GeoDesign Inc
An NV5 Company

REPORT OF GEOTECHNICAL ENGINEERING SERVICES

Woodside
7039 196th Avenue NE
Redmond, Washington

For
Polygon Northwest Company
October 4, 2019

GeoDesign Project: Polygon-161-01

GeoDesign Inc
An NV5 Company

October 4, 2019

Polygon Northwest Company
11624 SE 5th Street, Suite 100
Bellevue, WA 98005

Attention: Sunshine Kapus

Report of Geotechnical Engineering Services
Woodside
7039 196th Avenue NE
Redmond, Washington
GeoDesign Project: Polygon-161-01

GeoDesign, Inc. is pleased to submit this report of geotechnical engineering services for the proposed Woodside project located in Redmond, Washington. Our services for this project were conducted in general accordance with our proposal dated June 12, 2018.

We appreciate the opportunity to be of service to you. Please call if you have questions regarding this report.

Sincerely,

GeoDesign, Inc.

Scott V. Mills, P.E.
Principal Engineer

cc: Gary Sharnbroich, Core Design, Inc. (via email only)

RTL:SVM:kt
Attachments
One copy submitted (via email only)
Document ID: Polygon-161-01-100419-geor-rev2.docx

EXECUTIVE SUMMARY

This report presents the results of our geotechnical engineering evaluation for the proposed Woodside project located at 7039 196th Avenue NE in Redmond, Washington. We understand that Polygon Northwest Company (Polygon) is proposing to develop the site with approximately 28 new townhome and stacked condominium buildings. Each building will be two or three stories in height, including full or partial basements. The buildings will be constructed using wood framing. New roads, parking areas, and utilities will also be constructed. The site is approximately 12.8 acres in size and located in the southeast corner of the Redmond Cadman facility. The site is a former sand and gravel pit that has been filled with dumped soil and occasional debris from various sites in the Puget Sound area. The site is currently vacant and consists primarily of brush and dirt roads. The site location relative to surrounding physical features is shown on Figure 1. The proposed site plan is shown on Figure 2.

The buildings have not yet been designed, but we have assumed that structural loads will be typical for these types of structures. We have assumed that maximum column and wall loads will be less than 20 kips and 3 kips per foot, respectively. Polygon provided us with a site plan prepared by Core Design, Inc. Approximately 220,000 cubic yards of soil will be cut for this project and most of it will be exported from the site to the adjacent Cadman property. Cuts at the site will generally range from 6 to 20 feet and negligible new fill will be placed. Figure 3 shows the locations and amounts of proposed cuts and fills.

The soil profile generally consists of fill at the ground surface that is underlain by native silt, sand, and gravel. The thickness of the fill generally ranges from 15 to 53 feet. Groundwater is generally located at a depth of more than 40 to 50 feet BGS and will not impact the proposed project.

Based on our review of the available information and the results of our explorations, it is our opinion that the site can be developed as proposed. Our specific recommendations for site development and design are provided later in this report. The following geotechnical items should be addressed as part of the proposed project:

- The existing slope along the east edge of the property is a man-made slope that was constructed by Cadman between approximately 2002 and 2007. City of Redmond hazard mapping shows this slope to be a geologically hazardous area. LiDAR mapping shows a small surficial landslide along the east slope. The proposed Woodside project will re-grade this east slope to mitigate the landslide risk. The existing slope will be flattened and up to approximately 20 feet of soil will be removed from the top of the slope. This re-grading work will include repairing any remaining landslide areas that are encountered. In our opinion, the proposed grading plan will mitigate the landslide risk and it is not necessary to establish a buffer zone at the top of the slope, but this should be confirmed with the City of Redmond.
- The grading plan shows that cuts will be performed across the site. In our test pits we encountered a 1- to 2-foot-thick layer of cement-treated soil across the site at depths between 2.5 and 9.0 feet BGS. Polygon should anticipate difficult digging conditions when this layer is encountered during excavations.

- Our seismic analysis indicates that the site should be classified as Site Class D. The risk of liquefaction, lateral spreading, seismic-induced settlement, seismic-induced landslides, or surface fault rupture occurring is low.
- The grading plan shows that at least 6 feet of cuts will be performed across most of the site. In our opinion, this cut material has adequately surcharged the site and it is not necessary to place additional surcharge. If cuts will be less than 6 feet, we recommend that additional surcharge material be placed.
- The proposed buildings can be supported on conventional spread footings bearing on granular pads, improved soil, or compacted existing soil. We recommend that GeoDesign evaluate the subgrade at each footing location during construction. Subgrade soil that consists of silt or clay should be over-excavated and replaced with 18-inch-thick granular pads, cement amended, or improved using other methods. Subgrade soil consisting of sand should be compacted with a hoe pack. Some over-excavation may be required to remove concrete rubble or other unsuitable material from beneath footings.
- We recommend that the subgrade beneath new floor slabs be evaluated during construction to determine if scarifying and recompaction or over-excavation is required.
- We recommend that the upper 18 inches of road subgrade be properly compacted.
- The on-site sand, silt, and clay are suitable for use as structural fill, provided they are properly moisture conditioned. However, the soil is sensitive to small changes in moisture content and can be difficult, if not impossible, to adequately compact during wet weather or when the moisture content of the soil is more than a couple of percent above the optimum required for compaction.

TABLE OF CONTENTS **PAGE NO.**

TABLE OF CONTENTS **PAGE NO.**

ACRONYMS AND ABBREVIATIONS

ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
BGS	below ground surface
BNSF	Burlington Northern Santa Fe
DNR	Washington State Department of Natural Resources
g	gravitational acceleration (32.2 feet/second^2)
GPS	global positioning system
H:V	horizontal to vertical
IBC	International Building Code
ksf	kips per square foot
LiDAR	light detection and ranging
MCE	maximum considered earthquake
MCE_G	maximum considered earthquake geometric mean
OSHA	Occupational Safety and Health Administration
pcf	pounds per cubic foot
pci	pounds per cubic inch
PGA	peak ground acceleration
PGA_M	maximum considered earthquake geometric mean peak ground acceleration adjusted for site affects
psf	pounds per square foot
psi	pounds per square inch
SPT	standard penetration test
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering evaluation for the proposed Woodside project located at 7039 196th Avenue NE in Redmond, Washington. We understand that Polygon Northwest Company (Polygon) is proposing to develop the site with approximately 28 new townhome and stacked condominium buildings. Each building will be two or three stories in height, including full or partial basements. The buildings will be constructed using wood framing. New roads, parking areas, and utilities will also be constructed. The site is approximately 12.8 acres in size and located in the southeast corner of the Redmond Cadman facility. The site is a former sand and gravel pit that has been filled with dumped soil and occasional debris from various sites in the Puget Sound area. The site is currently vacant and consists primarily of brush and dirt roads. The site location relative to surrounding physical features is shown on Figure 1. The proposed site plan is shown on Figure 2.

The buildings have not yet been designed, but we have assumed that structural loads will be typical for these types of structures. We have assumed that maximum column and wall loads will be less than 20 kips and 3 kips per foot, respectively. Polygon provided us with a site plan prepared by Core Design, Inc. Approximately 220,000 cubic yards of soil will be cut for this project and most of it will be exported from the site to the adjacent Cadman property. Cuts at the site will generally range from 6 to 20 feet and negligible new fill will be placed. Figure 3 shows the locations and amounts of proposed cuts and fills.

Acronyms and abbreviations used herein are defined above, immediately following the Table of Contents.

2.0 PROJECT BACKGROUND

Polygon provided us with the following geotechnical engineering reports previously prepared by GeoEngineers for this property:

- GeoEngineers, 1986. *Report; Geotechnical Consultation; Pit Mapping; Redmond, Washington,* dated April 3, 1986.
- GeoEngineers, 2018. *Geotechnical Engineering Services; Cadman 12.8-acre Residential Property; Redmond, Washington*, dated January 12, 2018.

Based on these reports, the site was formerly a sand and gravel pit that was part of the Redmond Cadman facility. After mining activity on the site was completed in the late 1980s or early 1990s, the excavated area was filled with dumped soil and minor amounts of debris from various sites in the Puget Sound area until approximately 2016. As part of the filling process, the slope on the east side of the property was constructed at a slope of approximately 2.1H:1V to 2.8H:1V. The slope extends down 30 to 40 feet to the property line. There is a natural shallower slope below the property line that continues down an additional 40 feet to the valley floor. Based on aerial photographs, the east slope appears to have been primarily constructed between 2002 and 2007.

GeoEngineers excavated 12 test pits to depths of up to 15 feet BGS in 2017. Associated Earth Sciences drilled 10 soil borings to depths of up to 61.5 feet BGS in 2017. Most of the material encountered in these explorations consists of sand and silt fill with occasional gravel, cobbles, small boulders, organics (roots), and debris (wood, brick, plastic, concrete rubble). Perched water was occasionally encountered in the borings and the groundwater table was encountered at a depth of 55 feet BGS.

3.0 PURPOSE AND SCOPE

The purpose of this evaluation was to provide geotechnical engineering recommendations for use in design and construction of the proposed development. Specifically, we completed the following scope of services:

- Reviewed readily available, published geologic data and our in-house files for existing information on subsurface conditions in the site vicinity.
- Conducted a subsurface exploration program consisting of drilling 11 borings and excavating 9 test pits. The borings were drilled to depths of up to 81.5 feet BGS and the test pits were excavated to depths of up to 18 feet BGS.
- Maintained a continuous log of the explorations and collected soil samples at representative intervals.
- Performed a laboratory testing program that consisted of the following tests:
  - Thirty-nine moisture content determinations in general accordance with ASTM D2216
  - Twenty-six particle-size analyses in general accordance with ASTM D1140 or ASTM C136
  - Five Atterberg limits tests in general accordance with ASTM D4318
- Performed infiltration testing at the proposed stormwater infiltration vault location.
- Provided recommendations for site preparation and grading, demolition, stripping depths, subgrade preparation, suitability of using on-site soil for fill, imported fill material, compaction criteria, trench excavation and backfill, temporary and permanent slopes, drainage, and wet weather earthwork.
- Provided foundation support recommendations for the proposed development. Our recommendations include allowable bearing pressure, lateral resistance parameters, and settlement estimates.
- Provided retaining wall design recommendations, including lateral earth pressures, backfill, compaction, and drainage.
- Performed an analysis of the stability of the east slope at the site and provided recommendations for mitigating slope hazards.
- Periodically collected groundwater level readings from a vibrating wire piezometer installed in one of the borings. Provided an evaluation of groundwater conditions at the site.
- Provided seismic design recommendations in accordance with the procedures outlined in the 2015 IBC.
- Prepared this geotechnical engineering report that presents our findings, conclusions, and recommendations.

4.0 SITE CONDITIONS AND GEOLOGIC HAZARD EVALUATIONS

4.1 GEOLOGIC SETTING

Geologic mapping shows the site lies within the Sammamish River Valley, a broad, north-south trending valley resulting from several episodes of glacial scouring in the Puget Sound Region. This valley was later filled with glacial outwash deposits, post-glacial deposits, and recent alluvial deposits. The soil at the site is mapped as Pleistocene glacial outwash (Fraser-age) (DNR, 2019). Recessional outwash deposits typically include sand, gravel, and cobbles with varying amounts of silt. Recessional outwash deposits generally overlie glacially consolidated soil (Minard and Booth, 1988). The coarse recessional outwash at the site has previously been mined down to approximately the groundwater level.

The region is seismically active and more than 1,000 earthquakes are recorded by seismographs each year. The epicenters for the last three major earthquakes were under Olympia (1949), Seattle-Tacoma (1965), and Nisqually (2001) with Richter magnitudes of 7.1, 6.5, and 6.8, respectively. These major earthquakes are attributed to the subduction of the oceanic Juan de Fuca plate under the North American Plate (Lasmanis, 1991). Shallow crustal source earthquakes can also affect the site. Inferred fault traces of the Southern Whidbey Island fault zone are the closest seismogenic features and are located approximately 3 miles north of the site (DNR, 2019).

4.2 SURFACE CONDITIONS

The site 12.8 acres in size and located at the southeast corner of the Redmond Cadman facility. The site is bound by the Cadman facility on the north, an approximately 80-foot-high slope on the east, a single-family residential development on the south, and undeveloped property to the west. The site is currently vacant and covered with grass and brush vegetation, soil stockpiles, brush piles, and dirt roads. Elevations across the site generally range from approximately 130 to 150 feet. Berms are present along the west and south edges of the property that will be mostly removed by the proposed project. It is our understanding that the entire site consists of fill that was placed after the late 1980s or early 1990s. Excavations for this project are not anticipated to extend into native soil beneath the fill. As a result, it is our opinion that it is unlikely that excavations will encounter buried cultural resources. The 80-foot-high slope on the east edge of the property is covered with dense brush and leads down to Evans Creek.

4.3 SUBSURFACE CONDITIONS

We explored subsurface conditions at the site by drilling 1 borings (B-1 through B-11) and excavating 9 test pits (TP-1 through TP-9). The borings were drilled to depths of up to 81.5 feet BGS and the test pits were excavated to depths of up to 18 feet BGS at the approximate locations shown on Figure 2. Descriptions of the field exploration and laboratory testing programs, the exploration logs, and results of our laboratory testing are presented in Appendix A. Photographs of our test pit excavations are presented in Appendix B. Figures and logs from GeoEngineers' January 2018 report are presented in Appendix C.

Based on the information obtained from our explorations, the soil profile generally consists of fill at the ground surface that is underlain by native silt, sand, and gravel. The following sections provide a detailed description of each geologic unit encountered at the site.

4.3.1 Fill

We encountered fill in all our explorations generally ranging between 15 and 53 feet thick. The fill thickness is shallower on the east end of the site and becomes deeper toward the west end of the site. The fill generally consists of sand to silty sand and occasional zones of silt and clay. The fill frequently contains subrounded to subangular, fine to coarse gravel and occasional cobbles and small boulders. The fill occasionally contains organics (roots) and debris (wood, brick, concrete rubble). A zone of significant concrete rubble was encountered in one test pit. We did not observe zones of concentrated wood or organics. The sand is generally loose to medium dense, brown to gray, moist, fine to coarse, and contains varying amounts of fines. The silt and clay is generally medium stiff to stiff, brown to gray, moist, non-plastic to medium plasticity, and contains varying amounts of sand. Laboratory testing indicates that moisture contents in this layer generally ranged from 11 to 39 percent at the time of the explorations. Soil such as this generally exhibits variable strength and compressibility characteristics.

We encountered a 1- to 2-foot-thick layer of what appeared to be cement-treated soil in all of our test pits at depths between 2.5 and 9.0 feet BGS. The excavator we used was unable to dig through the cement-treated soil in four of the test pits. The cement-treated layer appears to generally be located at an elevation of 136 to 143 feet. We also observed the cement-treated layer at elevations of 123 and 132 feet at two test pits on the west side of the site. Ground surface elevations were estimated from topographic maps, which may account for some of the scatter in the elevations. Grading plans show that most, but not all, of the cement-treated layer will be removed. Where it remains, the cement-treated soil will be more difficult to excavate through than regular soil. We encountered difficulty in excavating through the cement-treated soil with our smooth, 4-foot-wide bucket, although we anticipate that excavating with a narrower bucket with teeth will be more effective. The grading summary presented on Figure 3 shows low-lying areas where proposed cuts will be less than 6 feet. Based on our test pits, it appears that these are the areas where it is most likely that the cement-treated layer will remain after grading.

We did not evaluate the corrosivity of the fill. If necessary, we can perform additional testing to evaluate this potential issue. Due to the relatively minor amounts of debris we encountered, we do not anticipate that this will be a significant design issue.

4.3.2 Native Silt, Sand, and Gravel

Beneath the fill we observed silt, sand, and gravel that extends to the maximum depths explored. The silt is generally stiff to hard, brown to gray, moist, non-plastic to medium plasticity, and contains varying amounts of sand. The sand is generally very dense, gray, moist to wet, fine to coarse, and contains varying amounts of gravel and fines. The gravel is generally very dense, gray, moist to wet, and contains varying amounts of sand and fines. Soil such as this generally exhibits high strength and low compressibility characteristics. We interpret this native material to be glacial till.

4.3.3 Groundwater

We observed frequent zones of perched water within the fill, but the regional groundwater level appeared to generally be located near the interface between the fill and native soil, which is approximately 40 to 50 feet BGS. A zone of artesian pressure was noted in boring B-6 at a depth

of 30 feet BGS. We measured groundwater at a depth of 39 to 44 feet BGS (elevation 90 to 95 feet) in a piezometer we installed in boring B-11. A summary of the groundwater data we collected from the piezometer is presented in Appendix D. We note that the depth to groundwater will fluctuate in response to seasonal changes, changes in surface topography, and other factors. It is our opinion that the groundwater level is sufficiently deep that it will not have a significant impact on the proposed project.

4.4 INFILTRATION TESTING

We performed infiltration testing in borings B-9 through B-11, which are located at the proposed infiltration vault location in the southwest portion of the site. We understand that the stormwater design for this project will be performed in general accordance with the 2012 Stormwater Management Manual for Western Washington, as amended in 2014. We performed the infiltration testing using the encased falling-head test method inside hollow-stem augers. This test method is generally not recommended by the referenced stormwater manual, but was the only feasible method of testing infiltration at depths of up to 38 feet BGS. We recommend that additional infiltration testing be performed during construction to verify that actual infiltration rates are consistent with the rates we measured.

We performed our infiltration tests in the fill at an elevation of approximately 110 feet, which is the proposed bottom elevation of the stormwater vault. When possible, we performed our infiltration testing with a head of approximately 10 feet of water in order to simulate the infiltration vault conditions. As a result of the perched water that was frequently encountered, we had to use larger heads of water in two of the tests to prevent perched water from flowing into the test holes.

We collected representative soil samples at the infiltration test depths so we could evaluate the percentage of fines present. A summary of the infiltration test results and fines content determinations is presented in Table 1. Plots of the infiltration test results are presented in Appendix E.

Table 1. Unfactored Measured Infiltration Test Results

Location	Elevation (feet)	Soil Type at Test Depth	Water Head (feet)	Measured Infiltration Rate (inches per hour)	Fines Content[1] (percent)
B-9	110	Fill – silty sand	15	0.5	28
B-10	110	Fill – silty sand	25	4.0	36
B-11	109	Fill – silty sand with gravel	10	1.0	34
Average infiltration rate in fill				1.8 (recommended)	

1. Fines content: material passing the U.S. Standard No. 200 sieve

Based on our measured infiltration rates and our groundwater readings, it is our opinion that it is feasible to infiltrate stormwater in the fill at elevation 110 feet. We recommend that an

unfactored infiltration rate of 1.8 inches per hour be used for design. This is the average infiltration rate we measured in the fill, which we feel is a reasonable value to use for design given the large size of the proposed infiltration vault.

The infiltration rates provided in Table 1 are measured rates and are unfactored. Additional factors of safety should be applied to the measured infiltration rates by the civil engineer during design to account for soil variations, the potential for long-term clogging due to siltation and buildup of organic material, maintenance, influent/pre-treatment control, and consequences of failure. The project civil engineer recommends using correction values of 0.8 (site variability) x 0.4 (test method) x 0.9 (degree of influent control), which results in a total correction factor of 0.288. This results in a design infiltration rate of 1.8 inches per hour x 0.288 = 0.52 inch per hour. We also recommend that infiltration testing be performed during construction at each infiltration location to verify that design infiltration rates are being achieved.

We considered using grain-size analysis to evaluate infiltration rates, but the rates we calculated using grain-size analysis did not match our field-measured rates. In our opinion, the permeability characteristics of the fill soil may differ from the characteristics of natural soil deposits used to develop the regression model that the grain-size analysis equations use.

4.5 GEOLOGIC HAZARD EVALUATIONS

The City of Redmond municipal code defines geologic hazards as areas that are susceptible to sliding, erosion, earthquakes, or other geologic hazards. Each of these hazards are discussed in the following sections.

4.5.1 Landslides

DNR and City of Redmond hazard mapping show possible landslide hazards along the site's east slope (DNR, 2019 and City of Redmond, 2016). The DNR mapping indicates historical landslides may have occurred more than 150 years ago. The City of Redmond mapping indicates that current slopes are greater than 40 percent. Based on our review of LiDAR mapping shown on Figure 4, it also appears there is a small surficial landslide along the east slope (DNR, 2019). Based on aerial photographs, the east slope appears to have been primarily constructed between 2002 and 2007. Aerial photographs showing the construction of the east slope are presented in Appendix F. The small landslide shown on the LiDAR mapping appears to have occurred in 2010 or 2011 after the slope was constructed.

As part of our June 2018 investigation, we walked along the top of the east slope to observe the existing slope conditions. We found access to the slope to be limited due to continuous fencing to keep trespassers out of the Cadman quarry and very dense vegetation on the slope that impeded access and visibility of the slope surface. We were unable to observe any landslides during our slope reconnaissance, including the shallow landslide shown on the LiDAR mapping. Given the current dense vegetation, it is our opinion that LiDAR mapping is the most effective way of identifying potential landslides along the slope. Additional slope evaluation should also be performed during construction once vegetation in the earthwork area is removed.

The project team proposes to eliminate the man-made landslide hazard on the east slope by re-grading the previously constructed slopes to a more stable configuration. The proposed grading

plans for the project are presented in Appendix G. Slopes on the grading plan that are greater than 40 percent are labeled as "Man Made Not Regulated" to emphasize that they are not naturally occurring slopes and will not need to be regulated once re-grading mitigates the landslide hazard. Approximately 15 to 20 feet of soil will be removed at the top of the east slope near the proposed buildings, as shown on the cross sections on Figures 5 and 6. This grading is to allow for the construction of daylight basements in the buildings, construction of a pedestrian path, and an overall lowering of the grades across the entire site. There will be a setback distance of at least 30 feet from the buildings to the top of the east slope. The new pedestrian path will be constructed between the buildings and the east slope. This will increase the stability of the overall east slope on both the site and the adjacent downhill property.

We performed a slope stability analysis to evaluate the stability of the proposed modifications to the top of the slope. We used the computer program SLOPE/W version 8.16.0.12829 to model and analyze the cross sections from Core Design shown on Figures 5 and 6. We assigned soil properties to the layers based on the results of our soil borings, laboratory testing, and experience working with similar soil. We analyzed the slope for both static and seismic conditions. We used a pseudo-static force of 0.165 g to model earthquake loading. This acceleration is one-half of the expected PGA of 0.33 g. We analyzed the stability of the current slope as well as the proposed grades. Representative results of our slope stability analysis are presented in Appendix H.

Our analysis shows that the proposed grading will increase the stability of the overall slope by removing weight from the top of the slope. The figures in Appendix H show that the current slope has static and seismic factors of safety of approximately 1.6 and 1.1, respectively. The most critical failures for the current slope grades are large and deep landslides. After the proposed grading is complete, the static and seismic factors of safety for the slope will be improved to approximately 1.6 to 2.2 and 1.2 to 1.7, respectively. The most critical failures after the proposed grading are shallow landslides, which are less destructive and can be more easily repaired. After the proposed grading is complete, the static and seismic factors of safety for a landslide reaching the buildings will be approximately 2.3 to 2.6 and 1.5 to 1.7, respectively. Since the static and seismic factors of safety are greater than 1.5 and 1.1, respectively, it is our opinion that the risk of a large landslide occurring is low.

Loose areas of soil that may be encountered during grading will be recompacted, which will reduce the risk of future shallow landslides, such as the one shown in the LiDAR mapping. We suspect that the landslide shown in the LiDAR mapping is relatively shallow and was caused by poor compaction of the outer slope face during construction. Once the proposed grading has been performed and soil on the slope has been recompacted, it is our opinion that the risk of shallow landslides occurring is low. In our opinion, the proposed grading of the east slope will mitigate the landslide hazard, which eliminates the need for a landslide buffer.

We recommend that the geotechnical engineer of record be present during construction to observe grading of the east slope and evaluate the compaction of fill and loose surficial material. Benching techniques should be used for any fill that is placed on the slope. We recommend that the finished grades along the east slope be surveyed to confirm that they are not steeper than what is shown on the plans. Soil stockpiles and equipment staging areas should not be placed at

the top of the slope. We recommend that the slope be regularly monitored by the contractor to look for signs of instability. If any signs of instability, seepage, or significant erosion are observed, the geotechnical engineer of record should be contacted to re-evaluate the slope.

We recommend that the slope be vegetated as soon as possible to minimize the risk of erosion. The existing vegetation below the grading area should be left in place to provide erosion protection. The slope can also be covered if rainfall will occur before the slope is vegetated. We recommend that drainage water not be directed to the top of the slope. Stormwater infiltration should not be allowed within 100 feet of the slope.

There are currently man-made berms on the south and west sides of the site that will be removed as part of the project. These berms were constructed as part of the mining operations that previously occurred on the site. Although these berms have slopes steeper than 40 percent with a vertical relief of more than 10 feet, we have not addressed these berms in this report since they will be removed as part of this project. These berms are not shown on the DNR or City of Redmond hazard mapping.

4.5.2 Erosion

USDA Soil Conservation Service mapping indicates that the soil at the site does not meet the City of Redmond criteria for being classified as an erosion hazard area (USDA, 2019). USDA mapping indicates the soil at the site is Everett (EvC), 8 to 15 percent slopes, which is not identified as having severe or very severe erosion hazards. The origin of the soil used to previously construct the east slope is not known. We anticipate that the proposed grading will reduce the potential for erosion by reducing the height of the slope, preventing drainage water from being directed to the slope, recompacting loose soil (if present) along the slope face, and revegetating the slope.

4.5.3 Earthquakes

Liquefaction is a phenomenon caused by a rapid increase in pore water pressure that reduces the effective stress between soil particles to near zero. The excessive buildup of pore water pressure results in the sudden loss of shear strength in a soil. Granular soil, which relies on interparticle friction for strength, is susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upwards, carrying soil particles with the draining water. In general, loose, saturated sand soil with low silt and clay content is the most susceptible to liquefaction. Low plasticity, silty sand and silt may be moderately susceptible to liquefaction under relatively higher levels of ground shaking. Liquefaction can densify subsurface soil, which can result in settlement at the ground surface.

The fill soil is generally unsaturated and above the regional groundwater level. The soil below the groundwater level consists of dense, glacially consolidated deposits. The closest mapped fault is more than 3 miles from the site. In our opinion, the soil at the site is not susceptible to liquefaction, lateral spreading, seismic-induced settlement, seismic-induced landslides, or surface fault rupture.

4.5.4 Other Geologic Hazards

According to DNR hazard mapping, there are no flooding, volcanic, mining, tsunami, or other geologic hazards at this site (DNR, 2019).

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Based on our review of the available information and the results of our explorations, it is our opinion that the site can be developed as proposed. Our specific recommendations for site development and design are provided later in this report. The following geotechnical items should be addressed as part of the proposed project:

- The existing slope along the east edge of the property is a man-made slope that was constructed by Cadman between approximately 2002 and 2007. City of Redmond hazard mapping shows this slope to be a geologically hazardous area. LiDAR mapping shows a small surficial landslide along the east slope. The proposed Woodside project will re-grade this east slope to mitigate the landslide risk. The existing slope will be flattened and up to approximately 20 feet of soil will be removed from the top of the slope. This regrading work will include repairing any remaining landslide areas that are encountered. In our opinion, the proposed grading plan will mitigate the landslide risk and it is not necessary to establish a buffer zone at the top of the slope, but this should be confirmed with the City of Redmond.
- The grading plan shows that cuts will be performed across the site. In our test pits we encountered a 1- to 2-foot-thick layer of cement-treated soil across the site at depths between 2.5 and 9.0 feet BGS. Polygon should anticipate difficult digging conditions when this layer is encountered during excavations.
- Our seismic analysis indicates that the site should be classified as Site Class D. The risk of liquefaction, lateral spreading, seismic-induced settlement, seismic-induced landslides, or surface fault rupture occurring is low.
- The grading plan shows that at least 6 feet of cuts will be performed across most of the site. In our opinion, this cut material has adequately surcharged the site and it is not necessary to place additional surcharge. If cuts will be less than 6 feet, we recommend that additional surcharge material be placed.
- The proposed buildings can be supported on conventional spread footings bearing on granular pads, improved soil, or compacted existing soil. We recommend that GeoDesign evaluate the subgrade at each footing location during construction. Subgrade soil that consists of silt or clay should be over-excavated and replaced with 18-inch-thick granular pads, cement amended, or improved using other methods. Subgrade soil consisting of sand should be compacted with a hoe pack. Some over-excavation may be required to remove concrete rubble or other unsuitable material from beneath footings
- We recommend that the subgrade beneath new floor slabs be evaluated during construction to determine if scarifying and recompaction or over-excavation is required.
- We recommend that the upper 18 inches of road subgrade be properly compacted.

- The on-site sand, silt, and clay are suitable for use as structural fill, provided they are properly moisture conditioned. However, the soil is sensitive to small changes in moisture content and can be difficult, if not impossible, to adequately compact during wet weather or when the moisture content of the soil is more than a couple of percent above the optimum required for compaction.

5.2 SITE PREPARATION

5.2.1 Stripping and Grubbing

Stripping and grubbing will be required to remove any vegetation that remains after cuts are performed. Root zone material should be stripped and removed from all building, pavement, and structural fill areas. We anticipate a stripping depth of approximately 6 inches will generally be adequate. Greater depths may be necessary to remove localized zones of organic material or deeper tree and shrub root zones. The actual stripping and grubbing depth should be based on field observations at the time of construction. Stripping and grubbing should extend at least 5 feet beyond the limits of proposed building and pavement areas. Stripped material should be transported off site for disposal or used as fill in landscaping areas.

5.2.2 Undocumented Fill

Undocumented fill is present across the entire site. The "Foundation Support" section provides our recommendations for dealing with undocumented fill beneath new foundations. Undocumented fill beneath floor slabs should be evaluated during construction to determine if scarifying and recompaction or over-excavation will be required. Concentrated zones of debris and organics should be over-excavated from beneath structural areas.

5.2.3 Subgrade Evaluation

A member of our geotechnical staff should observe exposed footing, floor slab, and pavement subgrade after stripping and excavation have been completed to confirm that there are no areas of unsuitable or unstable soil. The subgrade should be evaluated using a hand probe or proof rolling with a fully loaded dump truck (or similar heavy, rubber tire construction equipment). Proof rolling with a truck is the preferred method of evaluating subgrade, but may not be appropriate for certain circumstances such as wet subgrade or individual excavations for building footings. Soft, loose, or unsuitable soil found at the subgrade level should be over-excavated and replaced with structural fill or moisture conditioned and recompacted as structural fill. At a minimum, all roads should be proof rolled with a fully loaded truck after base rock is placed.

5.3 EXCAVATION

5.3.1 Temporary Excavations and Slopes

Excavations will be required for the installation of new foundations, utilities, pavement, and other earthwork. Conventional earthmoving equipment in proper working condition should be capable of making the necessary excavations. Temporary excavation sidewalls may stand vertical to a depth of approximately 4 feet, provided groundwater seepage does not occur. Excavations deeper than 4 feet will require shoring or should be sloped. Sloped excavations may be used to vertical depths of 10 feet BGS and should have side slopes no steeper than 1½H:1V, provided groundwater seepage does not occur. If slopes greater than 10 feet high are required,

GeoDesign should be contacted to make additional recommendations. Some areas may contain significant debris, which could result in excavations being larger than anticipated because of caving.

We recommend a minimum horizontal distance of 5 feet from the edge of existing improvements to the top of temporary slopes. All cut slopes should be protected from erosion by covering them during wet weather. If seepage, sloughing, or instability is observed, slopes should be flattened or shored.

5.3.2 Trench Backfill Material

City of Redmond trench backfill requirements should be followed for any public utilities that are installed. Our trench backfill recommendations for private utilities are provided below.

Trench backfill for the utility pipe base and pipe zone should consist of durable, well-graded, granular material that has a maximum particle size of 1 inch, has less than 5 percent by dry weight passing the U.S. Standard No. 200 sieve, and contains no organic or other deleterious material. Backfill above the pipe zone should meet the requirements above, except that the maximum particle size may be increased to 1½ inches.

Backfill for the pipe base and within the pipe zone should be placed in maximum 12-inch-thick lifts and compacted to not less than 90 percent of the maximum dry density, as determined by ASTM D1557, or as recommended by the pipe manufacturer. Backfill above the pipe zone should be placed in maximum 12-inch-thick lifts and compacted to not less than 92 percent of the maximum dry density, as determined by ASTM D1557. Trench backfill located within 2 feet of finish subgrade elevation should be placed in maximum 12-inch-thick lifts and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557. Outside of structural areas, trench backfill material should be compacted to at least 90 percent of the maximum dry density, as determined by ASTM D1557.

5.3.3 Excavation Dewatering

If it is required, we anticipate that excavation dewatering can generally be accomplished by pumping from sumps. The selection, design, and construction of the dewatering system should be the responsibility of the contractor, who is in the best position to modify or adapt the system to changing groundwater conditions and determine construction sequencing. Water generated during dewatering operations should be pumped to a suitable disposal point.

If water is present at the base of excavations, we recommend placing stabilization material at the base of the excavations consisting of 1 foot of well-graded gravel, crushed gravel, or crushed rock with a minimum particle size of 4 inches and less than 5 percent by dry weight passing the U.S. Standard No. 4 sieve. The material should be free of organic matter and other deleterious material and should be placed in one lift and compacted until well keyed.

5.3.4 Excavation Safety

All excavations should be made in accordance with applicable OSHA and state regulations. While this report describes certain approaches to excavation and dewatering, the contractor should be

responsible for selecting excavation and dewatering methods, monitoring the excavations for safety, and providing shoring as required to protect personnel and adjacent utilities and structures.

5.4 PERMANENT SLOPES

We recommend that permanent cut or fill slopes not exceed a gradient of 2H:1V, unless specifically evaluated for stability. Upslope buildings, access roads, and pavements should be set back a minimum of 5 feet from the crest of such slopes. Slopes should be planted with appropriate vegetation to provide protection against erosion as soon as possible after grading. Surface water runoff should be collected and directed away from slopes to prevent water from running down the face of the slope.

5.5 STRUCTURAL FILL

Structural fill includes fill beneath foundations, slabs, pavements, any other areas intended to support structures, or within the influence zones of structures. Structural fill should be free of organic matter and other deleterious material and, in general, should consist of particles no larger than 4 inches in diameter. Recommendations for suitable fill material are provided in the following sections.

5.5.1 On-Site Soil

The on-site coarse-grained soil will generally be suitable for use as structural fill. On-site coarse-grained soil should be placed in lifts with a maximum uncompacted thickness of 12 inches and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557.

The on-site fine-grained soil will be suitable for use as structural fill only if it can be moisture conditioned. Based on our experience, fine-grained soil is sensitive to small changes in moisture content and may be difficult, if not impossible, to compact adequately during wet weather or when the moisture content is more than a few percentage points above optimum. Available fine-grained soil may require extensive drying if it is used as structural fill. The material should be placed in lifts with a maximum uncompacted thickness of 8 inches and compacted to not less than 92 percent of the maximum dry density, as determined by ASTM D1557. We recommend using imported granular material for structural fill if the moisture content of the on-site fine-grained soil cannot be reduced.

5.5.2 Imported Granular Material

Imported granular material should be pit- or quarry-run rock, crushed rock, or crushed gravel and sand that is fairly well graded between coarse and fine and has less than 5 percent by dry weight passing the U.S. Standard No. 200 sieve. All granular material must be durable such that there is no degradation of the material during and after installation as structural fill. The percentage of fines can be increased to 12 percent if the fill is placed during dry weather and provided the fill material is moisture conditioned for proper compaction. The material should be placed in lifts with a maximum uncompacted thickness of 12 inches and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557. During the wet season or when wet subgrade conditions exist, the initial lift should have a maximum thickness of 18 inches and should be compacted by rolling with a smooth-drum, non-vibratory roller.

5.5.3 Recycled Concrete

Recycled concrete can be used for structural fill, provided the concrete is broken to a maximum particle size of 4 inches. This material must be durable such that there is no degradation of the material during and after installation as structural fill. Recycled concrete can be used as trench backfill and pavement base rock if it meets the size requirements for those applications and the requirements for imported granular material. The material should be placed in lifts with a maximum uncompacted thickness of 12 inches and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557.

5.6 DRAINAGE

5.6.1 Surface

The finished ground surface around the buildings should be sloped away from foundations at a minimum 2 percent gradient for a distance of at least 5 feet. Pavement surfaces and open space areas should be sloped such that surface water runoff is collected and routed to suitable discharge points. Runoff water should not be directed to the top of the slope.

5.6.2 Subsurface Drainage

We recommend that perimeter footing drains be installed around the buildings with basements. Footing drains and roof downspouts or scuppers should discharge to a solid pipe that carries the collected water to an appropriate stormwater system. Drainage water should not be directed to the tops of slopes.

5.6.3 Temporary Drainage

During grading, the contractor should be made responsible for temporary drainage of surface water as necessary to prevent standing water and/or erosion at the working surface. During rough and finished grading of the building sites, the contractor should keep all footing excavations and building pads free of water.

5.7 FOUNDATION SUPPORT

Based on the results of our explorations and analysis, the proposed buildings can be supported on conventional spread footings that bear on granular pads, improved soil, or compacted existing soil. We recommend that GeoDesign evaluate the subgrade at each footing location during construction. Subgrade soil that consists of silt or clay should be over-excavated and replaced with 18-inch-thick granular pads, cement amended, or improved using other methods. Subgrade soil that consists of sand should be compacted with a large hoe pack and density tested to verify that adequate compaction has been achieved. It is possible that some over-excavation will be required to remove concrete rubble or other unsuitable material from beneath footings.

Where used, granular pads should extend beyond the footing perimeter by 6 inches for every foot in depth below footing subgrade. Granular pads should be constructed of imported granular material as described in the "Structural Fill" section. The granular pads should be placed in 8- to 12-inch-thick lifts and compacted to 95 percent of the maximum dry density, as determined by ASTM D1557. Geogrid can also be installed beneath the granular pads to provide additional strength and support.

The grading plan shows that at least 6 feet of cuts will be performed across most of the site. In our opinion, this cut material has adequately surcharged the site and it is not necessary to place additional surcharge. If cuts will be less than 6 feet, we recommend that additional surcharge material be placed. Surcharge heights should be evaluated with respect to finish floor slab grades. Our surcharge recommendations are provided in the "Surcharge Program" section.

5.7.1 Bearing Capacity

We recommend that spread footings be sized based on an allowable bearing pressure of 2,500 psf. This is a net bearing pressure; the weight of the footing and overlying backfill can be ignored in calculating footing sizes. This bearing pressure applies to the total of dead and long-term live loads and may be increased by 50 percent for short-term loads, such as those resulting from wind or seismic forces. We calculated an ultimate bearing capacity of 7,500 psf for the soil at this site using traditional bearing capacity equations. We applied a factor of safety of 3 to arrive at our recommended static allowable bearing pressure of 2,500 psf. In our opinion, it is reasonable to use a factor of safety of 2 for short-term transient loads, which results in an allowable bearing pressure of 3,750 psf. This value represents a 50 percent increase over the static allowable bearing pressure.

We recommend that isolated column and continuous wall footings have minimum widths of 24 and 18 inches, respectively. The bottom of exterior footings should be founded at least 18 inches below the lowest adjacent grade. Interior footings should be founded at least 12 inches below the base of the floor slab.

5.7.2 Lateral Resistance

Lateral loads on footings can be resisted by passive earth pressure on the sides of the structures and by friction on the base of the footings. Our analysis indicates that the available passive earth pressure for footings confined by soil is 350 pcf, modeled as an equivalent fluid pressure. Adjacent floor slabs, pavements, or the upper 12 inches of adjacent, unpaved areas should not be considered when calculating passive resistance.

A coefficient of friction equal to 0.30 may be used when calculating resistance to sliding for footings in direct contact with fill soil. Footings in contact with crushed rock should be designed using a coefficient of friction of 0.50.

These passive earth pressure and coefficient of friction values are ultimate values. We recommend that a factor of safety of 1.5 be used to obtain the allowable values that should be used in design.

5.7.3 Settlement

We anticipate that total post-construction settlement of the new buildings will be less than 1 inch for shallow foundations designed in accordance with the recommendations provided above. Differential settlement between similarly loaded footings is expected to be less than ½ inch.

The grading plan summary presented on Figure 3 shows the current proposed cut and fill heights. As seen on the figure, there are some areas where proposed cut heights vary significantly over short distances. Most of the variation shown on the figure occurs around low-

lying areas. These low-lying areas will be surcharged, which is not shown on the grading exhibit. Surcharging these areas will reduce the potential for differential settlement. The largest variation in adjacent cut heights occurs at buildings five and six along the east slope where daylight basements are present. We note that these areas have been surcharged for years and that daylight basements are routinely constructed in the region without problems, despite varying cut depths between adjacent footings. In our opinion, differential settlement between adjacent footings will generally be less than ½ inch, provided the recommendations in this report are followed.

5.8 SLABS ON GRADE

We anticipate that the subgrade will generally provide adequate support for concrete slabs-on-grade. We recommend that the slab subgrade be evaluated during construction to determine if scarifying and recompaction or over-excavation will be required. A modulus of subgrade reaction of 120 pci can be used for design of the floor slabs, provided the subgrade is prepared in accordance with the recommendations presented in this section. Settlement of the slabs supporting the anticipated design loads and constructed as recommended is anticipated to be less than 1 inch of total settlement and ½ inch of differential settlement. A minimum of 6-mil Visqueen and a 4-inch-thick layer of clean crushed rock or pea gravel should be placed and compacted over the prepared subgrade to assist as a capillary break.

5.9 RETAINING WALLS

5.9.1 Assumptions

Our retaining wall design recommendations are based on the following assumptions: (1) the walls are conventional cast-in-place or soldier pile retaining walls, (2) the walls are less than 10 feet in height, and (3) adequate drainage is provided behind the wall to prevent hydrostatic pressures from developing. Re-evaluation of our recommendations will be required if the retaining wall design criteria for the project varies from these assumptions. Our recommendations in this section apply to both retaining walls and basement walls.

5.9.2 Wall Design Parameters

Retaining walls can be designed using the values provided on Figure 7. If the retained soil behind the wall is sloped, the recommended active and at-rest lateral earth pressures for cantilevered and braced walls should be multiplied by the factors provided in Table 1. We recommend that seismic lateral forces on walls be modeled using the values provided in Table 2 (where H is the height of the wall in feet) and the resulting seismic force is in pounds per linear foot of wall. The seismic forces will act as a distributed load across the wall, with the resultant acting through the centroid that is located at a height of 0.6H above the base of the wall.

Table 2. Lateral Earth Pressure Increase Factors and Seismic Lateral Forces for Sloped Soil Behind Walls

Slope of Retained Soil (degrees)	Lateral Active and At-Rest Earth Pressure Increase Factor	Additional Seismic Lateral Force (pounds per linear foot of wall)[1]
0	1.00	$7H^2$
5	1.06	$7.5H^2$
10	1.12	$8H^2$
15	1.17	$9H^2$
20	1.33	$10H^2$
25	1.52	$11H^2$

1. H is equal to the height of the wall in feet.

The pressures provided above will allow moderate relaxation of the wall toward the excavation, which will cause some ground surface settlement behind the wall. Based on our experience, settlement on the order of 1 inch can be expected adjacent to the wall. We anticipate that settlement will become negligible approximately 20 feet from the wall. Consequently, we recommend that construction of flatwork adjacent to retaining walls be postponed at least four weeks after construction, unless survey data indicates that settlement is complete prior to that time.

If surcharges (e.g., retained slopes, building foundations, vehicles, terraced walls, etc.) are located within a horizontal distance from the back of a wall equal to the height of the wall, additional pressures will need to be accounted for in the wall design. Figure 8 presents additional pressures resulting from some common loading scenarios. Our office should be contacted for additional pressures resulting from alternate loading scenarios. We recommend a vertical live load of 250 psf be applied at the surface of the retained soil where the wall retains roadways. The parameters described above are unfactored; therefore, appropriate factors of safety should be applied for design.

Lateral loads can be resisted by passive earth pressure in front of the wall and friction on the base of the wall footing. We recommend that a friction coefficient of 0.50 be used to compute the frictional resistance for footings bearing on crushed rock. We recommend that a friction coefficient of 0.30 be used to compute the frictional resistance for footings bearing on fill soil. An equivalent fluid unit weight of 350 pcf is recommended to compute the passive earth pressure acting on the front of the wall; this value should be reduced to 180 pcf if the ground in front of the wall slopes down at an inclination of 3H:1V or steeper. At locations where there is a slope in front of the retaining wall, we recommend that a minimum 5-foot-wide, horizontal bench be placed between the wall and the top of the slope. Retaining wall footings should be embedded a minimum of 12 inches for walls up to 10 feet tall.

These passive earth pressure and coefficient of friction values are ultimate values. We recommend that a factor of safety of 1.5 be used to obtain the allowable values that should be used in design.

5.9.3 Wall Drainage and Backfill

We recommend that drains be installed behind retaining walls to prevent buildup of hydrostatic pressures. Backfill material placed behind retaining walls and extending a horizontal distance of ½H (where H is the height of the retaining wall) should consist of imported granular material meeting the requirements described in the "Structural Fill" section. Alternatively, on-site soil can be used as backfill material provided a minimum 2-foot-wide column of angular drain rock wrapped in a drainage geotextile is placed against the wall and the on-site soil can be adequately moisture conditioned for compaction. The rock column should extend from the perforated drainpipe or foundation drains to within approximately 1 foot of the ground surface. The angular drain rock should have a maximum particle size of 2 inches, should have less than 2 percent by dry weight passing the U.S. Standard No. 200 sieve, should have at least two mechanically fractured faces, and should be free of organics and other unsuitable material.

Perforated collector pipes should be placed at the base of the granular backfill behind the walls. The pipe should be embedded in a minimum 2-foot-wide zone of angular drain rock wrapped in a drainage geotextile fabric. The collector pipes should discharge at an appropriate location away from the base of the wall. Unless measures are taken to prevent backflow into the drainage system of the wall, the discharge pipe should not be tied directly into stormwater drain systems.

Backfill should be placed and compacted as recommended for structural fill, with the exception of backfill placed immediately adjacent to walls. Backfill adjacent to walls should be compacted to a lesser standard to reduce the potential for compaction-induced earth pressures on the walls. Backfill located within a horizontal distance of 3 feet from the retaining walls should be compacted to approximately 90 percent of the maximum dry density, as determined by ASTM D1557. Backfill placed within 3 feet of the wall should be compacted in lifts less than 6 inches thick using hand-operated tamping equipment (such as a jumping jack or vibratory plate compactor). If flatwork (such as slabs, sidewalk, or pavement) will be placed adjacent to the wall, we recommend that the upper 2 feet of fill be compacted to 95 percent of the maximum dry density, as determined by ASTM D1557.

5.10 PAVING

We understand that the civil engineer will provide asphalt pavement recommendations for this project. We recommend that the upper 18 inches of road subgrade be scarified and compacted to 95 percent of the material's maximum dry density, as determined by ASTM D1557. We also recommend that GeoDesign evaluate the subgrade soil during construction to determine if any additional stabilization is needed. Additional stabilization could include using a subgrade geotextile, cement amending, or other measures.

According to the project grading plans, it may be necessary to place additional surcharge at some road locations where less than 6 feet of existing soil will be removed. Our surcharge recommendations are provided in the "Surcharge Program" section.

5.11 SEISMIC DESIGN PARAMETERS

We understand this project will be designed and constructed in accordance with the 2015 IBC. Based on the SPT blow count data collected during our explorations, it is our opinion that the site

should be classified as seismic Site Class D. Base shear forces can be computed using the parameters provided in Table 3. These parameters were obtained from USGS seismic design maps (USGS, 2018).

Table 3. IBC Seismic Design Parameters

Parameter	Short Period (T_s = 0.2 second)	1 Second Period (T_1 = 1.0 second)
Spectral Acceleration (MCE)	S_s = 1.246 g	S_1 = 0.477 g
Site Class	D	
Site Coefficient	F_a = 1.002	F_v = 1.523
Spectral Acceleration Parameters	S_{MS} = 1.248 g	S_{M1} = 0.726 g
Design Spectral Acceleration Parameters	S_{DS} = 0.832 g	S_{D1} = 0.484 g
Spectral PGA	0.50 g	
Design Spectral PGA	0.33 g	
MCE_G PGA Adjusted for Site Class Effects[1]	PGA_M = 0.50 g	

1. From ASCE 7-10. Minimum PGA value to use when evaluating liquefaction and soil strength loss, as required by ASCE 7-10 Section 11.8.3f.

5.12 NORTH BERM

We understand that a new 10- to 15-foot-high berm will be constructed on the north side of the proposed development to provide a visual and noise barrier between the existing Cadman facility and the new residences. We recommend that the new berm be constructed with slopes no steeper than 2H:1V. The new berm should be placed as structural fill. The structural fill should be free of organic matter and other deleterious material and, in general, should consist of particles no larger than 4 inches in diameter. If coarse-grained soil is used as structural fill, it should be compacted to not less than 95 percent of the material's maximum dry density, as determined by ASTM D1557. Fine-grained soil can also be used, although it is more moisture-sensitive and may require drying before it can be used as structural fill. We recommend that fine-grained soil be compacted to not less than 92 percent of the material's maximum dry density, as determined by ASTM D1557. We recommend that the slopes be slightly overbuilt and then the excess soil on the outer portion of the slopes be removed to result in well-compacted soil at the slope face. We recommend that the slopes of the berm be flattened to 3H:1V if it is necessary to mow vegetation on the berm slopes.

5.13 SURCHARGE PROGRAM

A surcharge program should be implemented to reduce the risk of excessive settlement occurring in undocumented fill that is present beneath buildings, roads, and other settlement-sensitive areas. Grading cuts will be performed across the entire site as part of this project. These cuts will generally be more than 6 feet and the soil that will be removed has effectively surcharged most of the site. Building, roadway, and other settlement-sensitive areas that will not

be cut by 6 feet to achieve finished grades should be surcharged. The surcharge height will vary by location, but it should result in at least 6 feet of soil above finish grade. Surveying should be performed to ensure that the correct amount of surcharge is placed.

Settlement typically occurs when new loads are introduced that compress the underlying soil. Long-term settlement can also occur if significant organics are present that gradually decompose or if the regional groundwater level is significantly lowered. Since the site has already been surcharged, the post-construction loads on the soil beneath roads and utilities will be less than they are currently, so we do not anticipate that settlement from loads will occur. We did not observe significant organics in our explorations and are not aware of plans to lower the regional groundwater level; we do not anticipate that settlement from these sources will occur.

Removing 6 feet of surcharge will unload the soil by approximately 700 psf (115 pcf x 6 feet). As a result, footings designed for an allowable bearing pressure of 2,500 psf will effectively be increasing the subgrade soil load by only 1,800 psf. The resulting settlement will also be reduced by compacting or replacing the upper 18 inches of subgrade beneath the foundations. Even when conservatively assuming relatively weak soil values for the fill, our settlement calculations show less than 1 inch of settlement will occur beneath new foundations. The relatively small foundations will also result in relatively shallow foundation influence zones, so most of the overall fill will not experience any increased loads from the foundations. Example settlement calculations are presented in Appendix I.

The surcharge embankment should extend at least 5 feet beyond the proposed building and road footprints. The surcharge embankment should have an in-place unit weight of at least 115 pcf. Temporary fill slopes for the surcharge can be constructed to a maximum slope of 1½H:1V. Surcharge-induced settlement will cause any buried utilities to settle. It should be verified that such utilities are capable of withstanding the predicted settlement without being damage.

We recommend that the added surcharge be left in place until settlement monitoring indicates that settlement has leveled off. We anticipate that a duration of one month to two months will be adequate, although the actual duration should be based on the results of the settlement monitoring program.

We recommend that multiple settlement monuments be installed at each surcharge location to monitor settlement. Settlement monuments typically consist of a steel rod that is attached to a 2-foot by 2-foot, square steel plate. Additional rods can be added using couplers. Care must be taken during fill construction not to bend or break the rods. Settlement monuments should be installed prior to site filling and immediately surveyed. Survey measurements should be taken at each settlement monument at least twice per week during fill construction and for at least one month after fill construction, followed by once weekly thereafter. In addition to recording the elevation of the settlement monument during each survey event, the elevation of the adjacent ground surface should also be recorded. The settlement monuments should be monitored using survey equipment with accuracy of 1/100th of a foot and referenced to a stationary datum established at least 200 feet from the edge of the surcharge area. The survey data should be provided to GeoDesign within three days of the survey.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 WET WEATHER CONSTRUCTION

The soil at this site can easily be disturbed by wet weather. Trafficability of soil at the ground surface may be difficult during extended wet periods or when the moisture content of the surface soil is more than a few percentage points above optimum. If not carefully executed, earthwork activities can create extensive soft areas, resulting in significant repair costs.

When the subgrade is wet of optimum, site preparation may need to be accomplished using track-mounted equipment loading into trucks supported on granular haul roads or working blankets. Based on our experience, at least 12 inches of granular material is typically required for light staging areas and at least 18 inches of granular material for haul roads subject to repeated equipment traffic. We typically recommend that imported granular material for haul roads and working blankets consist of durable crushed rock that is well graded and has less than 8 percent by dry weight passing the U.S. Standard No. 200 sieve. Where silt or clay is exposed at the ground surface, the performance of haul roads can typically be improved by placing a geotextile on the subgrade before placing the granular material. The granular material should be placed in a single lift and the surface compacted until well keyed. Although we have presented typical recommendations for haul road and working blankets, the actual thickness and material should be determined by the contractor based on their sequencing of the project and the type and frequency of construction equipment.

The base rock thickness for building slab areas is intended to support post-construction design loads and will not support construction traffic or pavement construction when the subgrade soil is wet. If construction is planned for periods when the subgrade soil is wet, an increased thickness of base rock or cement amending will be required.

6.2 EROSION CONTROL

The on-site soil is susceptible to erosion. Consequently, we recommend that slopes be covered with an appropriate erosion control product if construction occurs during periods of wet weather. We recommend that all slope surfaces be planted as soon as practical to minimize erosion. Surface water runoff should be collected and directed away from slopes to prevent water from running down the slope face. Erosion control measures such as straw bales, sediment fences, and temporary detention and settling basins should be used in accordance with local and state ordinances.

7.0 OBSERVATION OF CONSTRUCTION

Satisfactory foundation and earthwork performance depends to a large degree on quality of construction. Sufficient observation of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during the subsurface exploration. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect if subsurface conditions change significantly from those anticipated.

We recommend that GeoDesign be retained to observe earthwork activities. We anticipate that this will consist of evaluating footing, floor slab, sidewalk, and pavement subgrade; observing the placement of structural fill; evaluating subgrade repairs; testing trench backfill and asphalt concrete paving; and performing laboratory compaction and field moisture-density tests.

