DATE**	**START TIME**
See Figure 2	HSA	SPT	2/1/23	0900
REMARKS	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**FINISH DATE**	**FINISH TIME**
None	Not surveyed	15 feet bgs on 2/1/23	2/1/23	1245

Depth (ft)	Field ID + Sample Type	SPT N-value (uncorrected) 0 20 40 60 80	USCS Soil Type	AASHTO Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Wet Density (PCF)	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index
0			SP-SM			Brown poorly-graded SAND with silt, loose, moist, fine-textured.					
6	SPT BP3.1	6									
10	SPT BP3.2	0				Becomes very loose.					
15			ML			Dark gray SILT with sand, very soft, wet, low plasticity.					
16	SPT BP3.3	1									
20	SPT BP3.4	37	SP			Gray poorly-graded SAND, medium dense, wet.					
25						Bottom of soil boring at 25 feet bgs. Groundwater encountered at 15 feet bgs on 2/1/23. Piezometer installed at 25 feet and completed with flush mount monument on 2/1/23.					

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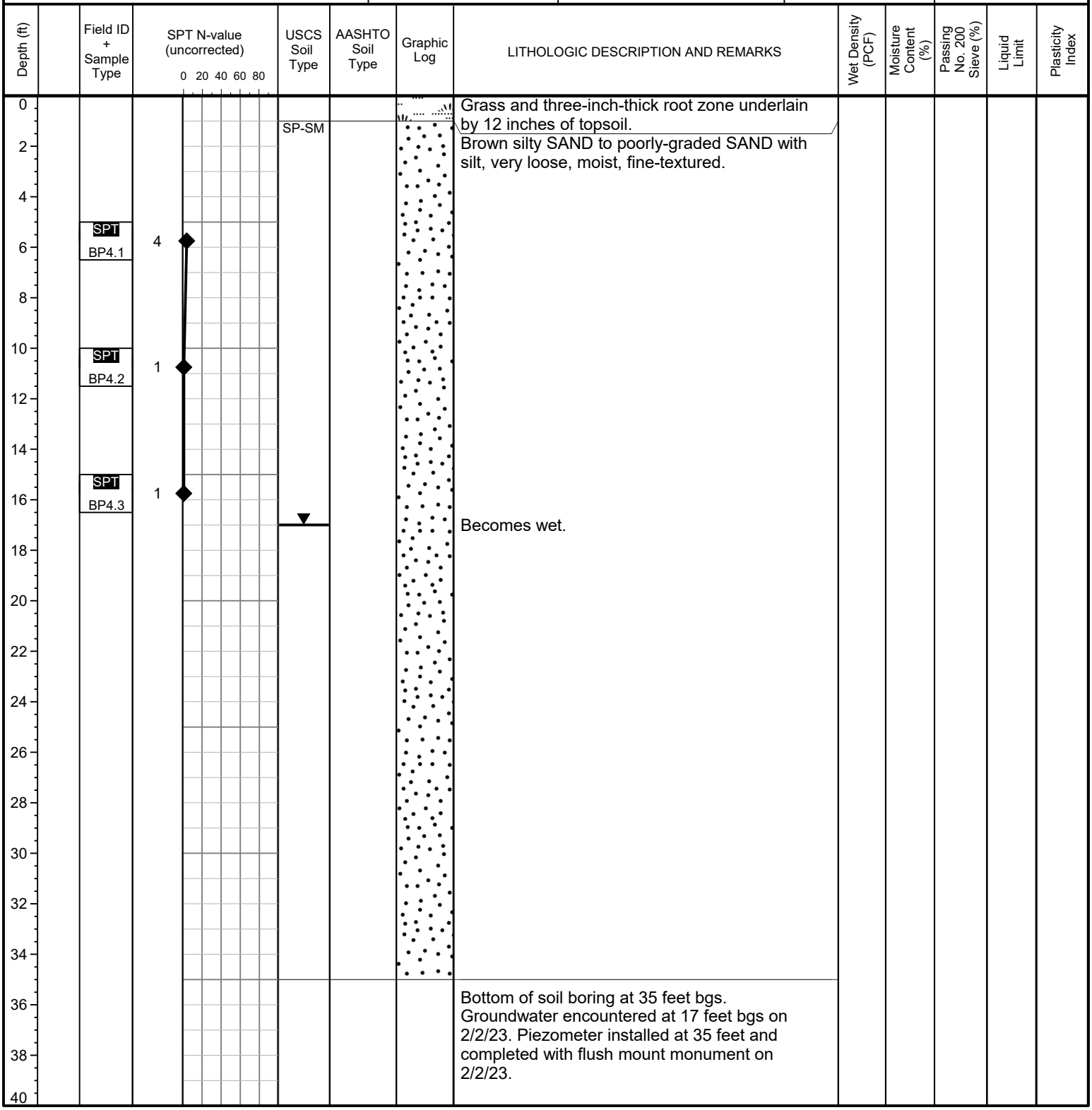
BORING LOG

Geotechnical ■ Environmental ■ Special Inspections
Columbia West Engineering, Inc

PROJECT NAME	CLIENT		PROJECT NO.	BORING NO.
Landing on the Cowlitz	CT6, LLC		22310	BP-4
PROJECT LOCATION	**DRILLING CONTRACTOR**	**DRILL RIG**	**TECHNICIAN**	**PAGE NO.**
Castle Rock, Washington	Western States	CME Track	MAC	1 of 1
BORING LOCATION	**DRILLING METHOD**	**SAMPLING METHOD**	**START DATE**	**START TIME**
See Figure 2	HSA	SPT	2/1/23	1300
REMARKS	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**FINISH DATE**	**FINISH TIME**
None	Not surveyed	17 feet bgs on 2/2/23	2/2/23	1045



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BORING LOG

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Columbia West Engineering, Inc

PROJECT NAME	CLIENT		PROJECT NO.	BORING NO.
Landing on the Cowlitz	CT6, LLC		22310	BP-5
PROJECT LOCATION	**DRILLING CONTRACTOR**	**DRILL RIG**	**TECHNICIAN**	**PAGE NO.**
Castle Rock, Washington	Western States	CME Track	MAC	1 of 1
BORING LOCATION	**DRILLING METHOD**	**SAMPLING METHOD**	**START DATE**	**START TIME**
See Figure 2	HSA	SPT	2/2/23	1100
REMARKS	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**FINISH DATE**	**FINISH TIME**
None	Not surveyed	17.5 feet bgs on 2/2/23	2/2/23	1600

Depth (ft)	Field ID + Sample Type	SPT N-value (uncorrected) 0 20 40 60 80	USCS Soil Type	AASHTO Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Wet Density (PCF)	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index
0			SP-SM			Brown poorly-graded SAND with silt, loose, moist, fine-textured.					
6	SPT BP5.1	7									
10	SPT BP5.2	10				Becomes medium dense.					
15	SPT BP5.3	5				Becomes loose.					
17.5						Becomes wet.					
20	SPT BP5.4	REFUSAL 50(3")	GP-GM			Gray to reddish gray poorly-graded GRAVEL with silt and sand, very dense, wet.					
25.5	SPT BP5.5	REFUSAL 50(5")									
30	SPT BP5.6	16				Becomes medium dense.					
31.5						Bottom of soil boring at 31.5 feet bgs. Groundwater encountered at 17.5 feet bgs on 2/2/23. Piezometer installed at 30 feet and completed with flush mount monument on 2/2/23.					

APPENDIX B
SOIL CLASSIFICATION INFORMATION

SOIL DESCRIPTION AND CLASSIFICATION GUIDELINES

Particle-Size Classification

COMPONENT	ASTM/USCS		AASHTO	
	size range	sieve size range	size range	sieve size range
Cobbles	> 75 mm	greater than 3 inches	> 75 mm	greater than 3 inches
Gravel	75 mm – 4.75 mm	3 inches to No. 4 sieve	75 mm – 2.00 mm	3 inches to No. 10 sieve
Coarse	75 mm – 19.0 mm	3 inches to 3/4-inch sieve	-	-
Fine	19.0 mm – 4.75 mm	3/4-inch to No. 4 sieve	-	-
Sand	4.75 mm – 0.075 mm	No. 4 to No. 200 sieve	2.00 mm – 0.075 mm	No. 10 to No. 200 sieve
Coarse	4.75 mm – 2.00 mm	No. 4 to No. 10 sieve	2.00 mm – 0.425 mm	No. 10 to No. 40 sieve
Medium	2.00 mm – 0.425 mm	No. 10 to No. 40 sieve	-	-
Fine	0.425 mm – 0.075 mm	No. 40 to No. 200 sieve	0.425 mm – 0.075 mm	No. 40 to No. 200 sieve
Fines (Silt and Clay)	< 0.075 mm	Passing No. 200 sieve	< 0.075 mm	Passing No. 200 sieve

Consistency for Cohesive Soil

CONSISTENCY	SPT N-VALUE (BLOWS PER FOOT)	D&M N-VALUE (BLOWS PER FOOT)	POCKET PENETROMETER (UNCONFINED COMPRESSIVE STRENGTH, tsf)
Very Soft	Less than 2	Less than 3	less than 0.25
Soft	2 to 4	3 to 6	0.25 to 0.50
Medium Stiff	4 to 8	6 to 12	0.50 to 1.0
Stiff	8 to 15	12 to 25	1.0 to 2.0
Very Stiff	15 to 30	25 to 65	2.0 to 4.0
Hard	30 to 60	65 to 145	greater than 4.0
Very Hard	greater than 60	greater than 145	-

RELATIVE DENSITY	SPT N-VALUE (BLOWS PER FOOT)	D&M N-VALUE (BLOWS PER FOOT)
Very Loose	0 to 4	0 to 11
Loose	4 to 10	11 to 26
Medium Dense	10 to 30	26 to 74
Dense	30 to 50	74 to 120
Very Dense	more than 50	More than 120

Relative Density for Granular Soil

Moisture Designations

TERM	FIELD IDENTIFICATION
Dry	No moisture. Dusty or dry.
Damp	Some moisture. Cohesive soils are usually below plastic limit and are moldable.
Moist	Grains appear darkened, but no visible water is present. Cohesive soils will clump. Sand will bulk. Soils are often at or near plastic limit.
Wet	Visible water on larger grains. Sand and silt exhibit dilatancy. Cohesive soil can be readily remolded. Soil leaves wetness on the hand when squeezed. Soil is much wetter than optimum moisture content and is above plastic limit.

Additional Constituents

Percent	Silt and Clay In:		Percent	Sand and Gravel In:	
	Fine-Grained Soil	Coarse-Grained Soil		Fine-Grained Soil	Coarse-Grained Soil
< 5	trace	trace	< 5	trace	trace
5 – 12	minor	with	5 – 15	minor	minor
> 12	some	silty/clayey	15 – 30	with	with
			> 30	sandy/gravelly	with Indicate approx. percentage

AASHTO SOIL CLASSIFICATION SYSTEM

TABLE 1. Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35 Percent or Less Passing .075 mm)				Silt-Clay Materials (More than 35 Percent Passing 0.075)		
Group Classification	A-1	A-3	A-2	A-4	A-5	A-6	A-7
Sieve analysis, percent passing:							
2.00 mm (No. 10)	-	-	-				
0.425 mm (No. 40)	50 max	51 min	-	-	-	-	-
0.075 mm (No. 200)	25 max	10 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing 0.425 mm (No. 40)							
Liquid limit				40 max	41 min	40 max	41 min
Plasticity index	6 max	N.P.		10 max	10 max	11 min	11 min
General rating as subgrade	Excellent to good				Fair to poor		

Note: The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.

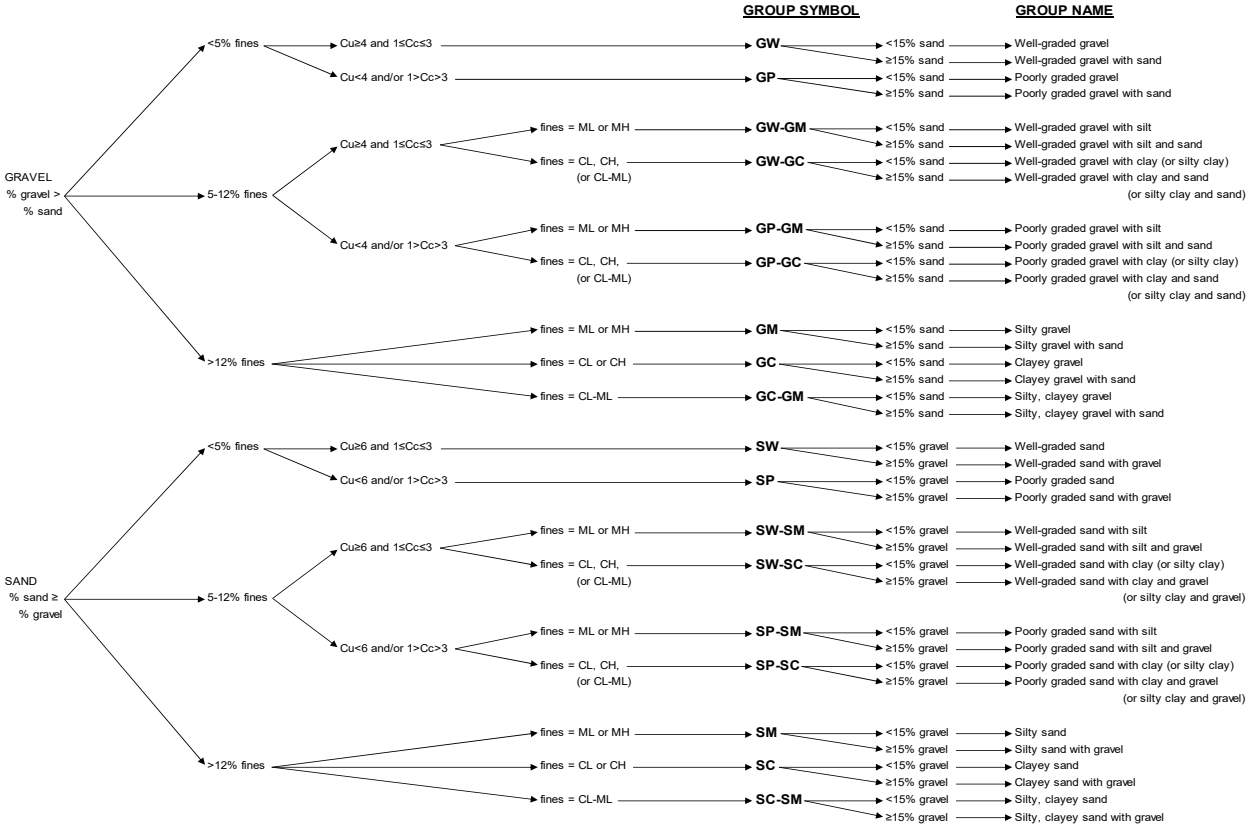
TABLE 2. Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35 Percent or Less Passing 0.075 mm)							Silt-Clay Materials (More than 35 Percent Passing 0.075 mm)			
	A-1			A-2							A-7
Group Classification	A-1-a	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7-5, A-7-6
Sieve analysis, percent passing:											
2.00 mm (No. 10)	50 max	-	-	-	-	-	-	-	-	-	-
0.425 mm (No. 40)	30 max	50 max	51 min	-	-	-	-	-	-	-	-
0.075 mm (No. 200)	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing 0.425 mm (No. 40)											
Liquid limit				40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min
Plasticity index	6 max		N.P.	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11min
Usual types of significant constituent materials	Stone fragments, gravel and sand		Fine sand	Silty or clayey gravel and sand				Silty soils		Clayey soils	
General ratings as subgrade	Excellent to Good							Fair to poor			

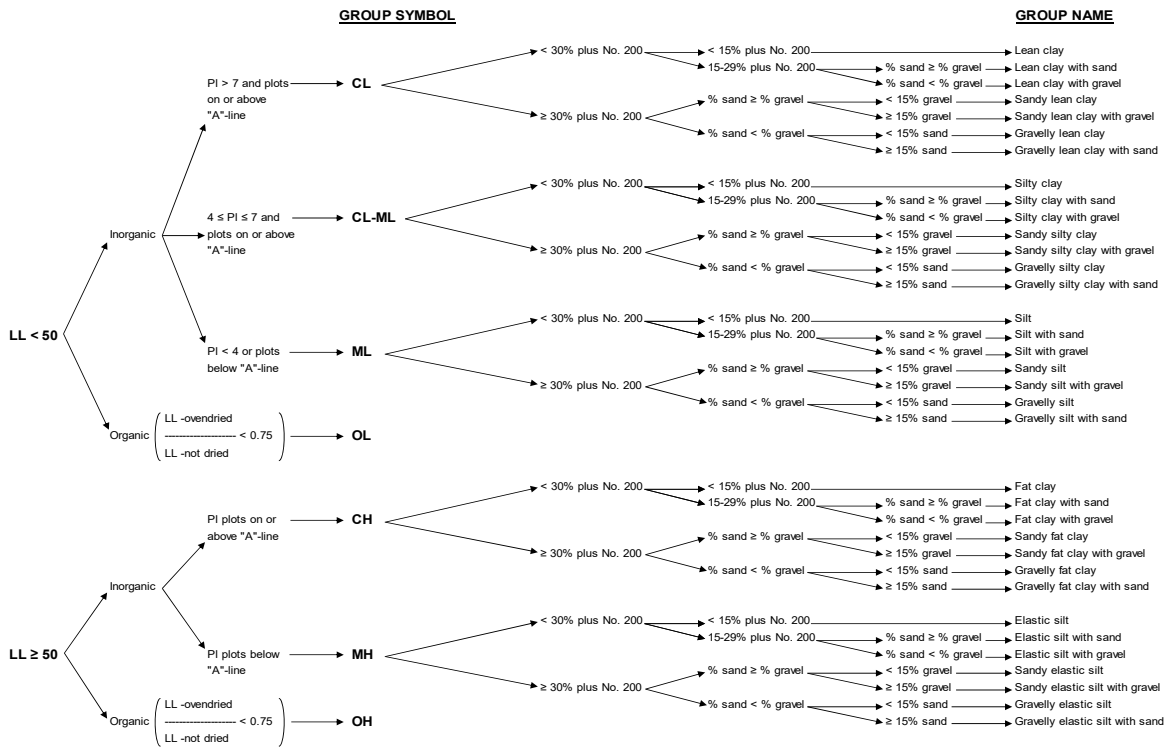
Note: Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30 (see Figure 2).

AASHTO = American Association of State Highway and Transportation Officials

USCS SOIL CLASSIFICATION SYSTEM



Flow Chart for Classifying Coarse-Grained Soils (More Than 50% Retained on No. 200 Sieve)

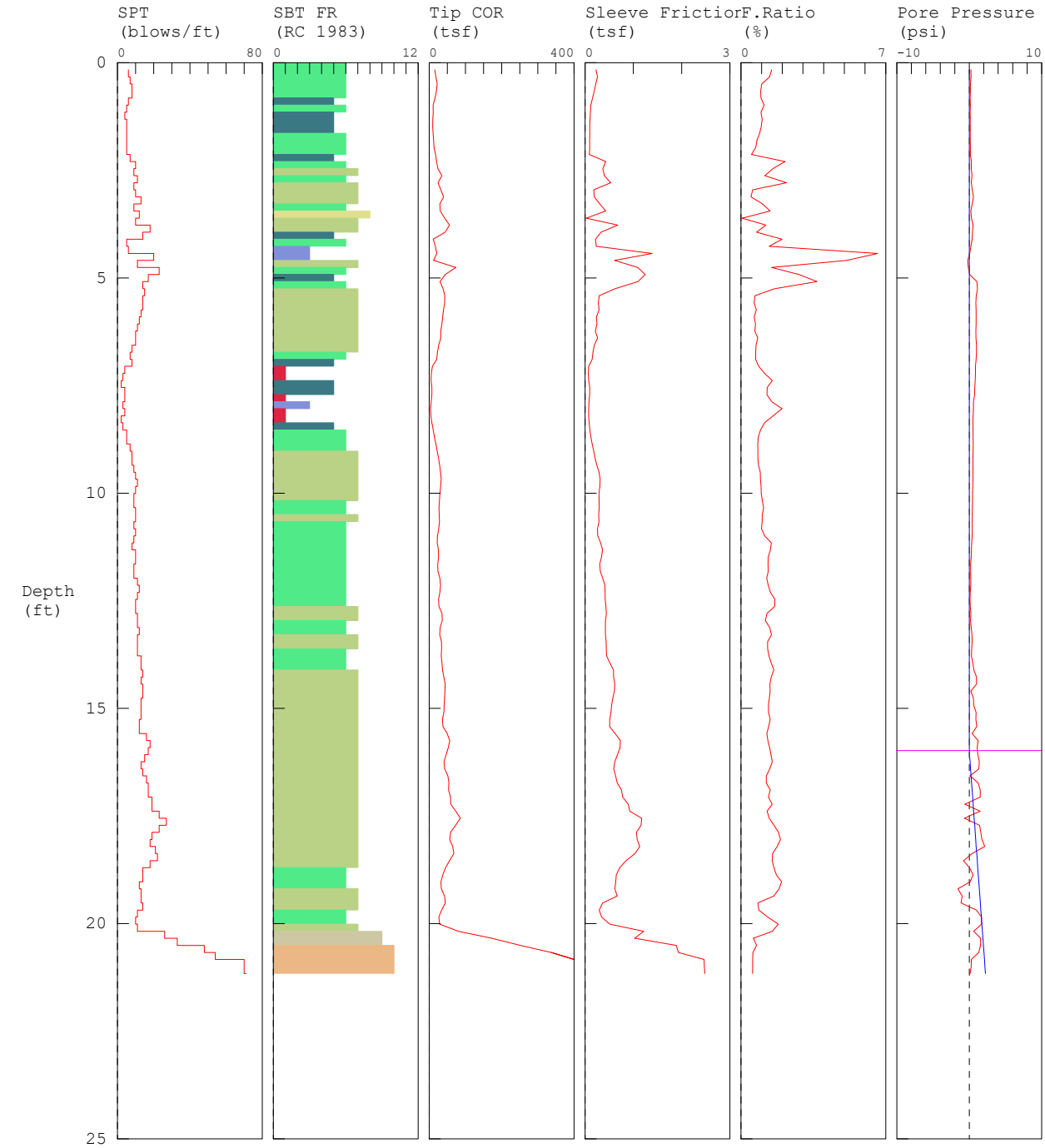


Flow Chart for Classifying Fine-Grained Soil (50% or More Passes No. 200 Sieve)

