Earth Solutions NW LLC

Geotechnical Engineering
Construction Observation/Testing
Environmental Services

GEOTECHNICAL ENGINEERING STUDY
202 ROOSEVELT AVENUE EAST
ENUMCLAW, WASHINGTON

ES-9764

15365 NE 90th Street, Suite 100 • Redmond, WA 98052 • (425) 449-4704
3130 Varney Lane, Suite 105 • Pasco, WA 99301 • (509) 905-0275
esnw.com

PREPARED FOR

STEVEN RICHARDSON

April 22, 2024

Stephen H. Avril
Project Manager

04/22/2024

Kyle R. Campbell, P.E.
Senior Principal Engineer

GEOTECHNICAL ENGINEERING STUDY
202 ROOSEVELT AVENUE EAST
ENUMCLAW, WASHINGTON

ES-9764

Earth Solutions NW, LLC
15365 NE 90th Street, Suite 100 • Redmond, WA 98052 • (425) 449-4704
3130 Varney Lane, Suite 105 • Pasco, WA 99301 • (509) 905-0275
esnw.com

Important Information about This

Geotechnical-Engineering Report

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

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will <u>not</u> likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will <u>not</u> be adequate to develop geotechnical design recommendations for the project.

Do <u>not</u> rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do <u>not</u> rely on an executive summary. Do <u>not</u> read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include 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 <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

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

April 22, 2024
ES-9764

Steven Richardson
P.O. Box 459
Ravensdale, Washington 98051

Attention: Kyle Fry

Greetings:

Earth Solutions NW, LLC (ESNW), is pleased to present this geotechnical engineering study to support the proposed commercial development. Based on the results of our investigation, the proposed project is feasible from a geotechnical standpoint. The site is underlain Holocene and Pleistocene Lahar deposits based on our subsurface exploration (March 29, 2024).

The site will be mass graded in limited fashion to create access drives and building pads. After completing earthwork activities in accordance with recommendations in this report, the proposed structures can be supported on conventional spread and continuous foundations.

New foundations can be supported on medium dense native soil or new structural fill. The subgrade soil conditions should be evaluated by ESNW after completion of each foundation excavation. Overexcavation and/or compaction of the exposed subgrade may be necessary where loose soil is exposed at the foundation subgrade elevations. If the foundation excavations are completed during wet weather conditions, the use of a geotextile fabric and imported crushed rock may be necessary in overexcavations.

If structural building pads are disturbed during wet weather, remediation measures such as cement modification or overexcavation and replacement with rock may be necessary in some areas.

From a geotechnical standpoint, infiltration on the subject site should be considered infeasible due to presence of groundwater seepage between one to five feet which should be considered a confining layer in regards to infiltration feasibility.

Pertinent geotechnical recommendations are provided in this study. We appreciate the opportunity to be of service to you on this project. If you have any questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Stephen H. Avril
Project Manager

Table of Contents

ES-9764

Table of Contents

Cont'd

ES-9764

GEOTECHNICAL ENGINEERING STUDY
202 ROOSEVELT AVENUE EAST
ENUMCLAW, WASHINGTON

ES-9764

INTRODUCTION

General

This geotechnical engineering study (study) was prepared for the proposed commercial development to be constructed to the southeast of 202 Roosevelt Avenue East in Enumclaw, Washington. The purpose of this study was to develop geotechnical recommendations for the project. The following tasks were completed as part of our scope of services for this project:

- Excavation, logging and sampling of test pits to characterize soil and groundwater conditions.
- Laboratory testing of soil samples collected at the test locations.
- Engineering analyses and recommendations for the proposed development.
- Preparation of this report.

Project Description

The proposed project consists of redevelopment of the parcel (2520069116) with construction of a new commercial construction. Significant grading is not anticipated as the site is relatively flat in nature. Infiltration is being investigated to aid in stormwater mitigation of new impervious surfaces; and ESNW has provided a preliminary infiltration opinion based on observations of the geologic conditions on-site.

Based on our experience with similar projects, we anticipate cuts and fills of less than five feet will be necessary to achieve the proposed finish grade elevations. Block retaining walls and rockeries can be utilized to facilitate grade changes where necessary.

Based on our experience with similar projects, the proposed commercial structure is anticipated to be two to three stories in height and constructed utilizing wood framing with a masonry veneer supported on conventional foundations. Perimeter footing loads are anticipated be 1 to 2 kips per linear foot, isolated footing loads will be less than 20 kips, and we anticipate slab-on-grade loading of 150 pounds per square foot (psf).

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

SITE CONDITIONS

Surface

The subject site is located on the south side of State Route 410, east of the intersection with Watson Street North in Enumclaw, Washington. The site is undeveloped and consists of two grass-covered fields separated by an L-shaped driveway directly southeast of 202 Roosevelt Avenue East.

Topography across the subject site is relatively flat in nature. The subject site is bordered by commercial development and another open field on the southeast corner of the property.

Subsurface

An ESNW representative observed, logged, and sampled a series of eight test pits on March 29, 2024. The test pits were excavated at accessible site locations using a mini track-hoe and operator contracted by ESNW. The subsurface exploration was completed to evaluate soil conditions, classify site soils, and characterize groundwater conditions within the proposed development area. The maximum exploration depth was approximately nine feet below the existing ground surface (bgs). The approximate locations of the explorations are depicted on Plate 2 (Test Pit Location Plan). Please refer to the logs provided in Appendix A for a more detailed description of subsurface conditions. Representative soil samples collected at the exploration locations were analyzed in general accordance with both Unified Soil Classification System (USCS) methods and procedures.

Topsoil

Topsoil, where present, was observed at depths of one to two feet bgs. The topsoil was characterized by its dark brown color, the presence of fine organic material, and small root intrusions. Topsoil is not suitable for use as structural fill material. ESNW should be provided the opportunity to observe site stripping operations to determine suitable stripping depths prior to fill and structure placement and construction.

Fill

Fill was not encountered during the site exploration. Based on the existing topography on site throughout the areas of improvements, ESNW anticipates some fill may be encountered during mass grading surrounding road and utility alignments. Where fill is encountered it is not suitable for bearing of structural elements during construction or for use a structural fill material.

