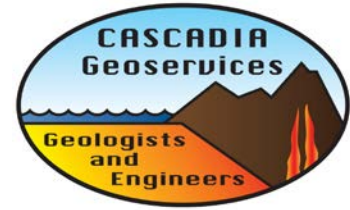


Cascadia Geoservices, Inc.  
1087 Lewis River Road #309  
Woodland, Washington 98674



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# Geotechnical Report

## Scott Hill Park and Sports Complex

Woodland, Washington

Prepared for: Rotary Club of Woodland

Sandy Larson, Project Chair, Rotary Club of Woodland  
P.O. Box 482  
Woodland, Washington 98674



Prepared by: Cascadia Geoservices, Inc.  
October 12, 2015

Project No. 15012

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Location Map

### **FIGURE 2:**

Conceptual Plan

### **FIGURE 3:**

Site Plan

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Site Reconnaissance Map

## **APPENDICIES**

### **APPENDIX A**

Test Pit Logs TP1-15

### **APPENDIX B**

Infiltration Test Logs P1-9 and Results

### **APPENDIX C**

Laboratory Test Results

## CERTIFICATE OF ENGINEER

Geotechnical Report  
Scott Hill Park and Sports Complex  
Woodland, Washington

The technical information and data contained in this report were prepared under the direction and supervision of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

Prepared by:



Rick Thrall, PE  
Principal Geotechnical Engineer

## 1.0 INTRODUCTION

The Rotary Club of Woodland is leading the development of the Scott Hill Park and Sports Complex in Woodland, Washington (site). The location of the site is shown on the attached Figure 1. A conceptual plan of the park has been developed as shown on Figure 2<sup>1</sup>, consisting of a combination of turf and grass baseball and soccer fields along with access roads, parking areas and appropriate amenities for public use. Cascadia Geotechnical, Inc. (CGS) has reviewed a previous 2005 Geotechnical Investigation Report<sup>2</sup> that was prepared for the site assuming a subdivision would be built at the park location. CGS also reviewed a 2014 Shannon and Wilson Geologic Hazard Evaluation<sup>3</sup>, which generally appears to update the previous 2005<sup>2</sup> report. We obtained plans from the City of Woodland showing the general subdivision layout and grading plan for the subdivision that we assume was made using the 2005 geotechnical information<sup>4</sup>.

According to the plans, the subdivision was to be split into two halves: a western half above the east-facing bluff, and an eastern half below the bluff in the Lewis River floodplain. A connecting road was proposed between the western and eastern halves through a draw to the east in the bluff. Of particular interest is the grading plan (west), sheet 3 of 10 of the plans, that shows planned contours for the subdivision superimposed on the original contours. The plan has been partially built with the site cut to near the planned contours and the connecting road graded in. Figure 3 shows the current topography of the site and our estimate of grading changes made to the original ground at various points around the site. We understand, based on personal communication with Bart Stepp (City of Woodland), that the excavated soils were likely moved to the proposed eastern site.

It is also understood that certain drainage improvements had been installed including excavating a large depression in the center of the park site (which we believe was a storm water retention pond) and storm drain pipework installed in the connecting road. We did not observe any of the pipe work, except some random pipes sticking out of the sides of the existing retention pond dig-out.

The conceptual layout includes typical park installations consisting of several natural grass soccer and baseball fields, one turf baseball and one turf soccer field, access roads off from Scott Hill Road from the south and Meriwether Lane to the East (labeled secondary access on the map), various drive-through, drop-off, and parking areas through the park, pedestrian trails, plazas and concessions, restrooms, play areas, etc.

After viewing the site and the plans, we understand that three major structures are need to support the design as laid out in the conceptual plan.

1. One would be a crossing at the base of the connecting road, shown on Figure 3, to make the east access serviceable.
2. A large gravity wall surrounding the north and east sides of Soccer 3 (Figure 3). If laid out on a map, the northeast corner of S-3, assumed to be a full-size soccer

<sup>1</sup> Map provided by Mr. Robert Bellami and the Rotary Club of Woodland.

<sup>2</sup> Formal Report entitled "Geotechnical Investigation, Meriwether Subdivision, Woodland, Washington." Prepared for Pacific Western Homes, Inc. by Shannon and Wilson, Inc., Dated April 8, 2005.

<sup>3</sup> Letter Report entitled "Geologic Hazard Evaluation, Scott Hill Park and Sports complex, Woodland, Washington." Prepared for Sandy Larson by Shannon and Wilson, Inc., Dated March 26, 2014.

<sup>4</sup> Drawings entitled "Meriwether HillTop". Prepared for Pacific Lifestyle Homes Inc., Prepared by Olson Engineering, Inc., Vancouver Washington. Sheets 1-10 dated March 2006, Sealed on May 1, 2006 by Peter A. Tuck, PE.

field with adequate spacing on the ends, sides, and between the fields, would nearly encroach into the roadway at about the location between test pit TP-2 and infiltration log P-9, which is nearly 40 to 50 feet below the surface level of S-3. Thus, a very large vertical retaining wall would be needed to preserve the corner of the field and road.

3. A cut wall up to 10 feet high along the south side of S-1, S-2, and S-3 to create space for the south end of the soccer fields.

Providing geotechnical design recommendations for the crossing and the walls is beyond the scope of this study.

## 2.0 SCOPE OF SERVICES

The basis of our explorations is to provide geotechnical design guidance and parameters based on the conceptual layout of the park shown on Figure 3. As part of the work we reviewed the potential unstable areas around the margins of the park that were indicated in the Shannon and Wilson reports. The scope of our work completed included the following:

- Review and integration of previous work completed on the site.
- Geologic site mapping and review of available geologic literature.
- Subsurface exploration and infiltration testing.
- Soils classification/laboratory testing.
- Engineering analysis integrating our results with the planned improvements.
- Preparation of this summary geotechnical report.

All work was carried out as indicated in our proposal authorized by you on June 29, 2015.

## 3.0 LITERATURE REVIEW

CGS reviewed the previous Shannon and Wilson (SW) 2005 Geotechnical Investigation Report<sup>2</sup> and design drawings that were prepared for the site with the assumption that a subdivision would be built<sup>4</sup>. We also reviewed the more recent SW Geologic Hazard Evaluation<sup>3</sup> which appears to update the previous 2005 report. We also reviewed a conceptual layout of the park<sup>1</sup>, an aerial photograph, and a map showing slope hazard areas surrounding the margins of the park provided by Mr. Balmelli of RB Engineering.

Based on the CGS site visits to the park site over the course of our studies, it appears that the site has undergone significant grading and levelling since the 2005 Shannon and Wilson report<sup>2</sup>. The surface and several feet deep of soil material has been excavated and likely moved to other areas of the site. We can, therefore, assume that most of the 2005 information is of little to no use in developing our updated assessment of the geotechnical conditions. Further, there appears to be a relatively large detention basin existing in the center of the park where the access and parking is planned between the soccer and baseball fields. This would need to be filled with structural fill as part of the present plan.

The flood deposits referenced in the 2005 Shannon and Wilson report<sup>2</sup> are fine-grained materials that were left on the margins of the Columbia River Valley from the Missoula floods which occurred over 10,000 years ago. These deposits are associated with landslides occurring regionally throughout the area. As indicated, several Inactive landslides are indicated surrounding the margins of the park, likely consisting of the flood deposits. Typically, "inactive" landslides are delicately balanced where any disturbance or change in conditions will set them off again. For this project, it is critical that these landslides not be re-activated due to Scott Hill Development activities.

## 4.0 INVESTIGATION

### 4.1 Field Investigation

The field investigations consisted of geologic reconnaissance and mapping, subsurface explorations, and infiltration testing. Our reconnaissance geologic mapping of the site was undertaken on Wednesday, July 22, 2015 by a licensed CGS registered geologist. Mapping focused on the east- and west-facing slopes and on the level transitional areas at the top of the slopes. The purpose of the mapping was to identify areas of geologically recent slope movement and to identify transitional areas that were unstable. Figure 4 shows the observed geologic features superimposed onto a topographic map of the site.

Subsurface explorations consisted of excavating 15 test pits to depths of up to 15.5 feet below ground surface (bgs). An additional 9 test pits were excavated for the purposes of infiltration testing. The surveyed locations of test pits TP-1 through TP-15 and infiltration testing P-1 through P-9 are shown on Figure 3. The test pits were excavated using a contract excavator and operator. Detailed logs for TP-1 through TP-15 are presented in Appendix A and P-1 through P-9 are in Appendix B. Field data and summary results for the Infiltration tests are also presented in Appendix B.

A CGS geologist or engineer was present throughout the exploration and testing to collect the soil samples and log the test pits. The final test pit logs are based on the field logs with occasional modifications made upon further laboratory examinations of the recovered samples. Refer to Table 1 in Appendix A for further detail regarding the classification of the soils collected during the subsurface exploration.

## 5.0 LABORATORY TESTING AND ANALYSIS

All of the soil samples were visually examined in our laboratory to refine the field classification in general accordance with the Unified Soil Classification system (visual-manual procedure). Moisture contents and percent fines testing were carried out on selected samples in accordance with the applicable ASTM procedures. Laboratory test data sheets are presented in Appendix C. Moisture content test results are shown on the right side of the test pit logs provided in Appendix A. P200 results are summarized on the infiltration test logs (Appendix B)

## 6.0 SITE CONDITIONS

### 6.1 Site Description and Surface Conditions

The site includes the highland plateau and adjoining slopes and covers an area of approximately 30 acres. The top of the highland plateau is at an elevation of between 150 to 160 feet Above Mean Sea Level (AMSL). The plateau is part of a

northwest-trending ridgeline which is, in turn, part of the southern Green Mountains. The plateau is generally flat with bordering east-, west-, and south-facing slopes.

Along the base of the eastern slope, a small unnamed creek was observed during our site visit. This creek drains south along the base of the slope into a wetland and man-made pond. No running water was observed in the creek at the time of our site visit, although hydric plants and soils were observed. The earlier Shannon and Wilson report<sup>2</sup> describes surface seeps which have formed at the base of the slope that feed the man-made pond.

Based on our site visits and a review of historic aerial photos, it appears that the site has undergone significant grading and levelling since 2005. In addition, a roughly graded storm water "dig out" has been excavated in the central part of the site (Figure 3). The pond measures 250 feet long by 140 feet wide and is 8 to 10 feet deep.

## 6.2 Regional and Local Geology

### 6.2.1 Background

In 2005, a geotechnical site investigation and report<sup>2</sup> of the site was completed as part of the preliminary design work for a subdivision. The area proposed for the subdivision included the western highland plateau area (now proposed for the sports complex) and the eastern portion which lies within the Lewis River floodplain. The western part of the site remains undeveloped. As part of the earlier development plan, a private road was proposed to connect the western part of the subdivision with Meriwether Lane and the subdivision development to the east. This road was roughed-in through a draw in the bluff but never completed. In 2014, a Shannon and Wilson follow-up letter<sup>4</sup> regarding development of the site into a sports complex was provided. This letter included an evaluation of potential geologic hazards including the stability of the slopes adjacent to the secondary access roadway, slopes on the east side of the site, and appropriate setbacks from top of slopes for sports and multi-use fields, restrooms, and concession facilities.

### 6.2.2 Regional Geology

The site is located within the northern extent of the Portland Basin, which is a topographic and structural depression in the central Puget-Willamette Lowland. Based on mapping done by others<sup>5</sup>, soils on the site consist of Kelso Silt Loam (Map unit 100 and 102.). As noted, several feet of these soils have been excavated from the top of the plateau as indicated in Figure 3, but are inferred to be present in level areas above and adjacent to the slopes where excavation has not occurred. These soils, where present, consist of silt and silty clay loam. The soils are described as moderately well drained and are derived from alluvium. Surface mapping conducted by others<sup>6</sup> indicate that these soils overlay Pleistocene Cataclysmic-Flood Deposits (map unit Qfs) consisting of unconsolidated deposits of rhythmically bedded silt and fine sand. These flood

<sup>5</sup> USDA United State Department of Agriculture. Natural Resource Conservation Service Web Soil Survey. Retrieved August 1, 2015 from <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>

<sup>6</sup> Russell C. Evarts. 2004. Geologic Map of the Woodland Quadrangle, Clark and Cowlitz Counties, Washington. U.S. Geological Survey Scientific Investigations Map 2827

deposits, in turn, overlay Pleistocene Alluvium (Map unit Qsh) which consists of unconsolidated sand and gravel composed predominantly of volcanic debris. Underlying the alluvium at the base of the slopes is Holocene to Pleistocene Alluvium (map unit Qa) consisting of unconsolidated silt, sand, and gravel deposited within the Lewis River Valley and along smaller tributary drainages. These alluvium deposits contain fine-grained lacustrine, aeolian, and organic-rich marsh deposits locally.

### 6.2.3 Regional Groundwater

Evidence of near-surface water was observed within the unnamed drainage at the base of the east-facing slope of the Lewis River floodplain and on the east-facing hillside. No groundwater was encountered within test pits excavated within the highland plateau area and no signs of shallow groundwater were observed in our explorations. If on-site infiltration is planned, we would recommend that piezometer(s) be installed and monitored in any planned concentrated infiltration area(s) to confirm that there exists plenty of headroom for infiltration above the high winter groundwater levels.

### 6.2.4 Landslides

The slopes which border the plateau have been mapped by others<sup>7</sup> as being either active slides, inactive landslides or potentially unstable slopes. Both the east facing and west facing slopes within the subject property are designated either as inactive landslides or as potentially unstable slopes. An area of the west facing slope south of the main entrance of the sports complex has been identified as an active landslide as has a portion of the west facing slope north of the site.

Our reconnaissance mapping (Figure 4) indicated that the east-facing slopes, both north of and south of the connector road, appeared to be old landslides that are currently inactive. We based this on circular scarps identified at the tops of the slopes and on partial landslide debris at the base of the slope. In some instances, landslide debris was not evident and we attribute this to erosion within the unnamed creek at the base of the slope. The landslides appear to be shallow and translational in nature. They also appear to be centered within the unconsolidated silts of the Cataclysmic-Flood Deposits. No evidence of mid-slope groundwater is apparent. We have inferred that along the east-facing slope, the slides may be due to erosion of the toe of the slope during high water flow within the unnamed creek. The landslide to the south of the connector road extends to the top of the slope (a vertical distance of over 100 feet) and creates a near-vertical scarp at the top of the slope. Hydric plants at the toe of the slope indicate that the toe is partially submerged during parts of the year within the wetland. This also appears to be a thin, translational landslide formed in very steep unconsolidated silt inferred to be flood deposits (map unit Qfs). The ages of the landslides are uncertain but based on deciduous trees growing in the debris pile, we estimate that they are more than 40 years old. Further, we are

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<sup>7</sup> Wegmann, K. W., 2003, Digital Landslide Inventory for the Cowlitz County Urban Corridor- Kelso to Woodland (Coweem.an River to Lewis River), Cowlitz County, Washington: Washington Division of Geology and Earth Resources, Report of Investigations 34, version 1.0.

aware of no available anecdotal evidence of landslides in this area since Woodland was developed more than 100 years ago.

The west-facing slopes appear less steep averaging 35 degrees. Here, landslides have formed on the slopes of steep gradient side drainages which have incised the slope. The slope west of proposed Baseball Field No 5 and 6 appear less steep averaging 30 degrees and are covered by similar age deciduous trees. There was no landslide debris observed at the base of the slope. These slopes are described by others<sup>7</sup> as potentially unstable, although our observations indicate that the slopes are relatively stable. On the far western slope along Old Pacific Highway, we understand, based on anecdotal evidence, that an old saw shop was taken out by a landslide in the late 70's or early 80's.

### **6.3 Subsurface Soil Conditions**

The surface at most of the locations consists of 4 to 6 inches of lightly farmed and replanted soils, likely installed after the initial excavation. The purpose of the planting was likely to stabilize the exposed dusty subsoils. Test pits TP-1 and TP-2, and the testing in P-9 represent the conditions along the connecting road. TP-1 consists of very stiff to stiff clay and silt, likely representative of the conditions at the west abutment of a potential crossing at that location. TP-2 is likely represents the deep section of the silt and fine sand flood deposits because it is in the deep part of the connecting road cut. The surficial silt in TP-10, TP-15 and P-1 likely represents the surficial silty portion of the flood deposits that has been removed from the rest of the site.

Overall, the subsurface conditions observed at the site were relatively uniform, consisting of an upper thin layer of organics underlain by variable consistency silty fine sand. The sand is interpreted to be flood deposits (map unit Qfs). The sand contains occasional silt and clay 6-inch-minus-size peds or nodules embedded in the sand indicating a "mixing" action in the deposition process. The test pits indicated generally decreasing silt content with depth. The sand becomes moister with depth, as would be expected.

### **6.4 Groundwater and Soil Infiltration**

No groundwater was encountered in the test pits. The results of infiltration testing and related percent fines results are summarized in Table 1 as follows.

**Table 1 – Summary of Soil Infiltration Results**

Test Hole Number	Depth, base of Test Zone (feet)	Soil Description in Test Zone	Average Infiltration Rate (inches/hour)	Fines (percent)
P-1	9.0	Fine sandy SILT	3.6	57
P-2	4.5	Silty fine SAND	3.8	27
P-3	5.5	Silty fine SAND	6.6	42
P-4	3.5	Silty fine SAND	6.5	53
P-5	5.5	Silty fine SAND	11.0	29
P-6	5.0	Silty fine SAND	7.5	Not tested
P-7	5.0	Silty fine SAND	4.1	25
P-8	5.5	Silty fine SAND	4.3	Not tested
P-9	7.0	Organic SILT	3.5	Not tested

## 7.0 GEOTECHNICAL ISSUES

The geotechnical work is intended to support proposed new construction consisting of site grading for athletic fields; some with a natural grass and some with turf substrate, grading for pavements and parking areas, foundations for minor structures such as small concession buildings and restrooms, support for light poles, and potential major structures such as large walls to support soccer fields S-1, S-2 and S-3 with a culvert or bridge crossing to the east of the secondary access. As indicated, additional work will be needed for the major structures. This document summarizes preliminary reconnaissance and exploration work completed in advance of completing the final planning phase. As that planning and design work progresses, the geotechnical information presented in this report can be used to assist in optimizing the design.