APPENDIX C
PERTINENT SUBSURFACE INFORMATION COLLECTED BY OTHERS

GeoDesign / CPT-1 / SW Larson Lane Castle Rock

OPERATOR: OGE BAK
CONE ID: DDG1296
HOLE NUMBER: CPT-1
TEST DATE: 1/13/2020 10:33:34 AM
TOTAL DEPTH: 21.161 ft

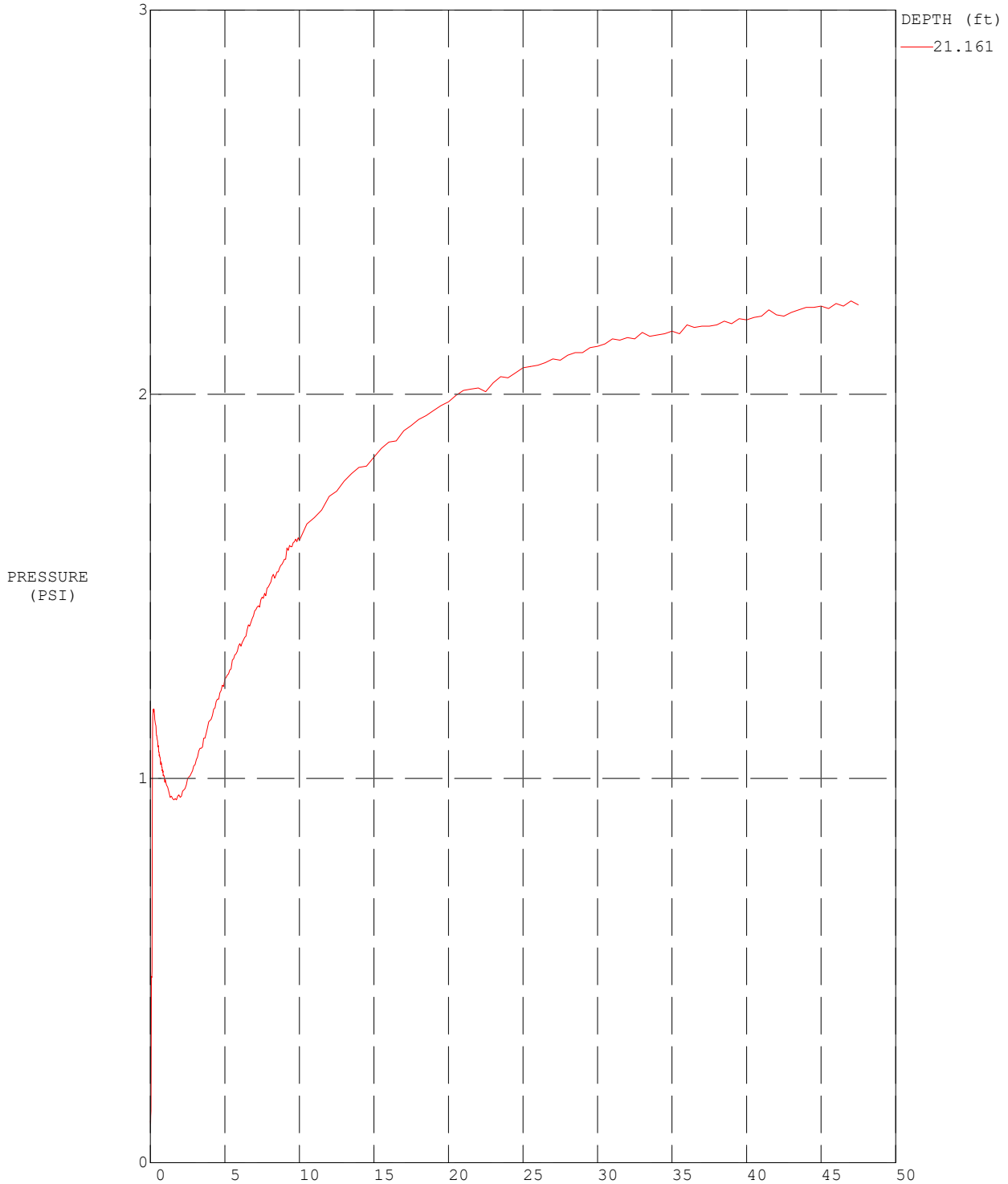


1 sensitive fine gra
2 organic materia
3 clay
4 silty clay to cl
5 clayey silt to silt
6 sandy silt to claye
7 silty sand to sandy
8 sand to silty sa
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

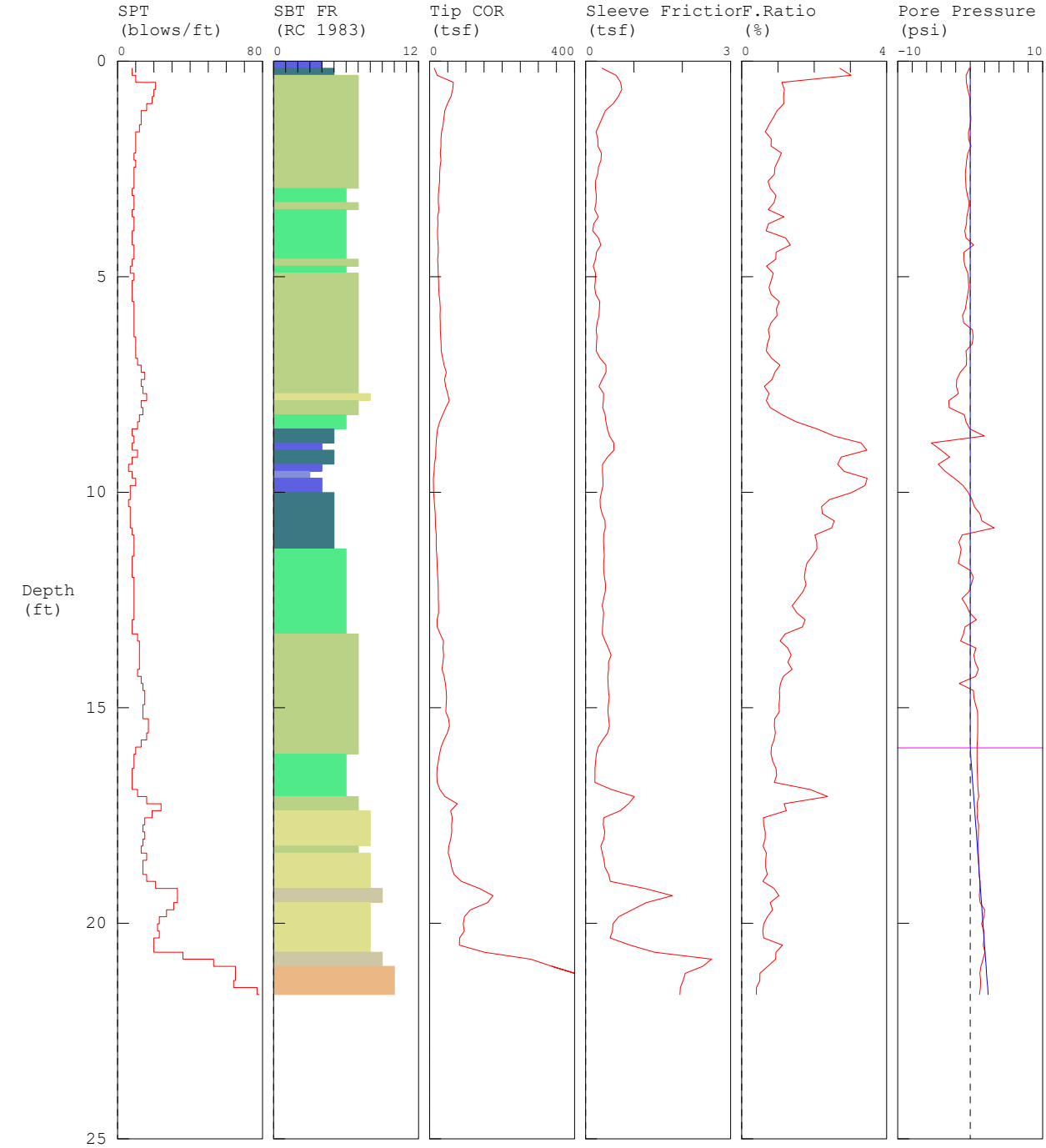
COMMENT: GeoDesign / CPT-1 / SW Larson Lane Castle Rock

TEST DATE: 1/13/2020 10:33:34 AM



GeoDesign / CPT-2 / SW Larson Lane Castle Rock

OPERATOR: OGE BAK
CONE ID: DDG1296
HOLE NUMBER: CPT-2
TEST DATE: 1/13/2020 12:14:29 PM
TOTAL DEPTH: 21.654 ft

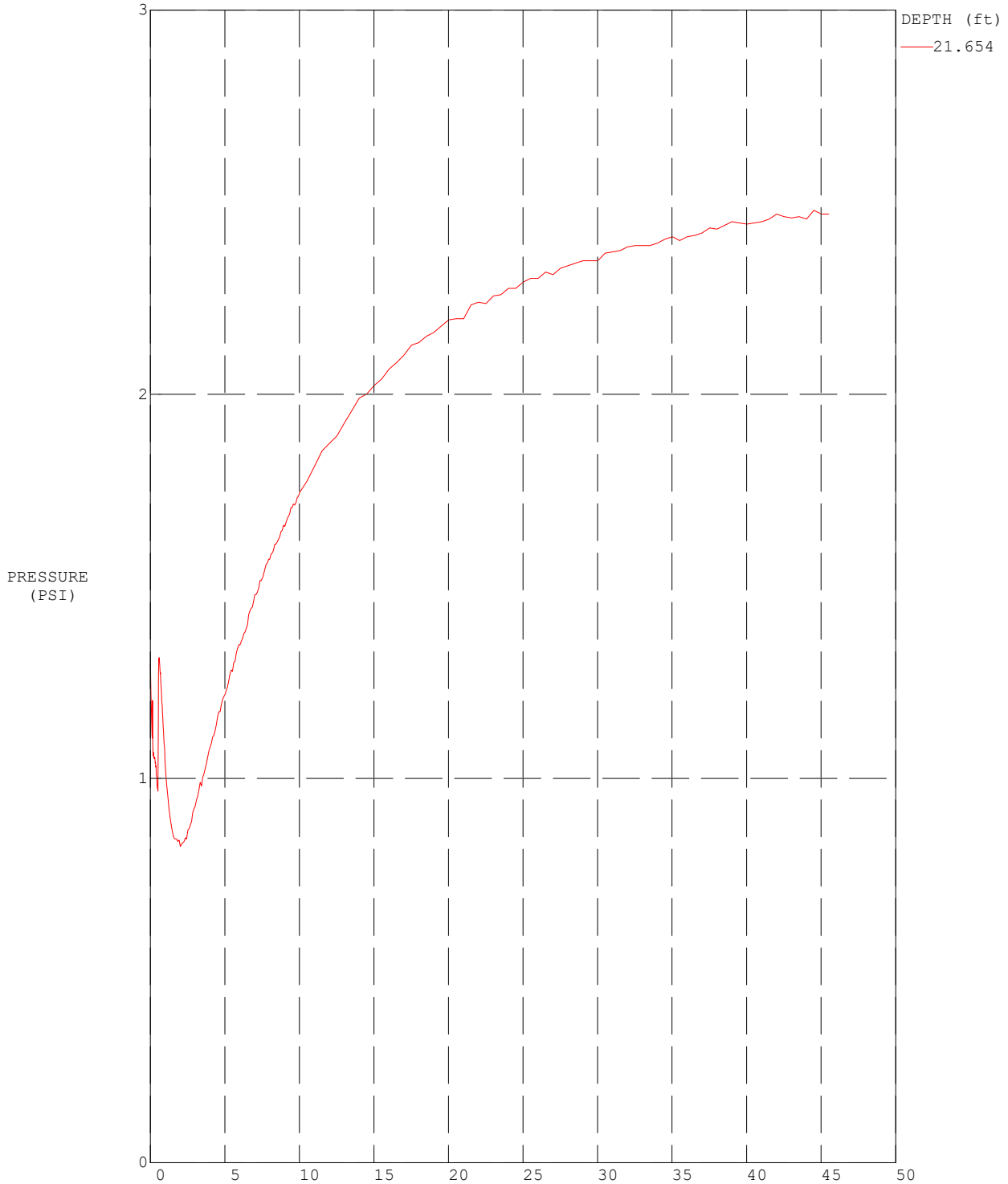


1 sensitive fine gra
2 organic materia
3 clay
4 silty clay to cl
5 clayey silt to silt
6 sandy silt to claye
7 silty sand to sandy
8 sand to silty sa
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

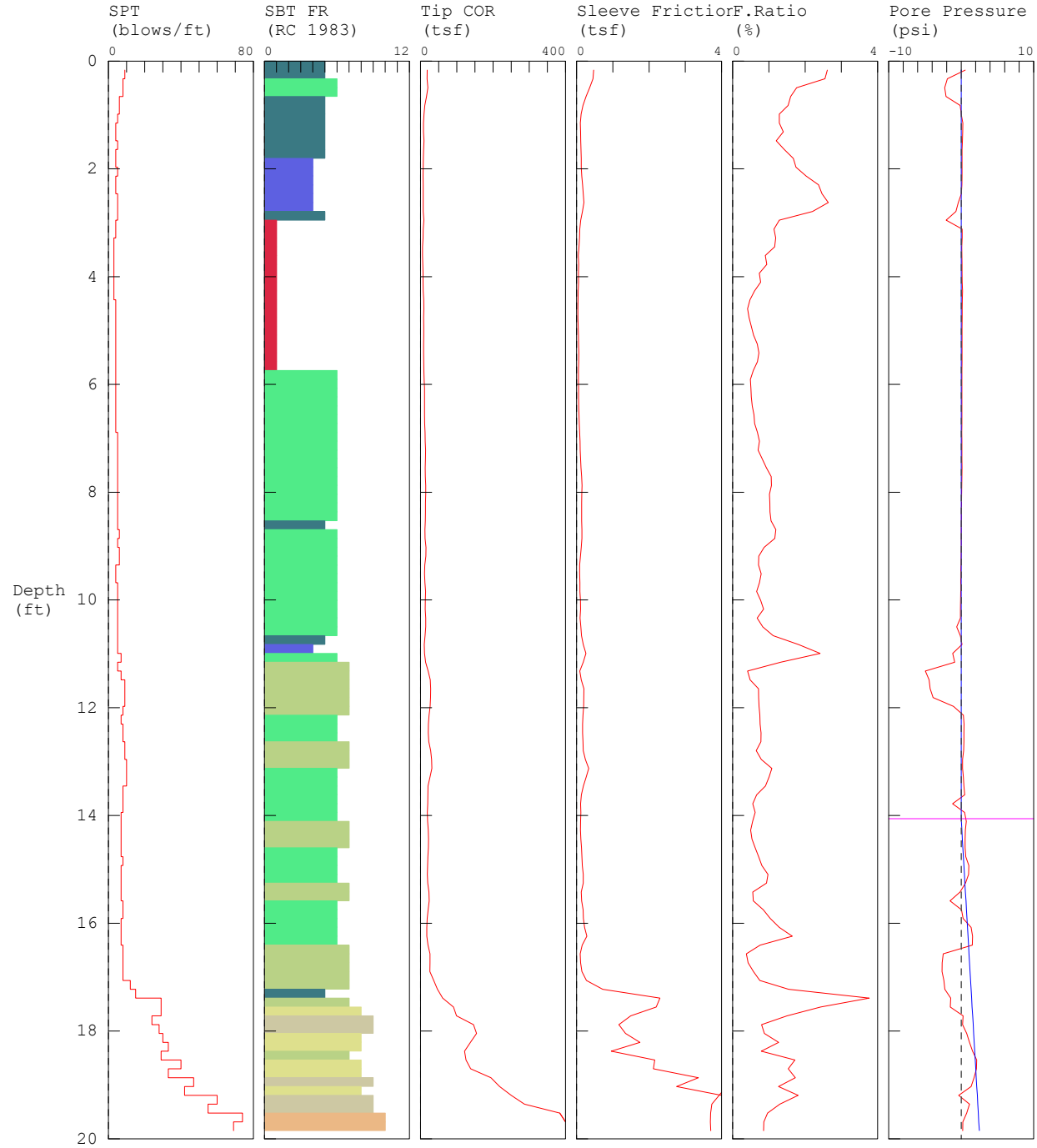
COMMENT: GeoDesign / CPT-2 / SW Larson Lane Castle Rock

TEST DATE: 1/13/2020 12:14:29 PM



GeoDesign / CPT-3 / SW Larson Lane Castle Rock

OPERATOR: OGE BAK
CONE ID: DDG1296
HOLE NUMBER: CPT-3
TEST DATE: 1/13/2020 1:40:18 PM
TOTAL DEPTH: 19.849 ft

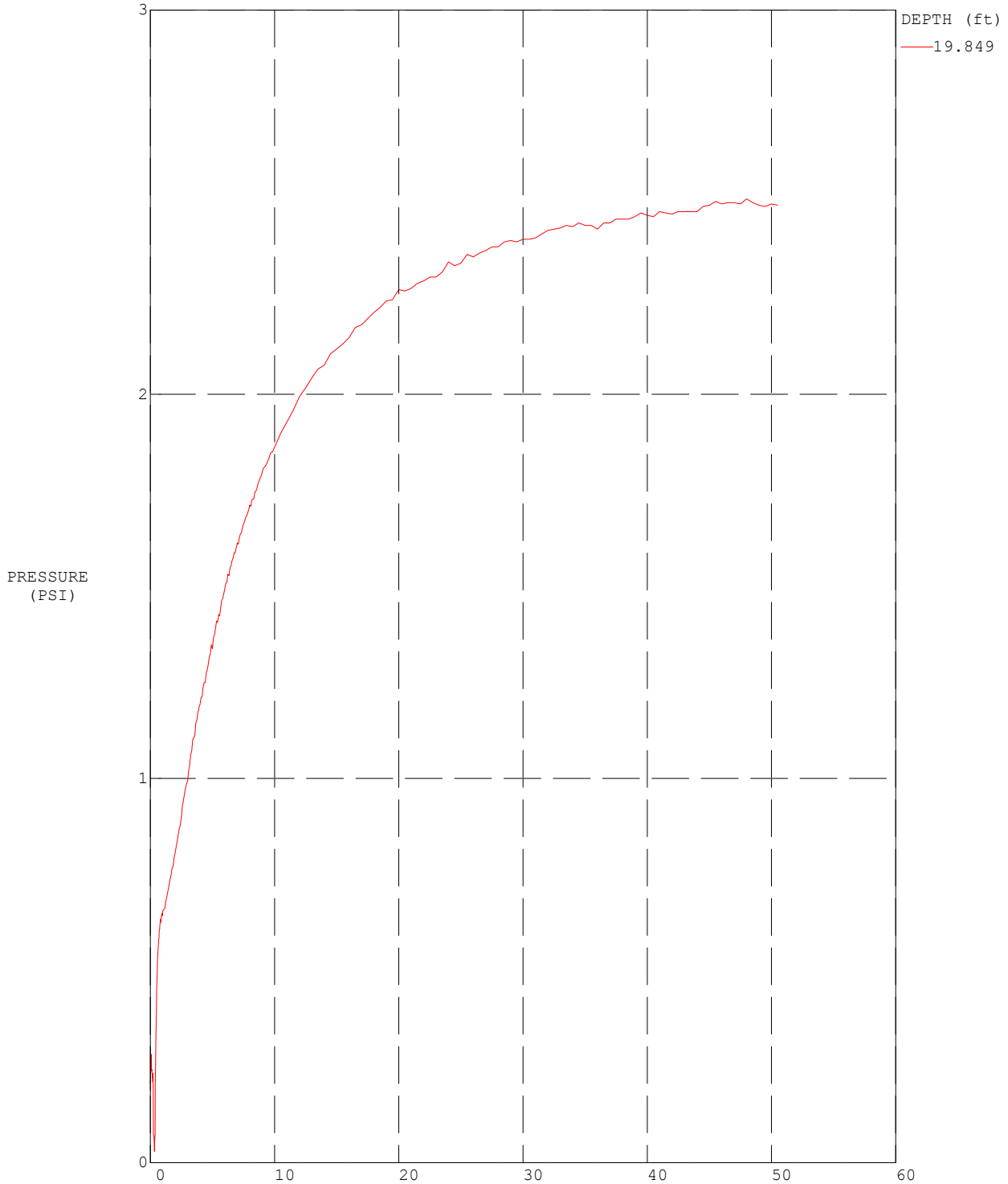


1 sensitive fine gra
2 organic materia
3 clay
4 silty clay to cl
5 clayey silt to silt
6 sandy silt to claye
7 silty sand to sandy
8 sand to silty sa
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: GeoDesign / CPT-3 / SW Larson Lane Castle Rock

TEST DATE: 1/13/2020 10:33:34 AM

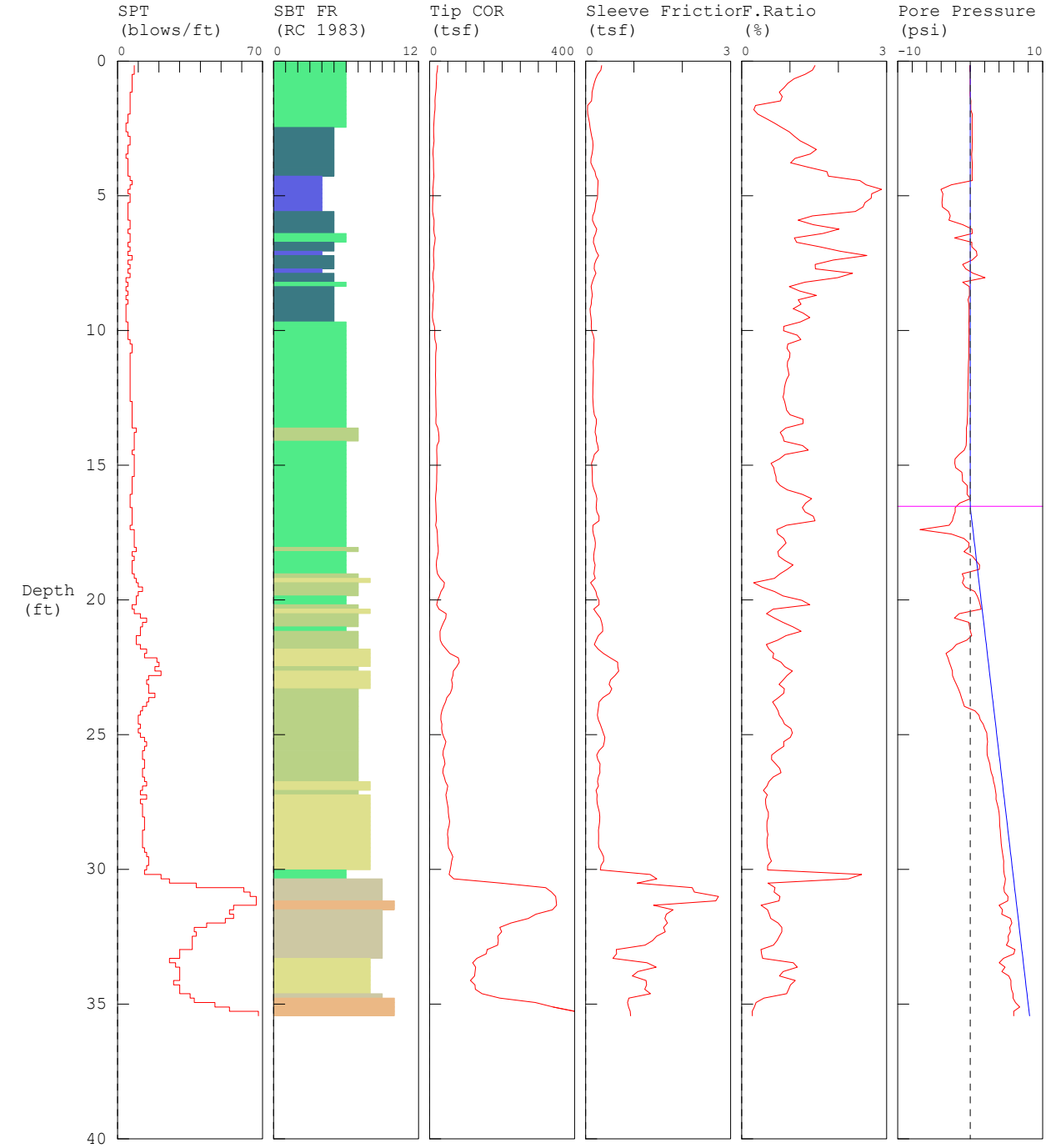


MAXIMUM PRESSURE = 2.508 (PSI)IME: (MINUTES)

