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Geotechnical Site Evaluation

87052 Vesta Lane
Bandon, Oregon 97411
T29S R15W Sec 01CB, Tax Lots 1600 and 1602

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Sent via email: bandondreams@gmail.com

September 29, 2021
CGS Project No. 21096

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INTRODUCTION

Cascadia Geoservices, Inc. (CGS) is pleased to provide you with this Geotechnical Site Evaluation report which summarizes our evaluation of your client's property located on Vesta Lane near Bandon, Oregon (see Figure 1, Location Map). We understand that your client is proposing to develop the property (subject property or site) with a residential structure and have requested that CGS evaluate the subject property and provide you and the design team with geotechnical recommendations for developing the site. This report summarizes our project understanding and site investigation, including subsurface explorations, and provides our conclusions and recommendations.

PROJECT UNDERSTANDING AND DESCRIPTION

Our understanding is based on telephone correspondence with you beginning on June 4, 2021, and on a preliminary site visit on June 18, 2021. Our understanding is further based on a second site visit on August 8, 2021, at which time a geologic reconnaissance of the site was completed and five exploratory test pits were excavated.

We understand that the site consists of two tax lots which combined are 0.36 acres. We further understand that your client is proposing to develop the site with a wood-framed residential structure and that the structure will be two-story and will be approximately 2,500 square feet. And we understand that you have no plans for excavations over 4 feet deep (except possibly for utility trenches) and no planned fills over 4 feet thick.

BEACH AND DUNE HAZARD

Based on a review of the Coos County Map Atlas,[1] Tax Lots 1600 and 1602 have been classified, in accordance with Goal 18 Eligibility Inventory, as "Not Eligible for Protection". The sand dunes on the site are classified as Younger, Stabilized Dunes, in accordance with USDA findings. This agrees with our site evaluation. Coos County has inventoried the site and surrounding area and has classified the site as having "limited suitability" for development. We note that the site is within the Sunset City Subdivision and is zoned Controlled Development 10 (CD-10), and that adjoining parcels to the west and south have been developed with residential structures.

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[1] Viewed online at https://www.coastalatlas.net

Based on our site evaluation and on our experience working in this region, it is our opinion that the proposed development will not have an adverse impact on either the site or adjacent areas. Further, it is our opinion that because the site is level and the soils well drained, there is no need for temporary or permanent stabilization programs and/or maintenance of new and existing vegetation other than those typically incorporated into residential landscaping. Further, we see no hazards to life, public and private property, or to the natural environment by the proposed development. Finally, it is our professional opinion that the proposed development will not cause excessive destruction of desirable vegetation (including inadvertent destruction by moisture loss or root damage), cause exposure of stable and conditionally stable areas to erosion or modify current air wave patterns leading to beach erosion.

SURFACE DESCRIPTION

The site is located within the Klamath Mountain physiographic region of southwestern Oregon and is within the Sunset City Subdivision in Coos County, Oregon. The site is generally level, rectangular in shape, and is located on an elevated coastal terrace, which is a regional landform on the southern Oregon coast, approximately 55.0 feet Above Mean Sea Level (AMSL) (see Figure 2, Site Map). The western boundary of the site is 230.0 feet east of an actively eroding sea cliff. The site is moderately to densely vegetated with native grasses and shore pines (see Photos 1 and 2).

During our recent site visits the subject property was observed to be stable and well drained with no ground cracks, areas of settlement, fresh earthen scarps, or landslides observed. Further, the site is not impacted by coastal erosion occurring along the base of the sea cliff to the west.

Based on mapping done by others,[2,3] soils at the site consist of sandy loam (8B – Bullards sandy loam, 0 to 7 percent slopes). The soils are described as well drained and derived from mixed eolian and marine deposits. These overlie surficial sediments of Quaternary marine terrace deposits which consist of unconsolidated to semi-consolidated sand, silt, clay, and gravel. Underlying these sediments are

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[2] United States Department of Agriculture. Natural Resource Conservation Service Web Soil Survey, viewed at http://websoilsurvey.nrcs.usda.gov/app

[3] Thomas J. Wiley, et al. (2014). Geologic Map of the Southern Oregon Coast between Port Orford and Bandon, Curry and Coos Counties, Oregon. Oregon Department of Geology and Mineral Industries (DOGAMI) open-file report O-14-0.

bedrock deposits of Late Mesozoic Mélange rocks of Sixes River. These deposits are an assemblage of sedimentary, volcanic, and metamorphic rocks which vary in both composition and degree of metamorphism. The contact between the terrace sands and bedrock is unconformable. This assemblage of rocks has been subsequently elevated during coastal uplift associated with regional tectonics.

SUBSURFACE EXPLORATIONS

During our August 8, 2021, site visit, CGS observed the excavation of five test pits (TP-1 through TP-5) by Natural Origins LLC of Bandon, Oregon (see Photo 3). The purpose of the test pits was to observe the subsurface soils on the site. The test pits were excavated to depths ranging from 0.5 to 9.0 feet below ground surface (bgs) at various locations as determined in the field and are shown on Figure 2, Site Map. Detailed logs for the test pits are included at the end of this report as Attachment 1.

Our test pits encountered loose sandy organic topsoil which overlays medium dense tan-brown fine sand (Photo 4). The sand is well cemented and is part of the surficial Quaternary Marine Terrace Deposits as identified by others[2]. In test pits TP-2 and TP-3 which were excavated in the northeastern portion of the site, a very dense dark gray gravel was encountered near surface (Photo 5). The gravel was very difficult to excavate causing TP-2 to be abandoned at 0.5 feet bgs and TP-3 to be started. TP-3 also encountered the gravel at 1.0-foot bgs which caused abandonment at 5. 0 feet bgs. A review of historical photographs of the area[4] indicate that a north-south road existed on this portion of the site that was subsequently abandoned and replaced by Roher Road to the east. We infer that the gravels encountered in TP-2 and 3 are part of the older roadbed.

Our analysis of the subsurface conditions on the site is based on the soils encountered in our test pits and is summarized as follows.

> **Topsoil:** Encountered from 0.0 to 1.0 feet below ground surface (bgs) in the test pits. Consists of very-loose-to-medium-dense, brown and reddish brown, silty fine sand; damp with variable amounts of root and other organics.

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[4] Google Earth, 1985, indicates that

Fine Sand and Silty Sand (Quaternary Marine Terrace Deposits): Encountered from 0.5 to 1.0 feet bgs to the depth of our explorations in TP-1, TP-4, and TP-5, and from 1.0 to 2.0 feet bgs in TP-3. The Quaternary marine terrace deposits were not encountered in TP-2. Consists of medium-dense, tannish brown and reddish brown, silty fine sand (see Photo 4). These soils were observed to be damp and moderately to strongly cemented. Based on mapping done by others,[2] we infer that these are part of the Quaternary marine terrace deposits.

Gravel: Encountered from 0.0 to 0.5 feet bgs in TP-2 and from 2.0 to 5.0 feet bgs in TP-3. Consists of dark greenish gray volcanics (see Photo 5). Where it was encountered near the surface in TP-2, it was observed to be very dense, causing abandonment of the test pit.

