GEOTECHNICAL ENGINEERING REPORT
WINCO FOODS LACEY
7540 MARTIN WAY EAST
LACEY, WASHINGTON

TERRACON PROJECT NO. B2095001
FEBRUARY 12, 2009

Prepared for:

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February 12, 2009

WinCo Foods, LLC
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Attention: Mr. Ty Morrison

Subject: Geotechnical Engineering Report
WinCo Foods Lacey
7540 Martin Way East
Lacey, Washington
Terracon Project No.: B2095001

Dear Mr. Morrison,

The enclosed report contains our findings from field exploration, laboratory testing and engineering analyses at the referenced project site. These services were authorized per our proposal, PB2090001 dated January 6, 2009 (authorized on January 9, 2009) and our Master Services Agreements signed December 1, 2008. The information in this report is based on our understanding of the proposed construction, and the soil and groundwater conditions encountered in the explorations and tests completed at the site on January 21st through 23rd, 2009.

We recommend that the project plans and specifications be submitted to Terracon for a general review, to confirm that the recommendations in this report are interpreted and implemented properly in the construction documents. We recommend that a representative of our firm be present on site during portions of the project construction to confirm that the soil and groundwater conditions are consistent with those that form the basis for the engineering recommendations in this report.

We appreciate the opportunity to provide these services. Please call if you have any questions.

Respectfully Submitted,

Terracon

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INTRODUCTION

This report summarizes the results of our geotechnical evaluation for the proposed WinCo Foods store on Martin Way in Lacey, Washington. These services were completed in general accordance with the scope of work in our proposal (PB2090001) dated January 6, 2009, as authorized on January 9, 2009.

The purpose of this evaluation is to assess subsurface conditions and provide geotechnical recommendations in support of the new WinCo Foods store. Our scope of services included field explorations, field testing, laboratory testing, engineering analyses, and preparation of this report.

PROJECT INFORMATION

The new WinCo Food store will be northwest of the intersection of Kingham Street SE and Martin Way SE in Lacey, Washington. Currently, we understand the store will have a footprint of 84,703 square feet and will be located in the western portion of the site. Additionally, one 3,800 square foot store/restaurant pad is planned on the site near the southeast corner abutting the extension of Kingham Street SE. The remainder of the site will be used for access and parking areas.

Based on WinCo Foods design criteria manual, the proposed store will be a one-story, slab-on-grade structure with design loads of:

- Maximum interior column loads of 65 kips dead, 55 kips live, and 75 kips live plus snow.
- Maximum perimeter column loads of 20 kips dead, 10 kips live, and 25 kips live plus snow.
- Continuous perimeter footing loads of 2.7 kips lineal foot dead, 0.4 kips per lineal foot live, and 0.5 kips per lineal foot live plus snow.
- Standardized floor slab consisting of an un-reinforced five (5) inch thick concrete slab with welded wire meshing.

Currently, Kingham Street SE does not extend north of the Martin Way SE intersection. We understand that WinCo is responsible for road improvements to this extension for ingress/egress to the store. We further understand that the civil engineer will provide pavement section recommendations for the street extension.

Resource Stewardship & Land Use

Stormwater facilities consisting of an underground infiltration gallery are planned in the northwest portion of the site. These facilities will underlie planned pavement areas.

We understand that the final planned grades will be near current grades. Our recommendations are based on finished grades being within 2 feet of existing grades. If larger grade changes are planned, we should be notified so we can review and modify our recommendations, as necessary.

SITE EXPLORATION PROCEDURES

Field Exploration

Five borings were completed in the planned footprint of the WinCo store on January 21, 2009. Eleven test pits were completed in the planned roadway improvement, parking areas and infiltration facility on January 22 and 23, 2009. Approximate boring and test pit locations are shown on Figure 1: Site and Exploration Plan. Exploration locations were determined by taping or pacing from current landmarks or features on the site and should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were drilled using a trailer-mounted hollow stem auger drill rig subcontracted to Terracon. Representative samples were obtained using split-barrel sampling procedures. In the split-barrel sampling procedure, a standard 2-inch O.D. split-barrel sampling spoon is driven into the ground with a 140-pound hammer falling a distance of 30 inches. A manual cathead hammer was used to advance the split-barrel sampler in the borings performed on the site. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the standard penetration resistance value. These values are indicated on the boring logs at the depths of occurrence. The samples were sealed and returned to the laboratory for testing and classification.

The test pits were excavated using a trackhoe under subcontract to Terracon. Excavations were logged and representative soil samples were obtained for further examination and classification in the laboratory.

Field logs of each boring and test pit were prepared by the field engineer/geologist. These logs included visual classifications of the materials encountered during drilling as well as our interpretation of the subsurface conditions between samples. The boring and test pit logs included in Appendix A represent an interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

One infiltration test was completed at the site in general accordance with Thurston County Stormwater guidelines (Chapter 4.4.2) and ASTM 3385-88 "Standard Test Method for Infiltration Rate of soils in Field Using Double Ring Infiltrometers." This test was performed near the center of the planned infiltration gallery.

Laboratory Testing

During the field investigation, a representative portion of each recovered sample was sealed in containers and transported to our laboratory for further visual and laboratory examination. Selected samples retrieved from the explorations were tested for moisture content and grain size analysis to aid in soil classification and provide input for our analysis. The results of the laboratory tests are enclosed in Appendix B of this report.

As a part of the laboratory testing program, the soil samples were classified in the laboratory based on visual observation, texture, plasticity, and the limited laboratory testing described above. Additional testing could be performed to more accurately classify the samples. Portions of the recovered samples will be retained for one month if additional testing is requested. The soil descriptions presented on the exploration logs are in accordance with our enclosed General Notes and Unified Soil Classification System (USCS). The estimated group symbol for the USCS is shown on the logs where gradation testing was completed. A brief description of the Unified System is enclosed as Appendix C of this report. Descriptions of the types of tests performed are given below.

Moisture Content Determinations

Moisture content determinations were performed on representative samples obtained from the exploration in order to aid in identification and correlation of soil types. Moisture content test results are included on the exploration logs.

Grain Size Analysis

A grain size analysis indicates the range in diameter of soil particles included in a particular sample. The results of the grain size determinations for the samples were used in classification of the soils, and are presented in Appendix B.

SITE CONDITIONS

The site is considered level with current grade changes estimated at less than 2-feet. The planned building and pavement areas, including the right-of-way easement for Kingham are covered with sparse weed vegetation and exposed gravel and sand. Trees are located along the northern portion of the western property boundary. The site appears to have had recent grading activities completed on it.

Resource Stewardship & Land Use

SUBSURFACE CONDITIONS

Soil Conditions

Subsurface conditions encountered at the exploration locations are indicated on the boring and test pit logs. Stratification boundaries on the boring logs represent the approximate depths of changes in soil types. Stratification boundaries on the test pit logs represent observed depths of changes in soil types at the locations indicated. In-situ, the transition between materials may be gradual. Please review the attached logs for a detailed description of the conditions encountered at the individual exploration location. Based on the results of the explorations, subsurface conditions on the project site can be generalized as follows. All depths discussed in the following paragraph are referenced below existing grade.

Fill consisting of silty sandy gravel was observed to a depth of approximately 3 to 4 feet in boring B-1 and test pit TP-9. It should be assumed that undocumented fill is located in other areas and may be thicker. Below the fill or surface at the other exploration locations, the predominant native soil type observed was sandy gravel with variable amounts of silt and cobbles. These gravels were in a medium dense to very dense condition. Glacial till consisting of very dense gravelly sand with variable silt content was observed below the gravels in the borings at depths ranging from 11 to 20 feet. Till was also observed in test pits TP-6 and TP-9 at depths of 4.5 and 11.5 feet, respectively. Interbeds of clayey silt with gravel and gravelly silt were observed in borings B-1, B-2, B-5, and test pits TP-6 and TP-10 at depths of 4, 7.5, 22, 0.5 and 6.5 feet, respectively. Silt layers ranged from approximately 2 to 6.5 feet in thickness.

Groundwater Conditions

The borings and test pits were monitored during exploration for the presence and level of groundwater. Groundwater levels observed are noted on the exploration logs. At the time of exploration, groundwater was observed at a depth of about 8 to 14 feet below the existing grades in borings B-1, B-2, B-4, B-5, and test pits TP-9 and TP-11. Groundwater was not observed in the other explorations.

It should be recognized that fluctuations of the groundwater table will occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the boring was performed. In addition, perched water can develop within seams and layers contained in fill soils or higher permeability soils overlying less permeable soils following periods of heavy or prolonged precipitation. Therefore, groundwater levels during construction or at other times in the future will be higher or lower than the levels indicated on the boring logs. Groundwater level fluctuations should be considered when developing the design and construction plans for the project

Resource Stewardship & Land Use

ENGINEERING RECOMMENDATIONS

Geotechnical Considerations

Based on observed subgrade conditions in the explorations, it is our opinion that the proposed development is feasible. However, undocumented fill identified in boring B-1 and test pit TP-9 is considered susceptible to post-construction settlement under building and pavement loads. It should be anticipated that fill will be present in other areas of the site. Existing undocumented fill should be removed and replaced with structural fill in building and pavement areas.