Native Soil

Underlying the topsoil, native soils encountered at the test locations were observed primarily as loose grading to medium dense silty sand with gravel (SM). Density was observed to increase at depths of between three to seven feet bgs across the subject site. In general, the native soil was generally encountered in a loose and wet condition during the time of exploration due to the presence of near-surface groundwater seepage.

Geologic Setting

Geologic mapping identifies Holocene and Pleistocene Lahar deposits (Qlh) across the site and the nearby area. Lahar deposits typically consist of a nonsorted mixture of silt, sand deposited during mud-flows resulting from volcanic activity associated with Mount Rainer which is located to the south of the area.

The referenced Web Soil Survey (WSS) identifies Buckley gravelly silt loam (Bu) 0 to 3 percent slopes as the primary unit underlying the subject site. The Buckley series soils consist of mudflow deposits. Based on our field observations, on-site native soils are consistent with the geologic map and soil mapping resources outlined in this section.

Groundwater

Groundwater seepage was observed at the test locations. The seepage was encountered between one to five feet below the surface at the time of exploration (March 2024). Groundwater seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. Groundwater seepage flow rates are typically higher during the winter, spring, and early summer months. Therefore, groundwater seepage must be expected in site excavations, particularly if excavations are made in winter, spring, and early summer months.

GEOLOGIC HAZARD AREAS EVALUATION

A review of the City of Enumclaw (COE) geologic hazard mapping was completed to evaluate whether geologically hazardous areas as defined by the city (including steep slopes, landslides, and liquefaction) exist on or near the subject site. Based on a review of the site conditions and geologic hazards map, the subject site is not mapped within, nor adjacent to, geologic hazard areas.

DISCUSSION AND RECOMMENDATIONS

General

Based on the results of our investigation, construction of the proposed commercial development is feasible from a geotechnical standpoint. The primary geotechnical considerations associated with the proposed development include foundation support and the suitability of using on-site soils as structural fill.

New foundations can be supported on medium dense native soil or new structural fill. The subgrade soil conditions should be evaluated by ESNW after completion of each foundation excavation. Overexcavation and/or compaction of the exposed subgrade may be necessary where loose soil is exposed at the foundation subgrade elevations. If the foundation excavations are completed during wet weather conditions, the use of a geotextile fabric and imported crushed rock may be necessary in overexcavations. Cement modification or aeriation of the site soils prior to compaction may be necessary given the volumes of near-surface groundwater seepage on the site.

If structural building pads are disturbed during wet weather, remediation measures such as cement treatment or overexcavation and replacement with rock may be necessary in some areas.

From a geotechnical standpoint, infiltration on the subject site should be considered infeasible due to the presence near-surface groundwater seepage on the site which represents a confining layer.

<u>Site Preparation and Earthwork</u>

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and site clearing and stripping activities. Subsequent earthwork activities will involve mass site grading and installation of infrastructure and stormwater management improvements.

Temporary Erosion Control

The following temporary erosion and sediment control (TESC) BMPs are offered:

- Temporary construction entrances and drive lanes, consisting of at least six inches of quarry spalls, should be considered to both minimize off-site soil tracking and provide a stable access entrance surface. Placing geotextile fabric underneath the quarry spalls will provide greater stability, if needed.

- Silt fencing should be placed around the construction site perimeter.

- When not in use, soil stockpiles should be covered or otherwise protected.

- Temporary measures for controlling surface water runoff, such as interceptor trenches, sumps, or swales, should be installed prior to beginning earthwork activities.

- Dry soils disturbed during construction should be wetted to minimize dust and airborne soil erosion.

- When appropriate, permanent planting or hydroseeding will help to stabilize on-site soil.

Additional TESC BMPs, as specified by the project civil engineer and indicated on the plans, should be incorporated into construction activities. TESC BMPs may be modified during construction as site conditions require and as approved by the site erosion control lead.

Stripping

Topsoil was encountered within the upper one to two feet at the test locations. The organic-rich topsoil should be stripped and segregated into a stockpile for later use on site or to haul off site. The material remaining immediately below the topsoil may have some root zones and will likely be variable in composition, density, and/or moisture content. The material exposed after initial topsoil stripping will need to be evaluated during construction for load-bearing capacities as it is exposed. ESNW should observe initial stripping activities to provide recommendations regarding stripping depths and material suitability.

Excavations and Slopes

Excavation activities on site are likely to expose loose transitioning to medium dense native soil within the upper six feet of existing grades. Based on the soil conditions observed at the test locations, the following maximum allowable temporary slope inclinations may be used. The applicable Federal Occupation Safety and Health Administration and Washington Industrial Safety and Health Act soil classifications are also provided:

- Areas exposing groundwater seepage or fill 1.5H:1V (Type C)
- Loose soil 1.5H:1V (Type C)
- Medium dense soil 1H:1V (Type B)

Permanent slopes should be planted with vegetation to both enhance stability and minimize erosion and should maintain a gradient of 2H:1V or flatter. The presence of perched groundwater may cause localized sloughing of temporary slopes. An ESNW representative should observe temporary and permanent slopes to confirm the slope inclinations are suitable for the exposed soil conditions and to provide additional excavation and slope recommendations, as necessary.

Care must be taken when considering the placement of a stormwater vault on the site. ESNW recommends the vault excavation not extend into an area where the roadways will be creating a surcharge on the vault excavation walls. Any planned vault should maintain a minimum 1H:1V (Horizontal:Vertical) setback from the road or any adjacent structures on or off-site. If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations.

In-situ and Imported Soil

The on-site soil is moisture sensitive, and successful use of the on-site soil as structural fill will largely be dictated by the moisture content at the time of placement and compaction. Given the groundwater seepage observed in the test pits, remedial measures will likely be necessary as part of site grading and earthwork activities, possibly even during the summer. Remedial measures would include aeration or cement modification of the site soils in order to moisture-condition the targeted soils for use as structural fill. If the on-site soil cannot be successfully compacted in its natural moisture or through moisture conditioning, the use of an imported soil may be necessary. In our opinion, a contingency should be provided in the project budget for the export of soil that cannot be successfully compacted as structural fill, particularly if grading activities take place during periods of rainfall. In general, soils with appreciable fines contents (greater than 5 percent) typically degrade rapidly when exposed to periods of rainfall.

