

**Geotechnical Investigation  
Proposed 1-Acre Residential Development  
314 Pleasant Avenue  
Oregon City, Oregon**

**Prepared For**

**Northwest Housing Alternatives  
2316 SE Willard Street  
Milwaukie, Oregon 97222**

**February 10, 2016  
Project No. 3016.1.1**

 **Northwest Geotech, Inc.**  
**Northwest Testing, Inc.**

February 10, 2016  
Project No. 3016.1.1

Northwest Housing Alternatives  
2316 SE Willard Street  
Milwaukie, Oregon 97222

Attention: Ms. Susan Wilson

Subject: Geotechnical Investigation  
Proposed 1-Acre Residential Development  
314 Pleasant Avenue  
Oregon City, Oregon

Dear Ms. Wilson:

As requested, Northwest Geotech, Inc. (NGI) has completed a geotechnical investigation in support of the subject project. Our investigation consisted of subsurface exploration, laboratory testing, engineering analysis, and preparation of this report. This report summarizes our findings and presents specific recommendations for the design and construction of the proposed site improvements.

### **SITE DESCRIPTION**

The subject site consists of an approximate 1-acre irregularly shaped parcel (Tax Lot 22E32CC04700) and is located at the northwest corner of Pleasant Avenue and Caufield Street in Oregon City, Oregon as shown on the Location Map, Figure 1. The site is bound to the south by Caufield Street and Pleasant Avenue, to the east by Molalla Avenue and to the north and west by existing residential properties. The site slopes down to the northeast with overall topographic relief of about 19 feet based on the survey provided. Slope gradients across the site vary from about 4.5 percent to 22 percent. The property was formerly occupied by a single family residence and two outbuildings; however, these structures had been demolished at the time of our subsurface exploration. Vegetation at the site consists of grass and scattered evergreen and coniferous trees.

### **PROJECT DESCRIPTION**

The project is planned to consist of constructing a new multi-family residential development consisting of a cluster of 4 to 5 detached structures of two stories in height. It is anticipated that the structures will be of conventional light frame construction with raised floors or concrete slab on grade floors. Associated improvements are anticipated to include paved parking and access drives, underground utilities, concrete curbs and walks, and landscaping. Development plans for the project have yet to be developed.

## **SUBSURFACE EXPLORATION**

NGI completed a subsurface exploration of the subject site on January 27, 2016. The exploration consisted of drilling 5 exploratory borings to depths of 16.5 feet in the approximate locations shown on the Site Plan, Figure 2. Each boring was logged by an engineer from our office who visually classified the subsurface soils in accordance with the Unified Soil Classification System (USCS). Bulk and relatively undisturbed samples of the subsurface soils were collected and returned to our laboratory for further examination and testing. Standard penetration tests (SPT) were also conducted at selected depth intervals to evaluate the consistency or relative density of the soil deposits. Detailed boring logs are presented in Appendix A.

## **LABORATORY TESTING**

Representative soil samples obtained during our subsurface exploration program were tested in the laboratory to verify field soil classification and to evaluate selected engineering properties. The laboratory testing program consisted of the following:

- Moisture Content
- Dry Density
- Atterberg Limits

The moisture content and dry density test results are shown on the boring logs. The Atterberg limits test result is presented in Appendix B.

## **SUBSURFACE CONDITIONS**

The site is mantled with one to two feet of soft topsoil and/or disturbed native soil. Below these materials, undisturbed native soil consisting of firm to stiff, slightly sandy, silty clay was encountered extending to depths of 9.5 to 16.5 feet. These silty clay deposits are considered to be of moderate plasticity and potentially expansive based on the building code definition. In borings B-1 through B-3 stiff, slightly sandy, silty clay and medium dense, silty clayey sand to stiff, silty clay were encountered at depths of 9.5 to 13.5 feet.

Groundwater was encountered at depths of 7 and 3.5 feet in borings B-1 and B-4, respectively. Groundwater conditions are expected to fluctuate seasonally.

## **FINDINGS AND CONCLUSIONS**

From a geotechnical engineering standpoint, the subject property is considered suitable for the proposed development provided the recommendations presented in the following sections of this report are incorporated into the design and construction of the project.

## **RECOMMENDATIONS**

### **Site Preparation**

Prior to grading, the site should be cleared of vegetation and surface or buried obstructions. Water wells to be removed should be capped below finished site grades and abandoned in accordance with local and state guidelines. Removal of topsoil, fill, or any soft, organic, or otherwise unsuitable soils will be required beneath proposed embankment fill, pavements and building areas. It is anticipated that overall topsoil stripping will be approximately 12 to 24 inches with some localized increases due to vegetation and root zones or existing fill. The stripping depths will need to be confirmed by the geotechnical engineer's representative prior to placement of building components, pavement sections, or structural fill.

Voids resulting from removal of buried or surface obstructions located in structural areas (such as a heating oil or septic tank) should be backfilled with clean, well graded, crushed aggregate compacted to a minimum of 92 percent of ASTM D1557 (modified Proctor) as outlined below.

