4. Geotechnical Soil Analysis Report (Includes Geologic Hazard Study)

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

January 7, 2014
Project No. 13-3186

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SUBJECT: PRELIMINARY GEOTECHNICAL SLOPE STABILITY EVALUATION AND RESULTS OF INFILTRATION TESTING
GREEN MOUNTAIN
NE INGLE ROAD & NE 28TH STREET
CAMAS, WASHINGTON

This report presents the results of a geotechnical engineering study conducted by GeoPacific Engineering, Inc. (GeoPacific) for the above-referenced project. The purpose of our investigation was to evaluate subsurface conditions at the site and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with GeoPacific Proposal No. P-4611b, dated October 15, 2013, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*. This report is considered Preliminary because a final grading plan has not been developed.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The subject site is located on the north side of NE Goodwin Road and east of NE Ingle Road in the City of Camas, Clark County, Washington. The property includes several tax lots that total approximately 281.6 acres. Topography on the southern portion of the site is flat to gently sloping with grades of about 5 to 10 percent. Steeper slopes (up to 35 percent grade) are present on Green Mountain, which is a basalt cinder cone, located in the northern portion of the site. Near vertical slopes are present at the base of Green Mountain where basalt bedrock is exposed.

The southern portion of the site is the Green Mountain Golf Course. Improvements include several structures, parking areas, cart tracks, and fairways. The northern portion of the site is currently unimproved. Vegetation consists of short grasses and dense to sparse trees. A power line easement diagonally bisects the site.

It is our understanding that the proposed development will consist of a subdivision for single family homes, new streets, and associated underground utilities. The conceptual master plan indicates high to low density development is planned. Much of the steeply sloping areas at the base of

Green Mountain will remain as open space or park areas. A grading plan has not been provided for our review; however, we anticipate maximum cuts and fills will be on the order of about 12 feet due to the sloping topography.

REGIONAL AND LOCAL GEOLOGIC SETTING

Regionally, the subject site lies within the Willamette Valley/Puget Sound lowland, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. A series of discontinuous faults subdivide the Willamette Valley into a mosaic of fault-bounded, structural blocks (Yeats et al., 1996). Uplifted structural blocks form bedrock highlands, while down-warped structural blocks form sedimentary basins.

The low-lying portion of the site is underlain by the Quaternary aged (last 1.6 million years) Willamette Formation, a catastrophic flood deposits associated with repeated glacial outburst flooding of the Willamette Valley (Trimble, 1963; Yeats et al., 1996; Phillips, 1987). The last of these outburst floods occurred about 10,000 years ago. These deposits typically consist of horizontally layered, micaceous, silty sand with gravel that is underlain by medium dense to dense gravel.

The Willamette Formation is underlain by a gravel conglomerate interbedded with siltstone and sandstone. Evarts (2006) indicates the age of the conglomerate is poorly constrained but is likely Pliocene to Pleistocene in age (10,000 to 5.3 million years ago). The conglomerate is partially cemented with the upper portion moderately weathered.

The northern portion of the subject site is underlain by Basaltic Andesite of Green Mountain (Evarts, 2006). The gray basaltic andesite lava flows erupted from a cinder cone on Green Mountain during the Pleistocene (2.6 to 5.3 million years ago). The basalt contains weathered ash, trace quartzite pebbles, and fine grained xenoliths (Evarts, 2006).

A portion of the site is underlain by Miocene to Pleistocene age (16 to 0.5 million years ago) terrigenous sedimentary rocks belonging to the Troutdale Formation (Evarts, 2006). The Troutdale Formation is informally divided into an upper and lower member. Lithologies in the upper member include lenticular layers of volcaniclastic (vitric) sand, quartzite-bearing gravel, fine-grained sand, silt and clay, micaceous quartz-rich sand, and conglomerate with a cumulative average thickness of 100 to 150 feet. The lower member consists primarily of laminated silty clay and sand with reported thicknesses in water well logs of up to 800 feet. These sediments vary from weakly-consolidated to well-indurated.

REGIONAL SEISMIC SETTING

At least four potential source zones capable of generating damaging earthquakes are thought to exist in the region. These include the Lacamas Creek-Sandy River Fault, Portland Hills Fault Zone, Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone, as discussed below.

Lacamas Creek-Sandy River Fault

The Lacamas Creek Fault is recognized based on a fault shear contact between Oligocene (30 million years old) volcanic rocks and the Troutdale Formation, and a series of prominent geomorphic lineaments with a cumulative length of 24 miles (Mundorff, 1964; Beeson et al., 1989).

The Sandy River Fault, interpreted from gravity and borehole data, forms a possible right stepping, 7-mile-long extension of the Lacamas Creek Fault that vertically displaces the Columbia River Basalt by 1,300 feet (Beeson et al., 1989; Geomatrix Consultants, 1995). A 1989, M3.9 earthquake in the vicinity may have occurred on the Lacamas Creek Fault. A comprehensive seismic hazard study commissioned by the Oregon Department of Transportation concluded that the Lacamas Creek-Sandy River Fault Zone is potentially active with a possible rupture length of greater than 25 miles. The Lacamas Creek Fault is mapped as being ½ mile southwest of the subject site (Figure 1).

Portland Hills Fault Zone

The Portland Hills Fault Zone is a series of NW-trending faults that include the central Portland Hills Fault, the western Oatfield Fault, and the eastern East Bank Fault. These faults occur in a northwest-trending zone that varies in width between 3.5 and 5.0 miles. The combined three faults vertically displace the Columbia River Basalt by 1,130 feet and appear to control thickness changes in late Pleistocene (approx. 780,000 years) sediment (Madin, 1990). The Portland Hills Fault occurs along the Willamette River at the base of the Portland Hills, and is about 13 miles southwest of the site. The Oatfield Fault occurs along the western side of the Portland Hills, and is about 16 miles southwest of the site. The accuracy of the fault mapping is stated to be within 500 meters (Wong, et al., 2000). No historical seismicity is correlated with the mapped portion of the Portland Hills Fault Zone, but in 1991 a M3.5 earthquake occurred on a NW-trending shear plane located 1.3 miles east of the fault (Yelin, 1992). Although there is no definitive evidence of recent activity, the Portland Hills Fault Zone is assumed to be potentially active (Geomatrix Consultants, 1995).

Gales Creek-Newberg-Mt. Angel Structural Zone

The Gales Creek-Newberg-Mt. Angel Structural Zone is a 50-mile-long zone of discontinuous, NW-trending faults that lies about 36 miles southwest of the subject site. These faults are recognized in the subsurface by vertical separation of the Columbia River Basalt and offset seismic reflectors in the overlying basin sediment (Yeats et al., 1996; Werner et al., 1992). A geologic reconnaissance and photogeologic analysis study conducted for the Scoggins Dam site in the Tualatin Basin revealed no evidence of deformed geomorphic surfaces along the structural zone (Unruh et al., 1994). No seismicity has been recorded on the Gales Creek Fault or Newberg Fault; however, these faults are considered to be potentially active because they may connect with the seismically active Mount Angel Fault and the rupture plane of the 1993 M5.6 Scotts Mills earthquake (Werner et al. 1992; Geomatrix Consultants, 1995).

Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year (Goldfinger et al., 1996). A growing body of geologic evidence suggests that prehistoric subduction zone earthquakes have occurred (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). This evidence includes: (1) buried tidal marshes recording episodic, sudden subsidence along the coast of northern California, Oregon, and Washington, (2) burial of subsided tidal marshes by tsunami wave deposits, (3) paleoliquefaction features, and (4) geodetic uplift patterns on the Oregon coast. Radiocarbon dates on buried tidal marshes indicate a recurrence interval for major subduction zone earthquakes of 250 to 650 years with the last event occurring 300 years ago (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). The inferred seismogenic portion of the plate interface lies approximately 50 miles west of the Portland Basin at depths of between 20 and 40 kilometers below the surface.

FIELD EXPLORATION

Our site-specific exploration for this report was conducted on November 5th through 7th, 2013. A total of 25 exploratory test pits were excavated with a medium sized trackhoe to depths ranging between 4 and 11.5 feet at the approximate locations shown on Figure 2. It should be noted that exploration locations were located in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate.

A GeoPacific geologist continuously monitored the field exploration program and logged the borings. Soils observed in the explorations were classified in general accordance with the Unified Soil Classification System. Rock hardness was classified in accordance with Table 1, modified from the ODOT Rock Hardness Classification Chart. During exploration, our geologist also noted geotechnical conditions such as soil consistency, moisture and groundwater conditions. Logs of test pits are attached to this report. The following report sections are based on the exploration program and summarize subsurface conditions encountered at the site.