8.0 LIMITATIONS

We have prepared this report for use by Polygon Northwest Company and members of their design and construction team for the proposed project. The data and report can be used for bidding or estimating purposes, but our report, conclusions, and interpretations should not be construed as warranty of the subsurface conditions and are not applicable to other sites.

Exploration observations indicate soil conditions only at specific locations and only to the depths penetrated. They do not necessarily reflect soil strata or water level variations that may exist between exploration locations. If subsurface conditions differing from those described are noted during the course of excavation and construction, re-evaluation will be necessary.

The site development plans and design details were preliminary at the time this report was prepared. When the design has been finalized and if there are changes in the site grades or location, configuration, design loads, or type of construction for the buildings, the conclusions and recommendations presented may not be applicable. If design changes are made, we request that we be retained to review our conclusions and recommendations, and to provide a written modification or verification.

The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time the report was prepared. No warranty, express or implied, should be understood.

♦ ♦ ♦

We appreciate the opportunity to be of continued service to you. Please call if you have questions concerning this report or if we can provide additional services.

Sincerely,

GeoDesign, Inc.

Ryan T. Lawrence, P.E. (Oregon)
Senior Project Engineer

Scott V. Mills, P.E.
Principal Engineer

Signed 10/04/2019

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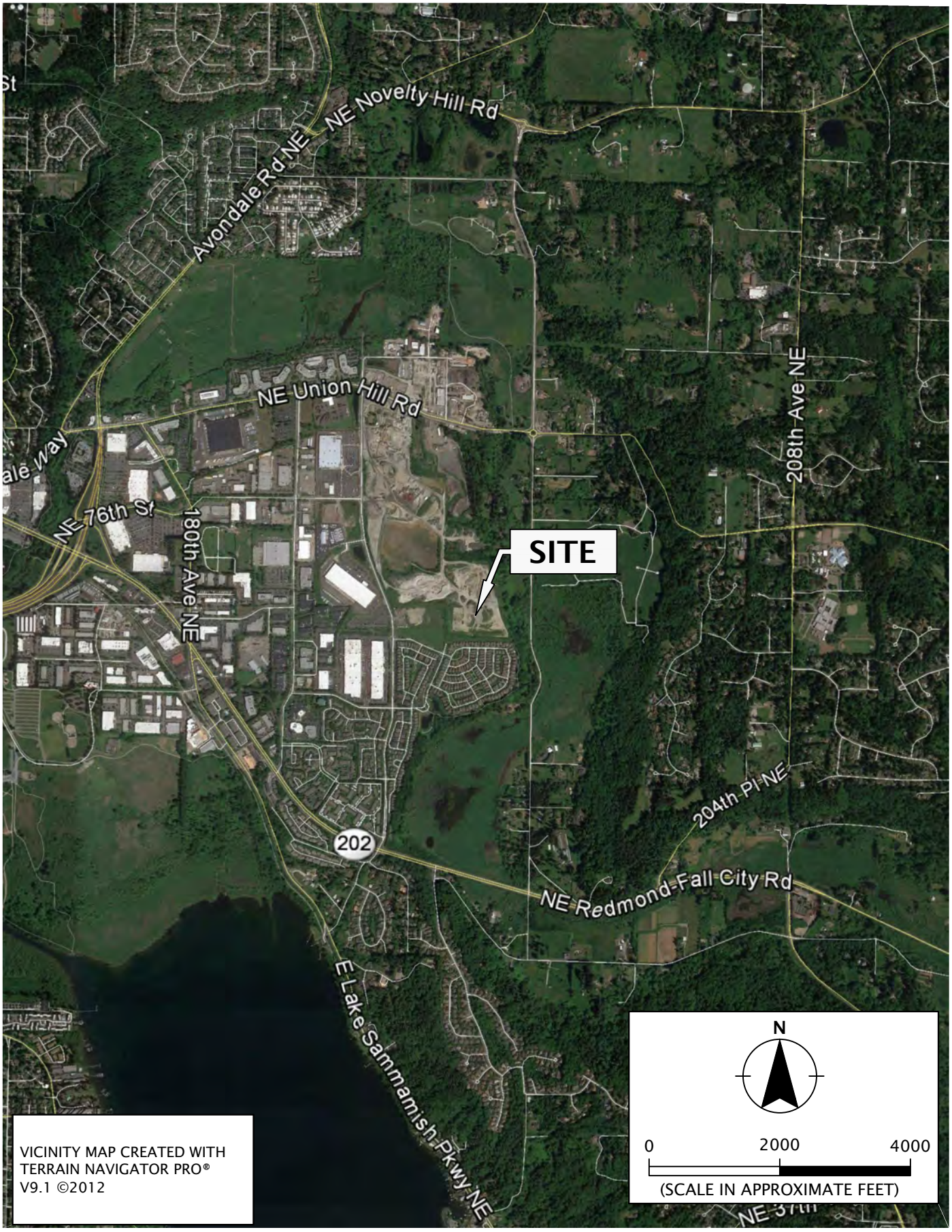
FIGURES



GEODESIGN INC AN NV5 COMPANY	POLYGON-161-01	**VICINITY MAP**	
	OCTOBER 2019	WOODSIDE REDMOND, WA	**FIGURE 1**

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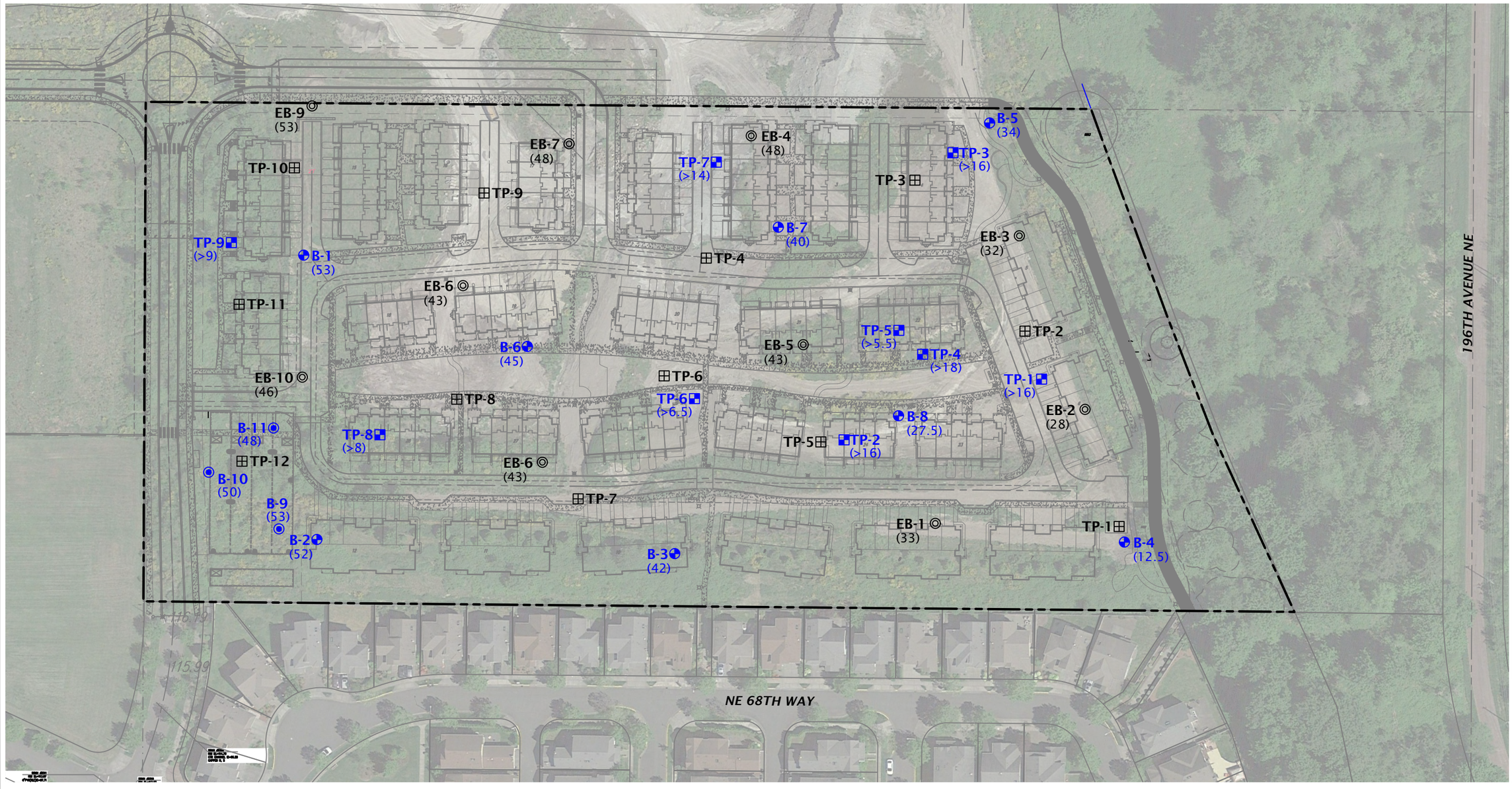
File Name: J:\M-R\Polygon\Polygon-161\Polygon-161-01\Figures\CAD\RevisedGeotechRpt2019\Polygon-161-01-VM01.dwg | Layout: FIGURE 1



LEGEND:

———	SITE BOUNDARY
B-1 (53)	BORING LOCATION AND DEPTH OF FILL IN FEET (GEODESIGN 2018)
TP-1 (>16)	TEST PIT LOCATION AND DEPTH OF FILL IN FEET (GEODESIGN 2018)
B-9 (53)	BORING LOCATION AND DEPTH OF FILL IN FEET (GEODESIGN 2019)
EB-1 (33)	PRIOR BORING LOCATION AND DEPTH OF FILL IN FEET (ASSOCIATED EARTH SCIENCES INC. 2017)
TP-1	PRIOR TEST PIT LOCATION (GEOENGINEERS 2017)

PROPOSED BUILDINGS (TYPICAL)

N

0 100 200

(SCALE IN FEET)

NOTES:

1. SITE PLAN BASED ON DRAWING PROVIDED BY CORE DESIGN, INC. SEPTEMBER 24, 2019.
2. AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO JULY 2, 2018.

SITE PLAN

WOODSIDE
REDMOND, WA

FIGURE 2

POLYGON-161-01

OCTOBER 2019

GeoDesign an NV5 company

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File Name: J:\M-R\Polygon\Polygon-161\Polygon-161-01\Figures\CAD\RevisedGeotechRpt2019\Polygon-161-01-SP01.dwg | Layout: FIGURE 2

MATCH LINE, SEE BELOW RIGHT

13' WIDE SOUND ATTENUATION BERM TO BE RELOCATED/CONSTRUCTED BY CADMAN.

EXISTING CONTOUR (TYP.)

PROPOSED CONTOUR (TYP.)

Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	-36.000	-6.000	
2	-6.000	0.000	
3	0.000	6.006	

LEGEND

- EXISTING 2' CONTOUR
- EXISTING 10' CONTOUR
- PROPOSED 2' CONTOUR
- PROPOSED 10' CONTOUR
- KEYSTONE WALL

N.E. 70TH ST. (PUBLIC)

192ND AVE N.E. / ROAD 'A' (PUBLIC)

ROAD 'B' (PRIVATE)

ROAD 'C' (PRIVATE)

ROAD 'D' (PRIVATE)

ROAD 'E' (PRIVATE)

ROAD 'F' (PRIVATE)

ROAD 'G' (PRIVATE)

ROAD 'H' (PRIVATE)

ROAD 'I' (PRIVATE)

ROAD 'J' (PRIVATE)

ROAD 'K' (PRIVATE)

STORM VAULT

OUTER 25% WETLAND BUFFER (TYP.)

APPROXIMATE 150' WETLAND BUFFER (TYP.)

GREATER OR EQUAL TO 6' CUT LINE. (TYP.)

188TH AVE NE

NE 70TH ST (PUBLIC)

MATCH LINE, SEE ABOVE LEFT

N

0 80 160

(SCALE IN FEET)

SITE PLAN BASED ON IMAGE OBTAINED FROM CORE DESIGN, INC. ON AUGUST 8, 2019

SITE PLAN - PROPOSED GRADING

WOODSIDE
REDMOND, WA

FIGURE 3

POLYGON-161-01

OCTOBER 2019

GeoDesign NW
AN NV5 COMPANY

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File Name: J:\M-R\Polygon\Polygon-161\Polygon-161-01\Figures\CAD\RevisedGeotechRpt2019\Polygon-161-01-SP-Prpsd-Grdng.dwg | Layout: FIGURE 3

LEGEND:

SITE BOUNDARY

N

0 100 200

(SCALE IN FEET)

LIDAR IMAGE OF SITE

WOODSIDE
REDMOND, WA

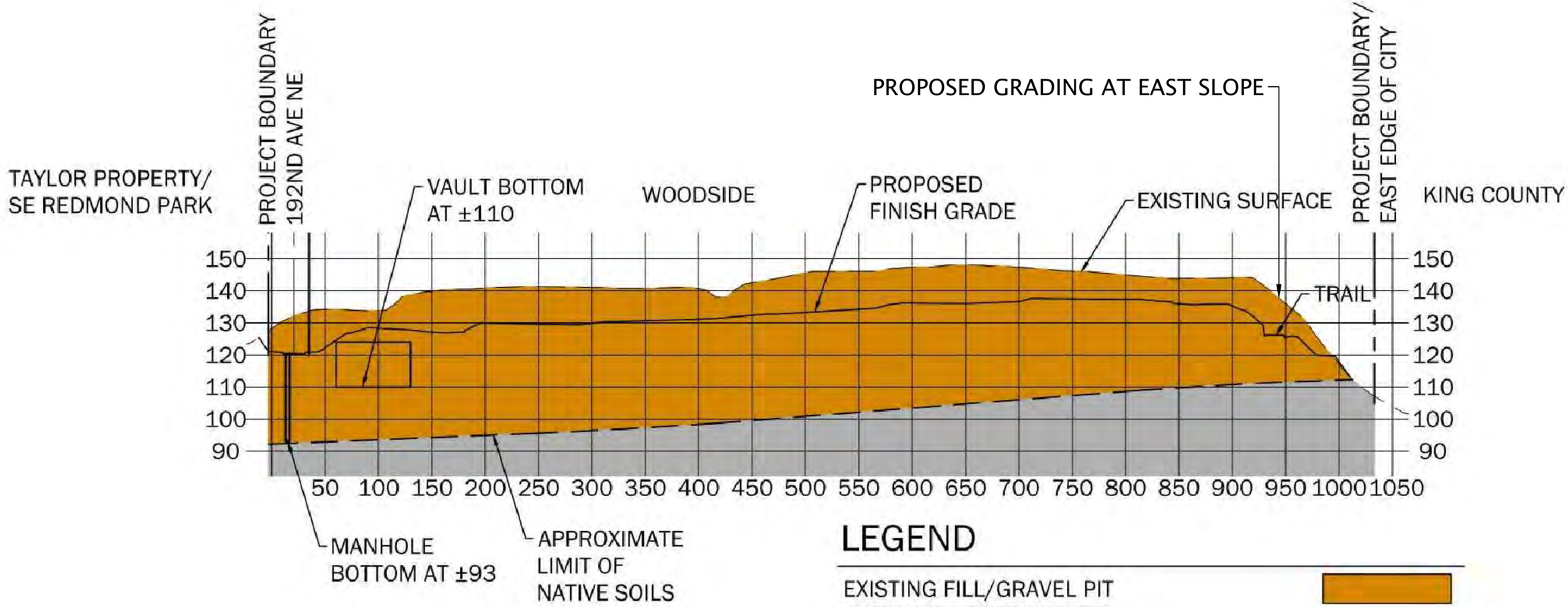
FIGURE 4

POLYGON-161-01

OCTOBER 2019

GEODESIGN INC
AN NV5 COMPANY

Printed By: aday | Print Date: 10/4/2019 10:13:11 AM
File Name: J:\M-R\Polygon\Polygon-161\Polygon-161-01\Figures\CAD\RevisedGeotechRpt2019\Polygon-161-01-LidarImage.dwg | Layout: FIGURE 4



LEGEND

EXISTING FILL/GRAVEL PIT
SOURCE: CORE DESIGN DESIGN WORK

NATIVE SOILS
SOURCE: GEODESIGNS GEOTECHNICAL REPORT

NOTE: THIS EXHIBIT SHOWS THE APPROXIMATE LIMIT OF NATIVE SOILS WITH THE PROPOSED DEEPEST UTILITIES (VAULT AND MANHOLE IN ROUNDABOUT AT 192ND AVE NE AND NE 70TH ST). THE REBUILDING OF THE SLOPE ON IS CLOSE TO NATIVE SOILS. SEE GEOTECH REPORT FOR DETAILS.

WOODSIDE

NATIVE SOIL CROSS SECTION LOOKING NORTH

NOTE:
1. CROSS SECTION OBTAINED FROM CORE DESIGN ON FEBRUARY 11, 2019.

SITE CROSS SECTION

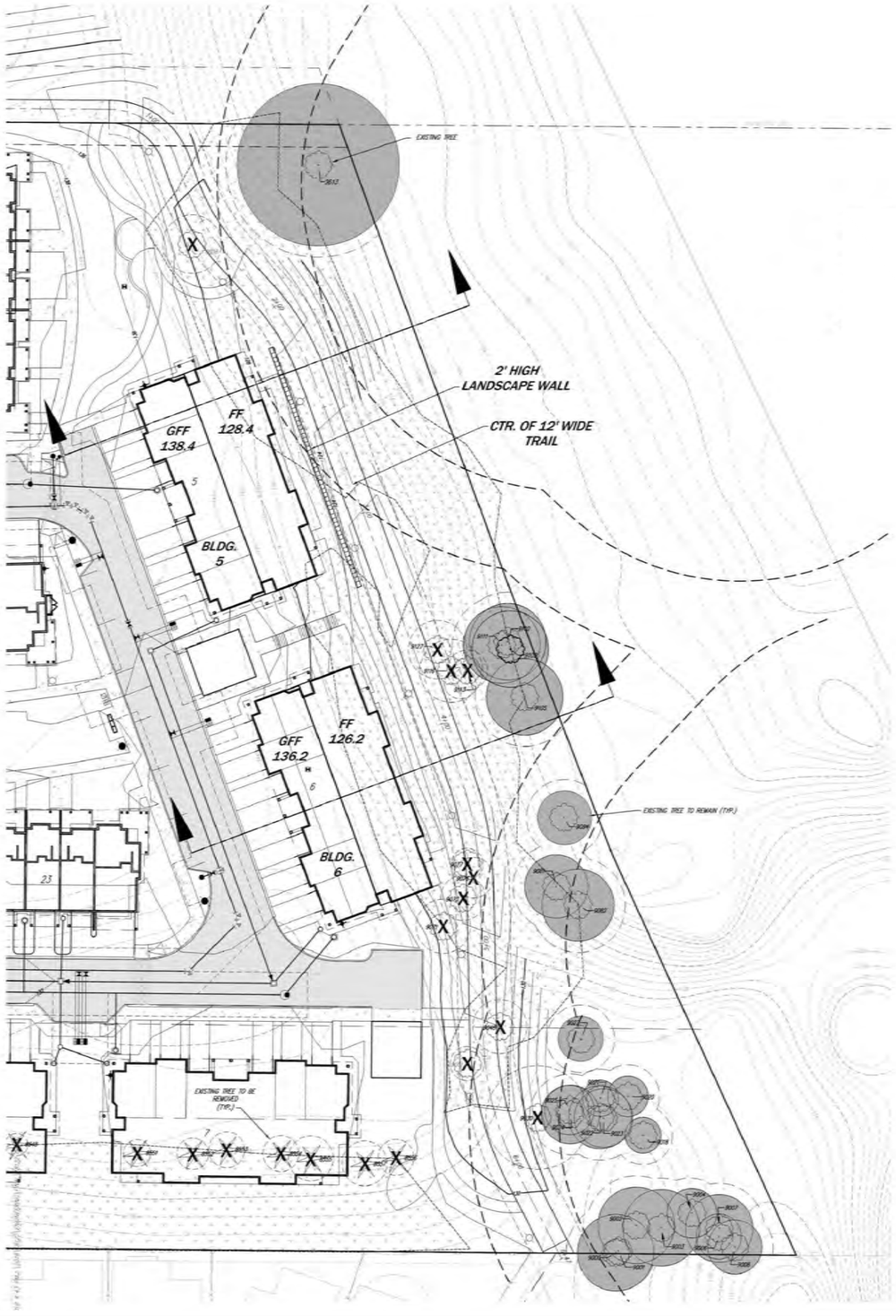
WOODSIDE
REDMOND, WA

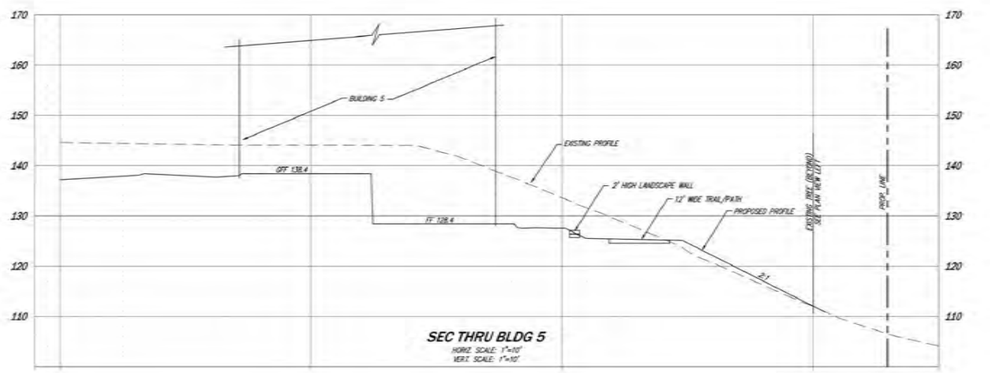
FIGURE 5

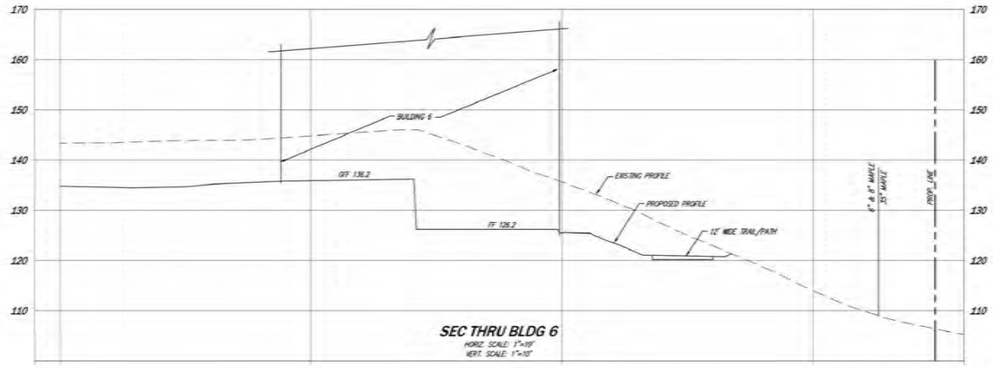
POLYGON-161-01

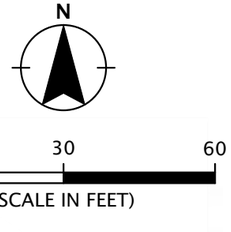
OCTOBER 2019

GEODESIGN AN NV5 COMPANY









SITE PLAN BASED ON IMAGE OBTAINED FROM CORE DESIGN, INC. ON AUGUST 8, 2019

EAST SLOPE CROSS SETIONS

WOODSIDE
REDMOND, WA

FIGURE 6

POLYGON-161-01

OCTOBER 2019

GEODESIGN NW AN NV5 COMPANY

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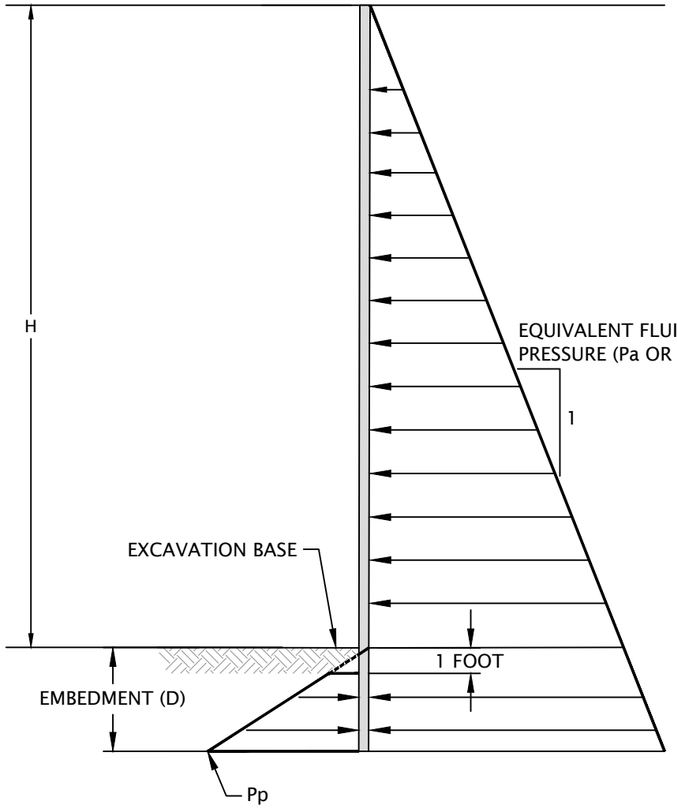
RECOMMENDED DESIGN PARAMETERS FOR CANTILEVERED WALLS



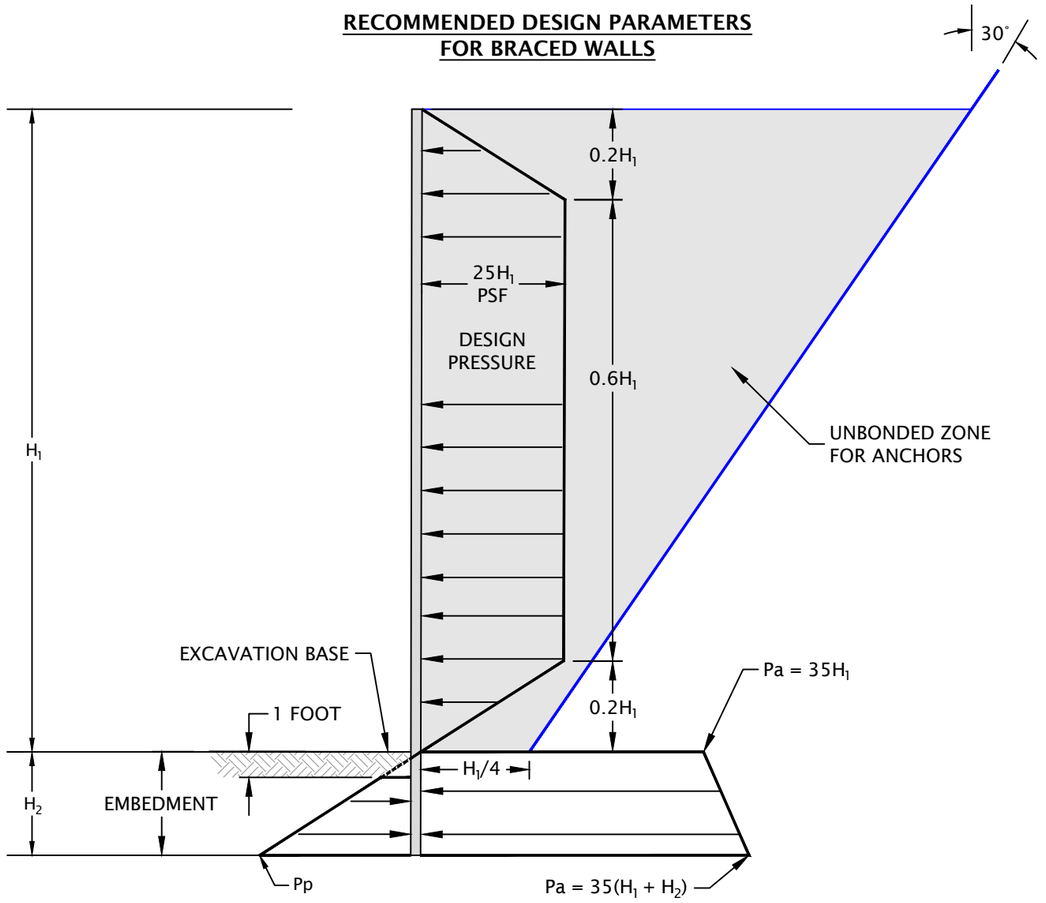
EXPLANATION:

Pa = 35 PCF (ACTIVE EQUIVALENT FLUID PRESSURE, ASSUMES WALL IS FREE TO ROTATE)
Po = 55 PCF (AT-REST EQUIVALENT FLUID PRESSURE, ASSUMES WALL IS RESTRAINED FROM ROTATION)
Pp = 350 D PCF
H = DEPTH OF SOLDIER PILE IN FEET
D = SOLDIER PILE EMBEDMENT DEPTH
PASSIVE PRESSURE ACTS OVER 2X THE PILE WIDTH
ACTIVE AND AT-REST PRESSURE ACTS OVER 1X THE PILE WIDTH BELOW EXCAVATION BASE

NOTES:

1. DOES NOT INCLUDE SURCHARGE OR SEISMIC LOADS.
2. LATERAL EARTH PRESSURES BASED ON WATER TABLE BELOW DEPTH OF SOLDIER PILE EMBEDMENT.
3. THE LATERAL EARTH PRESSURES ARE UNFACTORED.
4. PASSIVE PRESSURE RESISTANCE SHOULD BE NEGLECTED 1 FOOT BELOW THE BOTTOM OF THE EXCAVATION.

RECOMMENDED DESIGN PARAMETERS FOR BRACED WALLS



EXPLANATION:

PA = ACTIVE EQUIVALENT FLUID PRESSURE
Pp = 350 H_2 PCF
H_1 = DEPTH OF SOLDIER PILE EXPOSED HEIGHT IN FEET
H_2 = SOLDIER PILE EMBEDMENT DEPTH IN FEET
PASSIVE PRESSURE ACTS OVER 2X THE PILE WIDTH
ACTIVE AND AT-REST PRESSURE ACTS OVER 1X THE PILE WIDTH BELOW THE EXCAVATION BASE

NOTES:

1. DOES NOT INCLUDE SURCHARGE OR SEISMIC LOADS.
2. TIEBACKS SHOULD BE LOCKED OFF AT 100 PERCENT OF DESIGN LOAD.
3. THE LATERAL EARTH PRESSURES ARE UNFACTORED.
4. PASSIVE PRESSURE RESISTANCE SHOULD BE NEGLECTED 1 FOOT BELOW THE BOTTOM OF THE EXCAVATION.
5. LATERAL EARTH PRESSURES BASED ON WATER TABLE BELOW DEPTH OF SOLDIER PILE EMBEDMENT.

CANTILEVERED AND BRACED WALL DESIGN CRITERIA

FIGURE 7

WOODSIDE
REDMOND, WA

POLYGON-161-01

OCTOBER 2019

GEODESIGN INC
AN NV5 COMPANY

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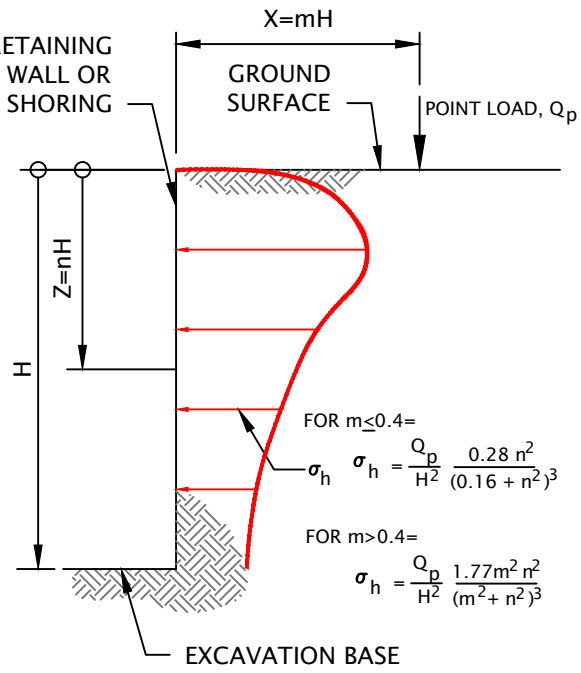
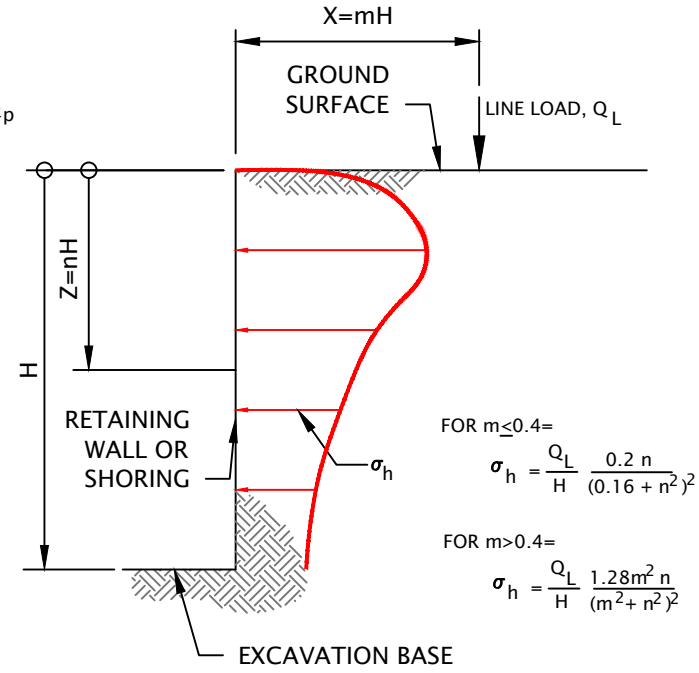
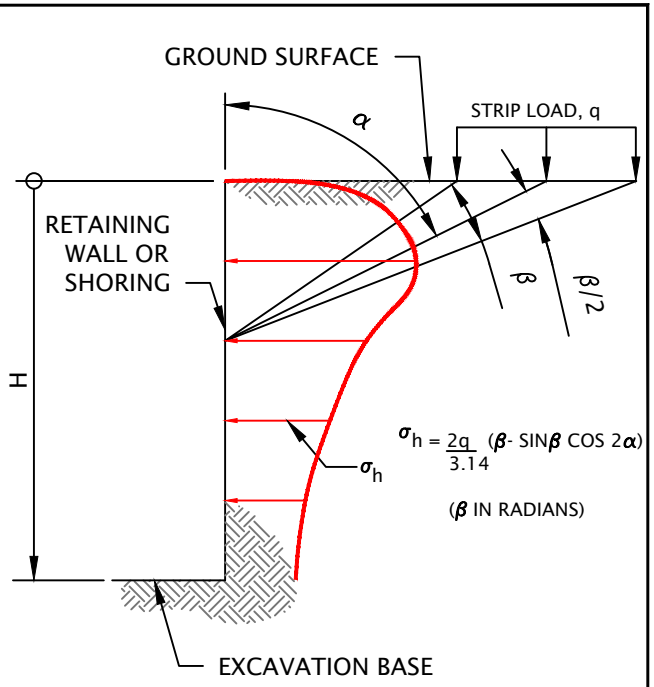
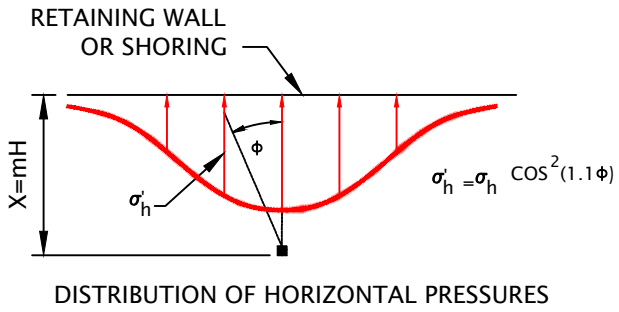








DISTRIBUTION OF HORIZONTAL PRESSURES

VERTICAL POINT LOAD

LINE LOAD PARALLEL TO WALL

STRIP LOAD PARALLEL TO WALL

NOT TO SCALE

NOTES:

1. FIGURE SHOULD BE USED IN CONJUNCTION WITH REPORT TEXT.
2. THESE GUIDELINES APPLY TO RIGID WALLS WITH POISSON'S RATIO ASSUMED TO BE 0.5 FOR BACKFILL MATERIALS.
3. LATERAL PRESSURES FROM ANY COMBINATION OF ABOVE LOADS MAY BE DETERMINED BY THE PRINCIPLE OF SUPERPOSITION.

GEODESIGN INC / NIVIS	POLYGON-161-01	**SURCHARGE-INDUCED LATERAL EARTH PRESSURES**	
	OCTOBER 2019	WOODSIDE REDMOND, WA	**FIGURE 8**

APPENDIX A

APPENDIX A

FIELD EXPLORATIONS

GENERAL

We performed a subsurface exploration program that consisted of drilling 11 borings (B-1 through B-11) and excavating 9 test pits (TP-1 through TP-9) at the approximate locations shown on Figure 2. The borings were drilled to depths up to 81.5 BGS and the test pits were excavated to depths up to 18 feet BGS. Drilling services were performed by Holocene Drilling, Inc. of Puyallup, Washington, and excavation services were performed by Northwest Construction, Inc. of Bellevue, Washington. The explorations were performed in June 2018 and February 2019. The explorations were observed by members of our geotechnical staff. We collected representative samples of the various soils encountered in the explorations for visual classification and laboratory testing. The exploration logs are presented in this appendix.

Exploration locations were selected by GeoDesign based on the proposed development plan. A cell phone with a GPS application was used to locate the explorations in the field. The exploration locations should be considered accurate only to the degree implied by the methods used. The exploration elevations were estimated from the proposed site plan provided to us by Polygon.

SOIL SAMPLING

We collected soil samples from the explorations using the following methods:

- SPTs were performed in general conformance with ASTM D1586. The sampler was driven with a 140-pound automatic trip hammer free-falling 30 inches. The number of blows required to drive the sampler 1 foot, or as otherwise indicated, into the soil is shown adjacent to the sample symbols on the exploration logs. Disturbed samples were collected from the split barrel for subsequent classification and index testing.
- Shelby tube samples were collected in general accordance with ASTM D1587. The 2.5-foot long, 3-inch-diameter, thin-walled, seamless steel tubes were pushed into the soil in one continuous stroke. Each tube, together with the encased soil, was removed from the ground and sealed.
- Representative grab samples from the test pits were collected from the test pit walls and/or base using the excavator bucket.

Sampling methods and intervals are shown on the exploration logs. The average efficiency of the automatic SPT hammer used by Holocene Drilling for borings B-1 through B-8 is not known because it has not been measured. In our experience, efficiencies of approximately 80 to 90 percent are typical for this type of hammer. The average efficiency of the SPT hammer used for borings B-9 through B-11 was 73 percent. The results of the calibration testing are presented at the end of this appendix.

SOIL CLASSIFICATION

The soil samples were classified in accordance with the "Exploration Key" (Table A-1) and "Soil Classification System" (Table A-2), which are presented in this appendix. The exploration logs

indicate the depths at which the soils or their characteristics change, although the change could be gradual. A horizontal line between soil types indicates an observed (visual or digging action) change. If the change occurred between sample locations and was not observed or obvious, the depth was interpreted and the change is indicated using a dashed line. Classifications are shown on the exploration logs.

LABORATORY TESTING

We visually examined soil samples collected from the explorations to confirm field classifications. We also performed the following laboratory testing.

MOISTURE CONTENT

We determined the natural moisture content of select soil samples in general accordance with ASTM D2216. The natural moisture content is the ratio of the weight of the water to soil in a test sample and is expressed as a percentage of the dry weight if the sample. The test results are presented in this appendix.

ATTERBERG LIMITS TEST

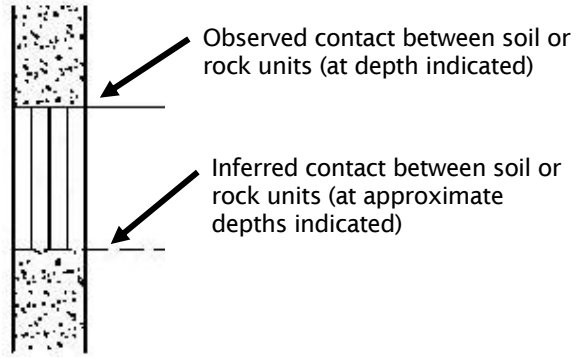
We determined the Atterberg limits of select soil samples in general accordance with ASTM D4318. Atterberg limits include the liquid limit, plastic limit, and the plasticity index of soil. These index properties are used to classify soil and for correlation with other engineering properties of soil. The test results are presented in this appendix.

PARTICLE-SIZE TESTING

We completed particle-size testing on select soil samples in general accordance with ASTM D1140 and ASTM C136. The testing consisted of determining the soil percentages passing various U.S. Standard sieves. The percent fines is the ratio of the dry weight of the material passing the U.S. Standard No. 200 sieve to the dry weight of the overall sample. The test results are presented in this appendix.

SYMBOL	SAMPLING DESCRIPTION
	Location of sample collected in general accordance with ASTM D1586 using Standard Penetration Test with recovery
	Location of sample collected using thin-wall Shelby tube or Geoprobe® sampler in general accordance with ASTM D1587 with recovery
	Location of sample collected using Dames & Moore sampler and 300-pound hammer or pushed with recovery
	Location of sample collected using Dames & Moore sampler and 140-pound hammer or pushed with recovery
	Location of sample collected using 3-inch-O.D. California split-spoon sampler and 140-pound hammer with recovery
	Location of grab sample
	Rock coring interval
	Water level during drilling
	Water level taken on date shown

Graphic Log of Soil and Rock Types



GEOTECHNICAL TESTING EXPLANATIONS

ATT	Atterberg Limits	P	Pushed Sample
CBR	California Bearing Ratio	PP	Pocket Penetrometer
CON	Consolidation	P200	Percent Passing U.S. Standard No. 200 Sieve
DD	Dry Density		
DS	Direct Shear	RES	Resilient Modulus
HYD	Hydrometer Gradation	SIEV	Sieve Gradation
MC	Moisture Content	TOR	Torvane
MD	Moisture-Density Relationship	UC	Unconfined Compressive Strength
NP	Non-Plastic	VS	Vane Shear
OC	Organic Content	kPa	Kilopascal

ENVIRONMENTAL TESTING EXPLANATIONS

CA	Sample Submitted for Chemical Analysis	ND	Not Detected
P	Pushed Sample	NS	No Visible Sheen
PID	Photoionization Detector Headspace Analysis	SS	Slight Sheen
		MS	Moderate Sheen
ppm	Parts per Million	HS	Heavy Sheen

RELATIVE DENSITY - COARSE-GRAINED SOIL

Relative Density	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)
Very Loose	0 – 4	0 – 11	0 – 4
Loose	4 – 10	11 – 26	4 – 10
Medium Dense	10 – 30	26 – 74	10 – 30
Dense	30 – 50	74 – 120	30 – 47
Very Dense	More than 50	More than 120	More than 47

CONSISTENCY - FINE-GRAINED SOIL

Consistency	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)	Unconfined Compressive Strength (tsf)
Very Soft	Less than 2	Less than 3	Less than 2	Less than 0.25
Soft	2 – 4	3 – 6	2 – 5	0.25 – 0.50
Medium Stiff	4 – 8	6 – 12	5 – 9	0.50 – 1.0
Stiff	8 – 15	12 – 25	9 – 19	1.0 – 2.0
Very Stiff	15 – 30	25 – 65	19 – 31	2.0 – 4.0
Hard	More than 30	More than 65	More than 31	More than 4.0

PRIMARY SOIL DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOIL (more than 50% retained on No. 200 sieve)	GRAVEL (more than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (< 5% fines)	GW or GP	GRAVEL
		GRAVEL WITH FINES (≥ 5% and ≤ 12% fines)	GW-GM or GP-GM	GRAVEL with silt
			GW-GC or GP-GC	GRAVEL with clay
		GRAVEL WITH FINES (> 12% fines)	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND (50% or more of coarse fraction passing No. 4 sieve)	CLEAN SAND (<5% fines)	SW or SP	SAND
		SAND WITH FINES (≥ 5% and ≤ 12% fines)	SW-SM or SP-SM	SAND with silt
			SW-SC or SP-SC	SAND with clay
		SAND WITH FINES (> 12% fines)	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOIL (50% or more passing No. 200 sieve)	SILT AND CLAY	Liquid limit less than 50	ML	SILT
			CL	CLAY
			CL-ML	silty CLAY
			OL	ORGANIC SILT or ORGANIC CLAY
		Liquid limit 50 or greater	MH	SILT
			CH	CLAY
			OH	ORGANIC SILT or ORGANIC CLAY
HIGHLY ORGANIC SOIL			PT	PEAT

MOISTURE CLASSIFICATION

Term	Field Test
dry	very low moisture, dry to touch
moist	damp, without visible moisture
wet	visible free water, usually saturated

ADDITIONAL CONSTITUENTS

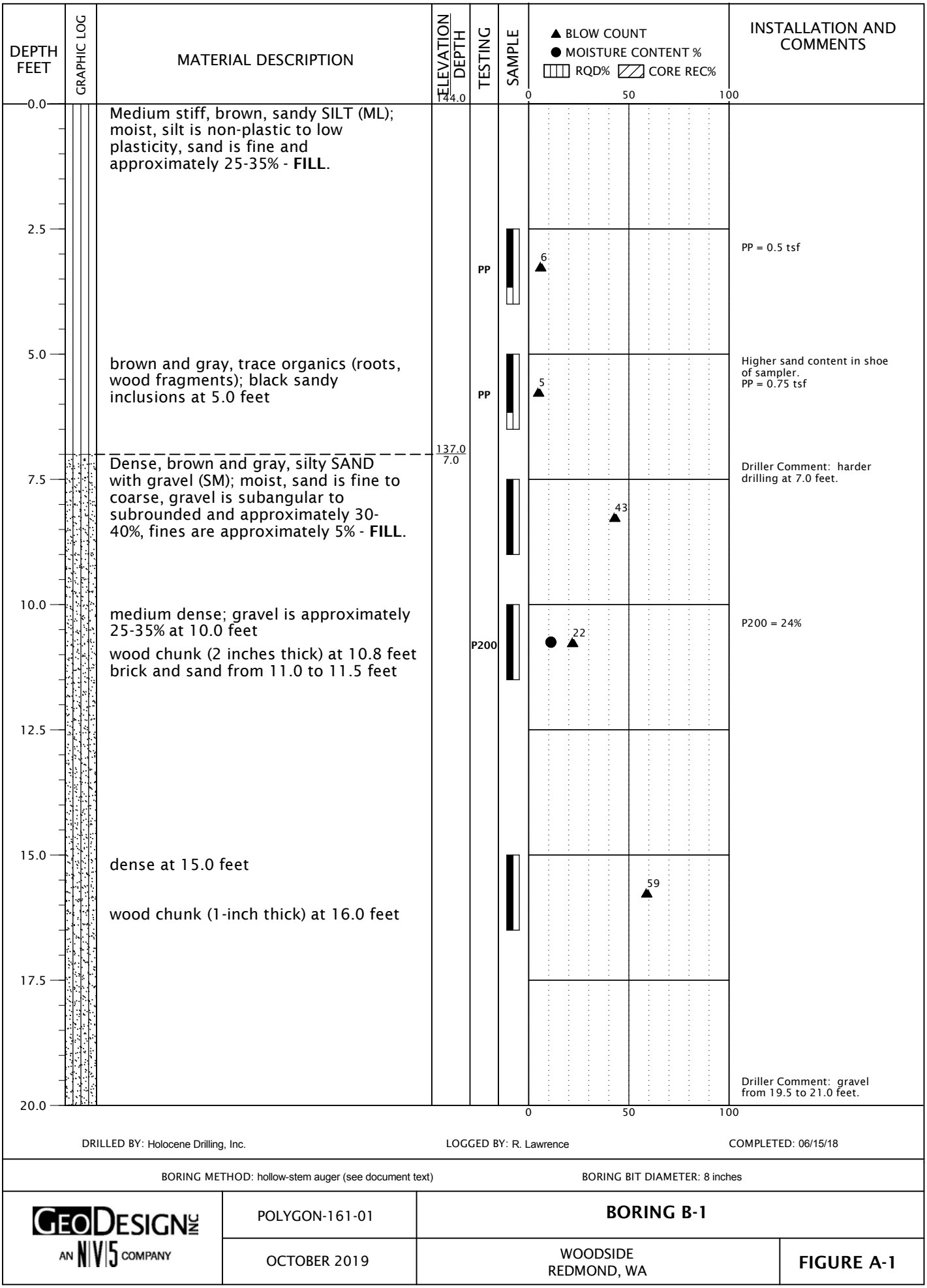
Secondary granular components or other materials such as organics, man-made debris, etc.

