Earth Solutions NW LLC

Geotechnical Engineering
Construction Observation/Testing
Environmental Services

PRELIMINARY GEOTECHNICAL ENGINEERING STUDY PROPOSED DEVELOPMENT HANSON PROPERTY 17406 - 19TH AVENUE NORTHEAST MARYSVILLE, WASHINGTON

ES-6143

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PREPARED FOR

HANSON SISTERS, LLC

July 30, 2018

Kyler T. Kelly
Staff Geologist

7/30/18

Henry T. Wright, P.E.
Senior Project Engineer

For: **Raymond A. Coglas, P.E.**
Principal Engineer

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Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you —* should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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Earth Solutions NW LLC

Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

July 30, 2018
ES-6143

Hanson Sisters, LLC
16720 Smokey Point Boulevard, Suite 3
Arlington, Washington 98223

Attention: Mr. Joel Hylback

Dear Mr. Hylback:

Earth Solutions NW, LLC (ESNW) is pleased to present this report titled "Preliminary Geotechnical Engineering Study, Proposed Development, Hanson Property, 17406 – 19th Avenue Northeast, Marysville, Washington". The primary purpose of this preliminary report is to provide initial site preparation and earthwork recommendations for establishing future building sites.

Based on the conditions observed during our fieldwork, the subject site is underlain by medium dense silt and sand recessional outwash deposits. Based on the results of our study, development of the site is feasible from a geotechnical standpoint. We understand existing site grades will be raised several feet to establish design elevations throughout the proposed development area. Fill heights on the order of six or more feet above existing grades are currently proposed. Based on identified soil conditions and the anticipated construction type consisting of relatively lightly loaded wood frame buildings, the proposed structures can be supported on conventional spread and continuous foundations bearing on the newly placed structural fill; ESNW should further evaluate this recommendation when building plans are available.

Recommendations for site preparation and earthwork, drainage, preliminary foundation design and other pertinent recommendations are provided in this study.

The opportunity to be of service to you is appreciated. If you have any questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Smyee M. Rogers

FOR: Kyler T. Kelly
Staff Geologist

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PRELIMINARY
GEOTECHNICAL ENGINEERING STUDY
PROPOSED DEVELOPMENT
HANSON PROPERTY
17406 – 19TH AVENUE NORTHEAST
MARYSVILLE, WASHINGTON

ES-6143

INTRODUCTION

General

This preliminary geotechnical engineering study was prepared for the proposed development to be constructed northwest of the intersection between 172nd Street Northeast and 19th Avenue Northeast in Marysville, Washington. Our scope of services for completing this geotechnical engineering study included the following:

- Observing, logging, and sampling test pits for purposes of characterizing site soil and groundwater conditions;
- Laboratory testing of soil samples collected at the test pit locations;
- Engineering analyses and recommendations for the proposed development, and;
- Preparation of this report with primary emphasis on earthwork recommendations for establishing future building sites.

The following documents and resources were reviewed as part of our report preparation:

- Geologic Map of the Arlington West 7.5 Minute Quadrangle, Snohomish County, Washington, compiled by James P. Minard, dated 1985;
- Marysville Municipal Code;
- 2014 Stormwater Management Manual for Western Washington, Volume III, provided by Washington State Department of Ecology;
- Web Soil Survey, online resource maintained by the Natural Resources Conservation Service under the United States Department of Agriculture, and;
- Marysville Geologic Hazards Map (May 2014).

Project Description

Based on the information provided to ESNW, over six feet of structural fill will be placed across the subject site in preparation for a future development. Site improvements will also include construction of access roads, utility installations, and stormwater drainage facilities.

At the time this report was prepared, specific building types and load values were not available; however, we anticipate the proposed structures will consist of relatively lightly loaded wood framing supported on conventional foundations. Based on our experience with similar developments, we estimate wall loads on the order of 2 to 4 kips per linear foot, column loads of 40 to 60 kips, and slab-on-grade loading of 150 pounds per square foot (psf). ESNW should review building plans when they are available and update the recommendations in this report as necessary.

Although formal plans have not been prepared at this time, we expect stormwater will be managed through a combination of detention and (to the extent practicable) stormwater infiltration. Further geotechnical evaluation and testing (where applicable) will be needed with respect to infiltration system designs.

If the above design assumptions are incorrect or change, ESNW should be contacted to review the recommendations in this report. ESNW should review the final design to verify the geotechnical recommendations provided in this report have been incorporated into the plans.

SITE CONDITIONS

Surface

The subject site is located northwest of the intersection between 172nd Street Northeast and 19th Avenue Northeast in Marysville, Washington, as illustrated on the Vicinity Map (Plate 1). The site consists of one tax parcel (Snohomish County parcel number 31051900401200) comprising approximately 18.87 acres of land area. The subject site is currently developed with a single-family residence and detached garages. The majority of the site consists of agricultural land. The site is relatively level with total elevation change on the order of four feet or less.

Subsurface

A representative of ENSW observed, logged, and sampled 11 test pits, excavated at accessible locations within the proposed development area, on June 15, 2018, using a mini-trackhoe and operator retained by ESNW. The test pits were completed for purposes of assessing soil conditions, classifying site soils, and characterizing near-surface groundwater conditions within the proposed development area. The approximate locations of the test pits are depicted on Plate 2 (Test Pit Location Plan). Please refer to the test pit logs provided in Appendix A for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were evaluated in general accordance with Unified Soil Classification System (USCS) and United States Department of Agriculture (USDA) methods and procedures.

Topsoil and Fill

Topsoil was observed extending to depths of approximately 12 to 18 inches below existing grades. The topsoil thickness is variable and vegetation roots extend below the topsoil zone into the underlying weathered native soil in some areas. The topsoil was characterized by dark brown color and fine organic material. Topsoil is not suitable for use as structural fill nor should it be mixed with material to be used as structural fill. Topsoil or otherwise unsuitable material can be used in landscape areas if desired.

Fill was encountered at test pit location TP-4 extending to a depth of two feet below the existing ground surface (bgs). The fill was characterized as loose silty sand containing inorganic debris. Given the previous use of the subject site as agricultural land, we do not expect significant fill deposits to be present throughout the rest of the site. If fill is encountered during grading activities, ESNW should evaluate suitability for reuse as structural fill and/or support of proposed structures.