Table 1. Rock Hardness Classification Chart

ODOT Rock Hardness Rating	Field Criteria	Unconfined Compressive Strength	Typical Equipment Needed For Excavation
Extremely Soft (R0)	Indented by thumbnail	<100 psi	Small excavator
Very Soft (R1)	Scratched by thumbnail, crumbled by rock hammer	100-1,000 psi	Small excavator
Soft (R2)	Not scratched by thumbnail, indented by rock hammer	1,000-4,000 psi	Medium excavator (slow digging with small excavator)
Medium Hard (R3)	Scratched or fractured by rock hammer	4,000-8,000 psi	Medium to large excavator (slow to very slow digging), typically requires chipping with hydraulic hammer or mass excavation)
Hard (R4)	Scratched or fractured w/ difficulty	8,000-16,000 psi	Slow chipping with hydraulic hammer and/or blasting
Very Hard (R5)	Not scratched or fractured after many blows, hammer rebounds	>16,000 psi	Blasting

Undocumented Fill – Undocumented fill was encountered directly at the ground surface in test pits TP-2, TP-4, TP-5, TP-12, TP-18, and TP-24. The fill generally consisted of brown silt (ML) with gravel or clayey silt (ML) to silty clay (CL). The fill was medium stiff to stiff and extended to a depth of 1 to 2.5 feet. It is likely that other areas of undocumented fill exist in the vicinity of the existing structures, driveways, and the golf course.

Topsoil Horizon – The ground surface in test pits TP-1, TP-3, TP-6 through TP-11, TP-13 through TP-17, TP-19 through TP-23, and TP-25 was directly underlain by a moderately to highly organic topsoil horizon. The dark brown silt (OL-ML) contained trace amounts of sand and gravel and contained fine roots throughout. The topsoil horizon was loose and extended to a depth of 9 to 18 inches. A moderately to highly organic, buried topsoil horizon was encountered beneath the fill in test pits TP-4, TP-5, TP-12, Tp-18, and TP-24. The buried topsoil horizons were on the order of 6 to 12 inches in thickness - extending to depths of 1.5 to 3.5 feet.

Colluvial Soil – Colluvial soil, formed by downward migration of material under gravitational forces, was encountered beneath the topsoil horizon in test pits TP-15 and TP-18. These soils generally consisted of stiff to very stiff, silty clay (CL) to clayey silt (ML) with weathered basalt that displayed strong orange and gray mottling. In explorations, the colluvial soil extended to a depth of 3 feet in test pit TP-15 and beyond the maximum depth of exploration in test pit TP-18 (11.5 feet).

Fine Grained Catastrophic Flood Deposits (Willamette Formation) – Underlying the topsoil horizon in test pits TP-1, TP-3, TP-6, TP-8 through TP-11, TP-13, and TP-17; the buried topsoil horizon in test pit TP-4; and the fill in test pit TP-2 was fine grained catastrophic flood deposits. These soils generally consisted of medium stiff to very stiff, light brown, sandy silt (ML) with trace clay that displayed subtle to strong orange and gray mottling. Where encountered, the flood deposits generally extended to a depth of 2.5 to 9 feet and beyond the maximum depth of exploration in test pits TP-1 and TP-9 (9 feet).

Conglomerate – Underlying the topsoil horizon in test pit TP-7; the buried topsoil horizon in test pits TP-5 and TP-12; and the fine grained catastrophic flood deposits in test pits TP-2 through TP-4, TP-6, TP-8, TP-10, TP-11, TP-13 and TP-17 was dense to very dense subrounded gravel (GM) with clayey silt to silty clay matrix or stiff to very stiff, clayey silt (ML) to silty clay (CL) with subrounded gravel. The conglomerate was partially cemented and extended beyond the maximum depth of exploration in test pits TP-2 through TP-8, TP-10 through TP-13, and TP-17 (6 to 10 feet). Practical refusal with a medium sized excavator was reached at a depth of 6.25 feet in test pit TP-12.

Troutdale Formation – Underlying the colluvial soil in test pit TP-15 and the topsoil horizon in test pit TP-16 was medium dense, silty sand (SM) with interbeds of stiff, sandy silt (ML). These soils were generally light brown in color and extended beyond the maximum depth of exploration in test pits TP-15 and TP-16 (9 to 10.5 feet).

Residual Soil – The topsoil horizon in test pits TP-14 and TP-19 through TP-25 was underlain by light reddish brown residual soil formed by in place decomposition of the underling Basaltic Andesite of Green Mountain Formation. These soils typically consisted of stiff to very stiff, clayey silt (ML) to silty clay (CL) with weathered basalt fragments. The residual soil extended to a depth of 3 to 6 feet or beyond the maximum depth of exploration in test pits TP-20 and TP-23 through TP-25 (9 to 11 feet).

Basaltic Andesite of Green Mountain – The residual soil in test pits TP-14, TP-19, TP-21, and TP-22 was underlain by Basaltic Andesite of Green Mountain. The light gray basalt contained trace silty clay to clayey silt matrix and was weathered to extremely soft (R0) to soft (R2) according to the ODOT rock hardness classification. Where encountered, the basalt extended beyond the maximum depth of exploration (8 to 10 feet). Practical refusal on medium hard (R3) basalt was encountered with a medium sized excavator at a depth of 6.5 feet in test pit TP-21.

Soil Moisture and Groundwater

On November 5 through 7, 2013, soils encountered in test pits were moist to wet. Static groundwater was encountered in test pit TP-1 at a depth of 2 feet. Groundwater seepage was encountered in test pits TP-3, TP-4, TP-6, TP-8, TP-11through TP-13, TP-15 through TP-17, TP-22, and TP-24 at depths of 2 to 8.5 feet. Discharge was visually estimated at less than 1 to 5 gallons per minute. Experience has shown that temporary perched storm-related groundwater conditions often occur within the surface soils over fine-grained native deposits such as those beneath the site, particularly during the wet season. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors.

INFILTRATION TESTING

Soil infiltration testing was performed using the pushed pipe infiltration method in test pits TP-1 through TP-3, and TP-19. The soil was pre-saturated for a period of over 3 hours. The water level was measured to the nearest tenth of an inch every half hour with reference to the ground surface. Table 2 presents the results of our falling head infiltration testing and moisture content.

Table 2. Summary of Infiltration Test Results

Test Pit	Depth (feet)	Soil Type (USCS / AASHTO)	Infiltration Rate (in/hr)	Hydraulic Head Range (inches)	Moisture Content
TP-1	4	Sandy SILT (ML / A-4 to A-7)	0	9-21	32.9%
TP-2	3	Sandy SILT (ML / A-4 to A-7)	3.9	4-15	26.8%
TP-3	4	Silty SAND (SM / A-2)	0.25	12-14	32.8%
TP-19	4	Sandy SILT (ML / A-4 to A-7)	0.6	11-13	24.1%

SLOPE STABILITY

For the purpose of providing a planning level study of slope stability hazards at the study site, GeoPacific performed a reconnaissance evaluation of slope geomorphology and evaluated near surface soil conditions encountered in backhoe test pits. This evaluation also included review of selected geologic literature pertaining to the site vicinity, review of the site topographic survey, and reconnaissance traverses of the site.

Regional Slope Stability Mapping

Regional slope stability mapping of Clark County, Washington published by the Washington Department of Natural Resources Division of Geology identifies an area of potential instability on the southwest side of Green Mountain (Fiksdal, 1975). This area roughly correlates with the near vertical rock exposures at the base of Green Mountain. No mapped landslides are indicated on more recent geologic mapping of the study area conducted by Evarts (2006).

Preliminary Slope Instability Hazard Zones

Based on the data review, field reconnaissance and site exploration, GeoPacific developed a slope instability hazard map of the study site (Figure 3). For preliminary land use planning purposes, we have divided the site into four general slope instability hazard zones as shown on Figure 3. Each of the zone areas are discussed below:

Zone 1: Areas of the site where the slope instability hazard is considered to be low are designated as Zone 1. Zone 1 includes areas where slopes are gently to moderately sloping and do not appear to have experienced prior slope instability. Zone 1 areas include the majority of the golf course area and the gently sloping area in the northern portion of the site.

