Storm Drainage Report

For

Atwal's Residence

At 4029 97th Ave SE

Mercer Island, WA 98040

Parcel # 5456000-0020

4/29/2023

April, 2023

Table of Contents

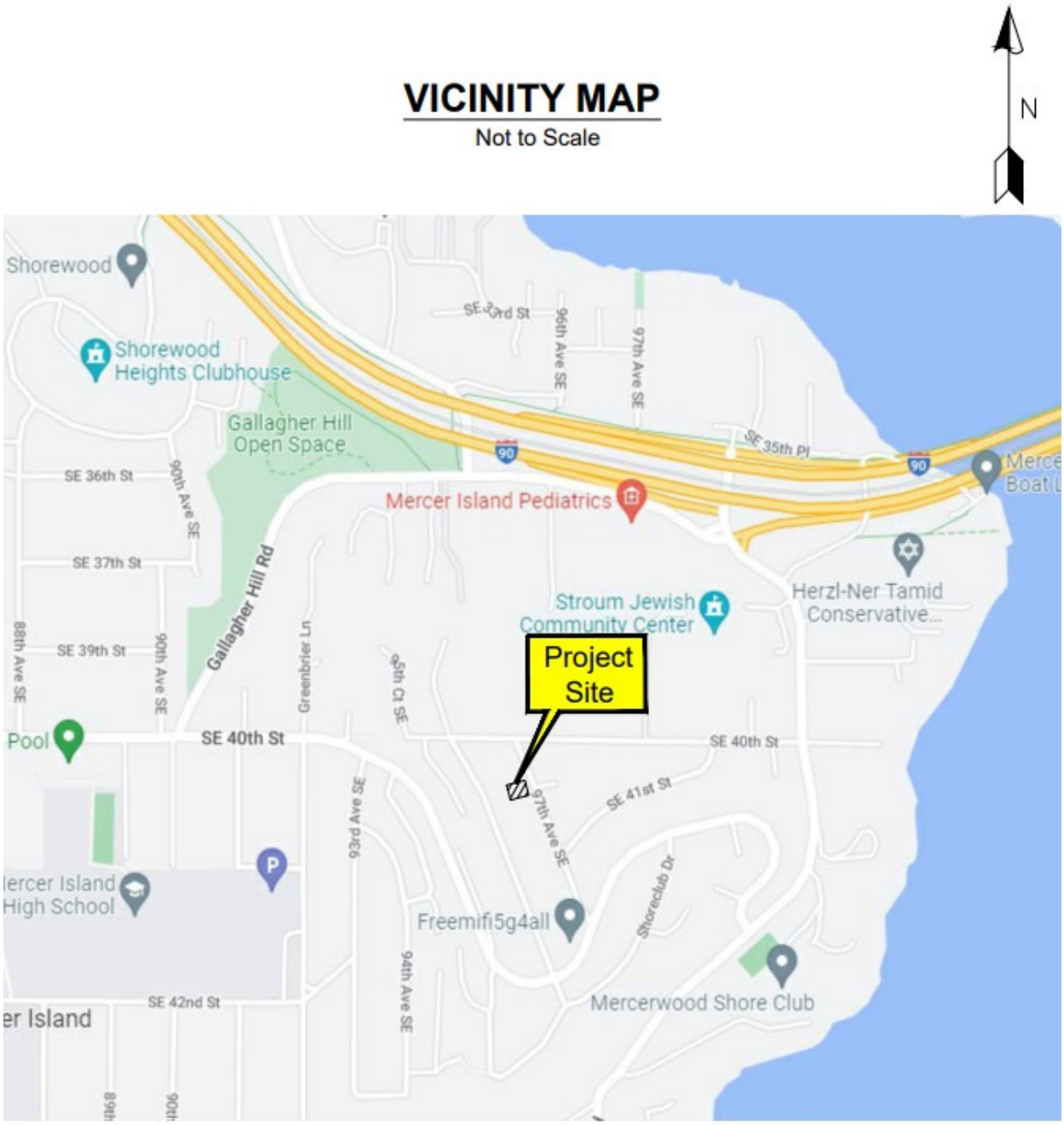
1.0 Project Overview

This proposed single-family resident development is a 0.183 acres lot project located in City of Mercer Island, King County, Washington. See Figure 1 for project Vicinity Map.

The subject property address is at 4029 97th Avenue SE in Mercer Island, Washington. The development includes a second story addition to the existing residence structure as well as an attached garage on the southern side of the site, accessible from 97th Avenue SE.

A primary component of the new development project plans is the satisfaction of current stormwater management requirements commensurate with Department of Ecology 2019 Stormwater Management manual for Western Washington (SWWMM) and/or City of Mercer Island Storm Management Standards. This stormwater report describes the existing drainage characteristics in the project area and presents the proposed On-Site stormwater management within the project to mitigate for the project impacts.

Figure 1: Vicinity Map



2.0 Site Conditions

2.1 Existing Site Conditions

The existing parcel is located at 4029 Avenue SE Mercer Island, WA. The property is bounded by 97th Avenue SE to east, single-family residences to the north, south, and west. The site consists of a rectangular shaped property covering 0.183 acres in square footage. It is currently occupied by a single-family residence in the central portion and a paved driveway in the northeast corner of the lot. Topographically, the site consists of a relatively level terrace bordered by a 3.75 foot-tall block wall on the western property line and a 2.0 foot-tall rockery on the eastern property line. Both of which appear to be in good condition ground cover within the site consists mainly of grass yard areas bordered by mulch areas with landscaping plants. Mixture of paved and stone walkways wrap around the residence structure. We did not observe any exposed soils or signs of erosion within the site during the field visit on November 11, 2022. We also did not observe any surface water within the site.

There is currently no stormwater management facilities located on the property. The existing stromwater runoff for the site disposal by infiltration and/ or surface sheet flow to 97th Ave SE roadway. The existing land cover is outlined in the Table 1.0.

Table 1.0: Existing Land Cover

-

Summary of Existing Site Conditions			
Surface Type	**Area**	**Units**	**Notes**
Total Lot	8,000	**SF**	
House	1,645	SF	
Porch	64		
Patio	402		
Driveway	355		
Impervious Subtotal	**2,466**	**SF**	

2.2 Existing Hydraulic Features

At this time, there is no stormwater drainage system on the site to collect stormwater runoff. The site stormwater disperses across the site from west to east direction. No wetlands or stream has been identified on or adjacent to the site.

2.3 Soils Information

The Geologic Units for this area are shown on the Preliminary Geologic Map of Seattle and Vicinity, Washington, by Waldron, H. H., Leisch, B. A., Mullineaux, D. R., and Crandell, D. R. (USGS, 1961). This site is mapped as older sand (Qos) with glacial till (Qt) in the near vicinity. Younger Sand is described as generally clean fine to medium sand. Glacial till is described as a mixture of sand, silt, and gravel that was deposited and subsequently overridden by an advancing glacier. The explorations throughout the site encountered silly sand with gravel and sandy silt with gravel which is more consistent with the description of glacial till at depth.

See Appendix F for Geotechnical Engineering Evaluation Report.

3.0 Developed Conditons

3.1 Design References

The following design references were utilized in development of the stormwater design:

* Department of Ecology Stormwater Management Manual for Western Washington (SWWMM) 2019

3.2 Minimum Requirements

Summary of project information for determining minimum stormwater requirements			
Key	**Component**	**Value**	**Notes**
A	Project Site Area	8,000 SF	
B	Existing Impervious Area	2,466 SF	
C	Existing Impervious Area Coverage	30.83 %	Calculated as B/A100%
D	New Impervious Area	1,393 SF	Attached Garage
E	Replaced Impervious Area	0.00 SF	
F	New Plus Replaced Impervious Area	1,393 SF	Calculated as D+E
G	Proposed Impervious Area	1,393 SF	Existing + Replaced Areas
H	Converted Impervious: Concrete to lawn/ landscape	355 SF	N/A
I	Converted Pervious: Native vegetation converted to pasture	0.00 SF	N/A
J	Total Area of Land Disturbing Activity	2,011 SF	

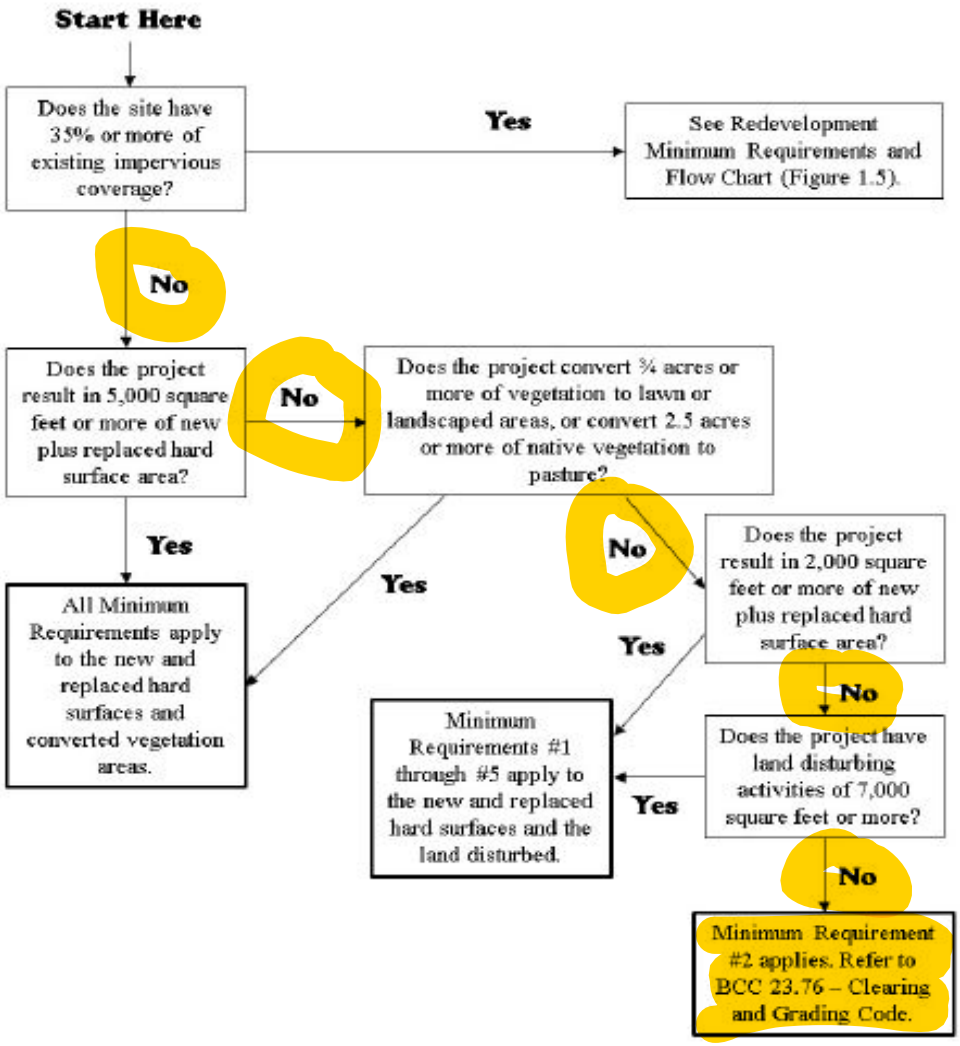


Figure 1.4 – Flow Chart for Determining Minimum Requirements for New Development Projects

Source: Adapted from Figure 2.4.1 of Volume I of the DOE Manual.

