Geotechnical Engineering Report

Proposed Panda Express & Retail Development
172nd Street NE
Arlington, Washington

January 18, 2011
Terracon Project No.: 81105123

Prepared for:
CFT Developments, LLC
c/o Panda Restaurant Group, Inc
Rosemead, California
Panda Project No.: 92-001N-11
CFT Project No.: CT-11-CT744

Prepared by:
Terracon Consultants, Inc.
Mountlake Terrace, Washington

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January 18, 2011

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Re: Geotechnical Engineering Report
Proposed Panda Express & Retail Development
172nd Street NE
Arlington, Washington
Terracon Project Number: 81105123
Panda Project Number: 92-001N-11
CFT Project Number: CT-11-CT744

Dear Mr. Shen:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our December 20, 2010 Task Order for Panda Project Number 92-001N-11 (CFT Project Number CT-11-CT744) under Master Service Agreement Panda RG.MSA.9.05 dated November 3, 2005. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

James P. Georgis

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EXECUTIVE SUMMARY

A geotechnical investigation has been completed for the proposed Panda Express & Retail Development to be located on the south side of 172nd Street NE about 600 feet west of 43rd Avenue NE in Arlington, Washington. Five (5) borings, designated B-1 through B-5, were completed to depths ranging from approximately 6½ to 51½ feet below the existing ground surface within the proposed building and parking lot areas.

Based on the information obtained from our subsurface exploration, the site is suitable for development of the proposed project. The following geotechnical considerations were identified:

- **Site Soils:** The site soils generally consist of about 4 to 5½ feet of existing fill underlain by recessional glacial outwash deposits. The fill generally consists of medium dense to dense silty, gravelly sand. The glacial outwash generally consists of medium dense to dense sand with variable silt and gravel content. Perched groundwater was encountered about 6½ feet below existing grade at the time of field exploration. The local groundwater table was encountered about 10 to 13 feet below existing grade at the time of field exploration. On-site granular fill and glacial outwash soils are suitable for use as engineered fill beneath foundations, floor slabs, and pavement areas provided that soil moisture conditions at the time of construction are such that adequate compaction can be achieved.

- **Seismic Site Classification:** Per Table 1613.5.2 of the 2009 International Building Code (IBC), the seismic site classification for this site is F due to the potential for liquefaction induced settlement below the water table associated with the design seismic event. Total seismic settlements could range from 1 to 2 inches. Differential seismic settlements could range from ½ to 1 inch over a distance of about 30 feet. The shallow foundation and slab-on-grade floor recommendations presented herein assume that these levels of potential seismic settlement are considered acceptable.

- **Foundations:** Conventional spread footings will provide adequate support for the proposed building provided that the foundation subgrades are properly prepared. Foundation support for the building may be obtained from either the existing granular fill or from new engineered fill. The upper one-foot of all foundation subgrades should be moisture conditioned, as necessary, and compacted to a firm and non-yielding condition and to at least 95 percent of the modified Proctor maximum dry density per ASTM:D-1557.

- **Floor Slabs:** Floor slabs for the building may be supported by either the existing granular fill or from new engineered fill. The upper one-foot of floor slab subgrades should be moisture conditioned, as necessary, and compacted to a firm and non-yielding condition and to at least 95 percent of the modified Proctor maximum dry density per ASTM:D-1557. Floor slab design should include a 4-inch minimum thickness capillary break.

- **Pavement Sections:** Pavement sections should be constructed over subgrades compacted as recommended above for floor slabs. Asphalt concrete pavements – 3 inches asphalt over 5 inches base; Portland cement concrete pavements – 5 inches concrete over 4 inches base.

Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support. We therefore recommend that Terracon be retained to monitor this portion of the work.

This geotechnical executive summary should be used in conjunction with the entire report for design and/or construction purposes. It should be recognized that specific details were not included or fully developed in this summary, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **General Comments** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
PROPOSED PANDA EXPRESS & RETAIL DEVELOPMENT
172ND STREET NE
ARLINGTON, WASHINGTON

Project No. 81105123
January 18, 2011

1.0 INTRODUCTION

A geotechnical engineering report has been completed for the proposed Panda Express & Retail Development to be located on the south side of 172nd Street NE about 600 feet west of 43rd Avenue NE in Arlington, Washington. Five (5) borings, designated B-1 through B-5, were completed to depths ranging from approximately 6½ to 51½ feet below the existing ground surface within the proposed building and parking lot areas. Logs of the borings along with a vicinity map and a boring location diagram are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- earthwork
- pavement recommendations
- foundation design and construction
- floor slab design and construction
- seismic considerations

2.0 PROJECT INFORMATION

2.1 Project Description

ITEM	DESCRIPTION
Site layout	See Appendix A, Exhibit A-2: Boring Location Diagram.
Structure	The project will include a single-story building with a total footprint of approximately 8,839 square feet. The building will include a 1,999 square foot Panda Express restaurant and a 6,840 square-foot retail space.
Building construction	Timber-framed structure with slab-on-grade concrete floor.
Finished floor elevation	Based on information provided by the client, we understand that the finish floor elevation will be within about 1 foot of existing grade.

ITEM	DESCRIPTION
Maximum loads	Columns: 75 kips (Based on MSA Project Description) Walls: 3.0 klf (Based on MSA Project Description) Slabs: 150 psf max (Assumed)
Maximum allowable static settlement	1-inch (Assumed)
Maximum allowable static differential settlement	Less than ¾-inch. (Assumed)
Grading	Grading plans were not available at the time this report was prepared. However, given the relatively level nature of the site, permanent cuts and fills are anticipated to be less than 2 feet.
Permanent cut and fill slopes	Assumed to be no steeper than 2½H:1V (Horizontal to Vertical). Slope stability analysis is not part of the scope of this investigation.
Free-standing retaining walls	None
Below grade areas	None
Traffic Loading	Asphalt concrete and Portland cement concrete. Typically light duty traffic flow with some large delivery trucks on a weekly basis based on MSA Project Description. We have assumed 20,000 18-Kip ESAL's in 20 years.

2.2 Site Location and Description

ITEM	DESCRIPTION
Location	The project is located on the south side of 172nd Street NE about 600 feet west of 43rd Avenue NE in Arlington, Washington. The site is a Wal-Mart supercenter retail development outlot. See Appendix A, Exhibit A-1: Vicinity Map.
Existing site features (site interior)	The site is undeveloped with the exception of several underground utilities which appear to terminate (stub-out) within the subject site. The site appears to be mantled by fill soils.
Surrounding developments	North: 172nd Street NE South: Wal-Mart access drive and supercenter West: 40th Avenue NE (private road) East: undeveloped Wal-Mart outlot
Current ground cover	Primarily sand and gravel.

ITEM	DESCRIPTION
Existing topography	Relatively level within proposed building and parking lot areas. The north and west margins of the previously graded outlot slope down to the adjacent roads with a total relief of about 1 to 3 feet.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Subsurface Profile

Specific conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs included in Appendix A of this report.

Based on the results of the borings, the site generally consists of fill soils on the order of 4 to 5½ feet thick underlain by recessional glacial outwash deposits. We understand that the fill soils were placed during construction of the adjacent Wal-Mart retail facility. A generalized description of the subsurface conditions encountered at the site is summarized in the table below. Please refer to the exploration logs enclosed in Appendix A for a more detailed description of the subsurface conditions encountered at the exploration locations.

SUMMARY OF SUBSURFACE SOIL CONDITIONS

Boring	Thickness of Existing Fill: Medium Dense to Dense Silty, Gravelly Sand (feet)	Thickness of Glacial Outwash deposits: Medium Dense to Dense Sand with Variable Silt and Gravel Content (feet)	Total Depth Explored (feet)
B-1	5	16½	21½
B-2	5	46½	51½
B-3	5½	16	21½
B-4	5	1½	6½
B-5	4	2½	6½

3.2 Geology

The *Geologic Map of the Arlington West Quadrangle, Snohomish County, Washington* (USGS Map MF-1740) maps the pre-developed site soils as the Marysville Sand Member of Quaternary age Vashon recessional outwash deposits. The Marysville Sand Member is described as primarily consisting of stratified sand with some fine gravel and some areas of silt and clay. The Marysville Sand Member was deposited by melt water originating from the receding Vashon glacier. The soils encountered on site below the surficial fill deposits appear to be representative of the Marysville Sand Member.