HYDROSTATIC PRESSURE = 2.51 (PSI), WATER TABLE: 14.06 ft

GeoDesign / CPT-4 / SW Larson Lane Castle Rock

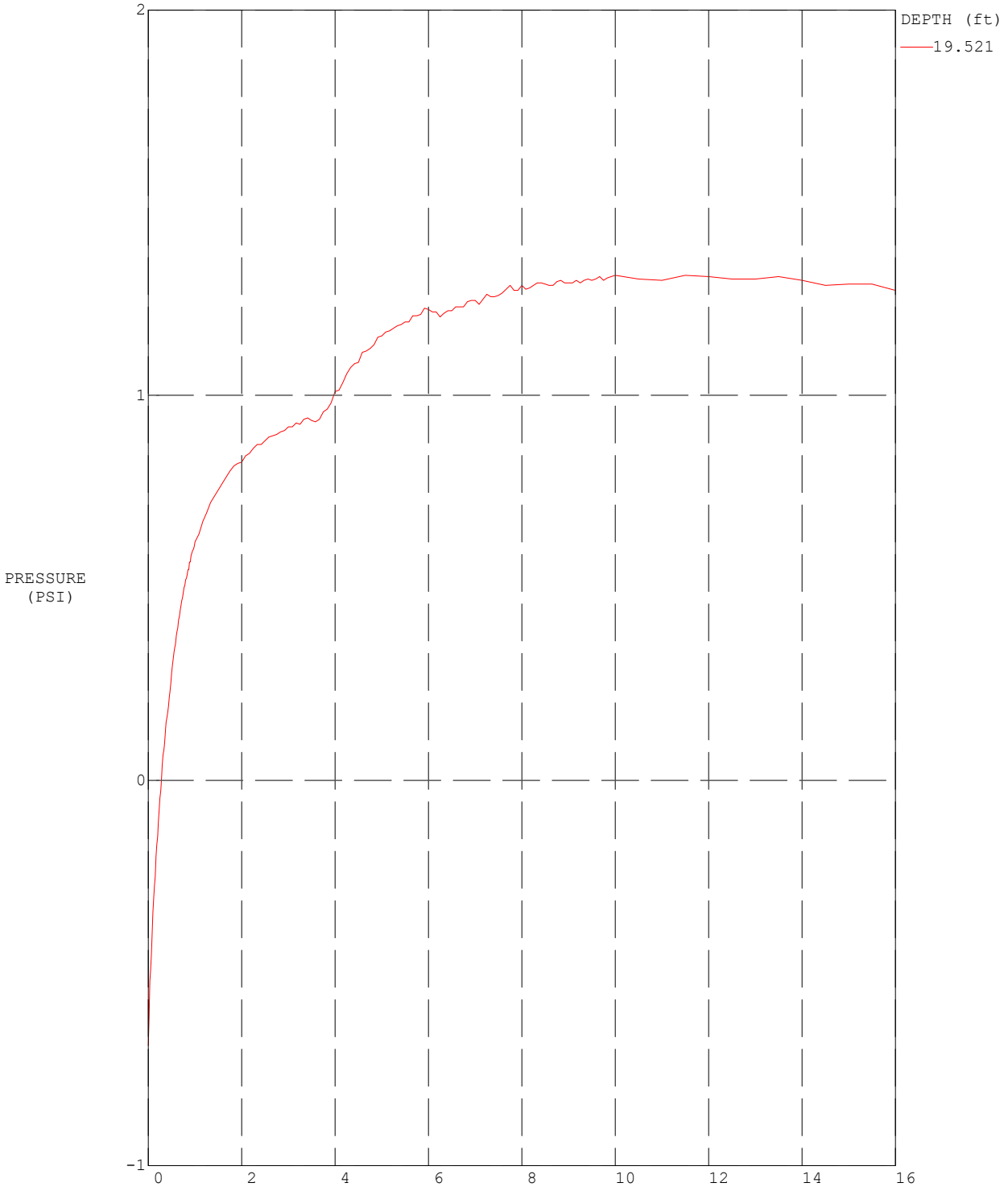
OPERATOR: OGE BAK
CONE ID: DDG1296
HOLE NUMBER: CPT-4
TEST DATE: 1/13/2020 3:11:15 PM
TOTAL DEPTH: 35.433 ft



*SBT/SPT CORRELATION: UBC-1983

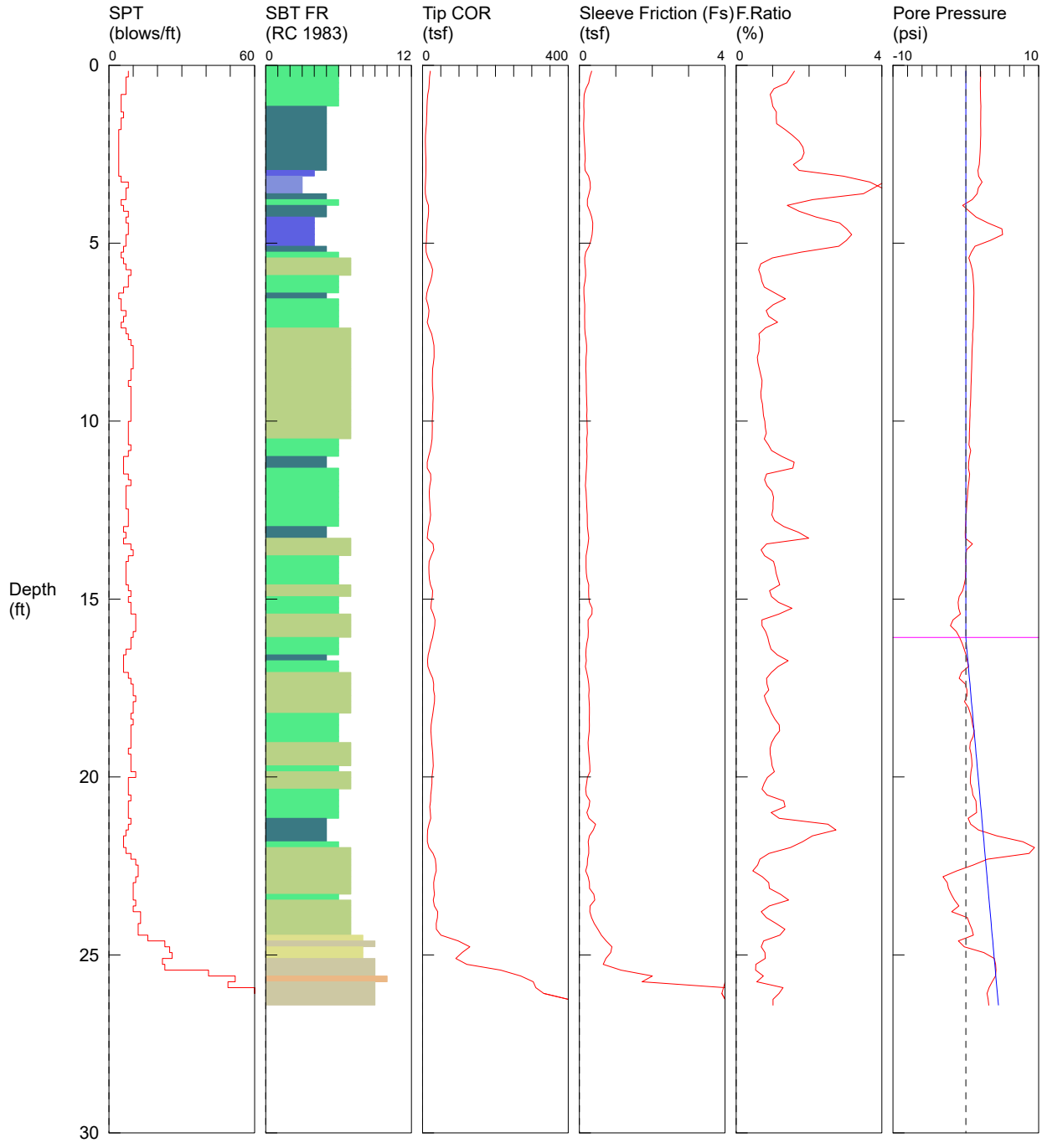
COMMENT: GeoDesign / CPT-4 / SW Larson Lane Castle Rock

TEST DATE: 1/13/2020 3:11:15 PM



GeoDesign / CPT-5 / SW Larson Lane Castle Rock

OPERATOR: OGE BAK
CONE ID: DDG1296
HOLE NUMBER: CPT-5
TEST DATE: 1/14/2020 8:44:26 AM
TOTAL DEPTH: 26.411 ft

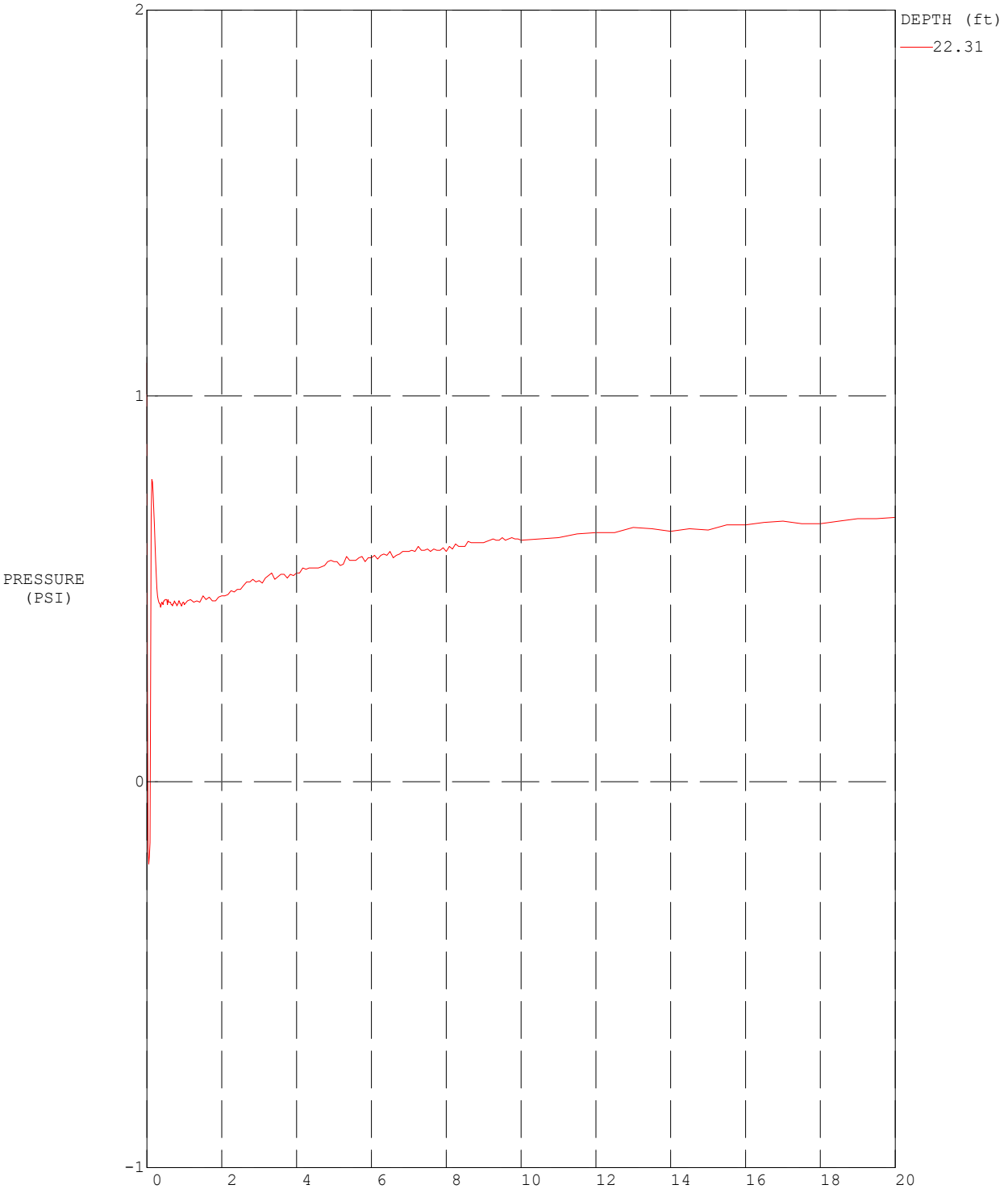


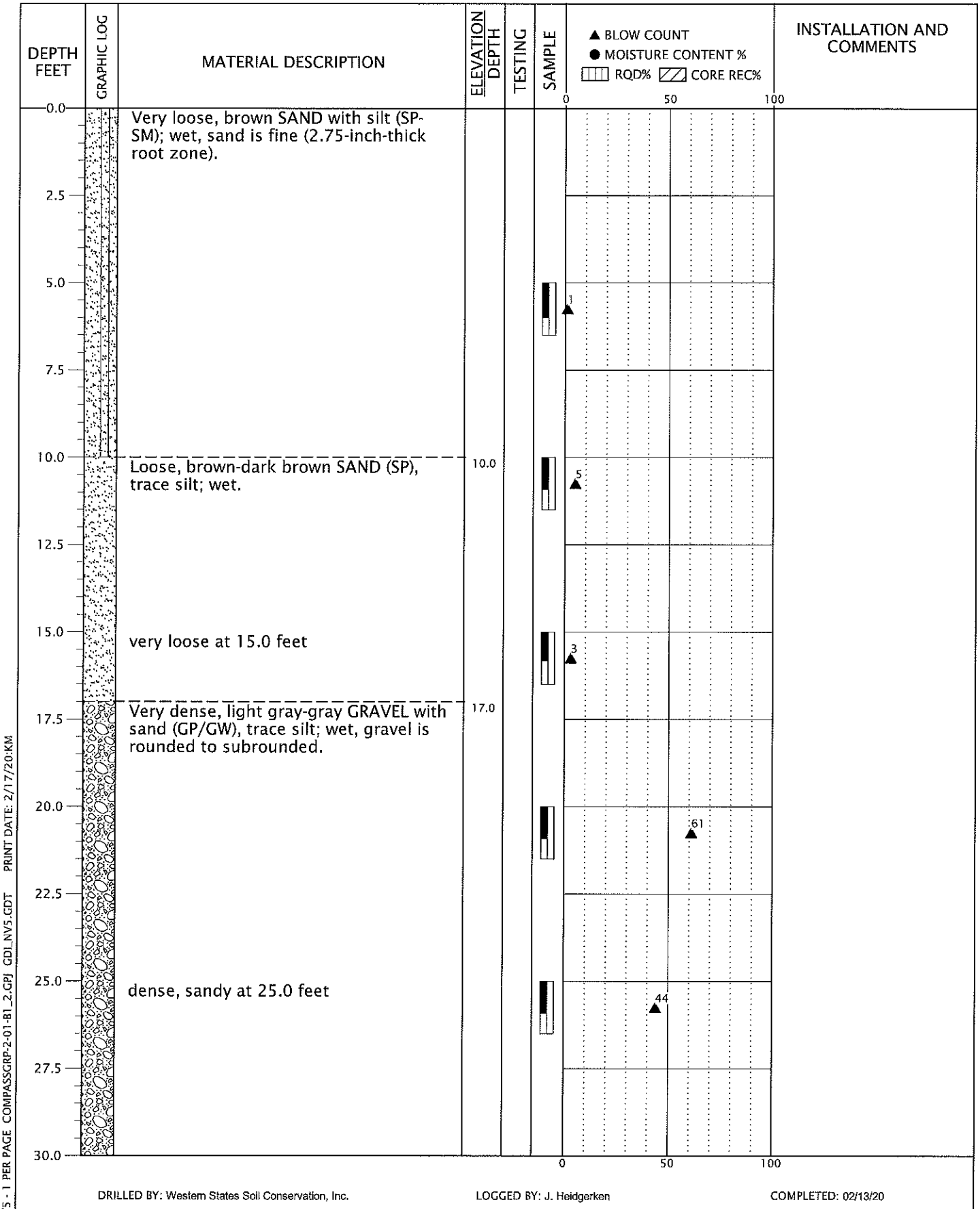
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: GeoDesign / CPT-5 / SW Larson Lane Castle Rock

TEST DATE: 1/14/2020 8:44:26 AM





DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: J. Heidgerken COMPLETED: 02/13/20

BORING METHOD: mud rotary (see document text) BORING BIT DIAMETER: 4 7/8 inches

GEODESIGN INC
AN NV5 COMPANY

COMPASSGRP-2-01

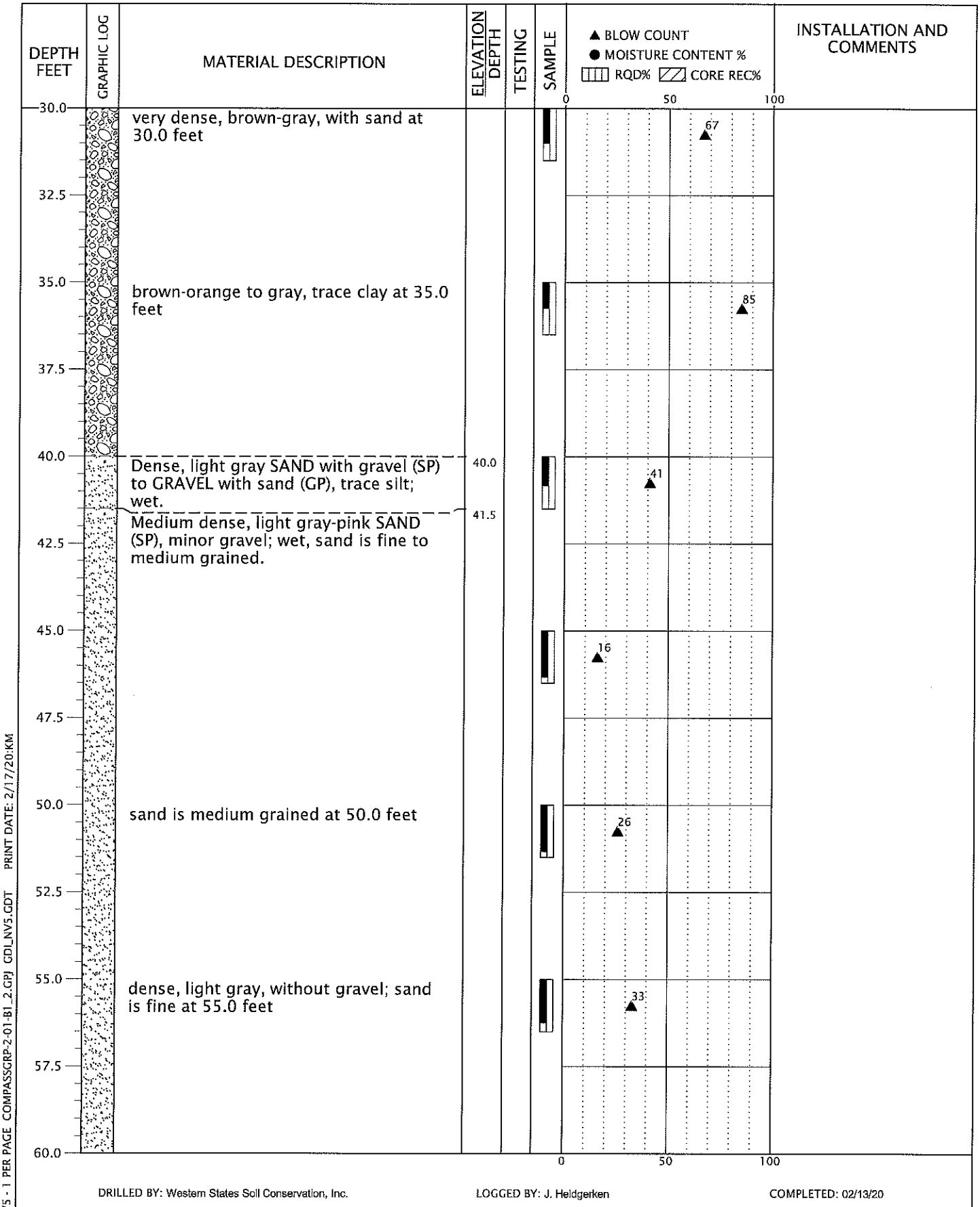
FEBRUARY 2020

BORING B-1

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-1

BORING LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2.GPJ GDI_NV5.GDT PRINT DATE: 2/17/20:KM



DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: J. Heldgerken COMPLETED: 02/13/20

BORING METHOD: mud rotary (see document text) BORING BIT DIAMETER: 4 7/8 inches

BORING LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2.GPJ GDI_NV5.GDT PRINT DATE: 2/17/20:KM

GEODESIGN INC AN NV5 COMPANY

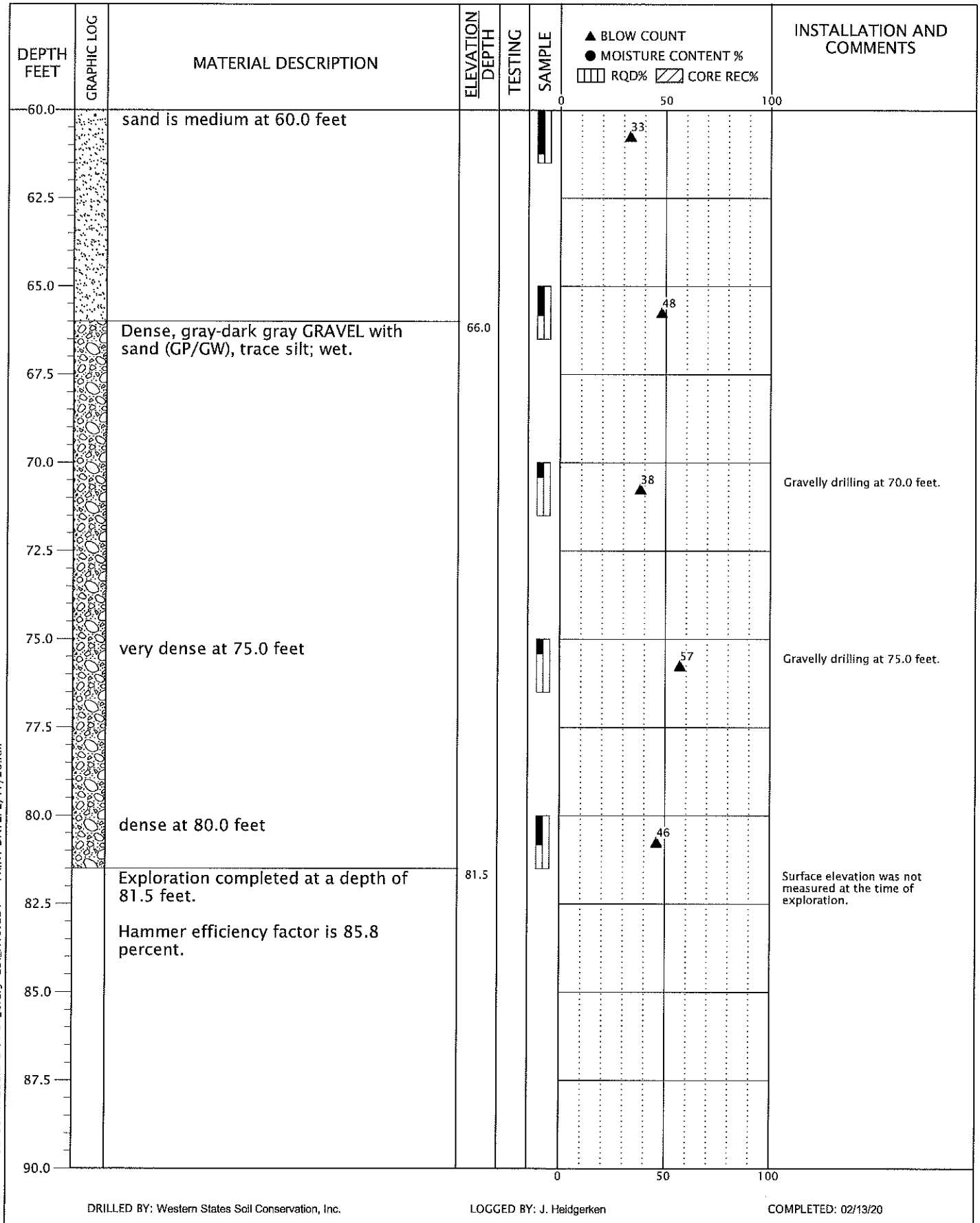
COMPASSGRP-2-01

FEBRUARY 2020

BORING B-1
(continued)

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-1



DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: J. Heidgerken COMPLETED: 02/13/20

