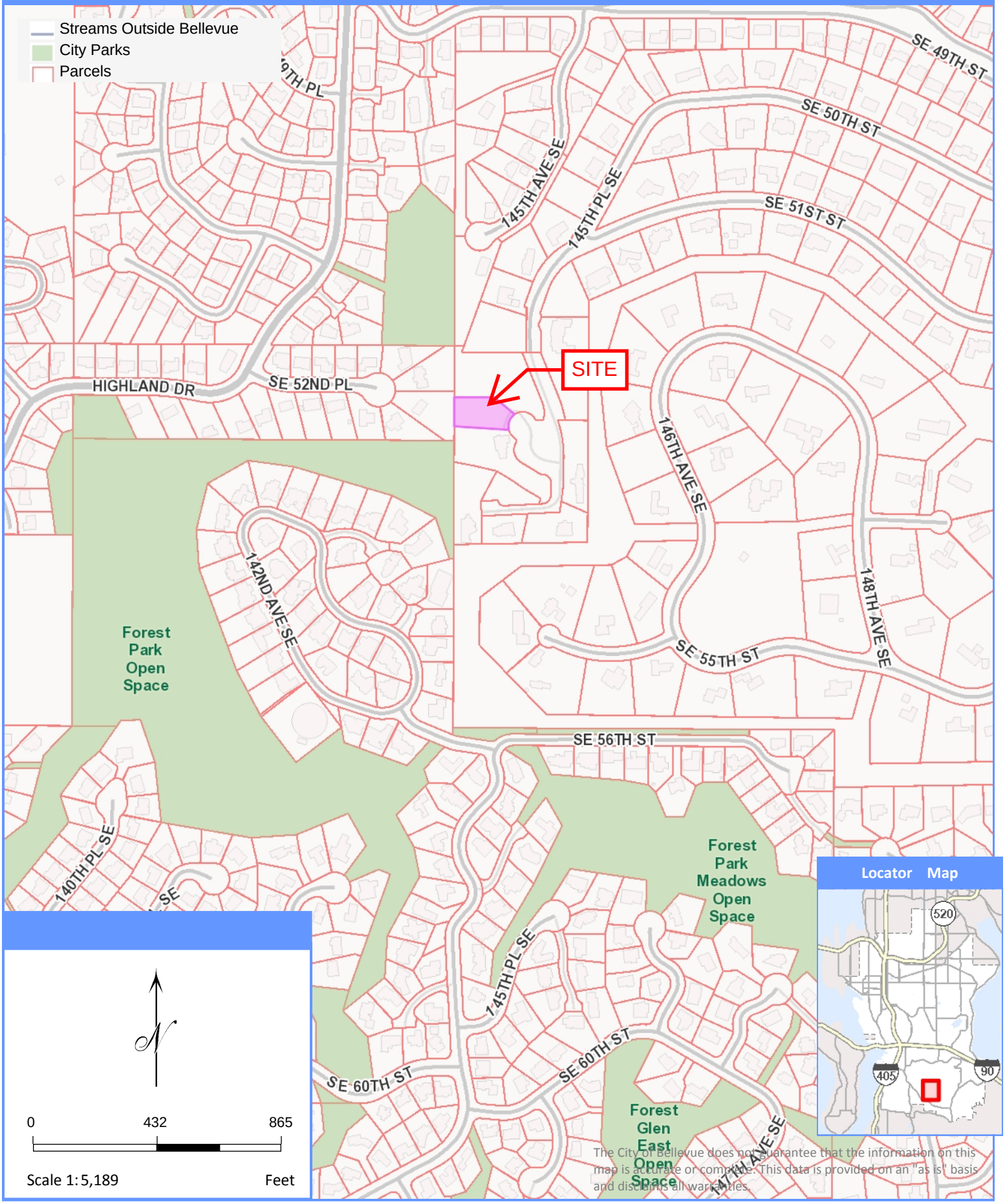
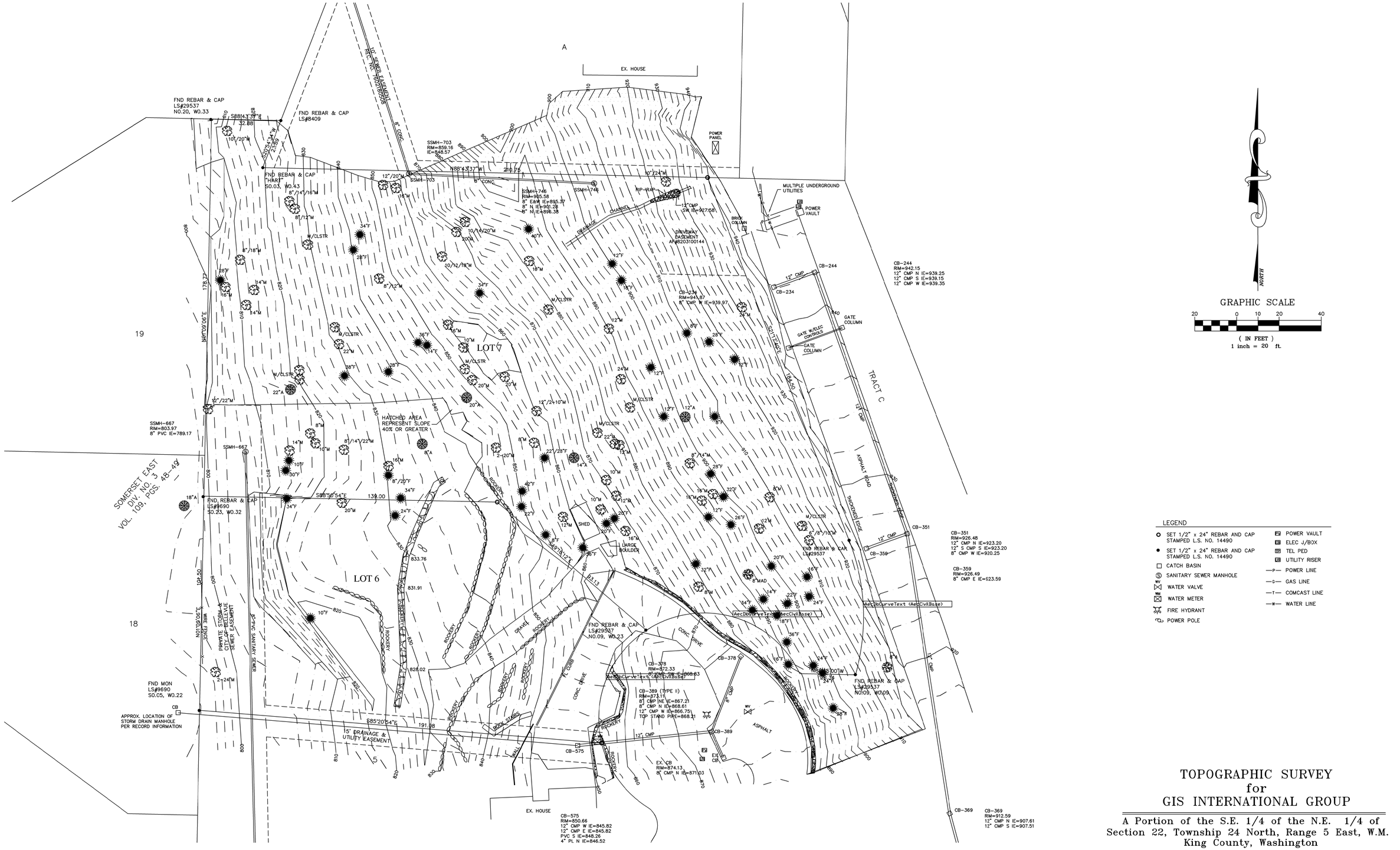


