LIMITED GEOTECHNICAL ENGINEERING REPORT
Pacer-Enviro Propane Project
74th Avenue NE
Arlington, Washington

March 12, 2010

Prepared for

Pacer-Enviro Propane LLC

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Bellingham, Washington

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March 12, 2010
Job No. 10-0110

Pacer-Enviro Propane LLC
PO Box 171
Arlington, WA 98223

Attn: Steve Stebing

Re: Limited Geotechnical and Infiltration Evaluation
Proposed Pacer-Enviro Propane Project
PN 31051400203400
74th Avenue NE
Arlington, Washington

Dear Mr. Stebing:

This report presents the results of our limited geotechnical and infiltration investigation for the project to be located off 74th Avenue NE in Arlington, Washington, the location of which is shown on the attached Vicinity Map (Figure 1). Our services were completed in accordance with your request.

PROJECT DESCRIPTION

We understand that there are plans to construct a new commercial building within the northern portion of the subject property. The subject property is generally flat, with some hummocky areas, and slopes downward slightly to the south.

We understand that the proposed commercial structure will be an approximately 2,800 square foot, 18 to 20 foot high, pre-engineered metal building. Additional improvements at the site will likely include pervious parking area(s) and access drive(s). It is our understanding that stormwater management will be controlled through infiltration methods.

SITE GEOLOGY

The Washington Division of Geology and Earth Sciences (2009) maps the near-surface geologic unit as being Fraser age continental glacial outwash. These deposits consist of sand and gravel and may include minor till. This unit has high permeability and good drainage. Soils encountered within our test pit explorations were generally consistent with the mapped deposits.

The soils encountered at the project site were relatively consistent with the mapped geology.

SUBSURFACE SOIL CONDITIONS

Subsurface soil conditions at the site were explored by excavating and sampling seven test pits using a tracked excavator on March 1st, 2010. Explorations were within the proposed building location and associated parking areas. Test pit locations were chosen by Pilchuck Construction. Our explorations were extended to depths ranging between approximately 6 to 10 feet below the existing ground surface (BGS). Please refer to the attached Site and Exploration Plan (Figure 2) for the approximate test pit locations.

The subsurface profile was very uniform across the site and consisted of granular, glacial outwash deposits.

At the surface of the majority of our explorations, we encountered approximately 12 inches of soft, moist, topsoil. Underlying the topsoil, very gravelly, fine to coarse sand was encountered to the full depths explored. An approximately 2 inch thick, black, stained layer was encountered in the majority of the test pits. The layer is likely due to a mineral transfer process and appears to correlate with the seasonal high groundwater table. In TP-6, approximately 3 feet of borrow fill was encountered directly under the topsoil layer. A 1 foot thick, relic topsoil layer was between the fill and native gravelly sands.

More detailed descriptions of the subsurface conditions encountered at each test pit location are included in the logs attached with this report.

GROUNDWATER

At the time of our subsurface investigation in early March of 2010, moderate to rapid groundwater seepage was observed within all of our explorations at depths ranging from 4 to 7 feet BGS.

In addition, evidence of a seasonal high water table, typically indicated by a distinct mottled contact or horizon, was apparent within the majority of our explorations at approximately the same depths.

Groundwater levels are not static, and vary with respect to surface runoff, precipitation, season, changes in site utilization, both on and off site, and other factors. In general, groundwater levels are higher during the wetter months, October through June.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are intended to help with the foundation design and stormwater planning phases of the project.

Site Preparation and Earthwork

The portions of the site to be occupied by the proposed building foundation, soil supported slabs or access drives and parking areas should be prepared by removing any existing fill, topsoil, significant accumulations of organics and unsuitable soil. We anticipate that approximately 12 inches of soil may need to be removed to reach suitable bearing conditions for the proposed foundation elements.

Prior to placement of any structural fill, the exposed subgrade under all areas should be recompacted to a dense and unyielding condition and proof rolled with a loaded dump truck, large self-propelled vibrating roller, or equivalent piece of equipment applicable to the size of the excavation. The purpose of this effort is to identify possible loose or soft soil deposits and recompact the soil exposed during site excavation activities.