Imported soil intended for use as structural fill should consist of a well-graded, granular soil with a moisture content that is at (or slightly above) the optimum level. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Structural Fill

Structural fill is defined as compacted soil placed in foundation, slab-on-grade, roadway, permanent slope, retaining wall, and utility trench backfill areas. Structural fill placed and compacted during site grading activities should meet the following specifications and guidelines:

- Structural fill material — Granular soil*
- Moisture content — At or slightly above optimum**
- Relative compaction*** — 95 percent (Modified Proctor)
- Loose lift thickness (maximum) — 12 inches

** Existing soil may not be suitable for use as structural fill unless at (or slightly above) the optimum moisture content at the time of placement and compaction.*
*** Soil shall not be placed dry of optimum and should be evaluated by ESNW during construction.*
**** Relative compaction of 90 percent can be considered for mass grading activities and should be evaluated by ESNW during construction.*

With respect to underground utility installations and backfill, local jurisdictions may dictate the soil type(s) and compaction requirements. Areas of otherwise unsuitable material and debris should be removed from structural areas and replaced with structural fill.

Foundations

After completing earthwork activities in accordance with recommendations in this report, new foundations can be supported on medium dense native soil or new structural fill. The subgrade soil conditions should be evaluated by ESNW after completion of each foundation excavation. Overexcavation and/or compaction of the exposed subgrade may be necessary where loose soil is exposed at the foundation subgrade elevations. If the foundation excavations are completed during wet weather conditions, the use of a geotextile fabric and imported crushed rock may be necessary in overexcavations. If proposed structures will incorporate heavier loads than those stated in the *Project Description* section of this report, revised foundation support recommendations may be necessary.

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

- Allowable soil bearing capacity 2,500 psf
- Passive earth pressure 300 pcf
- Coefficient of friction 0.40

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The passive earth pressure and coefficient of friction values include a safety factor of 1.5. With structural loading as expected, total settlement in the range of one inch is anticipated, with differential settlement of about one-half inch. Most of the anticipated settlement should occur during construction as dead loads are applied.

Seismic Design

The 2018 International Building Code (2018 IBC) recognizes the most recent edition of the Minimum Design Loads for Buildings and Other Structures manual (ASCE 7-16) for seismic design, specifically with respect to earthquake loads. Based on the soil conditions encountered at the test pit and boring locations, the parameters and values provided below are recommended for seismic design per the 2018 IBC.

Parameter	Value
Site Class	D*
Mapped short period spectral response acceleration, S_S (g)	1.29
Mapped 1-second period spectral response acceleration, S_1 (g)	0.38
Short period site coefficient, F_a	1.00
Long period site coefficient, F_v	1.92
Adjusted short period spectral response acceleration, S_{MS} (g)	1.48
Adjusted 1-second period spectral response acceleration, S_{M1} (g)	0.82
Design short period spectral response acceleration, S_{DS} (g)	0.99
Design 1-second period spectral response acceleration, S_{D1} (g)	0.55

* *Assumes dense soil conditions, encountered to a maximum depth of nine feet bgs during the field exploration, remain medium dense to dense to at least 100 feet bgs. Based on our experience with the project geologic setting across the Puget Sound region, soil conditions are likely consistent with this assumption.*

Liquefaction

Liquefaction is a phenomenon that can occur within a soil profile as a result of an intense ground shaking or loading condition. Most commonly, liquefaction is caused by ground shaking during an earthquake. Sand or silt soil profiles that are loose, cohesionless, and present below the groundwater table are most susceptible to liquefaction. During the ground shaking, the soil contracts, and porewater pressure increases. The increased porewater pressure occurs quickly and without sufficient time to dissipate, resulting in water flowing upward to the ground surface and a liquefied soil condition. Soil in a liquefied condition possesses very little shear strength in comparison to the drained condition, which can result in a loss of foundation support for structures.

In our opinion, the liquefaction potential for the site should be considered low. The relative density of the silty sand soil underlying the site and lack of a well-established near-surface groundwater table is the primary basis for this opinion.

Slab-on-Grade Floors

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

A capillary break consisting of a minimum of four inches of free-draining crushed rock or gravel should be placed below each 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 per manufacturer specifications.

Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. Retaining wall subgrade must be prepared in the same fashion as is recommended within the "Foundations" section of this report. The following parameters may be used for design:

- Active earth pressure (unrestrained condition) 35 pcf (equivalent fluid)
- At-rest earth pressure (restrained condition) 55 pcf
- Traffic surcharge* (passenger vehicles) 70 psf (rectangular distribution)
- Passive earth pressure 300 pcf (equivalent fluid)
- Coefficient of friction 0.40
- Seismic surcharge 8H psf**
- Allowable soil bearing capacity 2,500 psf

* *Where applicable.*
** *Where H equals the retained height (in feet).*

The above passive earth pressure and coefficient of friction values include a safety factor of 1.5 and are based on a level backfill condition and level grade at the wall toe. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other relevant loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along with the height of the wall and a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of less permeable soil if desired. A sheet drain may be considered instead of free-draining backfill. A perforated drainpipe 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. If drainage is not provided, hydrostatic pressures should be included in the wall design.

Drainage

Based on our field observations, groundwater seepage should be anticipated within site excavations, particularly utility and stormwater detention excavations. Temporary measures to control surface water runoff and groundwater seepage during construction will be critical to minimizing the potential for on-site soils to degrade. ESNW should be consulted during preliminary grading to identify areas of seepage and provide recommendations to reduce the potential for seepage-related instability.

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. Grades adjacent to buildings should be sloped away from the buildings at a gradient of either at least 2 percent for a horizontal distance of 10 feet or the maximum allowed by adjacent structures. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4. If footing drains are omitted, there is a higher potential for moisture issues for slabs-on-grade or crawl space areas.

Preliminary Infiltration Evaluation

As indicated in the *Subsurface* section of this report, the native soil encountered during our fieldwork was primarily characterized as mudflow deposits consisting of silty sand with gravel. Per our scope of services, infiltration testing was not included in the fieldwork, and ESNW has provided an infiltration opinion based on the observation of the subsurface conditions and experience on sites underlain by similar geology.