Map Generated on: 01/26/2017



GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 ft.

LEGEND

- SET 1/2" x 24" REBAR AND CAP STAMPED L.S. NO. 14490
- SET 1/2" x 24" REBAR AND CAP STAMPED L.S. NO. 14490
- CATCH BASIN
- SANITARY SEWER MANHOLE
- WATER VALVE
- WATER METER
- FIRE HYDRANT
- POWER POLE
- POWER VAULT
- ELEC J/BOX
- TEL PED
- UTILITY RISER
- —P— POWER LINE
- —G— GAS LINE
- —T— COMCAST LINE
- —W— WATER LINE

TOPOGRAPHIC SURVEY
for
GIS INTERNATIONAL GROUP

A Portion of the S.E. 1/4 of the N.E. 1/4 of Section 22, Township 24 North, Range 5 East, W.M. King County, Washington

LEGAL DESCRIPTION:

LOTS 6 AND 7, BELVEDERE, DIVISION A, AS PER PLAT RECORDED IN VOLUME 152 OF PLATS, PAGES 40 AND 41, RECORDS OF KING COUNTY AUDITOR

SITUATE IN THE COUNTY OF KING, STATE OF WASHINGTON

SUBJECT TO CONDITIONS, RESTRICTIONS AND EASEMENTS OF RECORD.

BENCH MARK – DATUM (NAVD88)

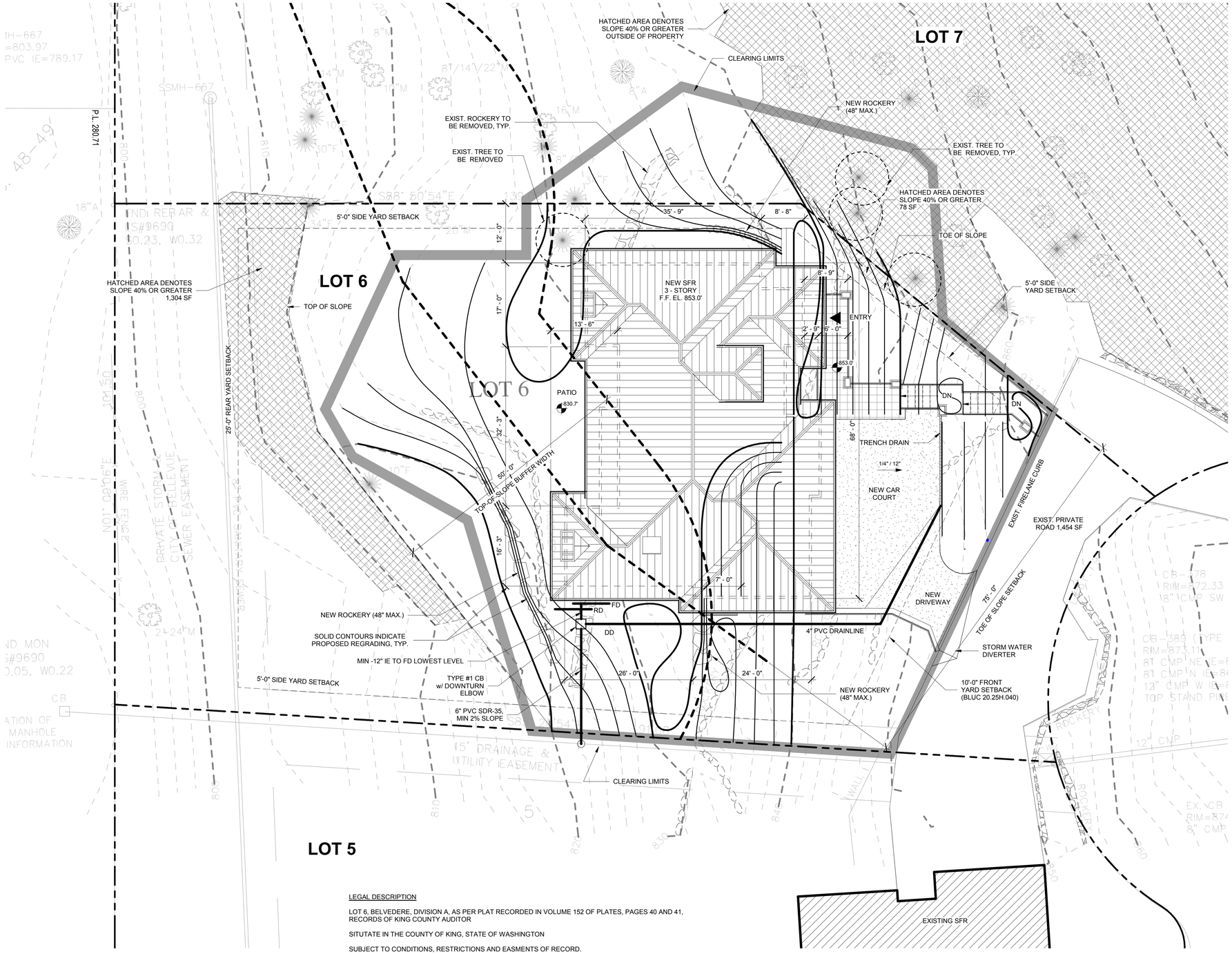
MONUMENT IN CASE AT SE 51ST ST. & 151 AVE. SE
ELEV. 942.07

JACKIE H. SIEBERT
STATE OF WASHINGTON
14490
REGISTERED
PROFESSIONAL LAND SURVEYOR

DATE:_____

Tri-County
Land Surveying Company
4610 200th St. S.W. Suite A
Lynnwood, Wa. 98036 (425)776-2926 Fax: 776-2850

DRAWN BY B.H.	DATE NOVEMBER, 2015	JOB NO. 15-129
CHECKED BY R.S.	SCALE 1" = 20'	SHEET 1 OF 1



1 Site Plan
1" = 10'-0"

LEGAL DESCRIPTION

LOT 6, BELVEDERE, DIVISION A, AS PER PLAT RECORDED IN VOLUME 152 OF PLATES, PAGES 40 AND 41, RECORDS OF KING COUNTY AUDITOR

SITUTATE IN THE COUNTY OF KING, STATE OF WASHINGTON

SUBJECT TO CONDITIONS, RESTRICTIONS AND EASMENTS OF RECORD.