A dynamic cone penetrometer (DCP)[5] and pocket penetrometer were used by CGS to test the relative consistency of the soils in the test pits. In general, the surficial topsoil was determined to be loose, with a penetration rate (PR) of from 2 to 4. The Quaternary marine terrace deposits, encountered beginning at 0.5 to 2.0 feet bgs, were determined to be medium dense, with a PR of from 6 to 16. Gravel encountered near the surface in TP-2 and in TP-3, causing refusal with the mini excavator, and had a PR of from 8 to 15.

Upon completion, the test pits were filled using uncompacted excavated material. The locations of the test pits were surveyed, marked, and plotted on Figure 2 based on GPS.

LABORATORY ANALYSIS

Select samples were packaged in moisture-proof bags and transported to our laboratory where they were classified in general accordance with the Unified Soil Classification System, Visual-Manual Procedure. In addition, select samples were analyzed, where applicable, for water content (ASTM D698), percent of fines (ASTM D1140), and Atterberg limits (ASTM D4318). The results are summarized below in Table 1. The Lab Analysis Reports for the samples are provided at the back of this report as Attachment 2.

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[5] The dynamic cone penetrometer (DCP) test uses a 15 lb. steel mass falling 20 inches to strike an anvil to penetrate a 1.5-inch-diameter 45° (vertex angle) cone that has been seated in the bottom of a hand-augered hole or test pit. The penetrometer is used to determine a penetration resistance relationship with the standard penetration resistance of virgin soils. N is the average number of blows needed to advance the cone a distance of 1 inch.

Table 1: Laboratory Testing Results

Sample ID	Depth below Surface (feet) / (Test Pit No.)	Type of Soil	Water Content (%)	Fines (%)	USCS Symbol[6]
SS-2	3/(TP-1)	Fine Sand	8.0	3.0	SP
SS-10	2/ (TP-4)	Silty Fine Sand	10.0	5.0	SM
SS-12	1.0/(TP-5)	Silty Fine Sand	12.0	27.0	SM

Our lab analysis indicates that the sands have a relatively low water content and variable, typically low percentage of fines. The sands are subangular to subrounded and are moderately to strongly cemented.

Our analysis and recommendations are based on the following physical properties of the soils encountered, which are listed below in Table 2.

Table 2: Physical Properties of Soil

Type of Soil	Depth below Surface (feet)	N Value[7]	Effective Unit Weight (pcf)	Drained Friction Angle, φ' (degrees)	Drained Cohesion, c' (psf)
SP/SM	0.0 - 9.0	10 - 20	80 - 125	38	0 - 200

GROUNDWATER

Groundwater was not encountered in our test pits. Further, there was no seepage or caving detected in the test pits. Our review of water-well cards for the area[8] indicates that groundwater levels are typically less than 30.0 feet bgs. Our soil samples were described as moist. We infer that the primary groundwater table forms at the contact between the overlaying porous sands of the Quaternary marine terrace deposits and bedrock. It is our opinion that water levels will rise during periods of sustained rainfall and that perched groundwater will form within the surficial sands above confining layers. Based on the topography, we anticipate that the hydraulic gradient is to the west towards the Pacific Ocean.

GEOLOGIC HAZARDS

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[6] Classification symbols are estimated based on visual observation.

[7] Determined based on Penetration rate

[8] Oregon Water Resources Department well report query, viewed online at https://apps.wrd.state.or.us/

A review of the State Landslide Inventory Database (Oregon HazVu)[9] indicates that the site is not part of an identified landslide, earthflow, or debris-flow complex.

A review of LIDAR mapping for the area[10] indicates that the site is located on a broad, level terrace east of a sea cliff. Based on our LIDAR review, there are no landforms which are indicative of geologic hazards which impact the site.

Based on a review of U.S. Geological Survey maps,[11] there are no geologically young fault systems within ½ mile of the subject property. As with other folds and faults located in the Cascadia forearc, it is suspected that great megathrust earthquakes along the Cascadia Subduction Zone will cause future rupture and displacement on these faults.

Seismic Design Criteria

Our seismic design parameters are based on Site Class D – Stiff Soil. The subject property is located in an area that is highly influenced by regional seismicity due to the proximity to the Cascadia Subduction Zone (CSZ). Seismic design criteria, in accordance with the ASCE[12] 7-16 (IBC-12[13]), are summarized in Table 3 below.

Table 3: ASCE 7-16 Seismic Design Parameters

Seismic Design Parameters	**Short Period**	**1 Second**
Maximum Credible Earthquake Spectral Acceleration	S_s = 2.023 g	S_1 = 0.969 g
Site Class	D – Stiff Soil	
Site Coefficient	F_a = 1.000	F_v = null
Adjusted Spectral Acceleration	S_{MS} = 2.023	S_{M1} = null
Design Spectral Response Acceleration Parameters	S_{DS} = 1.349	S_{D1} = null
Peak Ground Acceleration	PGA = 1.009 g	

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[9] (HazVu). Oregon Department of Geology and Mineral Industries (DOGAMI) Statewide Geohazards Viewer. Viewed at https://www.oregongeology.org

[10] LIDAR is an aerial imagery technology that penetrates the vegetative cover by measuring distance by measuring the amount of time it takes for light to travel from a light-emitting source to an object and back to a sensor.

[11] U.S. Geological Survey (USGS), Quaternary Faults Web Mapping Application, viewed at https://earthquake.usgs.gov

[12] American Society of Civil Engineers

[13] 2012 International Building Code

Liquefaction

Liquefaction occurs when loosely packed, water-logged granular sediments lose their strength in response to strong ground shaking during a seismic event. Liquefaction of soils occurring beneath buildings and other structures can cause major damage. Liquefaction potential was assessed based on the information obtained from our test pits and using the parameters provided in Youd & Andrus, et al., 2001.[14] According to our seismic analysis, the site will experience a peak ground acceleration (PGA) during a design seismic event of 1.009 g. Further, groundwater was not observed in our test pits to a depth of 9.0 feet bgs.

Based on the inferred depth of groundwater, the consistency and cementation of the soils encountered in our test pits, it is our opinion that liquefaction potential for the site is low to moderate.

Tsunamis

Based on recent mapping and modeling done by the state of Oregon,[15] the site is within the Tsunami Inundation Zone and may be inundated during a tsunami generated by a local-source (Cascadia Subduction Zone) moment magnitude (Mm) earthquake of 9.0 or greater. Because of this, we strongly recommend that your clients check local resources and the state of Oregon's Department of Geology and Mineral Industries (DOGAMI) Tsunami Resource Center[16] for current information regarding tsunami preparedness and emergency procedures.

DISCUSSION AND RECOMMENDATIONS

Based on our surface and subsurface investigation, it is our opinion that the subject property is suitable to site a single-family residence on a conventional shallow foundation, provided the site is prepared in accordance with our recommendations.

Due to the variability of soils encountered in our test pits, and to anticipated disturbance of the soils by the removal of shore pines on the site, we recommend that

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[14] Youd, T. L., Andrus, I. M., et al., 2001. Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils. ASCE, Journal of Geotechnical and Geoenvironmental Engineering, v. 127, no. 10, pp. 817-833.