Percent	Silt and Clay In: Fine-Grained Soil	Silt and Clay In: Coarse-Grained Soil	Percent	Sand and Gravel In: Fine-Grained Soil	Sand and Gravel In: Coarse-Grained Soil
< 5	trace	trace	< 5	trace	trace
5 – 12	minor	with	5 – 15	minor	minor
> 12	some	silty/clayey	15 – 30	with	with
			> 30	sandy/gravelly	Indicate %

GEODESIGN INC AN NV5 COMPANY

SOIL CLASSIFICATION SYSTEM

TABLE A-2



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: R. Lawrence

COMPLETED: 06/15/18

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 inches

GeoDesign Inc
AN NV5 COMPANY

POLYGON-161-01

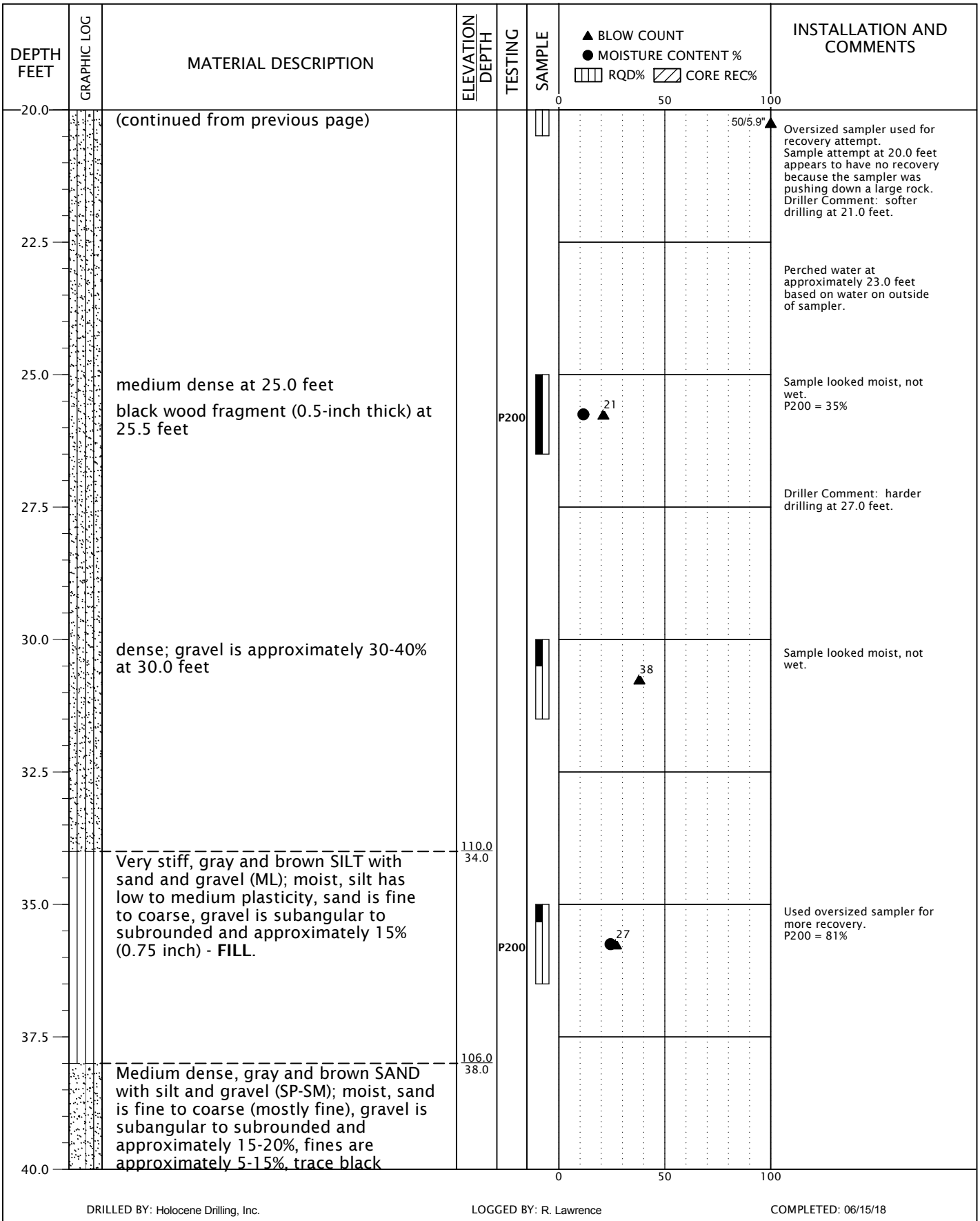
BORING B-1

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-1

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: R. Lawrence

COMPLETED: 06/15/18

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 inches

GeoDesign Inc
AN NV5 COMPANY

POLYGON-161-01

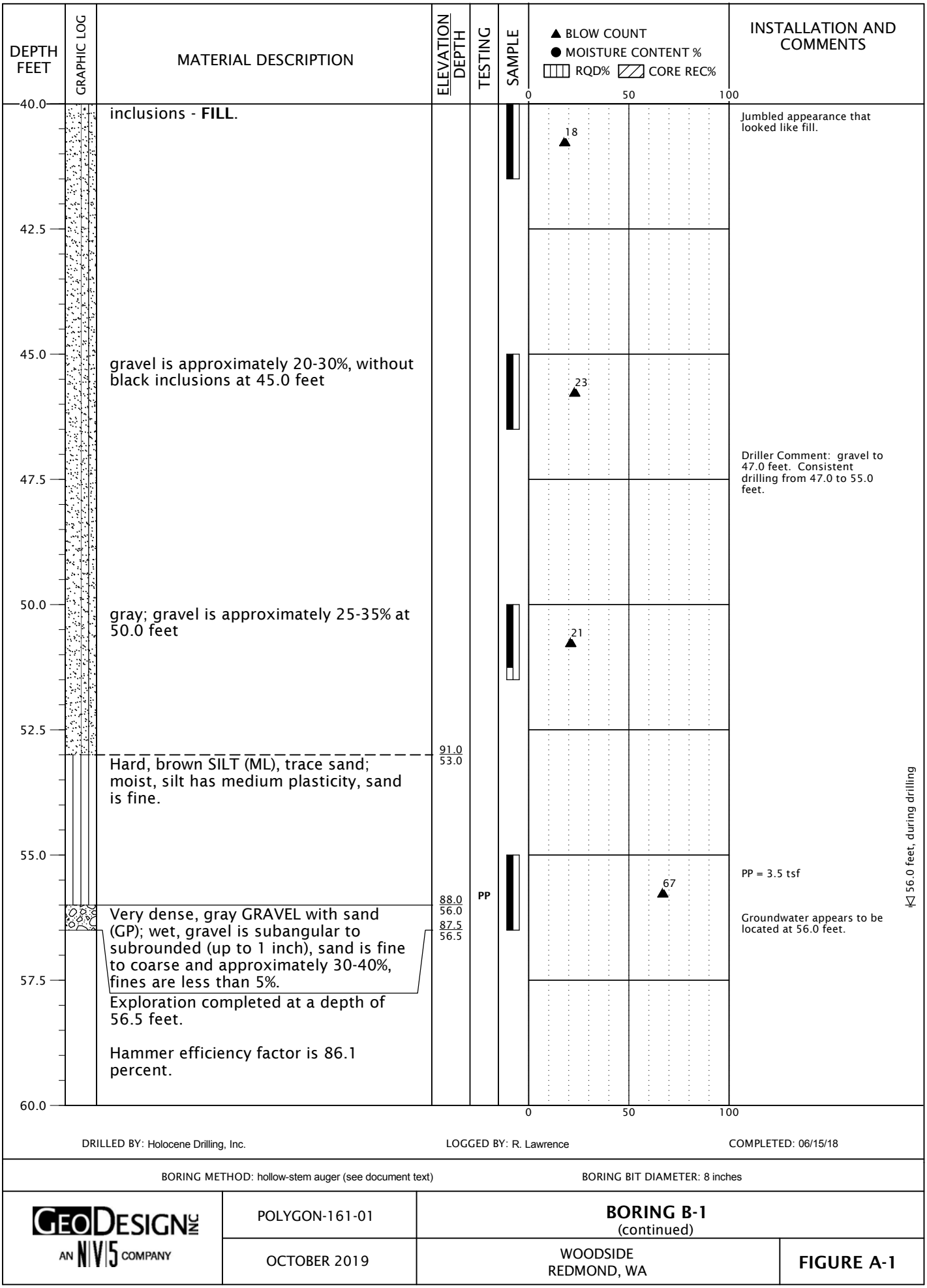
BORING B-1
(continued)

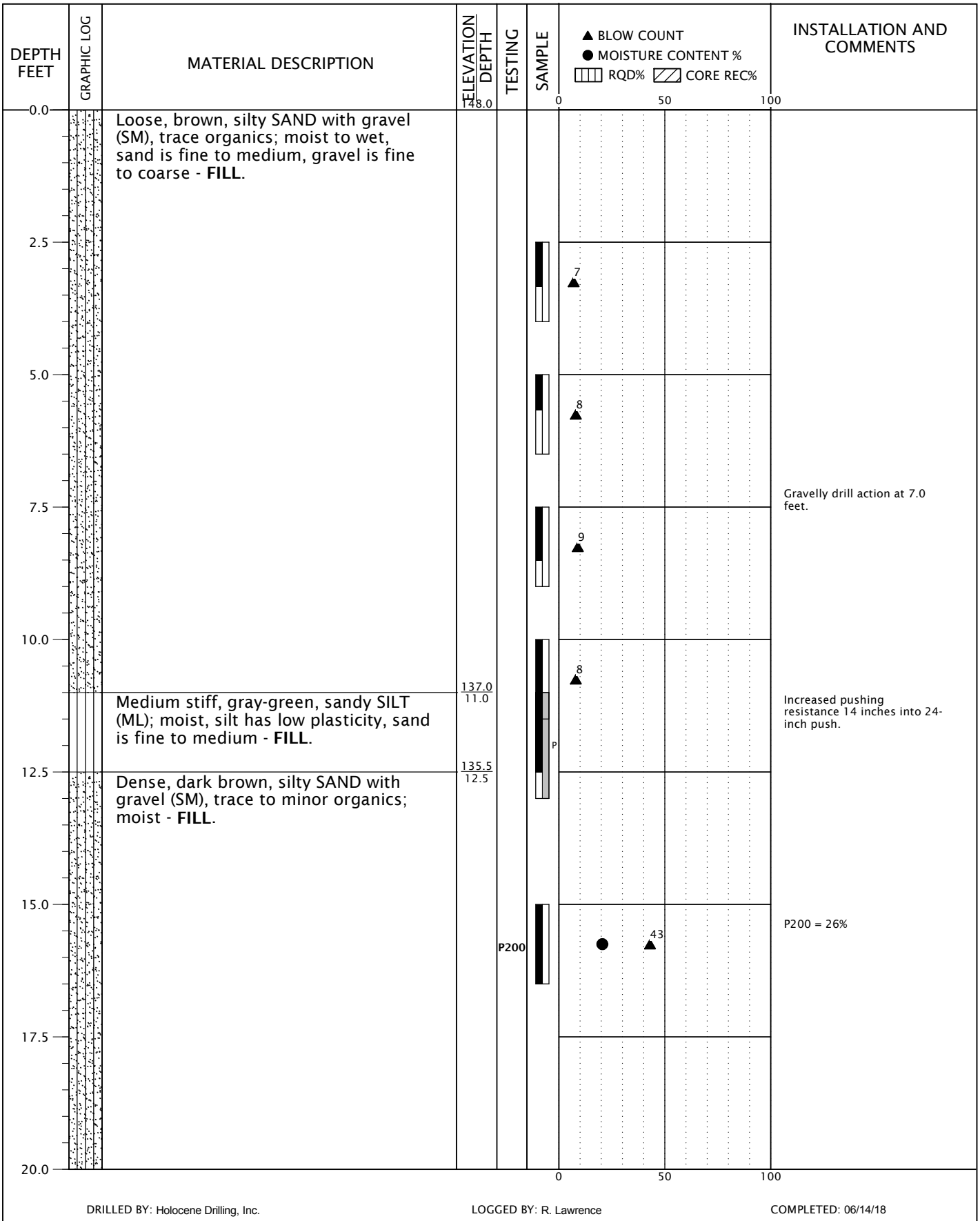
OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-1

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM


DEPTH FEET
GRAPHIC LOG
MATERIAL DESCRIPTION
ELEVATION DEPTH
TESTING
SAMPLE
▲ BLOW COUNT
● MOISTURE CONTENT %
RQD% CORE REC%
0
50
100
INSTALLATION AND COMMENTS
40.0
inclusions - FILL.
18
Jumbled appearance that looked like fill.
42.5
45.0
gravel is approximately 20-30%, without black inclusions at 45.0 feet
23
47.5
Driller Comment: gravel to 47.0 feet. Consistent drilling from 47.0 to 55.0 feet.
50.0
gray; gravel is approximately 25-35% at 50.0 feet
21
52.5
91.0
53.0
Hard, brown SILT (ML), trace sand; moist, silt has medium plasticity, sand is fine.
55.0
PP
67
PP = 3.5 tsf
88.0
56.0
87.5
56.5
Very dense, gray GRAVEL with sand (GP); wet, gravel is subangular to subrounded (up to 1 inch), sand is fine to coarse and approximately 30-40%, fines are less than 5%.
Groundwater appears to be located at 56.0 feet.
57.5
Exploration completed at a depth of 56.5 feet.
Hammer efficiency factor is 86.1 percent.
60.0
56.0 feet, during drilling
DRILLED BY: Holocene Drilling, Inc.
LOGGED BY: R. Lawrence
COMPLETED: 06/15/18
BORING METHOD: hollow-stem auger (see document text)
BORING BIT DIAMETER: 8 inches
GEODESIGN INC
AN NV5 COMPANY
POLYGON-161-01
BORING B-1
(continued)
OCTOBER 2019
WOODSIDE
REDMOND, WA
FIGURE A-1
BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc. LOGGED BY: R. Lawrence COMPLETED: 06/14/18

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 inches

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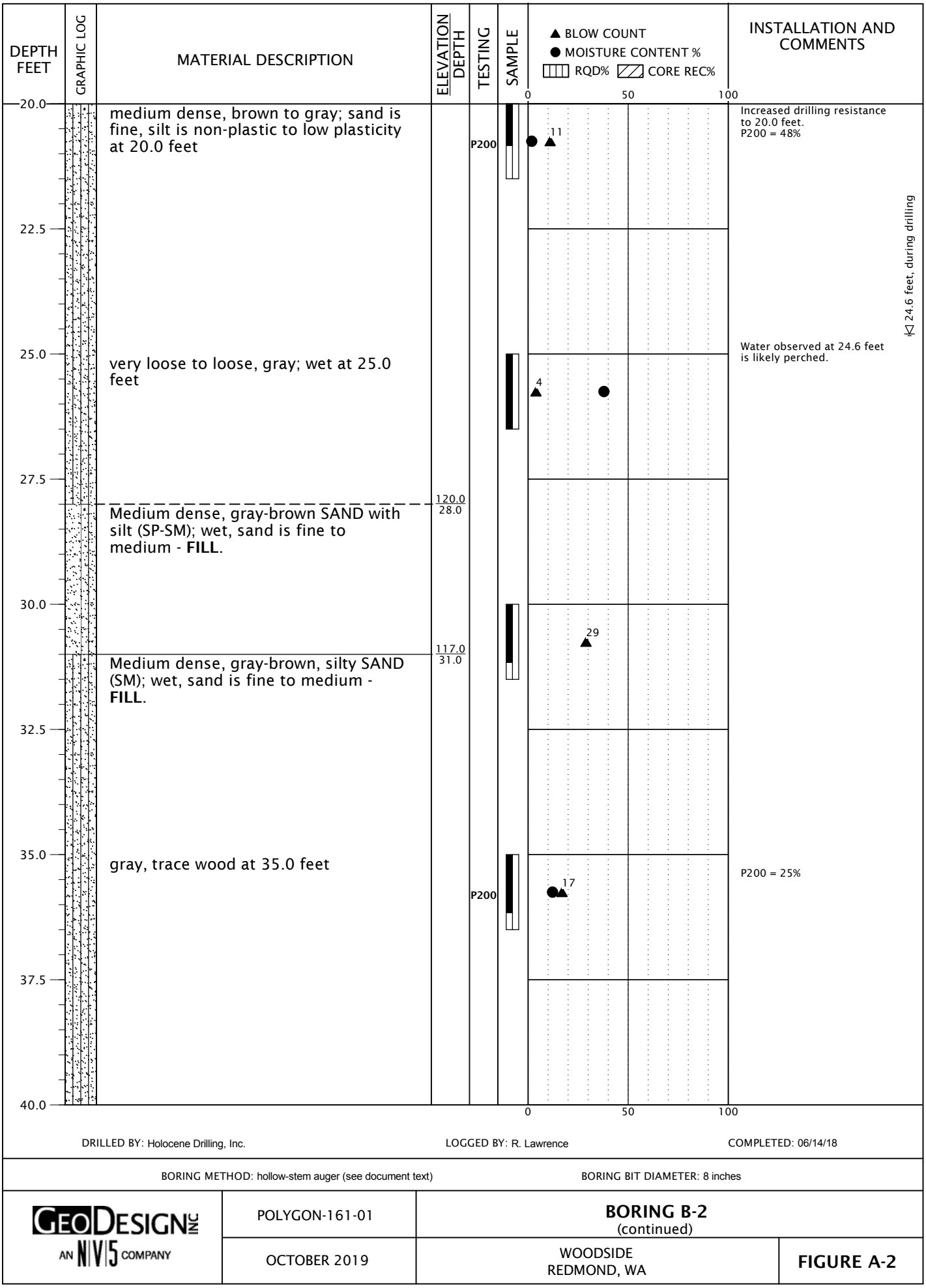
BORING B-2

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-2

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc. LOGGED BY: R. Lawrence COMPLETED: 06/14/18

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 inches

GeoDesign Inc
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POLYGON-161-01

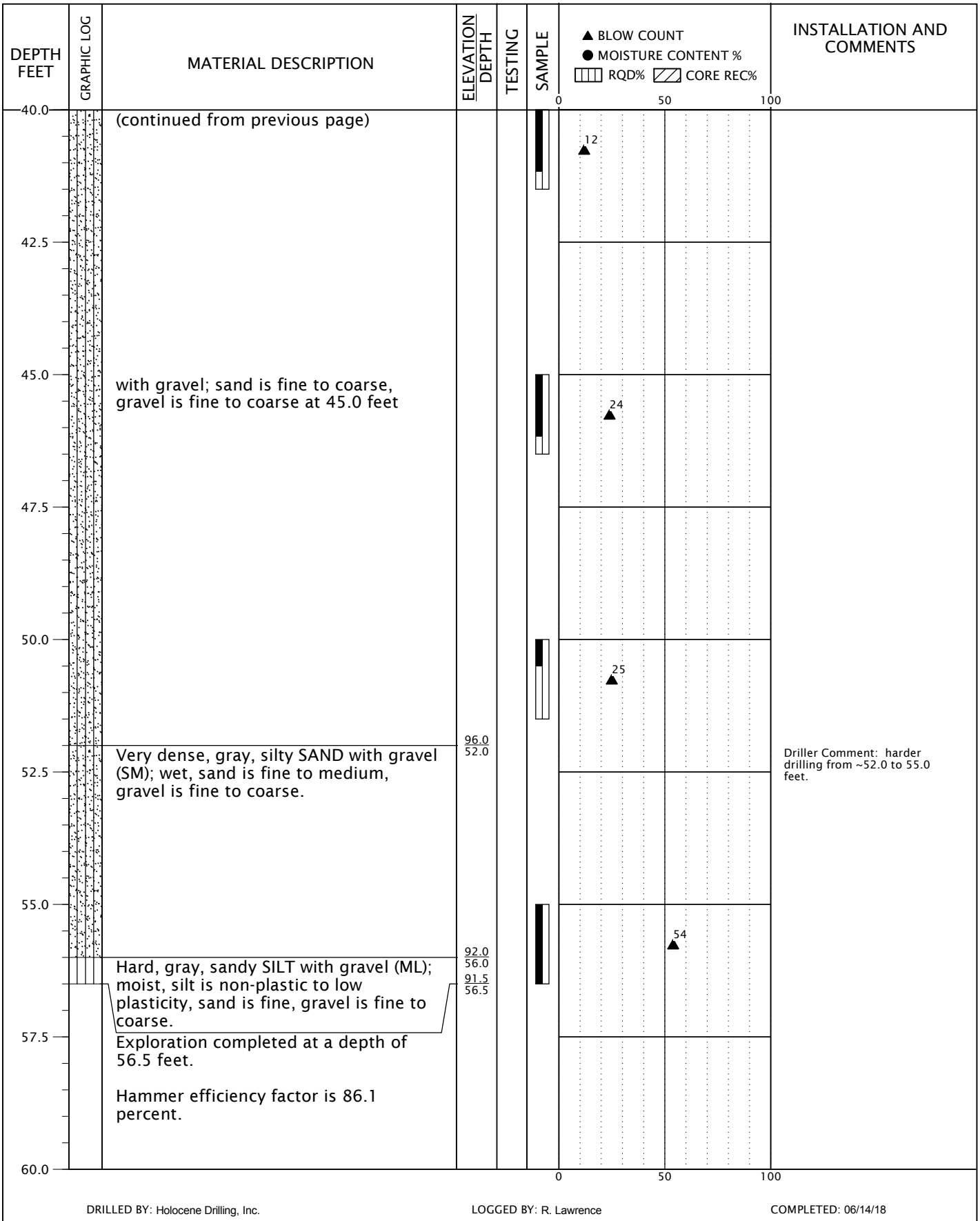
BORING B-2
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-2

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc. LOGGED BY: R. Lawrence COMPLETED: 06/14/18

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 inches

GeoDesign Inc
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POLYGON-161-01

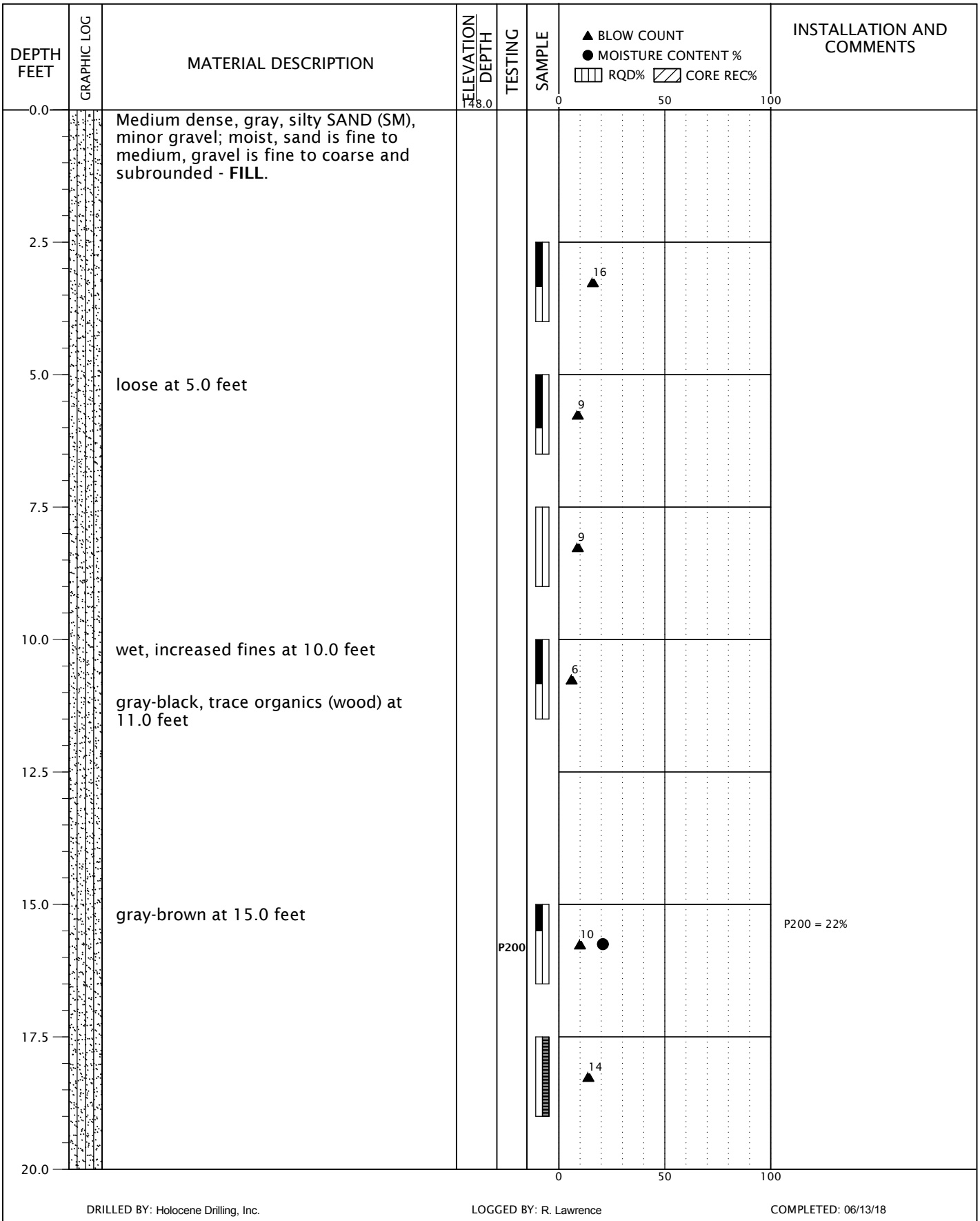
BORING B-2
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-2

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc. LOGGED BY: R. Lawrence COMPLETED: 06/13/18

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 inches

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BORING B-3

OCTOBER 2019

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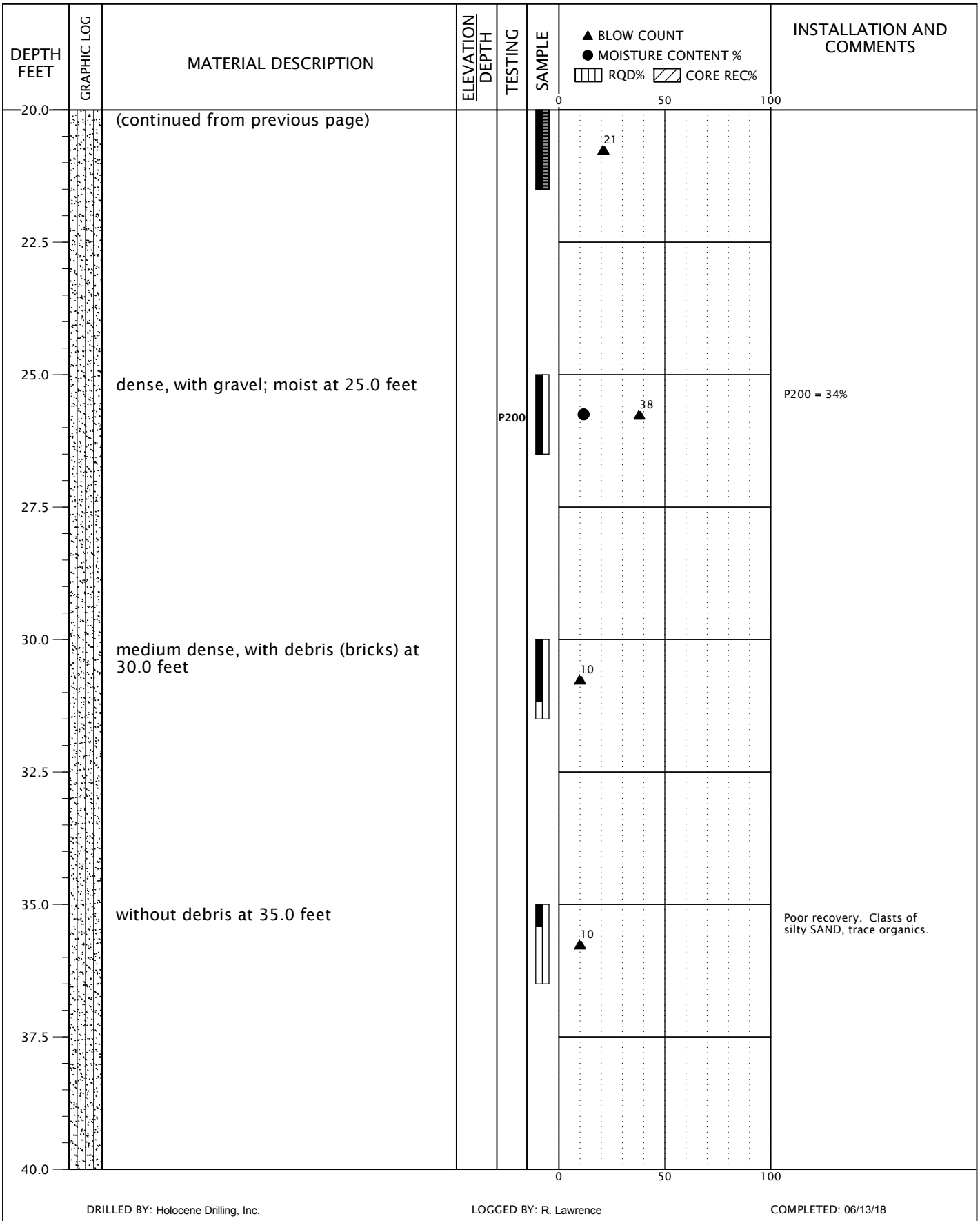
FIGURE A-3

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

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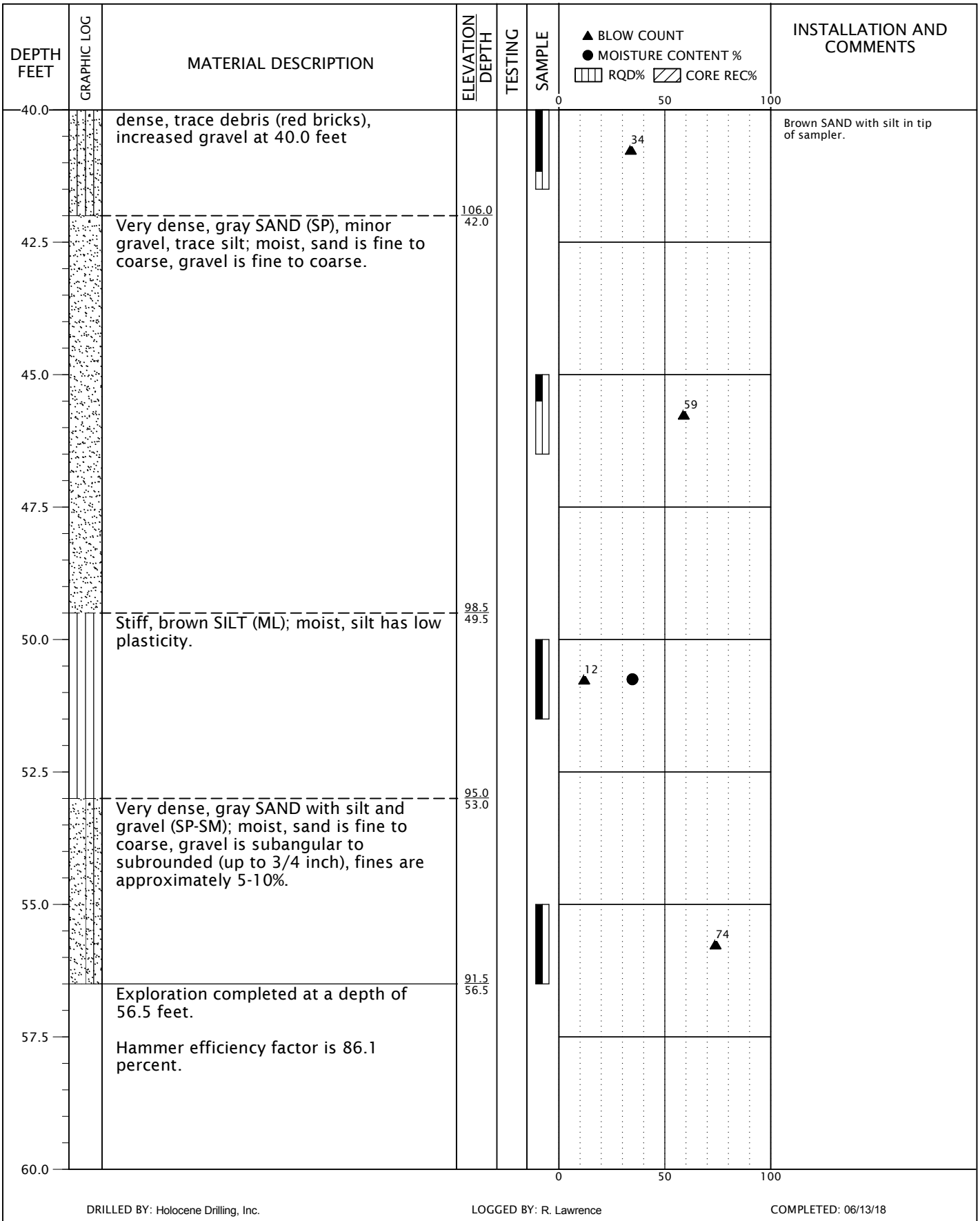
POLYGON-161-01

BORING B-3
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-3



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: R. Lawrence

COMPLETED: 06/13/18

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 inches

GeoDesign Inc
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POLYGON-161-01

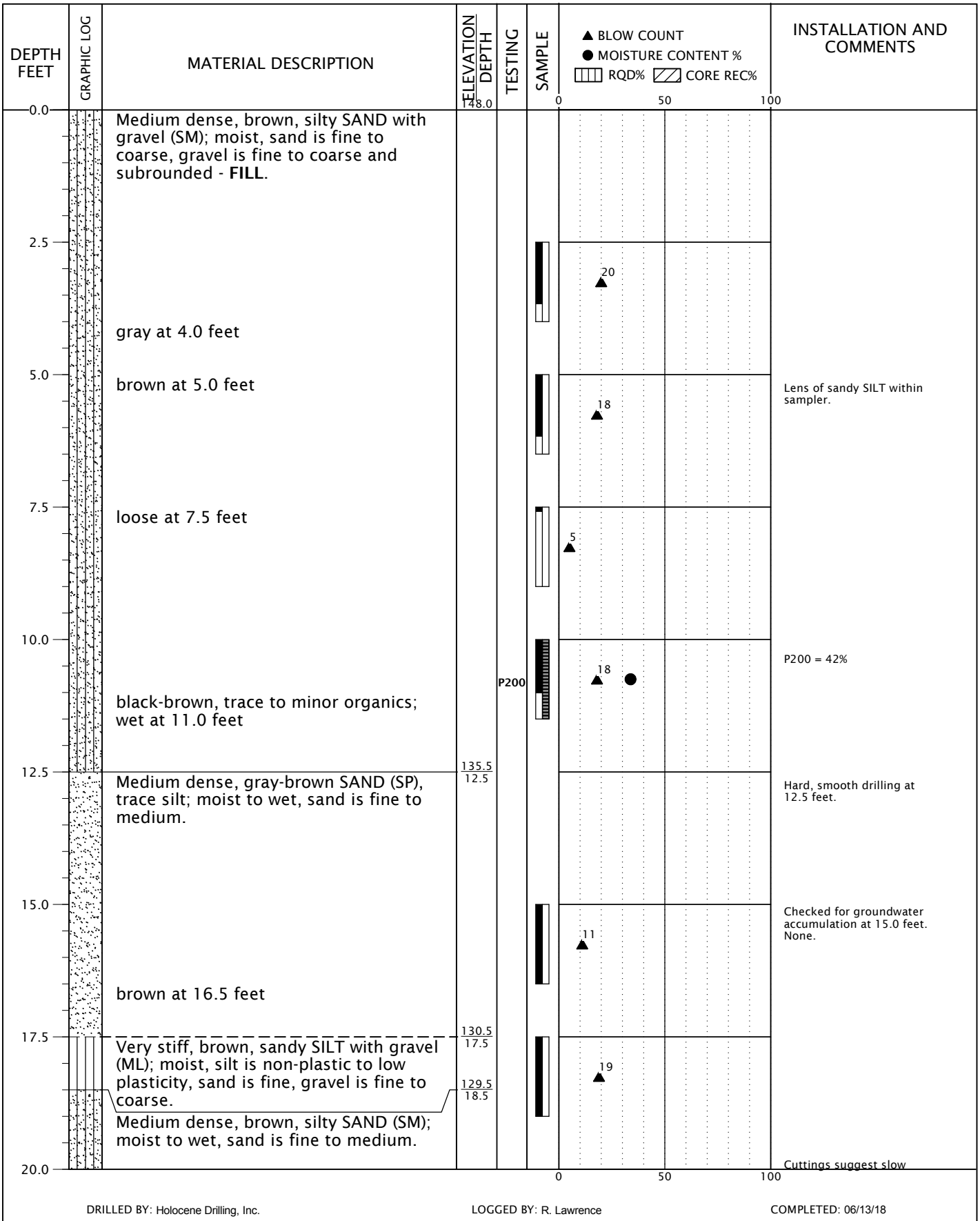
BORING B-3
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-3

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc. LOGGED BY: R. Lawrence COMPLETED: 06/13/18

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 inches

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BORING B-4

OCTOBER 2019

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FIGURE A-4

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
20.0		(continued from previous page)					
		very dense, gray, with gravel; moist, gravel is fine to coarse at 20.0 feet		P200 PP		● 58 ▲	seepage between 20.0 to 25.0 feet. P200 = 26% PP = >4.5 tsf
22.5							
25.0				PP		50/6" ▲	PP = >4.5 tsf
27.5							
30.0						50/5" ▲	
32.5							
35.0			112.2 / 35.8			50/4" ▲	
		Exploration completed at a depth of 35.8 feet. Hammer efficiency factor is 86.1 percent.					
37.5							
40.0						0 50 100	

DRILLED BY: Holocene Drilling, Inc. LOGGED BY: R. Lawrence COMPLETED: 06/13/18

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 inches

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POLYGON-161-01

BORING B-4 (continued)

OCTOBER 2019

WOODSIDE
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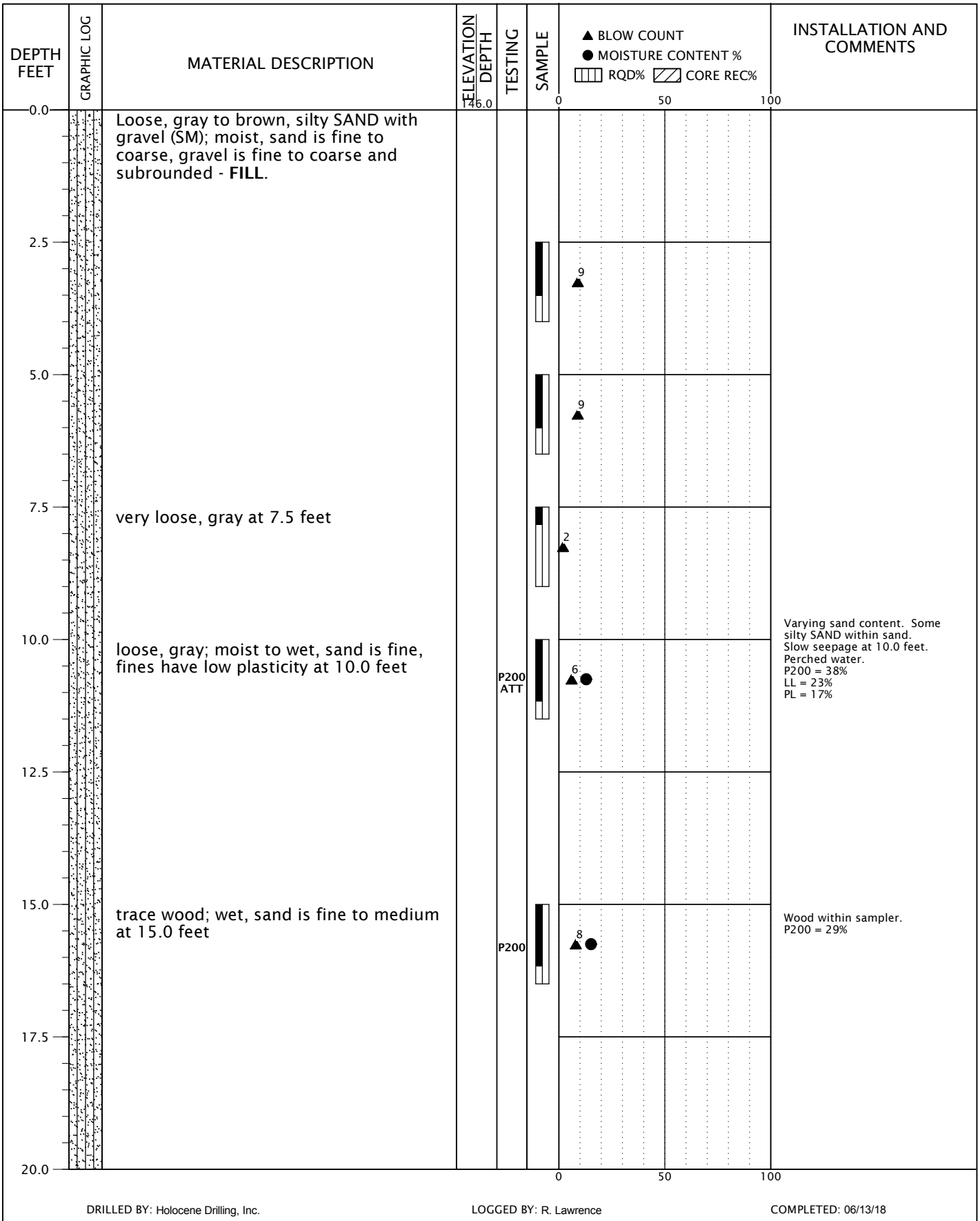
FIGURE A-4

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: R. Lawrence

COMPLETED: 06/13/18

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 inches

GeoDesign Inc
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POLYGON-161-01

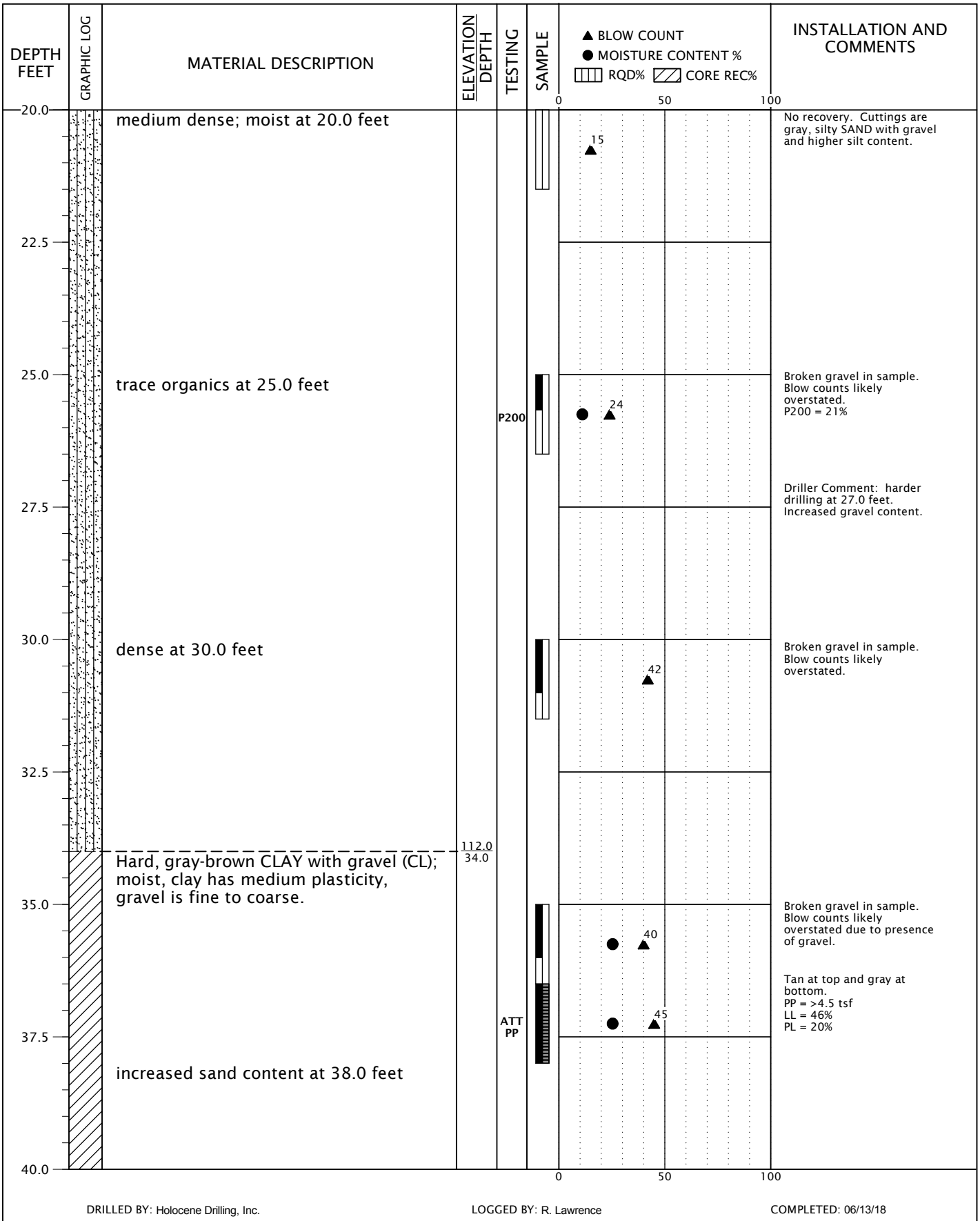
BORING B-5

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-5

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: R. Lawrence

COMPLETED: 06/13/18

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 inches

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POLYGON-161-01

BORING B-5
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-5

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▭ RQD% ▨ CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
40.0		gray, sandy, without gravel; clay is non-plastic to low plasticity at 40.0 feet		PP		▲ 35	Clayey SAND/very sandy CLAY within sample. PP = >4.5 tsf
42.5							
45.0		clay is non-plastic to medium plasticity at 45.0 feet		PP		● ▲ 49	3-inch- and 5-inch-thick layers of clayey SAND (SC) within sample at 45.0 feet. Increased plasticity with decreasing sand content. PP = >4.5 tsf
			99.5 / 46.5				
		Exploration completed at a depth of 46.5 feet.					
47.5		Hammer efficiency factor is 86.1 percent.					
50.0							
52.5							
55.0							
57.5							
60.0							

DRILLED BY: Holocene Drilling, Inc. LOGGED BY: R. Lawrence COMPLETED: 06/13/18

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 inches

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POLYGON-161-01

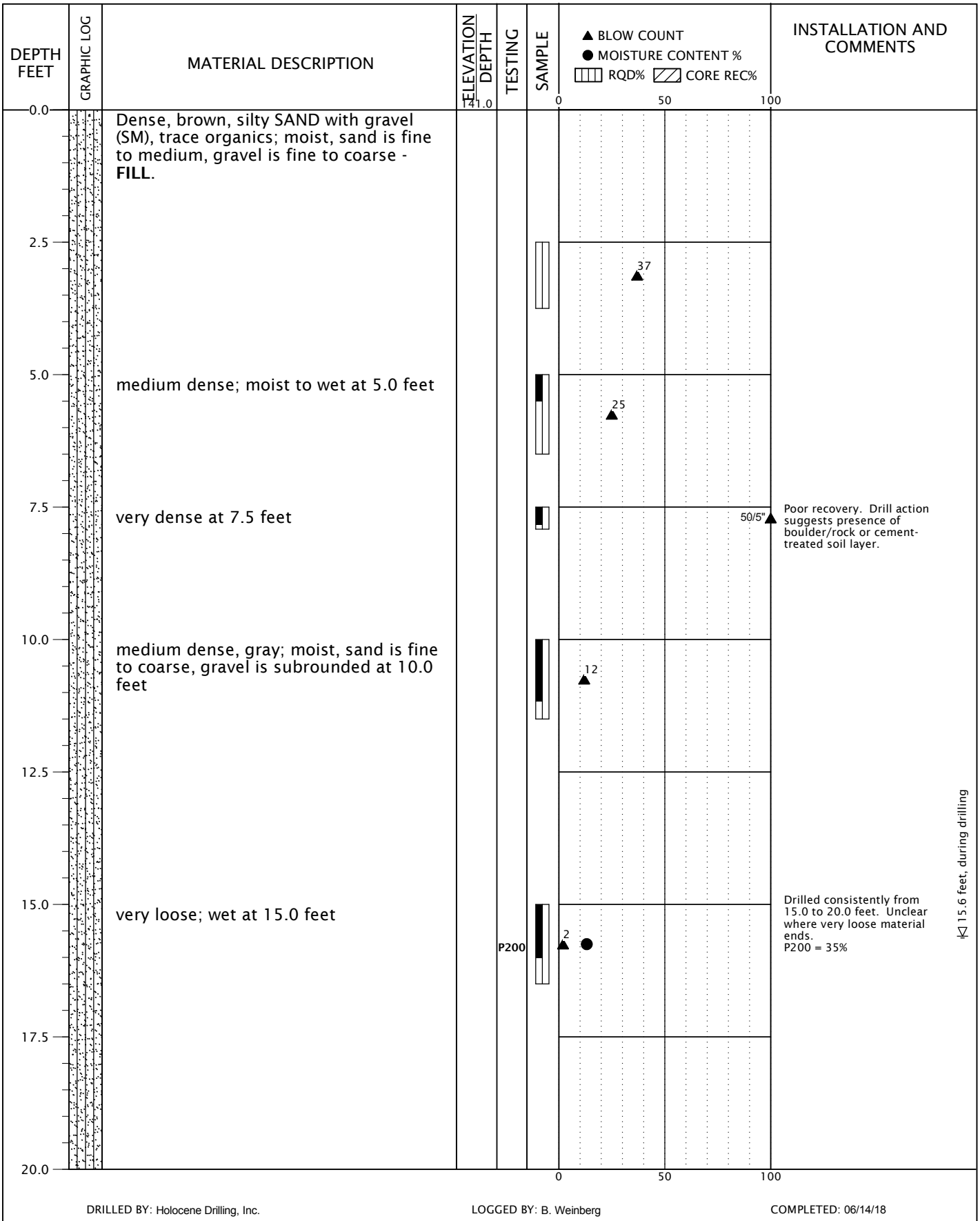
BORING B-5 (continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-5

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 06/14/18

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 inches

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POLYGON-161-01

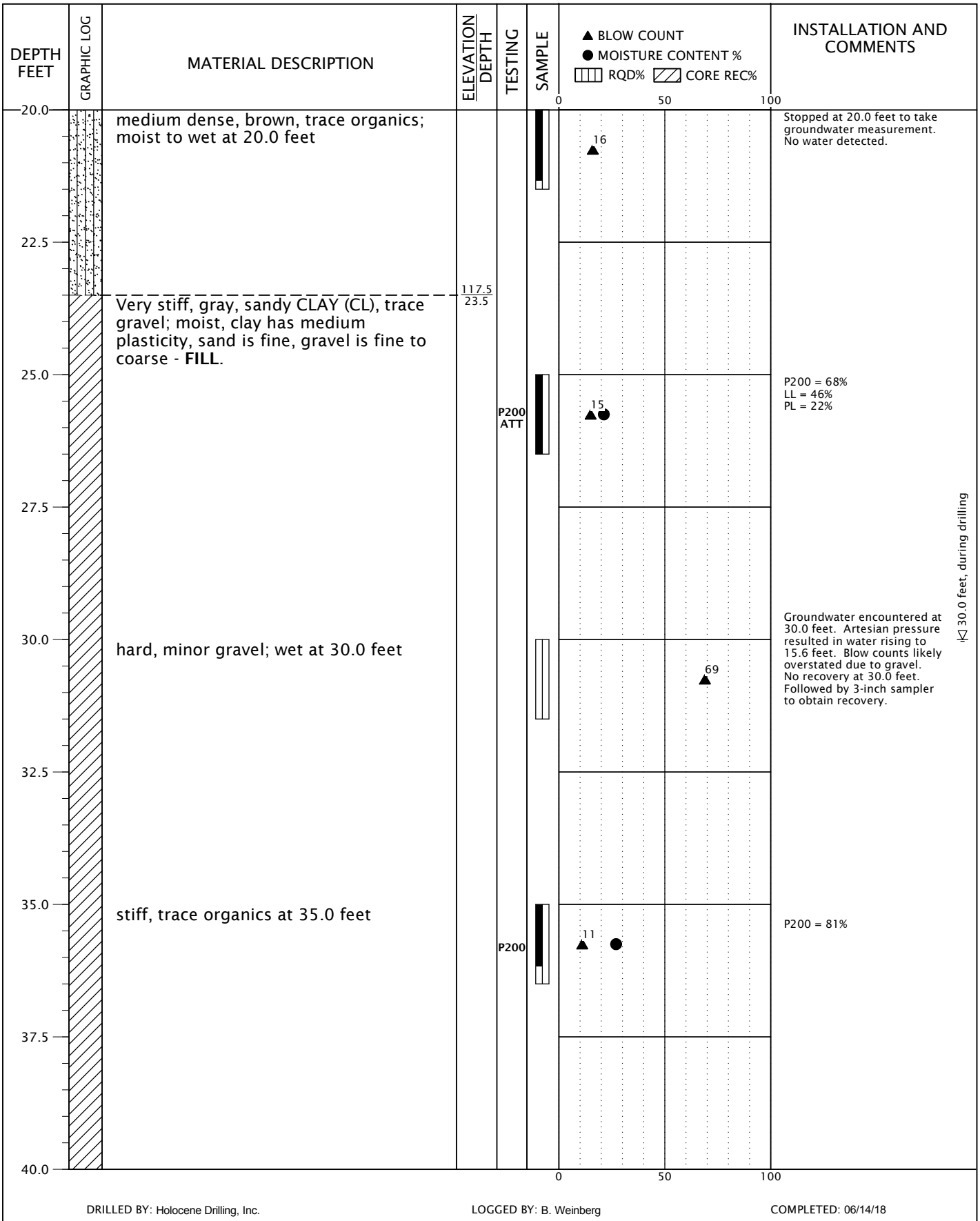
BORING B-6

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-6

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 06/14/18

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 inches

GEODESIGN INC
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POLYGON-161-01

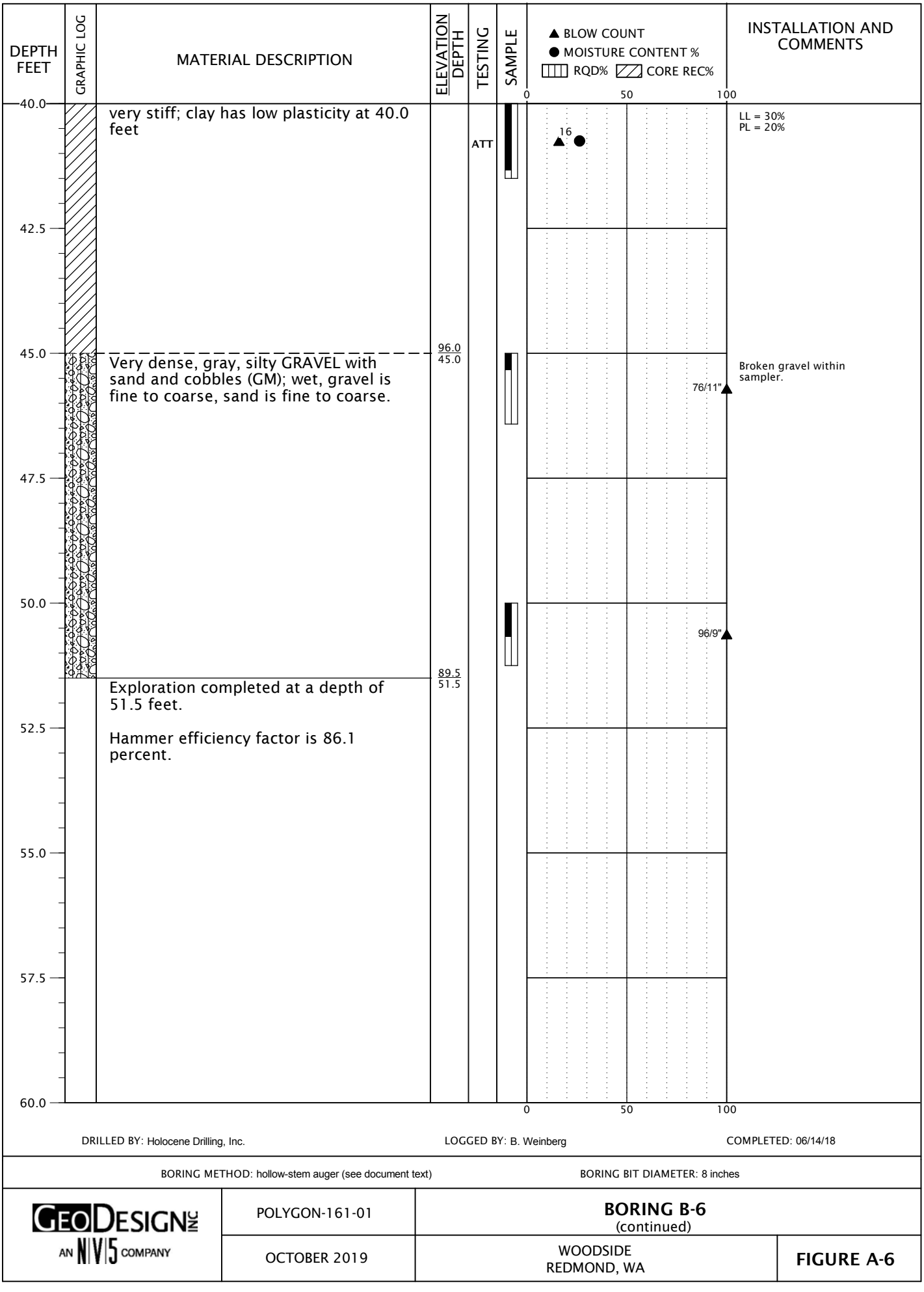
BORING B-6
(continued)

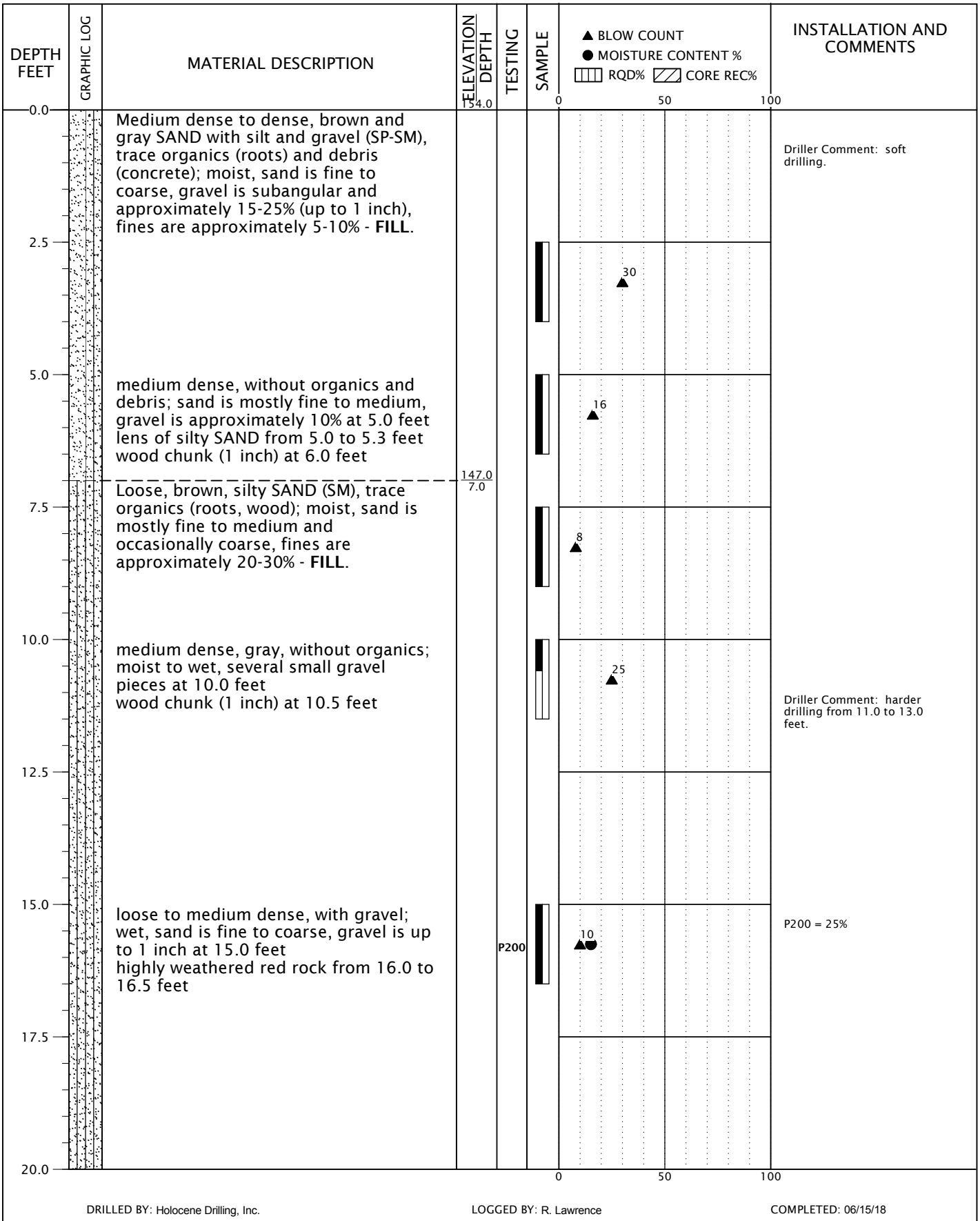
OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-6