Zone 2: Areas of the site where the slope instability hazard is considered to be moderate are designated as Zone 2. These include areas where slopes are moderately steep. Zone 2 areas are considered to be generally stable due the presence of underlying competent bedrock but may be subject to localized shallow seated slope movement of overlying colluvial soils. For preliminary planning purposes, Zone 2 areas may be considered generally suitable for development provided that adequate geotechnical evaluation and construction monitoring are performed. Localized mitigating measures may be necessary for development.

Zone 3: Areas of the site where the slope instability hazard is considered to be moderate due primarily to rockfall run-out hazard are designated as Zone 3. These include areas immediately downslope of the near vertical exposed basalt bedrock. Several large basalt boulders were observed in Zone 3. We anticipate that proposed development will most likely be set back from steep slopes within Zone 4. Development within Zone 3 may be geotechnically feasible based on the results of further geotechnical studies and analysis.

Zone 4: Zone 4 areas include the near-vertical exposed bedrock faces along the southwestern portion of Green Mountain where slope instability hazard is considered to be high due primarily to steep slopes and rockfall hazard. Zone 4 roughly correlates with the area of instability identified by Fiksdal (1975). The preliminary conceptual master plan for the development indicates the majority of Zone 4 will remain as Park and Open Space areas.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

The results of this preliminary slope stability hazard study indicate that large portions of the study site have a low susceptibility to slope instability hazards and are sufficiently stable for development. Other portions of the study site are characterized by moderate to high slope instability hazards. For preliminary planning purposes, we have divided the site into four general slope instability hazard zones as shown on Figure 3. These zone designations are preliminary assessments based on limited information and are intended to provide geotechnical guidance for development layout and planning. As specified in this report, supplemental geotechnical studies are recommended on selected portions of the site depending on the intended land use and actual development layout (see the Preliminary Slope Instability Hazard Zones Section). The scope of further investigation will depend on the actual proposed grading and utility plans and will most likely be phased in conjunction with phased construction of the development.

Green Mountain
Project No. 13-3186

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and their consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

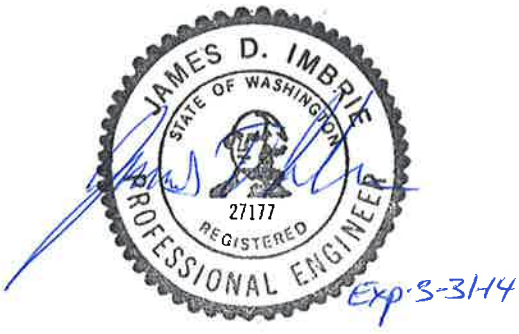
Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. The checklist attached to this report outlines recommended geotechnical observations and testing for the project. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.



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Senior Geologist

James D. Imbrie, P.E.
Principal Geotechnical Engineer

Attachments: References
Figure 1 – Vicinity Map
Figure 2 – Site and Exploration Plan
Figure 3 – Site and Relative Slope Instability Hazard Zones
Test Pit Logs (TP-1 through TP-25)

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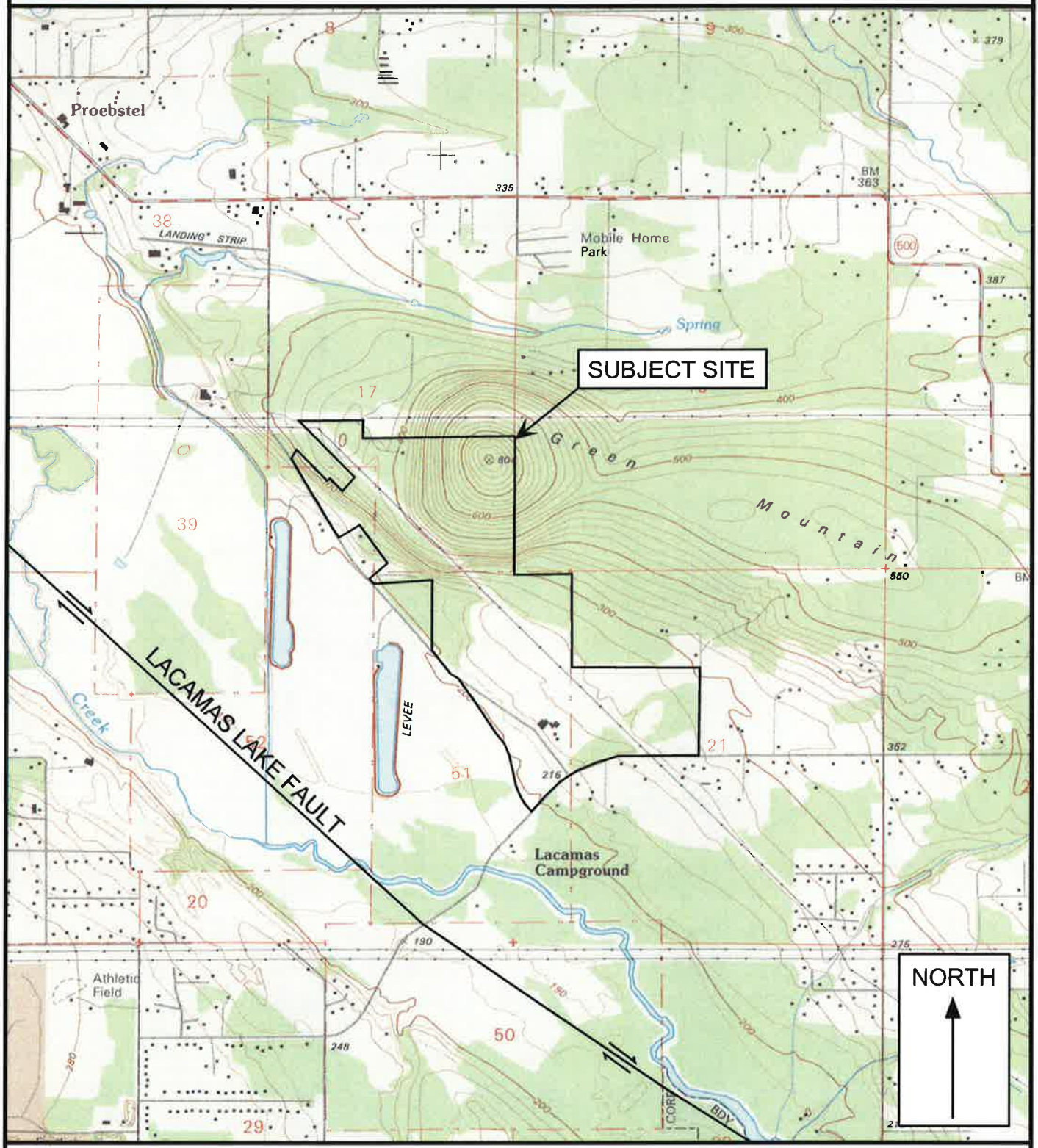
VICINITY MAP



Legend

Approximate Scale 1 in = 2,000 ft

Date: 1/7/2014
Drawn by: EKR

Base map: U.S. Geological Survey 7.5 minute Topographic Map Series, Lacamas Creek, Washington Quadrangle, 1990.

