Earth Solutions NW LLC

Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

GEOTECHNICAL ENGINEERING STUDY
73RD AVENUE SOUTHEAST SINGLE-FAMILY RESIDENCE
2434 – 73RD AVENUE SOUTHEAST
MERCER ISLAND, WASHINGTON

ES-10153

15365 NE 90th Street, Suite 100 • Redmond, WA 98052 • (425) 449-4704
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esnw.com

PREPARED FOR

RKK CONSTRUCTION, INC.

November 7, 2024

Stephen H. Avril
Project Manager

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STATE OF WASHINGTON
27674
REGISTERED
PROFESSIONAL ENGINEER

11/07/2024

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

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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 not 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 not be adequate to develop geotechnical design recommendations for the project.

Do not 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 not rely on an executive summary. Do not 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 not 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 Not 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 not 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 not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
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November 7, 2024
ES-10153

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

RKK Construction, Inc.
3056 – 70th Avenue Southeast
Mercer Island, Washington 98040

Attention: Jason Koehler

Greetings:

Earth Solutions NW, LLC (ESNW) is pleased to present this geotechnical engineering study to support the proposed residential construction at the subject address. Based on the results of our investigation, the proposed project is feasible from a geotechnical standpoint. The site is underlain by glacial till based on our subsurface exploration (October 3, 2024).

The site will be graded to create a building pad following site clearing. After completing earthwork activities in accordance with recommendations in this report, the proposed structure can be supported on conventional spread and continuous foundations bearing on undisturbed, competent native soil, re-compacted existing fill, or new structural fill. 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 nature of silty lacustrine deposits which represents a confining layer of soil.

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-10153

Table of Contents

Cont'd

ES-10153

GRAPHICS

APPENDICES

GEOTECHNICAL ENGINEERING STUDY
73RD AVENUE SOUTHEAST SINGLE-FAMILY RESIDENCE
2434 – 73RD AVENUE SOUTHEAST
MERCER ISLAND, WASHINGTON

ES-10153

INTRODUCTION

General

This geotechnical engineering study (study) was prepared for the proposed residential development to be constructed at 2434 – 73rd Avenue Southeast in Mercer Island, 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 development of the existing parcel with construction of a single-family residence following the demolition of the existing residence on the subject site. 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 and surface conditions on and around the subject site.

Based on our experience with similar projects and site grades we anticipate cuts and fills of up to five feet will be necessary to achieve the proposed finish grade elevations for driveway and building footprint following the demolition of the existing residence based on the gently sloped nature of the site where grades descend towards the east on the order of 15 feet across the entirety of the site based on review of the topographic information available for the site on-line. Block retaining walls and rockeries can be utilized to facilitate grade changes where necessary. ESNW can provide retaining wall and rockery designs upon request.

Based on our experience with similar projects, the proposed residential structure is anticipated to be two to three stories in height and constructed utilizing relatively lightly loaded wood framing 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 east side of 73rd Avenue Southeast, north of the intersection with Southeast 27th Street in Mercer Island, Washington (parcel number 5315100408). The site is currently developed with a residence and associated improvements. The site is vegetated with grass, trees, and general landscaping.

There are two sloped regions on the site. Based on review of the topographic survey provided to ESNW, the slope located on the west side of the site along the road descends into the site at about 40 percent for six vertical feet, and the slope on the east side descends off-site at about 12 percent inclination for six vertical feet.

Subsurface

An ESNW representative observed, logged, and sampled a series of three test pits in October of 2024. The test pits were excavated at accessible site locations using a client-provided limited-access excavator and operator. The subsurface exploration was completed to evaluate soil conditions, classify site soils, perform an infiltration investigation based on subsurface observations, and characterize groundwater conditions within the proposed development area. The maximum exploration depth was five feet below the existing ground surface (bgs). Due to the limited capacities of the client-provided excavator, deeper excavation was not possible. 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) and United States Department of Agriculture (USDA) methods and procedures.

Topsoil

Topsoil was observed at two of the test locations, and was observed in thicknesses up to six inches. Topsoil is characterized by its dark brown color, the presence of fine organic material, and small root intrusions. ESNW anticipates topsoil to be present on the site, however, and will typically be encountered in areas where limited to no past grading has taken place.

Fill

Fill was not encountered during the site exploration. The client should anticipate some fill may be encountered surrounding road and existing building alignments.

Native Soil

Underlying the topsoil, native soils encountered at the test locations were observed to be medium dense grading to dense sandy silt (Unified Soil Classification, ML). These soils are consistent with the typical makeup of lacustrine deposits. Density was observed to increase with depth. In general, the native soil was generally encountered in a moist condition during the time of exploration.

Geologic Setting

Geologic mapping identifies glacial till deposits (Qt) mapped for the area.

The referenced Web Soil Survey (WSS) identifies Kitsap silt loam (KpB) 2 to 8 percent slopes as the primary unit underlying the subject site. Kitsap series of soils consist of lacustrine deposits. Based on our field observations, on-site native soils are representative primarily of lacustrine deposits.

Groundwater

Groundwater seepage was not observed at the test locations. 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, perched groundwater seepage at the contact with the unweathered soil horizon should 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 Mercer Island information was completed to evaluate whether geologically hazardous areas are present within the subject site. The city provides geologic hazard information based on-line in the form of maps. Based on a review of the site conditions, mapping, and site exploration, the subject site is mapped within geologic hazard area consisting of an erosion hazard (known or suspect) with slopes of 15 to 39 percent, and landslide hazard area (known or suspect) with slopes 15 percent and higher (Slope Class ix and v).