Proof rolling should be carefully observed by qualified geotechnical personnel. Areas exhibiting significant deflection, pumping, or over-saturation that cannot be readily compacted should be overexcavated to firm soil. Overexcavated areas should be backfilled with compacted granular material placed in accordance with subsequent recommendations for structural fill. During periods of wet weather, proof rolling could damage the exposed subgrade. Under these conditions, qualified geotechnical personnel should observe subgrade conditions to determine if proof rolling is feasible.

Fill and Compaction

Structural fill used to obtain final subgrade in all structural locations must be properly placed and compacted. In general, any suitable, non-organic, predominantly granular soil may be used for structural fill material, including portions of the existing onsite soil, provided the material is properly moisture conditioned prior to placement and compaction, and the specified degree of compaction is obtained. If the existing onsite soil is to be reused for structural fill, any cobbles or other material greater than approximately 6 inches in diameter should be removed. Excavated site material containing topsoil, wood, trash, organic material, or construction debris will not be suitable for reuse as structural fill and should be properly disposed offsite or placed in nonstructural areas.

Reuse of Onsite Soil

Based on the conditions encountered during our site investigation, the site soils are suitable for foundation support and roadway structure subgrades. As previously stated, all cobbles greater than 6 inches in diameter should be removed before placement of the fill.

Imported Structural Fill

We recommend that imported structural fill consist of clean, well-graded sandy gravel, gravelly sand, or other approved naturally occurring granular material (pit run) with at least 40 percent retained on the No. 4 sieve, or a well-graded crushed rock. Structural fill for dry weather construction may contain on the order of 10 percent fines (that portion passing the U.S. No. 200 sieve) based on the portion passing the U.S. No. 4 sieve. Soil containing more than about 5 percent fines cannot consistently be compacted to a dense, non-yielding condition when the water content is greater than optimum. Accordingly, we recommend that imported structural fill with less than 5 percent fines be used during wet weather conditions. Due to wet weather or wet site conditions, soil moisture contents could be high enough that it may be very difficult to compact even "clean" imported select granular fill to a firm and unyielding condition. Soils with over-optimum moisture contents should be either scarified and dried back to more suitable moisture contents during periods of dry weather or removed and replaced with fill soils at a more suitable range of moisture contents.

Backfill and Compaction

Structural fill should be placed in horizontal lifts 8 to 10 inches in loose thickness and thoroughly compacted. All structural fill placed under load bearing areas should be compacted to at least 95 percent of the maximum dry density, as determined using test method ASTM D 1557. In paved areas, the fill should be compacted to at least 92 percent, except the upper 24 inches of subgrade, which should be compacted to a minimum of 95 percent of maximum dry density. The top of the compacted structural fill should extend outside all foundations and other structural improvements a minimum distance equal to the thickness of the fill. We recommend that compaction be tested after placement of each lift in the fill pad.

Seismic Design Considerations

The Pacific Northwest is seismically active and the site could be subject to ground shaking from a moderate to major earthquake. Consequently, moderate levels of earthquake shaking should be anticipated during the design life of the project, and the proposed structures should be designed to resist earthquake loading using appropriate design methodology. The relatively dense condition of the native soil observed and interpreted to underlie the site effectively precludes seismically induced soil liquefaction. In addition, it is anticipated that the site would not be subject to seismically induced landslides, lateral spreading, or other ground failure.

For structures designed using the seismic design provisions of the 2006 International Building Code, the relatively dense, gravelly sand (glacial outwash), interpreted to underlie site in the upper 100 feet, classifies as Site Class D, stiff soil profile, according to Site Class Definitions, Table 1613.5.2. The corresponding values for calculating a design response spectrum for the assumed soil profile type is considered appropriate for the site.

Foundation Support and Settlement

Based on the subsurface conditions encountered at the project site, approximately 1 foot of unsuitable soil may have to be removed prior to structural fill placement or foundation formwork. We recommend that the proposed conventional foundation bear directly on the medium dense to dense gravelly sand..

