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FINAL GEOTECHNICAL REPORT

Lower Cherry Creek Restoration, Phases II and III

KING COUNTY, WASHINGTON

SHANNON & WILSON

October 31, 2022

Shannon & Wilson No: 105606-004

Submitted To: Wild Fish Conservancy
15629 Main Street NE
Duvall, WA 98019
Attn: Mr. Micah Wait

Subject: FINAL GEOTECHNICAL REPORT, LOWER CHERRY CREEK RESTORATION, PHASES II AND III, KING COUNTY, WASHINGTON

Shannon & Wilson prepared this report and participated in this project under contract to the Wild Fish Conservancy. Our scope of services was specified in our proposal to the Wild Fish Conservancy dated March 17, 2021, and signed April 19, 2021. This report presents the results of our subsurface explorations and soil reuse evaluation for the project and was prepared by the undersigned.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or we may be of further service, please contact us.

Sincerely,

SHANNON & WILSON

10/31/22

Suzanna Y. Doak
Geologic Staff

Genevieve N. Sasaki, PE
Senior Engineer

SYD:BSR:GNS:SRB/syd

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ACRONYMS

3D	three-dimensional
bgs	below ground surface
DD7	King County Drainage District No. 7
ELJ	engineered log jam
OHWM	ordinary high water mark
Project	Lower Cherry Creek Restoration Project, Phases II and III
SR	State Route
SWIF	Southern Whidbey Island Fault
VWP	vibrating wire piezometer
WFC	Wild Fish Conservancy
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation

1 INTRODUCTION

This report presents the results of our geotechnical engineering studies completed for the Lower Cherry Creek Restoration, Phases II and III (Project) in King County, Washington. We understand that the Wild Fish Conservancy (WFC) plans to excavate along the Lower Cherry Creek channel to construct planting areas and install engineered log jams (ELJs) to provide improved habitat for the aquatic species in the creek. This report was prepared for the exclusive use of the WFC design team and their representatives to assist with the 90% design effort and with the WFC's evaluation of excavated material for reuse.

We prepared this report based on the 60% design drawings (Project drawings) for the Project, prepared by the WFC (2017). This report includes the results our geotechnical explorations in the Project area, recommendations for soil reuse, soil quantity estimates for proposed excavation areas, and construction considerations. We understand that the WFC will perform the permitting and the geotechnical design for the Project elements shown in the drawings. We understand that soil excavated for the Project will be reused as borrow fill at the levee; design and construction of the levee improvements project will be completed separately from this Project and by others.

2 SITE AND PROJECT DESCRIPTION

2.1 Site Description

The Project site is located along Lower Cherry Creek in Cherry Valley near Duvall, Washington (Figures 1 and 2). The creek is a major tributary to the Snoqualmie River, originating from Drunken Charlie Mountain. Lower Cherry Creek is the western portion and the lowest reach of the creek; it flows under the State Route (SR) 203 bridge before it joins the Snoqualmie River at the confluence (Washington Department of Fish and Wildlife [WDFW], 2022).

Lower Cherry Creek is bordered by privately owned pastureland. Vegetation along the creek banks is primarily blackberry bushes and canary grass. An existing levee is located upstream of SR 203 along the left bank of the creek. The levee begins approximately 900 feet south of the SR 203 bridge over Lower Cherry Creek and is approximately 5,000 feet long.

Various construction has occurred along Lower Cherry Creek in the past century. In the 1900s, the creek was ditched and realigned, and a flood protection levee was constructed on the left bank. The creek is within the Snoqualmie River floodplain and the creek receives

backwater when the Snoqualmie River floods. The areas adjacent to the creek are typically inundated during the flood season despite the presence of the levee. In recent years, fish habitat and levee restoration projects have occurred along the creek. In 2019, the WFC completed Phase I of a fish habitat restoration project at the river confluence in partnership with Sound Salmon Solutions and King County Drainage District No. 7 (DD7). A levee restoration project was completed at the same time by DD7; the levee project reused soil excavated from the habitat restoration project to widen approximately 1,000 feet of levee on the landward side.

2.2 Project Description

The Project location along Lower Cherry Creek extends from Hamstead Creek southeast of SR 203 to just upstream of the Snoqualmie River confluence west of SR 203 (Figure 2). Shannon & Wilson reviewed the Project drawings for Phases II and III of the Project (WFC, 2017). Based on the drawings, the Project will consist of the following:

- Excavation to lower the grade of the steep banks and construct planting benches along the left and right banks of the creek west of SR 203 and along the right bank east of SR 203;
- Installation of three ELJs, which will include excavation for the bench on which ELJ logs are driven and excavation into the creek bank;
- Regrading of the streambed below SR 203;
- Removal and replacement of an existing livestock crossing structure east of SR 203;
- Excavation to restore the side channel west of Hamstead Creek; and
- Installation of large woody debris and smaller log clusters throughout Lower Cherry Creek and the side channel.

We understand that soil excavated for the Project will be reused by others for a separate project to raise and widen the crest of the Lower Cherry Creek levee. Excess material or material deemed unsuitable for levee reuse will be hauled offsite.

3 SUBSURFACE EXPLORATIONS

3.1 Project Subsurface Explorations

We performed 14 test pits along the Lower Cherry Creek banks within the Project footprint (Figure 2). The test pits, designated TP-1a-22 through TP-7a-22 and TP-1b-22 through TP-7b-22, were excavated by Rivers Edge Environmental Services under subcontract to Shannon & Wilson. The seven test pits denoted with a "b" were excavated approximately

1 to 2 feet below ground surface (bgs) on the bank slope, from above the waterline to the top of the bank, to identify the potential presence of riprap. The remaining seven test pits, denoted with an "a", were set back from the top of the streambank and excavated to a depth up to 15 feet bgs or until groundwater was encountered or caving occurred. Our test pit explorations did not include excavation within identified wetland areas or below the ordinary high water mark (OHWM); therefore, we did not collect subsurface information about the streambed in Lower Cherry Creek.

A Shannon & Wilson representative was present during test pit excavations to log soils and collect soil samples. We performed visual classification and geotechnical laboratory testing on soil samples, including water content determination, grain-size distribution, Atterberg Limits, and compaction testing.

The test pit locations are shown in Figure 2. A summary of our field exploration program and logs of the test pits are included in Appendix A. Laboratory test results are included in Appendix B.

3.2 Previous Explorations

Shannon & Wilson previously performed three test pits in the Phase I construction area of the habitat restoration project at the river confluence. The test pits were excavated in June 2019 to a depth of approximately 10 feet bgs in order to evaluate material that would be excavated from the Phase I area and reused as borrow material for levee improvements. Shannon & Wilson observed the test pit excavation, collected soil samples, and performed geotechnical testing on the soil samples.

In addition to the test pits, Shannon & Wilson previously performed six borings upstream of the Phases II and III Project area. The borings were advanced through the crest of the Lower Cherry Creek levee. Two borings (B-1 and B-2) were completed in 2017 as part of preliminary design for levee improvements (Shannon & Wilson, 2018), and four borings (B-1-19 through B-4-19) were completed in 2019 as part of final design for levee improvements for the northern and middle portions of the levee (Shannon & Wilson, 2020).

We have included the logs and geotechnical laboratory testing results of the previous explorations in Appendix C. The locations of the previous test pits are shown in Figure 2. The locations of the previous borings are included in Appendix C.

4 GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Site Geology

The Project site is located within the Puget Lowlands of western Washington. The Puget Lowland is a structural depression bordered by the Olympic Mountain Range to the west and Cascade Mountain Range to the east. The geology of the area has been influenced by repeated cycles of glaciation, which filled the lowland to a significant depth with a complex sequence of glacial and nonglacial deposits.

The mapped geology at the site indicates it is underlain by Quaternary alluvial deposits of Holocene age (Dragovich and others, 2011). The site is within a lateral extension of the Snoqualmie River floodplain, which periodically floods when the Snoqualmie River overtops its banks (Bethel, 2004). The soil geology can be characterized as reworked alluvium from lateral channel migration, overbank material deposited by repeated flooding events, fine-grained lacustrine deposits generated from periods of ice or levee dammed sitting water, and interbedded organic layers. These soils and the geologic units they comprise are described further below.

We reviewed online maps available for the U.S. Geological Survey and Department of Natural Resources for faults close to the Project site (Washington Geologic Survey, 2022). A concealed, inferred strand of the Cherry Valley fault trends northwest to southeast approximately parallel to the creek's flow and strikes around 900 to 1,000 feet to the west of the Project area (Johnson and others, 2016). The fault is thought to be a conjugate fault to the larger Rattlesnake Mountain Fault Zone and Southern Whidbey Island Fault (SWIF) zone (Dragovich and others, 2010). Recurrence intervals for earthquakes on the SWIF vary between 9.2 and 8.8 thousand years ago. and the shortest period is 470 years (Sherrod and others, 2008).

4.1.1 Holocene Alluvium and Lacustrine (Ha and Hal)

The Holocene unit consists of fine and coarse-grained, post-glacial deposits in the Snoqualmie River Valley. We interpreted the soils we encountered in the test pits as consisting of reworked alluvium and overbank deposits (Ha) transitioning to lacustrine deposits (Hal).

The Ha soils we encountered in the Project test pits generally consisted of brown to gray-brown silt, sandy silt, and silty sand; trace cobbles and gravel; and trace organics. The Hal soils we encountered generally consisted of gray-brown to gray silt, elastic silt, lean clay, and fat clay with varying amounts of fine to coarse sand and trace organics. We observed roots in the upper 1 to 2 feet depth and localized iron oxide staining in these soils.

4.1.2 Holocene Peat (Hp)

Holocene Peats (Hp) are buried, compressed, and decaying organics found in inundated areas such as wetlands. The Hp unit was encountered in the 2019 borings upstream of the Project area and consisted of very soft to medium stiff peat and organic silt and clay interbedded between the Ha deposits (Appendix C). While this layer was not encountered in our Project test pits, this unit could be present in the Project area.

4.2 Riprap

We encountered riprap in test pit TP-4b-22 during our field explorations. The riprap consisted of a one-man (approximately 2 to 3 feet diameter) rock that was approximately 14 feet below the top of the creek bank. A photograph of the riprap is shown in Exhibit 4-1.

We did not encounter riprap in the remaining test pits. However, our test pit explorations did not extend below the water line, which was at approximately 15 feet below top of bank at the time of our field exploration. Riprap could be present below this depth or buried at other locations along the banks. Gravel and cobbles were encountered along the creek bank surface.

Exhibit 4-1: Photograph of Riprap Encountered in Test Pit TP-4b-22

4.3 Groundwater Conditions

Groundwater in the Project area is affected by and will fluctuate in response to precipitation and the water levels in Lower Cherry Creek and the Snoqualmie River. Zones of wet soil and iron oxide staining encountered in the test pits may be indicative of groundwater being present or groundwater fluctuation, but these observations are not reliable for establishing the groundwater level.

We observed seepage at approximately 14.5 feet bgs in test pit TP-1a-22 and at approximately 10 feet bgs in TP-4a-22 during excavation. We observed groundwater infiltrating the bottom of the test pit at TP-6a-22 and TP-7a-22 during excavation. Due to the rapid rate of water infiltration and wall sloughing, test pits TP-6a-22 and TP-7a-22 were

terminated at 13 feet and 14.5 feet bgs, respectively. Test pits located on the creek banks were excavated above the creek water level and did not encounter groundwater.

Previous explorations upstream of the Project area included installation of a vibrating wire piezometer (VWP) at boring B-1-19. The VWP was monitored for approximately one month, between mid-June and mid-July in 2019. Data recorded by the VWP indicated an average groundwater depth of approximately 12 feet bgs, which is an approximate groundwater elevation of 28 feet (Shannon & Wilson, 2020).

5 GEOTECHNICAL RECOMMENDATIONS

This section provides our recommendations for the reuse of material excavated at the areas and depths shown on the Project drawings. Our recommendations are based on our field explorations at the site and are intended to assist the WFC and its partners estimate the types and quantities of soils that will be generated by the Project's proposed construction. The recommendations provided herein should not replace or supersede design and construction requirements for the Project or for the levee. The designs, plans, and specifications for the future levee improvements project are ultimately the responsibility of the designer for that work. It is the responsibility of the engineers and contractors for whatever project the material is used in to review the engineering design and construction recommendations for their project to determine whether the soils that are excavated are appropriate for reuse in their project's specific application.

5.1 Material Reuse

According to the Project drawings, excavations for the Project include:

- Excavation for planting benches generally up to 10 feet deep or to approximate Elevation 30 feet.
- Excavations for the ELJ locations and the livestock crossing structure that are approximately 15 to 20 feet, or to approximate Elevation 24 feet.
- Excavation for restoration of the side channel to Elevation 27 feet; at the side channel confluence with the creek, excavation will extend to approximate Elevation 23 feet.
- Regrading of the creek streambed to Elevation 22 feet below SR 203.

Based on our explorations at the site, the proposed Project excavations will encounter fine- to coarse-grained alluvial soils (Ha) and deeper, fine-grained lacustrine soils (Hal). We generally observed organics and roots in the subsurface to a depth of approximately 1 to 2 feet. Project excavations may encounter interbedded layers of peat and organic soils (Hp) within the excavations. Descriptions of these units are provided in Section 4.

Based upon our explorations and laboratory testing and our understanding that this soil will be reused to widen and raise the existing Lower Cherry Creek levee, in our opinion, the material that will be encountered in the Project excavations would be suitable for that purpose.

Because our test pits were limited in depth to approximately 15 feet bgs and above the OHWM, we did not characterize the soils below this depth or in the streambed. Previously completed levee borings indicate that silty and clayey soils with some sand, organics, and peat are present below 15 feet bgs in the Project vicinity (Appendix C).

5.1.1 Topsoil

In our opinion, the organic-rich, surficial material that will be encountered in the Project excavation areas can likely be reused as topsoil.

5.1.2 Borrow Fill

Laboratory test results indicate that the soils proposed for reuse as borrow material will likely consist of soil with 50% or more fines and water contents between approximately 20% and 50% (Appendix B). Soil with this fines content is sensitive to moisture content at the time of compaction. Optimum water content for compaction of this soil is approximately 21 to 22% based on our compaction test results.

The moisture content of the proposed borrow fill is likely to exceed the optimum when excavated and will likely require moisture-conditioning to be at or near the optimum moisture content before placement and compaction. Moisture-conditioning could include spreading out and disking the soil during the drier months, stockpiling the soil for a period of time prior to use, and mechanically drying the soil among other methods. The presence of organics or a higher percentage of fines will likely contribute to a longer processing time.

We do not recommend that the soils proposed for reuse as borrow fill be mixed with other material to reach optimum moisture content without additional geotechnical testing and evaluation of the composite material.

Soil reused as borrow fill should have organics, roots, and deleterious material removed prior to being placed. If peat or other organic soils are encountered during construction, we recommend that the soil containing peat and organic soils be disposed of or only used as topsoil. Stripped topsoil, organic-rich soil, and peat should not be reused as borrow fill.

5.2 Soil Quantity Evaluation

We performed an evaluation of the soil quantities that will be excavated for construction of the Project. Our estimates are based on the excavation plan view and cross sections shown in the Project drawings (WFC, 2017). Material that may be generated from regrading of the streambed was not included in our quantity takeoffs.

5.2.1 Methodology

The WFC provided CAD files of the Project drawings which included lidar topography and three-dimensional (3D) surfaces of the proposed cuts for planting benches, ELJs, livestock crossing structure, and side channel. We used the included topography assuming it represents the existing ground surface at the site and the 3D surfaces to calculate the volume of material that will be excavated in these areas. We used the included 3D surfaces assuming they represent the Project excavation areas.

We included excavation volumes for construction of the ELJs in our quantity takeoff based on the typical ELJ section shown in the Project drawings. We assumed that each ELJ location would have a 10-foot-long excavation into the creek bank. We assumed that the excavation would be cut at a 1 Horizontal to 1 Vertical slope based on the typical ELJ section.

We assumed that the top 18 inches of proposed Project excavations would be segregated for reuse as topsoil. We assumed that the excavated soil below 18 inches will be placed for reuse and compacted; therefore, we did not include soil bulk factors in our estimates.

5.2.2 Quantities of Material

The estimated types and quantities of soils that will be generated from the proposed Project excavations are summarized by area in Exhibit 5-1. Based on the information we used and our methodology, in our opinion, the quantities we provide in Exhibit 5-1 are within 10% of the actual quantities.

Exhibit 5-1: Estimated Quantities of Soils from Proposed Project Excavations

Project Element	Approximate Project Stations	Estimated Soil Volume (CY)	
		Topsoil	Borrow Fill
Side Channel and Planting Benches	0+00 to 5+00	1,750	3,100
Planting Benches, ELJ, and Livestock Crossing Structure	16+80 to 23+35, Right Bank	1,550	3,700
Planting Benches and ELJs	24+60 to 31+75, Left Bank	1,250	5,200
	24+70 to 31+75, Right Bank	1,700	6,000
TOTAL VOLUME		**6,250**	**18,000**

CY = cubic yard

6 CONSTRUCTION CONSIDERATIONS

6.1 Fill Placement and Compaction

Where soil excavated for the Project is reused for widening and raising the existing levee, we recommend that, in accordance with the design recommendations for the Lower Snoqualmie Valley levee improvements project (Shannon & Wilson, 2020), the reused soil be compacted to a minimum 92% of the maximum dry density as specified in Section 2-03.3(14)C, Method C, of the Washington State Department of Transportation (WSDOT) Standard Specifications (WSDOT, 2022). Moisture content for the fill should be within 3% of its optimum at the time of compaction.

Fill should be placed and compacted in uniform horizontal lifts. The soil should be moisture-conditioned prior to placing and then adjusted during compaction to produce a firm, stable, and unyielding embankment. Padfoot compaction equipment should be considered for compaction of fine-grained soils.

6.2 Wet Weather Earthwork

Within the Project area, wet weather typically begins in mid-October and continues through about May, although rainy periods may occur at any time of year. Earthwork may be conducted near or below the groundwater table within saturated soil. The soils proposed for excavation and reuse as borrow fill soils contain significant fines content and are highly susceptible to changes in water content. Soil with significant fines tends to become difficult or impossible to compact if its moisture content greatly exceeds the optimum moisture content. The moisture content of most soil excavated from the site will likely exceed the optimum moisture for compaction.

During the wet weather months, groundwater levels might rise, resulting in seepage into the Project area. Performing earthwork during dry weather reduces the risks and costs associated with precipitation, trafficability, and the handling of wet soil. We recommend earthwork be scheduled for the dry weather months of June through September. The Contract Documents should include provisions for wet weather/wet condition earthwork.

7 USE OF REPORT

This report was prepared for the exclusive use of WFC to present data and soil reuse recommendations to support engineering and restoration construction for planting benches and ELJs along Lower Cherry Creek within the Project area. This report was prepared under a scope of services and level of effort determined by the WFC to be suitable for its purposes. This report presents the data from field explorations and laboratory testing of soils at the specific locations and depths indicated using the means and methods described in this report. No other representation is made. Subsurface conditions, such as those that may be interpreted from exploration logs and test results included in this report, should not be construed as a guarantee or warranty of any subsurface conditions.

Natural processes or human activity may alter subsurface conditions. Because a geotechnical report is based on conditions that existed at the time of subsurface explorations, decisions on additional actions at the site should not be based on a report whose adequacy may have been affected by time, unless verified.

8 CLOSURE

Within the limitations of the scope, schedule, and budget, the interpretations and conclusions presented in this report were prepared in accordance with generally accepted geologic and geotechnical engineering principles and practices in this area at the time this report was prepared. We make no other warranty, either express or implied.

Shannon & Wilson has prepared the enclosed, "Important Information About Your Geotechnical Report," to assist you and others in understanding the use and limitations of our report. This enclosure is presented at the end of this report.

9 REFERENCES

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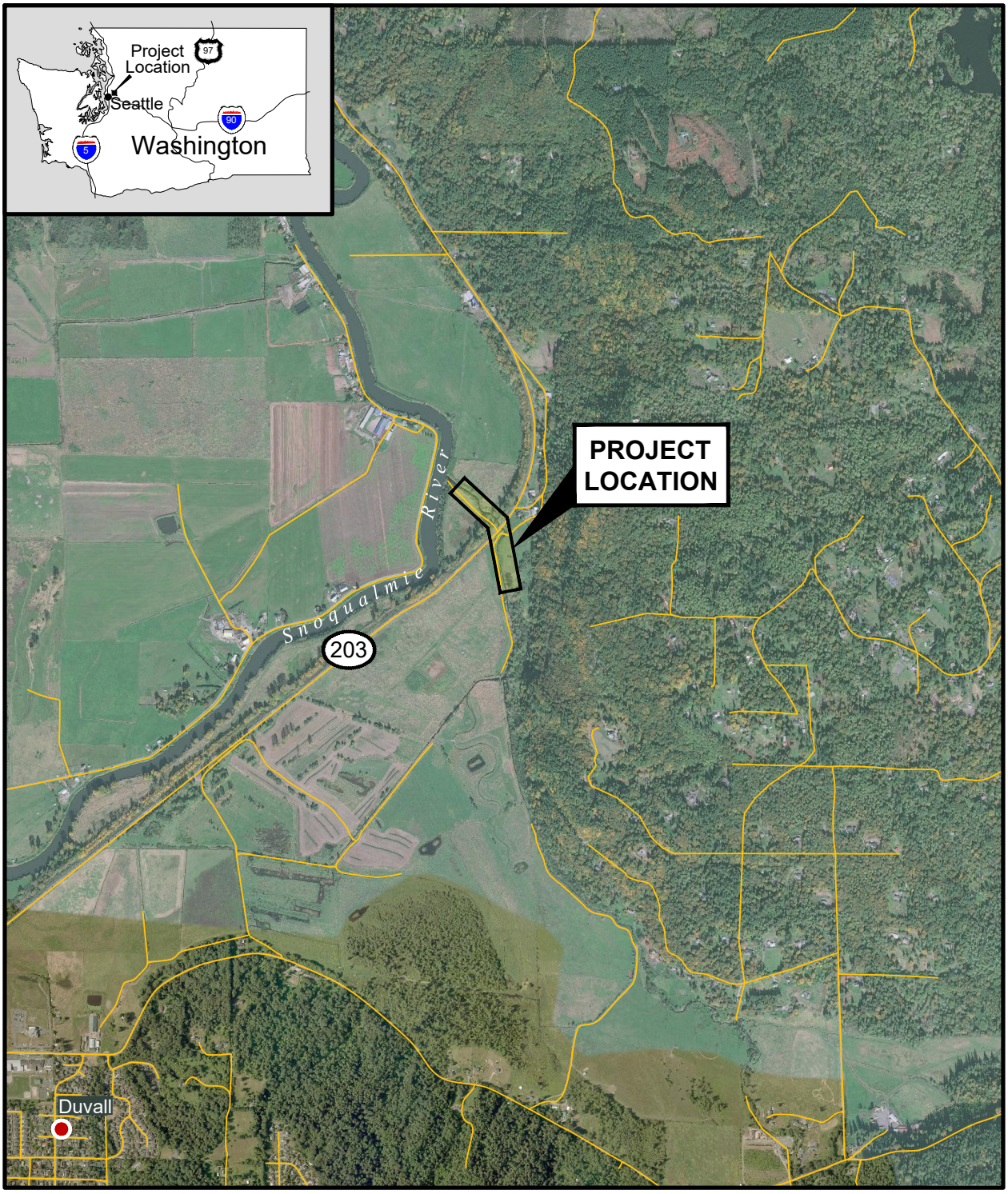

0 2,000 4,000

Approximate Scale in Feet

Lower Cherry Creek Restoration
Phases II & III Geotechnical Report
King County, Washington

VICINITY MAP

October 2022 105606-004

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1

Filename: C:\Users\jrs\CAD Group Dropbox\JDrive_SEA\105606\004\105606-004 Vicinity Map.dwg Date: 10-18-2022 Login: JRS

NOTE

Project areas based on Lower Cherry Creek Restoration draft design drawings, Phases II and III, provided by Wild Fish Conservancy and dated 2017.

LEGEND

- TP-1a-22 — 2022 Test Pit Designation and Approximate Location
- TP-1-19 — 2019 Test Pit Designation and Approximate Location
- Approximate Limits of Phase II Project Area
- Approximate Limits of Phase III Project Area

0 120 240

Scale in Feet

Lower Cherry Creek Restoration
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SITE AND EXPLORATION PLAN

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FIG. 2

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APPENDIX A: PROJECT SUBSURFACE EXPLORATIONS

Appendix A

Project Subsurface Explorations

APPENDIX A: PROJECT SUBSURFACE EXPLORATIONS

Appendix A

Project Subsurface Explorations

CONTENTS

Figures

APPENDIX A: PROJECT SUBSURFACE EXPLORATIONS

A.1 INTRODUCTION

We contracted with Rivers Edge Environmental Services to excavate 14 test pits on July 19 and 20, 2022. Rivers Edge used a Volvo EC 160DL track excavator to excavate the 14 test pits down to 15 feet below ground surface (bgs). Seven test pits were conducted along the bank of the creek, scraping from surface water to the top of the bank in order to identify the presence of riprap. These bank test pits were denoted with TP-1b-22 through TP-7b-22 from west to east. The remaining seven test pits were set back from the bank edge and denoted TP-1a-22 through TP-7a-22 from west to east. A Shannon & Wilson representative was present during test pit excavations to observe sampling operations, collect representative soil samples for laboratory testing, and prepare descriptive field logs of the test pits. The test pit locations are shown in Figure 2 within the main body of the report.

A.2 EXPLORATION LOCATIONS AND UTILITY CLEARANCE

The locations of the test pits are shown in Figure 2. Before performing the test pit excavations and drilling explorations, we provided an exploration plan, requested public and private utility locates, and coordinated with the property owner and the Wild Fish Conservancy (WFC) on bank access. Test pit locations were cleared for underground utility conflicts by public and private utility locates before excavations began. A representative from Shannon & Wilson was present during the private utility locate to aid in identifying the exploration locations and to collect approximate geographic coordinates using a handheld global positioning system unit.

During excavation of test pit TP-4a-22, we encountered a polyvinyl chloride (PVC) pipe at approximately 8.5 feet bgs. The PVC pipe was estimated to be 2 to 3 inches in diameter. We discussed the presence of the pipe with Micah Wait of WFC and assumed that it was likely abandoned.

A.3 TEST PIT PROCEDURES

A Shannon & Wilson representative collected grab and jar samples of soil excavated from the test pits. The soil samples were collected as bulk grab samples in sealed plastic bags and in airtight jar containers to preserve moisture. The samples were returned to our laboratory for further analysis and laboratory index testing. The Shannon & Wilson representative classified soil samples using the ASTM Designation D2488 Standard Recommended Practice for Description of Soils (Visual-manual Procedure) method (ASTM, 2014). The classification system is displayed in Figure A-1.

The banks where the seven test pits were excavated into the creek banks were smoothed by the excavator after their completion. Soil excavated from the test pits on the creek banks was temporarily stockpiled. This soil was combined with soil excavated from the remaining seven upland test pits and used as backfill in these test pits. The backfilled soils were tamped down using the excavator bucket.

Logs of the test pits are included in Appendix A as Figures A-2 through A-15. On the test pit logs, samples with a double line symbology and a "B" indicate bulk samples that were collected in the test pit; samples with a single line and a "J" indicate jar samples.

A.4 REFERENCE

ASTM International, 2014, Annual book of standards, construction, v. 4.08, soil and rock (I): D420 - D5876: West Conshohocken, Penn., ASTM International, 1 v.

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SOIL DESCRIPTION AND LOG KEY

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

Figure A-1
Sheet 1 of 2

Shannon & Wilson uses a soil identification system modified from the Unified Soil Classification System (USCS). Elements of the USCS and other definitions are provided on this and the following page. Soil descriptions are based on visual-manual procedures (ASTM D2488) and laboratory testing procedures (ASTM D2487), if performed.

Structure[1]

Interbedded	Alternating layers of varying material or color with layers at least 1/4-inch-thick; singular: bed.
Laminated	Alternating layers of varying material or color with layers less than 1/4-inch-thick; singular: lamination.
Fissured	Breaks along definite planes or fractures with little resistance.
Slickensided	Fracture planes appear polished or glossy; sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps that resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay.
Homogeneous	Same color and appearance throughout.

Angularity and Shape[1]

Angular	Sharp edges and unpolished planar surfaces.
Subangular	Similar to angular, but with rounded edges.
Subrounded	Nearly planar sides with well-rounded edges.
Rounded	Smoothly curved sides with no edges.
Flat	Width/thickness ratio > 3.
Elongated	Length/width ratio > 3.

Standard Penetration Test (SPT)[3]

Hammer	140 pounds with a 30-inch free fall. Rope on 6- to 10-inch-diameter cathead 2-1/4 rope turns, > 100 rpm. If automatic hammers are used, blow counts shown on boring logs should be adjusted to account for efficiency of hammer.
Sampler	10 to 30 inches long Shoe I.D. = 1.375 inches Barrel I.D. = 1.5 inches Barrel O.D. = 2 inches
N-Value	Sum blow counts for second and third 6-inch increments. Refusal: 50 blows for 6 inches or less or 10 blows for 0 inch.

Moisture Content

Dry	Absence of moisture, dusty, dry to the touch.
Moist	Damp but no visible water.
Wet	Visible free water, from below water table.

Gradation

Poorly Graded	Narrow range of grain sizes present or, within the range of grain sizes present, one or more sizes are missing (Gap Graded). Meets criteria in ASTM D2487, if tested.
Well-Graded	Full range and even distribution of grain sizes present. Meets criteria in ASTM D2487, if tested.

Cementation[1]

Weak	Crumbles/breaks with handling or slight finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

Plasticity[2]

Nonplastic	Cannot roll a 1/8-in. thread at any water content.	PI < 4
Low	A thread can barely be rolled and a lump cannot be formed when drier than the plastic limit.	4 < PI < 10
Medium	A thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. A lump crumbles when drier than the plastic limit.	10 < PI < 20
High	It takes considerable time rolling and kneading to reach the plastic limit. A thread can be rerolled several times after reaching the plastic limit. A lump can be formed without crumbling when drier than the plastic limit.	PI > 21

Additional Terms

Mottled	Irregular patches of different colors.
Bioturbated	Soil disturbance or mixing by plants or animals.
Diamict	Nonsorted sediment; sand and gravel in silt and/or clay matrix.
Cuttings	Material brought to surface by drilling.
Slough	Material that caved from sides of borehole.
Sheared	Disturbed texture, mix of strengths.

Notes:

[1]Reprinted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

[2]Adapted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

[3]Penetration resistances (N-values) shown on boring logs are as recorded in the field and have not been corrected for hammer efficiency, overburden, or other factors.

SHANNON & WILSON

SOIL DESCRIPTION AND LOG KEY

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

Figure A-1
Sheet 2 of 2

Unified Soil Classification System (USCS)
Modified From USACE Tech Memo 3-357, ASTM D2487, and ASTM D2488

Major Divisions			Symbol	Typical Identifications
Coarse-Grained Soils (more than 50% retained on No. 200 sieve)	Gravels (more than 50% of coarse fraction retained on No. 4 sieve)	Gravel (less than 5% fines)	GW	Well-graded Gravel; Well-graded Gravel with Sand
			GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Silty or Clayey Gravel (more than 12% fines)	GM	Silty Gravel; Silty Gravel with Sand
			GC	Clayey Gravel; Clayey Gravel with Sand
	Sands (50% or more of coarse fraction passes the No. 4 sieve)	Sand (less than 5% fines)	SW	Well-graded Sand; Well-graded Sand with Gravel
			SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Silty or Clayey Sand (more than 12% fines)	SM	Silty Sand; Silty Sand with Gravel
			SC	Clayey Sand; Clayey Sand with Gravel
Fine-Grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (liquid limit less than 50)	Inorganic	ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
		Organic	OL	Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
	Silts and Clays (liquid limit 50 or more)	Inorganic	MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
			CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
		Organic	OH	Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor		PT	Peat or other highly organic soils (see ASTM D4427)

Acronyms and Abbreviations

ATD	At Time of Drilling	MgO	Magnesium Oxide	psi	Pounds per Square Inch
Diam.	Diameter	mm	Millimeter	PVC	Polyvinyl Chloride
Elev.	Elevation	MnO	Manganese Oxide	rpm	Rotations per Minute
ft	Feet	NA	Not Applicable or Not Available	SPT	Standard Penetration Test
FeO	Iron Oxide	NP	Nonplastic	USCS	Unified Soil Classification System
gal	Gallons	O.D.	Outside Diameter	q_u	Unconfined Compressive Strength
Horiz.	Horizontal	OW	Observation Well	VWP	Vibrating Wire Piezometer
HSA	Hollow-Stem Auger	pcf	Pounds per Cubic Foot	Vert.	Vertical
I.D.	Inside Diameter	PID	Photoionization Detector	WOH	Weight of Hammer
in	Inches	PMT	Pressuremeter Test	WOR	Weight of Rods
lbs	Pounds	ppm	Parts per Million	Wt	Weight

Relative Density
Cohesionless Soils

N, SPT, Blows/ft	Relative Density
< 4	Very loose
4 - 10	Loose
10 - 30	Medium dense
30 - 50	Dense
> 50	Very dense

Relative Consistency
Cohesive Soils

N, SPT, Blows/ft	Relative Consistency
< 2	Very soft
2 - 4	Soft
4 - 8	Medium stiff
8 - 15	Stiff
15 - 30	Very stiff
> 30	Hard

Percentages[1, 2]

Trace	< 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

Well and Backfill Symbols

- Bentonite Cement Grout
- Bentonite Grout
- Bentonite Chips
- Silica Sand
- Perforated or Screened Casing
- Surface Cement Seal
- Asphalt or Cap
- Slough
- Inclinometer or Non-perforated Casing
- Instrumentation Riser or Electrical Lead
- Vibrating Wire Piezometer with Designation

Notes:

Dual symbols *(symbols separated by a hyphen, i.e., SP-SM, Sand with Silt)* are used for soils with between 5% and 12% fines or when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart. Graphics shown on the logs for these soil types are a combination of the two graphic symbols (e.g., SP and SM).

Borderline symbols *(symbols separated by a slash, i.e., CL/ML, Lean Clay to Silt; SP-SM/SM, Sand with Silt to Silty Sand)* indicate that the soil properties are close to the defining boundary between two groups.

No. 4 size = 4.75 mm = 0.187 in.; No. 200 size = 0.075 mm = 0.003 in.

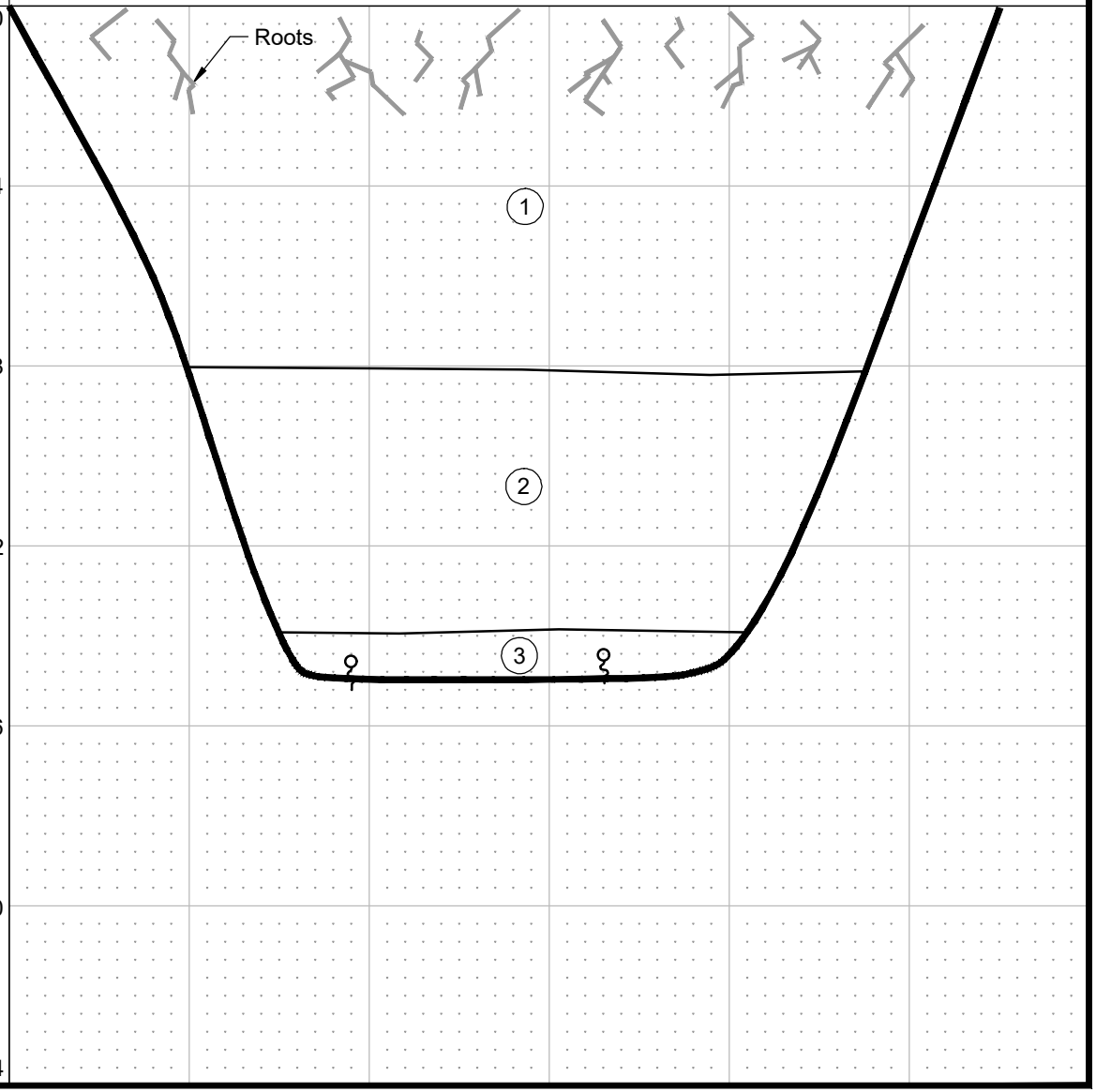
SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-1a-22

JOB NO: 105606-004 DATE: 7-19-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

Sketch of South Pit Side — Surface Elevation: Approx. 41 Ft.