Based on ESNW observation of the subsurface conditions consisting of dense lacustrine deposits, the site possesses a very low risk of erosion. The soil on the site presents a dense and stable state. In regards to erosion hazards, where disturbance is planned on the site, best management practices (BMP) must be utilized, and should consist of silt fencing, site grading which limits surface water from flowing towards and over slopes, and interceptor trenches where necessary.

The City of Mercer Island (COMI) municipal code requires a critical area study where development is planned within a critical area. ESNW has provided a critical area study in general accordance with the municipal code below. The code item (italics) is listed and ESNW response follows each code item needing addressing:

19.07.110 - Critical area study.

A. A critical area study shall be required when a development proposal will result in an alteration to one or more critical areas or critical area buffers or when required to determine the potential impact to a critical area.

B. The critical area study shall be in the form of a written report supported by graphic information prepared by a qualified professional using guidance based on the best available science consistent with the standards in WAC Chapter 365-195 and shall contain the following items, as applicable to adequately evaluate the proposal, proposed alterations, and mitigation:

1. *Disclosure of the presence of critical areas, including a delineation and type or category of critical area, on the development proposal site and any mapped or identifiable critical areas on or off site within the distance equal to the largest potential required buffer applicable to the development proposal area on the applicant's property;*

Based on a review of the site conditions, mapping, and site exploration, the subject site is mapped within geologic hazard area consisting of an erosion hazard (known or suspect) with slopes of 15 to 39 percent, and landslide hazard area (know or suspect) with slopes 15 percent and higher (Slope Class ix and v). The landslide hazard distinction is likely due to the minor slopes which descend both into and off the site. The slope at the roadside (west) which appears to be the result of past legal grading is inclined at about 40 percent for six vertical feet total. The slope on the east side descends off-site for six vertical feet total at about 12 percent inclination per the topographical survey provided to ESNW. These slopes do not meet the standard by COMI for the above-mentioned hazards as they are not over ten feet in relief per classification “ix” where 40 percent or more, it is the opinion of ESNW that they do not pose a threat of soil mobilization due to the dense and homogenous nature of the subsurface coupled with the lack of vertical relief.

2. *A topographic and boundary survey;*

ESNW has included a site plan as a plate which includes the test locations and property boundaries for the subject site. Additionally, ESNW has provided a topographic boundary survey of the site as an attachment.

3. *A statement specifying the accuracy of the report and all assumptions made and relied upon;*

In our opinion, this study is accurate and reliable based on best available science typical of practice in the field of geotechnical engineering for the area. The site-specific data collected and analysis (slope stability, geologic conditions, and liquefaction analysis) by ESNW staff may be relied upon.

4. *A description of the methodologies used to conduct the critical area study, including references;*

ESNW observed, logged, and sampled test pits on the subject site utilizing an excavator and operator retained by the client. The soil samples were returned to ESNW laboratory for sieve and moisture analysis in general accordance with the City of Mercer Island requirements. ESNW reviewed the topographical data, geologic maps, and critical areas maps (provided by the city) for the subject site and surrounding area to determine the risk of erosion and landslide on the site. ESNW analysis is based on experience on sites with similar surface and subsurface conditions in the region.

5. *A scale map of the development proposal site;*

Please see Plate 2 which is attached to this study.

6. *Photographic records of the site before the proposed alteration occurs;*

ESNW has attached photographs of the site pre-redevelopment.

7. *An assessment of the probable effects to critical areas and associated buffers, including impacts caused by the development proposal and associated alterations to the subject property and impacts to other properties and any critical areas or buffers located on them resulting from the development of the site and the proposed development;*

ESNW analyzed the erosion hazard and landslide hazard on the subject site. Based on the analysis, in our opinion there will be no adverse impacts to slope stability or erosion risks on the subject site and surrounding area due to the stable nature of the soil types on the site and the limited vertical extent of the slopes on the site Lacustrine deposits present a stable condition within sloped areas due to its cemented and dense nature.

Final grading plans were not available at the time of this report production. However, ESNW anticipates the proposed grading will mimic the current site conditions and the new structure will be sited below the slope located within the western portion of the site, and will not place additional surcharging onto the subject slopes.

In our opinion, there is no necessity for geologic critical areas buffers on the subject site based on the site conditions. The proposed development will not impact any critical areas buffers/conditions on adjacent properties based on our review of the conditions on and off-site provided the recommendations in this report are adhered to.

8. *A description of mitigation sequencing implementation described in section 19.07.100 including steps taken to avoid and minimize critical areas impacts to the greatest extent feasible;*

In this instance there will be impacts to the landslide hazard area on the site through grading. However, the installation of retaining walls and filling of the sloped region in the western portion of the site adjacent to the road will in-essence provide slope integrity in accordance with item F of the City of Mercer Island code Chapter 19.07.100 which states “Monitoring the impact and taking appropriate corrective measures to maintain the integrity of compensating measures.” In our opinion, grading of the site to remove the landslide and erosion hazards is suitable from a geotechnical standpoint.

