Bruce S. MacVeigh, P.E.
Civil Engineer/Small Site Geotechnical
14245 59th Ave. S.
Tukwila, WA 98168
Cell: 206-571-8794

February 16, 2025

Subject: GEOTECHNICAL REPORT, Existing Parcel, 9756 S.E. 40th Street, Mercer Island, WA 98040 (PN: 265550-0167) (Client: Danny Tran)

General:

The purpose of this report is to evaluate the soils on the above property for general construction considerations, for storm drainage infiltration, for stability of existing slopes on the site and for erosion characteristics. While this office is providing general geotechnical information, the formal engineering design work for future development will be by others.

The likely future use of the site is a remodel and second-story addition to the existing single-family residence. Specifics of future site layout are not determined at this time, however it is assumed that the existing building footprint will not significantly change. The parcel at present has an existing older single-family residence constructed in 1957, the subject of the remodel/addition. The remainder is residential lawn area, limited landscaping and an original concrete driveway. The site is in an established single family neighborhood, and water and sewer service are available.

The site area is approximately 7,700 square feet or 0.18 acres. The site is located on the northwest corner of the intersection of S.E. 40th Street, which is a public street, and 97th Avenue S.E., which is a private street. The site is referenced as being on the north side of 97XX block of S.E. 40th Street. The site is in the northeast area of Mercer Island and is approximately one-quarter mile south of I-90.

The site has original lawn around the residence, with limited landscaping. The house is undergoing some preliminary cleanup and some lawn areas are slightly disturbed. The original concrete driveway onto 97th Avenue S.E. is in place. It has several significant trees and an assortment of smaller trees along its west and north perimeter. The original site topography was a general downslope to the east at approximately 5 percent, with a slight north downslope. During the house construction, the building area and rear yard area (west area) were leveled, with cuts from the rear filling in the house location and some front yard area. At present, the rear or west limits of the site have two original down stepped rockeries, each about three feet high. The eastern front yard area slopes down from the house location approximately three feet.

With the leveling of the house location, the south limits of the site along S.E. 40th Street were also leveled. Since S.E. 40th Street has a downslope to the east, the cut along the south side of the street has varying cut levels. (See Site Photographs). The east site frontage along 97th Avenue S.E. is relatively level.

The site frontage on both streets is gravel shoulder. Noted is that at two locations along the site's frontage on 97th Avenue S.E. are catch basins. Based on site observations, the more central catch basin receives house runoff via a 4 inch pipe, with the catch basin 12 inch outlet running east, under 97th Avenue S.E.

The existing house is one-story and is wood framed. While older, it is in good structural condition. (Noted is that there is evidence of an old concrete stemwall settlement and cracking, with the existing foundation now relatively stable.)

Soils on site are not suitable for on-site stormwater infiltration, as will be discussed below.

Based on the proposed second story building addition, significant earthwork would likely not be required to for future work on the site.

Site Geology Information - Topographic Data:

A formal field topographic survey was not available. As noted, the building site and rear yard areas are level, with the above mentioned old west area rockeries and gentle but positive downslope to the east of the front yard. (See Site Photographs)

Site Geology Information - Subsurface Data:

The source of information to evaluate subsurface soils was a set of two soil logs prepared on February 7, 2025. They were located in the rear yard of the existing house. That area showed significant surface soil saturation and was determined the most useful location in determining site soil characteristics. The log information may be considered as applying to all areas of the site, allowing for the original cut and fill work during house construction. The soil log locations are shown on the attached IMap Topographic Map.

Both logs were excavated to a depth of 42 inches, or about 3.5 feet. Encountered in each log was an upper layer of Clayey Sand, slightly mottled, underlain to depth with a Sandy Hardpan, also slightly mottled. All soils were full-depth wet or saturated. (See attached Soil Logs). Noted is that the rear yard soils represent a cut area, the soils were dense and undisturbed. However, the logs may be assumed as reasonably representing general site soil conditions.

Note that the clay-based soils inhibit infiltration. There was no identified reliable depth of soil usable as permeable soil for the site.

The soils fairly well represent a more clay-influenced soil series typical in various outlying areas of Puget Sound region uplands, particularly in upper hilly locations along the east side of Puget Sound. Per the King County Soil Survey (1973) the soils at the site are rated as Kitsap Silt Loam Association, 2% to 8% (KpB). The Kitsap Silt Loam Association is typified by a general layering of clay-influenced or based material, including clay-based hardpan. In the standard description, per Survey, the soils have a heavier clay influence in the deeper levels. (See extract from the King County Soil Survey (1973)).

The following discussion is based on encountered soils and site characteristics. The location of the rear yard logs indicates significant clay content. Since it appears that area was excavated during house construction, the more significant clay content would be expected.

Also, as noted during the visit, a front part of the house concrete foundation (along the right side) was noted as having settled, creating a significant crack about one-half way along the foundation. The likely cause of the settlement is that that front part of the foundation had clay-based fill. At the time of house construction in 1957, neither the construction techniques or equipment would have been available to properly compact the clay-based soil. (Properly compacting clay soil is notoriously difficult.) It may be reasonably assumed that after nearly 70 years, the filled soils would now have settled compaction and settlement would be largely complete.