SOIL DESCRIPTION	Ground Water	% Water Content	Samples
(1) Brown, *Silt (ML)*; moist; nonplastic to low plasticity; trace organics; roots to about 2.5 feet. - Topsoil in top 3 inches			
(2) Brown to gray-brown, *Silt (ML)*; moist; low to medium plasticity; trace organics.		36	S-1
(3) Gray to gray-brown, *Silt (ML) to Lean Clay (CL)*; moist; trace fine to coarse sand; medium plasticity; trace organics; strong iron-oxide staining along sand layer.	▽	36	S-2

NOTES

1. Horizontal exaggeration = 2X.
2. Water seepage observed at depth of 14.5 feet.
3. Caving on north side of wall at depth of 10 feet.

FIG. A-2

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

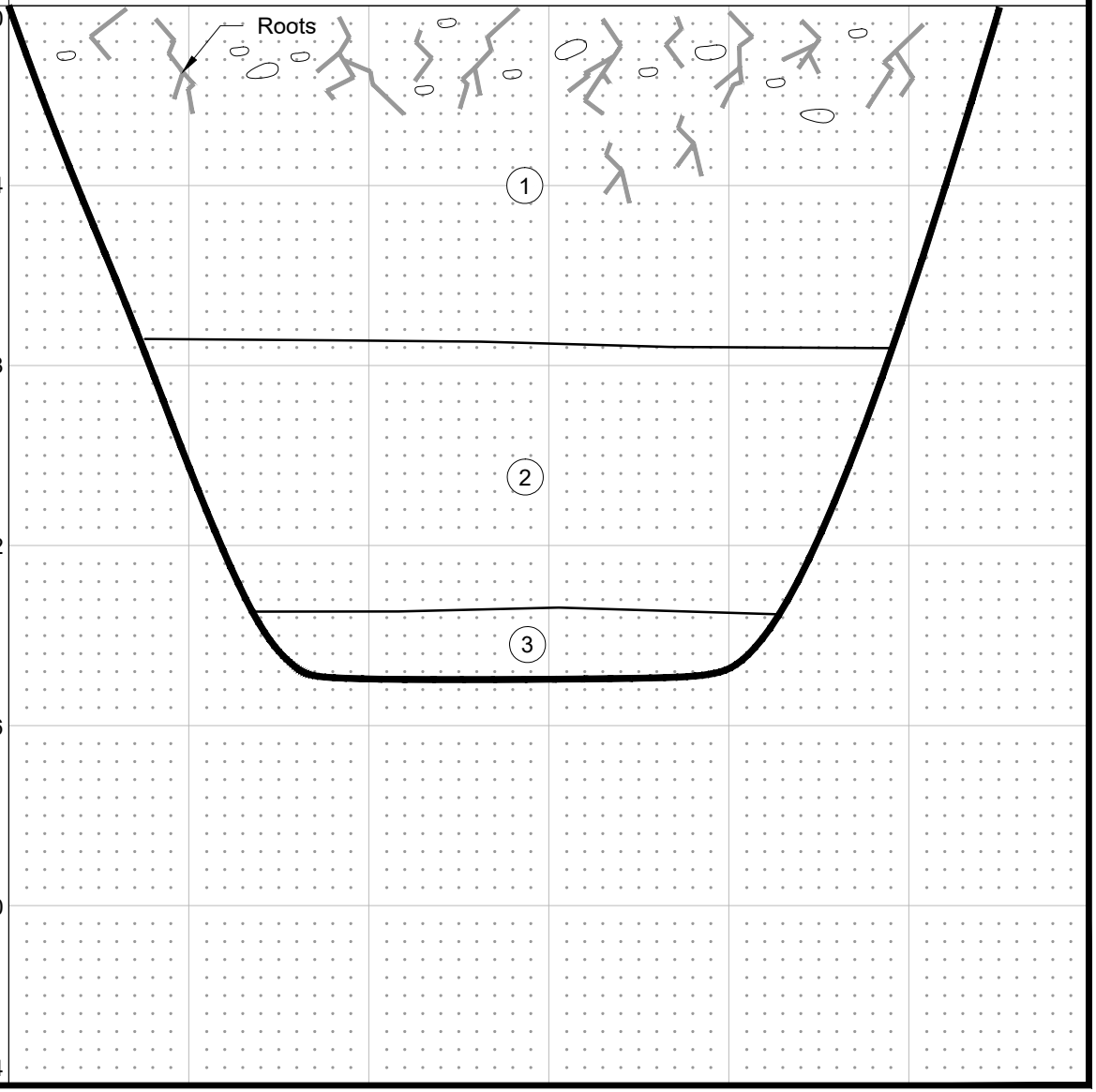
LOG OF TEST PIT TP-2a-22

JOB NO: 105606-004 DATE: 7-19-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

Sketch of South Pit Side — Surface Elevation: Approx. 40.5 Ft.

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Silt with Sand (ML)*; moist; trace subrounded cobbles and gravel; trace fine sand; medium plasticity; trace organics; roots to about 2.5 feet. - Topsoil in top 3 inches	None Observed	27	S-1 B S-4 J	0
(2) Gray-brown, *Elastic Silt (MH) to Lean Clay (CL)*; moist; trace fine sand; medium to high plasticity; trace organics; iron-oxide staining throughout.				4
(3) Gray, *Fat Clay (CH)*; moist; trace fine to coarse sand; medium to high plasticity; trace organics; seam of iron-oxide staining.		43 43	S-6 S-2	8
		47 40	S-5 S-3	12
				16
				20
				24



NOTES

1. Horizontal exaggeration = 2X.
2. After excavating to 15 feet, hole sloughed on north side of pit wall.

FIG. A-3

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

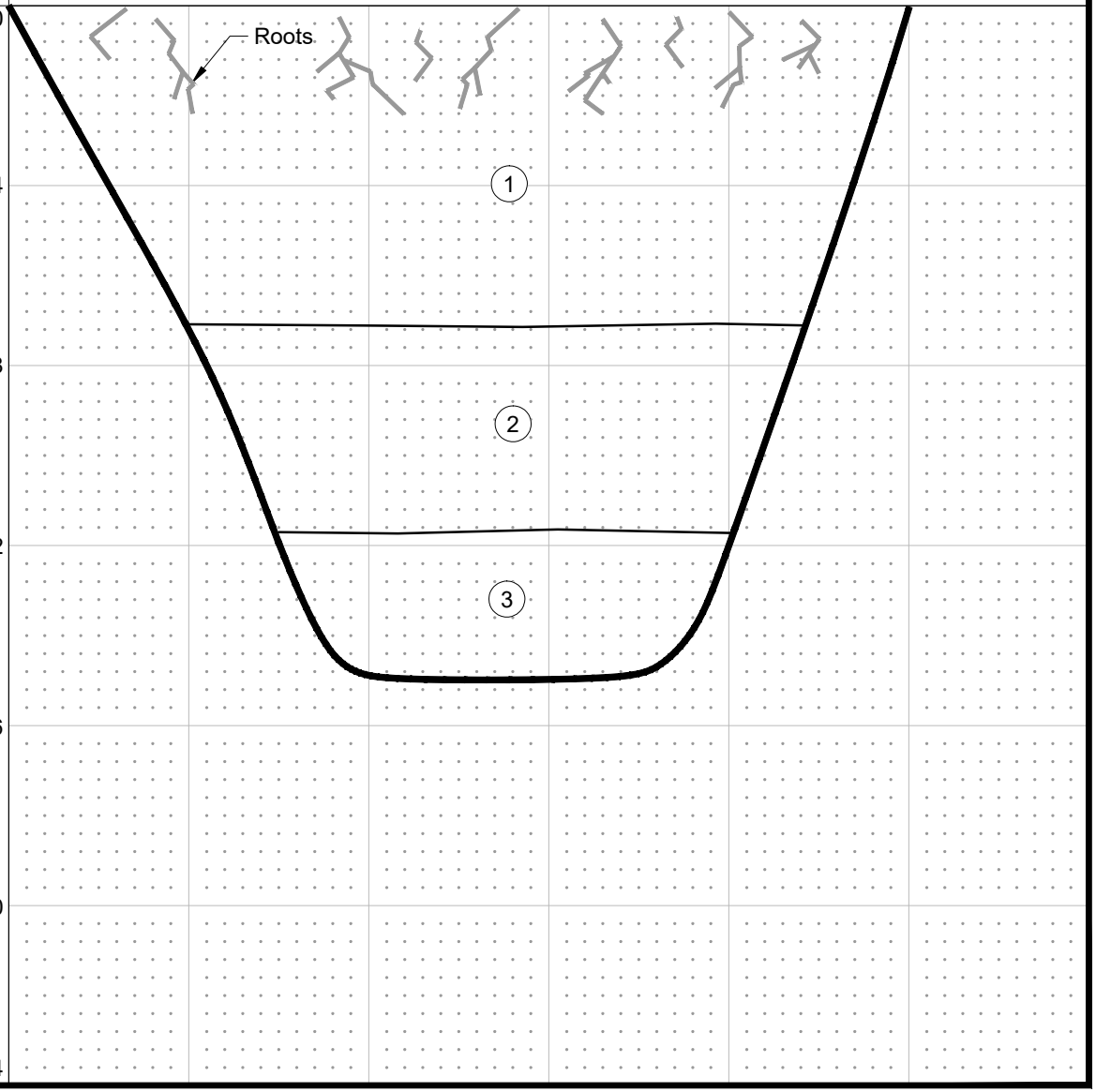
LOG OF TEST PIT TP-3a-22

JOB NO: 105606-004 DATE: 7-19-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

Sketch of South Pit Side — Surface Elevation: Approx. 40 Ft.

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Elastic Silt (MH)*; moist; trace subrounded cobbles and gravel; trace fine sand; medium plasticity; trace organics; roots to about 2.5 feet. - Topsoil in top 3 inches	None Observed	34	S-1 B S-2 J	0
(2) Gray-brown, *Silt (ML)*; moist; medium plasticity; trace iron-oxide staining.		35 41	S-3 S-5 S-4	4 8 12
(3) Gray, *Lean Clay (CL)*; moist; low to medium plasticity; trace organics; trace iron-oxide staining.		35	S-6 B S-7 J	16 20 24



NOTES

1. Horizontal exaggeration = 2X.
2. No water seepage or sloughing observed.

FIG. A-4

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

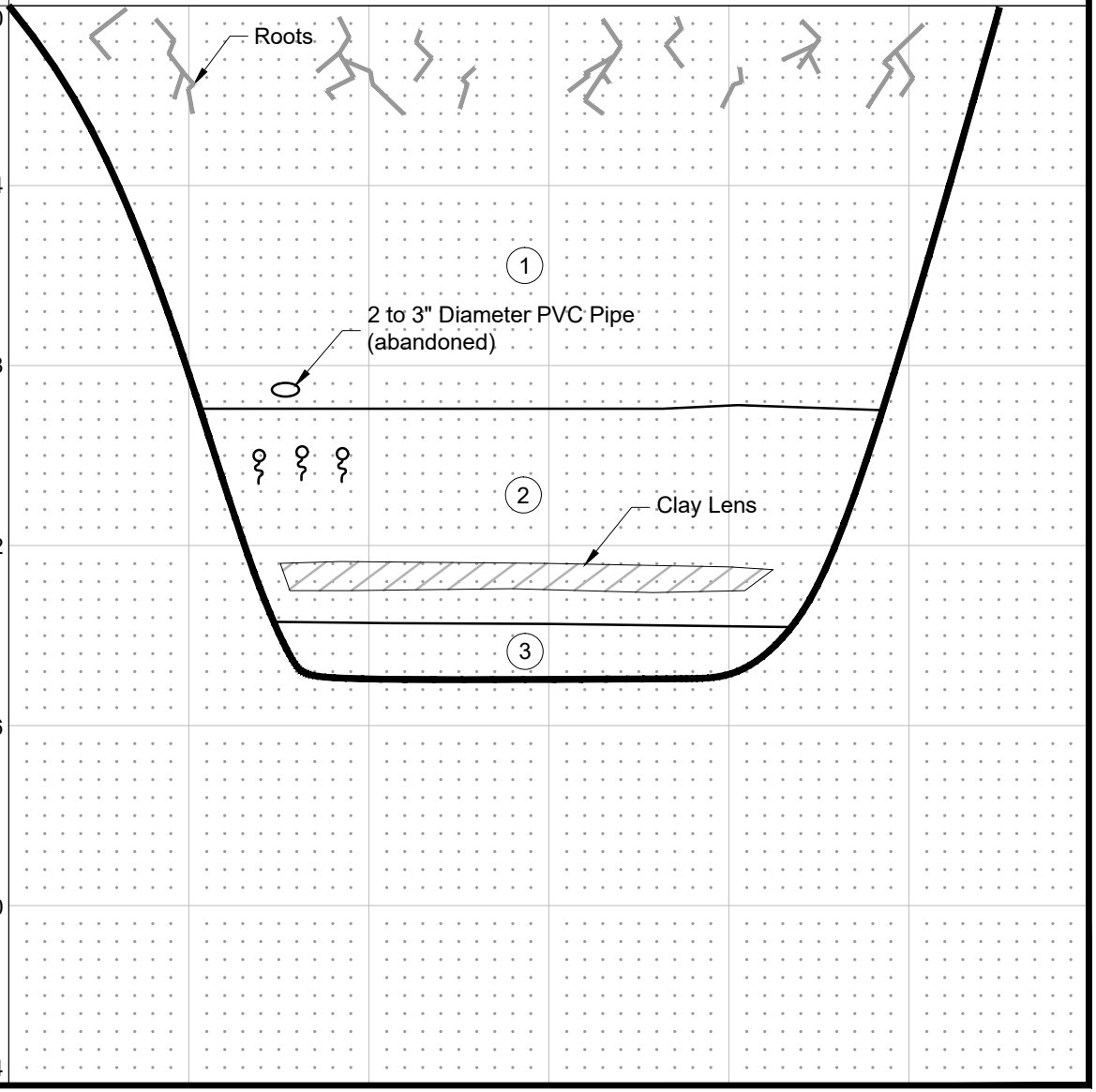
LOG OF TEST PIT TP-4a-22

JOB NO: 105606-004 DATE: 7-20-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

Sketch of South Pit Side — Surface Elevation: Approx. 39 Ft.

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Loose, brown, *Silt (ML)*; moist; trace cobble and gravel; fine sand; non-plastic to low plasticity; trace organics. - T-probe penetration: 6" at 3 feet bgs - PVC Pipe Approx. 8.5 feet bgs				0
(2) Brown, *Silt (ML) to Lean Clay (CL)*; moist; trace fine to coarse sand; low plasticity; organics; iron-oxide staining throughout. - Clay lens, 1/2- to 1-foot thick; medium plasticity				4
(3) Gray, *Sandy Silt (ML)*; moist; fine sand; low to medium plasticity; trace organics; trace iron-oxide staining.	▽	41	S-1	8
		37	S-2	12
		40	S-4 J S-3 B	16
				20
				24



NOTES

1. Horizontal exaggeration = 2X.
2. Water seepage observed at depth of 10 feet.
3. Caving on south wall after excavation.

FIG. A-5

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-5a-22

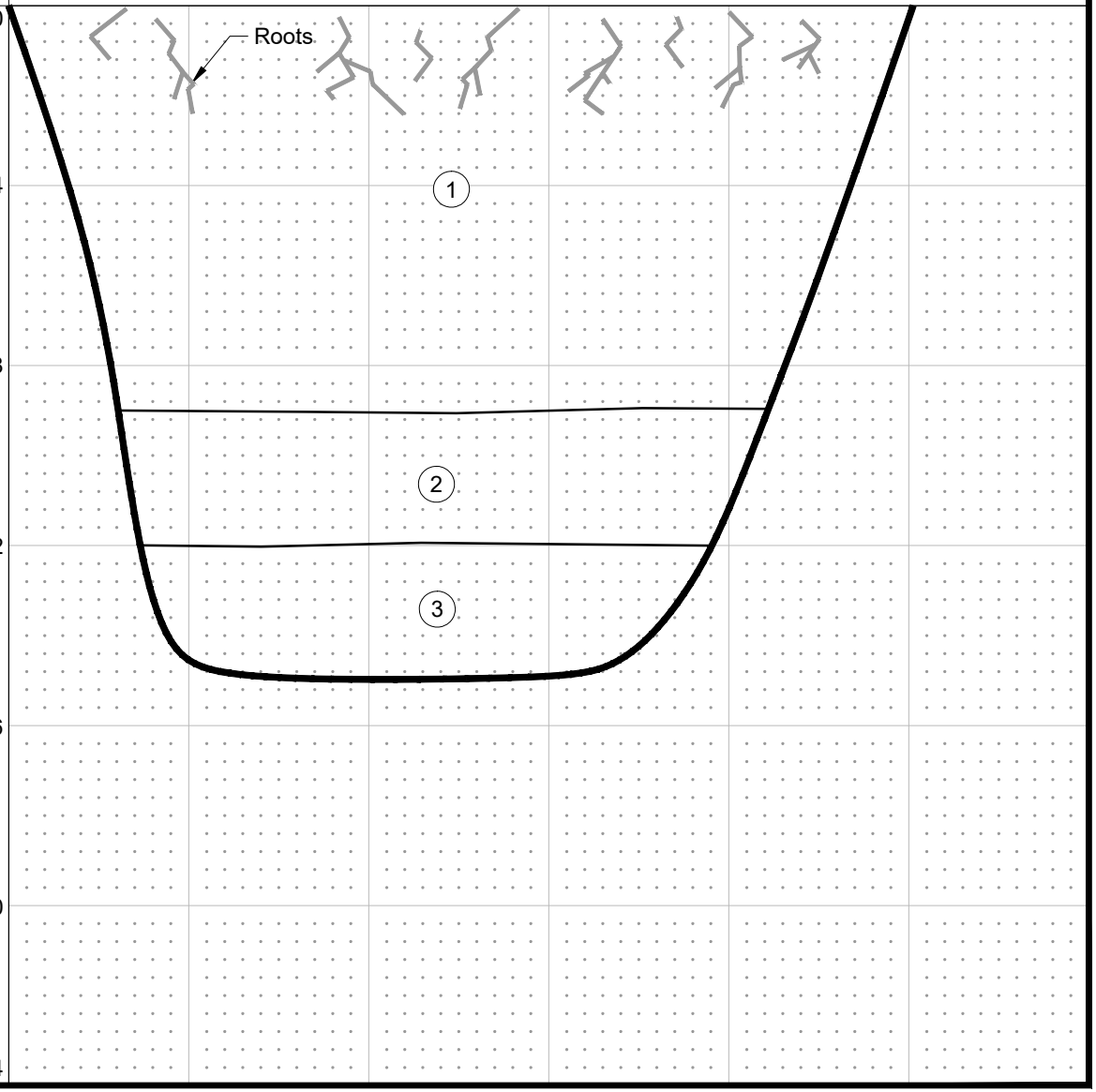
JOB NO: 105606-004 DATE: 7-20-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Very loose to loose, brown, *Silt (ML)*; moist; trace fine sand; nonplastic to low plasticity; trace organics; roots to 2 feet. - T-probe penetration: 12 inches at 3 feet bgs	None Observed	31	S-1	0
(2) Gray-brown, *Silt (ML)*; moist; trace fine sand; low to medium plasticity; trace organics.		40	S-2	4
(3) Gray, *Lean Clay (CL)*; moist; fine sand; medium plasticity; trace organics; trace iron-oxide staining.		37	S-3	8
		36	S-4	12
				16
				20
				24

Sketch of North Pit Side

Surface Elevation: Approx. 40 Ft.



NOTES

1. Horizontal exaggeration = 2X.
2. No water seepage or sloughing observed.

FIG. A-6

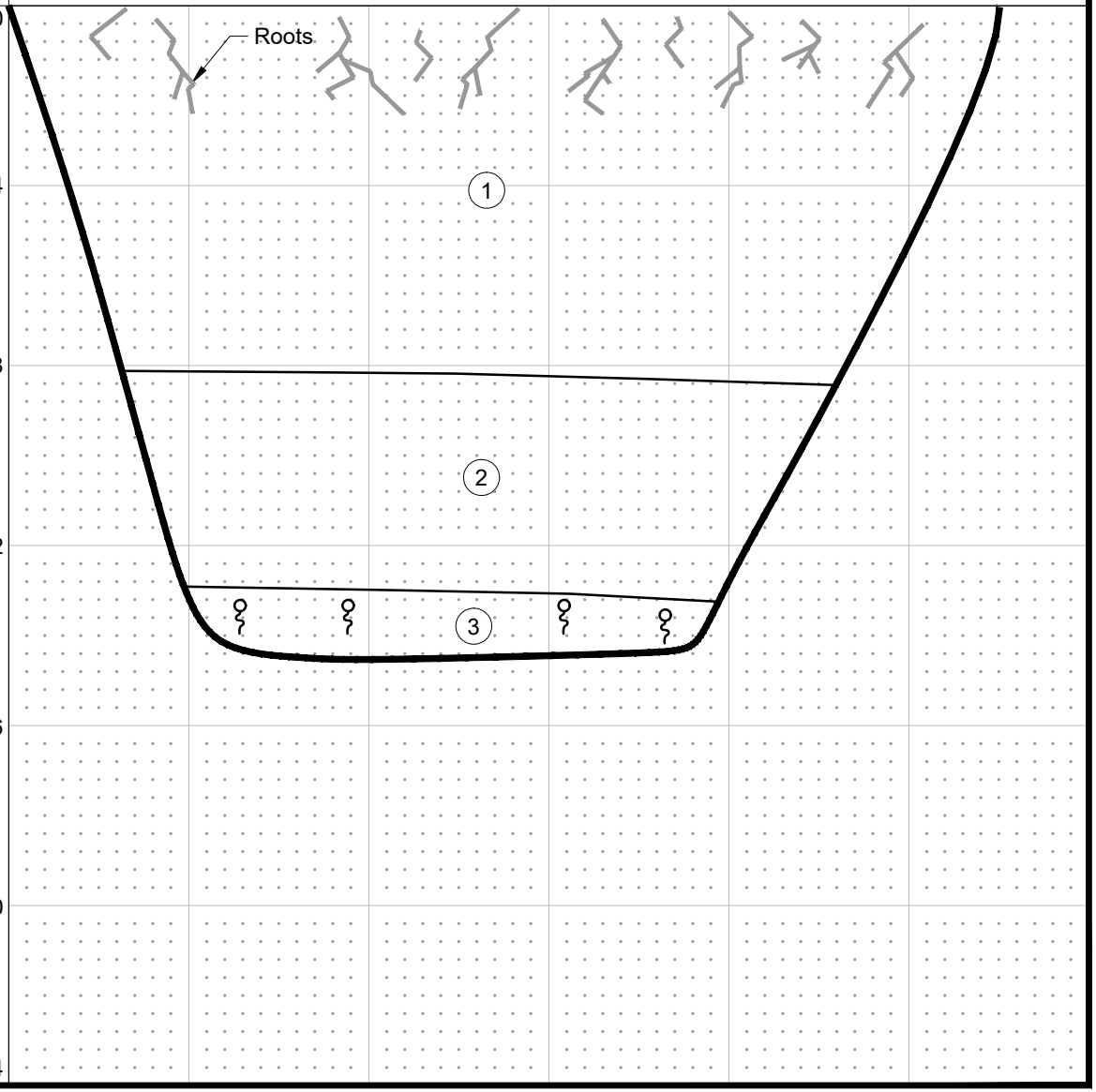
SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-6a-22

JOB NO: 105606-004 DATE: 7-20-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

Sketch of South Pit Side — Surface Elevation: Approx. 38 Ft.



SOIL DESCRIPTION	Ground Water	% Water Content	Samples
(1) Loose, brown, *Silt (ML)*; moist; fine sand; nonplastic to low plasticity; little organics; roots to 2.5 feet. - T-probe penetration: 6 inches at 2.5 feet bgs			
(2) Brown to gray-brown, *Silt (ML)*; moist; trace fine sand; low to medium plasticity; trace organics and charcoal; iron-oxide staining.		34	S-1
(3) Gray, *Lean Clay (CL)*; moist to wet; low to medium plasticity; trace organics; local iron-oxide staining.	▽		S-2

NOTES

1. Horizontal exaggeration = 2X.
2. Rapid water infiltrating hole at 14 feet bgs.

FIG. A-7

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

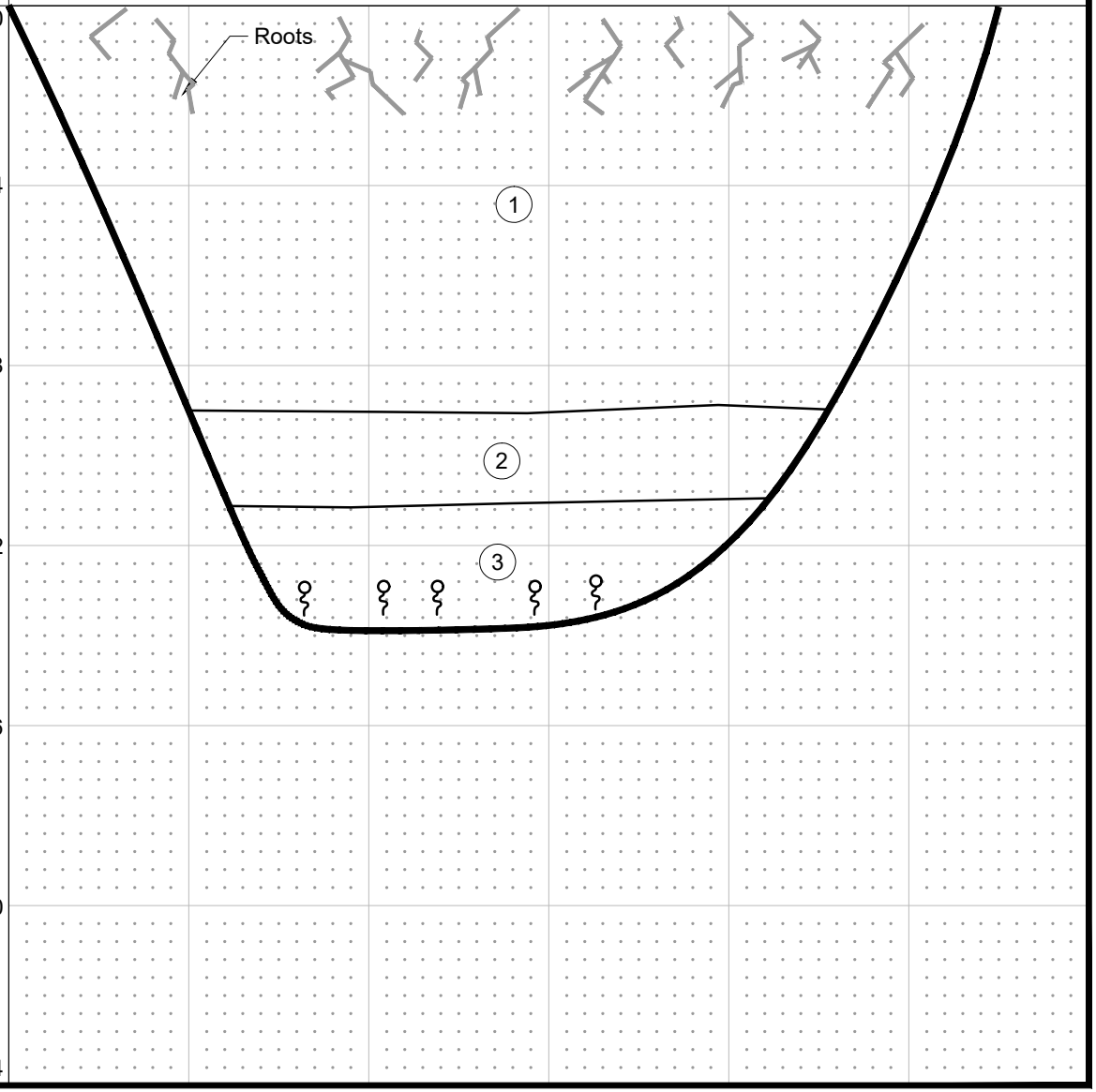
LOG OF TEST PIT TP-7a-22

JOB NO: 105606-004 DATE: 7-20-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

Sketch of East Pit Side — Surface Elevation: Approx. 38 Ft.

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Loose, brown, *Silt (ML)*; moist; trace fine sand; nonplastic to low plasticity; roots to 2.5 feet. - T-probe penetration: 6 inches at 2.5 to 3 ft bgs	▽	35	S-1 S-2 S-3	0
(2) Brown to gray-brown, *Silt (ML)*; low to medium plasticity; trace organics; iron-oxide staining throughout.				4
(3) Gray, *Lean Clay (CL)*; moist to wet; trace fine sand; medium plasticity; trace organics; iron-oxide staining.				8
				12
				16
				20
				24



NOTES

1. Horizontal exaggeration = 2X.
2. Rapid water infiltrating hole at 13 feet bgs.

FIG. A-8

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-1b-22

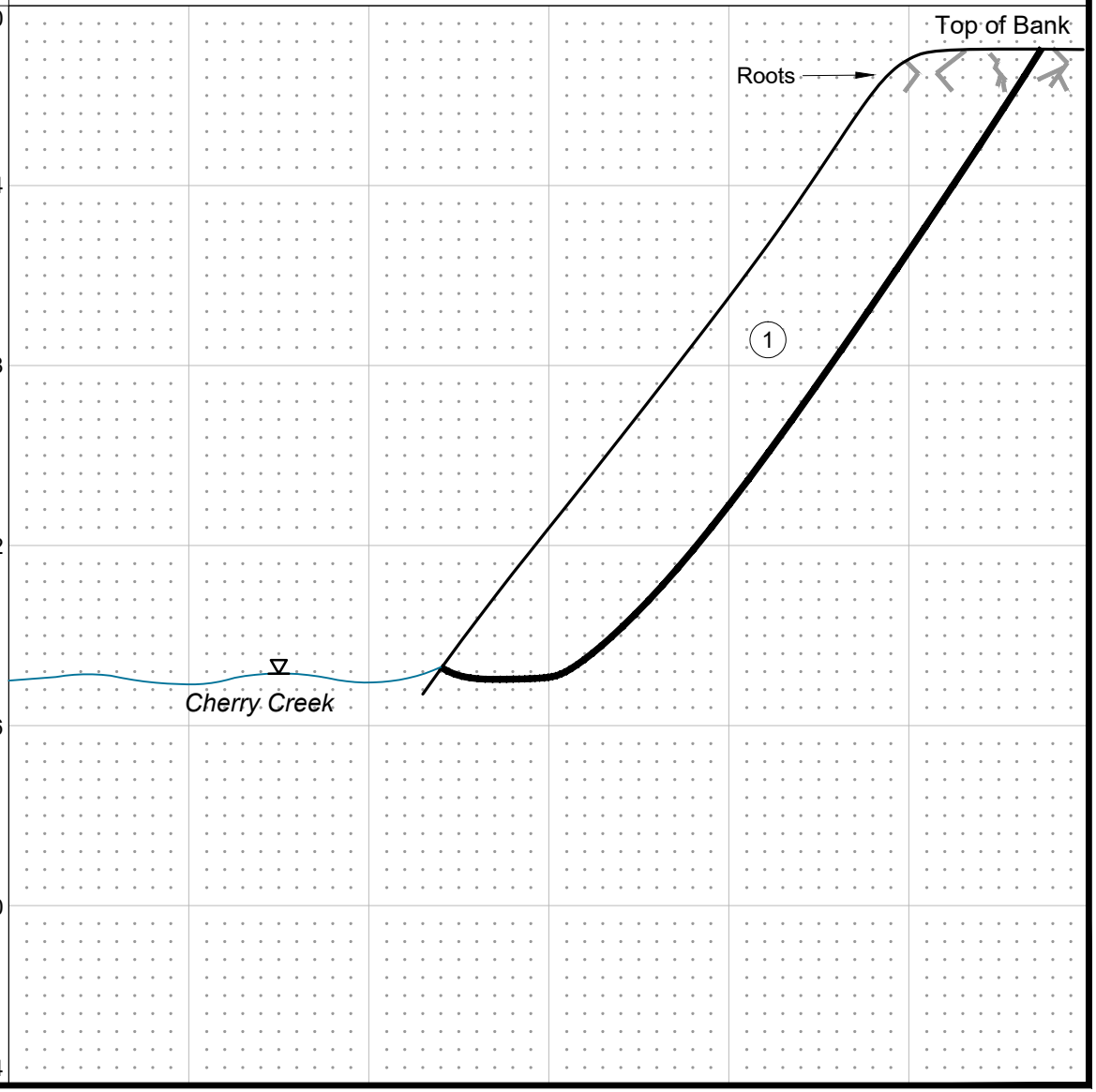
JOB NO: 105606-004 DATE: 7-19-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Sandy Silt (ML) to Silty Sand (SM)*; moist; trace cobbles and gravel; fine sand; nonplastic; trace organics; roots to about 1 foot.	None Observed		S-1	0

Sketch of Right Bank

Surface Elevation: Approx. 40 Ft.



NOTES

1. Horizontal exaggeration = 2X.
2. No riprap encountered from 0 to 2 feet scraping into river bank.

FIG. A-9

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

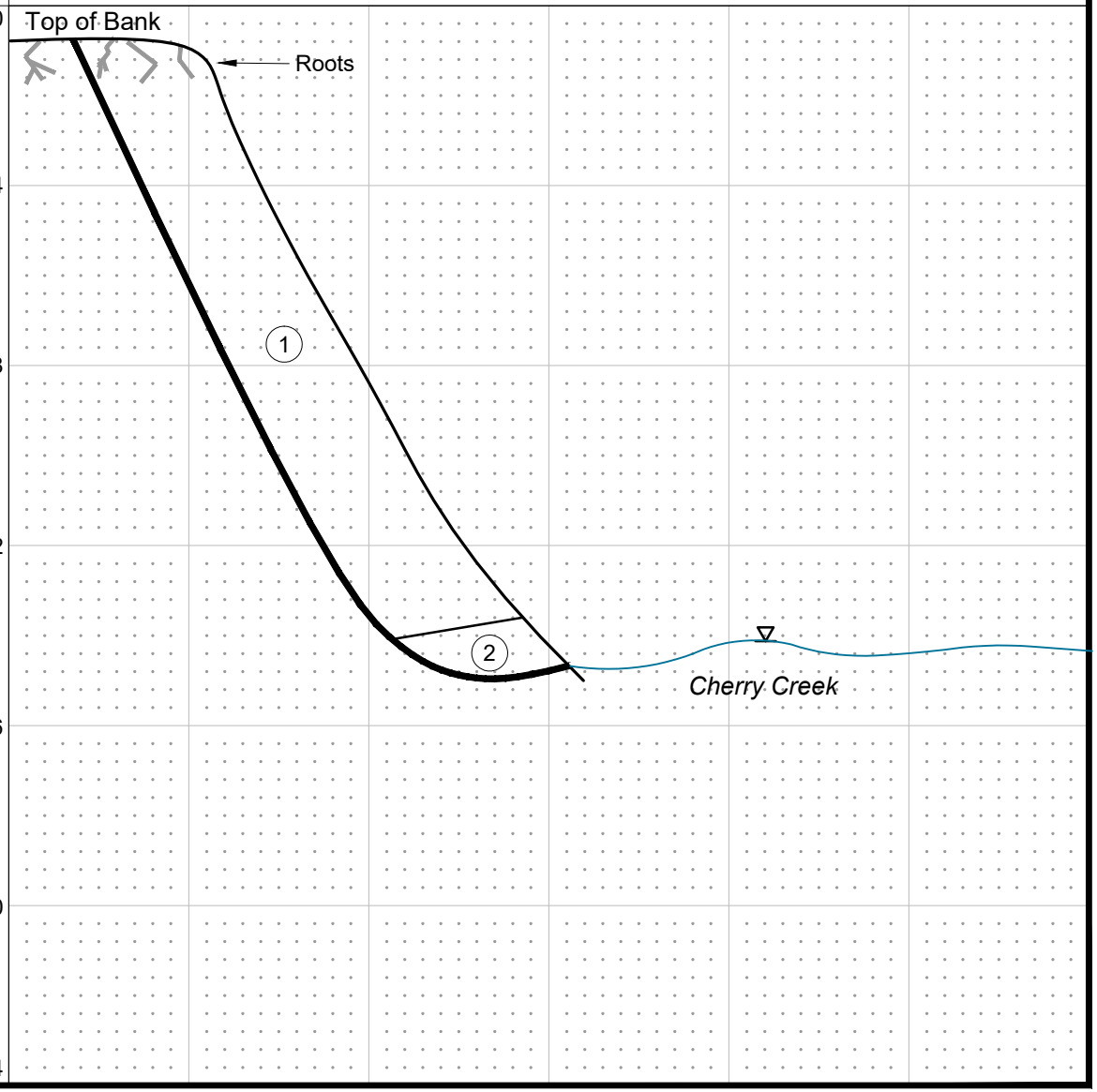
LOG OF TEST PIT TP-2b-22

JOB NO: 105606-004 DATE: 7-19-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

Sketch of Left Bank — Surface Elevation: Approx. 40 Ft.