Native Soil

Underlying the topsoil, poorly graded sand soils and sandy silt soils (USCS: SP and ML respectively) were encountered, consistent with Marysville sand member and clay member recessional outwash deposits. The native soils were observed to become wet at-depth. Moderate caving was observed beginning at depths of approximately one and one-half feet bgs at test pit locations TP-1, TP-2, TP-10, and TP-11.

Geologic Setting

The referenced geologic map identifies clay member recessional outwash deposits (Qvrc) and Marysville sand member recessional outwash (Qvrm) across the site and surrounding areas. As described on the geologic map resource, the clay member deposits are gray, olive gray, and mottled, massive clay and silt associated with the Marysville sand member. The Marysville sand member is typically well-drained, stratified to massive outwash sand, some fine gravel, and some areas of silt and clay. The referenced WSS resource identifies Custer fine sandy loam, Kitsap silt loam, and Norma taxadjunct loam (Map Unit Symbols: 13, 27, and 40 respectively) across the site and surrounding areas. Custer fine sandy loam was formed in outwash plains, Kitsap silt loam was formed in terraces, and Norma taxadjunct was formed in depressions and outwash plains. Based on our field observations, native soils on site are generally consistent with silt and sand recessional outwash deposits.

Groundwater

The groundwater table was encountered at relatively shallow depths at the test pit locations. Utility or vault excavations that extend into the groundwater table will likely require active dewatering during construction. Groundwater elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater levels and flow rates are higher during the wetter, winter, spring, and early summer months. It should be noted that winter groundwater level monitoring will likely be necessary to establish the seasonal high level if an infiltration system design is proposed.

Geologically Hazardous Areas Assessment

We reviewed the geologically hazardous areas section of the Marysville Municipal Code, Chapter 22E.010, and the referenced map resource depicting geologically hazardous areas within Marysville. Based on the results of our review, no geologically hazardous areas are located within or immediately adjacent to the subject property.

DISCUSSION AND RECOMMENDATIONS

General

Based on identified soil conditions and the anticipated construction type consisting of relatively lightly loaded wood frame buildings, the proposed structures can be supported on conventional spread and continuous foundations bearing on the newly placed structural fill proposed for raising site grades. Existing vegetation should be cleared, surficial organic material should be mowed, and fill areas should be static-rolled with a large drum roller prior to placing fill; a sheep-foot roller should be considered where silt soils are encountered. Additional footing subgrade preparation may be necessary at the time encountered of building construction; ESNW should further evaluate building support recommendations when building plans are available and during construction. It should be noted that the primary purpose of this report is to provide initial site preparation and earthwork recommendations for establishing the future building sites.

This study has been prepared for the exclusive use of Hanson Sisters LLC and their representatives. No warranty, expressed or implied, is made. This study has been prepared in a manner consistent with the level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area.

Site Preparation and Earthwork

Site preparation activities will consist of installing temporary erosion control measures and clearing and stripping the site. We understand grading activities will consist of placement of six feet or more of fill. Earthwork will be completed to establish approximate design elevations for the future development.

Temporary Erosion Control

Temporary construction entrances and drive lanes, consisting of at least six inches of quarry spalls, should be considered in order to minimize off-site soil tracking and to provide a temporary road surface; geotextile fabric may be necessary for additional stability. Temporary slopes and stockpiles should be covered when not in use. Silt fencing should be installed along the margins of the property. Erosion control measures should conform to the Washington State Department of Ecology and City of Marysville standards.

Site Stripping and Grading

Due to the expected placement of six or more feet of structural fill, minimal stripping will be required in proposed fill areas. The following recommendations pertaining to site stripping and grading can be considered for this project:

- Clear existing vegetation;
- In areas where fill placement will be greater than six feet, stripping can consist of mowing groundcover vegetation and removing cuttings;
- Static roll exposed soils with a large drum roller to a firm and unyielding state prior to placement of fill, and;
- All fill should be placed and graded for the support of the proposed development in accordance with the recommendations in this report.

A sheep-foot roller should be considered for use where silt soils are encountered. Additional site preparation might be required once stripping and grading has started. ESNW should be contacted to evaluate the depth of any stripping deemed necessary prior to placement of fill.

In-Situ Soils

The majority of the soils encountered during our subsurface exploration have a moderate to high sensitivity to moisture and were generally in a moist to wet condition at the time of the exploration on June 15, 2018. Soils encountered during site excavations that are excessively over the optimum moisture content will require aeration or treatment prior to placement and compaction. Conversely, soils that are substantially below the optimum moisture content will require moisture conditioning through the addition of water prior to use as structural fill. Areas of upper loose and wet soil will not be compactible if grading is attempted during the wet season. An ESNW representative should determine the suitability of in-situ soils for use as structural fill at the time of construction.

Wet Season Grading

If grading takes place during the wetter, winter or spring months, a contingency in the project budget should be included to allow for export of native soil and/or existing fill and import of structural fill as described below. Alternatively, cement treatment of wet material can be considered if accepted by the local jurisdiction.

Structural Fill

Structural fill is defined as compacted soil placed in foundation, slab-on-grade, and roadway areas as well as fills placed to construct permanent slopes and throughout retaining wall and utility trench backfill areas. Soils placed in structural areas should be placed in loose lifts of 12 inches or less and compacted to a relative compaction of at least 90 percent, based on the laboratory maximum dry density as determined by the Modified Proctor Method (ASTM D1557). It should be noted that the above compaction specification applies to the initial fill placement to establish rough grade elevations. More stringent compaction specifications will likely be required for utility trench backfill zones and finish subgrade areas.

Excavations and Slopes

The Federal Occupation Safety and Health Administration (OSHA) and the Washington Industrial Safety and Health Act (WISHA) provide soil classification in terms of temporary slope inclinations. Soils that exhibit a high compressive strength are allowed steeper temporary slope inclinations than are soils that exhibit lower strength characteristics.

Based on the soil conditions encountered at the test pit locations, site soils are classified as Type C by OSHA. New fill should also be considered Type C soil. Temporary slopes over four feet in height in Type C soils must be sloped no steeper than one-and-one-half horizontal to one vertical (1.5H:1V). Steeper temporary slopes may be feasible and should be evaluated by ESNW during construction. Where encountered, the presence of groundwater will cause caving of temporary slopes. ESNW should observe site excavations to confirm soil types and allowable slope inclinations. If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations.