### **Materials for Fill**

The on-site soils at the site are generally considered to be suitable for use as structural fill provided they are free of organic materials, debris, and rock fragments in excess of 6 inches in dimension. However, it is likely that the near surface fine-grained soils will have moisture contents well in excess of optimum moisture conditions, except perhaps during the driest portion of the year, and will require significant drying to achieve compaction.

Wet weather grading is not generally recommended at this site. Should grading activities proceed during the wet weather months, the use of imported granular fill such as clean sand, pit run gravel, or crushed aggregate (containing less than 5 percent material passing the No. 200 sieve) is recommended.

Representative samples of the materials to be used for fill will need to be tested in the laboratory by the geotechnical engineer's representative to determine the maximum density and optimum moisture content.

### **Structural Fill**

All fill materials placed within structural areas should be compacted while at a moisture content near optimum and to a density that is not less than 92 percent of the maximum dry density as determined in accordance with ASTM D1557 (modified Proctor). Where fill is required on ground sloping in excess of 5 horizontal to 1 vertical, the fill should be constructed by benching the slope prior to fill placement. The number and location of benches should be evaluated by the geotechnical engineer's representative during construction. In the event that springs are encountered, underdrainage (such as french drains or drainage blankets) may be required to mitigate groundwater conditions prior to placement of structural fill. For non-structural areas, the compacted dry density should not be less than 85 percent of the modified Proctor. Unless otherwise specified, the fill materials should be placed in layers that, when compacted, do not exceed 8 inches in thickness. Structural fill will need to be tested by the geotechnical engineer's representative during construction.

### **Trench Backfill**

We recommend that trench backfill consist of a clean crushed aggregate (or other suitable granular material) containing less than 5 percent fine materials passing the No. 200 sieve. Appropriate bedding materials should be placed beneath pipes to ensure no point or concentrated loading.

All granular trench backfill above the pipe zone and within structural areas should be compacted by mechanical means to at least 92 percent of the maximum dry density determined in accordance with ASTM D1557 (modified Proctor). The trench backfill will need to be tested by the geotechnical engineer's representative.

### **Cut/Fill Slopes**

Temporary cut slopes in excess of 4 feet in height and exposing the fine-grained on-site soils should be constructed no steeper than 1 horizontal to 1 vertical to a maximum height of 8 feet. If temporary cut slopes in excess of 8 feet in height are required or when groundwater seepage is encountered, this office should be consulted.

Permanent cut and fill slopes should be constructed no steeper than 2 horizontal to 1 vertical. Permanent slopes should be vegetated as soon as practical to minimize erosion.

### **Protection of Exposed Ground**

Excavation and construction operations will expose the near-surface moisture sensitive soils to inclement weather conditions. The exposed soils will likely rapidly deteriorate due to precipitation and/or the action of repetitive heavy construction equipment. Accordingly, walls and floors of excavations should be protected from the elements and from the action of repetitive construction traffic.

There is the likely potential that tire mounted earthwork equipment could induce excess pore water pressures in the near surface soils that could result in severe pumping (and disturbance) of the grade. This condition may be present irrespective of whether the project is completed in dry or wet weather months. In addition, rubber tired equipment could cause upward movement of water through capillary action where near-surface seepage conditions are present. NGI has provided wet weather geotextile and aggregate thickness recommendations for construction access and staging areas and these sections should be considered minimum sections to be used in conjunction with track-mounted equipment.

### **Wet Weather Grading/Erosion Control**

Wet weather grading of the near surface, moisture-sensitive soils is not generally recommended. In the event that wet weather grading is unavoidable due to construction schedules; stabilization of the subgrade soils with a geotextile and aggregate (or by other means) will likely become necessary. Also, construction traffic should be directed over access roads and staging areas constructed of a minimum of 12 inches of crushed aggregate placed

over a geotextile such as Mirafi 500X (or equivalent). In addition, the use of lightweight track-mounted equipment is recommended to minimize disturbance of the subgrade. Erosion control measures will need to be undertaken to meet Clackamas County and project requirements.

### **Excavations**

Based on the subsurface exploration, it is anticipated that excavations can be accomplished using conventional heavy earthmoving equipment. Temporary excavations in excess of 4 feet in depth will require shoring or sloping of the sidewalls to provide for worker safety. At the time of the subsurface exploration in January 2016, groundwater was encountered at depths of 7 and 3.5 feet in borings B-1 and B-4, respectively. Groundwater conditions are expected to fluctuate seasonally. Excavations below the water table or where significant groundwater seepage is encountered will need to be dewatered during construction.

### **Building Foundations**

Building loads may be supported on individual and/or continuous spread footings bearing on undisturbed native soils or compacted structural fill. Foundations may be designed for an allowable dead plus live load bearing capacity of 2,000 pounds per square foot with an increase of one-third allowed for short term wind or seismic loads.

Footings should be embedded a minimum of 18 inches below the lowest adjacent finished grade. Continuous and/or individual spread footings should be a minimum of 15 inches in the least dimension. If footing excavations are left open during wet weather periods or if seepage occurs, a 2 to 3 inch thick layer of clean crushed aggregate should be placed and seated by mechanical means to help avoid deterioration of the bearing soils.