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Silty Clayey Sand (SM)*; moist; fine sand; nonplastic to low plasticity; trace organics; roots to about 1.5 feet.	None Observed	19	S-1	0
(2) Gray, *Lean Clay (CL) to Elastic Silt (MH)*; moist; trace fine sand; low to medium plasticity; trace organics; trace iron-oxide staining.			S-2	12



NOTES

1. Horizontal exaggeration = 2X.
2. No riprap encountered from 0 to 2 feet scraping into river bank.

FIG. A-10

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-3b-22

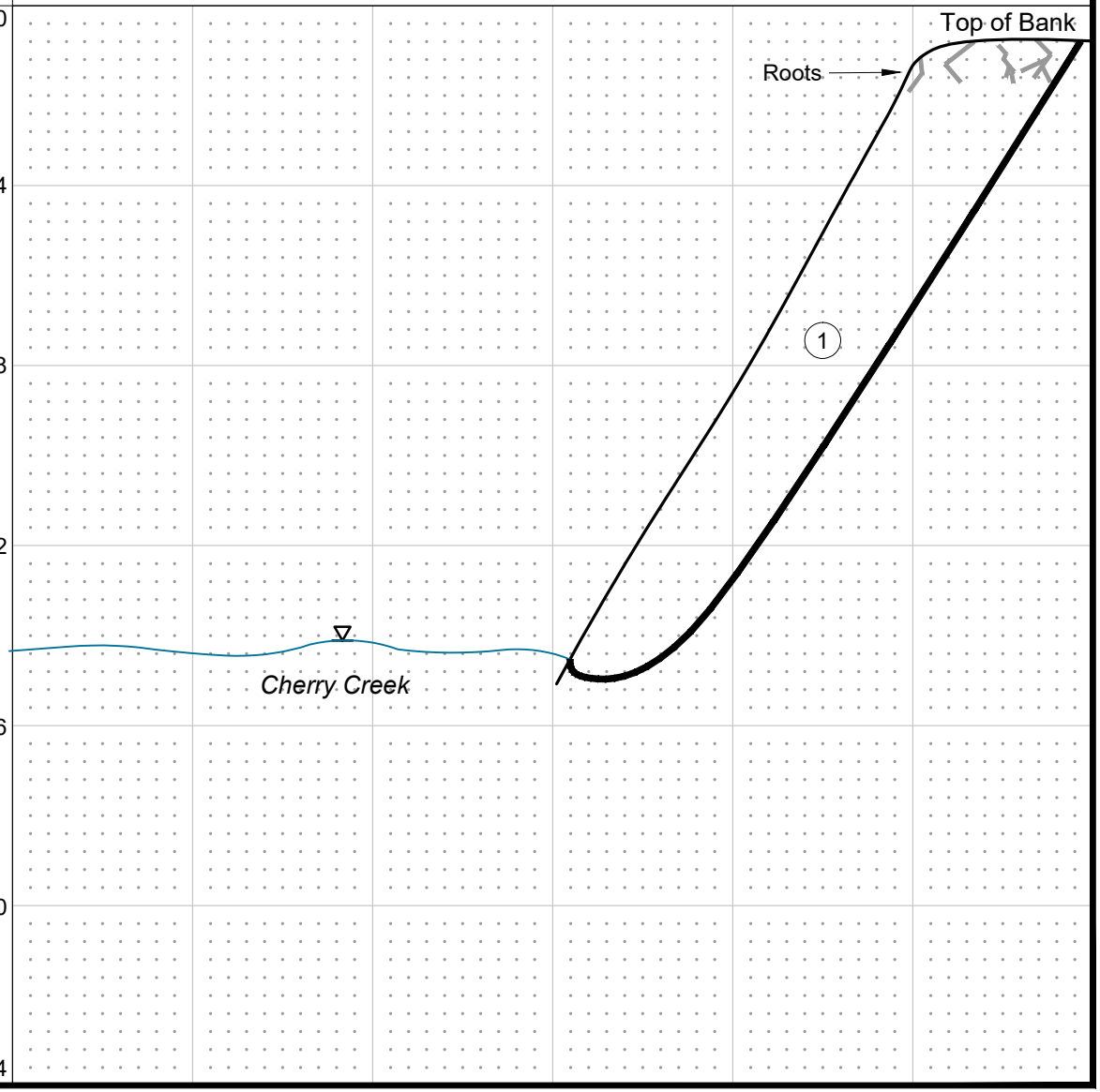
JOB NO: 105606-004 DATE: 7-19-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Silty Sand (SM)*; moist; fine sand; nonplastic; trace organics; roots to about 1.5 feet.	None Observed	17	S-1	0

Sketch of Right Bank

Surface Elevation: Approx. 39 Ft.



NOTES

1. Horizontal exaggeration = 2X.
2. No riprap encountered from 0 to 2 feet scraping into river bank.

FIG. A-11

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-4b-22

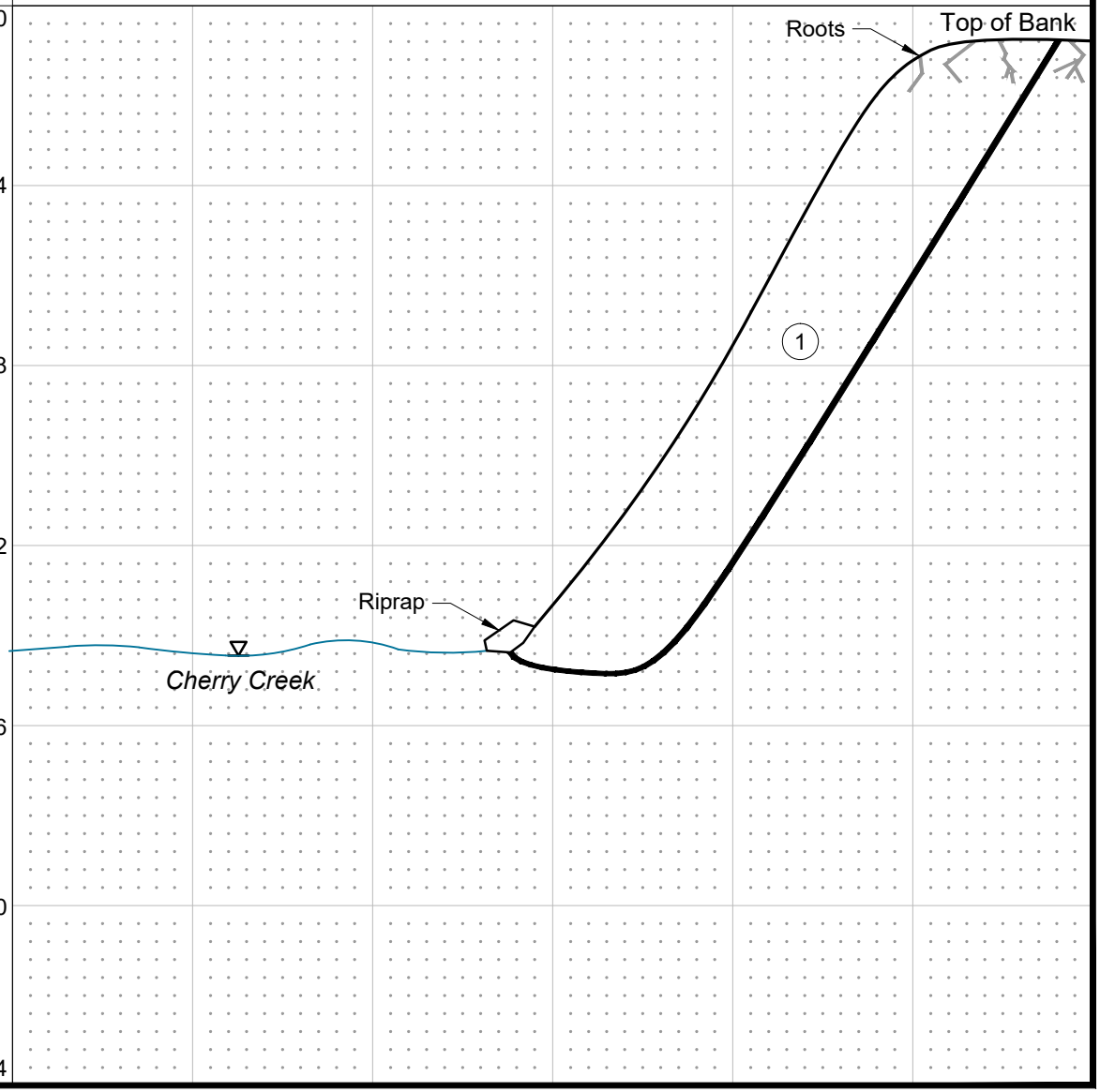
JOB NO: 105606-004 DATE: 7-20-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Silty Sand (SM)*; trace cobbles and gravel; fine sand; trace riprap; nonplastic to low plasticity; trace organics.	None Observed	27	S-1	0

Sketch of Right Bank

Surface Elevation: Approx. 38 Ft.



NOTES

1. Horizontal exaggeration = 2X.
2. One-man rock encountered and pulled from surface when scraping 0 to 2 feet into river bank.

FIG. A-12

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-5b-22

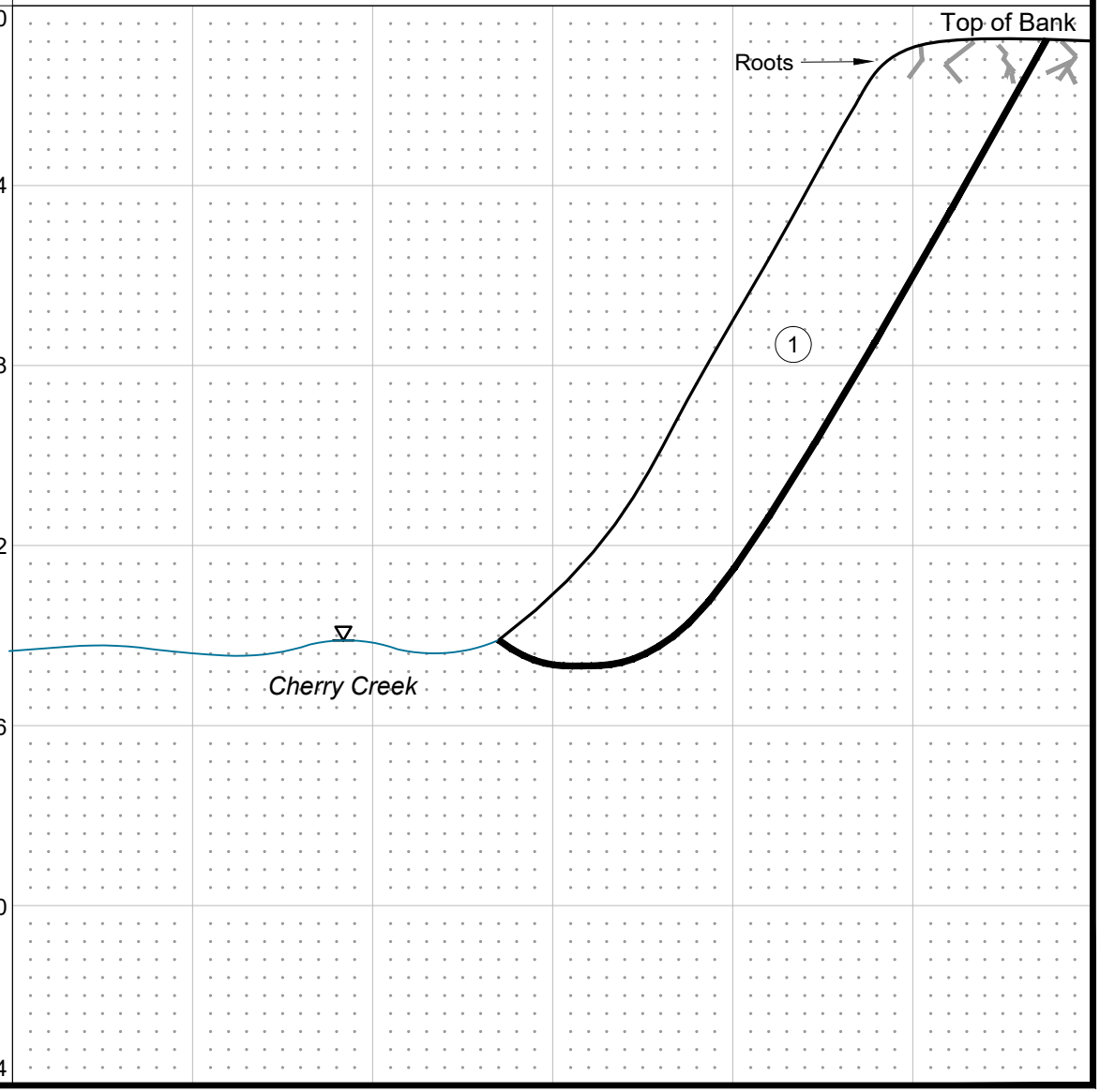
JOB NO: 105606-004 DATE: 7-20-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Silty Sand (SM)*; moist; nonplastic to low plasticity; roots to about 1.5 feet.	None Observed			0

Sketch of Right Bank

Surface Elevation: Approx. 39.5 Ft.



NOTES

1. Horizontal exaggeration = 2X.
2. No riprap encountered from 0 to 2 feet scraping into river bank.

FIG. A-13

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-6b-22

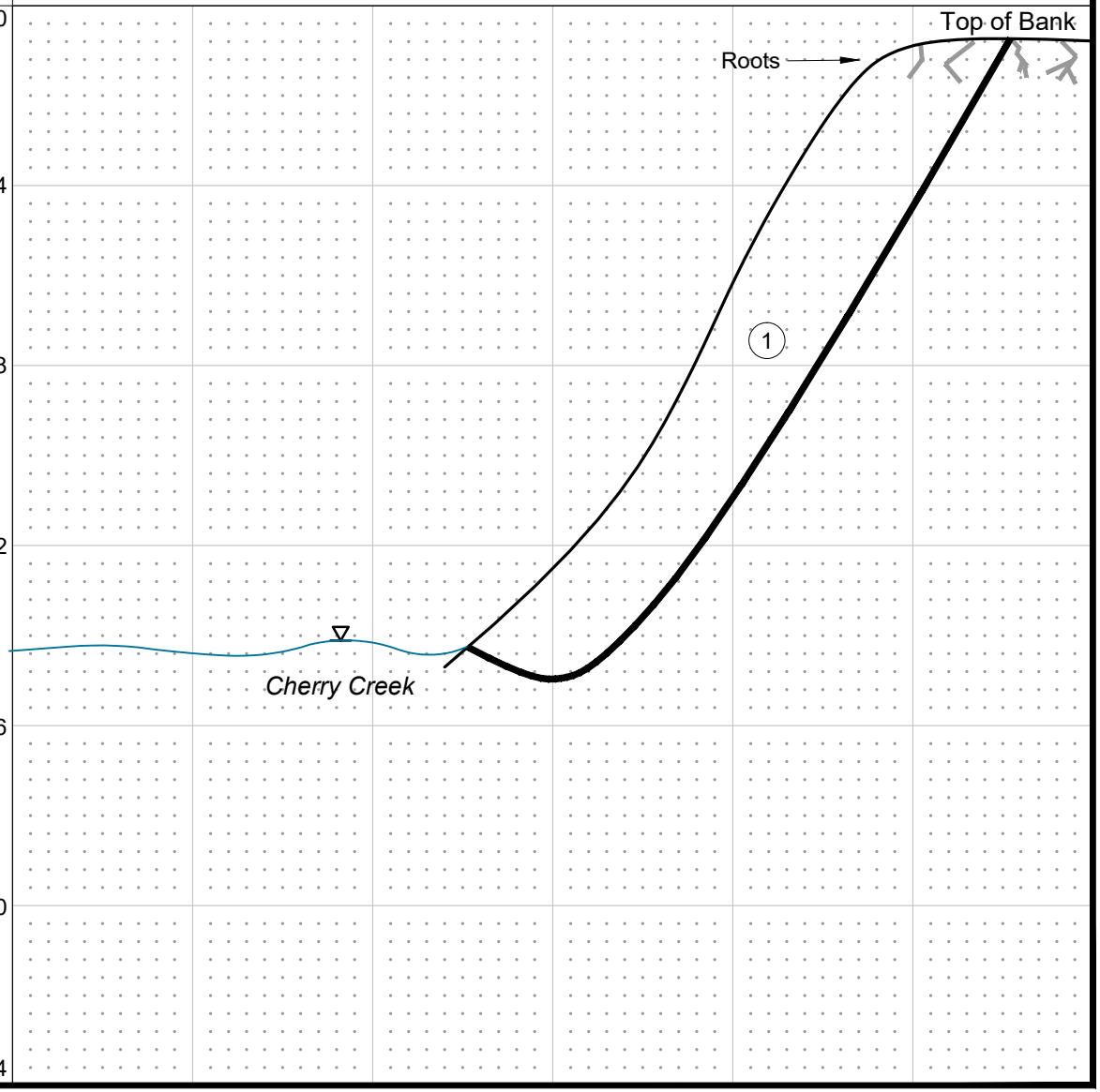
JOB NO: 105606-004 DATE: 7-20-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Sandy Silt (ML) to Silty Sand (SM)*; moist; nonplastic to low plasticity; trace organics; roots to about 1.5 feet	None Observed		S-1	0

Sketch of Right Bank

Surface Elevation: Approx. 38 Ft.



NOTES

1. Horizontal exaggeration = 2X.
2. No riprap encountered from 0 to 2 feet scraping into river bank.

FIG. A-14

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-7b-22

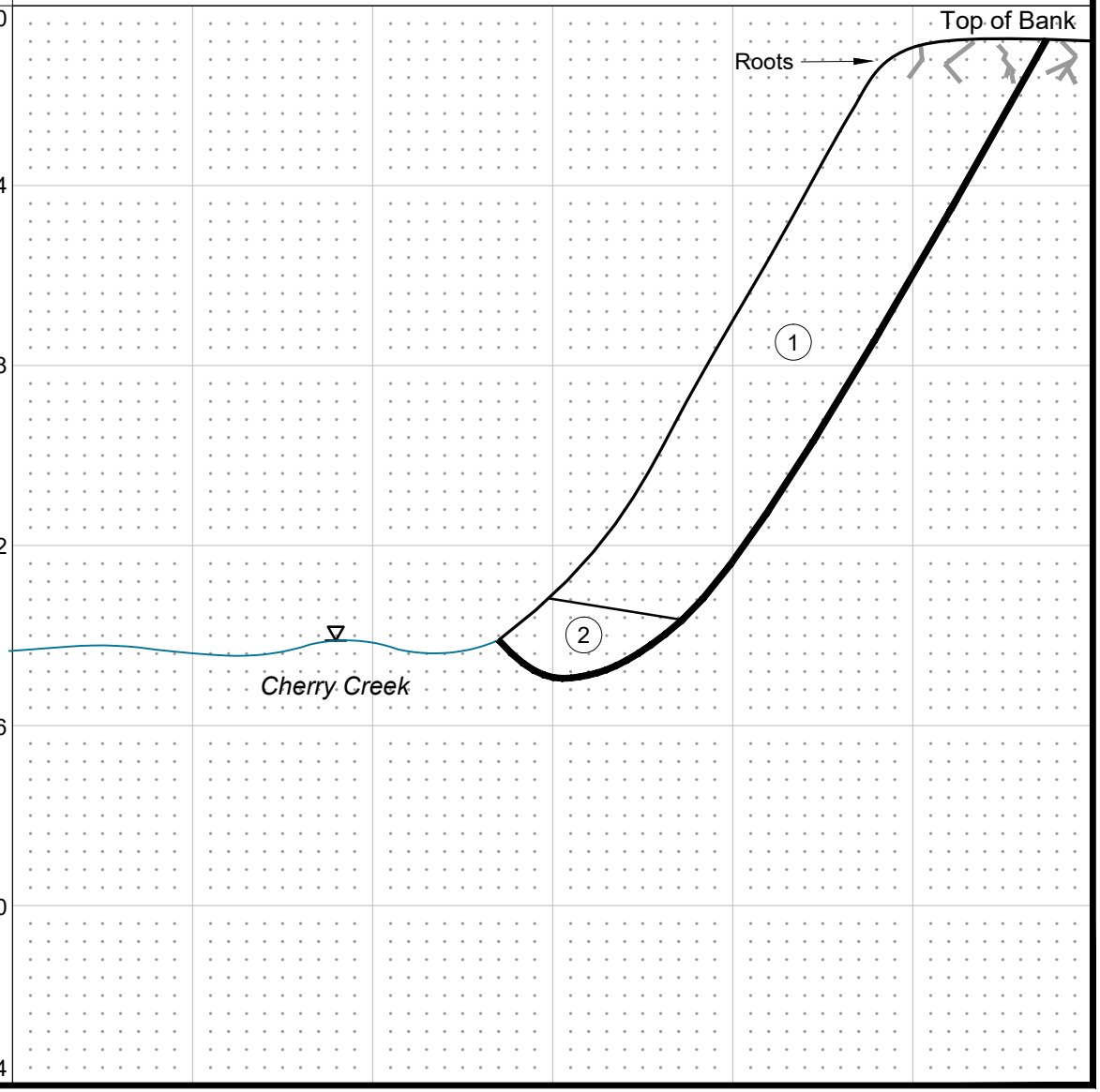
JOB NO: 105606-004 DATE: 7-20-22 LOCATION: See Site and Exploration Plan

PROJECT: Lower Cherry Creek Restoration; King County, Washington

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Silt (ML)*; moist; fine sand; nonplastic to low plasticity; trace organics; roots to about 1.5 feet.	None Observed	31	S-1	0
(2) Brown to gray-brown, *Silt (ML)*; moist; trace fine sand; nonplastic to low plasticity; trace organics; iron-oxide staining.				4
				8
				12
				16
				20
				24

Sketch of Right Bank

Surface Elevation: Approx. 38 Ft.



NOTES

1. Horizontal exaggeration = 2X.
2. No riprap encountered from 0 to 2 feet scraping into river bank.

FIG. A-15

APPENDIX B: GEOTECHNICAL LABORATORY TEST RESULTS

Appendix B

Geotechnical Laboratory Test Results

CONTENTS

Table B-1 - Summary of Laboratory Testing

Exploration Designation	Top Depth (feet)	Sample Number	USCS	Water Content (%)	Gravel Percent (%)	Sand Percent (%)	Fines Percent (%)	Liquid Limit, LL	Plastic Limit, PL	Plasticity Index, PI	Soil Description
TP-1a-22	8	S-1		35.6							
TP-1a-22	14	S-2	ML	36.3		3	97	37	25	12	Silt
TP-2a-22	2	S-4	ML	27.1	2	14	84	43	28	15	Silt with Sand
TP-2a-22	8	S-6	MH	42.6		2	98	50	29	21	Elastic Silt
TP-2a-22	9	S-2	CL	43.1				44	26	18	Lean Clay
TP-2a-22	13.5	S-5	CH	47.1		0	100	56	26	30	Fat Clay
TP-2a-22	14	S-3		40.4							
TP-2b-22	0	S-1	SC-SM	18.9	1	58	41	27	20	7	Silty, Clayey Sand
TP-3a-22	1	S-2	MH	33.8		4	96	50	30	20	Elastic Silt
TP-3a-22	10	S-3	ML	35.3		1	99	43	27	16	Silt
TP-3a-22	11	S-5		41.3							
TP-3a-22	14	S-7	CL	35.3	0	100		38	24	14	Lean Clay
TP-3b-22	0	S-1	SM	16.5	68	32		NP	NP	NP	Silty Sand
TP-4a-22	9	S-1		41.3							
TP-4a-22	13	S-2	CL	37.0	6	94		36	22	14	Lean Clay
TP-4a-22	14	S-4	ML	40.1	32	68		36	28	8	Sandy Silt
TP-4b-22	0	S-1	SM	27.3	56	44		33	24	9	Silty Sand
TP-5a-22	3	S-1		31.3							
TP-5a-22	9	S-2		40.0							
TP-5a-22	12	S-3	CL	36.8	6	94		35	21	14	Lean Clay
TP-5a-22	13	S-4		35.8							
TP-6a-22	11	S-1		34.4							
TP-7b-22	0	S-1	ML	30.8	5	95		38	26	12	Silt
TP-7a-22	11	S-2	CL	35.4	2	98		40	22	18	Lean Clay

NOTES:

NP - non-plastic; USCS = Unified Soil Classification System

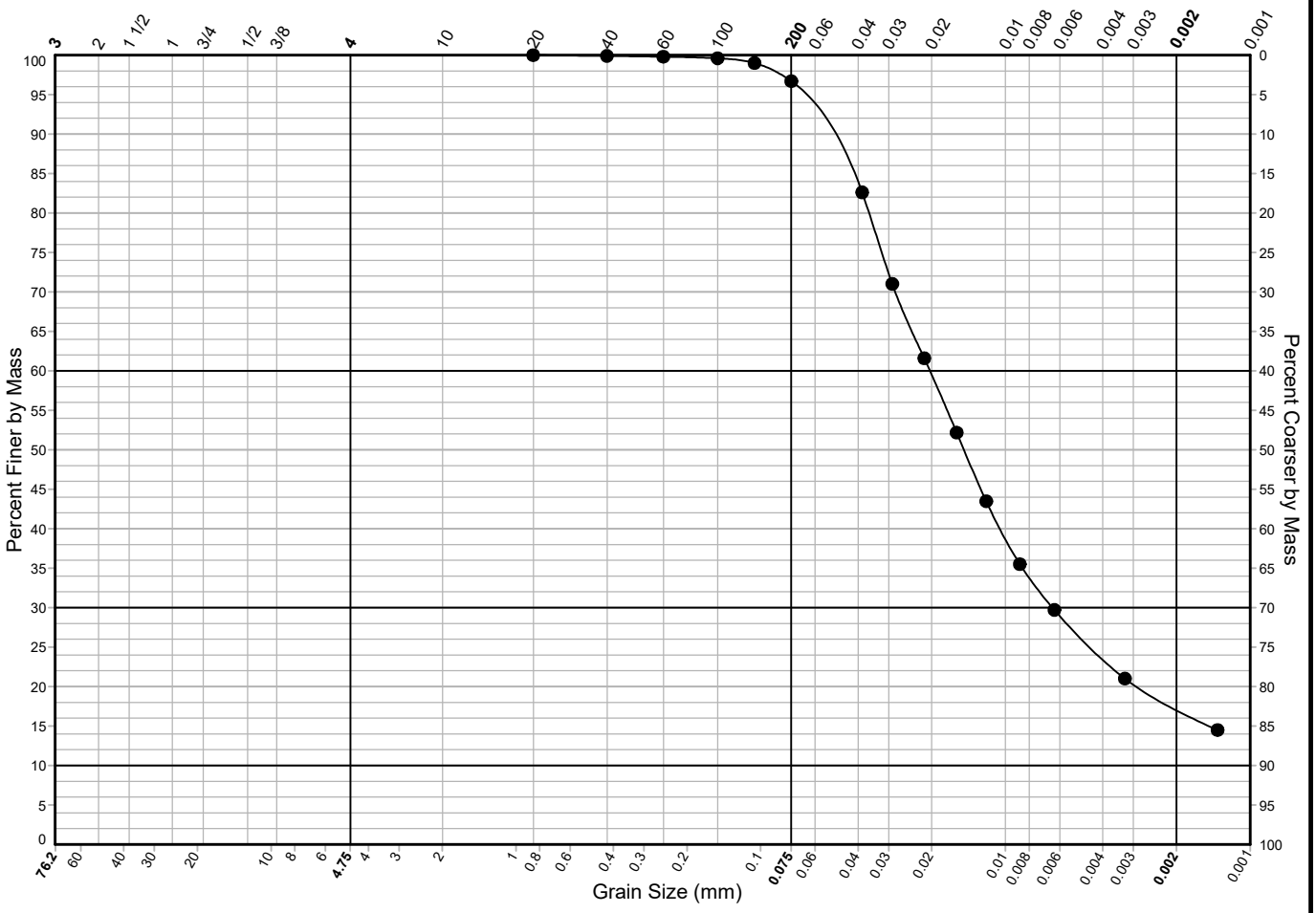
SHANNON & WILSON

GRAIN SIZE DISTRIBUTION PLOT

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-1a-22

Gravel		Sand			Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay-Size
Mesh Opening in Inches		Mesh Openings per Inch, U.S. Standard			Grain Size in Millimeters	



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-1a-22, S-2	14.0	ML	Silt			97			36	KCV	MXM	D7928

[2] Cobble percentages are calculated using the pre-removal, oven-dried mass of the total specimen. USCS Group Symbol, Soil Classification Group Name, Gravel %, Sand %, Fines %, <0.02mm %, and <2um% values are calculated from particles smaller than 76.2mm (3 inches) only, per ASTM D2487.

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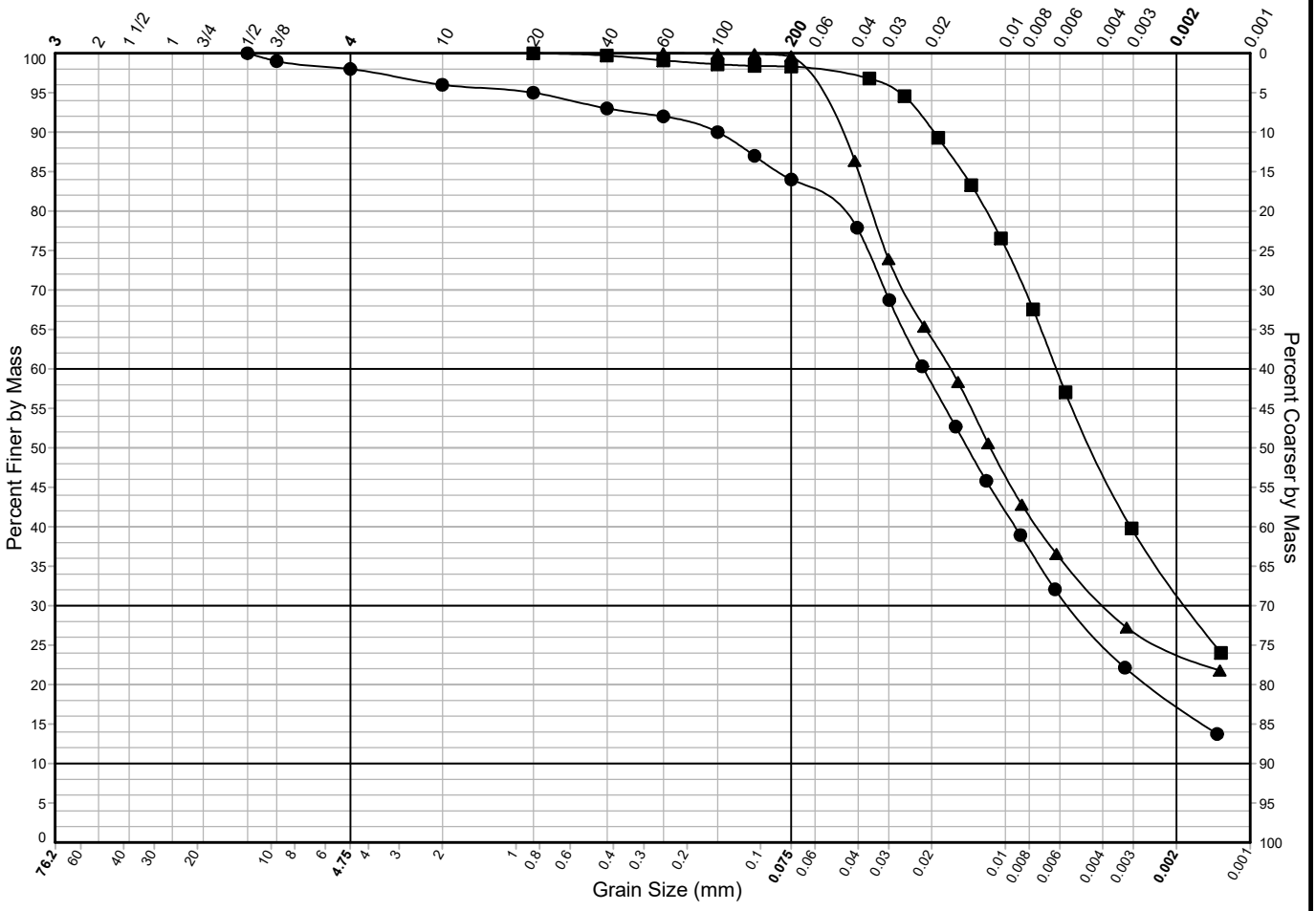
GRAIN SIZE DISTRIBUTION PLOT

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-2a-22

Gravel		Sand			Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay-Size
Mesh Opening in Inches		Mesh Openings per Inch, U.S. Standard			Grain Size in Millimeters	



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-2a-22, S-4	2.0	ML	Silt with Sand			84			27	KCV	MXM	D7928
■ TP-2a-22, S-6	8.0	MH	Elastic Silt			98			43	KCV	MXM	D7928
▲ TP-2a-22, S-5	13.5	CH	Fat Clay			100			47	KCV	MXM	D7928

[2] Cobble percentages are calculated using the pre-removal, oven-dried mass of the total specimen. USCS Group Symbol, Soil Classification Group Name, Gravel %, Sand %, Fines %, <0.02mm %, and <2um% values are calculated from particles smaller than 76.2mm (3 inches) only, per ASTM D2487.

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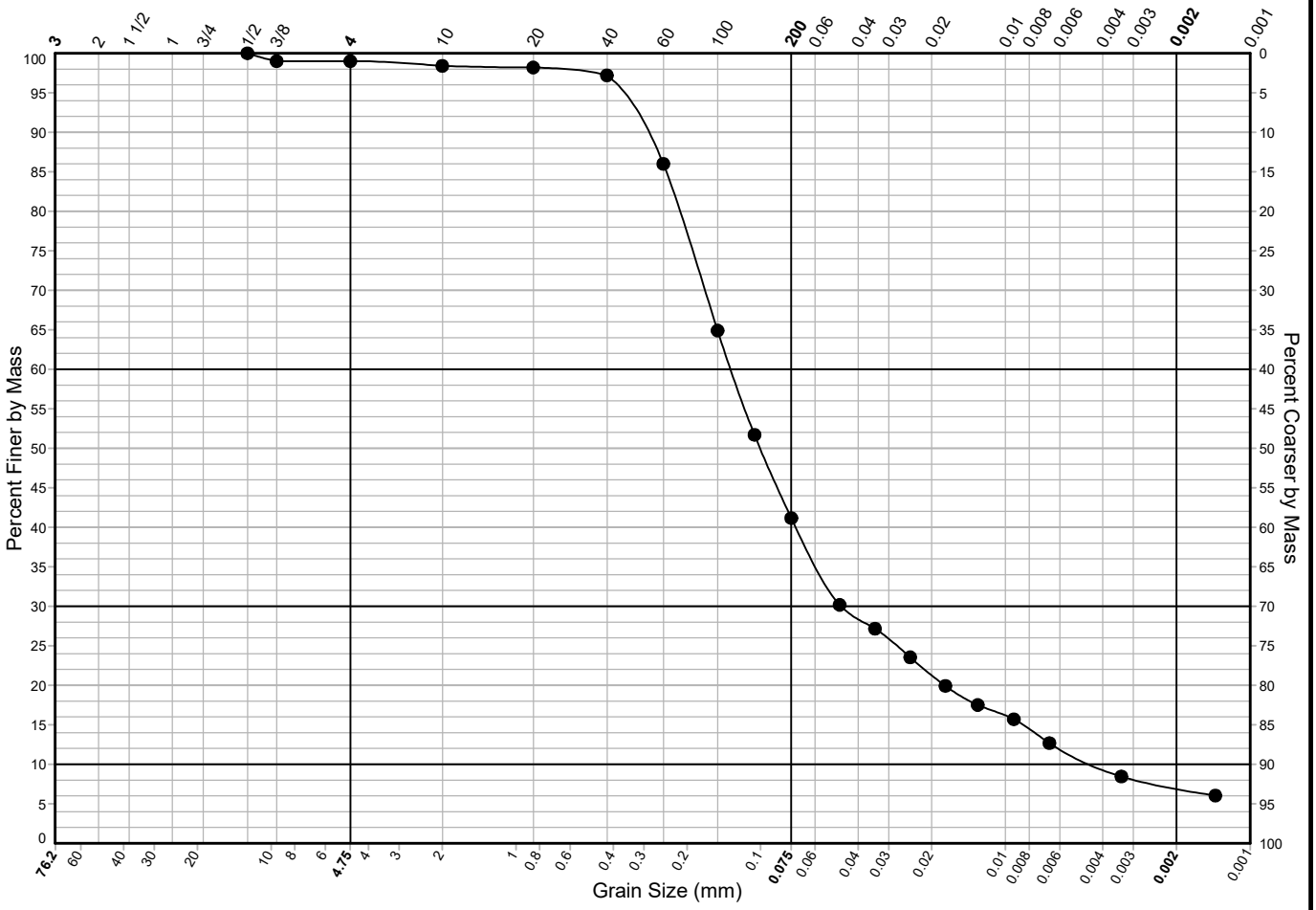
GRAIN SIZE DISTRIBUTION PLOT

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-2b-22

Gravel		Sand			Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay-Size
Mesh Opening in Inches		Mesh Openings per Inch, U.S. Standard			Grain Size in Millimeters	



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-2b-22, S-1	0.0	SC-SM	Silty, Clayey Sand			41			19	KCV	MXM	D7928

[2] Cobble percentages are calculated using the pre-removal, oven-dried mass of the total specimen. USCS Group Symbol, Soil Classification Group Name, Gravel %, Sand %, Fines %, <0.02mm %, and <2um% values are calculated from particles smaller than 76.2mm (3 inches) only, per ASTM D2487.

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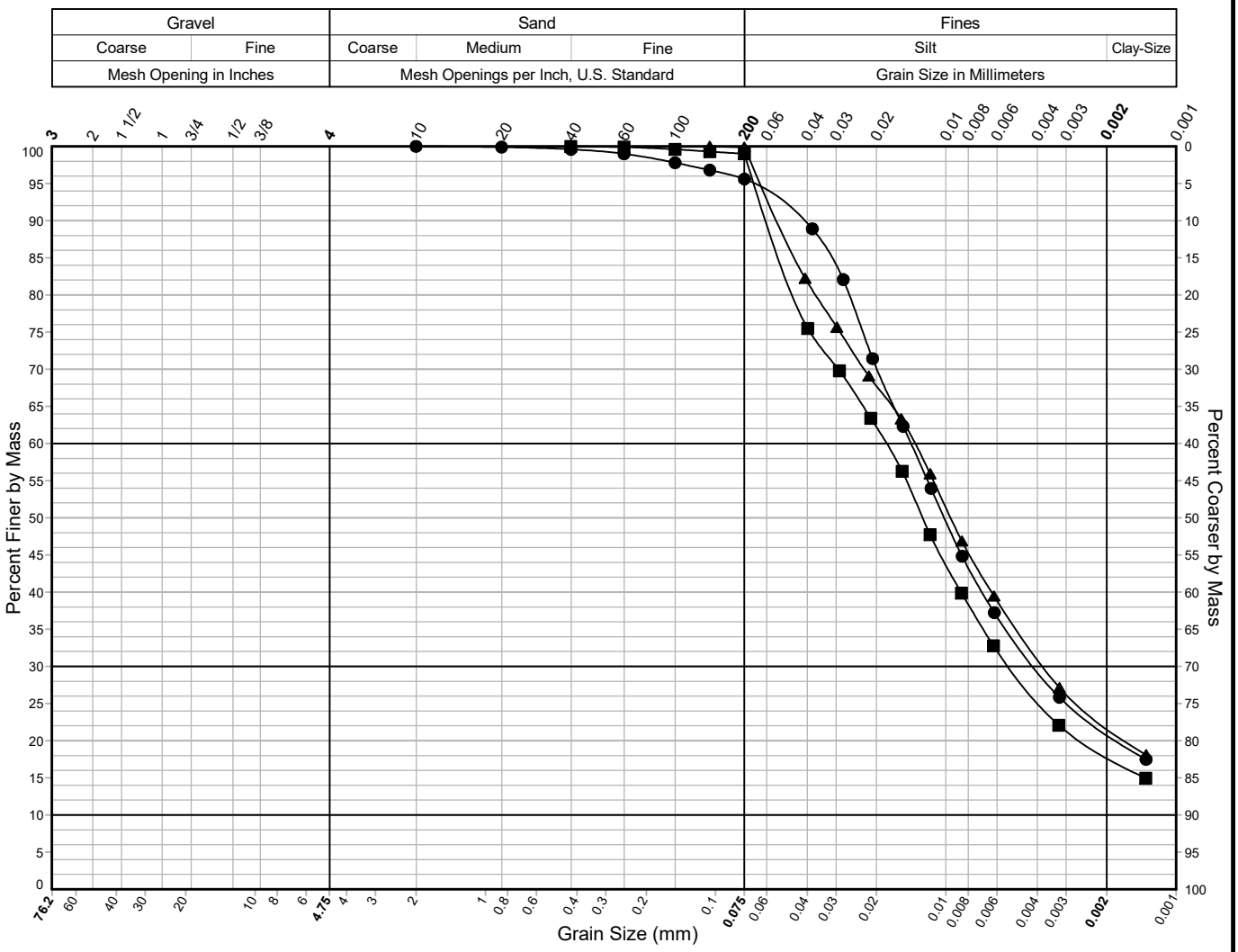
GRAIN SIZE DISTRIBUTION PLOT

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-3a-22



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-3a-22, S-2	1.0	MH	Elastic Silt			96			34	KCV	MXM	D7928
■ TP-3a-22, S-3	10.0	ML	Silt			99			35	KCV	MXM	D7928
▲ TP-3a-22, S-7	14.0	CL	Lean Clay			100			35	KCV	MXM	D7928

[2] Cobble percentages are calculated using the pre-removal, oven-dried mass of the total specimen. USCS Group Symbol, Soil Classification Group Name, Gravel %, Sand %, Fines %, <0.02mm %, and <2um% values are calculated from particles smaller than 76.2mm (3 inches) only, per ASTM D2487.