3.3 Groundwater

Groundwater was observed in borings B-1 through B-3 at the time of exploration. Groundwater observations are presented in the table below.

SUMMARY OF GROUNDWATER OBSERVATIONS

Exploration	Approximate Design Ground Surface Elevation [1] (ft)	Approximate Depth to Groundwater (ft)	Approximate Groundwater Elevation (ft)
B-1	125	6½ [2] and 12½	118½ [2] and 112½
B-2	125	13	112
B-3	125	10	115

1. Elevations are relative to topographic information presented on a June 2009 Grading and Drainage Plan prepared by David Evans & Associates for Wal-Mart Supercenter # 3757-00. Vertical datum unknown. Actual surface elevations unconfirmed.
2. Groundwater observed in boring B-1 at a depth of 6½ feet (approximately elevation 118½ feet) is interpreted to represent a perched groundwater condition.

These observations represent groundwater conditions at the time of the field exploration. Groundwater conditions should be expected to fluctuate due to changes in season, precipitation patterns, site utilization, on-site or off-site irrigation activities, and other on- and off-site factors.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Based on our subsurface exploration program and associated research, we conclude that the proposed restaurant and retail development is feasible from a geotechnical standpoint, contingent on proper design and construction practices.

Our subsurface explorations indicate that the site is mantled by existing fill soils. We understand that the fill soils were placed and tested during construction of the nearby Wal-Mart retail facility and outlots. However, Terracon did not observe the placement of the fill, or review inspection reports or test data regarding fill placement. Support of footings, floor slabs, and pavements on or above existing fill soils is discussed in this report. However, even with the recommended construction testing services, there is an inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by performing additional testing and evaluation during construction.

Our analyses indicate the potential for liquefaction induced settlement below the groundwater table due to ground vibrations associated with the design seismic event. Total seismic settlements could range from 1 to 2 inches. Differential seismic settlements could range from ½ to 1 inch over a distance of about 30 feet. The shallow foundation and slab-on-grade floor recommendations presented herein assume that these levels of potential seismic settlement are considered acceptable. Terracon is available to evaluate structural support options or ground improvement methods if these levels of potential seismic settlement are not acceptable.

Geotechnical engineering recommendations for foundation systems and other earthwork related phases of the project are outlined below. The recommendations contained in this report are based upon the results of field and laboratory testing (which are presented in Appendices A and B), engineering analyses, and our current understanding of the proposed project. ASTM and Washington State Department of Transportation (WSDOT) standard specifications cited herein respectively refer to the 2010 manual published by the American Society for Testing & Materials and the current edition of the *Standard Specifications for Road, Bridge, and Municipal Construction* (M41-10).

4.2 Earthwork

The following presents recommendations for site preparation, subgrade preparation and placement of engineered fills on the project. The recommendations presented in this report for design and construction of foundations, slabs, and pavements are contingent upon following the recommendations outlined in this section. All earthwork recommendations for the structure should incorporate the limits of the proposed structure plus a minimum of five feet beyond proposed perimeter building walls and any exterior columns.

Earthwork on the project should be observed and evaluated by Terracon. Evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

4.2.1 Site Preparation

Preparation for site grading and construction should begin with procedures intended to drain ponded water and control surface water runoff. It will be difficult to successfully utilize on-site soils as "engineered fill" if accumulated water is not drained prior to grading, or if drainage is not controlled during construction. Attempting to grade the site without adequate drainage control measures will reduce the amount of on-site soil effectively available for use, increase the amount of import fill materials required, and ultimately increase the cost of the earthwork and foundation construction phases of the project.

The site consists of a previously filled outlot and is primarily surfaced with sand and gravel. At the time of our evaluation, vegetation consisting of scattered ornamental shrubs was limited to narrow landscape strips along the south and east sides of 172nd Street NE and 40th Avenue NE, respectively. Organic-rich topsoil was not encountered in the explorations. As such, extensive clearing, grubbing, and topsoil stripping activities are not anticipated. However, if topsoil or other organic-rich soils are encountered they should be removed and should not be reused as structural fill. Any excavations that extend below finish grades should be backfilled with engineered fill as outlined subsequently in this report.

Although evidence of buried structures or debris was not observed during the site reconnaissance and subsurface evaluation, such features could be present at the site. If unexpected structures, debris, or unsuitable fills are encountered, such features should be removed and the excavation thoroughly cleaned of the unsuitable materials prior to backfill placement and/or construction.

4.2.2 Subgrade Preparation

After site preparation activities and excavation to design grade is completed, the exposed soils will generally consist of silty, gravelly sand. Prior to placement of engineered fill, we recommend that foundation, floor subgrade, pavement areas, and other areas to receive engineered fill be proofrolled and the upper one foot of the existing fill material be compacted to a firm and unyielding condition and to a minimum compaction level of 95 percent of the modified Proctor maximum dry density as determined by the ASTM:D-1557 test procedure. Typically, proofrolling and adequate compaction can only be achieved when soils are within approximately ±2 percent of their optimum moisture content. Soils which appear firm after stripping should be proof-rolled with a heavy compactor, loaded double-axle dump truck, or other heavy equipment under the observation of Terracon. This observer will assess the subgrade conditions prior to filling. Areas where loose or soft surface soils exist due to stripping and grading operations should be compacted or removed and replaced to the depth of the disturbance as subsequently recommended for engineered fill.

4.2.3 Engineered Fill Material Requirements

All fill material placed in building, pavement, and non-landscaped areas should be placed in accordance with the recommendations herein for engineered fill. Prior to placement, the surfaces to receive engineered fill should be prepared as previously described. All engineered fill should be free of organic material, debris, or other deleterious material. Individual particle size should be less than 3 inches in maximum dimension.

The suitability of soils for use as engineered fill depends primarily on the gradation and moisture content of the soil when it is placed. As the amount of fines (that soil fraction passing the U.S. No. 200 sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and adequate compaction becomes more difficult, or impossible, to achieve. Generally, soils containing more than about 5 percent fines by weight (based on that soil fraction passing the U.S. No. 4 sieve) cannot be compacted to a firm, non-yielding condition when the moisture content is more than a few percent from optimum. The optimum moisture content is that which yields the greatest soil density under a given compactive effort.

In general, the existing fill soils encountered to depths of about 4 to 5½ feet below the ground surface consist of silty, gravelly sand. These soils are considered acceptable for use as engineered fill from a compositional perspective and are considered to have a moderate to high moisture sensitivity relative to compaction due to their high fines content. The glacial outwash soils which underlie the existing fill primarily consist of sand with variable silt and gravel content and are also considered acceptable for use as engineered fill from a compositional perspective. The use of the existing fill soils or glacial outwash deposits will require strict control of the soil moisture content to achieve adequate compactions. Selective drying of over-optimum moisture soils may be achieved by scarifying or windrowing surficial materials during extended periods of dry weather. Soils which are dry of optimum may be moistened through the application of water and thorough blending to facilitate a uniform moisture distribution in the soil prior to compaction.

Import soils for use as engineered fill material within the proposed building and pavement areas can consist of “common” or “select” granular material, depending on the weather conditions at the time of placement and the anticipated weather conditions until the fill subgrades are protected. “Select” granular fill is recommended for use in wet weather conditions, and for filling in wet site or trench conditions. “Select” engineered fill should meet the general requirements of Section 9-03.14(1), Gravel Borrow, as presented in the Washington State Department of Transportation (WSDOT) *Standard Specifications for Road, Bridge, and Municipal Construction.* The percent passing the U.S. No. 200 mesh sieve should, however, be modified from the WSDOT specification as follows: For “Select” import fill, less than 5 percent by weight should pass the U.S. No. 200 mesh sieve. Select fill reduces the risk of wet weather delays for filling during the winter and spring months. Select fill can be placed and compacted in a wider variety of weather conditions than Common import fill, but introduces a risk of weather related delays. Fills constructed with Common import fill often require drying and recompaction during extended dry weather periods prior to constructing pavements, floor slabs, or foundations.