Lateral loads can be resisted by passive pressures acting against footings and by frictional resistance between foundation elements and supporting soils. A passive resistance of 200 pounds per square foot per foot of embedment depth and a friction factor of 0.30 may be used for design. The friction factor can be increased to 0.35 if crushed aggregate is used to support footings.

Settlement is anticipated to be within typical construction tolerances of one inch of total settlement and one-quarter to one-half inch of differential settlement. Where unusual loading patterns result in large differential loads, combined footings, eccentrically loaded footings, or other special foundation requirements, this office should be consulted. Foundations should be reinforced in accordance with structural considerations. Due to the potentially expansive soil conditions, reinforcement is recommended to include, at a minimum, two number 4 bars in the foundation and two number 4 bars in the stemwall.

### **Retaining Walls**

Retaining walls should be designed to withstand lateral earth pressures and any adjacent surcharge loads. Walls free to deflect and retaining level backfill composed of free-draining sand or gravel (containing less than 5 percent material passing the No. 200 sieve) may be designed for an equivalent fluid active pressure of 35 pounds per cubic foot. The on-site soils

are not generally recommended for wall backfill. Restrained walls should be designed for an equivalent fluid at-rest pressure of 50 pounds per cubic foot. Additional surcharge pressures from adjacent loadings or sloping backfill conditions should be added to these values.

For seismic loading, a unit pseudostatic force equal to  $7.1 \text{ pcf} (H)^2$ ; where H is the height of the wall in feet, should be added to the static active or at-rest lateral earth pressure. The location of the pseudostatic force can be assumed to act a distance of  $0.6H$  above the base of the wall.

The above design considerations assume that walls will be appropriately drained to prevent buildup of hydrostatic pressures. Wall foundations should be designed in accordance with the recommendations presented in the building foundations section of this report.

### **Floor Slabs**

Floor slabs should be at least 3.5 inches in thickness and underlain by a minimum of 6 inches of clean, free-draining, crushed rock compacted to a minimum of 95 percent of the maximum dry density as determined in accordance with ASTM D1557 (modified Proctor). Interior floor slabs should also be underlain by a suitable moisture barrier covered with a protective layer of clean sand. Slab thickness and reinforcing should be determined in accordance with structural considerations. Due to the potentially expansive soil conditions, reinforcement is recommended to include welded wire mesh at a minimum.

### **Seismic Design**

Based on the subsurface exploration and the 2012 IBC as modified by the 2014 OSSC the following seismic design parameters are recommended for the project.

Mapped Spectral Acceleration for Short Periods:  $S_s = 0.93$

Mapped Spectral Acceleration for a 1-Second Period:  $S_1 = 0.40$

Site Class: D

Site Coefficients:  $F_a = 1.13$  and  $F_v = 1.60$

Design Spectral Response Acceleration at Short Periods:  $S_{DS} = 0.70$

Design Spectral Response Acceleration at 1-Second Period:  $S_{D1} = 0.43$

The potential for seismic induced soil liquefaction at the site is considered to be low based on the plasticity of the subsurface soils. The risk of seismic slope instability at the site is also considered to be low. Based on the USGS Quaternary Fault Map, the site is located approximately 2.4 miles from the nearest mapped fault. Generally the risk of surface displacement is considered to be low if the site is more than 1000 feet from a mapped fault trace.

### **Temporary Construction Drainage**

Surface water should be diverted from excavations by means of temporary drainage facilities. Excavations should be de-watered as necessary by pumping or other suitable methods. Ponding of surface water in structural areas should also be prevented to the extent practical utilizing temporary drainage facilities.

### **Permanent Site Drainage**

Surface water should be diverted from foundations by grading the ground surface a minimum of 2 percent away from walls and carrying the runoff from roofs to a suitable gravity outlet.

Permanent subsurface drainage of each building perimeter is recommended to prevent potential subjection of foundations and slabs to hydrostatic pressures and to help keep the moisture content of subgrade materials from extreme seasonal variations. Construction of a continuous subdrain system which surrounds the building perimeter and is sloped (minimum 0.5 percent) to a suitable gravity outlet is recommended. A suitable subdrain system would consist of a 4-inch diameter, perforated PVC pipe (typical) embedded below and adjacent the bottom of footings and backfilled with approved drain rock. The type of PVC pipe to be utilized may depend on building agency requirements and should be verified prior to construction. In addition, to prolong the life of the subdrain system, NGI recommends lining the trench excavation with a geotextile filter such as Mirafi 140N or equivalent. The subdrain excavation should be constructed in a manner to prevent undermining of any foundation or slab component or disturbance to supporting soils.

In addition to the perimeter subdrain system, drainage of crawlspace areas is recommended. Each crawlspace should be graded to a low point for installation of a crawlspace drain that is tied into the perimeter subdrain and tight-lined to a suitable gravity outlet.

In the event that the subdrains are tied into the rain (roof) drain system, an approved backflow device will be required. If backflow devices are not allowed, these systems should be run independently.