In general, it appears that the park can be efficiently built based on our geotechnical results. The exposed near-surface soils are consistently firm, well drained, and are particularly well suited to the proposed park development. The side slopes of the plateau appear stable. A significant amount of work consisting of about 10 acres of clearing and an estimated 50,000 to 100,000 cubic yards of site grading, has already been completed. We did not detect a previous disposal site within or surrounding the park site; thus, we assume all of the stripped brush, woody material, and organic topsoil has been disposed of off the site. Similarly, it appears that most or all of the excavated soils were moved down to the east site, off of the park site. No loose or undocumented fill zones were detected in our explorations. Only a thin zone of brush and topsoil removal will be required.

The infiltration test results (Table 1) show consistently high infiltration rates indicating a well-drained site. This is a particularly good result for large areas of athletic fields, roads and parking needing drainage. Thus, if properly constructed, a significant portion of any precipitation hitting the fields or roadways (if permeable pavement is used) will just soak directly into the ground. It is particularly important to not reduce this natural drainage effect by installing impermeable planting zones or impermeable soil on top of the sandy soils. It is also important to not over compact the subgrade beneath the fields or roadways.

The site soils appear suitable for use both as subgrade or foundation materials and as compacted structural fill when excavated. Care should be taken when using sandy soils as trench backfill, or in zones of concentrated water flow. The mixture of sandy soils and saturated or flowing water conditions can result in unintended failures. Erodible "Running" sands are difficult to contain on slopes, behind walls, in subgrade areas beneath buildings or paved areas, in trenches, and in subgrade areas that might be subjected to concentrated water flow or ponding whether intended or not intended. Thus, there should be no areas of uncontrolled surface or subsurface flows existing on the site. This is particularly true for drain exit areas on the margins or on slopes surrounding the site. There should be no drains existing onto any slope. All drainage should be carried to the base of any slope and properly diffused.

Groundwater levels are generally below zones that might be affected by the development. The major cost items would likely be dealing with the potential of a shortage of suitable fills for roadway construction and leveling the fields, and for constructing suitable drainage or infiltration systems for dealing with storm water drainage and disposal over a large area.

### **7.1 Strippings**

Removal and disposal of strippings and soft soils in building, road, and athletic field areas has already been completed once. Light stripping will be required to remove the replanted grass and shallow roots. Significant stripping and removal of woody materials may be required in construction areas expanded beyond the already excavated zone. In general, site preparation will consist of light brushing and removal and disposal of 2 to 4 inches of the surface topsoil. Removal of a few inches thickness of topsoil over the developed areas will still generate a significant volume of material requiring disposal. The strippings are not suitable for structural fill but can be used in landscape areas, stockpiled in stable non-erosive piles, or hauled off site.

### **7.2 Groundwater**

Groundwater was not encountered in our test pit explorations. Because the site is elevated and well drained, groundwater will likely not impact the construction or operation of the park site. As previously indicated, depth to high (winter) groundwater level should be confirmed if on-site infiltration is contemplated.

### **7.3 Structural Fills for Building, Road, Parking and Athletic Field Areas**

Even though the site has been graded and flattened, there still exists significant relief on the order of 15 feet maximum across the site. Roadway and parking lot grading can be designed to generally follow the ground contours. A relatively large structural fill will be required to fill the existing infiltration pond dig out. Large natural

grass athletic fields must be leveled, sloped and/or crowned, and thus, may require significant grading to achieve a level surface over the width and depth of the fields. Artificial turf fields can be gently sloped to match the existing sloping ground, but may be built flatter since the turf fields are designed for drainage to flow through into the underlying gravels.

#### **7.4 Natural Grass Athletic Fields**

Drainage and growth support media for natural grass athletic fields require specialized drainage and growth support media so that the athletic fields can remain playable during the wet season and over the projected life of the facilities. Design of year-round-use fields is possible, though not common, in our wet climate. The design of these turfs are highly specialized and require selectively graded materials that can only be procured at a high cost relative to standard select fills. The costs may be significantly mitigated due to the sandy nature of the existing on-site subgrade soils. In my experience on these types of park projects, it becomes tempting to accept "substandard" (typically donated) materials near the end of the design/construction process when funds are dwindling. It is also my experience that the use of substandard materials is rarely cost effective in the long term. We strongly recommend that the designers procure the services of a specialized turf designer and commit to spend the dollars necessary to construct natural grass turf that is useable year round.

#### **7.5 Artificial Turf Athletic Fields**

The supporting subgrade, drainage requirements, grading, material types, specifications, and placement requirements are typically closely controlled by the turf manufacturers in order to implement the conditions of their warranty. A stiff compacted subgrade topped by 6 inches of coarse free-draining gravel, which in turn is topped by 2 inches of fine free-draining gravel, is a typical section. The turf can then be placed on top of the fine gravel. Each of the subgrade, coarse gravel, and fine gravel surfaces must be fine graded to close tolerance before the next layer is installed. Typically, the topping fine gravel must be graded to within ¼ inch of the neat line design prior to turf placement. Sub-drain systems are also commonly installed with the coarse gravel lift to supplement storm water flow through the gravel. Such an installation might consist of flat drains directed into the storm drain system. In the case of on-site infiltration, the storm drain system for the turf would consist of gravel-filled drainage trenches dug into the sandy subgrade. These would be placed between the fields and sized to infiltrate a significant portion of the runoff. Depending upon the amount of anticipated flow, the drainage trenches can further be directed to deep infiltration galleries. Any significant on-site infiltration injection area should be placed a minimum of 200 feet away from any steep slopes defining the edge of the plateau to minimize the potential for triggering landslides at the margins of the plateau. Further, winter groundwater levels should be determined so that the site can accommodate the anticipated inflow. These can be evaluated during the design phase.

## 8.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

### 8.1 Earthwork

#### 8.1.1 Excavations

All excavations can be accomplished with conventional excavating equipment. Because of safety considerations and the nature of temporary excavations, the contractor should be made responsible for maintaining safe temporary cut slopes and supports for utility trenches, etc. We recommend that the contractor incorporate all pertinent safety codes during construction including the latest Occupational Safety and Health Administration (OSHA) excavation requirements based on soil conditions and groundwater evidenced in cuts made during construction.

#### 8.1.2 Site Preparations

The existing, near-surface, and topsoil and root zone (organics) should be stripped and removed from the project site in all proposed improvement areas and a 5-foot margin around such areas. Mostly grass, an occasional tree, and shrubs should be removed from all improvement areas. Most of the stripping depths will be minimal from about 2 to 4 inches deep in the pre-excavated areas and deeper in undisturbed areas around the margins of the site.

CGS recommends that soil and subgrade disturbed during stripping operations be removed to expose firm undisturbed subgrade. Materials generated during stripping should be transported off the site or stockpiled for use in landscape areas. Excavated materials underlying the stripped sections can be selectively used for structural fill. Demolition might include removal and backfilling of the previously-installed buried pipe (assuming they are not incorporated into the existing project). We understand that there are no utility lines crossing the main portion of the site, with the exception of a water supply line that may cross somewhere in the vicinity of TP-3 and P-5 (refer, Figure 3).

Following stripping and prior to placing fill, pavement, or building improvements, the exposed subgrade should be evaluated by proof rolling. The subgrade should be proof rolled with a fully-loaded dump truck or similar heavy, rubber-tire, construction equipment to identify soft, loose, or unsuitable areas. A member of our geotechnical staff should observe the proof rolling. Soft or loose zones identified during the field evaluation should be lightly compacted to a firm condition or be excavated and replaced with structural fill, as discussed in the Structural Fill Section of this report. A CGS engineer should confirm the stripping depths and perform the proof roll.

#### 8.1.3 Wet Weather Construction

Construction during wet weather times of the year involving earthwork, grading, or construction traffic on the subgrade or partially finished roadways is not recommended for this site. The soils are extremely moisture sensitive and will be difficult, if not impossible, to work with in wet conditions.

If wet weather construction is required, alternative subgrade preparation methods will be required. One option would be to thicken the rock sections beneath access and construction roadways and use select imported rock rather

than native soils for structural fill. Wet subgrade materials may be able to be cement treated to facilitate construction. Cement treatment creates an impermeable subgrade and is not recommended for this site. Our office should evaluate site conditions prior to choosing a mitigation method. Please be aware that it is our experience that wet weather construction is typically more than twice the cost of standard construction.

#### **8.1.4** *Drainage*

The above indicated infiltration testing indicates sandy relatively well drained subgrade materials to depth over most of the site. Thus the native sandy soils used for subgrade or structural fill will likely provide a significant amount of informal drainage beneath the facilities. The infiltration tests were run on in-place, uncompacted soils. In improved areas, where the subgrade is compacted or structural fill is placed, the infiltration rates will be somewhat degraded. Thus, the infiltration rates should be conservatively applied when designing the storm water disposal system.

#### **8.1.5** *Structural Fills*

Depending upon finished roadway and athletic field final elevations, structural fills may be required to raise the site grades. Native material or imported material may be used for fill, provided the soil is comparably free draining, free of organics, cobbles larger than 6-inches in maximum diameter, or other deleterious matter; is of low plasticity and is at the proper water content.

At the time of our investigation, the sandy subgrade soils at the site had moisture contents that were generally judged to be variable; thus, the soils will need to be moisturized to achieve optimum moisture content for compaction.

Fills should be placed on level benches in 12-inch loose lifts and compacted to a dry density of at least 95 percent of its maximum dry density (MDD) as determined by the Standard Proctor Test (ASTM D-698). However, within 2 feet of the backs of any retaining walls, the fill should only be compacted to 92 percent of its MDD in order to limit the surcharging of the walls by the compacting equipment. The wall compaction requirement may be altered based on the typed of wall, or manufactures requirements if commercial wall installations are used.

Structural fill slopes should be placed and compacted beyond the final slope configuration and then trimmed back to a final maximum grade of 2H:1V (horizontal to vertical.). In areas where ponded water or flow through is anticipated to impinge at the top or base of the slope, slope grades will likely need flattening and should be evaluated by CGS on an individual basis.

#### **8.1.6** *Fills on Slopes*

All unretained fills to be placed on slopes steeper than 6H:1V will need to be keyed and benched into competent native materials. Any retained fills will need to be benched in competent native materials; however, a formal keyway is not required. The entire base of any keyway should extend into competent native soils. The entire bases of all benches should extend into or through competent

soils, as identified in the field by representatives from our office. It should be anticipated that the outer edge of bench excavations would extend at least 2 feet below native grade. Keyways should be at least 1½ times as wide as the compaction equipment, with a width no less than 10 feet. Keyways and benches should be sloped back into the hillside at a minimum 2 percent gradient.

For fills located in drainage swales or where deemed necessary by our personnel, sub drains should be provided within the fill (generally at keyway excavations). Sub drains will typically consist of a minimum 12-inch-wide column of drain rock, wrapped with filter fabric for at least half the height, and for the full width of the bench. These systems should drain to daylight

### **8.1.7** *Cut Slopes*

Cut slopes in native materials less than 10 feet tall and engineered fill slopes may have a maximum gradient of 2H:1V. Cut slopes in similar materials over 10 feet tall should be analyzed and approved by our office on an individual basis. The 20-foot-plus-high cut for the connector road seems to be at a 3H:1V slope. As with the fill slopes, areas where ponded water or flow through may impinge at the top or base of the slope, slope grading should be evaluated by CGS on an individual basis.

### **8.1.8** *Erosion Control and Drainage*

Newly exposed cut and fill slopes and subgrade surfaces will be susceptible to erosion and should be revegetated or otherwise protected as soon as practical after construction. If it is anticipated that an adequate vegetative cover may not be established before the onset of the winter wet season, a heavy mulch cover or erosion netting may be necessary to minimize erosion.

Water should not be allowed to pond or stand on any graded pads. Areas that could allow ponding water should be graded and sloped to drain. The surface runoff from graded areas should not be allowed to drain over any slopes.

## **9.0 FOUNDATION DESIGN**

### **9.1** *Foundation Design*

The native soils at the site should be prepared in accordance with Site Preparation Section of this report. The building foundations may be installed on either firm native subgrade or engineered structural fill. Continuous wall and isolated spread footings should be at least 18 inches or 2 feet wide, respectively. The bottom of exterior footings should be at least 18 inches below the lowest adjacent exterior grade. The bottom of interior footings should be established at least 12 inches below the base of any floor slab.

Footings bearing on prepared firm native subgrade or structural fill should be sized for an allowable bearing capacity of 2,000 pounds per square foot (psf). This is a net bearing pressure. The weight of the footing and overlying backfill can be disregarded in calculating footing sizes. The recommended allowable bearing pressure applies to the total of dead plus long-term-live loads, and this bearing pressure may be doubled for short-term loads such as those resulting from wind or seismic forces.

Based on the CGS analysis, total post-construction settlement was estimated to be less than one (1) inch, with post-construction differential settlement of less than 0.5 inch for the lightly loaded structures we anticipate for this project.

Lateral loads on footings can be resisted by passive earth pressure on the sides of the structures and by friction at the base of the footings. An allowable passive earth pressure of 250 pounds per cubic foot (pcf) may be used for footings confined by native soils and new structural fills. Adjacent floor slabs, pavements, or the upper 12-inch depth of adjacent unpaved areas should not be considered when calculating passive resistance. For footings in contact with native soils, use a coefficient of friction equal to 0.5 when calculating resistance to sliding.

A CGS geotechnical engineer (or designated representative) should confirm suitable bearing conditions and evaluate all footing subgrades. Observations should also confirm that loose or soft material, organics, unsuitable fill, and old topsoil zones are removed. Localized deepening of footing excavations may be required to penetrate any deleterious materials.

If construction occurs during wet weather, we recommend that a thin layer of compacted crushed rock be placed over the footing subgrades to help protect them from disturbance due to foot traffic and the elements.

The footings should be founded below a line projected at a 1H:1V slope from the base of any adjacent, near parallel, open or backfill excavations such as utility trenches. Any footings placed adjacent to any slopes must be embedded so that a minimum of 10 feet of horizontal distance is between the face of the footings and any adjacent, parallel slope.

## 9.2 Retaining Walls

The following is for walls less than 8 feet high. Any unrestrained retaining walls required for the proposed construction should be designed to resist an active pressure of 35 pounds per cubic foot (pcf) equivalent fluid weight (EFW) in supporting soils with retained slopes less than 4:1 (H:V). An active pressure of 50 pcf EFW should be used for retained slopes with an inclination of 2H:1V. Where retained slopes are greater than 4H:1V, though less than 2H:1V, the designer should linearly interpolate between 35 and 50 pcf EFW.

Any restrained retaining walls required should be designed for the aforementioned active pressures with an additional surcharge of 10 pcf EFW. We leave it to the design professional's judgment in determining whether a wall is restrained or not.

All retaining walls should also be designed to account for any surcharge loads (e.g., footings, vehicles, etc.) that are applied to the ground surface within a zone extending away from the back of the wall, a distance equal to the total height of the wall. Our office should be contacted for the design of walls greater than 8 feet high and for appropriate surcharges to be applied to the back of any walls. The actual surcharge distribution and magnitude on the wall will vary depending upon the size and location of the applied load.

### 9.3 Floor Slabs

Satisfactory subgrade support for building floor slabs can be obtained from the native subgrade and prepared in accordance with our Site Preparation Section. A minimum 6-inch-thick layer of imported granular material should be placed and compacted over the prepared subgrade for the small concession or restrooms contemplated for this project. Larger buildings should be evaluated by CGS on an individual basis. Imported granular material should be crushed rock or crushed gravel that meet specifications provided in the Oregon Department of Transportation (ODOT) SS 00330.14 – Selected Granular Backfill, and have less than 5 percent weight by passing the U.S. Standard No. 200 Sieve.

### 9.4 Poles

An allowable passive earth pressure of 250 pounds per cubic foot (pcf) may be used for poles supported within by native soils and/or new structural fills. Adjacent floor slabs, pavements, or the upper 12-inch depth of adjacent unpaved areas should not be considered when calculating passive resistance. The embedment conditions and quality of support materials should be confirmed during pole installation, particularly for large light poles.

## 10.0 PAVEMENTS

Based on our investigation results, the controlling subgrade material will be native medium dense to dense silty sand. Although not run as part of our scope, we estimate California bearing ratio (CBR) value on the order of 8 to 10 percent for the sandy subgrade material. Assuming mostly car-type traffic with occasional busses and trucks and assuming no construction traffic on finished subgrade or pavement sections, we can assume an asphalt concrete (flexible, AC) pavement thickness on the order of 3 inches of AC over 8 inches of compacted crushed rock in the travel and drop-off areas and 2.5 inches of AC over 6 inches of crushed rock base in the parking areas. These design thicknesses and materials details should be confirmed once traffic data becomes available.

Rigid portland cement concrete (PCC) pavements will perform better than AC in areas where short-radii turning and braking are expected (i.e., entrance/exit aprons and drop off areas) due to better resistance to rutting and shoving. Insets of PCC should be considered in high or heavy traffic areas.

Permeable brick, concrete, or AC pavements should also be considered given the sandy nature of the subgrade soils.

## 11.0 SEISMIC DESIGN CRITERIA

The seismic design criteria for this project is based on the 2012 IBC, Section 1613, and is taken from the US Geological Survey (USGS) Design Maps Summary Report. The seismic design criteria in accordance with the IBC are summarized in Table 2 as follows.