9. *Detailed studies, as required by this chapter, for individual critical area types in order to ensure critical area protection;*

ESNW has provided this document as a detailed study of the critical areas associated with the subject site.

10. *Assessment of potential impacts that may occur on adjacent sites, such as sedimentation or erosion, where applicable; and*

Where erosion control BMP are utilized during and after construction on the subject site, it is our opinion there will be minimal risk of erosion. Furthermore, due to the dense and stable nature of the site soils, there is a low risk of erosion and landslide on the subject site.

11. *A post-design memorandum prepared by a qualified professional confirming that the proposed improvements comply with the design recommendations.*

ESNW can provide a plan review upon request by the client.

C. The critical area study requirement may be waived or modified if the applicant demonstrates that the development proposal will not have an impact on the critical area or its buffer in a manner contrary to the purposes and requirements of this chapter.

DISCUSSION AND RECOMMENDATIONS

General

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

After completing earthwork activities in accordance with recommendations in this report, the proposed structure can be supported on conventional spread and continuous foundations bearing on undisturbed, competent native soil, re-compacted native soil, re-compacted existing fill or new structural fill. 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 based on the presence of the silty native deposits on the subject site. The lacustrine deposits represent a confining layer of soil which retards stormwater infiltration.

Site Preparation and Earthwork

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 will be encountered within the upper six inches on the subject site. Topsoil is not suitable for load bearing, and should be removed where encountered within building footprints and other structural areas to be developed. Topsoil is not suitable for use as structural fill material, but may be considered for placement in landscape zones of the site. Particularly where water quality treatment is required by the city. Root intrusions generally extend below the topsoil into the upper weathered soil. 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 likely be suitable for direct structural support as is but 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 medium dense to very dense native soil. 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)
- Dense unweathered till 0.75H:1V (Type A)

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 any structures on the site requiring temporary excavations. ESNW recommends excavations not extend into an area where the roadway or other neighboring structures will be creating a surcharge on the excavation walls. The excavations 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 till 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. Remedial measures may be necessary as part of site grading and earthwork activities. 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, the proposed structure(s) can be supported on conventional spread and continuous foundations bearing on undisturbed, competent native soil, re-compacted native soil, re-compacted existing fill or new structural fill. Where fill soil is encountered in foundation excavations, it must be evaluated by ESNW prior to placement of forms or re-bar. Based on the soil condition observed at the exploration locations, soils capable of providing the design bearing capacity are anticipated to be encountered two to four feet below existing grades at most locations. If structural building pads are prepared during wet weather, remediation measures such as cement treatment (as approved by COMI) or overexcavation and replacement with rock may be necessary in some areas. 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 2021 International Building Code (2021 IBC) recognizes ASCE 7-16 (formally known as the Minimum Design Loads and Associated Criteria for Buildings and Other Structures manual) for seismic design, specifically with respect to earthquake loads. Based on the soil conditions encountered at the test pit locations, the parameters and values provided below are recommended for seismic design per the 2021 IBC.

Parameter	Value
Site Class	D*
Mapped short period spectral response acceleration, S_S (*g*)	1.39
Mapped 1-second period spectral response acceleration, S_1 (*g*)	0.49
Short period site coefficient, F_a	1.00
Long period site coefficient, F_v	1.99
Adjusted short period spectral response acceleration, S_{MS} (*g*)	1.39
Adjusted 1-second period spectral response acceleration, S_{M1} (*g*)	0.98
Design short period spectral response acceleration, S_{DS} (*g*)	0.93
Design 1-second period spectral response acceleration, S_{D1} (*g*)	0.65

* *Assumes dense soil conditions, encountered to a maximum depth of five feet bgs during the field exploration, remain dense to at least 100 feet bgs. Based on our experience with the project geologic setting (glacial till) 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 negligible. The relative density of the soil underlying the site 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, seasonal groundwater seepage should be anticipated within site excavations despite observance of groundwater during exploration. Perched seepage is common on sites underlain by silty soils. 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.

If construction will incorporate crawl spaces rather than slab-on-grade, in our opinion, a crawl space drain system can be used in lieu of perimeter footing drains. The crawl space drain must provide positive drainage to an appropriate outlet.

Preliminary Infiltration Evaluation

As indicated in the *Subsurface* section of this report, the native soil encountered during our fieldwork was primarily characterized as silty lacustrine deposits. Per our scope of services, infiltration testing was not included in the fieldwork, but 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, stormwater infiltration on the subject site should be considered infeasible on the subject site due to the presence of dense silts. The silty soil on the subject site represents a confining layer of soil in regards to infiltration.

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 proof rolling 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 Mercer Island 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 county 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 drain 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 native soil will generally be suitable for support of utilities, however, existing fill may be unsuitable in its current condition, if encountered. 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 RKK Construction Inc., and their 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 Mercer Island municipal code
- Preliminary Geologic Map of Seattle and Vicinity, Washington, prepared by Waldron et al., dated 1962
- WSS, provided by the USDA, Natural Resources Conservation Service