### **Asphaltic Concrete Pavements**

Although no specific pavement design was completed for the project, we recommend the following minimum flexible pavement sections based on assumed traffic, the subsurface conditions, and our experience with similar projects.

#### **Cars and Light Trucks Only**

- 2.5 Inches of Asphaltic Concrete Pavement
- 8.0 Inches of Crushed Aggregate Base

### Occasional Heavy Trucks

- 3.0 Inches of Asphaltic Concrete Pavement
- 10.0 Inches of Crushed Aggregate Base

If significant heavy truck traffic is anticipated, this office should be consulted.

Prior to placement of the base course, the ground surface should be stripped of topsoil, existing fill, or otherwise unsuitable soils as described above for general grading operations. The upper 6 inches of exposed subgrade should then be scarified and compacted to at least 92 percent of maximum dry density by ASTM D1557 (Modified Proctor). The scarification procedure may be waived at the discretion of the soils engineer if proof-rolling of the subgrade with a fully loaded dump truck (or probing) reveals suitable conditions. A geotextile such as Mirafi 500X (or equivalent) is recommended to be placed between the subgrade and baserock section. Embankment fills and aggregate base for paved areas should be compacted to a minimum of 92 and 95 percent ASTM D1557, respectively. Asphaltic concrete pavements should be compacted to a minimum of 91 percent of the theoretical maximum density per ASTM D2041 (Rice Gravity). Aggregate base and asphaltic concrete materials should meet the requirements as outlined in the current Oregon Department of Transportation Standard Specifications.

### **ADDITIONAL SERVICES**

#### **Design Review**

This geotechnical report pertains to a specific site and development. It is not applicable to adjacent sites nor is it valid for types of developments other than that to which it refers. Any variation from the site or development necessitates a geotechnical review in order to determine the validity of the design concepts evolved herein.

Additionally, a geotechnical review of final plans and specifications is necessary to determine whether our recommendations have been properly interpreted and incorporated in the design and construction documents.

#### **Construction Monitoring**

Because of the judgmental character of soil and foundation engineering, as well as the potential for adverse circumstances arising from construction activity, observations during site preparation, excavation, and construction will need to be carried out by the geotechnical engineer or his representative. These observations then may serve as a basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein to the benefit of the project. Moreover, field engineering observations become increasingly important should earthwork proceed during adverse weather conditions.

**LIMITATIONS**

Within the limitations of scope, schedule, and budget, our services have been completed in accordance with the General Conditions with our Client and accepted geotechnical practices in this area at the time this report was prepared. One copy of our General Conditions is included in Appendix C of this report. This report was prepared for the exclusive use of NGI's client for the specific project and NGI does not authorize the segmented use of the advice herein nor the reliance upon the report by third parties without written authorization of NGI. The boring logs and related information depict generalized subsurface conditions only at these specific locations and at the particular time the subsurface exploration was completed. Soil and groundwater conditions at other locations may differ from the conditions at these boring locations. Also, the passage of time may result in a change in the soil and groundwater conditions at the site. This report pertains to the subject site only, and is not applicable to adjacent sites nor is it valid for types of development other than that to which it refers. Unless explicitly addressed in this report, slope stability analyses and seismic site hazard analyses have not been included. If you would like NGI to complete these services, please contact our office.

This opportunity to be of service is sincerely appreciated. If you should have any questions, please contact our office.

Respectfully submitted,

NORTHWEST GEOTECH, INC.