**Table 2: 2009 NEHRP Seismic Design Parameters**

	Short Period	1 Sec
Maximum Credible Earthquake Spectral Acceleration	$S_s = 0.907 \text{ g}$	$S_1 = 0.409 \text{ g}$
Site Class	D	
Site Coefficient	$F_a = 1.137$	$F_v = 1.5911$
Adjusted Spectral Acceleration	$S_{MS} = 1.032 \text{ g}$	$S_{M1} = 0.651 \text{ g}$
Design Spectral Response Acceleration Parameters	$S_{DS} = 0.688 \text{ g}$	$S_{D1} = 0.434 \text{ g}$

NEHRP = National Earthquake Hazards Reduction Program

## 12.0 LIMITATIONS AND RESTRICTIONS

The analysis, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of explorations and assume the soil test pits are representative of the subsurface conditions throughout the site. If during construction, subsurface conditions are found to differ from those encountered in the explorations, we should be advised at once so that we may review these conditions and reconsider our recommendations where necessary.

## **FIGURES**

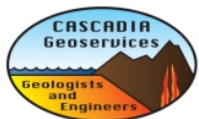
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Figure 1: Location Map

Figure 2: Conceptual Plan

Figure 3: Site Plan

Figure 4: Site Reconnaissance Map



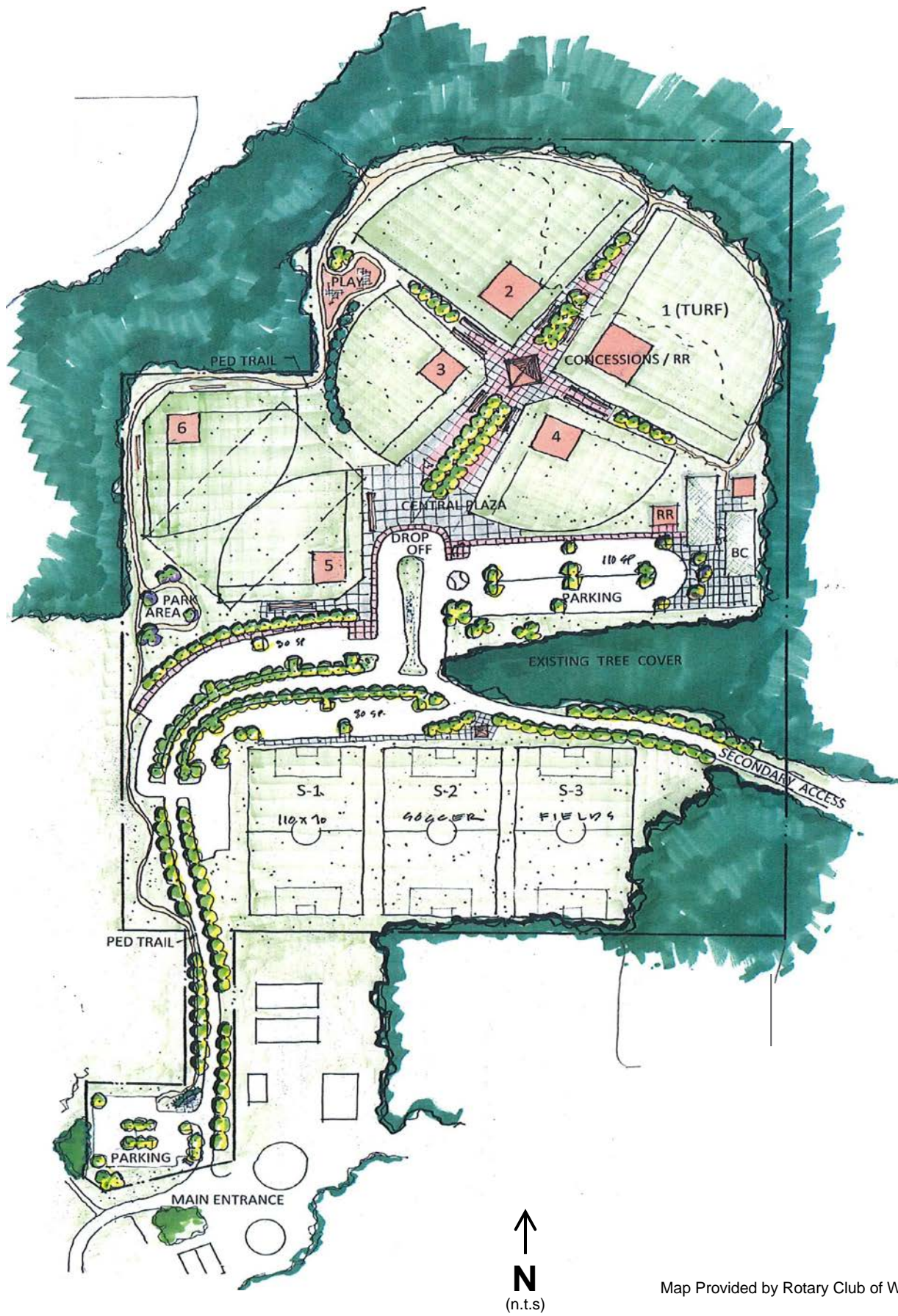
Project No: 15017

Date: July , 2015

**LOCATION MAP**  
 Scott Hill Park and Sports Complex  
 Woodland, Washington

FIGURE

1



Map Provided by Rotary Club of Woodland

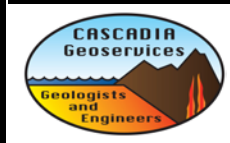
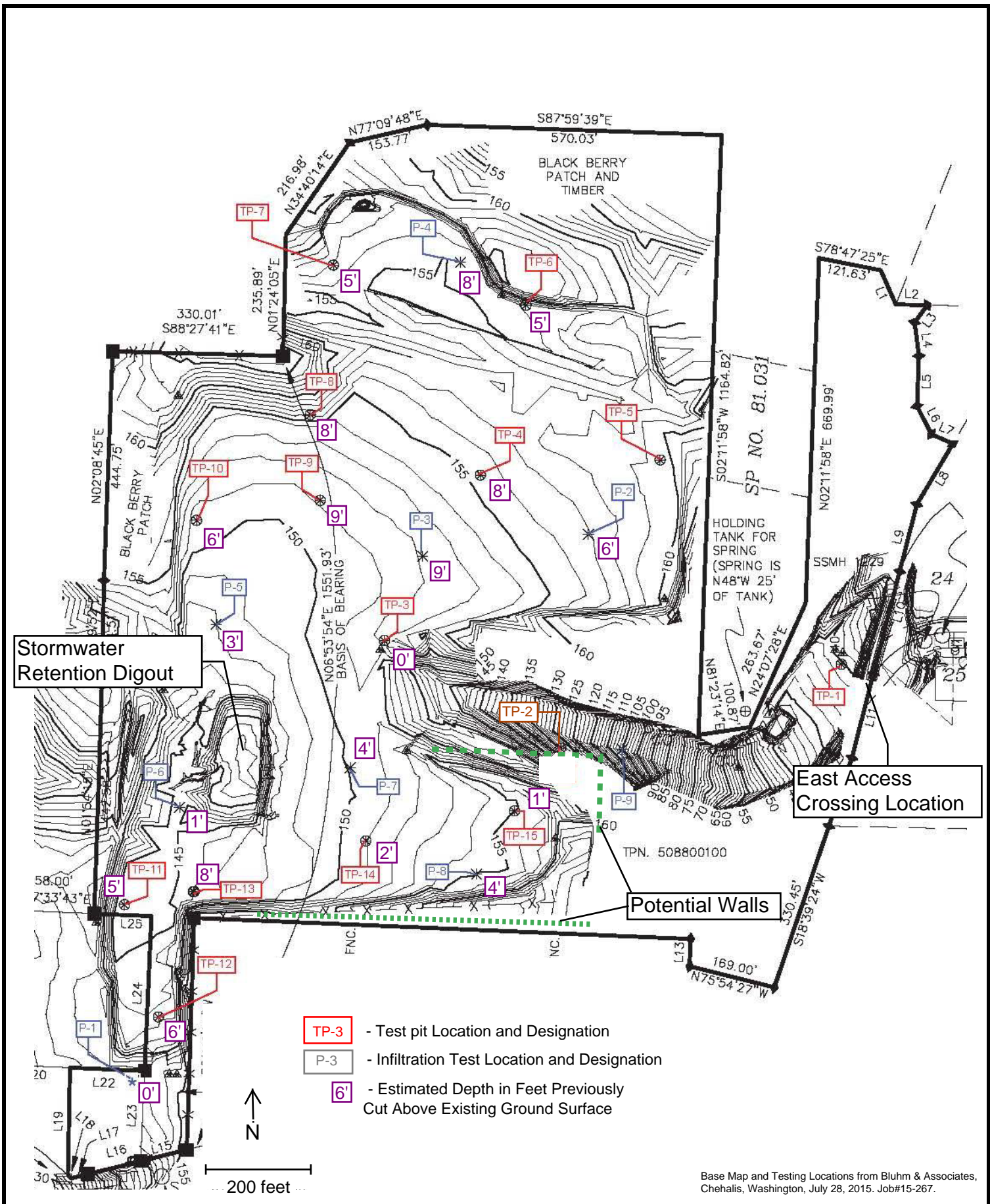


**PROJECT**  
15012

**DATE**  
September 2015

**CONCEPTUAL PLAN**  
Scott Hill Park and Sports Complex  
Woodland, Washington

**FIGURE**  
2

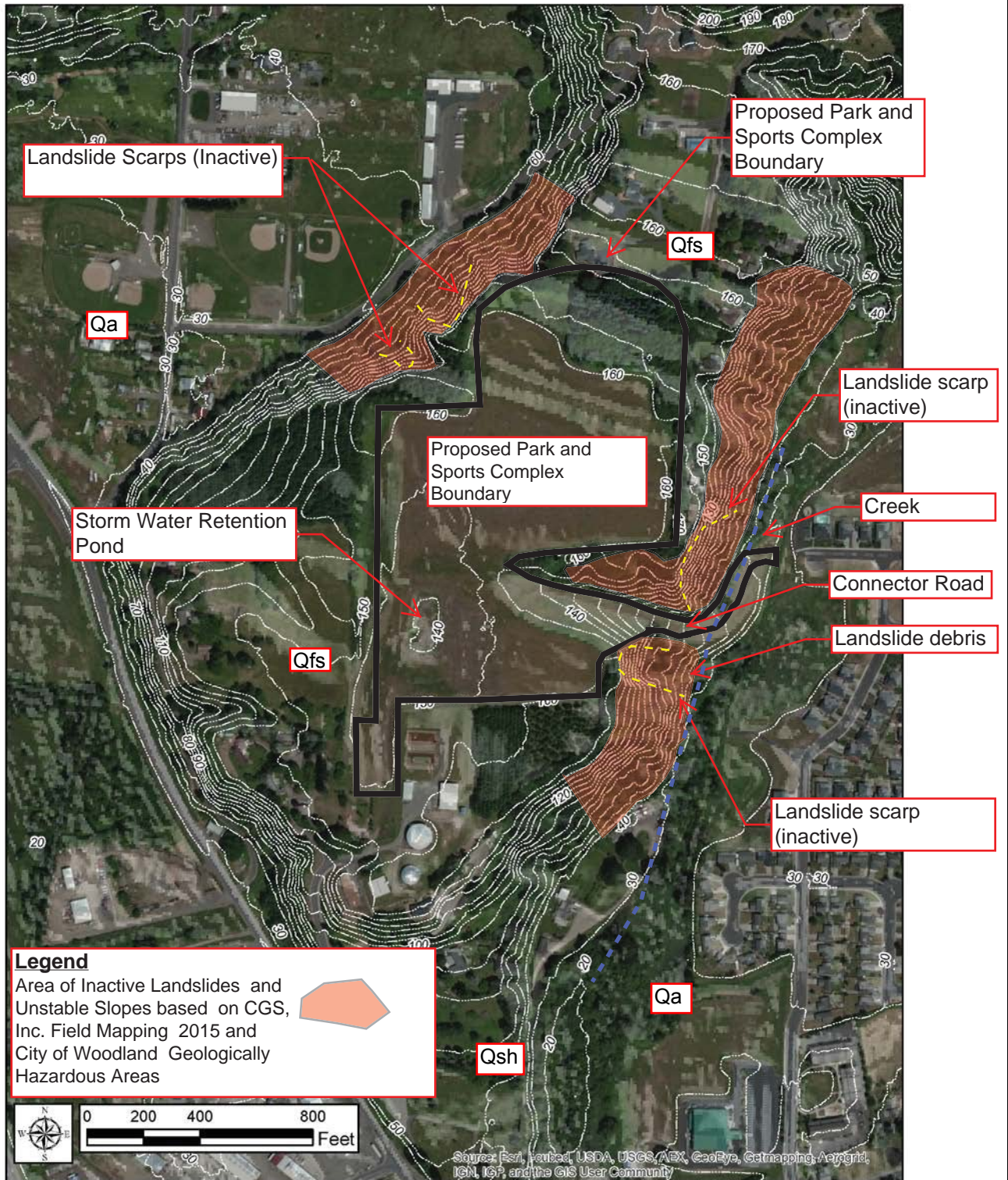


**PROJECT**  
15012

**DATE**  
September 2015

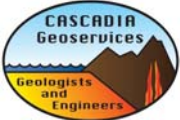
**SITE PLAN**  
 Scott Hill Park & Sports Complex  
 Woodland, Washington

**FIGURE**  
3



Base map by Shannon & Wilson, 2014

Prepared for Woodland Rotary

	<b>PROJECT</b> 15012	<b>GEOLOGIC SITE RECONNAISSANCE MAP</b> Scott Hill Park & Sports Complex Woodland, Washington	<b>FIGURE</b> 4
	<b>DATE</b> Sept., 2015		

## **APPENDIX A**

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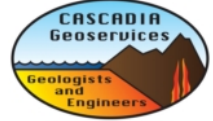
Test Pit Logs TP-1 through TP-15

**FIGURE TP-1**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

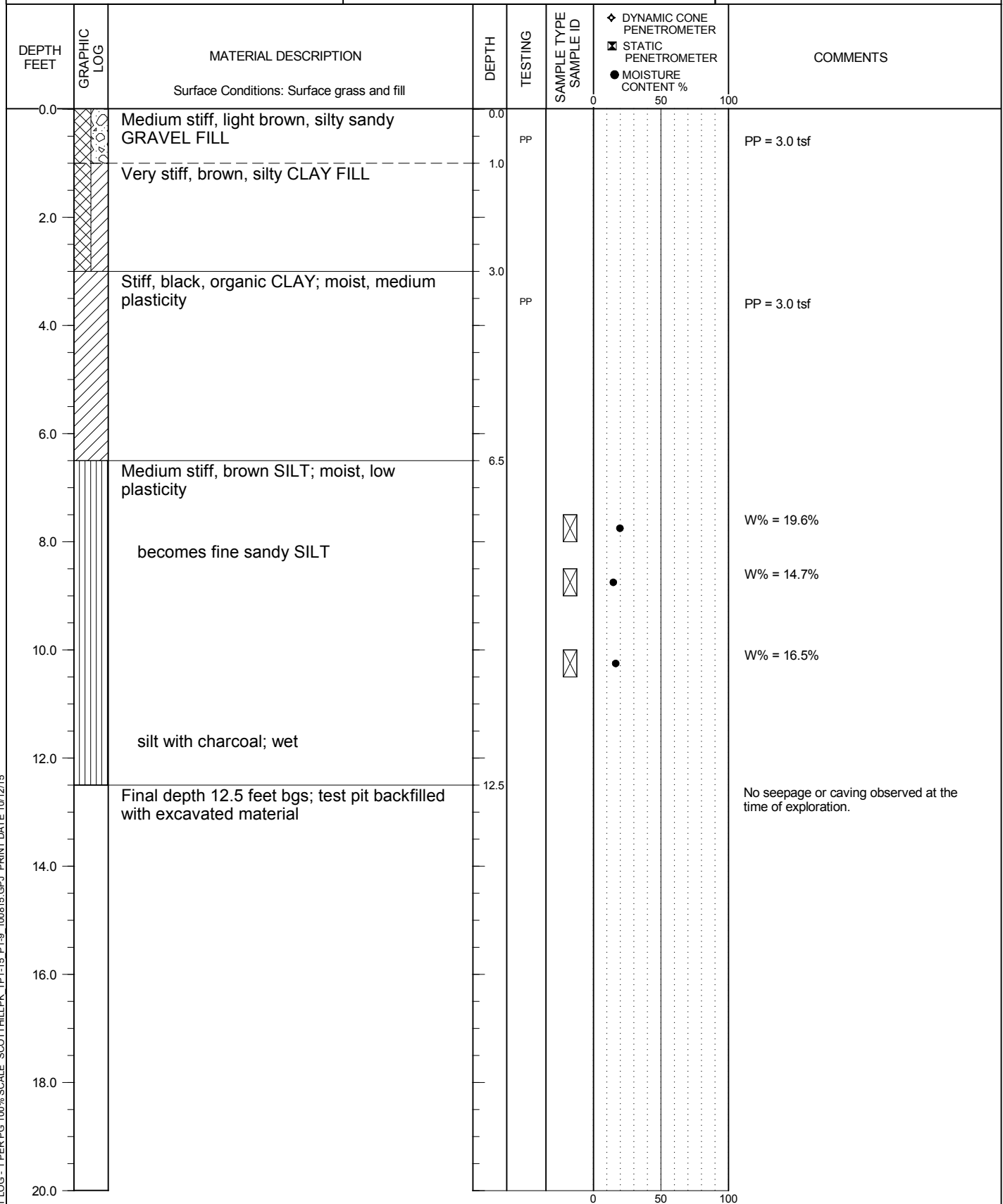
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-1 LOCATION:  
Base of ramp near crossing

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: E. Oberbeck & R. Thrall  
COMPLETED: 7/22/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