[15] Local-source (Cascadia Subduction Zone) Tsunami Inundation Map for Sisters Rock, Curry County, Oregon. DOGAMI TIM-Curr-06, Plate 1. State of Oregon Department of Geology and Mineral Industries online at http://www.oregongeology.org

[16] Viewed online at www.oregongeology.org

the topsoil and surficial soils be removed, and the foundation be built on mechanically compacted structural fill which is placed on the underlying medium-dense fine sand. We further recommend that the topsoil and surficial soils be removed to a depth of 3.0 feet bgs under the building footprint and a 5-foot margin around the footprint and that the building pad be rebuilt using clean, mechanically compacted structural fill. The fill should be approved by CGS.

Finally, we recommend that the site be graded to provide positive drainage away from the structure.

DESIGN

Spread Footing

As discussed, a single-family residence can be supported on a shallow foundation (such as conventional spread footings) which in turn is supported on mechanically compacted structural fill placed on the underlying fine sand encountered in our test pits.

Footings bearing on the structural fill should be sized for an allowable bearing capacity of 2,000 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 loads 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 CGS's estimates, total post-construction settlement is calculated to be less than one (1) inch, with post-construction differential settlement of less than 0.5 inch over a 50-foot span.

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. 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. The footings should be founded below an imaginary line projecting at a 1 horizontal to 1 vertical (1H:1V) slope from the base of any adjacent, parallel utility trenches.

Floor Slabs

Satisfactory subgrade support for reinforced building floor slabs can be obtained from the subgrade prepared in accordance with our site preparation recommendations. All loose fill and disturbed topsoil should be removed to a depth of 1.0-foot bgs. A minimum of 12 inches of loose, imported granular material should be placed and compacted over the prepared subgrade. Imported granular material should be clean sand, crushed rock or crushed gravel that is fairly well graded between coarse and fine, contains no deleterious materials, has a maximum particle size of one (1) inch, and has less than 5 percent by weight passing the U.S. Standard No. 200 Sieve.

CONSTRUCTION

Site Preparation

All loose surficial topsoil and underlying sands should be removed from the building footprint and a 5-foot margin around the footprint. The stripping depth should be a minimum of 3.0 feet bgs and may vary. The actual stripping depth should be based on field observations at the time of construction. Near-surface root zones should be stripped and removed from the project site in all proposed building and slab or pavement areas and for a 5-foot margin around such areas. In addition, root balls should be grubbed out to the depth of the roots which could exceed 4 feet bgs. Depending on the methods used to remove the root balls, considerable disturbance and loosening of the subgrade could occur during site grubbing. The soil disturbed during grubbing operations should be removed to expose firm, undisturbed subgrade. The resulting excavations should be backfilled with mechanically compacted structural fill.

Stripped materials should not be used as structural fill and should be transported off-site for disposal or stockpiled for use in landscaped areas. A CGS engineering geologist (or their representative) should confirm suitable bearing conditions and evaluate all footing subgrades. Deeper excavations and debris removal may be required at the discretion of the engineering geologist. The resulting subgrade should be compacted using a smooth-drum roller or plate compactor.

Structural fill should meet the specifications of Selected Granular Backfill in accordance with Oregon Standards for Specifications for Construction[17]. The imported granular material should be either clean sand, crushed rock or crushed gravel that is fairly well graded between coarse and fine, contain no deleterious material, has a maximum particle size of one (1) inch, and has less than 5 percent by weight passing the U.S. Standard No. 200 Sieve. The granular fill should be placed in 9-inch lifts and compacted to at least 95 percent of the maximum dry density, as determined by ASTM D1557. Compaction should be checked using either a nuclear gauge or Sand Cone Test, as determined by ASTM D1556, and by a proof-roll.

Where imported granular material is placed over soft-soil subgrades, we recommend a geotextile be placed as a barrier between the subgrade and imported granular material. Depending on site conditions, the geotextile should meet the specifications of ODOT SS 02320.10 – Geosynthetics, Acceptance, for soil separation or stabilization. The geotextile should be installed in conformance with ODOT SS 00350.40 – Geosynthetic Construction, General Requirements.

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

Probing

Following stripping, excavation, and site preparation and prior to placing structural fill, the exposed excavated surface and the footing or slab subgrade should be evaluated by probing. A member of our geotechnical staff should carry out the probing. Soft or loose zones identified during the field evaluation should be compacted to an unyielding condition or be excavated and replaced with structural fill.

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[17] Oregon Standards for Specifications for Construction, 2021. Oregon Department of Transportation. Viewed online at https://www.oregon.gov

Excavation

Subsurface conditions at the project site show predominately medium-dense fine sand and silty fine sand. Excavations in these soils may be readily accomplished with conventional earthwork equipment. The gravel encountered in our test pits TP-2 and TP-3 will likely require excavation using rock ripping excavation methods. We estimate that the rock will likely be variably rippable to depths of 3 feet.

Excavation and trench cuts in native materials should stand vertical to a depth of approximately 4 feet, provided no groundwater seepage is present in the trench walls, with the understanding that some sloughing may occur. The trenches should be flattened to 1.5H:1V if excessive sloughing occurs or seepage is present.

Groundwater was not encountered during our site exploration. However, during the wet months of the year, some shallow perched groundwater may be expected. If shallow groundwater is observed during construction, use of a trench shield (or other approved temporary shoring) is recommended for cuts that extend below groundwater seepage or if vertical walls are desired for cuts deeper than 4 feet. If shoring or dewatering is used, CGS recommends that the type and design of the shoring and dewatering systems be the responsibility of the contractor, who is in the best position to choose systems that fit the overall plan of operation. These excavations should be made in accordance with applicable Occupational Safety and Health Administration and state regulations.

DRAINAGE

We recommend that a robust perimeter drainage system be installed around the foundation and that the pad be graded to provide positive drainage away from the house.

WET-WEATHER/WET-SOIL CONDITIONS

The granular soils at the site are susceptible to disturbance during the wet season. Trafficability or grading operations within the exposed soils may be difficult during or after extended wet periods or when the moisture content of the soils is more than a few percentage points above optimum. Soils disturbed during site-preparation activities, or soft or loose zones identified during probing, should be removed and replaced with compacted structural fill.

CONSTRUCTION OBSERVATIONS

Satisfactory pavement and earthwork performance depends on the quality of construction. Sufficient monitoring of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. We recommend that a representative from CGS be retained to observe general excavation, stripping, fill placement, footing subgrades, and subgrades and base rock for floor slabs and pavements.

Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated.

LIMITATIONS

Cascadia Geoservices, Inc.'s (CGS) professional services are performed, findings obtained, and recommendations prepared in accordance with generally accepted principles and practices for engineering geologists. No other warranty, express or implied, is made. The Customer acknowledges and agrees that:

1. CGS is not responsible for the conclusions, opinions, or recommendations made by others based upon our findings.
2. This report has been prepared for the exclusive use of the addressee, and their agents, and is intended for their use only. It is not to be photographed, photocopied, or similarly reproduced, in total or in part, without the expressed written consent of the Customer and Cascadia Geoservices, Inc.
3. The opinions, comments, and conclusions presented in this report are based upon information derived from our literature review, historical topographic map and aerial photograph review, and on our site observations. The scope of our services is intended to evaluate soil and groundwater (ground) conditions within the primary influence or influencing the proposed development area. Our services do not include an evaluation of potential ground conditions beyond the depth of our explorations or agreed-upon scope of our work. Conditions between or beyond our site observations may vary from those encountered.

