



**CITY OF SWEET HOME**

**CONTRACT DOCUMENTS**

**FOR**

**MAHLER WATER RECLAMATION FACILITY  
IMPROVEMENTS PROJECT  
PHASE 1**

**SUPPLEMENTAL INFORMATION**

**GEOTECHNICAL DATA REPORT**

**AUGUST 2022**

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# City of Sweet Home Mahler Water Reclamation Facility Improvements

## Geotechnical Data Report

**Final Submittal**



July 2022

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## Acronyms and Abbreviations

ASTM	American Society for Testing and Materials
bgs	below ground surface
bpf	blows per foot
GDR	Geotechnical Data Report
I <sub>s(50)</sub>	point load index
LBVS	Little Butte Volcanic Series
MJA	McMillen Jacobs Associates
N-value	standard penetration test blows to advance final foot
OAR	Oregon Administrative Rules
PGA	peak ground acceleration
RQD	Rock Quality Designation
SPT	Standard Penetration Test
USGS	United States Geological Survey
West Yost	West Yost Associates, Inc.
WRF	Wastewater Reclamation Facility

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## 1.0 Introduction

### 1.1 General

McMillen Jacobs Associates (MJA) has been retained by West Yost Associates, Inc. (West Yost) to provide geotechnical engineering services for the City of Sweet Home Mahler Water Reclamation Facility Improvements project. The project owner is the City of Sweet Home. The Project site location is shown in the Vicinity Map, Figure 1. This Geotechnical Data Report (GDR) presents the results of our field explorations and laboratory testing, as well as a discussion on the site geology.

### 1.2 Project Description

The City of Sweet Home Mahler Water Reclamation Facility (WRF) is located at 1357 Pleasant Valley Road, in Sweet Home, Oregon. The WRF has been in service since 1947 with two major upgrades completed in 1974 and 1994 (Brown & Caldwell, 2016). Our project understanding is based on our communication with West Yost and the 90 percent submittal plans entitled *Mahler Water Reclamation Facility Improvements Project – Phase 1*, dated June 2022, prepared by West Yost. This GDR addresses both the Phase 1 and Phase 2 project improvements. However, Phase 2 of the project is only in the preliminary design stages and several details are still being worked out by West Yost. The proposed Phase 1 and Phase 2 improvements are shown in Figure 2.

#### 1.2.1 Phase 1 WRF Improvements

The proposed Phase 1 WRF improvements will include the following:

- *Main Electrical and Blower (MEB) Building*: The 22- by 67.5-foot MEB Building will be located within the north-central part of the WRF site. The interior of the building will be supported on a 6-inch-thick slab on grade foundation, while the perimeter of the structure will be supported on a 1.5-foot-wide continuous spread footing. A new generator, which will be installed on the north side of the MEB Building, will be supported on 12- by 28-foot, 12-inch-thick reinforced concrete slab on grade with thickened edges. Site grades will be raised up to approximately 6 feet in this area to facilitate construction of the MEB Building, with approximately 4 to 6 feet of fill placed below the building footprint. The approximately 6-foot-tall fill slope on the east side of the MEB Building will descend at 2H:1V (horizontal:vertical).
- *Influent Pump Station (IPS)*: The new, 40- by 56-foot IPS will be constructed just north of the existing IPS, within the southeast corner of the WRF site. The approximate southern half of the IPS structure, which supports above-grade piping, will be supported on a 12-inch-thick reinforced concrete slab on grade with thickened edges. The approximate northern half of the IPS structure, which houses five submerged pumps, will be supported on a 28-inch-thick reinforced concrete slab with a base elevation of approximately 491.2 feet (e.g., about 26.2 feet below grade).
- *Temporary Generator*: A temporary electrical generator, supported on an 18-inch-thick reinforced concrete slab, will be installed on the south side of existing Secondary Clarifier SC60.

- *Existing Bathroom Relocation:* The existing bathroom, currently along the northern fence line and east of the existing entrance gate, will be moved to the north side of the boat ramp access road.
- *Retaining Walls:* To support new fills placed for site grading, as well as proposed cuts, there are six retaining walls (designated Wall 1 through Wall 6) proposed as part of Phase 1 improvements. The retaining walls will be cast-in-place, reinforced concrete cantilevered walls ranging in height from 2.5 to 6.75 feet.
- *Existing Structures/Facilities to Remain In Use:* Secondary Clarifier Nos. 1 through 3; RAS/WAS Pump Station; Aeration Basin; Chlorine Contact Chamber; Aerobic Digester; Administration and Operations Building; Solids Building; Sand Filters; Lime Silo; and the electrical building on the south side of existing SC60.
- *Proposed Piping Improvements:* 12-inch storm drain; 10-inch storm drain; 8-inch to 36-inch sanitary sewer; 12-inch IPS forcemain to headworks (HDPE pipe); 24-inch RS IPS to Headworks (HDPE pipe); 6-inch PS forcemain; 12-inch RDPS; 6-inch SL-WAS; 6-inch SL-D forcemain; 4-inch PSC; and 10-inch DIP waterline relocation.
- *Demolition of the Following Existing Structures:* Backwash Storage; Waste Backwash Storage; the approximately 25- by 50-foot storage building on the west side of the WRF site; and several buildings clustered together in the central portion of the WRF site including the carport, an approximately 40- by 40-foot CMU building, an approximately 25- by 50-foot Quonset Hut storage building, and an approximately 15- by 35-foot shed.
- *Other Improvements:* The existing asphalt pavement and concrete curbs along the main entrance road and within the approximate western half of the site. The approximate western half of the WRF site, an area north of the boat ramp access drive, and a narrow area along the south site boundary will be surfaced with gravel as part of the Phase 1 improvements.

### 1.2.2 Phase 2 WRF Improvements

Although Phase 2 plans are not available as of the time of report issuance, West Yost provided us with preliminary information, the details of which are provided in the following:

- *Primary Clarifier:* The new primary clarifier will consist of an approximately 65- by 85-foot reinforced concrete tank structure. The base depth of the new primary clarifier will be approximately 9.5 to 22.5 feet below existing site grades and will be supported on an 18-inch-thick, reinforced concrete mat foundation system. The primary clarifier will be expanded to the north (designated Primary Clarifier 4) in a future project phase.
- *Secondary Clarifier 90 (SC90):* SC90 will consist of an approximately 95-foot diameter, 17-foot-tall reinforced concrete tank structure. SC90 will be a primarily below-grade structure, with the tank walls being about 2 feet above finish grade. The base depth of the SC90 will be approximately 15 feet below existing site grades and will be supported on a reinforced concrete mat foundation.
- *Building A (O&M and Controls):* This 40- by 120-foot building, oriented northeast-southwest, will be constructed at the west end of the WRF site and will be an at-grade structure supported on an interior slab-on-grade. The perimeter of the structure and interior load-bearing walls will be supported on shallow spread footings.

- *Building A (Headworks and Dewatering)*: This 40- by 120-foot building, oriented southeast-northwest, will abut the southeast corner of the O&M and Controls building to form the leg of the L-shaped Building A. This will be an at-grade structure supported on an interior slab-on-grade. The perimeter of the structure and interior load-bearing walls will be supported on shallow spread footings.
- *SC90 WAS and RAS Pump Stations*: Each of these two pump stations will be an approximately 10-foot diameter reinforced concrete vault structure with a base depth of approximately 16.5 feet below existing site grades and will be supported on a reinforced concrete mat foundation.
- *Existing Secondary Clarifier SC60 RAS/WAS Pump Station*: This pump station will be an approximately 10- by 20-foot reinforced concrete vault structure with a base depth of approximately 12.5 feet below existing site grades and will be supported on a reinforced concrete mat foundation.
- *Aeration Basin No. 3*: Aeration Basin No. 3 will consist of an approximately 40- by 75-foot reinforced concrete structure. The base depth of Aeration Basin No. 3 will be approximately 13 to 18 feet below existing site grades and will be supported on a reinforced concrete mat foundation. Aeration Basin No. 3 will be expanded to the north (designated Aeration Basin No. 4) in a future project phase and will likely be founded at the same depth as Aeration Basin No. 3.
- *Tertiary Filters*: The tertiary filters will be housed in an approximately 25- by 35-foot reinforced concrete tank structure. The base depth of Aeration Basin No. 3 will be approximately 18 feet below existing site grades and will be supported on a reinforced concrete mat foundation.
- *Tertiary Building, UV Disinfection, and UW Storage*: These facilities will be located adjacent to one another within an approximate 35- by 40-foot area. The UW Storage and UV Storage facilities will be constructed within the existing chlorine contact chamber. The portion of the Tertiary Building housing the utility water pumps will likely be approximately 7 feet below existing site grades.
- *Outfall*: The outfall pipe leads from the UV disinfection chamber to the South Santiam River. This will either be part of the Phase 2 improvements or in a future project phase.
- *Other Improvements*: New asphalt pavements along the entrance road from Pleasant Valley Road and withing most of the WRF site; new concrete curbs and sidewalks; two new entrance gates; and a new chain-link fence.

### 1.3 Purpose and Scope of Work

The primary purpose of this GDR is to compile sufficient geologic and geotechnical data at the project site to support the design and construction of the proposed improvements. This GDR presents a summary of geologic and geotechnical data collected from field explorations and testing, laboratory testing, a review of published geological sources, and other historical geotechnical information related to the project. Information contained in this GDR will be used to characterize subsurface conditions at the site and to develop recommendations for design and construction of the Project.

## 2.0 Site Conditions

### 2.1 Site Description

The existing WRF site is located on the south bank of the South Santiam River near its confluence with Ames Creek. The site is bordered by the Albany and Eastern railroad tracks to the south, a boat ramp access road and the South Santiam River beyond, private property to the west, and Ames Creek to the east. In general, the site slopes gently from the west to the east (i.e., towards Ames Creek) and gently from the south to the north towards the South Santiam River. The eastern two-thirds of the site, where most of the WRF is located, is situated on a relatively level terrace that generally sits 5 to 7 feet lower than the western one-third of the site and approximately 10 feet above Ames Creek to the east.

A paved access road runs along the north side of the site, from the Pleasant Valley Road WRF entrance at the west end of the site to the boat ramp and recreation use area at the north-northeast end of the site that provides public access to the South Santiam River. The paved WRF road, heading south from the access road from the main entrance gate, provides access to the main areas within the WRF. Bedrock is exposed along the South Santiam River and Ames Creek approximately 100 feet to the north-northeast of the site. Exposed bedrock on the riverbank slopes steeply into the river.

### 2.2 Regional Geology

The project site is located in the foothills of the Western Cascades, a north-south trending physiographic region that stretches from northern California to British Columbia, tucked between the Willamette Valley to the west and the younger High Cascades to the east. The Western Cascades in Oregon were formed by a series of volcanic events from approximately 35 to 17 million years ago. The region is marked by densely forested hills dissected by the region's many rivers (Madin, 1990; Schlicker and Deacon, 1967; Wilson, 1998; Popowski, 1996).

The Paleogene structural basement of this region of the Western Cascades is composed of non-marine volcanoclastic sedimentary rocks, tuff, basaltic andesite, andesite, and dacite of the Late Eocene to Oligocene Fisher Formation. The Fisher Formation is overlain by basalt lavas, ash-flow tuff, tuff, and non-marine sedimentary rocks of the Little Butte Volcanic Series. A subducting plate below the Eocene shoreline resulted in a volcanic chain that produced the volcanic activity responsible for the Fisher Formation and the Little Butte Volcanic Series. As the angle of the subducting plate shifted, the volcanic activity gradually shifted east of the region. The bedrock in the project area is composed of tholeiitic basalt from the Little Butte Volcanic Series.

Over the span of geologic time, quaternary sedimentary deposits of alluvium, colluvium, landslide deposits, and terrace deposits have accumulated on the volcanic rock surfaces and in the valleys formed by the rivers. The sediments that directly overlie the bedrock in the project area have been defined as alluvium. Regionally, the alluvium consists of unconsolidated gravel, sand, silt, and clay deposited in modern stream channels, adjoining flood plains, overbanks, and low bedrock terraces.

Across the project area, fill materials are present near the ground surface. These materials were generally placed to re-grade the site prior to development.

## **3.0 Site Investigations**

### **3.1 General**

The subsurface exploration was completed in three phases, between 2018 and 2022, and consisted of five boreholes (designated B-1 through B-5) and 35 probe-holes (designated P-01 through P-35).

The site investigations were performed under the direction of a geologist or geotechnical engineer from MJA, who examined and logged the soil and rock conditions encountered in the borings. The soils were classified in the field in accordance with the Visual-Manual Procedure (ASTM D 2488). Sample depths, stratigraphy, groundwater occurrence and soil engineering characteristics were also recorded. The stratigraphic contacts indicated on the logs represent the approximate boundaries between soil and rock; actual transitions may be more gradual. The boring logs are presented in Appendix A. The soil and rock samples were transported to the MJA Portland office for further examination. The rock core samples were transported, stored, cataloged, and disposed of in accordance with the Standard Practices for Preserving and Transporting Rock Core Samples (ASTM D 5079). The rock core photos are included in Appendix B

### **3.2 Exploratory Borings**

Phase one was completed between April 30 and May 2, 2018 and included the advancement of five boreholes (B-1 through B-5) and fifteen probe-holes (P-01 through P-15). The Phase one borings were completed by Western States Soil Conservations Services of Hubbard, Oregon using a truck-mounted CME-75 drill rig. The boreholes were advanced to depths ranging from 5.8 to 23 feet bgs using mud-rotary drilling techniques within soil materials, and HQ-triple-tube wireline coring in rock materials in accordance with ASTM D 2113. The probe-holes were advanced using hollow-stem auger drilling techniques and extended to depths ranging from 2.5 to 15 feet bgs at which point drilling refusal was encountered at the top of the bedrock surface.

Phase two was completed on October 29, 2019 and consisted of the advancement of 12 probe-holes (designated P-16 through P-27). The phase two probe-holes were completed by McCallum Rock Drilling of Salem, Oregon using a track-mounted Furakawa 900 drill rig. The probe-holes were advanced to depths ranging from 11 to 26 feet bgs using air percussion drilling methods.

Phase three was completed on June 20, 2022 and consisted of eight probe-holes (designated P-28 through P-35) advanced by PLI Systems of Hillsboro, Oregon using a truck-mounted Mobile B-75 drill rig. The probe-holes were advanced using hollow-stem auger drilling techniques and extended to depths ranging from 3.7 to 19 feet bgs.

In borings B-2 through B-5 and probe-holes P-28 through P-35, disturbed soil samples were collected in conjunction with a SPT at selected intervals using a standard 2-inch diameter split-barrel sampler, and automatic safety hammer system. In each test, the sampler was advanced 18 inches by dropping the 140-pound hammer a distance of 30 inches for each strike in accordance with ASTM D 1586. The number of hammer blows for each six inches of penetration was recorded. The standard penetration resistance (N-value) of the soil is calculated as the sum of the number of blows required for the final 12 inches of sampler penetration. The SPT N-values of greater than 50 blows per six inches of penetration is referred

to as refusal. The N-value is an indication of the relative density of granular soils and the relative consistency of cohesive soils. Uncorrected N-values are presented on the boring logs. In addition to the SPT sampling, relatively undisturbed samples were obtained in selected borings by pushing a 3-inch inside diameter thin wall sampler (Shelby Tube) in accordance with ASTM D 1587.

In the probe-holes in which SPT sampling was not performed, soil samples were taken from borehole cuttings. These sampling locations are shown in boring logs.

### **3.3 Piezometers**

Two-inch diameter piezometers were installed in two boreholes to allow for long-term, stabilized groundwater level measurements. Piezometers were installed in the following boreholes:

- Boring B-3, screened between 9 and 12 feet bgs.
- Boring B-5, screened between 5.5 and 8.5 feet bgs.

### **3.4 Borehole Backfill and Abandonment**

Piezometer construction and borehole backfilling and abandonment was performed in accordance with the requirements of the Oregon Department of Water Resources (OAR 690-240, Construction, Maintenance, Alteration, Conversion, and Abandonment of Monitoring Wells, Geotechnical Holes, and Other Holes in Oregon).

## 4.0 Laboratory Testing

Field samples obtained from exploratory borings were delivered to the MJA Portland office for further examination and storage. Each of the samples was re-examined and compared to the field boring log description to confirm the field classifications and maintain consistency. Representative samples were then selected for laboratory testing. Testing was performed on soil and rock samples from boreholes B-1, B-3, and B-5. The laboratory test results are provided in Appendix B. The laboratory testing included the following index and strength property tests, performed in accordance with relevant ASTM standards:

- Moisture content analyses (ASTM D 2216).
- Atterberg limits tests (ASTM D 4318).
- Point load tests of rock core (ASTM D 5731).
- Unconfined compressive strength of intact rock core (ASTM D 7012).