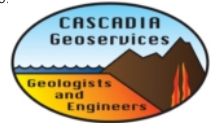
**TEST PIT TP-1**

**FIGURE TP-2**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

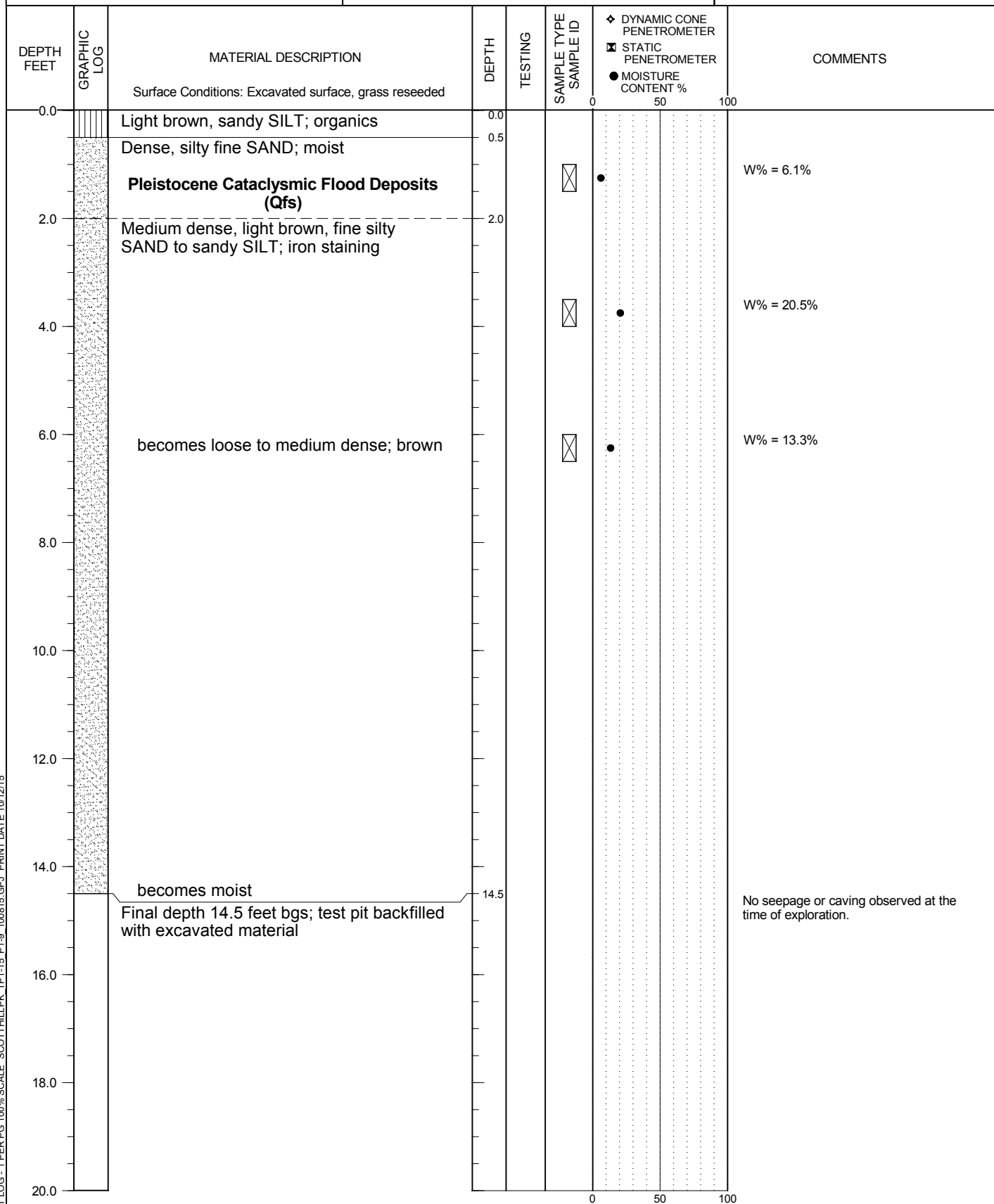
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-2 LOCATION:  
Halfway up ramp below top of cut

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: E. Oberbeck & R. Thrall  
COMPLETED: 7/22/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

**TEST PIT TP-2**

**FIGURE TP-3**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

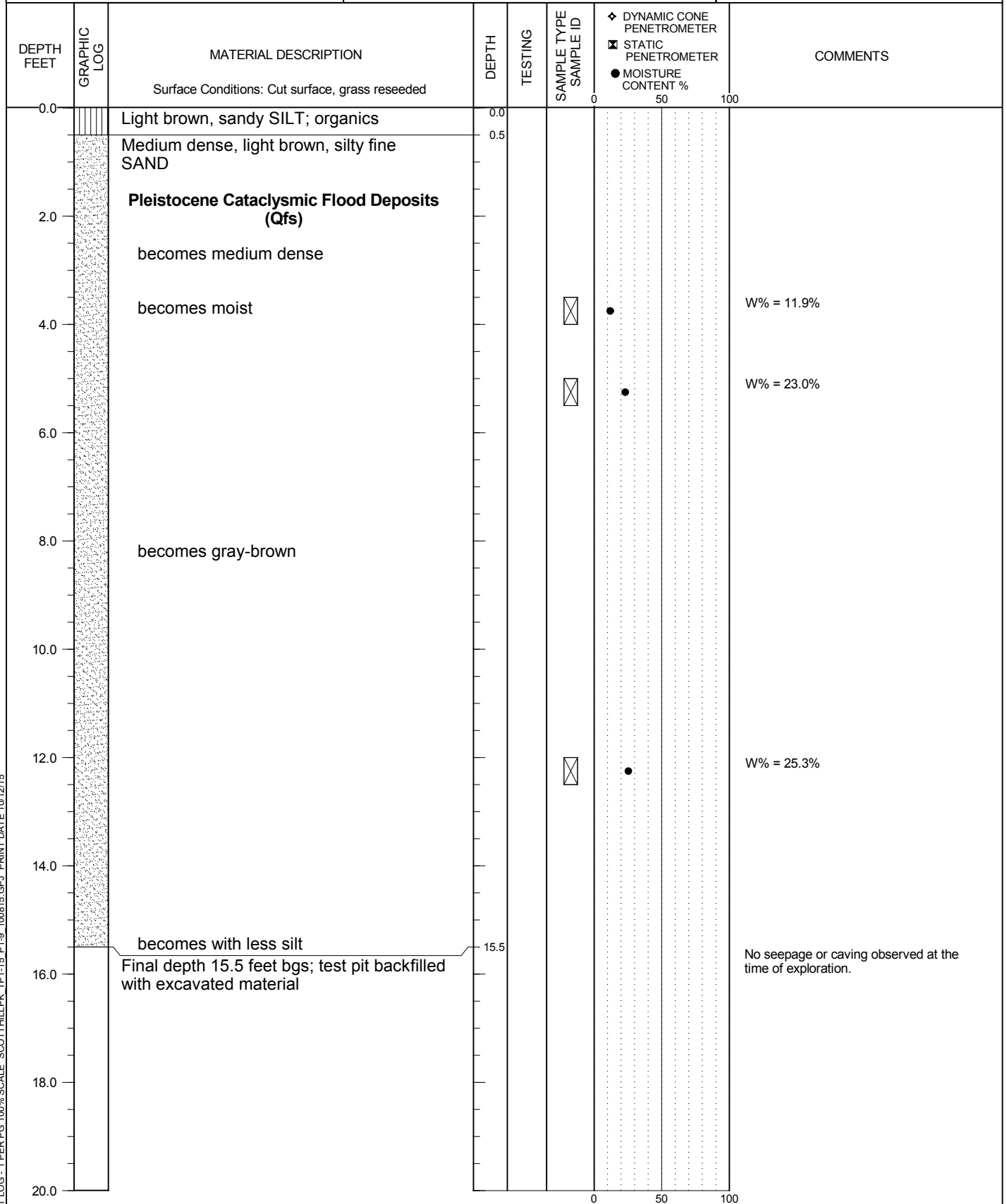
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-3 LOCATION:  
Just to the north at top of ramp

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP-1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: E. Oberbeck & R. Thrall  
COMPLETED: 7/22/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

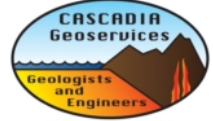
**TEST PIT TP-3**

**FIGURE TP-4**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

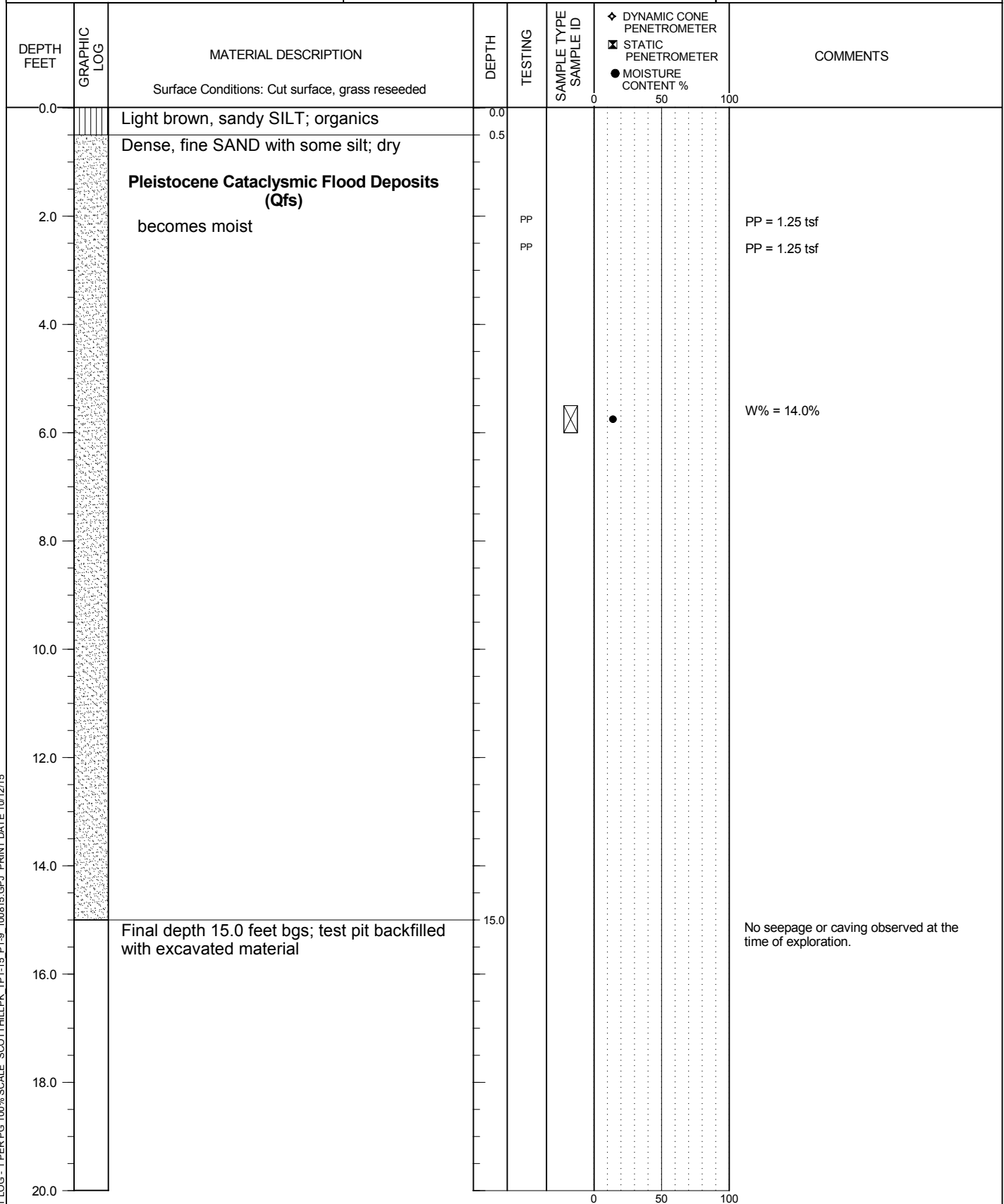
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-4 LOCATION:  
Center of north section (see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: E. Oberbeck & R. Thrall  
COMPLETED: 7/22/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

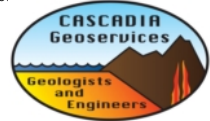
**TEST PIT TP-4**

**FIGURE TP-5**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-5 LOCATION:  
East side of north section (see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	<input type="checkbox"/> DYNAMIC CONE PENETROMETER <input checked="" type="checkbox"/> STATIC PENETROMETER <input type="checkbox"/> MOISTURE CONTENT %	COMMENTS
0.0		Surface Conditions: Cut surface, grass reseeded	0.0				
0.3		Light brown, sandy SILT; organics	0.3	PP			PP = 2.25 tsf
		Stiff, brown, fine sandy SILT		PP			PP = 4.5 tsf
2.0		<b>Pleistocene Cataclysmic Flood Deposits (Qfs)</b>					
2.5		Loose to medium dense, brown, silty fine SAND; moist	2.5				
4.0							
6.0							
8.0							
10.0							
12.0							
14.0							
15.5		Final depth 15.5 feet bgs; test pit backfilled with excavated material	15.5				No seepage or caving observed at the time of exploration.
16.0							
18.0							
20.0							

TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP-1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: E. Oberbeck & R. Thrall  
COMPLETED: 7/22/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

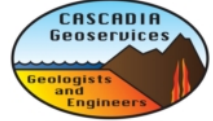
**TEST PIT TP-5**

**FIGURE TP-6**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

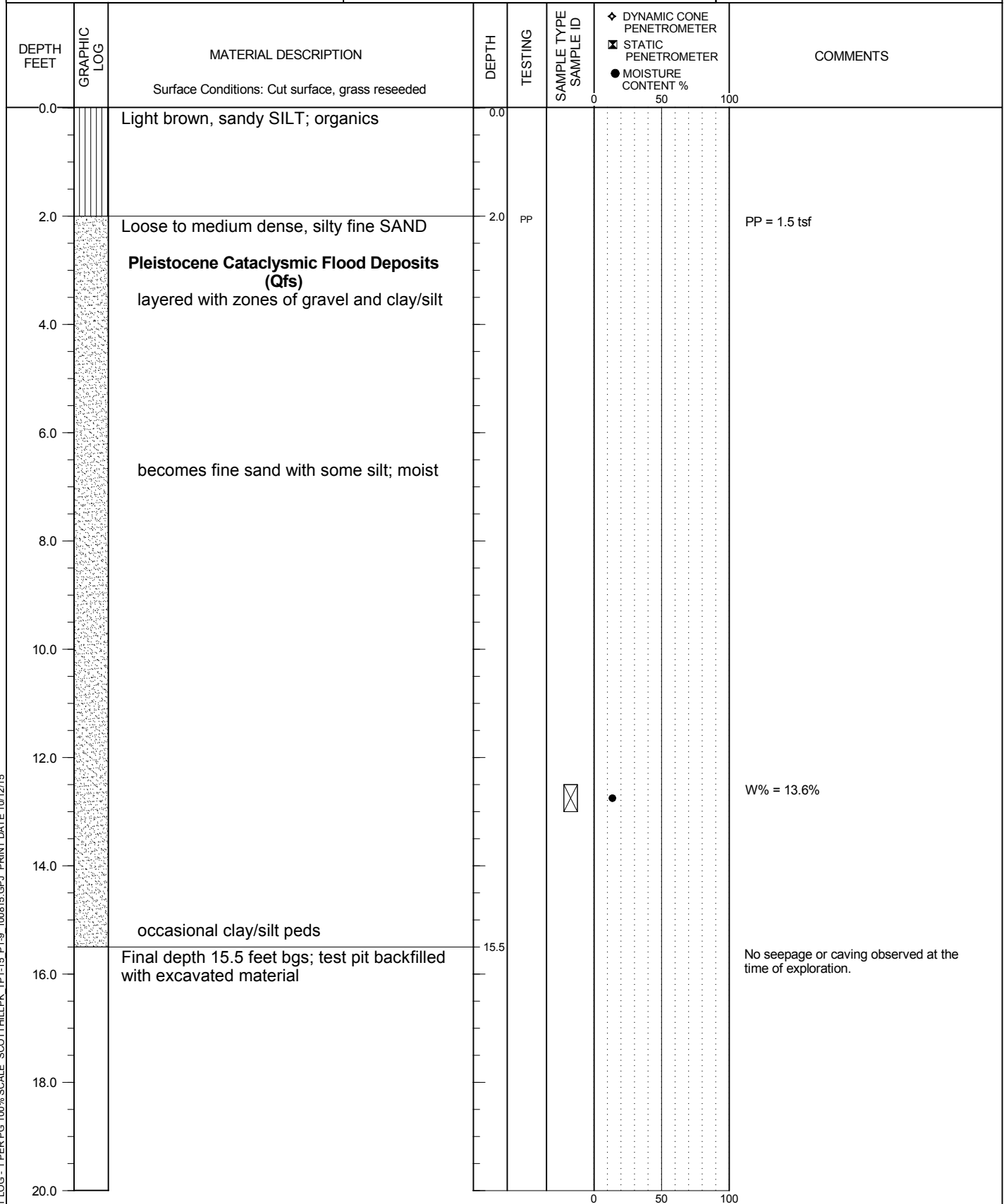
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-6 LOCATION:  
Northeast corner of site (see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP-1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: E.Oberbeck & R. Thrall  
COMPLETED: 7/22/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