Project: Green Mountain Camas, Washington	Project No. 13-3186	FIGURE 1

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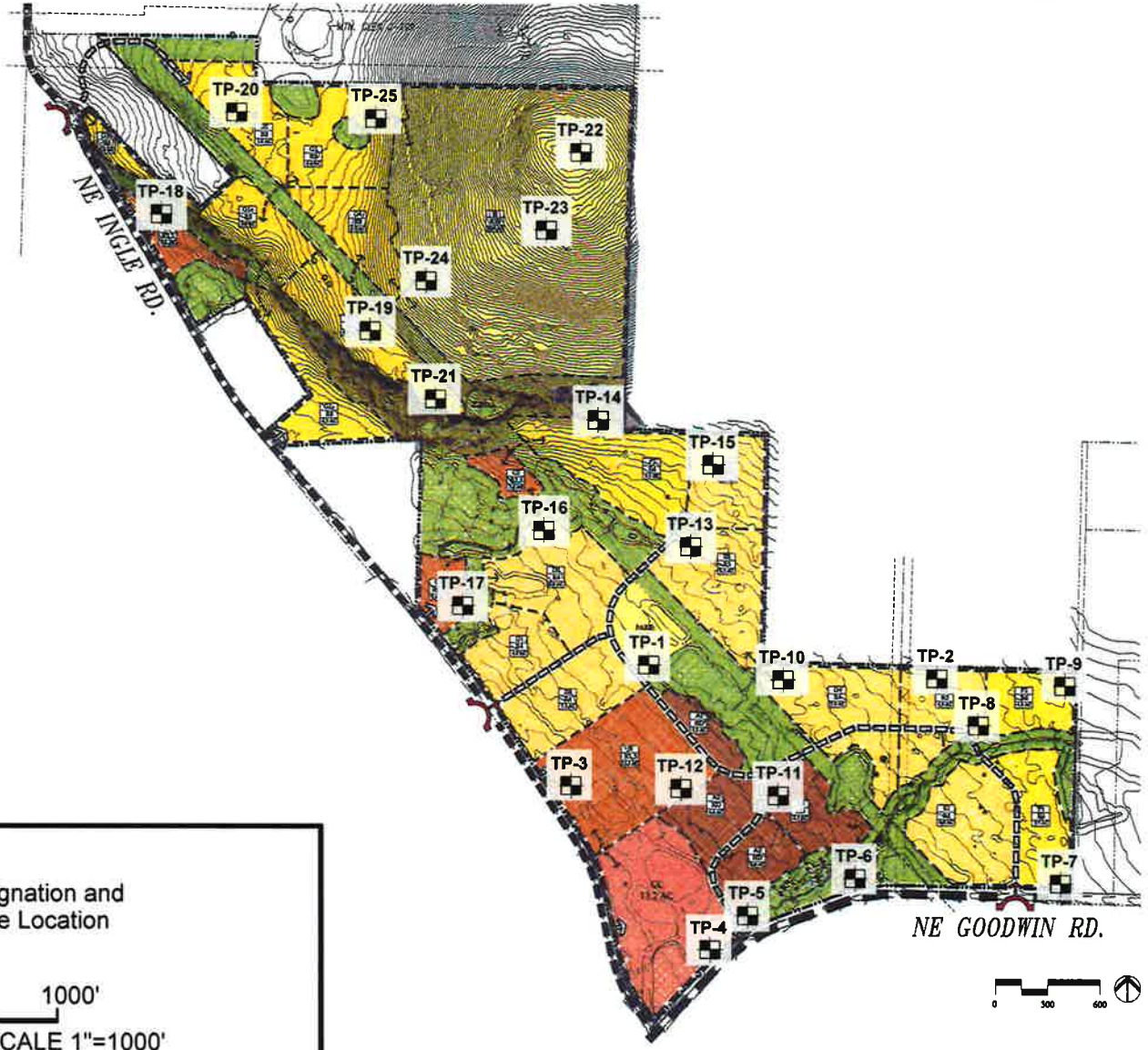
SITE PLAN AND EXPLORATION LOCATIONS



Legend

TP-1 Test Pit Designation and Approximate Location

0 1000'

APPROXIMATE SCALE 1"=1000'

North

Project: Green Mountain Camas, Washington	Project No. 13-3186	Date: 1/8/2014 Drawn by: EKR	FIGURE 2

GeoPacific Engineering, Inc.
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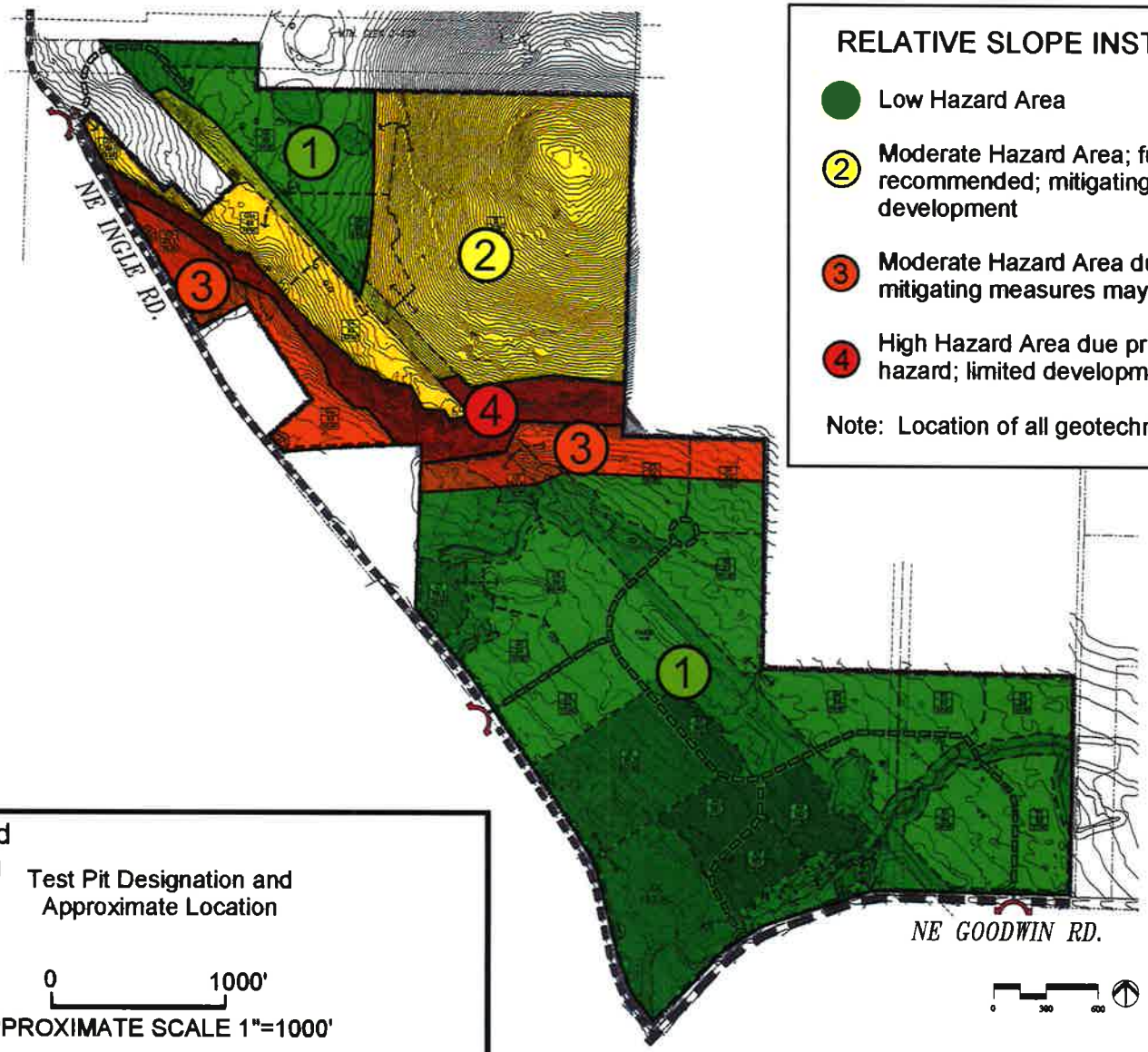
SITE PLAN AND RELATIVE SLOPE INSTABILITY HAZARD ZONES



RELATIVE SLOPE INSTABILITY HAZARD ZONES

- Low Hazard Area
- (2) Moderate Hazard Area; further slope stability study recommended; mitigating measures may be necessary for development
- (3) Moderate Hazard Area due primarily to rockfall hazard; mitigating measures may be necessary for development
- (4) High Hazard Area due primarily to steep slopes and rockfall hazard; limited development may be feasible

Note: Location of all geotechnical information is approximate.