Permanent slopes should be planted with vegetation to enhance stability and to minimize erosion, and should maintain a gradient of 2H:1V or flatter. An ESNW representative should observe temporary and permanent slopes to confirm the slope inclinations are suitable for the exposed soil conditions. Supplementary recommendations with respect to excavations and slopes may be provided as conditions warrant.

Preliminary Foundation Recommendations

Based on observed soil conditions and the anticipated lightly loaded wood frame structure type, the proposed structures can be supported on conventional spread and continuous footings bearing on the newly placed structural fill proposed for raising site grades. Additional footing subgrade preparation may be necessary at the time of building construction; ESNW should further evaluate building support and design recommendations when building plans are available and during construction.

Provided the structures will be supported as described above, the following parameters can be used for design of the new foundations:

- Allowable soil bearing capacity — 2,500 psf
- Passive earth pressure — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.40

A one-third increase in the allowable soil bearing capacity can be assumed for short-term wind and seismic loading conditions.

With structural loading as expected, total settlement in the range of one inch is anticipated, with differential settlement of about one-half inch. The majority of the settlements should occur during construction, as dead loads are applied.

Seismic Design Considerations

The 2015 International Building Code recognizes the American Society of Civil Engineers (ASCE) for seismic site class definitions. Based on the soil conditions observed at the test pit locations, in accordance with Table 20.3-1 of the ASCE Minimum Design Loads for Buildings and Other Structures manual, Site Class D should be used for design.

The referenced liquefaction susceptibility map indicates the site and surrounding areas maintain low to moderate liquefaction susceptibility. Liquefaction is a phenomenon where saturated and loose soils suddenly lose internal strength and behave as a fluid. This behavior is in response to increased pore water pressures resulting from an earthquake or other intense ground shaking. In our opinion, site susceptibility to liquefaction may be considered low to moderate. The proposed structural fill pad will improve building support with respect to potential liquefaction impacts.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed structures should be supported on a firm and unyielding subgrade. Unstable or yielding areas of the subgrade should be recompacted, or overexcavated and replaced with suitable structural fill, prior to construction of the slab.

A capillary break consisting of a minimum of four inches of free-draining crushed rock or gravel should be placed below the slab. The free-draining material should have a fines content of 5 percent or less (percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction). In areas where slab moisture is undesirable, installation of a vapor barrier below the slab should be considered. If a vapor barrier is to be utilized, it should be a material specifically designed for use as a vapor barrier and should be installed in accordance with the specifications of the manufacturer.

Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters can be used for retaining wall design:

- Active earth pressure (unrestrained condition) 35 pcf
- At-rest earth pressure (restrained condition) 55 pcf
- Traffic surcharge (passenger vehicles) 70 psf (rectangular distribution)
- Passive earth pressure 300 pcf
- Coefficient of friction 0.40
- Seismic surcharge 6H*

**Where H equals the retained height*

Additional surcharge loading from adjacent foundations, sloped backfill, retaining walls, or other loads should be included in the retaining wall design. Drainage should be provided behind retaining walls such that hydrostatic pressures do not develop. If drainage is not provided, hydrostatic pressures should be included in the wall design.

Retaining walls should be backfilled with at least 18 inches of free-draining material or suitable sheet drainage that extends along the height of the wall. The upper one foot of the wall backfill can consist of a less permeable soil, if desired. A perforated drain pipe should be placed along the base of the wall, and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3.

Drainage

Based on our field observations, shallow groundwater is expected to be encountered in excavationd that extend below existing site grades. If utility or vault excavations extend into the groundwater table, active dewatering during construction will likely be necessary. Groundwater (in general) should also be expected within shallower site excavations depending on the time of year grading operations take place. Temporary measures to control surface water runoff and groundwater seepage during construction would likely involve interceptor trenches and sumps and dewatering (where applicable).

Finish grades must be designed to direct surface drain water away from structures and slopes. Water must not be allowed to pond adjacent to structures or slopes, and should not be allowed to flow uncontrolled offsite. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4.

Preliminary Infiltration Evaluation

As indicated in the *Subsurface* section of this study, native soils encountered during our fieldwork were characterized primarily as silt and sand outwash deposits. The following preliminary recommendations pertaining to infiltration feasibility can be considered for this project:

- The results of USDA textural analyses performed on representative soil samples indicate native sand soils consist of slightly gravelly coarse sand and slightly gravelly sand with fines contents ranging from 8.4 to 10.2 percent and native silt soils consist of loam with fines contents ranging from 99.2 to 99.3 percent. Should infiltration be pursued, it should be targeted in areas where sand soils are present.

- Should infiltration be pursued, adequate separation between the seasonal high groundwater table and the infiltration system must be established to allow for infiltration feasibility. A winter monitoring program to establish the seasonal high groundwater level would be required.

Where infiltration facilities are incorporated into final designs, ESNW should provide design recommendations and related infiltration rates based on in-situ testing. The preliminary recommendations provided in this section should be confirmed during the appropriate phase of design and/or construction.

Utility Support and Trench Backfill

We understand that utility excavations will most likely occur within newly placed fill; however, where utility excavations extend into the groundwater table, remedial measures for proper support of the utilities may be needed. As previously stated, active dewatering of trench excavations would also likely be necessary for installations that extend below the groundwater table.

The native soils observed at the test pit locations may be suitable for use as structural backfill in the utility trench excavations provided the soil is at or near the optimum moisture content at the time of placement and compaction. Moisture conditioning of the soils may be necessary at some locations prior to use as structural fill. Utility trench backfill should be placed and compacted to the specifications of structural fill provided in this report, or to the applicable requirements of presiding jurisdiction.

Preliminary Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To ensure adequate pavement performance, the subgrade should be in a firm and unyielding condition when subjected to proofrolling with a loaded dump truck. Structural fill in pavement areas should be compacted to the specifications detailed in the *Site Preparation and Earthwork* section of this report. It is possible that soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas of unsuitable or yielding subgrade conditions may require remedial measures such as overexcavation and replacement with structural fill or thicker crushed rock sections prior to pavement. Cement treatment of the subgrade soil can also be considered for stabilizing pavement subgrade areas.