**TEST PIT TP-6**

**FIGURE TP-7**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

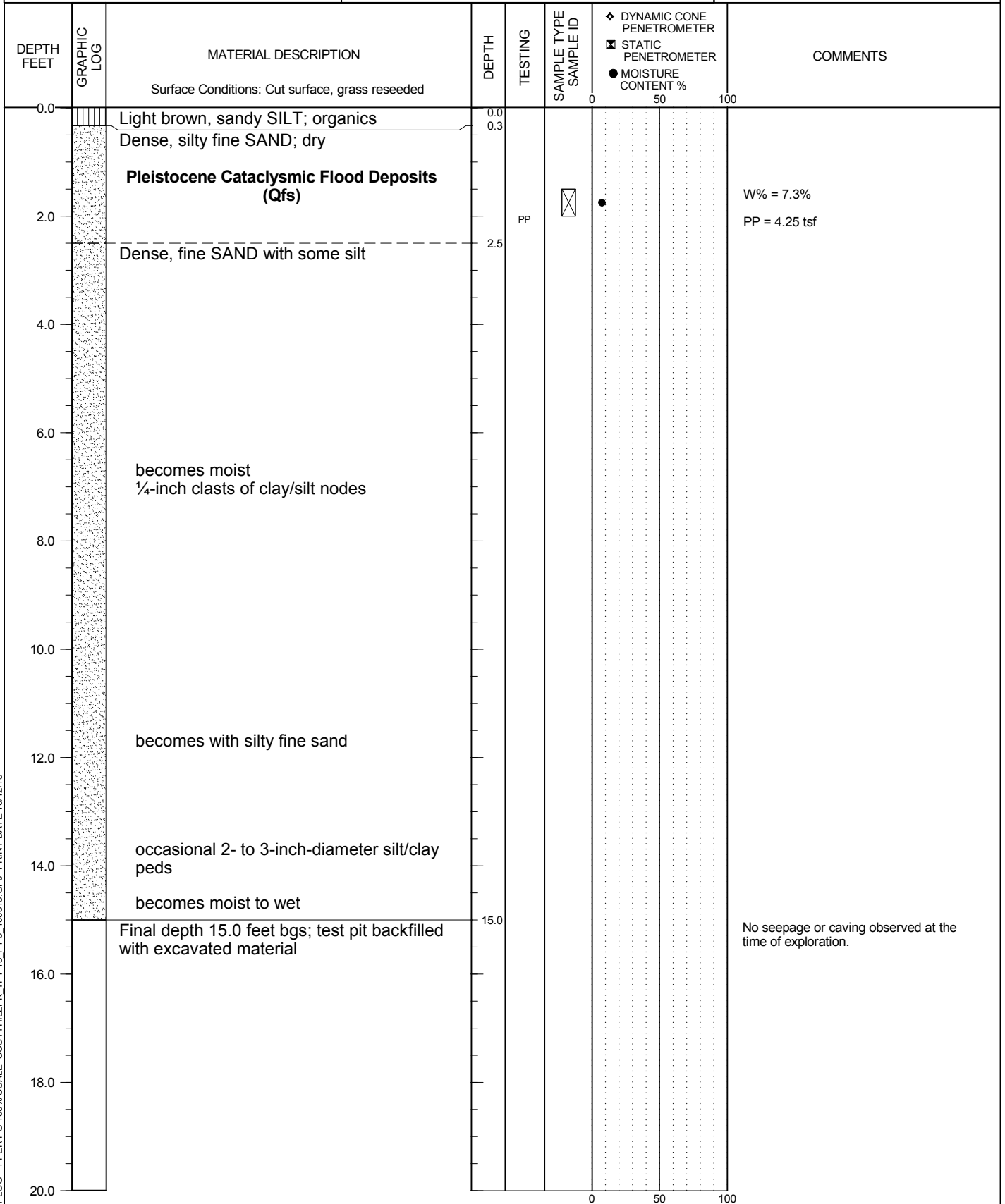
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-7 LOCATION:  
Northwest corner of site (see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: E. Oberbeck & R. Thrall  
COMPLETED: 7/22/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

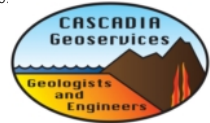
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**FIGURE TP-8**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

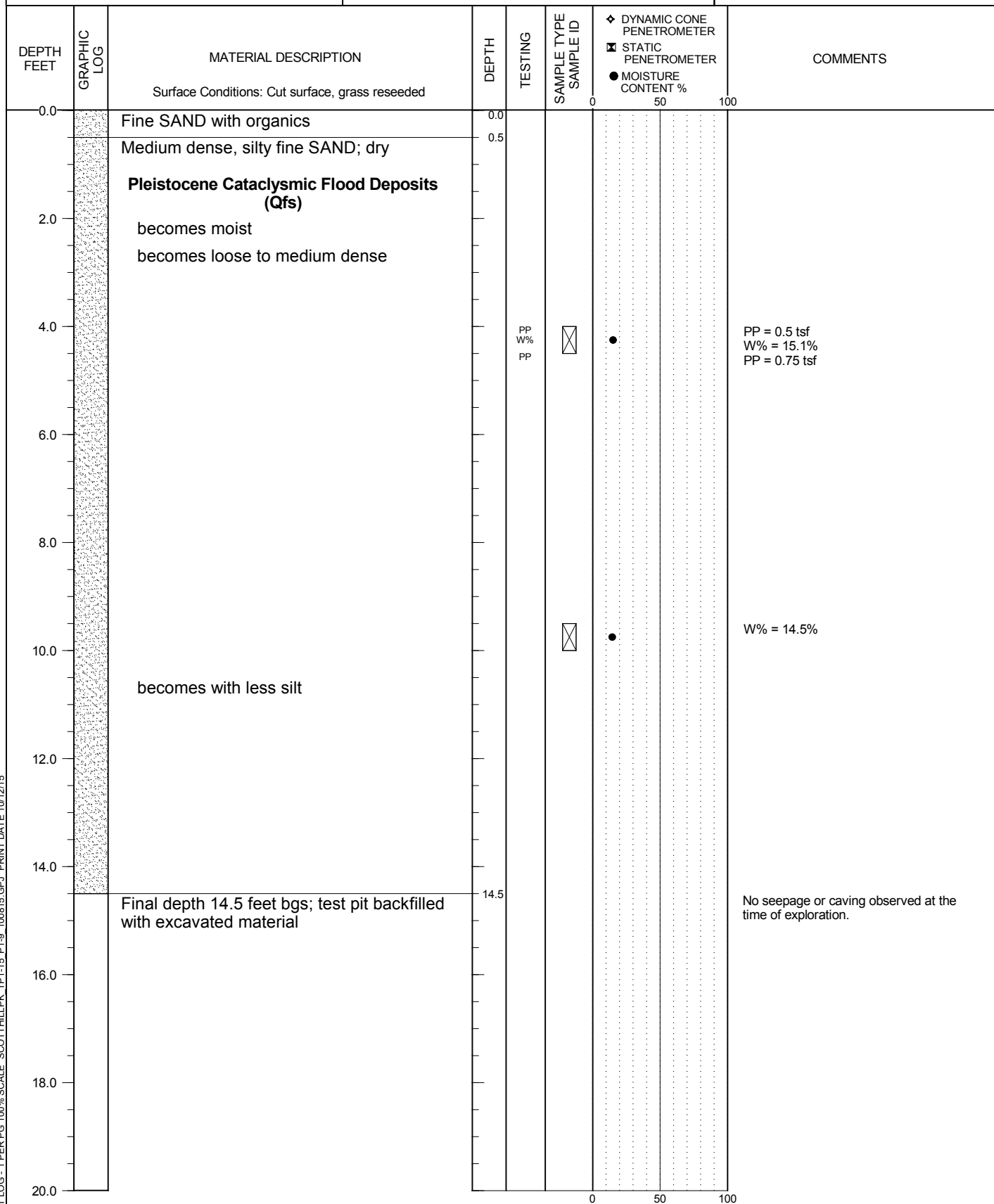
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-8 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/29/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: John Deere 690E

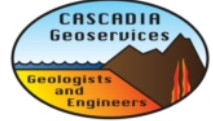
**TEST PIT TP-8**

**FIGURE TP-9**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

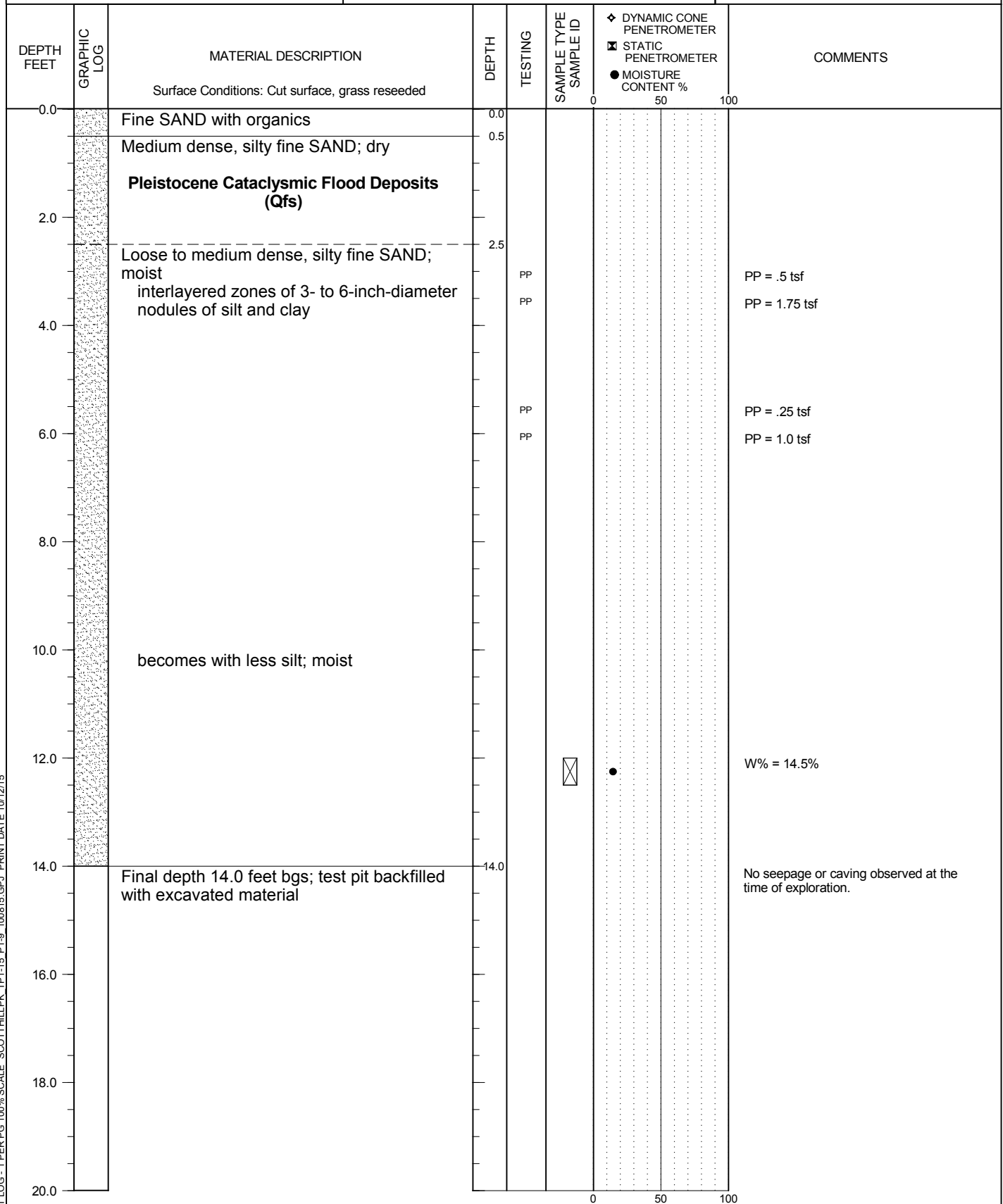
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-9 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP-1-15 P1-9\_100815.GPJ\_PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/29/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: John Deere 690E

**TEST PIT TP-9**

**FIGURE TP-10**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

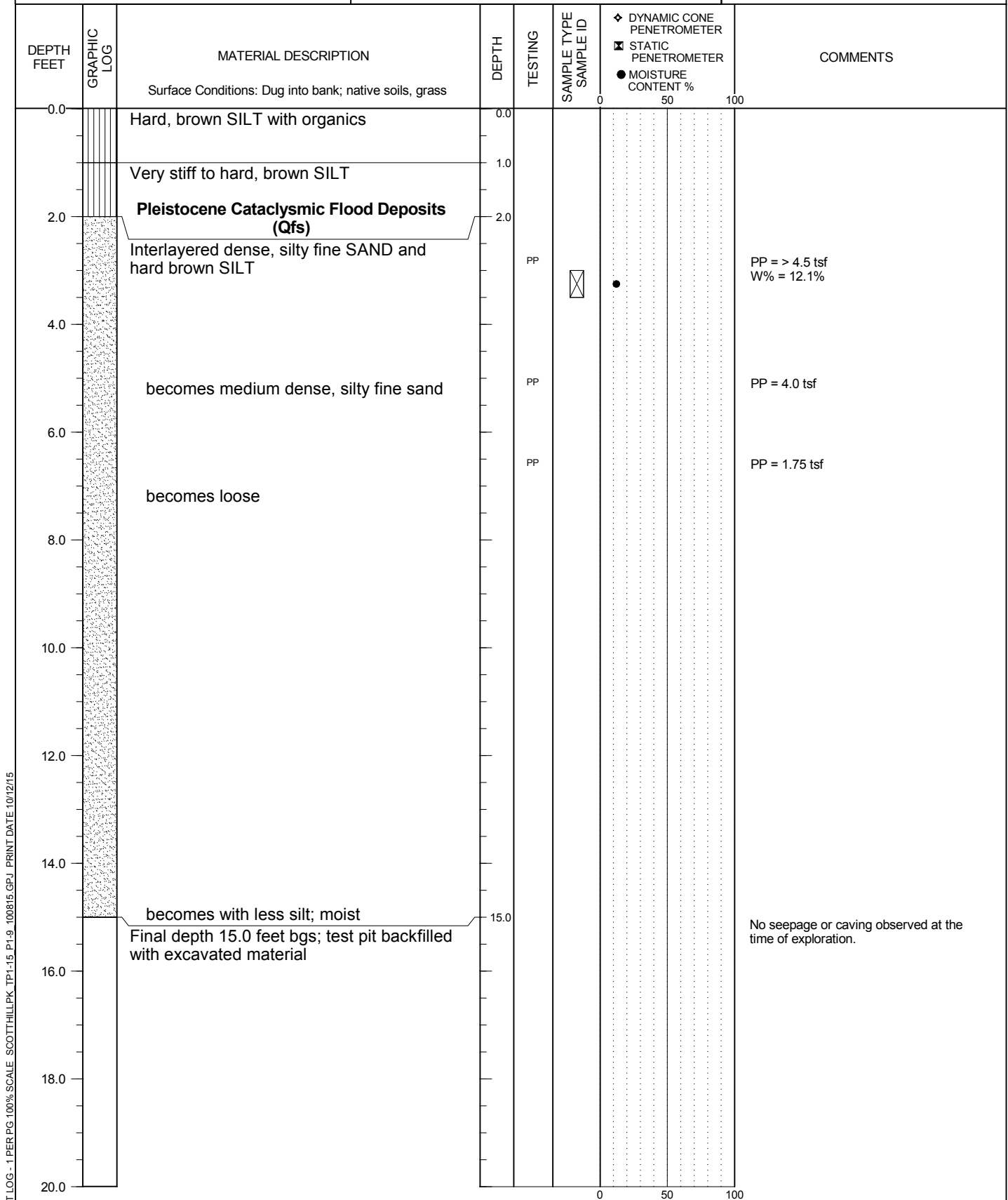
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-10 LOCATION:  
In native bark/grass (see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP-1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/29/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: John Deere 690E

**TEST PIT TP-10**



**FIGURE TP-12**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

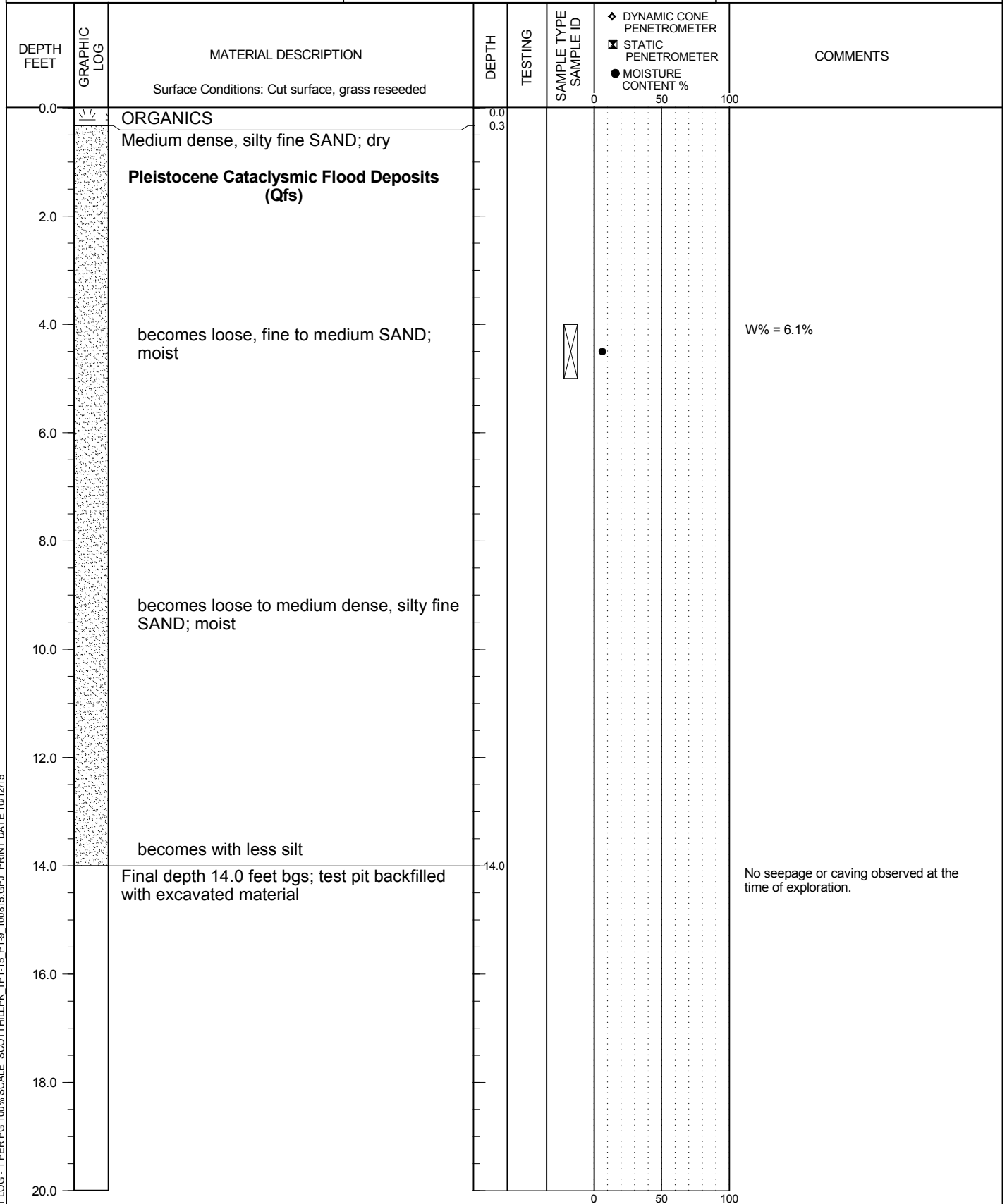
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-12 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP-1-15 P1-9\_100815.GPJ\_PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/29/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: John Deere 690E