4. Recommendations provided herein are based in part upon project information provided to CGS. If the project information is incorrect or if additional information becomes available, the correct or additional information should be immediately conveyed to CGS for review.
5. The scope of services for this subsurface exploration and report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.
6. If there is a substantial lapse of time between the submission of this report and the start of work at the site, if conditions have changed due to natural causes or construction operations at or adjacent to the site, or if the basic project scheme is significantly modified from that assumed, this report should be reviewed to determine the applicability of the conclusions and recommendations. Land use, site conditions (both on and off site), or other factors may change over time and could materially affect our findings. Therefore, this report should not be relied upon after two years from its issue, or in the event that the site conditions change.
7. The work performed by the Consultant is not warrantied or guaranteed.
8. There is an assumed risk when building on marginal ground, sites subject to flooding, or adjacent to bluffs, sea cliffs, or on steep ground.
9. The Consultant's work will be performed to the standards of the engineering and geology professions and will be supervised by licensed professionals. Attempts at improving marginal ground, sites subject to flooding, or adjacent to bluffs, sea cliffs, or on steep ground supporting the Customer's property may, through acts of God or otherwise, be temporary and that marginal ground, sites subject to flooding, or adjacent to bluffs, sea cliffs, or on steep ground may continue to degrade over time. The Customer hereby waives any claim that they may have against CGS for any claim, whether based on personal injury, property damage, economic loss, or otherwise, for any work performed by CGS for the Customer relating to or arising out of attempts to stabilize the marginal ground, sites subject to flooding, or bluffs, sea cliffs, or steep ground located at the Customer's property identified hereunder. It is further understood and agreed that continual monitoring of the Customer's property may be required, and that such

monitoring is done by sophisticated monitoring instruments used by CGS. It is further understood and agreed that repairs may require regular and periodic maintenance by the Customer.

10. The Customer shall indemnify, defend, at the Customer's sole expense, and hold harmless CGS, affiliated companies of CGS, its partners, joint ventures, representatives, members, designees, officers, directors, shareholders, employees, agents, successors, and assigns (Indemnified Parties) from and against any and all claims for bodily injury or death, damage to property, demands, damages, and expenses (including but not limited to investigative and repair costs, attorney's fees and costs, and consultant's fees and costs) (hereinafter "Claims") which arise or are in any way connected with the work performed, materials furnished, or services provided under this Agreement by CGS or its agents.

PROFESSIONAL QUALIFICATIONS

To review our professional qualifications, please visit our website at www.CascadiaGeoservices.com.

Sincerely,

Cascadia Geoservices, Inc.

CERTIFIED
OREGON
ERIC T. OBERBECK
1332
ENGINEERING GEOLOGIST

Eric Oberbeck

Adam Fulthorpe

Eric Oberbeck, RG/CEG
Expires June 1, 2022

Adam Fulthorpe, Staff Geologist

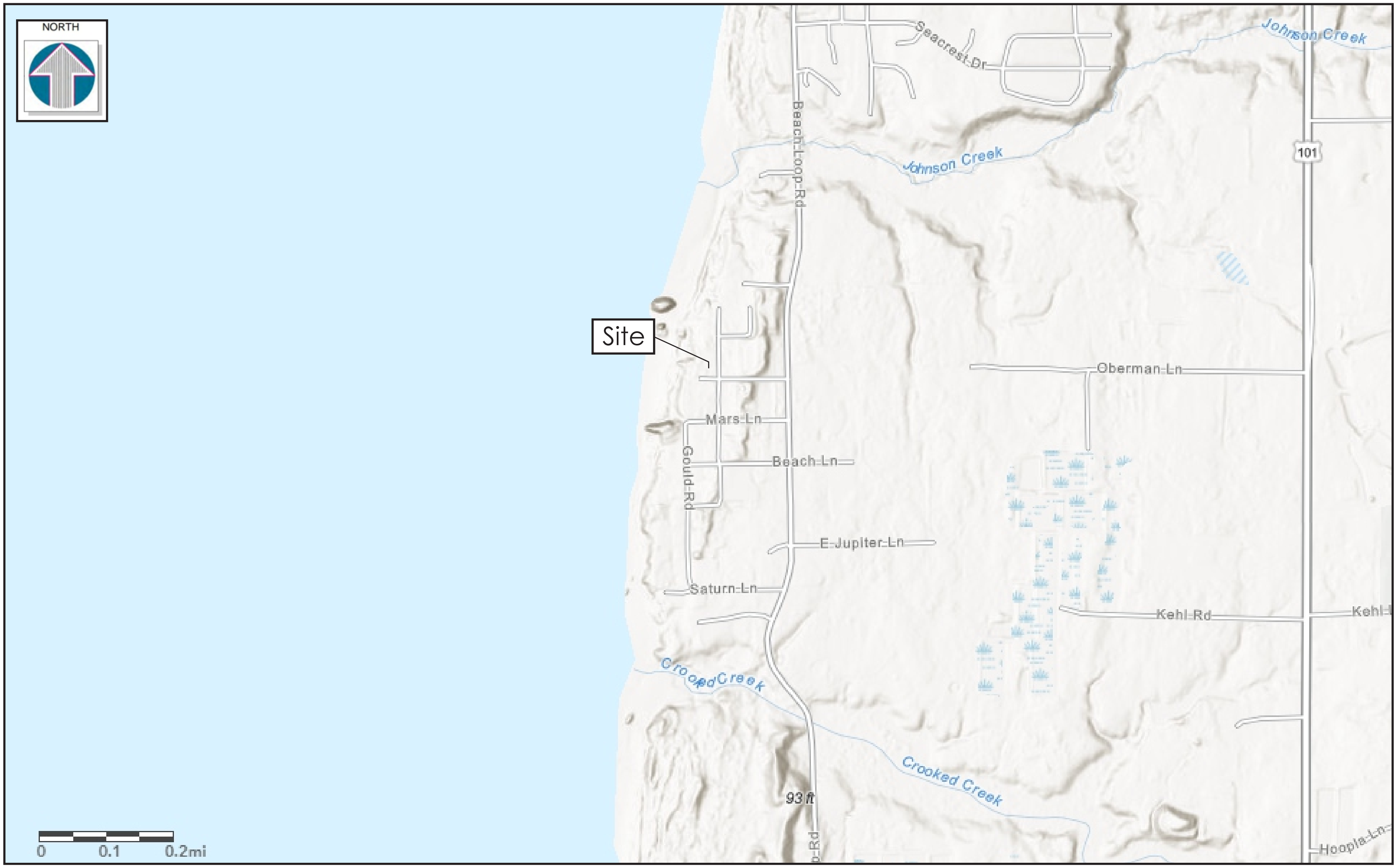
PHOTOS

FIGURES

Figure 1, Location Map
Figure 2, Site Map

ATTACHMENTS

Attachment 1 – Summary Test Pit Logs
Attachment 2 – Lab Analysis Reports



Base map provided by: ESRI

Prepared for: Mr. Corey Durbin

CASCADIA Geoservices
Geologists and Engineers

Project: 21096

September 2021

Location Map

Geotechnical Site Evaluation
87052 Vesta Lane, Bandon, Oregon 97411
T29S R15W Sec 01CB, Tax Lots 1600 and 1602