Discontinuous silt and silty clay layers up to 6.5 feet thick were observed in two of the explorations. The thicker sections of silt and clay were observed in the northeast corner of the building footprint (boring B-2). Due to the depth where these soils were observed, they are expected to consolidate under footing loads. Additional long-term settlement of the silt and clay is estimated to be on the order of 1 to 3 inches, depending on the elevation of the footing subgrades. This additional settlement would occur as differential settlement under building loads. Removal of portions of the silt/clay layer and replacement with structural fill, or a pre-load fill to consolidate the silt/clay are considered viable options to mitigate this differential settlement. The thicker silt/clay layers were encountered in only one boring within the northeast corner of the building footprint, and therefore the mitigation options could be limited to this corner of the pad. We recommend additional borings to determine whether other parts of the pad are underlain by this deposit (between the borings already completed), or extending the preload across the entire pad as a prudent measure to reduce the risk of pockets of this material being present undetected below footings.

Please refer to the following sections for further details and recommendations.

General Site Preparation

We recommend that the earthwork and subgrade preparation portions of this project be completed during extended periods of dry weather, if possible. If earthwork and subgrade preparation is completed during the wet season, it may be necessary to take extra precautionary measures to protect subgrade soils.

We recommend that preparation for site grading and construction should include procedures intended to drain ponded water, control surface water runoff, and to collect shallow subsurface seepage zones in excavations, where encountered. It will not be possible to successfully compact the subgrade or utilize on-site soils as structural 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 select import fill

Resource Stewardship & Land Use

materials required, and ultimately increase the cost of the earthwork phases of the project. Free water should not be allowed to pond on the subgrade soils. We anticipate that the use of berms and shallow drainage ditches, with sumps and pumps in utility trenches, will be sufficient for surface water control during wet weather and/or wet site conditions.

Site disturbance beyond the work area should be limited to reduce the potential for erosion and off-site sediment transport. Well-marked clearing limits should be field staked prior to start of construction.

Our analyses and recommendations assume that finish grades for the building and pavement areas are within 2 feet of existing ground surface elevations.

Excavations

The stability of excavations and temporary cut slopes made during site work is a function of many factors, including, but not limited to, the following considerations: 1) the presence and abundance of groundwater; 2) type and density of the various soil strata; 3) the depth of the cut; 4) surcharge loadings adjacent to the excavations; and 5) the length of time the excavation remains open. Consequently, it is exceedingly difficult to establish a safe and maintenance-free cut slope angle in advance of construction. Cut slope stability should, therefore, be the responsibility of the contractor since he is continuously at the job site, able to observe the nature and condition of the subsurface materials encountered, monitor the cut performance, and control the scheduling of site activities.

We recommend that excavations greater than 4 feet in vertical height be adequately sloped or braced to prevent injury to workers from localized sloughing and spalling. On a preliminary basis and based on observed conditions in the test pits, we anticipate that temporary construction cut slopes of 1.5H:1V (horizontal:vertical) or flatter will be necessary without bracing or shoring. Under adverse weather conditions, it may be necessary to flatten cut slopes, and temporary slopes should be draped with plastic sheeting or other means to protect them from the elements and minimize sloughing and erosion. All excavations should be accomplished in accordance with applicable local, State or Federal safety provisions.

Foundation Subgrade Preparation

The native sandy gravel soils observed in the test pits and borings are considered suitable for support of foundations. However, we recommend that the undocumented fill observed on the site be removed and replaced with structural fill in foundation areas. Failure to remove and replace the existing fill may result in added settlement and corresponding distress to the building and floor slabs.

Existing fill should be removed down to the medium dense to dense native sandy gravel. Following removal of the fill the exposed native subgrade should be proofrolled with a loaded dump truck or vibratory roller. Proofrolling efforts should result in the upper one foot of native soils achieving a compaction level of 95 percent of the maximum dry density per the ASTM-D 1557 test method. We recommend that Terracon observe the removal of existing fill and proofrolling.

In addition to the existing fill, the localized thicker zones of silt and clay, as observed in boring B-2, are susceptible to larger post-construction settlements than the granular native sands and gravels. We estimate that the consolidation of the silt/clay layers from building loads could be on the order of 1 to 3 inches, depending partially on final foundation subgrade elevation. To reduce potential settlements of the footings that overlie these soils and meet WinCo specifications, the silt and clay soils observed should be remediated by either overexcavation or preloading.

This layer of silt and clay appears to be isolated to the northeast portion of the building footprint as it was not observed in adjacent explorations (refer to logs B-2, B-3 and TP-9) or other explorations across the site. Because the lateral extent of the silt and clay does not appear to span a significant portion of the building pad area, we consider removal and replacement of the silt/clay with structural fill, or a preload fill over this portion of the building footprint, to be the most cost-effective options to mitigate the settlement risk. However, there is a risk that the compressible soil may be present under other parts of the pad (between the borings.) This risk can be reduced by either drilling additional borings in the pad, or by preloading the entire pad.

Partial removal of the silt and clay and replacement with structural fill could be completed and reduce the potential settlement to comply with WinCo requirements. For this option, we recommend that the upper portion of the silt/clay layer be removed to a depth of at least 10 feet below the planned bottom of footing elevation. A smooth bucket (no teeth) excavator should be used to minimize disturbance to the exposed silt/clay surface. Following removal to the specified depth, a separation geotextile fabric (such as Mirafi 500X, or equivalent) should be placed on the exposed silt/clay surface prior to structural fill placement. The purpose of the separation fabric is to reduce the chance of the structural fill layer from segregating or being pushed into the lower softer soil.

Preload Recommendations

As an alternative to excavation of the silt/clay and replacement with structural fill, a preload fill could be placed over the portions of the building pad underlain by the compressible silt/clay soils. Preloading would involve placement of a temporary surcharge load of fill materials above the ground surface. The temporary surcharge fill weight is used to equal or exceed the pressure imparted by the structure and live loads on the compressible soils at

depth in order to initiate settlement under the preload prior to construction. After completion of the preload, the temporary fill can be exported or used to grade other portions of the site.

The effectiveness of the preload depends on the imposed surcharge pressure and the amount of time that it is allowed to remain in place. Assuming a unit weight of preload fill material equal to 120 pounds per cubic foot, we recommend a minimum preload fill thickness of 3 to 5 feet above finished floor elevation. The final design height of preload will depend on final finished floor grade for the store.

The top of the preload should extend out a minimum of 5 feet beyond the limits of the northern and eastern footprint of the building and be sloped down at a maximum angle of 1½H: 1V. If additional borings confirm that the compressible soil is isolated to the Boring B-2 vicinity, the southern and western edges of the preload should extend at least 75 feet to the south and west of the northeast corner of the building. These limits could be modified with additional explorations to assess the lateral extent and depth of the thicker silt/clay layers. Alternately, if the limits of the silt and clay are not defined further by additional borings, it would be prudent to preload the entire building pad.

We recommend that preload material consist of granular sand and gravel (such as pit run). Consideration could be given to using base course material that could later be used in pavement sections.

Prior to placing any preload material, we recommend that settlement plates be installed and their elevations determined by a qualified surveyor to the nearest 0.01 foot. On a preliminary basis, we estimate that the preload will be required to remain in place for 4 to 6 weeks following the completion of filling to design top of preload grade. We estimate that the preload could settle between 1 to 2 inches during the preload period. Settlement plate elevations should be measured every two weeks during and after construction of any structural fill and preload. All settlement plate elevation data should be forwarded to Terracon for review and to determine when the preload can be removed. We recommend that the schedule for the project include a contingency to allow for possible longer preload periods.

Structural Fill

We recommend that all fill placed in foundation and pavement areas be placed in accordance with the recommendations in this section. The structural fill should be placed after preparation and compaction of the subgrade as discussed in the *Foundation Subgrade Preparation* section of this report.

We recommend that structural fill in foundation and pavement areas be placed in lifts not exceeding 10 inches in loose thickness and thoroughly compacted to at least 95 percent of

the maximum dry density (MDD) as determined by the ASTM D-1557 test procedure. Backfill in utility trenches in pavement areas can be compacted to 90 percent of the MDD to within 2 feet of the bottom of the pavement section with the upper 2 feet compacted to 95 percent of the MDD.

The suitability of excavated site soils and import soils for compacted structural fill use will depend on the gradation and moisture content of the soil when it is placed. As the amount of fines (that portion 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. Soils containing more than about 5 percent fines cannot be consistently compacted to a dense, non-yielding condition when the moisture content is more than 2 percent above or below optimum. Optimum moisture content is that moisture which results in the greatest compacted dry density with a specified compactive effort.

Non-organic site soils are considered suitable for structural fill provided that their moisture content is within about 2 percent of the optimum moisture level as determined by the ASTM D-1557 test. Excavated site soils may not be suitable for re-use as structural fill depending on the 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 site work. If wet weather occurs, the upper wetted portion of the site soils may need to be scarified and allowed to dry prior to further earthwork, or would need to be wasted from the site.

Placement and compaction of structural fill should be observed by a representative from our firm. A representative number of in-place density tests should be performed as the fill is being placed to confirm that the recommended level of compaction is being achieved.

Foundation Systems

Conventional spread footing foundations are considered suitable for support of the planned store provided subgrades have been prepared, and the settlement sensitive silt and clay layers are remediated, as discussed in this report .

Bearing Subgrade: We recommend that building foundations be supported on undisturbed native sandy gravel soils or on a zone of compacted structural fill prepared as discussed in the *Foundation Subgrade Preparation* and *Structural Fill* sections of this report. Foundations should not be supported on loose native soils or undocumented fill soils.

If unsuitable bearing soils are encountered in footing excavations, the excavations should be extended deeper to suitable soils and the overexcavation should be backfilled in accordance with the recommendations within this report.

Subgrade Observation: The foundation subgrade should be observed by a qualified Terracon representative before placing any formwork, reinforcement steel, structural fill, or concrete. All footing subgrades should be founded in those soils described in the *Foundation Subgrade Preparation* section of this report.