**TEST PIT TP-12**

**FIGURE TP-13**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

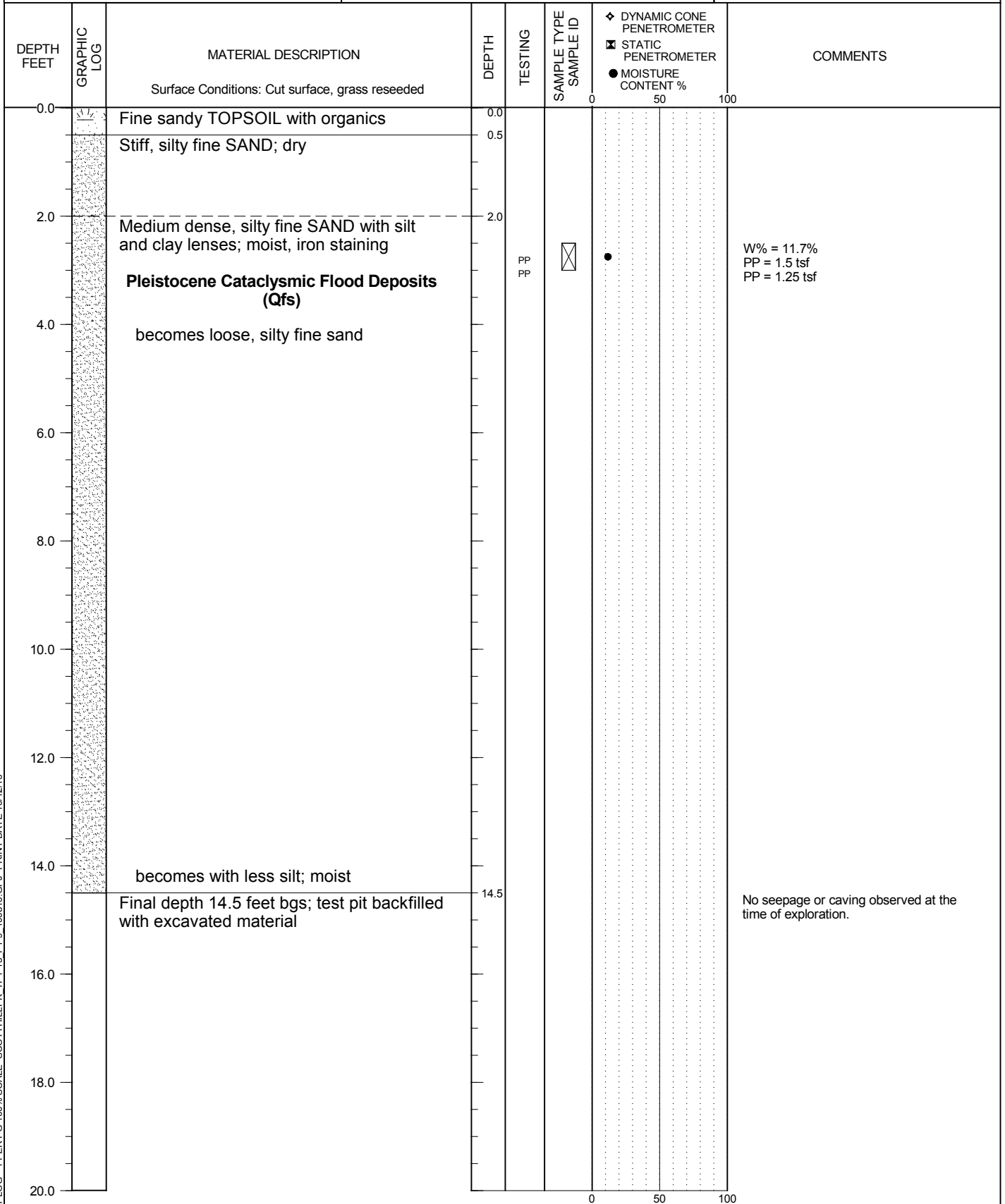
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-13 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP-1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/29/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: John Deere 690E

**TEST PIT TP-13**

**FIGURE TP-14**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-14 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	◆ DYNAMIC CONE PENETROMETER ☒ STATIC PENETROMETER ● MOISTURE CONTENT %	COMMENTS
		Surface Conditions: Cut surface, grass reseeded				0 50 100	
0.0		<b>ORGANICS</b>	0.0				
0.5		Dense, brown, silty fine SAND	0.5				
1.0		Medium dense, light brown, silty fine SAND	1.0	PP			PP = 1.75 tsf
2.0		<b>Pleistocene Cataclysmic Flood Deposits (Qfs)</b>	2.0	PP			PP = 2.5 tsf
3.0		Loose to medium dense, fine SAND with some silt; occasional iron staining	3.0				
4.0			4.0	PP			PP = 1.25 tsf
6.0		silt/clay peds becomes loose; moist becomes silty fine sand	6.0				
8.0			8.0				
10.0		becomes moist	10.0				
12.0		becomes with less silt	12.0				
13.0		Final depth 13.0 feet bgs; test pit backfilled with excavated material	13.0		☒	●	W% = 14.9%
14.0			14.0				No seepage or caving observed at the time of exploration.
16.0			16.0				
18.0			18.0				
20.0			20.0				

TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP1-15 P1-9\_100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/29/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: John Deere 690E

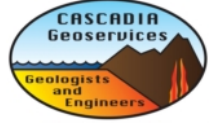
**TEST PIT TP-14**

**FIGURE TP-15**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

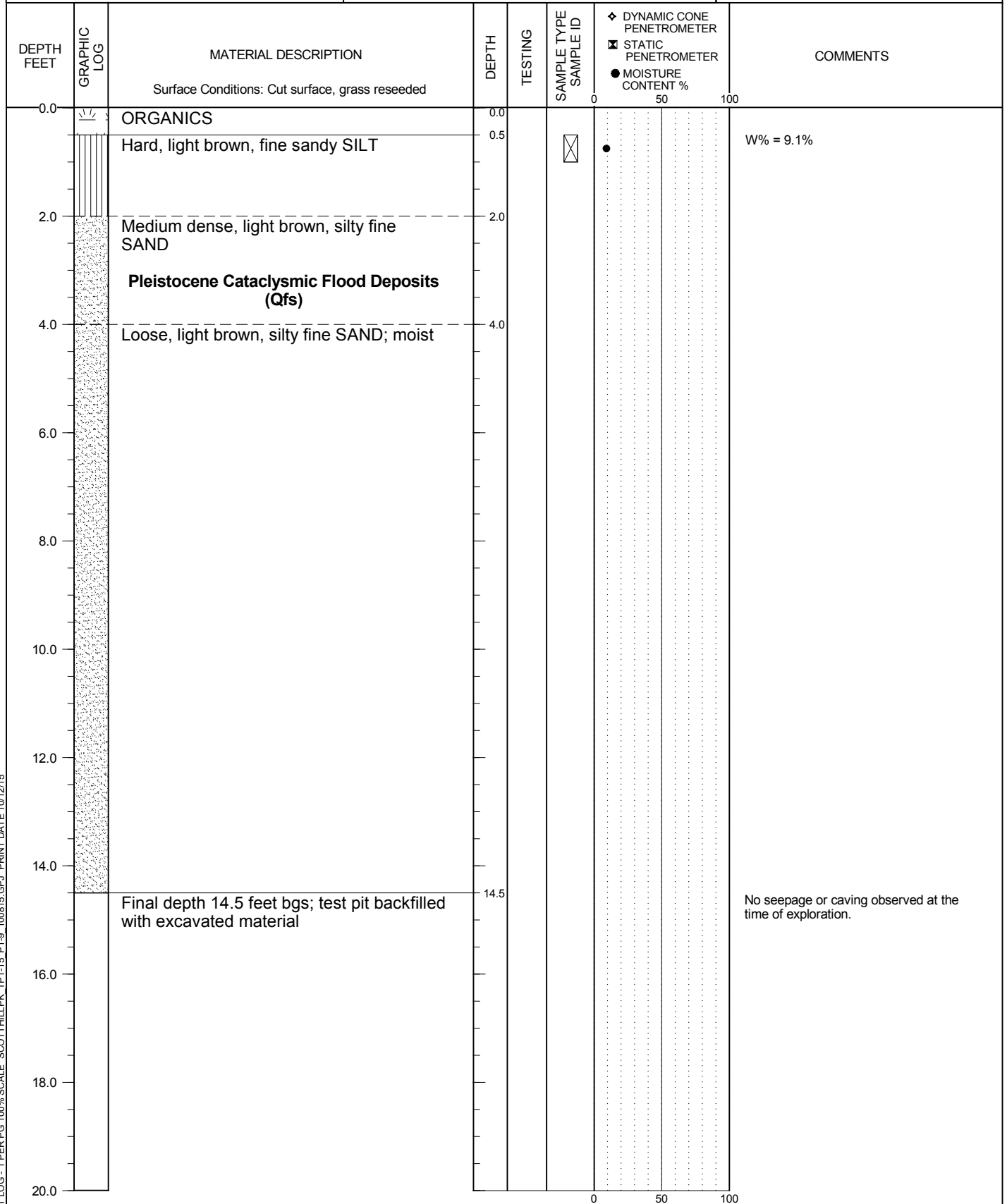
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST PIT TP-15 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



TEST PIT LOG - 1 PER PG 100% SCALE SCOTT HILL PK TP-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/29/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: John Deere 690E

**TEST PIT TP-15**

---

## **APPENDIX B**

Infiltration Test Logs P-1 through P-9  
Infiltration Test Results P-1 through P-9

**INFILTRATION TEST P-1**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

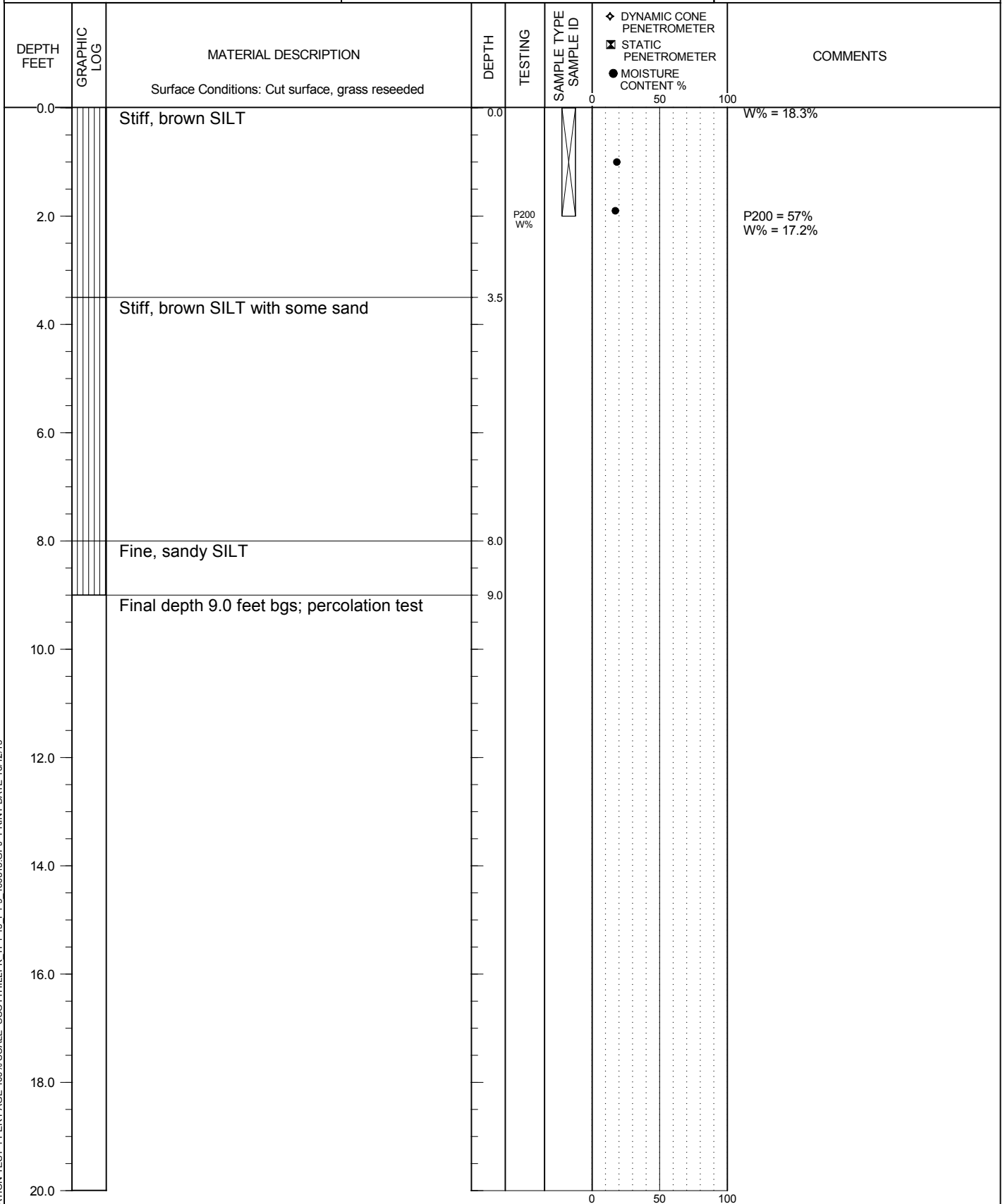
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST P-1 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
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INFILTRATION TEST-1 PER PAGE 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/23/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

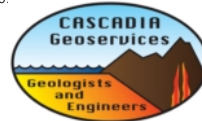
**INFILTRATION TEST P-1**

**INFILTRATION TEST P-2**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

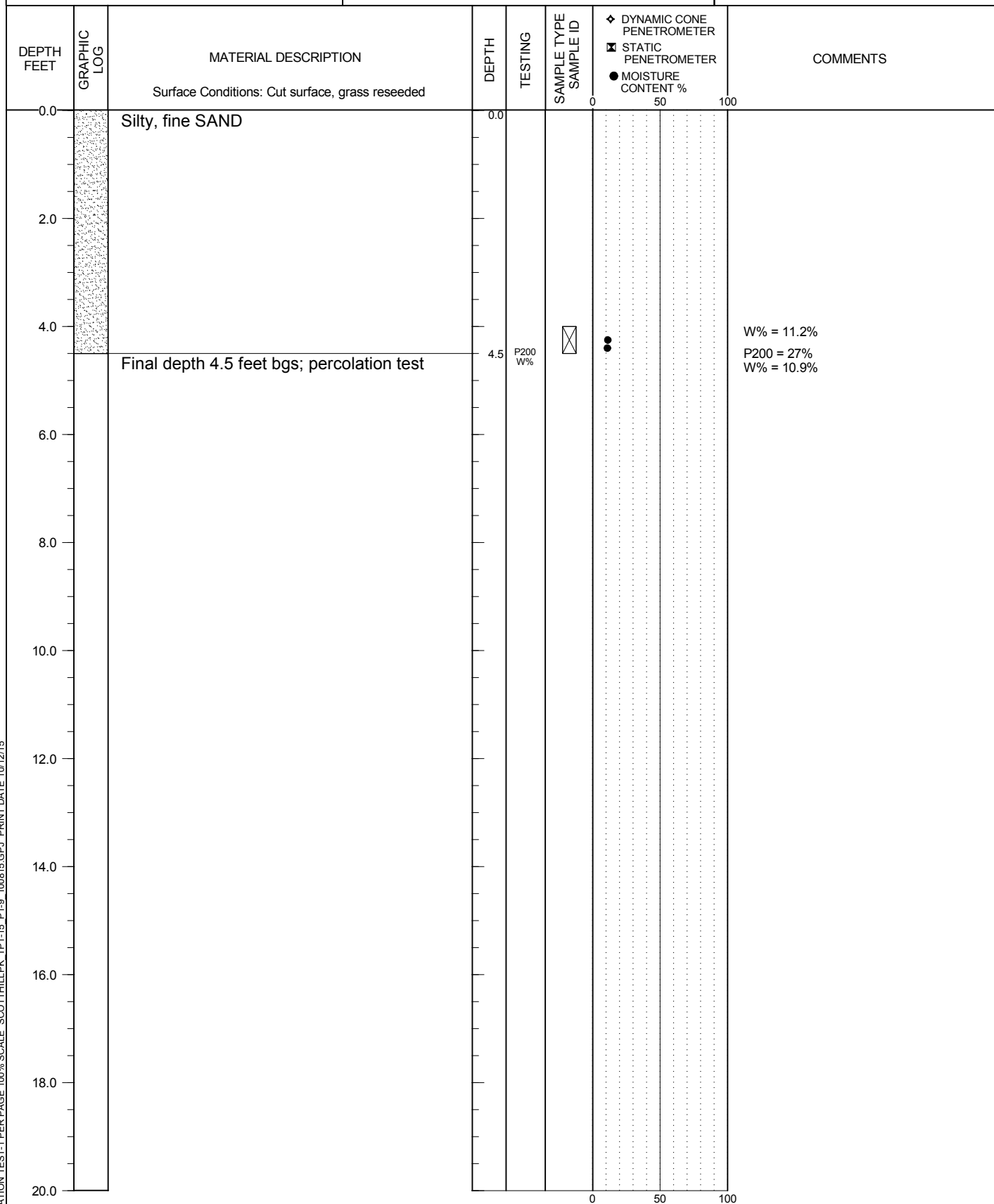
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST P-2 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