From a geotechnical standpoint, infiltration on the subject site should be considered infeasible due to the subsurface characteristics of the site particularly the near-surface groundwater seepage which represents a confining layer of soil in terms of infiltration potential.

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 previously detailed in this report. Soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas containing unsuitable or yielding subgrade conditions will require remedial measures, such as overexcavation and/or placement of thicker crushed rock or structural fill sections, prior to pavement.

We anticipate new pavement sections will be subjected primarily to passenger vehicle traffic. For lightly loaded pavement areas subjected primarily to passenger vehicles, the following preliminary pavement sections may be considered:

- A minimum of two inches of hot-mix asphalt (HMA) placed over four inches of crushed rock base (CRB).

- A minimum of two inches of HMA placed over three inches of asphalt-treated base (ATB).

The HMA, ATB, and CRB materials should conform to WSDOT and/or the City of Enumclaw specifications. All soil base material should be compacted to a relative compaction of 95 percent, based on the laboratory maximum dry density as determined by ASTM D1557. Final pavement design recommendations, including recommendations for heavy traffic areas, access roads, and frontage improvement areas, can be provided once final traffic loading has been determined. Road standards utilized by the City of Enumclaw may supersede the recommendations provided in this report.

If an inverted crown will be used for roadway surfaces, drainage measures should be included in the design to prevent accumulation of water in the subgrade adjacent to catch basins. Such measures can consist of finger drains extending from the catch basins.

Utility Support and Trench Backfill

In our opinion, the on-site soil will generally be suitable for support of utilities, however, some areas of existing fill may be unsuitable in the current condition. Remedial measures may be necessary in some areas to provide support for utilities, such as overexcavation and replacement with structural fill or placement of geotextile fabric. Groundwater seepage may be encountered within utility excavations, and caving of trench walls may occur where groundwater or unsuitable fill are encountered. Depending on the time of year and conditions encountered, dewatering or temporary trench shoring may be necessary during utility excavation and installation.

The on-site soil may not be suitable for use as structural backfill throughout utility trench excavations unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction. Moisture conditioning of the soil may be necessary at some locations prior to use as structural fill. Each section of the utility lines must be adequately supported in the bedding material. Utility trench backfill should be placed and compacted to the structural fill specifications previously detailed in this report or to the applicable specifications of the presiding jurisdiction.

LIMITATIONS

This study has been prepared for the exclusive use of Steven Richardson, and representatives. The recommendations and conclusions provided in this 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. No warranty, express or implied, is made. Variations in the subsurface conditions observed at the test locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions provided in this 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.

REFERENCES

The following documents were reviewed as part of the preparation of this study:

- City of Enumclaw critical area maps, provided on-line by the City of Enumclaw document center
- Geologic map of the Snoqualmie Pass 30x60 minute quadrangle, Washington, prepared by U.S. Geological Survey
- WSS, provided by the USDA, Natural Resources Conservation Service

Reference:
King County, Washington
OpenStreetMap.org

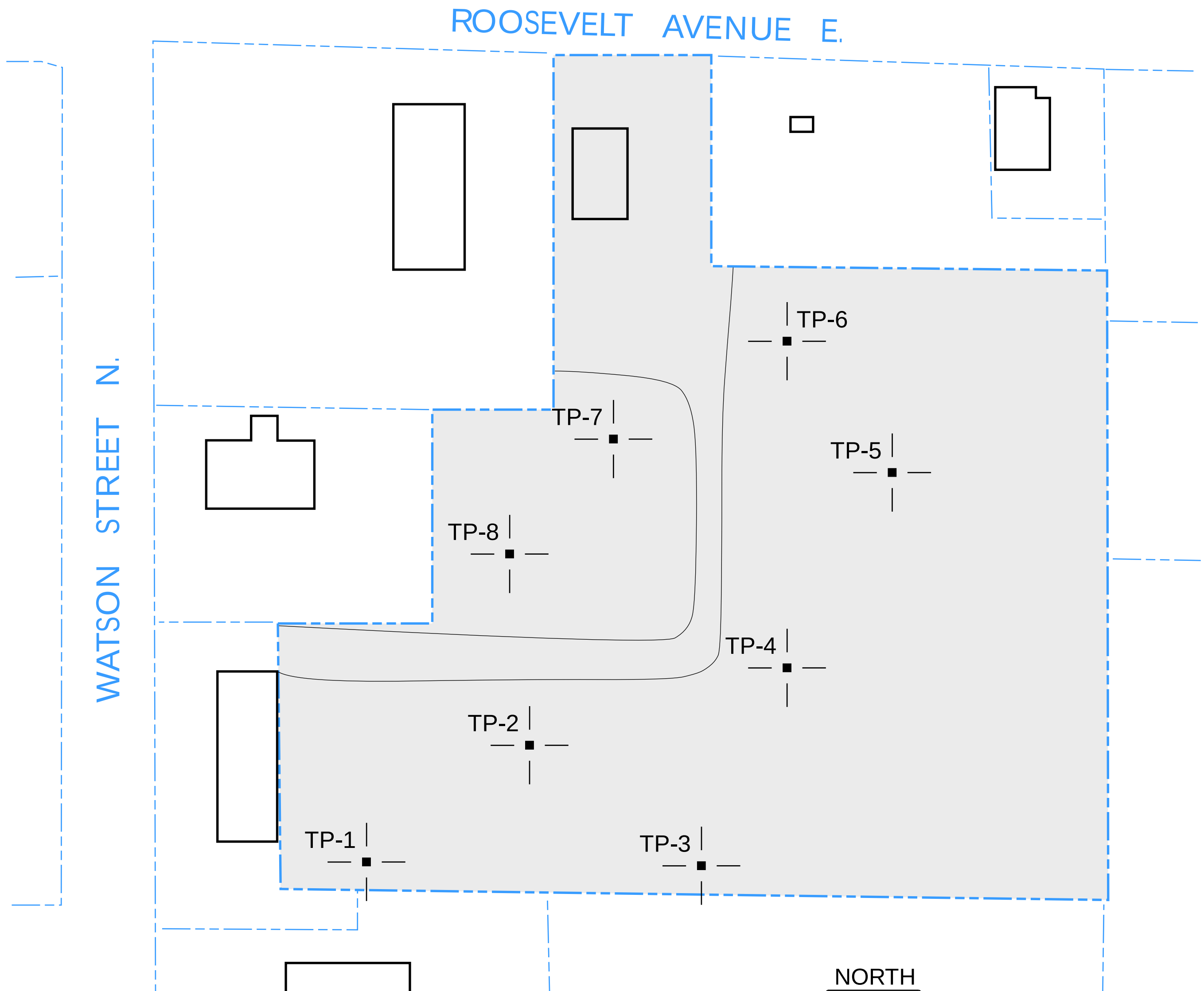
NORTH

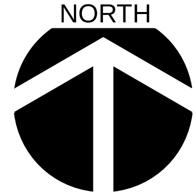
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