Bearing Pressures: Foundations supported as recommended in the *Foundation Subgrade Preparation* and *Structural Fill* sections of this report may be designed for a maximum allowable, net, bearing pressure of 3,000 psf. A one-third increase of the bearing pressure may be used for short-term dynamic loads such as wind and seismic forces.

Shallow Footing Depth and Width: The bottoms of all exterior footings should bear at least 18 inches below adjacent outside grade. Interior column footings should bear at least 12-inches below top of slab elevations. We recommend that all continuous and isolated footings be at least 24 inches wide.

Settlement: Provided that the subgrade has been prepared as described in this report, we estimate that post-construction settlement due to foundation loads will range on the order of 1-inch. If removal of portions of the silt/clay layers or preloading of the northeastern portion of the building footprint is not completed, settlements may be excessive in this area. For subgrades prepared as recommended, the estimated settlement is expected to occur during construction of the building. Differential settlement across the building is anticipated to be roughly ½ of the total amount.

Lateral Earth Pressures: Lateral foundation loads can be resisted by a combination of passive lateral earth pressure and base friction. We recommend using allowable design values of 300 pcf (pounds per cubic foot) and 0.4 for passive pressure and base friction coefficient, respectively. These values include a safety factor of about 1.5. For design purposes, we recommend an equivalent fluid weight of 35 pcf and 50 pcf for the active and at-rest conditions, respectively, for the native sandy gravel soils.

Soil Resistance: Based on previous testing on similar soil types as observed on this site, soils are anticipated to have a slight corrosion potential to steel and concrete.

Floor Slabs

Post-construction floor slab settlement should be anticipated to be similar to foundation settlements provided subgrades have been prepared as discussed in this report. We recommend a vertical subgrade soil modulus value of 300 kips per cubic foot (kcf) for the native sandy gravel soils at the site.

Slab-on-grade floors should be founded on the native sandy gravel or compacted structural fill subgrades constructed in accordance with the recommendations of this report. We recommend that 4 inches of free-draining granular material be placed under the slab to serve as a capillary break. The fines content of the capillary break material should be limited

to 3 percent or less, by weight, and at least 50 percent of the capillary break material should be retained on the No. 4 sieve.

Groundwater was observed in the explorations at depths of 10 feet or deeper. Shallow native soils are typically granular sandy gravels to gravelly sands. Therefore, the use of a vapor barrier membrane is not considered necessary below the slab, unless special floor coverings are planned. If a vapor retarder is used, we recommend using a puncture-resistant proprietary product such as RUFCO 3000B, Vapor Block VB 10, Stego Wrap, or an approved equivalent that is classified as a Class A vapor retarder in accordance with ASTM E 1745. To avoid puncturing of the vapor barrier, construction equipment should not be allowed to drive over any vapor retarder material. The slab designer and slab contractor should refer to ACI 302 for procedures and cautions regarding the use and placement of a vapor retarder. The moisture protection details should be reviewed by the architect and owner.

Seismic Design Considerations

Based on subsurface conditions encountered in the exploration and our familiarity with area soils, the subsurface site conditions are interpreted to correspond to Site Class C per the 2006 *International Building Code* (IBC). Site Class C applies to an average soil profile within the top 100 feet consisting predominantly of very dense soil characterized by Standard Penetration Test blow counts greater than 50, a shear wave velocity between 1,200 and 2,500 feet per second, and undrained shear strength greater than 2,000 psf.

We recommend that spectral response accelerations per Figures 1613.5(1) and 1613.5(2) as presented in the 2006 IBC be used in design. We are available to provide site-specific spectral response accelerations, if required.

Soil liquefaction is a condition wherein loose sand soils located below the groundwater surface lose strength during ground shaking associated with an earthquake. The native soils encountered in the exploratory boring consisted of predominantly gravelly sand and sandy gravel in a medium dense to very dense condition. Groundwater was observed within about 10 feet of the surface. Based on observed subsurface conditions, the risk of liquefaction at this site is considered low for the design level earthquake in the native granular soils observed in the borings.

Infiltration

An infiltration test was completed near the center of the proposed infiltration gallery in the northern portion of the site (at test pit TP-9). We used procedures presented in ASTM 3385-88 "Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometers" and Thurston County Stormwater guidelines to perform the test. The test was

completed at a depth of five (5) feet below the existing surface. The soils at the top of the tested area consisted of silty sandy gravel.

The field test results indicated an uncorrected infiltration rate of 4.8 inches per hour (in/hr) in the silty sandy gravel layer. This rate is considered reasonable for the soils observed at the test location.

Approximately one foot below the test location, gravel with sand and trace silt was encountered. Gradation testing of the gravel with sand and trace silt (1 foot below the tested soil in test pit TP-9) indicated that this soil would be classified as a sand per the USDA textural triangle classification system. Per Table 3.7 of the 2005 DOE Western Washington Stormwater Manual (Volume III), this soil would be classified as "clean sandy gravel" with a corresponding short-term infiltration rate of 20 in/hr.

Test pits TP-10 and TP-11 were also located in the planned infiltration gallery area. In test pit TP-10 a silt layer was observed between 4.5 and 6.5 feet below the surface. We expect that this silt layer will have reduced infiltration rates than at the test pit TP-9 infiltration test location. However, gravel with sand and silt was observed below this silt and is expected to have faster rates than those tested in TP-9 as suggested by the DOE manual and tables. Test pit TP-11 indicated gravel with sand and trace silt throughout the depth of the exploration.

It is our opinion that the 4.8 in/hr ultimate rate obtained in the field test in TP-9 is conservative considering that the predominant soil type observed below a depth of 5 feet in the gallery test pits was gravel with sand and trace silt. If the bottom elevation of the gallery is placed at a depth of 5 feet below existing site grades, the tested 4.8 in/hr rate is considered suitable when considering the slight variability in soil types at this depth across the gallery area. If the bottom of the gallery is extended to a depth of 6 to 6.5 feet below existing grades, a rate of 20 in/hr per the DOE manual is considered appropriate. Appropriate factors of safety per Thurston County or Washington State Department of Ecology should be applied to the rate used.

Groundwater was observed in all test pits completed in the gallery and ranged in depth from 8 feet (north side) to 10 feet (center and east side). Our field explorations were completed after the area had received an above normal storm event in early January 2009. It is our opinion that observed groundwater levels were likely above normal elevations. Therefore, for bottom of infiltration gallery elevations on the order of 5 to 6 feet below the existing ground surface, it appears that a separation of 3 feet to the groundwater table or impervious surface can be maintained.

Pavement Sections

Subgrades for pavement sections should be prepared as described in the *Foundation Subgrade Preparation* section of this report. All pavement subgrades should be proofrolled to assess the need for repairs to soft or yielding areas. Terracon should observe proofrolling of all pavement subgrades.

Subgrades below pavement sections should be graded to promote drainage under the pavement section and not allow for ponding of water beneath the section. If drainage is not provided and ponding occurs, the subgrade soils could become saturated, loose strength, and result in premature distress to the road/parking areas. In addition, the pavement surfacing should be graded or crowned to promote drainage and reduce the potential for ponding of water on the pavement surface.

Asphalt surfacing should consist of a HMA asphalt with 1/2-inch aggregate conforming to Specifications 9-03.8(6) "Proportions of Materials" of the WSDOT 2006 Standard Specifications and/or to applicable City of Auburn codes. Imported base material under concrete asphalt pavement should conform to Specification 9-03.9(3) of the WSDOT 2006 Standard Specifications. Base materials should be moisture conditioned and compacted to a minimum of 95 percent of the maximum dry density per ASTM D-1557, or equivalent density per other approved test method.

We have prepared recommended sections for both flexible (asphalt-concrete) and rigid (concrete) pavement sections. Our design is based on the following:

- Up to 10 semitrailer truck deliveries/day – gross weight limit of 105,500 pounds;
- 20-year life span;
- Calculated design life Equivalent Single Axle Loads (18 kips) of 375,000;
- Terminal serviceability of 2.5; and,
- Level of reliability 85 percent.

Based on observed subgrade conditions, previous laboratory testing, and our experience with site soils we have assigned a CBR value of 25 for our pavement analyses. If the above information requires modification based on WinCo design parameters or other conditions, we should be notified so we can review and modify our designs as necessary. Our recommended pavement sections are provided in Table 1, Pavement Sections.

TABLE 1 - PAVEMENT SECTIONS

Flexible Pavements		Rigid Pavements	
Light Duty	Heavy Duty	Light Duty	Heavy Duty
Asphalt	Asphalt	Concrete	Concrete
2"	4"	5"	6"
Base Course *	Base Course *	Base Course *	Base Course *
4"	6"	4"	4"

*Base Course can consist of either "Base Course" or "Top Course" material

Base course and top course materials should conform to section 9-03.9(3) of the 2008 WSDOT Standard Specifications for Road, Bridge, Municipal Construction manual. All base course material should be compacted to at least 95 percent of the maximum dry density per the ASTM-D1557 test method.