Site Geology Information - Site History:

The site reflects the general north-south glacier carving of Puget Sound region macro-topography evident in Puget Sound, the Duwamish Valley, the Kent Valley, Lake Washington, etc. The Alderwood Association, of which this appears to consist, is based on the general shaping of previous soils by glacier to create the valley forms, with bordering upland areas. This site would be in an upland area, and has likely encountered more than one glacial compaction event, with subsequent depositional outwash. The specifics of any site in the upland area require site-specific evaluation.

The level site topography observed during site visit indicates no evidence of catastrophic slope failure. Indeed, slope failure would not be likely with the generally level site topography. Even if the site had a significant slope, failure would not be likely since the established deep clay-based soils are dense and cohesive. No areas of obvious surface erosion or tell-tale exposed surface soils were observed.

Site Geology Information - Seismic Hazard:

Seismic hazards for slopes may be comprised of either general soil saturation or classic seismic liquefaction. With general saturation, failure occurs in either a direct diagonal slippage (shear failure) or at a saturated layer of loose silts which semi-liquefy and "pour" out of their original location in the hillside. The soils of this area do not appear susceptible to this mode of failure due to the clay-based soils. While the above general cause of hillside failure is not limited to seismic movement, even a significant seismic event would likely not trigger a failure. In addition, based on site observations, there is no indication of this mode of failure occurring previously on this site or in the surrounding area. Based on the above, the possibility of slope failure by this mode of failure is low to non-existent.

The second mode of failure is caused by a water saturation of a uniformly graded larger grained non-cohesive soil, which in this condition is subject to seismic movement. For this site, the possibility of full saturation of the clay-based soils is not possible.

In summary, based on the soils underlying construction locations for the site, including possible changes due to residential and driveway construction, the potential for seismic liquefaction settlement is negligible. No special mitigation measures are recommended for construction on this site to mitigate seismic liquefaction.

Geotechnical Engineering Information - Slope Stability Studies and Opinions of Slope Stability:

No previous slope stability studies are known to have been prepared for this site.

As noted above, the site has soil and topography which makes the possibility of long-term erosion or catastrophic failure negligible.

Reference slope stability, it is the opinion of this office, based on considerations discussed above, that the existing site is geologically stable for general future development.

Geotechnical Engineering Information - Proposed Angles of Cut and Fill Slopes and Site Grading Requirements:

Minimal to light earthwork may be required for the proposed house remodel and second story addition. Minor excavation may be required for any new utility trenching. The following are provided for general information.

It is recommended that the footing bases for new building areas be placed at or below a 2:1 slope from any adjacent steep downhill slopes created or encountered.

During temporary excavations for basements and foundations (if needed for this site), a vertical cut face is acceptable. For deeper excavations, with potential cuts up to eight or ten feet in depth, it is recommended that cuts be backsloped at 1:1 or flatter at depths of more than four feet, per standard practice. No significant cuts of that depth may be required for future site development.

Long term permanent cuts and fills involving native soils should be at a maximum of 2:1 unless otherwise approved by a licensed engineer familiar with the site. Permanent steep slopes may require designed yard retaining walls and/or basement walls as an alternate. Site grading should follow standard practice as regards erosion control, stockpiling of soils, and minimizing the areas to be cleared and disturbed to that necessary for approved construction.

No significant structural fill will likely be required for the future development. Should it be required, the following guidelines should be followed. Cut horizontal steps into the slope (for fills over 3 feet total), place non-clay materials in maximum 6" lifts, and mechanically compact to 95 percent. Note that for non-structural fill in yard areas, the 6" lifts and mechanical compaction may be omitted, although some settling will occur over time. Re-vegetation of finished slope areas should follow good landscaping practice.

Exposed surface clay-based soils will require soil amendment to establish new lawns and yard landscape areas.

Geotechnical Engineering Information - Structural Foundation Requirements and Estimated Foundation Settlement:

While a foundation bearing pressure of 2,000 PSF is likely suitable for undisturbed soils for this site, a soil bearing pressure of 1,500 PSF is recommended. All foundations should be placed on undisturbed soils a minimum of 18" below finished grade. All foundations should be placed at a 2:1 backslope or farther from the toe of any slope. Areas found to have unengineered old fill during construction should be evaluated prior to placement of foundations or roads/driveways in those areas.

Based on observed soils, a lateral resistance factor of 0.40 for lateral loading may be safely used for design of structural retaining walls and, where used, basement walls. Note that the basement floors, if any, will be cast concrete and will provide additional long term lateral resistance to movement of the walls and their footings. It is recommended that the inside of the basement wall footings be backfilled against prior to exterior backfilling as a good general construction practice. This backfilling may be omitted in shallow crawl space foundations.