Figure 1

Prepared for Mr. Corey Durbin

CASCADIA Geoservices Geologists and Engineers

Project: 21096

September 2021

Site Map

Geotechnical Site Evaluation
87052 Vesta Lane, Bandon, Oregon 97411
T29S R15W Sec 01CB, Tax Lots 1600 and 1602

Figure 2

CASCADIA Geoservices	Geotechnical Site Evaluation 87052 Vesta Lane Bandon, Oregon 97411	**Photographic Log**
	Date: September 2021	Cascadia Geoservices, Inc. Project No: 21096

Photo No: **1**

Direction Photo is Taken: West

Photo Description:

Aerial view of the site looking west

Photo No: **2**

Direction Photo is Taken: East

Photo Description:

Aerial view of the site looking south

Photo No: 3

Direction Photo is Taken: West

Photo Description:

CGS observed the excavation of five test pits on the site.

Photo No: 4

Direction Photo is Taken:

Photo Description:

Topsoil encountered from 0.0 to 1.0 feet over lays medium-dense, tannish brown and reddish brown, silty fine sand.

Photo No:	**5**
Direction Photo is Taken:	
Photo Description:	
Bedrock was encountered near the surface in TP-2 and was medium weak (R3) dark greenish gray severely weathered and highly fractured volcanics.	

Photo No:	
Direction Photo is Taken:	
Photo Description:	

TABLE 1 SOILS ATTACHMENT 1
FIELD CLASSIFICATIONS

SOIL DESCRIPTION FORMAT

(1) consistency,	(9) structure,
(2) color,	(10) cementation,
(3) grain size,	(11) reaction to HCL,
(4) classification name [secondary PRIMARY additional];	(12) odor,
(5) moisture,	(13) groundwater seepage,
(6) plasticity of fines,	(14) caving,
(7) angularity	**(15) (unit name and/or origin),**
(8) shape,	

Note: Bolded items are the minimum required elements for a soil description.

1. CONSISTENCY - COARSE-GRAINED

Term	SPT (140-lb. hammer)[1]	D & M Sampler (140-lb. hammer)[1]	Dynamic Cone Penetrometer Penetration Rate Sampler (DCP)[4,5,6]	Field Test (using ½-inch rebar)
Very loose	0 – 4	0 – 11	0 – 2	Easily penetrated when pushed by hand
Loose	4 – 10	11 – 26	2 – 5	Easily penetrated several inches when pushed by hand
Medium dense	10 – 30	26 – 74	6 – 31	Easily to moderately penetrated when driven by 5 lb. hammer
Dense	30 – 50	74 – 120	32 – 42	Penetrated 1-foot with difficulty when driven by 5 lb. hammer
Very dense	>50	>120	>43	Penetrated only few inches when driven by 5 lb. hammer

1. CONSISTENCY - FINE-GRAINED

Term	SPT (140-lb. hammer)[1]	D & M Sampler (140-lb. hammer)[1]	Dynamic Cone Penetrometer Penetration Rate Sampler (DCP)[5,6]	Pocket Pen.[2]	Torvane[3]	Field Test
Very soft	<2	<3	<2	<0.25	<0.13	Easily penetrated several inches by fist
Soft	2 – 4	3 – 6	2 – 3	0.25 – 0.5	0.13 – 0.25	Easily penetrated several inches by thumb
Medium stiff	5 – 8	7 – 12	4 – 7	0.50 – 1.0	0.25 – 0.5	Can be penetrated several inches by thumb with moderate effort
Stiff	9 – 15	13 – 25	8 – 16	1.0 – 2.0	0.5 – 1.0	Readily indented by thumb but penetrated only with great effort
Very stiff	16 – 30	26 – 65	17 – 27	2.0 – 4.0	1.0 – 2.0	Readily indented by thumbnail
Hard	>30	>65	>28	>4.0	>2.0	Difficult to indent by thumbnail

[1] Standard penetration resistance (SPT N-value); Dames and Moore (D & M) sampler, number of blows/ft. for last 12" and 30" drop. Unconfined
[2] compressive strength with pocket penetrometer; in tons per square foot (tsf).
[3] Undrained shear strength with torvane (tsf).
[4] Up to maximum medium-size sand grains only.
[5] Dynamic cone penetration resistance; number of blows/inch.
[6] Reference: George F. Sowers et. al. "Dynamic Cone for Shallow In-Situ Penetration Testing of In-Situ Soils, ASTM STP 399, ASTM, , pg. 29. 1966.

2. COLOR

Use common colors. For combinations use hyphens. To describe tint use modifiers: pale, light, and dark. For color variations use adjectives such as "mottled" or "streaked". Soil color charts may be required by client. **Examples:** red-brown; or orange-mottled pale green; or dark brown.

3. GRAIN SIZE

Description		Sieve*	Observed Size
boulders		–	>12"
cobbles		–	3" – 12"
gravel	coarse	¾" – 3"	¾" – 3"
	fine	#4 – ¾"	4.75 mm (0.19") – ¾"
sand	coarse	#10 – #4	2.0 – 4.75 mm
	medium	#40 – #10	0.425 – 2.0 mm
	fine	#200 – #40	0.075 – 0.425 mm
fines		<#200	<0.075 mm

4. CLASSIFICATION NAME

* Use of #200 field sieve encouraged for estimating percentage of fines.

	Name and Modifier Terms	Constituent Percentage	Constituent Type
Coarse grained	GRAVEL, SAND, COBBLES, BOULDERS	>50%	PRIMARY
	sandy, gravelly, cobbley, bouldery	30 – 50%	secondary
	silty, clayey*	15 – 50%	
	with (gravel, sand, cobbles, boulders)	15 – 30%	additional
	with (silt, clay)*	5 – 15%	
	trace (gravel, sand, cobbles, boulders)		
	trace (silt, clay)*	<5%	
Fine grained	CLAY, SILT*	>50%	PRIMARY
	silty, clayey*	30 – 50%	secondary
	sandy, gravelly		
	with (sand, gravel, cobbles, boulders)	15 – 30%	additional
	with (silt, clay)*		
	trace (sand, gravel, cobbles, boulders)	5 – 15%	
	trace (silt, clay)*		
Organic	PEAT	50 – 100%	PRIMARY
	organic (soil name)	15 – 50%	secondary
	(soil name) with some organics	5 – 15%	additional

* For classification and naming fine-grained soil: dry strength, dilatancy, toughness, and plasticity testing are performed (see Describing Fine-Grained Soil page 2). Confirmation requires laboratory testing (Atterberg limits and hydrometer).

TABLE 1 SOILS
FIELD CLASSIFICATIONS

5. MOISTURE

Term	Field Test
dry	absence of moisture, dusty, dry to touch
moist	contains some moisture
wet	visible free water, usually saturated

6. PLASTICITY OF FINES

See "Describing fine-grained Soil" on Page 2.