Project Keynotes

General Notes

Symbol Legend

- PROPERTY LINE
- YARD SETBACK
- 641 NEW CONTOURS
- EXIST. CONTOURS
- CLEARING LIMITS
- ECA: STEEP SLOPE 40% OR GREATER
- ECA BUFFER / SETBACK

SHUGART
WASSE
WICKWIRE
architects & interiors

911 WESTERN AVE. SUITE 301
SEATTLE, WASHINGTON 98104
P:206.264.7744 F:206.903.8373
SWW-AI.COM

GIS INTERNATIONAL GROUP

Belvedere Lot 6
5139 145th Pl SE
Bellevue, WA 98006

City of Bellevue Approvals

Revisions	Date

CALUP

Date:	**01/09/2017**
SWW #:	**1605**
City #:	
Drawing:	**EA**
Approval:	**MIW**

Site Plan

G00.30

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance
9505 19th Avenue S.E.
Suite 106
Everett, Washington 98208
(425) 337-3174
Fax (425) 337-3045

CRITICAL AREAS REPORT
AND
CONCEPTUAL MITIGATION PLAN

FOR

BELVEDERE LOT 6 – 145TH PLACE SE

Wetland Resources, Inc. Project #16102

Prepared By
Wetland Resources, Inc.
9505 19th Avenue SE, Suite 106
Everett, WA 98208
(425) 337-3174

Prepared For
GIS Development
Attn: Ryan Grams
2737 152nd Avenue NE
Suite 5D
Redmond, WA 98052

January 12, 2017

TABLE OF CONTENTS

List of Attachments

1.0 INTRODUCTION

Wetland Resources, Inc. (WRI) performed a site evaluation on April 21, 2016 to review critical areas on and in the vicinity of City of Bellevue parcel number 0713500060. The subject site is located immediately north of 5247 145th Place SE in the city of Bellevue, WA. The Public Land Survey System (PLSS) locator for the subject site is Section 22, Township 24N, Range 05E, W.M. The subject property is located within the Cedar/Sammamish watershed, Water Resources Inventory Area (WRIA) 8.

The subject site is located in a residential area in the city of Bellevue and is bordered on the east by 145th Place SE. The area to the west of the site is forested open space. The parcel to the northeast is undeveloped and is primarily forested. The parcel to the south is developed with a single-family residence and associated landscaping. The subject site contains lawn, a gravel pathway, and retaining walls. Topography of the site slopes to the west, with multiple areas on the site that contain slopes greater than 40 percent. An off site wetland and stream are located south of the subject property.

The purpose of this report is to provide information on existing conditions of the site as required when a project is requesting a modification of critical areas, buffers, or setbacks. This report documents presence of wetlands, streams, and steep slopes on and in the vicinity of the subject site. Wetland and stream information is provided in the body of this report. For information regarding the steep slopes present on the subject site, refer to the *Geotechnical Engineering Study* prepared by Geotech Consultants, Inc. dated December 15, 2015, which is included in Appendix A of this document.

2.0 REVIEW OF EXISTING INFORMATION

Prior to conducting an on-site investigation of the project area, public resource information was reviewed to identify the presence of wetlands, streams, and other critical areas within and near the project area. The following information was examined:

- *United States Fish and Wildlife Service (USFWS) National Wetlands Inventory*: This source does not depict any wetlands on-site or in the immediate vicinity.
- *USDA/NRCS Web Soil Survey*: The Web Soil Survey shows the soils on-site are Beausite gravelly sandy loam, 15 to 30 percent slopes.
- *WDFW SalmonScape Interactive Map*: The SalmonScape map indicates an intermittent stream south of the subject site.
- *WDFW Priority Habitat and Species (PHS) Interactive Map*: No priority habitats or species are mapped on, or immediately adjacent to, the site.
- *King County iMap Interactive Mapping Tool*: The King County iMap does not illustrate any wetlands or streams on, or in the immediate vicinity of, the subject property.

- *Washington State DNR Forest Practices Mapping Tool (FPMT)*: This source shows a Type N stream south of the subject site.

3.0 CRITICAL AREA DETERMINATION

3.1 FIELD DETERMINATION METHODOLOGY

Wetland conditions were evaluated using routine methodology described in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountians, Valleys, and Coast Region (Version 2.0) (U.S. Army Corps of Engineers 2010). Under the routine methodology, the process for making a wetland determination is based on three steps:

1.) Examination of the site for hydrophytic vegetation (species present and percent cover);

2.) Examination of the site for hydric soils;

3.) Determining the presence of wetland hydrology

Presence of on-site streams was determined using the methodology described in the Washington State Department of Ecology document *Determining the Ordinary High Water Mark on Streams in Washington State (Second Review Draft)* (Olson and Stockdale 2010).

No wetlands or streams were observed on the subject property. One wetland and one stream are located south of the subject property.

3.2 WETLAND DETERMINATION

Off site Wetland – Category III
One off site wetland is present adjacent to an off site stream south of the subject site. The wetland was rated pursuant to the Washington State Wetland Rating System for Western Washington 2014 Update (Hruby 2014). The wetland rating score presented in this report and in the attached figures is based on an approximate location and reconnaissance level evaluation of the off site wetland.

Dominant vegetation within the off site wetland includes red alder (*Alnus rubra*), trailing blackberry (*Rubus ursinus*), giant horsetail (*Equisetum telmateia*), and lady fern (*Athyrium filix-femina*). Soils within Wetland A are very dark grayish brown (10YR 3/2) sandy clay loam to a depth of 7 inches; light olive brown (2.5Y 5/2) sandy clay loam with dark yellowish brown (10YR 4/4) redoximorphic features between 7 and 16 inches in depth. There are olive brown (2.5Y 4/4) sand inclusions at 10 inches in depth. The soils were saturated at 5 inches in depth at the time of the site investigation.

This wetland is a Category III wetland with a moderate habitat score. In the City of Bellevue, wetlands with these characteristics on undeveloped sites receive a 110-foot buffer with a 15-foot building setback. This buffer extends into the southwest corner of the site. Please see Sheet 1 for

approximate wetland buffer location.