GENERAL COMMENTS

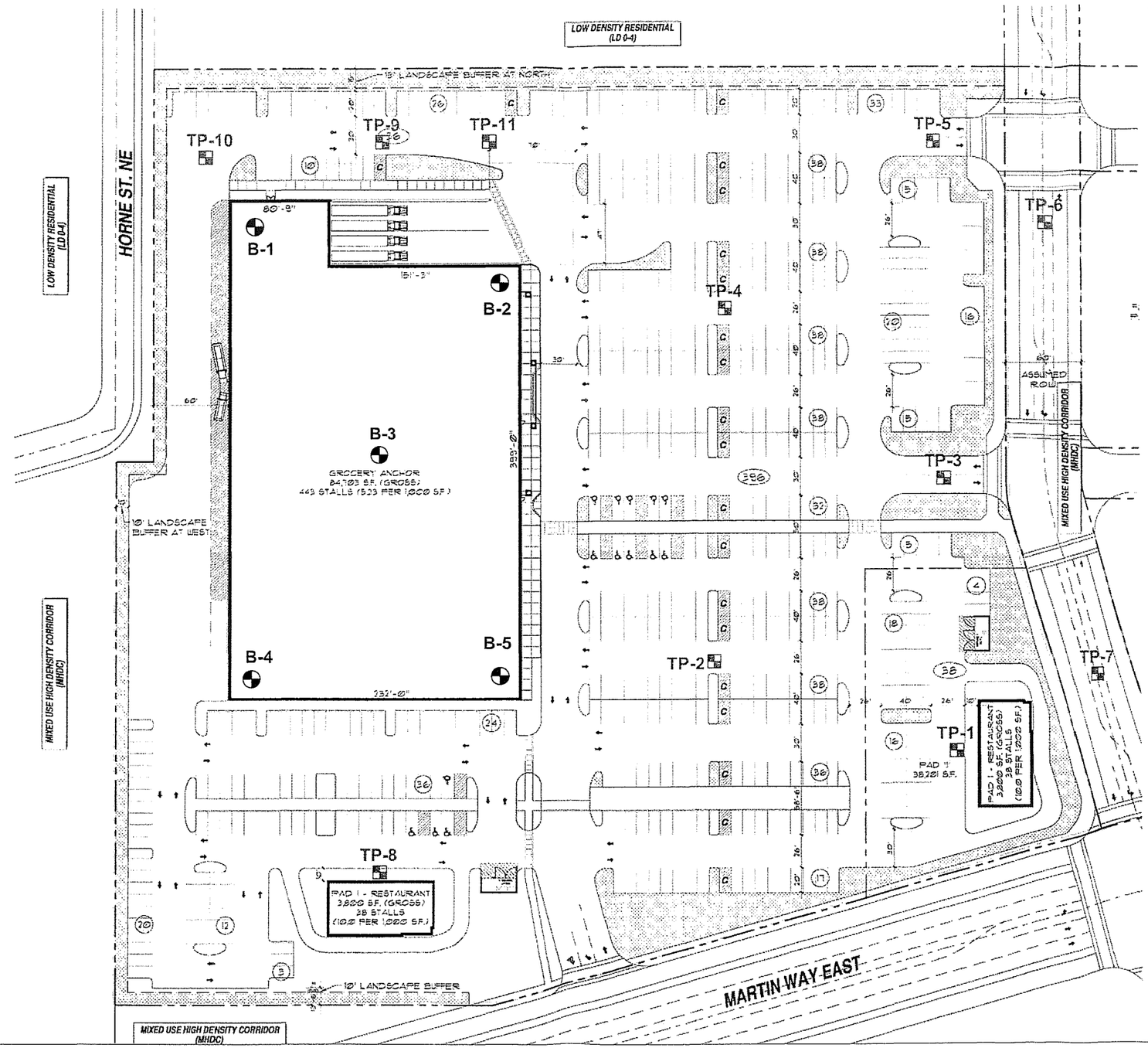
Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during 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 explorations 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 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 WinCo Foods, LLC for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices in this area at the time the report was prepared. No warranties, either expressed 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.



LEGEND:

- B-1 BORING NUMBER AND APPROXIMATE LOCATION
- TP-1 TEST PIT NUMBER AND APPROXIMATE LOCATION

Basemap PDF file provided by Tiland/Schmidt and modified by TERRACON.

REV.	DATE	BY	DESCRIPTION

Terracon
Consulting Engineers and Scientists

2115 South 56th Street, Suite 405 Tacoma, WA 98409
PH. (253) 573-9939 FAX. (253) 573-9959

For Geotechnical Use

SITE AND EXPLORATION PLAN

WinCo Foods - Lacey
Lacey, Washington
Prepared for: Winco Foods

FIGURE 1

DESIGNED BY:	
DRAWN BY:	JGE
APPVD. BY:	THR
SCALE:	1" = 80'
DATE:	Jan. 26, 2009
JOB NO.	B2095001
ACAD NO.	Fig1.dwg
SHEET NO.:	1 OF 1

Terracon

APPENDIX A

Boring and Test Pit Logs

Our field exploration for this portion of the project included five borings and eleven test pits completed on January 21 through 23, 2009. The approximate exploration locations are shown on Figure 1, Site and Exploration Plan. Exploration locations were determined by measuring distances from existing site features by pacing or taping. As such, the exploration location should be considered accurate to the degree implied by the measurement method. The following sections describe our procedures associated with the exploration. Descriptive logs of the explorations are enclosed in this appendix.

An independent contractor working under subcontract to our firm advanced the boring with a hollow-stem auger using a trailer-mounted drill rig. A geologist from our firm continuously observed the borings, logged the subsurface conditions, and obtained representative soil samples. The enclosed boring logs indicate the vertical sequence of soils and materials encountered in the boreholes, based primarily on our field classifications and supported by our subsequent laboratory testing. Where a soil contact was observed to be gradational or undulating, our log indicates the average contact depth. Soil samples were collected of representative soil layers and placed in air-tight containers for further examination and laboratory testing.

Test pits were excavated by a subcontracted excavating firm. A geologist or geotechnical engineer from our firm continuously observed the test pits, logged the subsurface conditions, and obtained representative soil samples. Spoils from the excavations were placed back into the test pits and tamped by the excavator bucket and/or track-rolled. Some settlement of the test pits should be expected with time.

LOG OF BORING NO. B-1

CLIENT: WinCo Foods

SITE: 7540 Martin Way East, Lacey, Washington

PROJECT: WinCo Foods - Lacey

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N * ** BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	LABORATORY TESTS
	SILTY SANDY GRAVEL, brown, medium dense, moist (Possible Fill)										
					HS						
				1	SS	3	16				
4											
	Driller noted less gravel at 4 feet.				HS						
	SANDY GRAVEL, with silt, dark brown, hard, moist	5		2	SS	14	17	15			GSA
7.5					HS						
	SANDY GRAVEL, trace silt, brown, medium dense, wet			3	SS	6	19				
10					HS						
	SANDY GRAVEL, trace silt, brownish grey, very dense, saturated	10		4	SS	3	50/3"				
11	**GRAVELLY SILTY SAND,** brownish grey, very dense, saturated (Glacial Till)				HS						
		15		5	SS	6	50/5.5"				
					HS						
20.5		20		6	SS	6	50/5"				
	Boring completed at 20.5 feet bgs.										

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

*Cathead 140H SPT hammer
**SPT-N Blows might be overstated due to presence of gravel and cobbles

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 10	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	1-21-09
BORING COMPLETED	1-21-09
RIG Deep Rock XL	DRILLER Geologic
LOGGED AJD	JOB # B2095001

LOG OF BORING NO. B-2

CLIENT: WinCo Foods

SITE: 7540 Martin Way East, Lacey, Washington

PROJECT: WinCo Foods - Lacey

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N * ** BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	LABORATORY TESTS
	SANDY GRAVEL, with silt, dark brown, dense, wet				HS						
				1	SS	6	39				
					HS						
5	**SILTY SANDY GRAVEL,** dark brown, loose, moist	5		2	SS	6	8				
					HS						
7.5	**SILT,** trace sand and gravel, light brown, soft, wet			3	SS	9	2				
					HS						
10	**SILTY CLAY,** mottled orange/grey, medium stiff, wet	10		4	SS	18	8				
					HS						
14 ▽	**GRAVELLY SILTY SAND,** brownish grey, very dense, saturated (Glacial Till)	15		5	SS	NR	37				
					HS						
21		20		6	SS	6	50/4"				
	Boring completed at 21 feet bgs.										

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

*Cathead 140H SPT hammer
**SPT-N Blows might be overstated due to presence of gravel and cobbles

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 14	WD	▼
WL	▼		▽
WL			

Terracon

Resource Stewardship & Land Use

BORING STARTED	1-21-09
BORING COMPLETED	1-21-09
RIG Deep Rock XL	DRILLER Geologic
LOGGED AJD	JOB # B2095001

LOG OF BORING NO. B-3

CLIENT: WinCo Foods

SITE: 7540 Martin Way East, Lacey, Washington

PROJECT: WinCo Foods - Lacey

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N * ** BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	LABORATORY TESTS
	SILTY SANDY GRAVEL, dark brown, medium dense, wet				HS						
				1	SS	9	24				
					HS						
		5		2	SS	6	13				
					HS						
7.5	**GRAVEL,** with sand, trace silt, brown, medium dense, wet			3	SS	3	20				
					HS						
10	**SANDY GRAVEL,** with silt, brown, dense, wet	10		4	SS	12	48				
					HS						
15	**GRAVELLY SILTY SAND,** grey, very dense, moist to wet (Glacial Till)	15		5	SS	.5	50/5"				
					HS						
20	**GRAVELLY SAND,** with silt, grey, medium dense, wet	20		6	SS	18	50/5"				
					HS						

Continued Next Page

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

*Cathead 140H SPT hammer
**SPT-N Blows might be overstated due to presence of gravel and cobbles

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

Terracon

BORING STARTED	1-21-09
BORING COMPLETED	1-21-09
RIG Deep Rock XL	DRILLER Geologic
LOGGED AJD	JOB # B2095001

LOG OF BORING NO. B-3

CLIENT
WinCo Foods

SITE
7540 Martin Way East
Lacey, Washington

PROJECT
WinCo Foods - Lacey

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N * ** BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	LABORATORY TESTS
	GRAVELLY SAND, with silt, grey, medium dense, wet										
25		25		7	SS HS	9	50/6"				
	SANDY GRAVEL, trace silt, grey, very dense, wet										
		30		8	SS HS	NR	50/6"				
35		35									
	Boring completed at 35 feet bgs.										