For relatively lightly loaded pavements subjected to automobiles and occasional truck traffic, the following sections can be considered for preliminary design:

- Two inches of hot mix asphalt (HMA) placed over four inches of crushed rock base (CRB), or;
- Two inches of HMA placed over three inches of asphalt treated base (ATB).

Heavier traffic areas generally require thicker pavement sections depending on site usage, pavement life expectancy, and site traffic. For preliminary design purposes, the following pavement sections for occasional truck traffic areas can be considered:

- Three inches of HMA placed over six inches of CRB, or;
- Three inches of HMA placed over four-and-one-half inches of ATB.

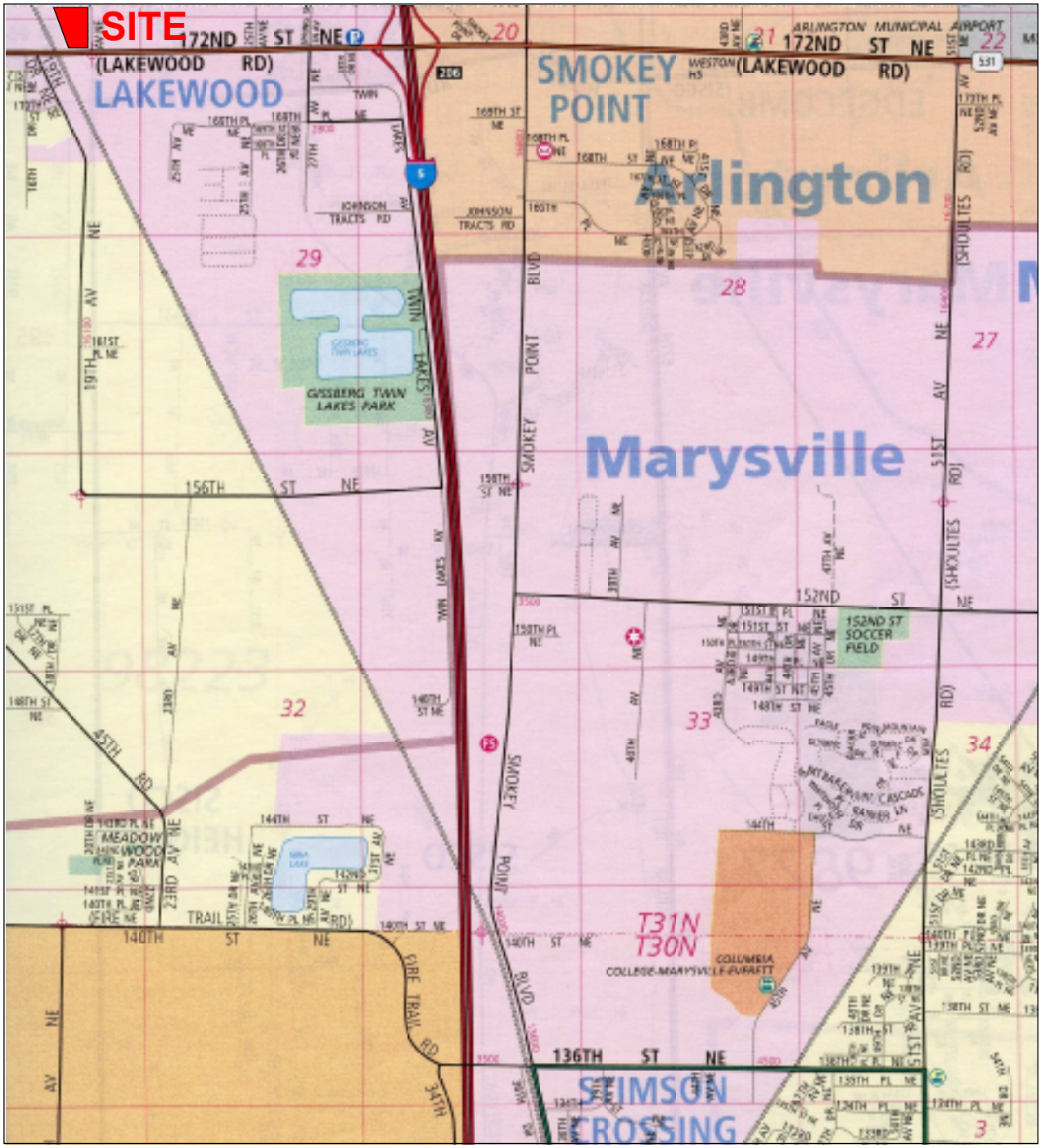
The HMA, CRB and ATB materials should conform to WSDOT specifications. Marysville minimum pavement requirements supercede our recommendations and may require thicker pavement sections.

LIMITATIONS

The recommendations and conclusions provided in this preliminary geotechnical engineering study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is not expressed or implied. Variations in the soil and groundwater conditions observed at the test pit locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions in this geotechnical engineering study if variations are encountered.

Additional Services

ESNW should have an opportunity to review the final design with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction.



Reference:
Snohomish County, Washington
Map 336
By The Thomas Guide
Rand McNally
32nd Edition