3.3 STREAM DETERMINATION

Stream – Type N
The off site stream is located south of the subject property in a ravine. It crosses under 145th Place SE through a culvert and flows to the west. The stream appears to connect to Coal Creek, which is a known salmon bearing stream. The FPMT shows a documented stream type break upstream of Coal Creek near Forest Drive SE, and classifies the on-site stream as a non-fish bearing stream. Per Bellevue Land Use Code (BLUC) 20.25H.075, this off-site stream is classified as Type N water and receives a 25-foot buffer and a 25-foot building setback (as the property the stream is on is developed).

In the City of Bellevue, stream buffers are measured from the top of bank. Top of bank is defined as:

A. The point closest to the boundary of the active floodplain of a stream where a break in the slope of the land occurs such that the grade beyond the break is flatter than 3:1 at any point for minimum distance of 50 feet measured perpendicularly from the break; and

B. For a floodplain area not contained within a ravine, the edge of the active floodplain of a stream where the slope of the land beyond the edge is flatter than 3:1 at any point for a minimum distance of 50 feet measured perpendicularly from the edge.

Top of bank location was estimated using topographical information on publicly available resources. It is estimated that the stream buffer and building setback are approximately 160 feet south of the subject parcel at the closest point.

3.4 STEEP SLOPES

Slopes of 40 percent or more that have a rise of at least 10 feet and exceed 1,000 square feet in area are designated critical areas under BLUC 20.25H.120.A.2. Steep slopes cover 1,304 square feet of the site. In general, there are steep slopes rising from the angled northeastern property line, and on the western portion of the lot, west of the planned house site. The steep slopes to the east of the site appear to be natural. The steep slope on the west portion of the lot is discrete and inconsistent with surrounding topography. This slope likely is at least partially the result of excavation for the sanitary sewer that was installed along the western edge of the property. For additional information regarding the steep slopes present on the subject site, refer to the *Geotechnical Engineering Study* prepared by Geotech Consultants, Inc. dated December 15, 2015. This report is included in Appendix A of this report. Per BLUC 20.25H.120, steep slopes require a 50-foot top of slope buffer and a 75-foot toe of slope structure set back.

4.0 HABITAT ASSESSMENT

Habitat associated with species of local importance listed in LUC 20.25H.165.A is designated as critical area under LUC 20.25H.150.B. Therefore, Wetland Resources, Inc. performed an assessment of the property to determine the likelihood of use by these species.

4.1 VEGETATION DESCRIPTION

The majority of the site is maintained lawn and landscaping, with some small trees on the west side of the site. Vegetation on the site includes: big leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), holly (*Ilex aquifolium*), Oso berry (*Oemleria cerasiformis*), Himalyan blackberry (*Rubus armeniacus*), western sword fern (*Polystichum munitum*), and various grass species.

4.2 SPECIES OF LOCAL IMPORTANCE

Forested areas adjacent to the subject site form high quality habitat, dominated by native upland vegetation. Multiple snags and copious large woody debris contribute to the heterogeneity of the environmental physiognomy, providing a varied habitat structure available to multiple species niches. A non-fish bearing stream to the south provides a persistent source of water and riparian habitat. No naturally occurring ponds are on the subject property. Forested habitat extends onto the subject site along the western property boundary, as part of a corridor connecting forested areas to the north and south.

Deer trails and scat are present throughout the parcels to the north and south of the site, indicating frequent use. Squirrel (*Sciurus* spp.) dreys (nests) are located just north of the site. Also, in the parcel north of the subject property, two highly decayed snags have many woodpecker holes present, but the damage appears to be from past activity. The forested portions of these properties most likely provide breeding habitat for migratory songbirds.

Potential habitat is present in the forested areas for a variety smaller mammalian species such as rabbits (*Sylvilagus* spp.) and raccoons (*Procyon lotor)*, although there were no observations of use by these species. Tree cavities ideal for roosting bats were not observed. No evidence was detected that would indicate use by raptor adults or juveniles on or adjacent to the subject property. Similarly, no heron rookeries were present.

Overall, the forested areas adjacent to the site provide many valuable habitat functions, such as thermal and visual cover, food, water, and a movement corridor. However, no habitat features where observed that indicate use by any threatened, endangered, or locally important species. The subject site is no more likely to provide potential habitat to locally important species than many undeveloped sites with forested areas in the city of Bellevue.

The forested environments adjacent to, and slightly extending onto, the subject site are clearly used by a variety of wildlife species. However, the only species that afford protection to upland areas are those listed by the state or federal government as endangered or threatened or species of local importance. There is no evidence that any of these species currently use the subject site

or the adjacent parcels. Further, there is no recorded information on commonly used available resources that would indicate such use.

4.3 POTENTIAL HABITAT IMPACT

No direct or indirect impacts are proposed to any habitats associated with species of local importance. The proposed development will maintain the existing vegetation on the west side of the subject site. The proposed residence and driveway will primarily impact lawn, gravel, and rockeries. In addition, the removal of invasive species and installation of additional native plants will add to the quality of habitat provided on the site.

5.0 PROPOSED MODIFICATION TO BLUC

The entire parcel is encumbered by steep slopes and associated buffers/setbacks. Strict adherence to the provisions in BLUC would preclude any development on this parcel. Any development on this parcel will require a modification to buffers, setbacks, and/or impacts to areas of steep slopes.

The applicant is proposing to construct a single-family home and new driveway segment on the subject property. The purpose of this critical area study is to modify the top of slope buffer and standard structure setback identified in BLUC 20.25H.120. Specifically, the applicant is proposing to infringe upon the steep slopes and the associated setbacks in the following manner:

BLUC 20.25H.120

- Temporarily impact 780 square feet of slope greater that 40 percent for construction of foundations and walls prior to backfilling.

- Temporarily disturb vegetation on steep slopes and within top-of-slope buffer for construction of foundations.

- Provide no setback from toe-of-slope.

- Reduce top-of-slope buffer to 14 feet at the narrowest point for a retaining wall and grading associated with the residence.

6.0 PROPOSED DEVELOPMENT

The applicant is proposing to construct a residence and access driveway on the east side of the property. This proposal requires a modification of the 75-foot toe of slope setback and 50-foot top of slope buffer, as well as impacts to 780 feet of steep slope area for temporary construction excavation. The disturbed slope will be restored and replanted.

This alternative was designed to minimize impacts to the steep slope areas as much as possible, with the residence and driveway located outside of all steep slopes.

Impacts to the top of slope buffer consist of a small portion of the residence and grading adjacent to the new residence. The top of slope buffer will be reduced to 14 feet at the narrowest point in the southern end of the site and the 50-foot width would remain on north end of the site.