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

*Cathead 140H SPT hammer
**SPT-N Blows might be overstated due to presence of gravel and cobbles

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

Terracon

BORING STARTED	1-21-09
BORING COMPLETED	1-21-09
RIG Deep Rock XL	DRILLER Geologic
LOGGED AJD	JOB # B2095001

LOG OF BORING NO. B-4

CLIENT: WinCo Foods

SITE: 7540 Martin Way East, Lacey, Washington

PROJECT: WinCo Foods - Lacey

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N * ** BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	LABORATORY TESTS
	SANDY GRAVEL, with silt, dark brown, medium dense, moist				HS						
				1	SS	9	17				
					HS						
		5		2	SS	6	15				
					HS						
7.5	**GRAVEL,** with sand, trace silt, brown, medium dense, wet			3	SS	6	19				
					HS						
10	**SANDY GRAVEL,** trace silt, brown, dense, wet	10		4	SS	9	45				
12 ▽	**GRAVELLY SILTY SAND,** grey, very dense, moist (Glacial Till)				HS						
		15		5	SS	.5	50/4.5"				
16	Boring completed at 16 feet bgs.										

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

*Cathead 140H SPT hammer
**SPT-N Blows might be overstated due to presence of gravel and cobbles

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 12	WD	▼
WL	▼		▽
WL			

Terracon

BORING STARTED	1-21-09
BORING COMPLETED	1-21-09
RIG Deep Rock XL	DRILLER Geologic
LOGGED AJD	JOB # B2095001

LOG OF BORING NO. B-5

CLIENT: WinCo Foods

SITE: 7540 Martin Way East, Lacey, Washington

PROJECT: WinCo Foods - Lacey

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N * ** BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	LABORATORY TESTS
GRAVEL, trace sand, brown, very dense, wet				HS						
			1	SS	6	63				
				HS						
Grades medium dense	5		2	SS	NR	23				
				HS						
7.5 Interbedded **SAND,** trace gravel & **SILTY SAND,** grey, dense, moist to wet			3	SS	12	34				
				HS						
10 **SANDY GRAVEL,** trace silt, brown, very dense, wet	10		4	SS	3	61				
				HS						
15 Interbedded **SAND,** with gravel & **SILTY SAND,** trace gravel, grey, very dense, wet to saturated ▽	15		5	SS	12	72				
				HS						
20 **SILTY GRAVELLY SAND,** grey, very dense, wet to saturated (Glacial Till)	20		6	SS	6	50/4"				
				HS						
22 **SILT,** brown grading to grey, hard, moist										

Continued Next Page

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

*Cathead 140H SPT hammer
**SPT-N Blows might be overstated due to presence of gravel and cobbles

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 16	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	1-21-09
BORING COMPLETED	1-21-09
RIG Deep Rock XL	DRILLER Geologic
LOGGED AJD	JOB # B2095001

LOG OF BORING NO. B-5

CLIENT: WinCo Foods

SITE: 7540 Martin Way East, Lacey, Washington

PROJECT: WinCo Foods - Lacey

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N * ** BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	LABORATORY TESTS
	SILT, brown grading to grey, hard, moist										
		25		7	SS	18	80				
					HS						
	30	30		8	SS	12	50/4"				
	SILTY GRAVELLY SAND, grey, very dense, wet to saturated (Glacial Till)				HS						
		35		9	SS	9	50/5.5"				
					HS						
	40	40		10	SS		58				
	Boring completed at 41.5 feet bgs.										

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

*Cathead 140H SPT hammer

**SPT-N Blows might be overstated due to presence of gravel and cobbles

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 16	WD	▼
WL	▼		▽
WL			

Terracon

Resource Stewardship & Land Use

BORING STARTED	1-21-09
BORING COMPLETED	1-21-09
RIG Deep Rock XL	DRILLER Geologic
LOGGED AJD	JOB # B2095001

LOG OF TEST PIT NO. TP-1

CLIENT WinCo Foods

SITE 7540 Martin Way East, Lacey, Washington

PROJECT WinCo Foods - Lacey

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	LABORATORY TESTS
0.5	Grass, root, topsoil										
1	**GRAVELLY SILT,** with sand & organics, dark brown, soft, moist			1	GRAB						
2.5	**SILTY GRAVEL,** with sand, orangish brown, medium dense, moist			2	GRAB			17			GSA
	SANDY GRAVEL, with cobbles, grey, medium dense, moist			3	GRAB						
		5									
8											
	END OF TEST PIT No caving observed at time of excavation. No groundwater observed at time of excavation.										

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

EXCAVATION STARTED			1-22-09
EXCAVATION COMPLETED			1-22-09
RIG	Track Hoe	Co	LEI
LOGGED	AJD	JOB #	B2095001

LOG OF TEST PIT NO. TP-10

CLIENT **WinCo Foods**

SITE **7540 Martin Way East, Lacey, Washington**

PROJECT **WinCo Foods - Lacey**

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, psf	TESTS LABORATORY TESTS
	0.5 **SILTY GRAVELLY SAND,** Dark brown, medium dense, moist (root zone)										
	SILTY SANDY GRAVEL, with cobbles, dark brown, medium dense, moist			1	GRAB						
	4.5 **SILT,** trace gravel, light brown, medium stiff, wet	5									
	6.5 **GRAVEL,** with silt and sand, brown, medium dense, saturated ∇			2	GRAB			33			200 Wash
	10			3	GRAB						
		10									

END OF TEST PIT
Moderate caving observed below 6.5 feet.
Severe seepage at 8.0 feet.

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	∇ 8	WL	∇
WL	∇		∇
WL			

Terracon

EXCAVATION STARTED			1-23-09
EXCAVATION COMPLETED			1-23-09
RIG	Track Hoe	Co	LEI
LOGGED	JGE	JOB #	B2095001

BOREHOLE 99 B2095001 LOGS.GPJ TERRACON.GDT 2/16/09

LOG OF TEST PIT NO. TP-11

CLIENT: WinCo Foods

SITE: 7540 Martin Way East, Lacey, Washington

PROJECT: WinCo Foods - Lacey

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, psf	TESTS LABORATORY TESTS
	GRAVEL, with sand & cobbles, trace silt, dark brown, medium dense, moist			1	GRAB						
3.5	**GRAVEL**, with sand & cobbles, trace silt, tan, medium dense, moist to saturated (USDA - Sand)	5		2	GRAB			2			GSA
11		10		3	GRAB						
	END OF TEST PIT Slight caving below 4 feet. Moderate seepage at 10 feet.										

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	WL	▼
WL	▼		▼
WL			

Terracon

EXCAVATION STARTED			1-23-09
EXCAVATION COMPLETED			1-23-09
RIG	Track Hoe	Co	LEI
LOGGED	JGE	JOB #	B2095001

LOG OF TEST PIT NO. TP-2

CLIENT: WinCo Foods

SITE: 7540 Martin Way East, Lacey, Washington

PROJECT: WinCo Foods - Lacey

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, psf	TESTS: LABORATORY TESTS
0.5	grass. dense roots, topsoil										
1.5	**GRAVELLY SILT,** with sand & organics, dark brown, soft, moist			1	GRAB						
2	**SANDY SILTY GRAVEL,** with cobbles, orangish brown, loose, moist										
	SANDY GRAVEL, with cobbles, grey, loose, moist			2	GRAB						
		5									
7											

END OF TEST PIT
Caving observed below 2 feet.
No groundwater observed at time of excavation.

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

Resource Stewardship & Land Use

EXCAVATION STARTED			1-22-09
EXCAVATION COMPLETED			1-22-09
RIG	Track Hoe	Co	LEI
LOGGED	AJD	JOB #	B2095001

LOG OF TEST PIT NO. TP-3

CLIENT **WinCo Foods**

SITE **7540 Martin Way East, Lacey, Washington**

PROJECT **WinCo Foods - Lacey**

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, psf	TESTS: LABORATORY TESTS
0.5	grass, dense roots, topsoil										
	GRAVEL, with sand & cobbles, trace silt, grey, loose, moist			1	GRAB						
		5									
6											
	END OF TEST PIT Caving observed throughout. No groundwater observed at time of excavation.										

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

EXCAVATION STARTED			1-22-09
EXCAVATION COMPLETED			1-22-09
RIG	Track Hoe	Co	LEI
LOGGED	AJD	JOB #	B2095001

Resource Stewardship & Land Use

LOG OF TEST PIT NO. TP-4

CLIENT: WinCo Foods

SITE: 7540 Martin Way East, Lacey, Washington

PROJECT: WinCo Foods - Lacey

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, psf	TESTS: LABORATORY TESTS
0.5	grass, dense roots, topsoil										
	GRAVEL, with sand & cobbles, trace silt, light brown, loose, moist			1	GRAB						
2.5	**SANDY GRAVEL,** with cobbles, grey, loose, moist			2	GRAB						
		5									
7	**END OF TEST PIT** Caving observed throughout. No groundwater observed at time of excavation.										