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM


DEPTH FEET
GRAPHIC LOG
MATERIAL DESCRIPTION
ELEVATION DEPTH
TESTING
SAMPLE
▲ BLOW COUNT
● MOISTURE CONTENT %
RQD% CORE REC%
INSTALLATION AND COMMENTS
0
50
100
40.0
very stiff; clay has low plasticity at 40.0 feet
ATT
16
LL = 30%
PL = 20%
42.5
45.0
96.0
45.0
Very dense, gray, silty GRAVEL with sand and cobbles (GM); wet, gravel is fine to coarse, sand is fine to coarse.
Broken gravel within sampler.
76/11"
47.5
50.0
96/9"
89.5
51.5
Exploration completed at a depth of 51.5 feet.
Hammer efficiency factor is 86.1 percent.
52.5
55.0
57.5
60.0
0
50
100
DRILLED BY: Holocene Drilling, Inc.
LOGGED BY: B. Weinberg
COMPLETED: 06/14/18
BORING METHOD: hollow-stem auger (see document text)
BORING BIT DIAMETER: 8 inches
GEODESIGN INC
AN NV5 COMPANY
POLYGON-161-01
BORING B-6
(continued)
OCTOBER 2019
WOODSIDE
REDMOND, WA
FIGURE A-6
BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc. LOGGED BY: R. Lawrence COMPLETED: 06/15/18

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 inches

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POLYGON-161-01	**BORING B-7**	
OCTOBER 2019	WOODSIDE REDMOND, WA	**FIGURE A-7**

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▭ RQD% ▨ CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
20.0		medium dense; moist to wet at 20.0 feet				20	
22.5							
25.0		loose; wet, gravel is subrounded and approximately 20-30% (up to 0.75 inch) at 25.0 feet		P200		8 ●	Appears to be zone of perched water at 25.0 feet. P200 = 18%
27.5							Driller Comment: hard drilling at 29.0 feet.
30.0		medium dense to dense, light brown; moist, gravel is angular to subrounded at 30.0 feet				30	
32.5							Driller Comment: soft drilling and water at 33.0 feet.
35.0		very dense, gray; wet at 35.0 feet				50/6"	Sampler seems to be pushing down rock.
37.5							
40.0							Driller Comment: drilling in

DRILLED BY: Holocene Drilling, Inc. LOGGED BY: R. Lawrence COMPLETED: 06/15/18

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 inches

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POLYGON-161-01

BORING B-7 (continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-7

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
40.0		Very dense, gray GRAVEL with sand (GP), trace silt; moist, gravel is angular to subangular, sand is fine to coarse.	114.0 / 40.0			71	gravel and cobbles from 40.0 to 45.0 feet. Heavy drill rig chatter noted. Large rock stuck in shoe; poor recovery.
42.5							
45.0						67	
		Exploration completed at a depth of 46.5 feet.	107.5 / 46.5				No groundwater observed in boring.
47.5		Hammer efficiency factor is 86.1 percent.					
50.0							
52.5							
55.0							
57.5							
60.0						0 50 100	

DRILLED BY: Holocene Drilling, Inc. LOGGED BY: R. Lawrence COMPLETED: 06/15/18

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 inches

GeoDesign Inc — An NV5 Company

POLYGON-161-01

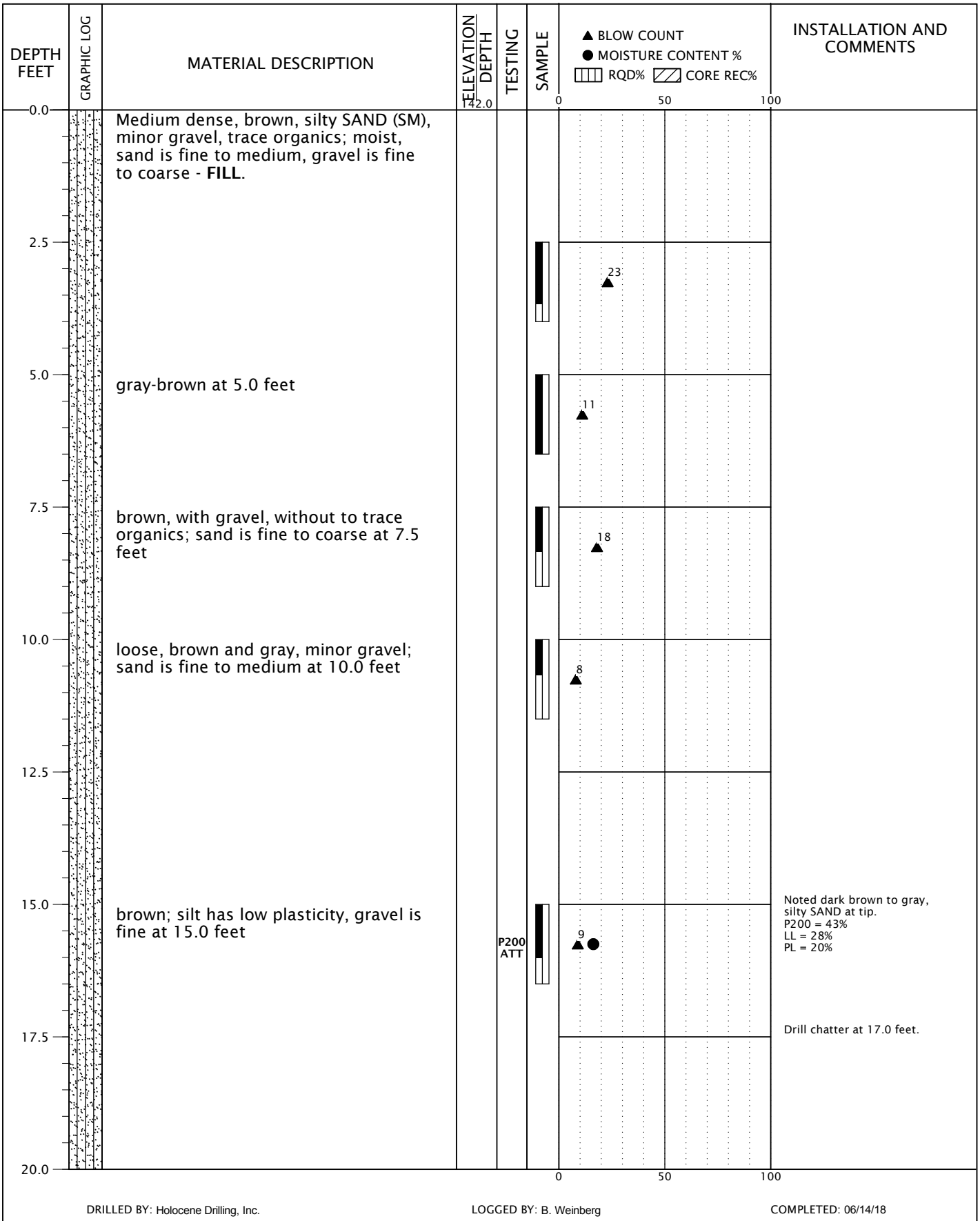
BORING B-7 (continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-7

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 06/14/18

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 inches

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POLYGON-161-01

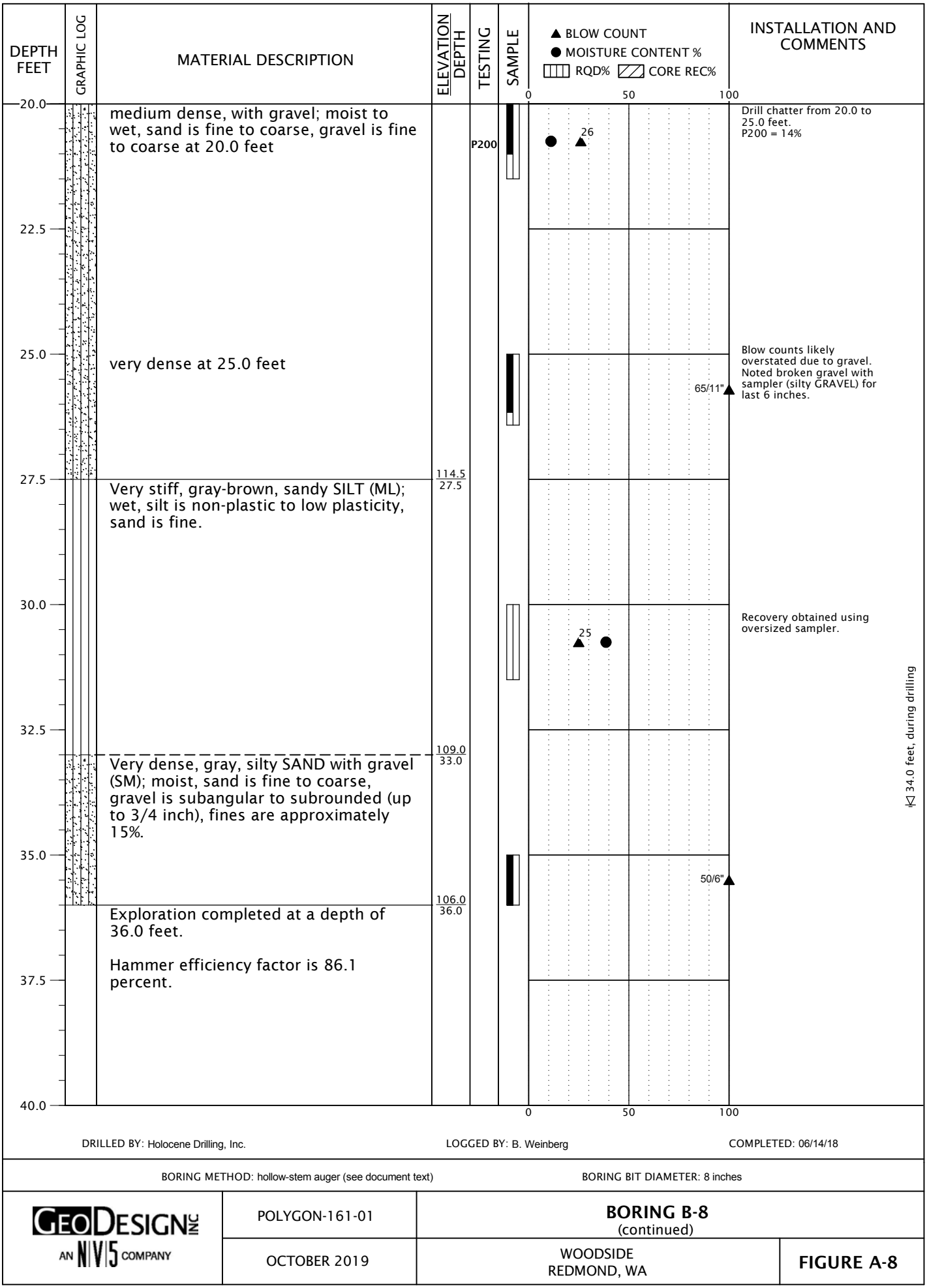
BORING B-8

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-8

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM


DEPTH FEET
GRAPHIC LOG
MATERIAL DESCRIPTION
ELEVATION DEPTH
TESTING
SAMPLE
▲ BLOW COUNT
● MOISTURE CONTENT %
RQD% CORE REC%
INSTALLATION AND COMMENTS
0
50
100
20.0
medium dense, with gravel; moist to wet, sand is fine to coarse, gravel is fine to coarse at 20.0 feet
P200
26
Drill chatter from 20.0 to 25.0 feet.
P200 = 14%
22.5
25.0
very dense at 25.0 feet
65/11"
Blow counts likely overstated due to gravel. Noted broken gravel with sampler (silty GRAVEL) for last 6 inches.
27.5
114.5
27.5
Very stiff, gray-brown, sandy SILT (ML); wet, silt is non-plastic to low plasticity, sand is fine.
30.0
25
Recovery obtained using oversized sampler.
32.5
109.0
33.0
Very dense, gray, silty SAND with gravel (SM); moist, sand is fine to coarse, gravel is subangular to subrounded (up to 3/4 inch), fines are approximately 15%.
35.0
50/6"
106.0
36.0
Exploration completed at a depth of 36.0 feet.
Hammer efficiency factor is 86.1 percent.
37.5
40.0
34.0 feet, during drilling
DRILLED BY: Holocene Drilling, Inc.
LOGGED BY: B. Weinberg
COMPLETED: 06/14/18
BORING METHOD: hollow-stem auger (see document text)
BORING BIT DIAMETER: 8 inches
GEODESIGN INC
AN NV5 COMPANY
POLYGON-161-01
BORING B-8
(continued)
OCTOBER 2019
WOODSIDE
REDMOND, WA
FIGURE A-8
BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% 0 50 100	INSTALLATION AND COMMENTS
0.0		Loose, brown, silty SAND (SM), trace to with gravel, trace organics; wet, sand is fine to medium, gravel is fine to coarse - **FILL**.	48.0				
2.5							
5.0						4	
7.5							
10.0		gray-brown at 10.0 feet				5	
12.5							
15.0		gray at 15.0 feet				10	
17.5							Hard drilling at 18.0 feet.
20.0						0 50 100	

DRILLED BY: Holocene Drilling, Inc. LOGGED BY: B. Weinberg COMPLETED: 02/26/19

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 1/4 inches

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BORING B-9

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-9

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
20.0		dense, gray-brown, with gravel; moist, sand is fine to coarse at 20.0 feet				▲ 37	
		Medium stiff, gray, sandy SILT (ML), minor gravel; moist, silt is non-plastic, sand is fine, gravel is fine to coarse - **FILL**.	126.0 / 22.0				
22.5							
25.0						▲ 5 ●	
27.5							
		Medium dense, gray, silty SAND with gravel (SM); moist to wet, sand is fine to medium, silt is non-plastic, gravel is fine to coarse - **FILL**.	119.0 / 29.0				
30.0						▲ 21	
32.5							
		Loose to medium stiff, gray-black, silty SAND (SM) to sandy SILT (ML), minor gravel and organics; wet, sand is fine to medium, gravel is fine to coarse - **FILL**.	114.0 / 34.0				
35.0						▲ 6	
37.5		Medium dense, gray-brown, silty SAND (SM), minor gravel, trace organics and debris; wet, sand is fine to medium, gravel is fine to coarse - **FILL**.	110.5 / 37.5				Infiltration test at 38.0 feet.
40.0							

DRILLED BY: Holocene Drilling, Inc. LOGGED BY: B. Weinberg COMPLETED: 02/26/19

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 1/4 inches

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POLYGON-161-01

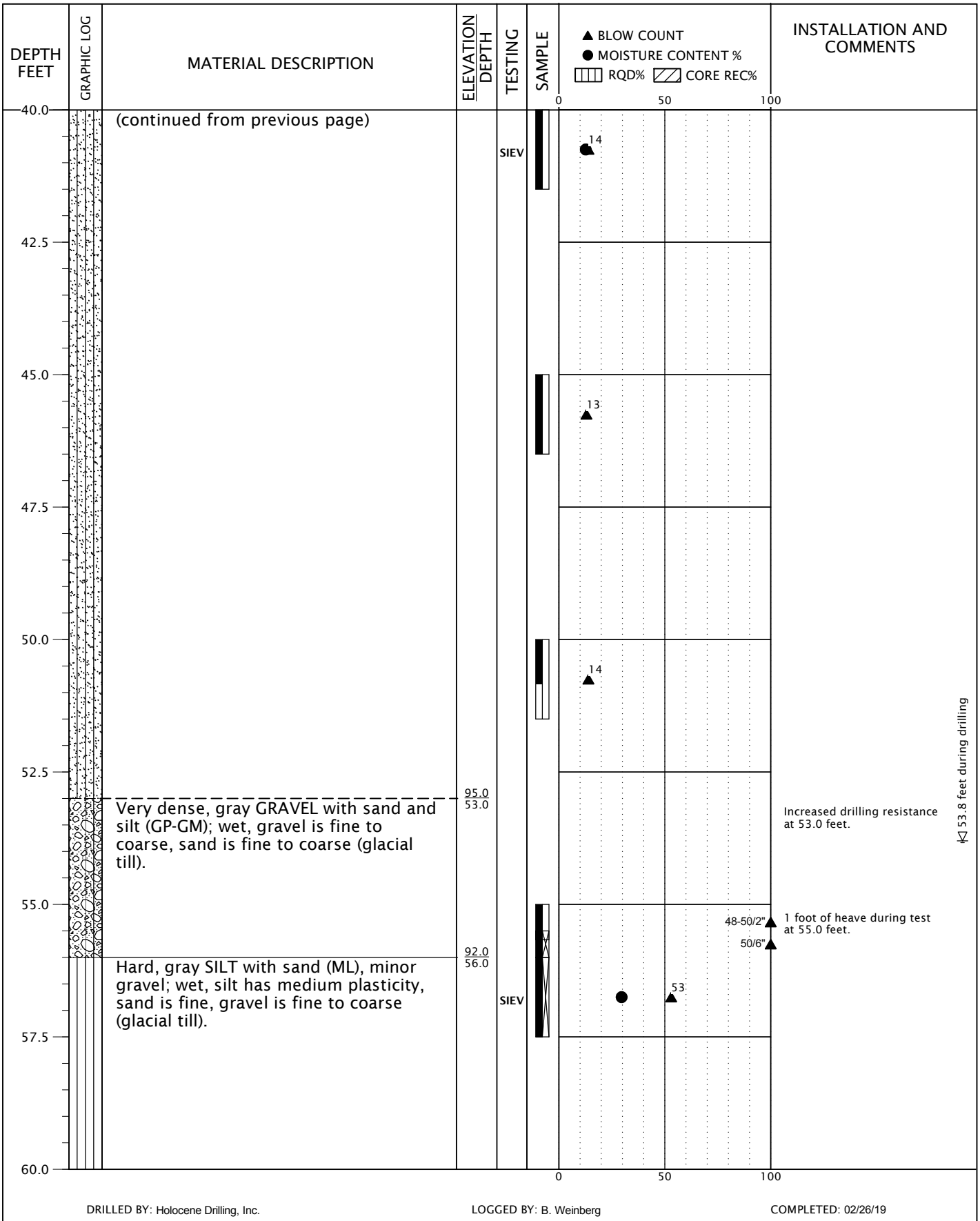
BORING B-9 (continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-9

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 02/26/19

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 1/4 inches

GEODESIGN INC
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POLYGON-161-01

BORING B-9
(continued)

OCTOBER 2019

WOODSIDE
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FIGURE A-9

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
60.0		(continued from previous page)				50/5"	
62.5							
65.0						50/2"	Increased sand content at 65.0 feet.
		Very dense, dark gray, silty SAND with gravel (SM); moist to wet, sand is fine to medium, gravel is fine to coarse (glacial till).	82.0 / 66.0				
67.5							
70.0						49-50/2"	
72.5							
75.0						50/3"	
77.5							
80.0							

DRILLED BY: Holocene Drilling, Inc. LOGGED BY: B. Weinberg COMPLETED: 02/26/19

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 1/4 inches

GeoDesign Inc — An NV5 Company

POLYGON-161-01

BORING B-9
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-9

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
80.0		(continued from previous page)				63	
		Exploration completed at a depth of 81.5 feet.	66.5 / 81.5				
		Hammer efficiency factor is 73.0 percent.					
82.5							
85.0							
87.5							
90.0							
92.5							
95.0							
97.5							
100.0							

DRILLED BY: Holocene Drilling, Inc. LOGGED BY: B. Weinberg COMPLETED: 02/26/19

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 1/4 inches

GeoDesign Inc
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POLYGON-161-01

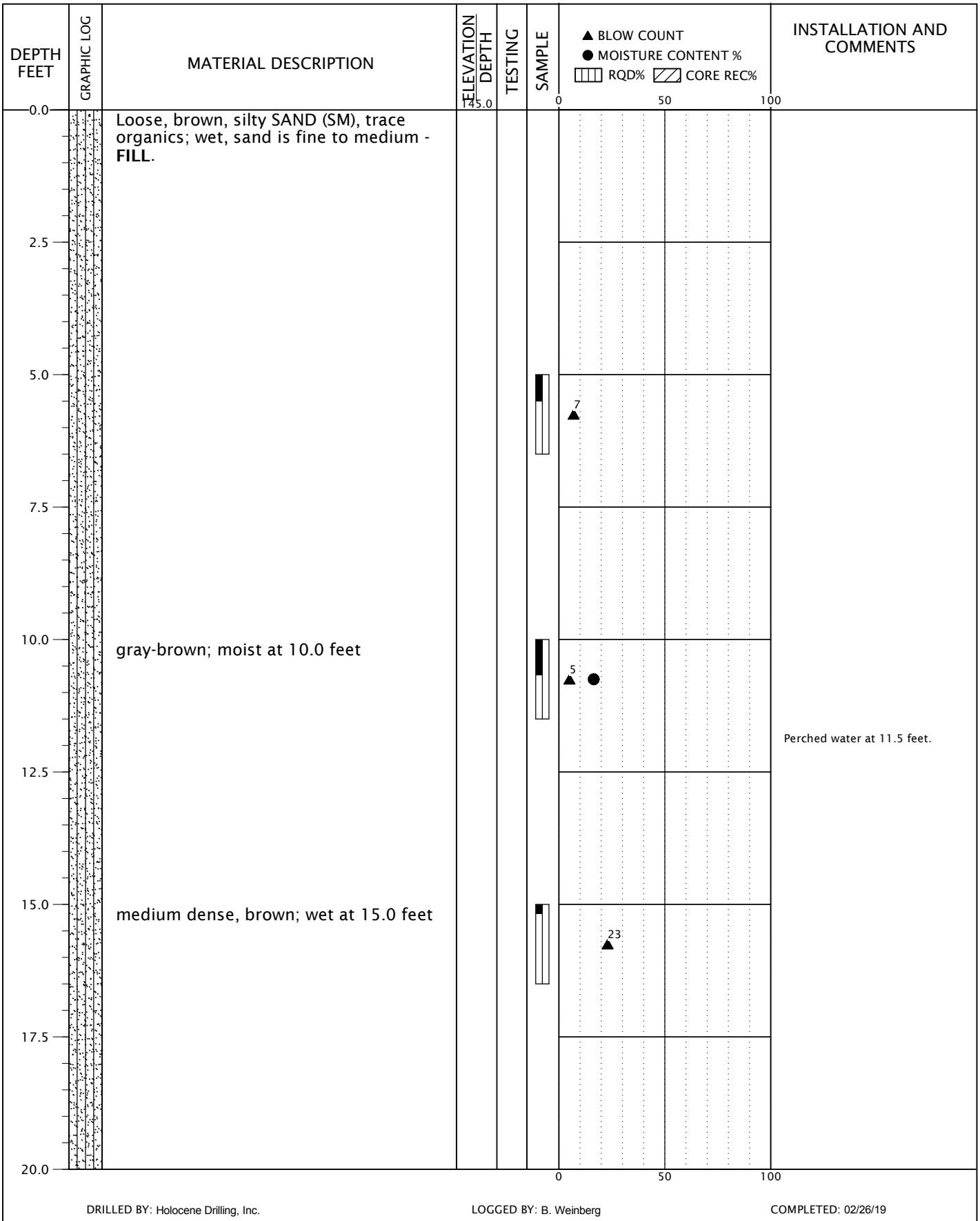
BORING B-9
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-9

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 02/26/19

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 1/4 inches

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BORING B-10

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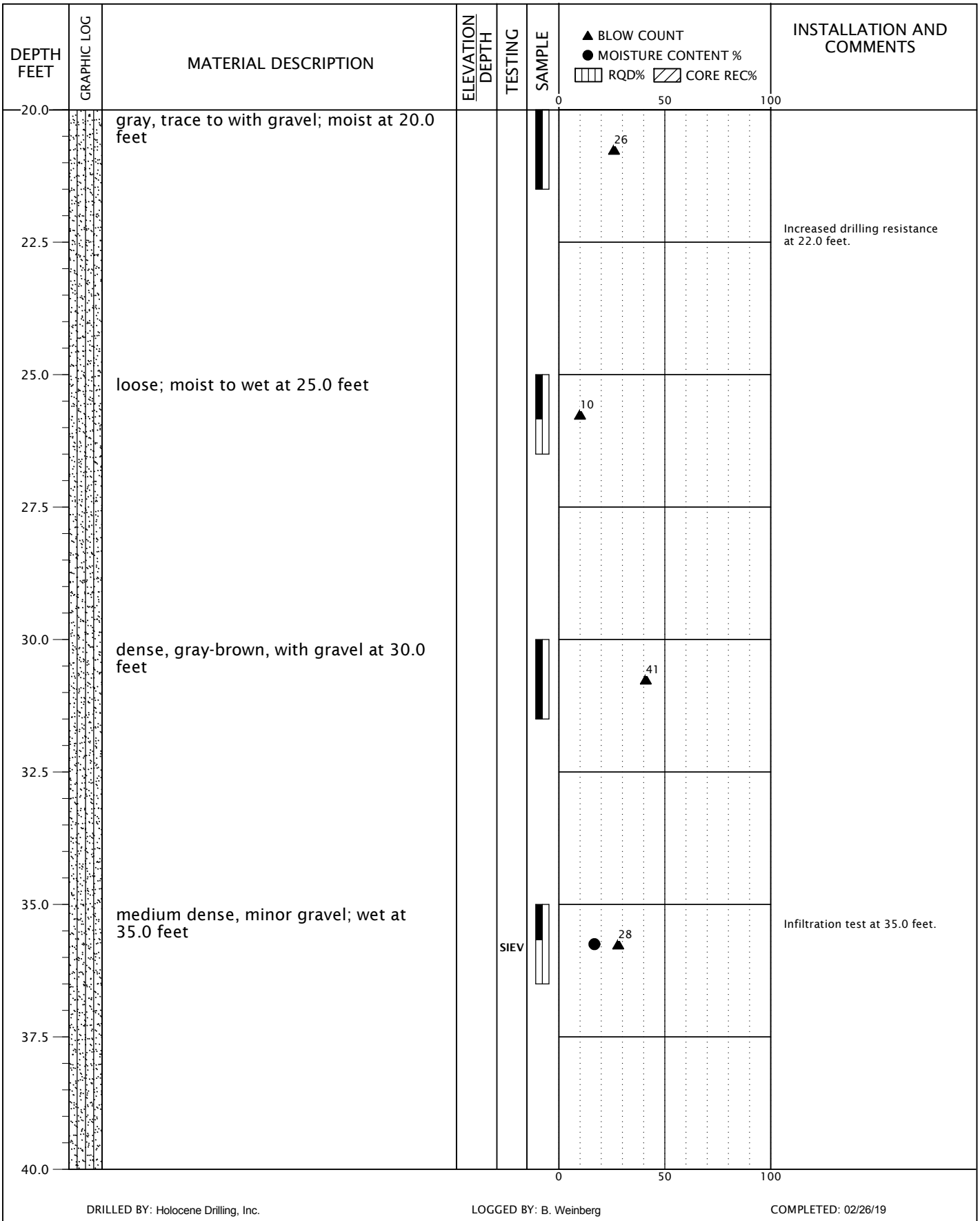
REDMOND, WA

FIGURE A-10

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 02/26/19

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 1/4 inches

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BORING B-10
(continued)

OCTOBER 2019

WOODSIDE
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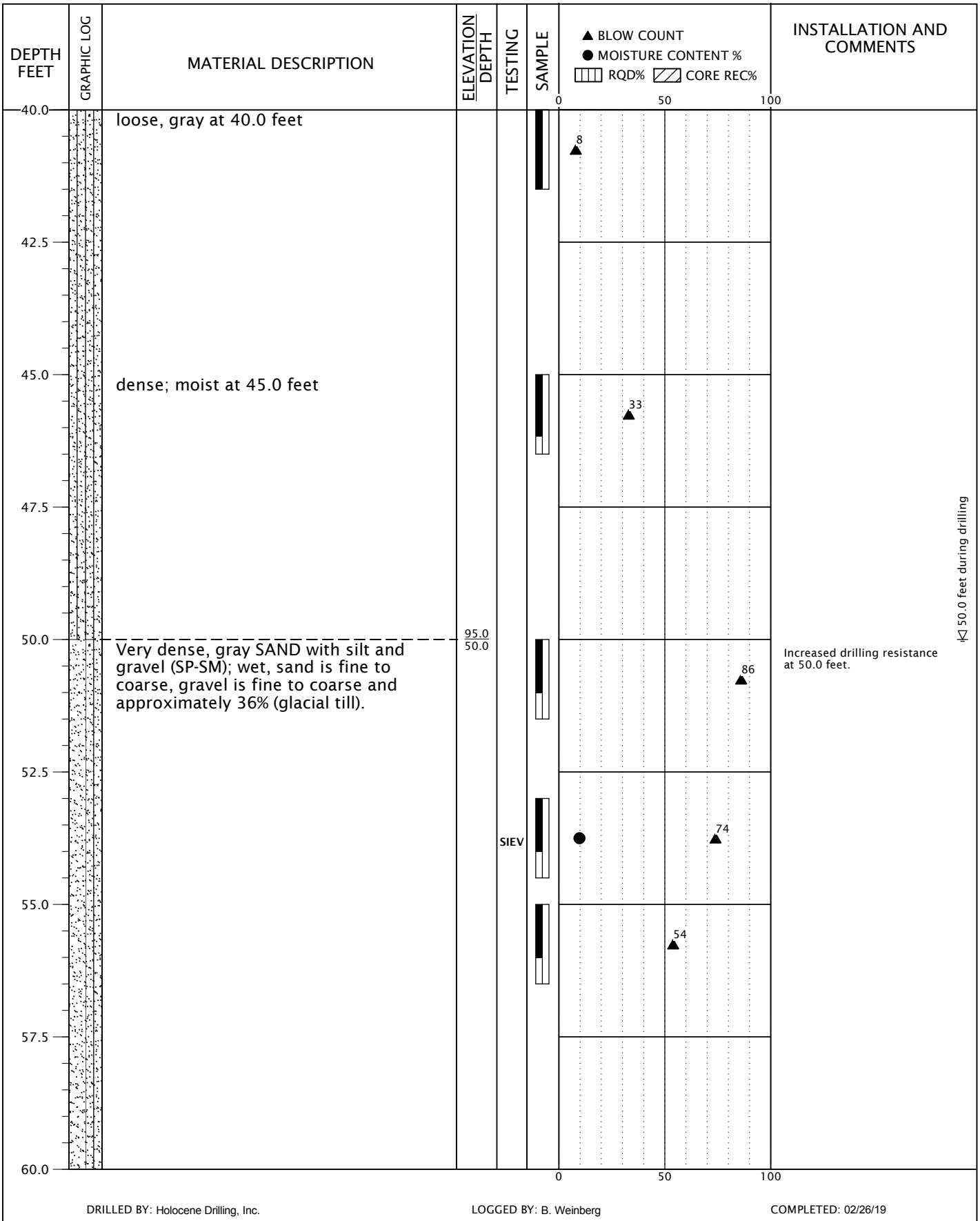
FIGURE A-10

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 02/26/19

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 1/4 inches

GEODESIGN INC
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POLYGON-161-01

BORING B-10
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-10

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
60.0		(continued from previous page)				77 ▲	
62.5			82.0 / 63.0				
		Very dense, gray, silty SAND with gravel (SM); wet, sand is fine to coarse, gravel is fine to coarse (glacial till).					
65.0						50/5" ▲	
67.5							
70.0						50/5" ▲	The groundwater level could not be observed during drilling due to perched water, but the soil was generally wet below a depth of 50.0 feet.
			74.6 / 70.4				
		Exploration completed at a depth of 70.4 feet.					
		Hammer efficiency factor is 73.0 percent.					
72.5							
75.0							
77.5							
80.0						0 50 100	

DRILLED BY: Holocene Drilling, Inc. LOGGED BY: B. Weinberg COMPLETED: 02/26/19

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 1/4 inches

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POLYGON-161-01

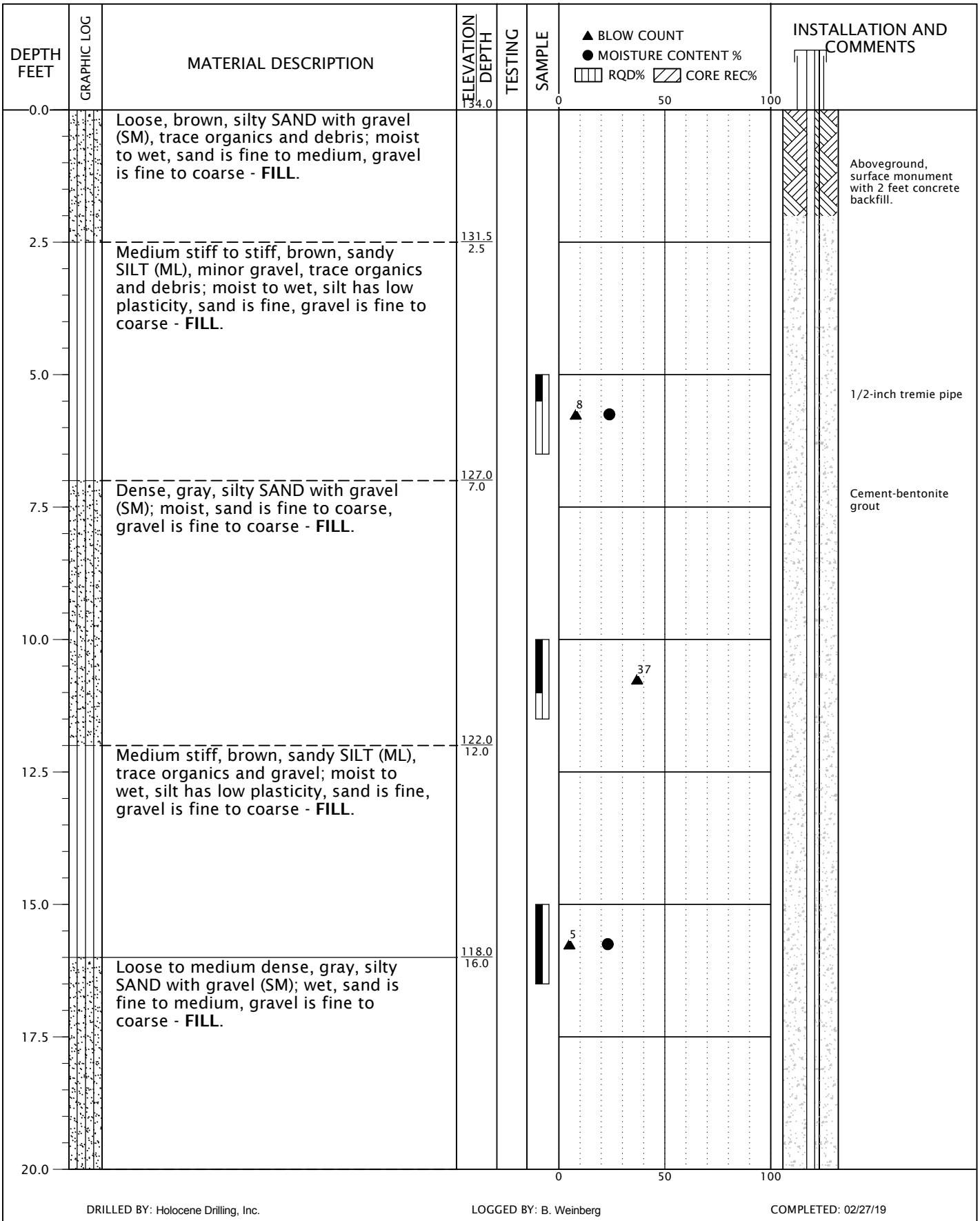
BORING B-10
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-10

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 02/27/19

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 1/4 inches

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BORING B-11

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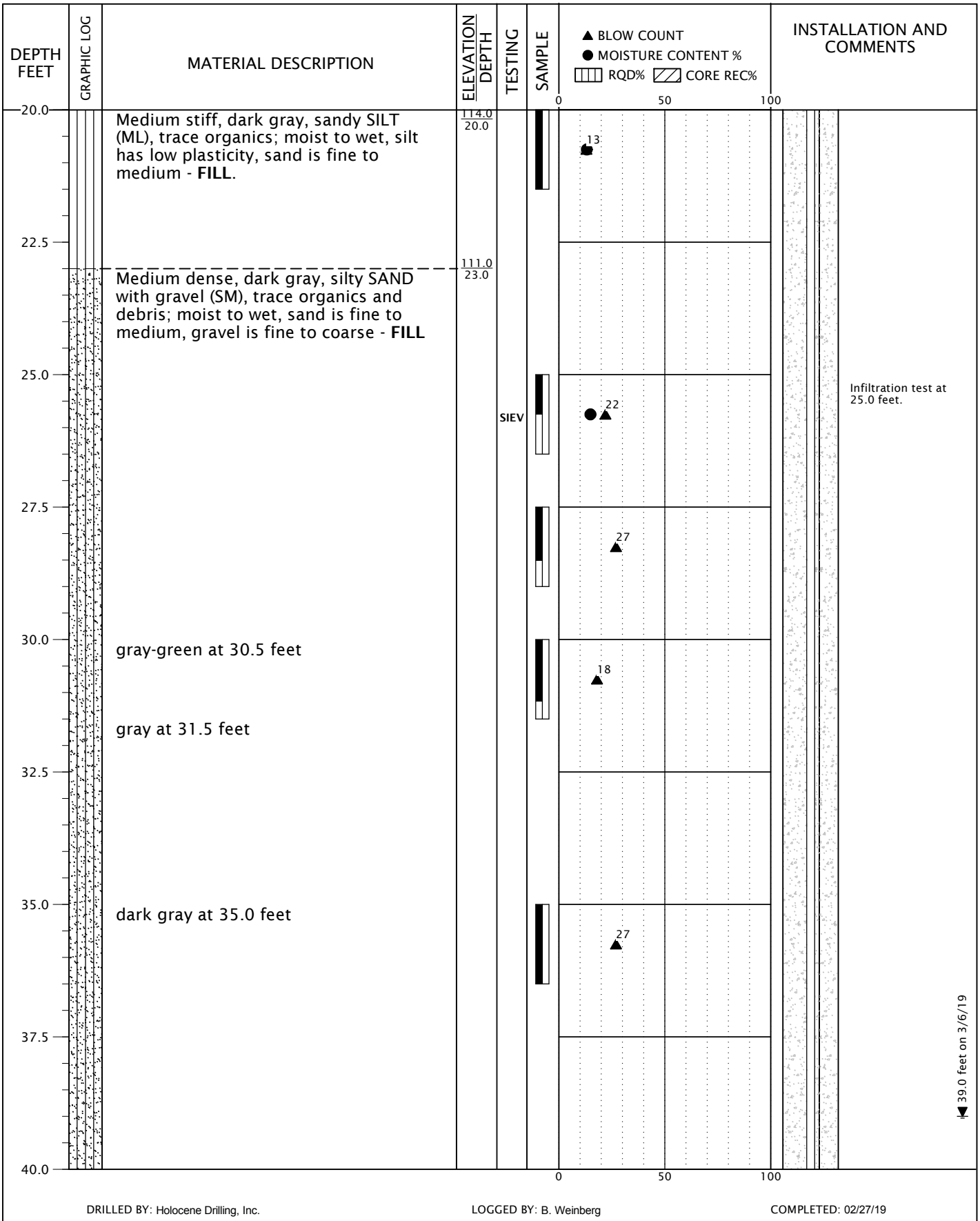
FIGURE A-11

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 02/27/19

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 1/4 inches

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POLYGON-161-01

BORING B-11
(continued)

OCTOBER 2019

WOODSIDE
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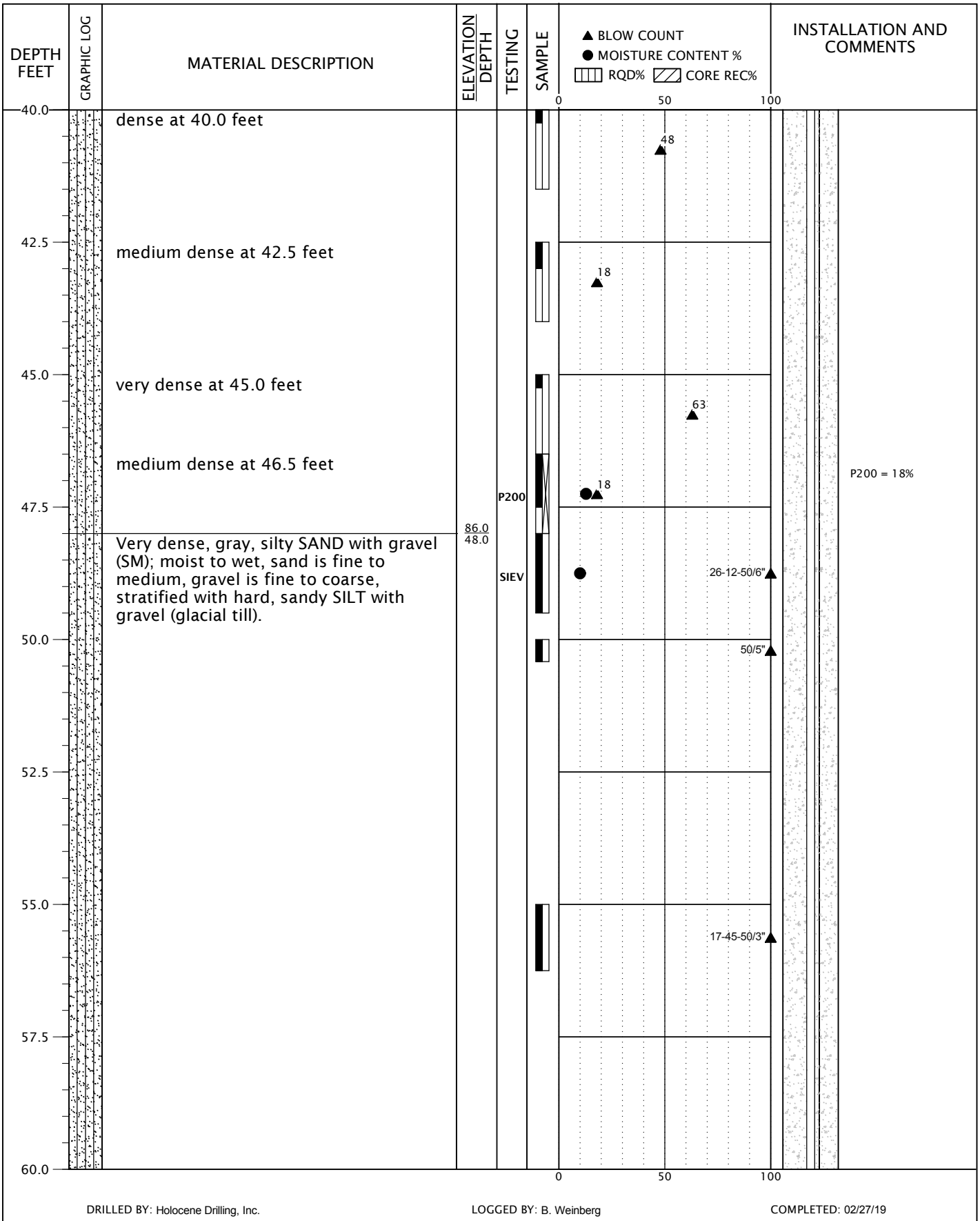
FIGURE A-11

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 02/27/19

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 1/4 inches

GEODESIGN INC
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POLYGON-161-01

BORING B-11
(continued)

OCTOBER 2019

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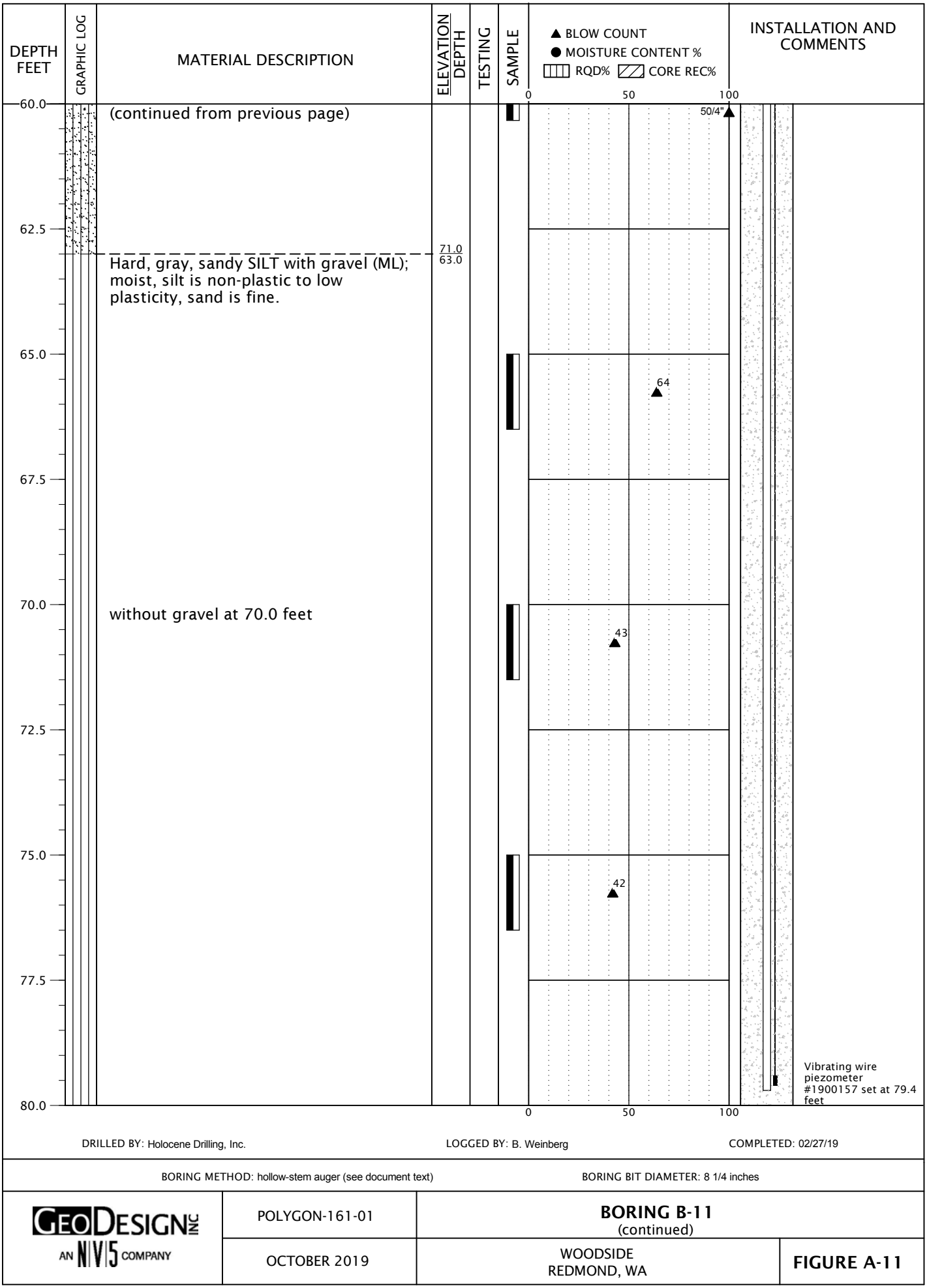
FIGURE A-11

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



DRILLED BY: Holocene Drilling, Inc.