Based on experience with similar soils used for wood frame residential construction, a settlement of less that 1/4 inch would be expected within a 50-foot length of foundation. It should be noted that during the site visit by this office, the foundation for the existing house on the site showed little or no settlement (except at the right front foundation section) but also noting the building is a relatively light wood frame structure).

Geotechnical Engineering Information - Soil Compaction Criteria:

Silty sandy loams, if encountered on site, would be suitable for deep structural fill. Compaction in foundation and vehicular traffic areas for all acceptable soils should be to 95%, uniformly and mechanically compacted. The need for structural backfill for this site, except in utility trenching, is minimal. As indicated above, backfilling of minor trenches with site medium sands or a good grade of pit run are acceptable, provided they are mechanically compacted in 6-inch lifts, and that it is done in only damp or dry weather. On-site clay-based soils are not suitable for any type of structural fill. Fill in yard areas is acceptable.

Questions relating to the adequacy of compacted material should be evaluated by a licensed engineer inspection on site.

Geotechnical Engineering Information - Proposed Surface and Subsurface Drainage:

Surface runoff from impervious surfaces in theory may be collected and routed to either common or individual component on-site infiltration systems. The site has no acceptable permeable soil layers.

Collected stormwater design for this site for new development could use a Perforated Pipe Connection installed in a site drainage line connected to an adjacent street system. As noted previously, the site roof runoff is already connected to a catch basin fronting the site on 97th Avenue S.E. The adding of a second story to the house will require a new building drainage system. It is recommended that collected roof runoff continue to be routed to the above identified fronting catch basin.

As an upgrade to the roof drainage system, it is recommended that in the run of line from the house to the catch basin, that a 2 foot wide by 10 foot long Perforated Pipe System in inserted in the line. The specifications for a Perforated Pipe Connection are per guidance in the King County Surface Water Manual, Appendix C, or as adopted by the City of Mercer Island.

Note that the actual drainage design for future site development will be prepared separately.

All foundations and cast concrete retaining walls should be protected by piped footing drains which lead to the site drainage system. An exception is that buildings with slab on grade ground floors, and no crawlspace, do not require footing drains. Also, exterior concrete retaining walls may substitute a formal rear footing drain with filter fabric backed weep holes provided periodically along the bottom of the walls. Also, loose placed block walls and rockeries need only filter fabric backing since they are automatically pervious.

Geotechnical Engineering Information - Proposed Use of On Site Sewage System(s)

This site is served by public sewer and does not require the use of OSS systems (drainfields).

Geotechnical Engineering Information - Lateral Earth Pressures:

Due to the dense nature of the in-place soils, an active design lateral pressure for retaining walls of 35 PCF is suitable, with an at rest (passive) lateral pressure for foundation walls of 45 PCF recommended. All walls over 4 feet in total height must be designed by a licensed engineer and use the 1.5 safety factor per accepted practice. All walls with either a soil or vehicular traffic surcharge will require consideration of the surcharge, to be determined as part of the specific wall design.

Geotechnical Engineering Information - Vulnerability of Site to Erosion:

The following is provided as general guidance should any significant earthwork be done on the site for the remodel/addition project.

Undisturbed bare surface soils on site are subject to some surface erosion. Disturbed soils are subject to significant erosion. Disturbed soils on or near slope areas (including site soil stockpiles) are subject to heavy erosion. For the above reasons the exposure of disturbed soils on or near the slope areas (including soil stockpiles) should be protected with straw or tarping if left exposed for more than one week during the wet season. All disturbed areas must have properly installed silt fencing on their downhill side. A standard stabilized rock construction entrance may be used on site to prevent mud and silt from the site entering the street drainage system. The existing paved driveway may serve as an alternate.

With the use of erosion control measures, as mentioned above, the proposed construction should be able to take place without significant erosion to the site, or the transporting of silts off site.

Geotechnical Engineering Information - Suitability of On-Site Soils for Use as Fill:

Any on-site silty sandy loams, if encountered but not likely, would be suitable for structural fill if placed in six-inch lifts which are mechanically compacted. The soil condition must be damp or dry, not wet or saturated.

On-site clay-based soils are not suitable for any type of structural fill. Fill in yard areas is acceptable. Questions relating to the adequacy of compacted material should be evaluated by a licensed engineer inspection on site.

Geotechnical Engineering Information - Laboratory Data and Soil Index Properties:

Field testing was done of soil samples encountered. Used were both wet and dry techniques. The site soils were found to be largely clay-based to depths up to 42 inches.

Formal laboratory testing of soil samples was not deemed necessary for the evaluation of site soils for this site and type of construction.

Geotechnical Engineering Information - Building Limitations:

General future site construction may take place during wet weather provided the above specified erosion control measures are strictly employed. Arbitrary wet weather restrictions based on specific dates for this site and its development are not recommended.

Providing the above recommendations and construction criteria are adhered to in the design and placement of the residential structure and related site work, no site related building limitations are recommended for these sites.

No dewatering procedures are foreseen for future site development.