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

Resource Stewardship & Land Use

EXCAVATION STARTED			1-22-09
EXCAVATION COMPLETED			1-22-09
RIG	Track Hoe	Co	LEI
LOGGED	AJD	JOB #	B2095001

LOG OF TEST PIT NO. TP-5

CLIENT WinCo Foods

SITE 7540 Martin Way East
Lacey, Washington

PROJECT WinCo Foods - Lacey

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	LABORATORY TESTS
0.5	2" grass, dense roots, topsoil										
	SANDY GRAVEL, with cobbles, grey, loose, moist			1	GRAB						
		5									
7											
	END OF TEST PIT Caving observed throughout. No groundwater observed at time of excavation.										

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

EXCAVATION STARTED			1-22-09
EXCAVATION COMPLETED			1-22-09
RIG	Track Hoe	Co	LEI
LOGGED	AJD	JOB #	B2095001

LOG OF TEST PIT NO. TP-6

CLIENT WinCo Foods

SITE 7540 Martin Way East, Lacey, Washington

PROJECT WinCo Foods - Lacey

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	LABORATORY TESTS
0.5	3" grass, dense roots, topsoil										
1.5	**GRAVELLY SILT,** with sand & organics, dark brown, soft, moist			1	GRAB						
4.5	**GRAVELLY SILT,** with sand & cobbles, brown, stiff, moist			2	GRAB						
9	**GRAVELLY SAND,** with silt & cobbles, grey, dense, moist (Glacial Till)	5		3	GRAB						
	END OF TEST PIT No caving observed at time of excavation. No groundwater observed at time of excavation.										

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

Resource Stewardship & Land Use

EXCAVATION STARTED	1-22-09		
EXCAVATION COMPLETED	1-22-09		
RIG	Track Hoe	Co	LEI
LOGGED	AJD	JOB #	B2095001

LOG OF TEST PIT NO. TP-7

CLIENT WinCo Foods

SITE 7540 Martin Way East, Lacey, Washington

PROJECT WinCo Foods - Lacey

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, psf	TESTS LABORATORY TESTS
	SANDY GRAVEL, with cobbles, grey, loose, moist			1	GRAB						
3											
	SANDY GRAVEL, grey, loose to medium dense, moist			2	GRAB						
		5									
7											
	END OF TEST PIT Caving observed throughout. No groundwater observed at time of excavation.										

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

EXCAVATION STARTED			1-22-09
EXCAVATION COMPLETED			1-22-09
RIG	Track Hoe	Co	LEI
LOGGED	AJD	JOB #	B2095001

LOG OF TEST PIT NO. TP-8

CLIENT WinCo Foods	
SITE 7540 Martin Way East Lacey, Washington	PROJECT WinCo Foods - Lacey

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, psf	TESTS: LABORATORY TESTS
0.5	3" grass, dense roots, topsoil										
	SANDY GRAVEL, with cobbles, grey, loose to medium dense, moist	5									
6											
	END OF TEST PIT Caving observed throughout. No groundwater observed at time of excavation.										

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

EXCAVATION STARTED			1-22-09
EXCAVATION COMPLETED			1-22-09
RIG	Track Hoe	Co	LEI
LOGGED	AJD	JOB #	B2095001

LOG OF TEST PIT NO. TP-9

CLIENT: WinCo Foods

SITE: 7540 Martin Way East, Lacey, Washington

PROJECT: WinCo Foods - Lacey

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, psf	TESTS: LABORATORY TESTS
	SILTY SANDY GRAVEL, with cobbles, brown, medium dense, moist to wet (Fill)										
3											
	SILTY GRAVEL, with sand & cobbles, dark brown, medium dense, moist (USDA - Silt loam)	5		1	GRAB			24			GSA
6											
	GRAVEL, with sand, trace silt, brown, medium dense, wet to saturated (USDA - Sand)			2	GRAB			4			GSA
10		10									
	SILTY SANDY GRAVEL, grey, very dense, moist (Glacial Till)			3	GRAB						
11.5											

END OF TEST PIT
Caving observed below 6 feet.
Moderate seepage at 10 feet.
IT-1 performed at 5 feet bgs.

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	WL	▼
WL	▼		▼
WL			

Terracon

EXCAVATION STARTED			1-23-09
EXCAVATION COMPLETED			1-23-09
RIG	Track Hoe	Co	LEI
LOGGED	JGE	JOB #	B2095001

BOREHOLE JOB B2095001 LOGS.GPJ TERRACON.GDT 2/16/09

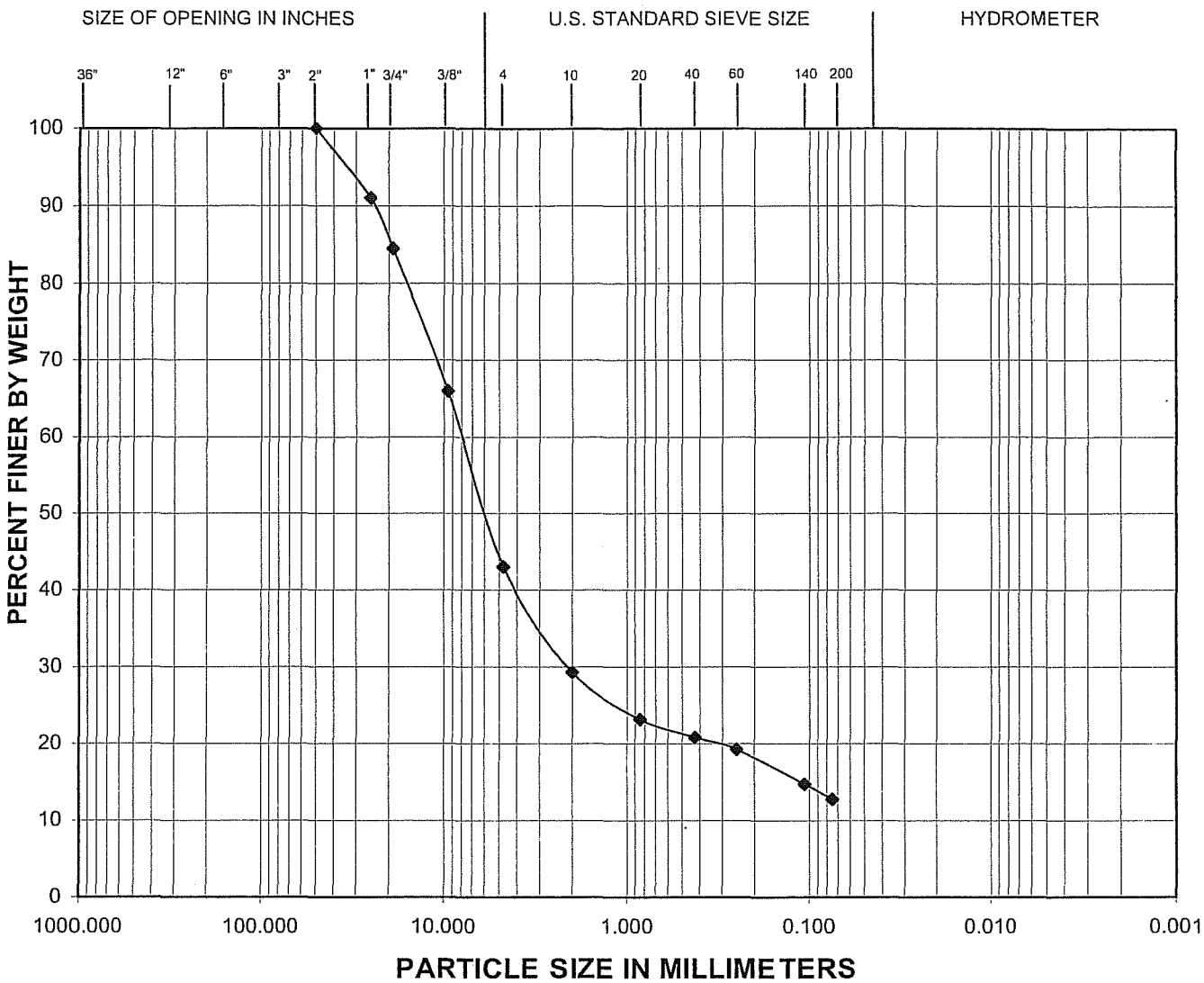
APPENDIX B

Laboratory Test Results

GRAIN SIZE ANALYSIS

Test Results Summary

ASTM D 422



BOULDERS	COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		GRAVEL		SAND			FINE GRAINED	

Exploration	Sample	Depth (feet)	Moisture (%)	Fines (%)	Description
B-1	S-2	5.0	15	12.8	sandy GRAVEL with silt

Terracon
2115 S.56th Street, #405 Tacoma, WA 98409
Phone: (253) 573-9939 Fax: (253) 573-9959

