EXHIBIT 10

Geotechnical ▪ Environmental ▪ Special Inspections
Columbia West Engineering, Inc
11917 NE 95th Street, Vancouver, Washington 98682
Phone: 360-823-2900, Fax: 360-823-2901
www.columbiawestengineering.com

May 29, 2015

Mr. Gus Harb, PE
Harb Engineering, Inc.
701 Columbia Street, Suite 111
Vancouver, Washington 98660

**Re: Preliminary Geotechnical Soils Investigation Results**
**The Village at Camas Meadows**
**Clark County Parcel No. 175951000**
**Camas, Washington**
**CWE W.O. No. 15064**

Mr. Harb:

As requested, Columbia West Engineering, Inc. is pleased to submit this preliminary geotechnical soils investigation results letter for the proposed Village at Camas Meadows project located in Camas, Washington. The purpose of this report is to provide soil conditions and groundwater elevation observations for subsequent use in development feasibility assessment for the proposed project. The specific scope of services was outlined in a proposal contract dated March 12, 2015. This report is subject to the limitations expressed in Appendix D.



## Site Location and Description

As indicated on Figures 1 and 2, the subject site is located between NW Payne Street and NW Nightshade Street at the east terminus of NW Camas Meadows Drive in Camas, Washington. The regulatory jurisdictional agency is the City of Camas. The approximate latitude and longitude are N 45° 37' 29" and W 122° 27' 01" and the legal description is a portion of the SW ¼ of Section 28, T2N, R3E, Willamette Meridian. The approximate 19.5-acre site consists of tax parcel 175951000.

The site lies on a north-facing slope near the western end of Lacamas Lake. Site elevations range from approximately 340 feet elevation in the southern portion of the site to approximately 230 feet elevation along the northwest property corner. Slope grades range from generally flat at the top of the hill at the southern property line to approximately 20 percent in a small area in the middle of the site. Most slopes are gentle and range from 5 to 10 percent. The site is vegetated with large, established fir and alder trees and associated underbrush. A single building and associated gravel parking area exists in the central portion of the site and the property is serviced by utilities from both NW Payne Street and NW Nightshade Street.

## Proposed Development

Proposed development is conceptual at the time of the investigation and is likely to consist of a mix of single-family and multi-family residential development as well as light commercial areas. The proposed development is anticipated to include an extension of NW Camas Meadow Drive, stormwater facilities, and other associated utility infrastructure. Columbia West has not reviewed preliminary grading plans but understands minor cut and fill areas may be proposed. This report is based upon proposed development as described above and may not be applicable if modified.

## Regional Geology and Soils Conditions

According to the *Geologic Map of the Lacamas Creek Quadrangle, Clark County, Washington (US Geological Survey (USGS), Science Investigation Map 2924, 2006)*, the site is underlain by two similar sedimentary formations. The southern and western portions of the site are underlain by an unnamed, Pleistocene to Pliocene, semi-consolidated, pebble to cobble conglomerate (QTc). This geologic unit is lithologically similar to the Pliocene or late Miocene Troutdale Formation, differing primarily in age of emplacement, degree of weathering, and the presence of hyaloclastite interbeds. Previously published geologic mapping has identified this unit as the Troutdale Formation (Ttfh).

According to USGS mapping, the eastern portion of the site is underlain by the Hyaoclastic sandstone member of the Troutdale formation (Ttfh). This Pliocene to Pleistocene formation is comprised of coarse-grained sandstone and pebble conglomerate containing basalt pebbles and cobbles.

The *Soil Survey of Clark County, Washington (United States Department of Agriculture, Soil Conservation Service [USDA SCS], November 1972)* identifies surface soils as Hesson clay loam. Although soil conditions may vary from the broad USDA descriptions, Hesson soils generally consist of fine to medium-textured, slowly permeable clays, silts, and sands. Hesson soils form on terraces over deeply weathered alluvium containing various amounts of gravel. Hesson soils are generally moisture sensitive and somewhat compressible, and are described as having moderate shrink/swell potential and low shear strength. Erosion hazard is slight to severe if near surface soils are left in a bare unvegetated condition.

**Field Exploration and Soil Description**

To investigate the feasibility of site improvements, a field investigation consisting of field reconnaissance and test pit explorations was conducted at the site on April 15, 2015. Test pit excavations were conducted with the use of a track-mounted excavator. Subsurface exploration consisted of 17 test pit explorations to a maximum depth of 16 feet below ground surface. Results of the subsurface explorations indicated that the site is generally covered with 12 to 18 inches of topsoil at the locations observed. Underlying the topsoil, three soil types were encountered. Conglomerate bedrock was encountered in some explorations ranging from 4 to 14 feet below ground surface.

*Soil Type 1: Sandy Clay*

Surficial soils in the northern portion of the site (located approximately north of the 315-foot contour on the existing conditions survey provided by MGS) generally consisted of moist to wet, medium-stiff to stiff sandy clay and resembled the USDA Hesson clay loam series. These soils were underlain by competent bedrock at various depths ranging from 4 to 14 feet. Soil Type 1 was encountered in test pits TP-1 through TP-6, TP-14 and TP-15. Groundwater seeps were encountered in these test pits at various depths and typically coincided with the depth of the soil-bedrock interface.

*Soil Type 2: Poorly-graded Sand with Silt and Clay*

Surficial soils in the southern portion of the site near the top of the hill (located approximately south of the 315-foot contour on the existing conditions survey) generally consisted of moist to damp, medium dense clayey sand in the first few feet, transitioning to poorly-graded sand with silt and clay at depth. Soil Type 2 was observed in test pits TP-12 and TP-13 and does not resemble a mapped soil series on the property. Though groundwater was not observed in test pit TP-12, shallow, heavy groundwater seeps and wet soils were observed at a depth of 4 feet in test pit TP-13.

*Soil Type 3: Unconsolidated Fill Material*

Soils in test pits TP-7 through TP-11, TP-16, and TP-17, located in the general vicinity of the gravel parking area north of the existing building, consisted of unconsolidated sand, clay and weathered conglomerate soils mixed with concrete slab remnants, asphalt remnants, wood debris, and organic-rich soils. Soils within this fill area are not suitable for bearing support of structures or paved areas in the present condition and may not be suitable for re-use as structural fill due to the presence of large pieces of debris and organic soils.

*Soil Type 4: Weathered and Competent Conglomerate Bedrock*

Weathered and competent conglomerate bedrock was encountered in test pits TP-1 through TP-6, as well as TP-9, and TP-15. Weathered bedrock was also encountered beneath unconsolidated fill material in test pits TP-7, TP-8, TP-16, and TP-17. These four test pits did not extend deep enough to encounter competent bedrock. The underlying weathered bedrock soil may be described as moist, stiff, moderately plastic clayey gravel with pebbles and cobbles. The bedrock consisted of angular to sub-rounded clasts of various sizes cemented in a matrix of sand, silt, and clay.

Representative soil samples were collected from the test pits at varying depths and archived for future analysis. Exploration logs for the test pit explorations are presented in Appendix B. Soil classification information is provided in Appendix C. A photo log is provided in Appendix A.