A preliminary stormwater plan is included with the Critical Areas Land Use Permit submittal. Due to risks associated with infiltration in poor soils, all stormwater will be collected and connected to the existing stormwater system.

6.1 Proposed Mitigation

Proposed mitigation for the temporary impact to vegetation on steep slope will be provided through restoration of the disturbed area. Mitigation for the modification of the top-of slope buffer will be provided through native vegetation enhancement. Vegetation enhancement will entail removing invasive species and installing native plants in top-of-slope buffer area.

7.0 Cumulative Impacts

The proposed residence and access drive have been designed according to the recommendations in the Geotechnical Engineering Study. The structure will be supported on piles driven to refusal in dense soil or bedrock. Foundation walls will be backfilled to maintain permanent support for the steep slopes to the east of the site. By implementing the design recommendations and construction techniques of the geotechnical engineer, the proposed project will preserve the integrity of the slope.

8.0 Additional Provisions Required for Landslide Hazards and Steep Slopes

8.1 BLUC 20.25H.125 Performance Standards – Landslide Hazards and Steep Slopes

Text in italics below is from BLUC 20.45H.125, with WRI responses in plain text.

In addition to generally applicable performance standards set forth in LUC 20.25H.055 and 20.25H.065, development within a landslide hazard or steep slope critical area or the critical area buffers of such hazards shall incorporate the following additional performance standards in design of the development, as applicable. The requirement for long-term slope stability shall exclude designs that require regular and periodic maintenance to maintain their level of function.

A. Structures and improvements shall minimize alterations to the natural contour of the slope, and foundations shall be tiered where possible to conform to existing topography;

The proposed residence and driveway are located outside of the steep slope areas. Some grading and temporary vegetation impacts on steep slopes will be necessary to provide a connection between the existing access road and a new segment of driveway for garage access and on-site parking. The pedestrian access will be above existing grade, avoiding the need for fill in that area. The foundation of the house will be tiered to minimize excavation between the two areas of steep slopes. The temporary excavations necessary at the toe of the steep eastern slope for construction of foundations will be backfilled to maintain long-term support for the slope.

B. Structures and improvements shall be located to preserve the most critical portion of the site and its natural landforms and vegetation;

In general, the house and driveway were positioned to have no impact on the western area of steep slopes as the soils in this area are composed of more fill material and disturbance of this area could pose risk to the neighboring properties to the west. The impact to the eastern slope was minimized to only the area necessary to provide temporary excavation to construct the house. The proposed project location preserves the greatest possible area of critical areas and associated buffers.

C. The proposed development shall not result in greater risk or a need for increased buffers on neighboring properties;

This development does not increase risk or buffers on neighboring properties.

D. The use of retaining walls that allow the maintenance of existing natural slope area is preferred over graded artificial slopes where graded slopes would result in increased disturbance as compared to use of retaining wall;

The area of the site where the proposed residence is located has been previously graded into terraced areas and pedestrian pathways. The proposed grading and retaining walls on the south side of the site were designed to limit changes to topography that may affect the area of steep slope to the west of the house. The retaining walls are proposed in lieu of fill on top of the existing grade, minimizing the disturbance in this area.

E. Development shall be designed to minimize impervious surfaces within the critical area and critical area buffer;

No new impervious surface is proposed within the steep slope areas. The house and driveway are positioned to minimize the new impervious area within the top-of-slope buffer. The length and location of the new drive are designed to impact the minimum area necessary in order to provide access to east side of the house, where there is an elevated attached garage.

F. Where change in grade outside the building footprint is necessary, the site retention system should be stepped and regrading should be designed to minimize topographic modification. On slopes in excess of 40 percent, grading for yard area may be disallowed where inconsistent with this criteria;

The proposed house is located in an area that was previously graded into terraces and is currently maintained lawn. No permanent grading will occur within slopes greater than 40

percent. Grading outside of the building footprint will be terraced where feasible and is limited to areas that have been determined to provide the most efficient foundation design. The foundations of the house have been stepped to follow the existing terraces in the building footprint. The proposed fill along the southwest corner of the house is intended to provide level pedestrian access around the structure. The fill in this area has been minimized as much as possible, and has been held back from the steep western slope.

G. Building foundation walls shall be utilized as retaining walls rather than rockeries or retaining structures built separately and away from the building wherever feasible. Freestanding retaining devices are only permitted when they cannot be designed as structural elements of the building foundation;

The house foundation walls will provide the majority of the support for the near-surface soils on the eastern, upslope, side of the residence. In order to maintain a setback between the house and the toe of the steep slope, while still providing a driveway, it will be necessary to construct free-standing retaining walls along the east side of the development area. The driveway has been moved as far south as possible to minimize the need for these free-standing walls.

H. On slopes in excess of 40 percent, use of pole-type construction which conforms to the existing topography is required where feasible. If pole-type construction is not technically feasible, the structure must be tiered to conform to the existing topography and to minimize topographic modification;

No structures are proposed within areas of slope greater than 40 percent. The house and driveway will be supported on piles, and the grade beams transferring the house loads to the piles will step with the existing grade.

I. On slopes in excess of 40 percent, piled deck support structures are required where technically feasible for parking or garages over fill-based construction types; and

No structures are proposed within areas of slope greater than 40 percent. The house and driveway will be supported on piles.

J. Areas of new permanent disturbance and all areas of temporary disturbance shall be mitigated and/or restored pursuant to a mitigation and restoration plan meeting the requirements of LUC 20.25H.210.

All temporary disturbances will be restored to pre-existing conditions. Additional enhancement plantings are proposed as mitigation for the top-of-slope buffer reduction. Please refer to section 9.0 of this report for details of the proposed mitigation plan.

8.2 BLUC 20.25H.135 Mitigation and Monitoring Additional Provisions

Detailed information regarding temporary erosion and sediment control as well as stormwater management will be submitted with the building permit application.

8.3 BLUC 20.25H.140 Critical Areas Report Additional Provisions and BLUC 20.25H.145 Approval of Modifications

An assessment of the geological characteristics, potential threats to adjacent properties, and the safety of the construction design is presented in the Geotechnical Engineering Study included in Appendix A of this report. The geotechnical engineer has reviewed the proposed residence and will review any modifications to the proposed residence location, design, and construction methods.

9.0 MITIGATION PLAN

9.1 PROJECT DESCRIPTION

The applicant is proposing to construct a single-family residence with associated access driveway and utilities. This proposed plan would temporarily impact 780 square feet of vegetation on steep slopes and reduces the top-of-slope buffer on site. All temporary vegetation impacts will be restored and native vegetation enhancement will be provided within the top-of-slope buffer.