Summary:

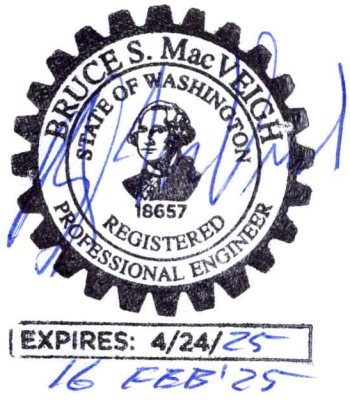
The site is suitable for conventional residential construction. Drainage of impervious surfaces, including roof and pavement areas, cannot use on-site infiltration.

Concerning drainage, the collected roof runoff should be routed through a Perforated Pipe Connection to the existing fronting catch basin. The existing concrete driveway slopes to the street, and is proposed to be retained. Note that a renewal surface treatment may be applied to the existing concrete surface, but would not trigger a drainage evaluation.

Other paved areas such as porches, patios and walks may us Sheet Flow Dispersion onto adjacent lawn.

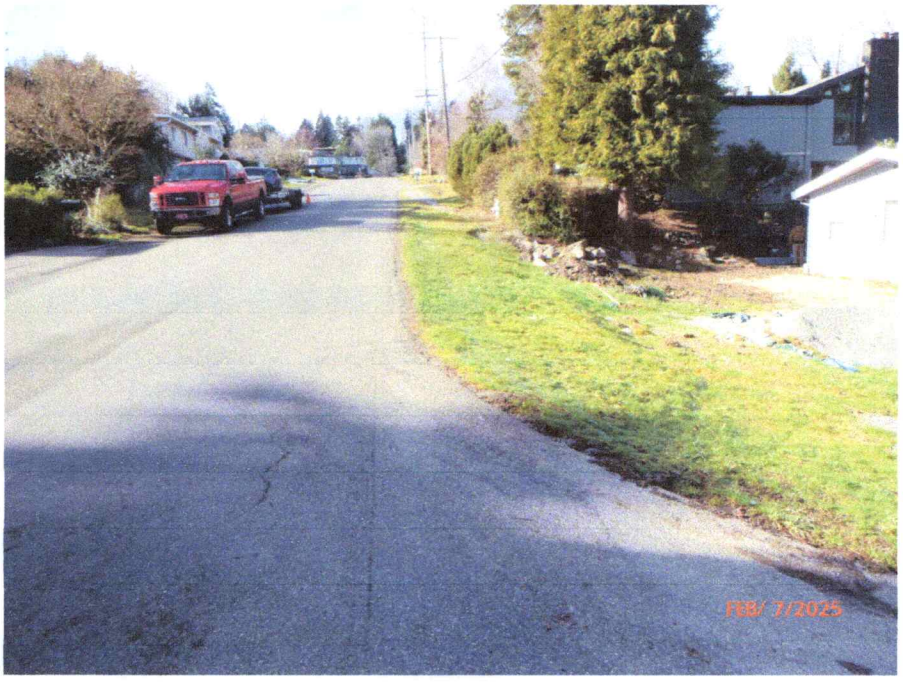
Questions relating to this report and to site related problems which may arise during construction may be directed to this office.

Bruce S. MacVeigh, P.E.
Civil Engineer



SE40thStreetgeo021625/2509

STREET VIEW OF SITE- LOOKING NORTHWEST FROM CORNER



STREET FRONTAGE ON S.E. 40TH STREET

STREET FRONTAGE ON 97TH AVENUE S.E.

EXISTING CATCH BASIN ON 97TH AVENUE S.E.