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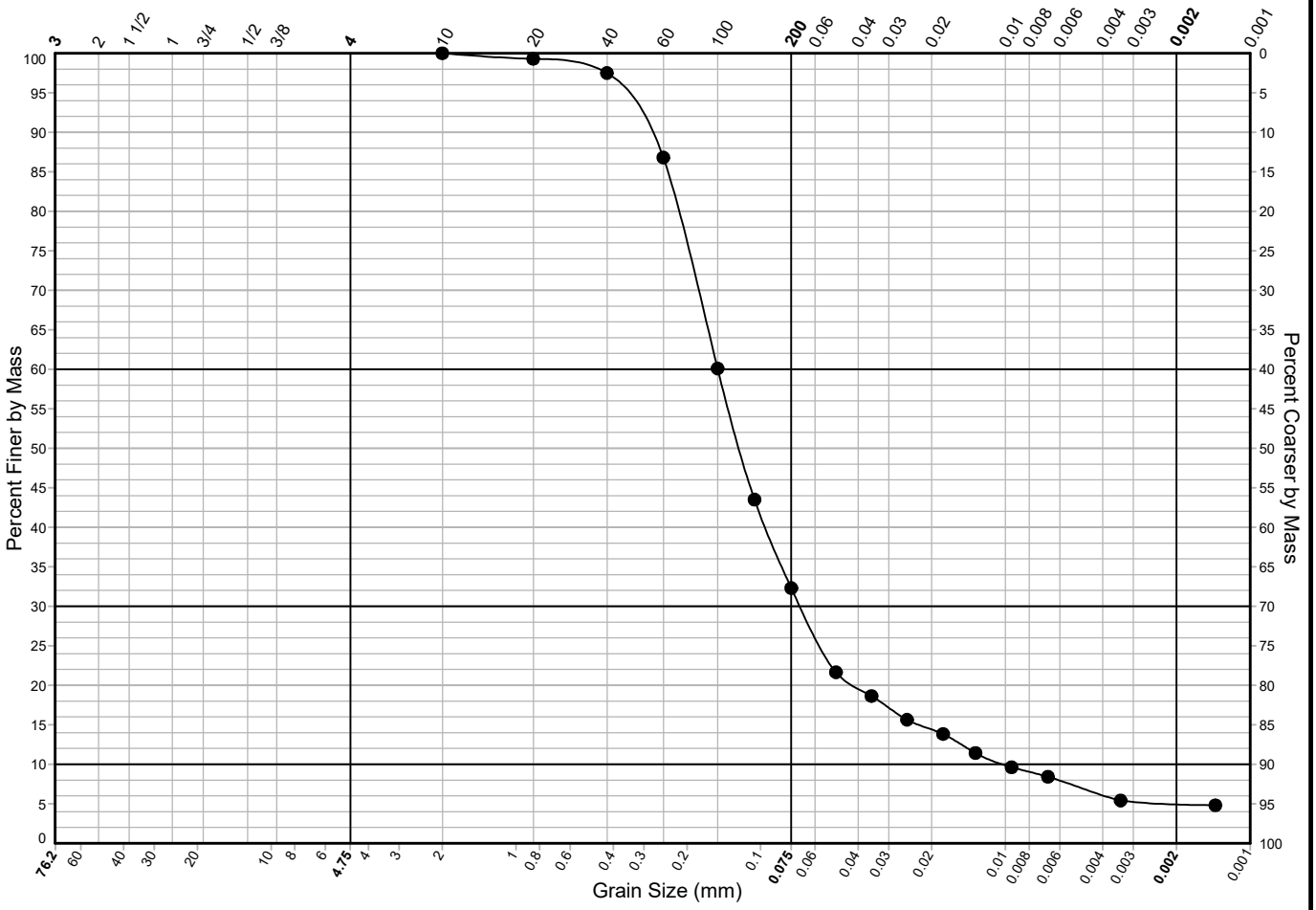
GRAIN SIZE DISTRIBUTION PLOT

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-3b-22

Gravel		Sand			Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay-Size
Mesh Opening in Inches		Mesh Openings per Inch, U.S. Standard			Grain Size in Millimeters	



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-3b-22, S-1	0.0	SM	Silty Sand			32			16	SJD	MXM	D7928

[2] Cobble percentages are calculated using the pre-removal, oven-dried mass of the total specimen. USCS Group Symbol, Soil Classification Group Name, Gravel %, Sand %, Fines %, <0.02mm %, and <2um% values are calculated from particles smaller than 76.2mm (3 inches) only, per ASTM D2487.

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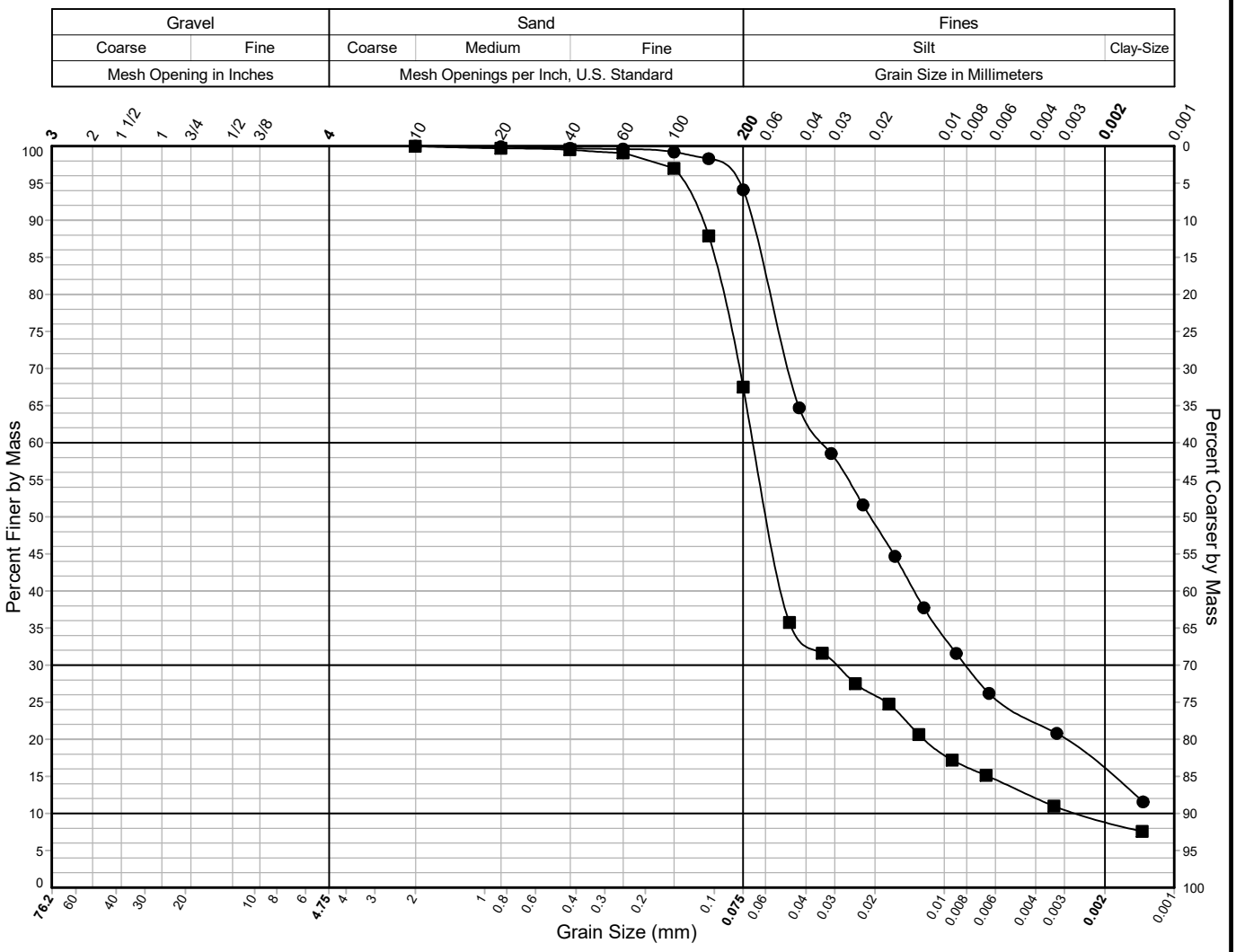
GRAIN SIZE DISTRIBUTION PLOT

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-4a-22



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-4a-22, S-2	13.0	CL	Lean Clay			94			37	KCV	MXM	D7928
■ TP-4a-22, S-4	14.0	ML	Sandy Silt			68			40	KCV	MXM	D7928

[2] Cobble percentages are calculated using the pre-removal, oven-dried mass of the total specimen. USCS Group Symbol, Soil Classification Group Name, Gravel %, Sand %, Fines %, <0.02mm %, and <2um% values are calculated from particles smaller than 76.2mm (3 inches) only, per ASTM D2487.

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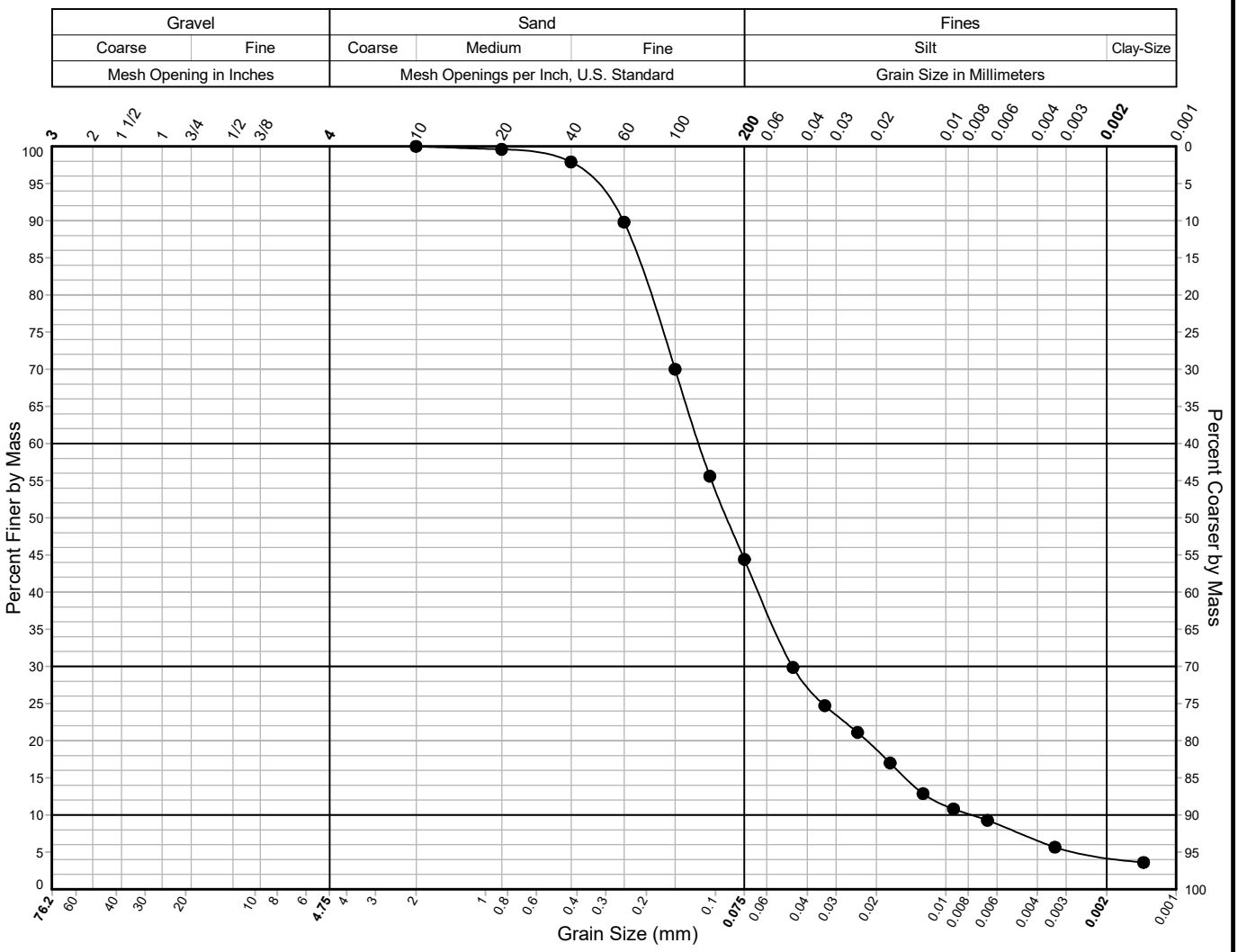
GRAIN SIZE DISTRIBUTION PLOT

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-4b-22



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-4b-22, S-1	0.0	SM	Silty Sand			44			27	SJD	MXM	D7928

[2] Cobble percentages are calculated using the pre-removal, oven-dried mass of the total specimen. USCS Group Symbol, Soil Classification Group Name, Gravel %, Sand %, Fines %, <0.02mm %, and <2um% values are calculated from particles smaller than 76.2mm (3 inches) only, per ASTM D2487.

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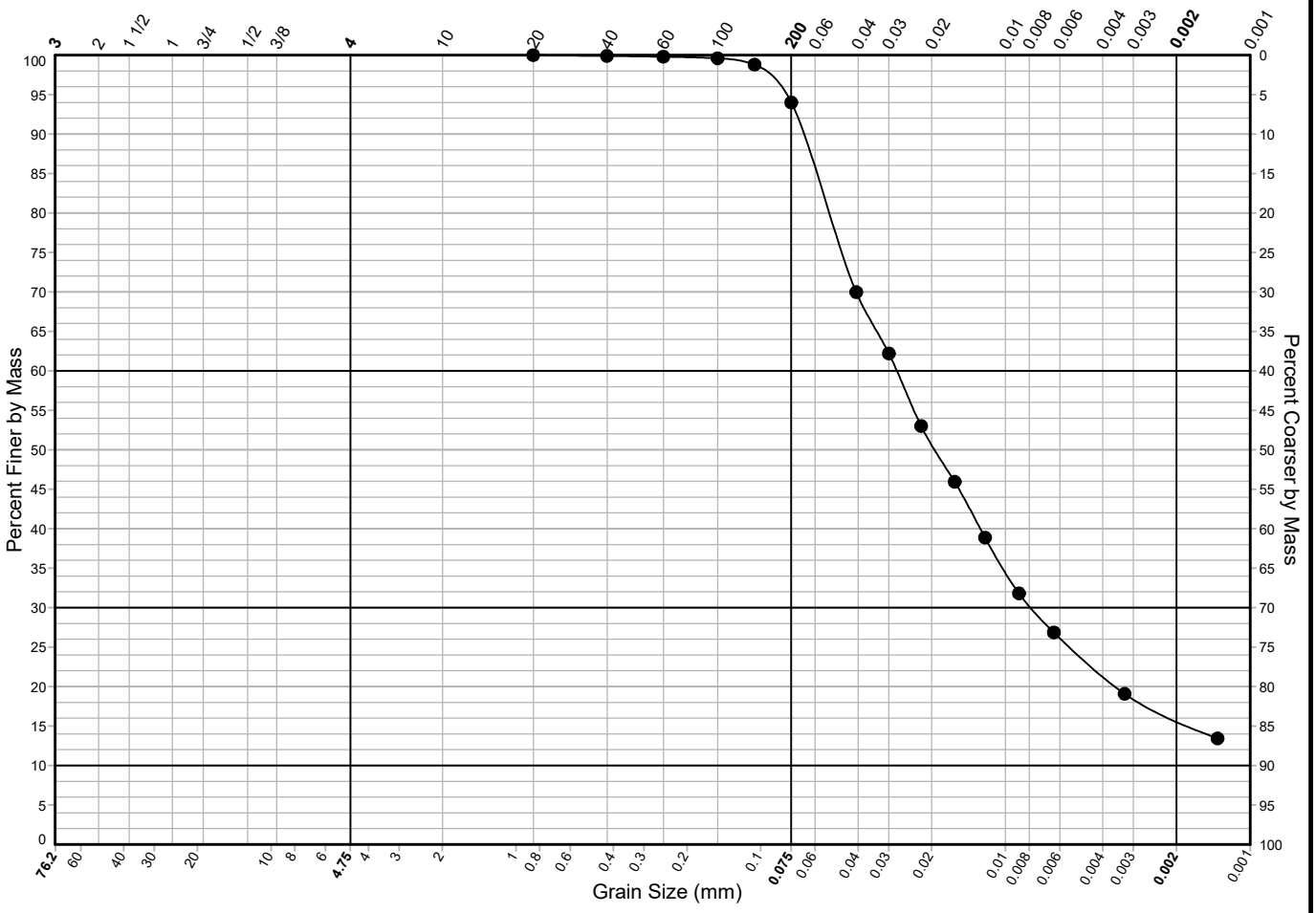
GRAIN SIZE DISTRIBUTION PLOT

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-5a-22

Gravel		Sand			Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay-Size
Mesh Opening in Inches		Mesh Openings per Inch, U.S. Standard			Grain Size in Millimeters	



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-5a-22, S-3	12.0	CL	Lean Clay			94			37	SJD	MXM	D7928

[2] Cobble percentages are calculated using the pre-removal, oven-dried mass of the total specimen. USCS Group Symbol, Soil Classification Group Name, Gravel %, Sand %, Fines %, <0.02mm %, and <2um% values are calculated from particles smaller than 76.2mm (3 inches) only, per ASTM D2487.

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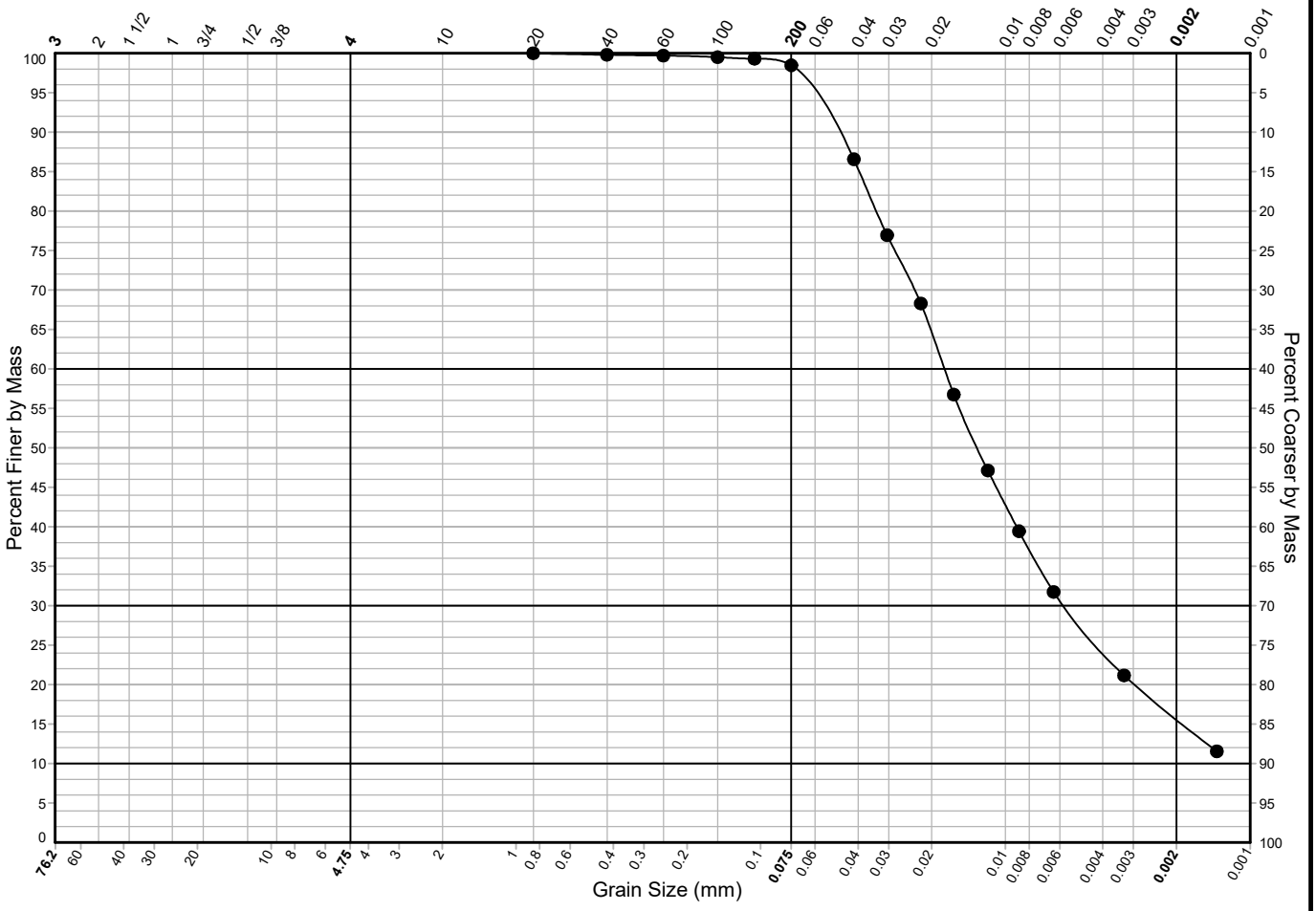
GRAIN SIZE DISTRIBUTION PLOT

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-7a-22

Gravel		Sand			Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay-Size
Mesh Opening in Inches		Mesh Openings per Inch, U.S. Standard			Grain Size in Millimeters	



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-7a-22, S-2	11.0	CL	Lean Clay			98			35	SJD	MXM	D7928

[2] Cobble percentages are calculated using the pre-removal, oven-dried mass of the total specimen. USCS Group Symbol, Soil Classification Group Name, Gravel %, Sand %, Fines %, <0.02mm %, and <2um% values are calculated from particles smaller than 76.2mm (3 inches) only, per ASTM D2487.

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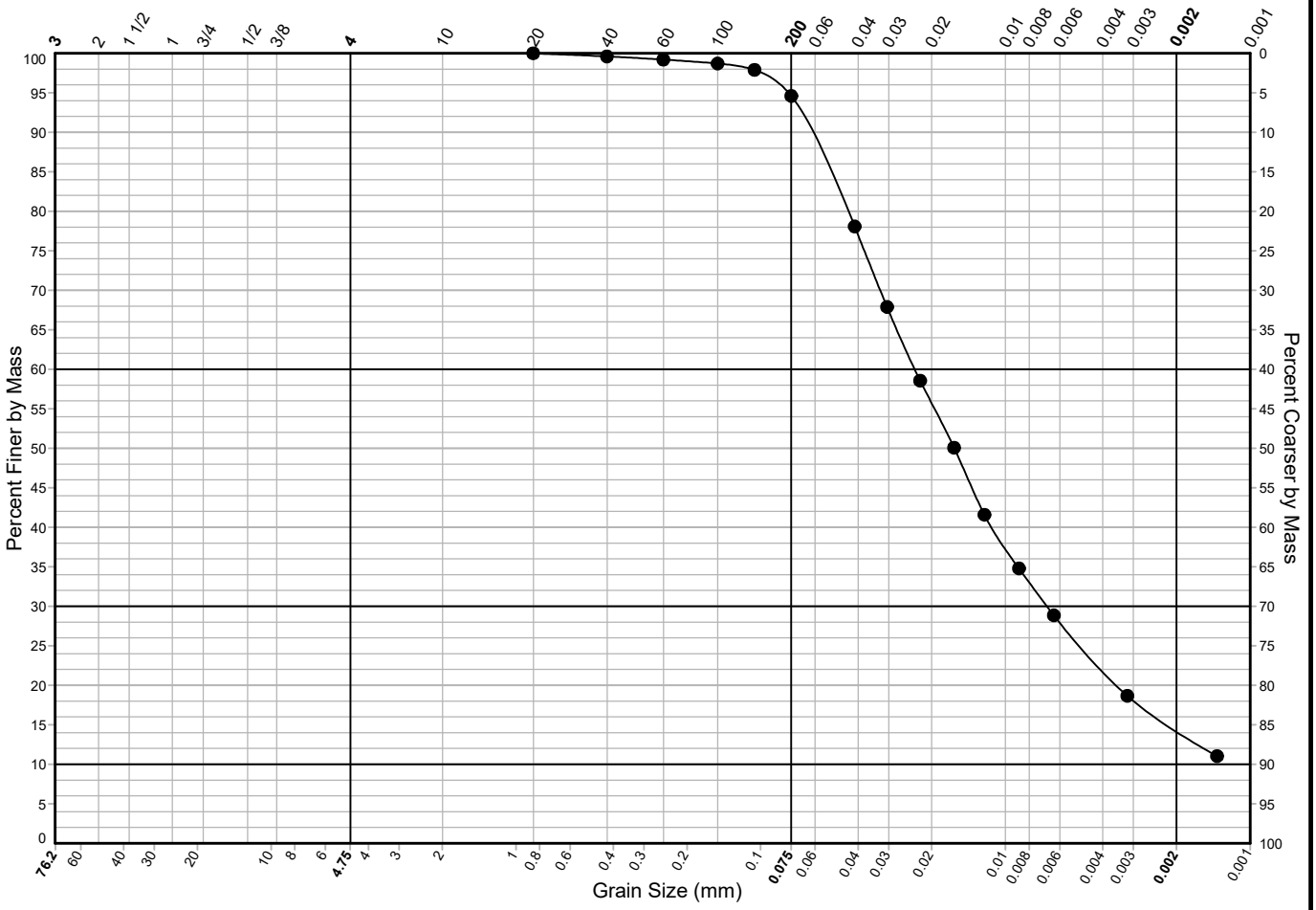
GRAIN SIZE DISTRIBUTION PLOT

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-7b-22

Gravel		Sand			Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay-Size
Mesh Opening in Inches		Mesh Openings per Inch, U.S. Standard			Grain Size in Millimeters	



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-7b-22, S-1	0.0	ML	Silt			95			31	SJD	MXM	D7928

[2] Cobble percentages are calculated using the pre-removal, oven-dried mass of the total specimen. USCS Group Symbol, Soil Classification Group Name, Gravel %, Sand %, Fines %, <0.02mm %, and <2um% values are calculated from particles smaller than 76.2mm (3 inches) only, per ASTM D2487.

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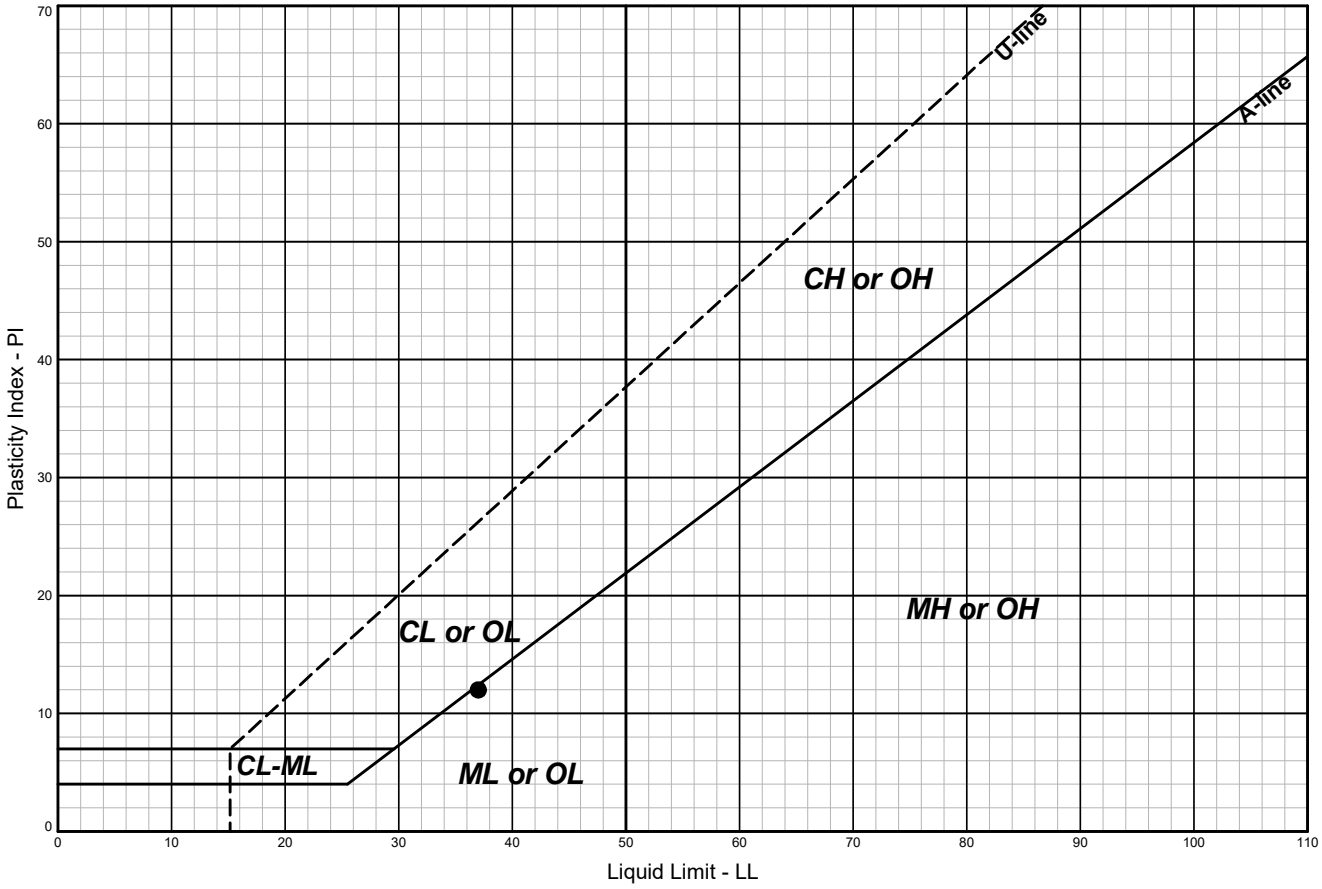
PLASTICITY CHART

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-1a-22



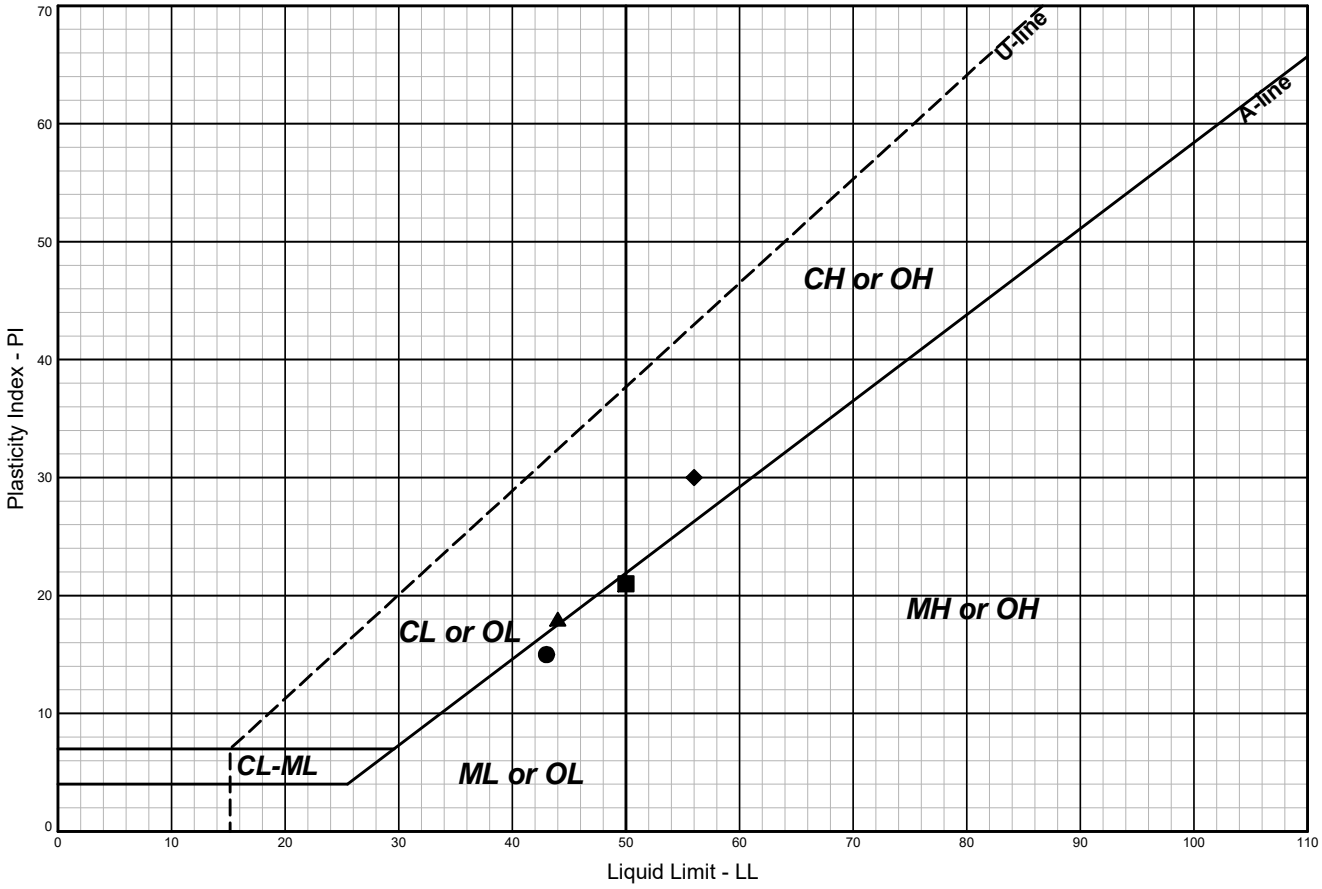
Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● TP-1a-22, S-2	14.0	ML	Silt	37	25	12	36		3	97		KCV	MXM	D4318

SHANNON & WILSON

PLASTICITY CHART

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-2a-22



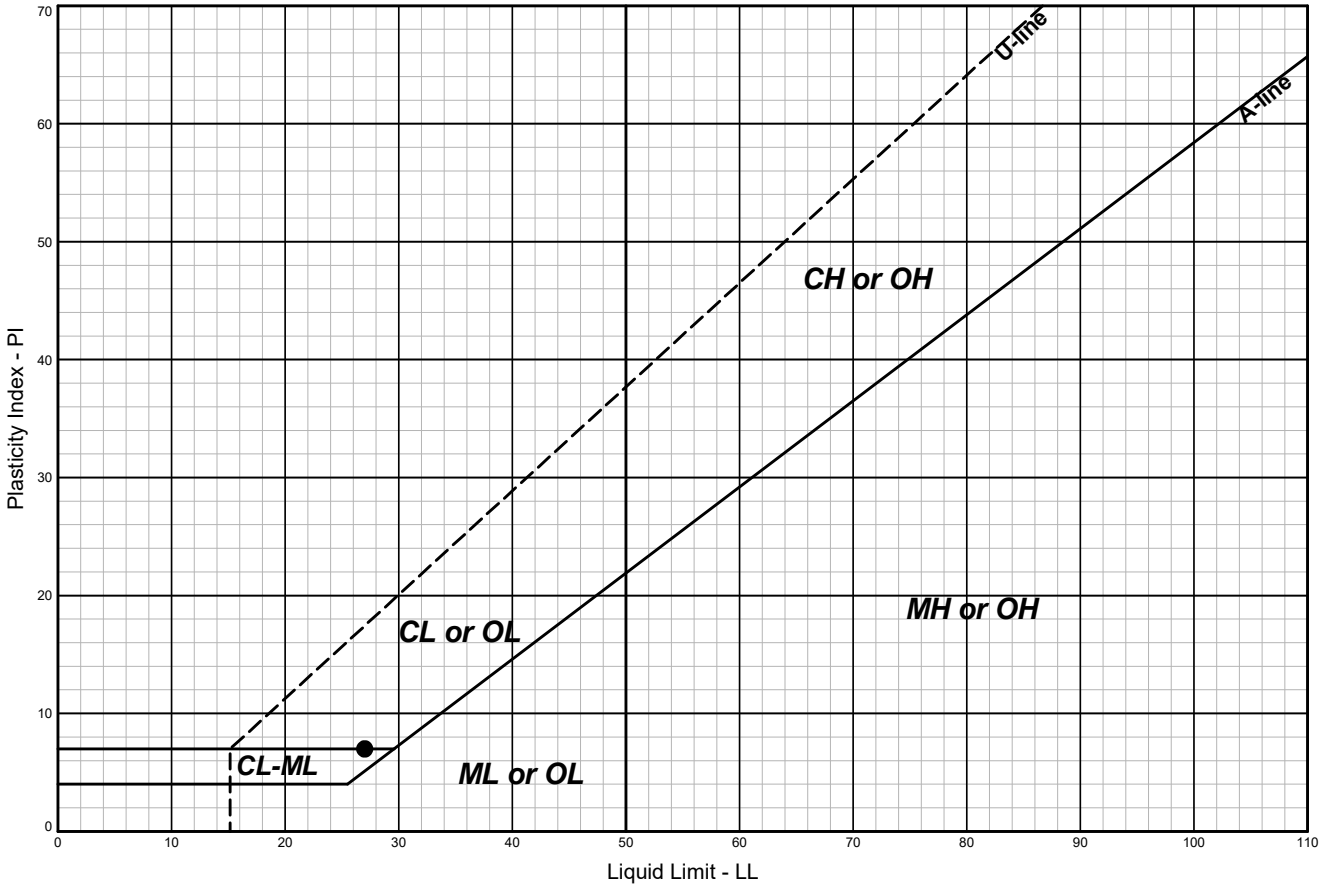
Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● TP-2a-22, S-4	2.0	ML	Silt with Sand	43	28	15	27	2	14	84		KCV	MXM	D4318
■ TP-2a-22, S-6	8.0	MH	Elastic Silt	50	29	21	43		2	98		KCV	MXM	D4318
▲ TP-2a-22, S-2	9.0	CL	Lean Clay	44	26	18	43					KCV	MXM	D4318
◆ TP-2a-22, S-5	13.5	CH	Fat Clay	56	26	30	47		0	100		DYB	MXM	D4318