LOGGED BY: B. Weinberg

COMPLETED: 02/27/19

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 8 1/4 inches

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POLYGON-161-01

BORING B-11
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-11

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
80.0		(continued from previous page)				47 ▲	
		Exploration completed at a depth of 81.5 feet.	52.5 / 81.5				WA Department of Ecology Well #BLI800
		Hammer efficiency factor is 73.0 percent.					
82.5							
85.0							
87.5							
90.0							
92.5							
95.0							
97.5							
100.0						0 50 100	

DRILLED BY: Holocene Drilling, Inc. LOGGED BY: B. Weinberg COMPLETED: 02/27/19

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 8 1/4 inches

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POLYGON-161-01

BORING B-11
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-11

BORING LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0	Medium dense, brown, silty SAND with gravel (SM), trace organics; moist, sand is fine to medium, gravel is fine to coarse - **FILL**.	146.0				
2.5	CEMENT-TREATED SOIL.	143.5 / 2.5				
	Dense, gray, silty SAND with gravel (SM); moist, sand is fine to medium, gravel is fine to coarse - **FILL**.	142.5 / 3.5	PP			Probing less than 1 inch. PP = >4.5 tsf
5.0	medium dense at 5.0 feet					
7.5	thin dark brown layer, trace organics at 7.0 feet gray, trace debris (bricks), without organics at 8.0 feet					Minor caving observed from 8.0 to 10.0 feet on west side (large rocks become dislodged).
10.0						
12.5						
15.0						
16.0	Exploration completed at a depth of 16.0 feet.	130.0 / 16.0				No groundwater seepage observed to the depth explored.
17.5						
20.0						

EXCAVATED BY: Northwest Construction, Inc. LOGGED BY: B. Weinberg COMPLETED: 06/15/18

EXCAVATION METHOD: excavator (see document text)

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TEST PIT TP-1

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-12

TEST PIT LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0			141.0				
		Loose, brown, silty SAND (SM), minor gravel; moist, sand is fine to medium, gravel is fine to coarse - **FILL**.					Noted pockets of soft to medium stiff, brown, sandy SILT; sand is fine within silty SAND layer.
2.5					☒		
5.0			136.0 / 5.0	PP			PP = >4.5 tsf Probing less than 2 inches. Hard digging for excavator.
		Dense, gray-brown, silty SAND with gravel (SM); moist, sand is fine to medium (cement-treated soil).					
			134.0 / 7.0				
7.5		Loose to medium dense, gray-brown, silty SAND with gravel (SM); moist, sand is fine to medium, gravel is fine to coarse - **FILL**.			☒		Minor caving observed from 7.0 to 14.0 feet on east side of test pit caved ~4 to 6 inches.
10.0							
12.5							
15.0							
			125.0 / 16.0				
		Exploration completed at a depth of 16.0 feet.					No groundwater seepage observed to the depth explored.
17.5							
20.0							

EXCAVATED BY: Northwest Construction, Inc. LOGGED BY: B. Weinberg COMPLETED: 06/15/18

EXCAVATION METHOD: excavator (see document text)

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TEST PIT TP-2

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WOODSIDE
REDMOND, WA

FIGURE A-13

TEST PIT LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	MOISTURE CONTENT % (0 – 50 – 100)	COMMENTS
0.0	Medium dense to dense, gray, silty SAND with gravel (SM); moist, sand is fine to medium, gravel is fine to coarse - **FILL**.	142.0	PP	☒		PP = >4.5 tsf
	medium dense, brown at 1.5 feet					
2.5			PP PP	☒		PP = 4.0 tsf PP = 4.5 tsf
5.0	medium dense to dense, gray-brown at 5.0 feet					Appears to be cement-treated soil from 5.0 to 7.0 feet that excavator could dig through.
			PP	☒		PP = >4.5 tsf
7.5	medium dense at 7.0 feet					Minor caving observed from 7.0 to 12.0 feet.
	loose; increased moisture content at 9.0 feet					
10.0				☒		
12.5						
15.0				☒		
	Exploration completed at a depth of 16.0 feet.	126.0 / 16.0				No groundwater seepage observed to the depth explored.
17.5						
20.0						

EXCAVATED BY: Northwest Construction, Inc. LOGGED BY: B. Weinberg COMPLETED: 06/15/18

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC AN NV5 COMPANY

POLYGON-161-01

TEST PIT TP-3

OCTOBER 2019

WOODSIDE
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FIGURE A-14

TEST PIT LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Very soft to soft, brown, sandy SILT (ML), trace gravel; moist, silt is non-plastic to low plasticity, sand is fine, gravel is fine to coarse - **FILL**.	145.0				
2.5					☒		Probing 3 feet at 2.0 feet.
5.0		CEMENT-TREATED SAND SOIL with crushed gravel.	140.0 / 5.0				Very difficult excavation from 5.0 to 6.5 feet.
		Dense, gray-brown, silty SAND with gravel (SM); moist, sand is fine to medium, gravel is fine to coarse - **FILL**.	138.5 / 6.5		☒		
7.5							Hard digging to ~9.0 feet. Soil from 6.5 to 9.0 feet may be lightly cement treated. Not as much digging resistance below 9.0 feet.
		loose to medium dense; increased moisture at 9.0 feet			☒		
10.0							
12.5							
15.0		Loose to medium dense, gray-brown SAND (SP), trace silt; moist, sand is fine to medium - **FILL**.	130.0 / 15.0		☒		
17.5							
		Exploration completed at a depth of 18.0 feet.	127.0 / 18.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored.
20.0						0 50 100	

EXCAVATED BY: Northwest Construction, Inc. LOGGED BY: B. Weinberg COMPLETED: 06/15/18

EXCAVATION METHOD: excavator (see document text)

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TEST PIT TP-4

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WOODSIDE
REDMOND, WA

FIGURE A-15

TEST PIT LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Very loose, brown, silty SAND with gravel (SM), trace organics; moist, sand is fine to medium, gravel is fine to coarse - **FILL**.	146.0				Probing 3 feet at 1.0 foot.
2.5							
		CEMENT-TREATED SOIL.	142.0 / 4.0				
5.0		Exploration terminated at a depth of 5.5 feet due to refusal.	140.5 / 5.5				No groundwater seepage observed to the depth explored. No caving observed to the depth explored.
7.5							
10.0							
12.5							
15.0							
17.5							
20.0							

EXCAVATED BY: Northwest Construction, Inc. LOGGED BY: B. Weinberg COMPLETED: 06/15/18

EXCAVATION METHOD: excavator (see document text)

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POLYGON-161-01

TEST PIT TP-5

OCTOBER 2019

WOODSIDE
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FIGURE A-16

TEST PIT LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Very loose, brown, silty SAND (SM), minor gravel; moist to wet, sand is fine to medium, gravel is fine to coarse - **FILL**.	142.0				
2.5					☒		Probing at 3.0 feet.
5.0							
		cement-treated soil at 6.5 feet	135.5 / 6.5				No groundwater seepage observed to the depth explored. No caving observed to the depth explored.
7.5		Exploration terminated at a depth of 6.5 feet due to refusal cement-treated soil.					
10.0							
12.5							
15.0							
17.5							
20.0							

EXCAVATED BY: Northwest Construction, Inc. LOGGED BY: B. Weinberg COMPLETED: 06/15/18

EXCAVATION METHOD: excavator (see document text)

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TEST PIT TP-6

OCTOBER 2019

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FIGURE A-17

TEST PIT LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	SAMPLE	COMMENTS
0.0	Loose to medium dense, gray, silty SAND with gravel (SM); moist, sand is fine to medium, gravel is fine to coarse - **FILL**.	141.0		
2.5				Probing 1 foot at 2.0 feet.
	CEMENT-TREATED SOIL.	136.5 / 4.5		
5.0				
	Loose to medium dense, brown-red SAND (SP), trace to with silt; wet, sand is fine to coarse - **FILL**.	135.0 / 6.0		
7.5				Slow groundwater seepage observed at 7.0 feet.
	Medium dense to dense, gray, silty SAND with gravel (SM), trace debris (wood); moist, sand is fine to medium, gravel is fine to coarse - **FILL**.	133.5 / 7.5		
10.0	thin layer of quarry spalls at 9.0 feet			
12.5				
	Exploration completed at a depth of 14.0 feet.	127.0 / 14.0		No caving observed to the depth explored.
15.0				
17.5				
20.0				

MOISTURE CONTENT % (0 — 50 — 100)

EXCAVATED BY: Northwest Construction, Inc. LOGGED BY: B. Weinberg COMPLETED: 06/15/18

EXCAVATION METHOD: excavator (see document text)

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TEST PIT TP-7

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FIGURE A-18

TEST PIT LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Loose, brown, sandy SILT (ML) to silty SAND (SM), trace organics (roots); moist, sand is fine, silt is non-plastic - **FILL**	140.0				Probing 2 feet at surface.
2.5				PP	☒		PP = 2.0 tsf
							Probing 2 feet at 3.0 feet.
				PP			PP = 1.5 tsf
		without organics at 4.0 feet					
5.0				PP			PP = 2.5 tsf
							Probing 1 foot at 6.0 feet.
7.5		cement-treated soil at 8.0 feet	132.0 / 8.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored.
		Exploration terminated at a depth of 8.0 feet due to practical refusal.					
10.0							
12.5							
15.0							
17.5							
20.0							

EXCAVATED BY: Northwest Construction, Inc. LOGGED BY: B. Weinberg COMPLETED: 06/15/18

EXCAVATION METHOD: excavator (see document text)

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TEST PIT TP-8

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FIGURE A-19

TEST PIT LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0			132.0				
		Loose to very loose, brown, silty SAND (SM), minor gravel; moist, sand is fine to medium, gravel is fine to coarse, material mixed with soft, brown, sandy SILT (ML); moist, silt is non-plastic to low plasticity, sand is fine.					
2.5				PP	☒		PP = 2.0 tsf
				PP			PP = 2.0 tsf
				PP			PP = 3.0 tsf
5.0							
			125.0 / 7.0				
7.5		Medium dense, gray, silty SAND with gravel (SM); moist, sand is fine - **FILL**.			☒		
			123.0 / 9.0				
		cement-treated soil at 9.0 feet					No groundwater seepage observed to the depth explored.
		Exploration terminated at a depth of 9.0 feet due to practical refusal.					No caving observed to the depth explored.
10.0							
12.5							
15.0							
17.5							
20.0						0 50 100	

EXCAVATED BY: Northwest Construction, Inc. LOGGED BY: B. Weinberg COMPLETED: 06/15/18

EXCAVATION METHOD: excavator (see document text)

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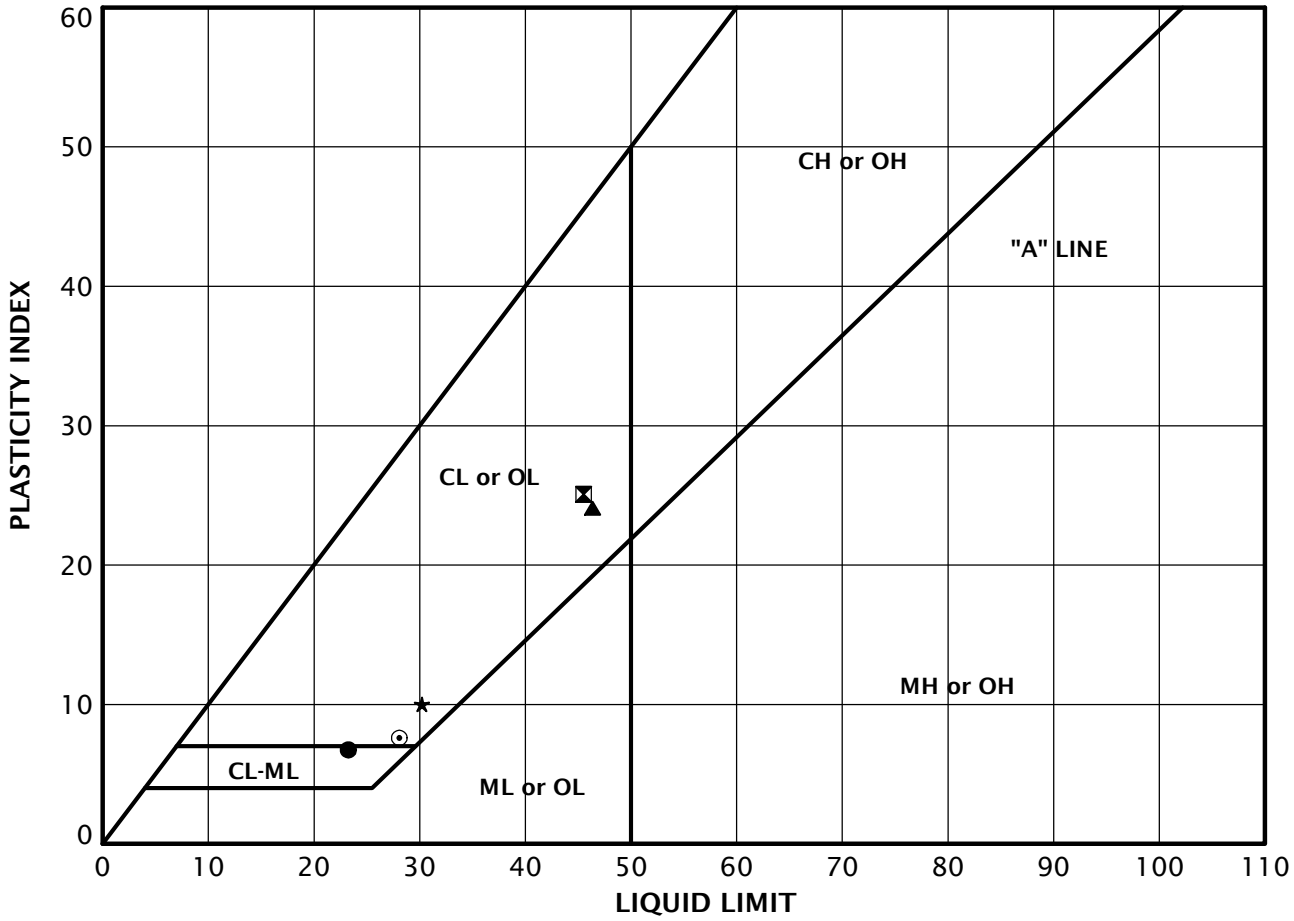
TEST PIT TP-9

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-20

TEST PIT LOG - GDI-NV5 - 1 PER PAGE POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM



KEY	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
●	B-5	10.0	13	23	17	6
⊠	B-5	36.5	25	46	20	26
▲	B-6	25.0	21	46	22	24
★	B-6	40.0	26	30	20	10
⊙	B-8	15.0	16	28	20	8

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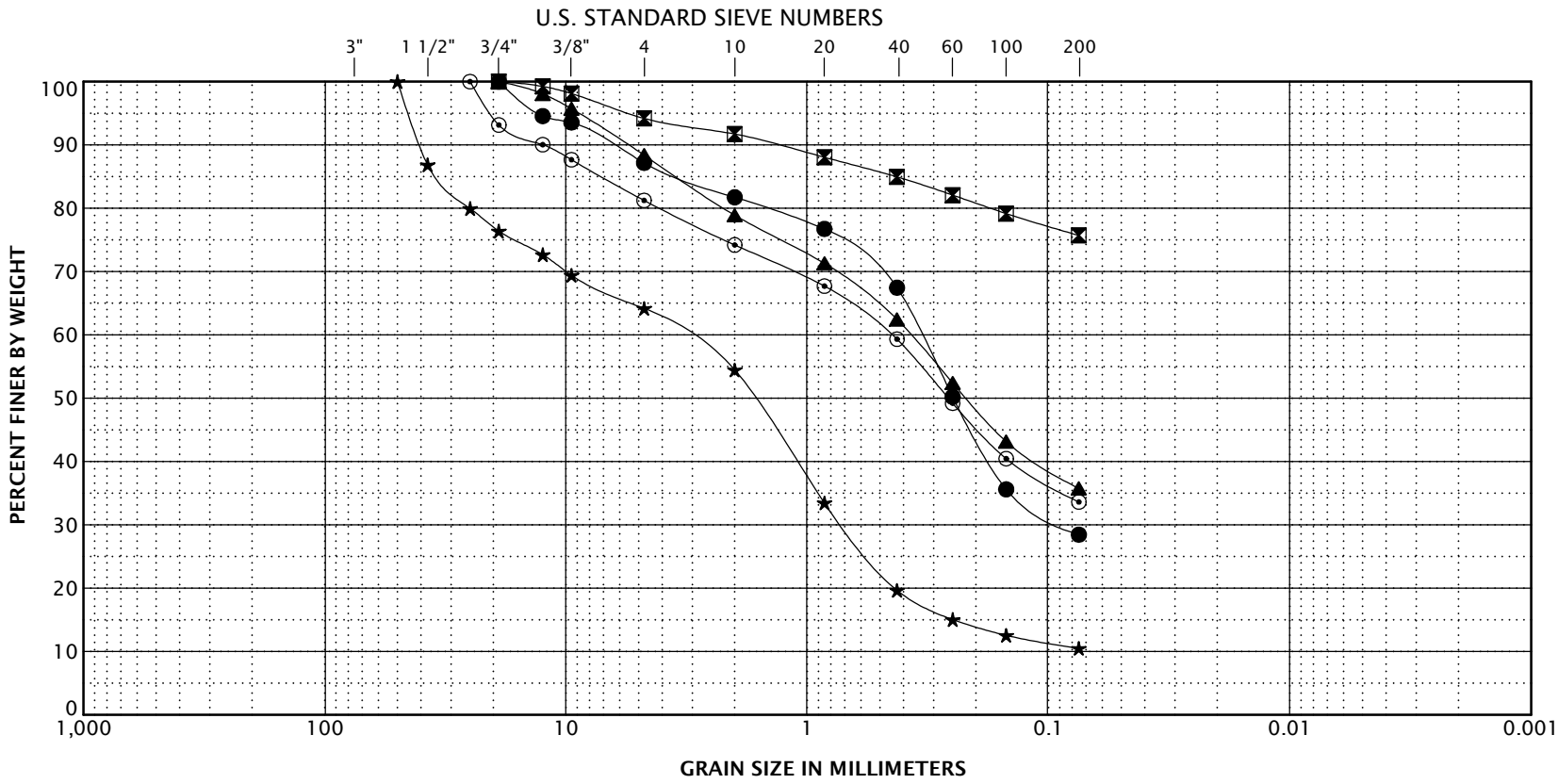
POLYGON-161-01

ATTERBERG LIMITS TEST RESULTS

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-21



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

KEY	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	D60	D50	D30	D10	D5	GRAVEL (PERCENT)	SAND (PERCENT)	SILT (PERCENT)	CLAY (PERCENT)
●	B-9	40.0	13	0.34	0.25	0.09			13	59	28	
⊠	B-9	56.0	30						6	18	76	
▲	B-10	35.0	17	0.37	0.22				12	53	36	
★	B-10	53.0	10	3.27	1.67	0.71			36	54	11	
⊙	B-11	25.0	15	0.45	0.26				19	48	34	

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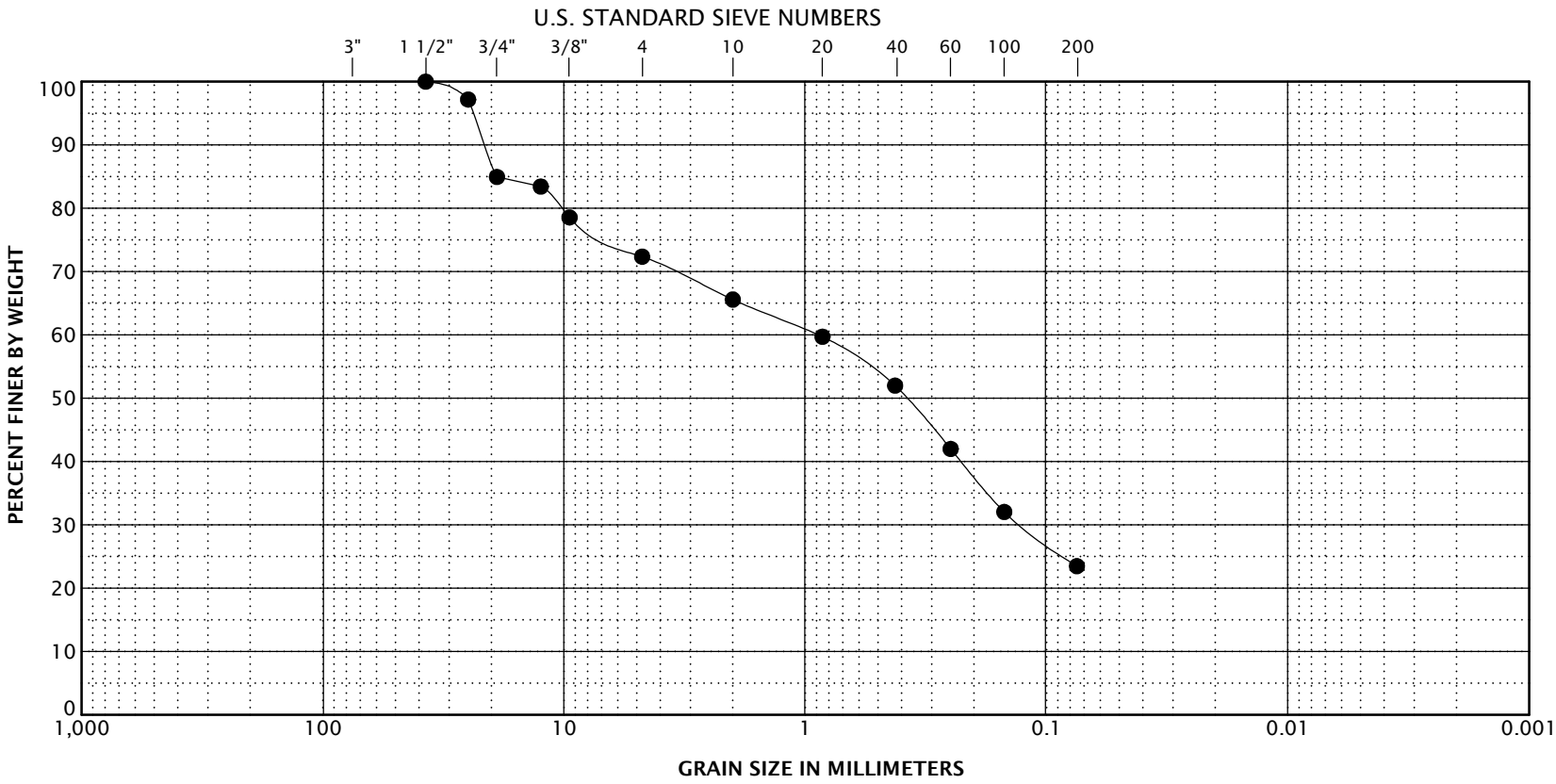
GRAIN-SIZE TEST RESULTS

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-22



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

KEY	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	D60	D50	D30	D10	D5	GRAVEL (PERCENT)	SAND (PERCENT)	SILT (PERCENT)	CLAY (PERCENT)
●	B-11	48.0	10	0.89	0.38	0.13			28	49	23	

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POLYGON-161-01

GRAIN-SIZE TEST RESULTS
(continued)

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-22

SAMPLE INFORMATION			MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
B-1	10.0	134.0	11				24			
B-1	25.0	119.0	12				35			
B-1	35.0	109.0	24				81			
B-2	15.0	133.0	21				26			
B-2	20.0	128.0	2				48			
B-2	25.0	123.0	38							
B-2	35.0	113.0	12				25			
B-3	15.0	133.0	21				22			
B-3	25.0	123.0	12				34			
B-3	50.0	98.0	35							
B-4	10.0	138.0	34				42			
B-4	20.0	128.0	7				26			
B-5	10.0	136.0	13				38	23	17	6
B-5	15.0	131.0	15				29			
B-5	25.0	121.0	11				21			
B-5	35.0	111.0	25							
B-5	36.5	109.5	25					46	20	26
B-5	45.0	101.0	22							
B-6	15.0	126.0	13				35			
B-6	25.0	116.0	21				68	46	22	24
B-6	35.0	106.0	27				81			
B-6	40.0	101.0	26					30	20	10
B-7	15.0	139.0	15				25			
B-7	25.0	129.0	14				18			
B-8	15.0	127.0	16				43	28	20	8
B-8	20.0	122.0	11				14			
B-8	30.0	112.0	39							

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POLYGON-161-01

SUMMARY OF LABORATORY DATA

OCTOBER 2019

WOODSIDE
REDMOND, WA

FIGURE A-23

LAB SUMMARY - GDI-NV5 POLYGON-161-01-B1_11-TP1_9.GPJ GDI_NV5.GDT PRINT DATE: 9/27/19:KM

SAMPLE INFORMATION			MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
B-9	25.0	123.0	13							
B-9	40.0	108.0	13		13	59	28			
B-9	56.0	92.0	30		6	18	76			
B-10	10.0	135.0	16							
B-10	35.0	110.0	17		12	53	36			
B-10	53.0	92.0	10		36	54	11			
B-11	5.0	129.0	24							
B-11	15.0	119.0	23							
B-11	20.0	114.0	13							
B-11	25.0	109.0	15		19	48	34			
B-11	46.5	87.5	13				18			
B-11	48.0	86.0	10		28	49	23			

Robert Miner Dynamic Testing, Inc.
Dynamic Measurements and Analyses for Deep Foundations

October 29, 2018

Mr. Jon Root
Holocene Drilling, Inc.
11412 62nd Ave E
Puyallup, WA 98373

Re: Penetration Test Energy Measurements
CME 850 Track Mounted Rig 2002, 140lb CME Auto Hammer
Bore Hole: Yard Test Hole, October 18, 2018
Holocene Drilling Yard, Puyallup, Washington

RMDT Job No. 18F25

Dear Mr. Root:

This letter presents energy transfer measurements made during Standard Penetration Tests for the drill hole and drill rig referenced above. Robert Miner Dynamic Testing, Inc. (RMDT) made dynamic measurements with a Pile Driving Analyzer® as a hammer advanced the NW rod during sampling with a split spoon sampler.

The purpose of RMDT's testing was the measurement of energy transferred to the drill rods. Measurements were made on a section of NW gauge rod at the top of the drill string. Strain gages and accelerometers on the rod were connected to a Pile Driving Analyzer® (PDA) which generally processed acceleration and strain measurements from each hammer blow and stored both the measurements and computed results. Measurements and data processing generally followed the ASTM D 4633-16 standard. Energy transfer past the gage location, EFV, was computed by the PDA using force and velocity records as follows:

$$EFV = \int_a^b F(t)\, v(t)\, dt$$

The value "a" corresponds to the start of the record which is when the energy transfer begins and *"b"* is the time at which energy transferred to the rod reaches a maximum value. Appendix A contains more information on our measurement equipment and methods of analysis. The EFV energy calculation is identical to the EMX energy result discussed in Appendix A. The EFV and EMX values apply to the sensor location near the top of the rod.

TEST DETAILS

On October 18, 2018, a boring was advanced at the maintenance yard of Holocene Drilling in Puyallup, Washington. The drill rig used during sampling was a track mounted CME 850 unit manufactured by Central Mine Equipment and referred to as the 2002 CME 850 Track Rig by the operator. The CME 850 unit drilled to five depth intervals ranging from 15 to 32.5 ft below ground surface and SPT tests were completed through hollow-stem augers at each depth.

The rod used to advance the spoon at each sample depth had a diameter matching that of NW rod. The automatic hammer in use during our testing was manufactured by Central Mine Equipment and appeared to use a chain drive powered by a hydraulic motor, with the ram and chain drive enclosed within an outer casing.

RESULTS

A summary of testing and monitoring results is given in Table 1. The tabulated results include the starting sample depth, the penetration resistance, the number of hammers blows in our data set, measured energy transfer, EFV, the computed transfer efficiency, ETR, and the hammer blow rate, BPM. Appendix B contains detailed numeric results for each individual test.

Energy measurements must be divided by the theoretical free fall energy of the hammer to obtain an efficiency. A 140 lb ram raised 30 inches above an impact surface has 350 lb-ft of potential energy. Thus, the transfer energy results for sampling with the 140 lb ram may be divided by 350 lb-ft to yield the ratio of the delivered energy to the nominal potential energy. This efficiency ratio, ETR, is given for each sample interval as a percent efficiency.

Table 1. Summary of Test Details and Results for the 140-lb ram and Split Spoon Sampler

Sample Starting Depth	Penetration Resistance (Blow/Set)	Number of Blows in Data Set	Average Transfer Energy EFV (lb-ft)	Average Transfer Efficiency ETR (percent)	Average Hammer Blow Rate BPM (blow/min)
15.0 ft	65/0.83ft	65	239	68	47
20.0 ft	59/4in	56	257	74	51
25.0 ft	58/5in	56	259	74	50
30.0 ft	34/1in	31	248	71	40
32.5 ft	43/4in	41	271	77	50
Average for Split Spoon Samples:			**255**	**73**	**48**

Five sample returns were monitored while the 140 lb ram and standard split spoon sampler were in use. The overall average ETR and hammer blow rate was 73-percent and 48 blows per minute, respectively. In our opinion, these overall average energy measurement values are consistent with our expectations for CME auto hammers operating in similar conditions.

It was a pleasure to assist you and to participate on this project with the staff of Holocene Drilling, Inc. Please do not hesitate to contact us if you or other project participants have any questions about this report.

Sincerely,

October 29, 2018

Andrew J. Banas, P.E.

Robert Miner Dynamic Testing, Inc.

APPENDIX B

APPENDIX B

TEST PIT PHOTOGRAPHS

Representative photographs of our test pit excavations are presented in this appendix. Additional photographs are on file in our office and are available upon request.

TEST PIT TP-1: SIDEWALLS.

TEST PIT TP-1: SIDEWALLS.

TEST PIT TP-2: SIDEWALLS.

TEST PIT TP-2: SIDEWALLS.

TEST PIT TP-3: SIDEWALLS.

TEST PIT TP-3: SIDEWALLS.

TEST PIT TP-4: SIDEWALLS.

TEST PIT TP-4: SIDEWALLS – NOTE OVERHANG OF CEMENT-TREATED SOIL.

TEST PIT TP-5: REFUSAL ON CEMENT-TREATED SOIL.

TEST PIT TP-5: REFUSAL ON CEMENT-TREATED SOIL.

TEST PIT TP-6: REFUSAL ON CEMENT-TREATED SOIL.

TEST PIT TP-6: REFUSAL ON CEMENT-TREATED SOIL.

TEST PIT TP-7: SIDEWALLS.

TEST PIT TP-7: EXCAVATED SOIL.

TEST PIT TP-8: REFUSAL ON CEMENT-TREATED SOIL.

TEST PIT TP-8: REFUSAL ON CEMENT-TREATED SOIL.

TEST PIT TP-9: REFUSAL ON CEMENT-TREATED SOIL.

TEST PIT TP-9: EXCAVATED SOIL.

APPENDIX C

APPENDIX C

PREVIOUS EXPLORATIONS

Figures and exploration logs from GeoEngineers' January 12, 2018 geotechnical report are presented in this appendix.

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Background or Aerial from Bing dated 2015.

Projection: WA State Plane, North Zone, NAD83, US Foot

Legend

- Site Boundary
- TP-1 — Test Pit by GeoEngineers, 2017
- EB-1 — Boring by Associated Earth Sciences Inc., 2017
- 46' — Depth of Fill (feet)
- A A' — Cross Section Location

N W E S

100 0 100
Feet

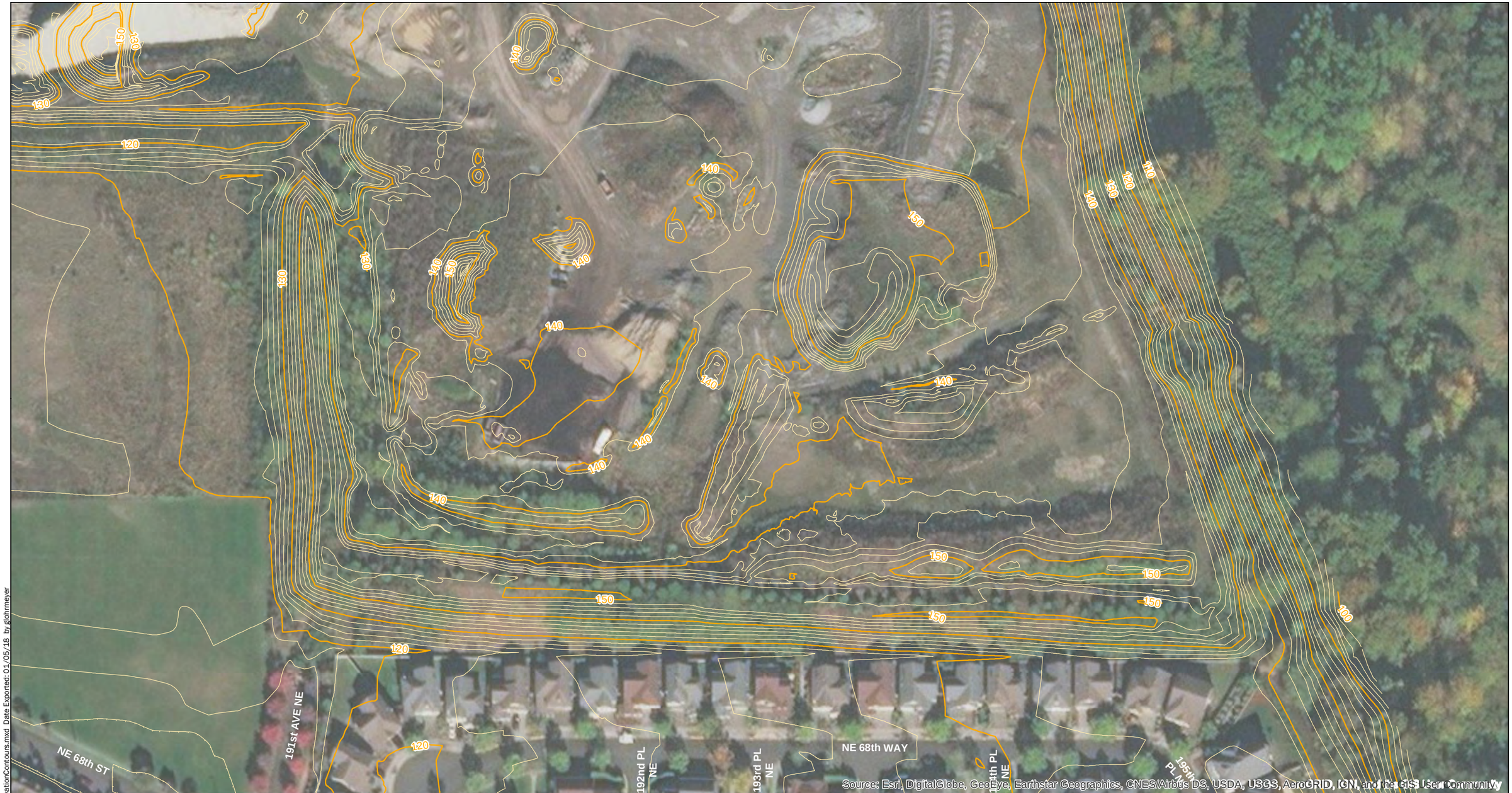
Site Plan

Cadman 12.8 Acre Residential Development
Redmond, Washington

GeoEngineers

Figure 2

P:\0\0643010\CAD\01\GeoTech\0643010001_F02 & F04_Site Plan & Section.dwg TAB:F02 Date Exported: 01/10/18 - 9:39 by lkillgore



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Contours from City of Redmond, 2012.

Projection: NAD 1983 HARN StatePlane Washington North FIPS 4601

Legend

- 2 Foot Contour
- 10 Foot Contour

N W E S

100 0 100

Feet

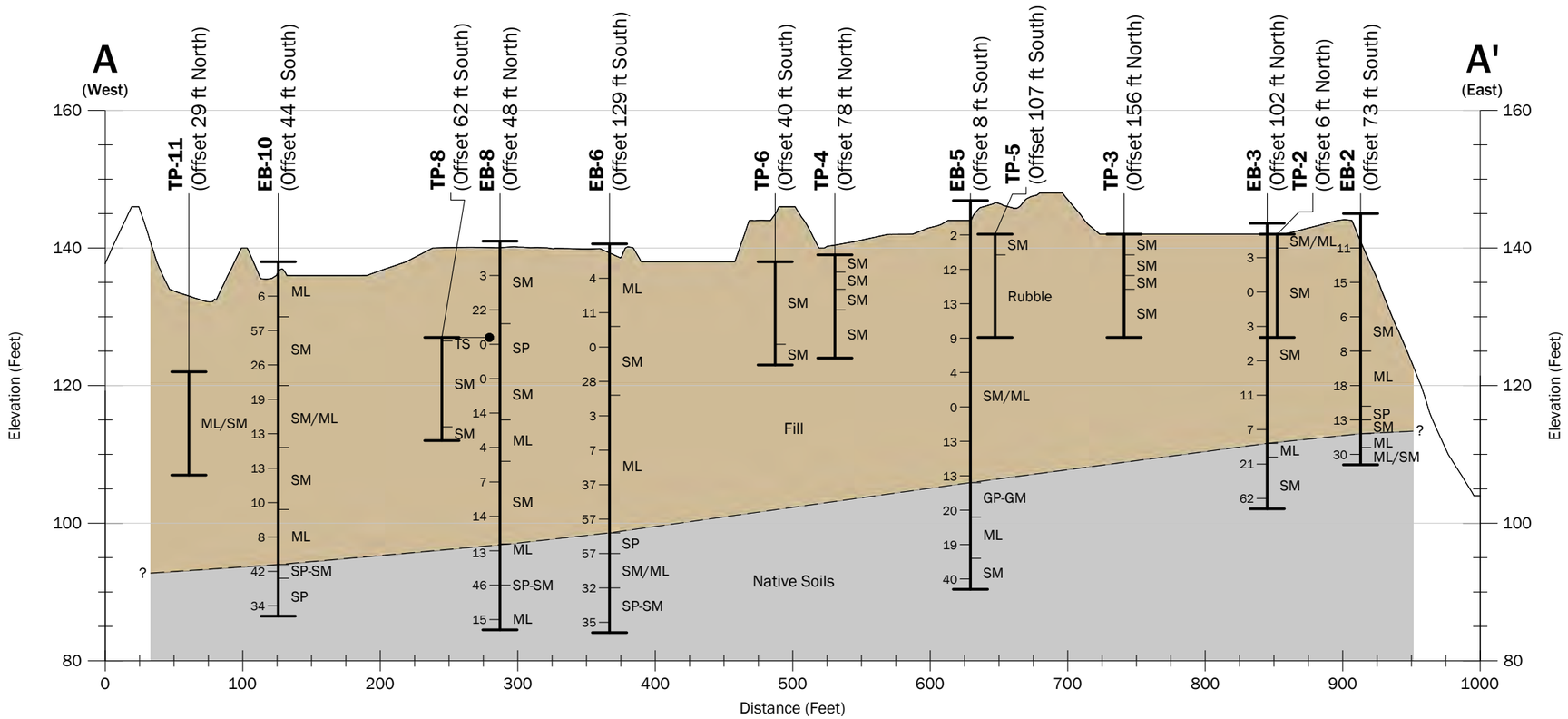
Elevation Contours

Cadman 12.8 Acre Residential Development
Redmond, Washington

GeoEngineers

Figure 3

P:\0.0643010\GIS\MXD\0643001001_F03_ElevationContours.mxd Date Exported: 01/05/18 by glohrmeyer



Notes:

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.
3. Ground surface based on elevation data from City of Redmond, 2012.
4. Blowcounts from AESI borings have been converted from Dames and Moore to an equivalent SPT value.

Datum: NAVD88

EB-X
TP-X
(Offset 7' S)
SM
20

Legend

- Boring or Test Pit
- Inferred Soil Contact
- Soil Classification
- Blow Count
- Fill
- Native Soils

100 0 100
Horizontal Scale in Feet

20 0 20
Vertical Scale in Feet
Vertical Exaggeration: 5X

Cross Section A-A'

Cadman 12.8 Acre Residential Development
Redmond, Washington

GeoEngineers

Figure 4

P:\0\0643010\CAD\01\GeoTech\064301001_F02 & F04_Site Plan & Section.dwg TAB:F04 Date Exported: 01/11/18 - 9:48 by tmichaud

APPENDIX A
Field Explorations

APPENDIX A
FIELD EXPLORATIONS

The subsurface conditions were evaluated by excavating 12 test pits (TP-1 through TP-12). The test pits were excavated on December 19, 2017 using a trackhoe owned and operated by Northwest Construction. The test pits were excavated to depths of about 15 feet with the exception of TP-12, which met refusal on a concrete slab at approximately 7 feet below the ground surface. The purpose of excavating these test pits was to characterize the upper 15 feet of fill soils present across the site.

The approximate locations of the test pits are shown on the Site Plan, Figure 2. Locations of the test pits were determined in the field using GISPro, an iOS mobile data collection and viewer application for iPad. The location accuracy of GISPro is 10 feet or less. Approximate test pit elevations were determined using the June 2017 site survey completed by Core Design.

The explorations were logged by a geotechnical engineer from our firm who identified the exploration locations, classified the soils encountered, obtained representative soil samples and maintained a detailed log of each exploration. The soils encountered were visually classified in the field in general accordance with the Unified Soil Classification System (USCS). Representative soil samples were obtained from the explorations, logged, placed in plastic bags, and transported to our laboratory for testing in Redmond, Washington

The test pit logs are summarized in Figures A-2 through A-13. A key to the symbols and terms used on the logs are included on Figure A-1. These logs are based on our interpretation of the field and laboratory data and indicate the various types of soils encountered. They also indicate the approximate depths at which the soils or their characteristics change, although the change may be gradual. If a change occurred between samples in the borings, it was interpreted.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Date Excavated 12/19/2017	Total Depth (ft) 15	Logged By YSC Checked By KMS	Excavator Northwest Construction Equipment Komatsu PC 400 LC	Groundwater not observed See "Remarks" section for caving observed	
Surface Elevation (ft) 134 Vertical Datum NAVD88		Latitude 47.666539 Longitude -122.080354		Coordinate System Decimal Degrees Horizontal Datum WGS84	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
133	1				SM/ML	Brown silty fine to medium sand and sandy silt with gravel and occasional cobbles (medium dense, moist) (fill)			
132	2	✓	1 MC				25		Probe depth = 1 to 2 inches
131	3				SM	Gray silty fine sand with gravel and cobbles (medium dense, moist)			
130	4								
129	5	✓	2 SA				14	43	Probe depth = 1 to 2 inches
128	6				SM/ML	Gray-brown silty fine to medium sand with gravel and sandy silt, occasional organic matter, wood debris (loose to medium dense, moist)			
127	7	✓	3 MC				19		
126	8								Caving observed at 8 feet
125	9				SM	Gray silty fine to medium sand with gravel (loose to medium dense, moist)			
124	10	✓	4 MC				12		
123	11				SM	Brown silty fine to medium sand with gravel, occasional cobbles and boulders, occasional brick fragments (loose to medium dense, moist) Boulder observed from 11 to 12 feet			
122	12								
121	13								
120	14								
119	15	✓	5 MC				7		

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-1

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-2
Sheet 1 of 1

Date Excavated	12/19/2017	Total Depth (ft)	15	Logged By YSC Checked By KMS	Excavator Northwest Construction Equipment Komatsu PC 400 LC	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) Vertical Datum	142 NAVD88	Latitude Longitude	47.667064 -122.080749	Coordinate System Horizontal Datum	Decimal Degrees WGS84	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
141	1				SM/ML	Brown silty fine to medium sand with gravel, pockets of sandy silt (medium dense, moist) (fill)			
140	2		1 SA		SM	Brown-gray silty fine to medium sand with gravel (loose, moist)	17	56	Probe depth = 1 to 2 inches Moderate caving observed below 2 feet
139	3								
138	4								Probe depth = 8 to 12 inches
137	5								
136	6		2 MC				21		
135	7								
134	8					Wood debris			
133	9								
132	10					Plastic sheeting			
131	11								
130	12		3 MC			Brick fragments	12		
129	13								
128	14								
127	15		4 MC				15		

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-2

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-3
Sheet 1 of 1

Date Excavated	12/19/2017	Total Depth (ft)	15	Logged By YSC Checked By KMS	Excavator Northwest Construction Equipment Komatsu PC 400 LC	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) Vertical Datum	142 NAVD88	Latitude Longitude	47.667473 -122.081214	Coordinate System Horizontal Datum	Decimal Degrees WGS84	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
141	1				SM	Brown silty fine to medium sand with gravel (medium dense, moist) (fill)			Probe depth = 1 to 2 inches
140	2								
139	3	✓	1 MC				13		
					SM	Dark brown silty fine to medium sand with gravel, organic debris (medium dense, moist)			
138	4					Old topsoil layer and pipe encountered at 4 feet			
137	5	✓	2 CP				16		MDD = 127 pcf; Optimum moisture content (OMC) = 11%
136	6				SM	Brown silty fine to medium sand with gravel and cobbles (medium dense, moist)			
135	7								
134	8	✓	3 MC				16		
					SM	Brown silty fine to medium sand with gravel and occasional cobbles (loose to medium dense, moist)			
133	9								
132	10								Moderate caving observed at 10 feet
131	11								
130	12	✓	4 SA				16	37	
129	13					8- to 12-inch cobble			
128	14								
127	15	✓	5 MC				15		

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-3

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-4
Sheet 1 of 1

Date Excavated	12/19/2017	Total Depth (ft)	15	Logged By YSC Checked By KMS	Excavator Northwest Construction Equipment Komatsu PC 400 LC	Groundwater not observed Caving not observed
Surface Elevation (ft)	139	Latitude	47.667251	Coordinate System	Decimal Degrees
Vertical Datum	NAVD88	Longitude	-122.08206	Horizontal Datum	WGS84

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
138	1				SM	Brown silty fine to medium sand with gravel (loose to medium dense, moist) (fill)			
137	2		1 MC				11		Probe depth = 2 to 8 inches
136	3				SM	Brown-gray silty sand (loose, moist)			
135	4		2 MC				15		Probe depth = 8 to 10 inches
134	5				SM	Brown-gray silty fine to medium sand with cobbles and occasional boulders (medium dense, moist)			
133	6					10-inch-diameter cobble			
132	7		3 MC				12		
131	8				SM	Brown-gray silty fine to medium sand with gravel (medium dense, moist)			
130	9								
129	10								
128	11		4 SA			Cobbles	10	27	
127	12								
126	13								
125	14					10- to 12-inch-diameter cobble			
124	15		5 MC				7		

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-4

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-5
Sheet 1 of 1

Date Excavated	12/19/2017	Total Depth (ft)	15	Logged By YSC Checked By KMS	Excavator Northwest Construction Equipment Komatsu PC 400 LC
See "Remarks" section for groundwater observed See "Remarks" section for caving observed					
Surface Elevation (ft) Vertical Datum	142 NAVD88	Latitude Longitude	47.66675 -122.081575	Coordinate System Horizontal Datum	Decimal Degrees WGS84

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
141	1				SM	Brown silty fine to coarse sand with gravel (medium dense, moist) (fill)			Probe depth < 1 inch
140	2	■	1 MC				15		
139	3				Rubble	Concrete and brick rubble with silty fine to medium sand with gravel matrix (loose, moist to wet)			Probe depth = 2 to 4 inches
138	4	■	2 SA; CP				16	40	MDD = 132 pcf; OMC = 9%*
137	5								Caving observed below 5 feet
136	6								Rubble fill observed in south half of test pit. 6-inch to 12-inch pieces of brick and concrete rubble fill between 3 and 15 feet. Trapped water in rubble fill void spaces.
135	7	■	3						
134	8								
133	9								
132	10								
131	11	■	4						
130	12								
129	13								
128	14								
127	15	■	5						

*Laboratory testing completed on sand and gravel fill from north half of test pit.

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-5

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-6
Sheet 1 of 1

Date Excavated 12/19/2017	Total Depth (ft) 15	Logged By YSC Checked By KMS	Excavator Northwest Construction Equipment Komatsu PC 400 LC	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) 138 Vertical Datum NAVD88		Latitude 47.666926 Longitude -122.082231	Coordinate System Decimal Degrees Horizontal Datum WGS84	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
137	1				SM	Brown silty fine to medium sand (loose, moist) (fill)			Probe depth = 10 to 15 inches
136	2		1 SA				16	43	
135	3								
134	4		2						Probe depth = 10 to 15 inches Caving observed at 4 feet
133	5								
132	6								
131	7								
130	8								
129	9								
128	10					Brick debris			
127	11		3						
126	12				SM	Brown silty fine to medium sand with gravel and occasional cobbles (medium dense, moist)			
125	13								
124	14								
123	15		4 MC				21		

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-6

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-7
Sheet 1 of 1

Date Excavated	12/19/2017	Total Depth (ft)	15	Logged By Checked By	YSC KMS	Excavator Equipment	Northwest Construction Komatsu PC 400 LC	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) Vertical Datum	126 NAVD88			Latitude Longitude	47.666586 -122.082563	Coordinate System Horizontal Datum	Decimal Degrees WGS84	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
125	1				SM	Brown silty fine to medium sand with occasional gravel (loose, moist) (fill)			
124	2	■	1 SA				14	39	Probe depth = 10 to 12 inches Moderate caving at 2 feet
123	3								
122	4	■	2 MC			Becomes loose to medium dense	11		Probe depth = 5 to 8 inches
121	5								
120	6								
119	7								Caving observed at 7 feet
118	8								
117	9	■	3 MC			Cobbles and boulders	11		
116	10								
115	11								
114	12								
113	13					Wood debris			
112	14								
111	15	■	4 MC				17		

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-7

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-8
Sheet 1 of 1

Date Excavated	12/19/2017	Total Depth (ft)	15	Logged By YSC Checked By KMS	Excavator Northwest Construction Equipment Komatsu PC 400 LC	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) Vertical Datum	127 NAVD88	Latitude Longitude	47.666857 -122.083073	Coordinate System Horizontal Datum	Decimal Degrees WGS84	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
126	0				TS	Dark brown topsoil with cobbles			
126	1				SM	Brown silty fine to medium sand with gravel (loose to medium dense, moist) (fill)			Probe depth = 1 to 2 inches
125	2	■	1 MC				10		
124	3								
123	4	■	2 SA; CP				11	31	Probe depth = 1 to 2 inches MDD = 133 pcf; OMC = 7%
122	5								
121	6								
120	7					20-inch concrete rubble			
119	8	■	3 MC				11		
118	9								
117	10								Moderate caving observed at 10 feet
116	11								
115	12					Plastic sheeting			
114	13				SM	Brown silty fine to medium sand with gravel and cobbles (loose to medium dense, moist)			
113	14								
112	15	■	4 MC				15		

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-8

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-9
Sheet 1 of 1

Date Excavated	12/19/2017	Total Depth (ft)	15	Logged By YSC Checked By KMS	Excavator Northwest Construction Equipment Komatsu PC 400 LC	Groundwater not observed Caving not observed
Surface Elevation (ft) Vertical Datum	136 NAVD88	Latitude Longitude	47.667415 -122.082974	Coordinate System Horizontal Datum	Decimal Degrees WGS84	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
135	1				SM	Brown silty fine to medium sand with gravel and cobbles (medium dense, moist) (fill)			Probe depth = 1 to 2 inches
134	2		1 MC				7		
133	3								
132	4		2 CP						Probe depth = 1 to 2 inches MDD = 137 pcf; OMC = 7%
131	5								
130	6								
129	7								
128	8				SM	Brown silty fine to medium sand with gravel, cobbles and occasional boulders, wood debris (medium dense, moist)			
127	9		3 SA				9	25	
126	10								
125	11								
124	12								
123	13								
122	14								
121	15		4 MC				15	10	

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-9

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-10
Sheet 1 of 1

Date Excavated	12/19/2017	Total Depth (ft)	15	Logged By Checked By	YSC KMS	Excavator Equipment	Northwest Construction Komatsu PC 400 LC	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) Vertical Datum	130 NAVD88			Latitude Longitude	47.667475 -122.083754	Coordinate System Horizontal Datum	Decimal Degrees WGS84	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
130	0				SM	Brown silty fine sand (loose, moist) (fill)			
129	1								
128	2		1 MC				21		
127	3								
126	4		2 MC			Occasional gravel	19		Severe caving observed below 4 feet
125	5								
124	6								
123	7								
122	8								
121	9		3 MC				23		
120	10								
119	11								
118	12				SM	Brown silty fine to medium sand with gravel (medium dense, moist)			
117	13								
116	14								
115	15		4 SA				10	25	

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-10

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-11
Sheet 1 of 1

Date Excavated	12/19/2017	Total Depth (ft)	15	Logged By YSC Checked By KMS	Excavator Northwest Construction Equipment Komatsu PC 400 LC	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) Vertical Datum	122 NAVD88	Latitude Longitude	47.667096 -122.083965	Coordinate System Horizontal Datum	Decimal Degrees WGS84	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
121	1				ML/SM	Brown-gray sandy silt to silty sand (soft to medium stiff, moist to wet) (fill)			Probe depth = 4 to 8 inches
120	2		1 SA				27	59	
119	3								Probe depth = 10 inches
118	4		2						Caving observed at 4 feet
117	5								
116	6								
115	7					Occasional gravel and glass fragments			
114	8		3						
113	9								
112	10					Roots and organic matter			
111	11								
110	12								
109	13								
108	14								
107	15		4						

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-11

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-12
Sheet 1 of 1

Date Excavated 12/19/2017	Total Depth (ft) 7	Logged By YSC Checked By KMS	Excavator Northwest Construction Equipment Komatsu PC 400 LC	Groundwater not observed Caving not observed
Surface Elevation (ft) 128 Vertical Datum NAVD88		Latitude 47.666665 Longitude -122.083945	Coordinate System Decimal Degrees Horizontal Datum WGS84	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
127	1				SM	Brown silty fine to coarse sand with gravel (loose to medium dense, moist) (fill)			
126	2	■	1 MC				11		
125	3				SM	Brown silty fine to medium sand with gravel, roots, old topsoil			
124	4	■	2 SA				11	27	
123	5								
122	6								
121	7	■	3 MC				13		

Refusal on concrete slab at 7 feet

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on GIS Pro. Vertical approximated based on June 2017 site survey by Core Design.

Log of Test Pit TP-12

GeoEngineers

Project: Cadman 12.8-acre Residential Development
Project Location: Redmond, Washington
Project Number: 0643-010-01

Figure A-13
Sheet 1 of 1

APPENDIX B
Laboratory Testing

APPENDIX B
LABORATORY TESTING

Soil samples obtained from the explorations were transported to our laboratory and examined to confirm or modify field classifications, as well as to evaluate index properties of the soil samples. Representative samples were selected for laboratory testing consisting of soil moisture content, percent fines, determination of grain size distribution, and Atterberg limits determination. The tests were performed in general accordance with test methods of the ASTM or other applicable procedures.

Visual Classifications

All soil samples obtained from the explorations were visually classified in the field and/or in our laboratory using a system based on the Unified Soil Classification System (USCS) and ASTM classification methods. ASTM test method D 2488 was used to visually classify the soil samples, while ASTM D 2487 was used to classify the soils based on laboratory tests results. These classification procedures are incorporated in the exploration logs shown in Appendix A.

Moisture Content Testing

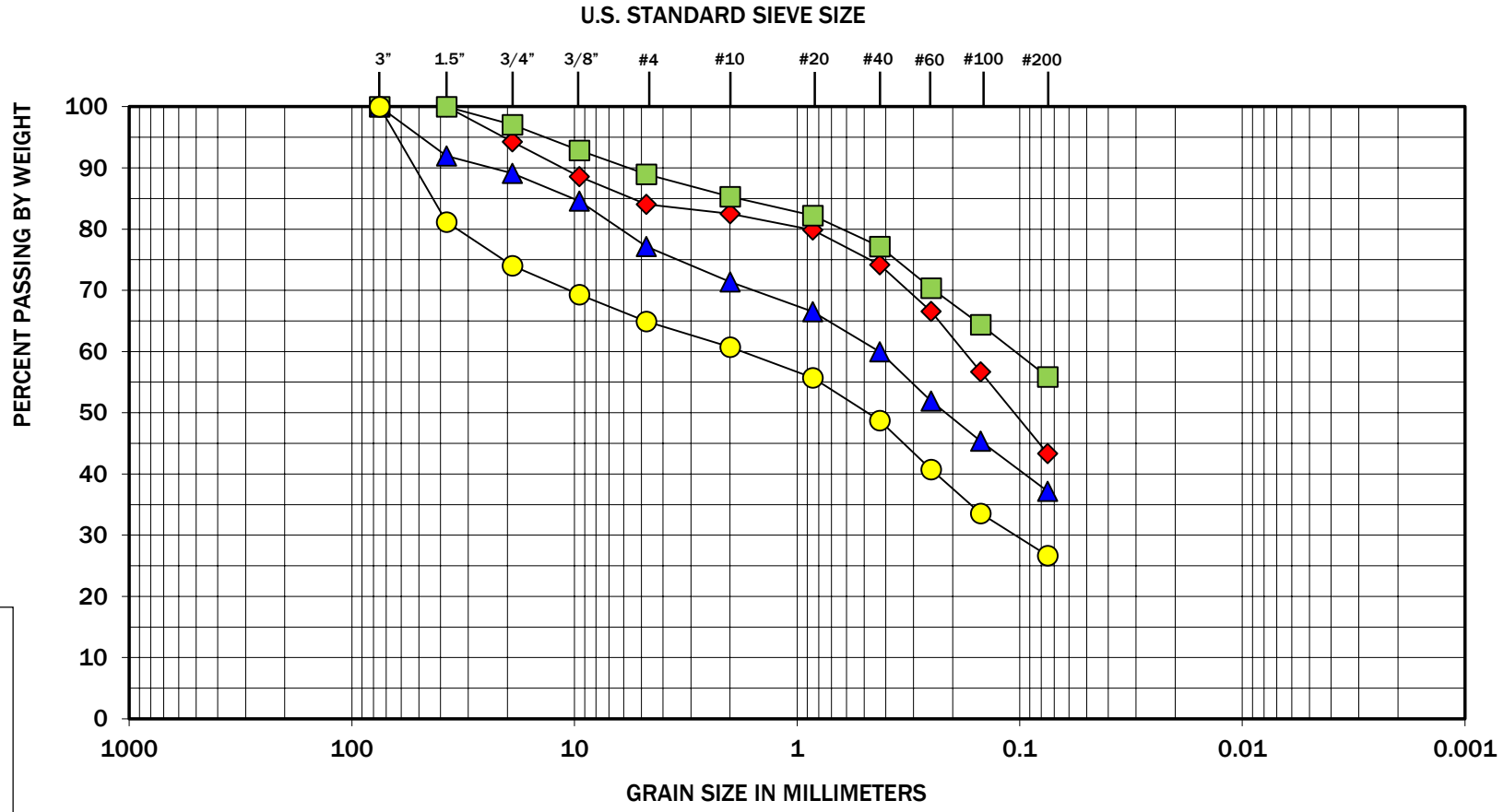
Moisture content tests were completed in general accordance with ASTM D 2216 for representative samples obtained from the explorations. The results of these tests are presented on the exploration logs in Appendix A at the depths at which the samples were obtained.

Grain Size Distribution

Sieve analyses were performed on selected samples in general accordance with ASTM D 422. The wet sieve analysis method was used to estimate the percentage of soil greater than the U.S. No. 200 mesh sieve. The results of the sieve analyses were plotted, classified in general accordance with the USCS, and presented on Figures B-1 through B-3.