SOIL LOG 1

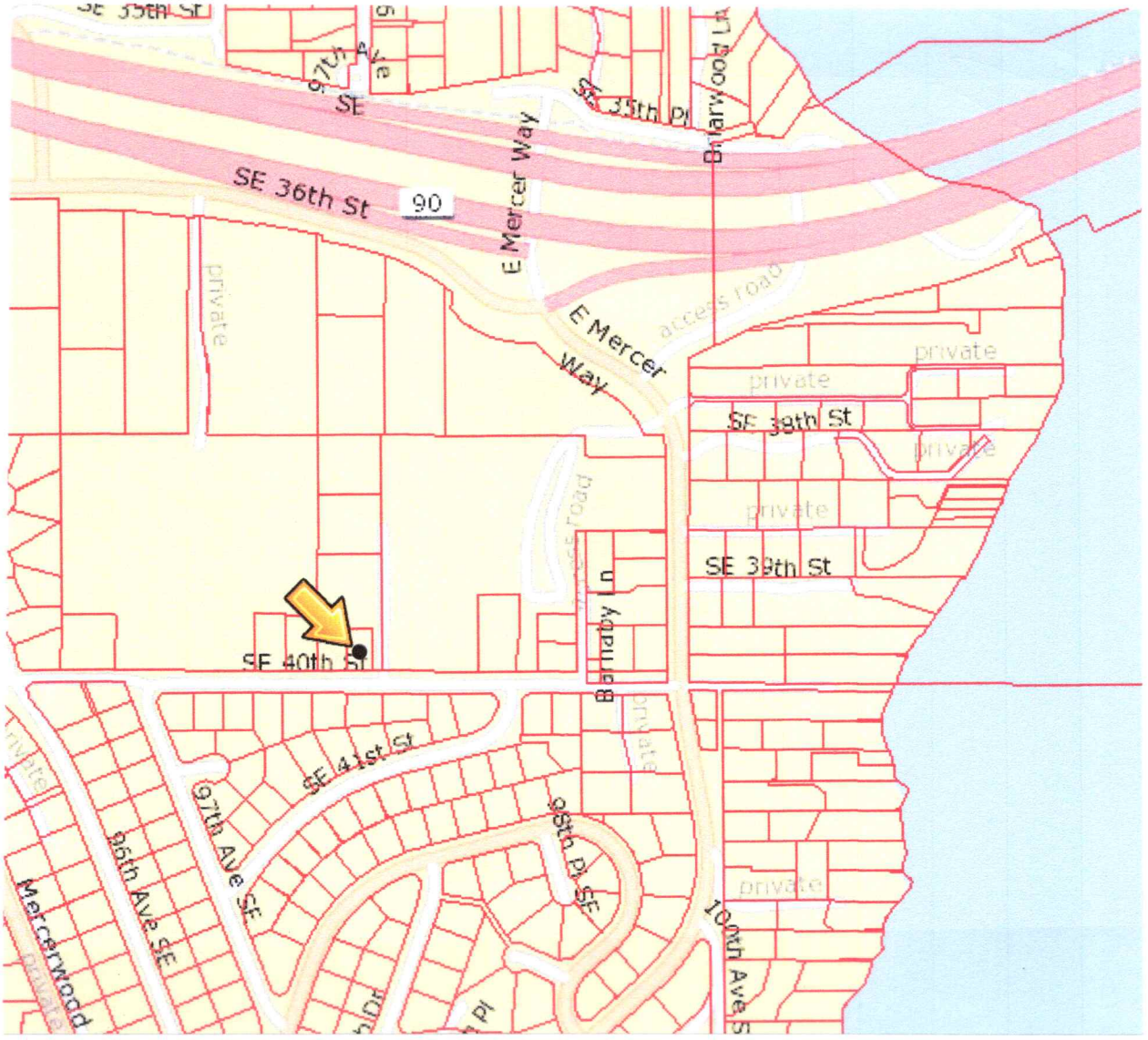
SOIL LOG 2

REAR YARD DOUBLE ROCKERY AND BASE “FRENCH DRAIN”

SOIL LOGS February 7, 2025

SL 1
0 - 36" **CLAYEY MEDIUM SAND** W/ROCKS/SLIGHT MOTTLING
36" – 42"+ **SANDY HARDPAN** DAMP/SLIGHT MOTTLING
NO GROUNDWATER ENCOUNDERED

SL 2
0 - 36" **CLAYEY MEDIUM SAND** W/ ROCKS/SLIGHT MOTTLING
36" – 42"+ **CLAYEY SAND/HARDPAN** DAMP/SLIGHT MOTTLING
NO GROUNDWATER ENCOUNDERED