BORING METHOD: mud rotary (see document text) BORING BIT DIAMETER: 4 7/8 inches

GEODESIGN INC
AN NV5 COMPANY

COMPASSGRP-2-01

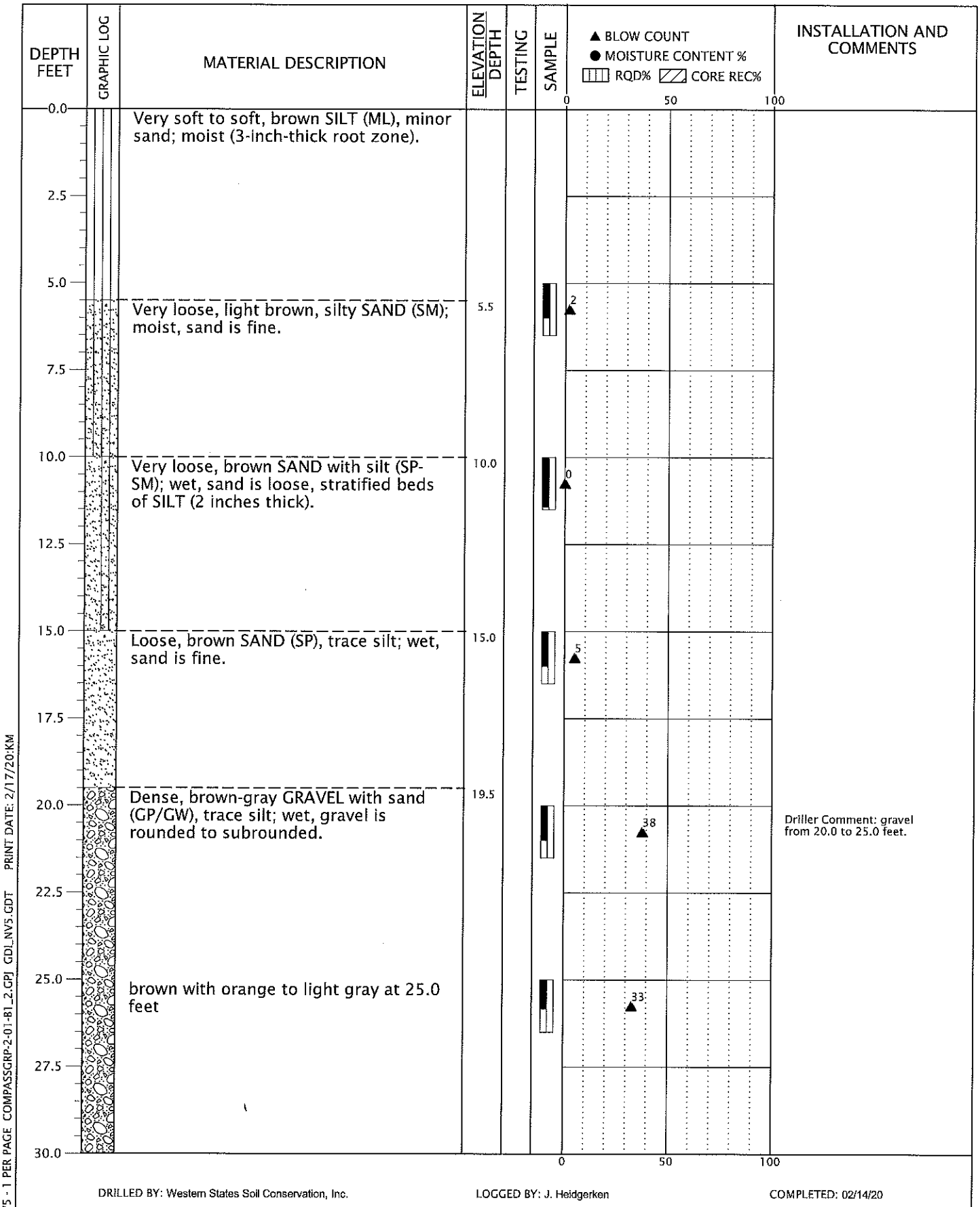
FEBRUARY 2020

BORING B-1
(continued)

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-1

BORING LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2.GPJ GDI_NV5.GDT PRINT DATE: 2/17/20:KM



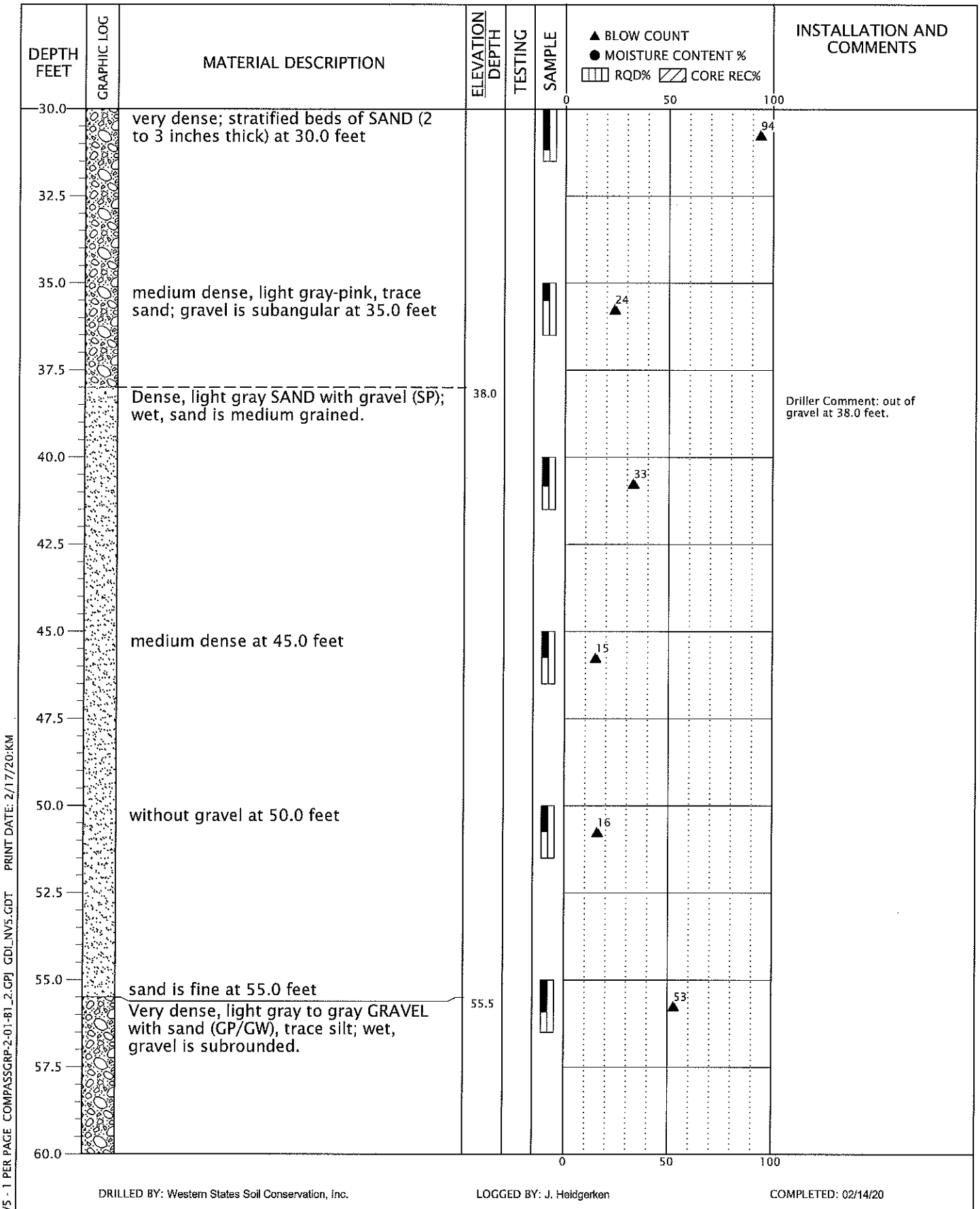
DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: J. Heidgerken COMPLETED: 02/14/20

BORING METHOD: mud rotary (see document text) BORING BIT DIAMETER: 4 7/8 inches

GEODESIGN INC
AN NV5 COMPANY

COMPASSGRP-2-01	**BORING B-2**	
FEBRUARY 2020	LARSON LANE SITE CASTLE ROCK, WA	**FIGURE A-2**

BORING LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2.GPJ GDI_NV5.GDT PRINT DATE: 2/17/20:KM



DRILLED BY: Western States Soil Conservation, Inc.

LOGGED BY: J. Heidgerken

COMPLETED: 02/14/20

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches

GeoDesign Inc
AN NV5 COMPANY

COMPASSGRP-2-01

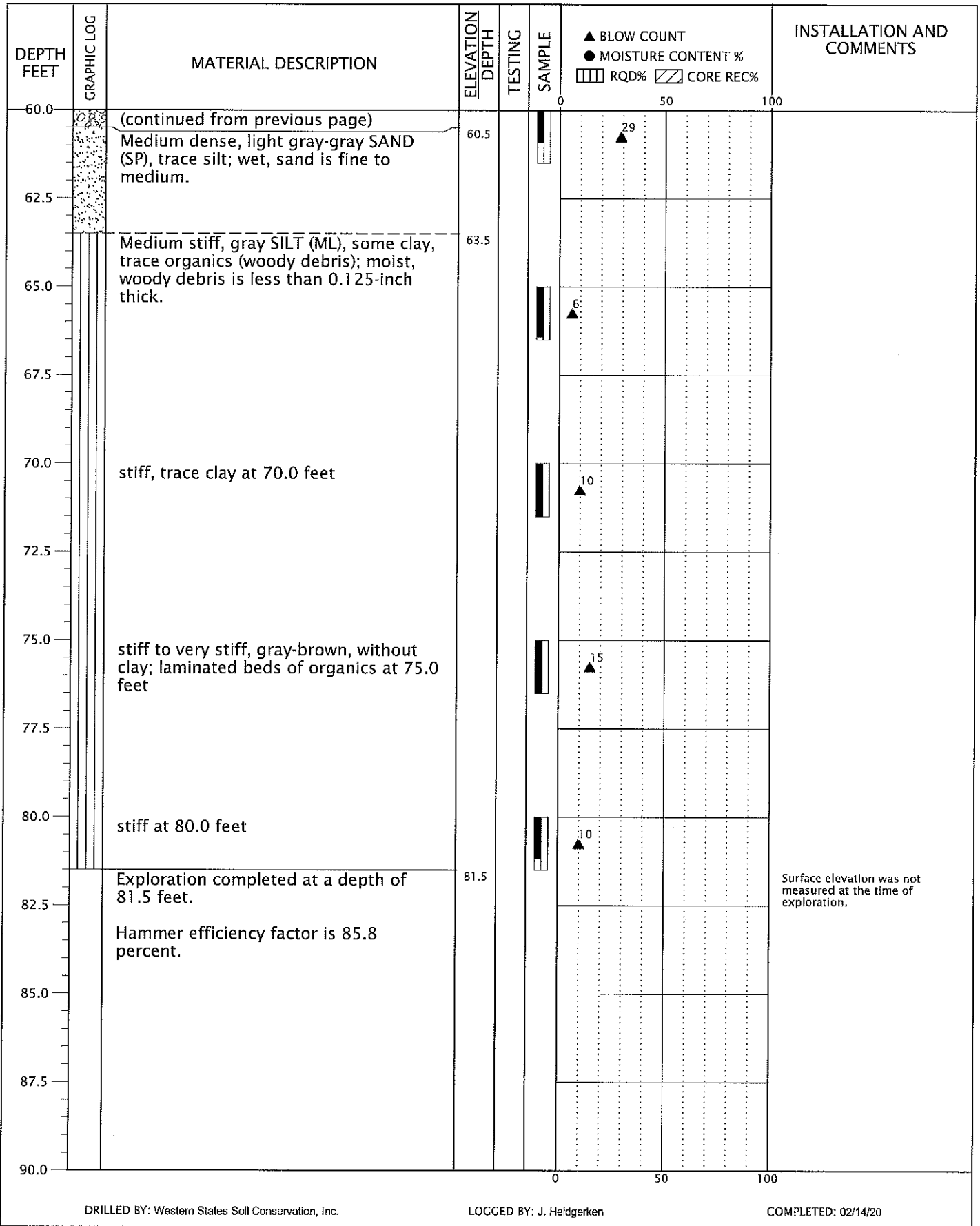
FEBRUARY 2020

BORING B-2
(continued)

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-2

BORING LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2.GPJ GDI_NV5.GDT PRINT DATE: 2/17/20:KM



DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: J. Heidgerken COMPLETED: 02/14/20

BORING METHOD: mud rotary (see document text) BORING BIT DIAMETER: 4 7/8 inches

GEODESIGN INC AN NV5 COMPANY

COMPASSGRP-2-01

BORING B-2
(continued)

FEBRUARY 2020

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-2

BORING LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2.GPJ GDI_NV5.GDT PRINT DATE: 2/17/20:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Loose, dark brown, silty SAND (SM), trace organics; moist to wet, sand is fine (3-inch-thick root zone).					
			0.8				
		Loose, brown SAND with silt (SP-SM), trace organics; moist, sand is fine. without organics at 1.5 feet					
2.5							
5.0							
7.5							
							Severe caving observed at 9.5 feet.
10.0		Loose, brown SAND (SP), trace silt; wet, sand is medium.	10.0				Rapid groundwater seepage observed at 10.5 feet.
12.5		Exploration completed at a depth of 12.5 feet.	12.5				Surface elevation was not measured at the time of exploration.
15.0							
17.5							
20.0						0 50 100	

EXCAVATED BY: Tapani, Inc. LOGGED BY: J. Guenther COMPLETED: 01/14/20

EXCAVATION METHOD: mini excavator (see document text)

GEODESIGN INC AN NV5 COMPANY

COMPASSGRP-2-01

TEST PIT TP-1

MARCH 2020

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-3

TEST PIT LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2-TP1_6.GPJ GDI_NV5.GDT PRINT DATE: 3/3/20:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Loose, dark brown, silty SAND (SM), trace organics; moist, sand is fine (3-inch-thick root zone).			☒		
		Loose, light brown SAND with silt (SP-SM), trace organics; moist, sand is fine.	1.5				
2.5		without organics at 2.5 feet			☒		
5.0							
7.5							Severe caving observed at 8.2 feet.
10.0							
		Loose, brown SAND (SP), trace silt; moist, sand is medium.	11.5		☒		
12.5		Exploration completed at a depth of 13.0 feet.	13.0				No groundwater seepage observed to the depth explored. Surface elevation was not measured at the time of exploration.
15.0							
17.5							
20.0							

EXCAVATED BY: Tapani, Inc. LOGGED BY: J. Guenther COMPLETED: 01/14/20

EXCAVATION METHOD: mini excavator (see document text)

GEODESIGN INC AN NV5 COMPANY

COMPASSGRP-2-01

TEST PIT TP-2

MARCH 2020

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-4

TEST PIT LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2-TP1_6.GPJ GDI_NV5.GDT PRINT DATE: 3/3/20:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium dense, dark brown SAND with silt (SP-SM), trace gravel and organics; moist to wet, sand is fine to coarse, gravel is fine and subrounded (4-inch-thick root zone).			☒		Minor caving observed between 1.0 and 4.0 feet.
2.5		gray-brown, minor gravel; sand is medium to coarse at 0.4 foot without organics at 1.5 feet			☒		
5.0		gray at 5.5 feet			☒		
7.5					☒		Slow groundwater seepage observed at 9.0 feet.
10.0					☒		
		Stiff, dark brown, sandy SILT (MH), trace organics; moist, silt has medium plasticity, sand is fine.	10.5				
		Exploration completed at a depth of 11.5 feet.	11.5				Surface elevation was not measured at the time of exploration.
12.5							
15.0							
17.5							
20.0							

EXCAVATED BY: Tapani, Inc. LOGGED BY: J. Guenther COMPLETED: 01/14/20

EXCAVATION METHOD: mini excavator (see document text)

GEODESIGN INC AN NV5 COMPANY

COMPASSGRP-2-01

TEST PIT TP-3

MARCH 2020

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-5

TEST PIT LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2-TP1_6.GPJ GDI_NV5.GDT PRINT DATE: 3/3/20:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Very loose to loose, gray-brown SAND with silt (SP-SM), minor gravel, trace organics; moist to wet, sand is medium to coarse.					Severe caving observed from 0.0 to 10.5 feet.
		without organics at 1.5 feet			☒		
2.5							
5.0							
7.5							
		gray at 9.5 feet			☒		Slow groundwater seepage observed at 10.0 feet.
10.0		Medium stiff, dark brown, sandy SILT (MH), trace organics; moist, silt has medium plasticity, sand is fine.	10.5		☒		
12.5		Exploration completed at a depth of 12.0 feet.	12.0				Surface elevation was not measured at the time of exploration.
15.0							
17.5							
20.0							

EXCAVATED BY: Tapani, Inc. LOGGED BY: J. Guenther COMPLETED: 01/14/20

EXCAVATION METHOD: mini excavator (see document text)

GEODESIGN INC AN NV5 COMPANY

COMPASSGRP-2-01

TEST PIT TP-4

MARCH 2020

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-6

TEST PIT LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2-TP1_6.GPJ GDI_NV5.GDT PRINT DATE: 3/3/20:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Loose, gray-brown SAND with silt (SP-SM), minor gravel, trace organics; moist to wet, sand is fine to coarse, gravel is fine to coarse and subrounded (4-inch-thick root zone). without organics at 1.5 feet			☒		Severe caving observed from 0.0 to 8.0 feet.
7.5		Soft to very soft, dark brown, sandy SILT (MH), trace organics; moist, silt has medium plasticity, sand is fine.	7.5		☒		Numerous sticks and roots from 8.0 to 9.0 feet.
12.5							Moderate groundwater seepage observed at 12.0 feet.
		Exploration completed at a depth of 13.0 feet.	13.0				Surface elevation was not measured at the time of exploration.
20.0							

EXCAVATED BY: Tapani, Inc. LOGGED BY: J. Guenther COMPLETED: 01/14/20

EXCAVATION METHOD: mini excavator (see document text)

GEODESIGN INC AN NV5 COMPANY

COMPASSGRP-2-01

TEST PIT TP-5

MARCH 2020

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-7

TEST PIT LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2-TP1_6.GPJ GDI_NV5.GDT PRINT DATE: 3/3/20:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium dense to dense, gray-brown SAND with silt (SP-SM), minor gravel, trace organics; moist to wet, sand is fine to coarse, gravel is fine to coarse and subrounded.					Severe caving observed from 0.0 to 11.0 feet.
2.5					☒		
		brown, without gravel and organics; sand is fine at 3.0 feet					
5.0					☒		
7.5							
10.0		Loose, dark brown SAND (SP), trace silt; wet, sand is medium.	10.0		☒		Rapid groundwater seepage observed at 10.0 feet.
		Exploration terminated at a depth of 11.0 feet due to caving.	11.0				Surface elevation was not measured at the time of exploration.
12.5							
15.0							
17.5							
20.0							

EXCAVATED BY: Tapani, Inc. LOGGED BY: J. Guenther COMPLETED: 01/14/20

EXCAVATION METHOD: mini excavator (see document text)

GeoDesign Inc
AN NV5 COMPANY

COMPASSGRP-2-01

TEST PIT TP-6

MARCH 2020

LARSON LANE SITE
CASTLE ROCK, WA

FIGURE A-8

TEST PIT LOG - GDI-NV5 - 1 PER PAGE COMPASSGRP-2-01-B1_2-TP1_6.GPJ GDI_NV5.GDT PRINT DATE: 3/3/20:KM

APPENDIX D
REPORT LIMITATIONS AND IMPORTANT INFORMATION

Geotechnical ■ Environmental ■ Special Inspections
Columbia West Engineering, Inc

Date: March 30, 2023
Project: Landing on the Cowlitz
Castle Rock, Washington

Geotechnical and Environmental Report Limitations and Important Information

Report Purpose, Use, and Standard of Care

This report has been prepared in accordance with standard fundamental principles and practices of geotechnical engineering and/or environmental consulting, and in a manner consistent with the level of care and skill typical of currently practicing local engineers and consultants. This report has been prepared to meet the specific needs of specific individuals for the indicated site. It may not be adequate for use by other consultants, contractors, or engineers, or if change in project ownership has occurred. It should not be used for any other reason than its stated purpose without prior consultation with Columbia West Engineering, Inc. (Columbia West). It is a unique report and not applicable for any other site or project. If site conditions are altered, or if modifications to the project description or proposed plans are made after the date of this report, it may not be valid. Columbia West cannot accept responsibility for use of this report by other individuals for unauthorized purposes, or if problems occur resulting from changes in site conditions for which Columbia West was not aware or informed.

Report Conclusions and Preliminary Nature

This geotechnical or environmental report should be considered preliminary and summary in nature. The recommendations contained herein have been established by engineering interpretations of subsurface soils based upon conditions observed during site exploration. The exploration and associated laboratory analysis of collected representative samples identifies soil conditions at specific discreet locations. It is assumed that these conditions are indicative of actual conditions throughout the subject property. However, soil conditions may differ between tested locations at different seasonal times of the year, either by natural causes or human activity. Distinction between soil types may be more abrupt or gradual than indicated on the soil logs. This report is not intended to stand alone without understanding of concomitant instructions, correspondence, communication, or potential supplemental reports that may have been provided to the client.

Because this report is based upon observations obtained at the time of exploration, its adequacy may be compromised with time. This is particularly relevant in the case of natural disasters, earthquakes, floods, or other significant events. Report conclusions or interpretations may also be subject to revision if significant development or other manmade impacts occur within or in proximity to the subject property. Groundwater conditions, if presented in this report, reflect observed conditions at the time of investigation. These conditions may change annually, seasonally or as a result of adjacent development.

Additional Investigation and Construction QA/QC

Columbia West should be consulted prior to construction to assess whether additional investigation above and beyond that presented in this report is necessary. Even slight variations in soil or site conditions may produce impacts to the performance of structural facilities if not adequately addressed. This underscores the importance of diligent QA/QC construction observation and testing to verify soil conditions do not differ materially or significantly from the interpreted conditions utilized for preparation of this report.

Therefore, this report contains several recommendations for field observation and testing by Columbia West personnel during construction activities. Actual subsurface conditions are more readily observed and discerned during the earthwork phase of construction when soils are exposed. Columbia West cannot accept responsibility for deviations from recommendations described in this report or future

performance of structural facilities if another consultant is retained during the construction phase or Columbia West is not engaged to provide construction observation to the full extent recommended.

Collected Samples

Uncontaminated samples of soil or rock collected in connection with this report will be retained for thirty days. Retention of such samples beyond thirty days will occur only at client's request and in return for payment of storage charges incurred. All contaminated or environmentally impacted materials or samples are the sole property of the client. Client maintains responsibility for proper disposal.

Report Contents

This geotechnical or environmental report should not be copied or duplicated unless in full, and even then only under prior written consent by Columbia West, as indicated in further detail in the following text section entitled *Report Ownership*. The recommendations, interpretations, and suggestions presented in this report are only understandable in context of reference to the whole report. Under no circumstances should the soil boring or test pit excavation logs, monitor well logs, or laboratory analytical reports be separated from the remainder of the report. The logs or reports should not be redrawn or summarized by other entities for inclusion in architectural or civil drawings, or other relevant applications.