“Common” engineered fill could consist of lesser quality, more moisture-sensitive soils that can be compacted to a firm and non-yielding condition if within +/- 2 percent of its optimum moisture content and at the specified compaction levels. “Common” engineered fill should meet the requirements of Section 9-03.14(3), Common Borrow, as presented in the WSDOT *Standard Specifications for Road, Bridge, and Municipal Construction.*

The use of other fill types should be reviewed and approved by the engineer. Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture content and densities throughout the fill. Fill lifts should not exceed 8 inches in loose thickness.

4.2.4 Compaction Requirements

Engineered fill should be placed in lifts no greater than 8 inches in loose thickness and compacted to a firm and non-yielding condition. Recommended compaction and moisture content criteria for engineered fill materials, including trench backfill, are as follows:

Material Type and Location	Per the Modified Proctor Test (ASTM:D-1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction	
		Minimum	Maximum
Beneath foundations	95	-2%	+2%
Beneath floor slabs	95	-2%	+2%
Utility trenches			
Landscape areas	90	2%	2%
Structural areas (upper 2 feet)	95	2%	2%
Structural areas (depth > 2 feet)	90	2%	2%
Beneath asphalt & concrete pavements:			
Upper foot[1]	95	-2%	+2%
one foot or more below subgrade	90	-2%	+2%
Aggregate base (beneath slabs and pavements)	95	-2%	+2%

1. Upper 2 feet should be compacted in areas where fill thickness permits.

4.2.5 Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately three percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

We recommend that downspouts, roof drains or scuppers discharge into tightline drain pipes that are routed to a suitable discharge location. Roof drains should not be connected to the recommended footing drain system. Sprinkler systems should not be installed within five feet of foundation walls. Landscaped irrigation adjacent to the foundation systems should be minimized or eliminated.

4.2.6 Permanent Slopes

We recommend that permanent cut and fill slopes should be constructed no steeper than 2½H:1V, provided that all embankment fill is compacted in accordance with the structural fill recommendations presented in this report. If the slopes are exposed to prolonged rainfall before vegetation becomes established, the surficial soils will be prone to erosion and possible shallow sloughing. We recommend covering permanent slopes with a rolled erosion protection material, such as Jute matting or Curlex II, if vegetation has not been established by the regional wet season (typically November through May).

4.2.7 Construction Considerations

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

Perched groundwater was encountered about 6½ feet below existing grade in boring B-1 at the time of exploration. Groundwater interpreted to represent the local groundwater table was encountered in borings B-1, B-2, and B-3 at depths ranging from about 10 to 13 feet below existing grade at the time of exploration. Depending upon depth of excavation and seasonal conditions, groundwater may be encountered in excavations on the site. Pumping from sumps may be utilized to control water within excavations. Well points may be required for significant groundwater flow, or where excavations penetrate groundwater to a significant depth.

Earthwork may be difficult during periods of elevated soil moisture and wet weather due to the moisture sensitive nature of the existing fill and alluvial soils. Excavated site soils may not be reusable as engineered fill depending on the soil moisture content and weather conditions at the time of construction. If soils are stockpiled for future reuse and wet weather is anticipated, the stockpile should be protected with plastic sheeting that is securely anchored. If on-site soils become unusable, it may become necessary to import clean, granular soils to complete wet weather site work.

Subgrade soils that become disturbed due to elevated moisture conditions should be overexcavated to expose firm, non-yielding, non-organic soils and backfilled with compacted engineered fill. Alternatively, depending on the depth of disturbance, the affected soils could be cement treated. Cement treatment of unsuitably wet and disturbed soils is a common practice in the Seattle area in the type of fill soils encountered at this site. We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through May) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork may require additional mitigative measures beyond that which would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils, draining of ponded water on the site, and collection and rerouting of groundwater seepage from upgradient on- and off-site sources. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic. Placing quarry spalls, crushed recycled concrete, or clean pit-run sand and gravel over these areas would further protect the soils from construction traffic.

If earthwork takes place during freezing conditions, we recommend that the exposed subgrade be allowed to thaw and be recompacted prior to placing subsequent lifts of engineered fill. Alternatively, the frozen soils could be scraped off to expose unfrozen soil. The frozen soils should not be reused as fill unless it is permitted to thaw and be conditioned to a suitable moisture content.

The contractor is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Terracon should be retained during the construction phase of the project to observe earthwork operations and to perform necessary tests and observations during subgrade preparation, placement and compaction of structural fill, backfilling of excavations, and just prior to construction of foundations and floor slabs.

4.3 Seismic Considerations

4.3.1 Tectonic Setting

The tectonic setting of western Washington is dominated by the Cascadia Subduction Zone formed by the Juan de Fuca plate subducting beneath the North American Plate. This setting leads to intraplate, crustal, and interplate earthquake sources. Seismic hazards relate to risks of injury to people and damage to property resulting from these three principle earthquake sources.

4.3.2 Ground Surface Rupture

Based on our review of the USGS Quaternary age fault database for Washington State, there does not appear to be a mapped Quaternary fault within a 10 mile radius of the site. Based on the reviewed database, it is our opinion that the risk of ground surface rupture at the site is low.

4.3.3 Landsliding

Based on the relatively level nature of the site and surrounding vicinity, it is our opinion that the risk of earthquake-induced landsliding is low.

4.3.4 Soil Liquefaction

Liquefaction is a phenomenon wherein saturated cohesionless soils build up excess pore water pressures during earthquake loading. Liquefaction typically occurs in loose soils, but may occur in denser soils if the ground shaking is sufficiently strong. We assessed the potential for liquefaction using the simplified procedure originally developed by Seed and Idriss (1971), and updated by Idriss (2004). It is an empirical method based on surficial expressions of soil liquefaction during past earthquakes. The method involves a comparison of earthquake-induced stresses to soil strength at the location and depth of each exploration sample. Soil strength is correlated to the standard penetration resistance blow count, $(N_1)_{60}$, after it has been normalized to an effective overburden pressure of 1 ton per square foot and corrected for drilling/sampling procedures and fines content. Earthquake-induced stresses are estimated with an equation that includes horizontal Peak Ground Acceleration (PGA) at the ground surface and earthquake magnitude as variables.

Our analysis was completed for a magnitude 6.7 design earthquake with a 2,500-year return period, and used a PGA of 0.30g. The earthquake magnitude is based on USGS 2002 deaggregated Probabilistic Seismic Hazard Analysis data. The PGA value is based on USGS National Seismic Hazard Mapping Project 2009 IBC spectral ordinates and has been factored in accordance with the 2009 International Building Code (IBC) seismic design method. The USGS obtained these values by performing probabilistic seismic hazard analyses that considered all potential earthquake sources that may contribute to strong ground shaking at the site. Magnitude, distance, and probability of occurrence were all factored into this hazard analysis.

Based on our analyses, zones of liquefied soil are anticipated to develop within the granular portions of the site glacial outwash deposits during ground shaking from an event with a 2,500-year return period. Soil liquefaction may be expressed at the ground surface as sand boils, ground cracks, vertical settlements, and lateral displacements. However, given the presence of non-liquefiable soils located above the water table, the potential for surficial expression of soil liquefaction such as sand boils and ground cracking is considered low at the project site.