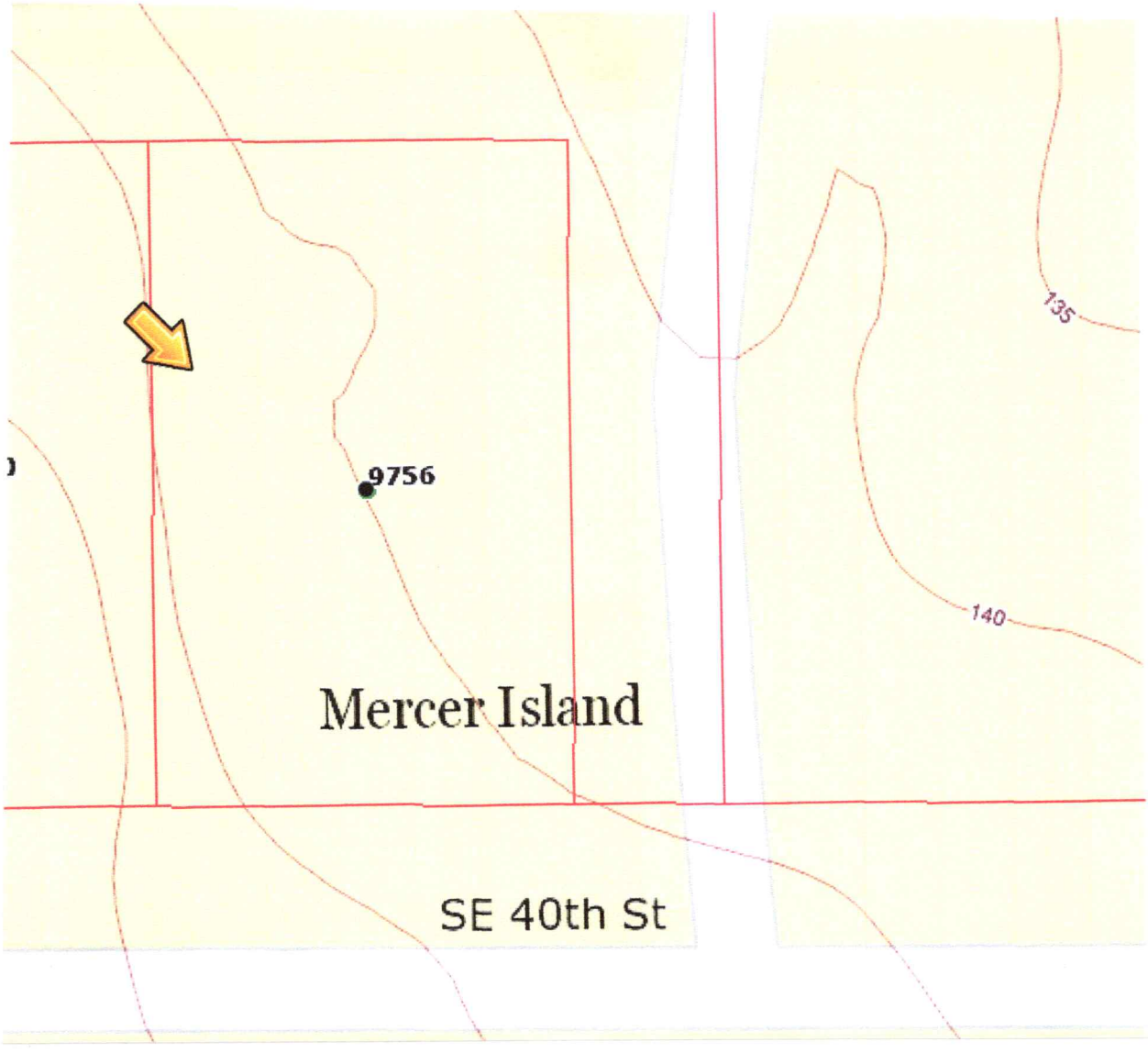


VICINITY MAP

1" = 500 FEET

AERIAL MAP

1' = 30 FEET



TOPOGRAPHIC MAP

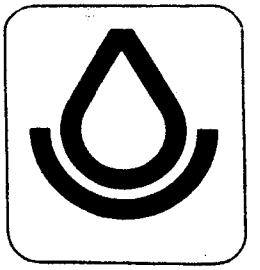
1" = 30 FEET

Extract

King County Soil Survey
1973

SOIL SURVEY

King County Area Washington



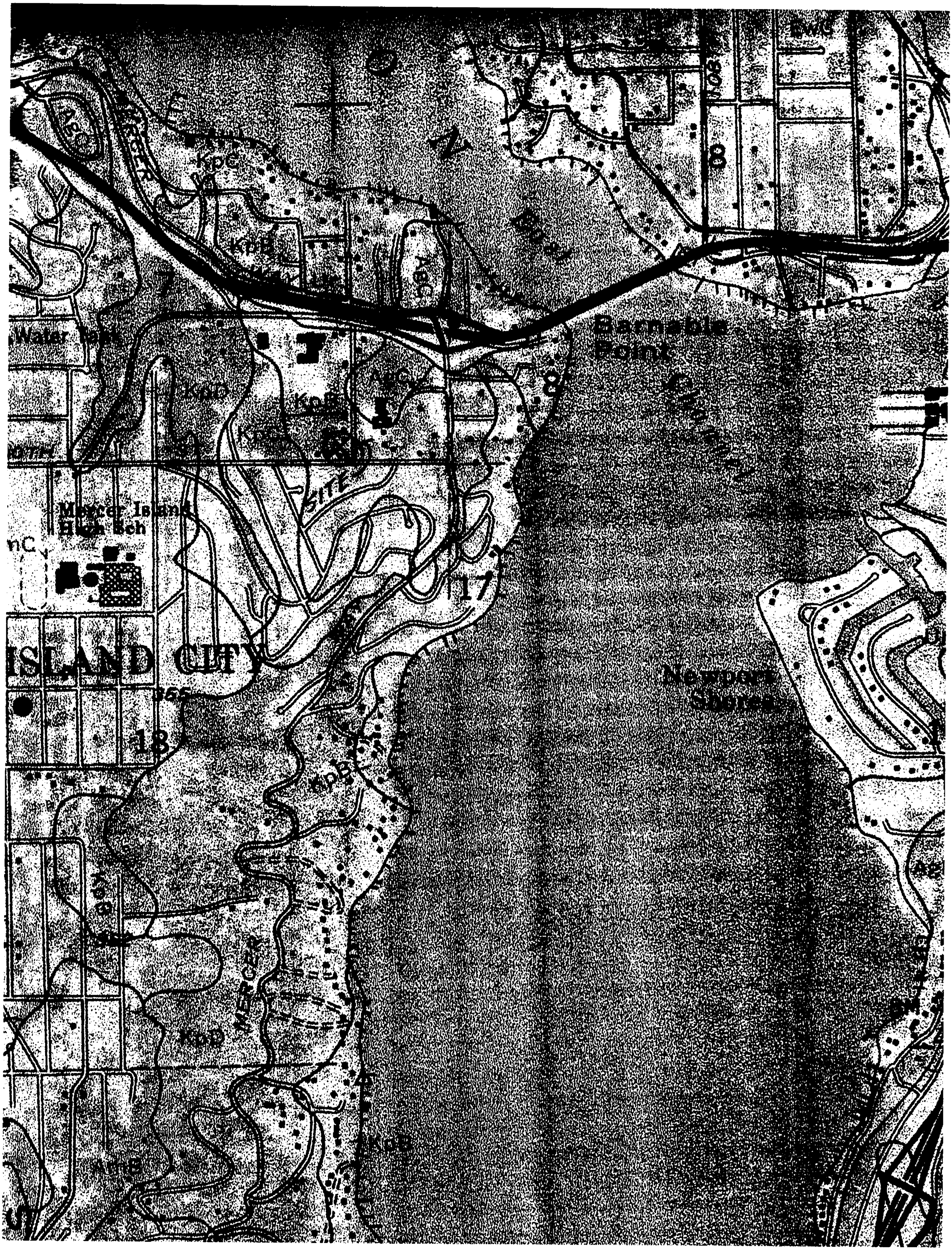
UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
in cooperation with
WASHINGTON AGRICULTURAL EXPERIMENT STATION
Issued November 1973