NORTH

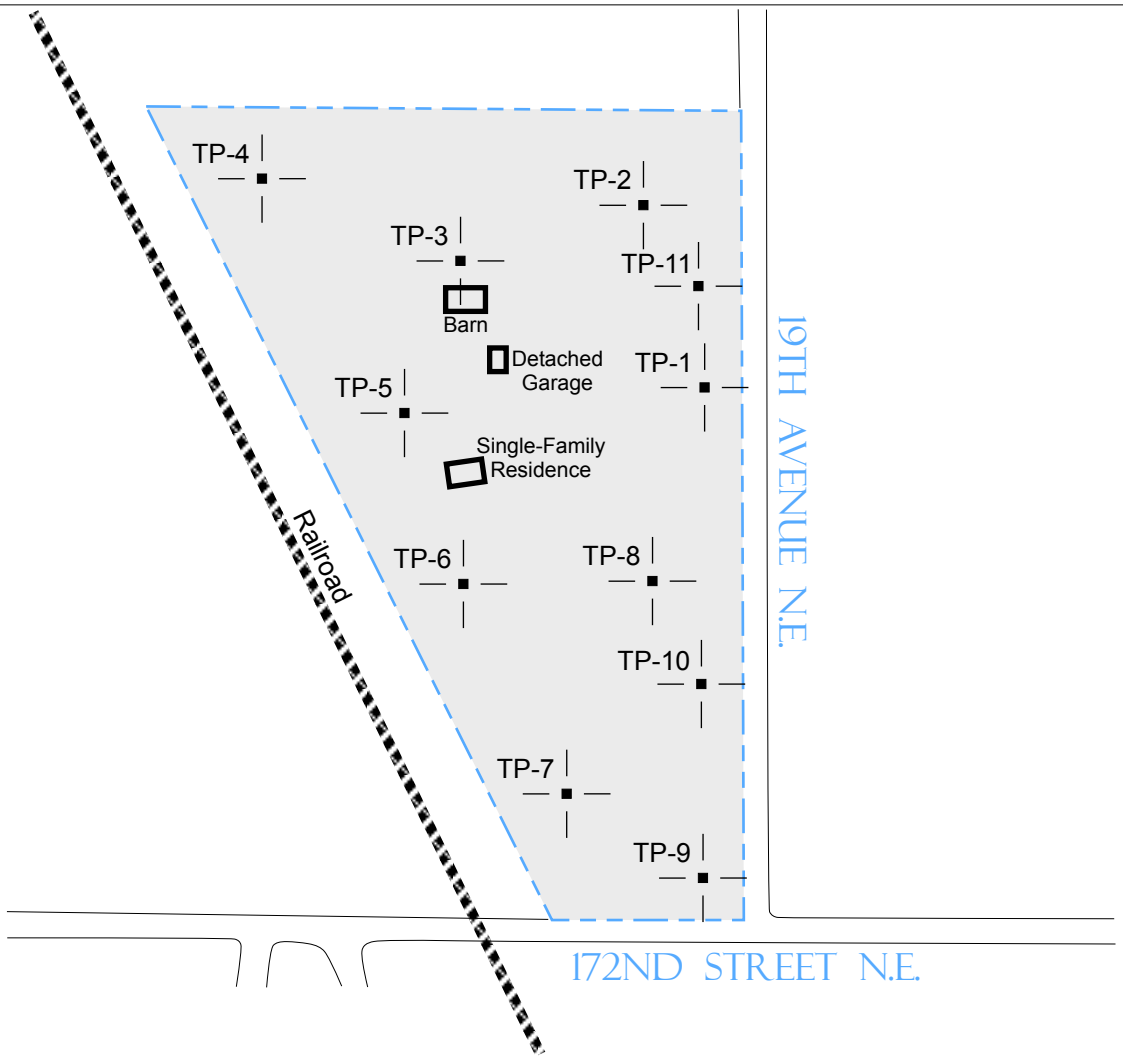
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
Hanson Property
Marysville, Washington

Drwn. CAM	Date 07/12/2018	Proj. No. 6143
Checked KTK	Date July 2018	Plate 1



LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-6143, June 2018

Subject Site

Existing Building

NORTH

NOT - TO - SCALE

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

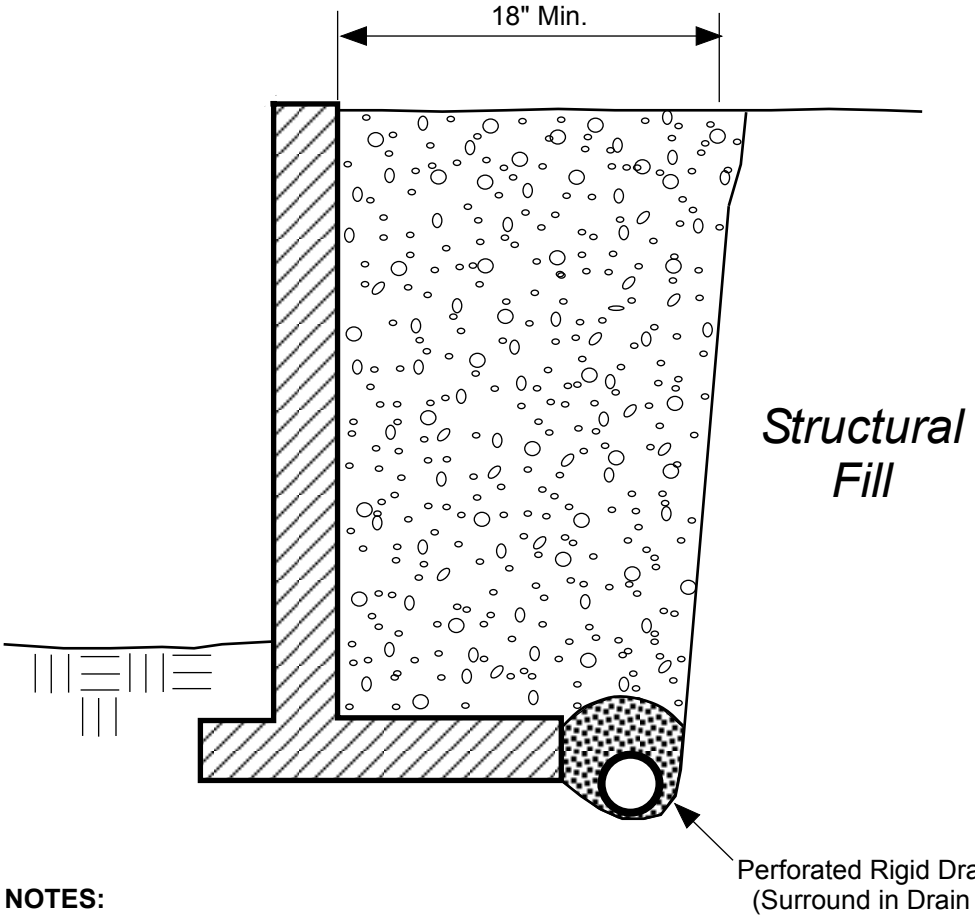
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Test Pit Location Plan
Hanson Property
Marysville, Washington

Drwn. CAM	Date 07/12/2018	Proj. No. 6143
Checked KTK	Date July 2018	Plate 2



NOTES:

- Free-draining Backfill should consist of soil having less than 5 percent fines. Percent passing No. 4 sieve should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free-draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1-inch Drain Rock.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