SHANNON & WILSON

PLASTICITY CHART

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-2b-22



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● TP-2b-22, S-1	0.0	SC-SM	Silty, Clayey Sand	27	20	7	19	1	58	41		SJD	MXM	D4318

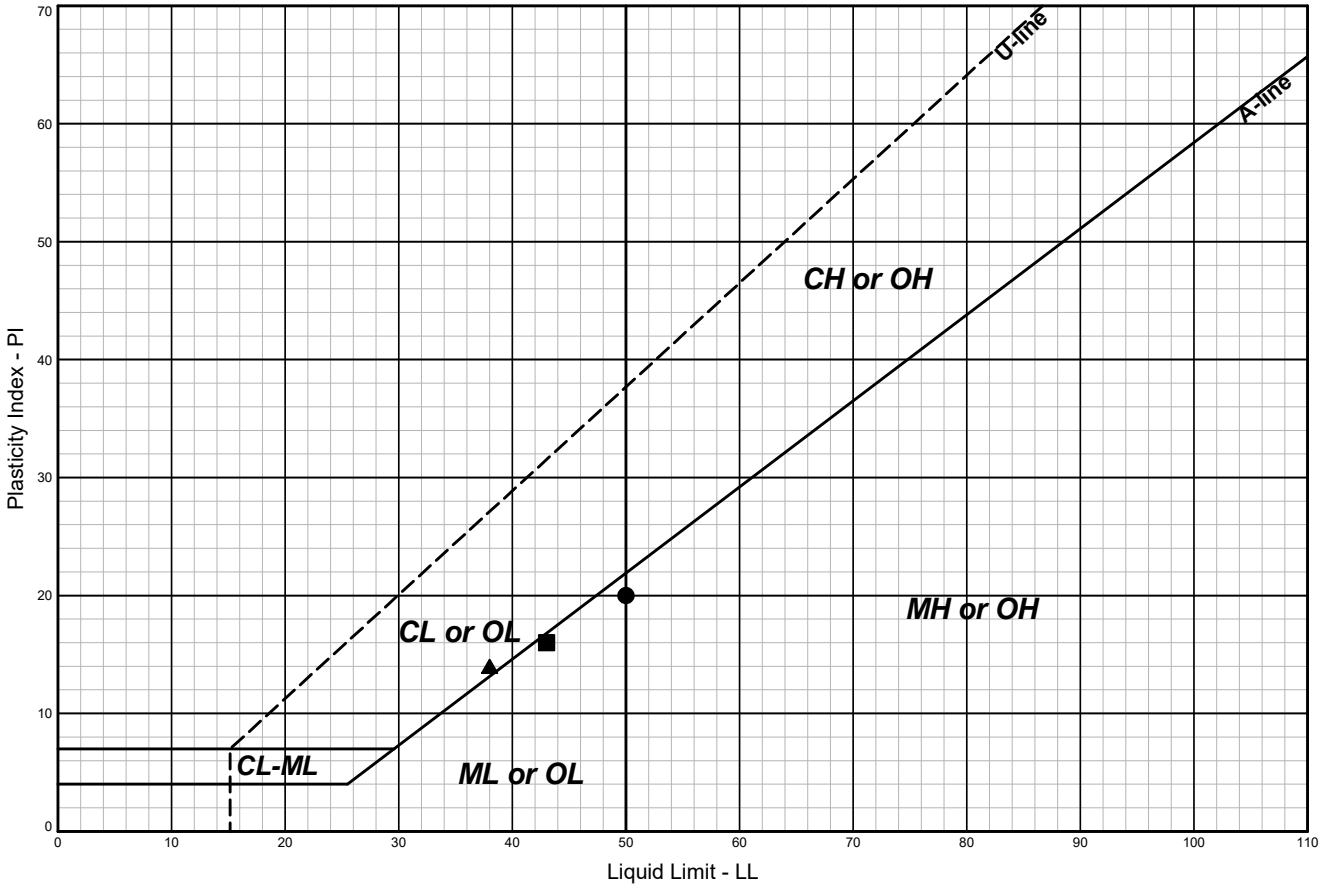
105606-002 A_ATT_MAIN 105606-002.GPJ SHAN_WIL.GDT 8/30/22

SHANNON & WILSON

PLASTICITY CHART

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-3a-22



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● TP-3a-22, S-2	1.0	MH	Elastic Silt	50	30	20	34		4	96		KCV	MXM	D4318
■ TP-3a-22, S-3	10.0	ML	Silt	43	27	16	35		1	99		KCV	MXM	D4318
▲ TP-3a-22, S-7	14.0	CL	Lean Clay	38	24	14	35			100		DYB	MXM	D4318

105606-002 A_ATT_MAIN 105606-002.GPJ SHAN_WIL.GDT 8/30/22

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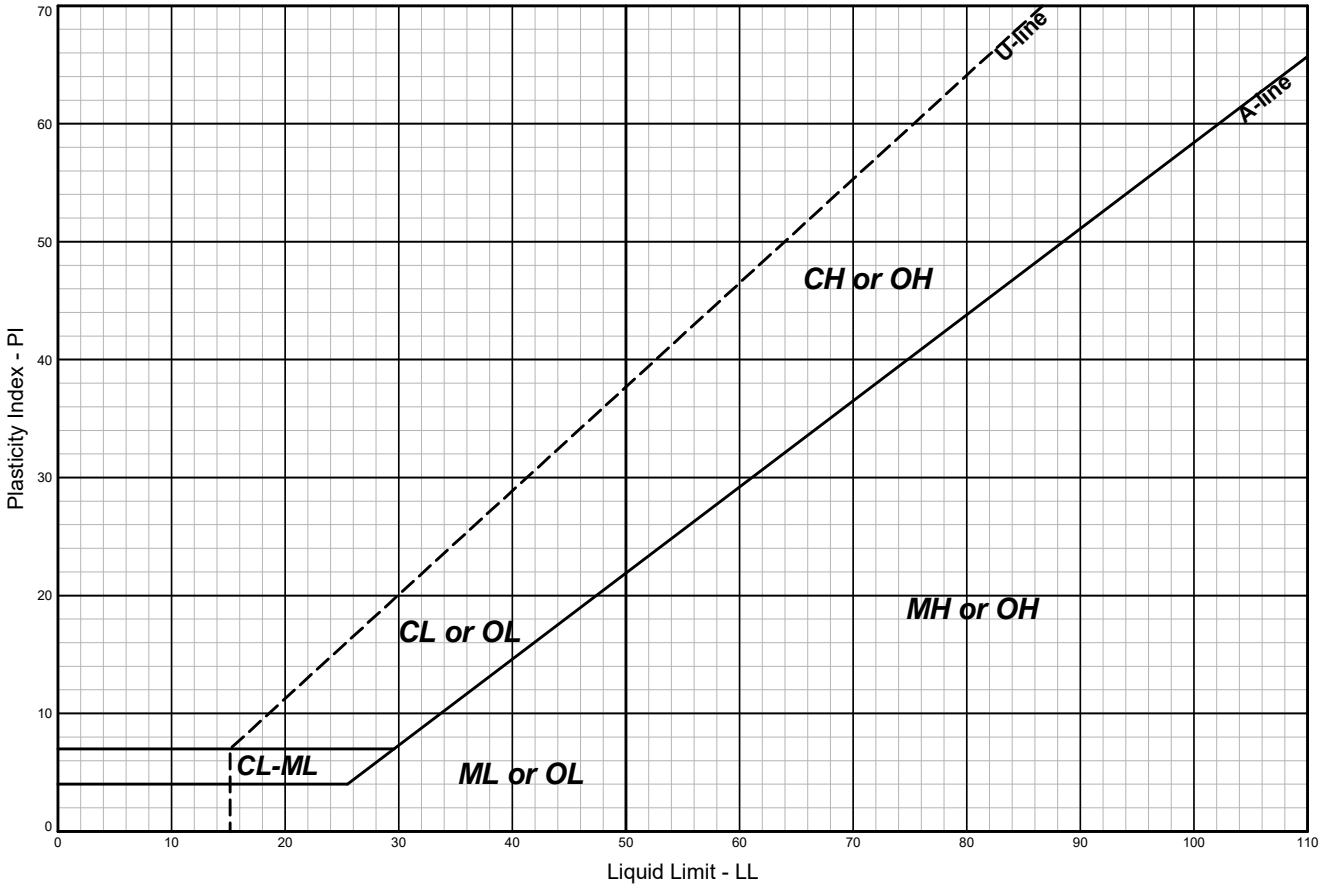
PLASTICITY CHART

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-3b-22



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
TP-3b-22, S-1	0.0	SM	Silty Sand	**NP**	**NP**	**NP**	16		68	32		KCV	MXM	D4318

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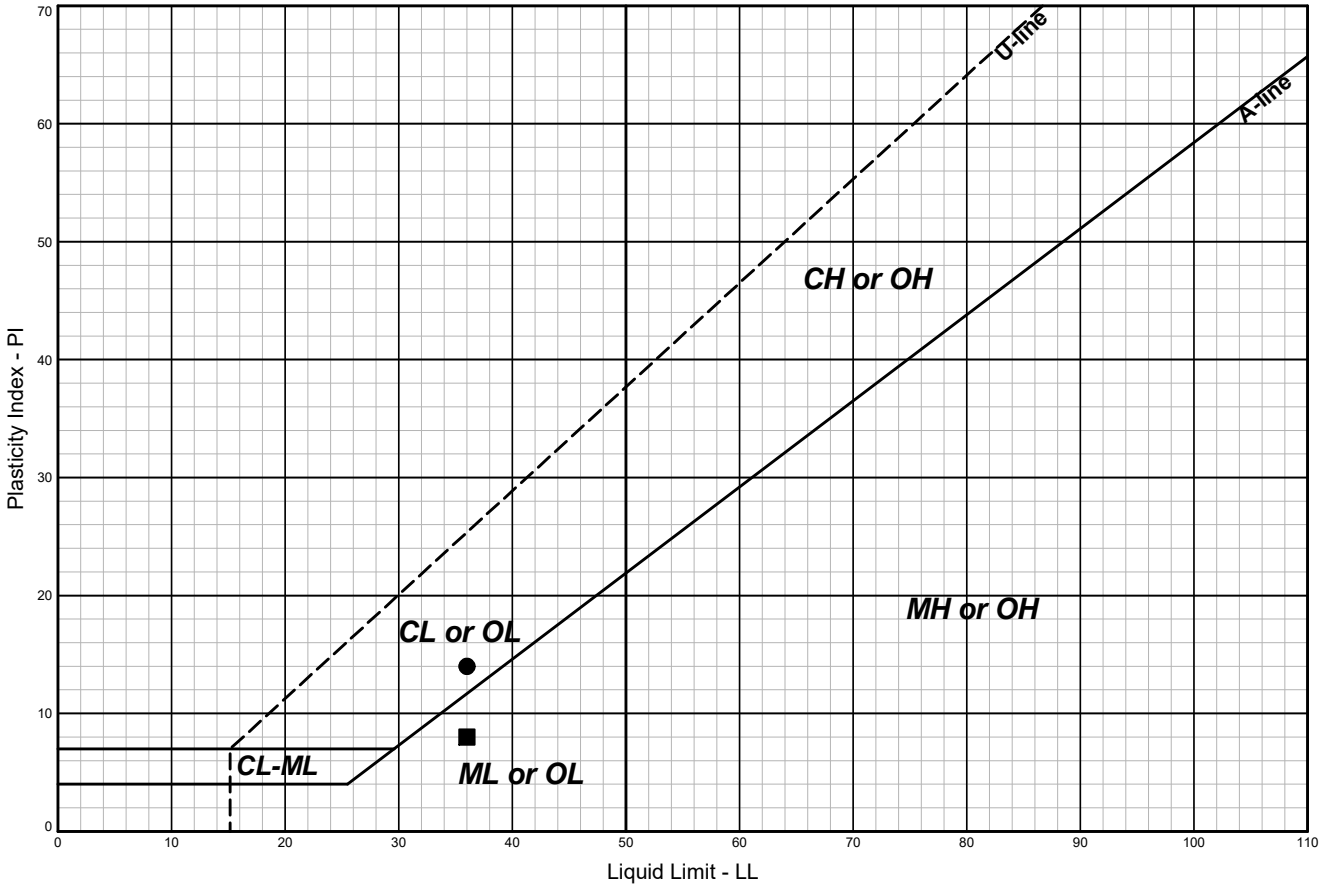
PLASTICITY CHART

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-4a-22



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● TP-4a-22, S-2	13.0	CL	Lean Clay	36	22	14	37		6	94		SJD	MXM	D4318
■ TP-4a-22, S-4	14.0	ML	Sandy Silt	36	28	8	40		32	68		KCV	MXM	D4318

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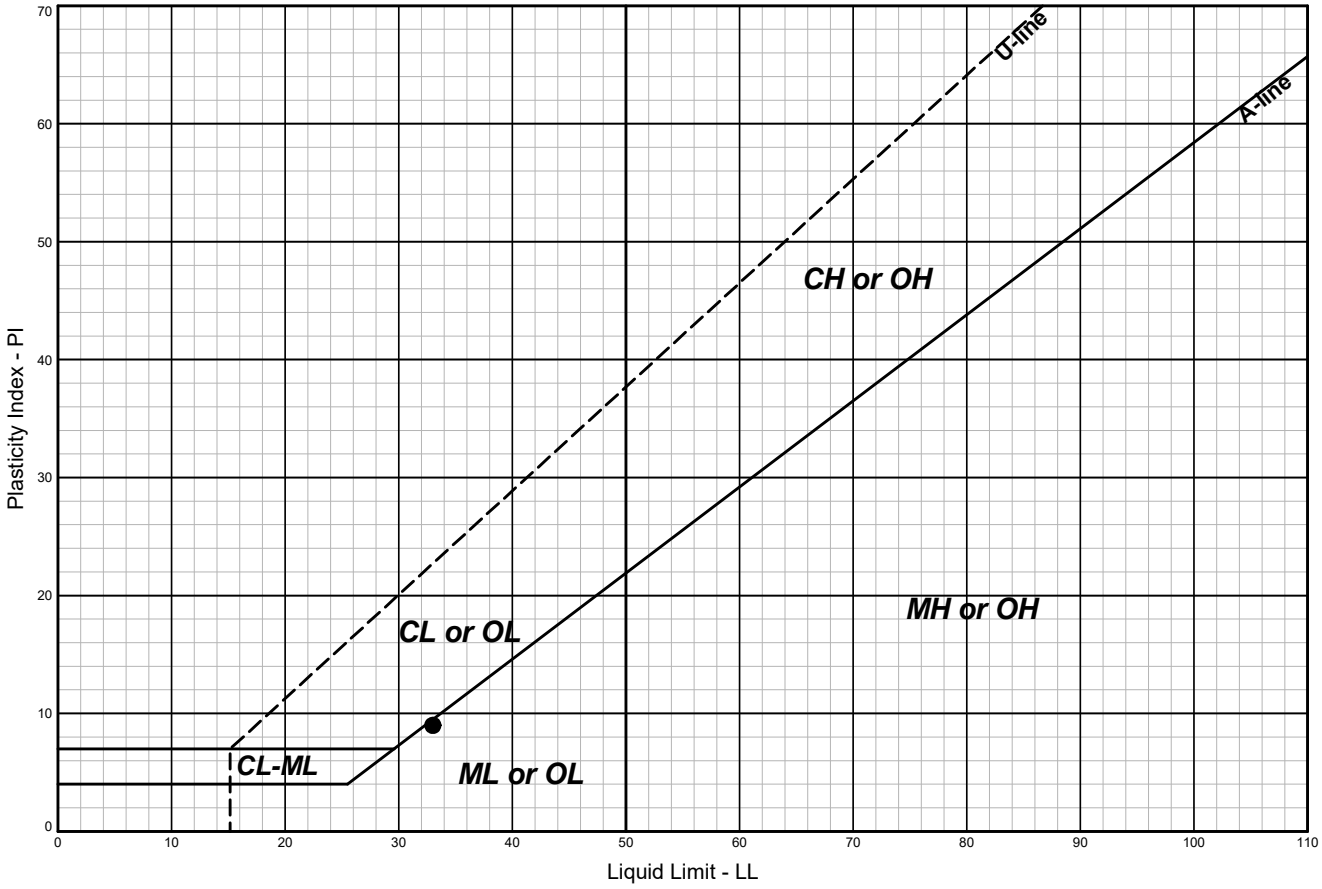
PLASTICITY CHART

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-4b-22



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● TP-4b-22, S-1	0.0	SM	Silty Sand	33	24	9	27		56	44		KCV	MXM	D4318

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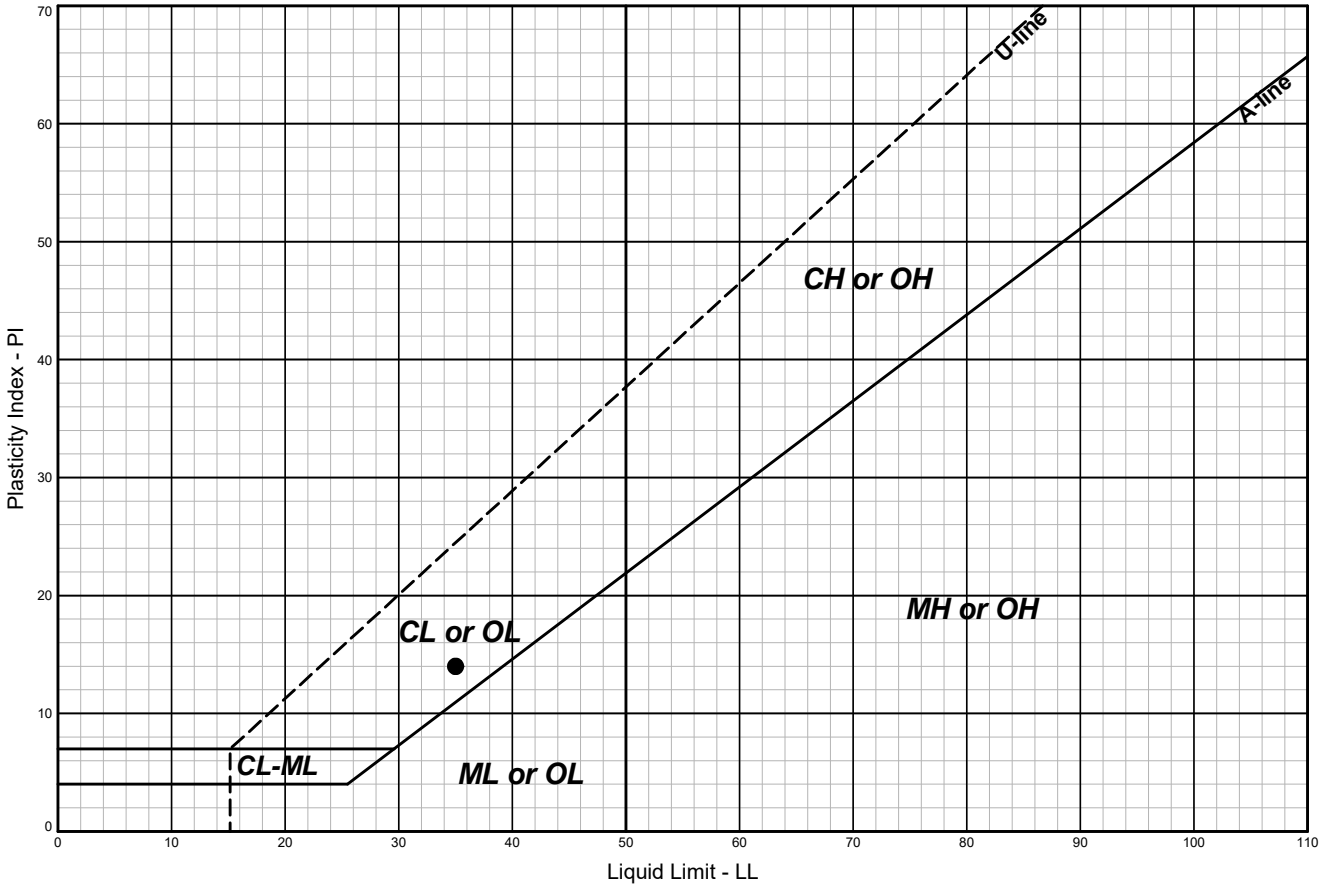
PLASTICITY CHART

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-5a-22



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● TP-5a-22, S-3	12.0	CL	Lean Clay	35	21	14	37		6	94		DYB	MXM	D4318

105606-002 A_ATT_MAIN 105606-002.GPJ SHAN_WIL.GDT 8/30/22

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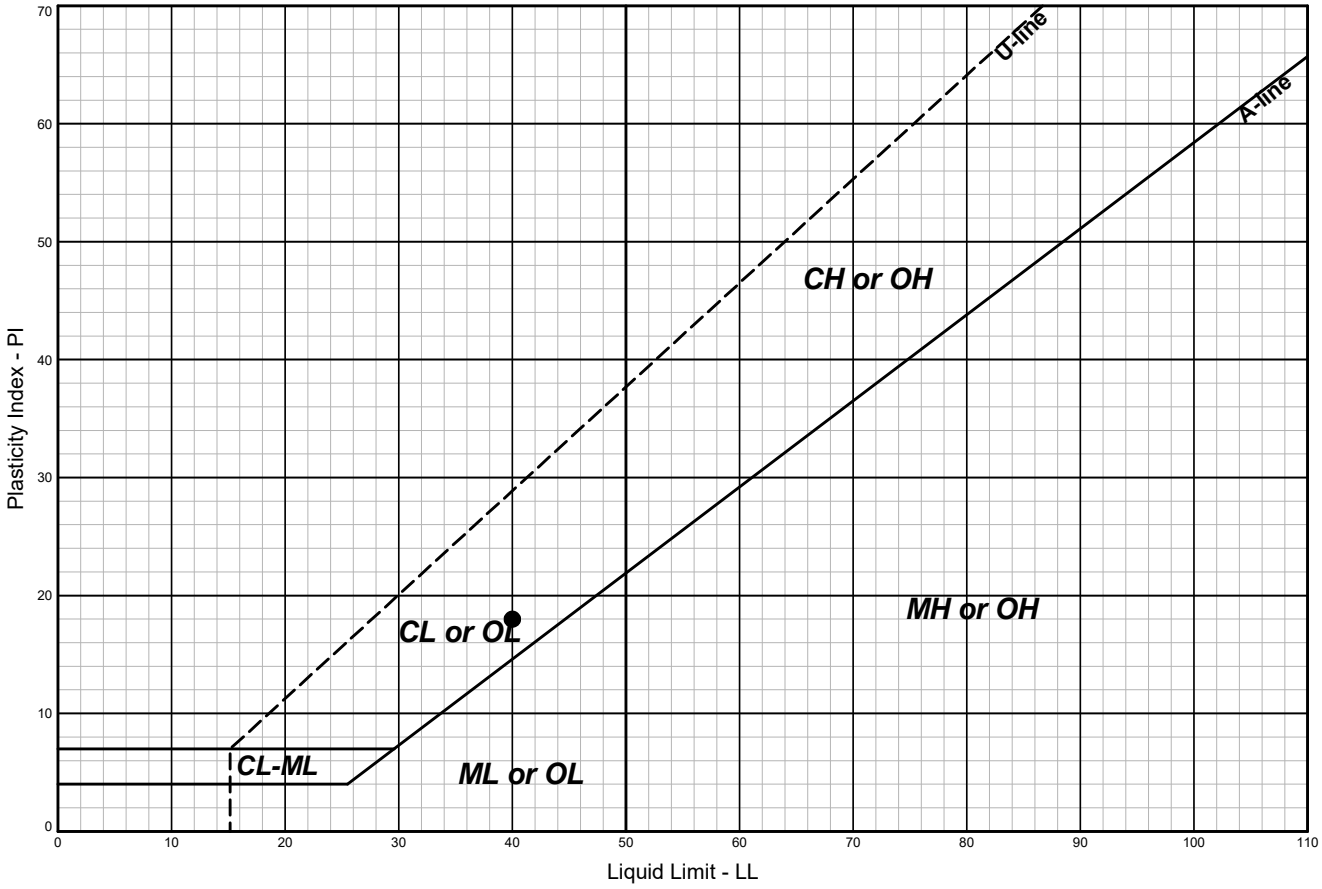
PLASTICITY CHART

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-7a-22



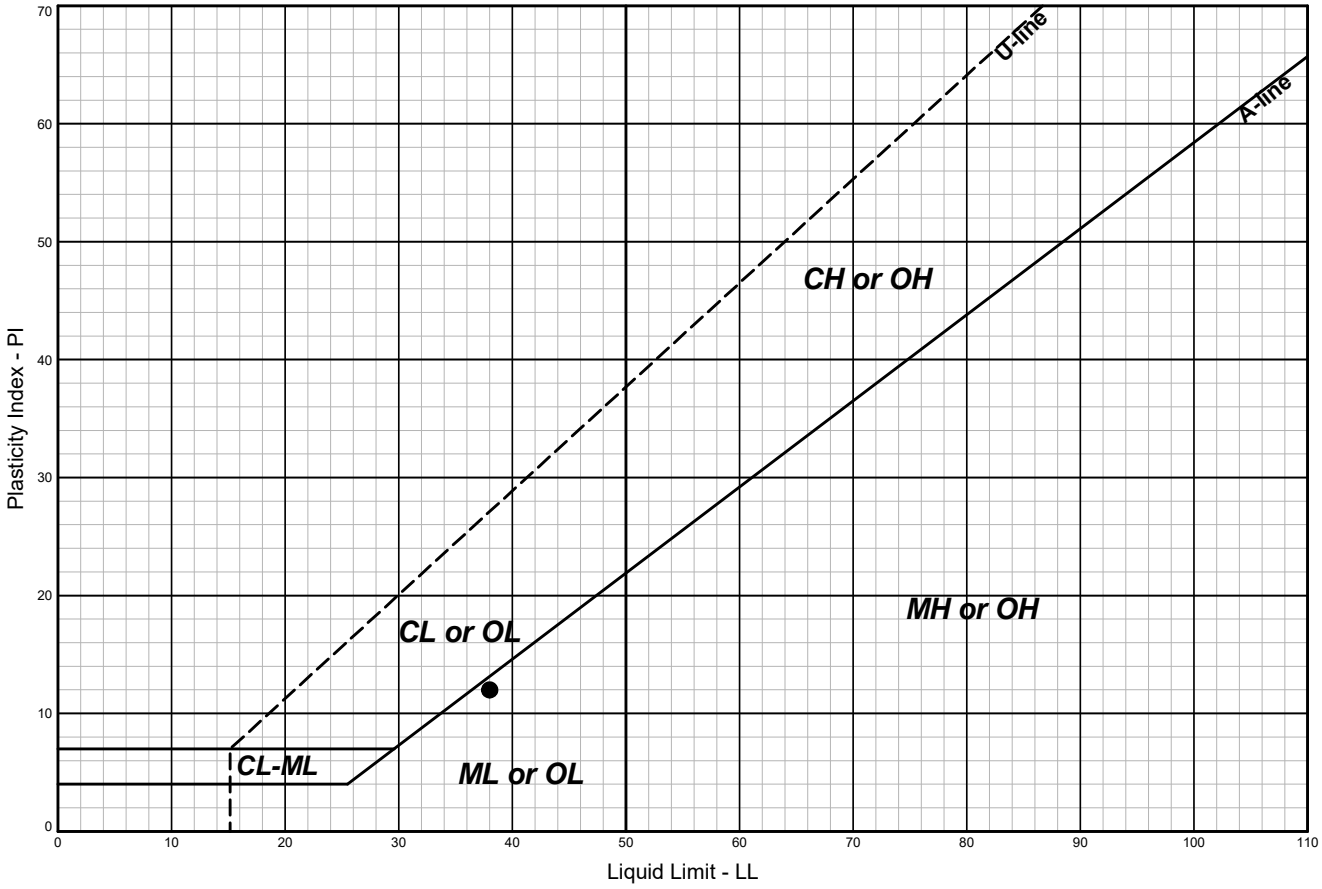
Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● TP-7a-22, S-2	11.0	CL	Lean Clay	40	22	18	35		2	98		DYB	MXM	D4318

SHANNON & WILSON

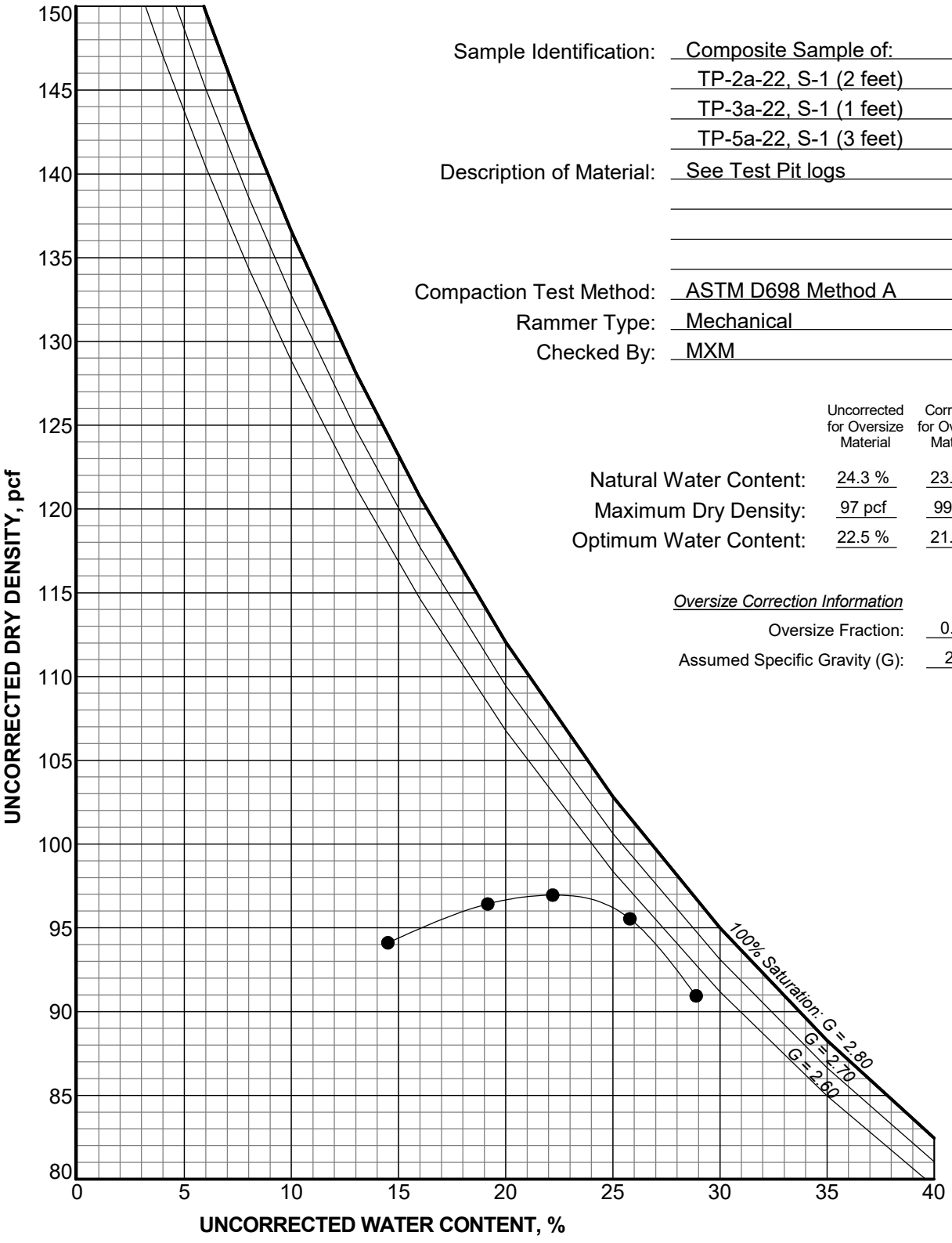
PLASTICITY CHART

Lower Cherry Creek Restoration
Phases II and III
King County, Washington

BORING TP-7b-22



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● TP-7b-22, S-1	0.0	ML	Silt	38	26	12	31		5	95		KCV	MXM	D4318



Sample Identification: Composite Sample of:
TP-2a-22, S-1 (2 feet)
TP-3a-22, S-1 (1 feet)
TP-5a-22, S-1 (3 feet)

Description of Material: See Test Pit logs

Compaction Test Method: ASTM D698 Method A
Rammer Type: Mechanical
Checked By: MXM

	Uncorrected for Oversize Material	Corrected for Oversize Material
Natural Water Content:	24.3 %	23.1 %
Maximum Dry Density:	97 pcf	99 pcf
Optimum Water Content:	22.5 %	21.4 %

Oversize Correction Information

Oversize Fraction: 0.05
Assumed Specific Gravity (G): 2.7

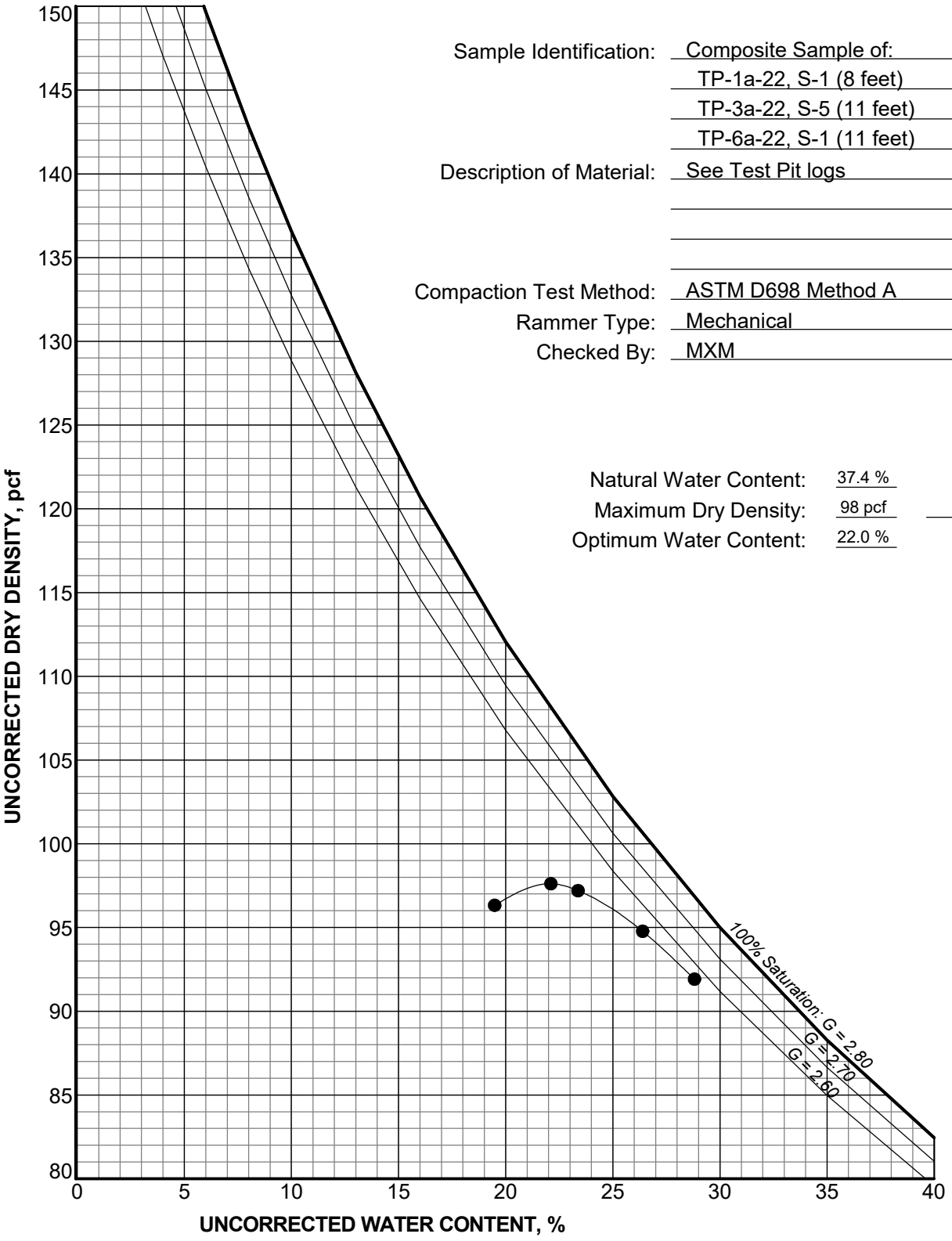
Lower Cherry Creek Restoration
Phases II and III Geotechnical Report
King County, Washington

MOISTURE-DENSITY TEST

October 2022 105606-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG.