According to the above Flow Chart for determining requirements for New Development project, Minimum Requirements #2 SWWMM 2019 apply to the new and replaced impervious surfaces and the land disturbed.

3.3 Proposed Development and On-Site Stormwater Management

The new development proposed plans include a second story addition to the existing residence structure, as well as an attached garage on the southern side.

See Appendix B for the proposed site conditions. The proposed land cover is outlined in Table 2.0.

Table 2.0: Developed Land Cover

Summary of Proposed Site Conditions			
Surface Type	**Area**	**Units**	**Notes**
Total Lot	**8,000**	**SF**	
Roof for (Addition)	872	SF	
New Driveway	372	SF	
New Walkway	149	SF	
Total New Impervious Subtotal	**1,393**	**SF**	
Existing Impervious Surfaces	2,111	SF	
Existing Lawn/Landscape	4,496	SF	
Pervious Total	**4,496**	**SF**	

3.4 Design Satisfaction of SMMWW Minimum Requirements

The following sections outline how the new single-family residential new development project design satisfies the #1 – # 5 minimum SMMWW requirements.

MR #1 – Stormwater Site Plans

Stormwater Site Plans will be prepared for the single- family residential new development. This report and other supporting studies and drawings will comprise the component Stormwater Site Plan.

MR #2 – Construction Stormwater Pollution Prevention

The single-family residential new development project will include in the contract plans, the TESC plan sheets to address erosion. The SPCC will be a stand-alone document prepared by the contractor to address potential mechanical or construction related spills that could potentially contaminate stormwater or soils.

MR #3 – Source Control of Pollutants

Pollutants will be prevented from coming in contact and mixing with stormwater by using silt fence along the property line to keep stormwater within construction site. Construction entrance will be implemented prior to construction to prevent wheel tracking pollutant from construction site into the roadway.

MR #4 – Maintaining the Natural drainage System

Drainage patterns will be maintained as a result of the Single-family residential new development project.

MR #5 – On-Site Stormwater Management

This new developed project does not require to provide flow control due the total new plus replaced surfaces are below the threshold. The total added impervious for the project 1,393 sf minus the existing driveway removal of 355 sf, so the total impervious surface for the project is 1,038 sf. Therefore, the project does not require to implement On-Site stormwater management for the addition. The stormwater for the new added impervious surfaces will convey to the new catch basin then tightline to the existing catch basin on the shoulder of the 97th Ave SE where the public existing drainage system located. See Appendix B for drainage system location and details.

See Appendix D for catch basin standard maintenance and List Approach Table.

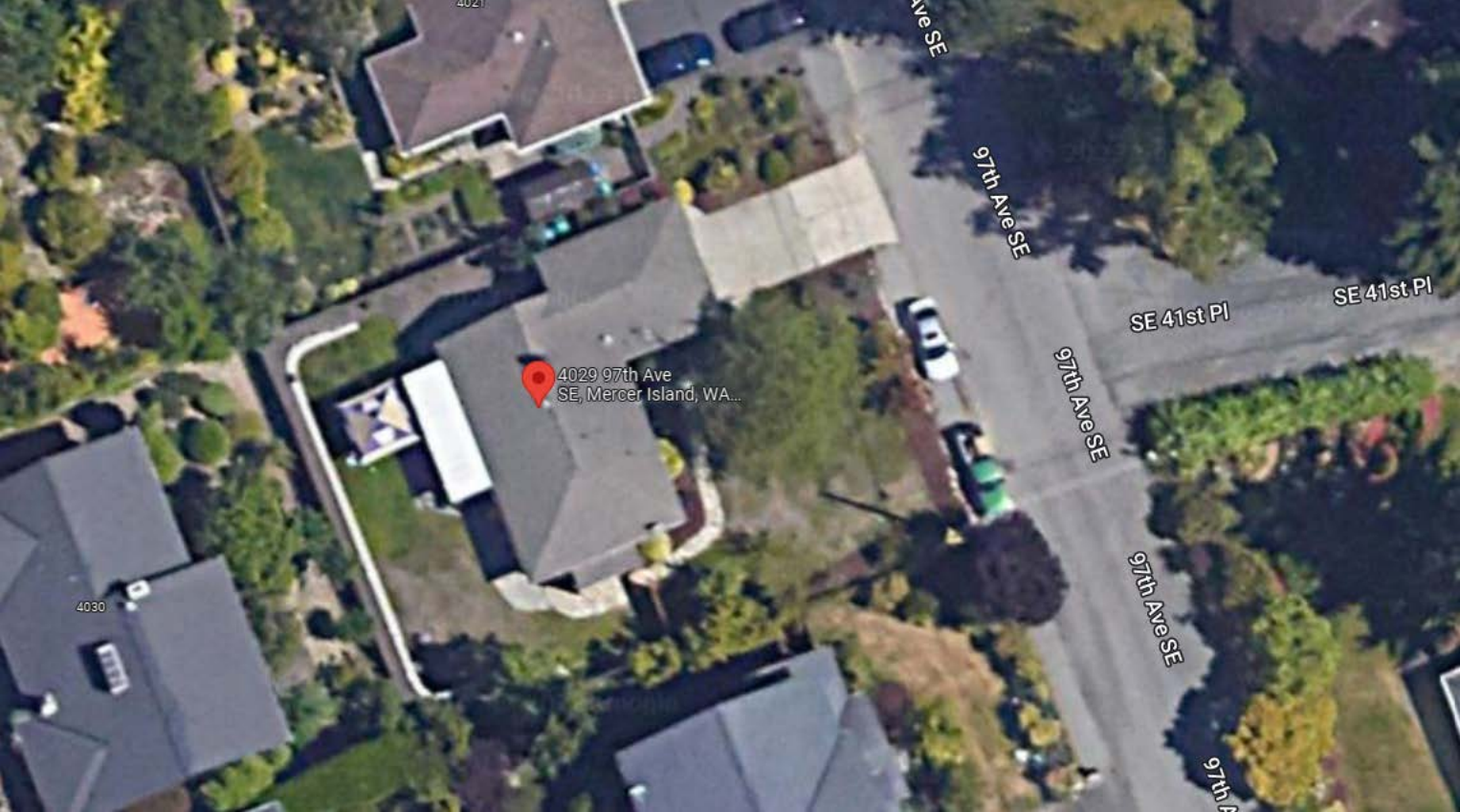
4.0 Operations and Maintenance

The owner will need to perform appropriate preventive maintenance steps to ensure that on-site stormwater management facilities are adequately maintained and allow for continued operations according to the maintenance section of the SMMWW 2019.

Appendix A

Existing Site Conditions and Photos


Google

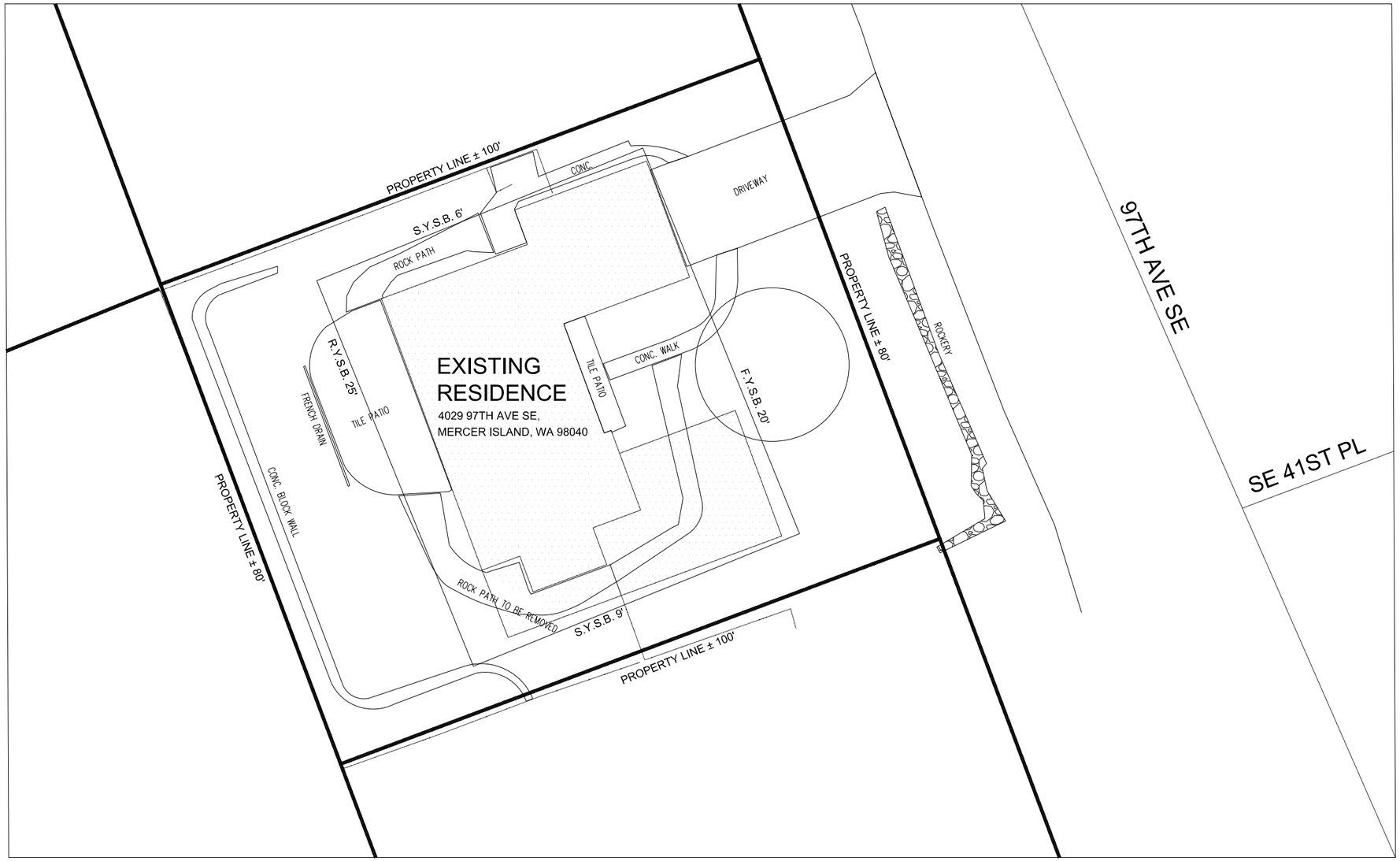

4029 97th Ave
SE, Mercer Island, WA...
97th Ave SE
SE 41st Pl
4030

PROJECT DESCRIPTION

X

LEGAL DESCRIPTION

MERCER WOOD ADD



SITE PLAN

SCALE 22X34 1" = 10'-0"
SCALE 11X17 1" = 20'-0"

0' 2.5' 5' 10' 20'

LOT COVERAGE

TOTAL LOT AREA	8000 SQ-FT
PORCH	64 SQ-FT
PATIO	402 SQ-FT
DRIVEWAY	355 SQ-FT
SFR	1645 SQ-FT
TOTAL	2466 SQ-FT

ALLOWABLE LOT COVERAGE = 8000 * 40% = 3200 SQ-FT
PROPOSED LOT COVERAGE = X SQ-FT (OK)