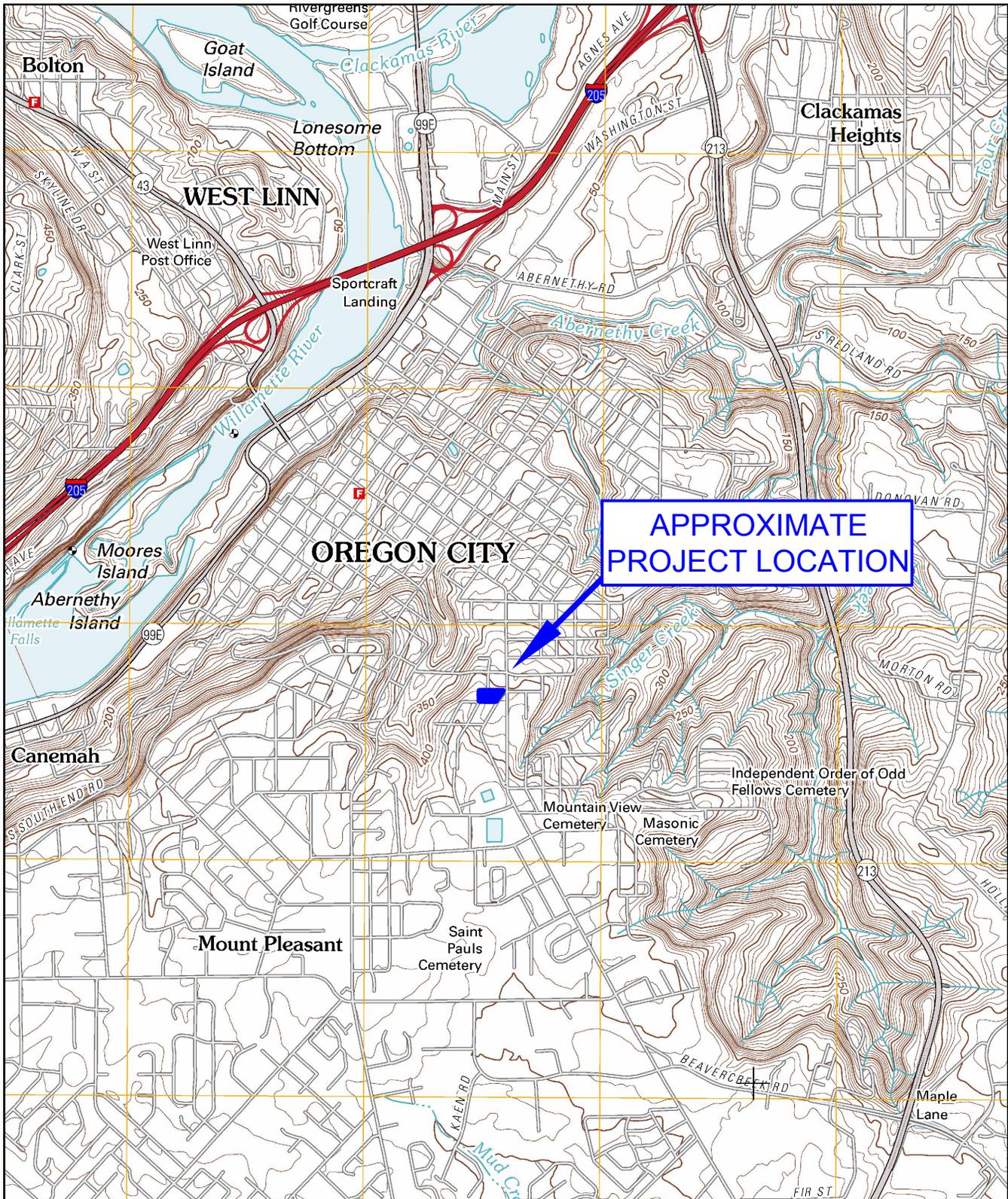


EXPIRATION DATE: 12/31/16

Wayne R. Olsen, P.E., G.E.  
Project Engineer

Thomas S. Ginsbach, P.E., G.E.  
President

Copies: (3) Addressee



# LOCATION MAP

PROJECT NO. 3016.1.1

PROPOSED 1-ACRE RESIDENTIAL DEVELOPMENT  
314 PLEASANT AVENUE  
OREGON CITY, OREGON

FIGURE NO. 1



## **APPENDIX A**

DRILLING COMPANY: GREG VANDEHEY SOIL SAMPLING		RIG: SIMCO 2400		DATE: 1/27/16		
BORING DIAMETER: 4 INCHES		HAMMER WEIGHT: 140 LBS		DROP: 30 INCHES		
ELEVATION:						
DEPTH (FEET)	DCP	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION BORING NO. B-1
0					ML	5" OF SOD OVER GRAY-BROWN, VERY WET, SOFT SLIGHTLY SANDY, SILTY CLAY WITH TRACE ORGANICS (TOPSOIL/DISTURBED NATIVE)
5		9	67.5	54.1	CH	GRAY-BROWN, WET, STIFF, SLIGHTLY SANDY, SILTY CLAY (NATIVE)  BECOMES SATURATED
10		13			CL	LIGHT BROWN, SATURATED, STIFF, SLIGHTLY SANDY, SILTY CLAY
15		11			SC	LIGHT BROWN, SATURATED, MEDIUM DENSE, SILTY, CLAYEY SAND
16.5		16				TOTAL DEPTH: 16.5 FEET GROUNDWATER ENCOUNTERED AT 7.0 FEET
20						<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  - SPT SAMPLER         </div> <div style="text-align: center;">  - SHELBY TUBE SAMPLER         </div> </div>
25						
30						

## BORING LOG

PROJECT NO. 3016.1.1	PROPOSED 1-ACRE RESIDENTIAL DEVELOPMENT 314 PLEASANT AVENUE OREGON CITY, OREGON	FIGURE NO. A-1
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DEPTH (FEET)		DCP	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION BORING NO. B-2
0						ML	4" OF SOD OVER GRAY-BROWN, VERY WET, SOFT SLIGHTLY SANDY, SILTY CLAY WITH TRACE ORGANICS (TOPSOIL/DISTURBED NATIVE)
5			9 13			CH	BROWN, WET, STIFF, SLIGHTLY SANDY, SILTY CLAY (NATIVE)
10			8	56.5	70.3	MH	LIGHT BROWN, VERY WET, STIFF, CLAYEY SILT
15			11				
TOTAL DEPTH: 16.5 FEET NO GROUNDWATER ENCOUNTERED							
<div style="display: flex; justify-content: center; gap: 20px;"> <div style="text-align: center;">  - SPT SAMPLER                 </div> <div style="text-align: center;">  - SHELBY TUBE SAMPLER                 </div> </div>							