Foundation support for the proposed improvements may be provided by continuous or isolated spread footings founded on the proof-rolled or recompacted, undisturbed, medium dense to dense, gravelly sand or on properly compacted structural fill placed directly over undisturbed native soil.

All continuous and isolated spread footings should be founded a minimum of 18 inches below the lowest adjacent final grade for freeze/thaw protection.

Allowable Bearing Capacity

Assuming the above foundation support criteria are satisfied, continuous or isolated spread footings founded directly on the native, gravelly sand or on compacted structural fill over undisturbed native soils may be proportioned using a maximum net allowable soil bearing pressure of 2,500 pounds per square ft (psf). The term "net allowable bearing pressure" refers to the pressure that can be imposed on the soil at foundation level resulting from the total of all dead plus live loads, exclusive of the weight of the footing or any backfill placed above the footing. The net allowable bearing pressure may be increased by one-third for transient wind or seismic loads.

Foundation Settlement

Settlement of shallow foundations depends on foundation size and bearing pressure, as well as the strength and compressibility characteristics of the underlying soil. Assuming construction is accomplished as previously recommended and for the maximum allowable soil bearing pressure recommended above, we estimate the total settlement of building foundations should be less than about 1 inch and differential settlement between two adjacent load-bearing components supported on competent soil should be less than about one half the total settlement. The soil response to applied stresses caused by building and other loads is expected to be predominantly elastic in nature, with most of the settlement occurring during construction as loads are applied.

Resistance to Lateral Loads

Passive earth pressures developed against the sides of building foundations, in conjunction with friction developed between the base of the footings and the supporting subgrade, will resist lateral loads transmitted from the structure to its foundation. For design purposes, the passive resistance of well-compacted fill placed against the sides of foundations may be considered equivalent to a fluid with a density of 250 pounds per cubic ft. The recommended value includes a safety factor of about 1.5 and is based on the assumption that the ground surface adjacent to the structure is level in the direction of movement for a distance equal to or greater than twice the embedment depth. The recommended value also assumes drained conditions that will prevent the buildup of hydrostatic pressure in the compacted fill. In design computations, the upper 12 inches of passive resistance should be neglected if the soil is not covered by floor slabs or pavement. If future plans call for the removal of the soil providing resistance, the passive resistance should not be considered.

An allowable coefficient of base friction of 0.35 for undisturbed native soil or structural fill, applied to vertical dead loads only, may be used between the underlying soil and the base of the footing. However, if passive and frictional resistance are considered together, one half the recommended passive soil resistance value should be used since larger strains are required to mobilize the passive soil resistance as compared to frictional resistance. A safety factor of about 1.5 is included in the base friction design value. We do not recommend increasing the coefficient of friction to resist seismic or wind loads.

Concrete Slabs-on-Grade

Conventional slab-on-grade floor construction is considered feasible for the planned site improvements. We recommend that interior concrete slab-on-grade floors be underlain by a minimum of 6 inches of compacted, clean, free-draining sand and gravel with less than 5 percent passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The purpose of this layer is to provide uniform support for the slab, provide a capillary break, and act as a drainage layer. To help reduce the potential for water vapor migration through floor slabs, at a minimum a continuous impermeable membrane of 6- to 10-mil polyethylene sheeting with tape-sealed joints should be installed below the slab. The American Concrete Institute (ACI) guidelines suggest that the slab may either be poured directly on the vapor retarding membrane or on a granular curing layer placed over the vapor retarding membrane depending on conditions anticipated during construction. We recommend that the architect or structural engineer specify if a curing layer should be used. If moisture control within the building is critical, we recommend an inspection of the vapor retarding membrane to verify that all openings have been properly sealed.

Exterior concrete slabs-on-grade, such as sidewalks, may be supported directly on undisturbed native, properly placed and compacted structural fill, or properly proof rolled existing fill material; however, long-term performance will be enhanced if exterior slabs are placed on a layer of clean, durable, well-draining granular material.