Reference:
King County, Washington
OpenStreetMap.org

NORTH

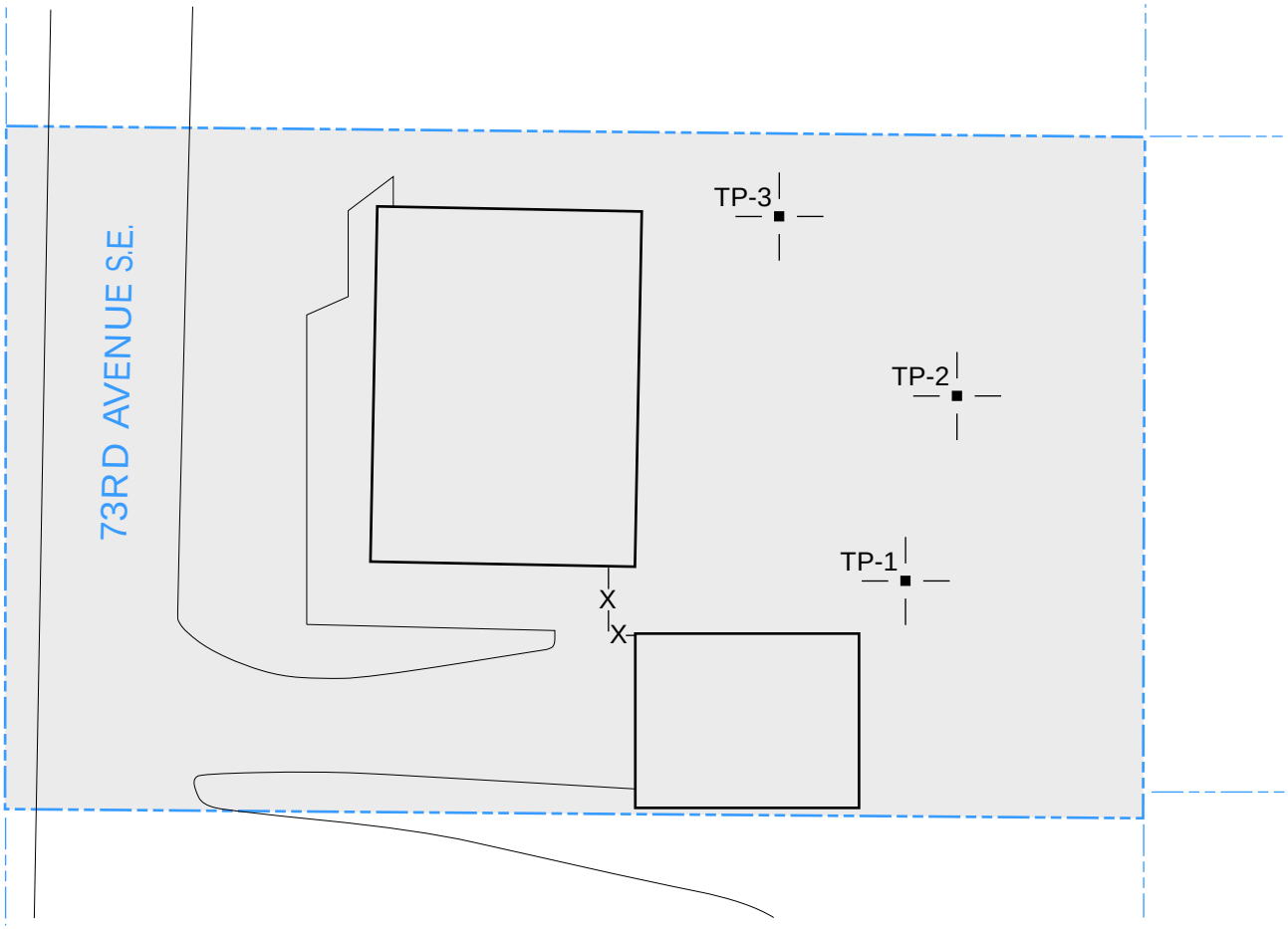
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
2434 – 73rd Avenue S.E. SFR
Mercer Island, Washington

Drawn MRS	Date 10/18/2024	Proj. No. 10153
Checked SES	Date Oct. 2024	Plate 1



NORTH

NOT - TO - SCALE

LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-10153, Oct. 2024

Subject Site

Existing Building

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.