Point load testing was performed by MJA. All other laboratory testing was performed by Northwest Testing, Inc. of Wilsonville, Oregon. Laboratory test results are presented in Appendix B. A summary of the laboratory test results is provided in Table 4-1 on the following page. Comprehensive laboratory test results are presented in Appendix C.

Table 4-1. Laboratory Test Results Summary

Sample Location or ID				Soil Description			Moisture %	Atterberg Limits			Strength Testing		
Boring	Sample, No.	Top Depth (feet)	Bottom Depth (feet)	Geologic Unit	USCS Soil Type	Soil or Rock Description					Point Load Strength Index, PLI	PLI Test Type	UCS <sup>1</sup>
								Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Corrected Point Load Strength Index, I <sub>s(50)</sub> (PSI)	Diametral or Axial	PSI
B-1	R-1	5.2	6.3	LBVS Basalt		BASALT							25,302
B-3	S-2	5	6.5	FILL	CH	SANDY FAT CLAY	44.8	51	28	23			
B-5	S-1	2.5	4	FILL	SM	SILTY SAND with Gravel	26.3	44	28	16			
B-5	R-1	11.7	12.4	LBVS Basalt		BASALT							29,919
B-5	R-2	18.0	19.0	LBVS Basalt		BASALT							6,932
B-5	R-2	16.8	17.2	LBVS Basalt		BASALT					513	Diametral	12,563 <sup>2</sup>
B-5	R-2	16.3	16.8	LBVS Basalt		BASALT					304	Diametral	7,437 <sup>2</sup>
B-5	R-2	16.8	17.0	LBVS Basalt		BASALT					653	Diametral	13,717 <sup>2</sup>
B-5	R-2	17.2	18.0	LBVS Basalt		BASALT					268	Diametral	5,098 <sup>2</sup>
B-5	R-2	17.6	18.0	LBVS Basalt		BASALT					569	Diametral	13,951 <sup>2</sup>
B-5	R-3	22.5	23.0	LBVS Basalt		BASALT					579	Diametral	13,315 <sup>2</sup>
B-5	R-1	9.0	9.5	LBVS Basalt		BASALT					407	Diametral	9,778 <sup>2</sup>
B-5	R-2	12.4	12.8	LBVS Basalt		BASALT					714	Diametral	17,138 <sup>2</sup>
B-5	R-2	15.8	16.7	LBVS Basalt		BASALT					383	Diametral	9,185 <sup>2</sup>
B-5	R-2	16.3	16.7	LBVS Basalt		BASALT					690	Diametral	14,493 <sup>2</sup>

<sup>1</sup> UCS = Unconfined compressive strength.

<sup>2</sup> UCS results from point load strength index testing are based on a correlation factor of 24.5, which was calculated by plotting the relationship between UCS and point load strength index test results.



## 5.0 Subsurface Conditions

The materials encountered in the explorations were grouped into three geotechnical units: Pavement, Fill, and Basalt (Little Butte Volcanic Series – Tholeiitic Basalt). These units have been defined by their geologic origin, stratigraphic position, engineering properties, and their distribution in the subsurface. Variations in subsurface conditions may exist between the locations of the borings. Contacts between the units may be more gradational than shown in the boring logs in Appendix A. The SPT N-values, shown on the boring logs and discussed below, are reported as counted in the field (uncorrected). Photos of rock core samples are provided in Appendix C. Cross sections of subsurface conditions are shown in Figures 3A through 3F. The following sections describe each geotechnical unit in greater detail.

### 5.1.1 Pavement

Asphalt concrete (AC) pavement was encountered in 12 borings (P-01, P-03, P-04, P-16, P-17, P-19, P-23, P-25, P-29, P-31, P-32, and P-34). The AC pavement ranged from about 4 to 6 inches in thickness and was typically underlain by about 4 inches of crushed rock base. Portland Cement Concrete (PCC) pavement was encountered in two borings (B-1 and P-27). In B-1, the PCC pavement was about 18 inches thick and underlain by about 12 inches of crushed rock base. In P-27, the PCC pavement section was about 6 inches thick.

### 5.1.2 Fill

Undocumented fill materials were present in all the explorations and were likely placed for site grading and development. We observed highly variable fill depths across the site, extending from the existing ground surface to depths ranging from 2 to 16.5 feet bgs. Additionally, the fill depths often varied considerably over short distances. The fill was underlain by bedrock, and generally consisted of silt with variable amounts of organics, lean to fat clay with variable amounts of sand and gravel, sand and gravel with variable amounts of silt and clay, and organic soil with variable amounts of sand. Undocumented fill refers to materials placed without (available) records of subgrade conditions or evaluation of compaction. Standard Penetration Tests (SPTs) conducted within the fill yielded N-values ranged from 0 to 45 blows per foot (bpf). The higher N-values were generally recorded at the fill-bedrock contact.

### 5.1.3 Basalt - Little Butte Volcanic Series Tholeiitic Basalt

The Little River Butte Volcanic Series (LRBV) in the project area consists of tholeiitic basalt and is bedrock in this area. The basalt was encountered beneath the fill in all the explorations. The contact between fill and LBVS was generally selected based on auger refusal, drilling resistance, drill cuttings, and/or SPT refusal (more than 50 blow counts for 6 inches or less of penetration). The depth to the LRBV ranged from 2.0 feet to 16.5 feet bgs.

The strength of the basalt rock generally varies from strong to very strong (R4 to R5). Rock strength descriptors are presented in Table 5-1. The basalt is slightly weathered to fresh, moderately to highly fractured (i.e., joint spacing from 3 feet to 2 inches), and gray. The joints were generally sub-horizontal or high angle, smooth to rough, planar, curved, and irregular in shape. The occasional joint had a less than

0.1-inch-thick light blue green coating. Core recovery ranged from 80 to 100 percent. The Rock Quality Designation of the cored rock (RQD) ranged from 42 to 86 percent, with an average value of 67 percent.

**Table 5-1. Definition of Rock Strength Descriptions**

<b>Grade<sup>1</sup></b>	<b>Approximate Uniaxial Compressive Strength (psi)</b>	<b>Qualitative Description</b>
R0	35 – 150	Extremely Weak
R1	150 – 700	Very Weak
R2	700 – 3,600	Weak
R3	3,600 – 7,200	Medium Strong
R4	7,200 – 14,500	Strong
R5	14,500 – 36,000	Very Strong
R6	>36,000	Extremely Strong

<sup>1</sup> Rock strength grades from Brown (1981).

Three unconfined compressive strength tests were completed on selected rock core samples. The unconfined compressive strength of the rock cores ranged from 6,932 psi to 25,919 psi with an average value of 19,384 psi. The results of point load tests indicate the Point Load Index ( $I_{S(50)}$ ) of the basalt ranged between approximately 268 psi and 714 psi, with an average value of 508 psi. Depth to rock at each exploration is summarized in Table 5-2. The depth to bedrock is also included on the geologic cross sections shown in Figures 3A through 3F.

**Table 5-2. Depth of Fill / Depth to Rock Summary**

<b>Exploration ID</b>	<b>Associated Structure(s)</b>	<b>Ground Surface Elevation (feet)</b>	<b>Depth to Rock (feet)</b>	<b>Rock Surface Elevation (feet)</b>
B-1	--	516.5	2.5	514.0
B-2	SC90 WAS Pump Station	518.3	16.5	501.8
B-3	Primary Clarifier	529.9	11	518.9
B-4	Building A – O&M & Controls	538.6	4.5	534.1
B-5	MEB Building	528.8	8.5	520.3
P-01	--	517.3	11	506.3
P-02	--	526.1	11.5	514.6
P-03	Primary Clarifier	530.4	16	514.4
P-04	Building A – Headworks & Dewatering	530.8	7.5	523.3
P-05	Building A – Headworks & Dewatering	533.1	3.5	529.6
P-06	Building A – O&M & Controls	536.2	3.5	532.7
P-07	--	538.0	2.5	535.5
P-08	Building A – O&M & Controls	535.3	7.5	527.8
P-09	--	530.5	4	526.5
P-10	--	530.1	5.5	524.6
P-11	MEB Building	529.8	5.5	524.3
P-12	MEB Building	526.4	5	521.4
P-13	Future Aeration Basin No. 4	523.6	8.5	515.1
P-14	Aeration Basin No. 3	521.7	5.5	516.2
P-15	--	519.1	2.5	516.6
P-16	IPS	517.1	12.0	505.1
P-17	--	516.5	6.0	510.5
P-18	SC90, SC60 RAS/WAS Pump Station	518.5	9.0	509.5
P-19	--	518.0	6.0	512.0
P-20	SC90 RAS Pump Station	525.4	8.0	517.4
P-21	Primary Clarifier, Aeration Basin No. 3	521.8	6.0	515.8
P-22	Aeration Basin No. 3	518.5	7.0	511.5
P-23	Primary Clarifier	530.4	15.0	515.4
P-24	MEB Building	529.7	3.0	526.7
P-25	Future Outfall	506.4	2.0	504.4
P-26	Future Outfall	507.2	3.0	504.2
P-27	--	516.6	10.0	506.6
P-28	IPS	516.5	11.0	505.5
P-29	IPS	517.3	12.5	504.8
P-30	SC90	519.8	11.0	508.8
P-31	SC90	520.8	10.0	510.8
P-32	Primary Clarifier, Future Primary Clarifier No. 4	530.4	10.0	520.4
P-33	Future Outfall	529.6	3.5	526.1
P-34	Tertiary Filters	516.9	15.0	501.9
P-35	-	517.5	6.0	511.5

## 5.2 Groundwater

Two-inch diameter, PVC groundwater observation wells were installed in borings B-3 and B-5. Initial groundwater levels recorded on May 2, 2018, with subsequent levels recorded on October 29, 2019, and on June 20, 2022. We also observed groundwater in nine other exploration locations, as summarized in Table 5-3. Groundwater levels are noted on the boring logs in Appendix A.

Groundwater levels may vary with precipitation, the time of year, and/or other factors. Generally, groundwater highs occur near the end of the wet season in late spring and groundwater lows occur near the end of the dry season in the early fall.

**Table 5-3. Groundwater Level Measurements**

Boring ID	Piezometer	Borehole Elevation (feet)	Depth to Groundwater (feet)			Groundwater Elevation (feet)		
			May 2, 2018	Oct 29, 2019	June 20, 2022	May 2, 2018	Oct 29, 2019	June 20, 2022
B-2	No	518.3	2.5	-	-	515.8	-	-
B-3	Yes	529.9	2.9	3.6	8.2	527.0	526.3	521.7
B-4	No	538.6	2.0	-	-	536.6	-	-
B-5	Yes	528.8	5.0	7.0	6.8	523.8	521.8	522.0
P-03	No	530.4	8.5	-	-	521.9	-	-
P-09	No	530.5	3.0	-	-	527.5	-	-
P-13	No	523.6	6.0	-	-	517.6	-	-
P-15	No	519.1	2.5	-	-	516.6	-	-
P-29	No	517.3	-	-	10.5	-	-	506.8
P-31	No	520.8	-	-	9.2	-	-	511.6
P-32	No	530.4	-	-	9.7	-	-	520.7

## 6.0 Limitations

This Geotechnical Data Report has been prepared for the City of Sweet Home Mahler Water Reclamation Facility Improvements Project located in Sweet Home, Oregon. This report contains a compilation of information from field explorations, laboratory test data, and published literature. The professional judgments and characterizations presented herein are based on this information. McMillen Jacobs Associates is not responsible for errors and omissions that may appear in the field exploration and laboratory test results performed by others.

It shall be noted that the geotechnical data were obtained at specific exploration locations at specific times. It must be acknowledged that variations in soil/rock conditions exist between exploration locations, and this report does not necessarily reflect the variations between explorations. The nature and extent of variation may not become evident until exposed during construction. No analyses, interpretations between exploration locations, conclusions, or design recommendations are contained in this report. This report should be made available to prospective contractors for use as factual data only, and not as a warranty of subsurface conditions.

The scope of our geotechnical services has not included an environmental evaluation regarding the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below the site, or for evaluation of disposal of contaminated soils or groundwater, should they be encountered.

This report has been completed within the limitations of the agreement between the Owners and West Yost Associates, Inc. and the West Yost Associates, Inc.-approved scope of work, schedule, and budget with McMillen Jacobs Associates. The services rendered have been performed in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same area. McMillen Jacobs Associates is not responsible for the use of this report in connection with anything other than the project at the project location.

### **MCMILLEN JACOBS ASSOCIATES**

---

Wolfe Lang, P.E., G.E.  
Principal Geotechnical Engineer

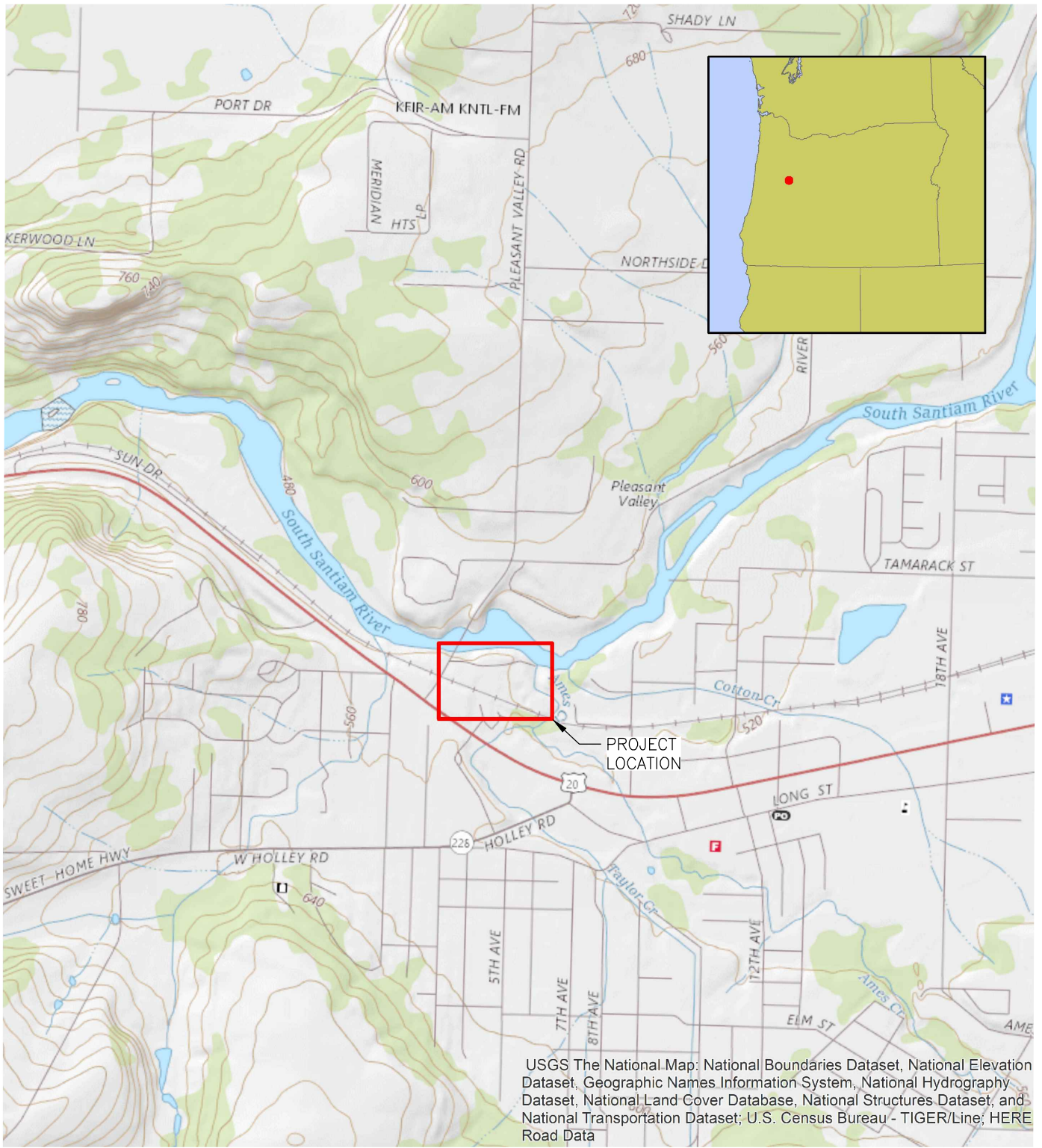
---

Jeff Quinn, P.E.  
Senior Project Engineer

## 7.0 References

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- Wilson, D.C., 1998, Post-middle Miocene geologic evolution of the Tualatin basin, Oregon: Oregon Geology, v. 60, no. 5, p. 99-116.