Report Limitations for Contractors

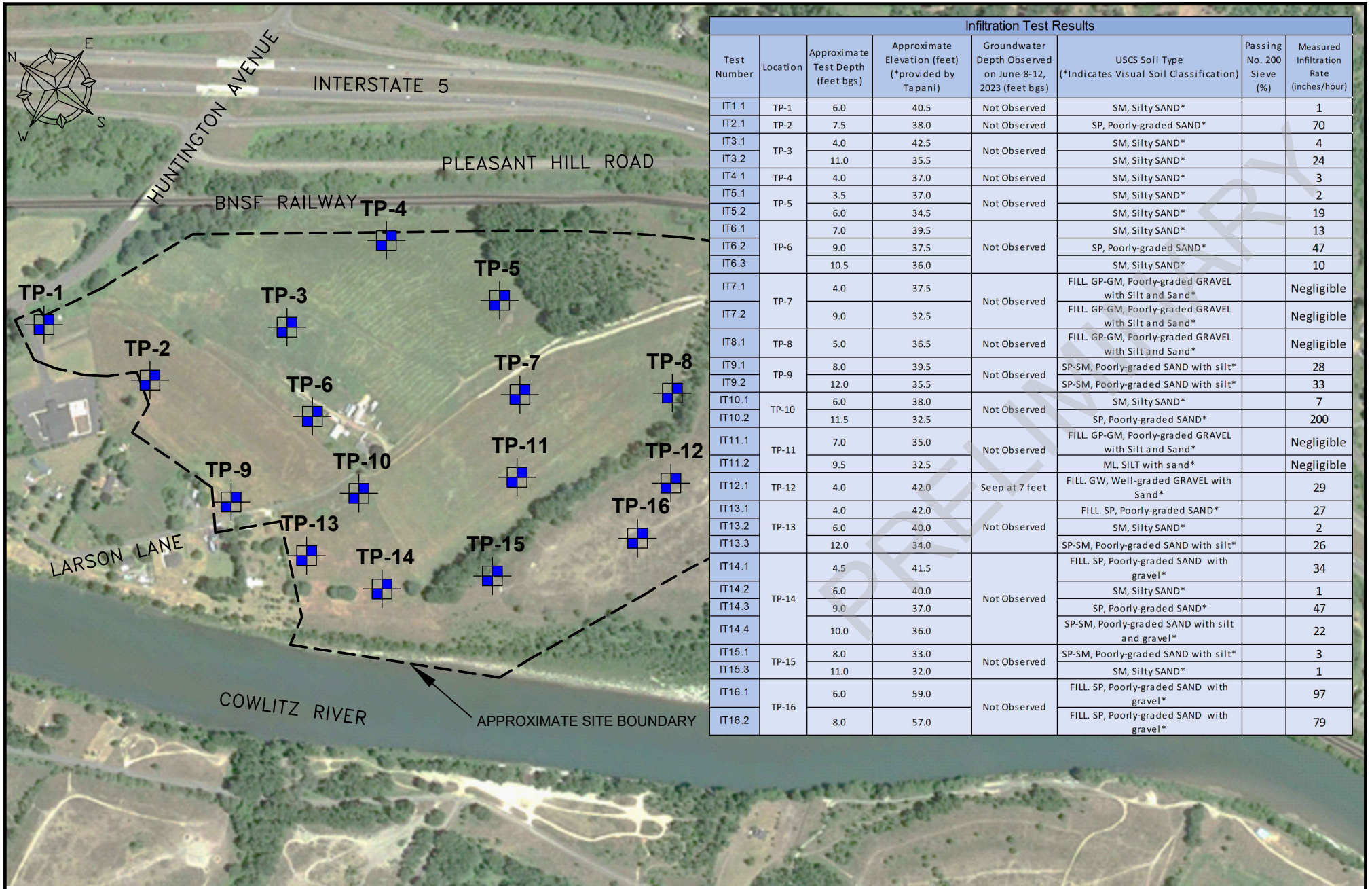
Geotechnical or environmental reports, unless otherwise specifically noted, are not prepared for the purpose of developing cost estimates or bids by contractors. The extent of exploration or investigation conducted as part of this report is usually less than that necessary for contractor's needs. Contractors should be advised of these report limitations, particularly as they relate to development of cost estimates. Contractors may gain valuable information from this report, but should rely upon their own interpretations as to how subsurface conditions may affect cost, feasibility, accessibility and other components of the project work. If believed necessary or relevant, contractors should conduct additional exploratory investigation to obtain satisfactory data for the purposes of developing adequate cost estimates. Clients or developers cannot insulate themselves from attendant liability by disclaiming accuracy for subsurface ground conditions without advising contractors appropriately and providing the best information possible to limit potential for cost overruns, construction problems, or misunderstandings.

Report Ownership

Columbia West retains the ownership and copyright property rights to this entire report and its contents, which may include, but may not be limited to, figures, text, logs, electronic media, drawings, laboratory reports, and appendices. This report was prepared solely for the client, and other relevant approved users or parties, and its distribution must be contingent upon prior express written consent by Columbia West. Furthermore, client or approved users may not use, lend, sell, copy, or distribute this document without express written consent by Columbia West. Client does not own nor have rights to electronic media files that constitute this report, and under no circumstances should said electronic files be distributed or copied. Electronic media is susceptible to unauthorized manipulation or modification, and may not be reliable.

Consultant Responsibility

Geotechnical and environmental engineering and consulting is much less exact than other scientific or engineering disciplines, and relies heavily upon experience, judgment, interpretation, and opinion often based upon media (soils) that are variable, anisotropic, and non-homogenous. This often results in unrealistic expectations, unwarranted claims, and uninformed disputes against a geotechnical or environmental consultant. To reduce potential for these problems and assist relevant parties in better understanding of risk, liability, and responsibility, geotechnical and environmental reports often provide definitive statements or clauses defining and outlining consultant responsibility. The client is encouraged to read these statements carefully and request additional information from Columbia West if necessary.



Infiltration Test Results

Test Number	Location	Approximate Test Depth (feet bgs)	Approximate Elevation (feet) (*provided by Tapani)	Groundwater Depth Observed on June 8-12, 2023 (feet bgs)	USCS Soil Type (*Indicates Visual Soil Classification)	Passing No. 200 Sieve (%)	Measured Infiltration Rate (inches/hour)
IT1.1	TP-1	6.0	40.5	Not Observed	SM, Silty SAND*		1
IT2.1	TP-2	7.5	38.0	Not Observed	SP, Poorly-graded SAND*		70
IT3.1	TP-3	4.0	42.5	Not Observed	SM, Silty SAND*		4
IT3.2		11.0	35.5		SM, Silty SAND*		24
IT4.1	TP-4	4.0	37.0	Not Observed	SM, Silty SAND*		3
IT5.1	TP-5	3.5	37.0	Not Observed	SM, Silty SAND*		2
IT5.2		6.0	34.5		SM, Silty SAND*		19
IT6.1	TP-6	7.0	39.5	Not Observed	SM, Silty SAND*		13
IT6.2		9.0	37.5		SP, Poorly-graded SAND*		47
IT6.3		10.5	36.0		SM, Silty SAND*		10
IT7.1	TP-7	4.0	37.5	Not Observed	FILL. GP-GM, Poorly-graded GRAVEL with Silt and Sand*		Negligible
IT7.2		9.0	32.5		FILL. GP-GM, Poorly-graded GRAVEL with Silt and Sand*		Negligible
IT8.1	TP-8	5.0	36.5	Not Observed	FILL. GP-GM, Poorly-graded GRAVEL with Silt and Sand*		Negligible
IT9.1	TP-9	8.0	39.5	Not Observed	SP-SM, Poorly-graded SAND with silt*		28
IT9.2		12.0	35.5		SP-SM, Poorly-graded SAND with silt*		33
IT10.1	TP-10	6.0	38.0	Not Observed	SM, Silty SAND*		7
IT10.2		11.5	32.5		SP, Poorly-graded SAND*		200
IT11.1	TP-11	7.0	35.0	Not Observed	FILL. GP-GM, Poorly-graded GRAVEL with Silt and Sand*		Negligible
IT11.2		9.5	32.5		ML, SILT with sand*		Negligible
IT12.1	TP-12	4.0	42.0	Seep at 7 feet	FILL. GW, Well-graded GRAVEL with Sand*		29
IT13.1	TP-13	4.0	42.0	Not Observed	FILL. SP, Poorly-graded SAND*		27
IT13.2		6.0	40.0		SM, Silty SAND*		2
IT13.3		12.0	34.0		SP-SM, Poorly-graded SAND with silt*		26
IT14.1	TP-14	4.5	41.5	Not Observed	FILL. SP, Poorly-graded SAND with gravel*		34
IT14.2		6.0	40.0		SM, Silty SAND*		1
IT14.3		9.0	37.0		SP, Poorly-graded SAND*		47
IT14.4		10.0	36.0		SP-SM, Poorly-graded SAND with silt and gravel*		22
IT15.1	TP-15	8.0	33.0	Not Observed	SP-SM, Poorly-graded SAND with silt*		3
IT15.3		11.0	32.0		SM, Silty SAND*		1
IT16.1	TP-16	6.0	59.0	Not Observed	FILL. SP, Poorly-graded SAND with gravel*		97
IT16.2		8.0	57.0		FILL. SP, Poorly-graded SAND with gravel*		79

TEST PIT WITH INFILTRATION TESTING

Geotechnical ▪ Environmental ▪ Special Inspections
Columbia West Engineering, Inc

Project: 22310
Date: 06/20/23
Drawn: MAC
Checked: GLW

EXPLORATION LOCATION MAP
LANDING ON THE COWLITZ

NOTES:
1. SITE LOCATION: 2542 SW LARSON LANE, CASTLE ROCK, WASHINGTON.
2. SITE CONSISTS OF PORTIONS OF TAX PARCEL NOS. 3092824, 3040258, 3040259, 3040322, 3014867, & 3045031 TOTALING APPROXIMATELY 118.2 ACRES.
3. DRAWING IS NOT TO SCALE.
4. BASE MAP OBTAINED FROM GOOGLE EARTH, 2023.
5. EXPLORATION LOCATIONS ARE APPROXIMATE AND NOT SURVEYED.
6. TEST PITS BACKFILLED LOOSELY WITH ONSITE SOILS ON JUNE 8, JUNE 9, AND JUNE 12, 2023.

FIGURE 2

A1
k = 18 in/hr at 6 feet
Sand with silt layer: 5 to 12 feet BGS

A2
k = 20 in/hr at 9 feet
Sand with silt layer: 9 to 12 feet BGS

A3
No IT conducted.
SILT profile observed

A13
k = 60 in/hr at 9 feet
Sand layer: 9 to 13 feet BGS

A12
No IT conducted.
Poorly drained profile.

A11
No IT conducted.
Poorly drained profile.

Not explored. Canal area.

A8
No IT conducted.
~13 feet of FILL.

A4
k = 65 in/hr at 10 feet
Sand with silt layer: 8 to 13 feet BGS

A5
No IT conducted.
~13 feet of FILL over SILT

A6
No IT conducted.
~11 feet of FILL over SILT

A7
No IT conducted.
~11 feet of FILL. Groundwater at 11 feet BGS.

HUNTINGTON AVENUE S.
BNSF TRACKS
PLEASANT HILL ROAD
SALMON CREEK
LARSEN LN SW
COWLITZ RIVER
COMMERCIAL
FLEX (EMP/COM)
OPEN SPACE
EMPLOYMENT
RESIDENTIAL
RECREATION
LANDING ON THE COWLITZ PROPERTY
D.N.R. PROPERTY
250' HABITAT BUFFER
200' SHORELINE PUBLIC ACCESS MGMT AREA
150' HIGH INTENSITY SHORELINE - OHWM BUFFER
SHORELINE
OHW

TP1 TP2 TP3 TP4 TP5 TP6 TP7 TP8 TP9 TP10 TP11 TP12 TP13 TP14 TP15 TP16
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13

0 150 300
SCALE: 1" = 150'

LEGEND

PROPERTY TESTED LOCATION

PROPOSED LOCATION

Know what's below. Call before you dig.

PRELIMINARY RESULTS FROM TESTING CONDUCTED ON MARCH 13, 2024

FILE: W:\17783 CASTLE ROCK ENVIRO AND FILL PERMITS\500 DESIGN\502 DRAWINGS\EXHIBITS\2024-03-06 ADDITIONAL INFILTRATION TEST LOCATIONS.DWG

MacKay Sposito
ENERGY PUBLIC WORKS LAND DEVELOPMENT
www.mackaysposito.com

LANDING ON THE COWLITZ
CASTLE ROCK, COWLITZ

INFILTRATION TEST LOCATIONS

REVISIONS:

JOB NO.:	23-463
DATE:	MARCH 2024
SCALE:	1" = 150'
DESIGNED BY:	MDR
DRAWN BY:	MDR
CHECKED BY:	TAW

EX1.0

11917 NE 95TH Street, Vancouver, Washington 98682
Phone: 360-823-2900, Fax: 360-823-2901
www.columbiawestengineering.com

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Columbia West Engineering, Inc

TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-17
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Not Observed	0800	0905

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						FILL. Gray poorly-graded SAND and gravel, dense.					
				ML		Orange-tan sandy SILT, moist to wet, medium dense, sand is fine.					
5	TP17.1			SP-SM		Light brown poorly-graded SAND with silt, moist, loose, sand is medium-grained and subangular.					
10						Bottom of test pit at 12 feet bgs. Groundwater not encountered on 3/13/24.					
15											

Preliminary
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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-18
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Not Observed	0905	0935

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						FILL. Gray poorly-graded SAND and gravel, dense.					
				ML		Gray SILT with sand, moist, soft, sand is fine.					
				SM		Brown silty SAND, moist, loose to medium dense, sand is fine-to medium-grained and subangular.					
5											
				SP-SM		Light brown poorly-graded SAND with silt, moist, loose, sand is medium-grained and subangular.					
10	TP18.1										
						Bottom of test pit at 12 feet bgs. Groundwater not encountered on 3/13/24.					
15											

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-19
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Not Observed	1010	1040

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						Organic strippings.					
				ML		Brown SILT, moist, soft, low to medium plasticity.					
5				SM		Brown silty SAND, moist, loose to medium dense, sand is fine-grained and subangular.					
10											
15						Bottom of test pit at 14.5 feet bgs. Groundwater not encountered on 3/13/24.					

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-20
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Not Observed	0935	1010

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						FILL. Gray poorly-graded SAND and gravel, dense.					
5				SM		Brown silty SAND, moist, loose to medium dense, sand is fine-grained and subangular.					
10	TP20.1			SP-SM		Gray and brown poorly-graded SAND with silt, moist, loose, sand is medium-grained and subangular.					
15						Bottom of test pit at 13 feet bgs. Groundwater not encountered on 3/13/24.					

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-21
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Not Observed	1040	1105

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						FILL. Gray poorly-graded SAND and gravel, dense.					
5						FILL. Light gray, poorly-graded GRAVEL with silt and sand, moist, very dense dense.					
10						FILL. Gray poorly-graded SAND and gravel, dense.					
				OH		Black organic SILT, moist, soft.					
15						Bottom of test pit at 14.5 feet bgs. Groundwater not encountered on 3/13/24.					

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-22
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Not Observed	1105	1130

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						FILL. Gray poorly-graded SAND and gravel, dense.					
5						FILL. Light gray, poorly-graded GRAVEL with silt and sand, moist, very dense dense.					
10						FILL. Gray poorly-graded SAND and gravel, dense.					
				OH		Black organic SILT, moist, soft.					
15						Bottom of test pit at 13 feet bgs. Groundwater not encountered on 3/13/24.					

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-23
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Observed at 11 feet BGS	1330	1500

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						3 inch root zone contained in 10 inches of sandy silt topsoil.					
						FILL. Light gray, poorly-graded GRAVEL with silt and sand, moist, very dense dense.					
5											
10						Becomes wet.					▼
						Bottom of test pit at 11 feet bgs. Groundwater encountered at 11 feet on 3/13/24.					
15											

Preliminary
03/20/2024 3:58:49 PM

11917 NE 95TH Street, Vancouver, Washington 98682
Phone: 360-823-2900, Fax: 360-823-2901
www.columbiawestengineering.com

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Columbia West Engineering, Inc

TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-24
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Not Observed	1500	1555

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						3 inch root zone contained in 10 inches of sandy silt topsoil.					
						FILL. Light gray, poorly-graded GRAVEL with silt and sand, moist, very dense dense.					
5											
10											
						Bottom of test pit at 13 feet bgs. Groundwater not encountered on 3/13/24.					
15											

Preliminary
03/20/2024 3:58:49 PM

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-25
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Not Observed	1130	1215

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						FILL. Gray poorly-graded SAND and gravel, dense.					
				SM		Brown silty SAND, moist, loose to medium dense, sand is fine-grained and subangular.					
5											
10											
						Bottom of test pit at 12 feet bgs. Groundwater not encountered on 3/13/24.					
15											

Preliminary
03/20/2024 3:58:49 PM

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-26
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Not Observed	1245	1330

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						FILL. Gray poorly-graded SAND and gravel, dense.					
				SM		Brown silty SAND, moist, loose to medium dense, sand is fine-grained and subangular.					
5											
10											
						Bottom of test pit at 14.5 feet bgs. Groundwater not encountered on 3/13/24.					
15											

Preliminary
03/20/2024 3:58:49 PM

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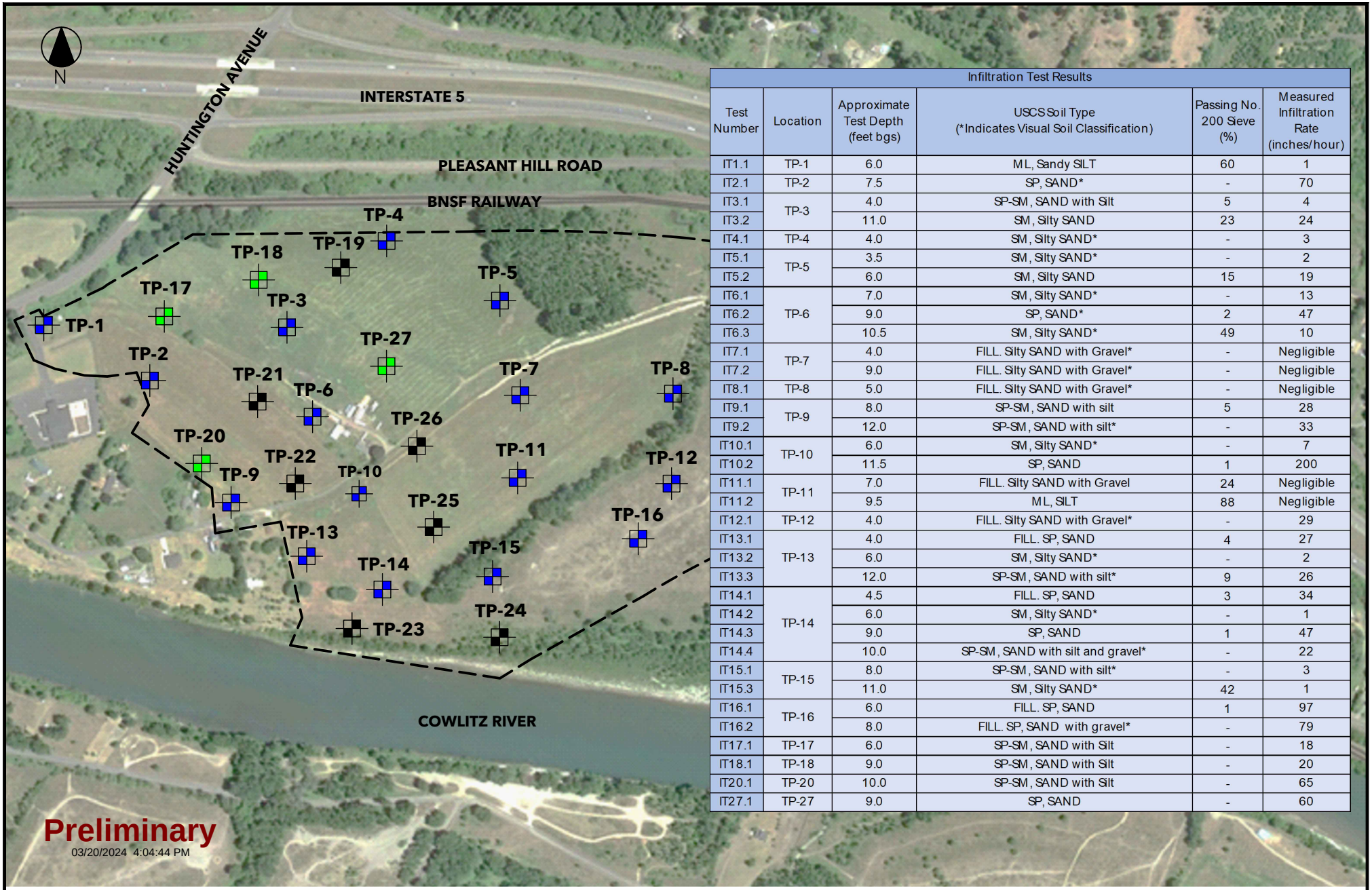
TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Landing at Cowlitz	CT6, LLC		22310	TP-27
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Castle Rock, Washington	Tapani	CAT 215 Excavator	MAC	3/13/24
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUNDWATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	Not Surveyed	Not Observed	1215	1245

Depth (feet)	Sample Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Groundwater Depth
0						FILL. Gray poorly-graded SAND and gravel, dense.					
				ML		Orange-tan sandy SILT, moist to wet, medium dense, sand is fine.					
5				SM		Brown silty SAND, moist, loose to medium dense, sand is fine-grained and subangular.					
	TP27.1										
10				SP-SM		Gray and brown poorly-graded SAND with silt, moist, loose, sand is medium-grained and subangular.					
						Bottom of test pit at 13 feet bgs. Groundwater not encountered on 3/13/24.					
15											

Preliminary
03/20/2024 3:58:49 PM



Infiltration Test Results

Test Number	Location	Approximate Test Depth (feet bgs)	USCS Soil Type (*Indicates Visual Soil Classification)	Passing No. 200 Sieve (%)	Measured Infiltration Rate (inches/hour)
IT1.1	TP-1	6.0	ML, Sandy SILT	60	1
IT2.1	TP-2	7.5	SP, SAND*	-	70
IT3.1	TP-3	4.0	SP-SM, SAND with Silt	5	4
IT3.2		11.0	SM, Silty SAND	23	24
IT4.1	TP-4	4.0	SM, Silty SAND*	-	3
IT5.1	TP-5	3.5	SM, Silty SAND*	-	2
IT5.2		6.0	SM, Silty SAND	15	19
IT6.1	TP-6	7.0	SM, Silty SAND*	-	13
IT6.2		9.0	SP, SAND*	2	47
IT6.3		10.5	SM, Silty SAND*	49	10
IT7.1	TP-7	4.0	FILL. Silty SAND with Gravel*	-	Negligible
IT7.2		9.0	FILL. Silty SAND with Gravel*	-	Negligible
IT8.1	TP-8	5.0	FILL. Silty SAND with Gravel*	-	Negligible
IT9.1	TP-9	8.0	SP-SM, SAND with silt	5	28
IT9.2		12.0	SP-SM, SAND with silt*	-	33
IT10.1	TP-10	6.0	SM, Silty SAND*	-	7
IT10.2		11.5	SP, SAND	1	200
IT11.1	TP-11	7.0	FILL. Silty SAND with Gravel	24	Negligible
IT11.2		9.5	ML, SILT	88	Negligible
IT12.1	TP-12	4.0	FILL. Silty SAND with Gravel*	-	29
IT13.1	TP-13	4.0	FILL. SP, SAND	4	27
IT13.2		6.0	SM, Silty SAND*	-	2
IT13.3		12.0	SP-SM, SAND with silt*	9	26
IT14.1	TP-14	4.5	FILL. SP, SAND	3	34
IT14.2		6.0	SM, Silty SAND*	-	1
IT14.3		9.0	SP, SAND	1	47
IT14.4		10.0	SP-SM, SAND with silt and gravel*	-	22
IT15.1	TP-15	8.0	SP-SM, SAND with silt*	-	3
IT15.3		11.0	SM, Silty SAND*	42	1
IT16.1	TP-16	6.0	FILL. SP, SAND	1	97
IT16.2		8.0	FILL. SP, SAND with gravel*	-	79
IT17.1	TP-17	6.0	SP-SM, SAND with Silt	-	18
IT18.1	TP-18	9.0	SP-SM, SAND with Silt	-	20
IT20.1	TP-20	10.0	SP-SM, SAND with Silt	-	65
IT27.1	TP-27	9.0	SP, SAND	-	60

SITE BOUNDARY | TEST PIT WITH INFILTRATION TEST (2023) | TEST PIT WITH INFILTRATION TEST (2024) | TEST PIT (2024)

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Columbia West Engineering, Inc

PROJECT: 22310
DATE: 03-20-24
DRAWN: GLW
CHECKED: NNP

EXPLORATION MAP
LANDING ON THE COWLITZ
CASTLE ROCK, WASHINGTON

NOTES:
1. SITE LOCATION: 2542 SW LARSON LANE, CASTLE ROCK, WASHINGTON.
2. SITE CONSISTS OF PORTIONS OF TAX PARCEL NOS. 3092824, 3040258, 3040259, 3040322, 3014867, & 3045031 TOTALING APPROXIMATELY 118.2 ACRES.
3. DRAWING IS NOT TO SCALE.
4. BASE MAP OBTAINED FROM GOOGLE EARTH, 2023.
5. EXPLORATION LOCATIONS ARE APPROXIMATE AND NOT SURVEYED.
6. TEST PITS TP-1 TO TP-16 BACKFILLED LOOSELY WITH ONSITE SOILS ON JUNE 8, JUNE 9, AND JUNE 12, 2023.
7. TEST PITS TP-17 TO TP-27 BACKFILLED LOOSELY WITH ONSITE SOILS ON MARCH 13, 2024.