GROSS FLOOR AREA

TOTAL LOT AREA	8000 SQ-FT
UPPER	984 SQ-FT
MAIN	2144 SQ-FT
TOTAL	3128 SQ-FT

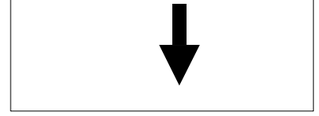
ALLOWABLE LOT COVERAGE = 8000 * 40% = 3200 SQ-FT
PROPOSED LOT COVERAGE = 3128 SQ-FT (OK)

LEGEND

- PROPERTY LINE OF PROPOSED PROJECT
- PROPERTY LINE OF ADJACENT PROPERTIES
- CONTOUR LINE – 5' ELEVATION CHANGE
- EXISTING STRUCTURE W/ INTERIOR RENOVATION & UPPER LEVEL ADDITION
- EXISTING STRUCTURE TO BE REMOVED
- EXISTING STRUCTURE
- CENTER LINE OF STREET
- EDGE OF CONCRETE
- ROOF OUTLINE
- PROPERTY SETBACK
- EDGE OF GRAVEL
- EASEMENT
- EXISTING TREES/FOLIAGE
- PRIMARY ENTRANCE (FOR DADUS, ADUS AND SFRS)

VICINITY MAP

FROM GOOGLE MAPS



PROJECT INFORMATION

OWNER	ATWAL AVNEET SINGH+GHUMMAN
JURISDICTION	MERCER ISLAND
PARCEL NUMBER	545600-0020
ZONING	R-8.4
YEAR BUILT	1955
LOT AREA	8,000 SQFT

SHEET INDEX

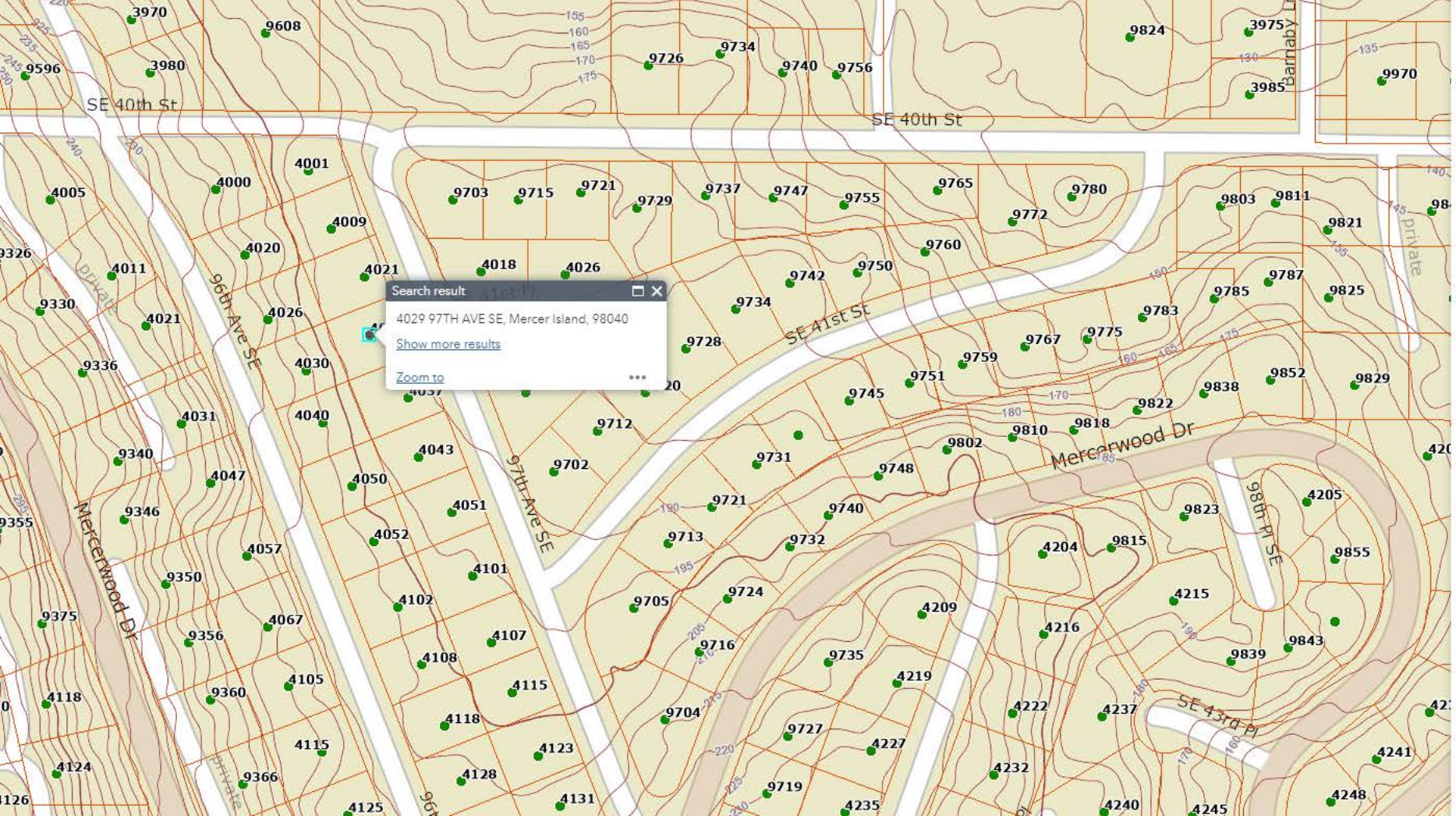
YARD CALCULATIONS

REAR YARD = 25 FEET REQUIRED
REAR YARD = 25'

FRONT YARD = 20 FEET REQUIRED
FRONT YARD = 20'

SIDE YARD = 15 FEET SUM REQUIRED
SIDE YARD = X'

MAX HEIGHT = 30 FEET TO TOP OF HIGHEST ROOF POINT



- King County Address Points
- Property Layers
- Administrative Areas
- Electoral Districts
- Elevation Contours
- Environmentally Sensitive Areas
- Flooding info
- Groundwater
- Hydrography and Hydrology
- Landslides
- Noxious Weeds
- Parks and Trails
- Planning
- Reference Layers
- King County Roads
- Stormwater Services

Appendix B

Developed Site
Conditions and Drainage
plan & Detail

LEGEND

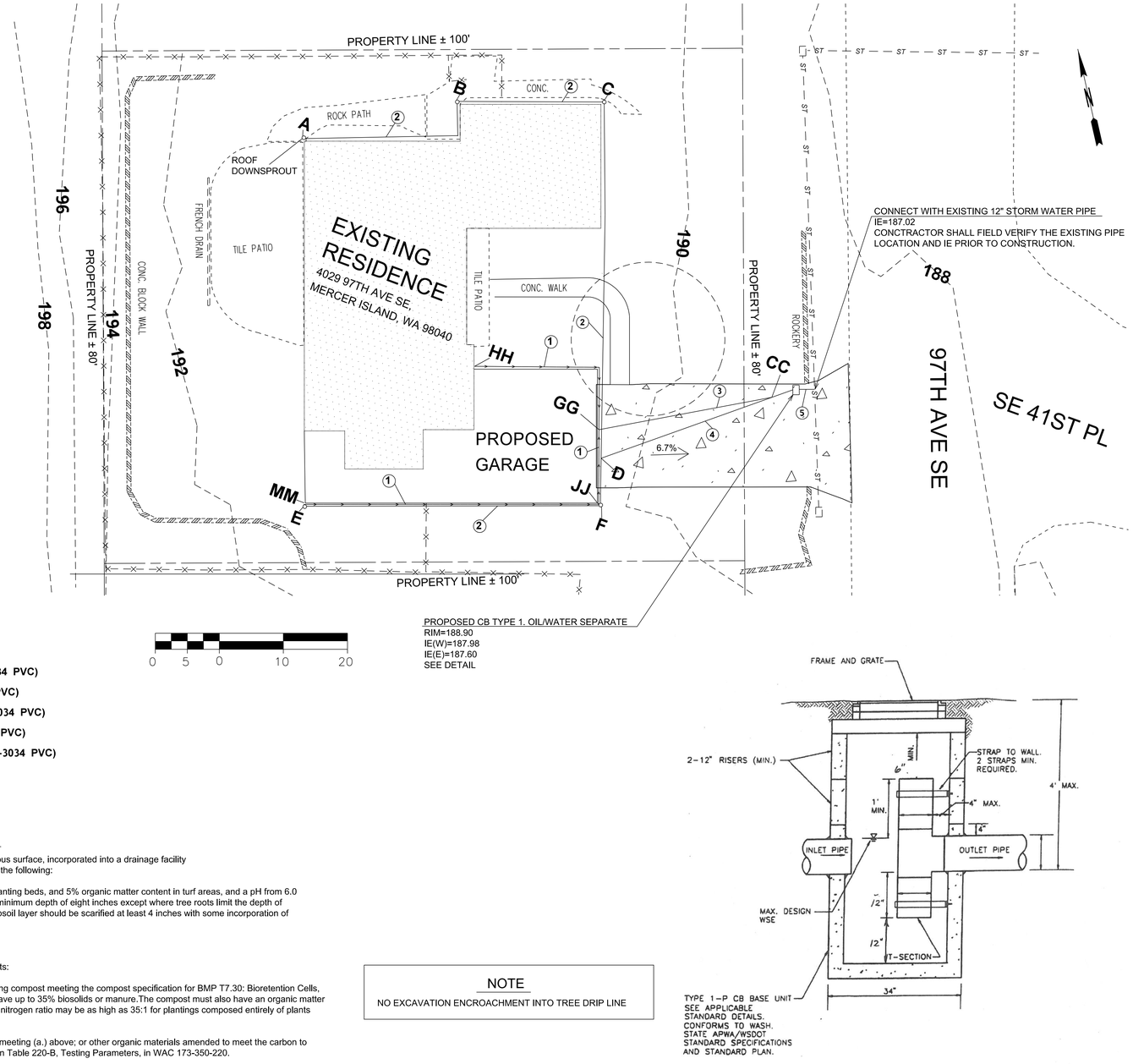
EXISTING EDGE OF PAVEMENT

EXISTING STORM LINE — ST — ST —

PROPOSED FOOTING DRAIN

EXISTING LOT LINE

TREE DRIP LINES



0 5 0 10 20

STORM DRAIN NOTES

① 4" FOOTING DRAIN MIN 1% GRADE (ASTM D-3034 PVC)
② 4" ROOF DRAIN MIN 2% GRADE (ASTM D-3034 PVC)
③ 4" STORM DRAIN, PVC, L=29.0', S=1.0%, (ASTM D-3034 PVC)
④ 4" STORM DRAIN, L=32.0', S=2.0% ((ASTM D-3034 PVC)
⑤ 6" PVC STORM DRAIN, MIN 2% GRADE (ASTM D-3034 PVC)

Post Construction Soil Quality

All areas subject to clearing and grading that have not been covered by impervious surface, incorporated into a drainage facility or engineered as structure fill or slope shall, at project completion, demonstrate the following:

1. A topsoil layer with a minimum organic matter content of 10% dry weight in planting beds, and 5% organic matter content in turf areas, and a pH from 6.0 to 8.0 or matching the pH of the undisturbed soil. The topsoil layer shall have a minimum depth of eight inches except where tree roots limit the depth of incorporation of amendments needed to meet the criteria. Subsoils below the topsoil layer should be scarified at least 4 inches with some incorporation of the upper material to avoid stratified layers, where feasible.