## Figures



PROJECT VICINITY MAP  
SCALE: NTS

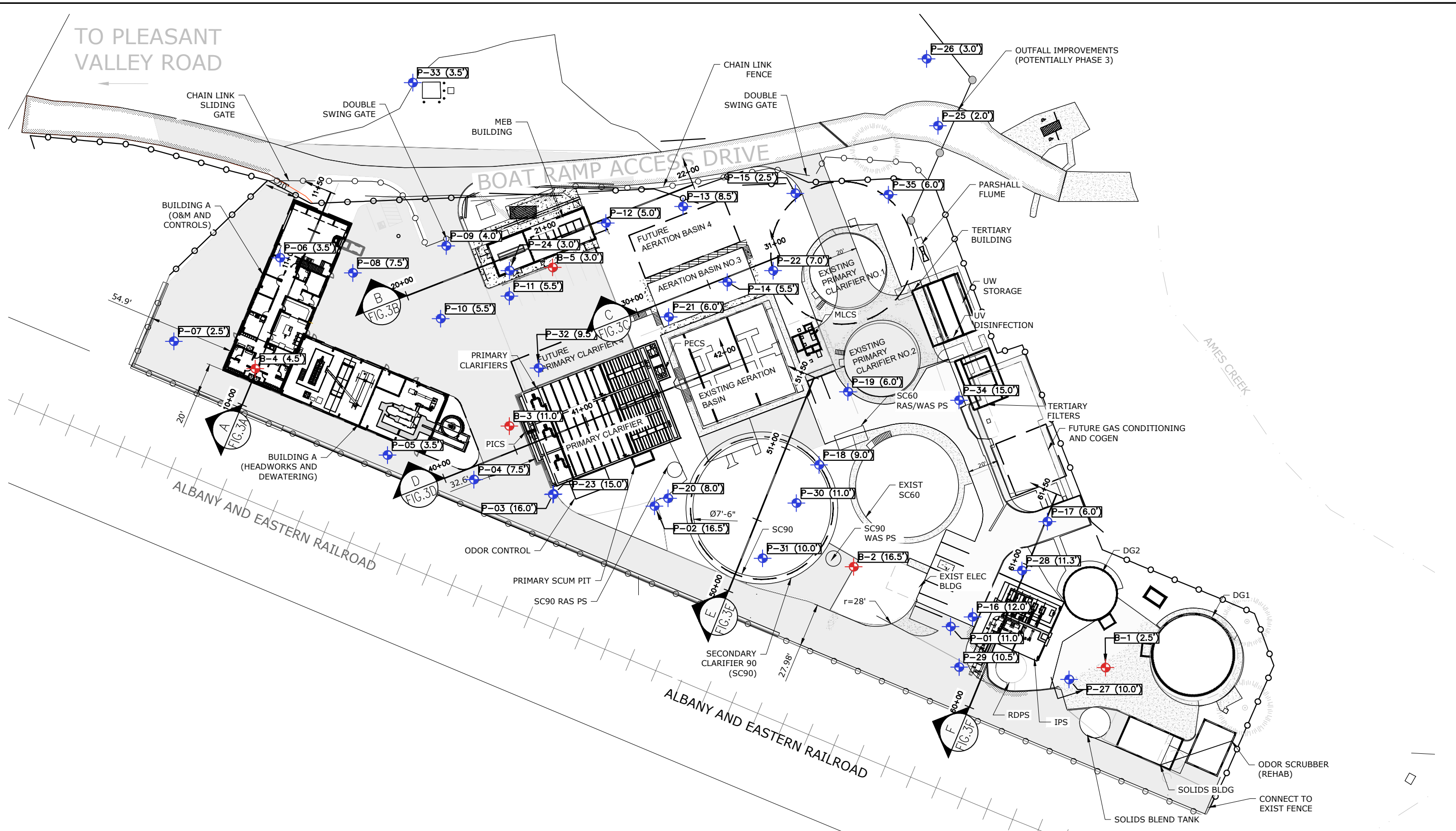


CITY OF SWEET HOME  
MAHLER WATER RECLAMATION FACILITY IMPROVEMENTS  
GEOTECHNICAL DATA REPORT  
PROJECT VICINITY MAP

FIG.1

JULY 2022





**LEGEND:**  
 B-1 (XX.X') BOREHOLE LOCATION (DEPTH TO ROCK IN FT)  
 P-01 (XX.X') PROBE-HOLE LOCATION (DEPTH TO ROCK IN FT)

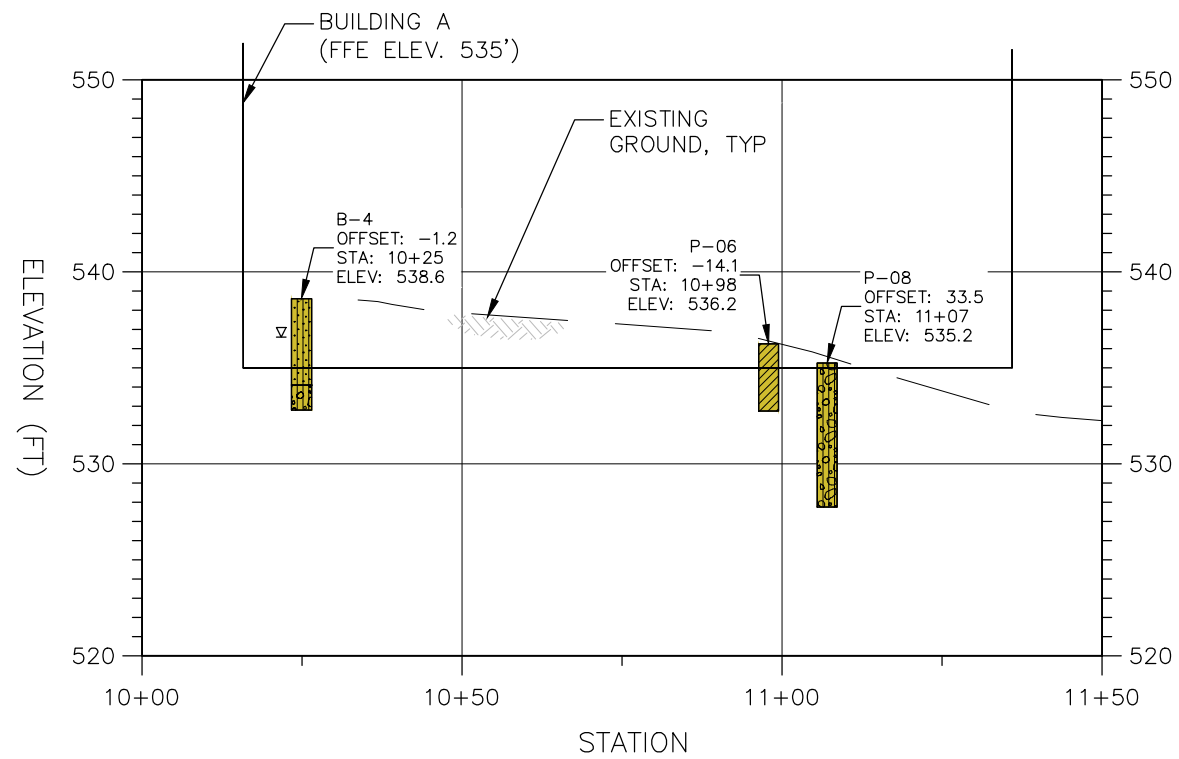
**EXPLORATION PLAN**  
 SCALE: 1"=60'

A  
—  
N

	<b>CITY OF SWEET HOME</b> <b>MAHLER WATER RECLAMATION FACILITY IMPROVEMENTS</b>
	GEOTECHNICAL DATA REPORT EXPLORATION PLAN

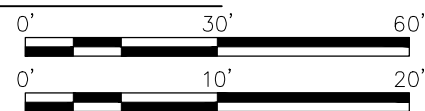
**FIG.2**  
 JULY 2022

Path: C:\Users\cburke\Box\Jobs\6367.0 Sweet Home WWTP Final Design Review\900 Design Review\970\_Xreis\SITE PLAN.dwg Plot date: Jul 22, 2022, CAD User: cburke



**GEOLOGIC PROFILE STA 10+00 TO 11+50**

SCALE: 1"=30' HORIZ  
1"=10' VERT



A  
FIG.2

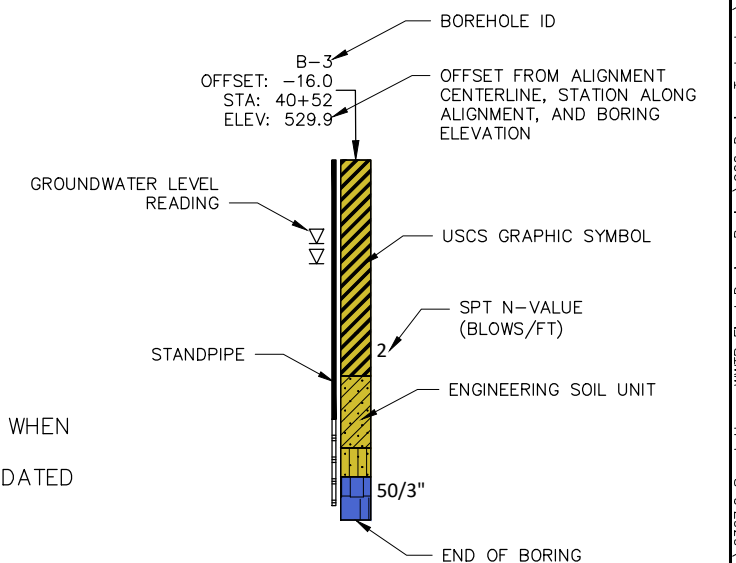
**STRATIGRAPHIC LEGEND:**

	WELL-GRADED GRAVEL (GW)		SILT (ML)		FILL
	SILTY GRAVEL (GM)		LEAN CLAY (CL)		BASALT
	CLAYEY GRAVEL (GC)		LOW PLASTICITY ORGANIC CLAY (OL)		
	SILTY SAND (SM)		FAT CLAY (CH)		
	CLAYEY SAND (SC)		BASALT		

**NOTES:**

1. BOREHOLE LOCATIONS ARE APPROXIMATE.
2. BOREHOLE LOCATIONS ARE PROJECTED PERPENDICULAR TO ALIGNMENT.
3. OFFSETS ARE NEGATIVE LEFT OF ALIGNMENT AND POSITIVE RIGHT OF ALIGNMENT WHEN TRAVELING IN THE DIRECTION OF INCREASING STATION.
4. ALIGNMENT IS BASED ON 90% DRAWINGS PROVIDED BY WEST YOST ASSOCIATES, DATED JUNE 2022.

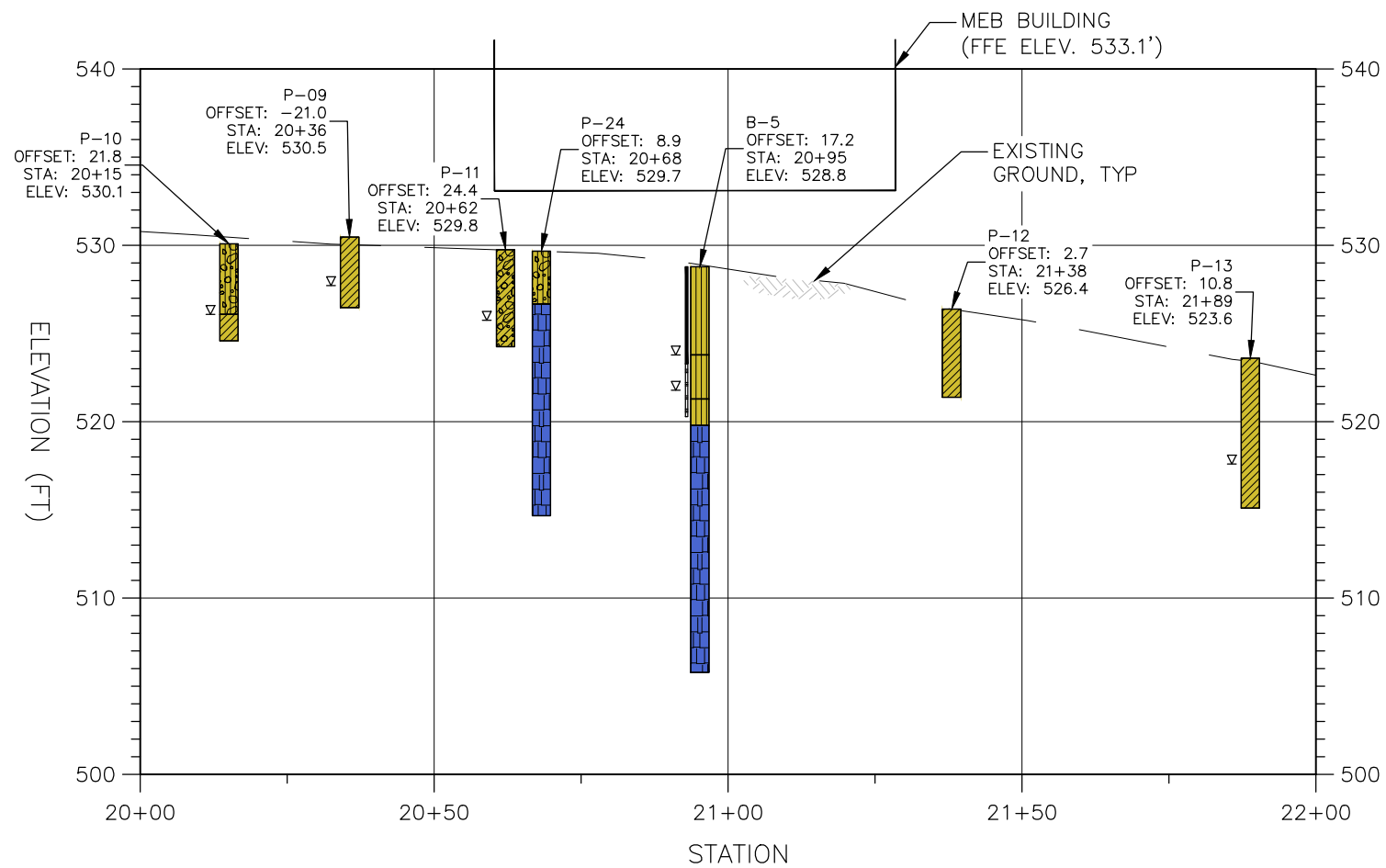
**BORING/PROBE-HOLE LEGEND:**



**CITY OF SWEET HOME**  
**MAHLER WATER RECLAMATION FACILITY IMPROVEMENTS**  
 GEOTECHNICAL DATA REPORT  
 GEOLOGIC PROFILE  
 BUILDING A

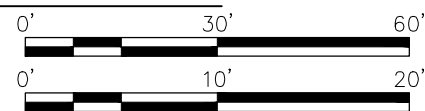
**FIG.3A**

JULY 2022



**GEOLOGIC PROFILE STA 20+00 TO 22+00**

SCALE: 1"=30' HORIZ  
1"=10' VERT



(B)  
FIG.2

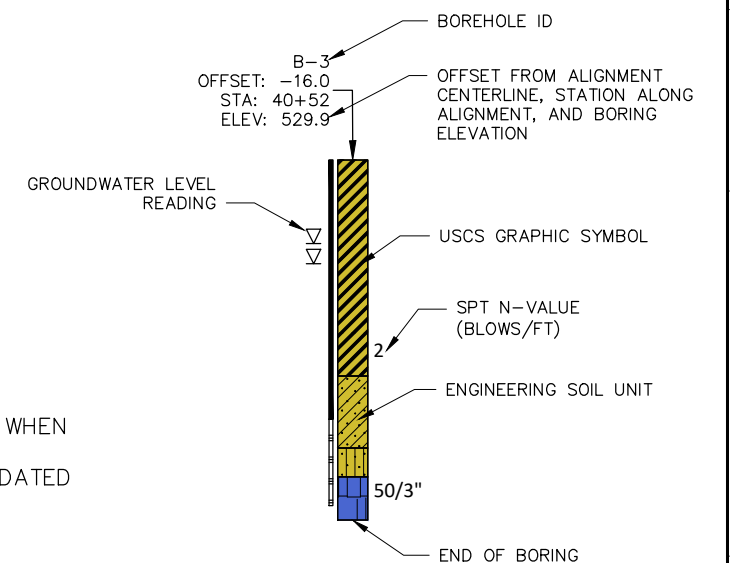
**STRATIGRAPHIC LEGEND:**

	WELL-GRADED GRAVEL (GW)		SILT (ML)		FILL
	SILTY GRAVEL (GM)		LEAN CLAY (CL)		BASALT
	CLAYEY GRAVEL (GC)		LOW PLASTICITY ORGANIC CLAY (OL)		
	SILTY SAND (SM)		FAT CLAY (CH)		
	CLAYEY SAND (SC)		BASALT		

**NOTES:**

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2. BOREHOLE LOCATIONS ARE PROJECTED PERPENDICULAR TO ALIGNMENT.
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4. ALIGNMENT IS BASED ON 90% DRAWINGS PROVIDED BY WEST YOST ASSOCIATES, DATED JUNE 2022.