Legend

TP-1 Test Pit Designation and Approximate Location

0 1000'

APPROXIMATE SCALE 1"=1000'

North

Project: Green Mountain Camas, Washington	Project No. 13-3186	Date: 1/7/2014 Drawn by: EKR	FIGURE 3

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP- 1**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	0.5					Moderately organic, sandy SILT (OL-ML), dark brown, roots throughout, loose, moist (Topsoil)
2	1.0				▽	Medium stiff, sandy SILT (ML), brown, micaceous, strong orange and gray mottling, moist to wet (Fine Grained Catastrophic Flood Deposits)
3	1.0				💧	
4	0.5					Test Pit Terminated at 4 Feet for Infiltration Testing. Note: Groundwater seepage encountered at 3 feet. Discharge visually estimated at less than 1 gallon per minute. Static groundwater at 2 Feet at Completion of Infiltration Testing.
5						
6						
7						
8						
9						
10						
11						
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-2**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	2.5					Stiff to very stiff, sandy SILT (ML), trace subrounded gravel, brown, trace roots throughout, 6 inch topsoil developed at surface, strong orange and gray mottling, trace black staining, moist (Fill)
2	2.0					
3	1.0					Stiff to very stiff, sandy SILT (ML), trace clay, brown, micaceous, strong orange and gray mottling, moist (Fine Grained Catastrophic Flood Deposits)
4						
5						
6						
7						Very stiff, clayey SILT (ML) to silty CLAY (CL), with sand, trace subrounded gravel, gray, black staining, strong orange and gray mottling, moist (Conglomerate)
8						
9						Test Pit Terminated at 8.5 Feet.
10						Note: No seepage or groundwater encountered.
11						
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-3**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	1.0					Highly organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
2	1.5					
3	4.0					Medium dense, silty SAND (SM) to medium stiff to very stiff, sandy SILT (ML), light brown, micaceous, subtle orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
4	4.5					
5						
6						
7						Dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, brown to gray, trace black staining, strong orange and gray mottling, moist (Conglomerate)
8						
9						Test Pit Terminated at 9 Feet.
10						
11						Note: Groundwater seepage encountered at 6.5 to 8.5 feet. Discharge visually estimated at 2 gallons per minute.
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-4**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	1.5					Stiff, sandy SILT (ML), trace gravel, light brown, trace roots throughout, 6 inch topsoil developed at surface, strong orange and gray mottling, trace black staining, moist to wet (Fill)
						Moderately organic, sandy SILT (ML), trace gravel, brown, moist (Buried Topsoil)
2	2.0					Very stiff, sandy SILT (ML) to silty SAND (SM), light brown, black staining, strong orange and gray mottling, sand is medium to coarse grained, moist to wet (Fine Grained Catastrophic Flood Deposits)
3	2.0					
4	3.0					
5						Very dense, subrounded GRAVEL (GM), with sandy silt, light brown to gray, black staining, partially cemented, strong orange and gray mottling, moist (Conglomerate)
6						
7						
8						
9						Test Pit Terminated at 8 Feet.
10						Note: Groundwater seepage encountered at 3 to 4 feet. Discharge visually estimated at 5 gallons per minute.
11						
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-5**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	1.0					Medium stiff to stiff, sandy SILT (ML), trace subrounded gravel, brown, trace roots throughout, thin topsoil developed at surface, strong orange and gray mottling, moist (Fill)
2	2.5					Highly organic, sandy SILT (ML), dark brown, roots throughout, moist (Buried Topsoil)
3	4.5					
4	4.5					Very dense, subrounded to subangular GRAVEL (GM), with sandy silt, light brown to gray, black staining, partially cemented, strong orange and gray mottling, damp to moist (Conglomerate)
5						
6						
7						
8						Test Pit Terminated at 7.5 Feet.
9						Note: No seepage or groundwater encountered.
10						
11						
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-6**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	1.0					Highly organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
2	2.0					
3	3.5					Medium stiff to very stiff, sandy SILT (ML), light brown, micaceous, trace roots, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
4	2.0					
5						
6						
7						Dense, subrounded GRAVEL (GM), trace sandy silt matrix, brown to gray, trace black staining, strong orange and gray mottling, moist (Conglomerate)
8						
9						Test Pit Terminated at 9 Feet.
10						
11						Note: Groundwater seepage encountered at 3.5 feet. Discharge visually estimated at less than 1 gallon per minute.
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-7**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	4.0					Highly organic, SILT (OL-ML), trace sand, dark brown, fine roots throughout, loose, moist (Topsoil)
2	2.5					
3	3.0					Dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, brown to gray, trace black staining, strong orange and gray mottling, moist (Conglomerate)
4	3.0					
5						
6						
7						
8						
9						Test Pit Terminated at 9 Feet.
10						Note: No seepage or groundwater encountered.
11						
12						

LEGEND

Bag Sample (100 to 1,000 g) | Bucket Sample (5 Gal. Bucket) | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-8**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	3.5					Moderately organic, SILT (OL-ML), brown, trace fill, fine roots throughout, loose, moist (Topsoil)
2	3.0					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
3	4.5					
4	3.5					Dense, subrounded GRAVEL (GM), trace sandy silt matrix, light brown to gray, trace black staining, strong orange and gray mottling, micaceous, moist (Conglomerate)
5						
6						
7						
8						
9						
10						Test Pit Terminated at 9.5 Feet.
11						Note: Groundwater seepage encountered at 7.5 feet. Discharge visually estimated at 3 gallons per minute.
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-9**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	3.0					Highly organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
2	2.0					
3	2.5					Stiff to very stiff, sandy SILT (ML), with clay, light brown to gray, micaceous, trace roots, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
4	2.5					
5						
6						
7						
8						
9						Test Pit Terminated at 9 Feet.
10						Note: No seepage or groundwater encountered.
11						
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-10**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	2.0					Moderately organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
2	2.0					Stiff to very stiff, sandy SILT (ML), trace clay, light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
3	1.5					
4	3.5					
5						Dense, subrounded GRAVEL (GM), trace sandy silt matrix, light brown to gray, trace black staining, strong orange and gray mottling, micaceous, moist (Conglomerate)
6						
7						Test Pit Terminated at 6 Feet.
8						Note: No seepage or groundwater encountered.
9						
10						
11						
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-11**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0						Moderately organic, SILT (OL-ML), brown, trace gravel fill, fine roots throughout, loose, moist (Topsoil)
1	4.0					
2	1.5					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
3	3.0					
4	2.5					
5						Medium dense, silty SAND (SM) to stiff, sandy SILT (ML), gray, micaceous, sand is fine to coarse grained, strong orange and gray mottling, trace black staining, moist to wet (Fine Grained Catastrophic Flood Deposits)
6						
7						
8						
9						Dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, light brown to gray, trace black staining, strong orange and gray mottling, micaceous, moist (Conglomerate)
10						Test Pit Terminated at 10 Feet.
11						
12						Note: Groundwater seepage encountered at 2.5 to 4.5 feet. Discharge visually estimated at 2 gallons per minute.

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-12**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	4.5					Medium stiff, sandy SILT (ML) and medium dense, silty SAND (SM), brown to gray, trace roots throughout, strong orange and gray mottling, moist (Fill)
2	4.0					Moderately organic, sandy SILT (ML), dark brown, roots throughout, moist (Buried Topsoil)
3						
4					≈	Very dense, subrounded GRAVEL (GM), with clayey silt, with coarse grained sand, light brown to gray, black staining, strong orange and gray mottling, damp to moist (Conglomerate)
5						
6						
7						
8						Practical Refusal on Very Dense Boulders at 6.25 Feet.
9						Note: Groundwater seepage encountered at 4 feet. Discharge visually estimated at 1 gallon per minute.
10						
11						
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-13**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1						Moderately organic, SILT (OL-ML), brown, fine roots throughout, loose, moist (Topsoil)
2	1.5					Medium stiff to very stiff, sandy SILT (ML), trace clay, light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
3	3.0					
4						
5						Dense, subrounded GRAVEL (GM), trace sandy silt matrix, trace clay, light brown to gray, trace black staining, well graded, strong orange and gray mottling, micaceous, moist (Conglomerate)
6						
7						
8						
9						Test Pit Terminated at 9 Feet.
10						Note: Groundwater seepage encountered at 8 feet. Discharge visually estimated at 1 gallon per minute.
11						
12						

LEGEND

Bag Sample (100 to 1,000 g) | Bucket Sample (5 Gal. Bucket) | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-14**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1						Highly organic, SILT (OL-ML), with basalt fragments, dark brown, fine roots throughout, loose, moist (Topsoil)
2	3.0					Stiff to very stiff, silty CLAY (CL) to clayey SILT (ML), with gray weathered basalt, light reddish-brown, trace fine roots throughout, black staining, moist (Residual Soil)
3						
4						
5						Very soft to medium hard (R1-R3), weathered BASALT, trace matrix of reddish-brown silty clay to clayey silt, gray, black staining, moist (Basalt of Green Mountain)
6						
7						
8						
9						
10						Test Pit Terminated at 10 Feet.
11						Note: No seepage or groundwater encountered.
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-15**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	1.5					Moderately organic, SILT (OL-ML), with basalt fragments, dark brown, fine roots throughout, loose, moist (Topsoil)
2	3.5				~	Stiff to very stiff, silty CLAY (CL) to clayey SILT (ML), with gray weathered basalt, light reddish-brown, trace fine roots throughout, strong orange and gray mottling, black staining, moist (Colluvial Soil)
3						
4						
5						Medium dense, silty SAND (SM) with interbeds of stiff, sandy SILT (ML), light brown, micaceous, sand is fine to medium grained, strong orange and gray mottling, trace black staining, moist (Troutdale Formation)
6						
7						
8						
9						
10						
11						Test Pit Terminated at 10.5 Feet.
12						Note: Groundwater seepage encountered at 2 feet. Discharge visually estimated at 1 gallon per minute.