Foundation and Site Drainage

To reduce the potential for groundwater and surface water to seep into interior spaces we recommend that an exterior footing drain system be constructed around the perimeter of new building foundations as shown in the Typical Footing and Wall Drain Section, Figure 3. The drain should consist of a minimum 4-inch diameter perforated pipe, surrounded by a minimum 12 inches of filtering media with the discharge sloped to carry water to a suitable collection system. The filtering media may consist of open-graded drain rock wrapped by a nonwoven geotextile fabric (such as Mirafi 140N, Synthetic Industries 351, or equivalent) or a graded sand and gravel filter. The drainage backfill should be carried up the back of wall and contain less than 3 percent by weight passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The invert of the footing drain pipe should be placed at approximately the same elevation as the bottom of the footing or 12 inches below the adjacent floor slab grade, whichever is deeper, so that water will not seep through walls or floor slabs. The footing drain should discharge to an approved drain system and include cleanouts to allow periodic maintenance and inspection.

Positive surface gradients should be provided adjacent to the proposed building to direct surface water away from the foundation and toward suitable drainage facilities. Roof drainage should not be introduced into the perimeter footing drains, but should be separately discharged directly to the stormwater collection system or other appropriate outlet. Impervious pavement and sidewalk areas should be sloped and drainage gradients should be maintained to carry all surface water away from the building towards the local stormwater collection system. Surface water should not be allowed to pond and soak into the ground surface near buildings or paved areas during or after construction. Construction excavations should be sloped to drain to sumps where water from seepage, rainfall, and runoff can be collected and pumped to a suitable discharge facility.

Stormwater Design Recommendations

From the explorations excavated in the areas of interest, four representative soil samples were selected and mechanically tested for grain size distribution and interpretation according to the United States Department of Agriculture (USDA) soil textural classification. Subsurface infiltration rates corresponding to the United States Department of Agriculture (USDA) soil textural classification were obtained from the

1992 Washington State Department of Ecology *Stormwater Management Manual for the Puget Sound Basin,* Table III – 3.1 and are reproduced in Table 1 below.

TABLE 1
Test Pit Soil Sample Infiltration Rates
Based On The 1992 DOE Stormwater Management Manual Table III -3.1

Test Pit Number	Sample Depth (ft)	Texture Class (USDA)	Soil Unit	Infiltration Rate Hydrologic (in/hr)	Design Infiltration Rate (F_d) (in/hr)	Hydrologic Soil Group
TP-1	2.0	Very Gravelly Sand	Glacial Outwash	8.27	4.1	A
TP-2	3.5	Very Gravelly Sand	Glacial Outwash	8.27	4.1	A
TP-4	5.0	Very Gravelly Sand	Glacial Outwash	8.27	4.1	A
TP-5	4.0	Gravelly Sand	Glacial Outwash	8.27	4.1	A

Based on the results of our USDA textural analysis and our interpretation of our soil logs, it appears that the Glacial Outwash, typically encountered to depths ranging between approximately 1 to 10 feet BGS, are classified as gravelly to very gravelly sand and correlate to a hydrologic infiltration rate of 8.27 inches per hour and a design rate of 4.1 inches per hour.

As mentioned previously, groundwater seepage and evidence of a seasonal high water table, typically indicated by a distinct mottled horizon, were observed within our test pit explorations at depths ranging from 4 to 7 feet BGS. Therefore, it would appear that a minimum of 3 feet of separation from the high water table would exist throughout the year if the base of the proposed stormwater infiltration systems were placed no deeper than approximately 1 to 4 feet below existing site grades. This observation is based on the maximum depth explored (10 feet) at the site during our visit in March of 2010.

Existing on-site native glacial outwash deposits encountered at the site within the infiltration area of interest are not recommended for treatment purposes due to the relatively high infiltration rates associated with the samples collected at these depths. Therefore, if treatment is necessary, we recommend that at least 18 inches of amended soil, suitable for treatment purposes, be based below the bottom of the storage for the proposed infiltration facility and the facility sized relative to the long-term design rate of the amended soil, or other appropriate methods of pretreatment be incorporated into the stormwater design as applicable.