Sample Identification: Composite Sample of:
TP-1a-22, S-1 (8 feet)
TP-3a-22, S-5 (11 feet)
TP-6a-22, S-1 (11 feet)

Description of Material: See Test Pit logs

Compaction Test Method: ASTM D698 Method A
Rammer Type: Mechanical
Checked By: MXM

Natural Water Content: 37.4 %
Maximum Dry Density: 98 pcf
Optimum Water Content: 22.0 %

Lower Cherry Creek Restoration
Phases II and III Geotechnical Report
King County, Washington

MOISTURE-DENSITY TEST

October 2022 105606-002

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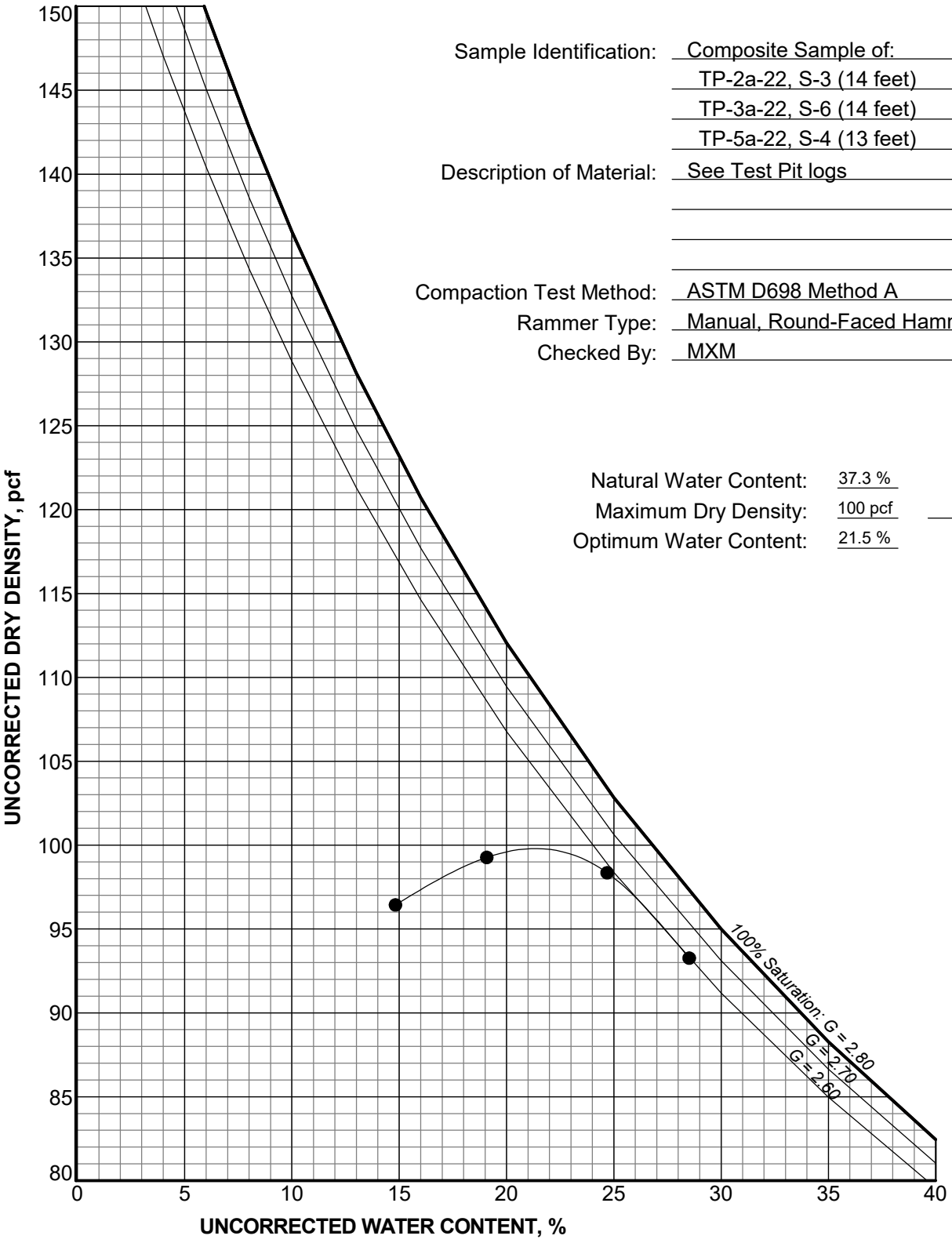
FIG.



Sample Identification: Composite Sample of:
TP-2a-22, S-3 (14 feet)
TP-3a-22, S-6 (14 feet)
TP-5a-22, S-4 (13 feet)

Description of Material: See Test Pit logs

Compaction Test Method: ASTM D698 Method A
Rammer Type: Manual, Round-Faced Hammer
Checked By: MXM

Natural Water Content: 37.3 %
Maximum Dry Density: 100 pcf
Optimum Water Content: 21.5 %

Lower Cherry Creek Restoration
Phases II and III Geotechnical Report
King County, Washington

MOISTURE-DENSITY TEST

October 2022 105606-002

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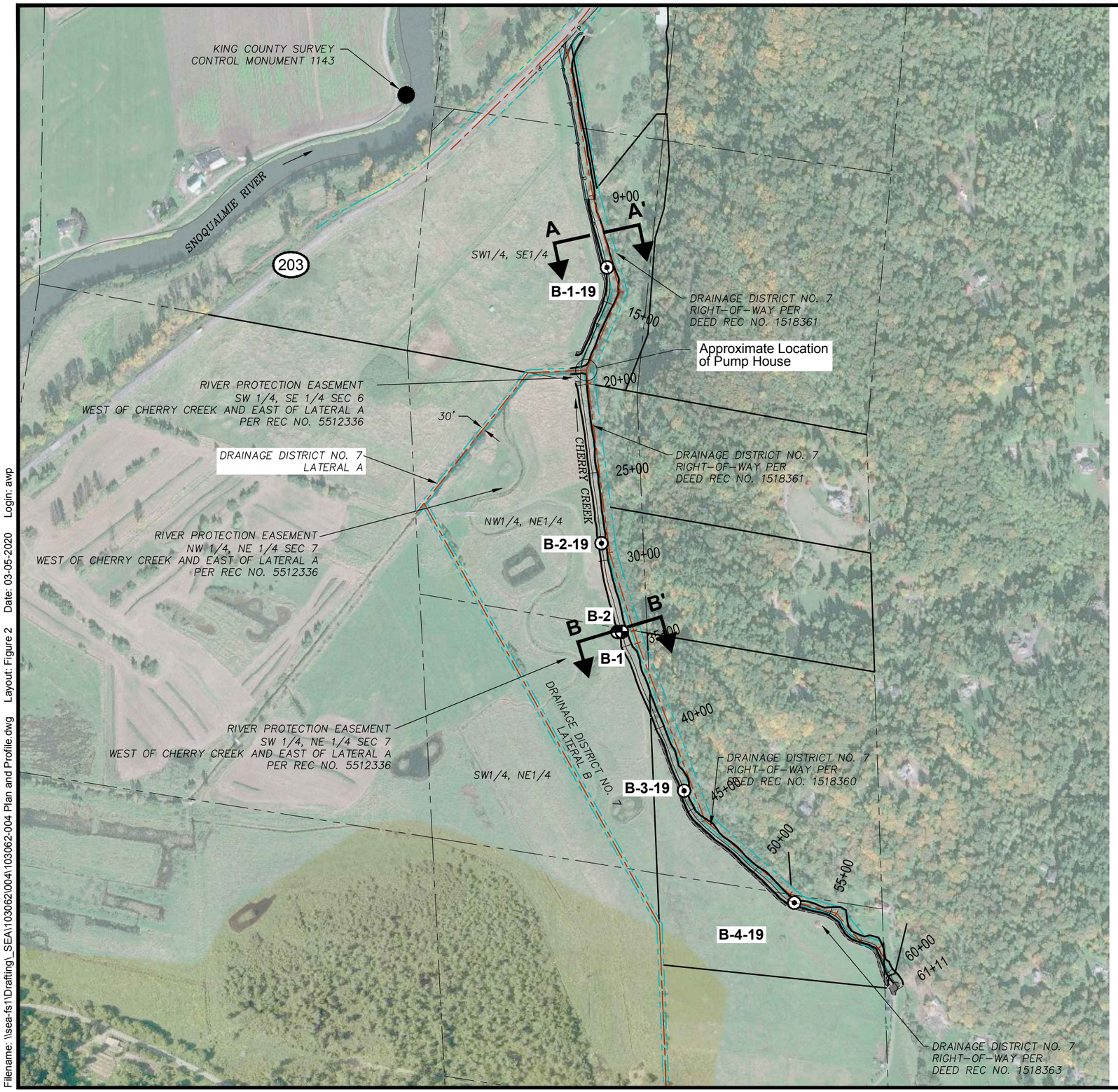
FIG.

APPENDIX C: PREVIOUS EXPLORATIONS

Appendix C

Previous Explorations

CONTENTS



N

LEGEND

B-1-19	2019 Boring Designation and Approximate Location
B-1	2017 Boring Designation and Approximate Location
	Fence Line
P	Power Line
	Section Line
	Lot Line
	Right of Way
	Right of Way Center Line
	Existing Levee Limits
	Gravel Paths
A	Generalized Subsurface Profile
9+00	Approximate Levee Stationing

Note:
Approximately 900 feet of levee immediately south of SR 203 previously removed. Remaining levee stationing begins at approximately Station 9+00.

0 600 1,200

Scale in Feet

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

SITE AND EXPLORATION PLAN

April 2020 103062-004

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2

Filename: \\sea-fs1\Drafting_SEA\103062\004\103062-004 Plan and Profile.dwg Layout: Figure 2 Date: 03-05-2020 Login: awp

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-1-19

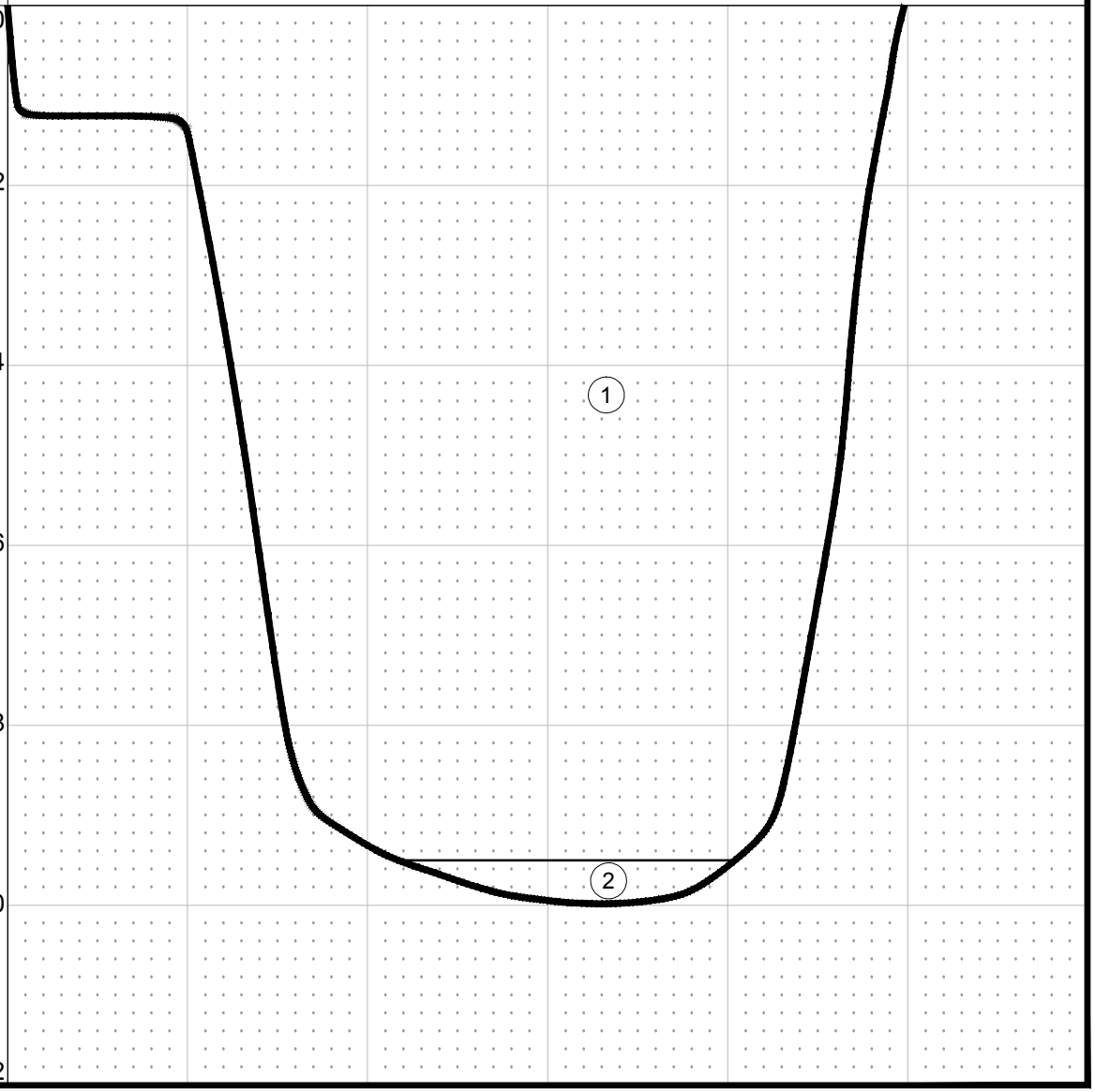
JOB NO: 103062-004 DATE: 6-13-2019 LOCATION: King County, Washington

PROJECT: Snoqualmie Valley Levee Upgrade, Lower Cherry Creek

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Silty Sand (SM)* to *Sandy Silt (ML)*; moist; fine sand; nonplastic; trace roots. (Ha)	None Observed			0
(2) Gray and reddish brown, mottled, *Sandy Silt (ML)*; moist to wet; fine sand; low plasticity; trace roots.			S-1	2
			S-2	4
		24.3	S-3A S-3B	6
				8
			S-4	10
				12

Sketch of East Pit Side

Surface Elevation: Approx. 37 Ft.



NOTE

PIT Dimensions: 5x10 ft

FIG. A-6

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-2-19

JOB NO: 103062-004 DATE: 6-13-2019 LOCATION: King County, Washington

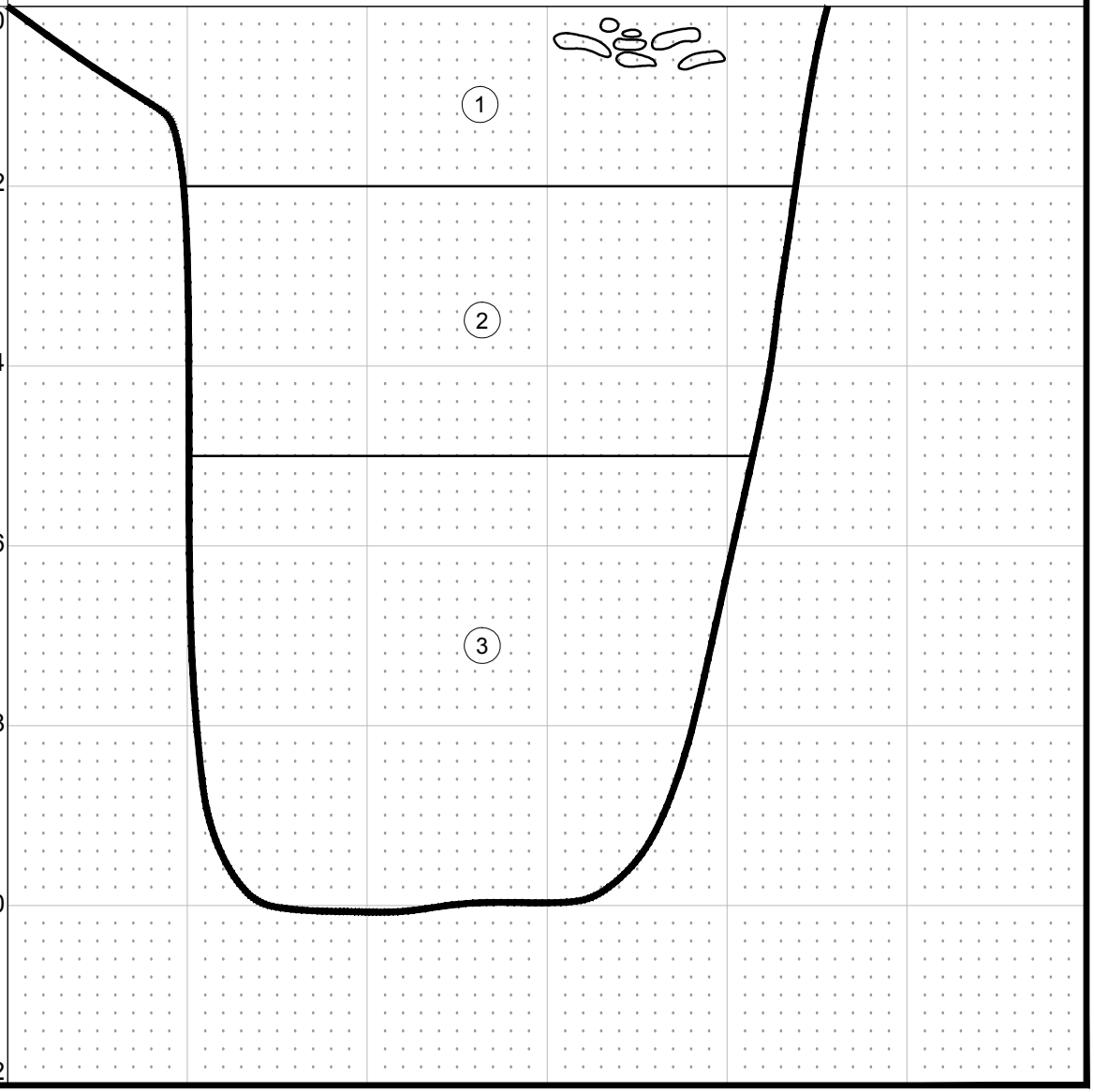
PROJECT: Snoqualmie Valley Levee Upgrade, Lower Cherry Creek

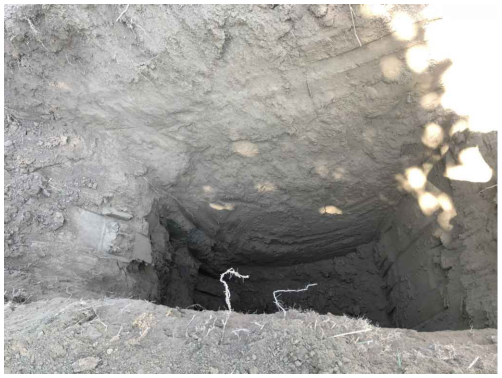
SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Brown, *Silty Sand with Cobbles (SM)*; moist; few cobbles; few subrounded gravel; fine sand; nonplastic.	None Observed			0
(2) Brown, *Silty Sand (SM)* to *Sandy Silt (ML)*; moist; fine sand; nonplastic; trace roots. (Ha)		25.2	S-1	2
(3) Brown, *Silt (ML)* to *Elastic Silt (MH)*; moist; trace fine sand; low to medium plasticity; trace roots.		40.9	S-2	4
				6
			S-3A S-3B	8
			S-4	10
				12

Sketch of East Pit Side

Surface Elevation: Approx. 40 Ft.

Horizontal Distance in Feet





NOTE

PIT Dimensions: 5x9 ft

FIG. A-7

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

LOG OF TEST PIT TP-3-19

JOB NO: 103062-004 DATE: 6-13-2019 LOCATION: King County, Washington

PROJECT: Snoqualmie Valley Levee Upgrade, Lower Cherry Creek

SOIL DESCRIPTION	Ground Water	% Water Content	Samples	Depth, Ft.
(1) Dark brown, *Silt (ML)*; moist; few coarse gravel; rounded and subrounded; few roots. (Ha)	None Observed			0
(2) Brown, *Silt (ML)* to *Elastic Silt (MH)*; moist; trace fine, rounded to subrounded gravel; trace fine sand; low to medium plasticity; trace roots. (Ha)		38.9	S-1A S-1B	2
(3) Brown, *Silt (ML)* to *Elastic Silt (MH)*; moist; trace fine sand; low to medium plasticity; slightly blocky.		34.1	S-2	4
				6
				8
				10
				12

NOTE

PIT Dimensions: 4x10 ft

Sketch of East Pit Side

Surface Elevation: Approx. 40 Ft.

Horizontal Distance in Feet

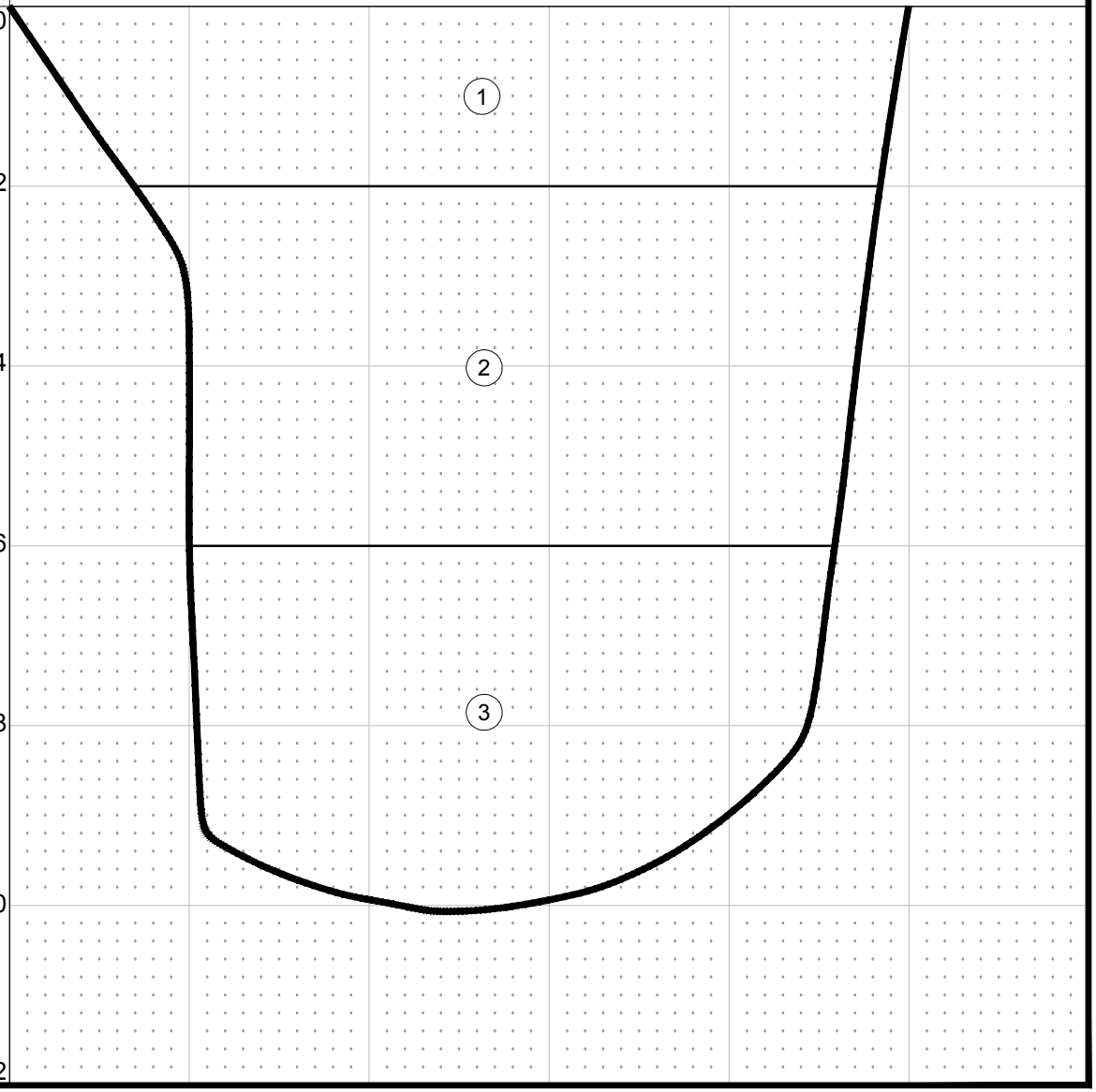


FIG. A-8

Total Depth:	76.5 ft.	Northing:	280,242 ft.	Drilling Method:	HSA & Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	41.0 ft.	Easting:	1,364,143 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Medium stiff, olive-brown *Silt with Sand (ML)*; moist; fine sand; low plasticity; few roots and organics; trace iron oxide staining. (Levee Fill)

2.5

Soft, mottled olive-brown *Silt with Sand (ML)* and *Silty Sand (SM)*; moist; fine to medium sand; nonplastic to low plasticity; trace roots; trace iron oxide staining. (Levee Fill)

4.5

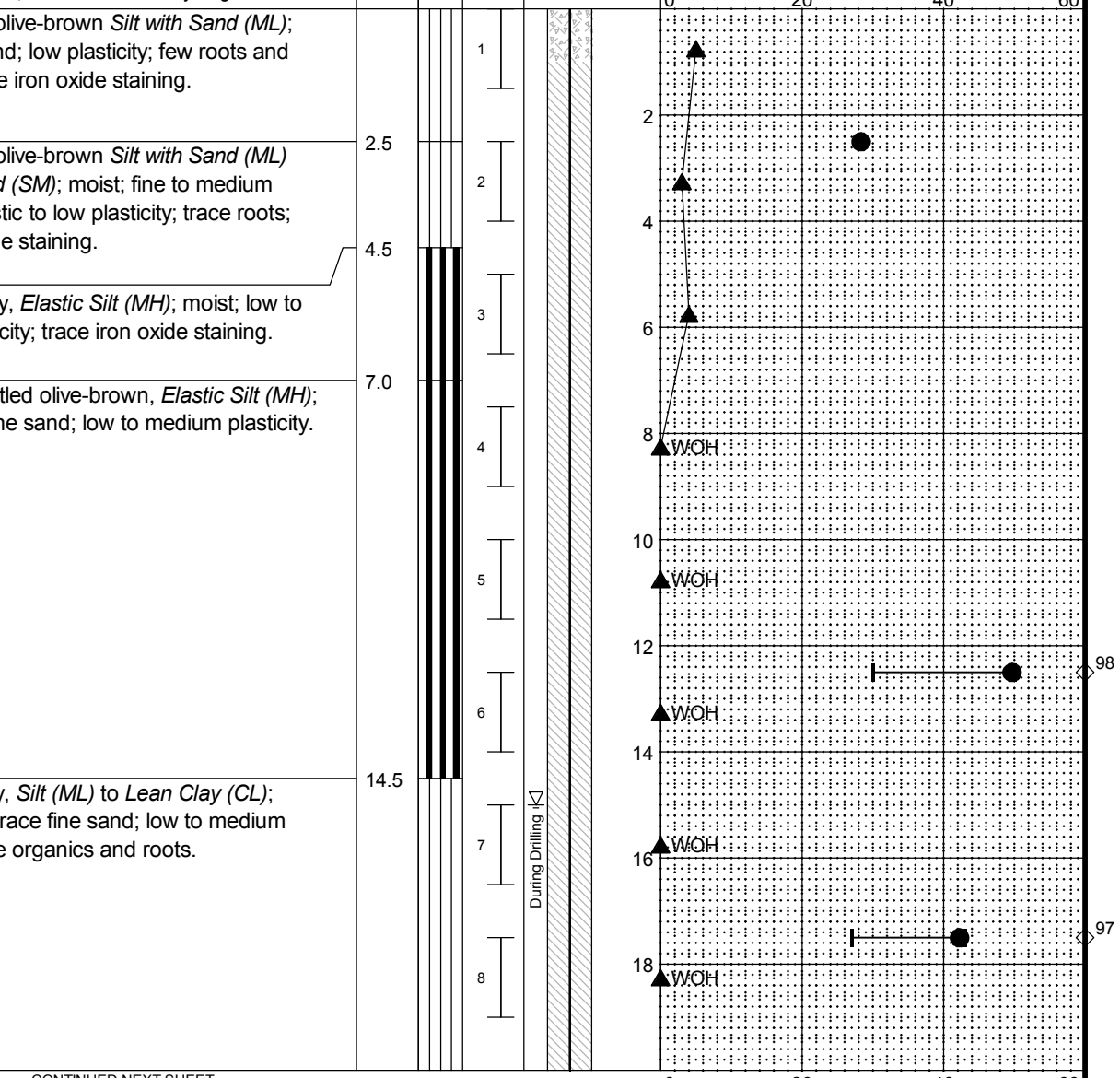
Soft, olive-gray, *Elastic Silt (MH)*; moist; low to medium plasticity; trace iron oxide staining. (Levee Fill)

7.0

Very soft, mottled olive-brown, *Elastic Silt (MH)*; moist; trace fine sand; low to medium plasticity. (Ha)

14.5

Very soft, gray, *Silt (ML)* to *Lean Clay (CL)*; moist to wet; trace fine sand; low to medium plasticity; trace organics and roots. (Ha)



CONTINUED NEXT SHEET

LEGEND

- * Sample Not Recovered
- 2.0" O.D. Split Spoon Sample
- Well Screen and Sand Filter
- Bentonite-Cement Grout
- Bentonite Chips/Pellets
- Bentonite Grout
- Ground Water Level ATD

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-1-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-2
Sheet 1 of 4

REV 3 - Approved for Submittal

Log: BON Rev: EAS Typ: LKN

MASTER_LOG_E 103062.GPJ SHAN_WIL.GDT 3/9/20

Total Depth:	76.5 ft.	Northing:	280,242 ft.	Drilling Method:	HSA & Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	41.0 ft.	Easting:	1,364,143 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

0 20 40 60

23.0 — Very soft, brown *Silt (ML)* to *Organic Soil (OL)*; moist to wet; low plasticity; little organics and roots.
(Ha)

28.0 — Very soft, gray, *Elastic Silt (MH)* to *Lean Clay (CL)*; moist to wet; trace fine sand; medium plasticity; few organics.
(Ha)

33.0 — Very soft, dark brown to gray-brown *Organic Soil (OH)*; moist; low to medium plasticity; some organics.
(Hp)

38.0 — Soft, gray, *Elastic Silt (MH)* to *Fat Clay (CH)*; moist; medium to high plasticity; few organics.
(Ha)

Samples: 9, 10, 11, 12

WOH

22 24 26 28 30 32 34 36 38

WC=157

95 PL=67 WC=121 LL=168

96 LL=80

0 20 40 60

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered
2.0" O.D. Split Spoon Sample
Well Screen and Sand Filter
Bentonite-Cement Grout
Bentonite Chips/Pellets
Bentonite Grout
Ground Water Level ATD

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-1-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-2
Sheet 2 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	76.5 ft.	Northing:	280,242 ft.	Drilling Method:	HSA & Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	41.0 ft.	Easting:	1,364,143 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

0 20 40 60

42 44 46 48 50 52 54 56 58

13 14 15 16

WOH WOH

WC=92

43.0 Very soft, gray-brown *Silt (ML)*; moist; low to medium plasticity; few organics.
(Ha)

48.0 Very soft, gray, *Elastic Silt (MH)* and *Lean Clay (CL)*; moist to wet; trace fine sand; medium plasticity; trace organics.
(Ha)

58.0 Very soft, gray, *Elastic Silt (MH)* to *Silt (ML)*; moist to wet; trace fine sand; low to medium plasticity; trace organics.

CONTINUED NEXT SHEET

0 20 40 60

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

LEGEND

* Sample Not Recovered
2.0" O.D. Split Spoon Sample
Well Screen and Sand Filter
Bentonite-Cement Grout
Bentonite Chips/Pellets
Bentonite Grout
Ground Water Level ATD

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-1-19

April 2020 103062-002

SHANNON & WILSON, INC.
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FIG. A-2
Sheet 3 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	76.5 ft.	Northing:	280,242 ft.	Drilling Method:	HSA & Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	41.0 ft.	Easting:	1,364,143 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

(Ha)

Very loose, gray *Silt with Sand (ML)*; wet; fine sand; low plasticity; few organics.
(Ha)

BOTTOM OF BORING
COMPLETED 6/11/2019

Depth, ft.: 73.0, 76.5

Symbol

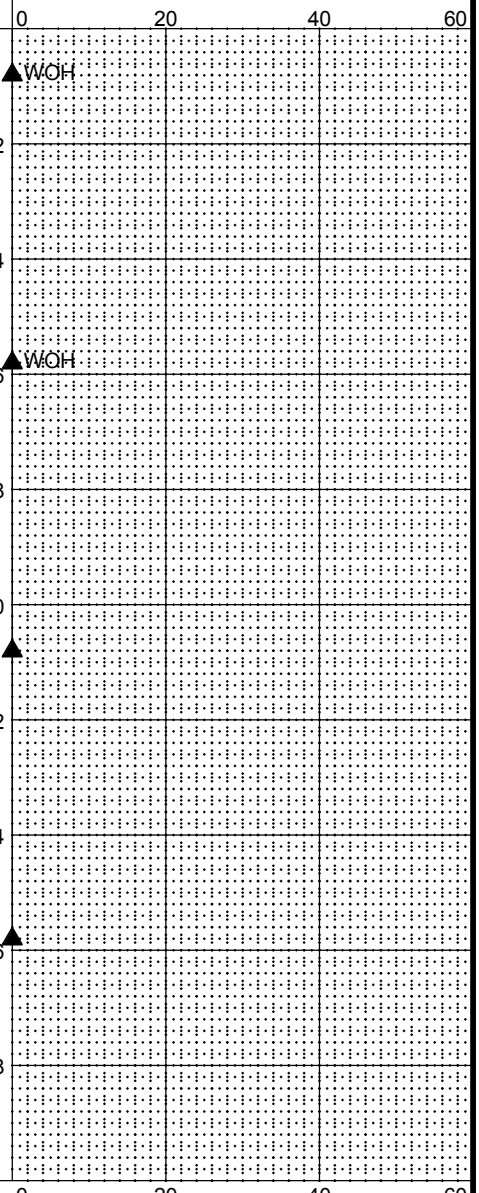
Samples: 17, 18, 19, 20

Ground Water

Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

* Sample Not Recovered
2.0" O.D. Split Spoon Sample
Well Screen and Sand Filter
Bentonite-Cement Grout
Bentonite Chips/Pellets
Bentonite Grout
Ground Water Level ATD

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit — Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-1-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-2
Sheet 4 of 4

Log: BON Rev: EAS Typ: LKN

MASTER_LOG_E_103062.GPJ_SHAN_WIL.GDT 3/9/20

REV 3 - Approved for Submittal

Total Depth:	61.5 ft.	Northing:	278,683 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	39.9 ft.	Easting:	1,364,111 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Medium stiff, brown *Silt (ML)*; moist; low plasticity; little roots to organics.
(Levee Fill)

2.5

Soft, mottled gray and brown *Elastic Silt (ML)*; moist; trace fine sand; low plasticity; trace organics.
(Levee Fill)

- Layer of clayey sand with gravel at 5 feet.

5.5

Medium stiff, gray, *Lean Clay (CL)*; moist; few fine to coarse sand; medium plasitcity.
(Levee Fill)

7.0

Soft, mottled brown and gray *Silt (ML)*; moist; trace fine sand; low plasticty; trace iron oxide staining; trace organics.
(Levee Fill)

9.5

Soft, brown *Silt (ML)*; moist; trace fine sand; low plasticity; trace organics.
(Ha)

12.0

Very soft, mottled orange to gray, *Elastic Silt (MH)* to *Silt (ML)*; moist to wet; low to medium plasticity; some iron oxide staining; trace organics.
(Ha)

17.0

Loose, gray, *Silty Sand (SM)*; wet; fine to medium sand; nonplastic; trace organics.
(Ha)

CONTINUED NEXT SHEET

Depth, ft. | Symbol | Samples | Ground Water Depth, ft.

Samples: 1, 2, 3, 4, 5, 6, 7, 8

Ground Water: ▽ During Drilling

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

0 20 40 60

2 4 6 8 10 12 14 16 18

96

0 20 40 60

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

LEGEND

* Sample Not Recovered
2.0" O.D. Split Spoon Sample
Thin Wall Sample
▽ Ground Water Level ATD

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-2-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-3
Sheet 1 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ_SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	61.5 ft.	Northing:	278,683 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	39.9 ft.	Easting:	1,364,111 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Very loose, gray, *Poorly Graded Sand with Silt (SP-SM)*; wet; trace fine gravel; fine to coarse sand; nonplastic.
(Ha)

20.0

Very soft, brown *Silt (ML)* to *Organic Silt (OL)*; moist; low plasticity; some organics.
(Hp)

23.0

Very soft, gray *Lean Clay with Sand (CL)*; moist to wet; fine sand; low to medium plasticity; trace organics.
(Ha)

28.0

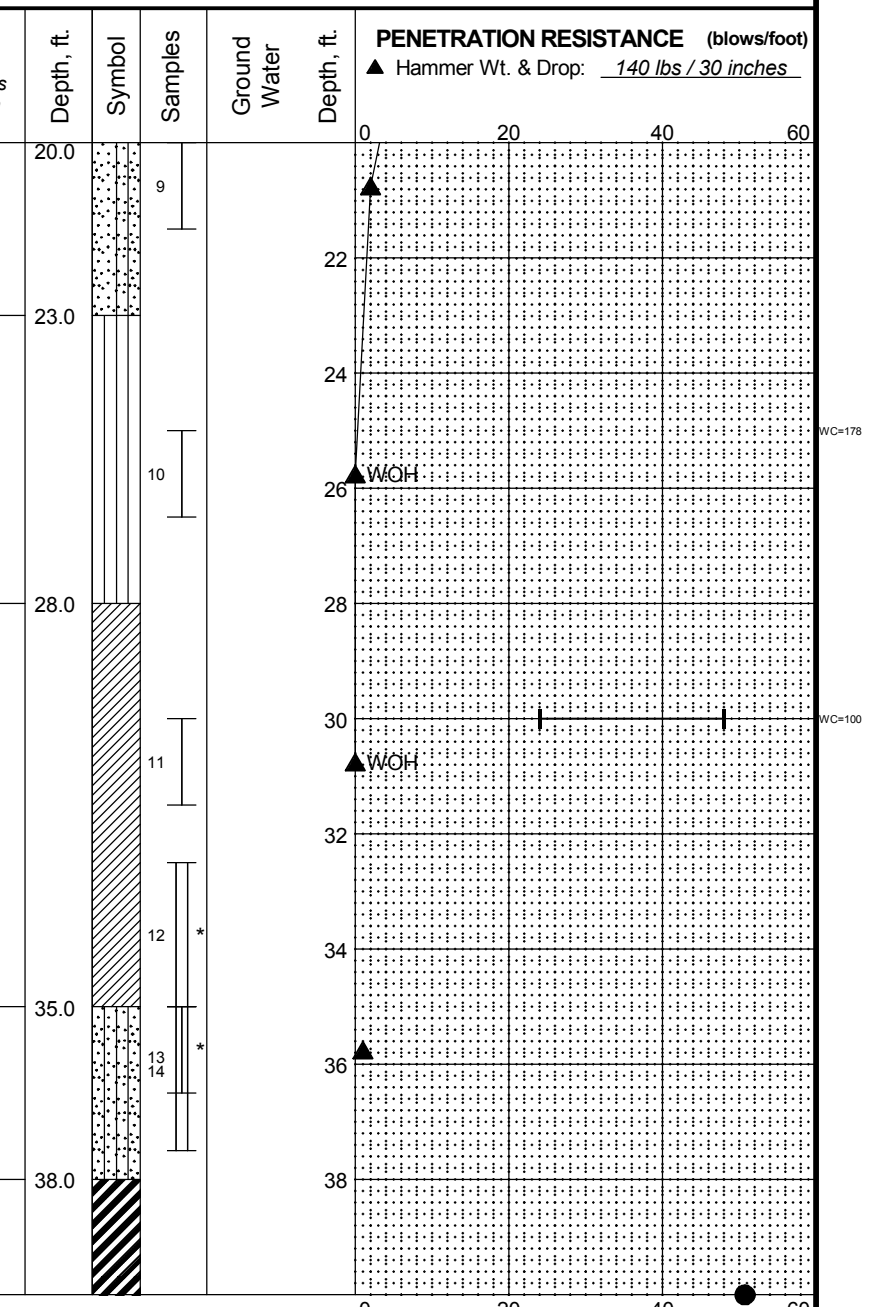
Very loose, gray, *Silty Sand (SM)*; wet; fine to medium sand; nonplastic to low plasticity.
(Ha)

35.0

Very soft, gray, *Fat Clay (CH)*; moist; medium to high plasticity; trace organics.
(Ha)

38.0

CONTINUED NEXT SHEET



LEGEND

* Sample Not Recovered
2.0" O.D. Split Spoon Sample
Thin Wall Sample
Ground Water Level ATD

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-2-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-3
Sheet 2 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	61.5 ft.	Northing:	278,683 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	39.9 ft.	Easting:	1,364,111 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60

42 44 46 48 50 52 54 56 58

WOH

15 16 17 18

44.0 Very soft, dark brown, *Organic Soil (OL)*; moist; low plasticity; mostly organics.
(Hp)

45.8 Very soft, gray, *Lean Clay (CL)*; moist; few fine sand; medium plasticity.
(Ha)

48.0 Medium stiff, gray, *Elastic Silt (MH)* to *Silt (ML)*; moist to wet; trace fine sand; low to medium plasticity; few organics.
(Ha)

51.2 Medium dense, gray, *Silty Sand (SM)*; wet; fine to coarse sand; nonplastic.
(Ha)

57.0 Very loose, gray, *Sandy Silt (ML)*; wet; fine to medium sand; nonplastic to low plasticity; little organics.
(Ha)

CONTINUED NEXT SHEET

0 20 40 60

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

LEGEND

* Sample Not Recovered
2.0" O.D. Split Spoon Sample
Thin Wall Sample
Ground Water Level ATD

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-2-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-3
Sheet 3 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	61.5 ft.	Northing:	278,683 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	39.9 ft.	Easting:	1,364,111 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

0 20 40 60

61.5 — 19

BOTTOM OF BORING
COMPLETED 6/12/2019

62 64 66 68 70 72 74 76 78

0 20 40 60

LEGEND

* Sample Not Recovered
2.0" O.D. Split Spoon Sample
Thin Wall Sample
Ground Water Level ATD

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-2-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-3
Sheet 4 of 4

Log: BON Rev: EAS Typ: LKN

MASTER_LOG_E_103062.GPJ SHAN_WIL.GDT 3/9/20

REV 3 - Approved for Submittal

Total Depth:	61.5 ft.	Northing:	277,284 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	40.4 ft.	Easting:	1,364,578 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Loose, brown *Silt with Sand (ML)*; moist; fine sand; nonplastic to low plasticity; few organics.
(Levee Fill)

4.5

Soft, brown *Gravelly Silt with Sand (ML)*; moist; fine, subrounded gravel; fine to coarse sand; low plasticity; trace organics.
(Levee Fill)

7.0

Soft, brown *Elastic Silt with Sand (MH)*; moist; few fine, subrounded gravel; fine to medium sand; nonplastic to low plasticity; trace organics; trace iron oxide staining; few silty, fine sand seams.
(Ha)
- Layer of silty sand at 10 feet.