2. Mulch planting beds with 2 inches of organic material

3. Use compost and other materials that meet these organic content requirements:

a. The organic content for "pre-approved" amendment rates can be met only using compost meeting the compost specification for BMP T7.30: Bioretention Cells, Swales, and Planter Boxes (p.959), with the exception- that the compost may have up to 35% biosolids or manure.The compost must also have an organic matter content of 40% to 65%, and a carbon to nitrogen ratio below 25:1.The carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.

b. Calculated amendment rates may be met through use of composted material meeting (a.) above; or other organic materials amended to meet the carbon to nitrogen ratio requirements, and not exceeding the contaminant limits identified in Table 220-B, Testing Parameters, in WAC 173-350-220.

Maintenance

1. Establish soil quality and depth toward the end of construction and once established, protect from compaction, such as from large machinery use, and from erosion.
2. Plant vegetation and mulch the amended soil area after installation.
3. Leave plant debris or its equivalent on the soil surface to replenish organic matter.
4. Reduce and adjust, where possible, the use of irrigation, fertilizers, herbicides and pesticides, rather than continuing to implement formerly established practices.

NOTE

NO EXCAVATION ENCROACHMENT INTO TREE DRIP LINE

CATCH BASIN TYPE I WITH OIL/WATER SEPARATED

NTS

ROOF DRAIN

ELE.POINT	INVERT	LENGTH	S
A	191	30	2.0%
B	190.4	25	2.0%
C	189.9	64	2.0%
D	188.62	32	2.0%
CB	187.98		
E	190.6	46	4.0%
F	188.8	8	2.0%
D	188.62		

PERFORATED FOOTING DRAIN

ELE.POINT	INVERT	LENGTH	S
MM	189.0	46	1%
JJ	188.5	12	1%
GG	188.4	29	1%
CC	188.1		
HH	189.0	30	
GG	188.4		2.0%

811 Know what's below. Call before you dig.

EXISTING UTILITIES ARE FOR REFERENCE ONLY.
CONTRACTOR SHALL FIELD VERY ALL EXISTING UTILITIES TO AVOID CONFLICTS.

FIELD BOOK:
SURVEYED:
SURVEY BASE MAP:
DESIGN ENTERED: J.W
DESIGNED S.W
CHECKED: S.W

SHAO MIN WU STATE OF WASHINGTON 36855 REGISTERED PROFESSIONAL ENGINEER

TANDEM ENGINEERING CONSULTANT INC
8822 NE 178TH ST
BOTHELL, WA 98011
(206) 795-5674

DRAINAGE & GRADATION PLAN

ATWAL'S RESIDENCE
4029 97TH AVE SE
MERCER ISLAND WA 98040

SHEET 3 OF 4 SHEETS

C-3.00

Appendix C

TESC Plan and Details

Appendix D

Catch Basin Maintenance
Standards

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

Table I-3.2: The List Approach for MR5 Compliance

List #1 (For MR #1 - #5 Projects That Are Not Flow Control Exempt)	List #2 (For MR #1 - #9 Projects That Are Not Flow Control Exempt)	List #3 (For Flow Control Exempt Projects)
Surface Type: Lawn and Landscaped Areas		
BMP T5.13: Post-Construction Soil Quality and Depth	BMP T5.13: Post-Construction Soil Quality and Depth	BMP T5.13: Post-Construction Soil Quality and Depth
Surface Type: Roofs		
1. BMP T5.30: Full Dispersion or BMP T5.10A: Downspout Full Infiltration	1. BMP T5.30: Full Dispersion or BMP T5.10A: Downspout Full Infiltration	1. BMP T5.10A: Downspout Full Infiltration
2. BMP T5.14: Rain Gardens or BMP T7.30: Bioretention	2. BMP T7.30: Bioretention	2. BMP T5.10B: Downspout Dispersion Systems
3. BMP T5.10B: Downspout Dispersion Systems	3. BMP T5.10B: Downspout Dispersion Systems	3. BMP T5.10C: Perforated Stub-out Connections
4. BMP T5.10C: Perforated Stub-out Connections	4. BMP T5.10C: Perforated Stub-out Connections	
Surface Type: Other Hard Surfaces		
1. BMP T5.30: Full Dispersion	1. BMP T5.30: Full Dispersion	BMP T5.12: Sheet Flow Dispersion or BMP T5.11: Concentrated Flow Dispersion
2. BMP T5.15: Permeable Pavements or BMP T5.14: Rain Gardens or BMP T7.30: Bioretention	2. BMP T5.15: Permeable Pavements	
3. BMP T5.12: Sheet Flow Dispersion or BMP T5.11: Concentrated Flow Dispersion	3. BMP T7.30: Bioretention	
	4. BMP T5.12: Sheet Flow Dispersion or BMP T5.11: Concentrated Flow Dispersion	
Notes for using the List Approach: 1. Size BMP T5.14: Rain Gardens and BMP T7.30: Bioretention used in the List Approach to have a minimum horizontal projected surface area below the overflow which is at least 5% of the area drain-		

Table I-3.2: The List Approach for MR5 Compliance (continued)

List #1 (For MR #1 - #5 Projects That Are Not Flow Control Exempt)	List #2 (For MR #1 - #9 Projects That Are Not Flow Control Exempt)	List #3 (For Flow Control Exempt Projects)
ing to it. 2. When the designer encounters BMP T5.15: Permeable Pavements in the List Approach, it is not a requirement to pave these surfaces. Where pavement is proposed, it must be permeable to the extent feasible unless BMP T5.30: Full Dispersion is employed.		

Objective

The objective of On-Site Stormwater Management is to use practices distributed across a development that reduce the amount of disruption of the natural hydrologic characteristics of the site.

Competing Needs Criteria

LID BMPs can be superseded or restricted where they are in conflict with:

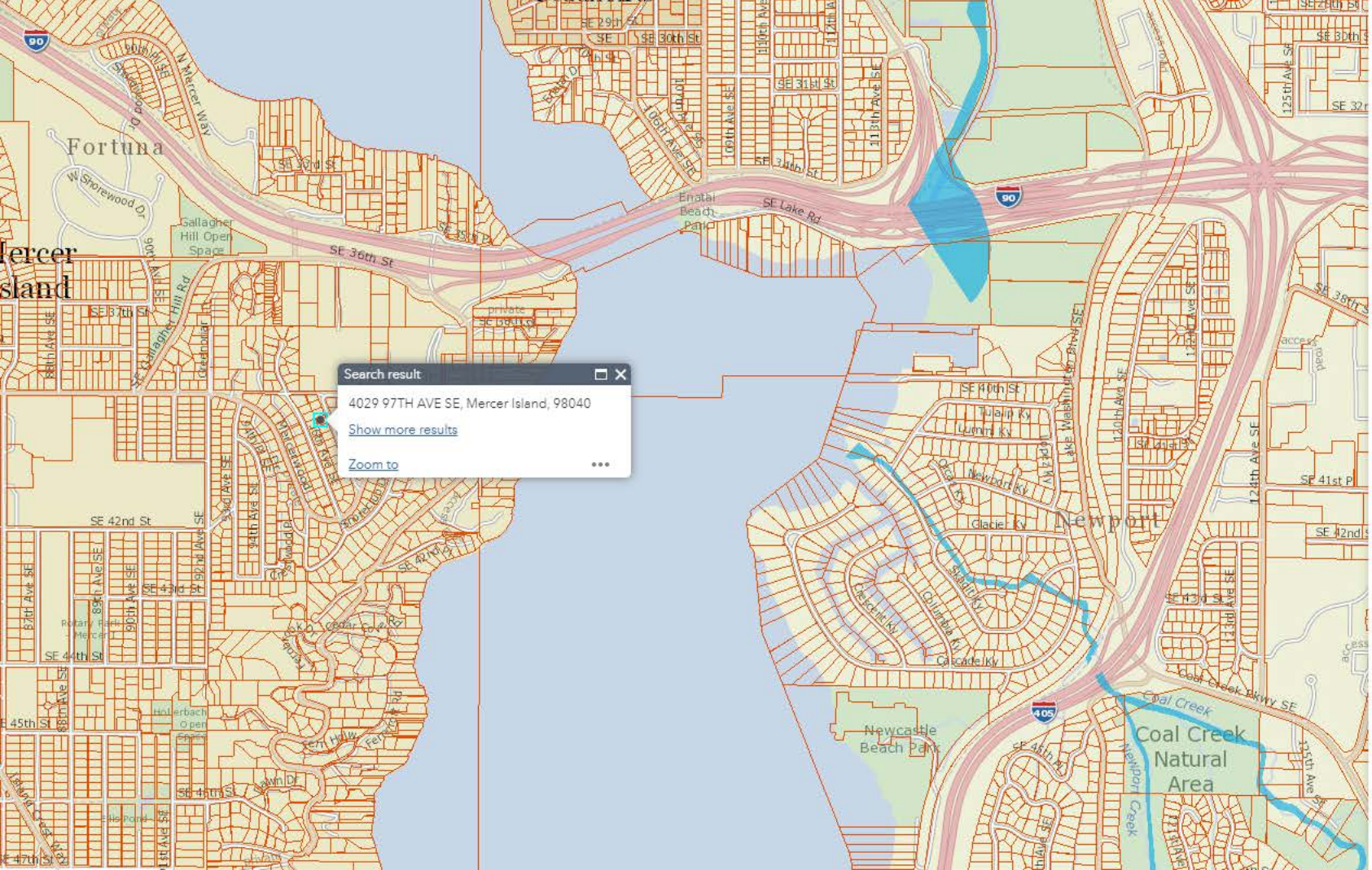
- Requirements of the following federal or state laws, rules, and standards:
  - Historic Preservation Laws and Archaeology Laws as listed at https://dahp.wa.gov/project-review/preservation-laws,
  - Federal Superfund or Washington State Model Toxics Control Act,
  - Federal Aviation Administration requirements for airports,
  - Americans with Disabilities Act.
- When an LID requirement has been found to be in conflict with special zoning district design criteria adopted and being implemented pursuant to a community planning process. The existing local codes may supersede or reduce the LID requirement.
- Public health and safety standards (e.g. active zone of a skate park, bike park, or sport court where permeable pavement violates safety standards).
- Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way.
- A local Critical Area Ordinance that provides protection of tree species.
- A local code or rule adopted as part of a Wellhead Protection Program established under the Federal Safe Drinking Water Act; or adopted to protect a Critical Aquifer Recharge Area established under the State Growth Management Act.