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, indicates the class of slope. Symbols without a slope letter are those of nearly level soils.

SYMBOL	NAME
AgB	Alderwood gravelly sandy loam, 0 to 6 percent slopes
AgC	Alderwood gravelly sandy loam, 6 to 15 percent slopes
AgD	Alderwood gravelly sandy loam, 15 to 30 percent slopes
AkF	Alderwood and Kitsap soils, very steep
AmB	Arents, Alderwood material, 0 to 6 percent slopes *
AmC	Arents, Alderwood material, 6 to 15 percent slopes *
An	Arents, Everett material *
BeC	Beausite gravelly sandy loam, 6 to 15 percent slopes
BeD	Beausite gravelly sandy loam, 15 to 30 percent slopes
BeF	Beausite gravelly sandy loam, 40 to 75 percent slopes
Bh	Bellingham silt loam
Br	Briscot silt loam
Bu	Buckley silt loam
Cb	Coastal Beaches
Ea	Earlmont silt loam
Ed	Edgewick fine sandy loam
EvB	Everett gravelly sandy loam, 0 to 5 percent slopes
EvC	Everett gravelly sandy loam, 5 to 15 percent slopes
EvD	Everett gravelly sandy loam, 15 to 30 percent slopes
EwC	Everett-Alderwood gravelly sandy loams, 6 to 15 percent slopes
InA	Indianola loamy fine sand, 0 to 4 percent slopes
InC	Indianola loamy fine sand, 4 to 15 percent slopes
InD	Indianola loamy fine sand, 15 to 30 percent slopes
KpB	Kitsap silt loam, 2 to 8 percent slopes
KpC	Kitsap silt loam, 8 to 15 percent slopes
KpD	Kitsap silt loam, 15 to 30 percent slopes
KsC	Klaus gravelly loamy sand, 6 to 15 percent slopes
Ma	Mixed alluvial land
NeC	Neiltan very gravelly loamy sand, 2 to 15 percent slopes
Ng	Newberg silt loam
Nk	Nooksack silt loam
No	Norma sandy loam
Or	Orcas peat
Os	Oridia silt loam
OvC	Ovall gravelly loam, 0 to 15 percent slopes
OvD	Ovall gravelly loam, 15 to 25 percent slopes
OvF	Ovall gravelly loam, 40 to 75 percent slopes
Pc	Pilchuck loamy fine sand
Pk	Pilchuck fine sandy loam
Pu	Puget silty clay loam
Py	Puyallup fine sandy loam
RaC	Ragnar fine sandy loam, 6 to 15 percent slopes
RaD	Ragnar fine sandy loam, 15 to 25 percent slopes
RdC	Ragnar-Indianola association, sloping *
RdE	Ragnar-Indianola association, moderately steep *
Re	Renton silt loam
Rh	Riverwash
Sa	Salal silt loam
Sh	Sammamish silt loam
Sk	Seattle muck
Sm	Shalcar muck
Sn	Si silt loam
So	Snohomish silt loam
Sr	Snohomish silt loam, thick surface variant
Su	Sultan silt loam
Tu	Tukwila muck
Ur	Urban land
Wo	Woodinville silt loam

* The composition of these units is more variable than that of the others in the area, but it has been controlled well enough to interpret for the expected use of the soils.



Water Tank
KpC
KpB
KpD
AgC
Barnable
Point
Mercer Island
High Sch
ISLAND CITY
Newport
Shores
17
18
MERCER

from very dark grayish brown to brown and dark yellowish brown. The C horizon ranges from dark grayish brown to pale olive and from loamy fine sand to sand. Thin lenses of silty material are at a depth of 4 to 7 feet in some places.