LIMITATIONS

The analyses, conclusions, and recommendations provided in this report are based on conditions encountered at the time of the subsurface exploration performed by GeoTest Services, Inc., information from previous studies and our experience and judgment. Our work has been performed in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in this area for the exclusive use of Pacer-Enviro Propane LLC and their representatives. No warranty, expressed or implied, is made.

We must presume the subsurface conditions encountered are representative for the proposed site for the purposes of formulating our recommendations. However, you should be aware that subsurface conditions may vary with time and between exploratory locations, and unanticipated conditions may be encountered. If construction reveals differing conditions or the design is modified, we should be retained to reevaluate our recommendations and provide written confirmation or modification, as needed.

We appreciate the opportunity to be of service to you on this project. If any questions should arise regarding this report, please contact the undersigned.

Respectfully Submitted,
GeoTest Services, Inc.

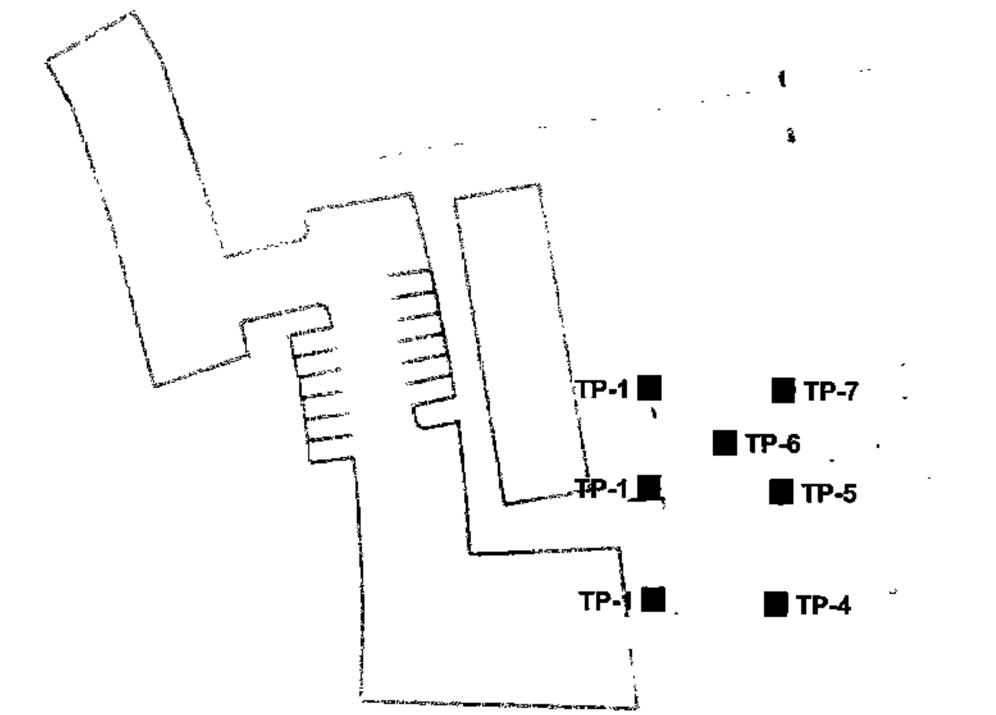
Tim Chylla, L.E.G.
Engineering Geologist

Attachments:		
	Figure 1	Vicinity Map
	Figure 2	Site and Exploration Plan
	Figure 3	Typical Footing Detail
	Figure 4	Soil Classification System and Key
	Figures 5-9	Logs of Test Pits
	Figure 10	Grain Size Distribution

REFERENCES:

Washington Division of Geology and Earth Sciences, 2009, Washington Interactive Geologic Map, (http://wigm.dnr.wa.gov/)

Washington State Department of Ecology. February 1992. *Stormwater Management Manual for the Puget Sound Basin*. 91-75.



NORTH

■ **Approximate Test Pit Location**

Site Plan Provided by:
Pilchuck Construction

Note: Building location has changed and Test Pit locations are based new design.