Supplemental Guidelines

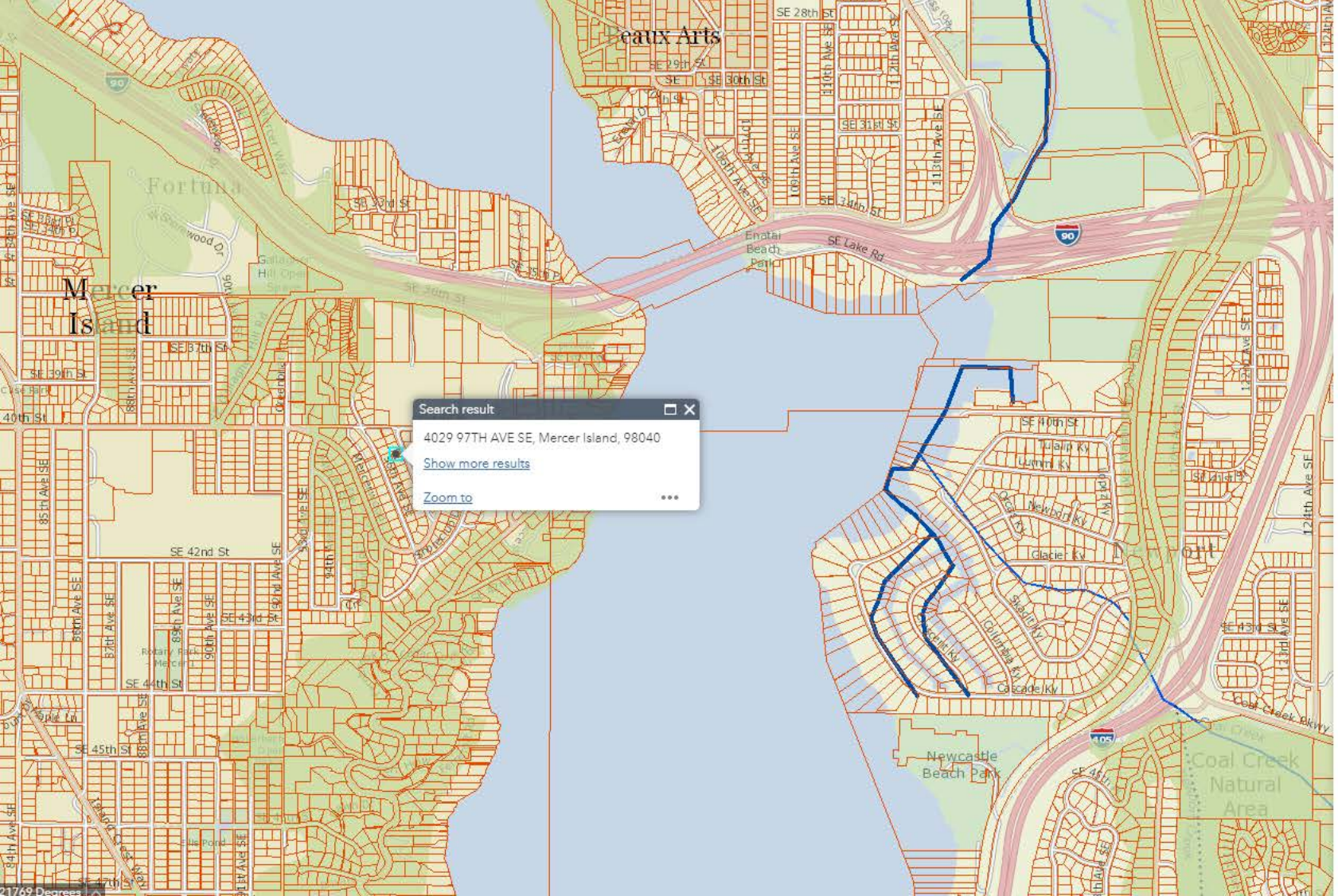
In order to meet the LID Performance Standard, designers may use any Flow Control BMP in the SWMMWW. There are no specific Flow Control BMPs that must be used to meet the LID Performance Standard.

Appendix E

Sensitive Areas Map



- Environmentally Sensitive Areas
- Flooding info
  - River gages
  - Flood photos
  - River miles from flood patrol map book
  - River facilities
  - Flood phases
  - Elevation certificates
  - Letter of Map Amendment and Revisions
  - FEMA cross-sections
  - FEMA FIRM panels
  - FEMA floodway
  - FEMA 100 year floodplain
  - FEMA 500 year floodplain
  - FEMA area with reduced risk due to levee
  - Regulatory floodplain
  - King County sea level rise risk area
- Groundwater


Search result
4029 97TH AVE SE, Mercer Island, 98040
Show more results
Zoom to
Beaux Arts
Mercer Island
Fortuna
Enatai Beach Park
SE Lake Rd
SE 40th St
SE 42nd St
SE 44th St
SE 45th St
Newcastle Beach Park
Coal Creek Natural Area
Coal Creek Pkwy
Elevation Contours
Environmentally Sensitive Areas
Tributary basins (2005 CAO)
Potential landslide hazard areas (2016, see explanation--->)
Potential landslide hazard areas 50-foot buffer (2016)
Landslide hazards, incorporated KC (1990)
Potential steep slope hazard areas (2016, see explanation--->)
Basin condition (2005 CAO)
Shoreline condition (2005 CAO)
Erosion hazard (1990 SAO)
Seismic hazard (1990 SAO)
Coal mine hazard (1990 SAO)
Stream (1990 SAO)
class 1
class 2 perennial
class 2 salmonid
class 3
unclassified
Wetland (1990 SAO)
Sensitive area notice on title
Chinook distribution

Appendix F

Geotechnical Report

NELSON GEOTECHNICAL
ASSOCIATES. INC.

17311-135th Ave. N.E. Suite A-500
Woodinville, WA 98072
(425) 486-1669
www.nelsongeotech.com

November 29, 2022

Avneet Atwal
Via Email: avneetatwal@gmail.com

Geotechnical Engineering Evaluation
Atwal Residence Addition
4029 – 97th Avenue SE
Mercer Island, Washington
NGA File No. 1408122

Dear Avneet:

We are pleased to submit the attached report titled ***"Geotechnical Engineering Evaluation – Atwal Residence Addition – 4029 - 97th Avenue SE – Mercer Island, Washington."*** Our services were completed in general accordance with the proposal signed by you on October 17, 2022.

The property is currently occupied with a single-family residence. Site topography is relatively level and includes a block retaining wall on the western property line and a rockery on the eastern property line. We understand that you plan to add a second story and attached garage to the existing residence structure.

It is our opinion that the planned development is feasible from a geotechnical standpoint, provided that our recommendations are incorporated into the design and construction of this project. Specifically, the report includes recommendations for foundations, erosion control, and drainage.

We should be retained to review and comment on final development plans, provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork and foundation installation activities comply with contract plans and specifications.

It has been a pleasure to provide service to you on this project. Please contact us if you have any questions regarding this report or require further information.

Sincerely,

NELSON GEOTECHNICAL ASSOCIATES, INC.

Khaled M. Shawish, PE
Principal

TABLE OF CONTENTS

LIST OF FIGURES

Geotechnical Engineering Evaluation
Atwal Residence Addition
4029 – 97th Avenue SE
Mercer Island, Washington

INTRODUCTION

This report presents the results of our geotechnical engineering investigation and evaluation of the proposed Atwal residence addition project located at **4029 – 97th Avenue SE on Mercer Island, Washington,** as shown on the Vicinity Map in Figure 1. The purpose of this study is to explore and characterize the site's surface and subsurface conditions and to provide geotechnical recommendations for the proposed site development.

The property is rectangular in shape and covers 0.18 acres in area. The property is currently occupied with a single-family residence in the central portion and a paved driveway in the northeast corner. The existing residence is a one-story structure. Topographically the site is relatively level but includes a block retaining wall on the western side of the site and a rockery on the eastern side of the site.

We understand that development plans indlude a second story addition to the existing residence structure, as well as an attached garage on the southern side. The City of Mercer Island has mapped landslide hazard areas and protected slopes areas within the site. The existing site layout is shown on the Schematic Site Plan in Figure 2.

SCOPE

The purpose of this study is to explore and characterize the site surface and subsurface conditions and provide opinions and recommendations for the proposed site development.

Specifically, our scope of services included the following:

1. Reviewing available soil and geologic maps of the area as well as other relevant geotechnical information, as provided.
2. Exploring the subsurface soil and groundwater conditions within the site with hand tools.
3. Mapping the conditions on the site slopes using shallow, hand-tool explorations where necessary to construct geological cross sections and qualitatively evaluate slope stability, as warranted
4. Performing laboratory grain-size sieve analysis on soil samples, as necessary.
5. Providing our opinion on the presence of geologic hazards effecting the site.

6. Providing recommendations for structure setbacks from geologic hazards, as necessary.

7. Providing recommendations for earthwork and foundation support.

8. Providing recommendations for temporary and permanent slopes.

9. Providing general recommendations for site drainage and erosion control.

10. Documenting the results of our findings, conclusions, and recommendations in a written geotechnical report.

SITE CONDITIONS

Surface Conditions

The site consists of a rectangular shaped property covering 0.18 acres in area. It is currently occupied by a single-family residence in the central portion and a paved driveway in the northeast corner. The property is bordered by 97th Avenue NE to the east and by neighboring residential properties on all other sides. Topographically, the site consists of a relatively level terrace bordered by a 3.75-foot-tall block wall on the western property line and a 2.0-foot-tall rockery on the eastern property line. Both of which appear to be in good condition Ground cover within the site consists mainly of grass yard areas bordered by mulched areas with landscaping plants. A mixture of paved and stone walkways wrap around the residence structure. We did not observe any exposed soils or signs of erosion within the site during our visit on November 11, 2022. We also did not observe any surface water within the site. However, we did observe the presence of a yard drain in the back yard.

Subsurface Conditions

Geology: The geologic units for this area are shown on the Preliminary Geologic Map of Seattle and Vicinity, Washington, by Waldron, H.H., Leisch, B.A., Mullineaux, D.R., and Crandell, D.R. (USGS, 1961). The site is mapped as older sand (Qos) with glacial till (Qt) in the near vicinity. Younger Sand is described as generally clean fine to medium sand. Glacial till is described as a mixture of sand, silt, and gravel that was deposited and subsequently overridden by an advancing glacier. Our explorations throughout the site encountered silty sand with gravel and sandy silt with gravel which is more consistent with the description of glacial till at depth.

Explorations: The subsurface conditions within the site were explored on November 11, 2022 with four hand auger explorations extending to depths of 1.0 to 2.0 feet below the existing ground surface. The approximate locations of the explorations are shown on the Schematic Site Plan in Figure 2. A geologist from Nelson Geotechnical Associates, Inc. (NGA) completed the explorations, examined the soils and geologic conditions encountered, obtained samples of the soil, and maintained logs of the explorations. The soils were visually classified in general accordance with the Unified Soil Classification System, presented in Figure 4. The logs of our explorations are presented in Figure 5. We present a brief description of the subsurface conditions in the following paragraphs. For a detailed description of the subsurface conditions, the exploration logs should be reviewed.

Undocumented Fill: At the surface of Hand Augers One and Three we encountered 1.0 to 0.5 feet of gray to light brown, silty fine to course sand, with varying amounts of organics, gravel, roots, and iron oxide weathering that we interpreted as undocumented fill soils. At the surface of Hand Auger Two and Four and beneath the initial layer of fill soils in Hand Auger One we encountered dark brown, fine to course silty sand with trace gravel and trace iron oxide weathering that we interpreted to be undocumented fill soils. Beneath the initial layer of fill soils in Hand Auger Three we encountered granular gravel with silt that we also interpreted as undocumented fill. Hand Auger Three was terminated within undocumented fill soils at a depth of 1.0 foot below the existing ground surface.

Glacial Till: Underlying the surficial fill soils in Hand Auger One we encountered gray, silty fine to course sand with gravel with trace iron oxide weathering that we interpreted as native glacial till soils at depth. Underlying the surficial fill soils in Hand Augers Two and Four we encountered gray brown to blue gray fine to medium sandy silt with iron oxidation weathering and trace gravel that we interpreted as native glacial till soils. Hand Augers One, Two, and Four were terminated within native soils at depths of 2.0 feet below the existing ground surface.

Hydrogeologic Conditions

Groundwater seepage was encountered at a depth of 1.0 foot below the existing ground surface within Hand Auger Four. We interpreted this seepage to be perched water. Perched water occurs when surface water infiltrates through less dense, more permeable soils and accumulates on top of a relatively low permeability material. Perched water does not represent a regional groundwater "table" within the upper soil horizons. Perched water tends to vary spatially and is dependent upon the amount of rainfall. We would expect the amount of perched groundwater to decrease during drier times of the year and increase during wetter periods.