**Groundwater**

Groundwater seeps were encountered during subsurface exploration in most of the excavations at the approximate depth of the soil-bedrock interface. Seeps were observed at depths ranging from 4 to 14 feet below ground surface. According to *Southwest Clark County Generalized Water Table Altitude and Depth to Groundwater Mapping (Clark County Water Quality Division, September 1995)*, the elevation of the shallow static aquifer within the site boundary ranges from approximately 320 feet amsl in the southwestern corner of the property to approximately 210 feet amsl at the northeastern boundary. This corresponds to a depth to groundwater of approximately 10 to 20 feet depending upon ground surface elevation. Groundwater elevation may vary depending upon location and elevation. Groundwater levels are also often subject to seasonal variance and may rise during extended periods of increased precipitation. Perched groundwater may also be present in localized areas.

**Preliminary Geotechnical Recommendations**

*Site Preparation and Grading*

Vegetation, organic material, unsuitable fill, and deleterious material that may be encountered should be cleared from areas identified for structures and site grading. Vegetation, other organic material, and debris should be removed from the site. Stripped topsoil should also be removed, or used only as landscape fill in nonstructural areas with slopes less than 25 percent. The anticipated stripping depth for sod and highly organic topsoil is anticipated to be approximately 12 to 18 inches. The required stripping depth may increase in areas of existing fill, heavy organics, or previously existing structures. Actual stripping depths should be determined based upon visual observations made during construction when soil conditions are exposed. The post construction maximum depth of landscape fill placed or spread on the site should not exceed one foot.

Unconsolidated fill material was encountered in a large area located north of the existing structure on the property. The area was previously used as a parking lot. As mentioned above, this fill material contained a significant amount of organic-rich soils and various construction debris (concrete, asphalt, etc.), unsuitable for structural support and likely unsuitable for re-use as structural fill. It may be possible to re-use portions of the material if time and care is taken to remove deleterious materials from the unconsolidated fill. The unconsolidated material should be removed completely in locations proposed for future structures.

If additional areas of previously disturbed soil, debris, or unconsolidated fill material are encountered during grading or construction activities, these materials should be removed completely and thoroughly from structural areas. This includes old foundations, basement walls, utilities, associated soft soils, and debris. Excavation areas should be backfilled with engineered structural fill.

Site grading activities should be performed in accordance with requirements specified in the 2012 International Building Code (IBC), Chapter 18 and Appendix J, with exceptions noted in the text herein. Site preparation, soil stripping, and grading activities should be observed and documented by an experienced geotechnical engineer or designated representative.

*Engineered Structural Fill*

Areas proposed for fill placement should be appropriately prepared as described in the preceding text. Surface soils should then be scarified and compacted prior to additional fill placement, especially in areas of soft, surficial clay soils. Engineered structural fill should be placed in loose lifts not exceeding 12 inches in depth and compacted using standard conventional compaction equipment. The soil moisture content should be within two percentage points of optimum conditions. A field density at least equal to 95 percent of the maximum dry density, obtained from the standard Proctor moisture-density relationship test (ASTM D698), is recommended for structural fill

placement. For engineered structural fill placed on sloped grades, the area should be benched to provide a horizontal surface for compaction.

Compaction of engineered structural fill should be verified by nuclear gauge field compaction testing performed in accordance with ASTM D6938. Field compaction testing should be performed for each vertical foot of engineered fill placed. Engineered fill placement should be observed by an experienced geotechnical engineer or designated representative.

Onsite native soils encountered in the test pits may be suitable as structural fill if properly handled. The clay soils that occupy the bulk of the property may be difficult to work with due to the moisture sensitivity of the soil and the excessive handling that may be necessary to dry them adequately. The sandy soils that were encountered in the southern portion of the property may be suitable for structural fill and may require the addition of moisture to bring the soils to optimum moisture content.

Engineered structural fill placement activities should be performed during dry summer months if possible. Clean native soils may be suitable for use as structural fill if adequately moisture-conditioned to achieve recommended compaction specifications. Because they are moisture-sensitive, the fine-textured soils that occupy the bulk of the property will likely be difficult to excavate and compact during wet weather conditions. If adequate compaction is not achievable with clean native soils, import structural fill consisting of well-graded granular material with a maximum particle size of three inches and no more than five percent passing the No. 200 sieve is recommended.

*Excavation*

Soils at the site were explored to a maximum depth of 16 feet using a track-mounted excavator. Competent conglomerate bedrock was encountered at depths ranging from 4 to 14 feet below ground surface in test pits TP-1 through TP-6, as well as TP-9, and TP-15. Weathered bedrock was encountered beneath the unconsolidated fill material in the central portion of the site (test pits TP-7, TP-8, TP-16, and TP-17). Table 1 presents a summary of depths to bedrock and groundwater seeps.



***Table 1. Depth to Bedrock and Groundwater Seeps***

| Test Pit No. | Ground Surface Elevation (feet) | Depth to Bedrock (feet) | Depth to Groundwater Seep (feet) |
|---|---|---|---|
| TP-1 | 233 | 14 | 10 |
| TP-2 | 234 | 13 | 6 |
| TP-3 | 240 | 4 | 6 |
| TP-4 | 250 | 9 | 8 |
| TP-5 | 248 | 13 | 5 |
| TP-6 | 247 | 7 | 7 |
| TP-7 | 270 | Not encountered | Not encountered |
| TP-8 | 275 | Not encountered | Not encountered |
| TP-9 | 285 | 7 | Not encountered |
| TP-10 | 290 | Not encountered | Not encountered |
| TP-11 | 290 | Not encountered | Not encountered |
| TP-12 | 335 | Not encountered | Not encountered |
| TP-13 | 319 | Not encountered | 4 |
| TP-14 | 313 | Not encountered | 3 |
| TP-15 | 295 | 5 | 6 |
| TP-16 | 296 | Not encountered | 8 |
| TP-17 | 290 | Not encountered | 8 |

The conglomerate was generally weathered in the top few feet, but became dense and massive with depth. If significant utilities or other excavations are designed at elevations that encounter bedrock, specialized rock-excavation techniques or blasting may be necessary. As mentioned previously,

groundwater seeps were also observed during the site investigation, often at a depth coincident with the soil-to-bedrock interface.

Near-surface soils are likely classified as Washington State Industrial Safety and Health Administration (WISHA) Type C. For temporary open-cut excavations deeper than four feet, but less than 20 feet in soils of these types, the maximum allowable slope is 1.5H:1V. WISHA soil type should be confirmed during field construction activities by the contractor. Soil is often anisotropic and heterogeneous, and it is possible that WISHA soil types determined in the field may differ from those described above.

The contractor should be held responsible for site safety, sloping, and shoring. Columbia West is not responsible for contractor activities and in no case should excavation be conducted in excess of all applicable local, state, and federal laws.

**Conclusion and Limitations**

Preliminary assessment of site soil conditions indicates that the proposed development of mixed-use single- and multi-family dwellings with areas of light commercial use is generally compatible with site soil conditions. Site challenges to design and construction of the proposed development include the presence of sensitive clay soils in the bulk of the property, relatively shallow bedrock and groundwater conditions, and large quantities of unconsolidated material that may not be easily re-used as fill due to the presence of deleterious materials.