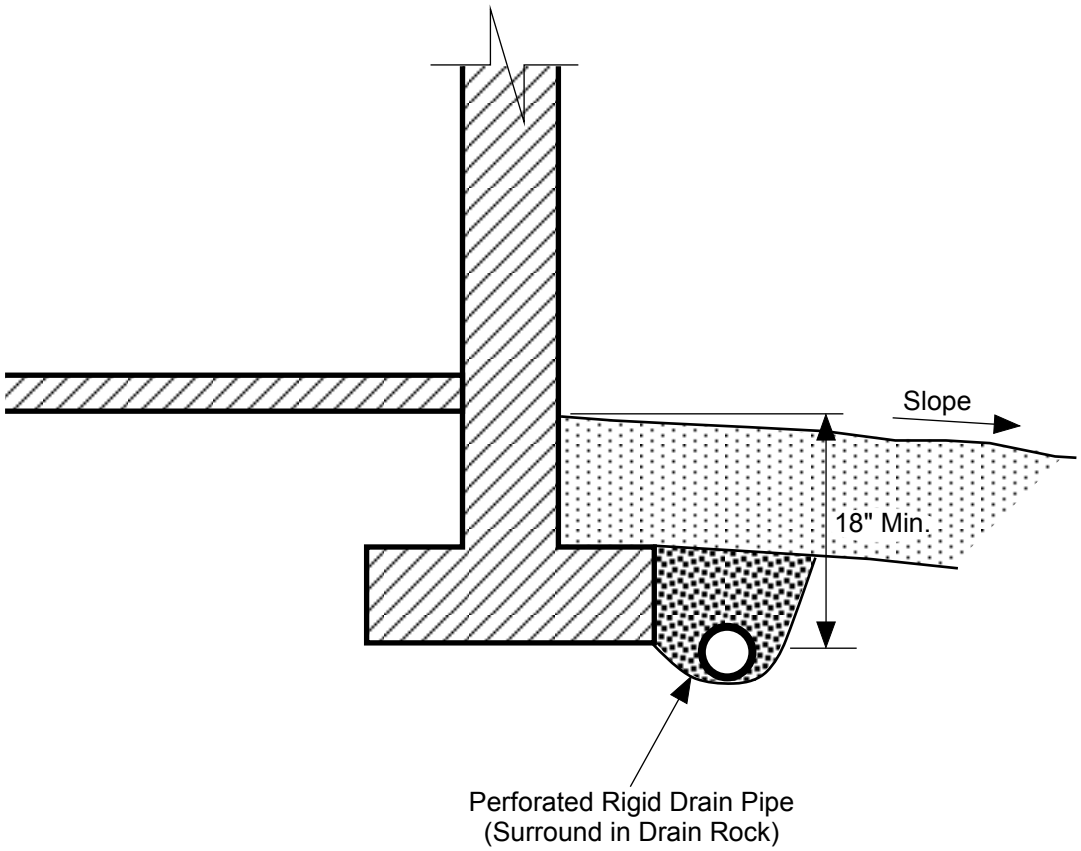
Free-draining Structural Backfill

1-inch Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

RETAINING WALL DRAINAGE DETAIL
Hanson Property
Marysville, Washington

Drwn. CAM	Date 07/12/2018	Proj. No. 6143
Checked KTK	Date July 2018	Plate 3



NOTES:

- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

Surface Seal: native soil or other low-permeability material.

1-inch Drain Rock

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

FOOTING DRAIN DETAIL
Hanson Property
Marysville, Washington

Drwn. CAM	Date 07/12/2018	Proj. No. 6143
Checked KTK	Date July 2018	Plate 4

Appendix A

Subsurface Exploration
Test Pit Logs

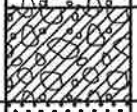
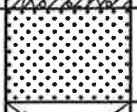
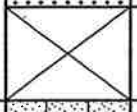
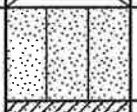
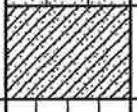
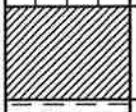
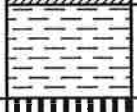
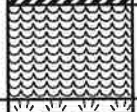
ES-6143

The subsurface conditions at the site were explored by excavating 11 test pits at the approximate locations illustrated on Plate 2 of this report. The test pits were advanced to a maximum depth of 10 feet bgs. The test pit logs are provided in this Appendix. The subsurface exploration was completed on June 15, 2018.

Logs of the test pits excavated by ESNW are presented in Appendix A. The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

Earth Solutions NW LLC

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-1

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ ▽ **AT TIME OF EXCAVATION** 4.0 ft

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL
					1.0
		MC = 26.70%	SP		Tan poorly graded SAND, loose to medium dense, wet -heavy iron oxide staining to 2.5' -becomes gray -caving from 3' to BOH
		MC = 20.50%			▽ -groundwater table at 4'
5		MC = 23.80%			5.5
					Test pit terminated at 5.5 feet below existing grade. Groundwater table encountered at 4.0 feet during excavation. Caving observed from 3.0 feet to BOH. Bottom of test pit at 5.5 feet.

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TEST PIT NUMBER TP-2

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL
				1.0	
		MC = 26.40%	SP		Tan poorly graded SAND, loose to medium dense, wet -moderate iron oxide staining to 4' -caving from 1.5' to 4'
		MC = 47.10% Fines = 99.20%		4.0	-groundwater seepage at 4'
5			ML		Gray sandy SILT, medium dense, wet [USDA Classification: LOAM]
		MC = 44.40%		8.0	Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 4.0 feet during excavation. Caving observed from 1.5 to 4.0 feet. Bottom of test pit at 8.0 feet.

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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-3

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL
				1.0	
			SP		Tan poorly graded SAND, loose to medium dense, moist to wet
					-light iron oxide staining to BOH
		MC = 18.10%			
				3.0	
			ML		Gray sandy SILT, medium dense, moist to wet
		MC = 27.30%			
5					
10				10.0	
		MC = 34.50%			Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-4

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL (Fill)
				1.0	
			SM		Brown silty SAND, loose, moist (Fill)
					-inorganic debris
				2.0	
		MC = 21.30%	SP		Tan poorly graded SAND, medium dense, wet
				3.5	
		MC = 24.00%	ML		Gray sandy SILT, medium dense, moist to wet
5					
		MC = 35.90%			
				9.0	
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 9.0 feet.