FIGURE
2

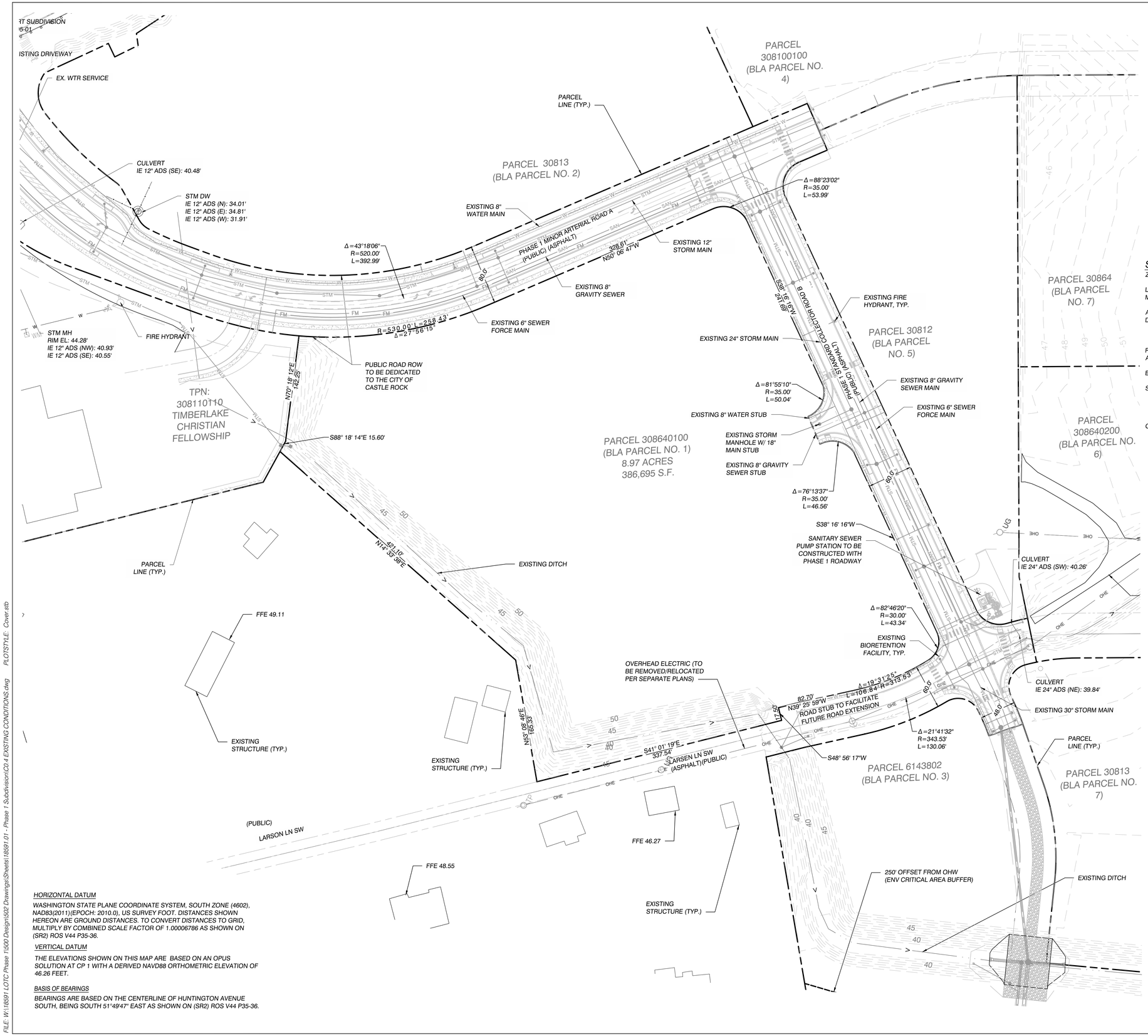
Appendix D Final Plans

Existing Conditions Plan

Grading & Erosion Control Plans

Street and Storm Plans

Street and Storm Profiles



SITE STATISTICS

ZONING:	*INDUSTRIAL*
LANDING ON THE COWLITZ (LOTC): MASTER PLAN DESIGNATION	*RESIDENTIAL*
APPLICABLE ZONING : DISTRICT STANDARDS	*HIGH DENSITY RESIDENTIAL (R-2) (LANDING ON THE COWLITZ CONDITIONS OF MATER PLAN APPROVAL, ITEM 2.C.)*
RECENT LAND USE DECISIONS : AFFECTING THE PROPERTY	*LANDING ON THE COWLITZ MASTER PLAN*
EXISTING USE OF PROPERTY:	*VACANT AND UNDEVELOPED*
SURROUNDING USES:	*RESIDENTIAL (NORTH); CHURCH (NORTHEAST); DEPARTMENT OF NATURAL RESOURCES (SOUTHEAST)*
CRITICAL AREA:	*THE EXISTING SITE AT THE TIME OF PRELIMINARY SUBDIVISION APPLICATION IS LOCATED WITHIN THE FEMA 100-YEAR FLOODPLAIN. HOWEVER, THE SUBDIVISION HAS BEEN DESINGED TO BE ABOVE THE BASE FLOOD ELEVATION (BFE) AT 50.8.*

NOTES

1. *EXISTING CONDITIONS SHOWN IN THIS PLAN SHALL BE THE EXISTING CONDITIONS FOLLOWING THE CONSTRUCTION OF THE PHASE 1 ACCESS AND UTILITIES, AS WELL AS THE LOTC OUTFALL. THIS CONSTRUCTION WILL BE COMPLETED PRIOR TO THE CONSTRUCTION OF THE RIVER'S EDGE SUBDIVISION.*
2. *REFER TO AFN 3762029 AND AFN 3763318 FOR FULL LEGAL DESCRIPTIONS OF THE EXISTING PARCELS REFERENCED IN THIS EXISTING CONDITIONS PLAN.*
3. *PORTIONS OF THE SITE CURRENTLY LIE WITHIN THE FEMA 100-YEAR FLOOD PLAIN BUT BUILDING PADS WILL BE PROPOSED A MINIMUM OF 1' ABOVE THE BASE FLOOD ELEVATION OF 48 FEET.*

SURVEY NOTE

THE BOUNDARY AND THE SUSEQUENT MATHEMATICAL SOLUTIONS USED IN THE ADJUSTED LEGAL DESCRIPTIONS HEREON ARE BASED ON BOUNDARY LINE ADJUSTMENT SURVEY RECORDED UNDER AUDITOR'S FILE NUMBER 3597924 IN CONJUNCTION WITH RECORD OF SURVEY BY MACKAY SPOSITIO, RECORDED UNDER AUDITOR'S FILE NUMBER 3732400, 34620229, AND 3763318.

HORIZONTAL DATUM

WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE (4602), NAD83(2011)(EPOCH: 2010.0), US SURVEY FOOT. DISTANCES SHOWN HEREON ARE GROUND DISTANCES. TO CONVERT DISTANCES TO GRID, MULTIPLY BY COMBINED SCALE FACTOR OF 1.00006786 AS SHOWN ON (SR2) ROS V44 P35-36.

VERTICAL DATUM

THE ELEVATIONS SHOWN ON THIS MAP ARE BASED ON AN OPUS SOLUTION AT CP 1 WITH A DERIVED NAVD88 ORTHOMETRIC ELEVATION OF 46.26 FEET.

BASIS OF BEARINGS

BEARINGS ARE BASED ON THE CENTERLINE OF HUNTINGTON AVENUE SOUTH, BEING SOUTH 51°49'47" EAST AS SHOWN ON (SR2) ROS V44 P35-36.

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www.mackaysposito.com

PRELIMINARY

ALEXANDRE W. TAYLOR
STATE OF WASHINGTON
22012357
REGISTERED
PROFESSIONAL ENGINEER

3/27/2025

RIVER'S EDGE AT THE LANDING SUBDIVISION
CASTLE ROCK, WASHINGTON

EXISTING CONDITIONS

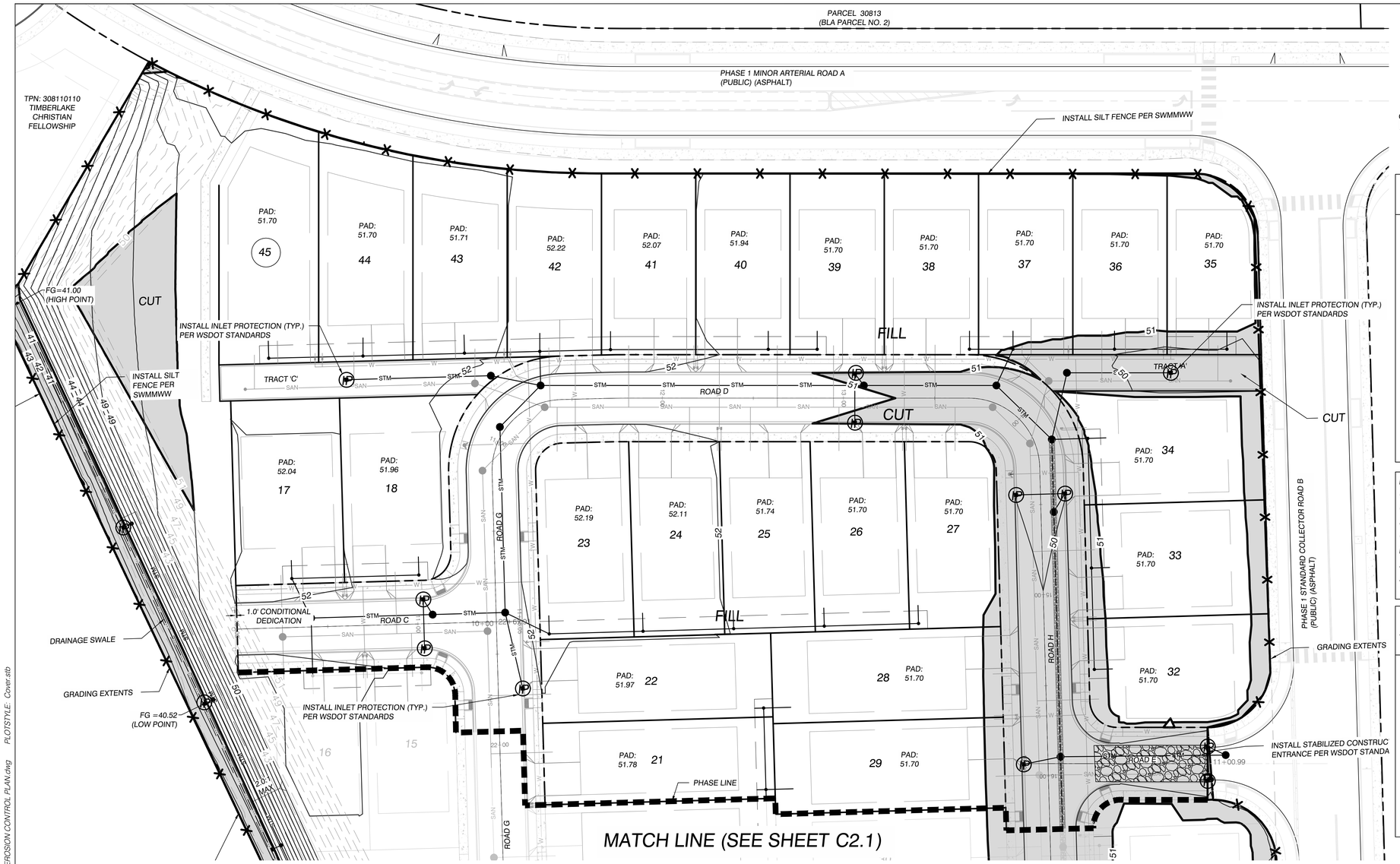
REVISIONS:

JOB NO.:	18591
DATE:	3/27/2025
SCALE: H: 1"= 60'	V: N/A
DESIGNED BY:	PJM
DRAWN BY:	PJM
CHECKED BY:	TAW

PRELIMINARY

C0.2

FILE: W:\18591 LOTC Phase 1\500 Design\502 Drawings\Sheets\18591.01 - Phase 1 Subdivision\C0.4 EXISTING CONDITIONS.dwg PLOTSTYLE: Cover.stb



LEGEND

- 298 — FINISHED GRADE CONTOUR
- 298 — EXISTING CONTOUR
- DRAINAGE SWALE
- AREA OF CUT
- AREA OF FILL
- IP — INLET PROTECTION
- STABALIZED CONSTRUCTION ENTRANCE
- SILT FENCE
- HIGH VISIBILITY FENCE

NOTE: DUE TO THE LIMITED EROSION CONTROL STANDARDS AVAILABLE BY THE CITY OF CASTLE ROCK, ALL EROSION AND SEDIMENT CONTROL DEVICES SHALL CONFORM WITH WSDOT STANDARDS. HOWEVER, CONTRACTOR MAY USE ALTERNATE DESIGNS IF THEY ARE APPROVED BY THE SITE INSPECTOR PRIOR TO INSTALLATION.

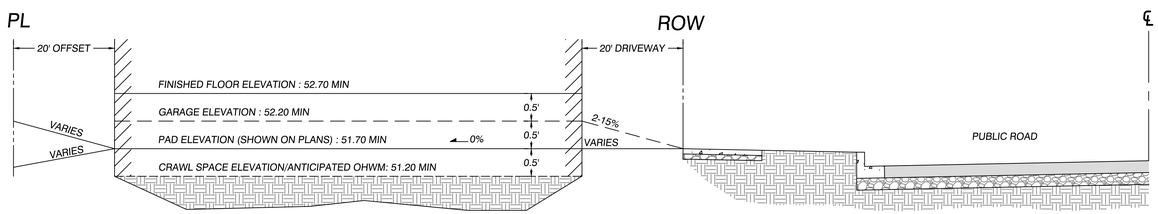
APPROXIMATE GRADING VOLUMES

CUT	2,000 CY
FILL	15,000 CY

NOTE: CUT AND FILL AREAS AND VOLUMES ARE CALCULATED FROM EXISTING GROUND TO FINISHED GRADE AND ARE NOT ADJUSTED FOR STRIPPINGS, TRENCH EXCAVATION, STRUCTURAL EXCAVATION OR SHRINK/SWELL. CONTRACTORS ARE SOLELY RESPONSIBLE FOR QUANTITY ESTIMATES FOR BIDDING PURPOSES.

CONSTRUCTION NOTES

1) ALL EROSION CONTROL DEVICES PROPOSED SHALL CONFORM WITH WSDOT STANDARDS.
2) CONTRACTOR TO CONSTRUCT EQUIPMENT AND PARKING AREA AT A SUITABLE LOCATION PRIOR TO BEGINNING GRADING ACTIVITIES. LOCATION TO BE DETERMINED PRIOR TO THE PRE-CONSTRUCTION CONFERENCE.
3) IF TRACKING OF SEDIMENT FROM THE SITE BECOMES A PROBLEM, A WHEEL WASH SHALL BE INSTALLED AT THE SITE ENTRANCE.
4) STOCKPILE AREAS PLACED ONSITE SHALL BE COORDINATED BY THE CONTRACTOR AND SURROUNDED WITH SILT FENCE AND COVERED WITH PLASTIC AS NECESSARY DURING CONSTRUCTION. MATERIAL NOT STOCKPILED ONSITE SHALL BE REMOVED TO AN APPROPRIATE IMPORT SITE.
5) ANY SLOPE LESS THAN 3:1 TO BE STABILIZED WITH SEEDING AND MULCH/STRAW.
6) CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING BMP T5.13.
7) EROSION CONTROL INSPECTION REQUIRED BEFORE YOU BEGIN ANY SITEWORK
8) THE BASE FLOOD ELEVATION IS 48.0 AND MINIMUM PAD ELEVATION (AS SHOWN ON PLAN) IS 51.70.



TYPICAL LOT SECTION

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ENERGY PUBLIC WORKS LAND DEVELOPMENT
www.mackaysposito.com

ANDREW W. TAYLOR
STATE OF WASHINGTON
22012357
REGISTERED
PROFESSIONAL ENGINEER

PRELIMINARY

3/27/2025

RIVER'S EDGE AT THE LANDING SUBDIVISION
CASTLE ROCK, WASHINGTON

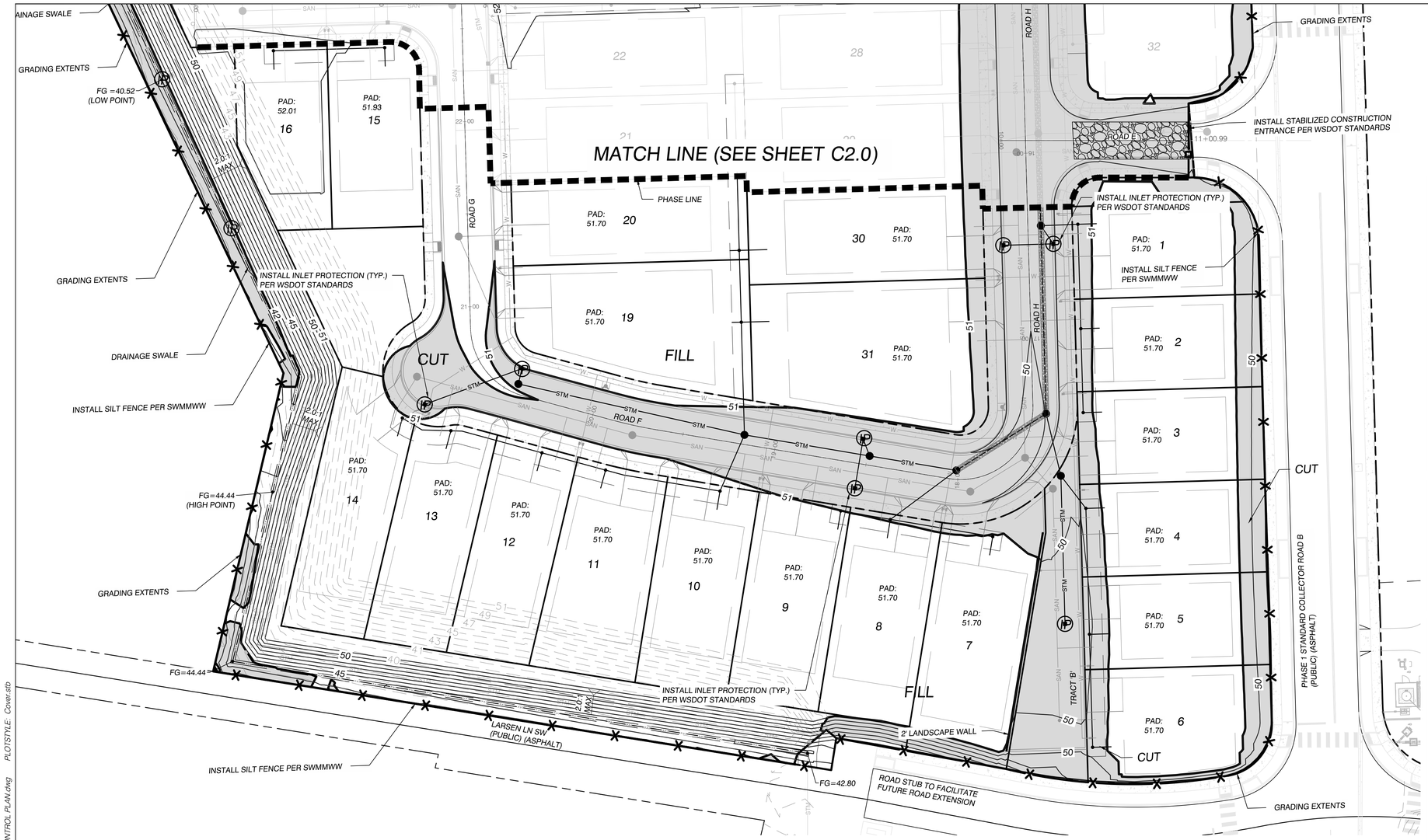
GRADING AND EROSION CONTROL PLAN (PHASE 1)

REVISIONS:

JOB NO.:	18591
DATE:	3/27/2025
SCALE: H: 1" = 30'	V: N/A
DESIGNED BY:	PJM
DRAWN BY:	PJM
CHECKED BY:	TAW

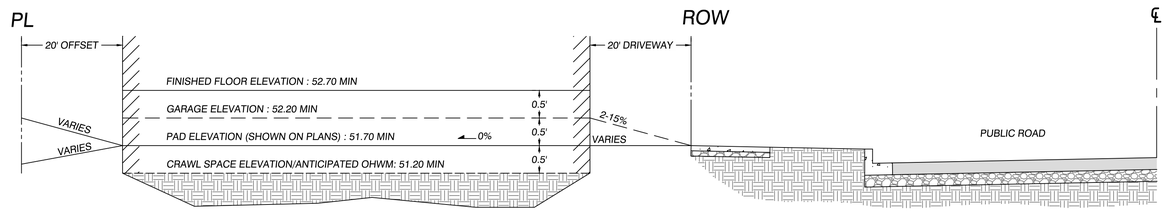
PRELIMINARY

C2.0



CONSTRUCTION NOTES

1) ALL EROSION CONTROL DEVICES PROPOSED SHALL CONFORM WITH WSDOT STANDARDS.
2) CONTRACTOR TO CONSTRUCT EQUIPMENT AND PARKING AREA AT A SUITABLE LOCATION PRIOR TO BEGINNING GRADING ACTIVITIES. LOCATION TO BE DETERMINED PRIOR TO THE PRE-CONSTRUCTION CONFERENCE.
3) IF TRACKING OF SEDIMENT FROM THE SITE BECOMES A PROBLEM, A WHEEL WASH SHALL BE INSTALLED AT THE SITE ENTRANCE.
4) STOCKPILE AREAS PLACED ONSITE SHALL BE COORDINATED BY THE CONTRACTOR AND SURROUNDED WITH SILT FENCE AND COVERED WITH PLASTIC AS NECESSARY DURING CONSTRUCTION. MATERIAL NOT STOCKPILED ONSITE SHALL BE REMOVED TO AN APPROPRIATE IMPORT SITE.
5) ANY SLOPE LESS THAN 3:1 TO BE STABILIZED WITH SEEDING AND MULCH/STRAW.
6) CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING BMP T5.13.
7) EROSION CONTROL INSPECTION REQUIRED BEFORE YOU BEGIN ANY SITEWORK
8) THE BASE FLOOD ELEVATION IS 48.0 AND MINIMUM PAD ELEVATION (AS SHOWN ON PLAN) IS 51.70.



TYPICAL LOT SECTION

LEGEND

- 298 — FINISHED GRADE CONTOUR
- 298 — EXISTING CONTOUR
- DRAINAGE SWALE
- AREA OF CUT
- AREA OF FILL
- INLET PROTECTION
- STABALIZED CONSTRUCTION ENTRANCE
- SILT FENCE
- HIGH VISIBILITY FENCE

NOTE: DUE TO THE LIMITED EROSION CONTROL STANDARDS AVAILABLE BY THE CITY OF CASTLE ROCK, ALL EROSION AND SEDIMENT CONTROL DEVICES SHALL CONFORM WITH WSDOT STANDARDS. HOWEVER, CONTRACTOR MAY USE ALTERNATE DESIGNS IF THEY ARE APPROVED BY THE SITE INSPECTOR PRIOR TO INSTALLATION.

APPROXIMATE GRADING VOLUMES

CUT	2,000 CY
FILL	15,000 CY

NOTE: CUT AND FILL AREAS AND VOLUMES ARE CALCULATED FROM EXISTING GROUND TO FINISHED GRADE AND ARE NOT ADJUSTED FOR STRIPPINGS, TRENCH EXCAVATION, STRUCTURAL EXCAVATION OR SHRINK/SWELL. CONTRACTORS ARE SOLELY RESPONSIBLE FOR QUANTITY ESTIMATES FOR BIDDING PURPOSES.