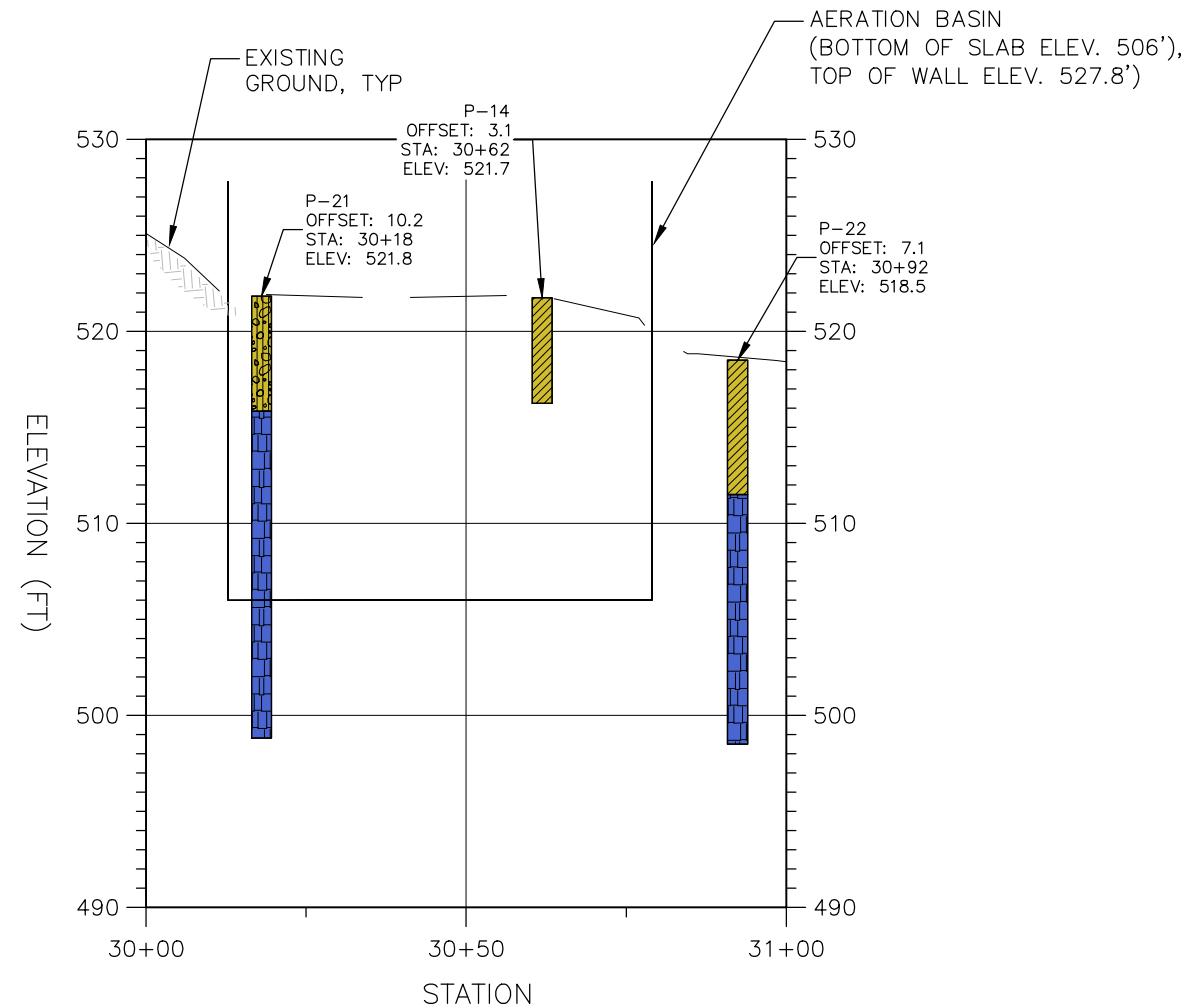
**BORING/PROBE-HOLE LEGEND:**



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 GEOTECHNICAL DATA REPORT  
 GEOLOGIC PROFILE  
 MEB BUILDING

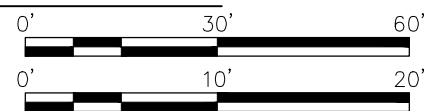
**FIG.3B**

JULY 2022



**GEOLOGIC PROFILE STA 30+00 TO 31+00**

SCALE: 1"=30' HORIZ  
1"=10' VERT



C  
FIG.2

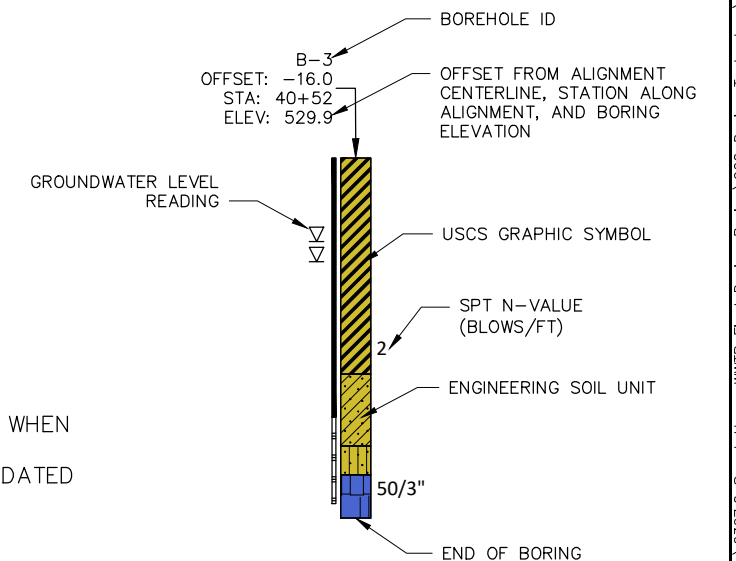
**STRATIGRAPHIC LEGEND:**

	WELL-GRADED GRAVEL (GW)		SILT (ML)		FILL
	SILTY GRAVEL (GM)		LEAN CLAY (CL)		BASALT
	CLAYEY GRAVEL (GC)		LOW PLASTICITY ORGANIC CLAY (OL)		
	SILTY SAND (SM)		FAT CLAY (CH)		
	CLAYEY SAND (SC)		BASALT		

**NOTES:**

1. BOREHOLE LOCATIONS ARE APPROXIMATE.
2. BOREHOLE LOCATIONS ARE PROJECTED PERPENDICULAR TO ALIGNMENT.
3. OFFSETS ARE NEGATIVE LEFT OF ALIGNMENT AND POSITIVE RIGHT OF ALIGNMENT WHEN TRAVELING IN THE DIRECTION OF INCREASING STATION.
4. ALIGNMENT IS BASED ON 90% DRAWINGS PROVIDED BY WEST YOST ASSOCIATES, DATED JUNE 2022.

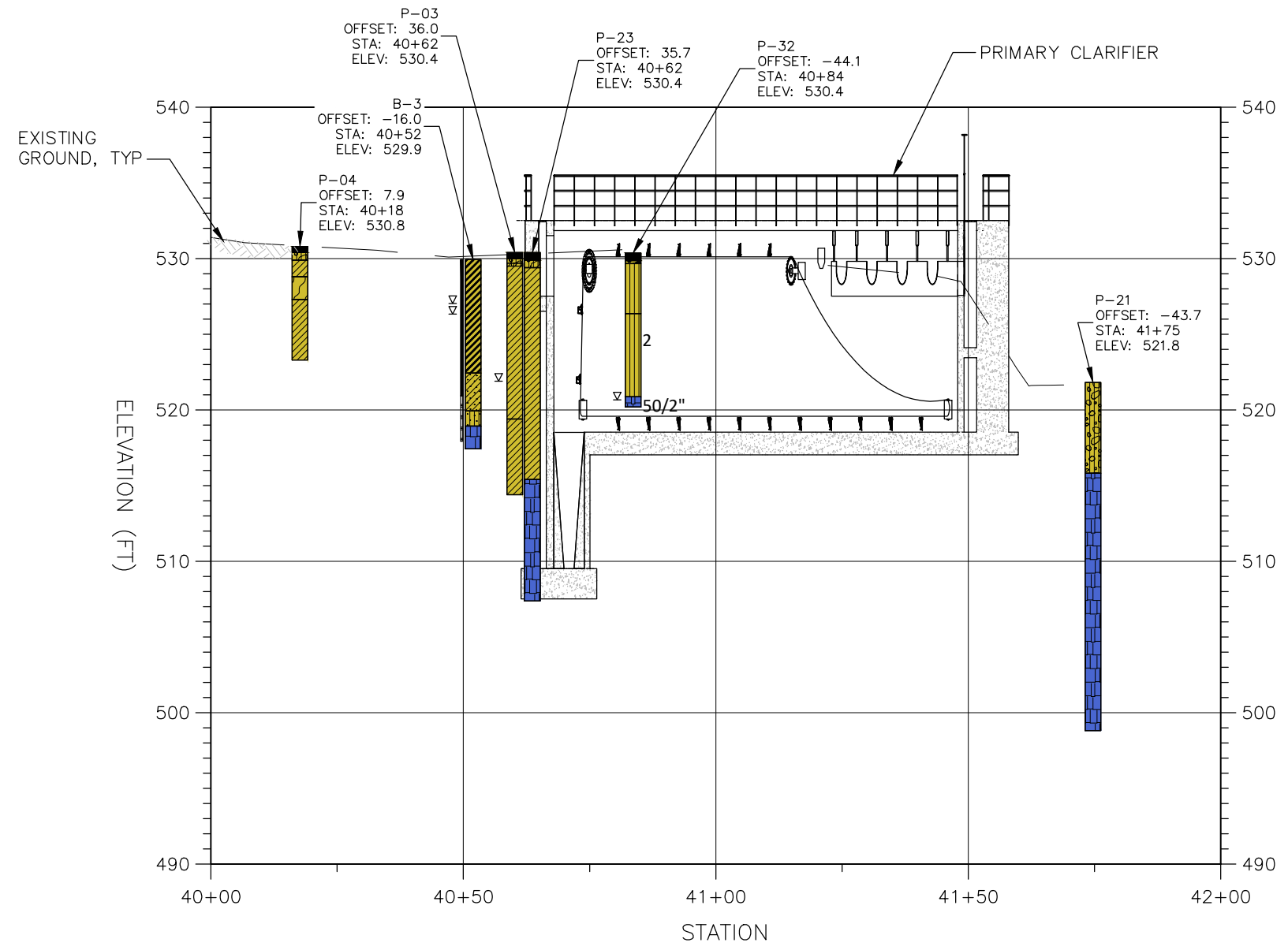
**BORING/PROBE-HOLE LEGEND:**



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 GEOTECHNICAL DATA REPORT  
 GEOLOGIC PROFILE  
 AERATION BASIN NO. 3

**FIG.3C**

JULY 2022



**GEOLOGIC PROFILE STA 40+00 TO 42+00**  
 SCALE: 1"=30' HORIZ  
 1"=10' VERT

0' 30' 60'  
 0' 10' 20'

D  
FIG. 2

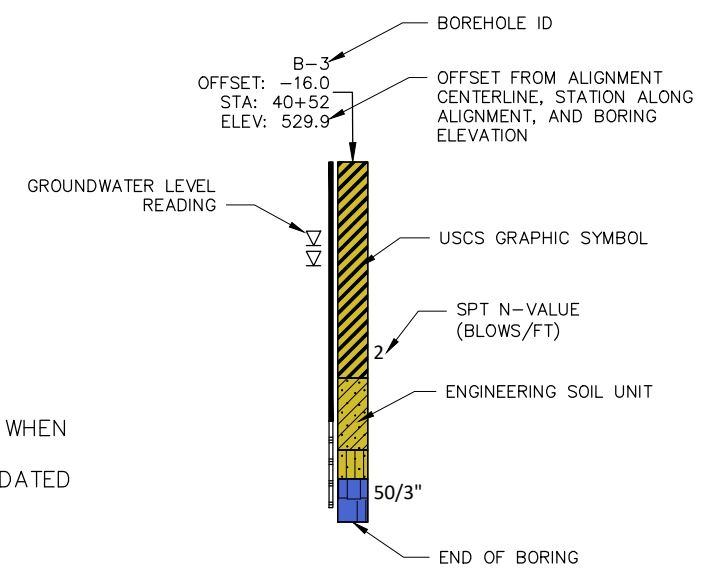
**STRATIGRAPHIC LEGEND:**

	WELL-GRADED GRAVEL (GW)		SILT (ML)		FILL
	SILTY GRAVEL (GM)		LEAN CLAY (CL)		BASALT
	CLAYEY GRAVEL (GC)		LOW PLASTICITY ORGANIC CLAY (OL)		
	SILTY SAND (SM)		FAT CLAY (CH)		
	CLAYEY SAND (SC)		BASALT		

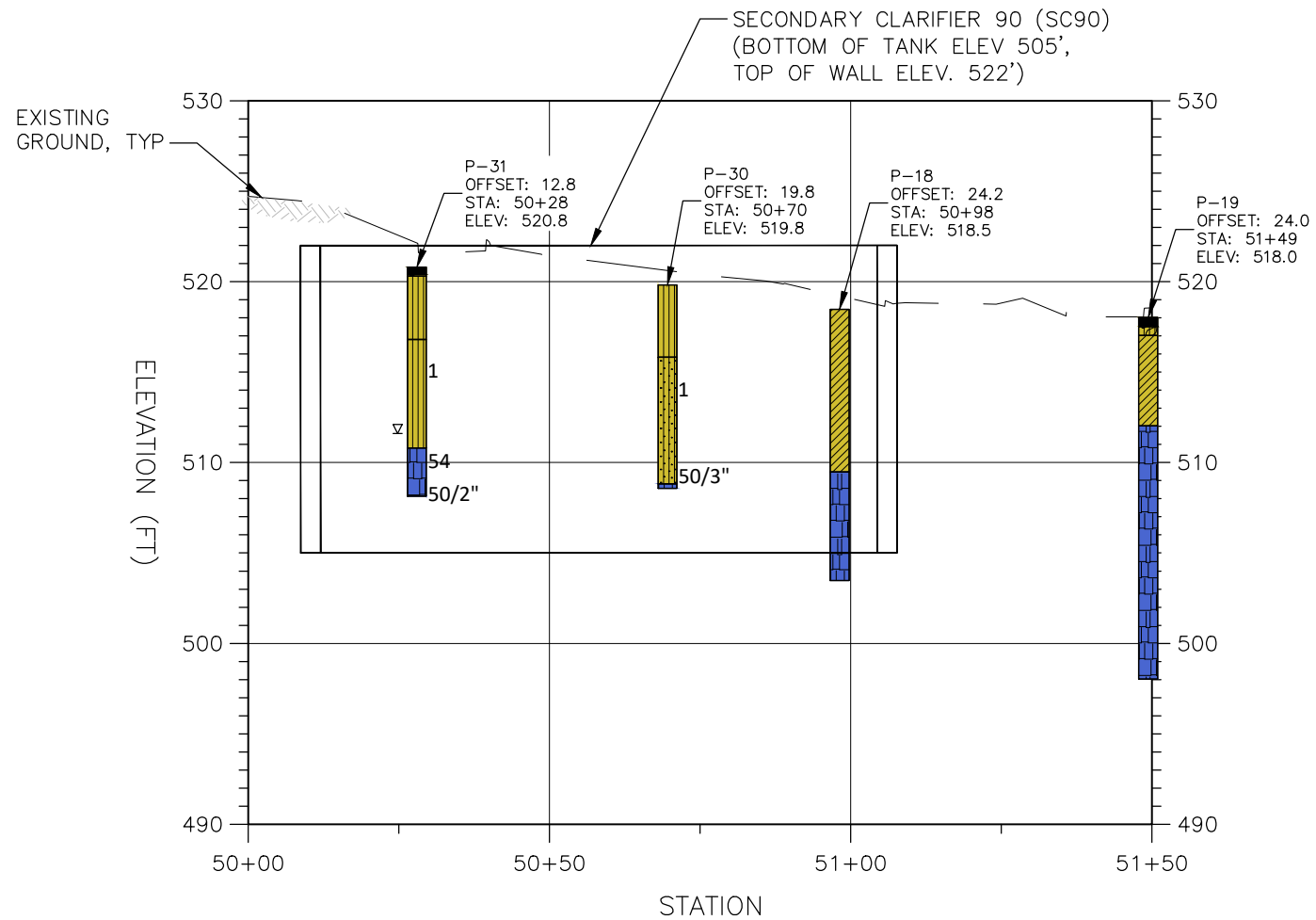
**NOTES:**

1. BOREHOLE LOCATIONS ARE APPROXIMATE.
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3. OFFSETS ARE NEGATIVE LEFT OF ALIGNMENT AND POSITIVE RIGHT OF ALIGNMENT WHEN TRAVELING IN THE DIRECTION OF INCREASING STATION.
4. ALIGNMENT IS BASED ON 90% DRAWINGS PROVIDED BY WEST YOST ASSOCIATES, DATED JUNE 2022.