GEOTEST SERVICES, INC.
741 Marine Drive
Bellingham, WA 98225
phone: (360) 733-7318
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Date: 3-12-10	By: TC	Scale: None	Project 10-0110

SITE AND EXPLORATION PAN
PACER ENVIRO PROPANE PROJECT
74TH AVENUE NE
ARLINGTON, WASHINGTON

Figure **2**

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL	TYPICAL DESCRIPTIONS[(1)(2)]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

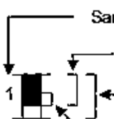
Notes: 1. Soil descriptions are based on the general approach presented in the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*, as outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the *Standard Test Method for Classification of Soils for Engineering Purposes*, as outlined in ASTM D 2487.

2. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent:	> 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
	> 12% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and ≤ 12% - "slightly gravelly," "slightly sandy," "slightly silty," etc.
	≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key

SAMPLE NUMBER & INTERVAL



- Sample Identification Number
- Recovery Depth Interval
- Sample Depth Interval
- Portion of Sample Retained for Archive or Analysis

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Other - See text if applicable

Groundwater

∇ ATD — Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

GEOTEST | Pacer Enviro Propane Project
74th Avenue NE
Arlington, Washington | Soil Classification System and Key | Figure 4

TP-1

Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	SOIL PROFILE	GROUNDWATER
						Excavation Method: Tracked Excavator Ground Elevation (ft): Unknown Excavated By: Pilchuck Construction	
0					SP	Medium dense to dense, brown, moist, very gravelly, fine to coarse SAND (Glacial Outwash) soil stratified in distinct layers	
2	1-1	d	W = 10 GS				
4						2 inch thick, black, stained layer encountered - likely due to mineral transfer and location of high water table	∇ Moderate groundwater seepage encountered at 4.0 ft.
6						End at 6 feet due to sidewall caving due to groundwater	

Test Pit Completed 03/01/10
Total Depth of Test Pit = 6.0 ft.

TP-2

Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	SOIL PROFILE	GROUNDWATER
						Excavation Method: Tracked Excavator Ground Elevation (ft): Unknown Excavated By: Pilchuck Construction	
0					SP	Medium dense to dense, brown, moist, very gravelly, fine to coarse SAND (Glacial Outwash) soil stratified in distinct layers	
4	2-1	d	W = 9 GS				
5						2 inch thick, black, stained layer encountered - likely due to mineral transfer and location of high water table	∇ Moderate groundwater seepage encountered at 5.0 ft.
10						End at 10 feet due to sidewall caving due to groundwater	

Test Pit Completed 03/01/10
Total Depth of Test Pit = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

TP-3

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): Unknown Excavated By: Pilchuck Construction	
0					OL	Soft, dark brown, moist, organic SILT (Topsoil)	
					SP	Brown, medium dense to dense, moist, very gravelly, fine to coarse SAND (Glacial Outwash) soil stratified in distinct layers	
4	3-1	d	W = 8				
6						2 inch thick, black, stained layer encountered - likely due to mineral transfer and location of high water table	∇ Rapid groundwater seepage encountered at 7.0 ft.
8						End at 9 feet due to sidewall caving due to groundwater	

Test Pit Completed 03/01/10
Total Depth of Test Pit = 9.0 ft.

TP-4

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): Unknown Excavated By: Pilchuck Construction	
0					OL	Soft, dark brown, moist, organic SILT (Topsoil)	
					SP	Medium dense to dense, brown, moist, very gravelly, fine to coarse SAND (Glacial Outwash) soil stratified in distinct layers	
5	4-1	d	W = 8 GS			2 inch thick, black, stained layer encountered - likely due to mineral transfer and location of high water table	
7							∇ Moderate groundwater seepage encountered at 7.0 ft.
8						End at 8 feet due to sidewall caving due to groundwater	

Test Pit Completed 03/01/10
Total Depth of Test Pit = 8.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

GEOTEST	Pacer Enviro Propane Project 74th Avenue NE Arlington, Washington	Log of Test Pits	Figure 6 (2 of 4)