This report was prepared in accordance with accepted standard conventional principles and practices of geotechnical engineering. This report pertains only to material tested and observed, and is based upon proposed site development as described in this report. The information, opinions and recommendations of this report are intended for use during the design phase of the project. This report is not an environmental assessment and should not be construed as a representative warranty of subsurface site conditions. The results and observations of this investigation are directly applicable and specifically accurate only for the exact tested locations on the date of the tests. The discovery of adverse environmental conditions, or subsurface soils that deviate significantly from those described in this report, should immediately prompt further investigation. The above statements are in lieu of all other statements expressed or implied.

This report was prepared solely for the client and is not to be reproduced without prior authorization from Columbia West. It is recommended that the conclusions and recommendations of this report be incorporated throughout the design process by all involved parties. Columbia West is not responsible for independent conclusions or recommendations made by others based upon information presented in this report. Additional limitations and important information about this report are provided in Appendix D. This information should be carefully read and understood by the client and civil/site plan engineer.

Columbia West appreciates the opportunity to provide geotechnical services. Please call me at 360-823-2900 if you have any questions or need additional information.

Sincerely,

**COLUMBIA WEST ENGINEERING, Inc.**

DRAFT

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Daniel E. Lehto, PE, GE

Principal

DEL:ASR

Attachments: Figures
Appendices A through D

## References

*Clark County Maps Online* (http://gis.clark.wa.gov/ccgis/mol/property.htm).

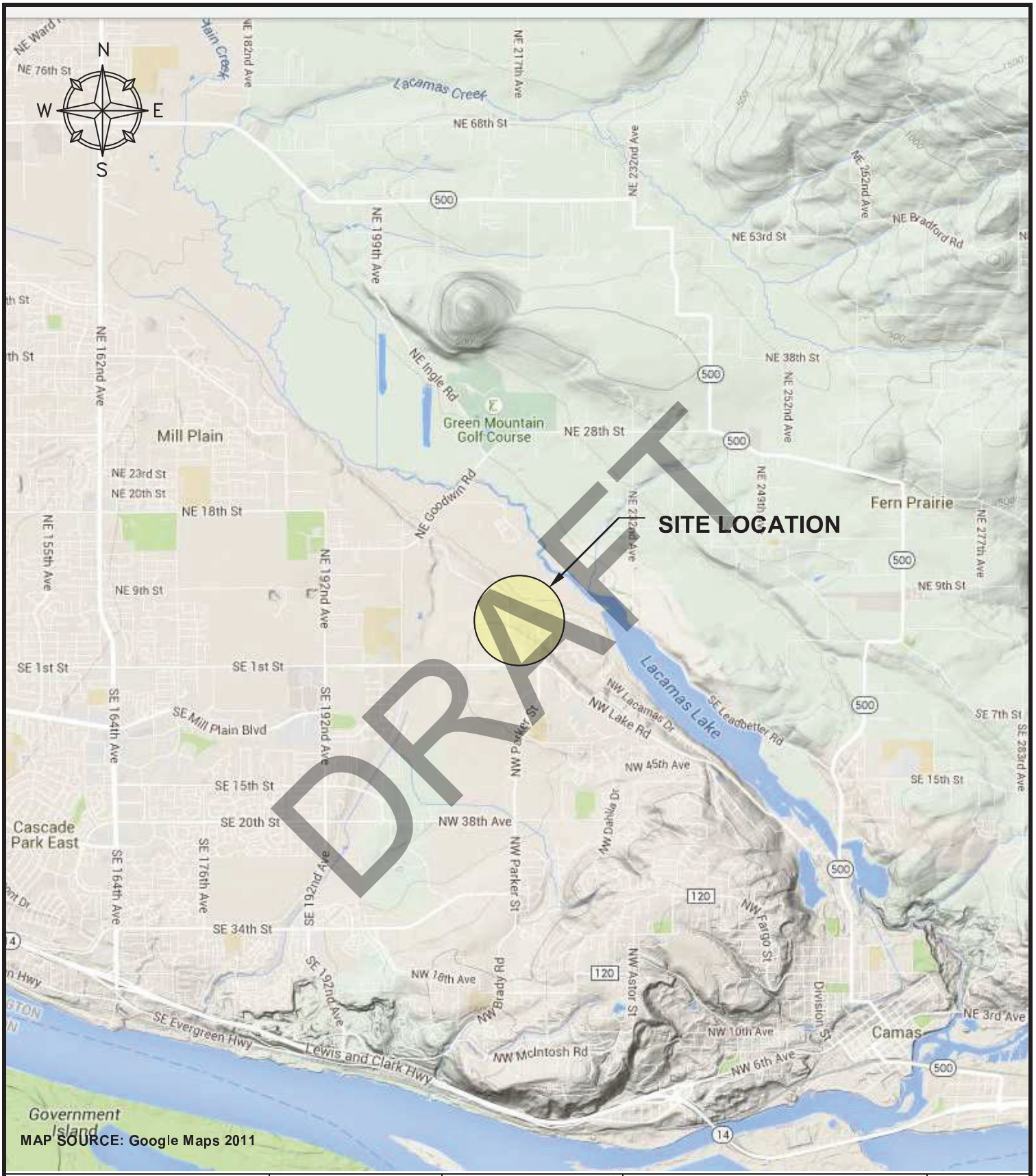
International Building Code: 2012 International Building Code, 2012 edition, International Code Council, 2012.

McGee, Dale A., *Soil Survey of Clark County, Washington,* Soil Conservation Service, United States Department of Agriculture, November, 1972.

Evarts, Russell C., *Geologic Map of the Lacamas Creek Quadrangle, Clark County, Washington (US Geological Survey (USGS), Science Investigation Map 2924, 2006)*.

Swanson, Rodney D., McCarley, Clifton, *Southwest Clark County Generalized Water Table Altitude and Depth to Groundwater Mapping*, Clark County Water Quality Division, September, 1995.