Earth Solutions NW
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Fax: 425-449-4711

TEST PIT NUMBER TP-5

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL
					1.0
					Gray sandy SILT, medium dense, moist to wet
		MC = 28.00%			-light iron oxide staining to BOH
5			ML		
		MC = 32.40%			
		MC = 28.30%			9.0
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 9.0 feet.

Earth Solutions NW
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Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-6

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL
					1.0
		MC = 24.70% LL = 35 PL = 29 Fines = 99.30% PI = 6			Gray sandy SILT, medium dense, moist to wet -light iron oxide staining to BOH
5		MC = 31.10%	ML		
		MC = 38.60%			
					9.0
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 9.0 feet.

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Bellevue, Washington 98005
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Fax: 425-449-4711

TEST PIT NUMBER TP-7

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL
					1.0
		MC = 27.70%	ML		Gray sandy SILT, medium dense, moist to wet -light iron oxide staining to BOH
5		MC = 27.10%			
		MC = 35.60%			9.0
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 9.0 feet.

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Fax: 425-449-4711

TEST PIT NUMBER TP-8

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL
					1.0
		MC = 16.30%	SP		Tan poorly graded SAND, loose to medium dense, moist to wet -light iron oxide staining to 4.5'
					3.0
5			ML		Gray sandy SILT, medium dense, moist to wet
		MC = 36.60%			-light groundwater seepage at 6'
		MC = 41.40%			9.0
					Test pit terminated at 9.0 feet below existing grade. Groundwater seepage encountered at 6.0 feet during excavation. No caving observed. Bottom of test pit at 9.0 feet.

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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-9

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 18": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL
				1.5	
		MC = 22.10%	SP		Tan poorly graded SAND, loose to medium dense, wet -light iron oxide staining to 4'
				4.0	
5			ML		Gray sandy SILT, medium dense, wet
		MC = 29.50%		5.5	
		MC = 31.00%			Test pit terminated at 5.5 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 5.5 feet.

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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-10

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL
				1.0	
		MC = 13.90% Fines = 8.40%	SP		Tan poorly graded SAND, loose to medium dense, moist -light iron oxide staining to 5' [USDA Classification: slightly gravelly coarse SAND]
		MC = 20.30%			-becomes wet -caving from 3' to 5' -becomes gray -groundwater seepage at 4'
5				5.0	
			ML		Gray sandy SILT, medium dense, wet
		MC = 35.10%		6.5	
					Test pit terminated at 6.5 feet below existing grade. Groundwater seepage encountered at 4.0 feet during excavation. Caving observed from 3.0 to 5.0 feet. Bottom of test pit at 6.5 feet.

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Fax: 425-449-4711

TEST PIT NUMBER TP-11

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property

DATE STARTED 6/15/18 **COMPLETED** 6/15/18 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ ▽ **AT TIME OF EXCAVATION** 4.0 ft

LOGGED BY KTK **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": exposed soil **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL
				1.0	
			SP		Tan poorly graded SAND, loose to medium dense, wet
					-heavy iron oxide staining to 3'
		MC = 33.40%			
					-becomes gray
		MC = 23.70% Fines = 10.20%			▽ -caving from 3.5' to BOH
					-groundwater table at 4'
5					[USDA Classification: slightly gravelly SAND]
		MC = 26.20%		6.0	
					Test pit terminated at 6.0 feet below existing grade. Groundwater table encountered at 4.0 feet during excavation. Caving observed from 3.5 feet to BOH.
					Bottom of test pit at 6.0 feet.