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PRELIMINARY
3/27/2025

RIVER'S EDGE AT THE LANDING SUBDIVISION
CASTLE ROCK, WASHINGTON

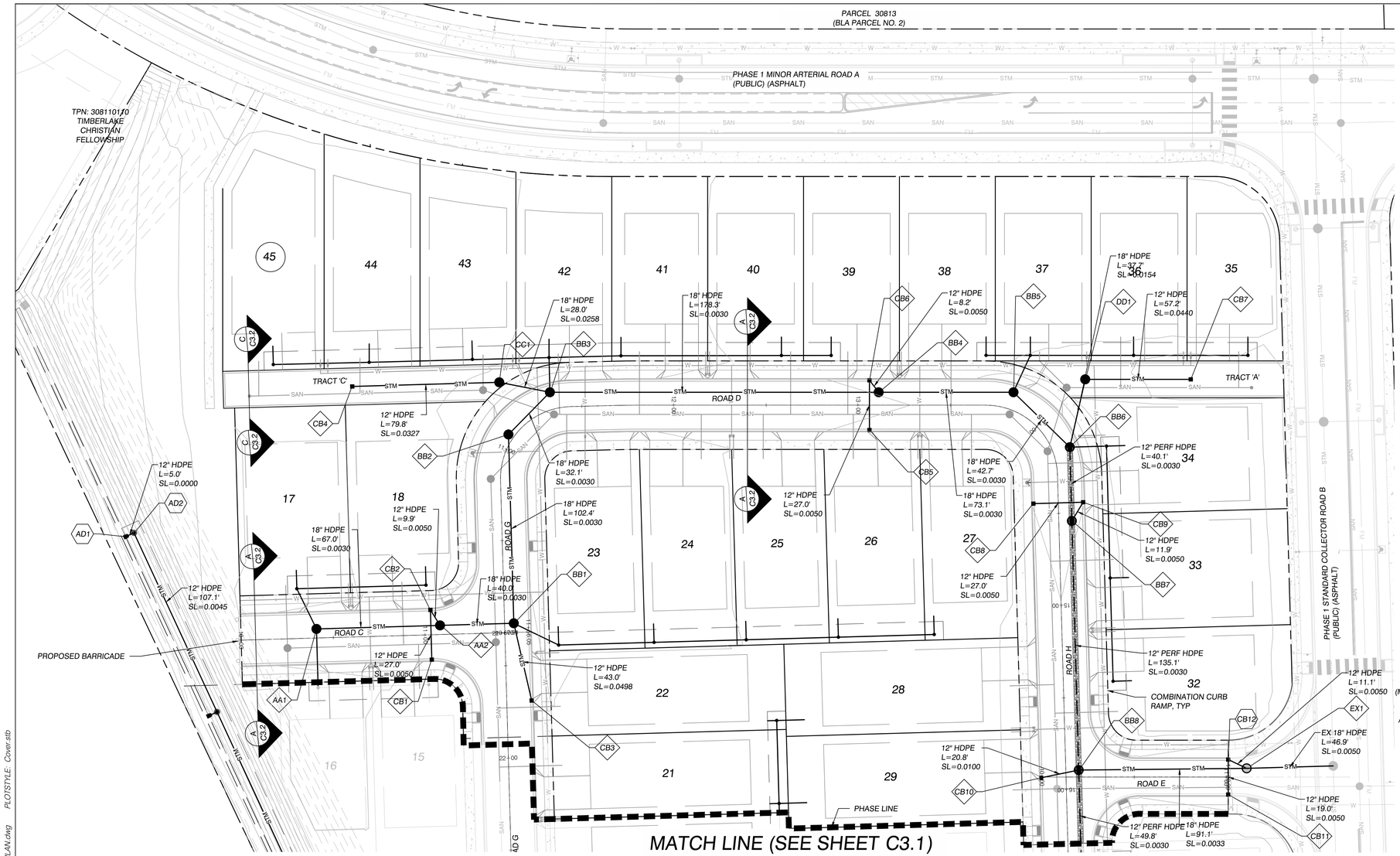
GRADING AND EROSION CONTROL PLAN (PHASE 2)

REVISIONS:

JOB NO.:	18591
DATE:	3/27/2025
SCALE: H: 1" = 30'	V: N/A
DESIGNED BY:	PJM
DRAWN BY:	PJM
CHECKED BY:	TAW

PRELIMINARY

C2.1



0 30 60

SCALE: 1" = 30'

LEGEND

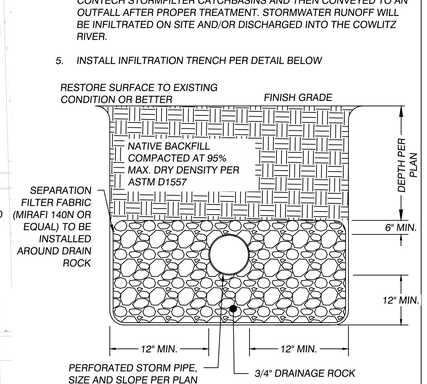
- PROPOSED ASPHALT
- PROPOSED CONCRETE
- PROPOSED INFILTRATION TRENCH
- BARRICADE
- STOP SIGN

NOTE:

1. HMA SECTIONS ARE TO BE CONSTRUCTED PER STREET SECTIONS, SHEET C3.2 .

STORMWATER:

1. ALL STORMWATER SYSTEMS WILL BE DESIGNED IN CONFORMANCE WITH CITY OF CASTLE ROCK STANDARDS AND THE STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON.
2. ALL STORMWATER FACILITIES WILL BE PRIVATELY OWNED AND MAINTAINED WITH A BLANKET ACCESS AND INSPECTION EASEMENT OVER THE PROPERTY DEDICATED TO CITY OF CASTLE ROCK.
3. NATIVE SOILS ON THE SITE ARE CONSIDERED TO BE WWHM GROUP 1 (EXCESSIVELY DRAINED SOILS A & B).
4. STORMWATER RUNOFF FROM PAVED SURFACES WILL BE ROUTED TO CONTECH STORMFILTER CATCHBASINS AND THEN CONVEYED TO AN OUTFALL AFTER PROPER TREATMENT. STORMWATER RUNOFF WILL BE INFILTRATED ON SITE AND/OR DISCHARGED INTO THE COWLITZ RIVER.
5. INSTALL INFILTRATION TRENCH PER DETAIL BELOW



INFILTRATION TRENCH SECTION

NO SCALE

INLET DATA

STRUCTURE ID	STRUCTURE DATA
AD1	N: 346651.76 E: 1035084.69 INSTALL DITCH INLET RIM = 41.00 12" IE OUT = 41.00
AD2	N: 346650.47 E: 1035089.52 INSTALL 24" RISER W/ ATRIUM GRATE RIM = 43.03 12" IE IN = 41.00 12" IE OUT = 41.00
CB1	STA 11+03.05 (13.5' RT-SUBDIVISION ROAD C) INSTALL STM CB RIM = 51.26 12" IE OUT = 47.26
CB2	STA 11+03.05 (13.5' LT-SUBDIVISION ROAD C) INSTALL 1-CARTRIDGE(18") CONTECH STORMFILTER CB RIM = 51.26 12" IE IN = 47.12 12" IE OUT = 46.52
CB3	STA 22+30.73 (13.5' RT-SUBDIVISION MAIN CIRCULATION) INSTALL 1-CARTRIDGE (18") CONTECH STORMFILTER CB RIM = 51.33 12" IE OUT = 49.03

INLET DATA

STRUCTURE ID	STRUCTURE DATA
CB4	N: 346635.47 E: 1035231.28 INSTALL 1-CARTRIDGE(18") CONTECH STORMFILTER CB RIM = 51.17 12" IE OUT = 48.87
CB5	STA 13+06.00 (13.5' RT-SUBDIVISION MAIN CIRCULATION) INSTALL STM CB RIM = 50.87 12" IE OUT = 46.87
CB6	STA 13+06.00 (13.5' LT-SUBDIVISION MAIN CIRCULATION) INSTALL 1-CARTRIDGE(27") CONTECH STORMFILTER CB RIM = 50.87 12" IE IN = 46.73 12" IE OUT = 46.23
CB7	N: 346346.81 E: 1035582.67 INSTALL 1-CARTRIDGE(18") CONTECH STORMFILTER CB RIM = 49.45 12" IE OUT = 47.15
CB8	STA 14+44.27 (13.5' RT-SUBDIVISION MAIN CIRCULATION) INSTALL STM CB RIM = 50.02 12" IE OUT = 46.02

INLET DATA

STRUCTURE ID	STRUCTURE DATA
CB9	STA 14+44.27 (13.5' LT-SUBDIVISION MAIN CIRCULATION) INSTALL 1-CARTRIDGE(18") CONTECH STORMFILTER CB RIM = 50.02 12" IE IN = 45.89 12" IE OUT = 45.39
CB10	STA 15+93.00 (13.5' RT-SUBDIVISION MAIN CIRCULATION) INSTALL 1-CARTRIDGE(18") CONTECH STORMFILTER CB RIM = 49.52 12" IE OUT = 46.47
CB11	STA 11+00.99 (9.5' RT-SUBDIVISION ROAD E) INSTALL STM CB RIM = 49.35 12" IE OUT = 45.35
CB12	STA 11+00.99 (9.5' LT-SUBDIVISION ROAD E) INSTALL 1-CARTRIDGE(18") CONTECH STORMFILTER CB RIM = 49.35 12" IE IN = 45.25 12" IE OUT = 45.25

STORM MANHOLE DATA

STRUCTURE ID	STRUCTURE DATA
AA1	STA 10+41.00 (4.9' LT-SUBDIVISION ROAD C) INSTALL 48" STM MH RIM = 51.62 18" IE OUT = 46.67
AA2	STA 11+08.05 (5.0' LT-SUBDIVISION ROAD C) INSTALL 48" STM MH RIM = 51.43 18" IE IN = 46.47 12" IE IN = 46.47 18" IE OUT = 46.27
BB1	STA 10+04.98 (5.0' RT-SUBDIVISION MAIN CIRCULATION) INSTALL 48" STM MH RIM = 51.63 18" IE IN = 46.15 12" IE IN = 46.89 18" IE OUT = 45.95
BB2	STA 11+07.14 (3.1' LT-SUBDIVISION MAIN CIRCULATION) INSTALL 48" STM MH RIM = 51.88 18" IE IN = 45.64 18" IE OUT = 45.44
BB3	STA 11+34.94 (9.3' LT-SUBDIVISION MAIN CIRCULATION) INSTALL 48" STM MH RIM = 51.74 18" IE IN = 45.34 18" IE IN = 45.34 18" IE OUT = 45.14

STORM MANHOLE DATA

STRUCTURE ID	STRUCTURE DATA
BB4	STA 13+11.00 (7.0' LT-SUBDIVISION MAIN CIRCULATION) INSTALL 48" STM MH RIM = 50.97 18" IE IN = 44.60 12" IE IN = 46.19 18" IE OUT = 44.40
BB5	STA 13+81.38 (9.4' LT-SUBDIVISION MAIN CIRCULATION) INSTALL 48" STM MH RIM = 50.49 18" IE IN = 44.18 18" IE OUT = 43.98
BB6	STA 14+16.94 (9.5' LT-SUBDIVISION MAIN CIRCULATION) INSTALL 48" STM MH RIM = 50.27 18" IE IN = 43.85 18" IE IN = 43.85 12" IE OUT = 43.65
BB7	STA 14+54.27 (7.1' LT-SUBDIVISION MAIN CIRCULATION) INSTALL 48" STM MH RIM = 50.09 12" IE IN = 43.53 12" IE IN = 45.33 12" IE OUT = 43.33
BB8	STA 15+89.39 (7.0' LT-SUBDIVISION MAIN CIRCULATION) INSTALL 48" STM MH RIM = 49.71 12" IE IN = 42.92 12" IE IN = 42.92 12" IE IN = 46.26 18" IE OUT = 42.72

STORM MANHOLE DATA

STRUCTURE ID	STRUCTURE DATA
CC1	N: 346586.06 E: 1035393.91 INSTALL 48" STM MH RIM = 52.28 12" IE IN = 46.26 18" IE OUT = 46.06
DD1	N: 346393.60 E: 1035526.69 INSTALL 48" STM MH RIM = 50.62 12" IE IN = 44.63 18" IE OUT = 44.43
EX1	N: 346165.49 E: 1035470.66 INSTALL EX 48" STM MH RIM = 49.53 18" IE IN = 42.42 12" IE IN = 45.19 18" IE OUT = 42.22

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PRELIMINARY

3/27/2025

RIVER'S EDGE AT THE LANDING SUBDIVISION
CASTLE ROCK, WASHINGTON

STREET AND STORM PLAN (PHASE 1)

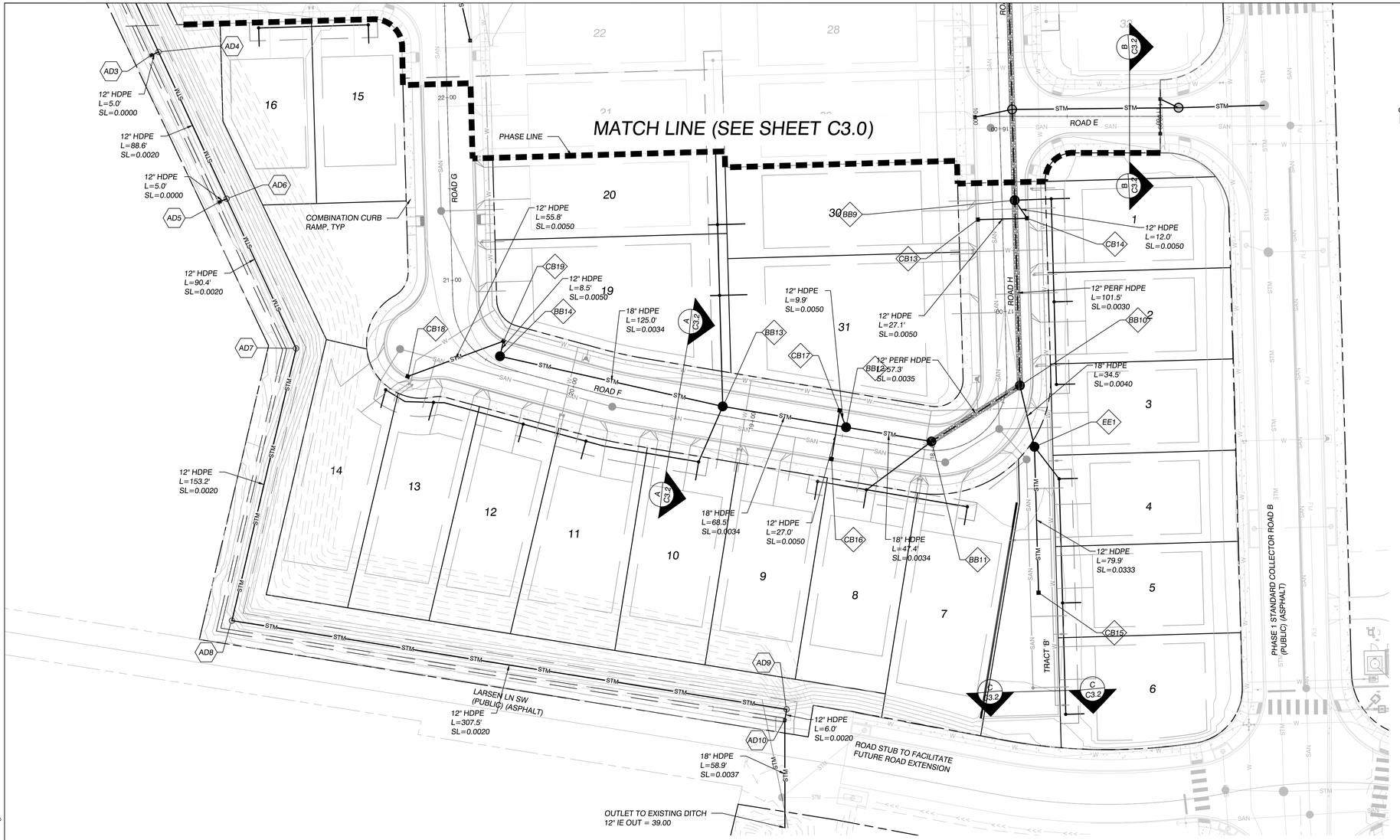
REVISIONS:

JOB NO.:	18591
DATE:	3/27/2025
SCALE: H: 1" = 30'	V: N/A
DESIGNED BY:	PJM
DRAWN BY:	PJM
CHECKED BY:	TAW

PRELIMINARY

C3.0

FILE: W:\18591 LOTC Phase 1\500 Design\502 Drawings\Sheets\18591.01 - Phase 1 Subdivision\C3.0 STREET AND STORM PLAN.dwg PLOTSTYLE: Cover.stb



LEGEND

- PROPOSED ASPHALT
- PROPOSED CONCRETE
- PROPOSED INFILTRATION TRENCH
- BARRICADE
- STOP SIGN

NOTE:

1. *HMA SECTIONS ARE TO BE CONSTRUCTED PER STREET SECTIONS, SHEET C3.2 .*

STORMWATER:

1. *ALL STORMWATER SYSTEMS WILL BE DESIGNED IN CONFORMANCE WITH CITY OF CASTLE ROCK STANDARDS AND THE STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON.*
2. *ALL STORMWATER FACILITIES WILL BE PRIVATELY OWNED AND MAINTAINED WITH A BLANKET ACCESS AND INSPECTION EASEMENT OVER THE PROPERTY DEDICATED TO CITY OF CASTLE ROCK.*
3. *NATIVE SOILS ON THE SITE ARE CONSIDERED TO BE WWHM GROUP 1 (EXCESSIVELY DRAINED SOILS A & B).*
4. *STORMWATER RUNOFF FROM PAVED SURFACES WILL BE ROUTED TO CONTECH STORMFILTER CATCHBASINS AND THEN CONVEYED TO AN OUTFALL AFTER PROPER TREATMENT. STORMWATER RUNOFF WILL BE INFILTRATED ON SITE AND/OR DISCHARGED INTO THE COWLITZ RIVER.*
5. *INSTALL INFILTRATION TRENCH PER DETAIL BELOW*

INLET DATA

STRUCTURE ID	STRUCTURE DATA
AD3	*N: 346548.33 E: 1035056.97* *INSTALL DITCH INLET* *RIM = 40.52* *12" IE OUT = 40.52*
AD4	*N: 346547.04 E: 1035061.80* *INSTALL 24" RISER W/ ATRIUM GRATE* *RIM = 42.92* *12" IE IN = 40.52* *12" IE OUT = 40.52*
AD5	*N: 346462.71 E: 1035034.03* *INSTALL DTCH INLET* *RIM = 40.88* *12" IE OUT = 40.34*
AD6	*N: 346461.42 E: 1035038.86* *INSTALL 24" RISER W/ ATRIUM GRATE* *RIM = 42.76* *12" IE IN = 40.34* *12" IE IN = 40.34* *12" IE OUT = 40.34*
AD7	*N: 346374.13 E: 1035015.47* *INSTALL 24" RISER W/ ATRIUM GRATE* *RIM = 42.54* *12" IE IN = 40.16* *12" IE OUT = 40.16*

INLET DATA

STRUCTURE ID	STRUCTURE DATA
AD8	*N: 346282.27 E: 103489.92* *INSTALL 24" RISER W/ ATRIUM GRATE* *RIM = 42.20* *12" IE IN = 39.85* *12" IE OUT = 39.85*
AD9	*N: 346050.26 E: 1035094.76* *INSTALL 24" AREA DRAIN W/ SOLID COVER* *RIM = 41.53* *12" IE IN = 39.23* *12" IE OUT = 39.23*
AD10	*N: 346046.36 E: 1035090.20* *INSTALL DITCH INLET* *RIM = 42.80* *12" IE IN = 39.22* *18" IE OUT = 39.22*
CB13	*STA 16+49.18 (13.5' RT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL STM CB* *RIM = 49.59* *12" IE OUT = 45.59*
CB14	*STA 16+49.25 (13.6' LT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL 1-CARTRIDGE(27")* *CONTECH STORMFILTER CB* *RIM = 49.59* *12" IE IN = 45.45* *12" IE OUT = 44.95*

INLET DATA

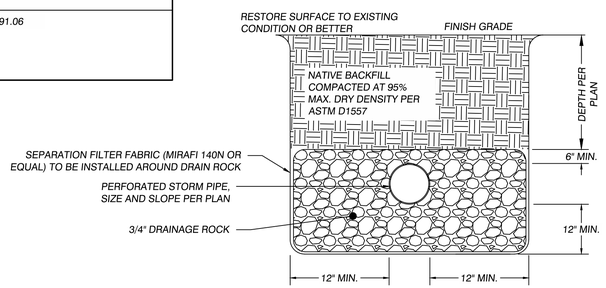
STRUCTURE ID	STRUCTURE DATA
CB15	*N: 346010.85 E: 1035241.56* *INSTALL 1-CARTRIDGE(18")* *CONTECH STORMFILTER CB* *RIM = 49.36* *12" IE OUT = 47.09*
CB16	*STA 18+53.78 (13.5' LT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL STM CB* *RIM = 50.20* *12" IE OUT = 46.20*
CB17	*STA 18+53.78 (13.5' RT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL 1-CARTRIDGE(27")* *CONTECH STORMFILTER CB* *RIM = 50.20* *12" IE IN = 46.06* *12" IE OUT = 45.56*
CB18	*STA 20+66.47 (37.4' LT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL STM CB* *RIM = 50.36* *12" IE OUT = 46.36*
CB19	*STA 20+45.96 (13.5' RT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL 1-CARTRIDGE(27")* *CONTECH STORMFILTER CB* *RIM = 50.78* *12" IE IN = 46.08* *12" IE OUT = 45.58*

STORM MANHOLE DATA

STRUCTURE ID	STRUCTURE DATA
BB9	*STA 16+39.18 (7.0' LT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL 48" STM MH* *RIM = 49.70* *12" IE IN = 43.27* *12" IE IN = 44.89* *12" IE OUT = 43.07*
BB10	*STA 17+39.92 (7.2' LT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL 48" STM MH* *RIM = 49.99* *12" IE IN = 43.77* *18" IE IN = 44.09* *12" IE OUT = 43.57*
BB11	*STA 18+00.88 (4.8' RT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL 48" STM MH* *RIM = 50.22* *18" IE IN = 44.17* *12" IE OUT = 43.97*
BB12	*STA 18+48.78 (5.0' RT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL 48" STM MH* *RIM = 50.36* *18" IE IN = 44.53* *12" IE IN = 45.51* *18" IE OUT = 44.33*
BB13	*STA 19+17.27 (5.1' RT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL 48" STM MH* *RIM = 50.56* *18" IE IN = 44.96* *18" IE OUT = 44.76*

STORM MANHOLE DATA

STRUCTURE ID	STRUCTURE DATA
BB14	*STA 20+43.64 (5.2' RT'-SUBDIVISION MAIN CIRCULATION)* *INSTALL 48" STM MH* *RIM = 50.93* *12" IE IN = 45.54* *18" IE OUT = 45.38*
DD1	*STA 13+78.53 (55.9' RT'-ROAD B)* *INSTALL 48" STM MH* *RIM = 49.53* *18" IE OUT = 42.22*
EE1	*N: 346073.60 E: 1035291.06* *INSTALL 48" STM MH* *RIM = 50.53* *12" IE IN = 44.43* *18" IE OUT = 44.23*



INFILTRATION TRENCH SECTION

NO SCALE

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PRELIMINARY

3/27/2025

RIVER'S EDGE AT THE LANDING
CASTLE ROCK, WASHINGTON

STREET AND STORM PLAN (PHASE 2)