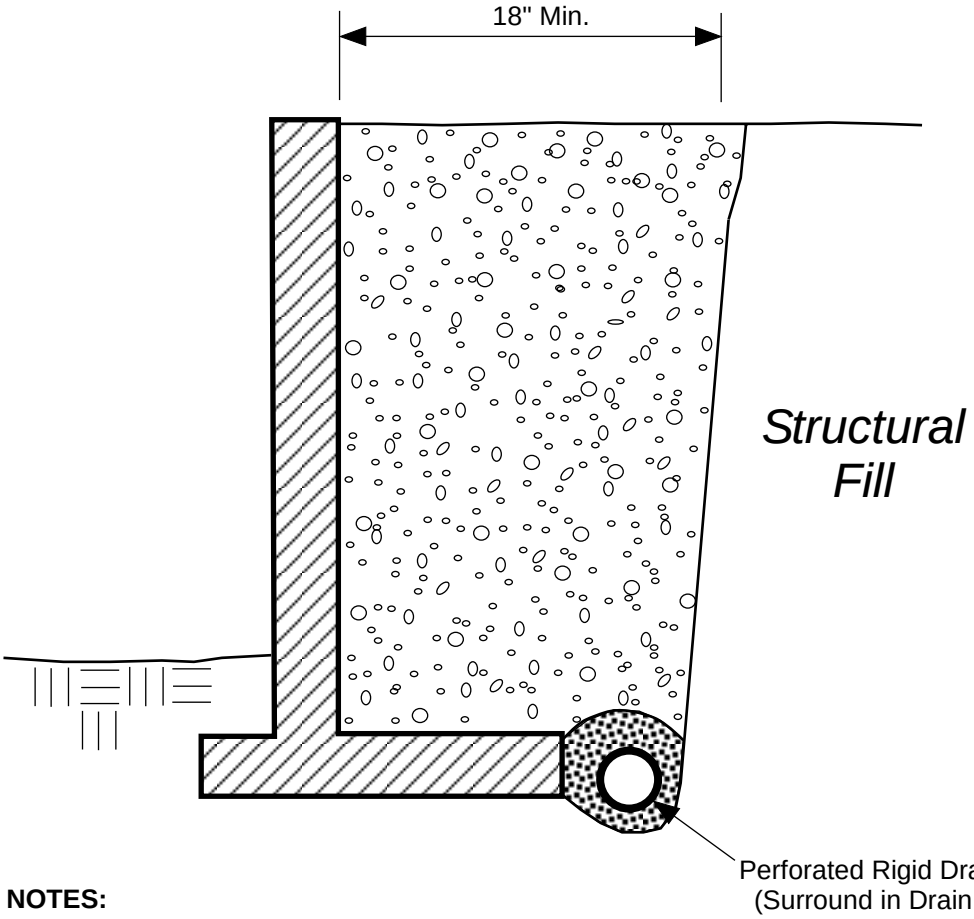
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Test Pit Location Plan
2434 – 73rd Avenue S.E. SFR
Mercer Island, Washington

Drawn MRS	Date 10/18/2024	Proj. No. 10153
Checked SES	Date Oct. 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

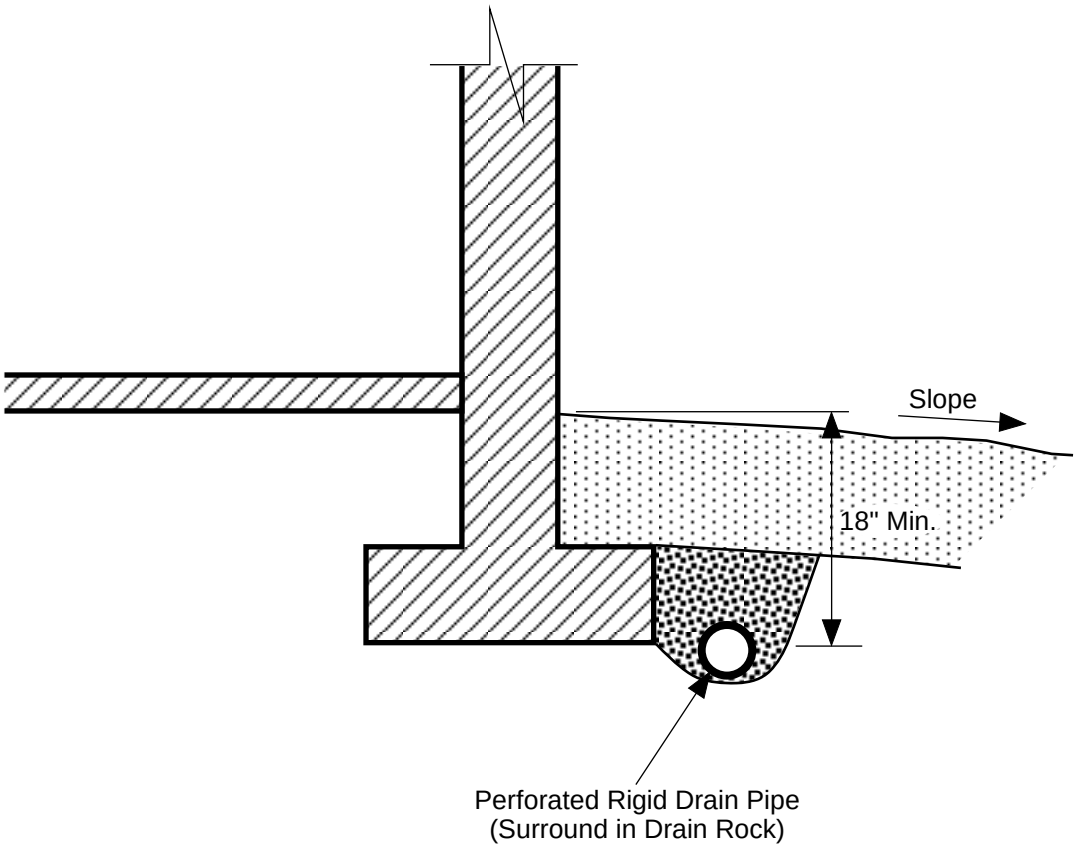
1-inch Drain Rock

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Retaining Wall Drainage Detail
2434 – 73rd Avenue S.E. SFR
Mercer Island, Washington

Drawn MRS	Date 10/30/2024	Proj. No. 10153
Checked SES	Date Oct. 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:

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
2434 – 73rd Avenue S.E. SFR
Mercer Island, Washington

Drawn MRS	Date 10/30/2024	Proj. No. 10153
Checked SES	Date Oct. 2024	Plate 4

Appendix A

Subsurface Exploration Logs

ES-10153

Subsurface conditions at the subject site were explored in October 2024. A total of three test pits were excavated using a drill rig and operator contracted by the 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 five 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