INFILTRATION TEST-1 PER PAGE 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/23/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

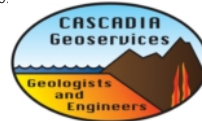
**INFILTRATION TEST P-2**

**INFILTRATION TEST P-3**

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SCOTT HILL PARK  
WOODLAND, WASHINGTON

1087 Lewis River Road #309  
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D. 360-225-3945  
C. 971-201-7359



APPROX. TEST P-3 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	◆ DYNAMIC CONE PENETROMETER ☒ STATIC PENETROMETER ● MOISTURE CONTENT %	COMMENTS
0.0		Surface Conditions: Cut surface, grass reseeded	0.0				
0.0 - 5.5		Silty, fine SAND					
5.5		Final depth 4.5 feet bgs; percolation test	5.5	P200 W%	☒	●	W% = 20.5% P200 = 42% W% = 19.8%
0.0 - 20.0							

INFILTRATION TEST-1 PER PAGE 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/23/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

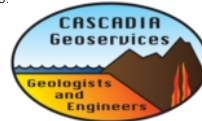
**INFILTRATION TEST P-3**

**INFILTRATION TEST P-4**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

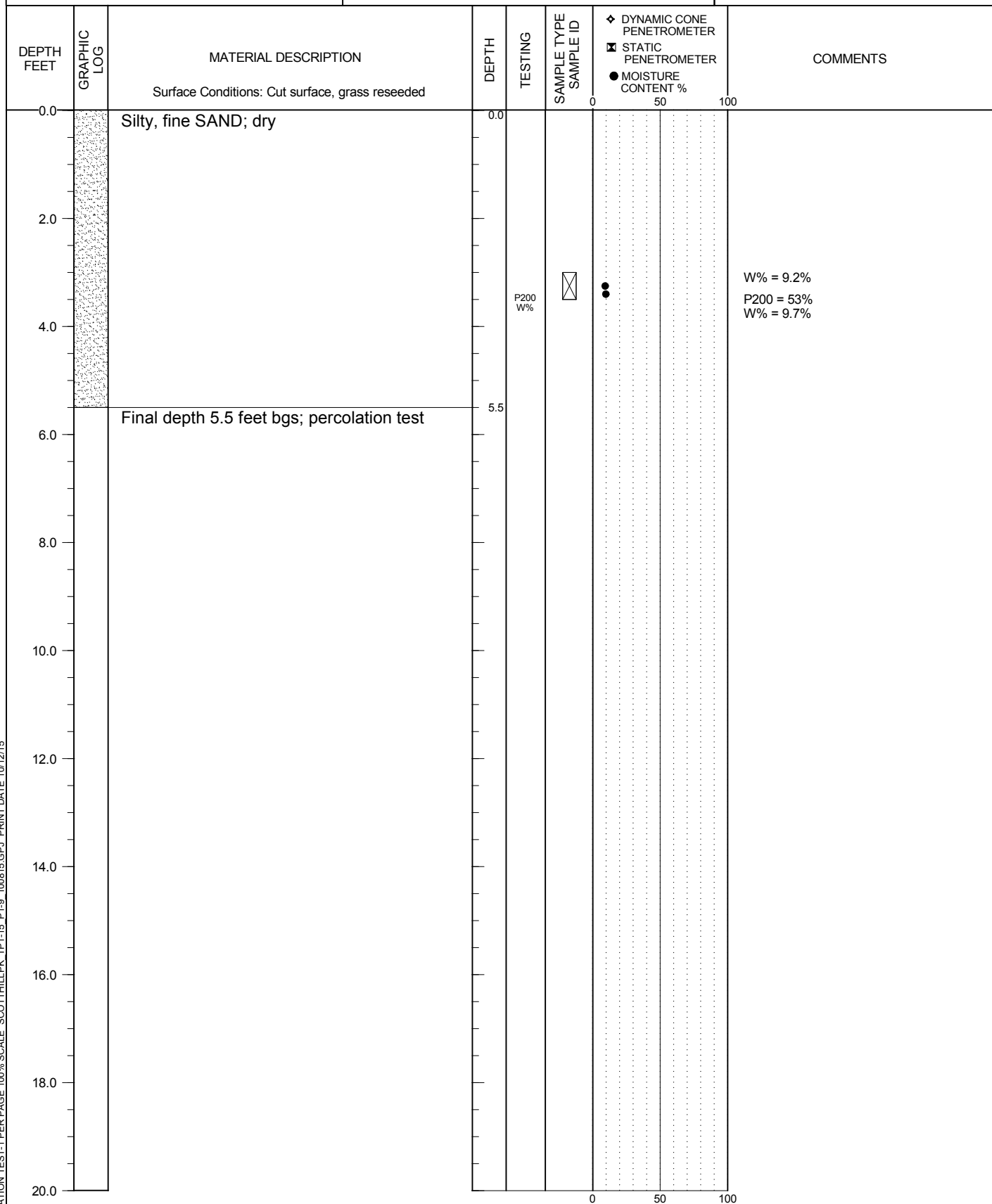
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST P-4 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



INFILTRATION TEST-1 PER PAGE 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/23/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

**INFILTRATION TEST P-4**

**INFILTRATION TEST P-5**

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SCOTT HILL PARK  
WOODLAND, WASHINGTON

1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST P-5 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	◆ DYNAMIC CONE PENETROMETER ☒ STATIC PENETROMETER ● MOISTURE CONTENT %	COMMENTS
0.0		Surface Conditions: Cut surface, grass reseeded	0.0				
0.0 - 5.5		Silty, fine SAND					
5.5		Final depth 4.5 feet bgs; percolation test	5.5	P200 W%	☒	●	W% = 13.0% P200 = 29% W% = 14.1%
0.0 - 20.0							

INFILTRATION TEST-1 PER PAGE 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/23/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

**INFILTRATION TEST P-5**

**INFILTRATION TEST P-6**

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SCOTT HILL PARK  
WOODLAND, WASHINGTON

1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST P-6 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	<input type="checkbox"/> DYNAMIC CONE PENETROMETER <input checked="" type="checkbox"/> STATIC PENETROMETER <input type="checkbox"/> MOISTURE CONTENT %	COMMENTS
0.0		Surface Conditions: Cut surface, grass reseeded	0.0				
0.0 - 0.5		TOPSOIL	0.5				
0.5 - 5.0		Silty, fine SAND	5.0				
5.0 - 20.0		Final depth 4.5 feet bgs; percolation test, installed data logger					

INFILTRATION TEST-1 PER PAGE 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/23/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

**INFILTRATION TEST P-6**

**INFILTRATION TEST P-7**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

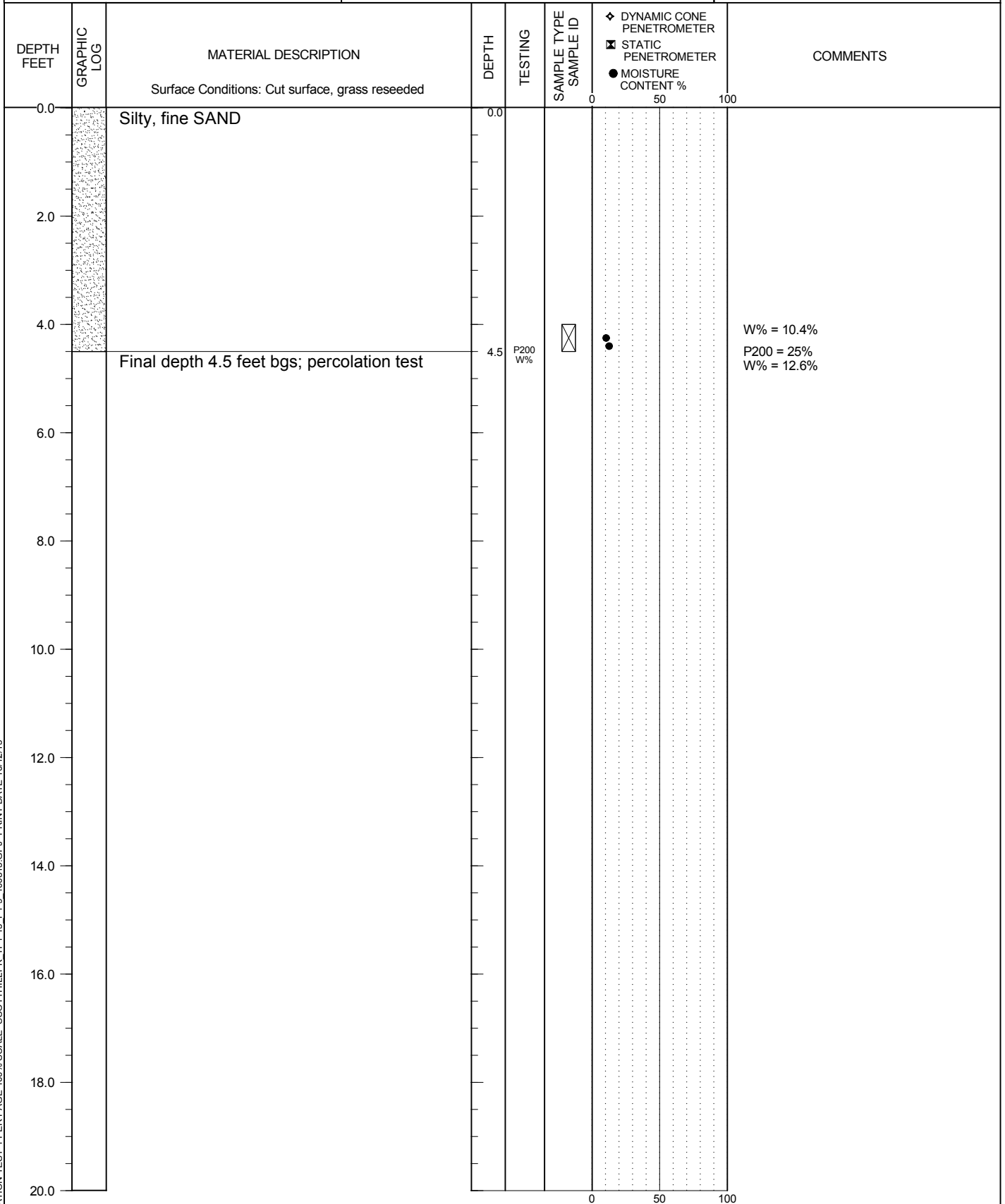
1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST P-7 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021



INFILTRATION TEST-1 PER PAGE 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/23/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

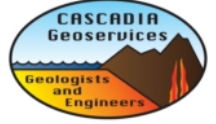
**INFILTRATION TEST P-7**

**INFILTRATION TEST P-8**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST P-8 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	<input type="checkbox"/> DYNAMIC CONE PENETROMETER <input checked="" type="checkbox"/> STATIC PENETROMETER <input type="checkbox"/> MOISTURE CONTENT %	COMMENTS
0.0		Surface Conditions: Cut surface, grass reseeded	0.0			0 50 100	
0.0	Silty, fine SAND						
2.0							
4.0							
5.5		Final depth 5.5 feet bgs; percolation test	5.5				
6.0							
8.0							
10.0							
12.0							
14.0							
16.0							
18.0							
20.0							

INFILTRATION TEST-1 PER PAGE 100% SCALE SCOTT HILL PK TP1-15 P1-9 100815.GPJ PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/23/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

**INFILTRATION TEST P-8**

**INFILTRATION TEST P-9**

Page 1 of 1

SCOTT HILL PARK  
WOODLAND, WASHINGTON

1087 Lewis River Road #309  
Woodland, WA 98674  
D. 360-225-3945  
C. 971-201-7359



APPROX. TEST P-9 LOCATION:  
(see map)

CASCADIA GEOSERVICES PROJECT NUMBER:  
15012

190 6th Street  
Port Orford, OR 97465  
D. 541-332-0433  
C. 541-655-0021

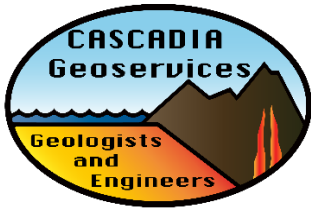
DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	<input type="checkbox"/> DYNAMIC CONE PENETROMETER <input checked="" type="checkbox"/> STATIC PENETROMETER <input type="checkbox"/> MOISTURE CONTENT %	COMMENTS
0.0		Surface Conditions: Cut surface, grass reseeded	0.0			0 50 100	
0.0 - 3.0	[Cross-hatched pattern]	Medium dense, brown, SILT FILL	0.0 - 3.0				
3.0 - 5.5	[Dashed pattern]	Buried TOPSOIL FILL;	3.0 - 5.5				
5.5 - 7.0	[Vertical lines pattern]	Medium dense, brown-black SILT	5.5 - 7.0				
7.0 - 20.0	[Vertical lines pattern]	Final depth 7.0 feet bgs; percolation test	7.0 - 20.0				

INFILTRATION TEST-1 PER PAGE 100% SCALE SCOTTHILLPK\_TP1-15\_P1-9\_100815.GPJ\_PRINT DATE 10/12/15

LOGGED BY: R. Thrall  
COMPLETED: 7/23/15

EXCAVATED BY: Thomas Buck Construction  
EXCAVATION METHOD: Volvo EC160B Backhoe

**INFILTRATION TEST P-9**



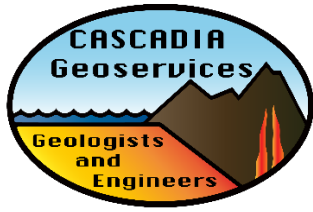
# Cascadia Geoservices, Inc.

1087 Lewis River Road #309  
 Woodland, Washington  
 Phone (503) 555-0190 Fax (503) 555-0191  
 Email: rick@cascadiageoservices.com  
 Web: www.cascadiageoservices.com

## Infiltration Testing

Location: Scott Hill Park		Date: 7-29-2015		Test Hole Number: P-1	
Depth to bottom of hole: 9 feet		Dimension of hole: 2'X3'		Test Method: Test Pit Infiltration	
Tester's Name: Rick Thrall		Tester's Company: CGS		Tester's Contact Number: 971-201-7359	
<b>Depth (feet):</b>		<b>Soil Texture:</b>			
0.0-3.5		stiff brown silt (sample)			
3.5-5.0		stiff brown silt with some sand			
5.0-9.0		fine sandy silt			
		P200 = 57.3%			
Presaturation Start Time: 9:30 am		Presaturation End Time: 2:15 pm			
Time:	Time Interval (minutes):	Measurement (inches):	Drop in water level, (inches):	Infiltration rate, (inches per hour):	Remarks:
14:15	0	93	0		
14:33	18	95	2	6.67	
14:57	42	95	2	2.86	
15:16	61	96	3	2.95	
15:36	81	97	4	2.96	
15:51	96	97	4	2.50	
	-855		-93		
	-855		-93		
	-855		-93		
	-855		-93		
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avg 3.59

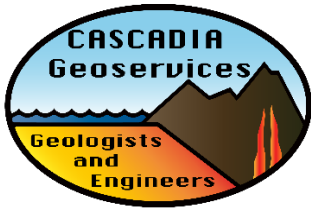


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 Woodland, Washington  
 Phone (503) 555-0190 Fax (503) 555-0191  
 Email: rick@cascadiageoservices.com  
 Web: www.cascadiageoservices.com

## Infiltration Testing

Location: Scott Hill Park			Date: 7-23-2015		Test Hole Number: P-2
Depth to bottom of hole: 4.5 feet			Dimension of hole: 2'X3'		Test Method: Test Pit Infiltration
Tester's Name: Rick Thrall			Tester's Company: CGS		Tester's Contact Number: 971-201-7359
Depth (feet):			Soil Texture:		
0.0-4.5			Silty fine sand (sample)		
			P200 = 27.3%		
Presaturation Start Time: 9:30 am			Presaturation End Time: 1:30 pm		
Time:	Time Interval (minutes):	Measurement (inches):	Drop in water level, (inches):	Infiltration rate, (inches per hour):	Remarks:
13:30	0	31	0		
13:39	9	31	0	0	
13:51	21	31	0	0	
14:10	40	36	5	7.50	
14:25	55	35	4	4.36	
14:44	74	36	5	4.05	
15:08	98	40	9	5.51	
15:27	117	40	9	4.62	
15:46	136	40	9	3.97	
	-810		-31		
	-810		-31		
	-810		-31		
	-810		-31		
	-810		-31		
	-810		-31		
			avg	3.75	

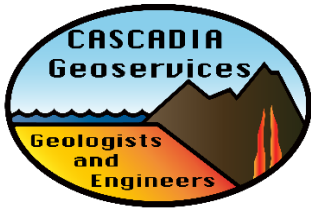


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 Woodland, Washington  
 Phone (503) 555-0190 Fax (503) 555-0191  
 Email: rick@cascadiageoservices.com  
 Web: www.cascadiageoservices.com