TP-5

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): Unknown Excavated By: Pilchuck Construction	
0					OL	Soft, dark brown, moist, organic SILT (Topsoil)	
2					SM	Medium dense to dense, brown, moist, silty, fine to coarse SAND (Glacial Outwash)	
4	5-1	d	W = 16 GS		SP	Medium dense to dense, brown, moist, very gravelly, fine to coarse SAND (Glacial Outwash) soil stratified in distinct layers 2 inch thick, black, stained layer encountered - likely due to mineral transfer and location of high water table	∇ Moderate groundwater seepage encountered at 5.0 ft.
6							
8						End at 9 feet due to sidewall caving due to groundwater	
10							
12							

Test Pit Completed 03/01/10
Total Depth of Test Pit = 9.0 ft.

TP-6

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): Unknown Excavated By: Pilchuck Construction	
0					OL	Soft, dark brown, moist, organic SILT (Topsoil)	
2					SP	Medium dense, brown, moist, very gravelly, fine to coarse SAND (Borrow Fill)	
4					OL	Soft, dark brown, moist, organic SILT with minor organic debris (Relic Topsoil)	
6	6-1	d	W = 10		SP	Medium dense to dense, brown, moist, very gravelly, fine to coarse SAND (Glacial Outwash)	∇ Moderate groundwater seepage encountered at 7.0 ft.
8						End at 8 feet due to sidewall caving due to groundwater	
10							
12							

Test Pit Completed 03/01/10
Total Depth of Test Pit = 8.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

TP-7

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): Unknown Excavated By: Pilchuck Construction	
0					OL	Soft, dark brown, moist, organic SILT (Topsoil)	
					SP	Medium dense to dense, brown, moist, very gravelly, fine to coarse SAND (Glacial Outwash) soil stratified in distinct layers	
2–4	7-1	d	W = 10				
4–6						2 inch thick, black, stained layer encountered - likely due to mineral transfer and location of high water table	∇ Moderate groundwater seepage encountered at 4.5 ft.
8						End at 8 feet due to sidewall caving due to groundwater	