SENSITIVE AREA EVALUATION

Seismic Hazard

We reviewed the 2018 International Building Code (IBC) for seismic site classification for this project. Since competent glacial soils were encountered at depth within the subject site, the site conditions best fit the IBC description for Site Class D. **Table 1** below provides seismic design parameters for the site that are in conformance with the 2018 IBC, which specifies a design earthquake having a two percent probability of occurrence in 50 years (return interval of 2,475 years).

Table 1 – 2018 IBC Seismic Design Parameters

Site Class	Spectral Acceleration at 0.2 sec. (g) S_s	Spectral Acceleration at 1.0 sec. (g) S_1	Site Coefficients		Design Spectral Response Parameters	
			F_a	F_v	S_{DS}	S_{D1}
D	1.406	0.489	1.200	null	1.124	null

The spectral response accelerations were obtained from the PSHPD Seismic Design Maps website (ASCE 7-16 data) for the project latitude and longitude. Hazards associated with seismic activity include liquefaction potential and amplification of ground motion. Liquefaction is caused by a rise in pore pressures in a loose, fine sand deposit beneath the groundwater table. It is our opinion that the medium dense or better glacial deposits interpreted to underlie the site have a low potential for liquefaction or amplification of ground motion.

Erosion Hazard

The criteria used for determination of the erosion hazard for affected areas include soil type, slope gradient, vegetation cover, and groundwater conditions. The erosion sensitivity is related to vegetative cover and the specific surface soil types, which are related to the underlying geologic soil units. The Natural Resources Conservation Service (NRCS) map of the King County area lists the soils on this site as Kitsap silt loam, 8 to 15 percent slopes. The soils survey lists the erosion hazard for these soils as severe in areas where soils are exposed. Based on our observations and the material encountered, we would interpret this site as having a low to moderate erosion hazard where the surficial soils remain vegetated and not disturbed.

Landslide Hazard

The criteria used for evaluation of landslide hazards include soil type, slope gradient, and groundwater conditions. Topographically, the site consists of a relatively level terrace supported by a 2.0-foot-tall rockery along the eastern property line and bordered by a 3.75-foot-tall block wall along the western property line. Both of which appeared to be in good condition.

The City of Mercer Island has mapped a landslide hazard within the development portion of the site. Upon review of the Mercer Island City Code (MICC), we have determined that the site does not contain a landslide hazard as defined by MICC 19.16.010.L due to a lack of measurable inclinations and no history of landslides or other similar ground movement within the site. The city of Mercer Island has also mapped a protected slope area on the western side of the site. MICC 19.16.010.P defines a protected slopes area as "Any area within a 40-foot radius of the base of the subject tree if there is any point within that area that is at least 12 feet higher or lower than the base of the tree." In our opinion there is no protected slope areas within the development portion of the site due to the total change in elevation across the site being less than 6.0 feet. However, we should note that since our explorations were restricted to the subject site there may be protected slope areas within other portions of the site due to conditions on neighboring properties.

Proper site grading and drainage, as recommended in this letter, should help maintain current stability conditions. No surface water or springs were observed within the site on our visit on November 11, 2022. We also did not observe any signs or erosion or exposed soils during our visit.

CONCLUSIONS AND RECOMMENDATIONS

General

It is our opinion that the planned second story and garage additions are feasible from a geotechnical standpoint. Our explorations within the proposed addition area and around the existing foundations encountered medium dense to dense native glacial soils at shallow depths. In our opinion, that existing residence foundations are in good condition and likely supported on competent bearing material. A structural engineer should, however, confirm the condition of the existing foundations. We recommend that all new foundations be conventional shallow spread footing supported on competent native glacial till or structural fill extending down to these soils. These soils should be encountered roughly 0.5 to 1.5 feet below the existing ground surface. We should note that deeper areas of loose or unsuitable soils may be encountered in unexplored areas of the site. If these conditions are encountered during construction, they may require over excavation. Further detail and recommendations regarding foundations is provided in the **Foundation** subsection of this report.

The surficial soils encountered on this site are considered moisture-sensitive and will disturb easily when wet. To lessen the potential impacts of construction on the slope and to reduce cost overruns and delays, we recommend that construction take place during the drier summer months. If construction takes place during the rainy months, additional expenses and delays should be expected. Additional expenses could include additional erosion control and temporary drainage measures, placement of a blanket of rock spalls to protect exposed subgrades, and the need for importing all-weather materials for structural fill

Erosion Control

The erosion hazard for the on-site soils is considered to be severe in areas where there is disturbance, but the actual hazard will be dependent on how the site is graded and how water is allowed to concentrate. Best Management Practices (BMPs) should be used to control erosion. Areas disturbed during construction should be protected from erosion. Erosion control measures may include diverting surface water away from the stripped or disturbed areas. Silt fences and/or straw bales should be erected to prevent muddy water from leaving the site. Stockpiles should be covered with plastic sheeting during wet weather. Disturbed areas should be planted as soon as practical, and the vegetation should be maintained until it is established. The erosion potential for areas not stripped of vegetation should be low to moderate. Replacement of vegetation should be performed in accordance with City of Mercer Island code. In areas that are disturbed during or after construction, planting, hydroseeding, and/or straw mulching are effective ways to minimize erosion and allow vegetation to be re-established rapidly.

Site Preparation and Grading

After erosion control measures are implemented, site preparation should consist of removing loose soils, topsoil, and any undocumented fill from foundations, slab, and pavement areas, to expose medium dense or better native soils at depth. The stripped soil should be removed from the site or stockpiled for later use as a landscaping fill. Based on our observations, we anticipate native, medium dense or better soil to be encountered at approximately 0.5 to 1.5 feet below the existing ground surface. We should note that additional deeper areas of unsuitable soils and/or undocumented fill could be encountered in unexplored areas of the site. This condition, if encountered, would require deeper excavations in foundation, slab, and pavement areas to remove the unsuitable soils.

After site preparation, if the exposed subgrade is deemed loose, it should be compacted to a non-yielding condition and then proof-rolled with a heavy rubber-tired piece of equipment. Areas observed to pump or weave during the proof-roll test should be reworked to structural fill specifications or over-excavated and replaced with properly compacted structural fill or rock spalls. If loose soils are encountered in the foundation areas, the loose soils should be removed and replaced with rock spalls. If significant surface water flow is encountered during construction, this flow should be diverted around areas to be developed, and the exposed subgrades should be maintained in a semi-dry condition.

If wet conditions are encountered, alternative site grading techniques might be necessary. These could include using large excavators equipped with wide tracks and a smooth bucket to complete site grading, and by covering exposed subgrade with a layer of crushed rock for protection. If wet conditions are encountered or construction is attempted in wet weather, fine-grained subgrade soils should not be compacted, as this could cause further subgrade disturbance. In wet conditions, it may be necessary to cover the exposed subgrade with a layer of crushed rock as soon as it is exposed to protect the moisture sensitive soils from disturbance by machine or foot traffic during construction. The prepared subgrade should be protected from construction traffic and surface water should be diverted around areas of prepared subgrade.

Temporary and Permanent Slopes

Temporary cut slope stability is a function of many factors, including the type and consistency of soils, depth of the cut, surcharge loads adjacent to the excavation, length of time a cut remains open and the presence of surface or groundwater. It is exceedingly difficult under these variable conditions to estimate a stable, temporary, cut slope angle. Therefore, it should be the responsibility of the contractor to maintain safe slope configurations since they are continuously at the job site, able to observe the nature and condition of the cut slopes, and able to monitor the subsurface materials and groundwater conditions encountered.

The following information is provided solely for the benefit of the owner and other design consultants and should not be construed to imply that Nelson Geotechnical Associates, Inc. assumes responsibility for job site safety. Job site safety is the sole responsibility of the project contractor.

For planning purposes, we recommend that temporary cuts in the on-site soils be no steeper than 1 Horizontal to 1 Vertical (1H:1V). If significant groundwater seepage or surface water flow were encountered, we would expect that flatter inclinations would be necessary. We recommend that cut slopes be protected from erosion. The slope protection measures may include covering cut slopes with plastic sheeting and diverting surface runoff away from the top of cut slopes. We do not recommend vertical slopes for cuts deeper than four feet if worker access is necessary. We recommend that cut slope heights and inclinations conform to appropriate OSHA/WISHA regulations. Permanent cuts should not be steeper than 2H:1V.

Foundations

We recommend any new foundations be supported on conventional shallow spread foundations placed on undisturbed medium dense or better native soils. Based on our subsurface explorations we anticipate that medium dense soils should be encountered 0.5 to 1.5 feet below the existing ground surface. Where undocumented fill or less dense soils are encountered at footing bearing elevation, the subgrade should be over-excavated to expose suitable bearing soil. New footings should be embedded a minimum of 18 inches below the lowest adjacent finished ground surface for frost protection and bearing capacity considerations. Foundations should be designed in accordance with the 2018 IBC. Footing widths should be based on the anticipated loads and allowable soil bearing pressure. Water should not be allowed to accumulate in footing trenches. All loose or disturbed soil should be removed from the foundation excavation prior to placing concrete. We should be retained to evaluate the foundation subgrade soils and embedment depths prior to placing foundation forms.

For new foundations constructed as outlined above, we recommend an allowable design bearing pressure of not more than 2,000 pounds per square foot (psf) be used for the footing design for footings founded on the medium dense or better native soils or structural fill extending to the native competent material. The foundation bearing soil should be evaluated by a representative of NGA. We should be consulted if higher bearing pressures are needed. Current IBC guidelines should be used when considering increased allowable bearing pressure for short-term transitory wind or seismic loads. Potential foundation settlement using the recommended allowable bearing pressure is estimated to be less than one inch total and ½-inch differential between adjacent footings or across a distance of about 20 feet, based on our experience with similar projects.

The existing residence foundations appear to be performing well and are likely supported on competent native soils. We expect that the competent native soils supporting the existing foundations should provide foundation design bearing capacities of 2,000 psf. If any loads from the proposed reconstruction will be supported by existing foundations, we recommend that the structural engineer evaluate the existing foundation design and confirm that the existing residence foundation can support the new loads. If additional foundation support is deemed necessary, we recommend existing foundations be widened to provide adequate support for planned loads. Depending on the actual loading on the existing foundations, additional settlement of up to 1.0 inch could be experienced by the existing foundations.

Structural Fill

General: Fill placed beneath foundations, pavement, or other settlement-sensitive structures should be placed as structural fill. Structural fill, by definition, is placed in accordance with prescribed methods and standards, and is monitored by an experienced geotechnical professional or soils technician. Field monitoring procedures would include the performance of a representative number of in-place density tests to document the attainment of the desired degree of relative compaction. The area to receive the fill should be suitably prepared as described in the **Site Preparation and Grading** subsection prior to beginning fill placement. Sloping areas to receive fill should be benched using a minimum 8-foot-wide horizontal benches into competent soils.

Materials: Structural fill should consist of a good quality, granular soil, free of organics and other deleterious material, and be well graded to a maximum size of about three inches. If greater than 100 cubic yards of fill is to be imported to the site, it must be accompanied by a source statement. All-weather fill should contain no more than five-percent fines (soil finer than U.S. No. 200 sieve, based on that fraction passing the U.S. 3/4-inch sieve). Due to the high silt content of the native material encountered within our explorations it is our opinion that the onsite soils are not suitable for use as structural fill. We should be retained to evaluate all proposed structural fill material prior to placement.