Ground shaking from an earthquake can result in subsidence of the ground surface and settlement of on-grade supported facilities. Seismic induced settlements tend to be greatest in loose granular soils, and particularly soils which are susceptible to liquefaction. Based on the results of our analyses, we estimate that total vertical settlements on the order of 1 to 2 inches could be experienced at the site during a design earthquake. Differential settlement could approach ½ to 1 inch over a distance of about 30 feet.

Lateral spreading is a phenomenon in which soil deposits which underlie a site can experience significant lateral displacements associated with the reduction in soil strength caused by soil liquefaction. This phenomenon tends to occur most commonly at sites where the soil deposits can flow toward a “free-face”, such as a water body. Due to the lack of a “free-face” condition, it is our opinion that the risk of lateral spreading at the site is low.

4.3.5 IBC Seismic Design Parameters

It is our understanding that seismic design for this project will be completed in accordance with the procedures presented in the 2009 IBC. Per the 2009 IBC seismic design procedures, the presence of liquefiable soils requires a Site Class definition of F. A Site Class of F requires a site-specific dynamic site response analysis, except for structures with periods of vibration equal to or less than 0.5 seconds. For structures with periods of vibration equal to or less than 0.5 seconds, site coefficients F_a and F_v may be taken equal to the values for the Site Class determined without regard to liquefaction. The structure is expected to have a period less than 0.5 seconds. Based on the subsurface conditions encountered at the site and published geologic literature, it is our opinion that an IBC Site Class of D describes the average properties of soil beneath the site to a depth of 100 feet, when disregarding liquefaction. This designation describes soils that are considered stiff with a shear wave velocity between 600 and 1,200 feet per second, average Standard Penetration Test values between 15 and 50, and an undrained shear strength between 1,000 and 2,000 psf.

The USGS National Seismic Hazard Mapping Project computes the 2009 IBC spectral ordinates (5 percent damping) at building periods of 0.2 and 1.0 seconds for ground motions at the project site with a 2 percent probability of exceedance in 50 years (2,500-year return period) as 1.06g and 0.36g. Therefore, we recommend that S_S and S_1 be assigned values of 1.06g and 0.36g, respectively. The ground accelerations are calculated for Site Class B and should be adjusted for Site Class D per Section 1613.5.3 of the 2009 IBC.

4.4 Foundations

Our subsurface explorations indicate that the site is mantled by approximately 4 to 5½ feet existing fill soils. We understand that the fill soils were placed during construction of the adjacent Wal-Mart retail facility and presumably, it was monitored and tested in accordance with the Wal-Mart specifications for outlot parcels. Support of foundations on or above existing fill soils is discussed below. However, even with the recommended construction testing services, there is an inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by performing additional testing and evaluation during construction.

Based on our analyses, conventional spread footings will provide adequate support for the proposed building provided that the foundation subgrades are properly prepared. Foundation support for the proposed structure may be obtained from either the existing granular fill or from new engineered fill placed in accordance with the recommendations provided in this report. The upper one-foot of all foundation subgrades should be moisture conditioned, as necessary, and compacted to a firm and non-yielding condition and to at least 95 percent of the modified Proctor maximum dry density per ASTM:D-1557. Design recommendations for foundations for the proposed structure and related structural elements are presented in the following sections.

Our analyses indicate the potential for liquefaction induced settlement due to ground vibrations associated with the design seismic event. Total seismic settlements could range from 1 to 2 inches. Differential seismic settlements could range from ½ to 1 inch over a distance of about 30 feet. The shallow foundation recommendations presented below assume that these levels of potential seismic settlement are considered acceptable. Terracon is available to evaluate structural support options or ground improvement methods if these levels of potential seismic settlement are not acceptable.

4.4.1 Shallow Foundation Design Recommendations

Design recommendations for shallow foundations bearing on compacted existing granular fill soils or new engineered fill are presented in the following paragraphs.

DESCRIPTION	Column	Wall
Net allowable bearing pressure [1]	2,500 psf	2,500 psf
Minimum dimensions	24 inches	18 inches
Minimum exterior footing embedment below finished grade for frost protection	18 inches	18 inches
Minimum interior footing embedment below finished grade for frost protection	12 inches	12 inches
Approximate total static settlement [2]	<1 inch	<1 inch
Estimated differential static settlement [2]	<¾ inch	<¾ inch
Allowable passive pressure [3]	250 pcf (triangular distribution)	
Ultimate coefficient of sliding friction	0.45	

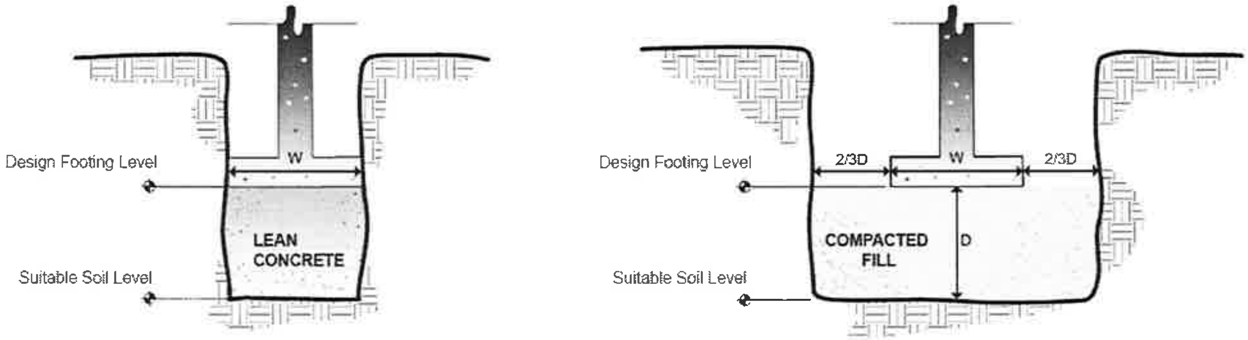
1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Assumes any unsuitable fill or soft soils, if encountered, will be undercut and replaced with engineered fill. Based upon a Factor of Safety of 3.
2. Assumes any unsuitable fill or soft soils, if encountered, will be undercut and replaced with engineered fill. Does not include potential seismic settlements discussed in Section 4.3 of this report.
3. Assumed that foundation backfill is compacted in accordance with Section 4.2.4. Based upon a Factor of Safety of 1.5.

The net allowable bearing pressures presented in the table above may be increased by one-third to resist transient, dynamic loads such as wind or seismic forces.

4.4.2 Shallow Foundation Construction Considerations

The base of all foundation excavations should be free of water and loose soil and rock prior to placing concrete, and should be compacted as recommended in this report. Concrete should be placed soon after excavating and compaction to reduce bearing soil disturbance. Should the soils at bearing level become excessively dry, disturbed, saturated, or frozen, the affected soil should be removed prior to placing concrete. It is recommended that a qualified geotechnical engineer be retained to observe and test the soil foundation bearing materials.

If unsuitable bearing soils are encountered in footing excavations, the excavation should be extended deeper to suitable soils. The footing could bear directly on suitable soils at the lower level or on lean concrete backfill placed in the excavations. We recommend that lean mix concrete have a minimum 28-day compressive strength of 100 psi. As an alternative, the footings could also bear on properly compacted backfill extending down to the suitable soils. Overexcavation for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled up to the footing base elevation with imported granular material placed in lifts of 8 inches or less in loose thickness and compacted to at least 95 percent of the material's modified Proctor maximum dry density (ASTM D 1557). The overexcavation and backfill procedures are described in the following figure.



Lean Concrete Backfill **Overexcavation / Backfill**

NOTE: Excavations in sketches shown vertical for convenience. Excavations should be sloped as necessary for safety.

4.4.3 Foundation Drains

In our opinion, the new building should be provided with permanent drainage systems to reduce the risk of future moisture problems. We offer the following recommendations and comments for drainage design and construction purposes.