JOB NO: B2095001

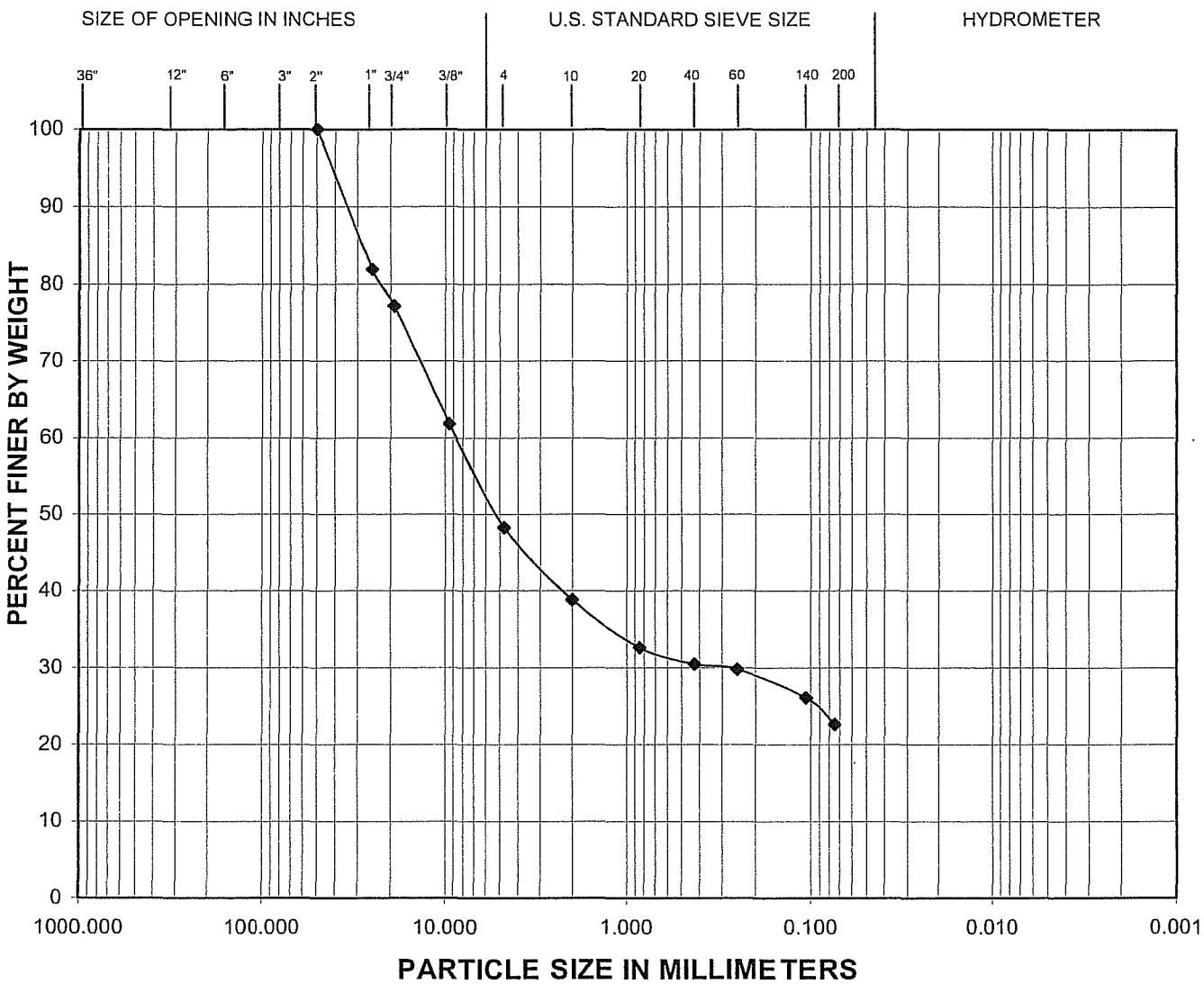
DATE OF TESTING: 01/29/09

PROJECT NAME: WinCo Lacey

GRAIN SIZE ANALYSIS

Test Results Summary

ASTM D 422



BOULDERS	COBBLES	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		GRAVEL		SAND			FINE GRAINED	

Exploration	Sample	Depth (feet)	Moisture (%)	Fines (%)	Description
TP-1	S-2	1.5	17	22.6	silty GRAVEL with sand

Terracon
2115 S.56th Street, #405 Tacoma, WA 98409
Phone: (253) 573-9939 Fax: (253) 573-9959

JOB NO: B2095001

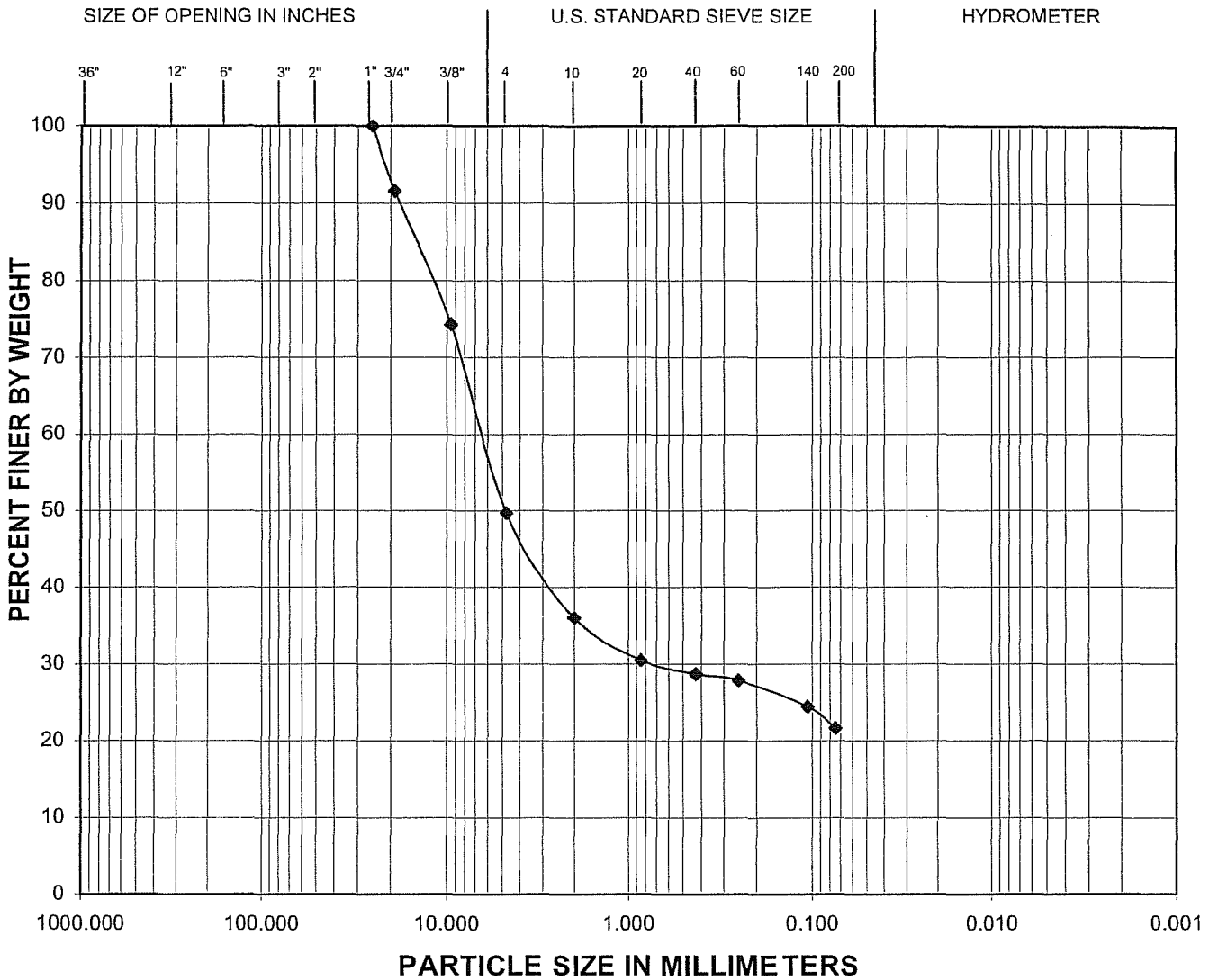
DATE OF TESTING: 01/29/09

PROJECT NAME: WinCo Lacey

GRAIN SIZE ANALYSIS

Test Results Summary

ASTM D 422



		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
BOULDERS	COBBLES	GRAVEL		SAND			FINE GRAINED	

Exploration	Sample	Depth (feet)	Moisture (%)	Fines (%)	Description
TP-9	S-1	5.0	24	21.7	silty GRAVEL with sand

Terracon
2115 S.56th Street, #405 Tacoma, WA 98409
Phone: (253) 573-9939 Fax: (253) 573-9959