## BORING LOG

PROJECT NO. 3016.1.1	PROPOSED 1-ACRE RESIDENTIAL DEVELOPMENT 314 PLEASANT AVENUE OREGON CITY, OREGON	FIGURE NO. A-2
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DRILLING COMPANY: GREG VANDEHEY SOIL SAMPLING		RIG: SIMCO 2400		DATE: 1/27/16		
BORING DIAMETER: 4 INCHES		HAMMER WEIGHT: 140 LBS		DROP: 30 INCHES		
ELEVATION:						
DEPTH (FEET)	DCP	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION BORING NO. B-3
0					GP	3" OF LOOSE 3/4 INCH MINUS CRUSHED AGGREGATE (FILL)
					CH	BROWN, WET, POORLY COMPACTED, SLIGHTLY SANDY, SILTY CLAY WITH TRACE ORGANICS (TOPSOIL/FILL)
		12			CH	BROWN, WET, STIFF, SLIGHTLY SANDY, SILTY CLAY (NATIVE)
5		13				
		14				
10			95.8	27.4		
					MH	GRAY, VERY WET, STIFF, CLAYEY SILT
15		8				
						TOTAL DEPTH: 16.5 FEET NO GROUNDWATER ENCOUNTERED
20						
						<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  - SPT SAMPLER         </div> <div style="text-align: center;">  - SHELBY TUBE SAMPLER         </div> </div>
25						
30						

## BORING LOG

PROJECT NO. 3016.1.1	PROPOSED 1-ACRE RESIDENTIAL DEVELOPMENT 314 PLEASANT AVENUE OREGON CITY, OREGON	FIGURE NO. A-3
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DEPTH (FEET)		DCP	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION BORING NO. B-4
0						ML	4" OF SOD OVER GRAY-BROWN, VERY WET, SOFT SLIGHTLY SANDY, SILTY CLAY WITH TRACE ORGANICS (TOPSOIL/DISTURBED NATIVE)
5			8	82.6	35.3	CH	BROWN, VERY WET, FIRM, SLIGHTLY SANDY, SILTY CLAY (NATIVE)
10			11				BECOMES STIFF
15			16				BECOMES VERY STIFF
20			17				TOTAL DEPTH: 16.5 FEET GROUNDWATER ENCOUNTERED AT 3.5 FEET
25							<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  - SPT SAMPLER         </div> <div style="text-align: center;">  - SHELBY TUBE SAMPLER         </div> </div>
30							

## BORING LOG

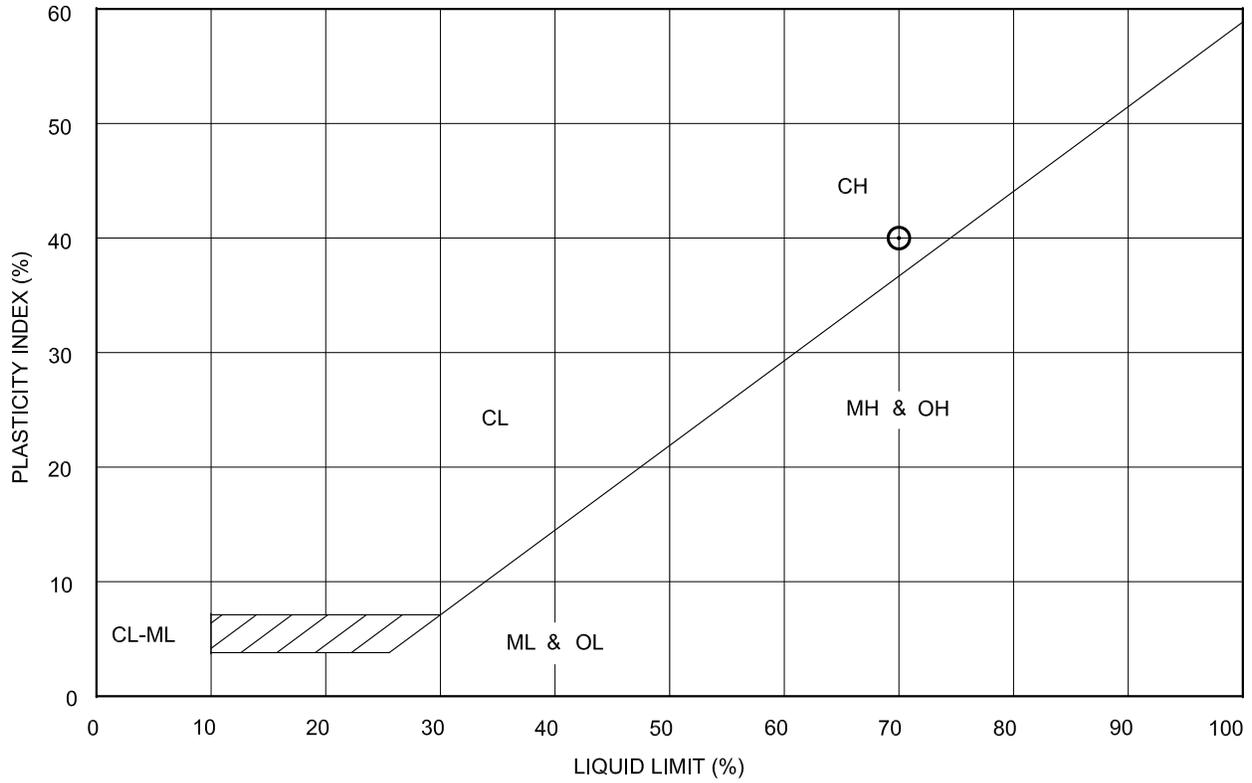
PROJECT NO. 3016.1.1	PROPOSED 1-ACRE RESIDENTIAL DEVELOPMENT 314 PLEASANT AVENUE OREGON CITY, OREGON	FIGURE NO. A-4
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DRILLING COMPANY: GREG VANDEHEY SOIL SAMPLING			RIG: SIMCO 2400		DATE: 1/27/16	
BORING DIAMETER: 4 INCHES		HAMMER WEIGHT: 140 LBS		DROP: 30 INCHES		ELEVATION:
DEPTH (FEET)	DCP	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION
						BORING NO. B-5
0					ML	4" OF SOD OVER GRAY-BROWN, VERY WET, SOFT SLIGHTLY SANDY, SILTY CLAY WITH TRACE ORGANICS (TOPSOIL/DISTURBED NATIVE)
5		18			CL	BROWN, WET, VERY STIFF, SLIGHTLY SANDY, SILTY CLAY (NATIVE)  BECOMES REDDISH BROWN
		23				
		25				
10		22				
15		14				
20						TOTAL DEPTH: 16.5 FEET NO GROUNDWATER ENCOUNTERED
25						☐ - SPT SAMPLER
30						