7. ANGULARITY

 rounded	 Angular
 subrounded	 Subangular

8. Shape

Term	Observation
flat	particles with width/thickness ratio >3
elongated	particles with length/width ratio >3
flat and elongated	particles meet criteria for both flat and elongated

9. STRUCTURE

Term	Observation
stratified	alternating layers >1 cm thick, describe variation
laminated	alternating layers <1 cm thick, describe variation
fissured	contains shears and partings along planes of weakness
slickensides	partings appear glossy or striated
blocky	breaks into lumps, crumbly
lensed	contains pockets of different soils, describe variation
homogenous	same color and appearance throughout

10. CEMENTATION

Term	Field Test
weak	breaks under light finger pressure
moderate	breaks under hard finger pressure
strong	will not break with finger pressure

11. REACTION TO HCL

Term	Field Test
none	no visible reaction
weak	bubbles form slowly
strong	vigorous reaction

12. ODOR

Describe odor as organic; or potential non-organic*
*Needs further investigation

13. GROUNDWATER SEEPAGE

Describe occurrence (i.e. from soil horizon, fissures with depths) and rate:
slow (<1 gpm); moderate (1-3 gpm); fast (>3 gpm)

14. CAVING

Describe occurrence (depths, soils) and amount with term

Test Pits	minor (<1 ft^3)	moderate (1-3 ft^3)	Severe (>3 ft^3)

15. (UNIT NAME/ORIGIN)

Name of stratigraphic unit (e.g. Willamette Silt), and/or origin of deposit (Topsoil, Alluvium, Colluvium, Decomposed Basalt, Loess, Fill, etc.).

DESCRIBING FINE-GRAINED SOIL

	Field Test			
Name	Plasticity (A below)	Dry Strength (B below)	Dilatancy Reaction (C below)	Toughness of Thread (D below)
SILT	non-plastic, low	none, low	rapid	low
SILT with some clay	low	low, medium	rapid, slow	low, medium
clayey SILT	low, medium	medium	slow	medium
silty CLAY	medium	medium, high	slow, none	medium, high
CLAY with some silt	high	High	none	high
CLAY	high	very high	none	high
organic SILT	non-plastic, low	low, medium	slow	low, medium
organic CLAY	medium, high	medium to very high	none	medium, high

A. PLASTICITY

Term	Observation
non-plastic	A 1/8" (3-mm) thread cannot be rolled at any water content.
low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be re-rolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
high	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be re-rolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

B. DRY STRENGTH

Term	Observation
none	Dry specimen crumbles into powder with mere pressure of handling.
low	Dry specimen crumbles into powder with some finger pressure.
medium	Dry specimen breaks into pieces or crumbles with considerable finger pressure.
high	Dry specimen cannot be broken with finger pressure. Will break into pieces between thumb and a hard surface.
very high	Dry specimen cannot be broken between thumb and a hard surface.

C. DILATANCY REACTION

Term	Observation
none	No visible change in the specimen.
slow	Water appears slowly on surface of specimen during shaking and doesn't disappear or disappears slowly upon squeezing.
rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

D. TOUGHNESS OF THREAD

Term	Observation
low	Only slight hand pressure is required to roll the thread near the plastic limit. The thread and lump are weak and soft.
medium	Medium pressure is required to roll the thread to near the plastic limit. The thread and lump have medium stiffness.
high	Considerable hand pressure is required to roll the thread to near the plastic limit. The thread and lump have very high stiffness.

Rock Descriptions

Scale of Rock Strength

Description	Designation	Unconfined Compressive Strength, psi	Unconfined Compressive Strength, MPa	Field Identification
Extremely weak rock	R0	35 – 150	0.25 – 1	Indented by thumbnail.
Very weak rock	R1	150 – 725	1 – 5	Crumbles under firm blows with point of geology pick; can be peeled by a pocket knife.
Weak rock	R2	725 – 3,500	5 – 25	Can be peeled with a pocket knife; shallow indentation made by firm blow with point of geological hammer.
Medium weak rock	R3	3,500 – 7,000	25 – 50	Cannot by scraped or peeled with a pocket knife; specimen can be fractured with a single firm blow of geological hammer.
Strong rock	R4	7,000 – 15,000	50 – 100	Specimen requires more than one blow with a geological hammer to fracture it.
Very strong rock	R5	15,000 – 36,000	100 – 250	Specimen requires many blows of geological hammer to fracture it.
Extremely strong rock	R6	> 36,000	> 250	Specimen can only be chipped with geological hammer.

Descriptive Terminology for Joint Spacing or Bedding

Descriptive Term	Spacing of Joints	
Very close	Less than 2 inches	< 50 mm
Close	2 inches - 1 foot	50 mm – 300 mm
Moderately close	1 foot - 3 feet	300 mm – 1 m
Wide	3 feet -10 feet	1 m – 3 m
Very wide	Greater than 10 feet	> 3 m

Descriptive Terminology for Vesicularity

Descriptive Term	Percent voids by volume
Dense	< 1%
Slightly vesicular	1 – 10%
Moderately vesicular	10 – 30%
Highly vesicular	30 – 50%
Scoriaceous	> 50%

Correlation of RQD and Rock Quality

Rock Quality Descriptor	RQD Value
Very poor	0 – 25
Poor	25 - 50
Fair	50 - 75
Good	75 – 90

Scale of Rock Weathering

Stage	Description	Quality Distinction
Fresh	Rock is fresh, crystals are bright, few joints may show slight staining as a result of ground water.	No discoloration
Very Slight	Rock is generally fresh, joints are stained, some joints may have thin clay coatings, crystals in broken face show bright.	Discoloration only on major discontinuity surfaces [1]
Slight	Rock is generally fresh, joints are stained and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some feldspar crystals are dull and discolored. Rocks ring under hammer if crystalline.	Discoloration on all discontinuity surfaces and on rock
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some are clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.	Decomposition and/or disintegration < 50% of rock [2]
Moderately Severe	All rock, except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick. Rock goes "clunk" when struck.	Decomposition and/or disintegration > 50%, but not complete
Severe	All rock, except quartz, discolored or stained. Rock "fabric" is clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of harder rock usually left, such as corestones in basalt.	
Very Severe	All rock, except quartz, discolored or stained. Rock "fabric" is discernible, but mass effectively reduced to "soil" with only fragments of harder rock remaining.	Decomposition and/or disintegration 100% with structure/fabric intact
Complete	Rock is reduced to "soil". Rock "fabric" is not discernible, or only in small scattered locations. Quartz may be present as dikes or stringers.	Decomposition and/or disintegration 100% with structure/fabric destroyed

NOTES:

[1] Discontinuities consist of any natural break (joint, fracture or fault) or plane of weakness (shear or gouge zone, bedding plane) in a rock mass

[2] Decomposition refers to chemical alteration of mineral grains; disintegration refers to mechanical breakdown

[3] Stage and description from ASCE Manual No. 56 (1976), quality distinction from Murray (1981)

Rock strength scale taken from Duncan C. Wyllie, "Foundations on Rock, Second Edition, 1999".