Compaction Testing

Compaction tests were completed on selected samples in general accordance with ASTM D 1557 (Modified Proctor 4-point). The compaction testing was used to determine representative values for MDD and optimum moisture content (OMC) of the onsite soils. The results of the compaction tests are shown on the test pit logs in Appendix A and in Figures B-4 through B-7 in Appendix B.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	TP-1	4.5	14	Silty fine sand with gravel (SM)
■	TP-2	2	17	Sandy silt (ML)
▲	TP-3	12	16	Silty fine to medium sand with gravel (SM)
●	TP-4	11	10	Silty fine to medium sand with gravel (SM)

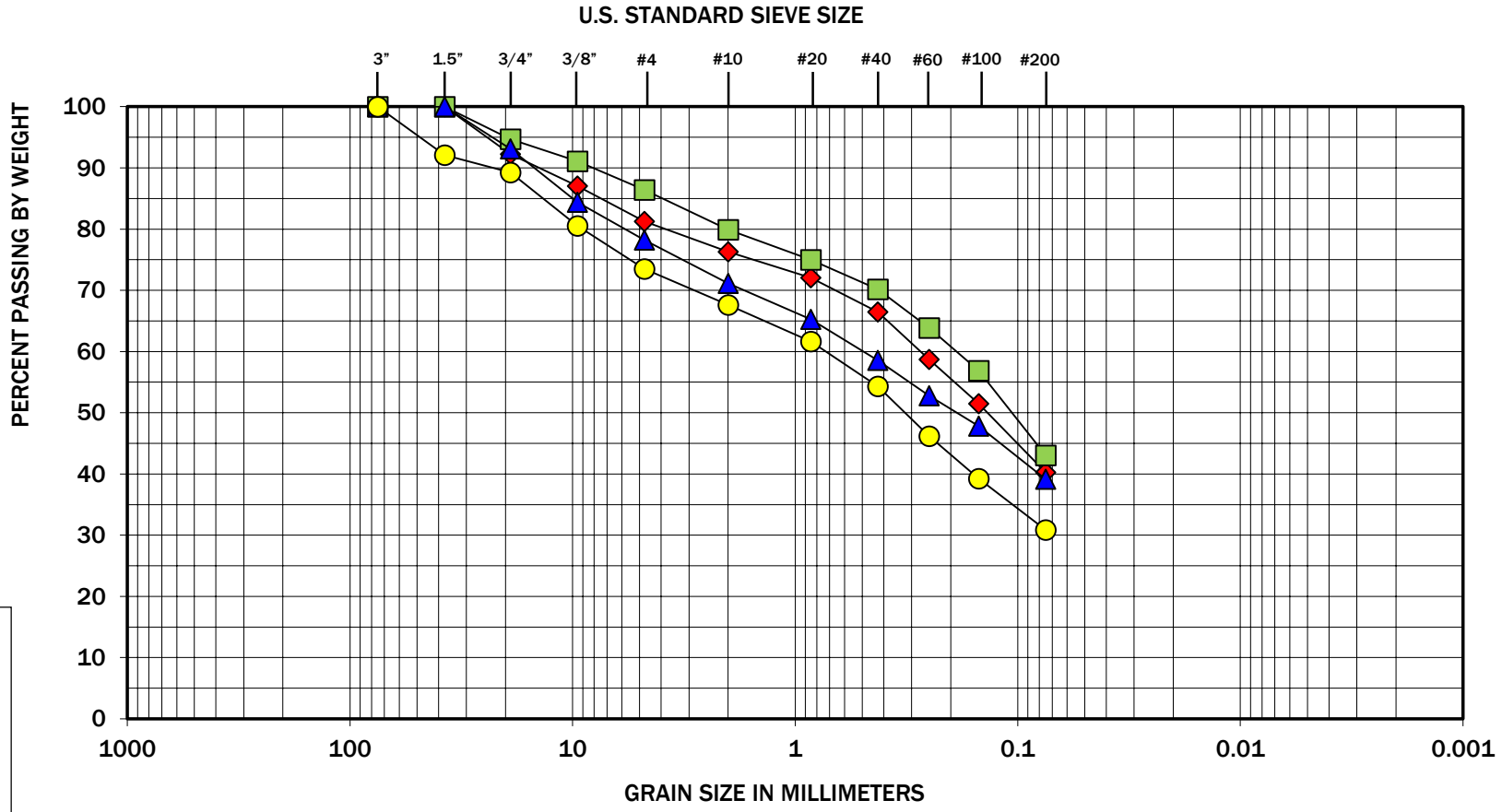
The grain size analysis results were obtained in general accordance with ASTM D 6913.

GeoEngineers

Figure B-1

Cadman 12.8-acre Residential Development
Redmond, Washington

Sieve Analysis Results



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	TP-5	4	16	Silty fine to medium sand with gravel (SM)
■	TP-6	2	16	Silty fine sand (SM)
▲	TP-7	2	14	Silty fine to medium sand with gravel (SM)
●	TP-8	4	11	Silty fine to medium sand with gravel (SM)

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The grain size analysis results were obtained in general accordance with ASTM D 6913.

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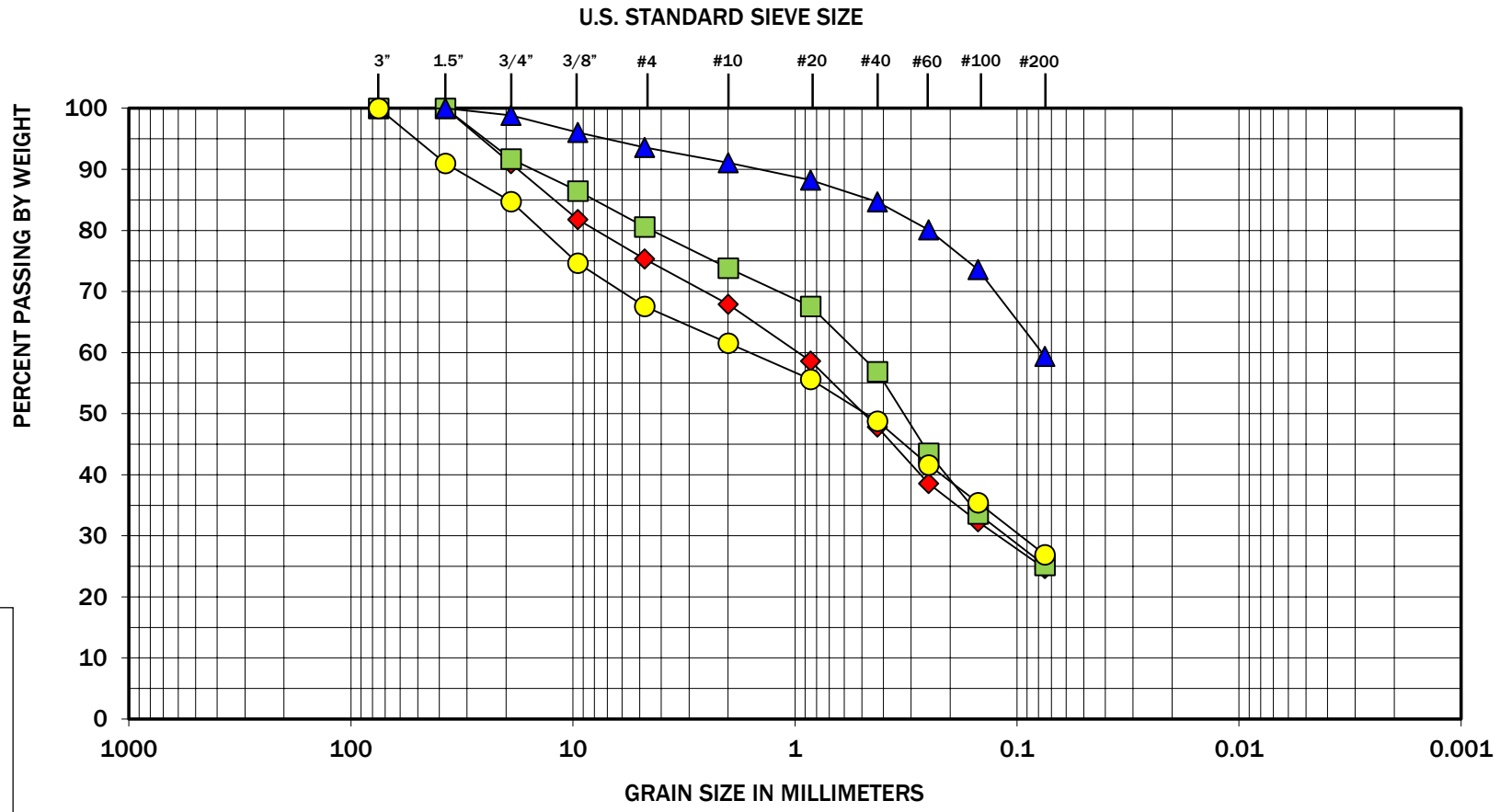
Figure B-2

Cadman 12.8-acre Residential Development
Redmond, Washington

Sieve Analysis Results



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	TP-9	10	9	Silty fine to medium sand with gravel (SM)
■	TP-10	15	10	Silty fine to medium sand with gravel (SM)
▲	TP-11	2	27	Sandy silt (ML)
●	TP-12	4	11	Silty fine to medium sand with gravel (SM)

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The grain size analysis results were obtained in general accordance with ASTM D 6913.

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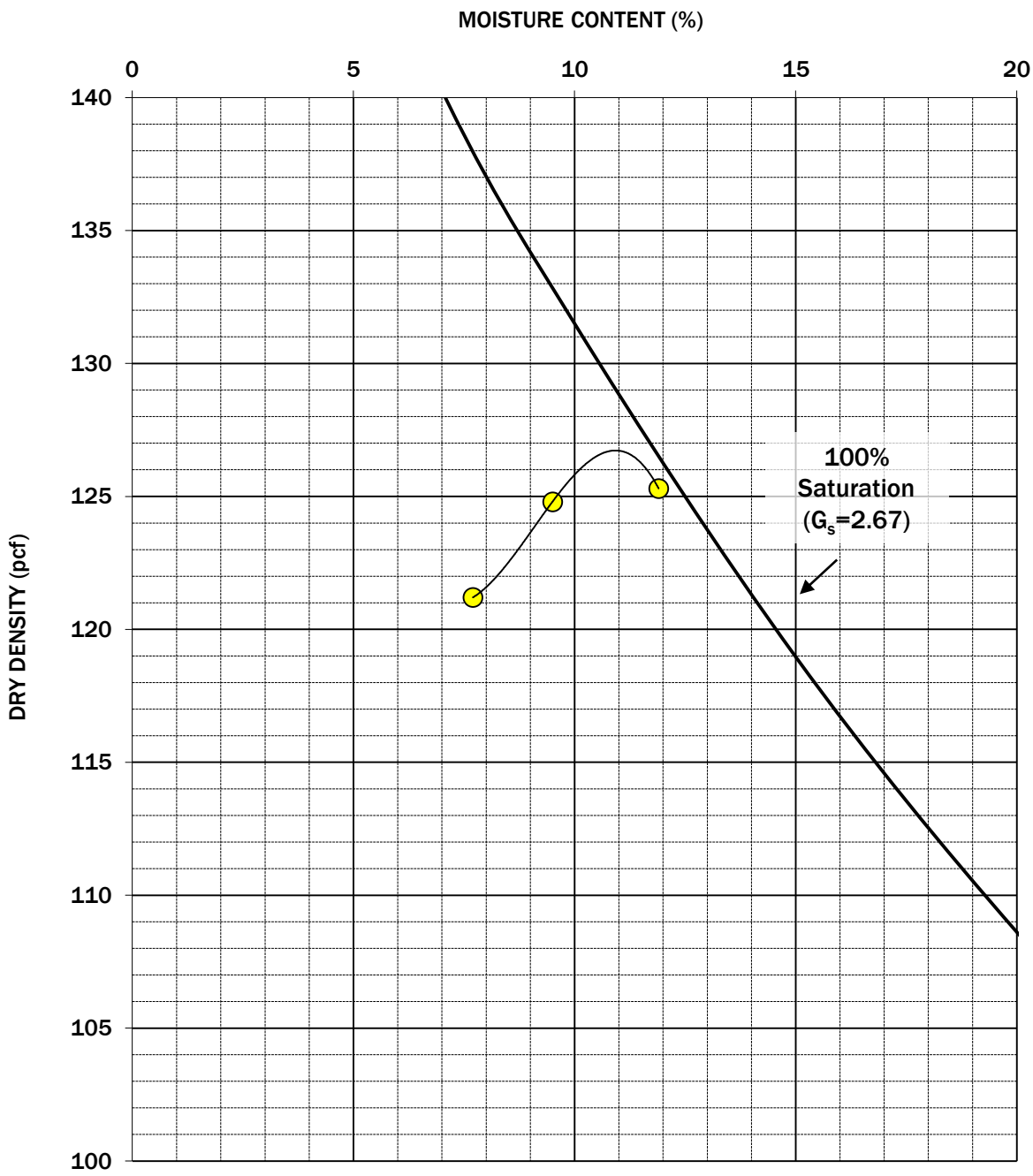
Figure B-3

Cadman 12.8-acre Residential Development
Redmond, Washington

Sieve Analysis Results



Symbol	Boring Number	Depth (feet)	Soil Description	Optimum Moisture (%)	Maximum Dry Density (pcf)
○ Uncorrected	TP-3	4	Silty fine to medium sand with gravel (SM)	10.6	126.7

The Proctor results were obtained in general accordance with ASTM D 1557.

Compaction Test Results

Cadman 12.8-acre Residential Development
Redmond, Washington

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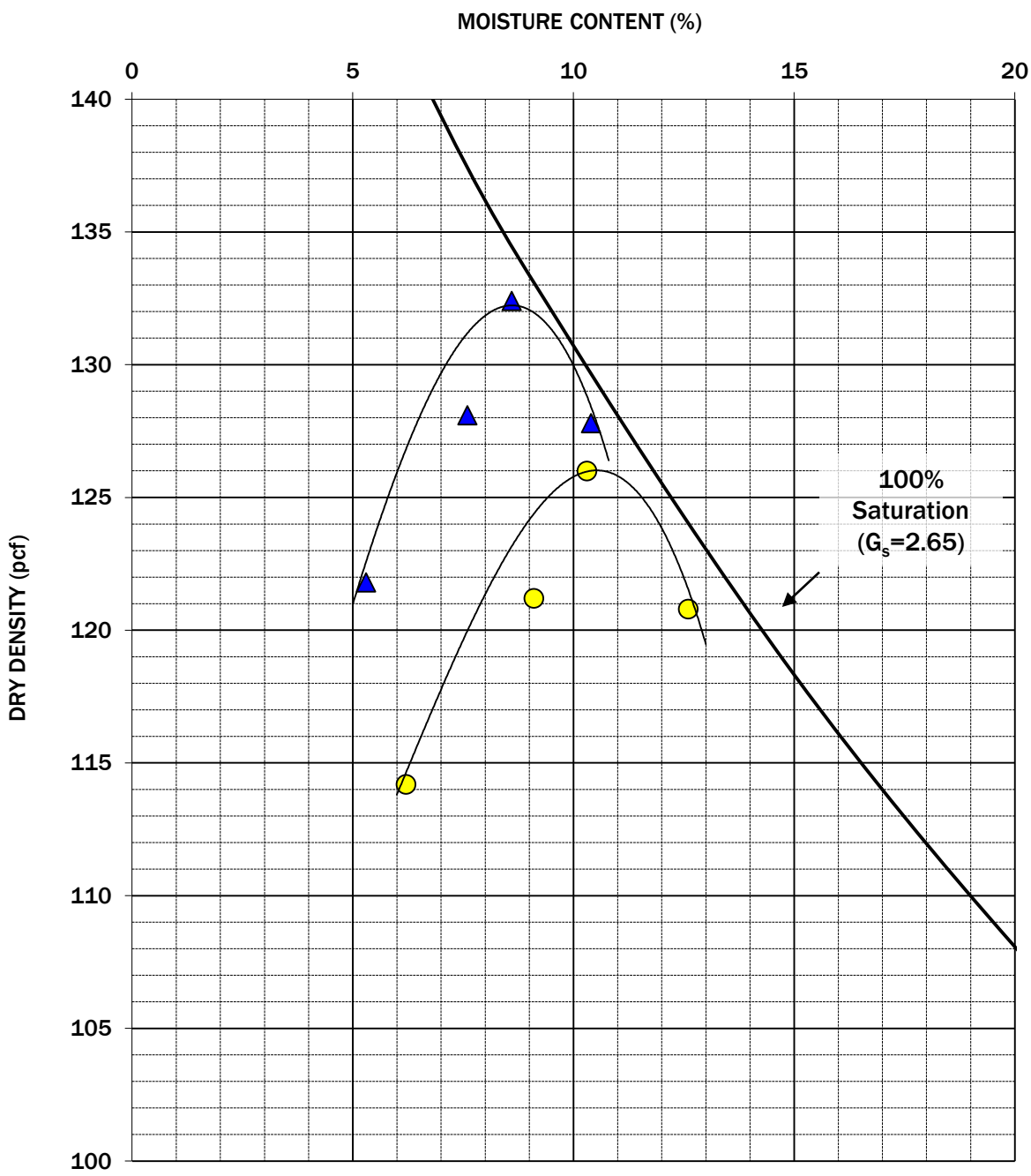
Figure B-4

0643-010-01 Date Exported: 12/22/2017



Symbol	Boring Number	Depth (feet)	Soil Description	Optimum Moisture (%)	Maximum Dry Density (pcf)
▲ Corrected ○ Uncorrected	TP-5	4	Silty fine to medium sand with gravel (SM)	8.6 10.3	132.4 126.0

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The Proctor results were obtained in general accordance with ASTM D 1557.

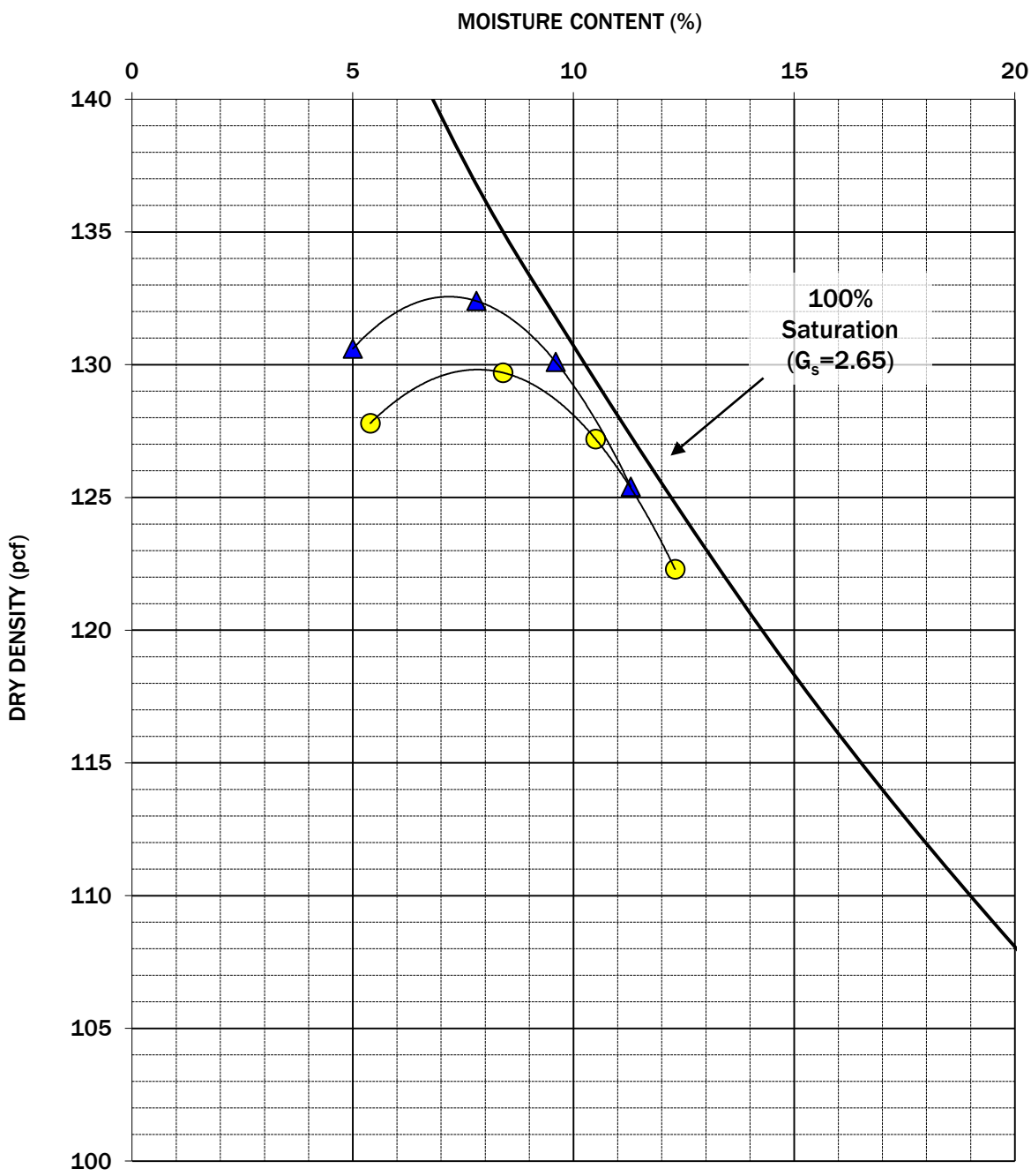
Compaction Test Results

Cadman 12.8-acre Residential Development
Redmond, Washington

GeoEngineers

Figure B-5

0643-010-01 Date Exported: 12/22/2017



Symbol	Boring Number	Depth (feet)	Soil Description	Optimum Moisture (%)	Maximum Dry Density (pcf)
▲ Corrected ○ Uncorrected	TP-8	4	Silty fine to medium sand with gravel (SM)	7.2 7.8	132.7 129.8

The Proctor results were obtained in general accordance with ASTM D 1557.

Compaction Test Results

Cadman 12.8-acre Residential Development
Redmond, Washington

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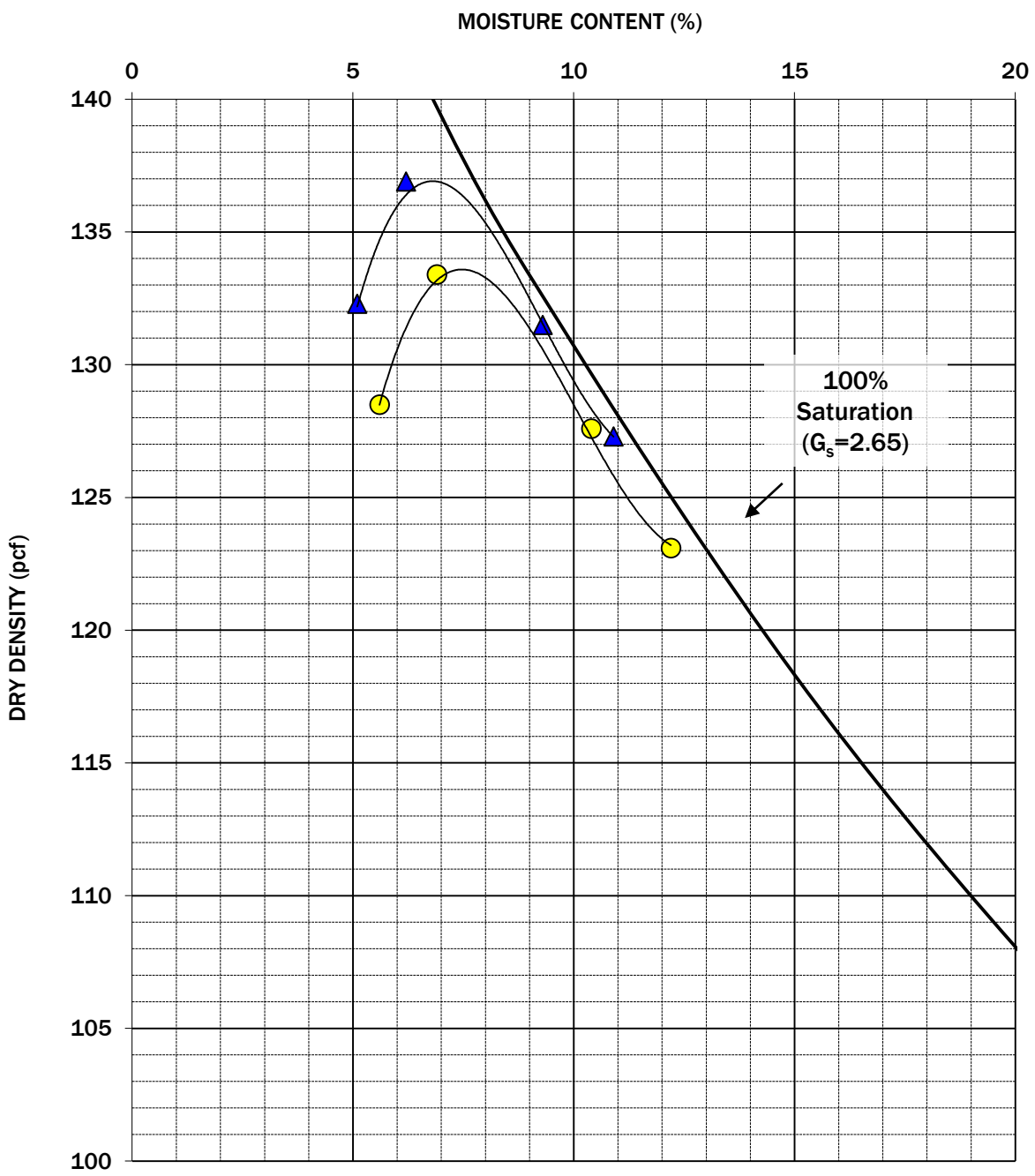
Figure B-6

0643-010-01 Date Exported: 12/22/2017



Symbol	Boring Number	Depth (feet)	Soil Description	Optimum Moisture (%)	Maximum Dry Density (pcf)
▲ Corrected ○ Uncorrected	TP-9	4	Silty fine to medium sand with gravel (SM)	6.5 7.3	136.9 133.4

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The Proctor results were obtained in general accordance with ASTM D 1557.

Compaction Test Results

Cadman 12.8-acre Residential Development
Redmond, Washington

GeoEngineers

Figure B-7

0643-010-01 Date Exported: 12/22/2017

APPENDIX C
Previous Explorations

APPENDIX C
PREVIOUS EXPLORATIONS

We reviewed 10 borings logs (EB-1 through EB-10) completed by Associated Earth Sciences, Inc. in October 2017. The boring logs are included in the section and the approximate locations are shown on Figure 2.

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-1	1 of 1

Project Name: Cadman Property
Location: Redmond, WA
Driller/Equipment: Cascade / Track Rig / Dames & Moore Sampler
Hammer Weight/Drop: 300# / 30"

Ground Surface Elevation (ft): 146.80
Datum: NAVD 88
Date Start/Finish: 10/9/17,10/9/17
Hole Diameter (in): 8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill					
5		S-1		Very moist, grayish brown, sandy, SILT, trace to occasional gravel, occasional organics; massive (ML). **EB-1:5**			8 9 8	▲12*	
10		S-2		Moist, brown, very silty, fine to medium SAND, some wood debris; poor recovery (SM). **EB-1:10**			0 1 1	▲1*	
15		S-3		Very moist, brown to grayish brown, sandy, SILT, some clay, trace gravel, some wood debris (ML). **EB-1:15**			0 0 1	▲0	
20		S-4		As above, minor oxidation staining. Moist, gray, very silty, gravelly, fine SAND, occasional debris (SM). **EB-1:20**			0 11 10	▲14*	
25		S-5		Very moist, brown to grayish brown, sandy, SILT, trace gravel, occasional debris (ML). Moist to very moist, grayish brown, sandy, SILT (ML). **EB-1:25**			0 2 3	▲3*	
30		S-6		Moist, brown, very gravelly, silty, SAND; blowcounts possibly overstated due to gravel in shoe (SM). Becomes SILT, some gravel (ML). **EB-1:30**			20 37 16	▲35*	
				Vashon Lodgement Till					
35		S-7		Moist, brownish gray, very silty, fine to medium SAND, some gravel; unsorted; cemented (SM). **EB-1:35**			7 12 30	▲28*	
40		S-8		As above, gray.			50/5"	▲40*	
				Bottom of exploration boring at 40.5 feet No groundwater encountered. No staining or odor observed unless otherwise noted. PID = 0.0 unless otherwise noted.					
45				*** Blowcounts / 6" shown represent Dames and Moore Sampler. Blows / Foot N-values shown have been converted to estimated SPT equivalent value.**					

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
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AESIBOR 170517 DM CONVERT.GPJ November 7, 2017

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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-2	1 of 1

Project Name: Cadman Property
Location: Redmond, WA
Driller/Equipment: Cascade / Track Rig / Dames & Moore Sampler
Hammer Weight/Drop: 300# / 30"

Ground Surface Elevation (ft): 145.00
Datum: NAVD 88
Date Start/Finish: 10/9/17,10/9/17
Hole Diameter (in): 8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill Cuttings: Moist, brown, very silty, gravelly, fine to medium SAND, scattered wood debris (SM).					
5		S-1		Moist, bluish gray, silty, fine to medium SAND, some gravel, scattered organics and debris; massive (SM). **EB-2:5**			4 6 10	▲11*	
10		S-2		Moist to very moist, bluish gray to brown, silty, fine to medium SAND to sandy, SILT, some gravel, scattered organics and debris; massive (SM-ML). **EB-2:10**			6 10 13	▲15*	
15		S-3		As above. **EB-2:15**			2 2 6	▲6*	
20		S-4		Very moist, brown with areas of gray, sandy, SILT, some gravel, occasional organics (ML). **EB-2:20**			5 7 6	▲8*	
25		S-5		Very moist, bluish gray, sandy, SILT, some gravel, occasional debris; massive (ML). Slightly moist, orangish red (iron oxide staining), silty, gravelly, SAND (SM). **EB-2:25**			5 13 12	▲18*	
				Pre-Fraser Undifferentiated					
30		S-6		Moist, brown, medium SAND, occasional silt lens, trace fine sand, trace silt (SP). **EB-2:30** Moist, brown, very silty, fine SAND, trace gravel, trace coarse sand (SM).			6 9 10	▲13*	
35		S-7		Moist, gray, SILT; massive (ML). Moist, grayish brown, silty, fine to medium SAND, some gravel (SM). **EB-2:35**			14 15 28	▲30*	
40				Bottom of exploration boring at 36.5 feet No groundwater encountered. No staining or odor observed unless otherwise noted. PID = 0.0 unless otherwise noted.					
45				*** Blowcounts / 6" shown represent Dames and Moore Sampler. Blows / Foot N-values shown have been converted to estimated SPT equivalent value.**					

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-3	1 of 1

Project Name: Cadman Property
Location: Redmond, WA
Driller/Equipment: Cascade / Track Rig / Dames & Moore Sampler
Hammer Weight/Drop: 300# / 30"

Ground Surface Elevation (ft): 143.56
Datum: NAVD 88
Date Start/Finish: 10/9/17,10/9/17
Hole Diameter (in): 8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill					
5		S-1		Moist, bluish gray, silty, fine to medium SAND, some gravel, some organics, scattered wood debris (SM). **EB-3:5**			3 2 2	▲3*	
10		S-2		Very moist to wet, gray, very silty, fine to medium SAND, trace gravel, occasional organics (SM). **EB-3:10**			0 0 0	▲0	
15		S-3		Moist, grayish brown, silty, fine to medium SAND, some gravel, scattered organics and wood debris; massive (SM). **EB-3:15**			2 2 2	▲3*	
20		S-4		Very moist, grayish brown with areas of greenish brown, sandy, SILT, some to trace gravel, trace organics, trace wood debris; massive (ML). **EB-3:20**			0 1 2	▲2*	
25		S-5		As above; becomes very sandy (ML-SM). Very moist, dark brown, very sandy, gravelly, SILT to silty, SAND, abundant wood debris; blowcounts likely overstated due to gravel (ML-SM). **EB-3:25**			2 3 13	▲11*	
30		S-6		Very moist, brown, sandy, SILT, some to trace gravel, occasional organics and wood debris (ML). **EB-3:30**			3 4 5	▲7*	
				Pre-Fraser Undifferentiated					
35		S-7		Very moist, grayish brown with minor orange oxide mottling, sandy, SILT to silty, SAND, some to trace gravel; cemented (ML-SM). **EB-3:35**			11 13 18	▲21*	
40		S-8		Very moist, grayish brown, silty, fine SAND, some medium sand, some gravel; cemented; unsorted (SM).			50 50/3"	▲62*	
45				Bottom of exploration boring at 40.8 feet Seepage at 10 feet. No staining or odor observed unless otherwise noted. PID = 0.0 unless otherwise noted.					

*** Blowcounts / 6" shown represent Dames and Moore Sampler. Blows / Foot N-values shown have been converted to estimated SPT equivalent value.**

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-4	1 of 2

Project Name: Cadman Property
Location: Redmond, WA
Driller/Equipment: Cascade / Track Rig / Dames & Moore Sampler
Hammer Weight/Drop: 300# / 30"

Ground Surface Elevation (ft): 142.23
Datum: NAVD 88
Date Start/Finish: 10/10/17,10/10/17
Hole Diameter (in): 8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill					
5		S-1		Moist, grayish brown with oxidation staining , very silty, gravelly, fine to medium SAND, scattered organics; cemented (SM). Moist, bluish gray, very silty, fine to medium SAND to sandy, SILT, trace gravel; massive (SM-ML). **EB-4:5**			3 16 13	▲20*	
10		S-2		Moist to very moist, gray to greenish gray with brownish orange mottling, very sandy, gravelly, SILT, occasional organics and wood debris; massive (ML). **EB-4:10**			15 15 18	▲23*	
15		S-3		As above. Moist, greenish gray, silty, fine to medium SAND, some to trace gravel, scattered organics and wood debris (SM). **EB-4:15**			5 3 1	▲3*	
20		S-4		Moist to very moist, grayish brown with areas of gray, very silty, SAND to sandy, SILT, trace gravel, occasional organics; slightly cemented; unsorted (SM-ML). **EB-4:20**			8 12 11	▲15*	
25		S-5		Moist, grayish brown, silty, SAND, some gravel, occasional organics; slightly cemented; unsorted (SM). **EB-4:25**			7 5 3	▲6*	
30		S-6		Very moist, greenish gray, SILT, trace fine sand, scattered wood debris; massive (ML). **EB-4:30**			7 9 12	▲14*	
35		S-7		As above, becomes sandy, SILT, some gravel (ML). **EB-4:35**			5 12 11	▲15*	
40		S-8		Very moist, greenish gray to brown, sandy, gravelly, SILT, scattered organics, scattered wood debris; unsorted; massive (ML). **EB-4:40**			7 7 10	▲12*	
45		S-9		As above. **EB-4:45**			3 9 17	▲18*	
				Vashon Advance Outwash					

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-4	2 of 2

Project Name: Cadman Property
Location: Redmond, WA
Driller/Equipment: Cascade / Track Rig / Dames & Moore Sampler
Hammer Weight/Drop: 300# / 30"

Ground Surface Elevation (ft): 142.23
Datum: NAVD 88
Date Start/Finish: 10/10/17,10/10/17
Hole Diameter (in): 8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-10		Moist, brown, medium SAND, some to trace fine sand, trace silt interbeds (SP). **EB-4:50**			19 20 25	▲31*	
				Pre-Fraser Undifferentiated					
55		S-11		Very moist, bluish gray, SILT, some to trace clay, occasional dropstones; massive (ML). **EB-4:55**			7 9 13	▲14*	
				Bottom of exploration boring at 56.5 feet No groundwater encountered. No staining or odor observed unless otherwise noted. PID = 0.0 unless otherwise noted.					
60				*** Blowcounts / 6" shown represent Dames and Moore Sampler. Blows / Foot N-values shown have been converted to estimated SPT equivalent value.**					
65									
70									
75									
80									
85									
90									
95									

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-5	1 of 2

Project Name	Cadman Property	Ground Surface Elevation (ft)	146.94
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade / Track Rig / Dames & Moore Sampler	Date Start/Finish	10/10/17,10/10/17
Hammer Weight/Drop	300# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill					
5		S-1		Moist to very moist, brown, SILT, some sand, some clay, trace gravel, scattered organics and wood debris, minor glass debris; massive (ML). **EB-5:5**			1 2 1	▲2*	
10		S-2		Moist, grayish brown, very silty, fine SAND, some gravel; unsorted (SM). **EB-5:10**			6 8 9	▲12*	
15		S-3		Very moist, dark brown, sandy, gravelly, SILT, scattered organics and wood debris; massive (ML). **EB-5:15**			6 7 12	▲13*	
20		S-4		Moist, gray, very sandy, SILT to very silty, SAND, some gravel, scattered organics and wood debris (SM). **EB-5:20**			4 6 7	▲9*	
25		S-5		Moist, dark brown to greenish brown, very silty, fine to medium SAND, some gravel, scattered organics and wood debris (SM). Wet, gray, silty, fine to medium SAND, trace gravel (SM). **EB-5:25**			0 3 3	▲4*	
30		S-6		Wet, gray, very silty, fine to medium SAND, occasional organics and wood debris (SM). **EB-5:30**			0 0 0	▲0	
35		S-7		As above, becomes gravelly. Asphalt lens (1 inch thick), black staining; petroleum odor. **PID = 6.7 ppm** **EB-5:35**			10 10 9	▲13*	
40		S-8		As above, very moist; poor recovery. **EB-5:40**			8 9 9	▲13*	
				Pre-Fraser Undifferentiated					
45		S-9		Moist, greenish gray, sandy, GRAVEL, some silt, occasional silt lens (GP-GM). **EB-5:45**			13 18 19	▲20*	

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

AESIBOR 170517 DM CONVERT.GPJ November 7, 2017

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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-5	2 of 2

Project Name	Cadman Property	Ground Surface Elevation (ft)	146.94
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade / Track Rig / Dames & Moore Sampler	Date Start/Finish	10/10/17,10/10/17
Hammer Weight/Drop	300# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	S-T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-10		Very moist, bluish gray, SILT, some clay; cemented; hard (ML). **EB-5:50**			11 13 15	▲19*	
55		S-11		Moist, bluish gray, very silty, fine SAND, some gravel; cemented/ unsorted (SM).			27 50/5"	▲40*	
				Bottom of exploration boring at 56 feet Seepage 30 to 35 feet. No staining or odor observed unless otherwise noted. PID = 0.0 unless otherwise noted. Temporary well installed - screened from 25 to 35 feet.				
60				*** Blowcounts / 6" shown represent Dames and Moore Sampler. Blows / Foot N-values shown have been converted to estimated SPT equivalent value.**					
65									
70									
75									
80									
85									
90									
95									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-6	1 of 2

Project Name	Cadman Property	Ground Surface Elevation (ft)	140.57
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade / Track Rig / Dames & Moore Sampler	Date Start/Finish	10/11/17,10/11/17
Hammer Weight/Drop	300# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill					
5		S-1		Moist, brown, very fine sandy, SILT, occasional organics and wood debris; massive (ML). As above, some gravel (ML). **EB-6:5**			4 3 4	▲4*	
10		S-2		Very moist, brown with areas of gray, very fine sandy, SILT, trace gravel, occasional organics and wood debris (ML). **EB-6:10**			8 9 9	▲11*	
15		S-3		Wet, gray, very silty, fine to coarse SAND, trace gravel (SM). **EB-6:15**			0 0 0	▲0	
20		S-4		Very moist to wet (water in sampler), grayish brown with minor oxidation staining, very silty, fine to medium SAND, some gravel, scattered organics and wood debris; cemented (SM). **EB-6:20**			12 24 15	▲28*	
25		S-5		Very moist, greenish grayish brown, SILT, some clay, some sand, some gravel, occasional organics and wood debris; massive (ML). **EB-6:25**			0 2 3	▲3*	
30		S-6		Very moist, greenish grayish brown with orange mottling, clayey, SILT, some sand, some gravel, occasional organics (ML). **EB-6:30**			0 2 10	▲7*	
35		S-7		Very moist, greenish gray, fine sandy, SILT to SILT, some fine sand, some gravel, scattered organics and wood debris; unsorted (ML). **EB-6:35**			12 20 32	▲37*	
40		S-8		Very moist, brown, fine sandy, SILT, trace gravel; blowcounts possibly overstated due to gravel in shoe (ML). Moist, bluish grayish brown, very silty, gravelly, fine to medium SAND (SM). **EB-6:40**			18 50/6"	▲57*	
				Weathered Pre-Fraser Undifferentiated					
45		S-9		Moist, grayish brown, medium to coarse SAND, some gravel, trace silt; pulverized rock; blowcounts possibly overstated due to gravel in shoe (SP). **EB-6:45**			18 50/6"	▲57*	
				Pre-Fraser Undifferentiated					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-6	2 of 2

Project Name: Cadman Property
Location: Redmond, WA
Driller/Equipment: Cascade / Track Rig / Dames & Moore Sampler
Hammer Weight/Drop: 300# / 30"

Ground Surface Elevation (ft): 140.57
Datum: NAVD 88
Date Start/Finish: 10/11/17,10/11/17
Hole Diameter (in): 8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-10		As above. Very moist, brown, very silty, fine SAND to sandy SILT, some gravel; unsorted; cemented (SM-ML).			33 21 23	▲32*	
55		S-11		Very moist to moist, gray, fine to medium SAND, some silt to silty, some gravel (SP-SM).			21 26 24	▲35*	
60				Bottom of exploration boring at 56.5 feet Seepage 15 to 20 feet. No staining or odor observed unless otherwise noted. PID = 0.0 unless otherwise noted. Temporary well installed - screened from 13 to 23 feet.					
65				*** Blowcounts / 6" shown represent Dames and Moore Sampler. Blows / Foot N-values shown have been converted to estimated SPT equivalent value.**					
70									
75									
80									
85									
90									
95									

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

AESIBOR 170517 DM CONVERT.GPJ November 7, 2017

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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-7	1 of 2

Project Name: Cadman Property
Location: Redmond, WA
Driller/Equipment: Cascade / Track Rig / Dames & Moore Sampler
Hammer Weight/Drop: 300# / 30"

Ground Surface Elevation (ft): 139.83
Datum: NAVD 88
Date Start/Finish: 10/11/17,10/11/17
Hole Diameter (in): 8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill					
5		S-1		Moist, greenish grayish brown, very silty, fine to medium SAND, some to trace gravel, scattered organics and wood debris (SM). **EB-7:5**			13 16 17	▲24*	
10		S-2		Moist, grayish brown, very silty, fine to medium SAND, some gravel, scattered organics and wood debris (SM). **EB-7:10**			12 20 25	▲33*	
15		S-3		As above. **EB-7:15**			6 11 11	▲15*	
20		S-4		Moist to very moist, greenish gray, very silty, fine SAND to sandy, SILT, some to trace gravel, occasional organics and wood debris (SM-ML). **EB-7:20**			4 5 7	▲7*	
25		S-5		No recovery.			8 10 10	▲14*	
30		S-6		Moist, grayish brown, very silty, fine SAND, some to trace gravel, occasional organics and wood debris (SM). **EB-7:30**			11 15 16	▲21*	
35		S-7		Very moist, greenish grayish brown with minor oxidation staining, very sandy, SILT, some gravel, scattered organics and wood debris; unsorted (ML). **EB-7:35**			4 4 5	▲6*	
40		S-8		Moist to very moist, grayish brown, silty, fine to medium SAND, some gravel, occasional wood debris; unsorted; massive (SM). **EB-7:40**			3 4 5	▲6*	
45		S-9		As above, very moist. Very moist, greenish grayish brown, very sandy, SILT, some gravel, some organics and wood debris; massive (ML). **EB-7:45**			5 15 14	▲20*	
				Vashon Lodgement Till					

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-7	2 of 2

Project Name: Cadman Property
Location: Redmond, WA
Driller/Equipment: Cascade / Track Rig / Dames & Moore Sampler
Hammer Weight/Drop: 300# / 30"

Ground Surface Elevation (ft): 139.83
Datum: NAVD 88
Date Start/Finish: 10/11/17,10/11/17
Hole Diameter (in): 8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-10		Very moist, grayish brown, silty, fine to medium SAND, some gravel; unsorted; slightly cemented (SM). **EB-7:50**			20 50/6"	▲57*	
				Pre-Fraser Undifferentiated					
55		S-11		Wet, grayish brown, medium to coarse SAND, some silt, trace gravel (SP-SM).			16 21 30	▲36*	
				Bottom of exploration boring at 56.5 feet No groundwater encountered. No staining or odor observed unless otherwise noted. PID = 0.0 unless otherwise noted.					
60				*** Blowcounts / 6" shown represent Dames and Moore Sampler. Blows / Foot N-values shown have been converted to estimated SPT equivalent value.**					
65									
70									
75									
80									
85									
90									
95									

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

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Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-8	1 of 2

Project Name: Cadman Property
Location: Redmond, WA
Driller/Equipment: Cascade / Track Rig / Dames & Moore Sampler
Hammer Weight/Drop: 300# / 30"

Ground Surface Elevation (ft): 141.00
Datum: NAVD 88
Date Start/Finish: 10/11/17,10/11/17
Hole Diameter (in): 8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill					
5		S-1		Moist, gray, very silty, gravelly, fine SAND, scattered organics and wood debris; massive (SM). **EB-8:5**			2 2 2	▲3*	
10		S-2		As above, becomes brownish gray (SM). **EB-8:10**			15 15 19	▲22*	
15		S-3		Moist, gray, fine to medium SAND, trace silt, occasional organics (SP). **EB-8:15**			0 0 0	▲0	
20		S-4		Very moist, gray to brown, fine to medium SAND, some silt to silty, trace gravel, occasional organics (SM). **EB-8:20**			0 0 0	▲0	
25		S-5		Wet, greenish grayish brown, very silty, fine to medium SAND, some gravel, scattered organics and wood debris, minor waste debris (SM). Becomes very moist. **EB-8:25**			9 9 12	▲14*	
30		S-6		Very moist to wet (water in spoon), brownish gray with slight oxidation staining, sandy, SILT, trace gravel, scattered organics and wood debris (ML). **EB-8:30**			1 2 4	▲4*	
35		S-7		Moist, gray, very silty, fine to medium SAND, trace gravel, occasional organics (SM). **EB-8:35**			4 6 8	▲7*	
40		S-8		Moist to very moist, grayish brown, very silty, fine to coarse SAND, some gravel; abundant wood debris (SM). Moist to very moist, grayish brown, very silty, fine to medium SAND, some gravel; slightly cemented (SM). **EB-8:40**			5 10 10	▲14*	
				Pre-Fraser Undifferentiated					
45		S-9		Very moist, greenish dark gray with slight oxidation staining, SILT, some sand, trace clay, trace gravel, minor organics and wood debris (ML). **EB-8:45**			5 8 11	▲13*	

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

AESIBOR 170517 DM CONVERT.GPJ November 7, 2017

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-8	2 of 2

Project Name	Cadman Property	Ground Surface Elevation (ft)	141.00
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade / Track Rig / Dames & Moore Sampler	Date Start/Finish	10/11/17,10/11/17
Hammer Weight/Drop	300# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-10		Very moist, greenish gray, medium to coarse SAND, some silt, trace gravels; cemented (SP-SM).			33 34 40	▲46*	
55		S-11		Wet, gray, very gravelly, medium to coarse SAND (SP).		▼	20 11 12	▲15*	
				Slightly moist, greenish brown, SILT, some clay, trace gravel, minor organics; hard (ML).					
60				Bottom of exploration boring at 56.5 feet Groundwater at 55 feet. Seepage at 25 feet. No staining or odor observed unless otherwise noted. PID = 0.0 unless otherwise noted.					
65				*** Blowcounts / 6" shown represent Dames and Moore Sampler. Blows / Foot N-values shown have been converted to estimated SPT equivalent value.**					
70									
75									
80									
85									
90									
95									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

AESIBOR 170517 DM CONVERT.GPJ November 7, 2017

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-9	1 of 2

Project Name	Cadman Property	Ground Surface Elevation (ft)	145.46
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade / Track Rig / Dames & Moore Sampler	Date Start/Finish	10/12/17,10/12/17
Hammer Weight/Drop	300# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill					
5		S-1		Moist, brown, very fine sandy, SILT, trace coarse sand, occasional fine gravel (ML). **EB-9:5**			2 2 3	▲3*	
10		S-2		As above, brown with pockets of gray. **EB-9:10**			0 1 1	▲1*	
15		S-3		Very moist, brownish gray, very sandy, SILT, some fine to coarse gravel, occasional organics and wood debris, minor waste debris (ML). **EB-9:15**			4 2 3	▲3*	
20		S-4		Very moist, gray to brownish gray, very silty, fine SAND to sandy, SILT, some to trace gravel; unsorted; massive (SM-ML). **EB-9:20**			5 6 9	▲10*	
25		S-5		Moist to very moist, bluish gray, silty, gravelly, medium SAND, some fine and coarse sand, occasional wood debris (SM). **EB-9:25**			10 12 16	▲14*	
30		S-6		Very moist, gray to brownish gray, very sandy, SILT, occasional fine to coarse gravel, occasional organics and wood debris (ML). **EB-9:30**			3 2 3	▲3*	
35		S-7		Very moist, grayish brown, sandy, SILT, some clay, trace gravel; massive (ML). **EB-9:35**			0 0 0	▲0	
40		S-8		As above.			0 0 0	▲0	
45		S-9		Very moist, brownish gray, very sandy, SILT, some fine to coarse gravel (ML). Asphalt debris. **EB-9:45**			1 2 1	▲2*	

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

AESIBOR 170517 DM CONVERT.GPJ November 7, 2017

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-9	2 of 2

Project Name	Cadman Property	Ground Surface Elevation (ft)	145.46
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade / Track Rig / Dames & Moore Sampler	Date Start/Finish	10/12/17,10/12/17
Hammer Weight/Drop	300# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-10		Very moist, gray, very sandy, gravelly, SILT; unsorted (ML).			4 5 5	▲7*	
				Pre-Fraser Undifferentiated					
55		S-11		Moist, gray, very sandy, gravelly, SILT; unsorted; slightly cemented (ML).			7 7 9	▲11*	
60		S-12		Moist, greenish gray, silty, gravelly, SAND (SM).			8 10 17	▲22*	
				Bottom of exploration boring at 61.5 feet No groundwater encountered. No staining or odor observed unless otherwise noted. PID = 0.0 unless otherwise noted.					
65				*** Blowcounts / 6" shown represent Dames and Moore Sampler. Blows / Foot N-values shown have been converted to estimated SPT equivalent value.**					
70									
75									
80									
85									
90									
95									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

AESIBOR 170517 DM CONVERT.GPJ November 7, 2017

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-10	1 of 2

Project Name	Cadman Property	Ground Surface Elevation (ft)	137.98
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade / Track Rig / Dames & Moore Sampler	Date Start/Finish	10/17/17,10/17/17
Hammer Weight/Drop	300# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill					
5		S-1		Moist, brown, SILT, some fine sand, trace gravel, minor waste debris (glass) (ML). **EB-10:5**			5 4 5	▲6*	
10		S-2		Moist to very moist, grayish brown, silty, fine to medium SAND, some gravel, scattered wood debris; massive; blowcounts overstated due to gravel (SM). **EB-10:10**			50/6"	▲57*	
15		S-3		Moist to very moist, grayish brown, silty, fine to medium SAND, some gravel; poor recovery; blowcounts overstated due to gravel in shoe (SM). **EB-10:15**			13 18 23	▲26*	
20		S-4		Very moist, grayish brown with slight oxidation staining, silty, fine to medium SAND to sandy, SILT, some gravel, occasional pocket of green clay, occasional organics (SM-ML). **EB-10:20**			10 8 20	▲19*	
25		S-5		As above, SILT, scattered wood debris and twigs (ML). **EB-10:25**			10 10 8	▲13*	
30		S-6		Moist to very moist, bluish gray to brownish gray, silty, fine to medium SAND, some gravel; abundant wood debris, scattered organics; unsorted; massive (SM). **EB-10:30**			10 9 10	▲13*	
35		S-7		As above. Becomes bluish gray, occasional organics, no wood. **EB-10:35**			8 6 9	▲10*	
40		S-8		Moist, bluish gray, very sandy, SILT, some gravel, organics, occasional organics and wood debris; unsorted; massive (ML). **EB-10:40**			3 5 6	▲8*	
45		S-9		As above, abundant wood debris (ML). **EB-10:45**			8 10 50	▲42*	
				Pre-Fraser Undifferentiated Moist, bluish gray, fine to medium SAND, some gravel, some silt; unsorted; cemented (SP-SM).					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

AESIBOR 170517 DM CONVERT.GPJ November 7, 2017

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
170517E001	EB-10	2 of 2

Project Name: Cadman Property
Location: Redmond, WA
Driller/Equipment: Cascade / Track Rig / Dames & Moore Sampler
Hammer Weight/Drop: 300# / 30"

Ground Surface Elevation (ft): 137.98
Datum: NAVD 88
Date Start/Finish: 10/17/17,10/17/17
Hole Diameter (in): 8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-10		Moist, greenish gray, fine to coarse SAND, some to trace gravel, some to trace silt; slightly cemented (SP).			18 20 25	▲34*	
				Bottom of exploration boring at 51.5 feet No groundwater encountered. No staining or odor observed unless otherwise noted. PID = 0.0 unless otherwise noted.					
55				*** Blowcounts / 6" shown represent Dames and Moore Sampler. Blows / Foot N-values shown have been converted to estimated SPT equivalent value.**					
60									
65									
70									
75									
80									
85									
90									
95									

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: KMA
Approved by: JHS

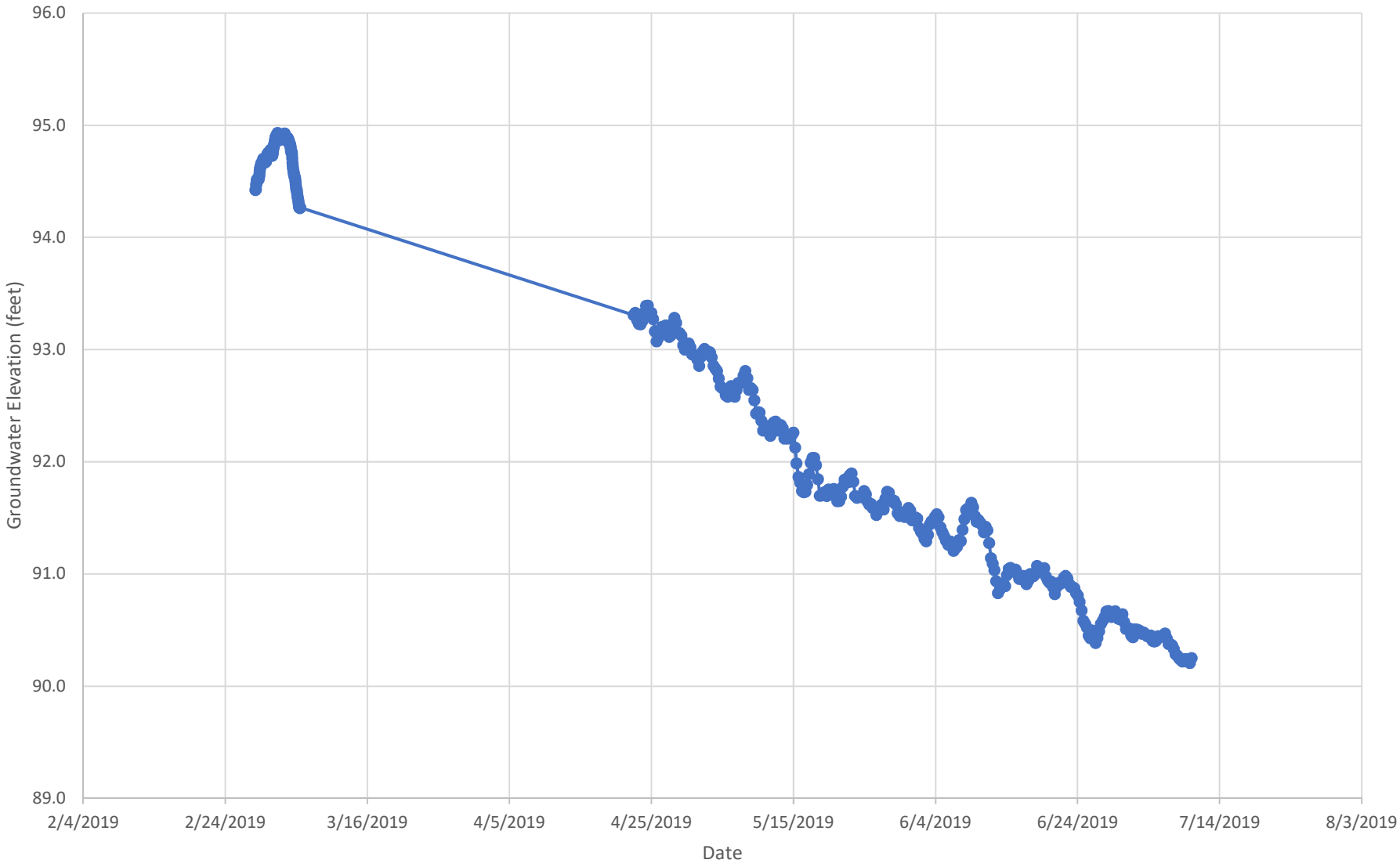
AESIBOR 170517 DM CONVERT.GPJ November 7, 2017

APPENDIX D

APPENDIX D

GROUNDWATER DATA

Groundwater data collected from the vibrating wire piezometer installed in boring B-11 is presented in this appendix.