# FIGURES




MAP SOURCE: Google Maps 2011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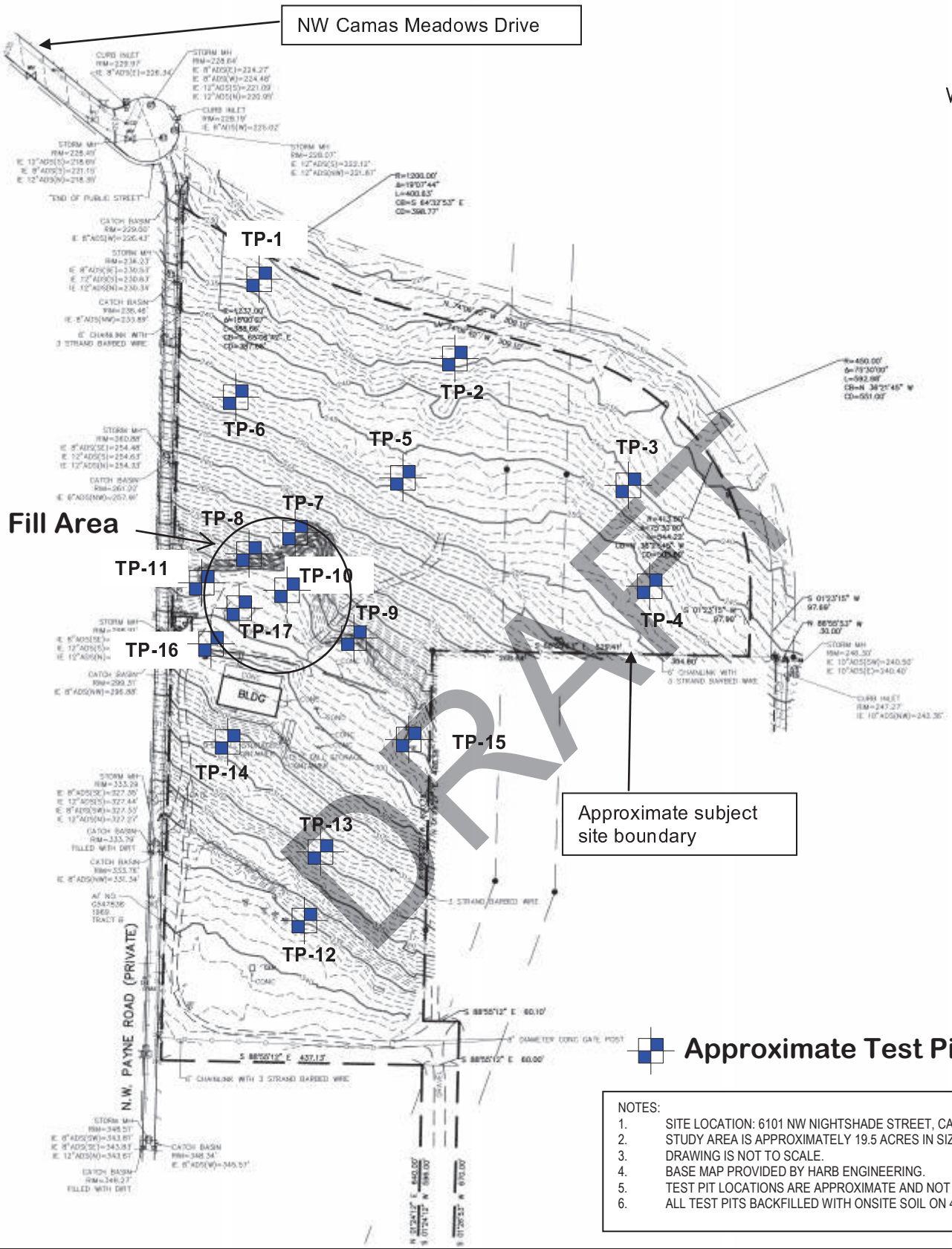
| | | | |
|---|---|---|---|
| Design | Drawn: ASR | | |
| Checked: DEL | Date: 04/22/15 | | |
| Client: HARB | Rev | By | Date |
| Job No.: 15064 | | | |
| CAD File: FIGURE 1 | | | |
| Scale: ~1:50,000 | | | |

**SITE LOCATION MAP**

VILLAGE AT CAMAS MEADOWS
CAMAS, WASHINGTON

FIGURE 1




**Approximate Test Pit Location**

NOTES:

1. SITE LOCATION: 6101 NW NIGHTSHADE STREET, CAMAS, WASHINGTON.
2. STUDY AREA IS APPROXIMATELY 19.5 ACRES IN SIZE.
3. DRAWING IS NOT TO SCALE.
4. BASE MAP PROVIDED BY HARB ENGINEERING.
5. TEST PIT LOCATIONS ARE APPROXIMATE AND NOT SURVEYED.
6. ALL TEST PITS BACKFILLED WITH ONSITE SOIL ON 4-15-2015.

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| | | | |
|---|---|---|---|
| Design | Drawn: ASR | | |
| Checked: LVL | Date: 04/23/15 | | |
| Client: HARB | Rev | By | Date |
| Job No.: 15064 | | | |
| CAD File: FIGURE 2 | | | |
| Scale: ~1:50,000 | | | |

**EXPLORATION LOCATION MAP**

VILLAGE AT CAMAS MEADOWS
CAMAS, WASHINGTON

FIGURE 2

# APPENDIX A
# PHOTO LOG

# PHOTO LOG
## Village at Camas Meadows
## Camas, Washington

Groundwater Seeps at 10 feet in TP-1

Weathered Conglomerate in TP-5


Exploring unconsolidated fill material in TP-8

Unconsolidated fill material in TP-8

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# PHOTO LOG
## Village at Camas Meadows
## Camas, Washington

Sandy soils in TP-12

Dry, sandy soils to 16 feet in TP-12

Excavator refusal in Conglomerate Bedrock, TP-15

Shallow Bedrock (5 feet) in TP-15

# APPENDIX B
# SUBSURFACE EXPLORATION LOGS

11917 NE 95TH Street, Vancouver, Washington 98682
Phone: 360-823-2900, Fax: 360-823-2901
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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-1 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 233 | apx. 10 feet | 930 | 950 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Approximately 18 inches of organic-rich topsoil, forest duff and tree roots. | | | | | |
| | | | | CL | | Light brown sandy clay, moist, soft, low plasticity. | | | | | |
| 5 | | | | GC | | Weathered Conglomerate: reddish brown clayey GRAVEL with pebbles and cobbles, moist, stiff, moderate plasticity. Angular to subrounded clasts composed of basalt and sandstone. | | | | | |
| 10 | ▼ | | | | | | | | | | |
| | | | | | | Reddish brown to yellow brown CONGLOMERATE BEDROCK, damp, very dense, competent bedrock (excavator refusal) at 15 feet. | | | | | |
| 15 | | | | | | Bottom of test pit at 15.0 feet.<br>Heavy groundwater seeps at 10 feet. | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-2 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 234 | apx. 6 feet | 950 | 1010 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Approximately 12 inches of organic-rich topsoil, forest duff and tree roots. | | | | | |
| | | | | CL | | Brown sandy clay, moist, soft, low plasticity. | | | | | |
| 5 | | | | GC | | Weathered Conglomerate: reddish brown clayey GRAVEL with pebbles and cobbles, moist, stiff, moderate plasticity. Angular to subrounded clasts composed of basalt and sandstone. | | | | | |
| 10 | | | | | | Reddish brown to yellow brown CONGLOMERATE BEDROCK, damp, very dense, competent bedrock (excavator refusal) at 14 feet. | | | | | |
| 15 | | | | | | Bottom of test pit at 14.0 feet. Groundwater seeps at 6 feet. | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-3 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 240 | apx. 6 feet | 1010 | 1030 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Approximately 12 inches of organic-rich topsoil, forest duff and tree roots. | | | | | |
| | | | | CL | | Reddish brown sandy CLAY, moist, medium-stiff to stiff, moderate plasticity. Transitions to conglomerate bedrock. | | | | | |
| 5 | ▼ | | | | | Reddish brown CONGLOMERATE BEDROCK, wet, very dense, refusal at 6 feet. Very difficult digging 4 to 6 feet. | | | | | |
| | | | | | | Bottom of test pit at 6.0 feet. Groundwater seeps at 6 feet. | | | | | |
| 10 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |

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| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-4 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 250 | seeps @ 8 feet | 1030 | 1050 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Approximately 12 inches of organic-rich topsoil, forest duff and tree roots. | | | | | |
| | | | | CL | | Brown sandy clay, moist, soft, low plasticity. | | | | | |
| | | | | GC | | Weathered Conglomerate: reddish brown clayey GRAVEL with pebbles and cobbles, moist, stiff, moderate plasticity. Angular to subrounded clasts composed of basalt and sandstone. | | | | | |
| 5 | | | | | | | | | | | |
| | ▼ | | | | | | | | | | |
| | | | | | | Reddish brown to yellow brown CONGLOMERATE BEDROCK, wet, very dense, refusal at 12 feet. Very difficult digging 9 to 12 feet. | | | | | |
| 10 | | | | | | | | | | | |
| | | | | | | Bottom of test pit at 12.0 feet. Groundwater seeps at 8 feet. | | | | | |
| 15 | | | | | | | | | | | |

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| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-5 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 248 | seeps @ 5 feet | 1050 | 1110 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Approximately 18 inches of organic-rich topsoil, forest duff and tree roots. | | | | | |
| | | | | CL | | Brown sandy clay, moist, soft, low plasticity. | | | | | |
| | | | | GC | | Weathered Conglomerate: Reddish brown to yellow brown clayey GRAVEL, moist, stiff, moderate plasticity. Rounded to sub-angular gravels and cobbles increase with depth. Represents weathering conglomerate bedrock. | | | | | |
| 5 | ▼ | | | | | | | | | | |
| 10 | | | | | | Reddish brown to yellow brown CONGLOMERATE BEDROCK, wet, very dense, refusal at 14 feet. | | | | | |
| | | | | | | Bottom of test pit at 14.0 feet. Groundwater seeps at 5 feet. | | | | | |
| 15 | | | | | | | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-6 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 247 | seeps @ 7 feet | 1110 | 1130 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Approximately 18 inches of organic-rich topsoil, forest duff and tree roots. | | | | | |
| | | | | CL | | Brown sandy clay, moist, soft, low plasticity. | | | | | |
| 5 | | | | CL | | Reddish to medium brown clayey GRAVEL, moist, stiff, moderate plasticity. Rounded to sub-angular gravels and cobbles increase with depth. Represents weathering conglomerate bedrock. | | | | | |
| | ▼ | | | | | Reddish brown to yellow brown CONGLOMERATE BEDROCK, wet, very dense, refusal at 12 feet. Very difficult digging 7 to 12 feet. | | | | | |
| 10 | | | | | | Bottom of test pit at 12.0 feet. Groundwater seeps at 7 feet. | | | | | |
| 15 | | | | | | | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-7 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 270 | not encountered | 1130 | 1150 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | FILL: unconsolidated fill material consisting of sandy clay soils, weathered conglomerate, concrete remnants. Minor amounts of organic soils mixed in with the fill. | | | | | |
| 5 | | | | GC | | Weathered Conglomerate: reddish brown clayey GRAVEL with pebbles and cobbles, moist, stiff, moderate plasticity. Angular to subrounded clasts composed of basalt and sandstone. | | | | | |
| | | | | | | Bottom of test pit at 8.0 feet.<br>Groundwater not encountered. | | | | | |
| 10 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-8 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 275 | not encountered | 1150 | 1210 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | FILL: unconsolidated fill material consisting of sandy clay soils, concrete and asphalt remnants, large pieces of styrofoam, and minor amounts of organic soils mixed in with the fill. | | | | | |
| 5 | | | | GC | | Weathered Conglomerate: reddish brown clayey GRAVEL with pebbles and cobbles, moist, stiff, moderate plasticity. Angular to subrounded clasts composed of basalt and sandstone. | | | | | |
| | | | | | | Bottom of test pit at 8.0 feet.<br>Groundwater not encountered. | | | | | |
| 10 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-9 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 285 | not encountered | 1210 | 1230 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | FILL: unconsolidated fill material consisting of organic-rich soils, sandy clay soils, concrete remnants. | | | | | |
| 5 | | | | | | Reddish brown to yellow brown CONGLOMERATE BEDROCK, wet, very dense, refusal at 9 feet. Very difficult digging 7 to 9 feet. | | | | | |
| 10 | | | | | | Bottom of test pit at 9.0 feet. Groundwater not encountered. | | | | | |
| 15 | | | | | | | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-10 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 290 | not encountered | 1230 | 1330 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Grey well-graded GRAVEL, 1 1/4"-0 crushed aggregate mixed with sandy soils, damp, dense, non-plastic. Parking area surface. | | | | | |
| | | | | | | FILL: unconsolidated fill material consisting of black to dark grey sandy CLAY with some organics. mixed with concrete remnants, tree debris, and weathered conglomerate. | | | | | |
| 5 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| | | | | | | Bottom of test pit at 13.0 feet. Groundwater seeps at 6 feet. | | | | | |
| 15 | | | | | | | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-11 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 290 | not encountered | 1330 | 1350 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Grey well-graded GRAVEL, 1 1/4"-0 crushed aggregate mixed with sandy soils, damp, dense, non-plastic. Parking area surface. | | | | | |
| | | | | | | FILL: Black to dark grey sandy CLAY with some organics. mixed with concrete remnants, tree debris, and weathered conglomerate. | | | | | |
| 5 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| | | | | | | Bottom of test pit at 13.0 feet. Groundwater not encountered. | | | | | |
| 15 | | | | | | | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-12 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 335 | not encountered | 1350 | 1410 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Approximately 12 inches of organic-rich topsoil and root zone. | | | | | |
| | | | | SC | | Brown clayey SAND, moist, medium stiff, low plasticity | | | | | |
| 5 | | | | SP | | Grey-brown poorly graded SAND with silt, damp, medium dense, non-plastic, medium to course textured sand. | | | | | |
| 10 | | | | | | | | | | | |
| 15 | | | | | | Bottom of test pit at 16.0 feet. Groundwater not encountered. | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-13 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 319 | apx. 4 feet | 1410 | 1430 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Approximately 18 inches of organic-rich topsoil and root zone. | | | | | |
| | | | | SC | | Brown clayey SAND, wet, medium dense, low plasticity, coarse-textured sand. | | | | | |
| 5 | | | | SP | | Brownish grey SAND with clay, wet to saturated, medium dense, low plasticity, trace small gravels. | | | | | |
| 10 | | | | | | Bottom of test pit at 10.0 feet.<br>Groundwater seeps at 4 feet. | | | | | |
| 15 | | | | | | | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-14 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 313 | seeps @ 3 feet | 1430 | 1450 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Approximately 18 inches of organic-rich topsoil and root zone. | | | | | |
| | ▼ | | | CL | | Brown sandy CLAY, moist, medium-stiff, low plasticity. | | | | | |
| 5 | | | | CL | | White to grey CLAY with gravel, moist to wet, stiff, high plasticity, rounded 1/2" to 4" gravels | | | | | |
| 10 | | | | | | | | | | | |
| 15 | | | | | | Bottom of test pit at 14.0 feet.<br>Groundwater seeps at 3 feet. | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-15 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 295 | seeps @ 6 feet | 1450 | 1510 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Approximately 12 inches of organic-rich topsoil and root zone. | | | | | |
| | | | | CL | | Brown sandy clay, moist, soft, low plasticity. | | | | | |
| | | | | GC | | Weathered Conglomerate: reddish brown clayey GRAVEL with pebbles and cobbles, moist, stiff, moderate plasticity. Angular to subrounded clasts composed of basalt and sandstone. | | | | | |
| 5 | | | | | | Reddish brown to yellow brown CONGLOMERATE BEDROCK, wet, very dense, refusal at 6 feet. Very difficult digging 5 to 6 feet. | | | | | |
| | ▼ | | | | | Bottom of test pit at 6.0 feet. Groundwater seeps at 6 feet. | | | | | |
| 10 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-16 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 296 | apx. 8 feet | 1510 | 1530 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | FILL: unconsolidated fill material consisting of organic-rich soils, sandy clay soils, concrete remnants. | | | | | |
| 5 | | | | | | | | | | | |
| | ▼ | | | GC | | Weathered Conglomerate: reddish brown clayey GRAVEL with pebbles and cobbles, moist, stiff, moderate plasticity. Angular to subrounded clasts composed of basalt and sandstone. | | | | | |
| 10 | | | | | | Bottom of test pit at 12.0 feet.<br>Groundwater seeps at 8 feet. | | | | | |
| 15 | | | | | | | | | | | |