TABLE 2

KEY TO TEST PIT AND BORING LOG SYMBOLS

CASCADIA Geoservices

SAMPLE NUMBER ACRONYMS/WATER SYMBOLS

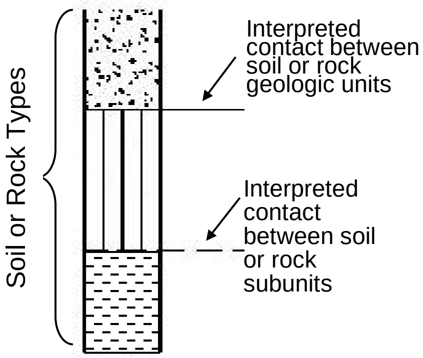
DM - Dames & Moore Sampler
GR - Grab or Bulk Samples
OS - Osterberg (Piston) Sampler
C - Rock Core
SA - Screen Air Sampling
SW - Screen Water Sampling
SS - SPT Standard Penetration Drive Sampler (ASTM D1586)
ST - Shelby Tube Push Sampler (ASTM D1587)

Water Level During Drilling/ Excavation
▽

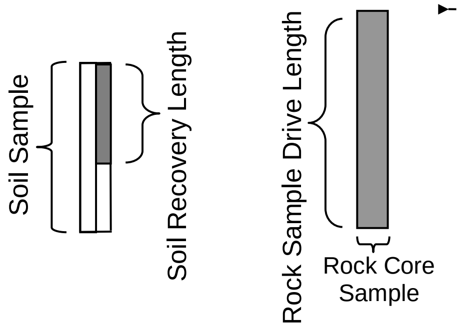
Water Level on Date Measured
▼

LOG GRAPHICS/INSTALLATIONS

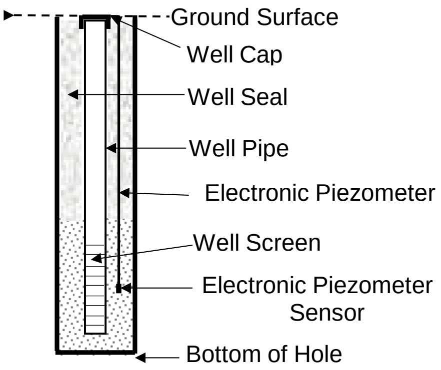
Soil and Rock



Soil and Rock Sampling Symbols



Instrumentation Detail



GEOTECHNICAL FIELD & LABORATORY TESTING/ACRONYM EXPLANATIONS

ATT	Atterberg Limits	OC	Organic Content
AMSL	Above Mean Sea Level	OD	Outside Diameter
BGS	Below ground surface	P200	Percent Passing U.S. Standard No. 200 Sieve
CBR	California Bearing Ratio	PI	Plasticity Index
CON	Consolidation	PL	Plasticity Limit
DCP	Dynamic Cone Penetrometer	PP	Pocket Penetrometer
DD	Dry Density	RES	Resilient Modulus
DS	Direct Shear	SC	Sand Cone
GPS	Global Positioning System	SIEV	Sieve Gradation
HCL	Hydrochloric Acid	SP	Static Penetrometer
HYD	Hydrometer Gradation	TOR	Torvane
kPa	kiloPascal	UC	Unconfined Compressive Strength
LL	Liquid Limit	VS	Vane Shear

ENVIRONMENTAL TESTING/ACRONYM EXPLANATIONS

ATD	At Time of Drilling	ND	Not Detected
BGS	Below ground surface	NS	No Sheen
CA	Sample Submitted for Chemical Analysis	PID	Photoionization Detector Headspace Analysis
HS	High Sheen		
MS	Moderate Sheen	PPM	Parts Per Million

Rev. 3/2019

ATTACHMENT 1

TEST PITS

CASCADIA GEOSERVICES
PROJECT NO: 21096

DURBIN PROPERTY
87052 VESTA LANE
BANDON, OREGON 97411

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

◆ DYNAMIC PENETROMETER (DP or DCP)
☒ STATIC PENETROMETER (SP)
● MOISTURE CONTENT (%)
INDEX PROPERTIES (IP)
NUCLEAR DENSITY (ND)
DRY DENSITY (DD)
SIEVE (SIEV)

TP-1 SURFACE CONDITIONS: Dry

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE/ SAMPLE ID	0 / 25 / 50	COMMENTS
0.0	Very loose, brown, sandy ORGANICS; dry, with roots (TOPSOIL)	0.0				
1.0	Loose, light gray, fine SAND; dry, moderate cementation	0.5	P200	☒ SS-1	●	P200 = 54% W% = 5.0%
2.0	**QUATERNARY MARINE TERRACE DEPOSITS**					
3.0	becomes medium dense, tannish-orangish-brown fine sand: moist, well cemented		DCP P200	☒ SS-2	◆ 16 ●	P200 = 3% W% = 8.0%
4.0						
5.0			DCPs P200	☒ SS-3	◆◆ 9 10 ●	P200 = 5% W% = 11.0%
6.0						
7.0			DCP P200	☒ SS-4	◆ 5 ●	P200 = 2% W% = 4.0%
8.0	becomes loose tannish-brown fine sand		P200	☒ SS-5	●	P200 = 2% W% = 4.0%
9.0	Final depth 9.0 feet bgs; test pit backfilled with uncompacted excavated material	9.0				No seepage or caving observed to the depth explored

TP-1 Location: Lat: 43.088197 Long: -124.432867 (See Figure 2); Elevation: 56 feet (GPS) Date Completed: 8/20/2021

TP-2 SURFACE CONDITIONS: Dry

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE/ SAMPLE ID	0 / 25 / 50	COMMENTS
0.0	Hard, dark greenish-gray, GRAVEL; dry, angular (fresh volcanic BEDROCK). Hard digging, test pit abandoned	0.0				
1.0	**SIXES RIVER MELANGE**	0.5	P200	☒ SS-6	●	P200 = 2% W% = 1.0% No seepage or caving observed to the depth explored
2.0	Final depth 0.5 feet bgs; test pit backfilled with uncompacted excavated material					
3.0						
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						

TP-2 Location: Lat: 43.088197 Long: -124.432867 (See Figure 2); Elevation: 56 feet (GPS) Date Completed: 8/20/2021

EXCAVATION METHOD: Mini Excavator
EXCAVATED BY: Natural Origins LLC
LOGGED BY: A. Fulthorpe

ALL EXPLORATIONS-2 PER PAGE DURBINPROP_TP1-5_082921.GPJ PRINT DATE 8/30/21

TEST PITS

CASCADIA GEOSERVICES
PROJECT NO: 21096

DURBIN PROPERTY
87052 VESTA LANE
BANDON, OREGON 97411

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

◆ DYNAMIC PENETROMETER (DP or DCP)
☒ STATIC PENETROMETER (SP)
● MOISTURE CONTENT (%)
INDEX PROPERTIES (IP)
NUCLEAR DENSITY (ND)
DRY DENSITY (DD)
SIEVE (SIEV)