## Infiltration Testing

Location: Scott Hill Park			Date: 7-23-2015		Test Hole Number: P-3
Depth to bottom of hole: 5.5 feet			Dimension of hole: 2'X3'		Test Method: Test Pit Infiltration
Tester's Name: Rick Thrall			Tester's Company: CGS		Tester's Contact Number: 971-201-7359
Depth (feet):			Soil Texture:		
0.0-5.5			silty fine sand (sample)		
			P200 = 41.6%		
Presaturation Start Time: 9:30 am			Presaturation End Time: 1:37 pm		
Time:	Time Interval (minutes):	Measurement (inches):	Drop in water level, (inches):	Infiltration rate, (inches per hour):	Remarks:
13:37	0	48	0		
13:44	7	49	1	8.57	
13:50	13	48	0	0.00	
14:05	28	53	5	10.71	
14:24	47	54	6	7.66	
14:42	65	56	8	7.38	
15:05	88	58	10	6.82	
15:25	108	59	11	6.11	
15:44	127	60	12	5.67	
	-817		-48		
	-817		-48		
	-817		-48		
	-817		-48		
	-817		-48		
	-817		-48		
avg				6.62	



# Cascadia Geoservices, Inc.

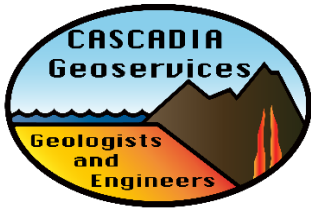
1087 Lewis River Road #309  
 Woodland, Washington  
 Phone (503) 555-0190 Fax (503) 555-0191  
 Email: rick@cascadiageoservices.com  
 Web: www.cascadiageoservices.com

## Infiltration Testing

Location: Scott Hill Park		Date: 7-23-2015		Test Hole Number: P-4	
Depth to bottom of hole: 3.5 feet		Dimension of hole: 2'X3'		Test Method: Test Pit Infiltration	
Tester's Name: Rick Thrall		Tester's Company: CGS		Tester's Contact Number: 971-201-7359	
Depth (feet):		Soil Texture:			
0.0-3.5		silty fine sand (sample)			
		P200 = 53.1%			
Presaturation Start Time: 9:30 am		Presaturation End Time: 1:32 pm			
Time:	Time Interval (minutes):	Measurement (inches):	Drop in water level, (inches):	Infiltration rate, (inches per hour):	Remarks:
13:22	0	29	0		
13:32	10	30	1	6.00	
13:41	19	31	2	6.32	
14:07	45	35	6	8.00	
14:27	65	36	7	6.46	
14:47	85	37	8	5.65	
15:10	108	0	-29		
	-802		-29		
	-802		-29		
	-802		-29		
	-802		-29		
	-802		-29		
	-802		-29		
	-802		-29		
	-802		-29		

avg

6.48



# Cascadia Geoservices, Inc.

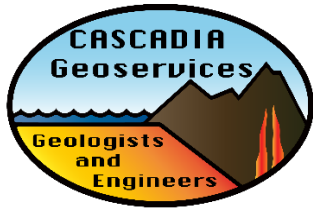
1087 Lewis River Road #309  
 Woodland, Washington  
 Phone (503) 555-0190 Fax (503) 555-0191  
 Email: rick@cascadiageoservices.com  
 Web: www.cascadiageoservices.com

## Infiltration Testing

Location: Scott Hill Park		Date: 7-23-2015		Test Hole Number: P-5	
Depth to bottom of hole: 5.5 feet		Dimension of hole: 2'X3'		Test Method: Test Pit Infiltration	
Tester's Name: Rick Thrall		Tester's Company: CGS		Tester's Contact Number: 971-201-7359	
<b>Depth (feet):</b>		<b>Soil Texture:</b>			
0.0-5.5		silty fine sand			
		P200 = 28.7%			
Presaturation Start Time: 9:30 am		Presaturation End Time: 1:15 pm			
Time:	Time Interval (minutes):	Measurement (inches):	Drop in water level, (inches):	Infiltration rate, (inches per hour):	Remarks:
13:15	0	48	0		
13:25	10	52	4	24	
13:34	19	53	5	15.79	
13:59	44	56	8	10.91	
14:30	75	59	11	8.80	
14:50	95	60	12	7.58	
15:12	117	63	15	7.69	
15:28	133	63	15	6.77	
15:48	153	64	16	6.27	
	-795		-48		
	-795		-48		
	-795		-48		
	-795		-48		
	-795		-48		
	-795		-48		

avg

10.98



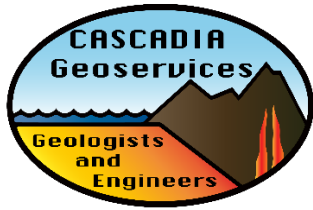
# Cascadia Geoservices, Inc.

1087 Lewis River Road #309  
 Woodland, Washington  
 Phone (503) 555-0190 Fax (503) 555-0191  
 Email: rick@cascadiageoservices.com  
 Web: www.cascadiageoservices.com

## Infiltration Testing

Location: Scott Hill Park		Date: 7-29-2015		Test Hole Number: P-6	
Depth to bottom of hole: 5 feet		Dimension of hole: 2'X3'		Test Method: Test Pit Infiltration	
Tester's Name: Rick Thrall		Tester's Company: CGS		Tester's Contact Number: 971-201-7359	
<b>Depth (feet):</b>		<b>Soil Texture:</b>			
0.0-3.5		topsoil			
3.5-5.0		silty fine sand			
Presaturation Start Time: 9:30 am		Presaturation End Time: 1:08 pm			
Time:	Time Interval (minutes):	Measurement (inches):	Drop in water level, (inches):	Infiltration rate, (inches per hour):	Remarks:
13:08	0	46	0		
13:17	9	48	2	13.33	
13:27	19	49	3	9.47	
13:58	50	52	6	7.20	
14:31	83	54	8	5.78	
14:51	103	54	8	4.66	
15:14	126	56	10	4.76	
15:30	142	0	-46		
	-788		-46		
	-788		-46		
	-788		-46		
	-788		-46		
	-788		-46		
	-788		-46		
	-788		-46		

avg 7.54



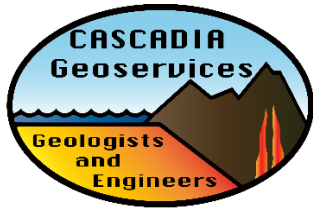
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 Woodland, Washington  
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 Web: www.cascadiageoservices.com

## Infiltration Testing

Location: Scott Hill Park		Date: 7-23-2015		Test Hole Number: P-7	
Depth to bottom of hole: 4.75 feet		Dimension of hole: 2'X3'		Test Method: Test Pit Infiltration	
Tester's Name: Rick Thrall		Tester's Company: CGS		Tester's Contact Number: 971-201-7359	
<b>Depth (feet):</b>		<b>Soil Texture:</b>			
0.0-4.75		silty fine sand (sample)			
		P200 = 24.6%			
Presaturation Start Time: 9:30 am		Presaturation End Time: 1:54 pm			
Time:	Time Interval (minutes):	Measurement (inches):	Drop in water level, (inches):	Infiltration rate, (inches per hour):	Remarks:
13:54	0	42	0		
14:01	7	42	0	0	
14:20	26	44	2	4.62	
14:38	44	45	3	4.09	
15:01	67	48	6	5.37	
15:20	86	50	8	5.58	
15:39	105	51	9	5.14	
	-834		-42		
	-834		-42		
	-834		-42		
	-834		-42		
	-834		-42		
	-834		-42		
	-834		-42		
	-834		-42		

avg 4.13



# Cascadia Geoservices, Inc.

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 Web: www.cascadiageoservices.com

## Infiltration Testing

Location: Scott Hill Park		Date: 7-23-2015		Test Hole Number: P-8	
Depth to bottom of hole: 5.5 feet		Dimension of hole: 2'X3'		Test Method: Test Pit Infiltration	
Tester's Name: Rick Thrall		Tester's Company: CGS		Tester's Contact Number: 971-201-7359	
Depth (feet):		Soil Texture:			
0.0-5.5		silty fine sand			
Presaturation Start Time: 9:30 am		Presaturation End Time: 2:04 pm			
Time:	Time Interval (minutes):	Measurement (inches):	Drop in water level, (inches):	Infiltration rate, (inches per hour):	Remarks:
14:04	0	48	0		
14:18	14	49	1	4.29	
14:36	32	50	2	3.75	
14:59	55	52	4	4.36	
15:19	75	54	6	4.80	
15:38	94	55	7	4.47	
	-844		-48		
	-844		-48		
	-844		-48		
	-844		-48		
	-844		-48		
	-844		-48		
	-844		-48		
	-844		-48		
	-844		-48		
	-844		-48		

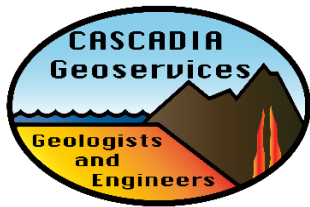
avg 4.33



## **APPENDIX C**

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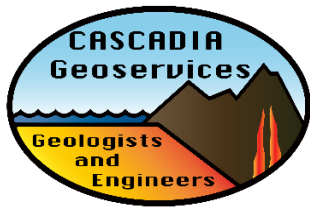
Laboratory Test Results



# Water Content Determination

ASTM D2216

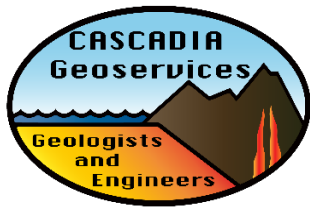
Project Name: SCOTT HILL			Project Number: 15012		
Recorded By: RGT			Date: 8/15/15		
Remarks:					
<b>Sample Designation</b>	<b>TP7</b>	<b>TP14</b>	<b>TP13</b>	<b>TP11</b>	<b>TP1</b>
<b>Sample Depth</b>	<b>2'</b>	<b>13'</b>	<b>3'</b>	<b>12.5'</b>	<b>12.5'</b>
Pan Number	25	12	24	15	14
Wt. Wet Soil +Pan (g)	21.47	15.52	18.81	15.31	21
Wt. Dry Soil +Pan (g)	20.02	13.53	16.86	14.14	18.04
Wt. Water (g)	1.45	1.99	1.95	1.17	2.96
Wt. Pan (g)	0.2	0.2	0.2	0.2	0.2
Wt. Dry Soil (g)	19.82	13.33	16.66	13.94	17.84
Water Content (%)	7.3	14.9	11.7	8.4	16.6
<b>Sample Designation</b>	<b>TP1</b>	<b>TP3</b>	<b>TP15</b>	<b>P2</b>	<b>P1</b>
<b>Sample Depth</b>	<b>9'</b>	<b>3.5'</b>	<b>?</b>	<b>BOT@4'</b>	<b>1-2'</b>
Pan Number	13	1	11	23	22
Wt. Wet Soil +Pan (g)	19.71	19.69	36.4	21.58	39.77
Wt. Dry Soil +Pan (g)	17.21	17.62	33.37	19.42	33.66
Wt. Water (g)	2.5	2.07	3.03	2.16	6.11
Wt. Pan (g)	0.2	0.2	0.2	0.2	0.2
Wt. Dry Soil (g)	17.01	17.42	33.17	19.22	33.46
Water Content (%)	14.7	11.9	9.1	11.2	18.3
<b>Sample Designation</b>	<b>P4</b>	<b>P7</b>	<b>P5</b>	<b>TP9</b>	<b>TP8</b>
<b>Sample Depth</b>	<b>BOT@3.5'</b>	<b>BOT@4.5'</b>	<b>BOT@5.5'</b>	<b>12'</b>	<b>4.5'</b>
Pan Number	21	18	20	19	17
Wt. Wet Soil +Pan (g)	21.28	19.46	16.69	16.83	19.79
Wt. Dry Soil +Pan (g)	19.51	17.65	14.79	14.72	17.22
Wt. Water (g)	1.77	1.81	1.9	2.11	2.57
Wt. Pan (g)	0.2	0.2	0.2	0.2	0.2
Wt. Dry Soil (g)	19.31	17.45	14.59	14.52	17.02
Water Content (%)	9.2	10.4	13.0	14.5	15.1



# Water Content Determination

ASTM D2216

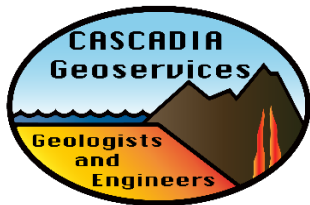
Project Name: SCOTT HILL			Project Number: 15012		
Recorded By: RGT			Date: 8/15/15		
Remarks:					
<b>Sample Designation</b>	<b>TP7</b>	<b>TP14</b>	<b>TP13</b>	<b>TP11</b>	<b>TP1</b>
<b>Sample Depth</b>	<b>2'</b>	<b>13'</b>	<b>3'</b>	<b>12.5'</b>	<b>12.5'</b>
Pan Number	25	12	24	15	14
Wt. Wet Soil +Pan (g)	21.47	15.52	18.81	15.31	21
Wt. Dry Soil +Pan (g)	20.02	13.53	16.86	14.14	18.04
Wt. Water (g)	1.45	1.99	1.95	1.17	2.96
Wt. Pan (g)	0.2	0.2	0.2	0.2	0.2
Wt. Dry Soil (g)	19.82	13.33	16.66	13.94	17.84
Water Content (%)	7.3	14.9	11.7	8.4	16.6
<b>Sample Designation</b>	<b>TP1</b>	<b>TP3</b>	<b>TP15</b>	<b>P2</b>	<b>P1</b>
<b>Sample Depth</b>	<b>9'</b>	<b>3.5'</b>	<b>?</b>	<b>BOT@4'</b>	<b>1-2'</b>
Pan Number	13	1	11	23	22
Wt. Wet Soil +Pan (g)	19.71	19.69	36.4	21.58	39.77
Wt. Dry Soil +Pan (g)	17.21	17.62	33.37	19.42	33.66
Wt. Water (g)	2.5	2.07	3.03	2.16	6.11
Wt. Pan (g)	0.2	0.2	0.2	0.2	0.2
Wt. Dry Soil (g)	17.01	17.42	33.17	19.22	33.46
Water Content (%)	14.7	11.9	9.1	11.2	18.3
<b>Sample Designation</b>	<b>P4</b>	<b>P7</b>	<b>P5</b>	<b>TP9</b>	<b>TP8</b>
<b>Sample Depth</b>	<b>BOT@3.5'</b>	<b>BOT@4.5'</b>	<b>BOT@5.5'</b>	<b>12'</b>	<b>4.5'</b>
Pan Number	21	18	20	19	17
Wt. Wet Soil +Pan (g)	21.28	19.46	16.69	16.83	19.79
Wt. Dry Soil +Pan (g)	19.51	17.65	14.79	14.72	17.22
Wt. Water (g)	1.77	1.81	1.9	2.11	2.57
Wt. Pan (g)	0.2	0.2	0.2	0.2	0.2
Wt. Dry Soil (g)	19.31	17.45	14.59	14.52	17.02
Water Content (%)	9.2	10.4	13.0	14.5	15.1



# Percent Fines (-#200)

ASTM D1140

Project Name: Scott Hill			Project Number: 15012		
Recorded By: rgt			Date: August 15, 2015		
Remarks:					
Sample Designation	P7 bot	P4 bot	P2 bot	P3 bot	P5 bot
Sample Depth	4.5'	3-5'	4'	5.5'	5.5'
Pan Number	5	4	6	2	3
Wt. Wet Soil +Pan (g)	256.99	478.66	380.83	596.96	381.44
Wt. Dry Soil +Pan (g)	230.05	437.65	344.89	500.70	336.32
Wt. Water (g)	26.94	41.01	35.94	96.26	45.12
Wt. Pan (g)	15.40	15.48	15.46	15.38	15.45
Wt. Dry Soil (g)	214.65	422.17	329.43	485.32	320.87
Water Content (%)	12.6%	9.7%	10.9%	19.8%	14.1%
Test Sample Data					
Wt. Dry Soil (g)	214.65	422.17	329.43	485.32	320.87
After Washing Data					
Pan Number	5	4	6	2	3
Wt. Dry Soil +Pan (g)	177.28	213.57	254.81	298.68	244.27
Wt. Pan (g)	15.40	15.48	15.46	15.38	15.45
Wt. Dry Soil (+200) (g)	161.88	198.09	239.35	283.30	228.82
%Fines Calculation					
AW Wt. Dry Soil (g)	161.88	198.09	239.35	283.30	228.82
Loss (g) C=A-B	52.77	224.08	90.08	202.02	92.05
Fines (%) (C/A)*100	24.6%	53.1%	27.3%	41.6%	28.7%



# Percent Fines (-#200)

ASTM D1140

Project Name: Scott Hill		Project Number: 15012			
Recorded By: rgt		Date: August 15, 2015			
Remarks:					
Sample Designation	P1				
Sample Depth	2				
Pan Number	big 5				
Wt. Wet Soil +Pan (g)	941.95				
Wt. Dry Soil +Pan (g)	848.68				
Wt. Water (g)	93.27				
Wt. Pan (g)	305.05				
Wt. Dry Soil (g)	543.63				
Water Content (%)	17.2%				
<b>Test Sample Data</b>					
Wt. Dry Soil (g)	543.63				
<b>After Washing Data</b>					
Pan Number	big 5				
Wt. Dry Soil +Pan (g)	537.14				
Wt. Pan (g)	305.05				
Wt. Dry Soil (+200) (g)	232.09				
<b>%Fines Calculation</b>					
AW Wt. Dry Soil (g)	232.09				
Loss (g) C=A-B	311.54				
Fines (%) (C/A)*100	57.3%				