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# TEST PIT LOG

| PROJECT NAME | CLIENT | | PROJECT NO. | TEST PIT NO. |
|---|---|---|---|---|
| The Village at Camas Meadows | Harb Engineering | | 15064 | TP-17 |
| **PROJECT LOCATION** | **CONTRACTOR** | **EQUIPMENT** | **ENGINEER** | **DATE** |
| Camas, Washington | Rotschy, Inc. | Excavator | ASR | 4/15/15 |
| **TEST PIT LOCATION** | **APPROX. SURFACE ELEVATION** | **GROUNDWATER DEPTH** | **START TIME** | **FINISH TIME** |
| See Figure 2 | 290 | apx. 8 feet | 1530 | 1550 |

| Depth (feet) | Sample Field ID | SCS Soil Survey Description | AASHTO Soil Type | USCS Soil Type | Graphic Log | LITHOLOGIC DESCRIPTION AND REMARKS | Moisture Content (%) | Passing No. 200 Sieve (%) | Liquid Limit | Plasticity Index | Infiltration Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | FILL: unconsolidated fill material consisting of organic-rich soils, sandy clay soils, concrete remnants. | | | | | |
| 5 | | | | | | | | | | | |
| | ▼ | | | GC | | Weathered Conglomerate: reddish brown clayey GRAVEL with pebbles and cobbles, moist, stiff, moderate plasticity. Angular to subrounded clasts composed of basalt and sandstone. | | | | | |
| 10 | | | | | | Bottom of test pit at 12.0 feet.<br>Groundwater seeps at 8 feet. | | | | | |
| 15 | | | | | | | | | | | |

# APPENDIX C
# SOIL CLASSIFICATION INFORMATION

# SOIL DESCRIPTION AND CLASSIFICATION GUIDELINES

## Particle-Size Classification

| COMPONENT | ASTM/USCS | | AASHTO | |
|---|---|---|---|---|
| | size range | sieve size range | size range | sieve size range |
| Cobbles | > 75 mm | greater than 3 inches | > 75 mm | greater than 3 inches |
| Gravel | 75 mm – 4.75 mm | 3 inches to No. 4 sieve | 75 mm – 2.00 mm | 3 inches to No. 10 sieve |
| Coarse | 75 mm – 19.0 mm | 3 inches to 3/4-inch sieve | - | - |
| Fine | 19.0 mm – 4.75 mm | 3/4-inch to No. 4 sieve | - | - |
| Sand | 4.75 mm – 0.075 mm | No. 4 to No. 200 sieve | 2.00 mm – 0.075 mm | No. 10 to No. 200 sieve |
| Coarse | 4.75 mm – 2.00 mm | No. 4 to No. 10 sieve | 2.00 mm – 0.425 mm | No. 10 to No. 40 sieve |
| Medium | 2.00 mm – 0.425 mm | No. 10 to No. 40 sieve | - | - |
| Fine | 0.425 mm – 0.075 mm | No. 40 to No. 200 sieve | 0.425 mm – 0.075 mm | No. 40 to No. 200 sieve |
| Fines (Silt and Clay) | < 0.075 mm | Passing No. 200 sieve | < 0.075 mm | Passing No. 200 sieve |

## Consistency for Cohesive Soil

| CONSISTENCY | SPT N-VALUE (BLOWS PER FOOT) | POCKET PENETROMETER (UNCONFINED COMPRESSIVE STRENGTH, tsf) |
|---|---|---|
| Very Soft | 2 | less than 0.25 |
| Soft | 2 to 4 | 0.25 to 0.50 |
| Medium Stiff | 4 to 8 | 0.50 to 1.0 |
| Stiff | 8 to 15 | 1.0 to 2.0 |
| Very Stiff | 15 to 30 | 2.0 to 4.0 |
| Hard | 30 to 60 | greater than 4.0 |
| Very Hard | greater than 60 | - |

## Relative Density for Granular Soil

| RELATIVE DENSITY | SPT N-VALUE (BLOWS PER FOOT) |
|---|---|
| Very Loose | 0 to 4 |
| Loose | 4 to 10 |
| Medium Dense | 10 to 30 |
| Dense | 30 to 50 |
| Very Dense | more than 50 |

## Moisture Designations

| TERM | FIELD IDENTIFICATION |
|---|---|
| Dry | No moisture. Dusty or dry. |
| Damp | Some moisture. Cohesive soils are usually below plastic limit and are moldable. |
| Moist | Grains appear darkened, but no visible water is present. Cohesive soils will clump. Sand will bulk. Soils are often at or near plastic limit. |
| Wet | Visible water on larger grains. Sand and silt exhibit dilatancy. Cohesive soil can be readily remolded. Soil leaves wetness on the hand when squeezed. Soil is much wetter than optimum moisture content and is above plastic limit. |

# AASHTO SOIL CLASSIFICATION SYSTEM

**TABLE 1. Classification of Soils and Soil-Aggregate Mixtures**

| General Classification | Granular Materials (35 Percent or Less Passing .075 mm) | | | | Silt-Clay Materials (More than 35 Percent Passing 0.075) | | |
|---|---|---|---|---|---|---|---|
| Group Classification | A-1 | A-3 | A-2 | A-4 | A-5 | A-6 | A-7 |
| Sieve analysis, percent passing: | | | | | | | |
| 2.00 mm (No. 10) | - | - | - | | | | |
| 0.425 mm (No. 40) | 50 max | 51 min | - | - | - | - | - |
| 0.075 mm (No. 200) | 25 max | 10 max | 35 max | 36 min | 36 min | 36 min | 36 min |
| Characteristics of fraction passing 0.425 mm (No. 40) | | | | | | | |
| Liquid limit | | | | 40 max | 41 min | 40 max | 41 min |
| Plasticity index | 6 max | N.P. | | 10 max | 10 max | 11 min | 11 min |
| General rating as subgrade | Excellent to good | | | | Fair to poor | | |

Note: The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.