Fill Placement: Following subgrade preparation, placement of structural fill may proceed. All fill should be accomplished in uniform lifts up to eight inches thick. Each lift should be spread evenly and be thoroughly compacted prior to placement of subsequent lifts. All structural fill underlying building areas and pavement subgrade should be compacted to a minimum of 95 percent of its maximum dry density. Maximum dry density, in this report, refers to that density as determined by the ASTM D-1557 Compaction Test procedure. The moisture content of the soils to be compacted should be within about two percent of optimum so that a readily compactable condition exists. It may be necessary to over-excavate and

remove wet soils in cases where drying to a compactable condition is not feasible. All compaction should be accomplished by equipment of a type and size sufficient to attain the desired degree of compaction.

Slab-on-Grade

Slab-on-grade should be supported on subgrade soils prepared as described in the **Site Preparation and Grading** subsection of this report. We recommend that all floor slabs be underlain by at least six inches of free-draining gravel with less than three percent by weight of the material passing Sieve #200 for use as a capillary break. We recommend that the capillary break be hydraulically connected to the footing drain system to allow free drainage from under the slab. A suitable vapor barrier, such as heavy plastic sheeting (6-mil minimum), should be placed over the capillary break material. An additional 2-inch-thick moist sand layer may be used to cover the vapor barrier. This sand layer is optional and is intended to be used to protect the vapor barrier membrane and to aid in curing the concrete.

Pavements

Pavement subgrade preparation and structural fill, where required, should be completed as recommended in the **Site Preparation and Grading** and **Structural Fill** subsections of this report. Pavement subgrade should be proof-rolled with a heavy, rubber-tired piece of equipment, to identify soft or yielding areas that require repair. The pavement section should be underlain by a minimum of six inches of clean granular pit run or crushed rock. We should be retained to observe the proof-rolling and recommend subgrade repairs prior to placement of the asphalt or hard surfaces.

Site Drainage

Surface Drainage: All runoff generated on this site should be collected and routed into a permanent discharge system. Water should not be allowed to stand in any areas where footings, slabs, or pavements are to be constructed. Final site grades should allow for drainage away from the residence. We suggest that the finished ground be sloped at a minimum downward gradient of three percent, for a distance of at least 10 feet away from structures. Surface water should be collected by permanent catch basins and drain lines and be discharged into an approved discharge system.

Subsurface Drainage: If groundwater is encountered during construction, we recommend that the contractor slope the bottom of the excavation and collect the water into ditches and small sump pits where the water can be pumped out and routed into a permanent storm drain. We were unable to confirm the presence of footing drains around existing footings during our site visit. The presence of footing drains should be evaluated during construction and if not present they should be installed. We recommend the use of footing drains around all new and existing foundations. Footing drains should be

installed at least one foot below planned finished floor elevation. The drains should consist of a minimum 4-inch-diameter, rigid, slotted or perforated, PVC pipe surrounded by free-draining material wrapped in a filter fabric.

We recommend that the free-draining material consist of an 18-inch-wide zone of clean (less than three-percent fines), granular material placed along the back of walls. Pea gravel is an acceptable drain material. The free-draining material should extend up the wall to one foot below the finished surface. The top foot of backfill should consist of impermeable soil placed over plastic sheeting or building paper to minimize surface water or fines migration into the footing drain. Footing drains should discharge into tightlines leading to an approved collection and discharge point with convenient cleanouts to prolong the useful life of the drains. Roof drains should not be connected to wall, yard, or footing drains.

CONSTRUCTION MONITORING

We recommend that we be retained to provide construction monitoring services to evaluate conditions encountered in the field with respect to anticipated conditions, to provide recommendations for design changes should the conditions differ from anticipated, and to evaluate whether construction activities comply with contract plans and specifications.

USE OF THIS REPORT

NGA has prepared this report for **Avneet Atwal** and associated agents, for use in the planning and design of the development on this site only. The scope of our work does not include services related to construction safety precautions and our recommendations are not intended to direct the contractors' methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. There are possible variations in subsurface conditions between the explorations and also with time. Our report, conclusions, and interpretations should not be construed as a warranty of subsurface conditions. A contingency for unanticipated conditions should be included in the budget and schedule. We recommend that we be retained to review the project plans after they have been developed to determine that recommendations in the report were incorporated into project plans.

We recommend that NGA be retained to review final plans prior to construction. We also recommend that NGA be retained to provide monitoring and consultation services during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork and foundation installation activities comply with

contract plans and specifications. We should be contacted a minimum of one week prior to construction activities and could attend pre-construction meetings if requested.

Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering practices in effect in this area at the time this report was prepared. No other warranty, expressed or implied, is made. Our observations, findings, and opinions are a means to identify and reduce the inherent risks to the owner.

o-o-o

It has been a pleasure to provide service to you on this project. If you have any questions or require further information, please call.

Sincerely,

NELSON GEOTECHNICAL ASSOCIATES, INC.

Sarah L. Dunn
Staff Geologist II

11.29.2022

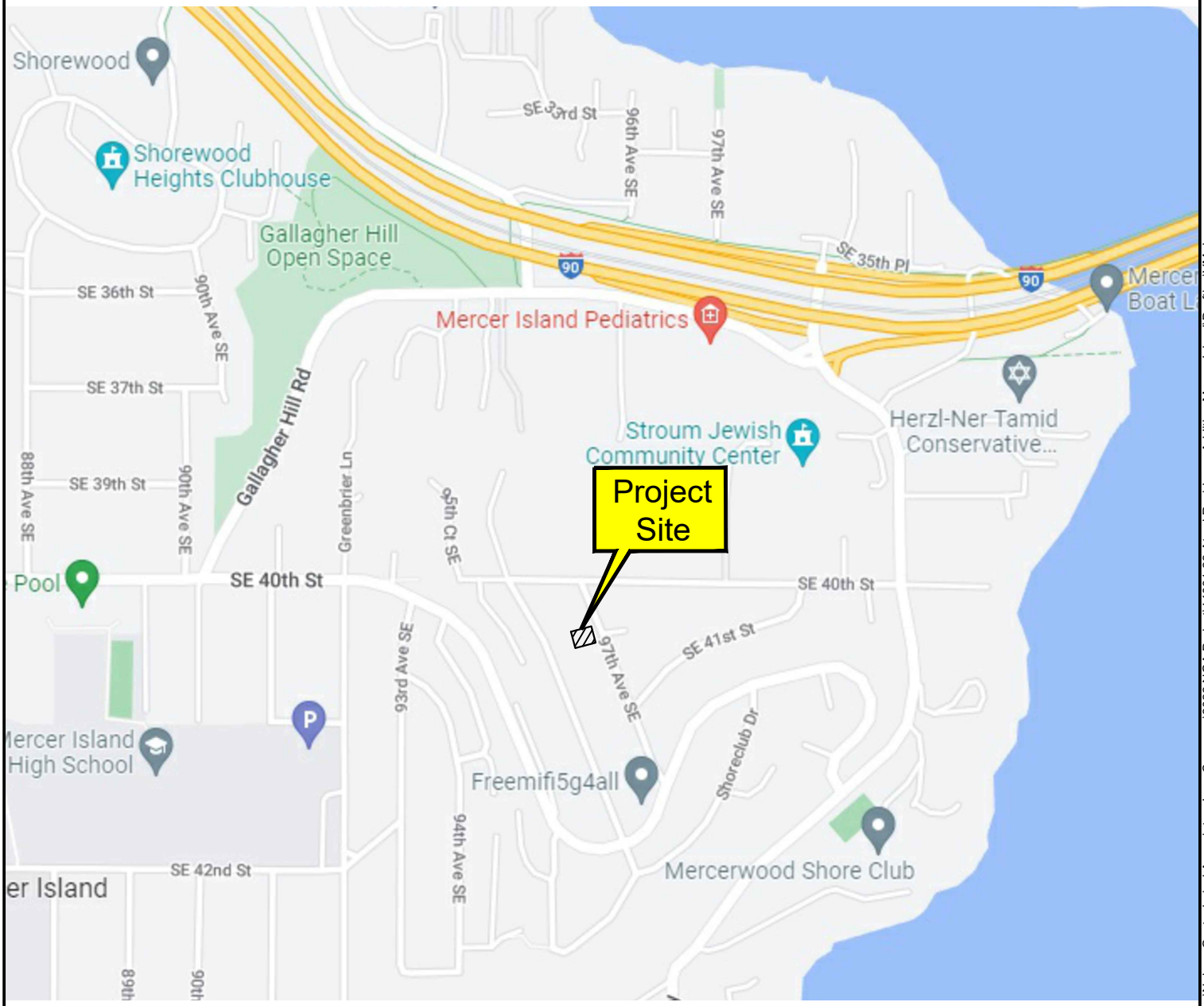
Khaled M. Shawish, PE
Principal

SLD:KMS:dy

Five Figures Attached

VICINITY MAP

Not to Scale



Mercer Island, WA

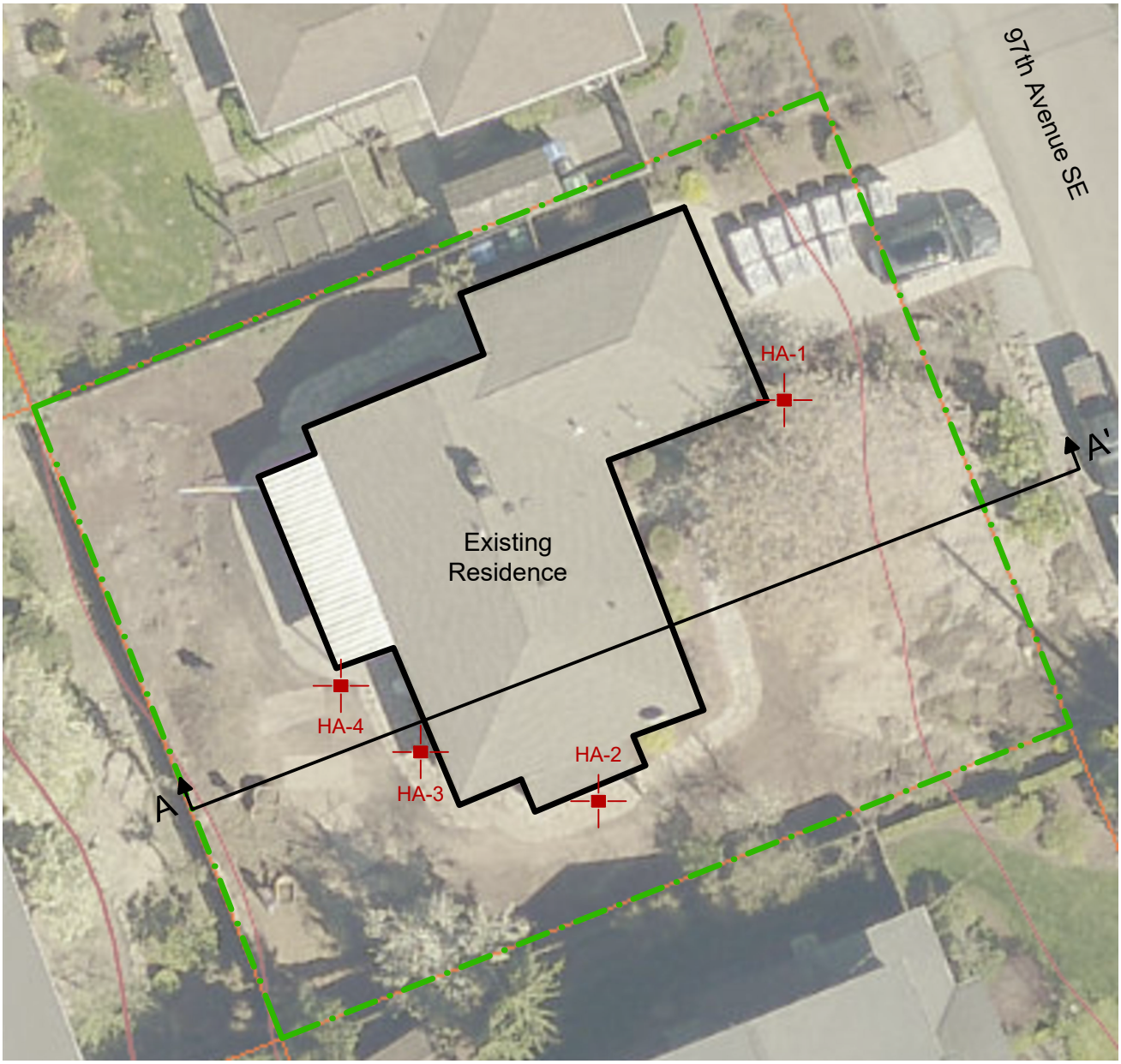
Project Number	Atwal Residence Addition Vicinity Map	NELSON GEOTECHNICAL ASSOCIATES, INC	No.	Date	Revision	By	CK
1408122			1	11/9/22	Original	FKS	SLD
Figure 1		