9.2 GOALS, OBJECTIVES, AND PERFORMANCE STANDARDS

9.2.1 Goal – Improve Wildlife Habitat On-site

- Objective 1 – Increase diversity of native species within the native vegetation enhancement areas

  Performance Standard 1: 100 percent survival rate of the planted species within the first year of planting

  Performance Standard 2: 80 percent survival rate of the planted species at the end of the five-year monitoring period

- Objective 2 – Control invasive species within the native vegetation enhancement and restoration areas

  Performance Standard 3: 0 percent invasive species present within the enhancement/restoration areas at the end of the first year of planting

  Performance Standard 4: Maximum 15 percent invasive species present within the enhancement/restoration areas at the end of the five-year monitoring period

9.3 MITIGATION SPECIFICATIONS

9.3.1 Erosion and Sediment Control Plan

A detailed erosion control and sediment plan will be submitted with the building permit application.

9.3.2 Temporary Impact Restoration and Tree Replacement

Construction of the house will require vegetation removal within 780 square feet of steep slopes and the removal of four significant trees. All temporary vegetation impacts will be restored through installation of native plants. The significant trees will be replaced at a 2:1 ratio. The replacement trees will be installed in the area of vegetation restoration.

Native Vegetation Restoration – Planting Area A (780 square feet)

Common Name	*Latin Name*	*Size*	*Spacing*	*Quantity*
Vine Maple	*Acer circinatum*	1 gal.	6'	5
Indian plum	*Oemleria cerasiformis*	1 gal.	6'	5
Snowberry	*Symphoricarpos albus*	1 gal.	6'	5
Western sword fern	*Polystichum munitum*	1 gal.	6'	5
Dull Oregon grape	*Mahonia nervosa*	1 gal.	6'	5

Tree Replacement Planting – Planting Area A

Common Name	*Latin Name*	*Size*	*Quantity*
Big leaf maple	*Acer macrophyllum*	2 gal	4
Douglas fir	*Pseudotsuga menziesii*	2 gal.	4

9.3.3 Native Vegetation Enhancement Plantings

Mitigation for the top-of-slope buffer modification will be in the form of control of invasive species and planting of native plants within the specified enhancement area west of the proposed residence. Please see the conceptual mitigation plan on Sheet 2 attached to this report for planting locations.

Enhancement Plantings – Area B (1,200 square feet)

Common Name	*Latin Name*	*Size*	*Spacing*	*Quantity*
Vine Maple	*Acer circinatum*	1 gal.	6'	6
Indian plum	*Oemleria cerasiformis*	1 gal.	6'	6
Oceanspray	*Holodiscus discolor*	1 gal.	6'	6
Snowberry	*Symphoricarpos albus*	1 gal.	6'	6
Western sword fern	*Polystichum munitum*	1 gal.	6'	6
Dull Oregon grape	*Mahonia nervosa*	1 gal.	6'	6

9.4 TIMING

Unless timing restrictions are established by the director for this project, all work shall be completed prior to final building inspection or issuance of a temporary certificate of occupancy or certificate of occupancy, as applicable for the development.

9.5 MONITORING

9.5.1 Purpose of Monitoring

The purpose of monitoring is to evaluate the success of the proposed enhancement plan. If, at the end of five years post-installation, the criteria for success set forth below are met, then the project will be considered successful. Upon completion of the proposed enhancement project, an

inspection by a qualified ecologist or landscape architect will be made to determine plan compliance. A compliance report/as-built will be supplied to the City of Bellevue within 30 days after the completion of planting. The city must approve the as-built document before the monitoring period commences. A qualified ecologist or landscape architect shall conduct monitoring of the plant conditions in the spring and fall annually for five years. For each year monitored, a written report describing the progress and condition of the mitigation plan will be submitted to the City of Bellevue after the fall inspection. Final inspection will occur five years after completion of project installation. At that time, the contracted ecologist or landscape architect shall prepare a report evaluating the success of the project.

9.5.2 Requirements for monitoring project

1. Initial compliance report
2. Yearly site inspections (twice yearly; once in the spring and fall) for five years
3. Annual reports (one report submitted in the fall of each monitored year), including a final report at the conclusion of the fifth year with an assessment of mitigation success or failure.

9.5.3 Definition of Success

The goal of this enhancement plan shall be to control invasive and non-native species and establish well-vegetated buffer areas dominated by native trees and shrubs. Therefore, the criteria for success shall be a minimum 80 percent survival of the planted species at the end of five years. In addition, not more than 10 percent areal cover from non-native, invasive species shall be present in the buffer area at the end of five years, or that area shall not be considered successful.

9.5.4 Monitoring Protocol

During the initial site inspection, photo points will be established as appropriate. These will be used throughout the five-year monitoring period. For installed vegetation monitoring, two meter wide transects shall be established as appropriate. Along these transects, sample plots that are representative of the vegetative community will be chosen. These plots shall be fixed, located using stakes, GPS, or other method and used for the duration of the monitoring period. Plant survival and invasive species cover within the sampling areas are assumed to be representative of the entire site. In addition to the sampling areas, a visual inspection of the entire mitigation area shall be conducted to assess any high mortality areas not represented by the transects.

If one or more of the planted species exhibit a high rate of mortality and are deemed inappropriate for the site, the consulting ecologist and/or landscape architect may recommend a substitution.

9.6 CONTINGENCY PLAN

If, during any of the semi-annual inspections, more than 20 percent of the plants are severely stressed or it appears 20 percent may not survive, additional plants of the same species will be added to the mitigation areas. If invasive, non-native species exceed 15 percent of plant populations (as measured by percent cover), manual or chemical control (by a licensed applicator) may be necessary. If any of these situations persist to the next semi-annual inspection, a meeting with the City of Bellevue, the consulting ecologist, and the property owner will be held

to decide upon contingency plans. Elements of a contingency plan may include, but will not be limited to: more aggressive weed control, mulching, replanting with larger plant material, species substitution, fertilization, soil amendments, and/or irrigation.

9.7 VEGETATION MANAGEMENT PLAN

This mitigation project will require periodic maintenance to replace mortality of planted species and control invasive, non-native plant species, and other undesirable competing species. The mitigation planting areas will be maintained (at a minimum) in spring and late summer of each year for the five-year monitoring period. Maintenance may include, but will not be limited to, removal of competing species and non-native vegetation (by hand if necessary), irrigation, replacement of dead plants, and/or the replacement of mulch during each maintenance period. Chemical control of invasive, non-native species, if necessary, shall be applied only after approval by the City of Bellevue. Herbicide shall be applied by a licensed applicator following all label instructions. Chemical control and fertilization within the mitigation areas will only be performed if deemed necessary.

Irrigation of plantings during the dry season (generally June through September) is highly recommended for the first two years following installation. If adequate rainfall occurs during the dry season to support the establishment of plants, then irrigation measures may not be necessary. Due to the steep slopes on the site, a drip system that waters for short periods at a time shall be used to prevent any erosion or slope stability issues.