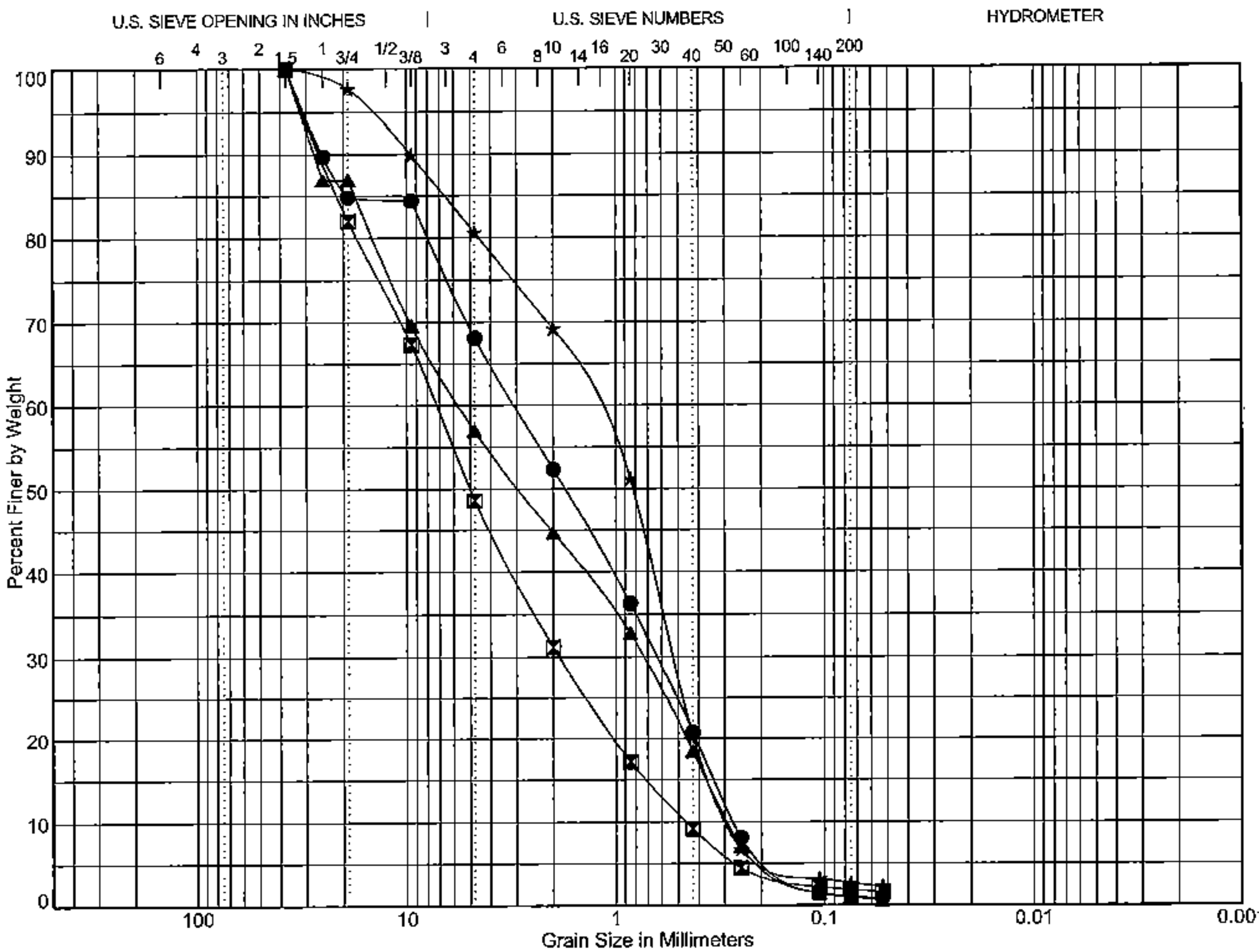
Test Pit Completed 03/01/10
Total Depth of Test Pit = 8.0 ft.

Depth scale (ft): 0, 2, 4, 6, 8, 10, 12

10-0110 3/12/10 X:\0-PROJECTS\0-PROJECTS GEO\00000-PROJECTS 2010-GEO\LIMITED GEO EVALUATIONS\PACER ENVIRO\PACER ENVIRO - 10.0110 - PROPANE PROJECT\PACER ENVIRO.GPJ TEST PIT LOG

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

GEOTEST	Pacer Enviro Propane Project 74th Avenue NE Arlington, Washington	Log of Test Pits	Figure 8 (4 of 4)



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Point	Depth	Classification	LL	PL	PI	C_c	C_u
● TP-1	2.0	POORLY GRADED SAND with GRAVEL (SP)				0.50	11.25
⊠ TP-2	3.5	WELL-GRADED GRAVEL with SAND (GW)				1.05	15.88
▲ TP-4	5.0	POORLY GRADED SAND with GRAVEL (SP)				0.34	19.62
★ TP-5	4.0	POORLY GRADED SAND with GRAVEL (SP)				0.76	4.54

Point	Depth	D_{100}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
● TP-1	2.0	37.5	3.044	1.765	0.643	0.271	15.2	16.7	15.8	31.6	19.8	1.0
⊠ TP-2	3.5	37.5	7.251	5.007	1.865	0.457	18.0	33.4	17.4	22.0	7.4	1.8
▲ TP-4	5.0	37.5	5.631	2.92	0.744	0.287	13.1	30.0	12.3	26.3	17.5	0.9
★ TP-5	4.0	37.5	1.292	0.828	0.529	0.285	2.3	17.1	11.4	49.0	17.6	2.6

$C_c = D_{30}^2/(D_{60} * D_{10})$
$C_u = D_{60}/D_{10}$

To be well graded: $1 < C_c < 3$ and $C_u > 4$ for GW or $C_u > 6$ for SW

GEOTEST

Pacer Enviro Propane Project
74th Avenue NE
Arlington, Washington

Grain Size Test Data

Figure 8