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-16**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	0.5					Moderately organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
2	2.0					
3	3.5					Medium dense, silty SAND (SM) with interbeds of stiff, sandy SILT (ML), light brown to gray, micaceous, sand is coarse to medium grained, strong orange and gray mottling, trace black staining, moist to wet (Troutdale Formation)
4	2.0					
5						
6						
7						
8						
9						Test Pit Terminated at 9 Feet.
10						
11						Note: Groundwater seepage encountered at 3.5 to 6.5 feet. Discharge visually estimated at 2 gallons per minute.
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-17**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	1.0					Moderately organic, SILT (OL-ML), brown, fine roots throughout, loose, moist (Topsoil)
2	1.0					Medium stiff to very stiff, sandy SILT (ML), with clay, light brown, micaceous, strong orange and gray mottling, trace roots, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
3	4.0				~	
4	1.5					
5						Dense to very dense, subrounded GRAVEL (GM), trace sandy silt matrix, trace clay, light brown to gray, trace black staining, partially cemented, strong orange and gray mottling, micaceous, moist (Conglomerate)
6						
7						
8						
9						
10						Test Pit Terminated at 9.5 Feet.
11						Note: Groundwater seepage encountered at 3.5 feet. Discharge visually estimated at less than 1 gallon per minute.
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-18**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	0.5					Medium stiff, clayey SILT (ML), trace basalt, trace sand, light brown, thin topsoil at surface, trace roots throughout, strong orange and gray mottling, moist (Fill)
2	0.5					
3	3.0					Moderately organic, sandy SILT (ML), with basalt fragments, dark brown to gray, roots throughout, moist (Buried Topsoil)
4	4.0					Stiff to very stiff, sandy SILT (ML) and moderately weathered basalt, light brown, trace fine roots throughout, strong orange and gray mottling, black staining, moist (Colluvial Soil)
5						
6						
7						
8						
9						
10						
11						
12						Test Pit Terminated at 11.5 Feet. Note: No seepage or groundwater encountered.

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-19**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	2.5					Highly organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
2	1.5					Stiff to dense, clayey SILT (ML) and BASALT fragments, light reddish-brown, rock content increases with depth, trace fine roots throughout, rock up to 36 inches in size, black staining, moist (Residual Soil)
3	2.5					
4	2.5					
5						
6						
7						Extremely soft to soft (R0-R2), weathered BASALT, trace matrix of reddish-brown silty clay to clayey silt, gray, black staining, moist (Basalt of Green Mountain)
8						
9						Test Pit Terminated at 9 Feet.
10						Note: No seepage or groundwater encountered.
11						
12						

LEGEND

Bag Sample | Bucket Sample | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-20**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1						Highly organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
2						Stiff to dense, clayey SILT (ML) and BASALT fragments, light reddish-brown, rock content increases with depth, trace fine roots throughout, rock up to 36 inches in size, black staining, moist (Residual Soil)
3						
4						
5						
6						
7						
8						
9						Test Pit Terminated at 9 Feet.
10						Note: No seepage or groundwater encountered.
11						
12						

LEGEND

Bag Sample | Bucket Sample | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 11/5-7/2013
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-21**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1						Highly organic, SILT (OL-ML), with basalt fragments, dark brown, fine roots throughout, loose, moist (Topsoil)
2	4.5					Stiff to dense, clayey SILT (ML) with weathered basalt fragments, light brown, trace fine roots throughout, black staining, moist (Residual Soil)
3	4.5					
4	4.5					
5						Soft (R2), weathered BASALT, trace matrix of reddish-brown silty clay to clayey silt, gray, black staining, moist (Basalt of Green Mountain)
6						
7						Practical Refusal on Medium Hard (R3) Basalt at 6.5 Feet.
8						Note: No seepage or groundwater encountered.
9						
10						
11						
12						

LEGEND

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-22**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	2.0					Moderately organic, clayey SILT (OL-ML), with basalt fragments, dark brown, fine roots throughout, loose, moist (Topsoil)
2	1.5					Stiff, clayey SILT (ML) to silty CLAY (CL), with weathered basalt fragments, light reddish-brown, trace fine roots throughout, black staining, moist (Residual Soil)
3	1.5					
4	4.5					
5						Extremely soft to soft (R0-R2), weathered BASALT, trace matrix of reddish-brown silty clay to clayey silt, gray, black staining, moist (Basalt of Green Mountain)
6						
7						
8						Test Pit Terminated at 8 Feet.
9						
10						Note: Groundwater seepage encountered at 5 feet. Discharge visually estimated at less than 1 gallon per minute.
11						
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-23**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	0.5					Highly organic, SILT (OL-ML), with basalt fragments, dark brown, fine roots throughout, loose, moist (Topsoil)
2	2.0					Stiff to very stiff, clayey SILT (ML) to silty CLAY (CL), with weathered basalt fragments, light brown, trace fine roots throughout, black staining, moist (Residual Soil)
3	4.0					
4	2.0					
5						
6						
7						
8						
9						
10						
11						Test Pit Terminated at 11 Feet.
12						Note: No seepage or groundwater encountered.

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
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TEST PIT LOG

Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-24**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	2.0					Medium stiff, clayey SILT (ML) to silty CLAY (CL), light brown, thin topsoil at surface, trace roots throughout, strong orange and gray mottling, moist (Fill)
2	2.0					Moderately organic, sandy SILT (ML), with basalt fragments, dark brown to gray, roots throughout, moist (Buried Topsoil)
3	2.0					Stiff, clayey SILT (ML) to silty CLAY (CL), light brown, strong orange and gray mottling, trace fine roots throughout, black staining, moist (Residual Soil)
4	3.0					
5						
6						Stiff, clayey SILT (ML) to silty CLAY (CL), with weathered basalt fragments, light reddish-brown, trace fine roots throughout, black staining, moist (Residual Soil)
7						
8						
9						
10						Test Pit Terminated at 9.5 Feet.
11						Note: Groundwater seepage encountered at 3.5 feet. Discharge visually estimated at less than 1 gallon per minute.
12						

LEGEND

Bag Sample

Bucket Sample


Shelby Tube Sample


Seepage


Water Bearing Zone


Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

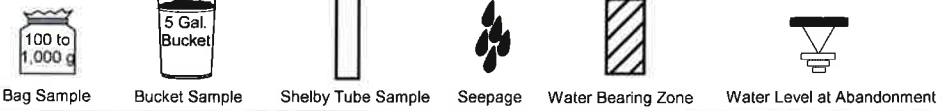
Project: Green Mountain
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-25**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	1.0					Moderately organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
2	2.0					Stiff to very stiff, clayey SILT (ML) to silty CLAY (CL), light reddish-brown, trace fine roots, black staining, moist (Residual Soil)
3	4.0					
4	3.5					
5						
6						
7						
8						Stiff to very stiff, clayey SILT (ML) to silty CLAY (CL), with weathered basalt fragments, light reddish-brown, trace fine roots throughout, black staining, moist (Residual Soil)
9						
10						Test Pit Terminated at 10 Feet.
11						Note: No seepage or groundwater encountered.
12						