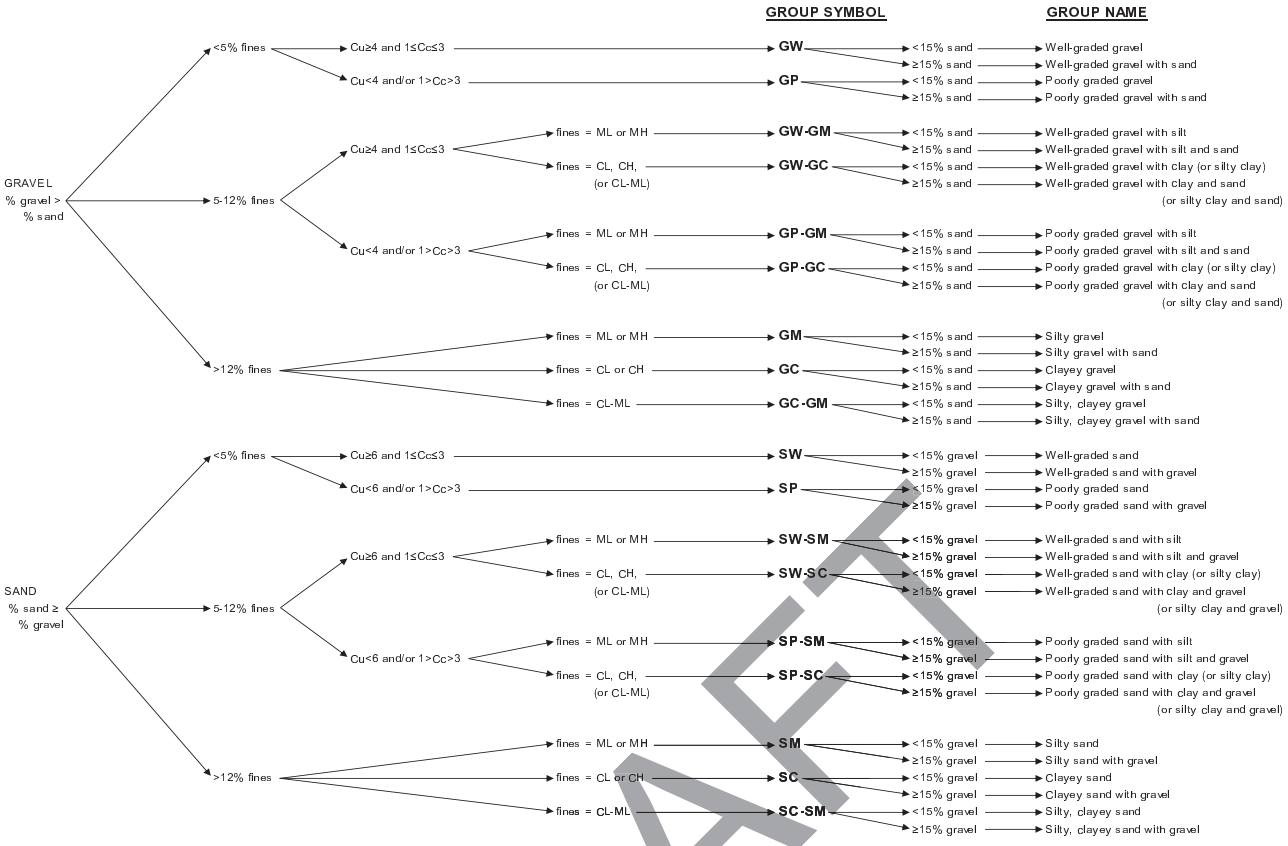
**TABLE 2. Classification of Soils and Soil-Aggregate Mixtures**

| General Classification | Granular Materials (35 Percent or Less Passing 0.075 mm) | | | | | | | Silt-Clay Materials (More than 35 Percent Passing 0.075 mm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A-1 | | | A-2 | | | | | | | A-7 |
| Group Classification | A-1-a | A-1-b | A-3 | A-2-4 | A-2-5 | A-2-6 | A-2-7 | A-4 | A-5 | A-6 | A-7-5, A-7-6 |
| Sieve analysis, percent passing: | | | | | | | | | | | |
| 2.00 mm (No. 10) | 50 max | - | - | - | - | - | - | - | - | - | - |
| 0.425 mm (No. 40) | 30 max | 50 max | 51 min | - | - | - | - | - | - | - | - |
| 0.075 mm (No. 200) | 15 max | 25 max | 10 max | 35 max | 35 max | 35 max | 35 max | 36 min | 36 min | 36 min | 36 min |
| Characteristics of fraction passing 0.425 mm (No. 40) | | | | | | | | | | | |
| Liquid limit | | | | 40 max | 41 min | 40 max | 41 min | 40 max | 41 min | 40 max | 41 min |
| Plasticity index | 6 max | | N.P. | 10 max | 10 max | 11 min | 11 min | 10 max | 10 max | 11 min | 11min |
| Usual types of significant constituent materials | Stone fragments, gravel and sand | | Fine sand | Silty or clayey gravel and sand | | | | Silty soils | | Clayey soils | |
| General ratings as subgrade | Excellent to Good | | | | | | | Fair to poor | | | |

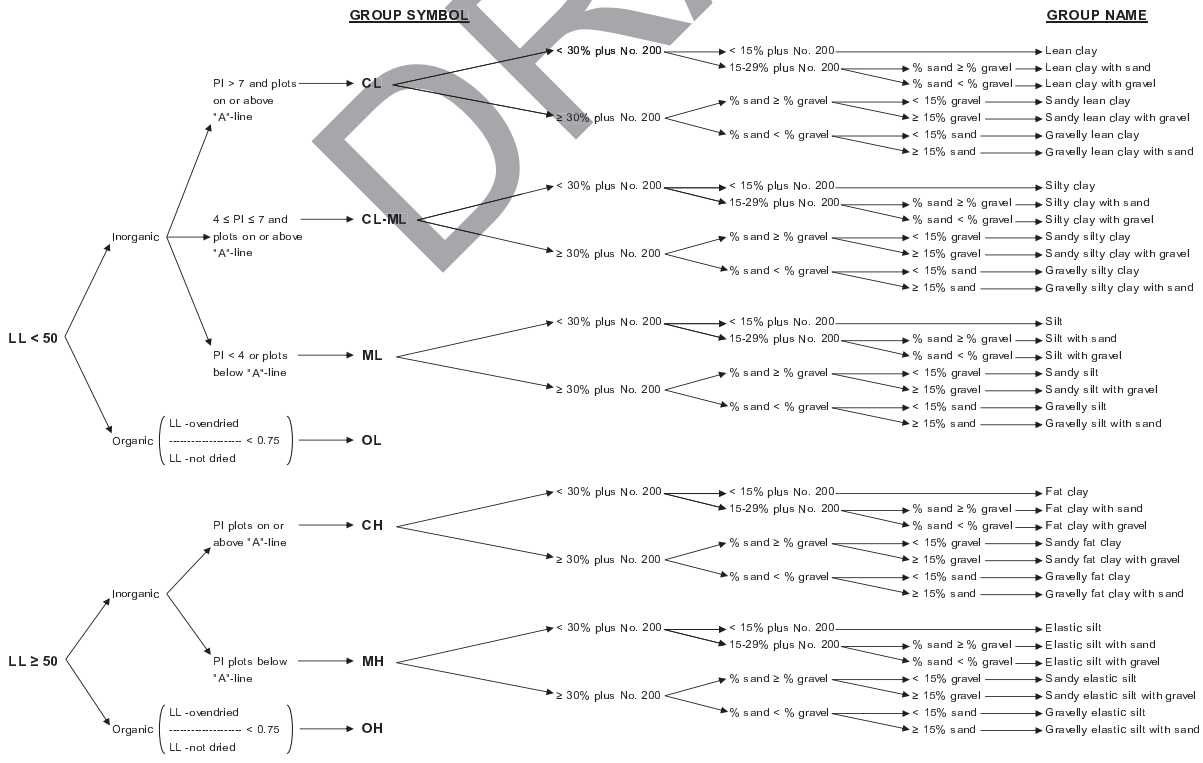
Note: Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30 (see Figure 2).