We recommend that the building be encircled with a perimeter foundation drain to collect exterior seepage water. The drain should consist of a minimum 4-inch diameter perforated pipe embedded in at least an 18-inch wide envelope of clean, free-draining, well graded mixture of course sand and gravel. The free-draining materials should comply with WSDOT Standard Specification 9-03.12(4), Gravel Backfill for Drains. A non-woven filter fabric such as Mirafi

140N, or equivalent, should envelope the free-draining granular material. Ideally, the drain invert would be installed at or very slightly below the base of the perimeter footings.

Roof downspouts, parking lot drains, and drains from any other runoff surfaces should not be tied into the perforated piping system of the foundation drains. Instead, the runoff water collected from such sources should be routed through a separate tightline piping system and sent to a municipal catch basin or other appropriate discharge location. Also, final site grades should slope downward away from the buildings so that runoff water will flow by gravity to suitable collection points, rather than ponding near the foundation walls.

4.5 Floor Slabs

Our subsurface explorations indicate that the site is mantled by approximately 4 to 5½ feet existing fill soils. We understand that the fill soils were placed during construction of the adjacent Wal-Mart retail facility and presumably, it was monitored and tested in accordance with the Wal-Mart specifications for outlot parcels. Support of floor slabs on or above existing fill soils is discussed below. However, even with the recommended construction testing services, there is an inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by performing additional testing and evaluation during construction.

Floor slabs for the proposed structure may be supported on either compacted existing granular fill soils or on new engineered fill placed in accordance with the recommendations provided in this report. The upper one foot of floor slab subgrades should be moisture conditioned, as necessary, and compacted to a firm and non-yielding condition and to at least 95 percent of the modified Proctor maximum dry density per ASTM:D-1557. Design recommendations for floor slabs are presented in the following sections.

Our analyses indicate the potential for liquefaction induced settlement due to ground vibrations associated with the design seismic event. Total seismic settlements could range from 1 to 2 inches. Differential seismic settlements could range from ½ to 1 inch over a distance of about 30 feet. The shallow foundation recommendations presented below assume that these levels of potential seismic settlement are considered acceptable. Terracon is available to evaluate structural support options or ground improvement methods if these levels of potential seismic settlement are not acceptable.

4.5.1 Design Recommendations

ITEM	DESCRIPTION
Floor slab support [1]	Compacted existing granular fill or new engineered fill prepared in accordance with this report
Modulus of subgrade reaction	200 pounds per square inch per inch (psi/in) for point loading conditions
Capillary break [2]	Minimum of 4 inches of free draining granular material

1. Floor slabs should be structurally independent of any building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation. We recommend subgrades be maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become desiccated prior to construction of floor slabs, the affected material should be removed or the materials scarified, moistened, and recompacted. Upon completion of grading operations in the building areas, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the building floor slabs.
2. The floor slab design should include a capillary break comprised of a compacted clean, free-draining, well graded mixture of course sand and gravel. The capillary break material should contain less than 5 percent fines, based on that soil fraction passing the U.S. No. 4 sieve. Alternatively, Crushed Surfacing Top Course meeting the general requirements of Section 9-03.9(3), as presented in the Washington State Department of Transportation (WSDOT) *Standard Specifications for Road, Bridge, and Municipal Construction, could be considered.* However, the WSDOT specification should be modified to a maximum of 5 percent by weight passing the US No. 200 sieve.

Where appropriate, saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or any cracks that develop should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy-duty concrete pavement and wet environments.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

4.5.2 Construction Considerations

On most project sites, site grading is generally accomplished early in the construction phase. However, as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. As a result, the floor slab subgrades may become unsuitable for placement of capillary break material and concrete and corrective action may be required.

We recommend the area underlying the floor slab be rough graded and then thoroughly proofrolled with a loaded tandem axle dump truck prior to final grading and placement of capillary break material. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the affected material with properly compacted engineered fill. All floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the capillary break material and concrete.

4.6 Pavement Recommendations

We understand that asphalt concrete (flexible) pavement will be used for parking areas and that Portland cement concrete (rigid) pavement may be used for loading and dumpster areas. Detailed traffic loading conditions were not available at the time this report was prepared. However, we understand that typical traffic is expected to be "light duty" with some large delivery trucks and garbage trucks on a weekly basis.

It must be recognized that pavement design is a compromise between high initial cost and little maintenance on one side and low initial cost coupled with the need for periodic maintenance and repairs. As a result, the owner will need to take part in the development of an appropriate pavement section. Critical features which govern the durability of the surface include the level of compaction of the subgrade, the stability of the subgrade, the presence or absence of moisture, free water and organics, the fines content of the subgrade soils, the traffic volume, and the frequency of use by heavy vehicles.

The pavement subgrade is anticipated to consist primarily of silty, gravelly sand. An assumed California Bearing Ratio (CBR) value of about 15 percent was used for flexible pavement design based on a Unified Soil Classification System (USCS) designation of SM and our experience with similar soils in this area. An assumed modulus of subgrade reaction (k) value of about 200 pci was used for design of Portland cement concrete pavement sections. Our pavement design recommendations are based on an assumed traffic load of 20,000 Equivalent Single Axle Loads (ESALs) over a 20 year design period.

The pavement design recommendations presented herein assume that the subgrade and any structural fill placed in pavement areas will be prepared in accordance with the recommendations presented in this report. The top 12 inches of the subgrade should be proofrolled and compacted to a firm and non-yielding condition and to at least 95 percent of the modified Proctor maximum dry density (ASTM:D-1557). Flexible and rigid pavement design recommendations are presented in the following table.

Pavement Type	Material Thickness (inches)			
	Asphalt Concrete [1]	**Portland Cement Concrete** [2]	**Aggregate Base** [3]	**Total Thickness**
Flexible Pavement	3.0	--	5.0	8.0
Rigid Pavement	--	5.0 [4]	4.0	9.0

1. ½-inch nominal aggregate hot-mix asphalt per WSDOT 9-03.8(1).
2. A 28 day minimum compressive strength of 4,000 psi and a modulus of rupture of at least 580 psi.
3. Crushed Surfacing Base Course per WSDOT 9-03.9(3).
4. Special consideration should be given to locations subject to extreme loading, such as dumpster areas. We recommend a minimum Portland cement concrete thickness of 6 inches for dumpster pads.

The manufacturing and placement of pavements and crushed base course should conform to specifications presented in Divisions 5 and 4, respectively, of the 2010 Washington State Department of Transportation, Standard Specifications for Roads, Bridges, and Municipal Construction, as well as the project plans and specifications. We recommend that the asphalt concrete conform to Section 9-02.1(4) for PG 58-22 Performance Grade Asphalt Cement as presented in the 2010 WSDOT Standard Specifications. We recommend that the gradation of the asphalt aggregate conform to the aggregate gradation control points for ½-inch mixes as presented in Section 9-03.8(6), HMA Proportions of Materials.

Aggregate base materials should be compacted to a firm and non-yielding condition and to at least 95 percent of the modified Proctor maximum dry density (ASTM:D-1557). We recommend that all base course be proofrolled with a loaded dump truck prior to placing the following lift of material. We recommend that asphalt be compacted to a minimum of 92 percent of the Rice (theoretical maximum) density or 96 percent of Marshall (Maximum laboratory) density.

In our opinion, Portland cement concrete pavement is preferable in areas subject to repeated truck traffic, such as loading dock areas, truck turning areas, and dumpster pads. Recommended pavement sections based upon a more detailed pavement design could be provided if specific traffic loadings, frequencies, and desired pavement design life are provided. Final pavement designs should be in accordance with local, city or county ordinances.

On most project sites, site grading is generally accomplished early in the construction phase. However, as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, or rainfall. As a result, the pavement subgrade may not be suitable for pavement construction later in the construction schedule and corrective action may be required.

The pavement sections outlined above were determined based on anticipated post-construction traffic loading estimates for this type of development. These pavement sections do not account for heavy construction traffic during the early stages of the development. A partially constructed structural section may be subjected to heavy construction traffic that can result in pavement deterioration and premature failure. Our experience indicates that this pavement construction practice can result in pavements that will not perform as intended. Several alternatives are available to mitigate the impact of heavy construction traffic on the pavement construction. These include using thicker sections to account for the construction traffic, using some method of soil stabilization to improve the support characteristics of the pavement subgrade, or by routing heavy construction traffic around paved areas.