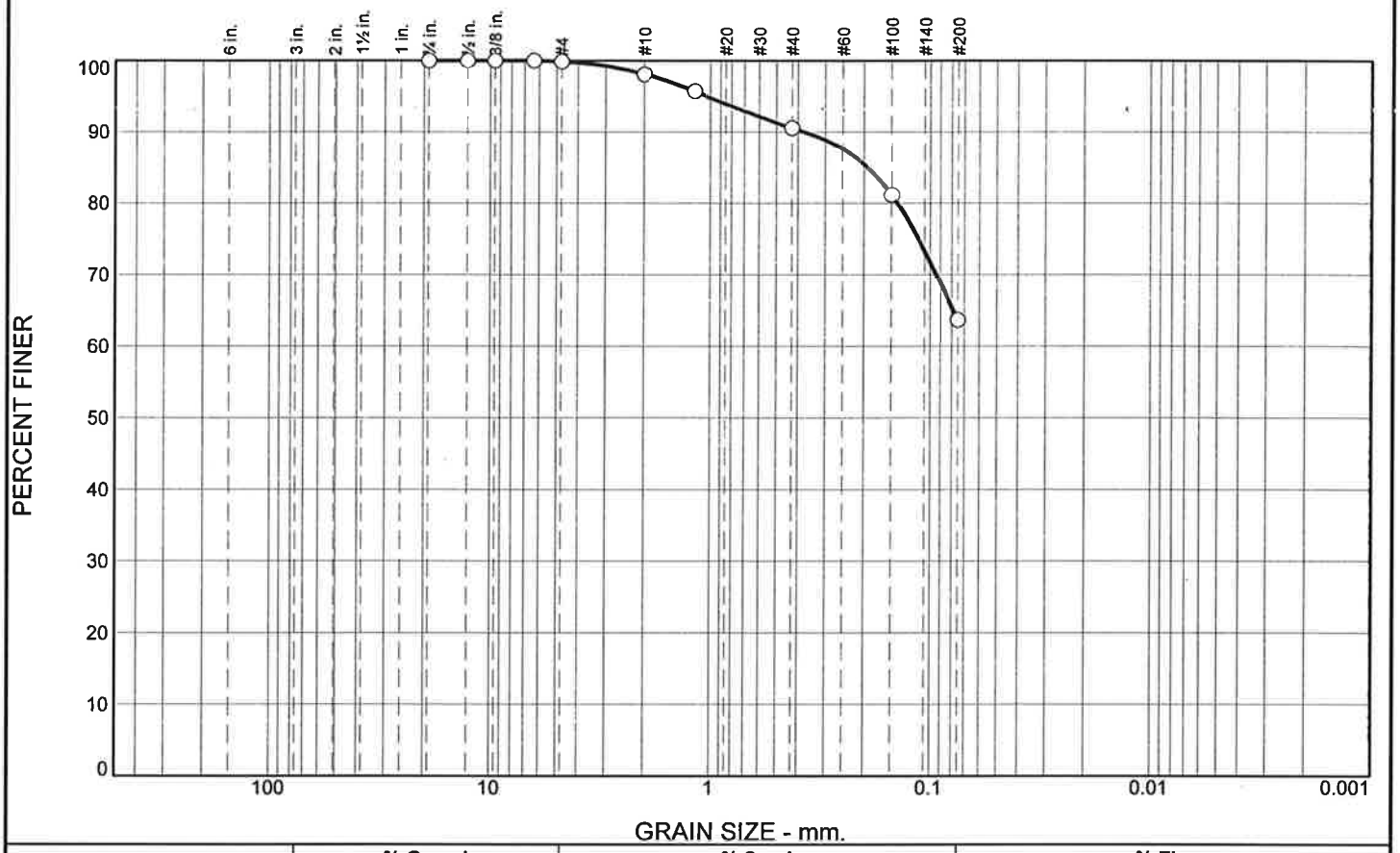
LEGEND



Bag Sample | Bucket Sample | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	1.8	7.6	26.8	63.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
1/4	100.0		
#4	99.9		
#10	98.1		
#16	95.6		
#40	90.5		
#100	81.2		
#200	63.7		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3771 D_{85}= 0.1919 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-4 to A-7

Remarks

32.9% Moisture

Sample Number: TP-1 **Depth:** 4'

Date: 11.5.2013

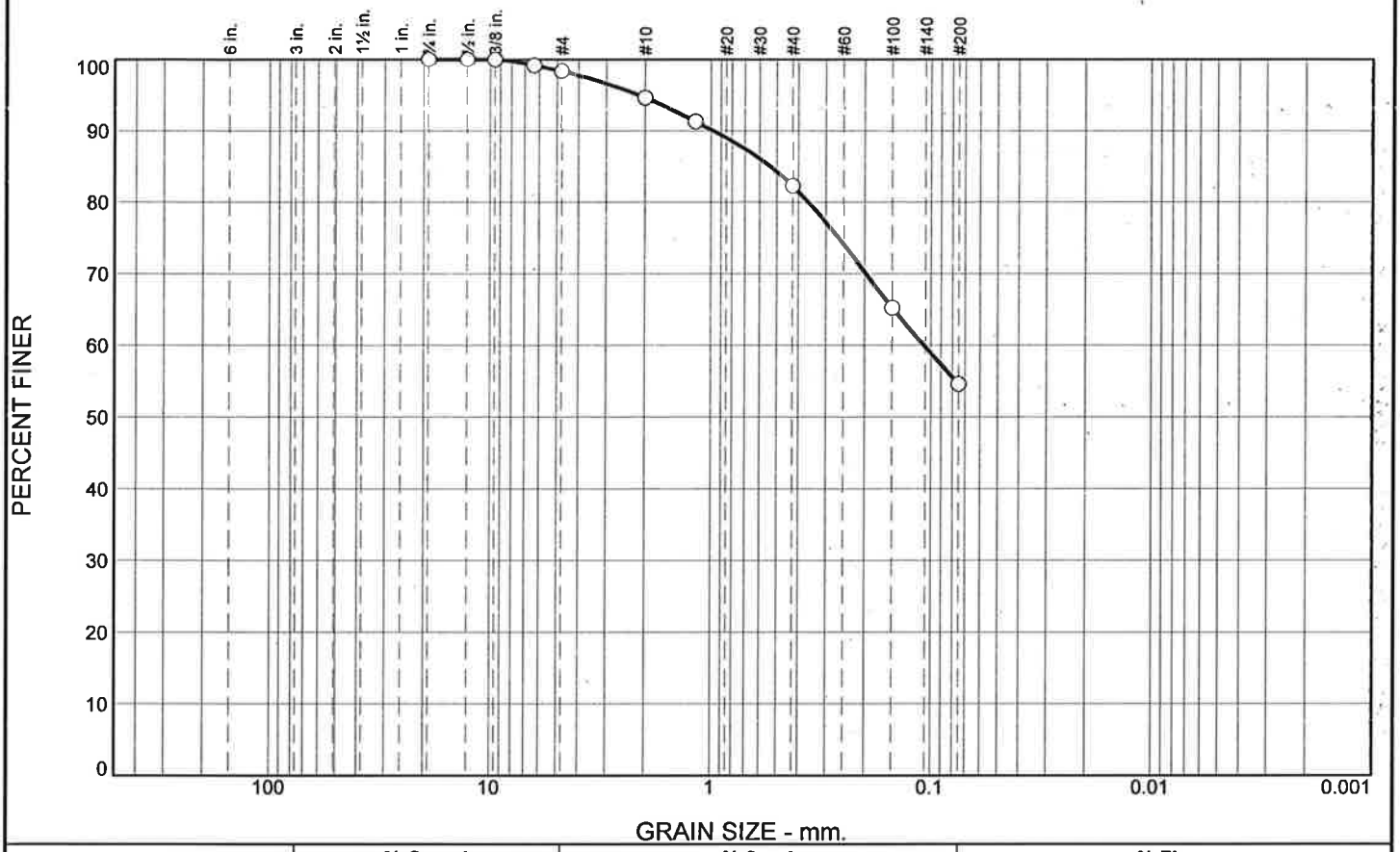
GEOPACIFIC ENGINEERING, INC.