**BORING/PROBE-HOLE LEGEND:**

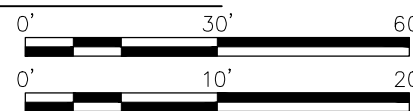


	<b>CITY OF SWEET HOME</b> <b>MAHLER WATER RECLAMATION FACILITY IMPROVEMENTS</b>	<b>FIG.3D</b>  JULY 2022
	GEOTECHNICAL DATA REPORT GEOLOGIC PROFILE PRIMARY CLARIFIER	



**GEOLOGIC PROFILE STA 50+00 TO 51+50**

SCALE: 1"=30' HORIZ  
1"=10' VERT



E  
FIG.2

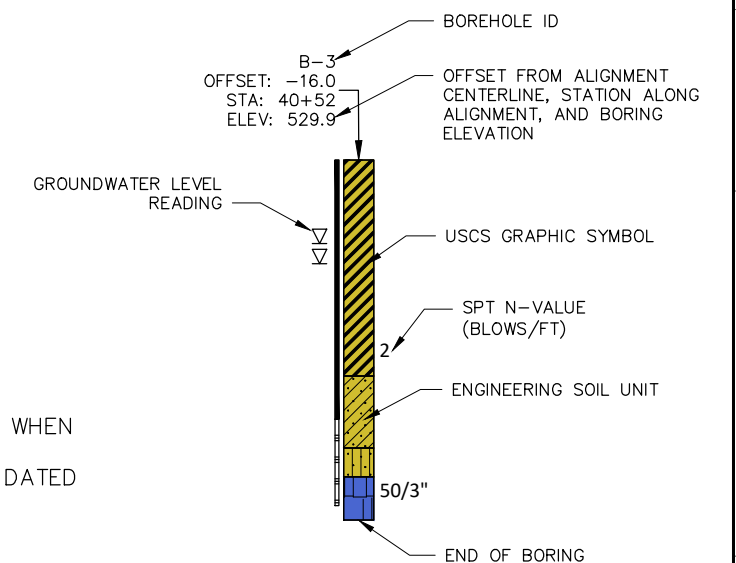
**STRATIGRAPHIC LEGEND:**

	WELL-GRADED GRAVEL (GW)		SILT (ML)		FILL
	SILTY GRAVEL (GM)		LEAN CLAY (CL)		BASALT
	CLAYEY GRAVEL (GC)		LOW PLASTICITY ORGANIC CLAY (OL)		
	SILTY SAND (SM)		FAT CLAY (CH)		
	CLAYEY SAND (SC)		BASALT		

**NOTES:**

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2. BOREHOLE LOCATIONS ARE PROJECTED PERPENDICULAR TO ALIGNMENT.
3. OFFSETS ARE NEGATIVE LEFT OF ALIGNMENT AND POSITIVE RIGHT OF ALIGNMENT WHEN TRAVELING IN THE DIRECTION OF INCREASING STATION.
4. ALIGNMENT IS BASED ON 90% DRAWINGS PROVIDED BY WEST YOST ASSOCIATES, DATED JUNE 2022.

**BORING/PROBE-HOLE LEGEND:**

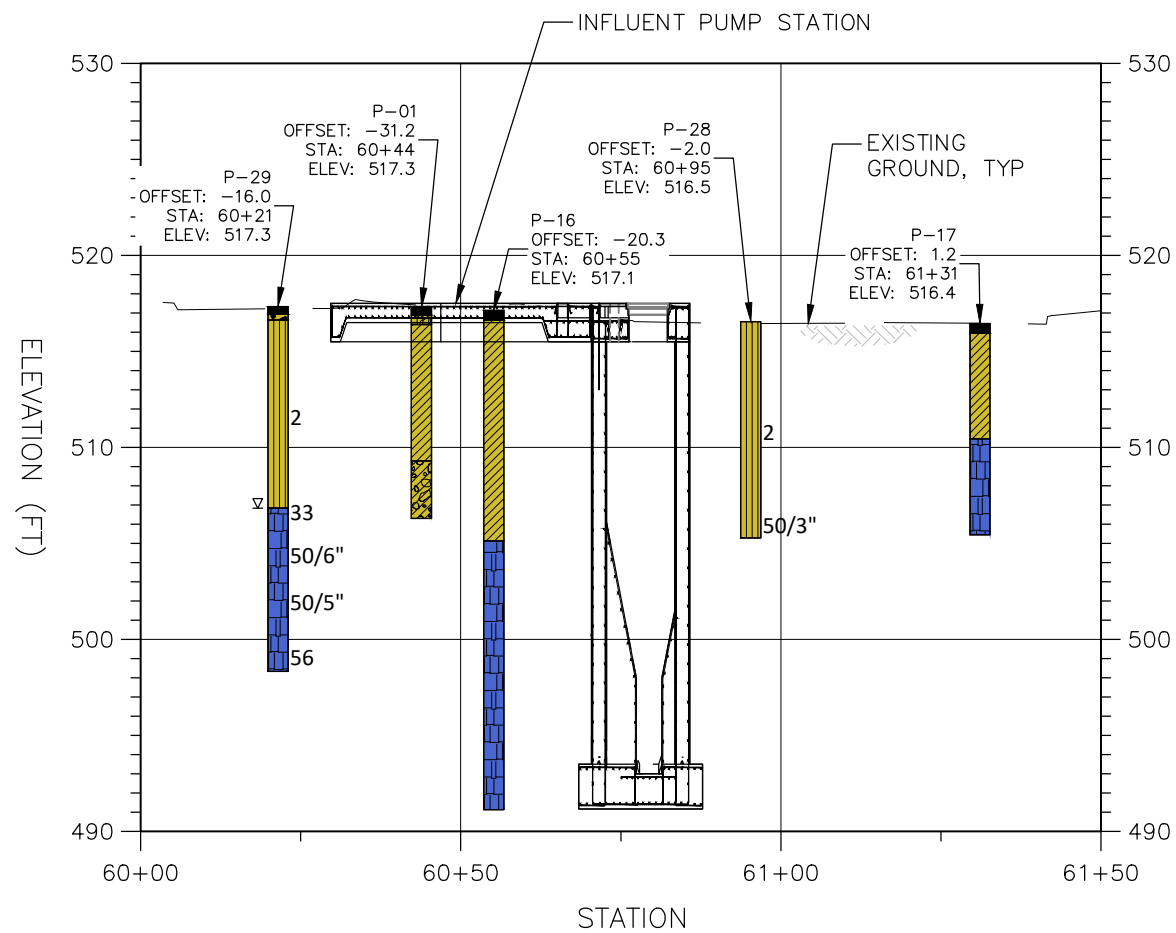


**CITY OF SWEET HOME**  
MAHLER WATER RECLAMATION FACILITY IMPROVEMENTS  
GEOTECHNICAL DATA REPORT  
GEOLOGIC PROFILE  
SECONDARY CLARIFIER 90 (SC90)

**FIG.3E**

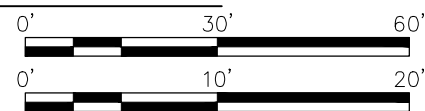
JULY 2022





**GEOLOGIC PROFILE STA 60+00 TO 61+50**

SCALE: 1"=30' HORIZ  
1"=10' VERT



F  
FIG.2

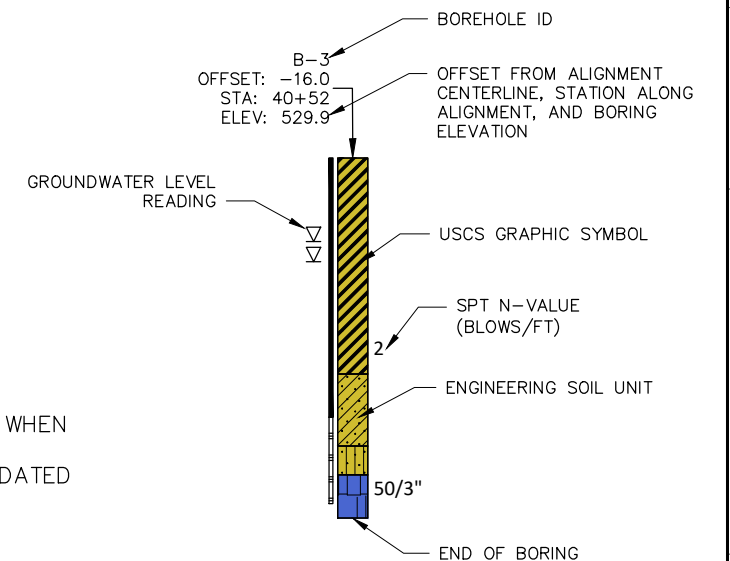
**STRATIGRAPHIC LEGEND:**

WELL-GRADED GRAVEL (GW)	SILT (ML)	FILL
SILTY GRAVEL (GM)	LEAN CLAY (CL)	BASALT
CLAYEY GRAVEL (GC)	LOW PLASTICITY ORGANIC CLAY (OL)	
SILTY SAND (SM)	FAT CLAY (CH)	
CLAYEY SAND (SC)	BASALT	

**NOTES:**

1. BOREHOLE LOCATIONS ARE APPROXIMATE.
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3. OFFSETS ARE NEGATIVE LEFT OF ALIGNMENT AND POSITIVE RIGHT OF ALIGNMENT WHEN TRAVELING IN THE DIRECTION OF INCREASING STATION.
4. ALIGNMENT IS BASED ON 90% DRAWINGS PROVIDED BY WEST YOST ASSOCIATES, DATED JUNE 2022.

**BORING/PROBE-HOLE LEGEND:**



**CITY OF SWEET HOME**  
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 GEOTECHNICAL DATA REPORT  
 GEOLOGIC PROFILE  
 INFLUENT PUMP STATION

**FIG.3F**

JULY 2022

**Appendix A**  
**Boring Logs**



<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring B-1</h2>
--	---

Date(s) Drilled: <b>04/30/2018</b>	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>Mud Rotary and HQ Wireline/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>13.5 ft</b>	
Hole Diameter: <b>4.00 in</b>	Hammer Weight/Drop (lb/in./Type): <b>140 lb / 30 in / Automatic</b>	Ground Surface Elevation/Datum: <b>516.5 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617396.39 E, 275319.73 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
512									Concrete - 18" thick (Pavement)		
507			100	RUN 1				GM	Dense, moist, gray Silty Gravel (GM); Fine to coarse angular gravel, low plasticity silt (Base Aggregate) BASALT, very strong (R5), slightly weathered to fresh, moderately to highly fractured, planar, stepped, smooth to rough joints with very narrow apertures (Little Butte Volcanic Series - Tholeiitic Basalt) <i>Run 1: 3.5-8.5 feet.</i> <i>RQD = 59%</i>  <i>Run 2: 8.5 -13.5 feet:</i> <i>RQD = 42%</i> <i>Planar and irregular, smooth to slightly rough joints.</i>		At 2.5 feet very slow, very rough drilling. At 3.5 feet switch to rock coring.  From 5.20 feet to 6.30 feet, UCS = 25,300 psi.
502			80	RUN 2							Borehole completed at 13.5ft. below ground surface (bgs).
497											
492											
487											

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring B-2</h2>
--	---

Date(s) Drilled: 05/01/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>Mud Rotary/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>16.5 ft</b>	
Hole Diameter: <b>4.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>140 lb / 30 in / Automatic</b>	Ground Surface Elevation/Datum: <b>518.2 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617232.28 E, 275385.44 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<div style="font-size: 8px;"> <input type="checkbox"/> BLOWS/FT            20 40 60 80  <input type="checkbox"/> MC  <input type="checkbox"/> LL/PL         </div>					
514	5		47	S1	7-5-11 (N=16)			OH	Organic Soil (OL/OH); Mulch (Fill) Very stiff, moist, brown to gray brown, Sandy LEAN CLAY with Gravel (CL); Medium plasticity, medium to low toughness, fine to coarse sand, fine angular gravel (Fill)		
			27	S2	2-4-4 (N=8)			SM	Loose, moist to wet, brown, Silty SAND with Gravel (SM); Fine to coarse sand, fine angular gravel, medium plasticity, slow dilatancy (Fill)		
			53	S3	2-3-1 (N=4)			SM	Very loose, wet, brown, Silty SAND (SM); Fine to medium sand, low plasticity fines, rapid dilatancy (Fill)		
509	10		73	S4	2-0-0 (N=WOR)			SM	<i>At 10.0 grades to orange-brown, occurrence of trace, fine, angular gravel, and slow dilatancy.</i>		
			33	S5	0-0-1 (N=1)						
504	15		100	S5	17-18-27 (N=45)			GC	Very dense, moist, gray and olive-brown, CLAYEY GRAVEL with Sand (GC); Fine to coarse angular gravel, fine to coarse sand, medium plasticity fines (Fill)		
											Borehole completed at 16.5ft. below ground surface (bgs).

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring B-3</b>
--	--------------------------

Date(s) Drilled: 05/02/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>Mud Rotary/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>12.5 ft</b>	
Hole Diameter: <b>4.00 in</b>	Hammer Weight/Drop (lb/in./Type): <b>140 lb / 30 in / Automatic</b>	Ground Surface Elevation/Datum: <b>529.9 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617007.93 E, 275477.18 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
525	5		53	S1	3-2-1 (N=3)			CH	Soft, moist, gray with trace orange mottles, Sandy FAT CLAY (CH); High plasticity, medium toughness, fine sand, occasional organics (Fill)		
			60	S2	0-1-1 (N=2)				<i>At 5.0 feet grades to scattered woody organics.</i>		
520	10		100	S3	1-1-1 (N=2)			SC	Very loose, moist to wet, gray, CLAYEY SAND (SC); Fine to medium sand, medium plasticity and medium toughness fines, occasional 1-inch sandy lenses of slow dilatancy (Fill)		
			87	S4	0-16-49 (N=65)			SM	Medium dense, wet, red-brown, SILTY SAND (SM); Fine to medium sand, low plasticity fines, slow dilatancy (Fill)		
			0	S5	50/0" (Refusal)				Dark gray basalt chips in cuttings (Little Butte Volcanic Series - Tholeiitic Basalt)		At 11.0 feet very rough , very slow drilling.
515	15										Borehole completed at 12.5ft. below ground surface (bgs).
510	20										
505	25										
500	30										