JOB NO: B2095001

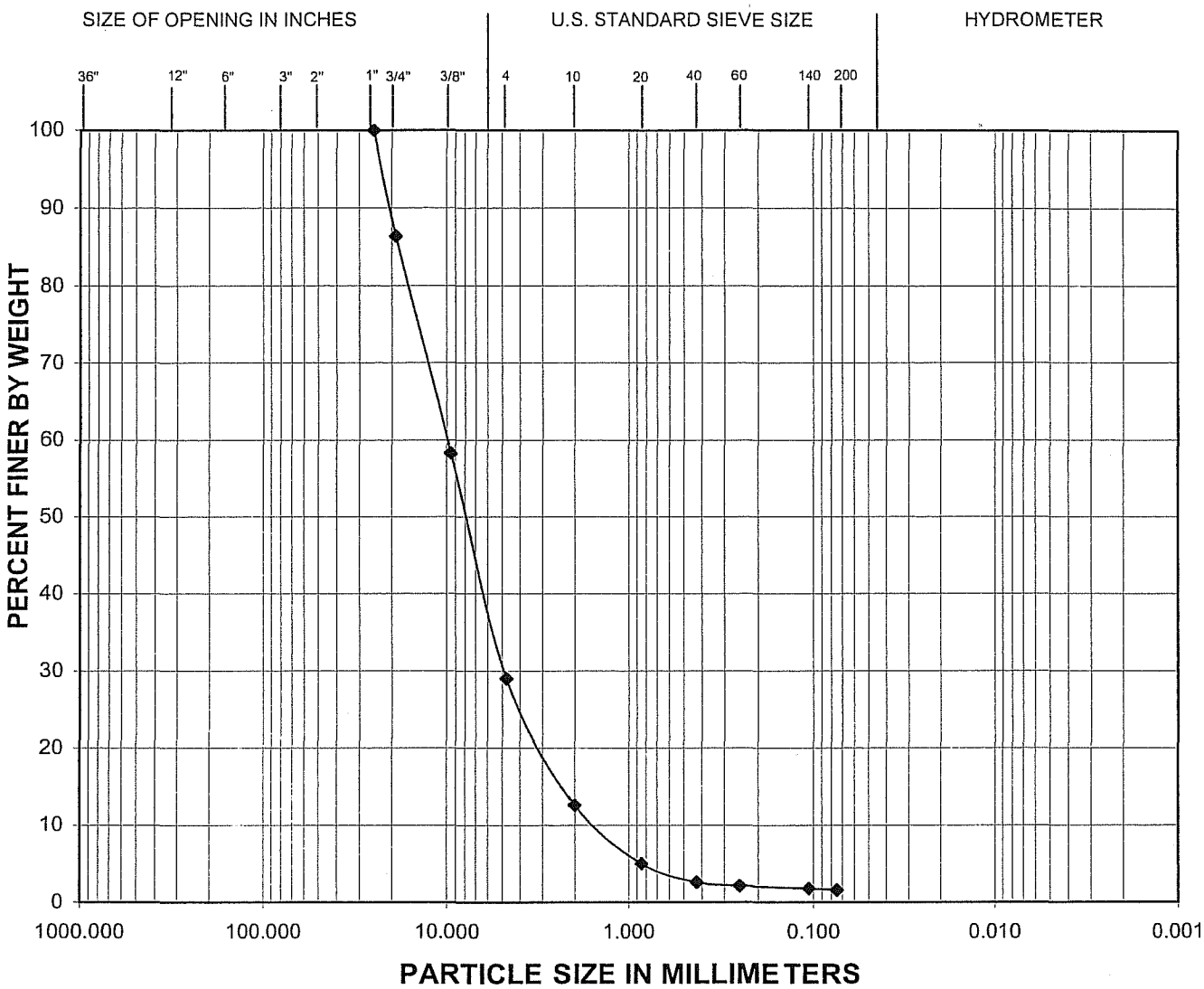
DATE OF TESTING: 01/27/09

PROJECT NAME: WinCo Lacey

GRAIN SIZE ANALYSIS

Test Results Summary

ASTM D 422



		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
BOULDERS	COBBLES	GRAVEL		SAND			FINE GRAINED	

Exploration	Sample	Depth (feet)	Moisture (%)	Fines (%)	Description
TP-9	S-2	8.0	4	1.6	GRAVEL with sand trace fines

Terracon
2115 S.56th Street, #405 Tacoma, WA 98409
Phone: (253) 573-9939 Fax: (253) 573-9959

JOB NO: B2095001

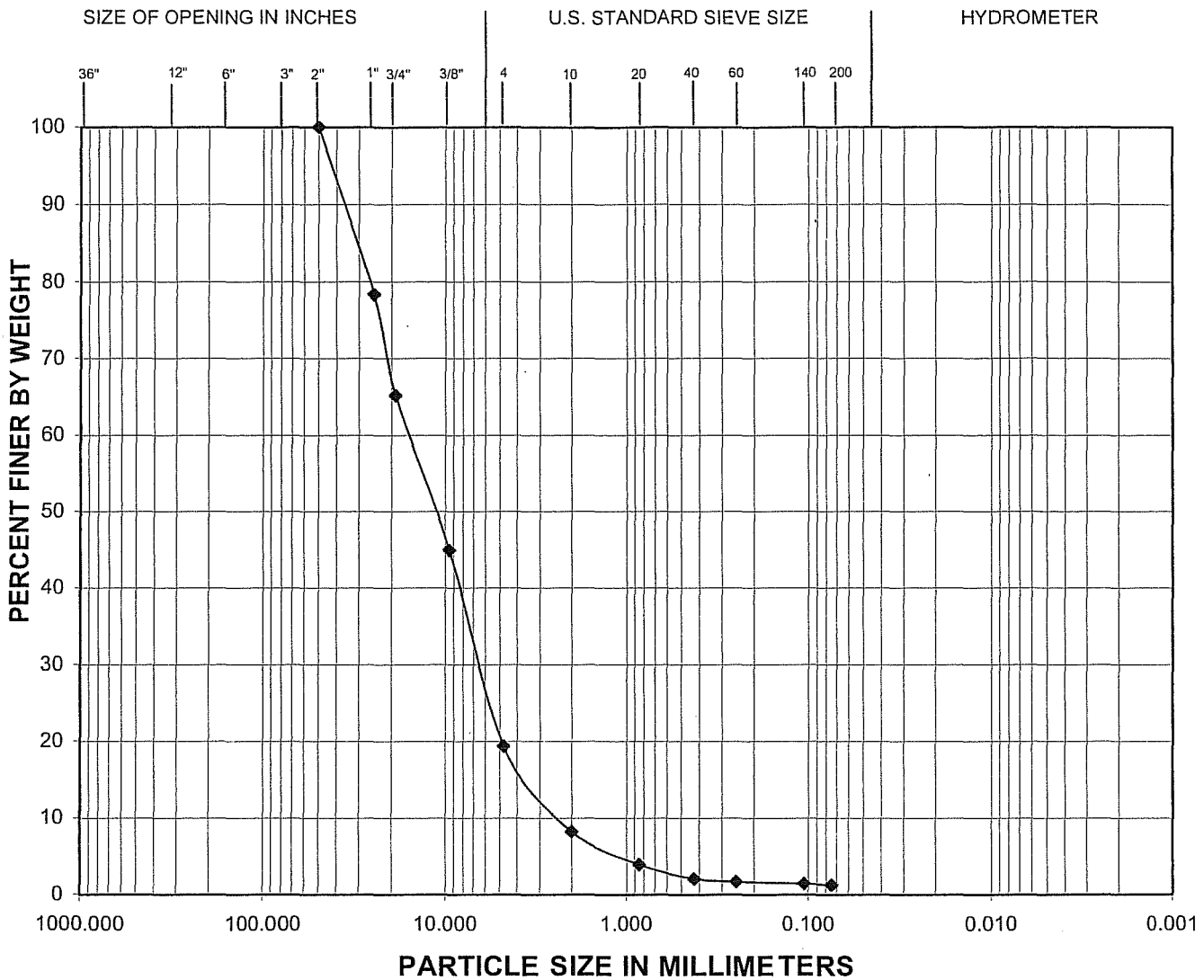
DATE OF TESTING: 01/27/09

PROJECT NAME: WinCo Lacey

GRAIN SIZE ANALYSIS

Test Results Summary

ASTM D 422



		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
BOULDERS	COBBLES	GRAVEL		SAND			FINE GRAINED	

Exploration	Sample	Depth (feet)	Moisture (%)	Fines (%)	Description
TP-11	S-2	4.5	2	1.3	GRAVEL with sand trace silt

Terracon
2115 S.56th Street, #405 Tacoma, WA 98409
Phone: (253) 573-9939 Fax: (253) 573-9959

JOB NO: B2095001

DATE OF TESTING: 01/27/09

PROJECT NAME: WinCo Lacey

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APPENDIX C

General Notes
Unified Soil Classification System

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	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	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

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 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 - 4	Soft
1,000 – 2,000	4 - 8	Medium Stiff
2,000 – 4,000	8 - 15	Stiff
4,000 – 8,000	15 - 30	Very Stiff
8,000+	> 30	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
> 50	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
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
Modifiers	> 12

PLASTICITY DESCRIPTION

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

Terracon

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 ≥ 4 and 1 ≤ Cc ≤ 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 ≥ 6 and 1 ≤ Cc ≤ 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 / Liquid limit - not dried < 0.75	OL	Organic clay[K,L,M,N]
					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 / Liquid limit - not dried < 0.75	OH	Organic clay[K,L,M,P]
					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] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[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.

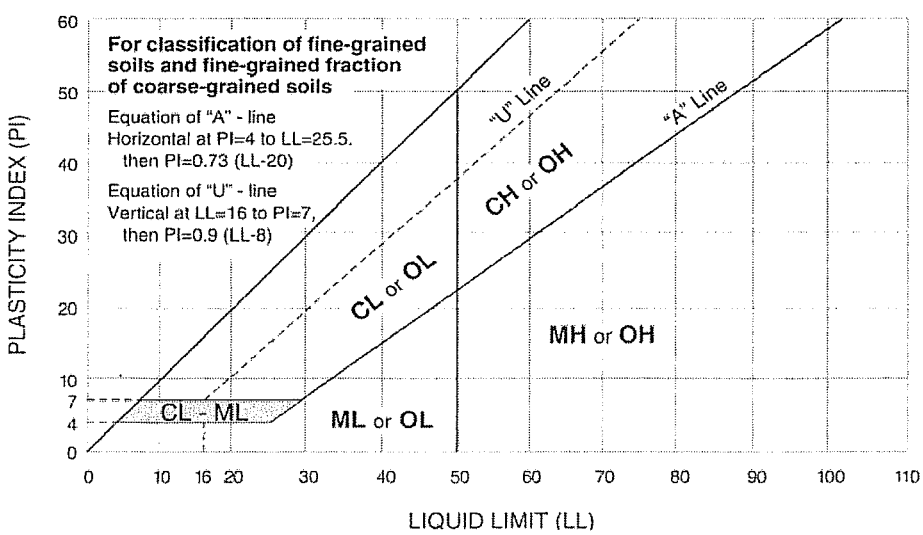
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[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.



Resource Stewardship & Land Use

Terracon

Form 111—6/98