Soils included with this soil in mapping make up no more than 25 percent of the total acreage. Some areas are up to 10 percent Alderwood soils, on the more rolling and undulating parts of the landscape; some are up to 8 percent the deep, gravelly Everett and Neilton soils; some are up to 15 percent Kitsap soils, which have platy lake sediments in the subsoil; and some are up to 15 percent Ragnar soils, which have a sandy substratum.

Permeability is rapid. The effective rooting depth is 60 inches or more. Available water capacity is moderate. Runoff is slow to medium, and the erosion hazard is slight to moderate.

This soil is used for timber and for urban development. Capability unit IVs-2; woodland group 4s3.

Indianola loamy fine sand, 0 to 4 percent slopes (InA).--This soil occupies smooth terraces in long narrow tracts adjacent to streams. Areas range from about 3 to 70 acres in size.

Soils included with this soil in mapping make up no more than 20 percent of the total acreage. Some areas are up to 5 percent Alderwood soils, on the more rolling and undulating parts of the landscape; some are about 10 percent the deep, gravelly Everett and Neilton soils; some are up to 10 percent Indianola loamy fine sand that has stronger slopes; and some areas are up to 10 percent the poorly drained Norma, Shalcar, Tukwila soils.

Runoff is slow, and the erosion hazard is slight.

This soil is used for timber. Capability unit IVs-2; woodland group 4s3.

Indianola loamy fine sand, 15 to 30 percent slopes (InD).--This soil is along entrenched streams.

Soils included with this soil in mapping make up no more than 25 percent of the total acreage. Some areas are up to 10 percent Alderwood soils; some are about 5 percent the deep, gravelly Everett and Neilton soils; some are up to 15 percent Kitsap soils, which have platy, silty lake sediments in the subsoil; and some are up to 15 percent Indianola loamy fine sand that has milder slopes.

Runoff is medium, and the erosion hazard is moderate to severe.

This soil is used for timber. Capability unit VIe-1; woodland group 4s2.

Kitsap Series

The Kitsap series is made up of moderately well drained soils that formed in glacial lake deposits, under a cover of conifers and shrubs. These soils are on terraces and strongly dissected terrace fronts. They are gently undulating and rolling and moderately steep. Slopes are 2 to 70 percent. Platy, silty sediments are at a depth of 18 to 40 inches. The annual precipitation is 35 to 60 inches, and the mean annual air temperature is about 50° F. The frost-free season is 150 to more than 200 days. Elevation ranges from about sea level to 500 feet.

In a representative profile, the surface layer and subsoil are very dark brown and dark yellowish-brown silt loam that extends to a depth of about 24 inches. The substratum is olive-gray silty clay loam. It extends to a depth of 60 inches or more.

Kitsap soils are used for timber and pasture.

Kitsap silt loam, 2 to 8 percent slopes (KpB).--This undulating soil is on low terraces of the major valleys of the Area. Areas range from 5 acres to more than 600 acres in size and are nearly circular to irregular in shape. Some areas are one-eighth to a half mile wide and up to 3 or 4 miles long.

Representative profile of Kitsap silt loam, 2 to 8 percent slopes, in pasture, 820 feet west and 330 feet south of east quarter corner of sec. 28, T. 25 N., R. 7 E.:

Ap--0 to 5 inches, very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate, medium, granular structure; slightly hard, very friable, nonsticky, nonplastic; many roots; medium acid; abrupt, smooth boundary.

B2--5 to 24 inches, dark yellowish-brown (10YR 3/4) silt loam, brown (10YR 5/3) dry; 2 percent iron concretions; weak, coarse, prismatic structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; slightly acid; abrupt, wavy boundary. 18 to 21 inches thick.

IIC--24 to 60 inches, olive-gray (5Y 5/2) silty clay loam, light gray (5Y 7/2) dry; many, medium and coarse, prominent mottles of dark yellowish brown and strong brown (10YR 4/4 and 7.5YR 5/8); moderate, thin and medium, platy structure; hard, firm, sticky, plastic; few roots to a depth of 36 inches, none below; strongly acid.

The A horizon ranges from very dark brown to dark brown. The B horizon ranges from dark yellowish brown to dark brown and from silt loam to silty clay loam. The platy IIC horizon ranges from grayish brown to olive gray and from silt loam to silty clay loam that has thin lenses of loamy fine sand in places. Brownish mottles are common in the upper part of the IIC horizon.

Some areas are up to 10 percent included Alderwood gravelly sandy loam; some are up to 5 percent the very deep, sandy Indianola soils; and some are up to 5 percent the poorly drained Bellingham, Tukwila, and Seattle soils.

Water flows on top of the substratum in winter. Permeability is moderate above the substratum and very slow within it. The effective rooting depth is about 36 inches. Available water capacity is moderate to moderately high. Runoff is slow to medium, and the erosion hazard is slight to moderate.

This soil is used for timber and pasture. Capability unit IIIe-1; woodland group 2d2.