## BORING LOG

PROJECT NO. 3016.1.1	PROPOSED 1-ACRE RESIDENTIAL DEVELOPMENT 314 PLEASANT AVENUE OREGON CITY, OREGON	FIGURE NO. A-5
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## APPENDIX B



SYMBOL	SAMPLE LOCATION	FIELD (%) MOISTURE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	UNIFIED SOIL CLASS.
⊙	B-1 @ 5.0 - 7.0 FT.	54.1	70	30	40	CH

## ATTERBERG LIMITS TEST RESULT - ASTM D4318

PROJECT NO. 3016.1.1

PROPOSED 1-ACRE RESIDENTIAL DEVELOPMENT  
314 PLEASANT AVENUE  
OREGON CITY, OREGON

FIGURE NO. B-1

## APPENDIX C

**1. PARTIES AND SCOPE OF WORK:** Northwest Geotech, Inc., (NGI) shall include said company, its engineers, employees, insurers, or authorized representatives. "Work" means the service(s) performed by NGI for Client or at Client's direction. This "Agreement" consists of NGI's proposal, NGI's Schedule of Fees and Services, Client's written acceptance, NGI's signed acceptance, and these General Conditions. "Client" refers to the individual or business entity executing this Agreement. The individual executing this Agreement represents and warrants that he/she is the duly authorized agent of the Client. Client may choose representatives for the purpose of ordering and directing the Work and in such case the term "Client" also includes the principal for whom the Work is being performed and the Client's representatives. Prices quoted and charged by NGI for its Work are predicated upon the conditions and the allocations of risks and obligations expressed in this Agreement. Unless this Agreement specifically provides that NGI is to perform its Work pursuant to specified Federal, State, or local regulations, Client assumes sole responsibility for determining whether the quantity and the nature of the Work ordered by Client is adequate and sufficient for Client's intended purpose. Client shall communicate this Agreement including these General Conditions to each and every third party to whom Client transmits any part of NGI's Work or to whom Client sells, transfers, or assigns an interest in the site or project. NGI shall have no duty or obligation to any third party greater than that set forth in this Agreement. Executing this Agreement or ordering Work from NGI shall constitute acceptance of the terms of these General Conditions. NGI shall be under no obligation to inform other parties of its activities or discoveries, but shall not be negligent if it does so.

**2. PAYMENT FOR SERVICES:** Invoices will be submitted monthly for services and Client agrees that the invoice amount is due when received unless otherwise agreed. A service charge of one and one-half percent (1-1/2%) per month (but not exceeding the maximum allowable by law) will be added to any account not paid within 30 days after billing. In the event that any portion of the account remains unpaid 30 days after billing, NGI may immediately discontinue services on any and all projects for Client and/or demand prepayment of fees at NGI's option. Client shall pay all costs incurred by NGI in collecting any delinquent amount, including staff time, court costs and attorney fees at trial and appeal. In the event that NGI obtains a judgment against Client and must execute upon that judgment, Client agrees to pay all attorney fees and costs associated with the execution. If Client objects to all or any portion of any invoice, Client shall notify NGI in writing of the same within ten (10) days from the date of receipt of said invoice and shall pay that portion of the invoice not in dispute, and the parties shall immediately make every effort to settle the disputed portion of the invoice. Failure to make payment within sixty (60) days of invoice shall constitute a release of NGI from any and all claims which Client may have, either in tort or contract, and whether known or unknown at the time. These General Conditions are notice that a construction lien may be claimed for all material, labor and services furnished.