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

Vicinity Map
Kaykol Electric Building
Enumclaw, Washington

Drawn CAM	Date 04/19/2024	Proj. No. 9764
Checked SES	Date April 2024	Plate 1





LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-9764, March 2024

Subject Site

Existing Building

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.

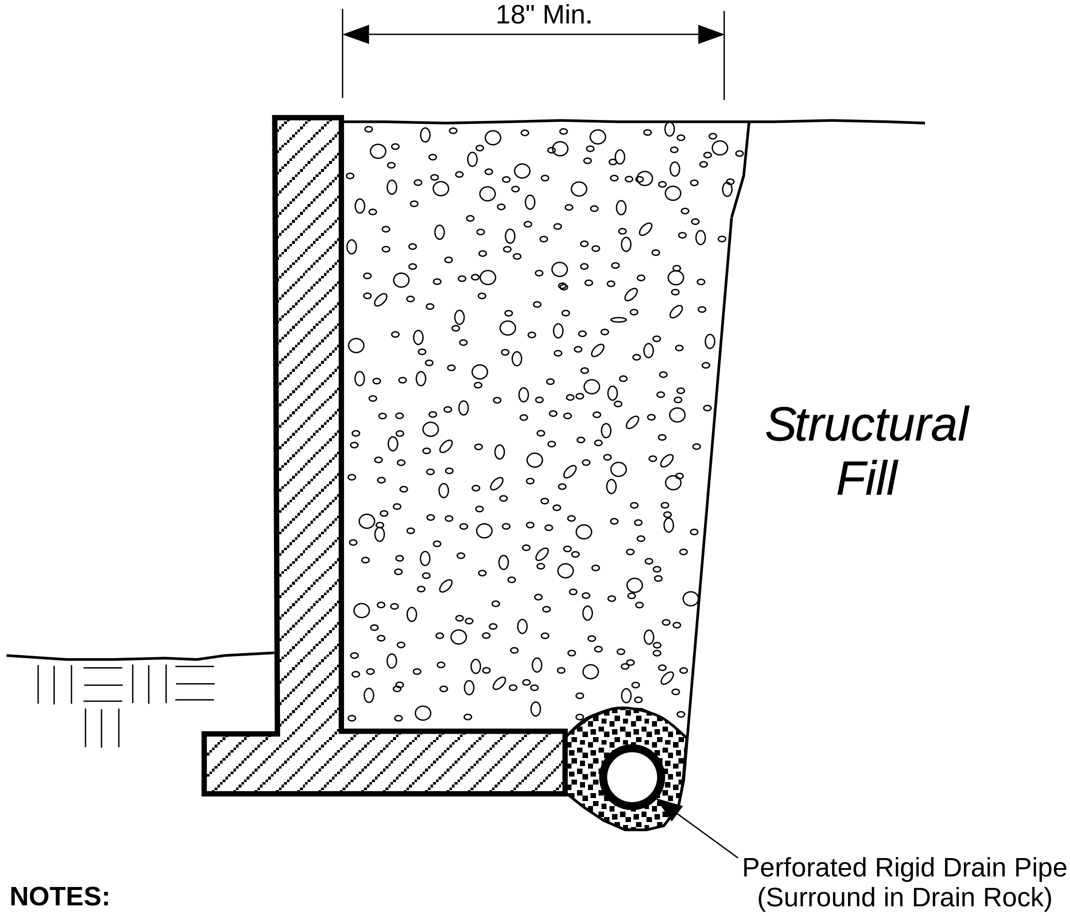
Earth Solutions NW LLC

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Test Pit Location Plan
Kaykol Electric Building
Enumclaw, Washington

Drawn CAM	Date 04/19/2024	Proj. No. 9764
Checked SES	Date April 2024	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:

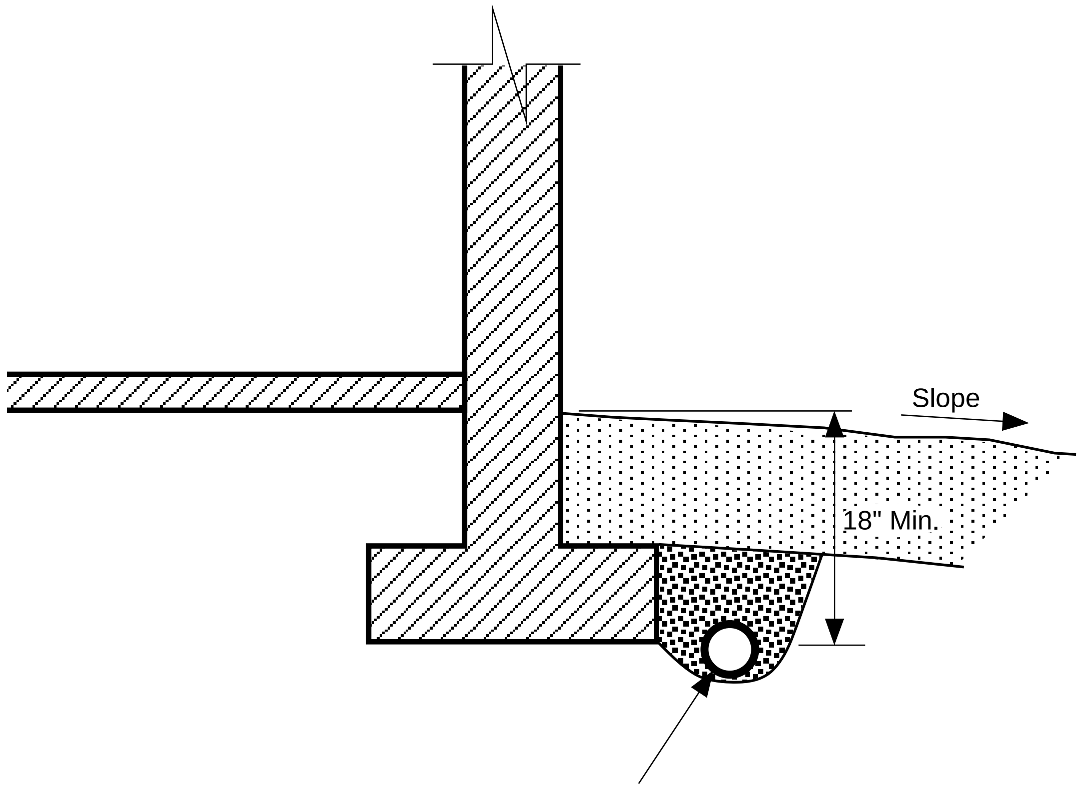
Free-draining Structural Backfill

1-inch Drain Rock

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

Retaining Wall Drainage Detail
Kaykol Electric Building
Enumclaw, Washington

Drawn CAM	Date 04/19/2024	Proj. No. 9764
Checked SES	Date April 2024	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:

(fine dot pattern)	Surface Seal: native soil or other low-permeability material.
(dense rock pattern)	1-inch Drain Rock

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

Footing Drain Detail
Kaykol Electric Building
Enumclaw, Washington

Drawn CAM	Date 04/19/2024	Proj. No. 9764
Checked SES	Date April 2024	Plate 4

Appendix A

Subsurface Exploration Logs

ES-9764

Subsurface conditions at the subject site were explored on March 29, 2024. A total of eight test pits were excavated using an excavator and operator contracted by ESNW. The approximate locations of the explorations are illustrated on Plate 2 of this study. The test logs are provided in this Appendix. The maximum exploration depth was approximately nine feet bgs.

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.

Coarse-Grained Soils - More Than 50% Retained on No. 200 Sieve	Gravels - More Than 50% of Coarse Fraction Retained on No. 4 Sieve	< 5% Fines	GW	Well-graded gravel with or without sand, little to no fines
			GP	Poorly graded gravel with or without sand, little to no fines
		> 12% Fines	GM	Silty gravel with or without sand
			GC	Clayey gravel with or without sand
	Sands - 50% or More of Coarse Fraction Passes No. 4 Sieve	< 5% Fines	SW	Well-graded sand with or without gravel, little to no fines
			SP	Poorly graded sand with or without gravel, little to no fines
		> 12% Fines	SM	Silty sand with or without gravel
			SC	Clayey sand with or without gravel
Fine-Grained Soils - 50% or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less Than 50		ML	Silt with or without sand or gravel; sandy or gravelly silt
			CL	Clay of low to medium plasticity; lean clay with or without sand or gravel; sandy or gravelly lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt with or without sand or gravel; sandy or gravelly elastic silt
			CH	Clay of high plasticity; fat clay with or without sand or gravel; sandy or gravelly fat clay
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck, and other highly organic soils
Fill			FILL	Made Ground

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch

Damp - Perceptible moisture, likely below optimum MC

Moist - Damp but no visible water, likely at/near optimum MC

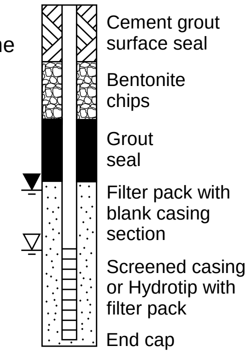
Wet - Water visible but not free draining, likely above optimum MC

Saturated/Water Bearing - Visible free water, typically below groundwater table

Symbols

ATD = At time of drilling

Static water level (date)



Terms Describing Relative Density and Consistency

Coarse-Grained Soils:

Density	SPT blows/foot
Very Loose	< 4
Loose	4 to 9
Medium Dense	10 to 29
Dense	30 to 49
Very Dense	≥ 50

Fine-Grained Soils:

Consistency	SPT blows/foot
Very Soft	< 2
Soft	2 to 3
Medium Stiff	4 to 7
Stiff	8 to 14
Very Stiff	15 to 29
Hard	≥ 30

Test Symbols & Units

Fines = Fines Content (%)

MC = Moisture Content (%)

DD = Dry Density (pcf)

Str = Shear Strength (tsf)

PID = Photoionization Detector (ppm)

OC = Organic Content (%)

CEC = Cation Exchange Capacity (meq/100 g)

LL = Liquid Limit (%)

PL = Plastic Limit (%)

PI = Plasticity Index (%)

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

Modifier Definitions

Percentage by Weight (Approx.)	Modifier
< 5	Trace (sand, silt, clay, gravel)
5 to 14	Slightly (sandy, silty, clayey, gravelly)
15 to 29	Sandy, silty, clayey, gravelly
≥ 30	Very (sandy, silty, clayey, gravelly)

Classifications of soils in this geotechnical report and as shown on the exploration logs are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates, and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D2487 and D2488 were used as an identification guide for the Unified Soil Classification System.