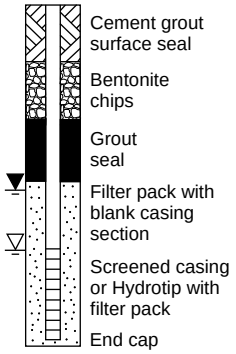
Wet - Water visible but not free draining, likely above optimum MC

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-10153 **PROJECT NAME** 2434 – 73rd Avenue S.E. SFR

DATE STARTED 10/3/24 **COMPLETED** 10/3/24 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.58801 **LONGITUDE** -122.24126

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, minimal root intrusions
0.5					Brown sandy SILT, medium dense, damp
					-probed 3"
2.5	GB	MC = 3.4	ML		
					-becomes gray, dense, moist -probed 1" [USDA Classification: slightly gravelly silt LOAM]
5.0	GB	MC = 22.2 Fines = 64.3			
5.0					Test pit terminated at 5.0 feet below existing grade. No groundwater encountered 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-10153 **PROJECT NAME** 2434 – 73rd Avenue S.E. SFR

DATE STARTED 10/3/24 **COMPLETED** 10/3/24 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.58809 **LONGITUDE** -122.24120

LOGGED BY SES **CHECKED BY** SHA **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Planter area **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 -probed 4'
0.5					Brown sandy SILT, medium dense, damp
	GB	MC = 5.7			
2.5			ML		-probed 2"
					-becomes wet
5.0	GB	MC = 61.9			
5.0					Test pit terminated at 5.0 feet below existing grade. No groundwater encountered 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-3

PROJECT NUMBER ES-10153 **PROJECT NAME** 2434 – 73rd Avenue S.E. SFR

DATE STARTED 10/3/24 **COMPLETED** 10/3/24 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.58812 **LONGITUDE** -122.24128

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					Brown sandy SILT, medium dense, damp -probed 3"
2.5	GB	MC = 12.0 Fines = 57.0	ML		[USDA Classification: slightly gravelly silt LOAM] -probed 1"
5.0	GB	MC = 16.1		5.0	

Test pit terminated at 5.0 feet below existing grade. No groundwater encountered 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