Preventive maintenance should be planned and provided for through an on-going pavement management program. Preventive maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon should also be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

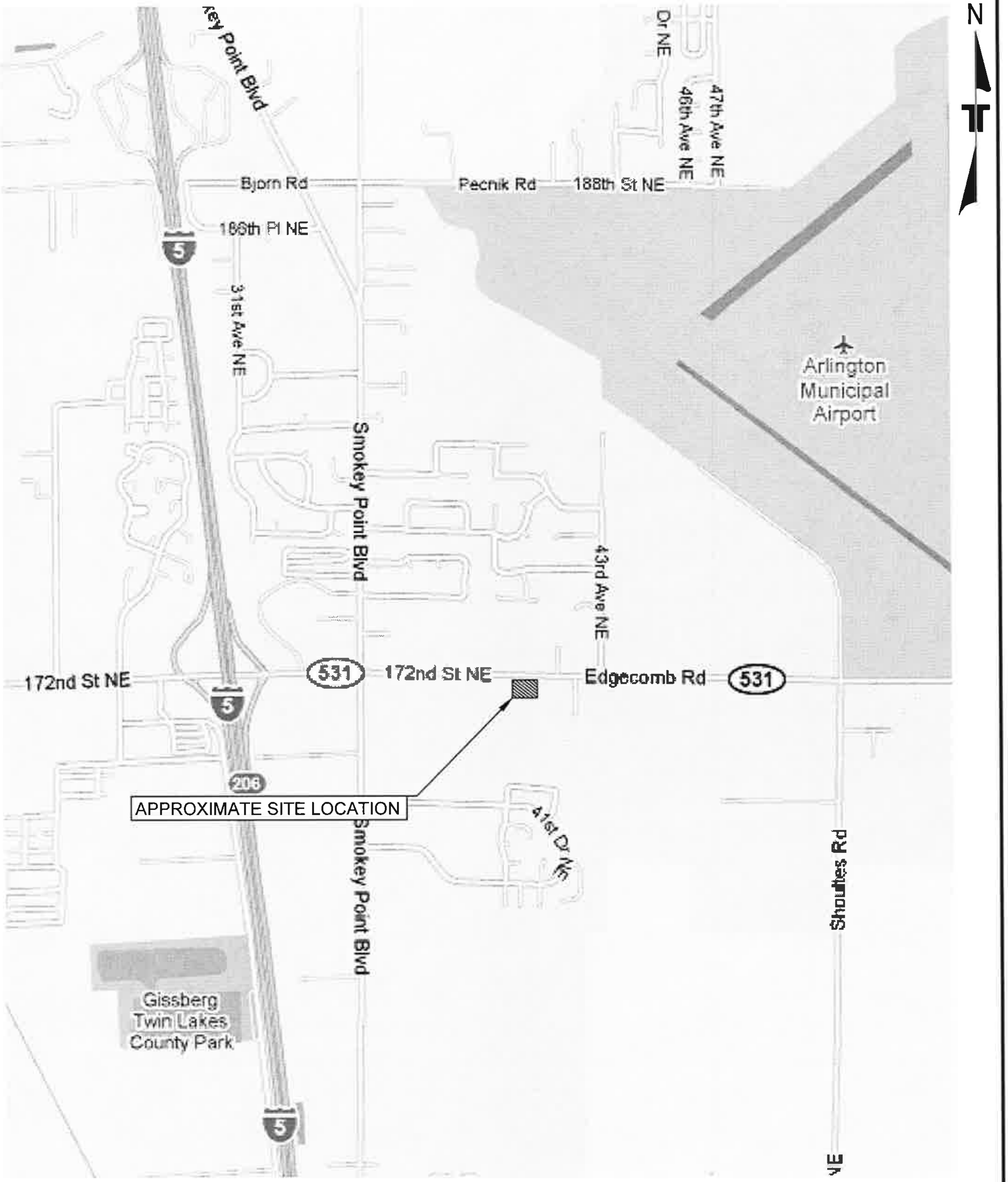
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between explorations, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION



REFERENCE: Google Maps, 2011.

Project No.	81105123
Scale:	Not to scale
File No.	81105123.dwg
Date:	January 2011

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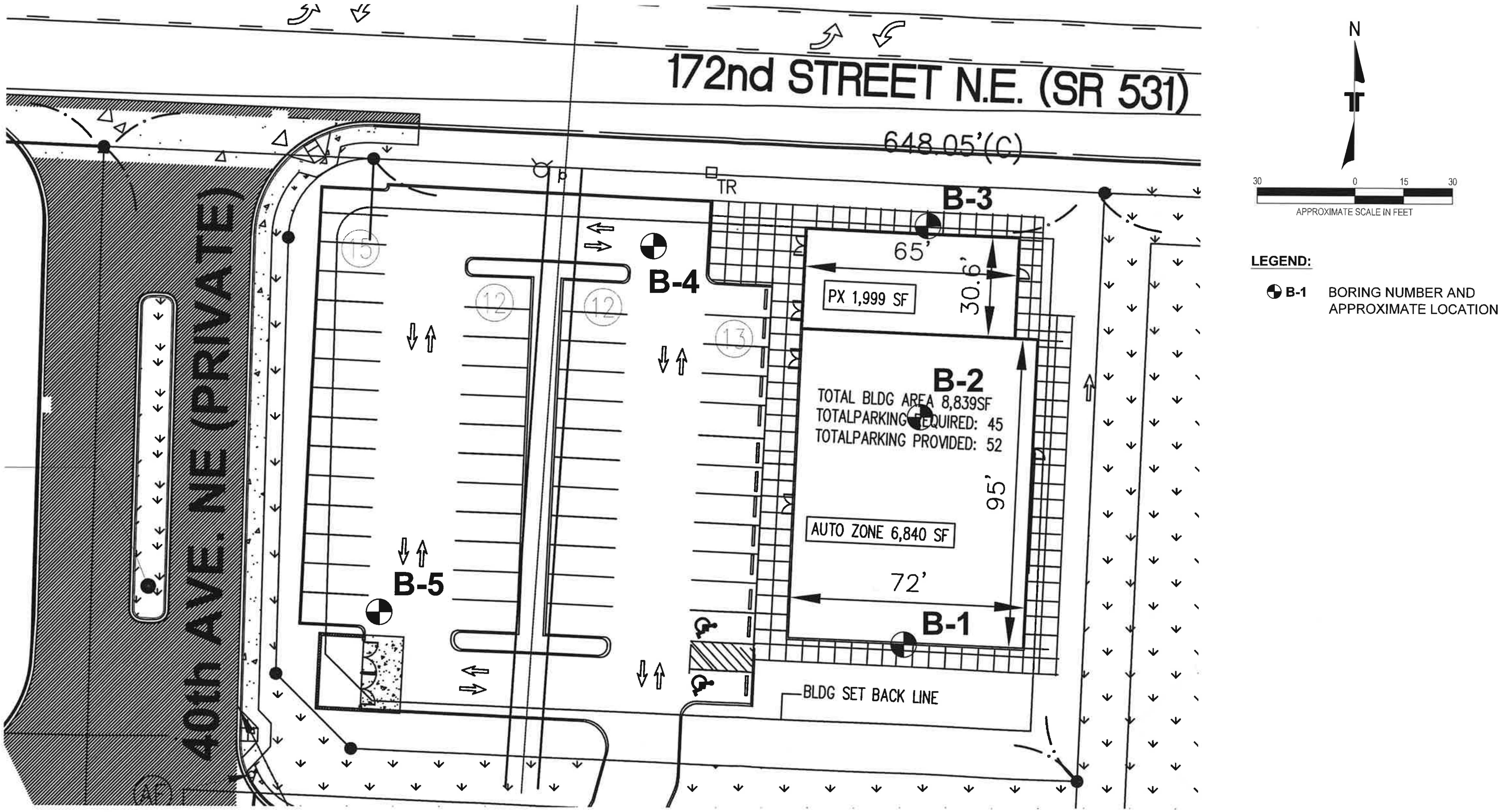
VICINITY MAP

Panda Express & Retail Development
Arlington, Washington

EXHIBIT
A-1



REFERENCE: UNDATED AND UNTITLED SITE PLAN PROVIDED BY PANDA RESTAURANT GROUP, INC.