10.0 USE OF THIS REPORT

This Critical Areas Report and Conceptual Mitigation Plan is supplied to GIS Development as a means of determining on-site critical area conditions, as required by the City of Bellevue during the permitting process. This report is based largely on readily observable conditions and, to a lesser extent, on readily ascertainable conditions. No attempt has been made to determine hidden or concealed conditions.

The laws applicable to wetlands are subject to varying interpretations and may be changed at any time by the courts or legislative bodies. This report is intended to provide information deemed relevant in the applicant's attempt to comply with the laws now in effect.

The work for this report has conformed to the standard of care employed by wetland ecologists. No other representation or warranty is made concerning the work or this report, and any implied representation or warranty is disclaimed.

Wetland Resources, Inc.

Meryl Kamowski
Senior Ecologist

Scott Walters
Associate Ecologist

11.0 REFERENCES

Bellevue, City of. Bellevue Municipal Code. Title 20, Land Use Code. Chapter 20.25H, Critical Areas Overlay.

Cowardin, et al., 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior. FWS/OBS-79/31. December 1979.

King County. 2015. King County iMap Interactive Mapping Tool. http://gismaps.kingcounty.gov/iMap/.

Lichvar, R.W., M. Butterwick, N.C. Melvin, and W.N. Kirchner. 2014. The National Wetland Plant List: 2014 Update of Wetland Ratings. Phytoneuron 2014-41: 1-42.

Munsell Color. 2012. Munsell Soil Color Book. Munsell Color, Grand Rapids, MI.

Natural Resources Conservation Service (NRCS). 2015. Web Soil Survey. U.S. Department of Agriculture. http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

Olson, P., & Stockdale, E. (2010). *Determining the Ordinary High Water Mark on Streams in Washington State*. Second Review Draft. Washington State Department of Ecology, Shorelands & Environmental Assistance Program, Lacey, WA. *Ecology Publication*, 08-06.

U.S. Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0). Vicksburg, MS

U.S. Department of Agriculture, Soil Conservation Service. Washington, D.C. Soil Survey of King County Area Washington. November 1973.

U.S. Fish & Wildlife Service. 2015. National Wetlands Inventory (NWI) Online Mapper. http://www.fws.gov/wetlands/Data/Mapper.html.

WA Department of Fish & Wildlife. 2015a. Priority Habitat and Species (PHS) Interactive Map. http://apps.wdfw.wa.gov/phsontheweb/.

WA Department of Fish & Wildlife. 2015b. SalmonScape Online Mapping Application. http://apps.wdfw.wa.gov/salmonscape/map.html.

Appendix A: Geotechnical Engineering Study

GEOTECH
CONSULTANTS, INC.

13256 Northeast 20th Street, Suite 16
Bellevue, Washington 98005
(425) 747-5618 | GEOTECHNW.COM

December 15, 2015

JN 15481

GIS Development
600 Stewart Street, Suite 603
Seattle, Washington 98101

Attention: Ryan Grams *via email: rg@gisinternational.com*

Subject: **Transmittal Letter – Geotechnical Engineering Study**
Proposed Two New Residences
Lots 6 & 7, 5247 – 145th Place Southeast
Bellevue, Washington

Dear Mr. Grams:

We are pleased to present this geotechnical engineering report for the proposed two new residences to be constructed in Bellevue. The scope of our services consisted of exploring site surface and subsurface conditions, and then developing this report to provide recommendations for general earthwork and design considerations for foundations, retaining walls, and slope stability. This work was authorized by your acceptance of our proposal, P-9274 dated September 16, 2015.

The attached report contains a discussion of the study and our recommendations. Please contact us if there are any questions regarding this report, or for further assistance during the design and construction phases of this project.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

Marc R. McGinnis, P.E.
Principal

ASM/MRM: at

GEOTECHNICAL ENGINEERING STUDY
Proposed Two New Residences
Lots 6 & 7, 5247 – 145th Place Southeast
Bellevue, Washington

This report presents the findings and recommendations of our geotechnical engineering study for the site of the proposed two new residences to be located in Bellevue.

We were provided with a preliminary site plan and a topographic map. SkB Architects developed this preliminary plan, which is dated August 14, 2015. Tri-County Land Surveying Company developed the topographic map which is dated November, 2015. No formal development plans had been prepared at the time of this report. However, based on our discussions with GIS Development, we understand that the development will consist of constructing a single-family residence one on both Lot 6 and Lot 7 on the residential development. The residence on Lot 6 will be located in the central portion of the lower, western end of the parcel. A new driveway will extend from the eastern end of the new residence to the existing paved driveway that serves the adjacent residence on Lot 5 (5247 – 145th Place Southeast). On Lot 7, the residence is proposed along the upper, eastern property line directly off of the private access road designated Tract C. It is our understanding that this residence will be elevated over the existing slope with a first-floor elevation similar to that of the adjacent roadway. This house siting and configuration is intended to minimize disturbance on the steep slope. Similar construction is being used for the new house being built on the lot immediately to the north of Lot 7.

If the scope of the project changes from what we have described above, we should be provided with revised plans in order to determine if modifications to the recommendations and conclusions of this report are warranted.

SITE CONDITIONS

SURFACE

The Vicinity Map, Plate 1, illustrates the general location of the site. The irregular-shaped subject site consists of two parcels; Lot 6 (King County Parcel #0713500060) and Lot 7 (King County Parcel #0713500070). The subject site as a whole slopes moderately to steeply downward from east to west. The site is bordered by a paved private access road to the east, and residential properties of similar size developed with single-family residences to the north, south, and west. Lot 5 (5247 – 145th Place Southeast) is developed to the south of Lot 6, and a new home is under construction on the lot to the north of Lot 7.

Lot 6: The irregular-shaped parcel has approximate dimensions of 210 feet in the east-west direction and 100 feet in the north-south direction. The lot slopes downward at a 32-percent slope from east to west and has been previously graded with multiple tiered 2- to 5-foot-tall rockeries with flat, grass lawn areas between them. This landscaping appears to have occurred in conjunction with development of Lot 5. The lower end of the lot becomes steeper, with a short, localized steep slope in the central portion of the lot. A paved driveway is located along the eastern end of the lot that provides access to the adjacent residence to the south (on Lot 5) from the roadway Tract C. It should be noted that a sanitary sewer easement runs north to south through the western end of Lot 6.

Lot 7: This 1.16-acre parcel is irregularly shaped with average dimensions of 313 feet in the east-west direction and 235 feet in the north-south direction. The eastern edge of this lot is close to the paved road that provides access to the neighborhood from the end of 145th Place Southeast. In general, the parcel can be divided into the very steep, upper, eastern half sloped at approximately a 70 percent grade and the less steeply inclined western half at approximately a 40-percent grade. The entire parcel is overgrown with brush and mature trees.