10.7

Very soft, mottled orange and brown *Silt (ML)* to *Elastic Silt (MH)*; moist; few fine sand; low to medium plasticity; iron oxide staining.
(Ha)

12.5

Very soft, gray, *Lean Clay (CL)*; moist; few fine sand; low to medium plasticity; few organics and roots.
(Ha)

14.5

15.5

Very soft, dark brown, *Organic Soil (OL)*; moist; low plasticity; mostly organics.
(Hp)

Very soft, gray and dark brown, *Elastic Silt (MH)*; moist; low to medium plasticity; few to little organics.
(Ha)

19.0

Depth, ft. | Symbol | Samples | Ground Water | Depth, ft.

Samples: 1, 2, 3, 4, 5, 6, 7, 8*, 9

Ground Water: None Observed During Drilling

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60

2 4 6 8 10 12 14 16 18

WC=60

PL=73
WC=144
LL=171

0 20 40 60

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered
2.0" O.D. Split Spoon Sample
Thin Wall Sample
Well Screen and Sand Filter
Bentonite-Cement Grout
Bentonite Chips/Pellets
Bentonite Grout

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-3-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-4
Sheet 1 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	61.5 ft.	Northing:	277,284 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	40.4 ft.	Easting:	1,364,578 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Soft, dark brown, *Elastic Silt (MH)*; moist; trace fine sand; low to medium plasticity; little organics.
(Ha)

23.0

Soft, gray, *Lean Clay (CL)* to *Lean Clay with Sand (CL)*; moist; fine sand; low plasticity; few organics.
(Ha)

26.0

Very loose, gray, *Silty Sand (SM)*; wet; fine to medium sand; nonplastic.
(Ha)

27.0

Very loose, gray, *Sandy Silt (ML)*; wet; fine sand; low plasticity; trace organics.
(Ha)

33.0

Medium stiff, gray, *Elastic Silt (MH)* to *Silt (ML)*; moist; trace fine sand; medium plasticity; few organics.
(Ha)

- Layer of wet, silty sand at 35.8 feet.
- Layer of wet, white silt at 36.1 feet.

37.0

Very soft, gray, *Elastic Silt (MH)* to *Lean Clay (CL)*; moist; trace fine sand; low to medium plasticity; few organics.
(Ha)

Depth, ft. | Symbol | Samples | Ground Water | Depth, ft.

10 | 11 | 12

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

0 20 40 60

22 24 26 28 30 32 34 36 38

95

0 20 40 60

CONTINUED NEXT SHEET

LEGEND

- * Sample Not Recovered
- 2.0" O.D. Split Spoon Sample
- Thin Wall Sample
- Well Screen and Sand Filter
- Bentonite-Cement Grout
- Bentonite Chips/Pellets
- Bentonite Grout

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-3-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-4
Sheet 2 of 4

Log: BON Rev: EAS Typ: LKN

MASTER_LOG_E_103062.GPJ_SHAN_WIL.GDT 3/9/20

REV 3 - Approved for Submittal

Total Depth:	61.5 ft.	Northing:	277,284 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	40.4 ft.	Easting:	1,364,578 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

0 20 40 60

42 44 46 48 50 52 54 56 58

13 14 15 16

48.0 — Medium dense, gray, *Silty Sand (SM)*; wet; fine to medium sand; nonplastic to low plasticity; trace organics. (Ha)

52.0 — Soft, gray, *Fat Clay (CH)* to *Lean Clay (CL)*; moist; medium to high plasticity. (Ha)

58.0 — Very loose, red-brown, *Silty Sand with Gravel (SM)*; moist; fine to coarse sand; nonplastic to low plasticity.

WC=67

CONTINUED NEXT SHEET

0 20 40 60

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

Thin Wall Sample

Well Screen and Sand Filter

Bentonite-Cement Grout

Bentonite Chips/Pellets

Bentonite Grout

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-3-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-4
Sheet 3 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	61.5 ft.	Northing:	277,284 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	40.4 ft.	Easting:	1,364,578 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

0 20 40 60

(Ha)

17

61.5

BOTTOM OF BORING
COMPLETED 6/12/2019

62 64 66 68 70 72 74 76 78

0 20 40 60

LEGEND

* Sample Not Recovered
2.0" O.D. Split Spoon Sample
Thin Wall Sample
Well Screen and Sand Filter
Bentonite-Cement Grout
Bentonite Chips/Pellets
Bentonite Grout

◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-3-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-4
Sheet 4 of 4

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	51.5 ft.	Northing:	276,652 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	39.1 ft.	Easting:	1,365,202 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Loose, gray-brown, *Sandy Silt (ML)*; moist; fine sand; low plasticity; trace organics.
(Levee Fill)

3.5

Loose, red-brown, *Silty Sand (SM)*; moist; fine to coarse sand; nonplastic to low plasticity; iron oxide staining.
(Ha)

5.0

Very loose, gray, *Sandy Silt (ML)*; moist; fine sand; low plasticity; few organics; trace iron oxide staining.
(Ha)

7.0

Very soft, gray, *Lean Clay (CL)*; moist; few fine sand; medium plasticity; trace organics.
(Ha)

8.5

Very soft, dark brown, *Sandy Elastic Silt (MH)*; fine sand; low to medium plasticity; little organics.
(Hp)

11.0

Very soft, gray-brown *Silt (ML)* to *Elastic Silt (MH)*; wet; low to medium plasticity; little organics.
(Ha)
- Layer of wet, silty sand at 11 feet.

13.0

Very soft, gray, *Lean Clay (CL)*; moist; low to medium plasticity; trace to few organics.
(Ha)

17.5

Very loose, gray, *Silty Sand (SM)*; wet; fine to medium sand; nonplastic to low plasticity.
(Ha)

18.0

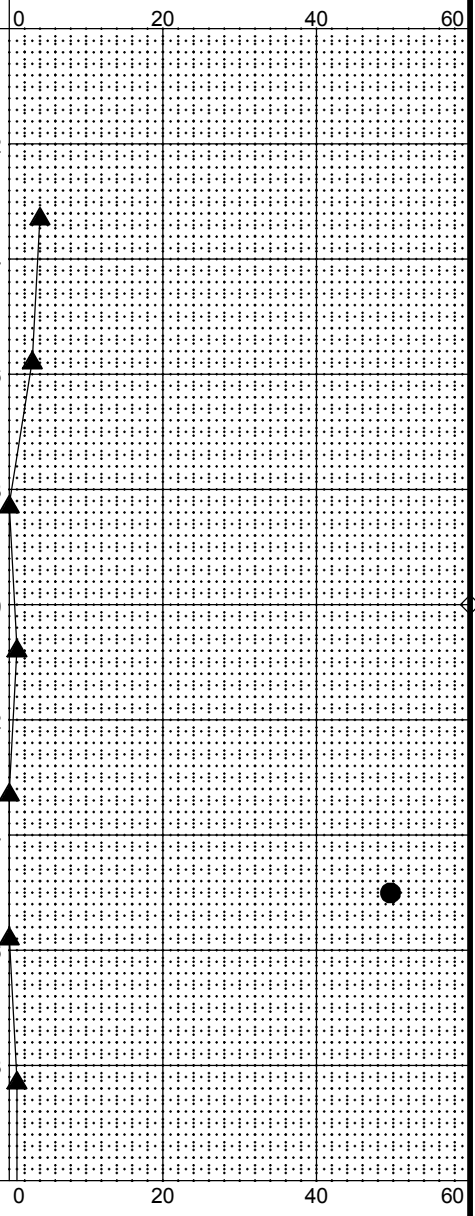
Depth, ft. | Symbol | Samples | Ground Water Depth, ft.

Samples: 1, 2, 3, 4, 5, 6, 7

Ground Water: None Observed During Drilling

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

CONTINUED NEXT SHEET

LEGEND

* Sample Not Recovered
⌶ 2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-4-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-5
Sheet 1 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ_SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	51.5 ft.	Northing:	276,652 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	39.1 ft.	Easting:	1,365,202 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Very soft, gray, *Lean Clay (CL)* to *Lean Clay with Sand (CL)*; moist to wet; fine sand; low to medium plasticity; trace organics.
(Ha)

21.0

Very loose, gray, *Silty Sand (SM)*; wet; fine to coarse sand; nonplastic to low plasticity.
(Ha)

23.0

Very loose, gray, *Sandy Silt (ML)*; moist to wet; fine sand; low plasticity; few organics.
(Ha)

28.0

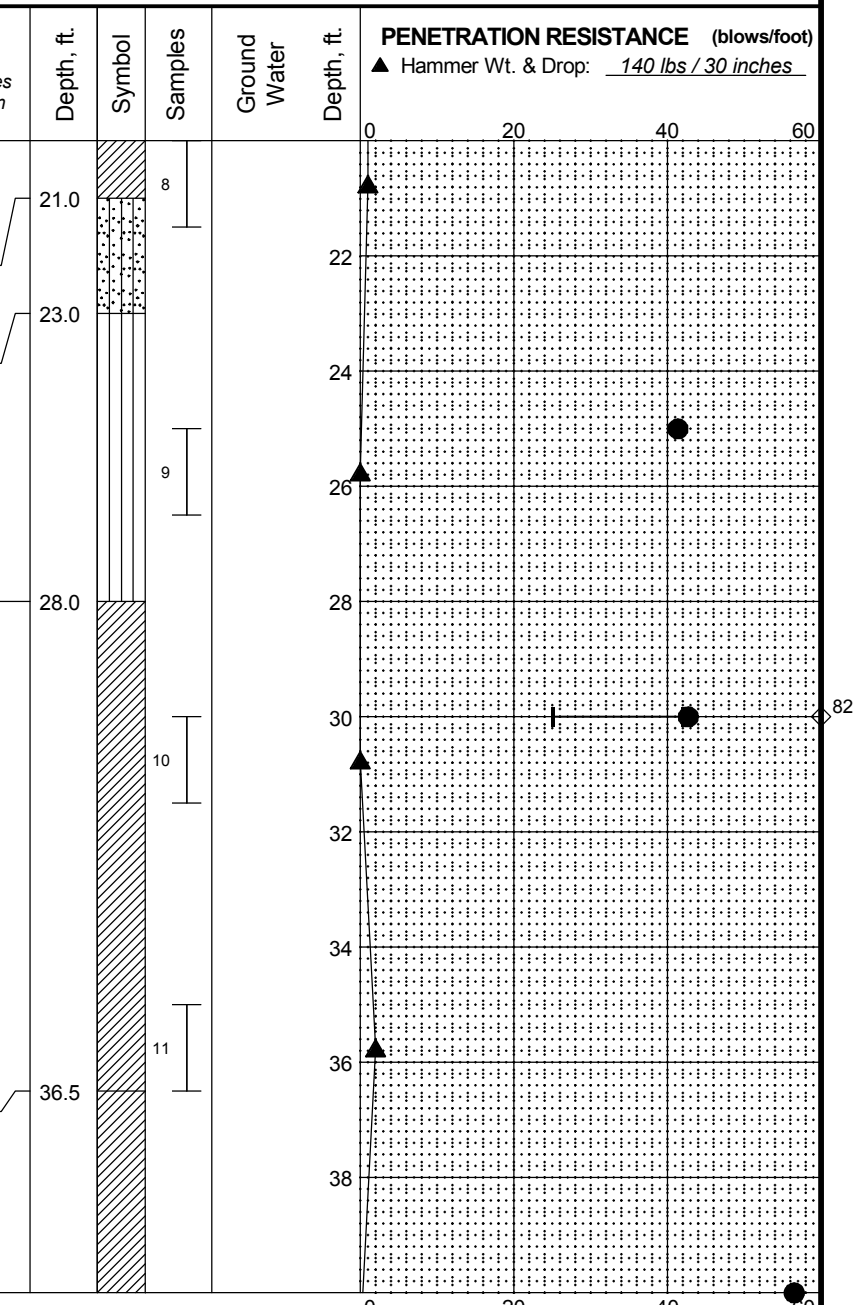
Very soft, gray, *Lean Clay with Sand (CL)*; moist; fine sand; low to medium plasticity; few wet, silty sand seams.
(Ha)

- Layer of light gray silt at 36.3 feet.

36.5

Very soft, gray-brown, *Sandy, Lean Clay (CL)*; moist; fine sand; medium plasticity; few organics.
(Ha)

CONTINUED NEXT SHEET



LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-4-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-5
Sheet 2 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ_SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	51.5 ft.	Northing:	276,652 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	39.1 ft.	Easting:	1,365,202 ft.	Drilling Company:	Holt Services	Rod Diam.:	2.5-inch
Vert. Datum:	NAVD 88	Station:	-	Drill Rig Equipment:	B57	Hammer Type:	Hydraulic
Horiz. Datum:	NAD 83	Offset:	-	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

0 20 40 60

42 44 46 48 50 52 54 56 58

12 13 14

44.0 Loose, gray, *Poorly Graded Sand with Silt (SP-SM)*; wet; fine to coarse sand; nonplastic; trace organics.
(Ha)

49.0 Medium stiff, dark brown, *Organic Soil (OL)*; moist; low plasticity; mostly organics and wood.
(Hp)

51.5 BOTTOM OF BORING
COMPLETED 6/13/2019

0 20 40 60

LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-4-19

April 2020 103062-002

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-5
Sheet 3 of 3

REV 3 - Approved for Submittal

MASTER_LOG_E_103062.GPJ_SHAN_WIL.GDT 3/9/20 Log: BON Rev: EAS Typ: LKN

Total Depth:	41.5 ft.	Northing:	278,183 ft.	Drilling Method:	HSA and Mud Rotary	Hole Diam.:	4.78 in.
Top Elevation:	39.0 ft.	Easting:	1,364,227 ft.	Drilling Company:	Holt	Rod Diam.:	3-inch rod
Vert. Datum:	NAVD88	Station:	34+16.59 ft.	Drill Rig Equipment:	B-57	Hammer Type:	Automatic
Horiz. Datum:		Offset:	0	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Soft, brown to gray *Silt to Sandy Silt (ML)*; moist to wet; medium plasticity.
(Levee Fill)

12.0

Very soft to soft, brown to gray *Silt to Sandy Silt (ML)*; wet; medium to high plasticity.
(Ha)

41.5

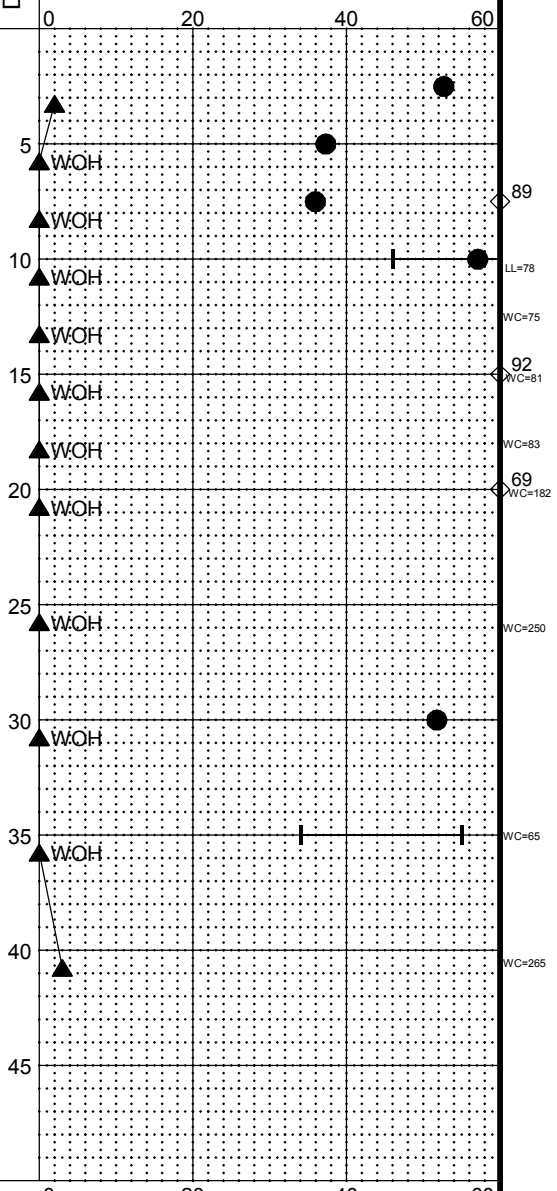
BOTTOM OF BORING
COMPLETED 10/18/2017

Depth, ft. | Symbol | Samples | Ground Water Depth, ft.

None Observed During Drilling

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations, and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. Corrected log issued March 2020 based on revised geologic interpretation.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-1

April 2020 | 21-1-30038-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-9

REV 3 - Approved for Submittal

MASTER_LOG_E_21-30038.GPJ_SHAN_WIL.GDT 3/9/20 Log: JFW Rev: JKG Typ: LKN

Total Depth:	26.5 ft.	Northing:	278,182 ft.	Drilling Method:	HSA and Mud Rotary	Hole Diam.:	4.75 in.
Top Elevation:	31.0 ft.	Easting:	1,364,202 ft.	Drilling Company:	Holt	Rod Diam.:	3-inch rod
Vert. Datum:	NAVD88	Station:	34+10.47 ft.	Drill Rig Equipment:	B-57	Hammer Type:	Automatic
Horiz. Datum:		Offset:	24ft W	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between material types, and the transition may be gradual.

Depth, ft. | Symbol | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

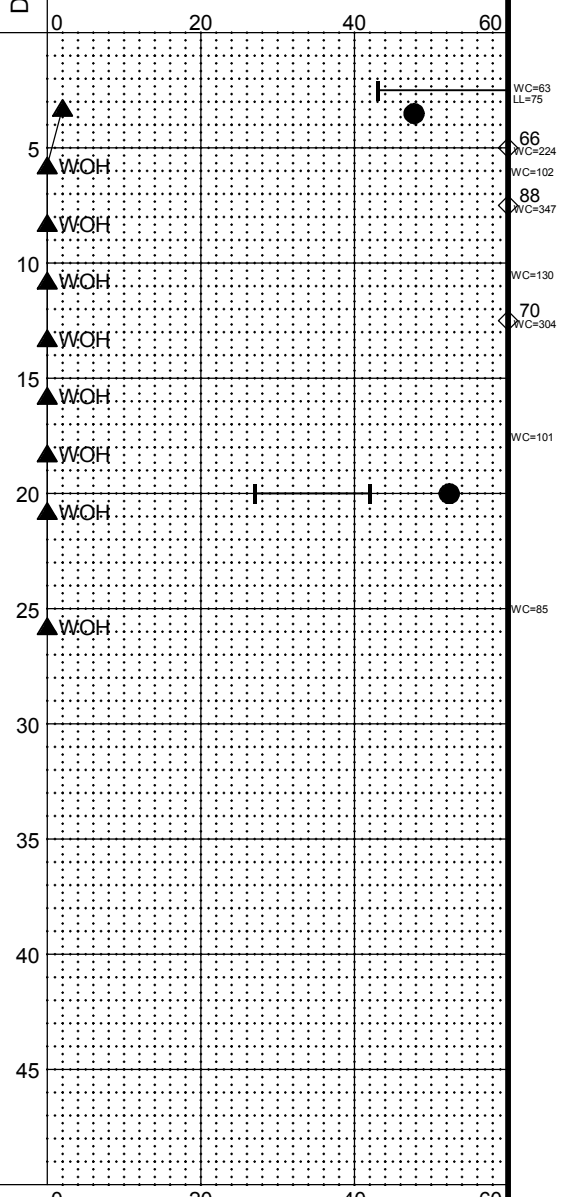
Very soft to soft, brown to gray *Silt to Sandy Silt (ML)*; moist to wet; medium to high plasticity. (Ha)

26.5

BOTTOM OF BORING
COMPLETED 10/19/2017

Samples: 1, 2, 3, 4, 5, 6, 7, 8, 9

Ground Water: None Observed During Drilling



LEGEND

* Sample Not Recovered

2.0" O.D. Split Spoon Sample

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations, and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. Corrected log issued March 2020 based on revised geologic interpretation.

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

LOG OF BORING B-2

April 2020 | 21-1-30038-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-10

REV 3 - Approved for Submittal

MASTER_LOG_E 21-30038.GPJ SHAN_WIL.GDT 3/9/20 Log: JFW Rev: JKG Typ: LKN

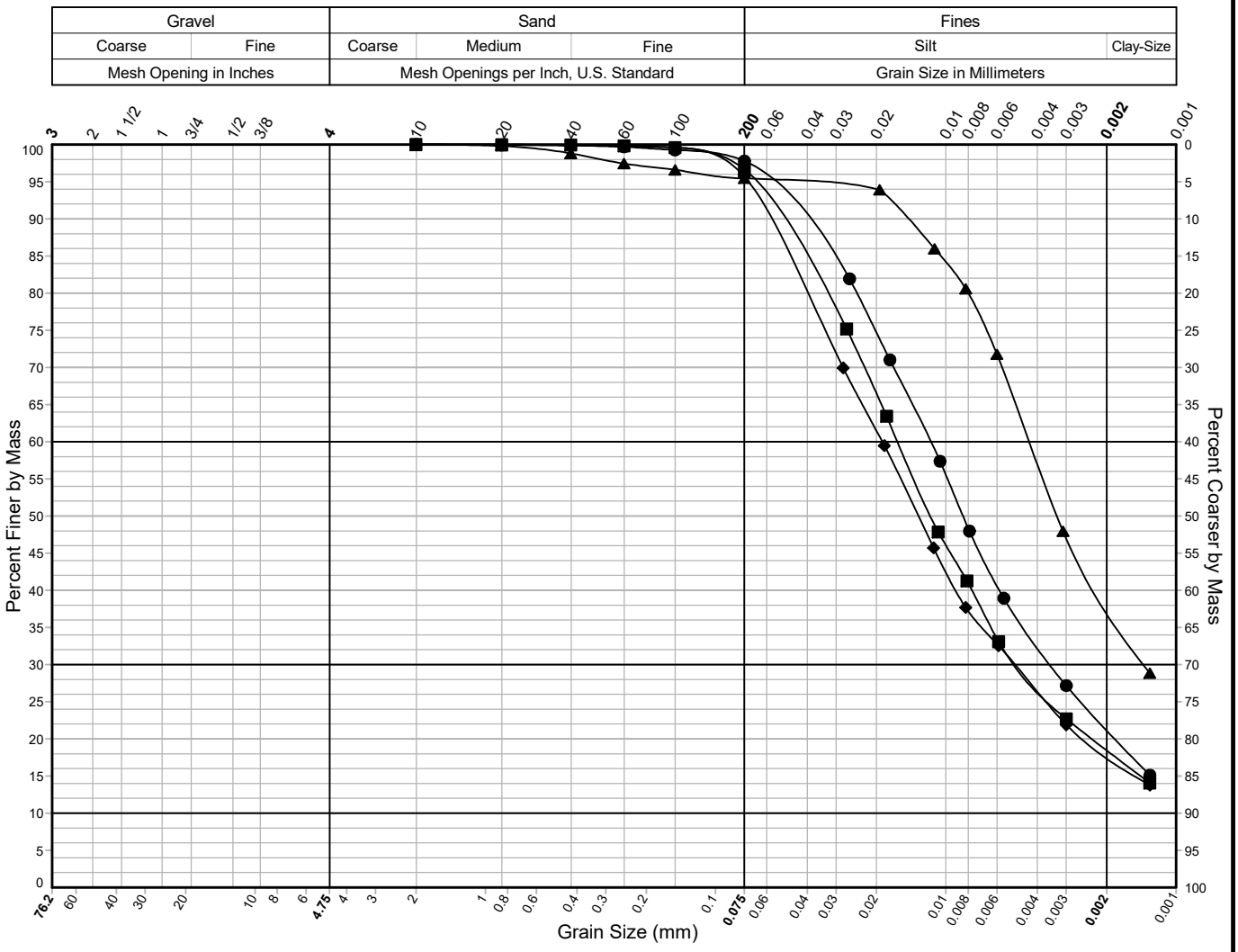
LABORATORY TEST SUMMARY

Boring	Top Depth (ft)	Sample Number	Sample Type	Blow Count	USCS	WC (%)	OC (%)	% Gravel	% Sand	% Fines	% Clay-size	LL	PL	Soil Description
B-1-19	2.5	S-2	SPT	3		28.3								
B-1-19	12.5	S-6	SPT	0	MH	49.7			2	98	21	50	30	Elastic Silt
B-1-19	17.5	S-8	SPT	0	ML	42.3			3	97	19	43	27	Silt
B-1-19	25	S-10	SPT	1		156.8								
B-1-19	35	S-12	SPT	0	OH	121.3	11.9		5*	95*	38*	168	67	Organic Silt
B-1-19	40	S-13	SPT	2	MH	44.6			4*	96*	18*	80	39	Elastic Silt
B-1-19	50	S-15	SPT	0		91.9								
B-1-19	60	S-17	SPT	0		39.1								
B-2-19	2.5	S-2	SPT	2	MH	37.8						51	34	Elastic Silt
B-2-19	14	S-7	TW		MH	49.9		3*	1*	96*	20*	51	32	Elastic Silt
B-2-19	25	S-10	SPT	0		177.7	16.0							
B-2-19	30	S-11	SPT	0	CL	100.2						48	24	Lean Clay
B-2-19	40	S-15	SPT	0		50.7								
B-2-19	50	S-17	SPT	14		43.2								
B-2-19	60	S-19	SPT	0		42.7								
B-3-19	5	S-3	SPT	2	ML	44.4		30*	17*	53*	21*			Gravelly Silt with Sand
B-3-19	7.5	S-4	SPT	3	MH	47.0						50	30	Elastic Silt with Sand
B-3-19	12.5	S-6	SPT	0		60.1								
B-3-19	19	S-9	SPT	2	MH	144.1						171	73	Elastic Silt
B-3-19	35	S-12	SPT	7	ML	57.4			5	95	20			Silt
B-3-19	55	S-16	SPT	2		67.4								
B-4-19	10	S-4	SPT	1	MH	84.8			34*	66*	15*	81	63	Sandy Elastic Silt
B-4-19	15	S-6	SPT	0		49.6								
B-4-19	25	S-9	SPT	0		41.4								
B-4-19	30	S-10	SPT	0	CL	42.7			18	82	18	42	25	Lean Clay with Sand
B-4-19	40	S-12	SPT	0		56.5								
TP-1-19	7	S-3A	GRAB		ML	24.3				53				Sandy Silt
TP-2-19	2.7	S-1	GRAB			25.2								
TP-2-19	7.5	S-3A	GRAB			40.9								
TP-3-19	5.5	S-1A	GRAB		ML	38.9						49	29	Silt with Sand
TP-3-19	10	S-2	GRAB		MH	34.1						53	31	Elastic Silt

GRAIN SIZE DISTRIBUTION PLOT

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

BORING B-1-19



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● B-1-19, S-6	12.5	MH	Elastic Silt		2	98	75	21	49.7	AKV	AKV	D422
■ B-1-19, S-8	17.5	ML	Silt		3	97	66	19	42.3	AKV	AKV	D422
▲ B-1-19, S-12*	35.0	OH	Organic Silt		5	95		38	121.3	AKV	AKV	D422
◆ B-1-19, S-13*	40.0	MH	Elastic Silt		4	96	61	18	44.6	AKV	AKV	D422

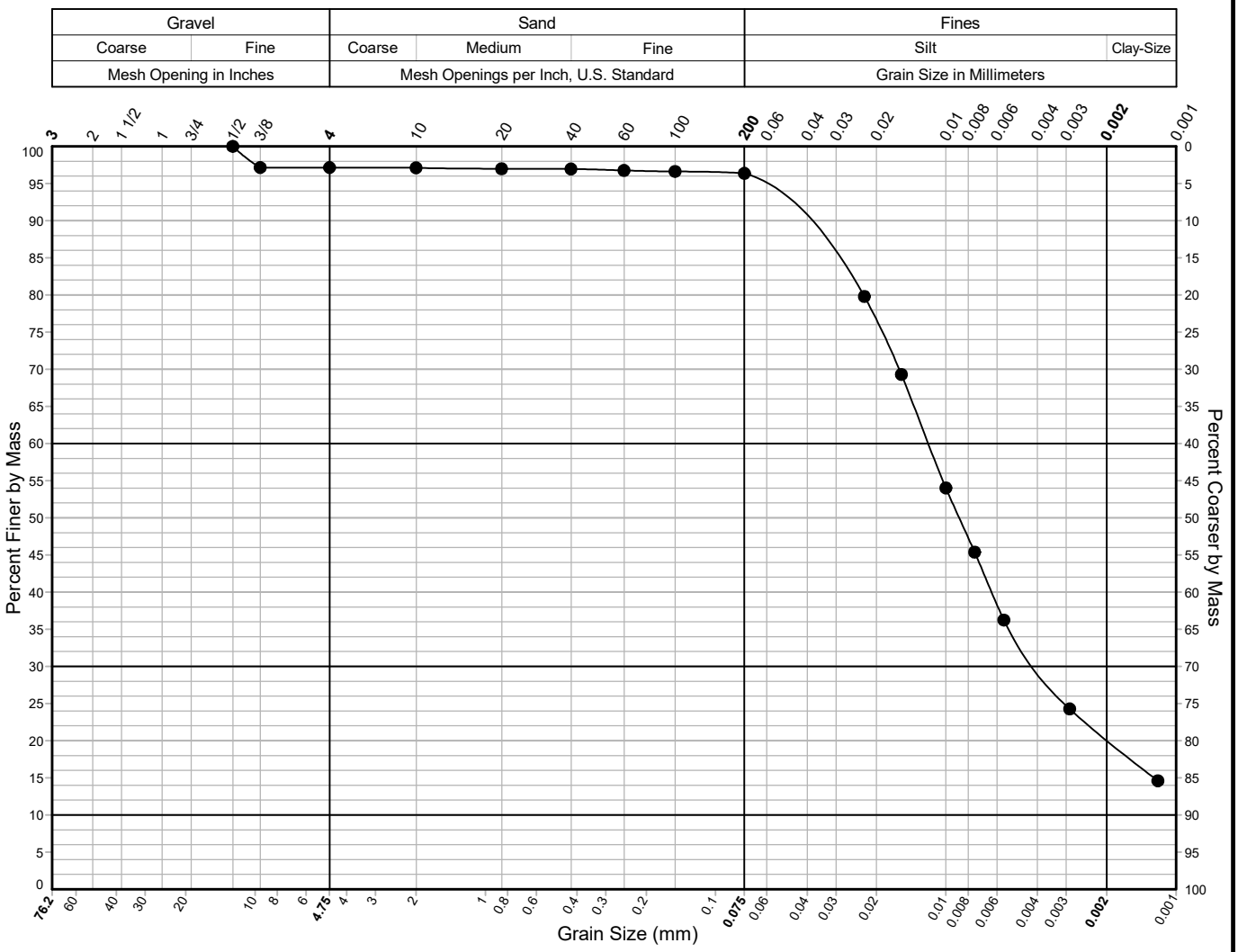
* *Test specimen did not meet minimum mass recommendations.*

SHANNON & WILSON, INC.

GRAIN SIZE DISTRIBUTION PLOT

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

BORING B-2-19



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● B-2-19, S-7*	14.0	MH	Elastic Silt	3	1	96	76	20	49.9	AKV	AKV	D422

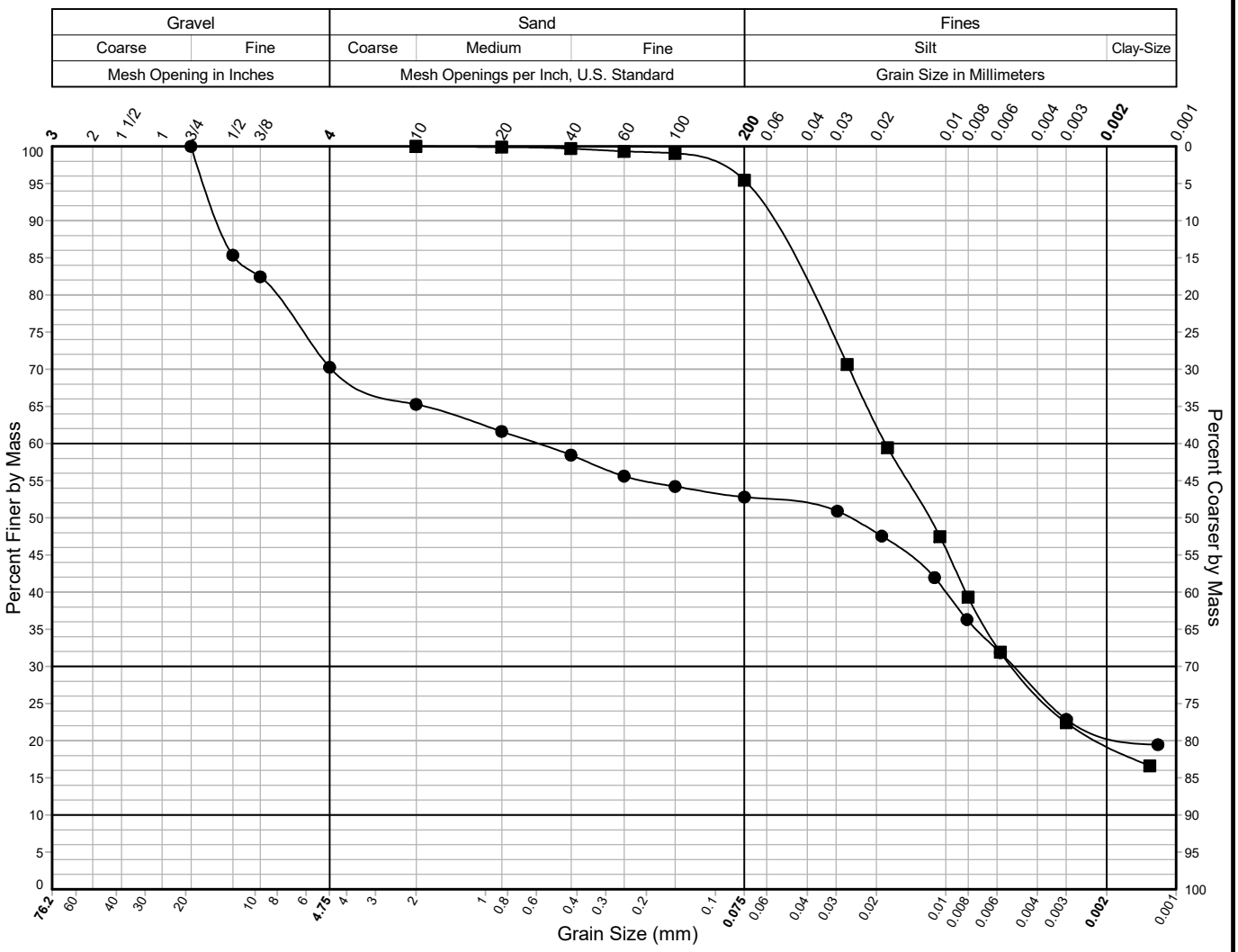
* *Test specimen did not meet minimum mass recommendations.*

SHANNON & WILSON, INC.