Project Mngr:	JPG	Project No.	81105123
Drawn By:	JPG	Scale:	AS SHOWN
Checked By:	TAJ	File No.	81105123.dwg
Approved By:	TAJ	Date:	January 2011

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BORING LOCATION DIAGRAM
Panda Express & Retail Development
Arlington, Washington

EXHIBIT
A-2

Field Exploration Description

Our field exploration for this project included 5 borings completed on January 3, 2011. The approximate exploration locations are shown on the Boring Location Diagram, Exhibit A-2. The exploration locations were determined by measuring distances from existing site features with a fiberglass tape relative to a June 2009 Grading and Storm Drainage Plan prepared by David Evans and Associates for Wal-Mart Supercenter #3757-00. Ground surface elevations at the exploration locations were interpolated from topographic information presented on the Grading and Storm Drainage Plan. The Grading and Storm Drainage Plan vertical datum is not known. The locations and elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were advanced by an independent drilling company working under subcontract to Terracon. The borings were advanced with a hollow stem auger using a track-mounted drill rig. A geotechnical engineer from our firm continuously observed the borings, logged the subsurface conditions encountered, and obtained representative soil samples. All samples were stored in moisture-tight containers and transported to our laboratory for testing.

Throughout the drilling operation, soil samples were obtained at 2.5- to 5-foot depth intervals by means of the Standard Penetration Test (ASTM: D-1586). This testing and sampling procedure consists of using a cathead to drive a standard 2-inch outside diameter steel split spoon sampler 18 inches into the soil with a 140-pound hammer free falling 30 inches. The number of blows required to drive the sampler through each 6-inch interval is recorded, and the total number of blows struck during the final 12 inches is reported as the Standard Penetration Resistance, or "blow count" (N value). If a total of 50 blows is struck within any 6-inch interval, the driving is stopped and the blow count is reported as 50 blows for the actual penetration distance. The resulting Standard Penetration Resistance values indicate the relative density of granular soils and the relative consistency of cohesive soils.

The enclosed boring logs describe the vertical sequence of soils and materials encountered in each boring, based primarily upon our field classifications. Where a soil contact was observed to be gradational, our logs indicate the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our logs also graphically indicate the blow count, sample type, sample number, and approximate depth of each soil sample obtained from the boring. If groundwater was encountered in a borehole, the approximate groundwater depth, and date of observation, are depicted on the log.

LOG OF BORING NO. B-1

Page 1 of 1

CLIENT
Panda Restaurant Group, Inc.

SITE
172nd Street NE, Arlington, WA

PROJECT
Panda Express & Retail Development

Approx. Surface Elev.: 125 ft

DEPTH, ft.	DESCRIPTION	Elev.
5	**SILTY, GRAVELLY SAND**, gray/brown, medium dense, wet (FILL)	120
8.5	**MEDIUM TO COURSE SAND**, trace to with silt, gray, medium dense, wet ▽	116.5
12.5	**SILTY, GRAVELLY SAND**, brown, dense, moist ▼	112.5
16.5	**MEDIUM TO COURSE SAND**, trace gravel and silt, gray, dense, saturated becomes interlayed with **SILTY, GRAVELLY SAND**, brown, dense, wet to saturated	108.5
21.5	**MEDIUM TO COURSE SAND**, trace gravel, trace to with silt, gray/brown, medium dense, saturated	103.5

Boring completed at 21.5 feet.
Perched groundwater observed at about 6.5 feet and local groundwater table observed at about 12.5 feet while drilling.

		SAMPLES				TESTS		
DEPTH, ft.	USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	SPT-N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, tsf
	SM	S-1	SS	18	19	12		
5	SP	S-2	SS	18	22	13		
	SP	S-3	SS	18	37	8		
10	SM	S-4	SS	18	37			
15	SP SM	S-5	SS	18	30			
20	SP	S-6	SS	18	21			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ 6.5 Perched	▼ 12.5 WD
WL	▽	▼
WL		

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BORING STARTED		1-3-11	
BORING COMPLETED		1-3-11	
RIG	Track	CO.	Geologic
LOGGED	RWS	JOB #	81105123

LOG OF BORING NO. B-2

CLIENT
Panda Restaurant Group, Inc.

SITE
172nd Street NE, Arlington, WA

PROJECT
Panda Express & Retail Development

Approx. Surface Elev.: 125 ft

Depth, ft.	DESCRIPTION	Elev., ft
5	**SILTY, GRAVELLY SAND**, gray/brown, medium dense grading to dense, wet (FILL)	120
7.5	**MEDIUM TO COURSE SAND**, with silt, gray, medium dense, wet	117.5
11	**SILTY, GRAVELLY SAND**, brown, medium dense, wet	114
23	**MEDIUM TO COURSE SAND**, with silt, trace gravel, gray/brown, medium dense, wet to saturated ∇	102
	FINE TO MEDIUM SAND, trace silt and gravel, gray, medium dense, wet to saturated	

Continued Next Page

		SAMPLES				TESTS		
DEPTH, ft.	USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	SPT-N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, tsf
	SM	S-1	SS	18	35	10		
5	SP SM	S-2	SS	18	25	14		
	SM	S-3	SS	12	22	9		
10	SM	S-4	SS	18	36			
15	SP SM	S-5	SS	18	17	21		
20	SP SM	S-6	SS	18	18			
25								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	∇ 13	WD	▼
WL	▼		∇
WL			

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BORING STARTED			1-3-11
BORING COMPLETED			1-3-11
RIG	Track	CO.	Geologic
LOGGED	RWS	JOB #	81105123

LOG OF BORING NO. B-2

CLIENT **Panda Restaurant Group, Inc.**	
SITE **172nd Street NE, Arlington, WA**	PROJECT **Panda Express & Retail Development**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT-N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, tsf
	FINE TO MEDIUM SAND, trace silt and gravel, gray, medium dense, wet to saturated		SP	S-7	SS	18	17	22		
		30	SP	S-8	SS	18	28			
		35	SP	S-9	SS	18	21			
	grades to with silt	40	SP SM	S-10	SS	18	26			
42.5	82.5									
	SILTY, FINE SAND, gray, dense, wet to saturated	45	SM	S-11	SS	18	34			
		50								

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	∇ 13	WD	▼
WL	▼		▼
WL			

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BORING STARTED			1-3-11
BORING COMPLETED			1-3-11
RIG	Track	CO.	Geologic
LOGGED	RWS	JOB #	81105123

LOG OF BORING NO. B-2

Page 3 of 3

CLIENT **Panda Restaurant Group, Inc.**	
SITE **172nd Street NE, Arlington, WA**	PROJECT **Panda Express & Retail Development**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT-N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, tsf
▨ 51.5	**SILTY, FINE SAND**, gray, dense, wet to saturated 73.5		SM	S-12	SS	18	28			
	Boring completed at 51.5 feet. Groundwater observed at about 13 feet while drilling.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ 13	WD ▼
WL	▼	▼
WL		

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BORING STARTED			1-3-11
BORING COMPLETED			1-3-11
RIG	Track	CO.	Geologic
LOGGED	RWS	JOB #	81105123

LOG OF BORING NO. B-3

Page 1 of 1

CLIENT **Panda Restaurant Group, Inc.**	
SITE **172nd Street NE, Arlington, WA**	PROJECT **Panda Express & Retail Development**

Approx. Surface Elev.: 125 ft

Depth, ft	Description	Elev., ft
0 – 5.5	**SILTY, GRAVELLY SAND**, medium dense grading to dense, moist to wet (FILL)	119.5
5.5 – 13	**FINE TO MEDIUM SAND**, trace silt, medium dense, moist grading to wet to saturated ∇	112
13 – 21.5	**MEDIUM TO COURSE SAND**, trace silt and gravel, gray, medium dense, wet to saturated	103.5

Boring completed at 21.5 feet.
Groundwater observed at about 10 feet while drilling.

DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT-N BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, tsf
	SM	S-1	SS	18	44	8		
5	SP	S-2	SS	18	42	7		
	SP	S-3	SS	18	13	9		
10	SP	S-4	SS	18	11			
15	SP	S-5	SS	18	17			
20	SP	S-6	SS	18	24			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft

WL	∇ 10	WD ▼
WL	▼	▼
WL		

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BORING STARTED			1-3-11
BORING COMPLETED			1-3-11
RIG	Track	CO.	Geologic
LOGGED	RWS	JOB #	81105123

LOG OF BORING NO. B-4

Page 1 of 1

CLIENT
Panda Restaurant Group, Inc.

SITE
172nd Street NE, Arlington, WA

PROJECT
Panda Express & Retail Development

Approx. Surface Elev.: 125 ft

GRAPHIC LOG	DESCRIPTION	Depth, ft	Elev., ft
▨	**SILTY, GRAVELLY SAND**, gray/brown, medium dense grading to dense, moist to wet (FILL)	5	120
░	**SILTY SAND**, gray/brown, medium dense, moist	6	119
░	**SAND**, trace silt, tan/brown, medium dense, moist to wet	6.5	118.5
	Boring completed at 6.5 feet. No groundwater observed while drilling.		

		SAMPLES				TESTS		
DEPTH, ft.	USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	SPT-N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, tsf
	SM	S-1	SS	18	30	11		
5	SM	S-2	SS	18	20	12		

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▼
WL		

Terracon
21905 64th Avenue West, Suite 100
Mountlake Terrace, Washington 98043
T: (425) 771-3304 F: (425) 771-3549

BORING STARTED			1-3-11
BORING COMPLETED			1-3-11
RIG	Track	CO.	Geologic
LOGGED	RWS	JOB #	81105123

LOG OF BORING NO. B-5

Page 1 of 1

CLIENT
Panda Restaurant Group, Inc.

SITE
172nd Street NE, Arlington, WA

PROJECT
Panda Express & Retail Development

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 125 ft	DEPTH, ft.	USCS SYMBOL	SAMPLES				TESTS		
				NUMBER	TYPE	RECOVERY, in.	SPT-N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, tsf
▨ 4	**SILTY, GRAVELLY SAND**, gray/brown, medium dense grading to dense, moist to wet (FILL) (S-1 blowcount overstated, driven on rock) 121		SM	S-1	SS	15	50/3"	9		
⁙ 6.5	**FINE TO MEDIUM SAND**, trace silt, tan/gray, medium dense, moist 118.5	5	SP	S-2	SS	18	14	6		

Boring completed at 6.5 feet.
No groundwater observed while drilling.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	∇	∇
WL		

Terracon

21905 64th Avenue West, Suite 100
Mountlake Terrace, Washington 98043
T: (425) 771-3304 F: (425) 771-3549

BORING STARTED			1-3-11
BORING COMPLETED			1-3-11
RIG	Track	CO.	Geologic
LOGGED	RWS	JOB #	81105123

TC_BOREHOLE 81105123 GINT B-1 TO B-5 LOGS.GPJ TERRACON.GDT 1/18/11

APPENDIX B

LABORATORY TESTING

Laboratory Testing

Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS) described in Appendix C. At that time, the field descriptions were confirmed or modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil samples and the test results are presented in this appendix. The laboratory test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

- Moisture Content
- 200 Wash Analysis

Exhibit B-1

U.S. NO. 200 WASH TEST RESULTS

ASTM D 1140

SAMPLE LOCATION	DEPTH (ft)	MOISTURE CONTENT (%)	PERCENT PASSING THE U.S. NO. 200 SIEVE
B-2, S-5	15	21	7
B-2, S-7	25	22	5

Terracon	Project No: 81105123 Date of Testing: 1/11/2011	Project Name: Arlington Panda Express & Retail Development

APPENDIX C

SUPPORTING DOCUMENTS

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS: Split Spoon – 1-$^{3}/_{8}$" I.D., 2" O.D., unless otherwise noted
ST: Thin-Walled Tube - 3" O.D., unless otherwise noted
RS: Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted
DB: Diamond Bit Coring - 4", N, B
BS: Bulk Sample or Auger Sample

HS: Hollow Stem Auger
PA: Power Auger
HA: Hand Auger
RB: Rock Bit
WB: Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL: Water Level
WCI: Wet Cave in
DCI: Dry Cave in
AB: After Boring

WS: While Sampling
WD: While Drilling
BCR: Before Casing Removal
ACR: After Casing Removal

N/E: Not Encountered

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	0-1	Very Soft
500 – 1,000	2-3	Soft
1,001 – 2,000	4-6	Medium Stiff
2,001 – 4,000	7-12	Stiff
4,001 – 8,000	13-26	Very Stiff
8,000+	26+	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Ring Sampler (RS) Blows/Ft.	Relative Density
0 – 3	0-6	Very Loose
4 – 9	7-18	Loose
10 – 29	19-58	Medium Dense
30 – 49	59-98	Dense
50+	99+	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other Constituents	Percent of Dry Weight
Trace	< 15
With	15 – 30
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other Constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

Exhibit C-1

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	$PI > 7$ and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			$PI < 4$ or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

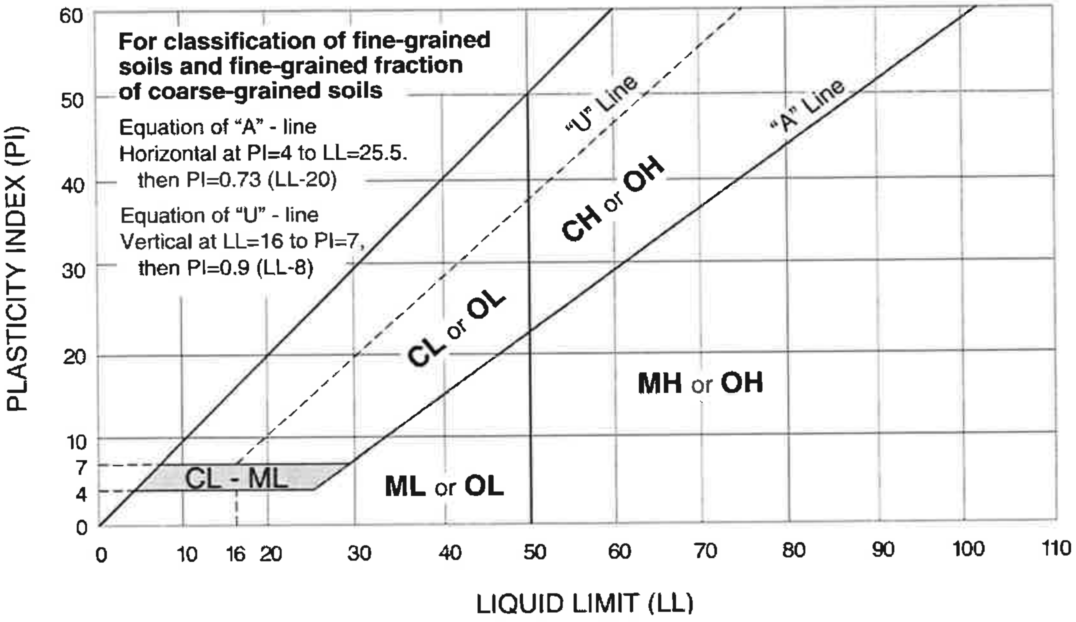

Exhibit C-2