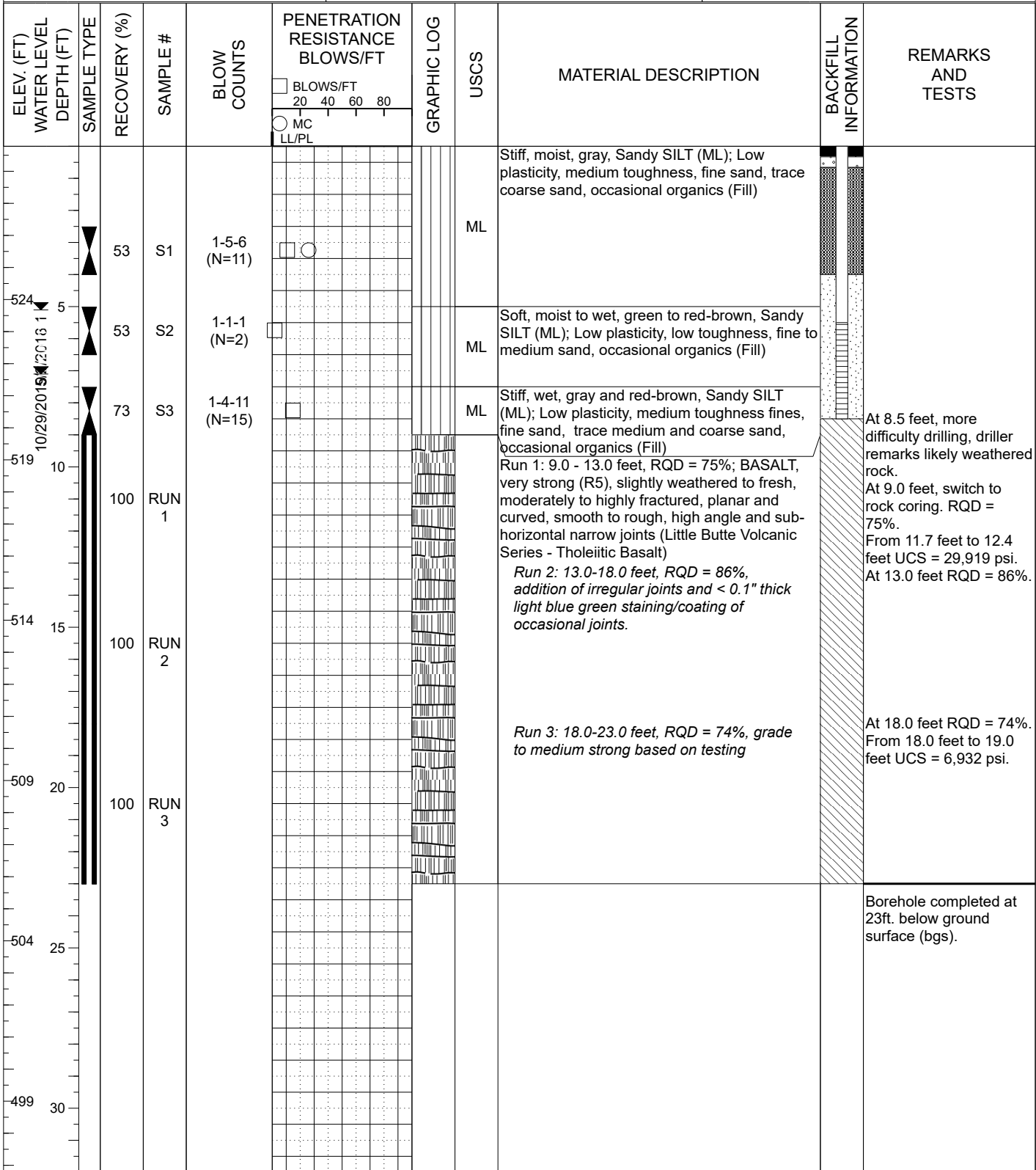
<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring B-4</h2>
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Date(s) Drilled: 05/01/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>Mud Rotary/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>5.8 ft</b>	
Hole Diameter: <b>4.00 in</b>	Hammer Weight/Drop (lb/in./Type): <b>140 lb / 30 in / Automatic</b>	Ground Surface Elevation/Datum: <b>538.6 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7616842.35 E, 275514.57 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
534 5/2/2018 1						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL		SM	Medium dense, moist to wet, dark gray, SILTY SAND with Gravel (SM); Fine to medium sand, fine angular gravel, low plasticity fines, slow dilatancy, scattered organics (Fill)		At 4.5 feet very slow, very rough drilling.
534 5								GM	Very dense, moist, gray and orange, SILTY GRAVEL with Sand (GM); Fine to coarse gravel, fine to coarse sand, medium plasticity fines (Fill)		Borehole completed at 5.8ft. below ground surface (bgs).
529 10											
524 15											
519 20											
514 25											
509 30											

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring B-5</b>
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Date(s) Drilled: 05/02/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>Mud Rotary and HQ Wireline/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>23.0 ft</b>	
Hole Diameter: <b>4.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>140 lb / 30 in / Automatic</b>	Ground Surface Elevation/Datum: <b>528.8 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617036.16 E, 275580.52 N</b>	Elevation Source: <b>Site Survey</b>	



## Boring B-5

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-01</b>
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Date(s) Drilled: 04/30/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: 4-1/4" Hollow stem auger/CME 75	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>11.0 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>517.3 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617295.47 E, 275346.48 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
513	5			S1				GM	Asphalt (Pavement)		
								CL	Dense, gray, Silty GRAVEL (GM); (Base Aggregate) Very soft to soft, moist, brown, LEAN CLAY with Sand (CL); Low plasticity, medium toughness, fine sand, trace medium sand, occasional organics (Fill)		At 9.0 feet driller remarks that the material stiffens.
508	10							GC	Very loose to loose, moist to wet, gray brown, CLAYEY GRAVEL with Sand (GC); Fine to coarse angular basalt gravel, fine to coarse sand, low plasticity fines (Fill)		At 10.0 feet, driller remarks that the material feels like rock but the auger is able to continue to spin. Auger refusal at 11 feet.
503	15										Borehole completed at 11ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.
498	20										
493	25										
488	30										

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-02</h2>
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Date(s) Drilled: 05/01/2018 - 01/05/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: 4-1/4" Hollow stem auger/CME 75	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>11.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in./Type)	Ground Surface Elevation/Datum: <b>526.1 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617102.54 E, 275424.97 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
522	5					<div style="font-size: 8px;"> <input type="checkbox"/> BLOWS/FT            20 40 60 80  <input type="checkbox"/> MC  <input type="checkbox"/> LL/PL         </div>		CL	Soft to very soft, moist, brown to light brown, Sandy LEAN CLAY with Gravel (CL); Low plasticity, fine angular gravel, occasional organics (Fill)		At 2.5 feet very slow, very rough drilling.  Auger refusal at 11.5 feet.
517	10										Auger refusal at 11.5 feet.
512	15										Borehole completed at 11.5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.
507	20										
502	25										
497	30										

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-03</b>
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Date(s) Drilled: <b>04/30/2018</b>	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>4-1/4" Hollow stem auger/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>16.0 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in./Type):	Ground Surface Elevation/Datum: <b>530.4 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617036.27 E, 275432.54 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
526	5						GM	GM	Asphalt (Pavement) Base rock (Fill)		
521	10						CL	CL	Very soft to soft, moist, dark gray-brown, LEAN CLAY with Sand (CL); Fine sand (Fill)		
516	15						CL	CL	Very soft to soft, moist to wet, gray, Sandy LEAN CLAY (CL); Medium plasticity, fine to medium sand (Fill)  <i>At 13.0 feet, grades to brown, moist to wet, decrease in sand content.</i>		
											Auger refusal at 16 feet.
511	20										Borehole completed at 16ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.
506	25										
501	30										



<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-04</b>
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Date(s) Drilled: 04/30/2018 - 04/30/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: 4-1/4" Hollow stem auger/CME 75	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>7.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>530.8 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7616984.89 E, 275442.28 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
526				S1				GM	Asphalt - 5" thick (Pavement)		
								CL	Dense, moist, gray Silty GRAVEL (GM); Fine to coarse angular gravel, low plasticity silt, 5 inches thick (Base Aggregate)		
								OL/OH	Very soft to soft, moist, dark gray-brown, LEAN CLAY (CL); (Fill)		
								OH	Hard, moist, brown, Organic Soil with Sand (OL/OH); Frequent hard wood in clay (Fill)		
				S2				CL	Very soft to soft, moist, green-brown with brown-orange mottles, LEAN CLAY (CL); Low plasticity, fine sand, trace medium sand (Fill)		At 2.5 feet driller remarks that material becomes stiffer, woody material began smoking so driller added water to hole, very slow drilling. Organic chemical odor in the wood fiber of Sample 1. Auger refusal at 7.5 feet.
521											Borehole completed at 7.5ft. below ground surface (bgs).
											Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.
516											
511											
506											
501											

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-05</b>
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Date(s) Drilled: 05/01/2018 - 05/01/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: 4-1/4" Hollow stem auger/CME 75	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>3.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>533.1 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7616928.58 E, 275458.29 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL			Very soft to soft, moist, brown to light brown, LEAN CLAY with Sand (CL); Low plasticity, medium toughness, fine sand, trace coarse angular gravel, occasional organics (Fill)		Auger refusal at 3.5 feet.
-529	5							CL			Borehole completed at 3.5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.
-524	10										
-519	15										
-514	20										
-509	25										
-504	30										



<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-06</h2>
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Date(s) Drilled: 04/30/2018 - 04/30/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: 4-1/4" Hollow stem auger/CME 75	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>3.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>536.2 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7616858.52 E, 275586.88 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
				S1		<div style="font-size: 8px;"> <input type="checkbox"/> BLOWS/FT            20 40 60 80  <input type="checkbox"/> MC  <input type="checkbox"/> LL/PL         </div>		CL	Stiff, moist to wet, brown, LEAN CLAY (CL); Low plasticity, medium toughness, trace fine to medium sand, fine gravel, occasional woody organics (Fill)		Auger refusal at 3.5 feet.  Borehole completed at 3.5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.
532	5										
527	10										
522	15										
517	20										
512	25										
507	30										

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-07</b>
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Date(s) Drilled: <b>04/30/2018</b>	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>4-1/4" Hollow stem auger/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>2.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>538.0 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7616789.32 E, 275532.46 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL		GM	Very loose to loose, moist, dark brown, SILTY GRAVEL with Sand (GM); Angular fine to coarse gravel with cobbles, low plasticity fines (Fill)		Auger refusal at 2.5 feet.  Borehole completed at 2.5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.
533	5										
528	10										
523	15										
518	20										
513	25										
508	30										

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-08</h2>
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Date(s) Drilled: <b>04/30/2018</b>	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>4-1/4" Hollow stem auger/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>7.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>535.2 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7616905.96 E, 275577.01 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
531	5			S1		<div style="font-size: 8px;"> <input type="checkbox"/> BLOWS/FT            20 40 60 80  <input type="checkbox"/> MC  <input type="checkbox"/> LL/PL         </div>	GM	Very loose to loose, moist, dark brown, SILTY GRAVEL with Sand (GM); Fine to coarse angular to subangular gravel, fine to coarse sand, low plasticity fines, occasional woody organics (Fill)	Slight petroleum odor while drilling.  Auger refusal at 7.5 feet.		
526	10								Borehole completed at 7.5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.		
521	15										
516	20										
511	25										
506	30										

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-09</b>
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Date(s) Drilled: 05/01/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: 4-1/4" Hollow stem auger/CME 75	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>4.0 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>530.5 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7616966.80 E, 275594.59 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
526 5/2/2018 5 521 10 516 15 511 20 506 25 501 30				S1		<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL		CL	Moist, gray-brown, Sandy LEAN CLAY with Gravel (CL); Low plasticity, fine to coarse sand, fine angular gravel, scattered organics (Fill)		Slight petroleum odor.  Auger refusal at 4 feet.  Borehole completed at 4ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.



<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-10</h2>
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Date(s) Drilled: <b>04/30/2018</b>	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>4-1/4" Hollow stem auger/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>5.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>530.1 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7616963.18 E, 275547.22 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
518 526 521 516 511 506 501						<div style="font-size: small;"> <input type="checkbox"/> BLOWS/FT            20 40 60 80  <input type="checkbox"/> MC  <input type="checkbox"/> LL/PL         </div>		GM  CL	Very loose to loose, moist, brown, SILTY GRAVEL with Sand (GM); Fine to coarse gravel, fine and coarse sand, low plasticity. (Fill)  Very soft to soft, wet, gray-brown, LEAN CLAY with Sand (CL); Low plasticity, fine sand, trace angular fine angular gravel. (Fill)		Auger refusal at 5.5 feet.  Borehole completed at 5.5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-11</h2>
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Date(s) Drilled: 04/30/2018 - 04/30/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: 4-1/4" Hollow stem auger/CME 75	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>5.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>529.8 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617007.94 E, 275561.88 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
525 5 518 5				S1		<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL		GC	Very loose to loose, moist to wet, brown to gray brown, Clayey GRAVEL with Sand (GC); Fine to coarse gravel, fine to coarse sand (Fill)		Auger refusal at 5.5 feet.  Borehole completed at 5.5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.



<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-12</b>
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Date(s) Drilled: <b>04/30/2018</b>	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>4-1/4" Hollow stem auger/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>5.0 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>526.4 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617070.84 E, 275609.56 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
522	5			S1				CL	Very soft to soft, moist, brown, Gravelly LEAN CLAY with Sand (CL); Low plasticity, fine to coarse angular gravel, fine to coarse sand (Fill)		Auger refusal at 5 feet.
517	10										Borehole completed at 5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.
512	15										
507	20										
502	25										
497	30										

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-13</h2>
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Date(s) Drilled: 04/30/2018 - 04/30/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: 4-1/4" Hollow stem auger/CME 75	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>8.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>523.6 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617121.16 E, 275620.34 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
519	5							CL	Very soft to soft, moist to wet, dark brown to gray brown, Sandy LEAN CLAY with Gravel (CL); Low plasticity, fine to coarse sand, fine angular gravel (Fill)		Loose gravelly material begins caving at the ground surface.  Auger refusal at 8.5 feet.
514	10										Borehole completed at 8.5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.
509	15										
504	20										
499	25										
494	30										

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-14</h2>
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Date(s) Drilled: 05/01/2018	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: 4-1/4" Hollow stem auger/CME 75	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>5.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>521.7 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617149.97 E, 275571.01 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
517	5			S1				CL	Very soft to soft, wet, gray-brown, Sandy LEAN CLAY with Gravel (CL); Low plasticity, fine to coarse sand, fine angular gravel (Fill)		Observed groundwater at approximately 4.0 feet water present, difficult to measure due to gravel.  <u>Auger refusal at 5.5 feet.</u>  Borehole completed at 5.5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.
512	10										
507	15										
502	20										
497	25										
492	30										

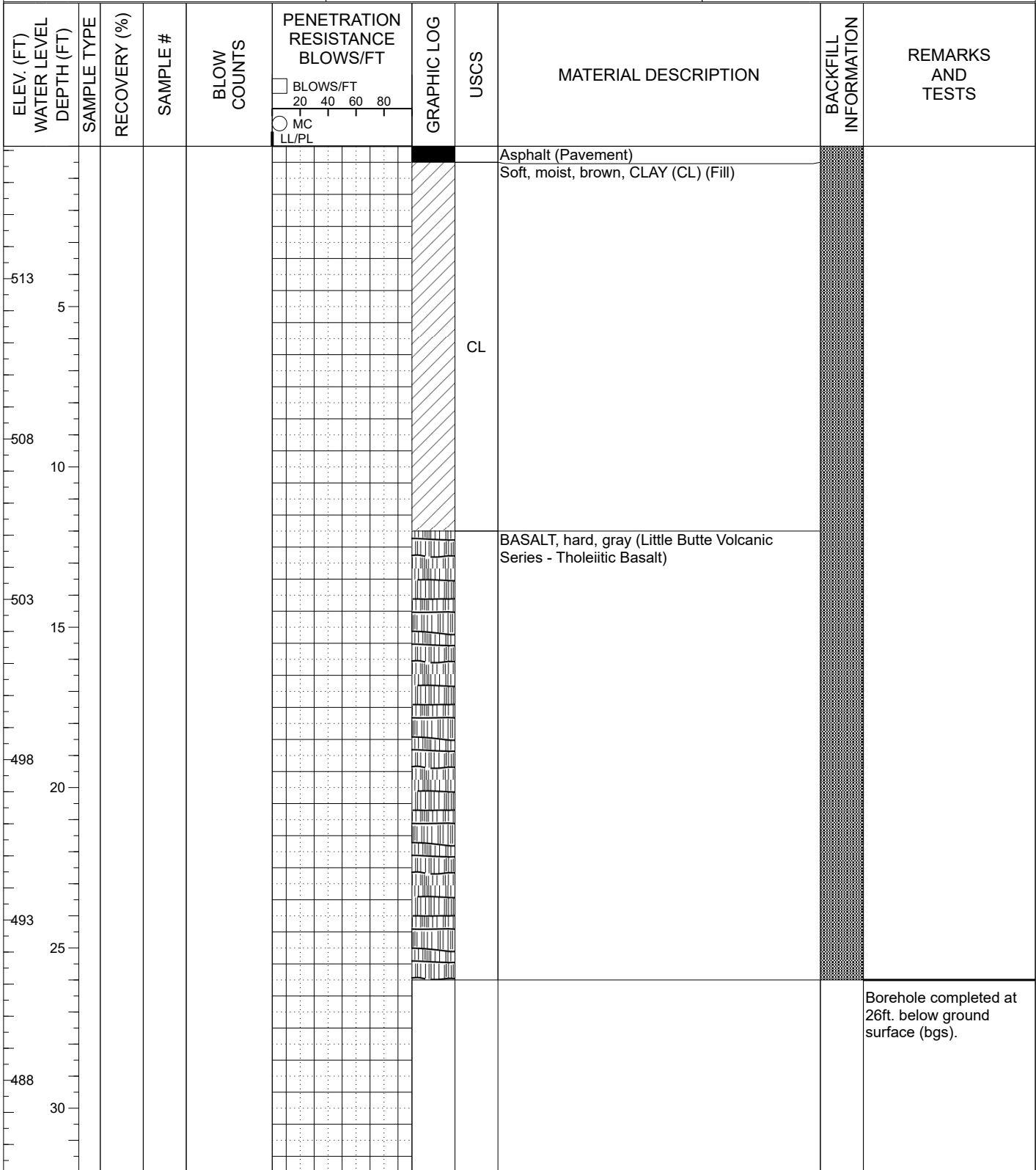
<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-15</h2>
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Date(s) Drilled: <b>04/30/2018</b>	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>J. Irizarry</b>	Checked By: <b>K. Elliott</b>
Drilling Method/Rig Type: <b>4-1/4" Hollow stem auger/CME 75</b>	Drilling Contractor: <b>Western States Soil Conservation, Inc.</b>	Total Depth of Borehole: <b>2.5 ft</b>	
Hole Diameter: <b>4.25 in</b>	Hammer Weight/Drop (lb/in.)/Type:	Ground Surface Elevation/Datum: <b>519.1 ft</b>	
Location: <b>Survey</b>	Coordinates: <b>7617194.34 E, 275628.88 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
4/30/2018 515 5 510 10 505 15 500 20 495 25 490 30						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL		GC	Very loose to loose, moist to wet, brown, CLAYEY GRAVEL with Sand (GC); Fine angular gravel, fine to coarse sand (Fill)		Auger refusal at 2.5 feet.  Borehole completed at 2.5ft. below ground surface (bgs).  Grab samples obtained from auger cuttings during exploration. Reported relative density and apparent consistency based on reactions while drilling.