GRAIN SIZE DISTRIBUTION PLOT

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

BORING B-3-19



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● B-3-19, S-3*	5.0	ML	Gravelly Silt with Sand	30	17	53	48	21	44.4	AKV	AKV	D422
■ B-3-19, S-12	35.0	ML	Silt		5	95	63	20	57.4	BXK	AKV	D422

* *Test specimen did not meet minimum mass recommendations.*

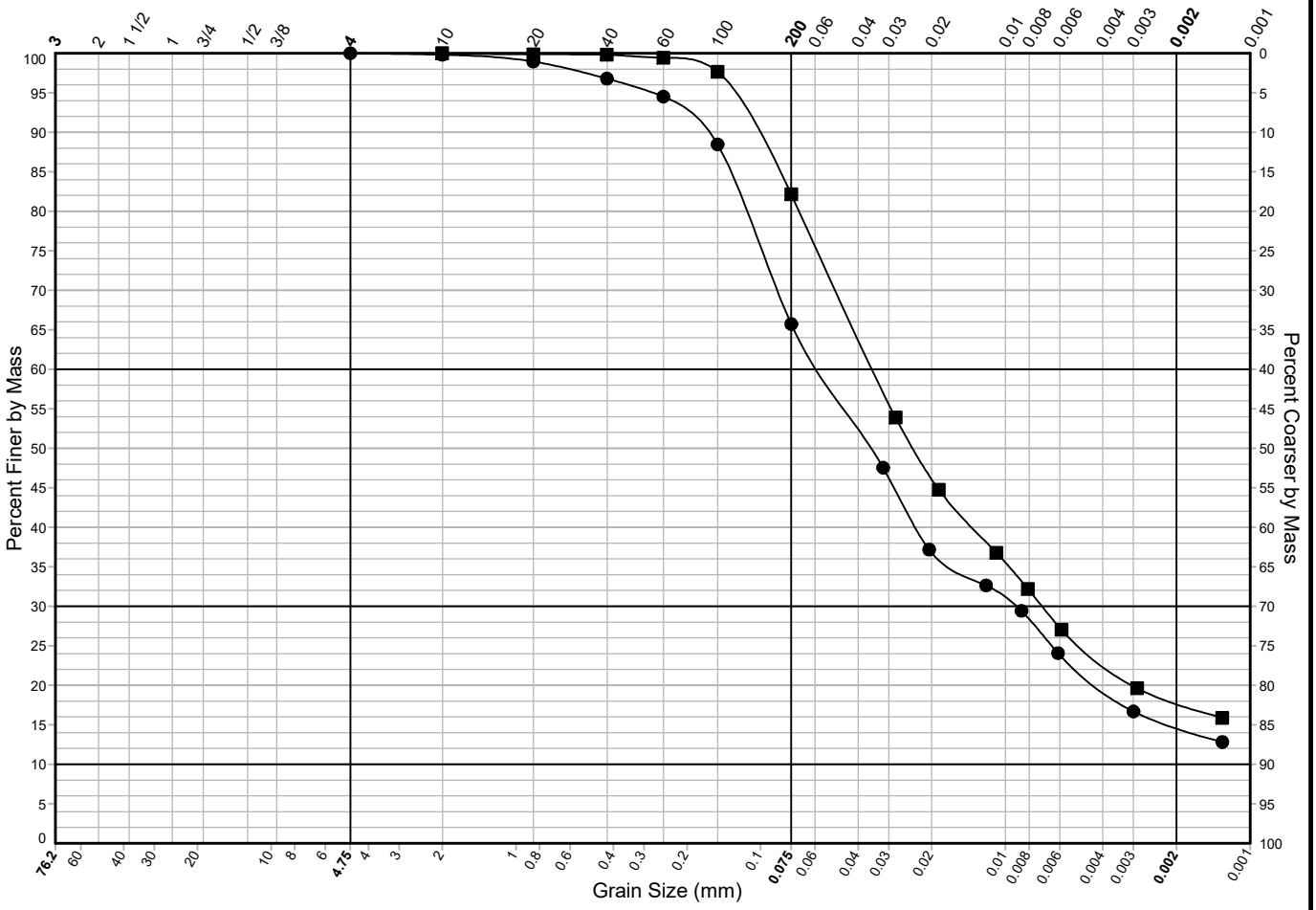
SHANNON & WILSON, INC.

GRAIN SIZE DISTRIBUTION PLOT

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

BORING B-4-19

Gravel		Sand			Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay-Size
Mesh Opening in Inches		Mesh Openings per Inch, U.S. Standard			Grain Size in Millimeters	



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● B-4-19, S-4*	10.0	MH	Sandy Elastic Silt		34	66	37	15	84.8	BXK	AKV	D422
■ B-4-19, S-10	30.0	CL	Lean Clay with Sand		18	82	46	18	42.7	BXK	AKV	D422

* *Test specimen did not meet minimum mass recommendations.*

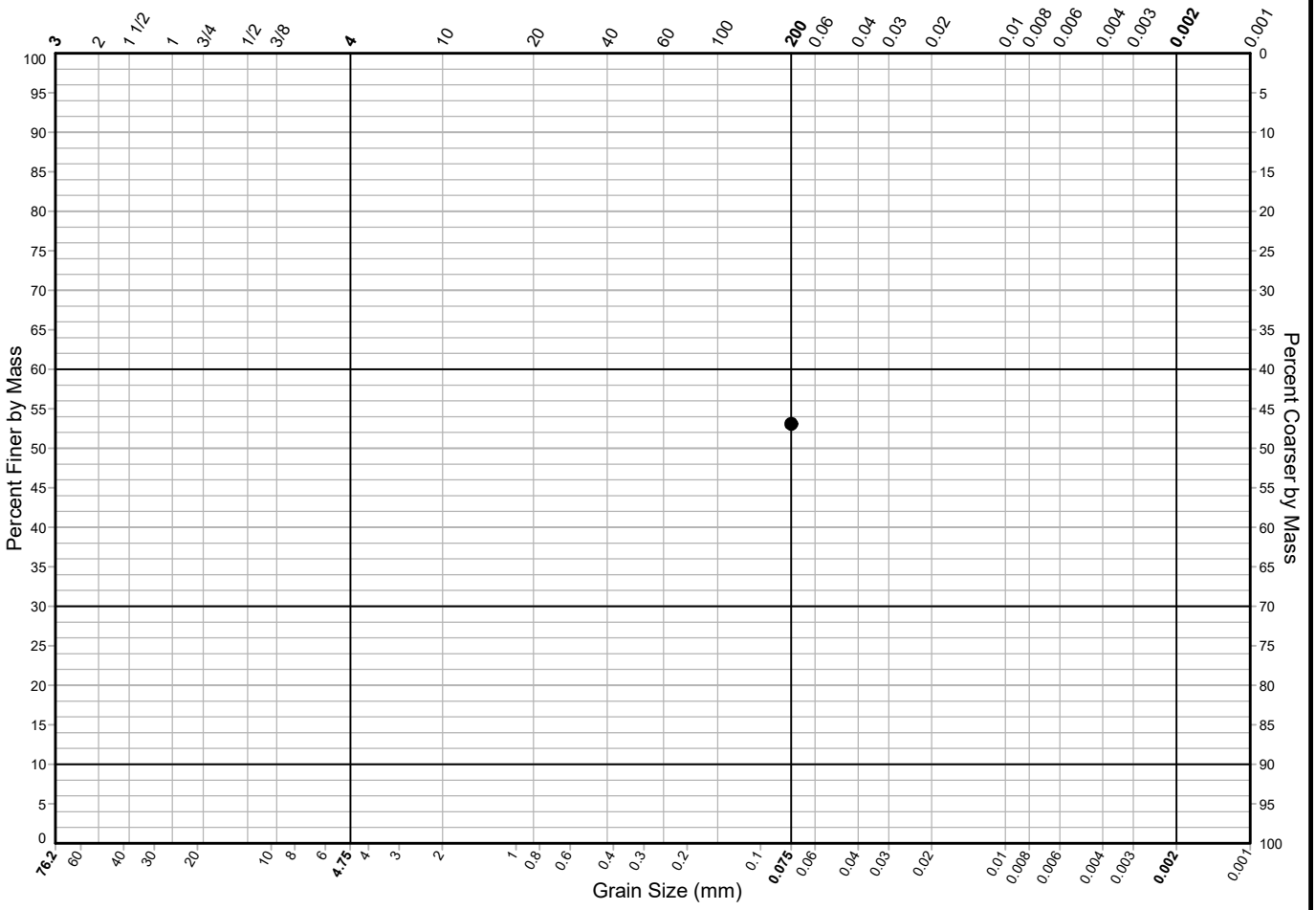
SHANNON & WILSON, INC.

GRAIN SIZE DISTRIBUTION PLOT

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

TEST PIT TP-1-19

Gravel		Sand			Fines	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay-Size
Mesh Opening in Inches		Mesh Openings per Inch, U.S. Standard			Grain Size in Millimeters	



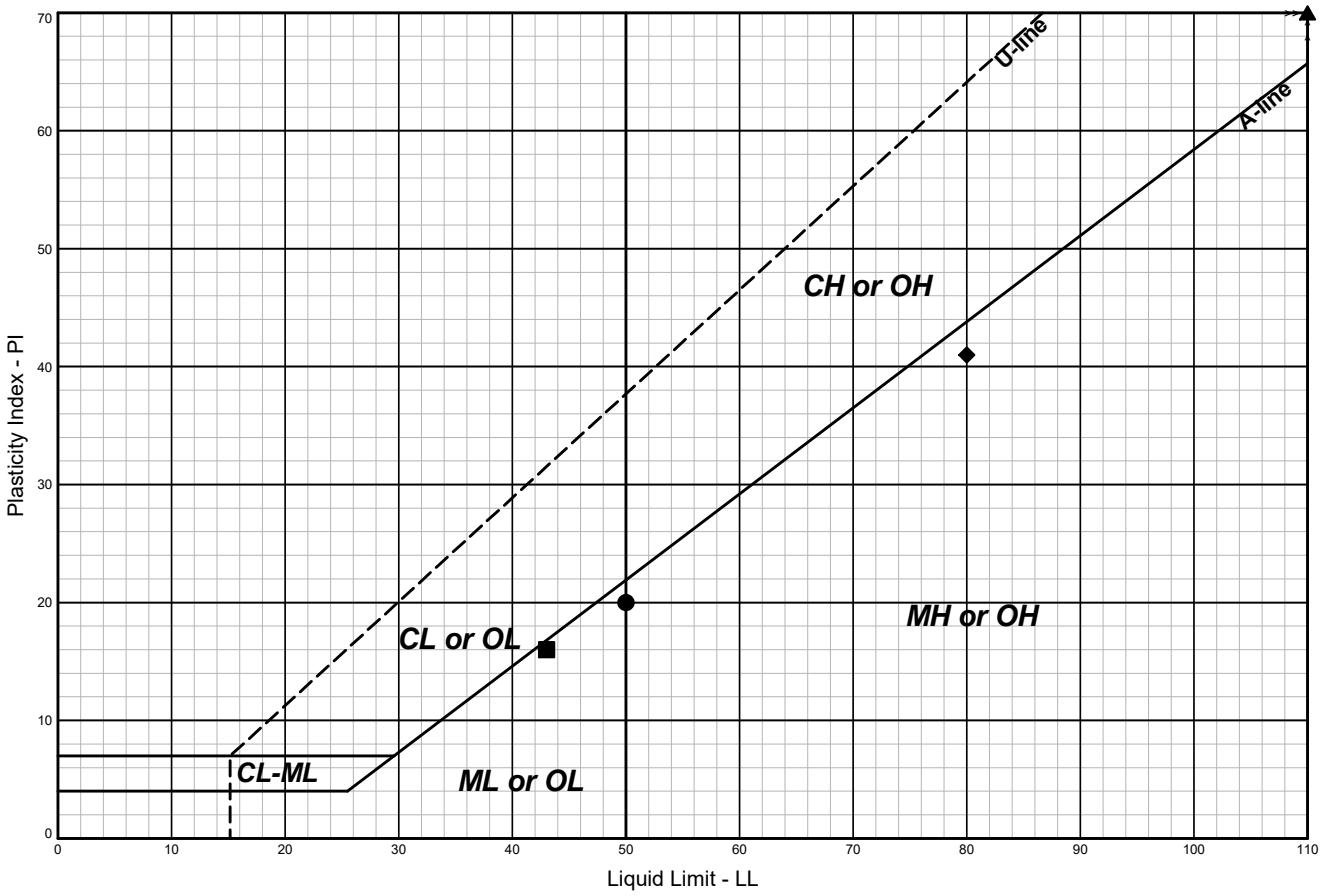
Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● TP-1-19, S-3A	7.0	ML	Sandy Silt			53			24.3	KMP	AKV	D1140

SHANNON & WILSON, INC.

PLASTICITY CHART

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

BORING B-1-19



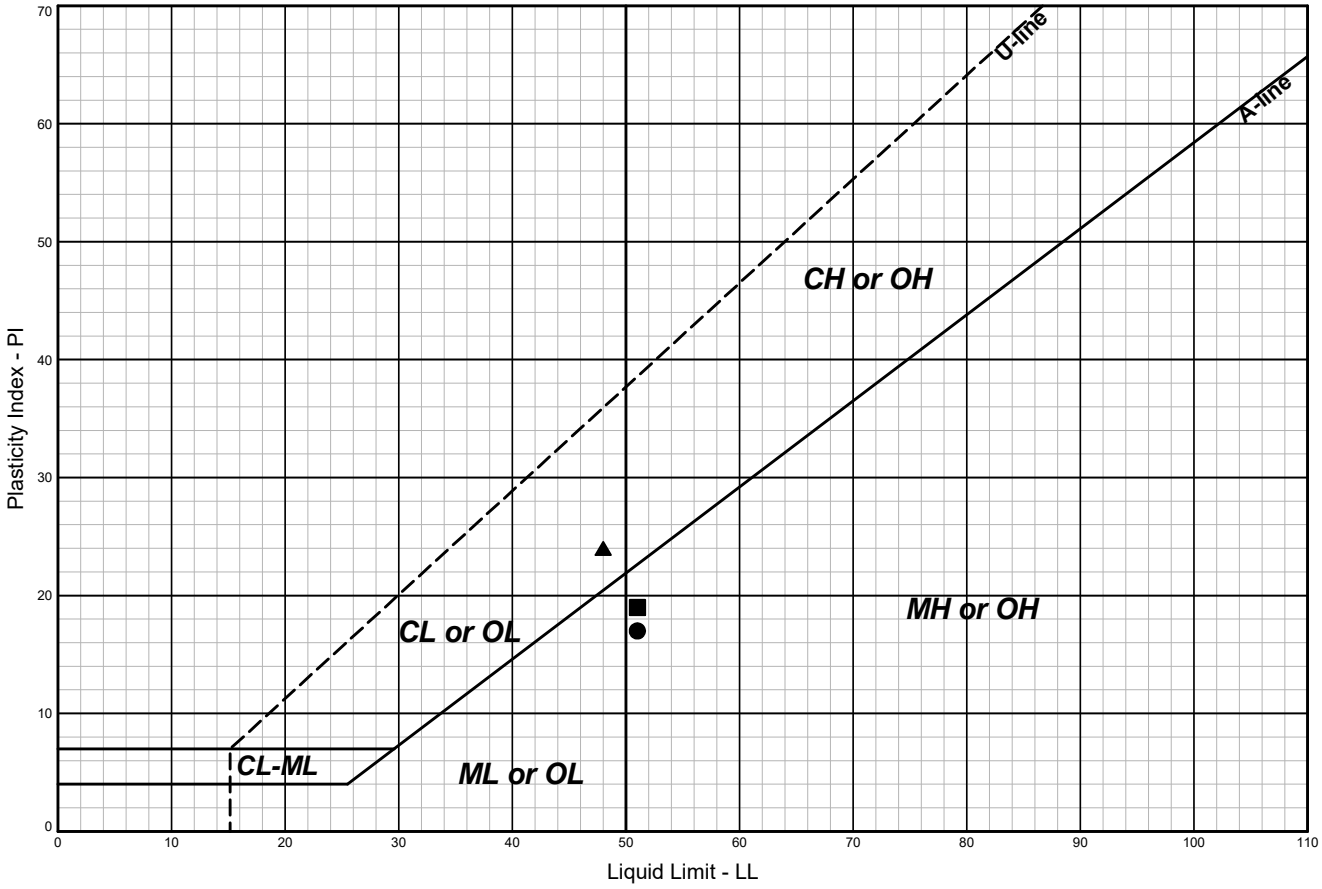
Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	OLL	OLL/ LL	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● B-1-19, S-6	12.5	MH	Elastic Silt	50	30	20			49.7		2	98	21	AKV	AKV	D4318
■ B-1-19, S-8	17.5	ML	Silt	43	27	16			42.3		3	97	19	AKV	AKV	D4318
▲ B-1-19, S-12	35.0	OH	Organic Silt	168	67	101	84	0.50	121.3		5	95	38	AKV	AKV	D4318
◆ B-1-19, S-13	40.0	MH	Elastic Silt	80	39	41			44.6		4	96	18	AKV	AKV	D4318

SHANNON & WILSON, INC.

PLASTICITY CHART

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

BORING B-2-19



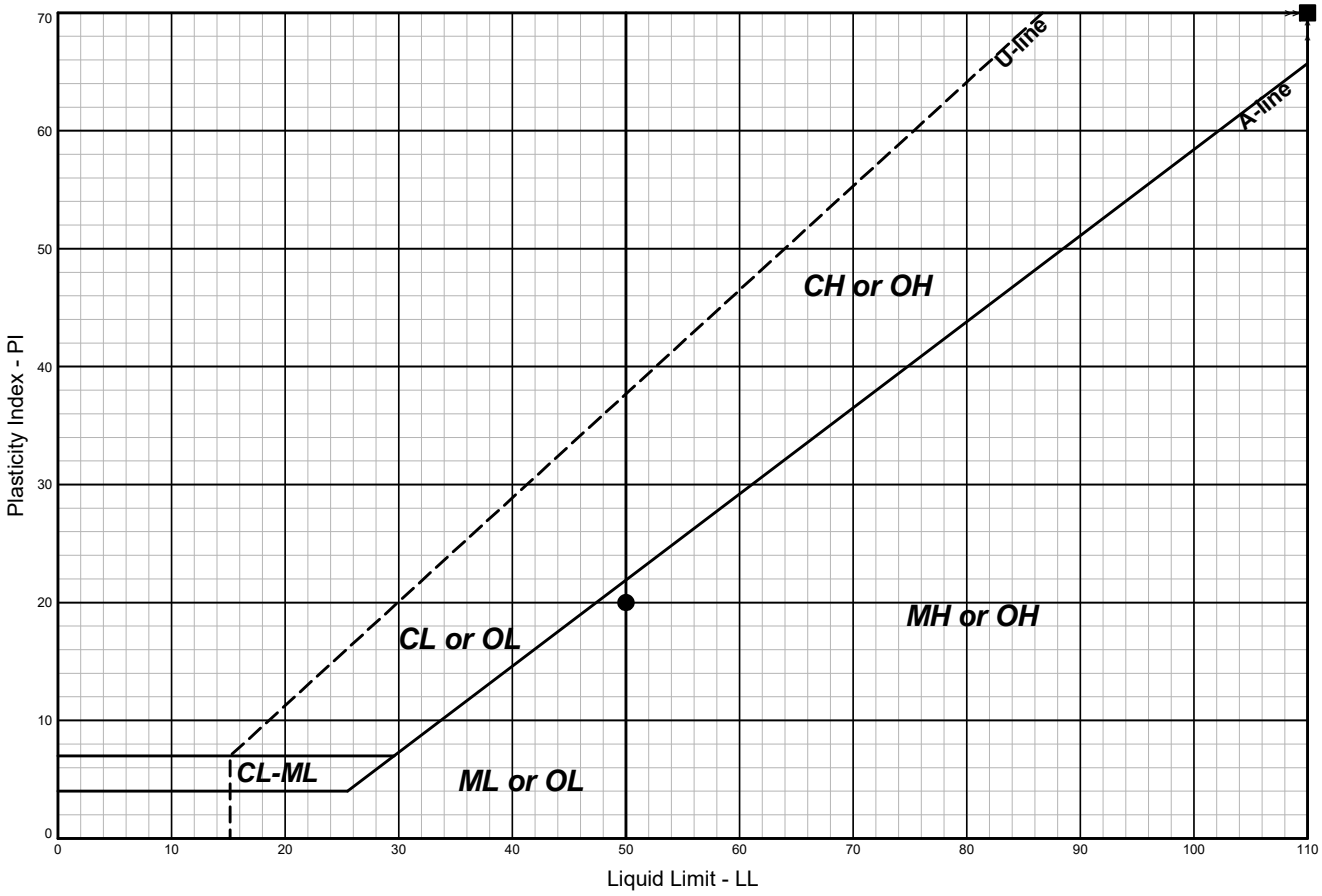
Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● B-2-19, S-2	2.5	MH	Elastic Silt	51	34	17	37.8					AKV	AKV	D4318
■ B-2-19, S-7	14.0	MH	Elastic Silt	51	32	19	49.9	3	1	96	20	AKV	AKV	D4318
▲ B-2-19, S-11	30.0	CL	Lean Clay	48	24	24	100.2					AKV	AKV	D4318

SHANNON & WILSON, INC.

PLASTICITY CHART

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

BORING B-3-19



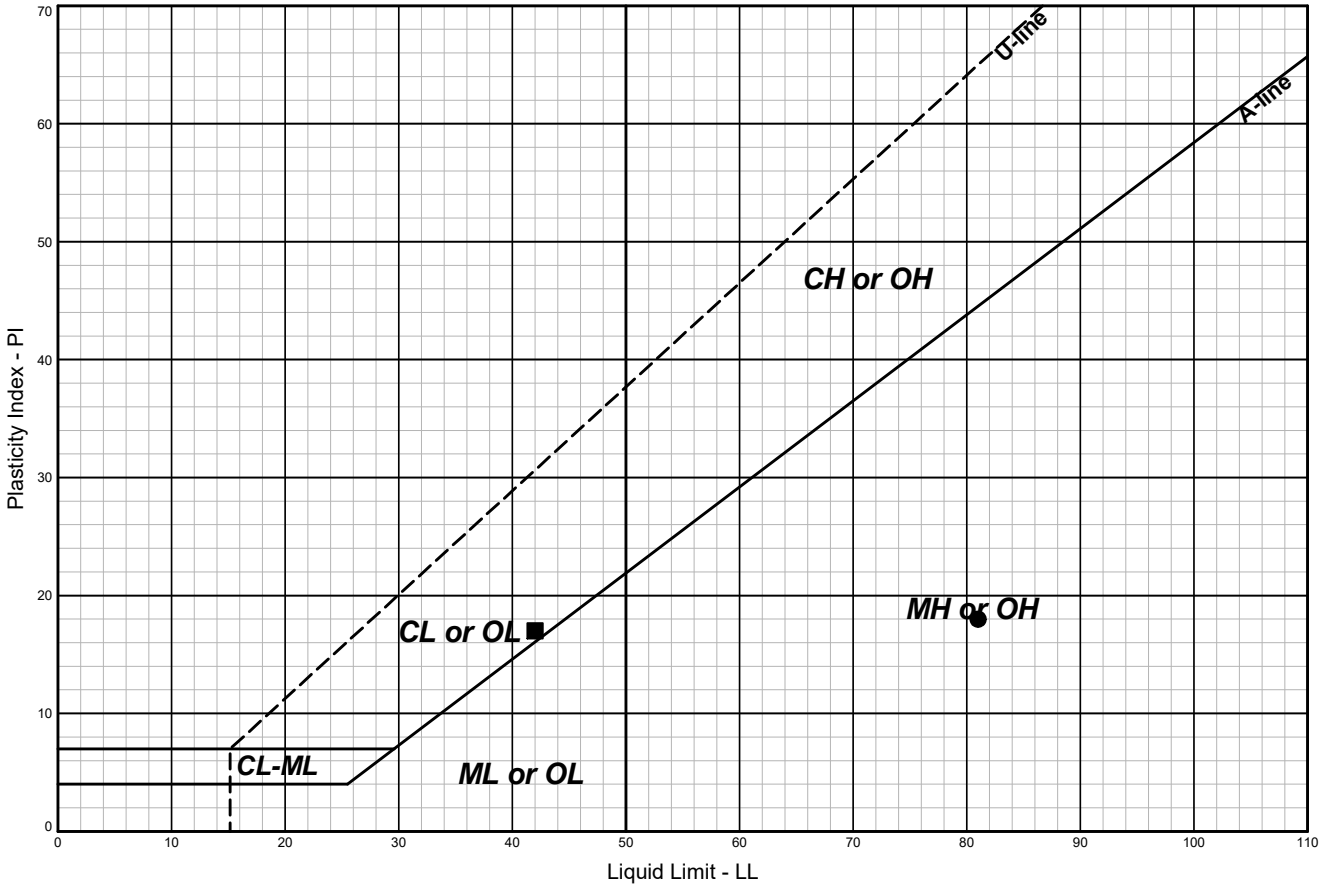
Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● B-3-19, S-4	7.5	MH	Elastic Silt with Sand	50	30	20	47.0					AKV	AKV	D4318
■ B-3-19, S-9	19.0	MH	Elastic Silt	171	73	98	144.1					AKV	AKV	D4318

SHANNON & WILSON, INC.

PLASTICITY CHART

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

BORING B-4-19



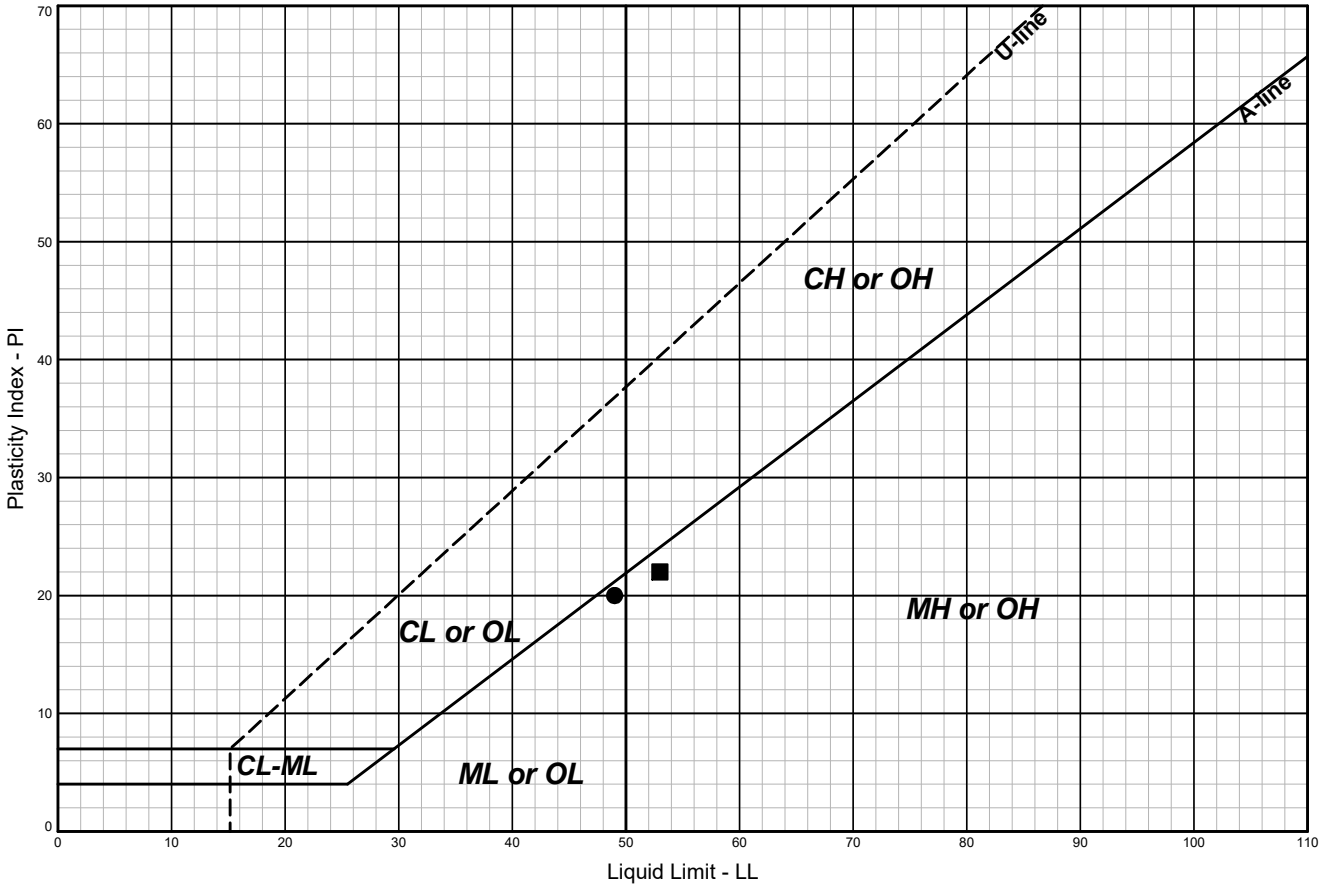
Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● B-4-19, S-4	10.0	MH	Sandy Elastic Silt	81	63	18	84.8		34	66	15	AKV	AKV	D4318
■ B-4-19, S-10	30.0	CL	Lean Clay with Sand	42	25	17	42.7		18	82	18	AKV	AKV	D4318

SHANNON & WILSON, INC.

PLASTICITY CHART

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

TEST PIT TP-3-19



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● TP-3-19, S-1A	5.5	ML	Silt with Sand	49	29	20	38.9					AKV	AKV	D4318
■ TP-3-19, S-2	10.0	MH	Elastic Silt	53	31	22	34.1					MXC	AKV	D4318

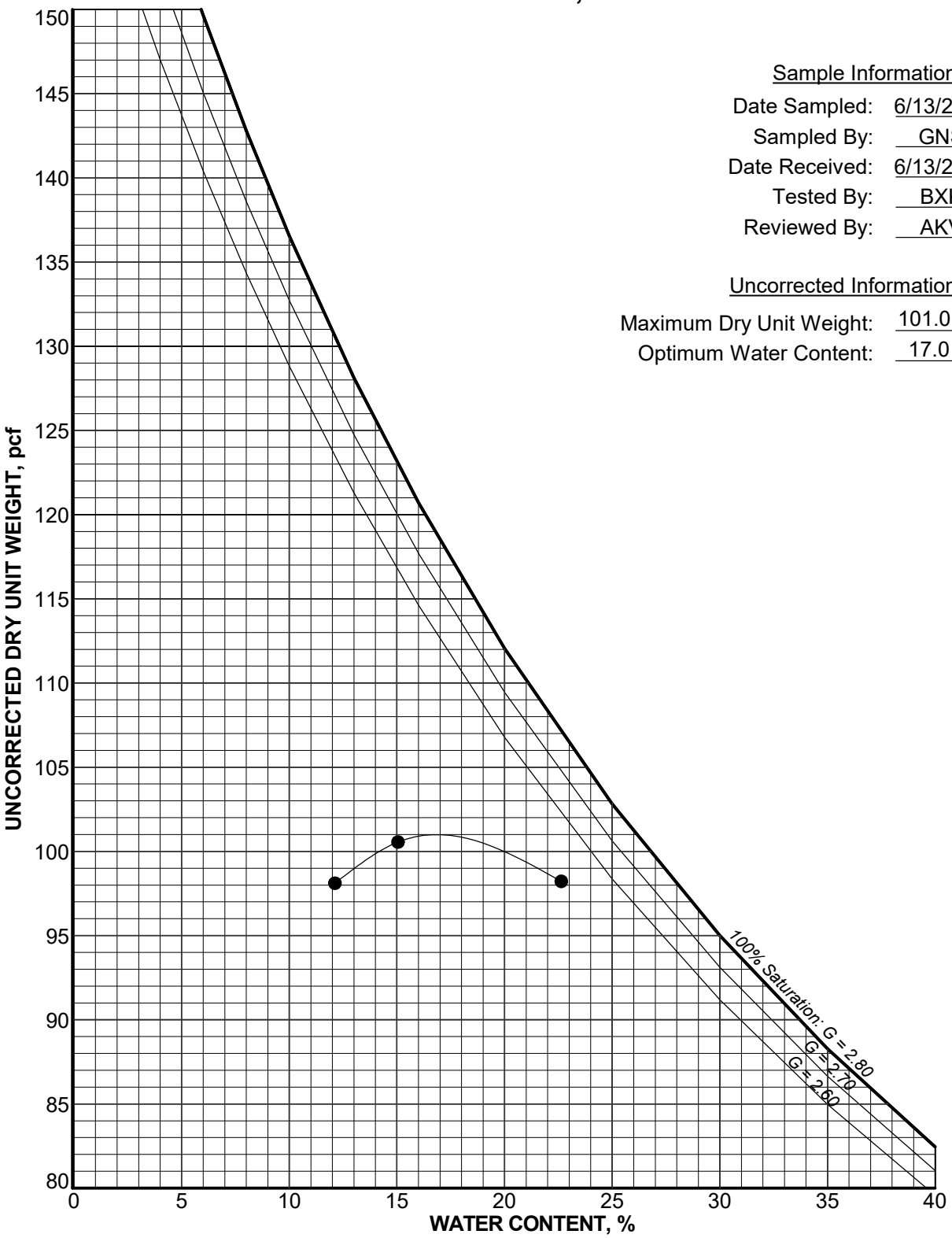
SHANNON & WILSON, INC.

COMPACTION TEST

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

TP-1, S-3B, 7.0 ft

ASTM D698 Method B, Mechanical



Sample Information

Date Sampled:	6/13/2019
Sampled By:	GNS
Date Received:	6/13/2019
Tested By:	BXK
Reviewed By:	AKV

Uncorrected Information

Maximum Dry Unit Weight:	101.0 pcf
Optimum Water Content:	17.0 %

COMPACT_MAIN_JFL 103062.GPJ 103062-002 11/5/19

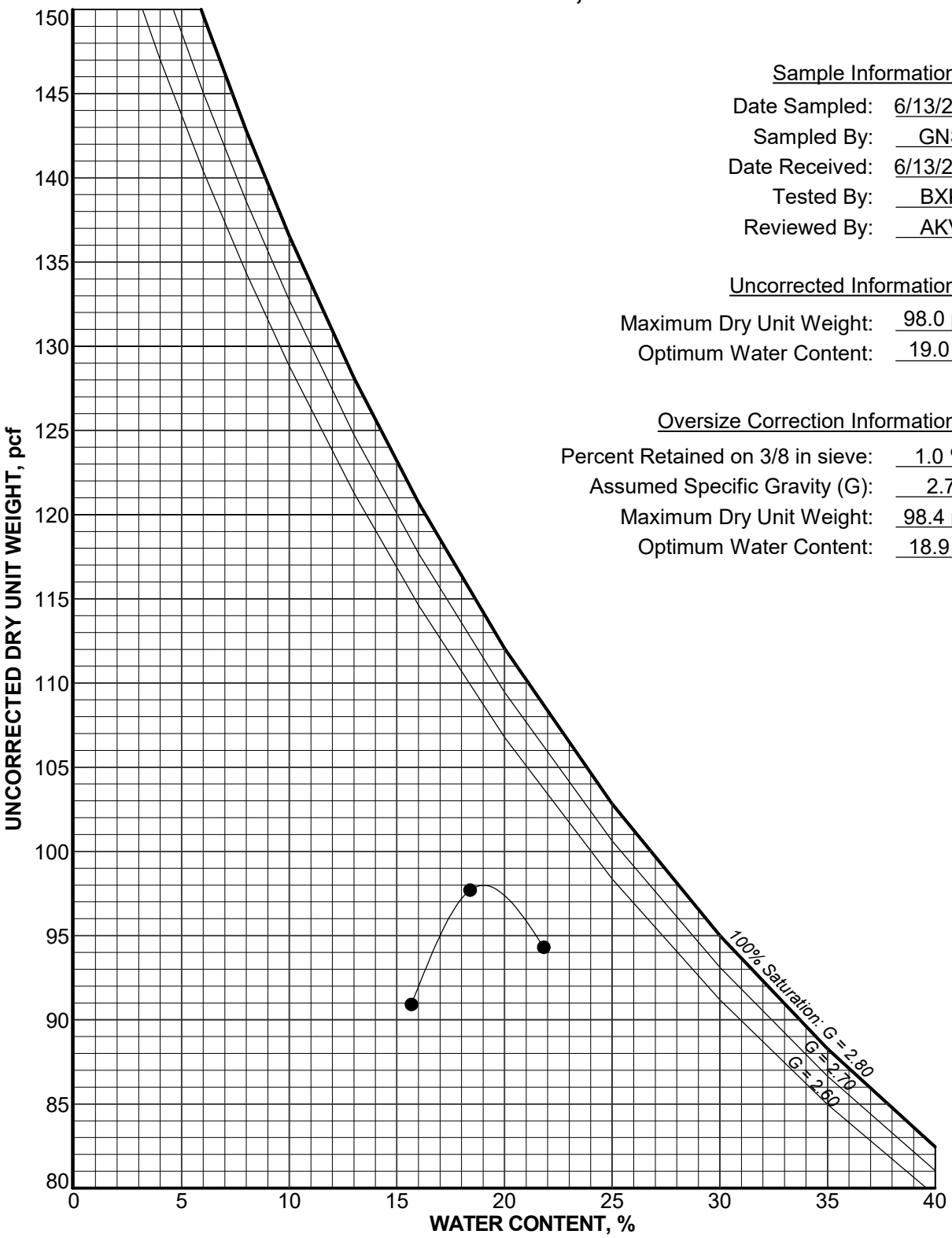
SHANNON & WILSON, INC.

COMPACTION TEST

Snoqualmie Valley Levee Upgrade
Lower Cherry Creek
King County, Washington

TP-3, S-1A, 5.5 ft

ASTM D698 Method B, Mechanical



Sample Information

Date Sampled:	6/13/2019
Sampled By:	GNS
Date Received:	6/13/2019
Tested By:	BXK
Reviewed By:	AKV

Uncorrected Information

Maximum Dry Unit Weight:	98.0 pcf
Optimum Water Content:	19.0 %

Oversize Correction Information

Percent Retained on 3/8 in sieve:	1.0 %
Assumed Specific Gravity (G):	2.7
Maximum Dry Unit Weight:	98.4 pcf
Optimum Water Content:	18.9 %

IMPORTANT INFORMATION

Important Information

About Your Geotechnical Report

IMPORTANT INFORMATION

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining

IMPORTANT INFORMATION

your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims

being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the GBA, Silver Spring, Maryland