Appendix B

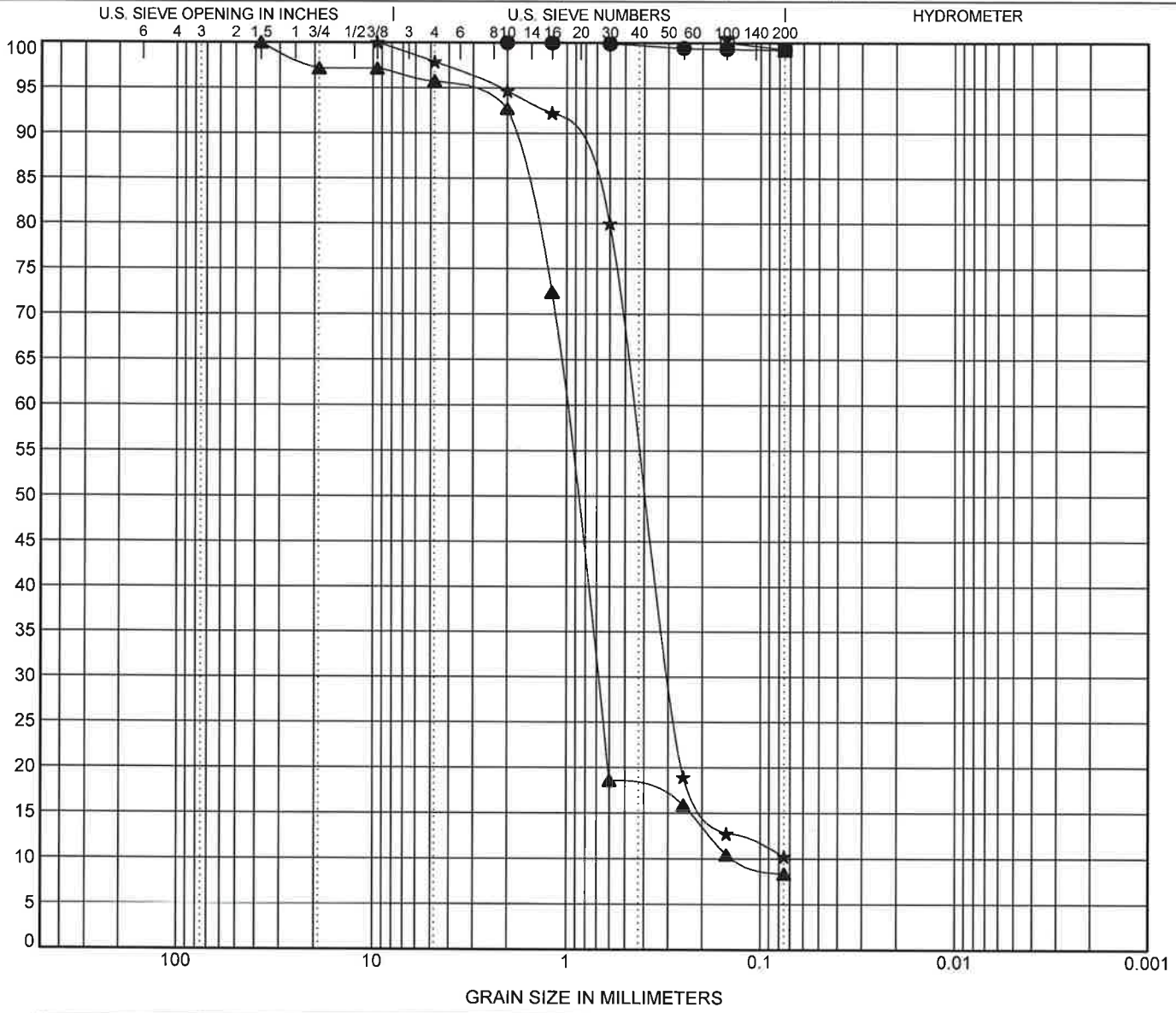
Laboratory Test Results

ES-6143

Earth Solutions NW, LLC
1805 - 136th PL N.E., Suite 201
Bellevue, WA 98005
Telephone: 425-449-4704
Fax: 425-449-4711

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
● TP-02	4.00ft.	USDA: Gray Loam. USCS: ML.		
⊠ TP-06	2.00ft.	Gray SILT, ML		
▲ TP-10	2.00ft.	USDA: Tan Slightly Gravelly Coarse Sand. USCS: SP-SM.	3.67	7.80
★ TP-11	4.00ft.	USDA: Gray Slightly Gravelly Sand. USCS: SW-SM.	2.70	6.39

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● TP-02	4.0ft.	2							99.2	
⊠ TP-06	2.0ft.	0.15				35	29	6	99.3	
▲ TP-10	2.0ft.	37.5	1.01	0.693	0.129				8.4	
★ TP-11	4.0ft.	9.5	0.451	0.293					10.2	

GRAIN SIZE USDA ES-6143 LARSON-HANSEN PROPERTY.GPJ GINT US LAB.GDT 7/13/18

Earth Solutions NW, LLC
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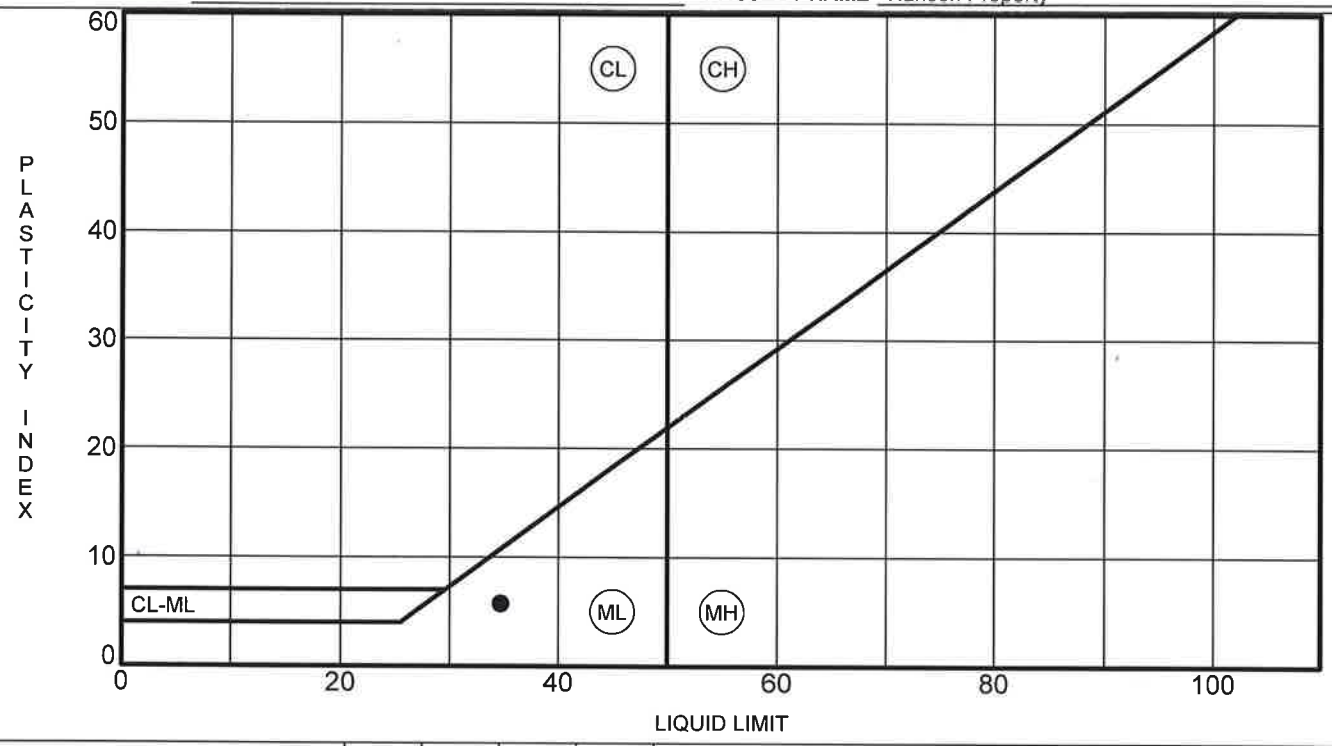
Bellevue, WA 98005
Telephone: 425-449-4704
Fax: 425-449-4711

ATTERBERG LIMITS' RESULTS

PROJECT NUMBER ES-6143 **PROJECT NAME** Hanson Property



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**TP-06**	**2.0**	**35**	**29**	**6**	**99.3**	**Gray SILT, ML**

Report Distribution

ES-6143

EMAIL ONLY

Hanson Sisters, LLC
16720 Smokey Point Boulevard, Suite 3
Arlington, Washington 98223

Attention: Mr. Joel Hylback

EMAIL ONLY

Land Technologies, Inc.
18820 – 3rd Avenue Northeast
Arlington, Washington 98223

Attention: Mr. Merle Ash