Woodinville Office
17311-135th Ave. NE, A-500
Woodinville, WA 98072
(425) 486-1669 / Fax: 481-2510

Wenatchee Office
105 Palouse St.
Wenatchee, WA 98801
(509) 665-7696 / Fax: 665-7692

www.nelsongeotech.com

Site Plan



LEGEND

Property line

HA-1

Number and approximate location of hand auger

A A'

Approximate location of cross-section

0 20 40

Scale: 1 inch = 20 feet

Reference: Site Plan based on field measurements, observations, and aerial parcel map review.

Project Number	Atwal Residence Addition Site Plan
1408122	
Figure 2	

NELSON GEOTECHNICAL ASSOCIATES, INC

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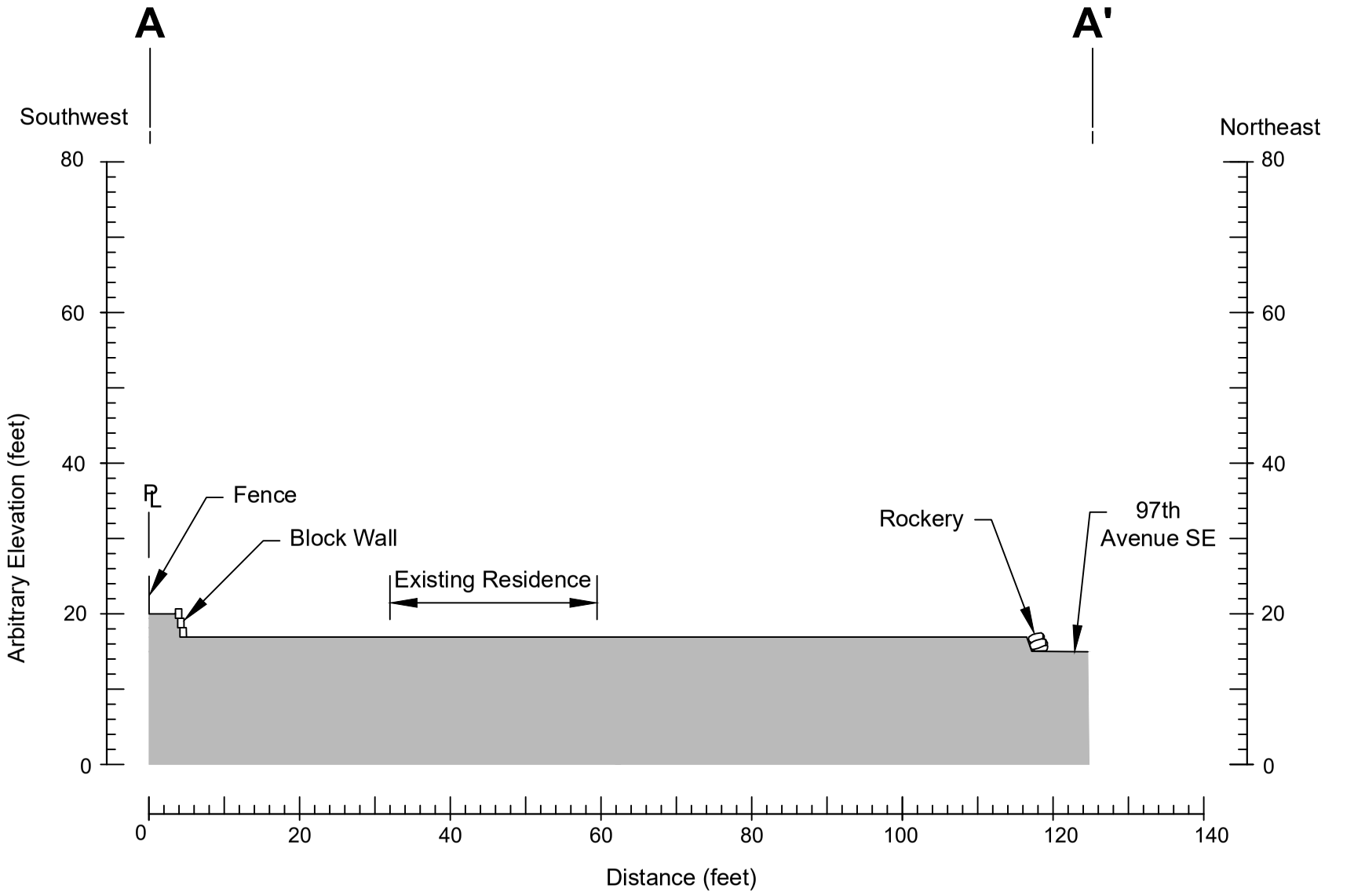
Figure 3

Project Number 1408122

Atwal Residence Addition
Cross-Section A-A'



Exploration

Test Pit Designation → TP-1

Groundwater Level During Exploration →

Geologic Contact (approximate) → ?—?

NOTES:
1) Stratigraphic conditions are interpolated between the explorations. Actual conditions may vary.
2) Elevations are arbitrary.

Reference: Cross Section is based on field measurements using a hand-held clinometer and 100-ft tape measure.

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UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE - GRAINED SOILS MORE THAN 50 % RETAINED ON NO. 200 SIEVE	GRAVEL MORE THAN 50 % OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVEL	GW	WELL-GRADED, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND MORE THAN 50 % OF COARSE FRACTION PASSES NO. 4 SIEVE	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE - GRAINED SOILS MORE THAN 50 % PASSES NO. 200 SIEVE	SILT AND CLAY LIQUID LIMIT LESS THAN 50 %	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY LIQUID LIMIT 50 % OR MORE	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1) Field classification is based on visual examination of soil in general accordance with ASTM D 2488-93.

2) Soil classification using laboratory tests is based on ASTM D 2488-93.

3) Descriptions of soil density or consistency are based on interpretation of blowcount data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

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

Moist - Damp, but no visible water.

Wet - Visible free water or saturated, usually soil is obtained from below water table

Project Number	Atwal Residence Addition Soil Classification Chart	NELSON GEOTECHNICAL ASSOCIATES, INC
1408122		Woodinville Office 17311-135th Ave. NE, A-500 Woodinville, WA 98072 (425) 486-1669 / Fax: 481-2510
Figure 4		Wenatchee Office 105 Palouse St. Wenatchee, WA 98801 (509) 665-7696 / Fax: 665-7692
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LOG OF EXPLORATION

DEPTH (FEET)	USCS	SOIL DESCRIPTION
HAND AUGER ONE		
0.0 – 1.0		MULCH UNDERLAIN BY GRAY TO LIGHT BROWN, SILTY, ORGANIC RICH FINE TO MEDIUM SAND WITH WOOD CHIPS, CONCRETE DEBRIS, ROOTS, AND GRAVLE (LOOSE, DRY TO MOIST) (**TOPSOIL**)
1.0 – 1.5		BROWN, SILTY FINE TO COURSE SAND WITH TRACE IRON OXIDATION WEATHERING, WOOD CHIPS, ROOTS, AND GRAVEL (DENSE, DRY TO MOIST) (**UNDOCUMENTED FILL**)
1.5 – 2.0	SM	GRAY SILTY FINE TO COURSE SAND WITH GRAVEL AND TRACE IRON OXIDATION WEATHERING (TO DENSE TO VERY DENSE, DRY TO MOIST)
		SAMPLES WERE COLLECTED AT 1.5 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED CAVING WAS NOT ENCOUNTERED HAND AUGER MET REFUSAL AT 2.0 FEET ON 11/8/22
HAND AUGER TWO		
0.0 – 1.0		DARK BROWN, SILTY FINE TO COURSE SAND WITH TRACE GRAVEL AND TRACE IRON OXIDATION WEATHERING (LOOSE, MOIST) **(UNDOCUMENTED FILL)**
1.0 – 2.0	SC - ML	GRAY TO GRAY BROWN, FINE TO MEDIUM SANDY SILT WITH TRACE GRAVEL AND IRON OXIDATION WEATHERING (DENSE TO VERY DENSE, MOIST)
		SAMPLES WERE COLLECTED AT 1.5 FEET GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED CAVING WAS NOT ENCOUNTERED HAND AUGER WAS COMPLETED AT 2.0 FEET ON 11/8/22
HAND AUGER THREE		
0.0 – 0.5		MULCH UNDERLAIN BY GRAY TO LIGHT BROWN, FINE TO COARSE SILTY SAND WITH TRACE GRAVEL AND TRACE IRON OXIDATION WEATHERING (LOOSE TO MEDIUM DENSE, MOIST) **(UNDOCUMENTED FILL)**
0.5 – 1.0	ML	GRAY, GRANUALR GRAVEL WITH SILT (LOOSE, MOIST) **(UNDOCUMENTED FILL)**
		SAMPLES WERE NOT COLLECTED GROUNDWATER SEEPAGE WAS NOT ENCOUNTERED CAVING WAS NOT ENCOUNTERED HAND AUGER MET REFUSAL AT 1.0 FEET ON 11/8/22
HAND AUGER FOUR		
0.0 – 0.5		DARK BROWN, FINE TO COURSE, ORANGIC RICH, SILTY SAND WITH TRACE GRAVEL AND ROOTS (LOOSE, MOIST) **(UNDOCUMENTED FILL)**
0.5 – 2.0	SC - ML	GRAY BROWN TO BLUE GRAY FINE TO MEDIUM SANDY SILT WITH IRON OXIDATION WEATHERING (DENSE TO VERY DENSE, MOIST TO WET)
		SAMPLES WERE NOT COLLECTED GROUNDWATER SEEPAGE WAS ENCOUNTERED AT 1.0 FEET CAVING WAS NOT ENCOUNTERED HAND AUGER WAS COMPLETED AT 2.0 FEET ON 11/8/22