TP-3

SURFACE CONDITIONS: Dry

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE/ SAMPLE ID	0 — 25 — 50	COMMENTS
0.0	Medium dense, reddish-brown, fine SAND; dry, with roots (TOPSOIL)	0.0				
1.0	Medium dense, reddish-brown, fine SAND; damp **QUATERNARY MARINE TERRACE DEPOSITS**	1.0				
2.0	Medium dense, reddish-brown and dark greenish-gray, sandy GRAVEL; damp, gravel is angular volcanics (Severley Weathered Volcanics) **SIXES RIVER MELANGE**	2.0	P200 DCPs	☒ SS-7	8 9 ◆◆ ●	W% = 24.0% P200 = 34%
4.0			P200 DCPs	☒ SS-8	● 14 15 ◆◆	W% = 8.0% P200 = 4%
5.0	Final depth 5.0 feet bgs; test pit backfilled with uncompacted excavated material	5.0	P200	☒ SS-9	●	P200 = 2% W% = 8.0% No seepage or caving observed to the depth explored
6.0						
7.0						
8.0						
9.0						

TP-3 Location: Lat: 43.088197 Long: -124.432867 (See Figure 2); Elevation: 56 feet (GPS) Date Completed: 8/20/2021

TP-4

SURFACE CONDITIONS: Dry

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE/ SAMPLE ID	0 — 25 — 50	COMMENTS
0.0	Loose, brown, fine SAND; dry, with roots (TOPSOIL)	0.0				
1.0	Medium dense, tannish-brown, fine SAND; dry, moderate cementation **QUATERNARY MARINE TERRACE DEPOSITS**	1.0				
2.0			P200 DCPs	☒ SS-10	6 7 ◆◆ ●	W% = 10.0% P200 = 5%
3.0						
4.0			P200 DCPs	☒ SS-11	6 7 ◆◆ ●	W% = 13.0% P200 = 11%
5.0	Final depth 5.0 feet bgs; test pit backfilled with uncompacted excavated material	5.0				No seepage or caving observed to the depth explored
6.0						
7.0						
8.0						
9.0						

TP-4 Location: Lat: 43.088197 Long: -124.432867 (See Figure 2); Elevation: 56 feet (GPS) Date Completed: 8/20/2021

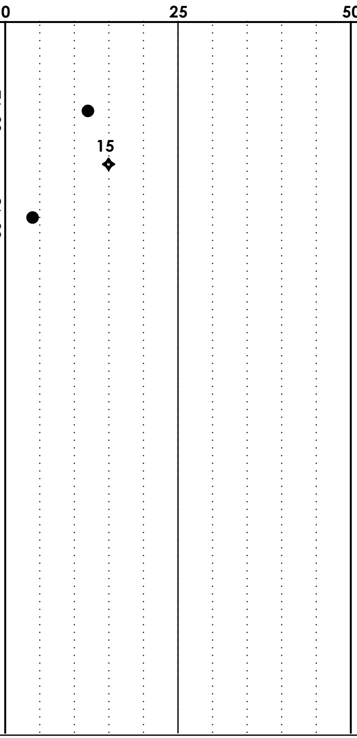
EXCAVATION METHOD: Mini Excavator
EXCAVATED BY: Natural Origins LLC
LOGGED BY: A. Fulthorpe

TEST PIT CASCADIA GEOSERVICES PROJECT NO: 21096	DURBIN PROPERTY 87052 VESTA LANE BANDON, OREGON 97411	Cascadia Geoservices, Inc. 190 6th Street Port Orford, OR 97465 D. 541-332-0433 C. 541-655-0021

◆ DYNAMIC PENETROMETER (DP or DCP)
☒ STATIC PENETROMETER (SP)
● MOISTURE CONTENT (%)
INDEX PROPERTIES (IP)
NUCLEAR DENSITY (ND)
DRY DENSITY (DD)
SIEVE (SIEV)

TP-5 SURFACE CONDITIONS: Dry

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE/ SAMPLE ID	COMMENTS
0.0	Loose, brown, fine SAND; dry, with roots (TOPSOIL)	0.0			
1.0	Medium dense, tannish-brown, fine SAND; damp, strong cementation	1.0	P200	☒ SS-12	P200 = 27% W% = 12.0%
2.0	**QUATERNARY MARINE TERRACE DEPOSITS**		DCP		
	becomes tannish-orangish-brown		P200	☒ SS-13	P200 = 0% W% = 4.0%
3.0	Final depth 3.0 feet bgs; test pit backfilled with uncompacted excavated material	3.0			No seepage or caving observed to the depth explored
4.0					
5.0					
6.0					
7.0					
8.0					
9.0					



TP-5 Location: Lat: 43.088197 Long: -124.432867 (See Figure 2); Elevation: 56 feet (GPS) Date Completed: 8/20/2021

EXCAVATION METHOD: Mini Excavator
EXCAVATED BY: Natural Origins LLC
LOGGED BY: A. Fulthorpe

CASCADIA GEOSERVICES, INC.
Material Laboratory
190 6th St
Port Orford, Oregon 97465
P.541-332-0433

Project No.: 21096
Testing Date: 08/26/2021
Tests Performed: Water Content, Soil Finer Than 75µm
Standards Followed: D2216, D1140
Performed By: AF

Notes:

Water Content (D2216)

Sample Name	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12	SS-13
Pan Letter	A	B	C	D	E	F	G	H	I	J	K	L	M
M_c = Mass of Container, g	1.87	1.87	1.87	1.87	1.88	1.84	1.86	1.87	1.87	1.89	1.85	1.86	1.85
M_{cms} = Mass of Container and Moist Specimen, g	26.07	38.44	35.46	28.41	36.30	31.33	36.59	54.02	37.52	30.86	36.56	32.71	30.16
M_{cds} = Mass of Container and Dry Specimen, g	24.94	35.82	32.19	27.31	34.95	31.07	29.76	50.37	34.90	28.14	32.53	29.33	29.05
M_s = Mass of Oven Dry Specimen = M_{cds} - M_c, g	23.07	33.95	30.32	25.44	33.07	29.23	27.90	48.50	33.03	26.25	30.68	27.47	27.20
M_w = Mass of Water = M_{cms} - M_{cds}, g	1.13	2.62	3.27	1.10	1.35	0.26	6.83	3.65	2.62	2.72	4.03	3.38	1.11
w = Water Content = M_w/M_s X 100%	5%	8%	11%	4%	4%	1%	24%	8%	8%	10%	13%	12%	4%

% Finer Than 75µm (D1140)

Sample Name	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12	SS-13
Pan Letter	A	B	C	D	E	F	G	H	I	J	K	L	M
M_c = Mass of Container, g	1.87	1.87	1.87	1.87	1.88	1.84	1.86	1.87	1.87	1.89	1.85	1.86	1.85
M_{crs} = Mass of Container and Retained Specimen, g	17.69	46.78	40.76	46.77	47.06	31.83	31.83	60.84	48.98	37.67	41.62	29.86	42.95
M_s = Mass of Oven Dry Specimen = M_{cds} - M_c, g	23.07	33.95	30.32	25.44	33.07	29.23	27.90	48.50	33.03	26.25	30.68	27.47	27.20
M_r = Mass of Retained Specimen = M_{crs} - M_c, g	10.66	32.91	28.70	24.88	32.41	28.71	18.48	46.74	32.23	24.85	27.25	19.95	27.07
% Finer Than 75µm = $(M_s - M_r)/M_s$ X 100%	54%	3%	5%	2%	2%	2%	34%	4%	2%	5%	11%	27%	0%