Client: Metropolitan Land Group
Project: Green Mountain

Project No: 13-3186 **Figure**

Tested By: MTB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.7	3.6	12.4	27.7	54.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
1/4	99.2		
#4	98.3		
#10	94.7		
#16	91.3		
#40	82.3		
#100	65.3		
#200	54.6		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9782 D_{85}= 0.5356 D_{60}= 0.1075
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-4 to A-7

Remarks

26.8% Moisture

Sample Number: TP-2 **Depth:** 3'

Date: 11.5.2013

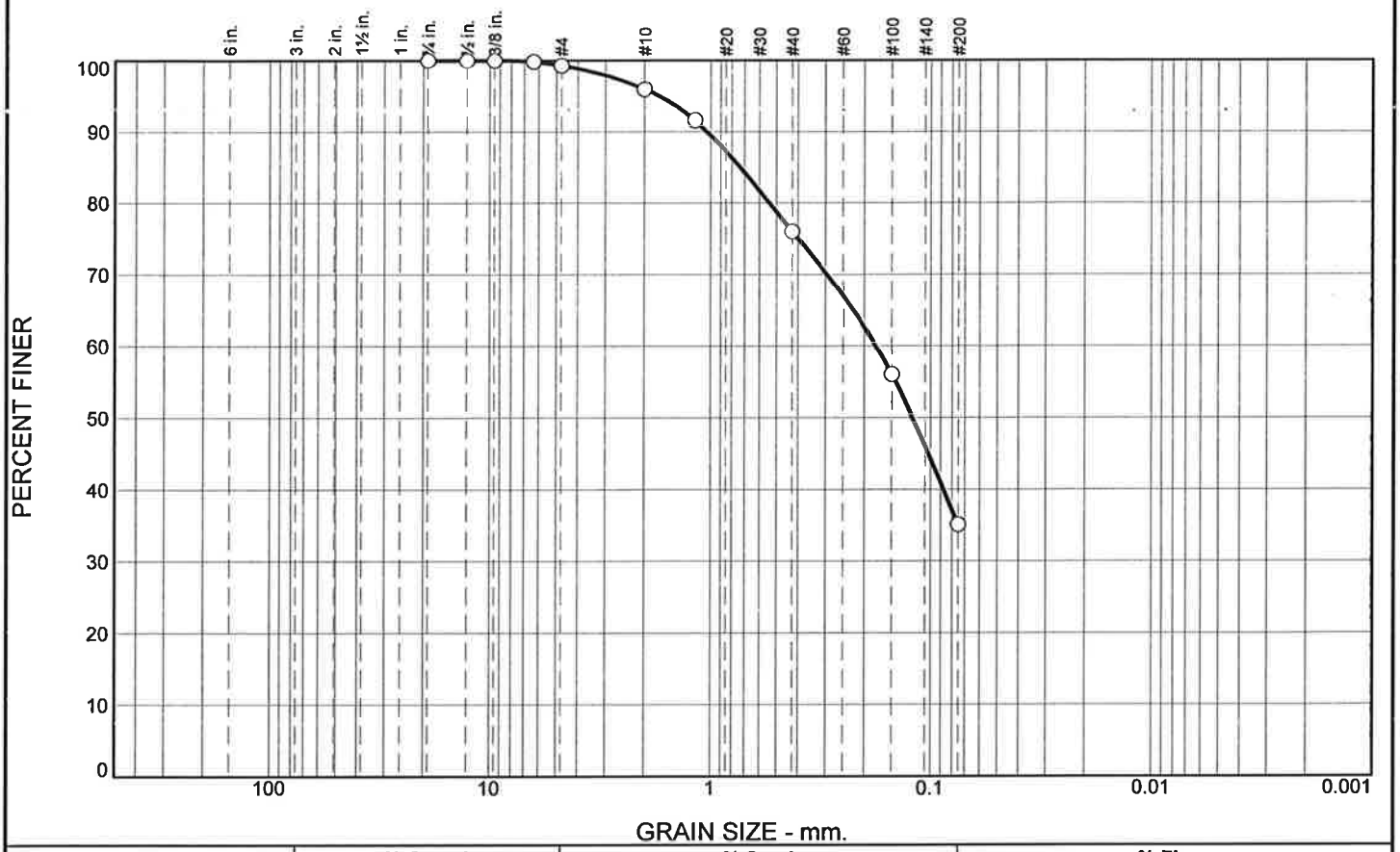
GEOPACIFIC ENGINEERING, INC.

Client: Metropolitan Land Group
Project: Green Mountain

Project No: 13-3186 **Figure**

Tested By: MTB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	3.4	19.9	40.9	35.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
1/4	99.8		
#4	99.3		
#10	95.9		
#16	91.5		
#40	76.0		
#100	56.0		
#200	35.1		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.0391 D_{85}= 0.7327 D_{60}= 0.1771
D_{50}= 0.1207 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2

Remarks

32.8% Moisture

Sample Number: TP-3 **Depth:** 4'

Date: 11.5.2013

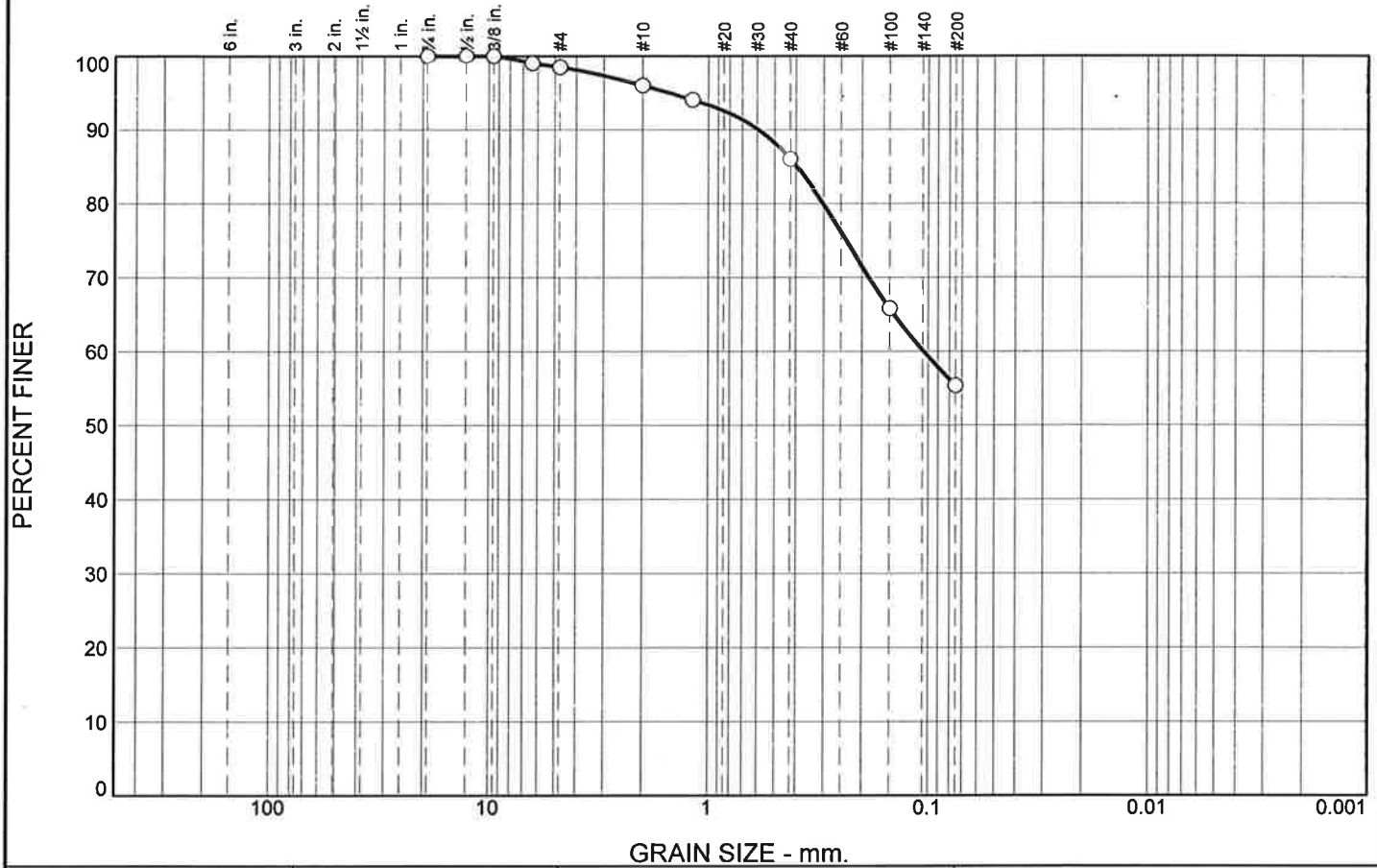
GEOPACIFIC ENGINEERING, INC.

Client: Metropolitan Land Group
Project: Green Mountain

Project No: 13-3186 **Figure**

Tested By: MTB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.5	2.5	9.9	30.7	55.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
1/4	99.1		
#4	98.5		
#10	96.0		
#16	94.1		
#40	86.1		
#100	65.8		
#200	55.4		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5915 D_{85}= 0.3967 D_{60}= 0.1046

D_{50}= D_{30}= D_{15}=

D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-4 to A-7

Remarks

24.1% Moisture

Sample Number: TP-19 **Depth:** 4'

Date:

GEOPACIFIC ENGINEERING, INC.

Client: Metropolitan Land Group

Project: Green Mountain

Project No: 13-3186 **Figure**