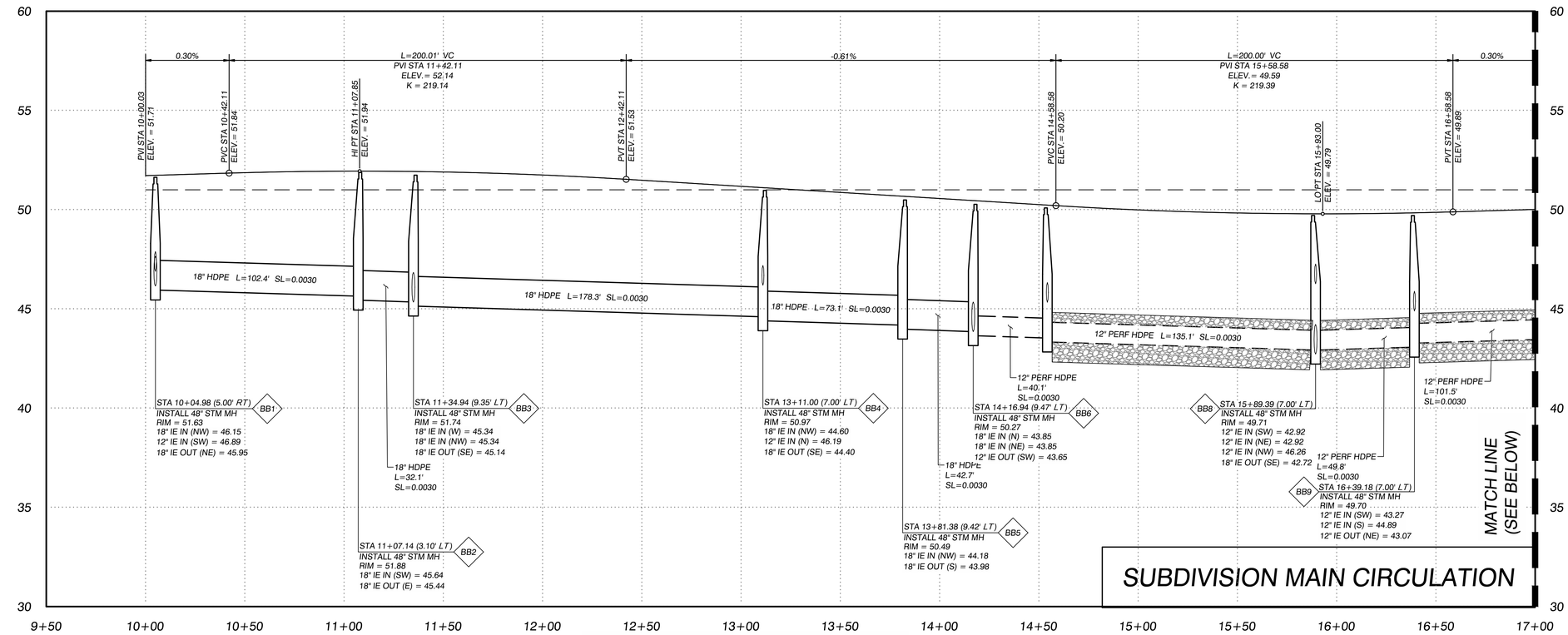
REVISIONS:

JOB NO.:	18591
DATE:	3/27/2025
SCALE: H: 1" = 30'	V: N/A
DESIGNED BY:	PJM
DRAWN BY:	PJM
CHECKED BY:	TAW

PRELIMINARY

C3.1

FILE: W:\18591 LOTC Phase 1\500 Design\502 Drawings\Sheets\18591.01 - Phase 1 Subdivision\C3.0 STREET AND STORM PLAN.dwg PLOTSTYLE: Cover.stb

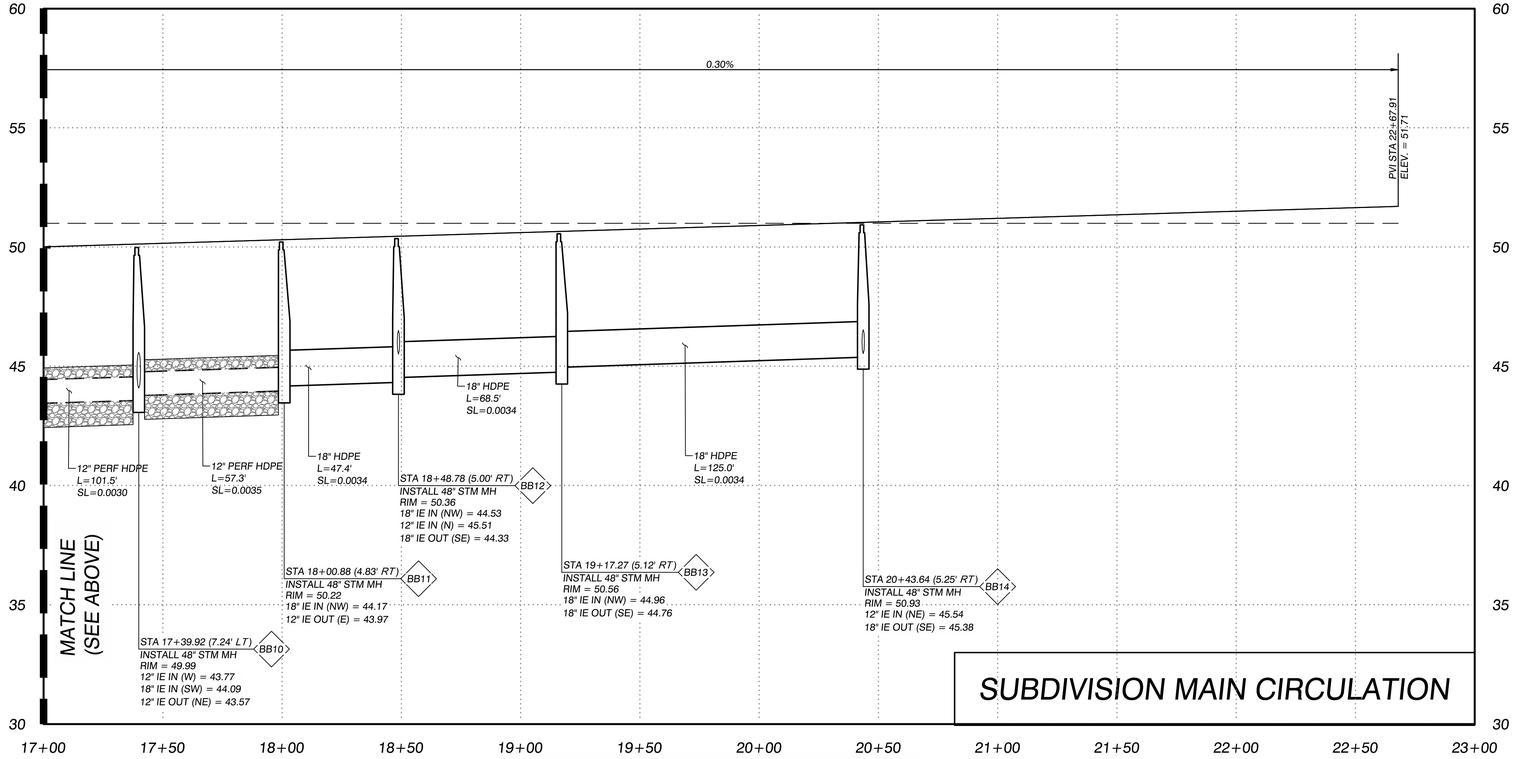


MAIN CIRCULATION PROFILE

STA 10+00 - STA 17+00

0 30 60

SCALE: 1" = 30'



MAIN CIRCULATION PROFILE

STA 17+00 - STA 22+67.91

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PRELIMINARY

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3/27/2025

RIVER'S EDGE AT THE LANDING SUBDIVISION
CASTLE ROCK, WASHINGTON

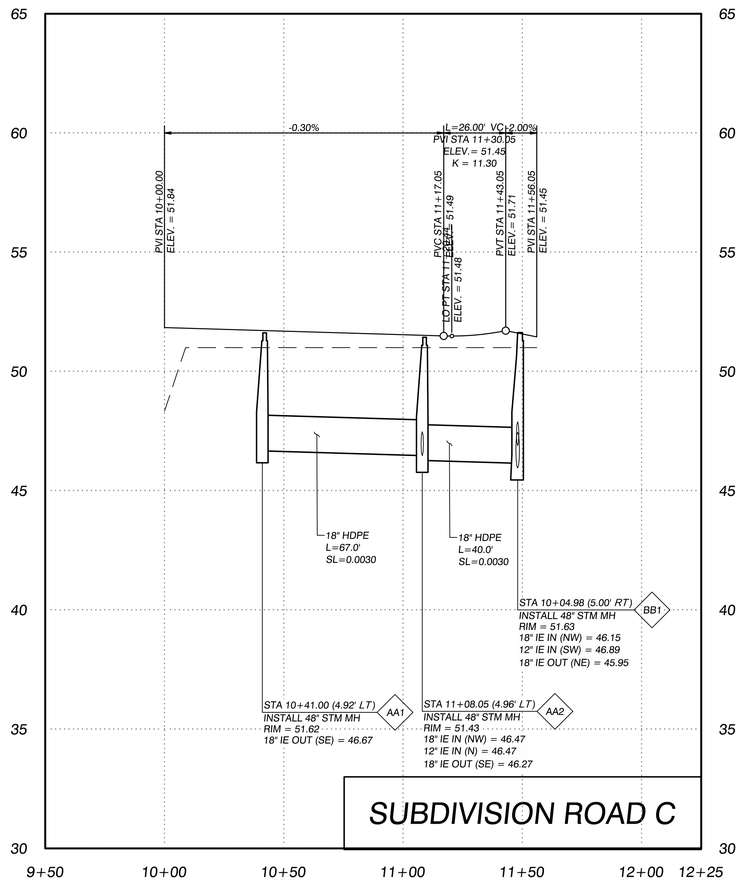
MAIN CIRCULATION STREET AND STORM PROFILE

REVISIONS:

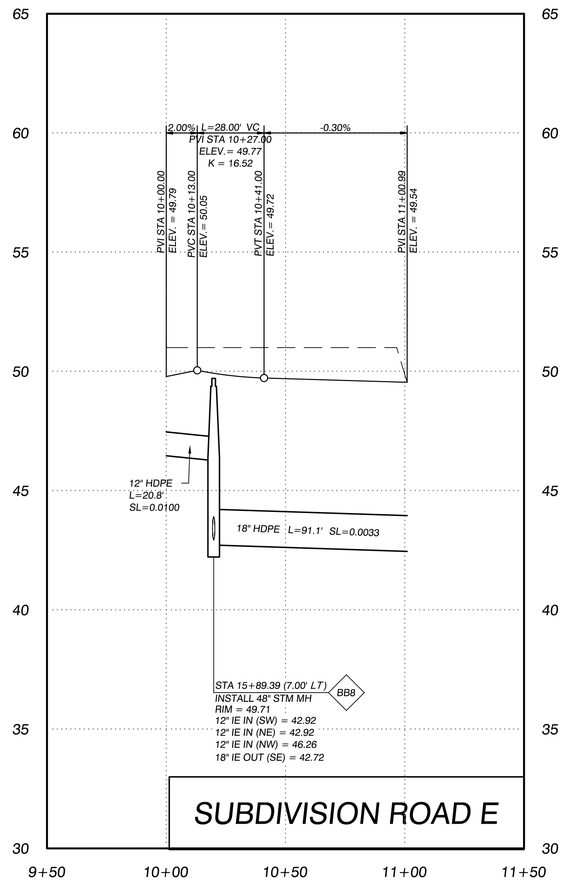
JOB NO.:	18591
DATE:	3/27/2025
SCALE: H: 1" = 30'	V: 5:1
DESIGNED BY:	PJM
DRAWN BY:	PJM
CHECKED BY:	TAW

PRELIMINARY

C3.3



ROAD C PROFILE



ROAD E PROFILE

0 30 60

SCALE: 1" = 30'

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PRELIMINARY

3/27/2025

RIVER'S EDGE AT THE LANDING SUBDIVISION
CASTLE ROCK, WASHINGTON

ROAD C AND ROAD E STREET AND STORM PROFILES

REVISIONS:

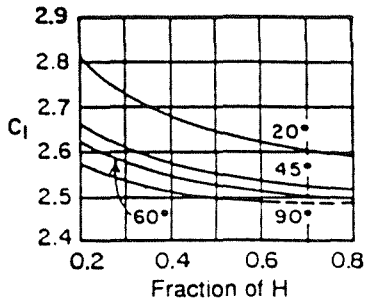
JOB NO.:	18591
DATE:	3/27/2025
SCALE: H: 1" = 30'	V: 5:1
DESIGNED BY:	PJM
DRAWN BY:	PJM
CHECKED BY:	TAW

PRELIMINARY

C3.4

Appendix E Operation and Maintenance

Control Structures and Catch Basins (1992 SWMMPSB)



$$Q = C_d(\text{Tan}(\Theta/2))H^{5/2}, \text{ in cfs}$$

Details

Standard control structure details are shown in Figures III-2.36 and III-2.37.

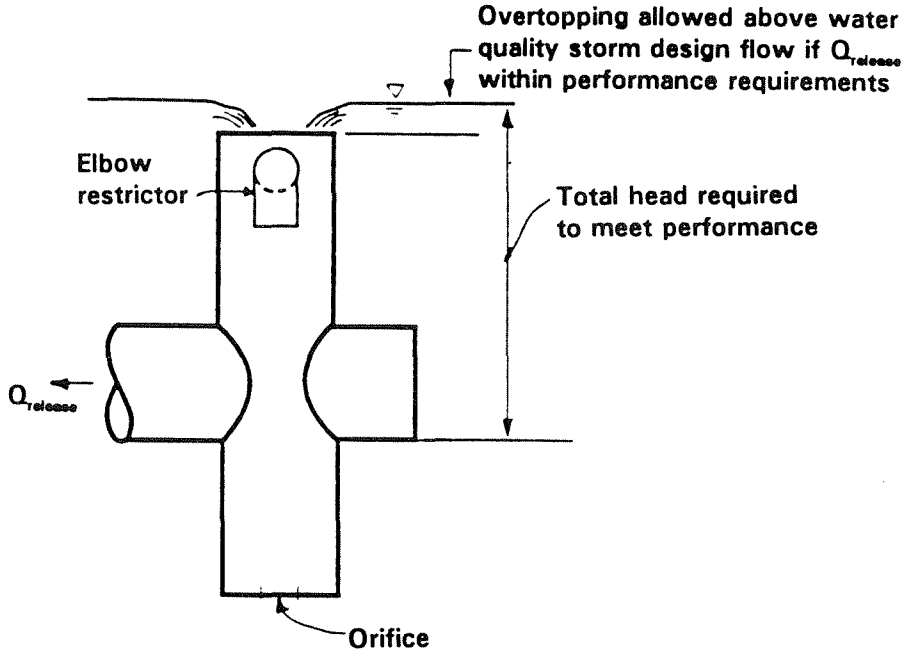
III-2.4.3 Maintenance of Control Structures

Control structures and catch basins have a history of maintenance-related problems and it is imperative that a good maintenance program be established for their proper functioning. A typical problem is that sediment builds up inside the structure which blocks or restricts flow to the inlet. To prevent this problem these structures should be routinely cleaned out a least twice per year. Regular inspections of control structures should be conducted to detect the need for non-routine cleanout, especially if construction or land-disturbing activities are occurring in the contributing drainage area.

A 15-foot wide access road to the control structure should be installed for inspection and maintenance.

Table III-2.10 provides maintenance recommendations for control structures and catch basins.

Figure III-2.36 Standard Control Structure Detail - Orifice Control



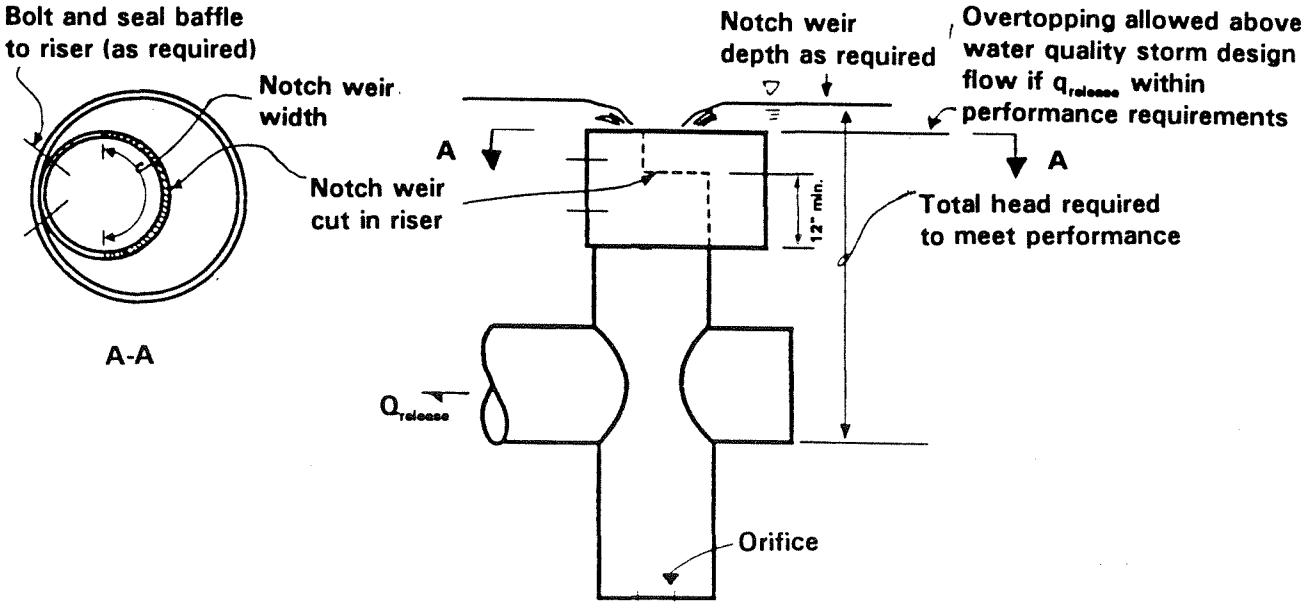
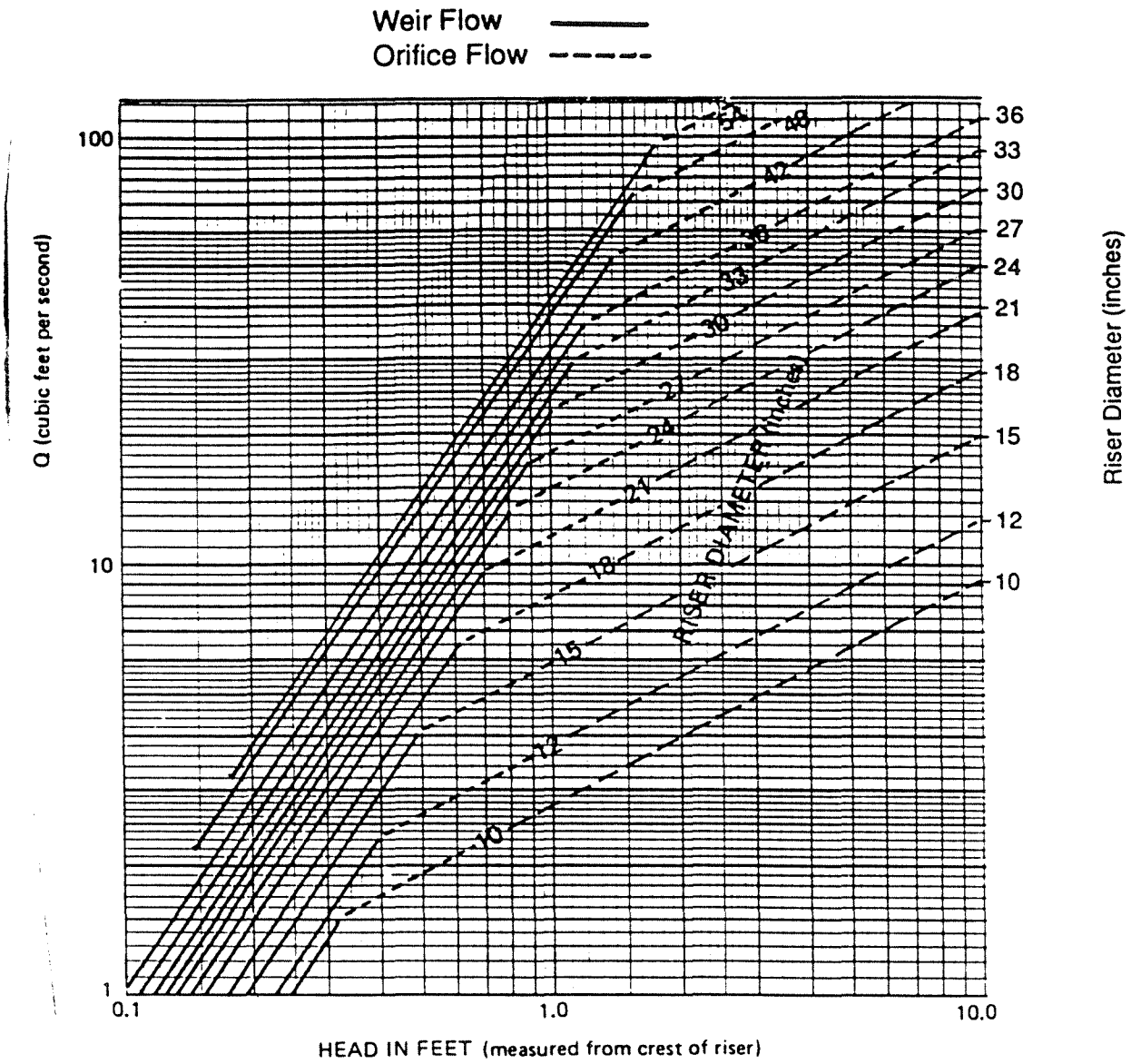


Figure III-2.37 Standard Control Structure Detail - Notch Control

Figure III-2.38 Riser Inflow Curves



SOURCE: USDA-SCS

$Q_{WIER} = 9.739\ DH^{3/2}$

$Q_{ORIFICE} = 3.782\ D^2H^{1/2}$

Q in cfs, D and H in feet

Table III-2.10 Maintenance of Control Structures and Catchbasins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
I. Control Structure/ Flow Restrictor - General	Trash & Debris (includes sediment)	Distance between debris buildup & bottom of orifice is $< 1\frac{1}{2}$ feet.	All trash & debris removed.
	Structural Damage	Structure is not securely attached to manhole wall & outlet pipe structure should support at least 1000# of up or down pressure.	Structure securely attached to wall & outlet pipe.
		Structure is not in upright position (up to 10% from plumb allowed).	Structure in correct position.
		Connections to outlet pipe are not watertight & show signs of rust.	Connections to outlet pipe are watertight; structure repaired or replaced and works as designed.
		Any holes - other than designed holes - in structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up & down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain leading to gate is missing or damaged.	Chain is in place & works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
	Obstructions	Trash, debris, sediment or vegetation blocking the plate.	Plate is free of all obstructions & works as designed.
Overflow Pipe	Obstructions	Trash or debris is blocking or potentially blocking the overflow pipe.	Pipe is free of all obstructions & works as designed.
Manhole		See "Pipes/Tanks" standard, Section III-4.6.1.	See "Pipes/Tanks" standard, Section III-4.6.1.
II. Catchbasins - General	Trash & Debris (includes sediment)	Trash & debris $\geq$ ½ ft.^{3} which is located immediately in front of the catchbasin opening of is blocking capacity by >10%.	No trash or debris immediately in front of the catchbasin opening.
		Trash or debris in the basin that exceeds ⅙ the depth from the bottom of basin to the invert of the lowest pipe.	No trash or debris in the catchbasin.
		Trash or debris in any inlet or pipe blocking more than ⅙ of its height.	Inlet & outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors or dangerous gases (e.g. methane).	No dead animals or vegetation present within the catchbasin.

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Catchbasins - General, con't.		No condition present which would attract or support the breeding of insects or rodents.	
	Structural Damage to Frame and/or Top Slab	Frame is even with curb.	
		Top slab is free of holes & cracks.	
		Frame is sitting flush on top slab.	
	Cracks in Basin Walls or Bottom	Basin repaired or replaced to design standards.	
		No cracks more than ¼ in. wide at the joint of inlet/outlet pipe.	
	Settlement/misalignment	Basin replaced or repaired to design standards.	
	Fire Hazard	No flammable chemicals present.	
	Vegetation	No vegetation blocking opening to basin.	
		No vegetation or root growth present.	
	Pollution	No pollution present other than surface film	
	68^F^Cider than ½ in. & longer than 1 ft. at the joint of any inlet or outlet pipe or any evidence of soil particles entering the catchbasin through cracks.		
	Basin has settled > 1 in. or has rotated > 2 in. out of alignment.		
	Presence of chemicals such as natural gas, oil and gasoline.		
	Vegetation growing across & blocking >10% of the basin opening.		