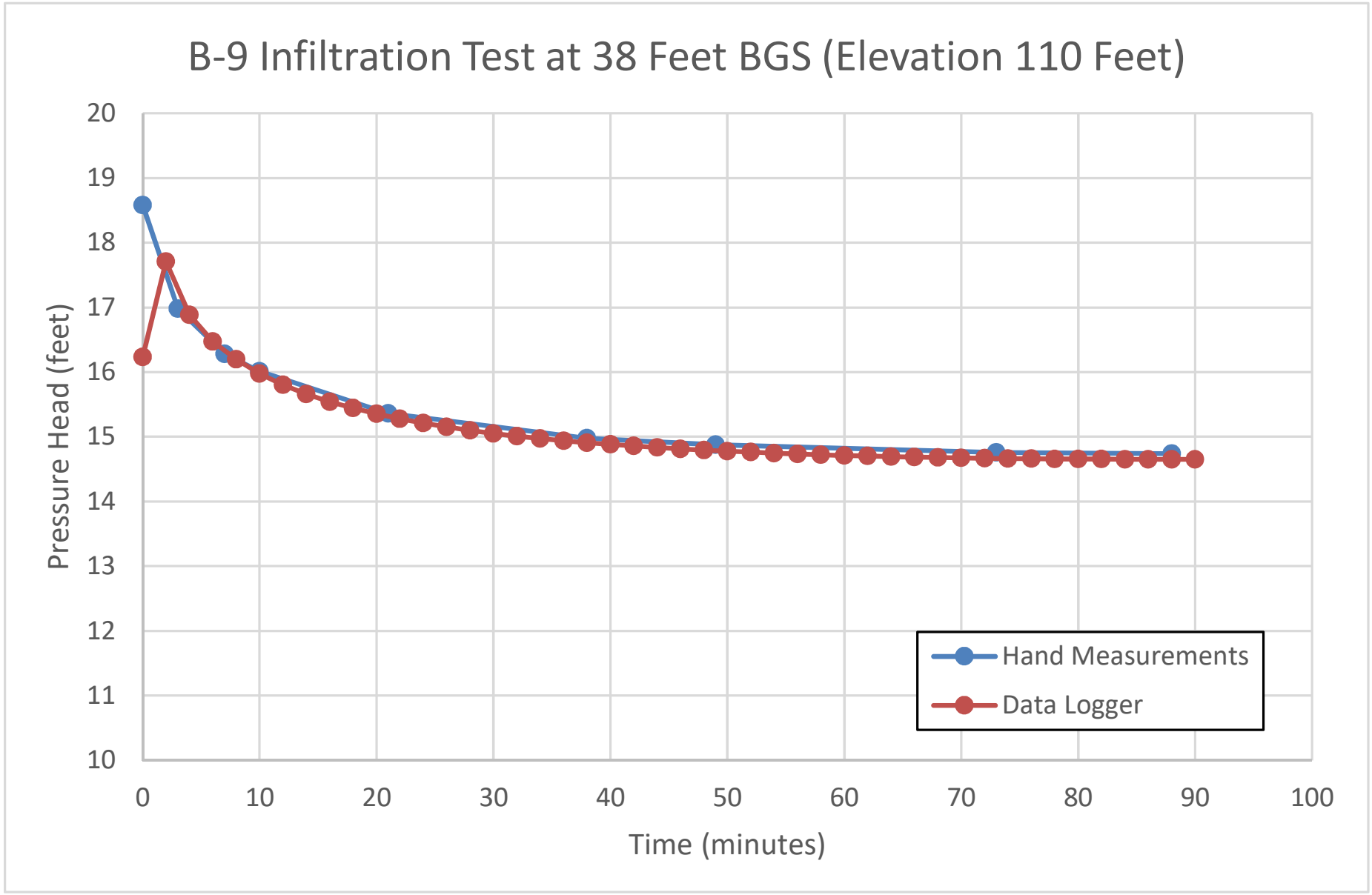
GeoDesign Inc an NV5 company	POLYGON-161-01	**GROUNDWATER READINGS**	
	OCTOBER 2019	WOODSIDE REDMOND, WA	**FIGURE D-1**

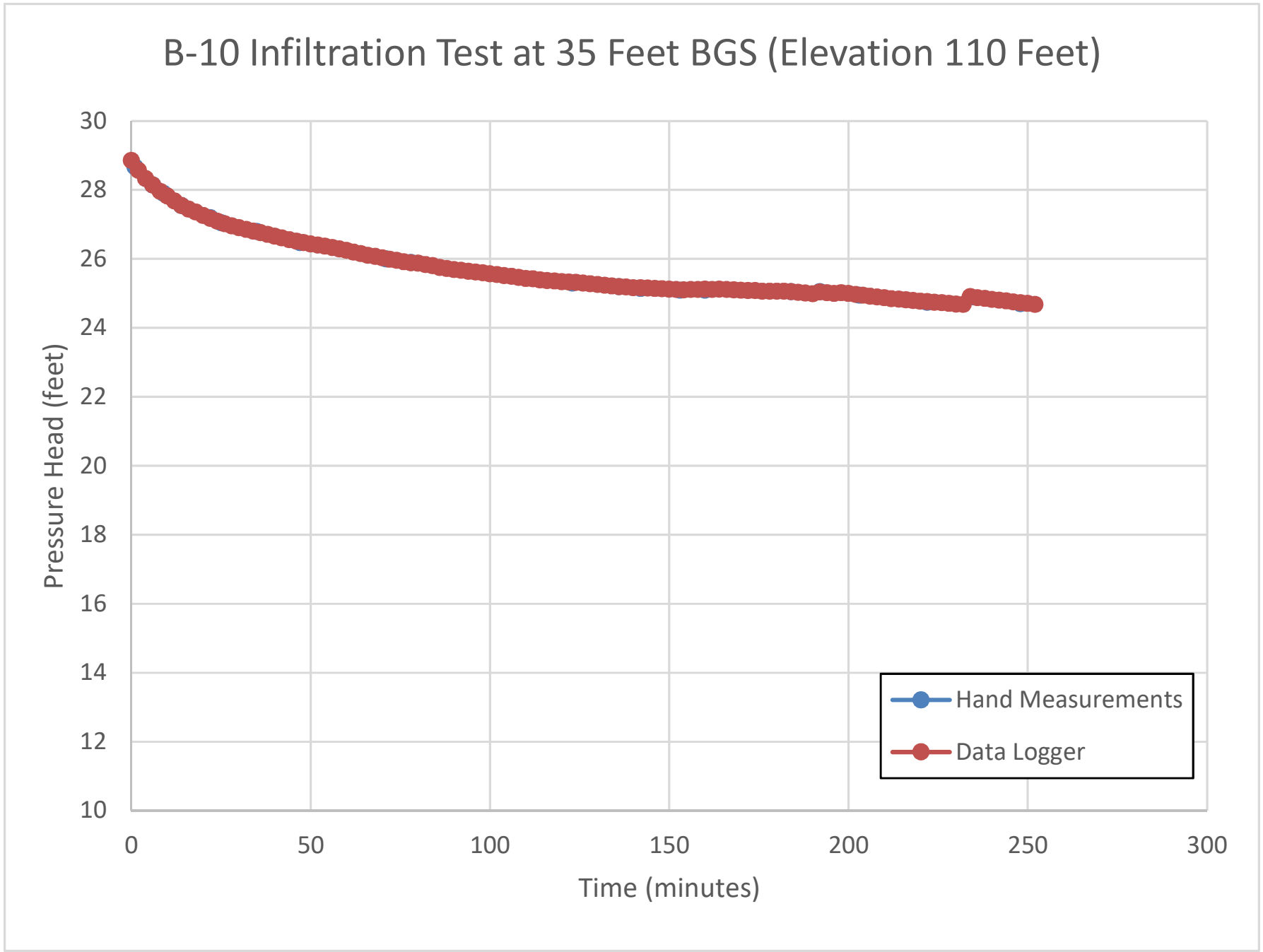
APPENDIX E

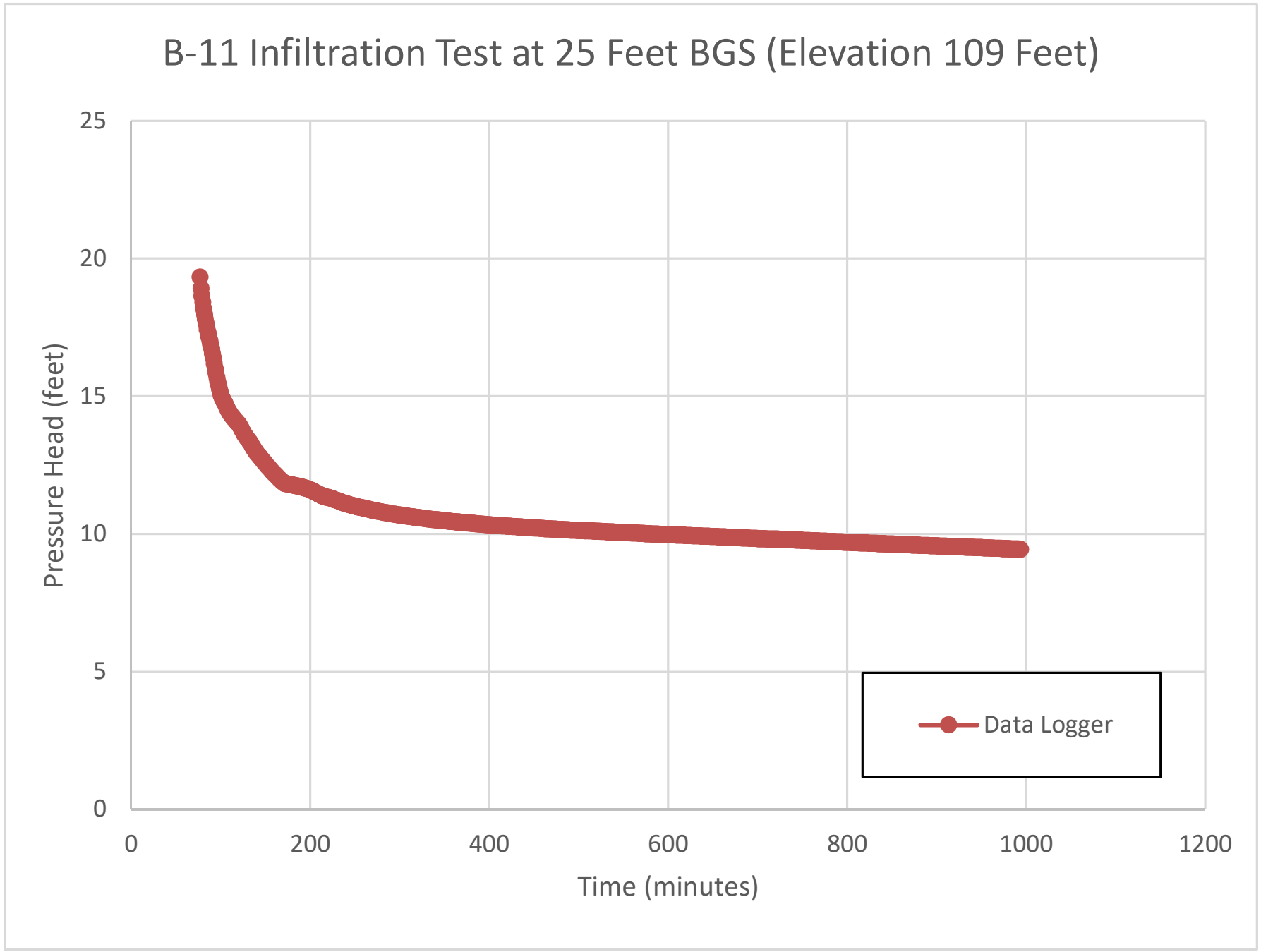
APPENDIX E

INFILTRATION TEST RESULTS

Plots of our infiltration test results are presented in this appendix.


B-9 Infiltration Test at 38 Feet BGS (Elevation 110 Feet)
Pressure Head (feet)
20
19
18
17
16
15
14
13
12
11
10
0
10
20
30
40
50
60
70
80
90
100
Time (minutes)
Hand Measurements
Data Logger


B-10 Infiltration Test at 35 Feet BGS (Elevation 110 Feet)
Pressure Head (feet)
30
28
26
24
22
20
18
16
14
12
10
0
50
100
150
200
250
300
Time (minutes)
Hand Measurements
Data Logger


B-11 Infiltration Test at 25 Feet BGS (Elevation 109 Feet)
Pressure Head (feet)
25
20
15
10
5
0
0
200
400
600
800
1000
1200
Time (minutes)
Data Logger

APPENDIX F

APPENDIX F

AERIAL PHOTOGRAPHS OF THE EAST SLOPE

Aerial photographs of the man-made east slope are presented in this appendix.

CADMAN SITE EAST SLOPE AERIAL PHOTOS

Photo 1: 2002 site aerial photo.

Photo 2: 2005 site aerial photo. Earthwork expands to the east.

Photo 3: 2006 site aerial photo. Filling takes place on the east edge of the property.

Photo 4: 2007 site aerial photo. Appear to be outfalls or drains installed on the slope.

Photo 5: 2011 site aerial photo. Note small landslide on the new slope.

Photo 6: 2018 site aerial photo. Vegetation has grown on the new slope.

APPENDIX G

APPENDIX G

GRADING PLANS

The proposed grading plans for this project are presented in this appendix.

NE 1/4, SE 1/4, SEC. 7, TWP. 25 N., RGE. 6 E., W.M.

SCALE: 1" = 40'

0 20 40 80

MATCH LINE. SEE SHEET C3.00-A

5' WIDE SOUND ATENUATION BERM TO BE RELOCATED/CONSTRUCTED BY CADMAN.

EXISTING CONTOUR (TYP.)

PROPOSED CONTOUR (TYP.)

N.E. 70TH ST. (PUBLIC)

182ND AVE N.E. /ROAD 'A' (PUBLIC)

ROAD 'A' (PRIVATE)

ROAD 'B' (PRIVATE)

ROAD 'C' (PRIVATE)

ROAD 'D' (PRIVATE)

ROAD 'E' (PRIVATE)

ROAD 'F' (PRIVATE)

ROAD 'G' (PRIVATE)

ROAD 'H' (PRIVATE)

ROAD 'I' (PRIVATE)

PROPOSED 2:1 SLOPE (TYP.)

PROPOSED 2:1 SLOPE (TYP.)

KEYSTONE WALL (TYP.)

1.0' HIGH

OUTER 25% WETLAND BUFFER (TYP.)

1.9' HIGH

1.0' HIGH

APPROXIMATE 150' WETLAND BUFFER (TYP.)

TREE TO BE RETAINED (TYP.)

TREE TO BE REMOVED (TYP.)

STORM VAULT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

LEGEND

128	EXISTING 2' CONTOUR
130	EXISTING 10' CONTOUR
128	PROPOSED 2' CONTOUR
130	PROPOSED 10' CONTOUR
	KEYSTONE WALL

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

UNDERGROUND LOCATOR SERVICE
CALL BEFORE YOU DIG!
811

APPROVED FOR CONSTRUCTION

FOR: Director of Public Works

City of Redmond

Date: _____

Plan Chk Engr: _____

Storm: _____

Utility: _____

Fire: _____

Trans/Engr: _____

Planning: _____

This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.

NO.	REVISIONS	DATE
1	PREP. ROUND 2	2/20/19
2	PREP. ROUND 3	6/14/19

6-13-2019

CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING

CORE DESIGN

12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

PLN_____-

OVERALL GRADING PLAN
WOODSIDE

POLYGON WLH, L.L.C.
11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

DATE	NOVEMBER 9, 2018
DESIGNED	G.R.S., P.E.
DRAWN	L.G.WIGHT
APPROVED	G.R.S.

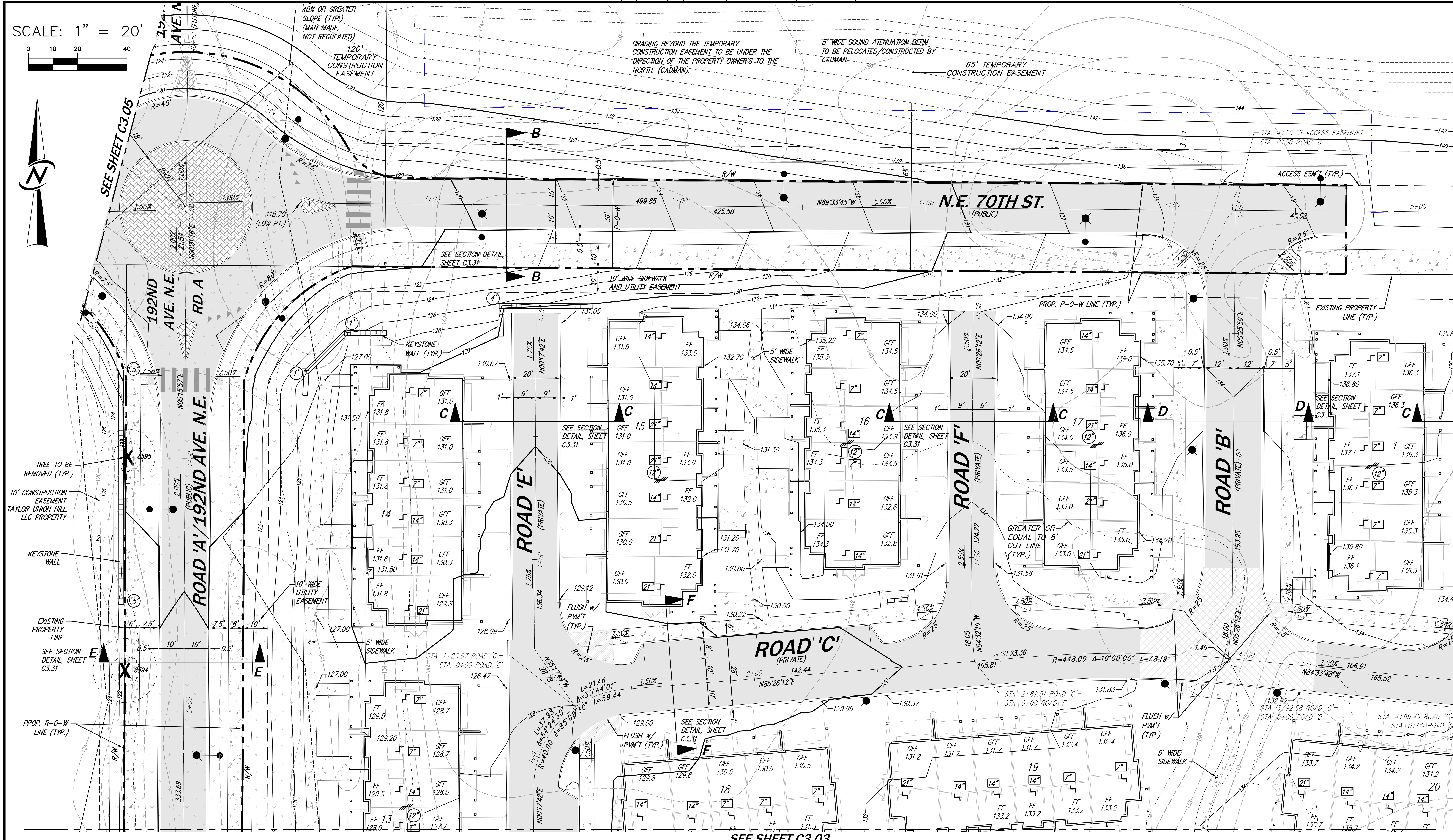
GARY R. SHARNBROICH, P.E.
PROJECT MANAGER

SHEET C3.00 OF

PROJECT NUMBER 18122

X:\2018\18122\Engineering\Civil\Sheets\18122 C3.00.dwg, 6/14/2019 7:33:19 AM, DWG To PDF.pc3, 30.0 IW

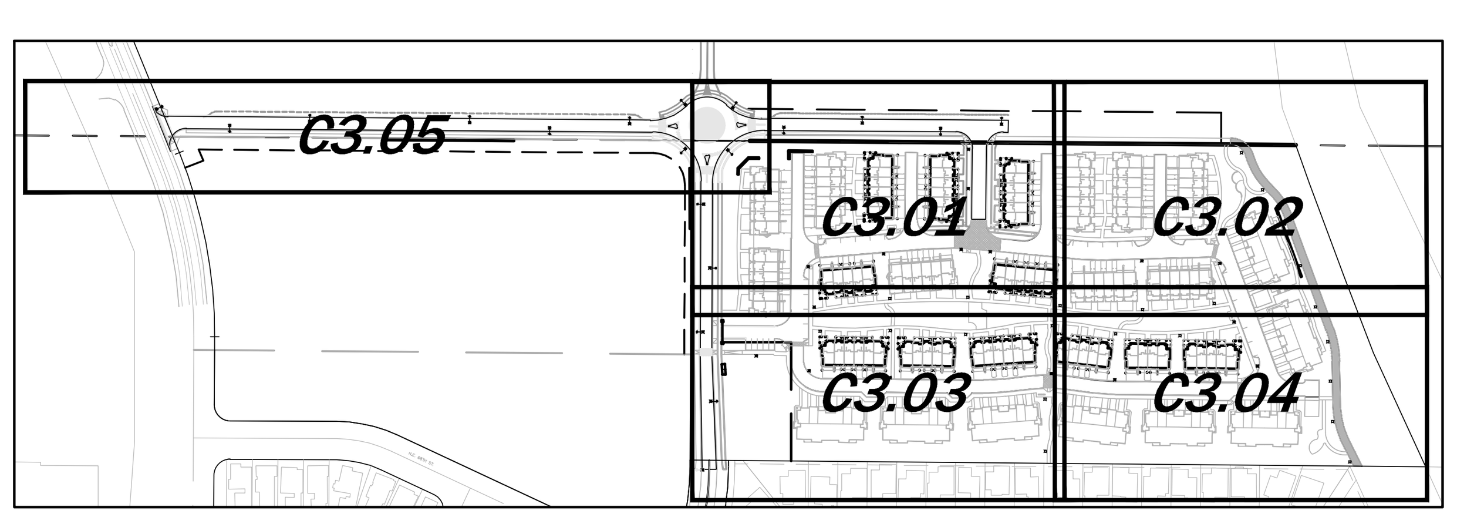
NE 1/4, SE 1/4, SEC. 7, TWP. 25 N., RGE. 6 E., W.M.



NOTE: 20' ACCESS EASEMENT OVER ALL PRIVATE ROADS.

NOTE: ALL CURB RAMPS SHALL BE ADA COMPLIANT.

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.



KEY MAP

1" = 300'

GENERAL LEGEND

PROPOSED

	VERTICAL CURB	150.50 FF	FINISHED FLOOR ELEVATION
	ROLLED CURB	150.20 GFF	GARAGE FLOOR ELEVATION @ GARAGE DOOR
	ASPHALT PAVEMENT	12"	GRADE CHANGE BETWEEN ADJACENT UNITS
	CONCRETE SIDEWALK/DRIVEWAY	14"	GRADE STEP FROM FINISHED FLOOR TO GARAGE
	KEYSTONE/BLOCK WALL		
120	FINISH GRADE CONTOUR		
120	EXISTING GRADE CONTOUR		

UNDERGROUND LOCATOR SERVICE
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APPROVED FOR CONSTRUCTION

FOR: Director of Public Works

City of Redmond

Date: ____

Plan Chk Engr: ____
Storm: ____
Utility: ____
Fire: ____
Trans/Engr: ____
Planning: ____

This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.

NO.	REVISIONS	DATE
1	PREP ROUND 2	2/20/19
2	PREP ROUND 3	6/14/19

GARY R. SHARNBROICH, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER — 6-13-2019

CORE DESIGN
CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING
12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

GRADING PLAN
WOODSIDE

POLYGON WLH, L.L.C.
11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

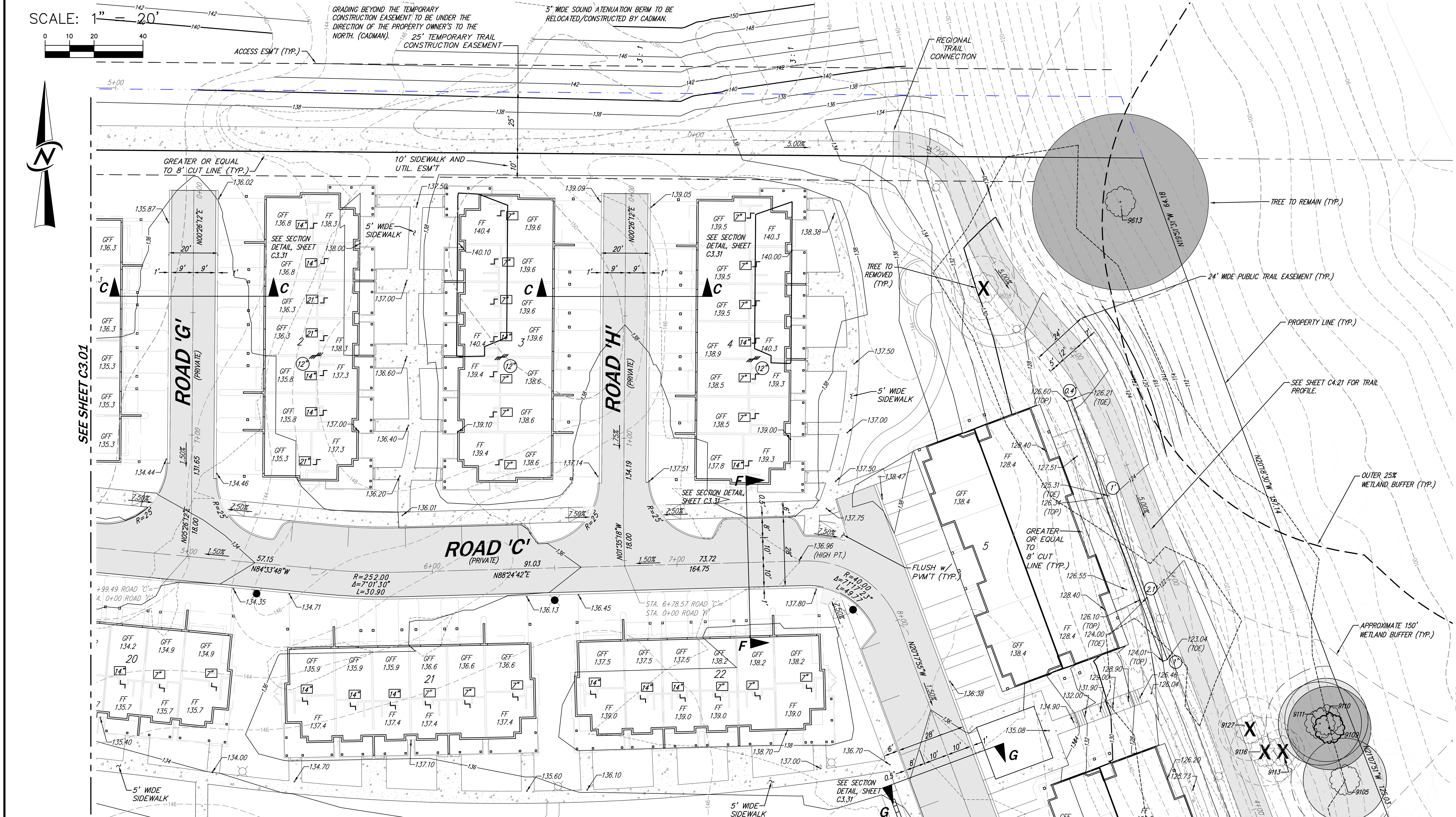
DATE	NOVEMBER 9, 2018
DESIGNED	G.R.S., P.E.
DRAWN	L.G.WIGHT
APPROVED	G.R.S.
	GARY R. SHARNBROICH, P.E. PROJECT MANAGER

SHEET C3.01 OF

PROJECT NUMBER 18122

NE 1/4, SE 1/4, SEC. 7, TWP. 25 N., RGE. 6 E., W.M.

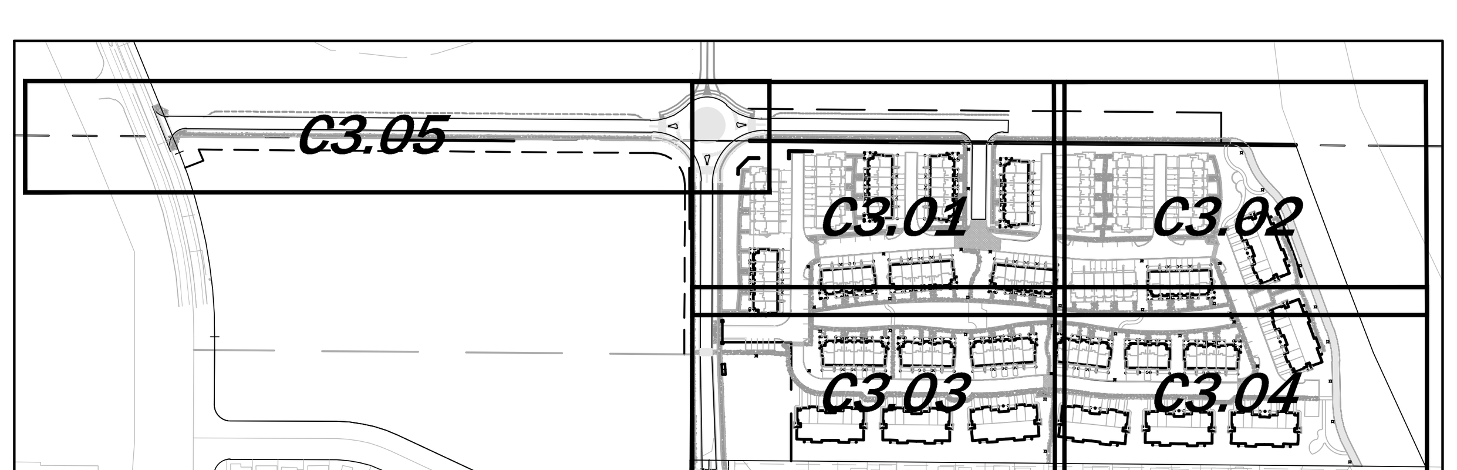
SCALE: 1" = 20'



NOTE: 20' ACCESS EASEMENT OVER ALL PRIVATE ROADS.

NOTE: ALL CURB RAMPS SHALL BE ADA COMPLIANT.

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.



KEY MAP

1" = 300'

GENERAL LEGEND

PROPOSED

VERTICAL CURB	
ROLLED CURB	
ASPHALT PAVEMENT	
CONCRETE SIDEWALK/DRIVEWAY	
KEYSTONE/BLOCK WALL	
120	FINISH GRADE CONTOUR
120	EXISTING GRADE CONTOUR
150.50 FF	FINISHED FLOOR ELEVATION
150.20 GFF	GARAGE FLOOR ELEVATION @ GARAGE DOOR
12"	GRADE CHANGE BETWEEN ADJACENT UNITS
14"	GRADE STEP FROM FINISHED FLOOR TO GARAGE

UNDERGROUND LOCATOR SERVICE
CALL BEFORE YOU DIG!
811

APPROVED FOR CONSTRUCTION

FOR: Director of Public Works

City of Redmond

Date:

Plan Chk Engr:
Storm:
Utility:
Fire:
Trans/Engr:
Planning:

This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.

NO.	REVISIONS	DATE
1	PREP ROUND 2	2/20/19
2	PREP ROUND 3	6/14/19

6-12-2019

CORE DESIGN
CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING
12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

GRADING PLAN
WOODSIDE
POLYGON WLH, L.L.C.
11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

DATE	NOVEMBER 9, 2018
DESIGNED	G.R.S., P.E.
DRAWN	L.G.WIGHT
APPROVED	G.R.S.
	GARY R. SHARNBROICH, P.E. PROJECT MANAGER

SHEET C3.02 OF

PROJECT NUMBER 18122

NE 1/4, SE 1/4, SEC. 7, TWP. 25 N., RGE. 6 E., W.M.

SCALE: 1" = 20'

0 10 20 40

SEE SHEET C3.01

SEE SHEET C3.04

ROAD 'A' / 192ND AVE. N.E. (PUBLIC)

ROAD 'C' (PRIVATE)

ROAD 'I' (PRIVATE)

ROAD 'D' (PRIVATE)

STA. 3+20.19 ROAD 'A' = STA. 0+00 ROAD 'I'

STA. 1+42.14 ROAD 'I' = STA. 0+00 ROAD 'C' = STA. 0+00 ROAD 'D'

10' CONSTRUCTION EASEMENT TAYLOR UNION HILL, LLC PROPERTY

10' CONSTRUCTION EASEMENT CITY OF REDMOND PROPERTY

R/W

5' WIDE SIDEWALK

GREATER OR EQUAL TO 8' CUT LINE (TYP.)

STROBE ACTIVATED GATE.

RAISED CROSSWALK PER C.O.R. STD. DTL. NO. 479.

40% OR GREATER SLOPE (TYP.) (MAN MADE, NOT REGULATED)

10' WIDE UTILITY EASEMENT

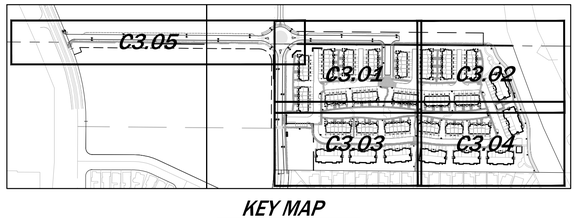
TREE TO BE REMOVED. (TYP.)

STORM DETENTION VAULT (PRIVATE)

STORM EASEMENT TO CITY FOR REDMOND

STORM DETENTION VAULT (PUBLIC)

SEE SECTION DETAIL, SHEET C3.31



KEY MAP
1" = 300'

GENERAL LEGEND

PROPOSED

- VERTICAL CURB / ROLLED CURB
- ASPHALT PAVEMENT
- CONCRETE SIDEWALK/DRIVEWAY
- KEYSTONE/BLOCK WALL
- 120 FINISH GRADE CONTOUR
- 120 EXISTING GRADE CONTOUR
- 150.50 FF — FINISHED FLOOR ELEVATION
- 150.20 GFF — GARAGE FLOOR ELEVATION @ GARAGE DOOR
- (12") — GRADE CHANGE BETWEEN ADJACENT UNITS
- (14") — GRADE STEP FROM FINISHED FLOOR TO GARAGE

NOTE: 20' ACCESS EASEMENT OVER ALL PRIVATE ROADS.

NOTE: ALL CURB RAMPS SHALL BE ADA COMPLIANT.

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

UNDERGROUND LOCATOR SERVICE
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811

APPROVED FOR CONSTRUCTION

FOR: Director of Public Works

City of Redmond

Date: _____

Plan Chk Engr: _____

Storm: _____

Utility: _____

Fire: _____

Trans/Engr: _____

Planning: _____

This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.

NO.	REVISIONS	DATE
1.	PREP. ROUND 2	2/20/19
2.	PREP. ROUND 3	6/14/19

6-12-2019

CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING

CORE DESIGN

12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

GRADING PLAN
WOODSIDE

POLYGON WLH, L.L.C.

11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

PLN_____-

DATE	NOVEMBER 9, 2018
DESIGNED	G.R.S., P.E.
DRAWN	L.G. WIGHT
APPROVED	G.R.S.

GARY R. SHAHNBROICH, P.E.
PROJECT MANAGER

SHEET C3.03 OF

PROJECT NUMBER 18122

J:\2018\18122\Engineering\final\sheets\18122 C3.01-C3.05.dwg 6/14/2019 1:48:55 AM, EDWG To PDF.pc3 - 1.05.DWG

SCALE: 1" = 20'

0 10 20 40

SEE SHEET C3.02

SEE SHEET C3.03

ROAD 'C' (PRIVATE)

ROAD 'D' (PRIVATE)

GREATER OR EQUAL TO 8' CUT LINE (TYP.)

SEE SECTION DETAIL, SHEET C3.31

TREE TO REMOVED (TYP.)

40% OR GREATER SLOPE (TYP.) (MAN MADE, NOT REGULATED)

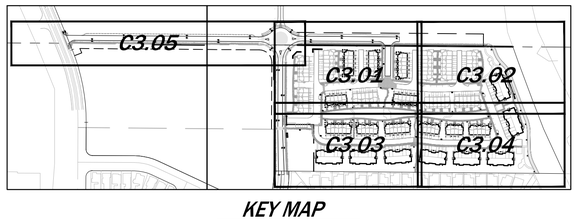
OUTER 25% WETLAND BUFFER (TYP.)

PROPERTY LINE (TYP.)

SEE SHEET C4.21 FOR TRAIL PROFILE.

24' WIDE PUBLIC TRAIL EASEMENT.

TREE TO REMAIN (TYP.)



KEY MAP

1" = 300'

GENERAL LEGEND

PROPOSED

- VERTICAL CURB
- ROLLED CURB
- ASPHALT PAVEMENT
- CONCRETE SIDEWALK/DRIVEWAY
- KEYSTONE/BLOCK WALL
- 120 FINISH GRADE CONTOUR
- 120 EXISTING GRADE CONTOUR
- 150.50 FF FINISHED FLOOR ELEVATION
- 150.20 GFF GARAGE FLOOR ELEVATION @ GARAGE DOOR
- (12") GRADE CHANGE BETWEEN ADJACENT UNITS
- (14") GRADE STEP FROM FINISHED FLOOR TO GARAGE

NOTE: 20' ACCESS EASEMENT OVER ALL PRIVATE ROADS.

NOTE: ALL CURB RAMPS SHALL BE ADA COMPLIANT.

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

UNDERGROUND LOCATOR SERVICE
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APPROVED FOR CONSTRUCTION

FOR: Director of Public Works

City of Redmond

Date: _____

Plan Chk Engr: _____
Storm: _____
Utility: _____
Fire: _____
Trans/Engr: _____
Planning: _____

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NO.	REVISIONS	DATE
1.	PREP. ROUND 2	2/20/19
2.	PREP. ROUND 3	6/14/19

6-13-2019

CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING

CORE DESIGN

12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

GRADING PLAN WOODSIDE

POLYGON WLH, L.L.C.

11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

DATE	NOVEMBER 9, 2018
DESIGNED	G.R.S., P.E.
DRAWN	L.G. WIGHT
APPROVED	G.R.S.

GARY R. SHARNBROICH, P.E.
PROJECT MANAGER

SHEET C3.04 OF

PROJECT NUMBER 18122

SCALE: 1" = 20'

0 10 20 40

5' WIDE SOUND ATENUATION BERM TO BE RELOCATED/CONSTRUCTED BY CADMAN.

GRADING BEYOND THE TEMPORARY CONSTRUCTION EASEMENT TO BE UNDER THE DIRECTION OF THE PROPERTY OWNER'S TO THE NORTH. (CADMAN).

GREATER OR EQUAL TO 8' CUT LINE (TYP.)

80' TEMPORARY CONSTRUCTION EASEMENT

5' WIDE SOUND ATENUATION BERM TO BE RELOCATED/CONSTRUCTED BY CADMAN.

40% OR GREATER SLOPE (TYP.) (MAN MADE, NOT REGULATED)

120' TEMPORARY CONSTRUCTION EASEMENT

MATCH LINE

N.E. 70TH ST. (PUBLIC)

192ND AVE. N.E. (PUBLIC)

192ND AVE. N.E. (FUTURE)

RD. A

8+76.39 NE 70TH ST.
0+00 ROAD 'A'

EDGE OF PVM'T

EXTRUDED CURB

843.89

118.70 (LOW PT.)

127.00

KEYSTONE WALL

PROPOSED R-O-W (TYP.)

20' WIDE CONSTRUCTION ESM'T

SEE SECTION DETAIL, SHEET C3.31

SEE SHEET C3.01

GRADING BEYOND THE TEMPORARY CONSTRUCTION EASEMENT TO BE UNDER THE DIRECTION OF THE PROPERTY OWNER'S TO THE NORTH. (CADMAN).

GREATER OR EQUAL TO 8' CUT LINE (TYP.)

140' TEMPORARY CONSTRUCTION EASEMENT

80' TEMPORARY CONSTRUCTION EASEMENT

STORM EASEMENT TO CITY OF REDMOND

SEE SHEET C4.32 FOR DETENTION POND DETAILS.

188TH AVE NE

N.E. 70TH ST. (PUBLIC)

106.57 (LOW PT.)

N89°33'45"W 1.15%

N67°43'44"E 32.50

R=25'

EDGE OF PVM'T

EXTRUDED CURB

2.40%

MATCH LINE

PROPOSED R-O-W (TYP.)

20' WIDE CONSTRUCTION ESM'T

SEE SECTION DETAIL, SHEET C3.31

KEY MAP
1" = 300'

C3.05 C3.01 C3.02 C3.03 C3.04

GENERAL LEGEND

EXISTING

- MONUMENT
- CATCH BASIN TYPE 1
- SEWER MANHOLE
- WATER VALVE
- WATER METER
- LIGHT POLE
- JUNCTION BOX
- POWER VAULT
- SIGN
- 120 EXISTING GRADE CONTOUR

PROPOSED

- VERTICAL CURB
- ROLLED CURB
- ASPHALT PAVEMENT
- CONCRETE SIDEWALK/DRIVEWAY
- KEYSTONE/BLOCK WALL
- 120 FINISH GRADE CONTOUR

NOTE: 20' ACCESS EASEMENT OVER ALL PRIVATE ROADS.

NOTE: ALL CURB RAMPS SHALL BE ADA COMPLIANT.

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

APPROVED FOR CONSTRUCTION

FOR: Director of Public Works

City of Redmond

Date: _____

Plan Chk Engr: _____
Storm: _____
Utility: _____
Fire: _____
Trans/Engr: _____
Planning: _____

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NO.	REVISIONS	DATE
1	PREP. ROUND 2	2/20/19
2	PREP. ROUND 3	6/14/19

SHARNBROICH, CARY R. 18122 REGISTERED PROFESSIONAL ENGINEER
6-12-2019

CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING

CORE DESIGN

12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

PLN ____-____

GRADING PLAN
WOODSIDE

POLYGON WLH, L.L.C.

11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

DATE	NOVEMBER 9, 2018
DESIGNED	G.R.S., P.E.
DRAWN	L.G.WIGHT
APPROVED	G.R.S.

CARY R. SHARNBROICH, P.E.
PROJECT MANAGER

SHEET C3.05 OF

PROJECT NUMBER 18122

APPENDIX H

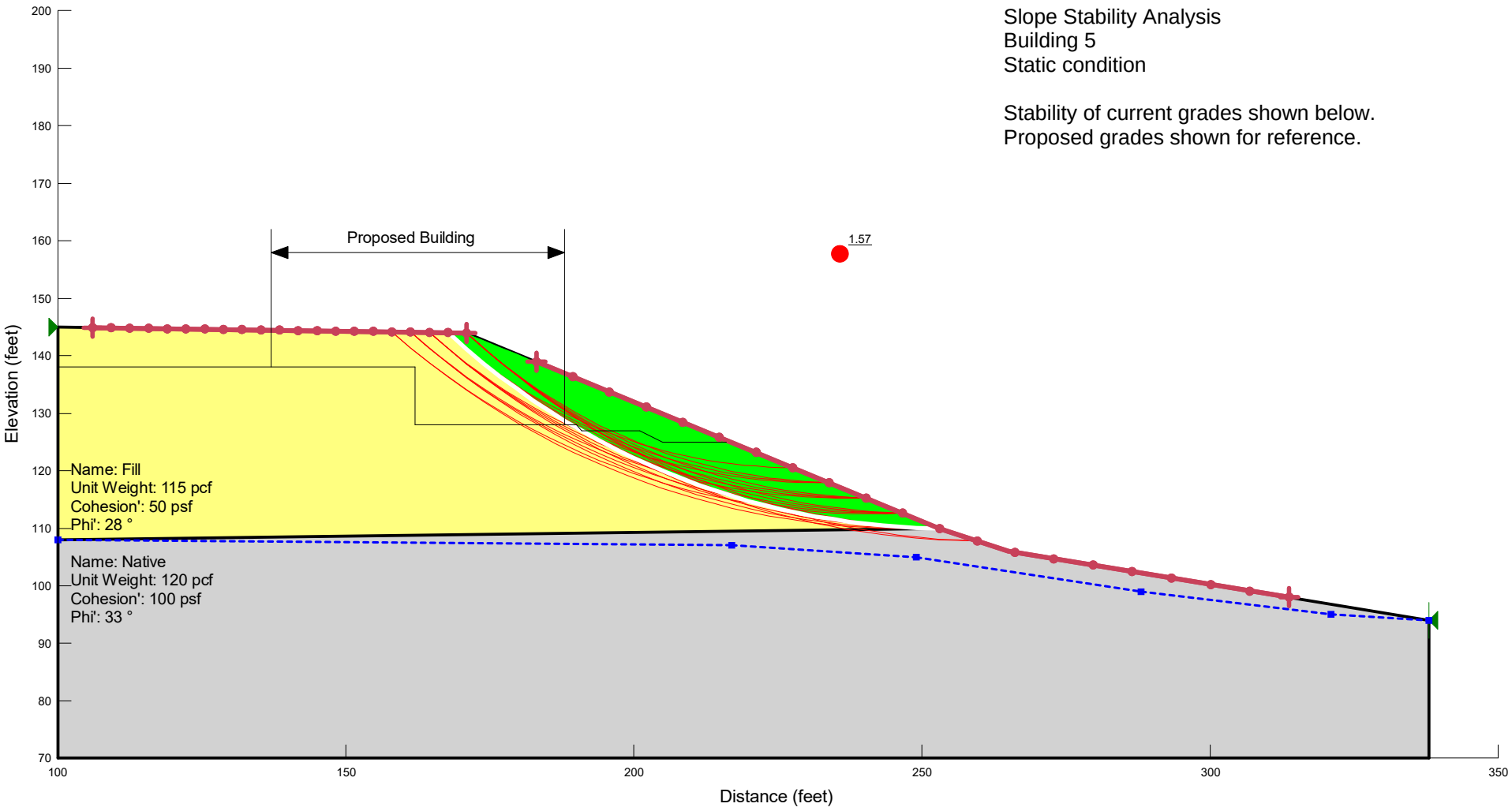
APPENDIX H

SLOPE STABILITY ANALYSIS RESULTS

Representative results from our slope stability analysis are presented in this appendix.

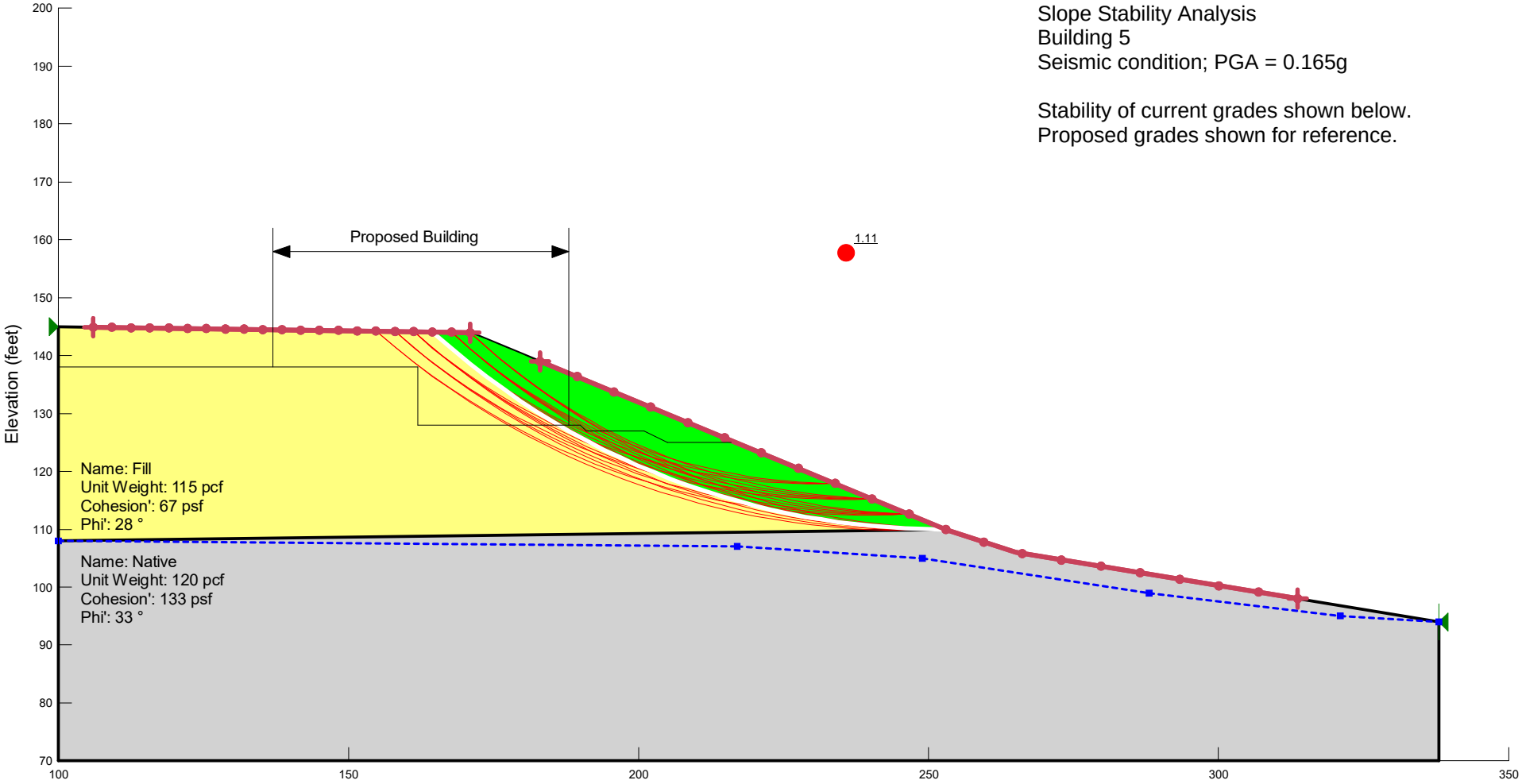
Slope Stability Analysis
Building 5
Static condition

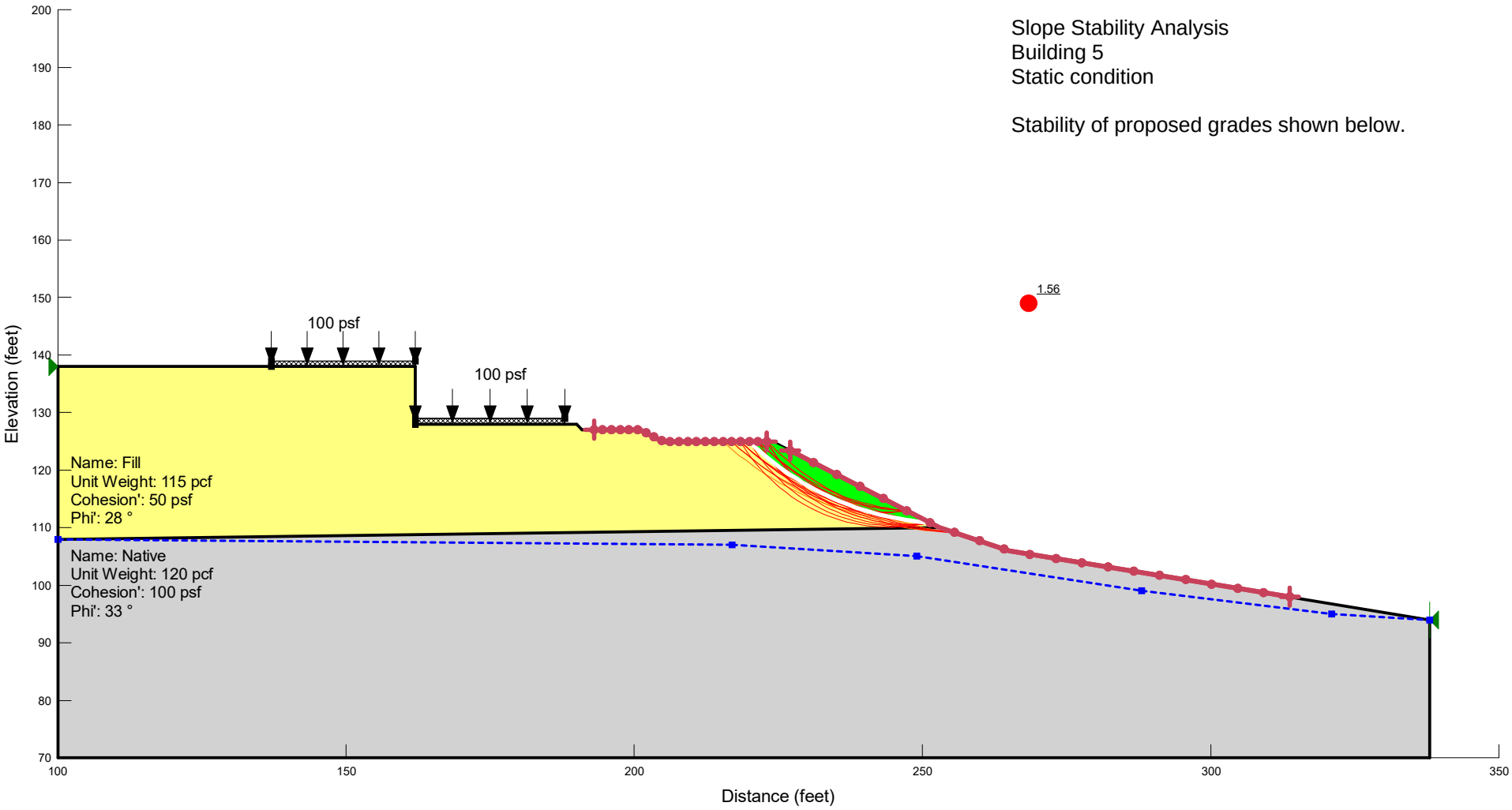
Stability of current grades shown below.
Proposed grades shown for reference.