**3. SITE CONDITIONS:** Client will grant or obtain free access to the site for all personnel and equipment required for NGI to perform the Work. NGI shall take reasonable measures and precautions to minimize damage to each site and any improvements located thereon as the result of its Work and the use of its equipment; however, NGI has not included in its fee the cost of restoration of damage which may occur. If Client or the possessor of any interest in any site desires or requires NGI to restore site to its former conditions, upon written request, NGI will perform such additional work as is necessary and Client agrees to pay to NGI the cost thereof. While NGI will take reasonable precautions to minimize damage to site, Client is responsible for identifying underground structures and agrees to defend, indemnify and hold NGI harmless from all loss, liability, costs (including attorney fees at trial and on appeal), and damage resulting from underground structures not properly located and marked, and from all third party suits for trespass.

**4. DISCLOSURE:** Client agrees to provide NGI all information in its possession that may be pertinent to the scope of Work, including any information concerning actual or possible presence of hazardous materials. Client agrees that the discovery of unanticipated hazardous materials constitutes a changed condition mandating a re-negotiation of the scope of Work or termination of services. Client agrees to compensate NGI for all

costs incident to the discovery of unanticipated hazardous materials. NGI will immediately inform Client of the detection of unanticipated hazardous materials. Client will defend, indemnify, and hold NGI harmless from any claim, liability, costs (including attorney fees at trial and on appeal), or injury, including delay of the project associated with the discovery of unanticipated hazardous materials or any disclosure of these conditions as required by governing law or regulation. All hazardous materials, including samples taken for testing will remain the property and responsibility of Client.

**5. ENVIRONMENTAL INDEMNITY:** To the fullest extent permitted by law Client agrees to defend, indemnify, and hold harmless NGI from any loss, costs, damage, expense (including attorney fees and costs at trial and appeal), or any theory of liability arising out of or in connection with NGI's exacerbation of existing environmental pollution or contamination or any newly caused pollution or contamination.

**6. THIRD PARTY INDEMNITY:** To the fullest extent permitted by law Client agrees to defend, indemnify and hold NGI harmless from any claims, demands, suits, charges, expense (including attorney fees and costs at trial and appeal), and/or allegations of responsibility by any and all third parties including but not limited to contractors, subcontractors, agents, employees, assignees, transferees, successors, invitees, neighbors, and the public relating to conditions on or about the project, except to the extent that a claim is the result of negligence of NGI. Client shall notify any third party who may perform work on the project or to whom Client sells, transfers, or assigns an interest in the site or project of the standard of care being undertaken by NGI pursuant hereto and of the limitations of liability contained herein. Client shall require as a condition to the performance of any such third party a like indemnity and limitation of liability on their part against NGI.

**7. CONTRACTOR'S RESPONSIBILITY:** Our duties do not include supervising the Client's contractors or overseeing, or providing the means and methods of their work. NGI shall have no authority to control any contractor or other entity regarding their work or their safety practices. The purpose of NGI's Work shall be to provide our Client with a greater degree of confidence that the work will meet specifications, not to control or guarantee the work of the contractor. NGI has no duty to inspect or correct health and safety deficiencies of the Client, contractors, or other entities except for NGI personnel. We will not be responsible for the failure of the Client's contractors to perform in accordance with their undertakings and the providing of our services shall not relieve others of their responsibilities to the Client or to others. NGI reserves the right to report to the Client any unsafe condition observed at the project without altering the foregoing.

**8. FEE SCHEDULE:** Where NGI's services are quoted or estimated on the basis of the current fee schedule, should the project extend beyond the end of the calendar year, the fee schedule then in use shall apply unless otherwise negotiated in advance.

**9. LIMITATIONS OF PROCEDURES:** Information obtained from inspections, analysis and testing of sample materials shall be accurately reported in reports. However, variations between inspected or tested discrete locations may occur and the risk of such occurrence is understood and accepted by Client. If conditions different than are indicated in our report come to your attention after you receive the report, it is recommended that you contact NGI immediately to authorize appropriate further investigation and to inform NGI completely on what you have discovered. If NGI completes borings or test pits in the performance of its Work there is the possibility that settlement of the backfill will occur. Client agrees to accept all responsibility for conditions related to backfill settlement. Unless explicitly addressed in NGI's proposals or reports our services do not include seismic or slope stability evaluation.

**10. SCHEDULES AND DELAYS:** All promises of services time are approximations by NGI and are subject to the Client and contractor's schedules, weather conditions, traffic conditions, disputes with workmen or parties, accidents, strikes, natural disasters or other causes. In no event shall NGI be responsible for any damage or expense due to delays from any cause, other than to the extent the damage or expense is caused by NGI's own negligence after having been warned in writing by the Client of the damage or expense which may result from the delay.