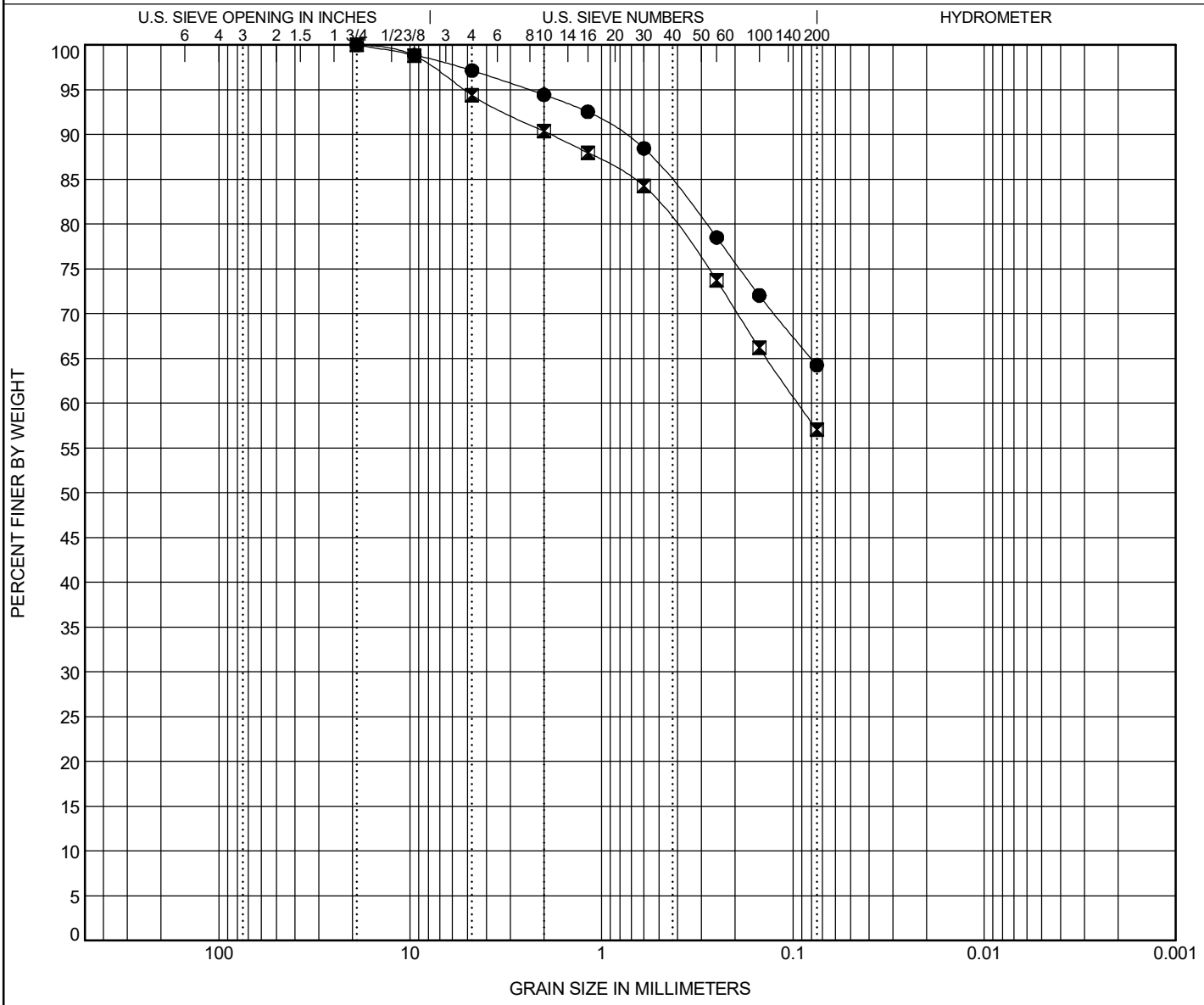
Laboratory Test Results

ES-10153

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-10153 **PROJECT NAME** 2434 - 73rd Avenue S.E. SFR



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
● **TP-01**	**5.00ft.**	**USDA: Gray Slightly Gravelly Silt Loam. USCS: Sandy ML.**		
⊠ **TP-03**	**2.00ft.**	**USDA: Brown Slightly Gravelly Silt Loam. USCS: Sandy ML.**		

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● **TP-01**	**5.0ft.**	**19**							**64.3**	
⊠ **TP-03**	**2.0ft.**	**19**	**0.094**						**57.0**	

Appendix C

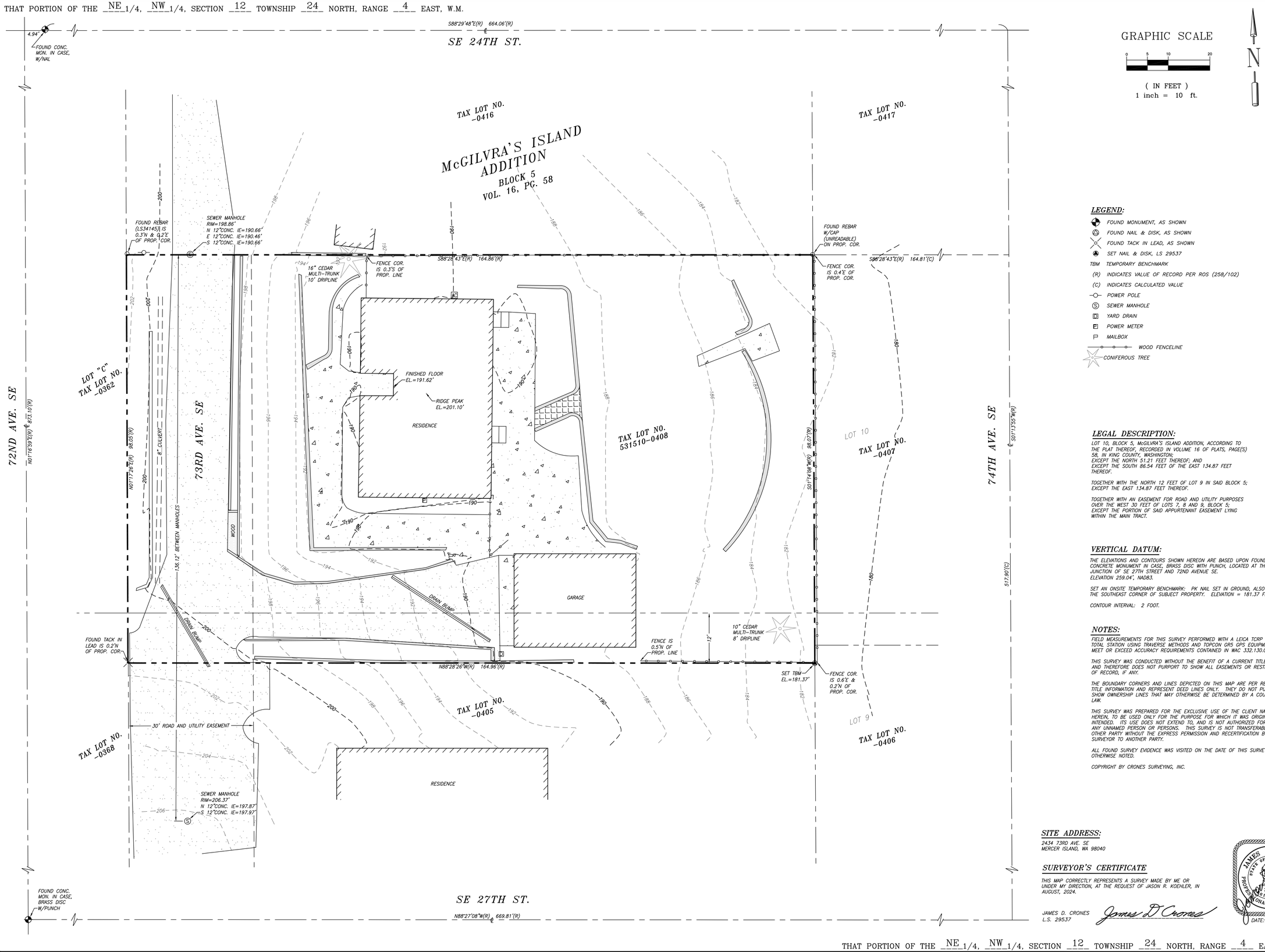
Photos and Topographic Survey

ES-10153


ADT


73rd Ave SE
73rd Ave SE
2434

THAT PORTION OF THE NE 1/4, NW 1/4, SECTION 12 TOWNSHIP 24 NORTH, RANGE 4 EAST, W.M.