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

EXPLORATION LOG KEY

Earth Solutions NW LLC

15365 NE 90th Street, Suite 100
Redmond, WA 98052
Office (425) 449-4704 | esnw.com
Branch Office: Pasco, WA

TEST PIT NUMBER TP-1

PROJECT NUMBER ES-9764
PROJECT NAME Kaykol Electric Building
DATE STARTED 3/29/24 **COMPLETED** 3/29/24
GROUND ELEVATION
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.19788 **LONGITUDE** -121.97829
LOGGED BY SES **CHECKED BY** SHA
GROUND WATER LEVEL:
NOTES
∇ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Grass
AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		TOPSOIL
2.0					-minor groundwater seepage at 2'
2.0			SM		Gray silty SAND with gravel, medium dense, wet
2.5					
	GB	MC = 17.5 Fines = 28.9			[USDA Classification: gravelly sandy LOAM]
5.0					
	GB	MC = 15.2			
7.5					
8.0	GB	MC = 13.3 Fines = 22.6			[USDA Classification: gravelly sandy LOAM]

Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 2.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW LLC
15365 NE 90th Street, Suite 100
Redmond, WA 98052
Office (425) 449-4704 | esnw.com
Branch Office: Pasco, WA

TEST PIT NUMBER TP-2

PROJECT NUMBER ES-9764
PROJECT NAME Kaykol Electric Building
DATE STARTED 3/29/24 **COMPLETED** 3/29/24
GROUND ELEVATION
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.19806 **LONGITUDE** -121.97792
LOGGED BY SES **CHECKED BY** SHA
GROUND WATER LEVEL:
NOTES
AT TIME OF EXCAVATION
SURFACE CONDITIONS Grass
AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		TOPSOIL
1.5			SM		Gray silty SAND with gravel, loose to medium dense, wet
2.5					
					-light caving to BOH
	GB	MC = 24.7			-light groundwater seepage
5.0					
					-becomes medium dense
					-iron oxide staining
7.5	GB	MC = 22.2			
8.0					

Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 4.0 feet during excavation. Caving observed from 3.0 feet to BOH.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW LLC
15365 NE 90th Street, Suite 100
Redmond, WA 98052
Office (425) 449-4704 | esnw.com
Branch Office: Pasco, WA

TEST PIT NUMBER TP-3

PROJECT NUMBER ES-9764
PROJECT NAME Kaykol Electric Building
DATE STARTED 3/29/24 **COMPLETED** 3/29/24
GROUND ELEVATION
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.19791 **LONGITUDE** -121.97748
LOGGED BY SES **CHECKED BY** SHA
GROUND WATER LEVEL:
NOTES
AT TIME OF EXCAVATION
SURFACE CONDITIONS
AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		TOPSOIL -moderate groundwater seepage
2.0					
2.5			SM		Gray silty SAND with gravel, loose to medium dense, wet
	GB	MC = 23.7			
5.0					-light caving to BOH
7.5					
8.0	GB	MC = 18.6			

Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 1.0 foot during excavation. Caving observed from 5.0 feet to BOH.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW LLC
15365 NE 90th Street, Suite 100
Redmond, WA 98052
Office (425) 449-4704 | esnw.com
Branch Office: Pasco, WA

TEST PIT NUMBER TP-4

PROJECT NUMBER ES-9764
PROJECT NAME Kaykol Electric Building
DATE STARTED 3/29/24 **COMPLETED** 3/29/24
GROUND ELEVATION
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.19828 **LONGITUDE** -121.97719
LOGGED BY SES **CHECKED BY** SHA
GROUND WATER LEVEL:
NOTES
AT TIME OF EXCAVATION
SURFACE CONDITIONS
AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		Dark brown TOPSOIL
1.0			SM		Gray silty SAND with gravel, loose to medium dense, wet
2.5	GB	MC = 20.3			-moderate groundwater seepage
					-light caving to BOH
5.0					-increasing sand
					-becomes brown
	GB	MC = 19.9			
7.5					-becomes gray, medium dense
9.0	GB	MC = 15.6 Fines = 24.2			[USDA Classification: gravelly sandy LOAM]

Test pit terminated at 9.0 feet below existing grade. Groundwater seepage encountered at 2.5 feet during excavation. Caving observed from 3.5 feet to BOH.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW LLC
15365 NE 90th Street, Suite 100
Redmond, WA 98052
Office (425) 449-4704 | esnw.com
Branch Office: Pasco, WA

TEST PIT NUMBER TP-5

PROJECT NUMBER ES-9764
PROJECT NAME Kaykol Electric Building
DATE STARTED 3/29/24 **COMPLETED** 3/29/24
GROUND ELEVATION
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.19851 **LONGITUDE** -121.97684
LOGGED BY SES **CHECKED BY** SHA
GROUND WATER LEVEL:
NOTES
AT TIME OF EXCAVATION
SURFACE CONDITIONS
AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		Dark brown TOPSOIL, minimal root intrusions
1.5					-moderate groundwater seepage at 1.5'
			SM		Gray silty SAND with gravel, loose to medium dense, wet
2.5					
	GB	MC = 20.1			
5.0					-becomes brown
					-becomes gray
7.5					
8.0	GB	MC = 15.2			

Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 1.5 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW LLC
15365 NE 90th Street, Suite 100
Redmond, WA 98052
Office (425) 449-4704 | esnw.com
Branch Office: Pasco, WA

TEST PIT NUMBER TP-6

PROJECT NUMBER ES-9764
PROJECT NAME Kaykol Electric Building
DATE STARTED 3/29/24 **COMPLETED** 3/29/24
GROUND ELEVATION
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.19870 **LONGITUDE** -121.97727
LOGGED BY SES **CHECKED BY** SHA
GROUND WATER LEVEL:
NOTES
AT TIME OF EXCAVATION
SURFACE CONDITIONS Grass
AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		Dark brown TOPSOIL
1.5			SM		Gray silty SAND with gravel, loose to medium dense, wet
	GB	MC = 22.5			
2.5					
					-light groundwater seepage
5.0					
	GB	MC = 29.2			-4" sand lens in SM
7.5					
8.0	GB	MC = 18.6			

Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 3.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW LLC

15365 NE 90th Street, Suite 100
Redmond, WA 98052
Office (425) 449-4704 | esnw.com
Branch Office: Pasco, WA

TEST PIT NUMBER TP-7

PROJECT NUMBER ES-9764
PROJECT NAME Kaykol Electric Building
DATE STARTED 3/29/24 **COMPLETED** 3/29/24
GROUND ELEVATION
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.19858 **LONGITUDE** -121.97773
LOGGED BY SES **CHECKED BY** SHA
GROUND WATER LEVEL:
NOTES
AT TIME OF EXCAVATION
SURFACE CONDITIONS Grass
AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		Dark brown TOPSOIL
1.5			SM		Gray silty SAND with gravel, loose to medium dense, wet
2.5					
	GB	MC = 21.1			
5.0					-light groundwater seepage
					-becomes medium dense
7.5					
8.0	GB	MC = 19.7 Fines = 27.8			[USDA Classification: gravelly sandy LOAM]

Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 5.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW LLC
15365 NE 90th Street, Suite 100
Redmond, WA 98052
Office (425) 449-4704 | esnw.com
Branch Office: Pasco, WA

TEST PIT NUMBER TP-8

PROJECT NUMBER ES-9764
PROJECT NAME Kaykol Electric Building
DATE STARTED 3/29/24 **COMPLETED** 3/29/24
GROUND ELEVATION
EXCAVATION CONTRACTOR NW Excavating
LATITUDE 47.19834 **LONGITUDE** -121.97802
LOGGED BY SES **CHECKED BY** SHA
GROUND WATER LEVEL:
NOTES
∇ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Grass
AFTER EXCAVATION

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB	MC = 45.7	TPSL		Dark brown TOPSOIL
1.0					Gray silty SAND with gravel, loose to medium dense, wet
2.5					
	GB	MC = 25.9	SM		-light groundwater seepage
5.0					
7.5					
9.0	GB	MC = 15.3			

Test pit terminated at 9.0 feet below existing grade. Groundwater seepage encountered at 4.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Appendix B

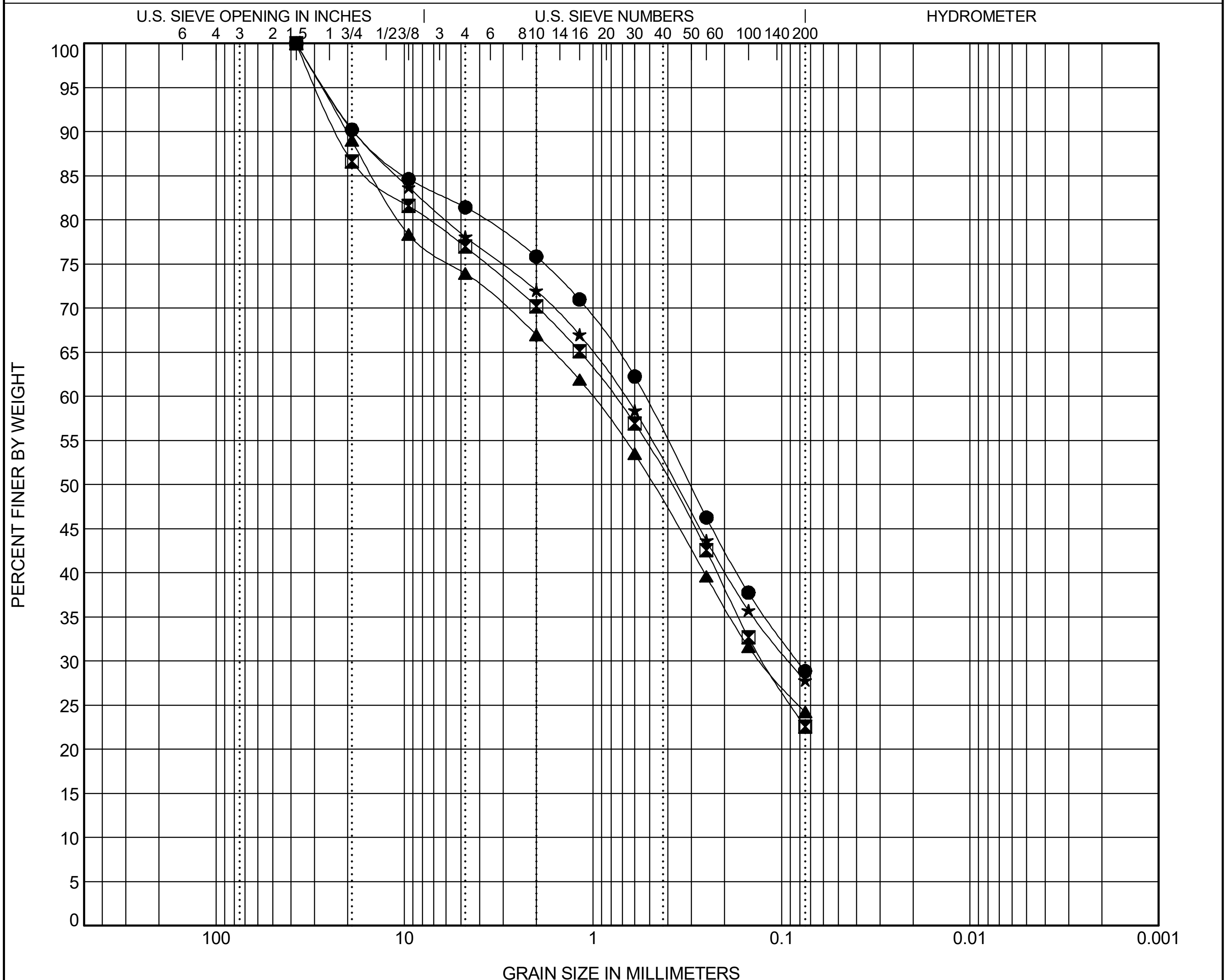
Laboratory Test Results

ES-9764

Earth Solutions NW LLC
15365 NE 90th Street, Suite 100
Redmond, WA 98052
Office (425) 449-4704 | esnw.com
Branch Office: Pasco, WA

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-9764 **PROJECT NAME** Kaykol Electric Building



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	Cc	Cu
●	TP-01	3.00ft.	**USDA: Gray Gravelly Sandy Loam. USCS: SM with Gravel.**		
⊠	TP-01	8.00ft.	**USDA: Gray Gravelly Sandy Loam. USCS: SM with Gravel.**		
▲	TP-04	9.00ft.	**USDA: Gray Gravelly Sandy Loam. USCS: SM with Gravel.**		
★	TP-07	8.00ft.	**USDA: Gray Gravelly Sandy Loam. USCS: SM with Gravel.**		

	Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	TP-01	3.0ft.	37.5	0.53	0.082					28.9	
⊠	TP-01	8.0ft.	37.5	0.772	0.125					22.6	
▲	TP-04	9.0ft.	37.5	1.012	0.129					24.2	
★	TP-07	8.0ft.	37.5	0.68	0.091					27.8	