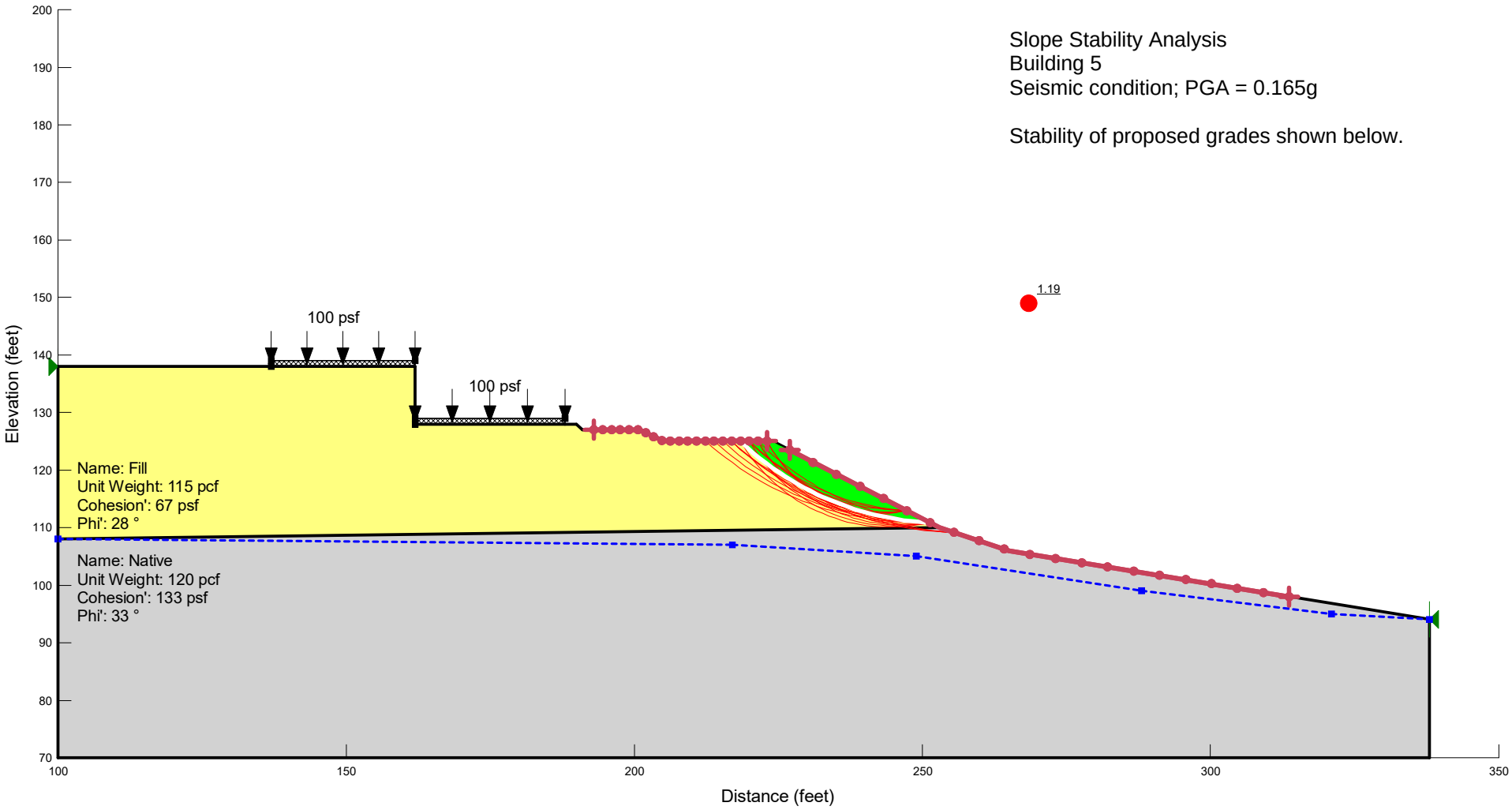


Slope Stability Analysis
Building 5
Seismic condition; PGA = 0.165g

Stability of current grades shown below.
Proposed grades shown for reference.

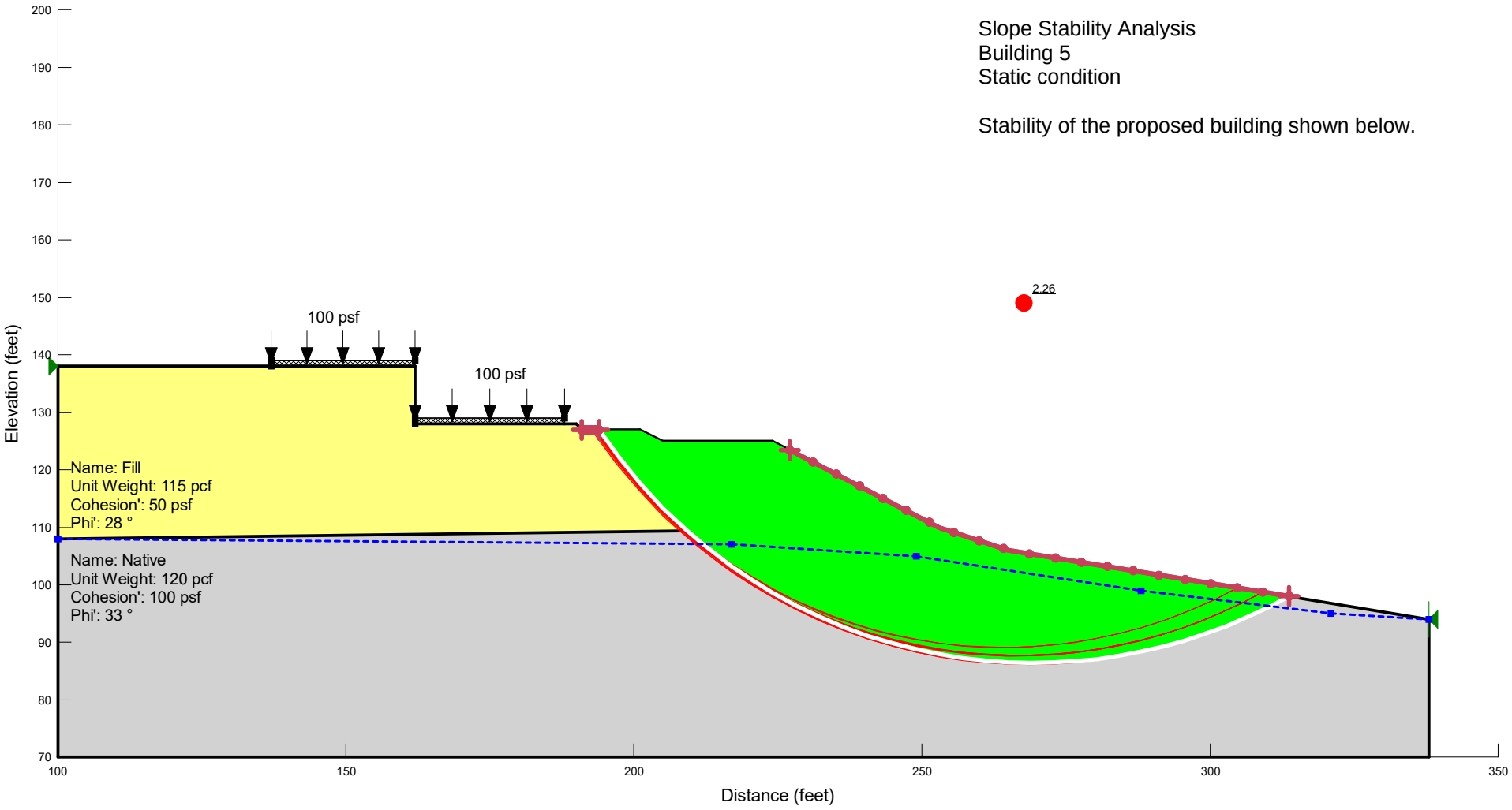



Slope Stability Analysis
Building 5
Static condition
Stability of proposed grades shown below.
1.56
100 psf
100 psf
Name: Fill
Unit Weight: 115 pcf
Cohesion': 50 psf
Phi': 28 °
Name: Native
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 33 °
Elevation (feet)
Distance (feet)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
100
150
200
250
300
350


Slope Stability Analysis
Building 5
Seismic condition; PGA = 0.165g
Stability of proposed grades shown below.
1.19
100 psf
100 psf
Name: Fill
Unit Weight: 115 pcf
Cohesion': 67 psf
Phi': 28 °
Name: Native
Unit Weight: 120 pcf
Cohesion': 133 psf
Phi': 33 °
Elevation (feet)
Distance (feet)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
100
150
200
250
300
350

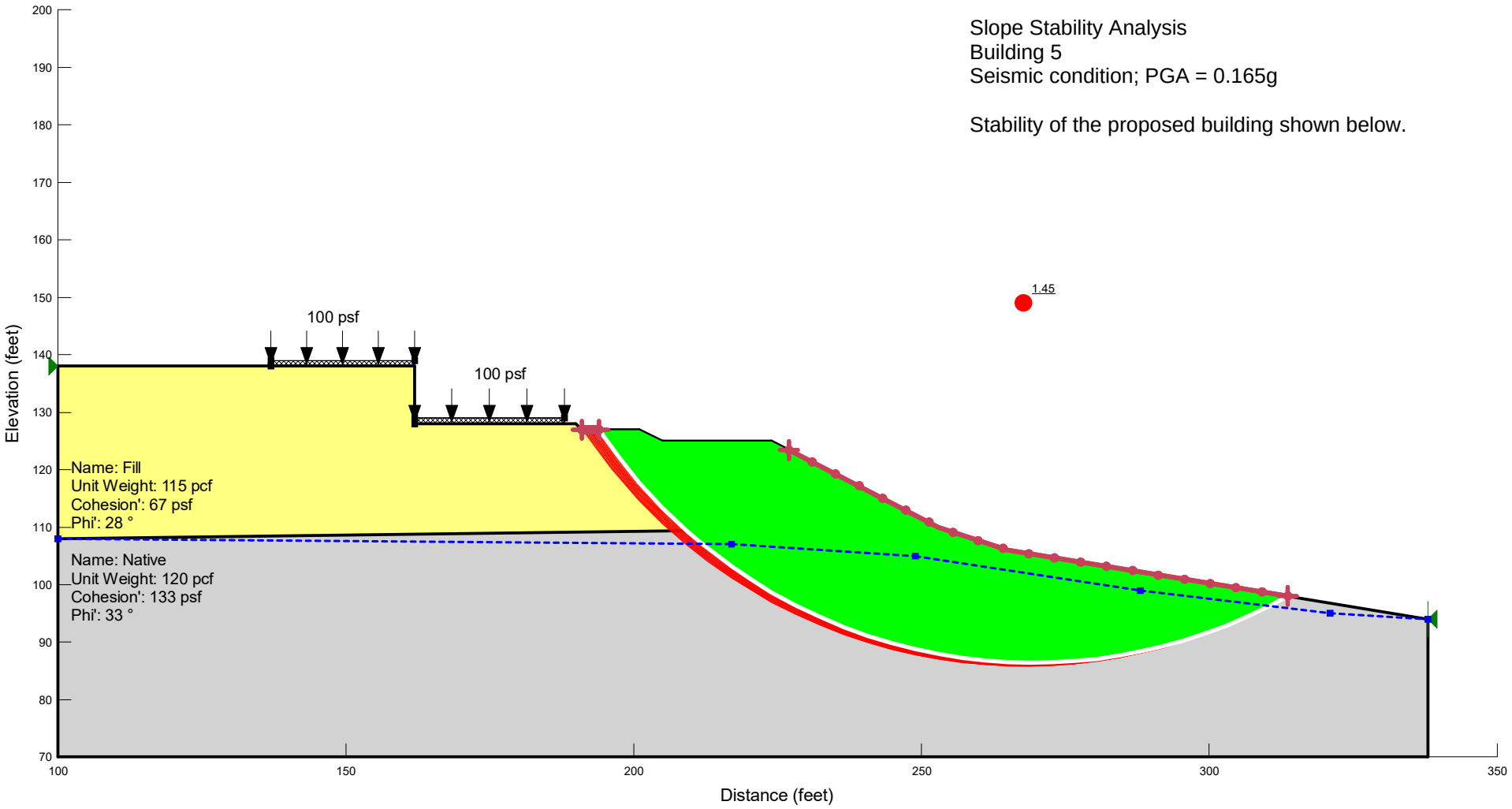
Slope Stability Analysis
Building 5
Static condition

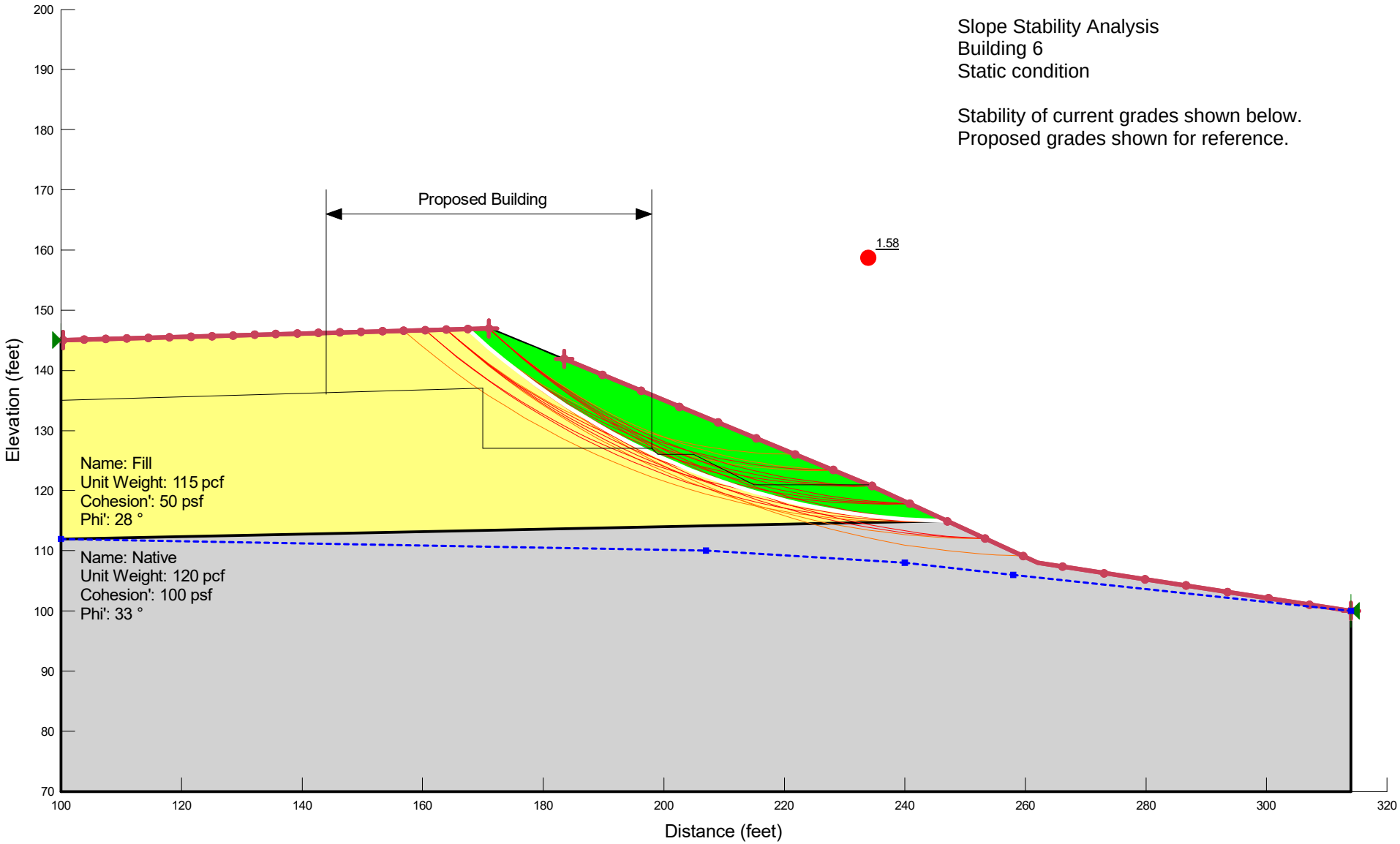
Stability of the proposed building shown below.

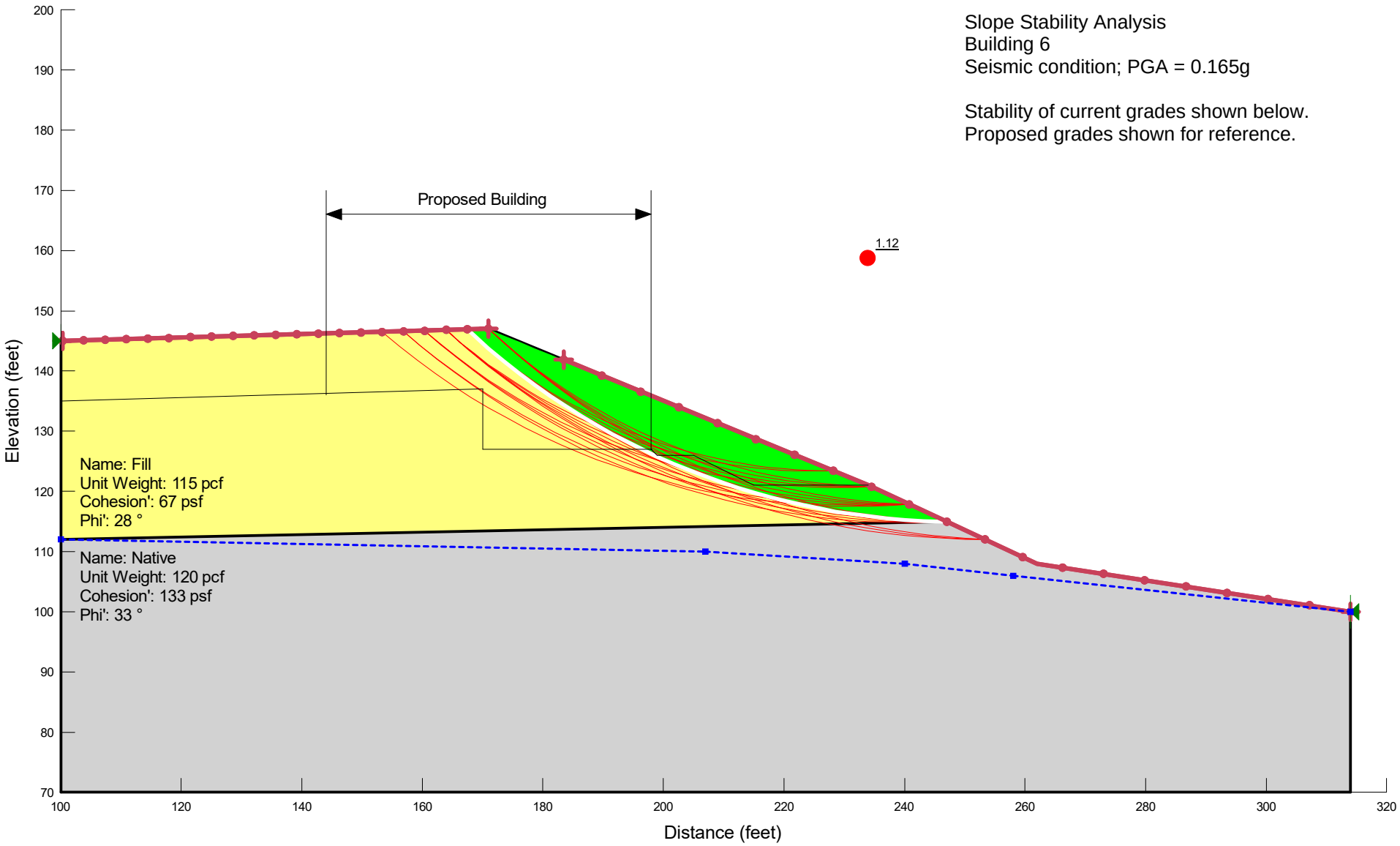


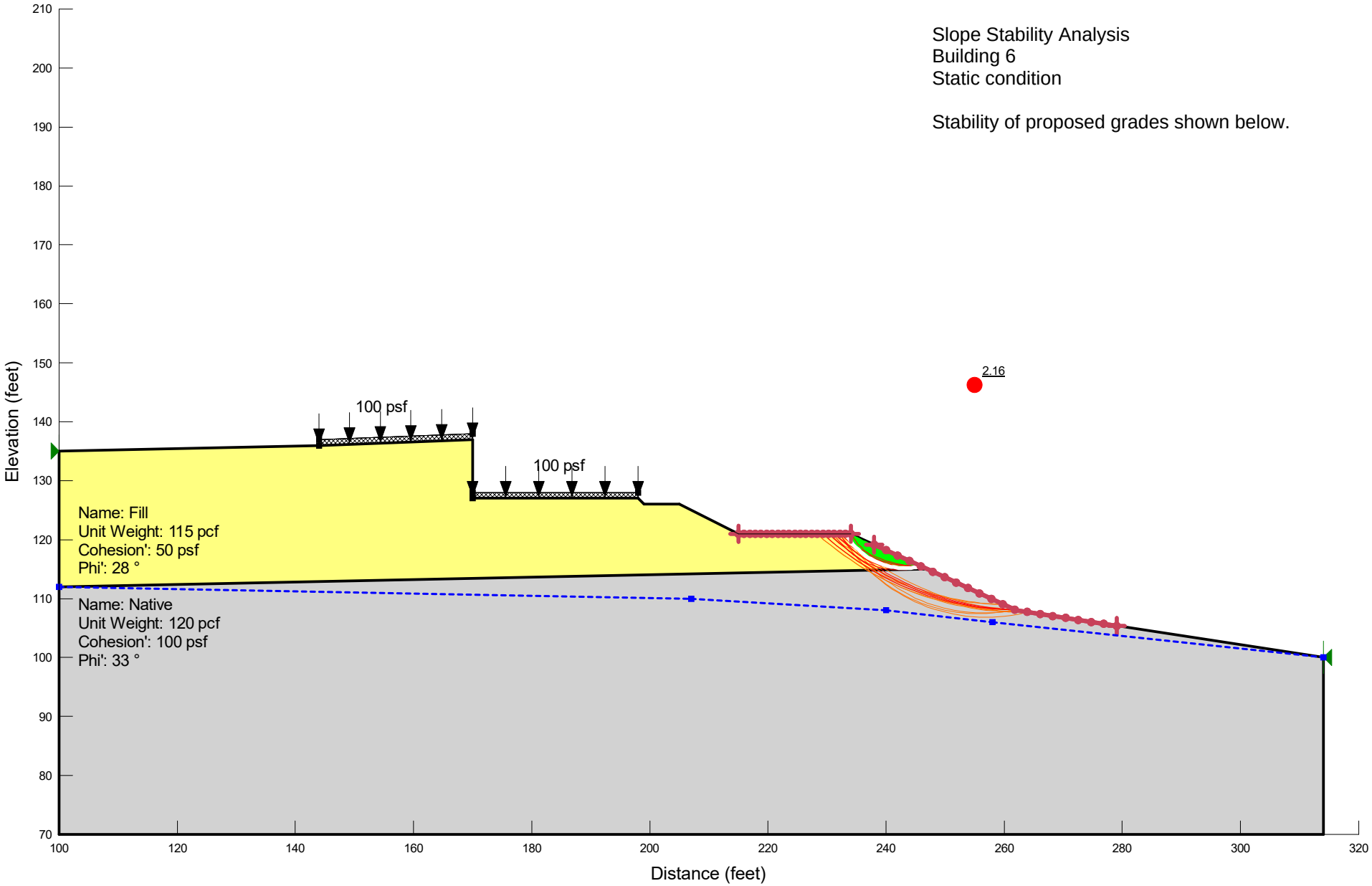
Slope Stability Analysis
Building 5
Seismic condition; PGA = 0.165g

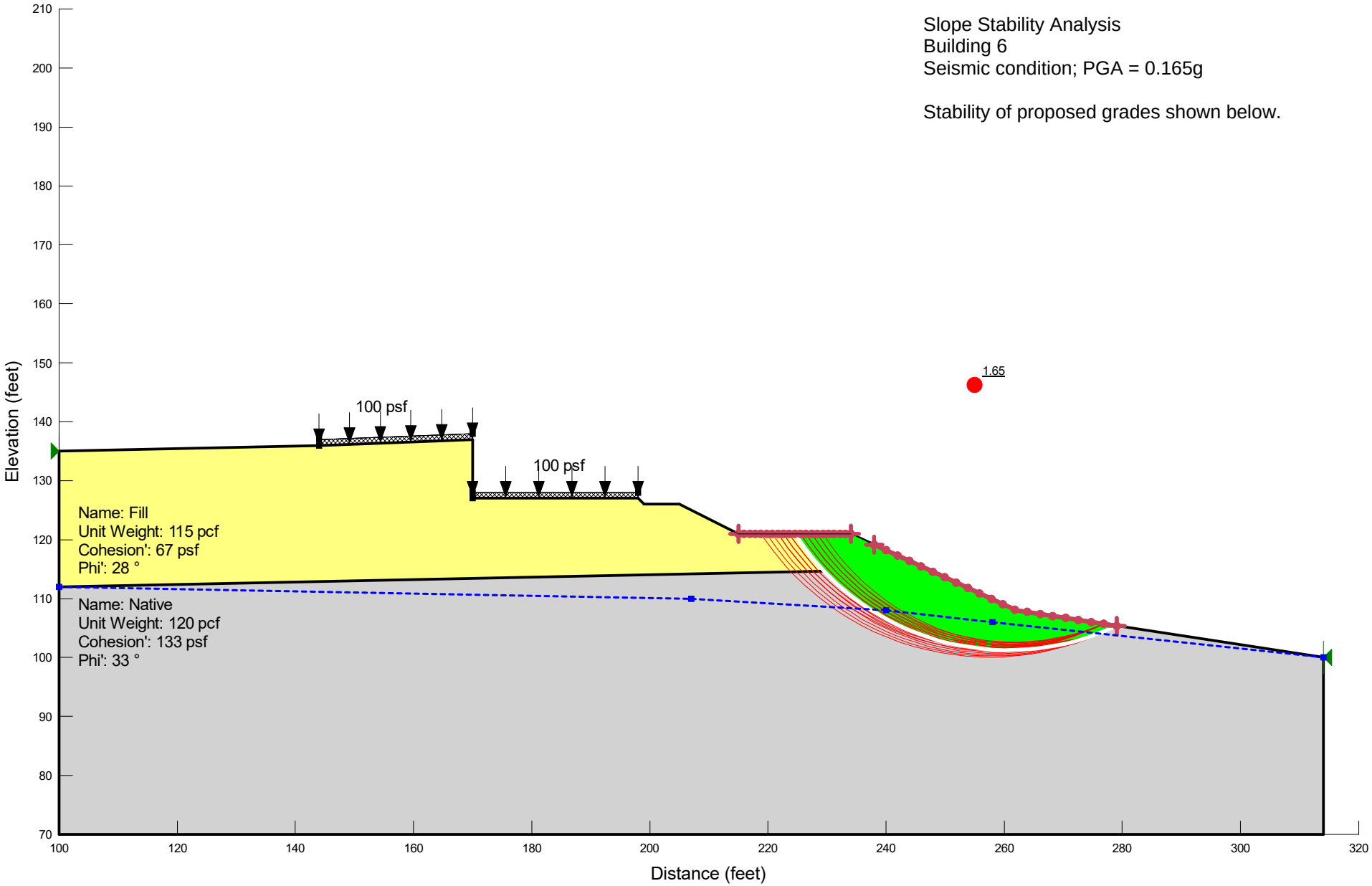
Stability of the proposed building shown below.

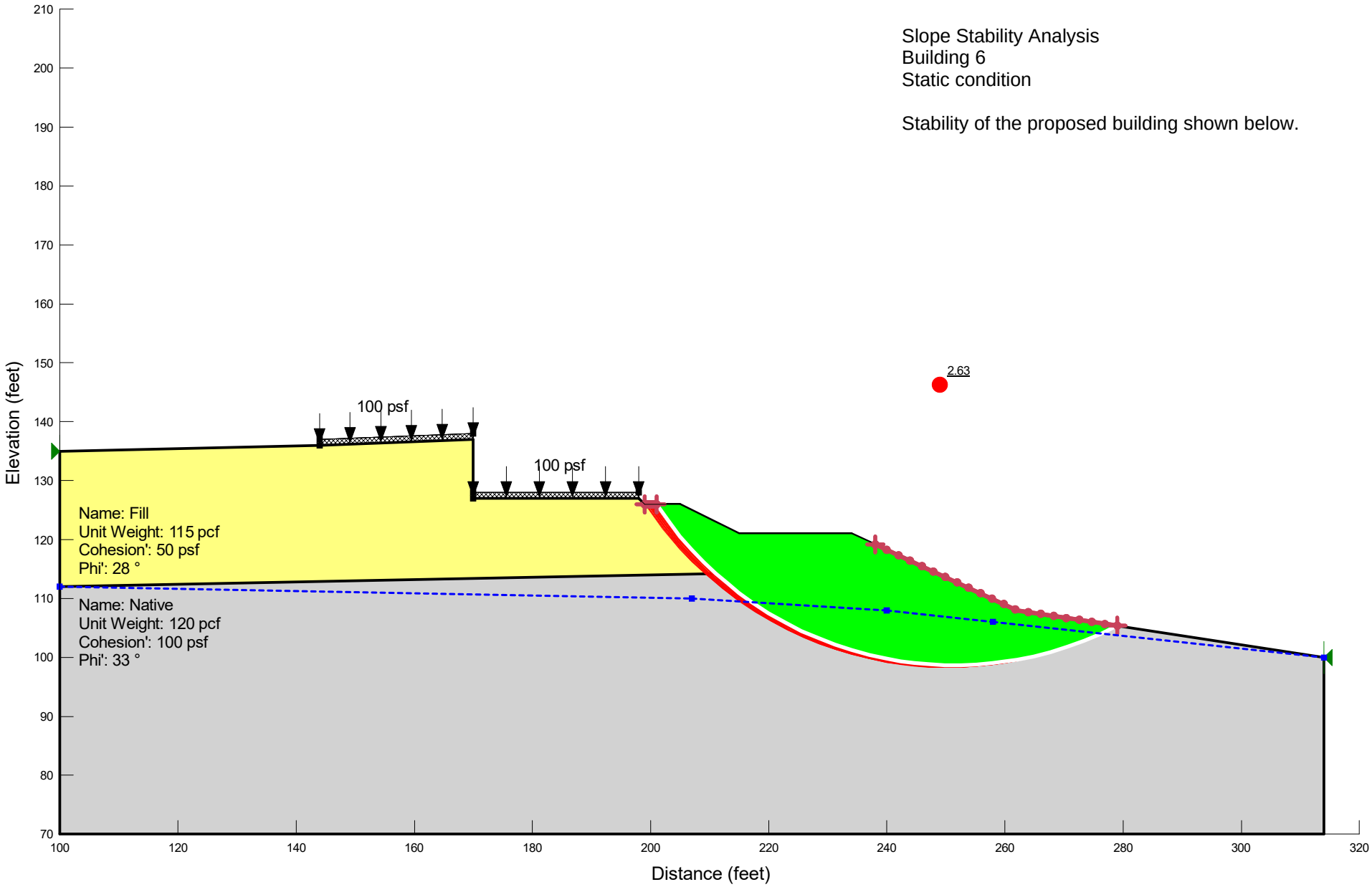


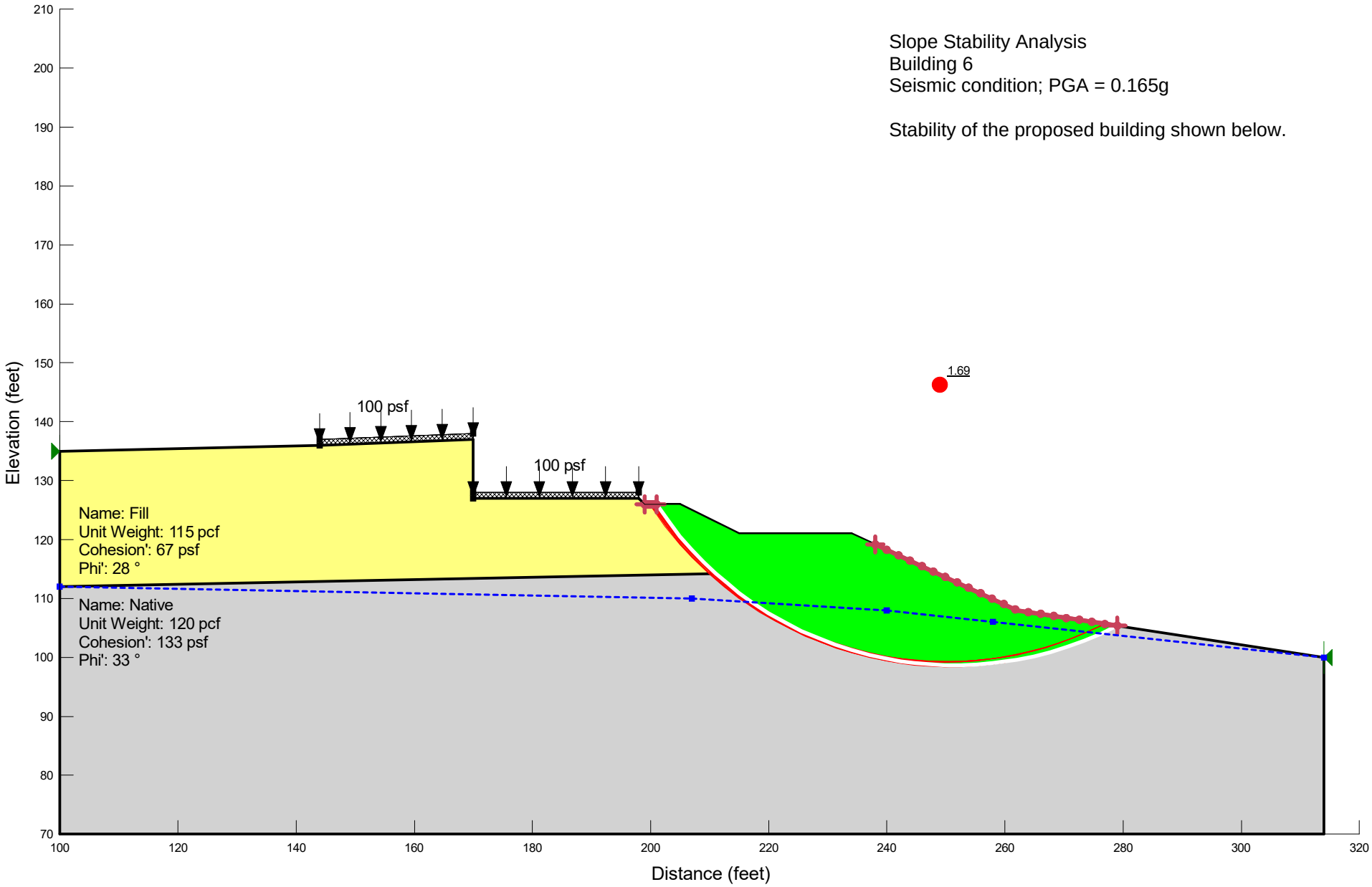

Slope Stability Analysis
Building 6
Static condition
Stability of current grades shown below.
Proposed grades shown for reference.
Proposed Building
1.58
Name: Fill
Unit Weight: 115 pcf
Cohesion': 50 psf
Phi': 28 °
Name: Native
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 33 °
Elevation (feet)
Distance (feet)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
100
120
140
160
180
200
220
240
260
280
300
320


Slope Stability Analysis
Building 6
Seismic condition; PGA = 0.165g
Stability of current grades shown below.
Proposed grades shown for reference.
Proposed Building
1.12
Name: Fill
Unit Weight: 115 pcf
Cohesion': 67 psf
Phi': 28 °
Name: Native
Unit Weight: 120 pcf
Cohesion': 133 psf
Phi': 33 °
Elevation (feet)
Distance (feet)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
100
120
140
160
180
200
220
240
260
280
300
320


Slope Stability Analysis
Building 6
Static condition
Stability of proposed grades shown below.
2.16
100 psf
100 psf
Name: Fill
Unit Weight: 115 pcf
Cohesion': 50 psf
Phi': 28 °
Name: Native
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 33 °
Elevation (feet)
Distance (feet)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
100
120
140
160
180
200
220
240
260
280
300
320


Slope Stability Analysis
Building 6
Seismic condition; PGA = 0.165g
Stability of proposed grades shown below.
1.65
100 psf
100 psf
Name: Fill
Unit Weight: 115 pcf
Cohesion': 67 psf
Phi': 28 °
Name: Native
Unit Weight: 120 pcf
Cohesion': 133 psf
Phi': 33 °
Elevation (feet)
Distance (feet)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
100
120
140
160
180
200
220
240
260
280
300
320


Slope Stability Analysis
Building 6
Static condition
Stability of the proposed building shown below.
2.63
100 psf
100 psf
Name: Fill
Unit Weight: 115 pcf
Cohesion': 50 psf
Phi': 28 °
Name: Native
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 33 °
Elevation (feet)
Distance (feet)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
100
120
140
160
180
200
220
240
260
280
300
320

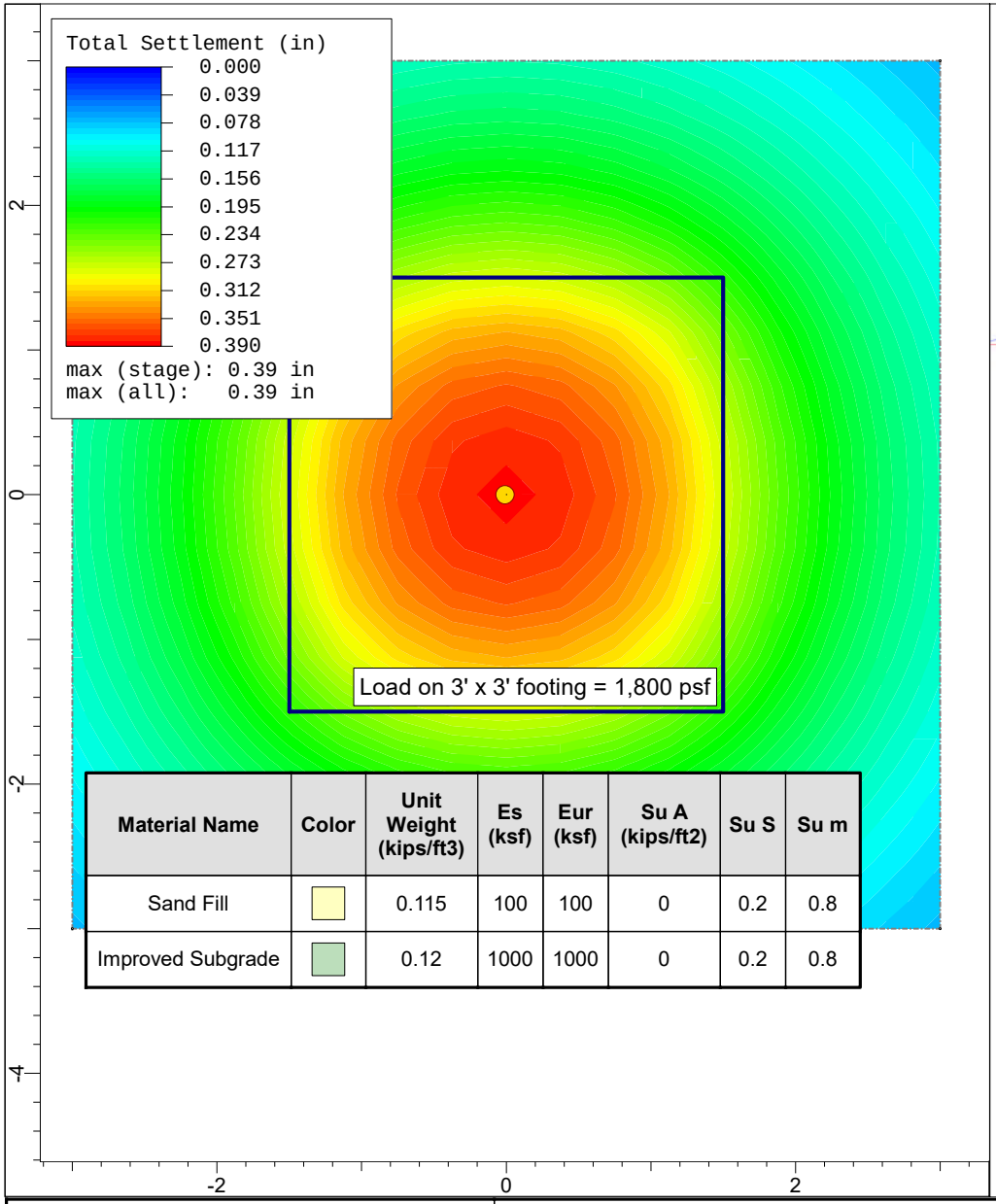

Slope Stability Analysis
Building 6
Seismic condition; PGA = 0.165g
Stability of the proposed building shown below.
1.69
100 psf
100 psf
Name: Fill
Unit Weight: 115 pcf
Cohesion': 67 psf
Phi': 28 °
Name: Native
Unit Weight: 120 pcf
Cohesion': 133 psf
Phi': 33 °
Elevation (feet)
Distance (feet)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
100
120
140
160
180
200
220
240
260
280
300
320

APPENDIX I

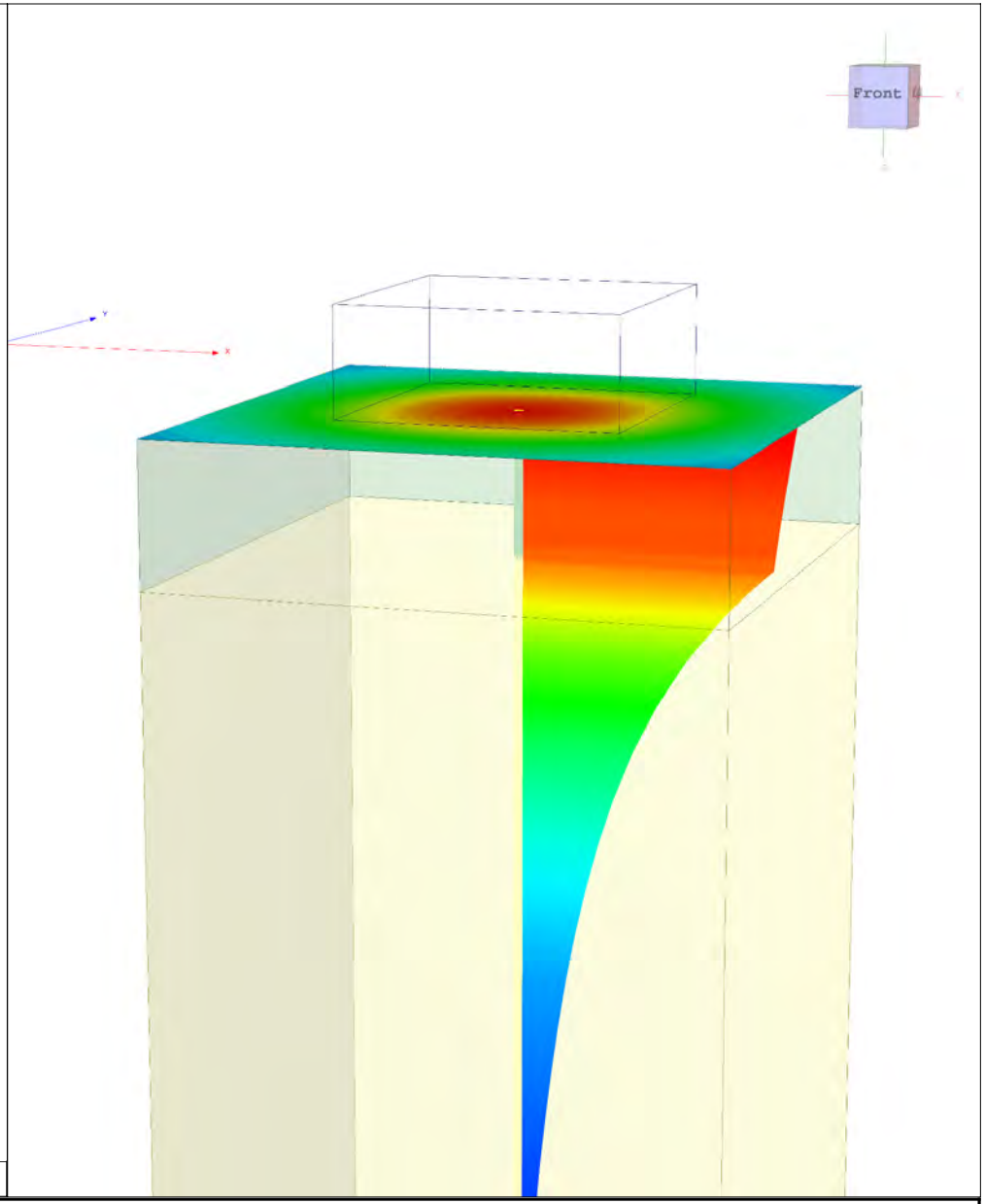
APPENDIX I

FOOTING SETTLEMENT CALCULATIONS

Representative settlement calculations for the proposed footings on surcharged subgrade are presented in this appendix.



Material Name	Color	Unit Weight (kips/ft3)	Es (ksf)	Eur (ksf)	Su A (kips/ft2)	Su S	Su m
Sand Fill		0.115	100	100	0	0.2	0.8
Improved Subgrade		0.12	1000	1000	0	0.2	0.8

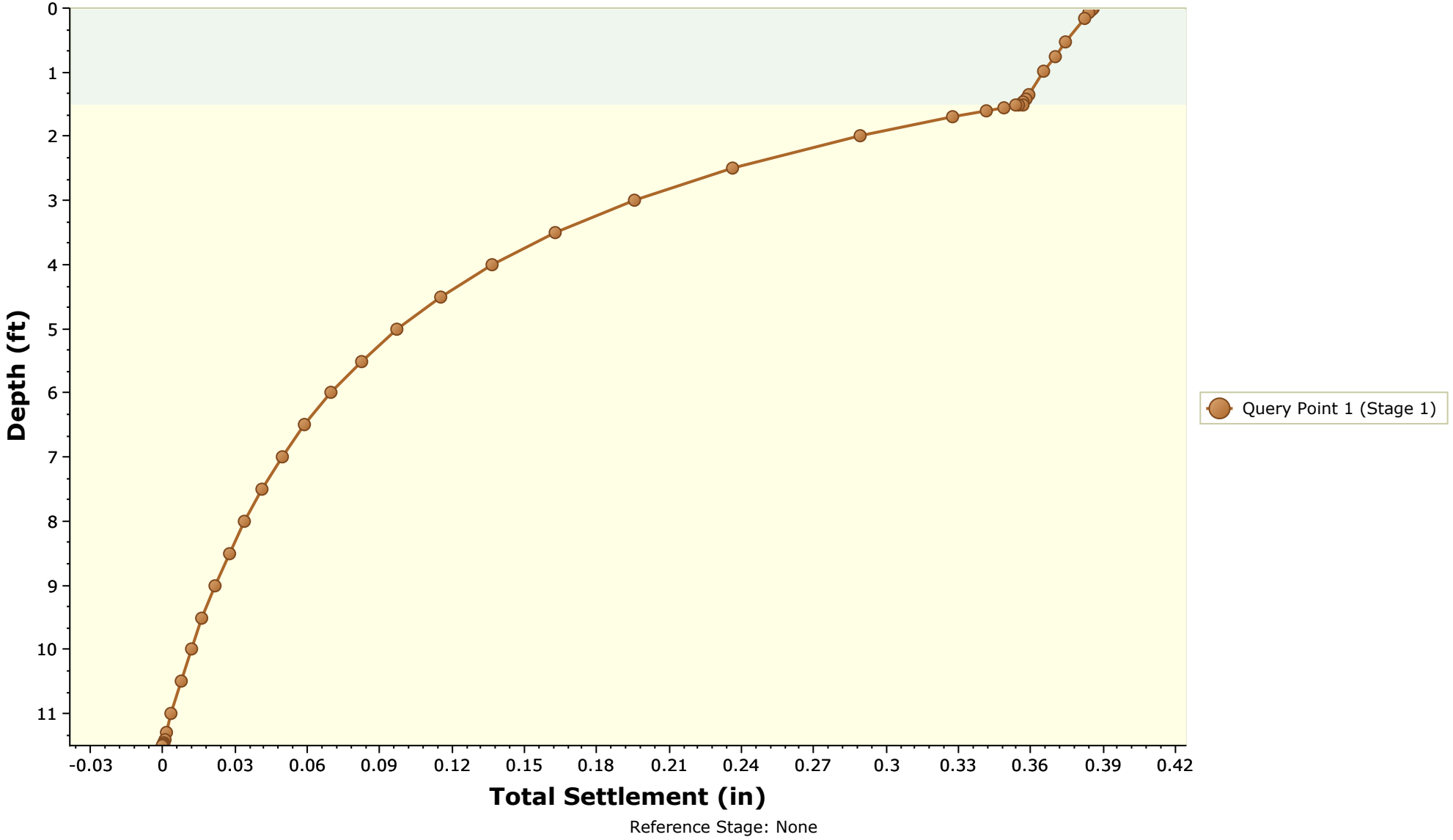


rocscience

SETTLE3D 4.023

Project	Woodside		
Analysis Description	Example Footing Settlement Calculations		
Drawn By	R. Lawrence	*Company*	GeoDesign, Inc.
Date	8/7/2019, 1:33:45 PM	*File Name*	Footing Settlement.s3z

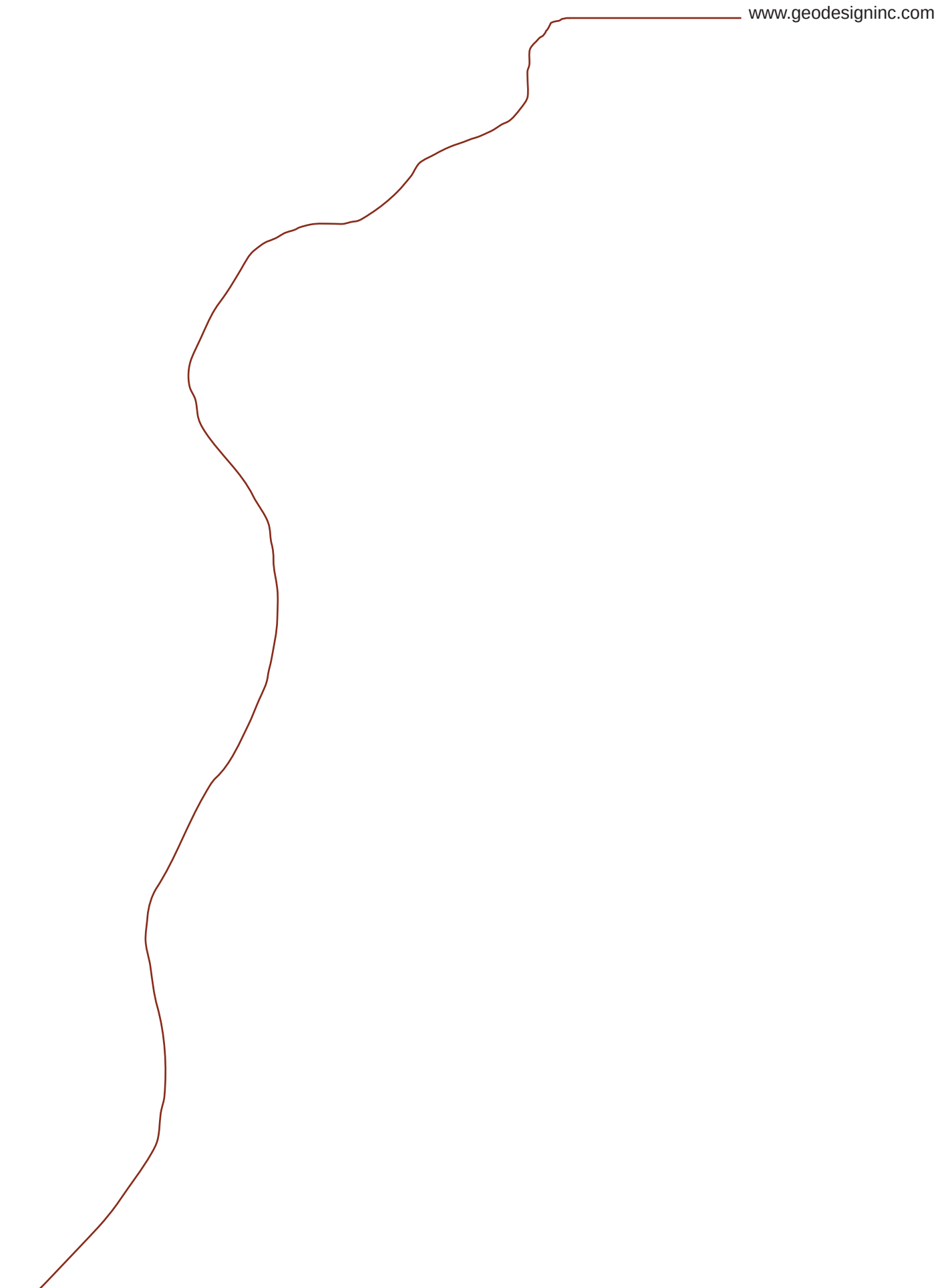
Total Settlement vs. Depth



Reference Stage: None

rocscience	*Project*	Woodside	
	Analysis Description	Example Footing Settlement Calculations	
	Drawn By	R. Lawrence	*Company* GeoDesign, Inc.
	Date	8/7/2019, 1:33:45 PM	*File Name* Footing Settlement.s3z

SETTLE3D 4.023


www.geodesigninc.com