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-16</h2>
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Date(s) Drilled: 10/29/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>26.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>N/A</b>	Ground Surface Elevation/Datum: <b>517.1 ft</b>	
Location: <b>Sweet Home WWTP</b>	Coordinates: <b>7617309.79 E, 275352.81 N</b>	Elevation Source: <b>Site Survey</b>	



<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-17</b>
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Date(s) Drilled: 10/29/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>11.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>N/A</b>	Ground Surface Elevation/Datum: <b>516.4 ft</b>	
Location: <b>Sweet Home WWTP</b>	Coordinates: <b>7617358.56 E, 275414.92 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
512	5								Asphalt (Pavement)		
								CL	Soft, moist, brown, CLAY (CL) (Fill)		
507	10								Basalt, hard, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		
502	15										
497	20										
492	25										
487	30										
											Borehole completed at 11ft. below ground surface (bgs).

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-18</h2>
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Date(s) Drilled: 10/29/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>15.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>N/A</b>	Ground Surface Elevation/Datum: <b>518.5 ft</b>	
Location: <b>Sweet Home WWTP</b>	Coordinates: <b>7617209.77 E, 275451.86 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
514	5							CL	Soft, moist, brown, CLAY (CL) (Fill)		
509	10								BASALT, hard, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		
504	15										
499	20										
494	25										
489	30										
											Borehole completed at 15ft. below ground surface (bgs).



**Boring P-18**

**Project: Sweet Home WWTP Schematic Design**  
**Project Location: Sweet Home, OR**  
**Project Number: 5834.0**

**Log of Boring P-19**

Date(s) Drilled 10/29/2019	Geotechnical Consultant McMillen Jacobs Associates	Logged By L. Ferguson	Checked By J. Quinn
Drilling Method/ Rig Type Air Track Probe/Furukawa HCR900	Drilling Contractor McCallum Rock Drilling	Total Depth of Borehole 20.0 ft	
Hole Diameter 3.00 in	Hammer Weight/Drop (lb/in.)/Type N/A	Ground Surface Elevation/Datum 518.0 ft	
Location Sweet Home WWTP	Coordinates 7617228.61 E, 275499.48 N	Elevation Source Site Survey	

ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
					<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
514							GM	Asphalt (Pavement) Medium dense, gray, silty GRAVEL (GM) (Fill) Soft, moist, brown, CLAY (CL) (Fill)		
509							CL	BASALT, hard, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		
504										
499										
494										
489										
										Borehole completed at 20ft. below ground surface (bgs).



**Boring P-19**



<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-20</h2>
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Date(s) Drilled: 10/29/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>20.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in./Type): <b>N/A</b>	Ground Surface Elevation/Datum: <b>525.4 ft</b>	
Location: <b>Sweet Home WWTP</b>	Coordinates: <b>7617111.38 E, 275430.15 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
521	5							CL	Soft, moist, brown, CLAY (CL) (Fill)		
516	10								BASALT, hard, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		
511	15										
506	20										
501	25										
496	30										
											Borehole completed at 20ft. below ground surface (bgs).



### Boring P-20

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-21</h2>
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Date(s) Drilled: 10/29/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>23.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>N/A</b>	Ground Surface Elevation/Datum: <b>521.8 ft</b>	
Location: <b>Sweet Home WWTP</b>	Coordinates: <b>7617111.78 E, 275548.31 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
-517	5						GM		Loose, gray, silty GRAVEL (GM) (Fill)		
-512	10								BASALT, hard, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		
-507	15										
-502	20										
-497	25										
-492	30										Borehole completed at 23ft. below ground surface (bgs).



### Boring P-21

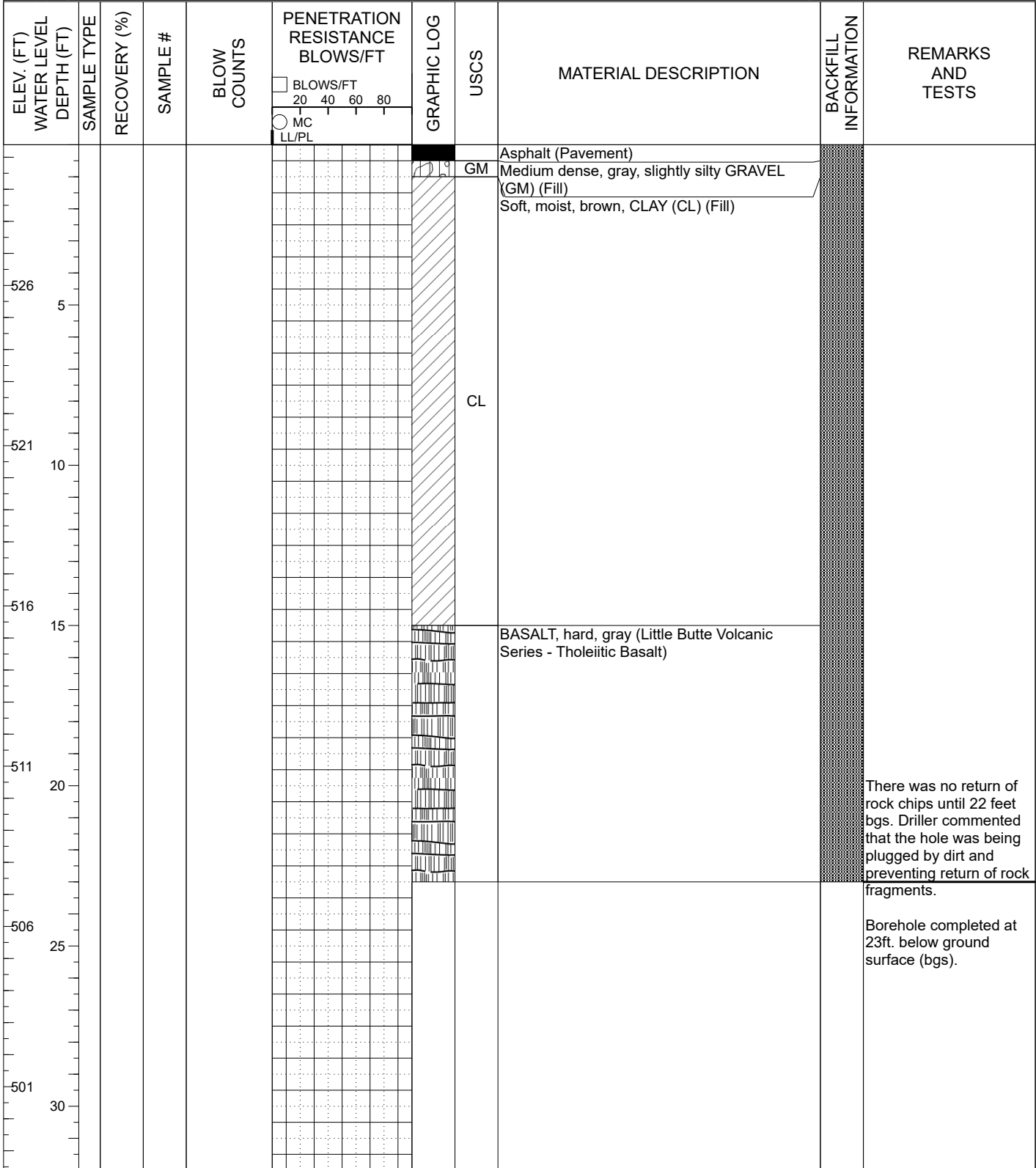
<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-22</h2>
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Date(s) Drilled: 10/29/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>20.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>N/A</b>	Ground Surface Elevation/Datum: <b>518.5 ft</b>	
Location: <b>Sweet Home WWTP</b>	Coordinates: <b>7617179.82 E, 275578.51 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
514	5							CL	Soft, moist, brown, slightly sandy CLAY (CL) (Fill)		
509	10								BASALT, hard, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		
504	15										
499	20										
494	25										
489	30										
											Borehole completed at 20ft. below ground surface (bgs).

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-23</b>
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Date(s) Drilled: 10/29/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>23.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>N/A</b>	Ground Surface Elevation/Datum: <b>530.4 ft</b>	
Location: <b>Sweet Home WWTP</b>	Coordinates: <b>7617036.68 E, 275432.95 N</b>	Elevation Source: <b>Site Survey</b>	



<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-24</b>
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Date(s) Drilled: 10/30/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>15.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>N/A</b>	Ground Surface Elevation/Datum: <b>529.7 ft</b>	
Location: <b>Sweet Home WWTP</b>	Coordinates: <b>7617008.03 E, 275578.53 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
							GM		Loose, gray, silty GRAVEL (GM) (Fill)		
-525	5								BASALT, hard, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		Driller commented that it got wet around 5 feet bgs.
-520	10										
-515	15										
-510	20										
-505	25										
-500	30										Borehole completed at 15ft. below ground surface (bgs).

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-25</b>
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Date(s) Drilled: 10/29/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>15.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>N/A</b>	Ground Surface Elevation/Datum: <b>506.4 ft</b>	
Location: <b>Pleasant Valley Boat Ramp</b>	Coordinates: <b>7617287.27 E, 275672.91 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
502	5							GM	Asphalt (Pavement)		
									Medium dense, gray, silty GRAVEL (GM) (Fill)		
497	10								BASALT, hard, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		
492	15										
487	20										
482	25										
477	30										
											Borehole completed at 15ft. below ground surface (bgs).

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<b>Log of Boring P-26</b>
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Date(s) Drilled: 10/29/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>23.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>N/A</b>	Ground Surface Elevation/Datum: <b>507.2 ft</b>	
Location: <b>Pleasant Valley Boat Ramp</b>	Coordinates: <b>7617279.85 E, 275716.52 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
								GM	Medium dense, gray, silty GRAVEL (GM) (Fill)		
503	5								BASALT, fractured, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		Driller comments that between 5 and 12 feet bgs seemed like highly fractured rock.
498	10								BASALT, hard, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		
493	15										
488	20										
483	25										Borehole completed at 23ft. below ground surface (bgs).
478	30										

<b>Project: Sweet Home WWTP Schematic Design</b> <b>Project Location: Sweet Home, OR</b> <b>Project Number: 5834.0</b>	<h2 style="margin: 0;">Log of Boring P-27</h2>
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Date(s) Drilled: 10/29/2019	Geotechnical Consultant: <b>McMillen Jacobs Associates</b>	Logged By: <b>L. Ferguson</b>	Checked By: <b>J. Quinn</b>
Drilling Method/Rig Type: <b>Air Track Probe/Furukawa HCR900</b>	Drilling Contractor: <b>McCallum Rock Drilling</b>	Total Depth of Borehole: <b>26.0 ft</b>	
Hole Diameter: <b>3.00 in</b>	Hammer Weight/Drop (lb/in.)/Type: <b>N/A</b>	Ground Surface Elevation/Datum: <b>516.6 ft</b>	
Location: <b>Sweet Home WWTP</b>	Coordinates: <b>7617372.72 E, 275312.04 N</b>	Elevation Source: <b>Site Survey</b>	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL			Concrete (Pavement) Soft, moist, brown, slightly sandy CLAY (CL) (Fill)		
-512	5						CL	CL			
-507	10								BASALT, hard, gray (Little Butte Volcanic Series - Tholeiitic Basalt)		
-502	15										
-497	20										
-492	25										
-487	30										Borehole completed at 26ft. below ground surface (bgs).



**Project: Sweet Home WWTP Final Design Review**  
**Project Location:**  
**Project Number: 6367.0**

**Log of Boring P-28**

Date(s) Drilled 06/20/2022 - 06/20/2022	Geotechnical Consultant McMillen Jacobs Associates	Logged By A. Judy	Checked By J. Quinn
Drilling Method/ Rig Type 8.25" Hollow Stem Auger/CME 75	Drilling Contractor PLI Systems, Inc.	Total Depth of Borehole 11.2 ft	
Hole Diameter 8.25 in	Hammer Weight/Drop (lb/in.)/Type 140 lb / 30 in / Automatic	Ground Surface Elevation/Datum 516.5 ft	
Location See Figure 2 Site Plan	Coordinates 7617342.00 E, 275383.00 N	Elevation Source Site Survey	

ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT		GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
					MC	LL/PL					
512	5	67	SPT-1	1-1-1 (N=2)				ML	Soft, moist, brown, SILT (ML); low plasticity, trace fine gravel, trace fine sand, trace wood fibers. (Fill)  <i>Becomes gray mottled at 5.5 feet.</i>		
			100	G-1							
507	10	64	SPT-2	1-7-50/3" (Refusal)					10 - 11 feet: sample consists of approx. 50% wood fibers by volume. <i>Auger refusal at 11.25 feet on basalt bedrock.</i>		
502	15										
497	20										
492	25										
487	30										

Borehole completed at 11.25ft. below ground surface (bgs).