GRAPHIC SCALE

0 5 10 20

(IN FEET)
1 inch = 10 ft.

N

LEGEND:

- FOUND MONUMENT, AS SHOWN
- FOUND NAIL & DISK, AS SHOWN
- FOUND TACK IN LEAD, AS SHOWN
- SET NAIL & DISK, LS 29537
- TBM TEMPORARY BENCHMARK
- (R) INDICATES VALUE OF RECORD PER ROS (258/102)
- (C) INDICATES CALCULATED VALUE
- POWER POLE
- SEWER MANHOLE
- YARD DRAIN
- POWER METER
- MAILBOX
- WOOD FENCELINE
- CONIFEROUS TREE

LEGAL DESCRIPTION:

LOT 10, BLOCK 5, McGILVRA'S ISLAND ADDITION, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 16 OF PLATS, PAGE(S) 58, IN KING COUNTY, WASHINGTON;
EXCEPT THE NORTH 51.21 FEET THEREOF; AND
EXCEPT THE SOUTH 86.34 FEET OF THE EAST 134.87 FEET THEREOF.

TOGETHER WITH THE NORTH 12 FEET OF LOT 9 IN SAID BLOCK 5; EXCEPT THE EAST 134.87 FEET THEREOF.

TOGETHER WITH AN EASEMENT FOR ROAD AND UTILITY PURPOSES OVER THE WEST 30 FEET OF LOTS 7, 8 AND 9, BLOCK 5; EXCEPT THE PORTION OF SAID APPURTENANT EASEMENT LYING WITHIN THE MAIN TRACT.

VERTICAL DATUM:

THE ELEVATIONS AND CONTOURS SHOWN HEREON ARE BASED UPON FOUND CONCRETE MONUMENT IN CASE, BRASS DISC WITH PUNCH, LOCATED AT THE JUNCTION OF SE 27TH STREET AND 72ND AVENUE SE. ELEVATION 259.04', NAD83.

SET AN ONSITE TEMPORARY BENCHMARK: PK NAIL SET IN GROUND, ALSO BEING THE SOUTHEAST CORNER OF SUBJECT PROPERTY. ELEVATION = 181.37 FEET.

CONTOUR INTERVAL: 2 FOOT.

NOTES:

FIELD MEASUREMENTS FOR THIS SURVEY PERFORMED WITH A LEICA TCRP 1200 TOTAL STATION USING TRAVERSE METHODS AND TOPCON GR5 GPS EQUIPMENT THAT MEET OR EXCEED ACCURACY REQUIREMENTS CONTAINED IN WAC 332.130.090.

THIS SURVEY WAS CONDUCTED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT AND THEREFORE DOES NOT PURPORT TO SHOW ALL EASEMENTS OR RESTRICTIONS OF RECORD, IF ANY.

THE BOUNDARY CORNERS AND LINES DEPICTED ON THIS MAP ARE PER RECORD TITLE INFORMATION AND REPRESENT DEED LINES ONLY. THEY DO NOT PURPORT TO SHOW OWNERSHIP LINES THAT MAY OTHERWISE BE DETERMINED BY A COURT OF LAW.

THIS SURVEY WAS PREPARED FOR THE EXCLUSIVE USE OF THE CLIENT NAMED HEREIN, TO BE USED ONLY FOR THE PURPOSE FOR WHICH IT WAS ORIGINALLY INTENDED. ITS USE DOES NOT EXTEND TO, AND IS NOT AUTHORIZED FOR USE BY ANY UNNAMED PERSON OR PERSONS. THIS SURVEY IS NOT TRANSFERABLE TO ANY OTHER PARTY WITHOUT THE EXPRESS PERMISSION AND RECERTIFICATION BY THIS SURVEYOR TO ANOTHER PARTY.

ALL FOUND SURVEY EVIDENCE WAS VISITED ON THE DATE OF THIS SURVEY UNLESS OTHERWISE NOTED.

SITE ADDRESS:

2434 73RD AVE. SE
MERCER ISLAND, WA 98040

SURVEYOR'S CERTIFICATE

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION, AT THE REQUEST OF JASON R. KOEHLER, IN AUGUST, 2024.

JAMES D. CRONES
L.S. 29537

JAMES D. CRONES — STATE OF WASHINGTON — 29537 — REGISTERED PROFESSIONAL LAND SURVEYOR

DATE: 08-30-24

CRONES LAND SURVEYING
425-432-5930 - www.crones.com
23806 190th Ave. SE Kent WA, 98042

JASON R. KOEHLER

LOT SURVEY
TOPOGRAPHIC SURVEY

KING COUNTY WASHINGTON

Revisions

Drawing Date 08/30/2024
Scale 1" = 10'
Surveyed SC/CK
Drawn RJR
Checked JJC
Filename KOEHL-03A-TOPO.DWG

SHEET 1 of 1

THAT PORTION OF THE NE 1/4, NW 1/4, SECTION 12 TOWNSHIP 24 NORTH, RANGE 4 EAST, W.M.