AASHTO = American Association of State Highway and Transportation Officials

# USCS SOIL CLASSIFICATION




Flow Chart for Classifying Coarse-Grained Soils (More Than 50% Retained on No. 200 Sieve)




Flow Chart for Classifying Fine-Grained Soil (50% or More Passes No. 200 Sieve)

# APPENDIX D
# REPORT LIMITATIONS AND IMPORTANT INFORMATION

Geotechnical ▪ Environmental ▪ Special Inspections
Columbia West Engineering, Inc

Date: May 29, 2015
Project: Village at Camas Meadows
Camas, Washington

## Geotechnical and Environmental Report Limitations and Important Information

### Report Purpose, Use, and Standard of Care

This report has been prepared in accordance with standard fundamental principles and practices of geotechnical engineering and/or environmental consulting, and in a manner consistent with the level of care and skill typical of currently practicing local engineers and consultants. This report has been prepared to meet the specific needs of specific individuals for the indicated site. It may not be adequate for use by other consultants, contractors, or engineers, or if change in project ownership has occurred. It should not be used for any other reason than its stated purpose without prior consultation with Columbia West Engineering, Inc. (Columbia West). It is a unique report and not applicable for any other site or project. If site conditions are altered, or if modifications to the project description or proposed plans are made after the date of this report, it may not be valid. Columbia West cannot accept responsibility for use of this report by other individuals for unauthorized purposes, or if problems occur resulting from changes in site conditions for which Columbia West was not aware or informed.

### Report Conclusions and Preliminary Nature

This geotechnical or environmental report should be considered preliminary and summary in nature. The recommendations contained herein have been established by engineering interpretations of subsurface soils based upon conditions observed during site exploration. The exploration and associated laboratory analysis of collected representative samples identifies soil conditions at specific discreet locations. It is assumed that these conditions are indicative of actual conditions throughout the subject property. However, soil conditions may differ between tested locations at different seasonal times of the year, either by natural causes or human activity. Distinction between soil types may be more abrupt or gradual than indicated on the soil logs. This report is not intended to stand alone without understanding of concomitant instructions, correspondence, communication, or potential supplemental reports that may have been provided to the client.

Because this report is based upon observations obtained at the time of exploration, its adequacy may be compromised with time. This is particularly relevant in the case of natural disasters, earthquakes, floods, or other significant events. Report conclusions or interpretations may also be subject to revision if significant development or other manmade impacts occur within or in proximity to the subject property. Groundwater conditions, if presented in this report, reflect observed conditions at the time of investigation. These conditions may change annually, seasonally or as a result of adjacent development.

### Additional Investigation and Construction QA/QC

Columbia West should be consulted prior to construction to assess whether additional investigation above and beyond that presented in this report is necessary. Even slight variations in soil or site conditions may produce impacts to the performance of structural facilities if not adequately addressed. This underscores the importance of diligent QA/QC construction observation and testing to verify soil conditions do not differ materially or significantly from the interpreted conditions utilized for preparation of this report.

Therefore, this report contains several recommendations for field observation and testing by Columbia West personnel during construction activities. Actual subsurface conditions are more readily observed and discerned during the earthwork phase of construction when soils are exposed. Columbia West cannot accept responsibility for deviations from recommendations described in this report or future

performance of structural facilities if another consultant is retained during the construction phase or Columbia West is not engaged to provide construction observation to the full extent recommended.

**Collected Samples**

Uncontaminated samples of soil or rock collected in connection with this report will be retained for thirty days. Retention of such samples beyond thirty days will occur only at client's request and in return for payment of storage charges incurred. All contaminated or environmentally impacted materials or samples are the sole property of the client. Client maintains responsibility for proper disposal.

**Report Contents**

This geotechnical or environmental report should not be copied or duplicated unless in full, and even then only under prior written consent by Columbia West, as indicated in further detail in the following text section entitled *Report Ownership*. The recommendations, interpretations, and suggestions presented in this report are only understandable in context of reference to the whole report. Under no circumstances should the soil boring or test pit excavation logs, monitor well logs, or laboratory analytical reports be separated from the remainder of the report. The logs or reports should not be redrawn or summarized by other entities for inclusion in architectural or civil drawings, or other relevant applications.

**Report Limitations for Contractors**

Geotechnical or environmental reports, unless otherwise specifically noted, are not prepared for the purpose of developing cost estimates or bids by contractors. The extent of exploration or investigation conducted as part of this report is usually less than that necessary for contractor's needs. Contractors should be advised of these report limitations, particularly as they relate to development of cost estimates. Contractors may gain valuable information from this report, but should rely upon their own interpretations as to how subsurface conditions may affect cost, feasibility, accessibility and other components of the project work. If believed necessary or relevant, contractors should conduct additional exploratory investigation to obtain satisfactory data for the purposes of developing adequate cost estimates. Clients or developers cannot insulate themselves from attendant liability by disclaiming accuracy for subsurface ground conditions without advising contractors appropriately and providing the best information possible to limit potential for cost overruns, construction problems, or misunderstandings.

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**Consultant Responsibility**

Geotechnical and environmental engineering and consulting is much less exact than other scientific or engineering disciplines, and relies heavily upon experience, judgment, interpretation, and opinion often based upon media (soils) that are variable, anisotropic, and non-homogenous. This often results in unrealistic expectations, unwarranted claims, and uninformed disputes against a geotechnical or environmental consultant. To reduce potential for these problems and assist relevant parties in better understanding of risk, liability, and responsibility, geotechnical and environmental reports often provide definitive statements or clauses defining and outlining consultant responsibility. The client is encouraged to read these statements carefully and request additional information from Columbia West if necessary.