**Project: Sweet Home WWTP Final Design Review**  
**Project Location:**  
**Project Number: 6367.0**

**Log of Boring P-29**

Date(s) Drilled 06/20/2022 - 06/20/2022	Geotechnical Consultant McMillen Jacobs Associates	Logged By A. Judy	Checked By J. Quinn
Drilling Method/Rig Type 8.25" Hollow Stem Auger/CME 75	Drilling Contractor PLI Systems, Inc.	Total Depth of Borehole 19.0 ft	
Hole Diameter 8.25 in	Hammer Weight/Drop (lb/in.)/Type 140 lb / 30 in / Automatic	Ground Surface Elevation/Datum 517.3 ft	
Location See Figure 2 Site Plan	Coordinates 7617301.00 E, 275320.00 N	Elevation Source Site Survey	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT		GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						MC	LL/PL					
513	5	Hand	100	G-1						Asphalt - 5" thick (Pavement)		
		Hand	20	SPT-1	1-0-2 (N=2)				ML	Base Aggregate - 3" thick (Fill) Soft, moist, brown, SILT (ML); low plasticity, trace fine gravel, trace fine sand, trace wood fibers. (Fill)		
508	10	Hand	100	G-2						<i>Becomes wet at 10 feet.</i>		Auger grinding below 10 - 15 feet.
		Hand	33	SPT-2	0-7-26 (N=33)					BASALT; very weak, dark brown, highly weathered to decomposed (Little Butte Volcanic Series - Tholeiitic Basalt)		
		Hand	100	G-3								
		Hand	70	SPT-3	50/12" (Refusal)							
503	15	Hand	98	SPT-4	26-50/5" (Refusal)					<i>Penetration rate decreases significantly at 15 feet; stronger rock inferred below this depth.</i>		Smooth, slow drilling below 15 feet.
		Hand	87	SPT-5	12-23-33 (N=56)					<i>Becomes dark blue-gray at 18 feet.</i>		
498	20											Borehole completed at 19ft. below ground surface (bgs).
493	25											
488	30											

**Project: Sweet Home WWTP Final Design Review**  
**Project Location:**  
**Project Number: 6367.0**

**Log of Boring P-30**

Date(s) Drilled 06/20/2022 - 06/20/2022	Geotechnical Consultant McMillen Jacobs Associates	Logged By A. Judy	Checked By J. Quinn
Drilling Method/Rig Type 8.25" Hollow Stem Auger/CME 75	Drilling Contractor PLI Systems, Inc.	Total Depth of Borehole 11.2 ft	
Hole Diameter 8.25 in	Hammer Weight/Drop (lb/in.)/Type 140 lb / 30 in / Automatic	Ground Surface Elevation/Datum 519.8 ft	
Location See Figure 2 Site Plan	Coordinates 7617195.00 E, 275427.00 N	Elevation Source Site Survey	

ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT		GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
					MC	LL/PL					
515		100	G-1					ML	Moist, light brown, SILT with gravel (ML); low plasticity, fine to coarse angular gravel. (Fill)		
515		100	SPT-1	1-0-1 (N=1)	1			SM	Very soft, wet, light brown, Silty SAND (SM); fine to medium sand, low plasticity fines. (Fill)		
510		40	SPT-2	8-11-50/3" (Refusal)					Basalt inferred below 11 feet. Auger refusal at 11.25 feet on basalt bedrock.		Borehole completed at 11.25ft. below ground surface (bgs).
505											
500											
495											
490											



**Boring P-30**

Sheet 1 of 1

**Project: Sweet Home WWTP Final Design Review**  
**Project Location:**  
**Project Number: 6367.0**

**Log of Boring P-31**

Date(s) Drilled 06/20/2022 - 06/20/2022	Geotechnical Consultant McMillen Jacobs Associates	Logged By A. Judy	Checked By J. Quinn
Drilling Method/Rig Type 8.25" Hollow Stem Auger/CME 75	Drilling Contractor PLI Systems, Inc.	Total Depth of Borehole 12.7 ft	
Hole Diameter 8.25 in	Hammer Weight/Drop (lb/in.)/Type 140 lb / 30 in / Automatic	Ground Surface Elevation/Datum 520.8 ft	
Location See Figure 2 Site Plan	Coordinates 7617173.00 E, 275391.00 N	Elevation Source Site Survey	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT		GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						MC	LL/PL					
516	5		33	SPT-1	0-0-1 (N=1)				ML	Asphalt - 5" thick (Pavement) Base Aggregate - 1" thick (Fill) Moist, light brown, SILT with gravel (ML); low plasticity, fine to coarse angular gravel. (Fill)		
511	10		40	SPT-2	30-38-16 (N=54)				ML	Very soft, moist to wet, Sandy SILT (ML); fine to medium sand, low plasticity fines. (Fill)		
			147	SPT-3	50/2" (Refusal)					Basalt inferred below 10 feet.		Rod chatter begins at 9 feet and increases significantly below 10 feet.
506	15									Auger refusal at 12.67 feet on basalt bedrock.		Borehole completed at 12.67ft. below ground surface (bgs).
501	20											
496	25											
491	30											



**Project: Sweet Home WWTP Final Design Review**  
**Project Location:**  
**Project Number: 6367.0**

**Log of Boring P-33**

Date(s) Drilled 06/20/2022 - 06/20/2022	Geotechnical Consultant McMillen Jacobs Associates	Logged By A. Judy	Checked By J. Quinn
Drilling Method/Rig Type 8.25" Hollow Stem Auger/CME 75	Drilling Contractor PLI Systems, Inc.	Total Depth of Borehole 3.7 ft	
Hole Diameter 8.25 in	Hammer Weight/Drop (lb/in.)/Type 140 lb / 30 in / Automatic	Ground Surface Elevation/Datum 529.6 ft	
Location See Figure 2 Site Plan	Coordinates 7616945.00 E, 275701.00 N	Elevation Source Site Survey	

ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
					<input type="checkbox"/> BLOWS/FT 20 40 60 80 <input type="checkbox"/> MC <input type="checkbox"/> LL/PL					
525	Handwritten symbol	100	G-1	50/2" (Refusal)		[Hand-drawn graphic log showing soil texture]	GM	Moist, brown, Silty GRAVEL (GM); fine to coarse gravel, non-plastic fines. (Fill)		Strong rod chatter from ground surface to 3.5 feet bgs.
	Handwritten symbol	0	SPT-1					Basalt inferred below 3.5 feet. Auger refusal at 3.67 feet on basalt bedrock.		Auger bit grinding at 3.5 feet.
520										Borehole completed at 3.67ft. below ground surface (bgs).
515										
510										
505										
500										



**Boring P-33**

Sheet 1 of 1

**Project: Sweet Home WWTP Final Design Review**  
**Project Location:**  
**Project Number: 6367.0**

**Log of Boring P-34**

Date(s) Drilled 06/20/2022 - 06/20/2022	Geotechnical Consultant McMillen Jacobs Associates	Logged By A. Judy	Checked By J. Quinn
Drilling Method/Rig Type 8.25" Hollow Stem Auger/CME 75	Drilling Contractor PLI Systems, Inc.	Total Depth of Borehole 15.0 ft	
Hole Diameter 8.25 in	Hammer Weight/Drop (lb/in.)/Type 140 lb / 30 in / Automatic	Ground Surface Elevation/Datum 516.9 ft	
Location See Figure 2 Site Plan	Coordinates 7617301.00 E, 275494.00 N	Elevation Source Site Survey	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT		GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						MC	LL/PL					
										Asphalt - 5" thick (Pavement) Base Aggregate - 2" thick (Fill)		
									GM	Moist, brown, Silty GRAVEL (GM); fine to coarse gravel, low plasticity fines. (Fill)		
									ML	Soft to very soft, moist, brown, SILT (ML); low plasticity, trace fine sand. (Fill)		
512	5		100	G-1	1-1-3 (N=4)							
507	10		33	SPT-2	1-0-1 (N=1)					Becomes very soft, grades to Silt with sand at 10 feet.		
502	15		100	SPT-3	50/2" (Refusal)					Auger refusal at 15 feet on basalt bedrock.		
497	20											
492	25											
487	30											

Borehole completed at 15ft. below ground surface (bgs).



**Project: Sweet Home WWTP Final Design Review**  
**Project Location:**  
**Project Number: 6367.0**

**Log of Boring P-35**

Date(s) Drilled 06/20/2022 - 06/20/2022	Geotechnical Consultant McMillen Jacobs Associates	Logged By A. Judy	Checked By J. Quinn
Drilling Method/ Rig Type 8.25" Hollow Stem Auger/CME 75	Drilling Contractor PLI Systems, Inc.	Total Depth of Borehole 7.1 ft	
Hole Diameter 8.25 in	Hammer Weight/Drop (lb/in.)/Type 140 lb / 30 in / Automatic	Ground Surface Elevation/Datum 517.5 ft	
Location See Figure 2 Site Plan	Coordinates 7617255.00 E, 275628.00 N	Elevation Source Site Survey	

ELEV. (FT)	WATER LEVEL DEPTH (FT)	SAMPLE TYPE	RECOVERY (%)	SAMPLE #	BLOW COUNTS	PENETRATION RESISTANCE BLOWS/FT		GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	BACKFILL INFORMATION	REMARKS AND TESTS
						MC	LL/PL					
513	5		60	SPT-1	0-1-2 (N=3)				GM	Moist, dark gray and brown, Silty GRAVEL (GM); fine to coarse gravel. (Fill)		Rod chatter from ground surface to 5 feet bgs.
			0	SPT-2	50/1" (Refusal)				ML	Soft, moist, brown, SILT (ML); low plasticity, trace fine sand. (Fill)		Rod chatter and difficulty advancing auger below 6 feet.
										Basalt inferred below 6 feet.		Borehole completed at 7.08ft. below ground surface (bgs).
										Auger refusal at 7.08 feet on basalt bedrock.		
508	10											
503	15											
498	20											
493	25											
488	30											



**Appendix B**  
**Rock Core Photos**



**BOREHOLE B-01, 3.5 TO 13.5 FEET**



**BOREHOLE B-05, 9.0 TO 16.3 FEET**



**BOREHOLE B-05, 16.3 TO 23 FEET**

## **Appendix C**

### **Laboratory Test Results**

## TECHNICAL REPORT

<b>Report To:</b>	Mr. Farid Sariosseiri McMillen Jacobs Associates 1500 SW First Avenue, Suite 750 Portland, Oregon 97201	<b>Date:</b>	5/14/18
		<b>Lab No:</b>	18-108
<b>Project:</b>	Laboratory Testing – Sweet Home WWTP 5834.0	<b>Project No.:</b>	2286.1.1

**Report of:** Atterberg limits, moisture content, and compressive strength of rock

### Sample Identification

NTI completed Atterberg limits, moisture content, and compressive strength of rock testing on samples delivered to our laboratory on May 9, 2018 by a McMillen Jacobs Associates representative. Testing was performed in accordance with the standards indicated. Our laboratory test results are summarized on the following tables and attached pages.

### Laboratory Test Results

<b>Atterberg Limits (ASTM D 4318)</b>			
Sample ID	Liquid Limit	Plastic Limit	Plasticity Index
B-3 S-2 @ 5 – 6.5 ft.	51	28	23
B-5 S-1 @ 2.5 – 4 ft.	44	28	16

<b>Moisture Content of Soil (ASTM D 2216)</b>	
Sample ID	Moisture Content (Percent)
B-3 S-2 @ 5 – 6.5 ft.	44.8
B-5 S-1 @ 2.5 – 4 ft.	26.3

**Copies:** Addressee

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SHEET 1 of 4

REVIEWED BY: Bridgett Adame *BKA*

TECHNICAL REPORT



## TECHNICAL REPORT

**Report To:** Mr. Farid Sariosseiri  
 McMillen Jacobs Associates  
 1500 SW First Avenue, Suite 750  
 Portland, Oregon 97201

**Date:** 5/14/18  
**Lab No:** 18-108

**Project:** Laboratory Testing – Sweet Home WWTP 5834.0

**Project No.:** 2286.1.1

### Laboratory Testing

Compressive Strength of Intact Rock Core Specimens (ASTM D 7012 Method C)				
Sample ID	Diameter (inches)	Height (inches)	Rate of Loading (lbs/s)	Uniaxial Compressive Strength (psi)
B-1 R-1 @ 5.2 – 6.3 ft.	2.41	4.88	100	25,302

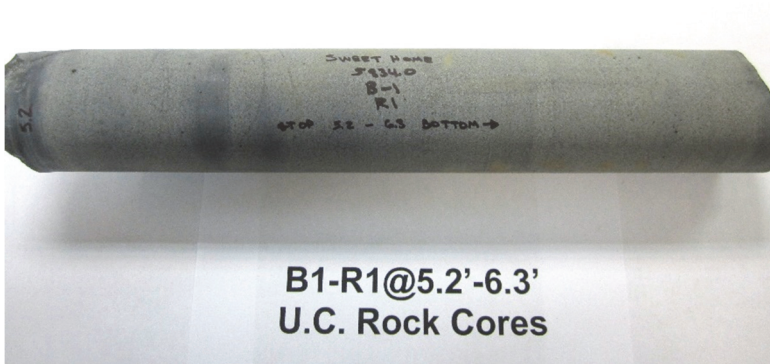


Photo1: As received sample

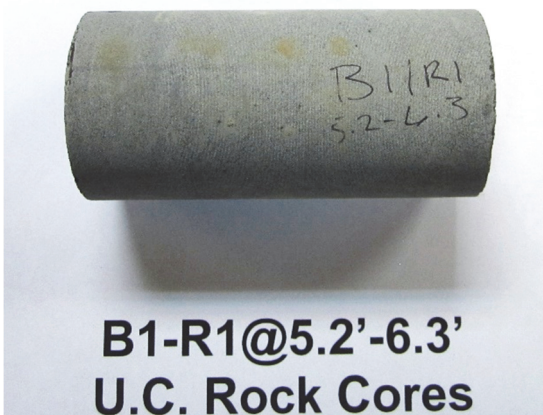


Photo 2: Test sample before testing



Photo 3: Test sample after testing

## TECHNICAL REPORT

<b>Report To:</b>	Mr. Farid Sariosseiri McMillen Jacobs Associates 1500 SW First Avenue, Suite 750 Portland, Oregon 97201	<b>Date:</b>	5/14/18
<b>Project:</b>	Laboratory Testing – Sweet Home WWTP 5834.0	<b>Lab No:</b>	18-108
		<b>Project No.:</b>	2286.1.1

### Laboratory Testing

Compressive Strength of Intact Rock Core Specimens (ASTM D 7012 Method C)				
Sample ID	Diameter (inches)	Height (inches)	Rate of Loading (lbs/s)	Uniaxial Compressive Strength (psi)
B-5 R-1 @ 11.7 – 12.4 ft.	2.41	4.85	100	25,919



Photo1: As received sample



Photo 2: Test sample before testing



Photo 3: Test sample after testing

### Laboratory Testing

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SHEET 3 of 4

REVIEWED BY: Bridgett Adame

## TECHNICAL REPORT

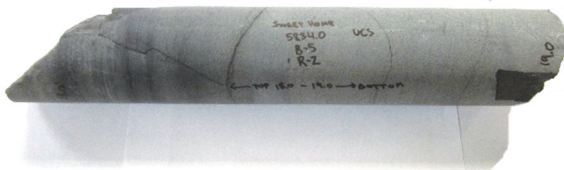
**Report To:** Mr. Farid Sariosseiri  
 McMillen Jacobs Associates  
 1500 SW First Avenue, Suite 750  
 Portland, Oregon 97201

**Date:** 5/14/18  
**Lab No:** 18-108

**Project:** Laboratory Testing – Sweet Home WWTP 5834.0

**Project No.:** 2286.1.1

Compressive Strength of Intact Rock Core Specimens (ASTM D 7012 Method C)				
Sample ID	Diameter (inches)	Height (inches)	Rate of Loading (lbs/s)	Uniaxial Compressive Strength (psi)
B-5 R-2 @ 18 – 19 ft.	2.41	4.86	100	6932



**B5-R2@18.0'-19.0'  
 U.C. Rock Cores**

Photo1: As received sample



**B5-R2@18.0'-19.0'  
 U.C. Rock Cores**

Photo 2: Test sample before testing



**B5-R2@18.0'-19.0'  
 U.C. Rock Cores**

Photo 3: Test sample after testing





## *Point Load Strength Index Test Results ASTM D-5731*

PROJECT:	Sweet Home WWTP	LAB SAMPLE NO.:	
PROJECT NO.:	5834.0	SAMPLE NO.:	5834.0 - B-5
PROJECT LOCATION:	Sweet Home, OR	SAMPLE DESCRIP:	Basalt
SAMPLED BY:	Julia Irizarry	DATE REPORTED:	5/11/2018
DATE SAMPLED:	5/2/2018	REPORTED BY:	Devin Roth

Sample No.	Test Number	Test Type*	Rock Type	Width, W	Depth or Diameter, D	Failure Load, P	De <sup>2</sup>	Point Load Strength Index, I <sub>s(50)</sub>	Uniaxial Compressive Strength, UCS	
				(in)	(in)					(lbs)
1	1	d	Basalt	5.31	2.36	5959	10313	513	12563	
2	2	d	Basalt	5.91	2.36	3828	11459	304	7437	
2B	3	d	Basalt	3.23	2.36	5158	6264	653	13717	
3	4	d	Basalt	10.04	2.36	5104	19481	268	5098	
3B	5	d	Basalt	5.59	2.36	6882	10848	569	13951	
5	6	d	Basalt	6.69	2.36	8044	12987	579	13315	
6	7	d	Basalt	5.12	2.36	4598	9931	407	9778	
7	8	d	Basalt	4.13	2.36	6830	8021	714	17138	
8	9	d	Basalt	11.42	2.36	8044	22154	383	9185	
9	10	d	Basalt	5.20	2.36	7882	10084	690	14493	
								<b>Min</b>	<b>268</b>	<b>5098</b>
								<b>Max</b>	<b>714</b>	<b>17138</b>
								<b>Avg</b>	<b>508</b>	<b>11667</b>

Size Corrected Point Load Index, I<sub>s(50)</sub>

I<sub>s(50)</sub> = **508 psi** or **73,159 psf** or **3.5 MPa**

Mean Uniaxial Compressive Strength, σ<sub>c</sub>

σ<sub>c</sub> = **11,667 psi** or **1,680,111 psf** or **80 MPa**

\*Test Type

d = diametral

a = axial

b = block

l = lump