SUBSURFACE

The subsurface conditions were explored by drilling six borings at the approximate locations shown on the Site Exploration Plan, Plate 2. Our exploration program was based on the proposed construction, anticipated subsurface conditions and those encountered during exploration, and the scope of work outlined in our proposal.

The borings were drilled on November 16 and 17, 2015 using both a small track-mounted, hollow-stem auger drill and a portable Acker drill. The Acker drill system utilizes a small, gasoline-powered engine to advance a hollow-stem auger to the sampling depth. Samples were taken at approximate 5-foot intervals with a standard penetration sampler. This split-spoon sampler, which has a 2-inch outside diameter, is driven into the soil with a 140-pound hammer falling 30 inches. The number of blows required to advance the sampler a given distance is an indication of the soil density or consistency. A geotechnical engineer from our staff observed the drilling process, logged the test borings, and obtained representative samples of the soil encountered. The Test Boring Logs are attached as Plates 3 through 8.

Soil Conditions

Lot 6: The soils encountered in our borings generally consisted of loose to medium-dense silty sand and sandy silt which became dense to very dense below depths of 20 to 25 feet from the existing grade. Borings 1 and 3 encountered dense silt at depths of 23 and 30 feet respectively. This dense soil appears to have been glacially compressed, while the upper, loose soils have not been.

Lot 7: Boring 4, located at the top of the steep slope along the eastern property line encountered 11 feet of loose to medium-dense, silty sand fill soils which were likely placed during grading for the roadway. A thin layer of brown silty sand/weathered sandstone was encountered overlying very dense, dark gray sandstone at a depth of approximately 12.5 feet. This bedrock is typical for the area. We encountered similar fill over weathered sandstone during our work on the foundation piles for the house under construction to the north.

Borings 5 and 6 were located on the very steep slope, near the western end of the proposed residence. Loose silty sand/weathered sandstone was encountered overlying very dense sandstone at depths of 6 to 9 feet. It was impossible for the small Acker drill to auger more than a few feet into the sandstone, due to its density.

No obstructions were revealed by our explorations. However, debris, buried utilities, and old foundation and slab elements are commonly encountered on sites that have had previous development.

Groundwater Conditions

Perched groundwater seepage was observed at a depth of 7 and 8.5 feet in Borings 1 and 3 located on Lot 6. The borings were conducted relatively early in the winter, and were left open for only a short time period. Therefore, the seepage levels on the logs represent the location of transient water seepage and may not indicate the static groundwater level. Groundwater levels encountered during drilling can be deceptive, because seepage into the boring can be blocked or slowed by the auger itself.

It should be noted that groundwater levels vary seasonally with rainfall and other factors. We anticipate that groundwater could be found in more permeable soil layer and at the contact point between the loose upper weathered soils and the underlying dense bedrock.

The stratification lines on the logs represent the approximate boundaries between soil types at the exploration locations. The actual transition between soil types may be gradual, and subsurface conditions can vary between exploration locations. The logs provide specific subsurface information only at the locations tested. If a transition in soil type occurred between samples in the borings, the depth of the transition was interpreted. The relative densities and moisture descriptions indicated on the boring logs are interpretive descriptions based on the conditions observed during drilling.

SLOPE STABILITY ANALYSIS

To evaluate the steep slope on Lot 7 and provide recommendations for the proposed development, we conducted a slope stability analysis using the computer program SLOPE/W. We developed a cross section of the slope using the topographic survey of the site provided to us.

The analysis is largely dependent on the soil profile of the slope and the parameters of each soil type; the most notable parameter being the angle of internal friction. These values were determined from the soils and bedrock observed in the borings we conducted on the site. The existing slope was evaluated for both static and dynamic loading conditions. The dynamic loading condition was completed assuming a peak design ground acceleration of 0.37g. A potential slope failure surface with factors of safety of at least 1.5 under static conditions and 1.2 under seismic conditions would extend down to the contact between the weathered sandstone and the underlying dense sandstone. Shallower slides affecting the fill and loose, native soil are more likely to occur over time, particularly following extended wet weather.

The recommendations presented in this report are intended to prevent the planned development from adversely affecting stability of the steep slope. They are also intended to protect the residence from damage in the event of foreseeable slope movement.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

THIS SECTION CONTAINS A SUMMARY OF OUR STUDY AND FINDINGS FOR THE PURPOSES OF A GENERAL OVERVIEW ONLY. MORE SPECIFIC RECOMMENDATIONS AND CONCLUSIONS ARE CONTAINED IN THE REMAINDER OF THIS REPORT. ANY PARTY RELYING ON THIS REPORT SHOULD READ THE ENTIRE DOCUMENT.

Lot 6

The soils encountered in the upper 20 feet of our borings in the area of the proposed residence on Lot 6 consisted of loose soils that are not suitable to support the proposed house without the risk of excessive post-construction settlement. Therefore, we recommend supporting this residence on a deep foundation system consisting of small-diameter steel pipe piles that are driven into the dense underlying soils. The ***Pipe Piles*** section of this report should be reference for additional recommendations.

It is likely that some settlement of the ground surrounding pile-supported buildings will occur over time. In order to reduce the potential problems associated with this, we recommend the following:

- Fill to the desired site grades several months prior to constructing on-grade slabs, walkways, and pavements around the buildings. This allows the underlying soils to undergo some consolidation under the new soil loads before final grading is accomplished.

- Connect all in-ground utilities beneath the floor slabs to the pile-supported floors or grade beams. This is intended to prevent utilities, such as sewers, from being pulled out of the floor as the underlying soils settle away from the slab. Hangers or straps can be poured into the floors and grade beams to carry the piping. The spacing of these supporting elements will depend on the distance that the pipe material can span unsupported.

- Construct all entrance walkways as reinforced slabs that are doweled into the grade beam at the door thresholds. This will allow the walkways to ramp down and away from the building as they settle, without causing a downset at the threshold.

- Isolate on-grade elements, such as walkways or pavements, from pile-supported foundations and columns to allow differential movement.

Projects involving small-diameter pipe piles often include the need for lateral resistance from fill placed against the foundations. If this is the case for this project, it is important that the structural engineer indicate this requirement on the plans for the general and earthwork contractor's information. Compaction requirements for this fill are discussed below in ***Pipe Piles***. The building department may require that we verify suitable compaction of this fill prior to completion of the project.

A utility and drainage easement runs through the western end of the parcel which contains a sanitary sewer line. It would be prudent to determine the exact location of the sewer line prior to installing the pipe pile foundation system.

Due to the presence of homes downslope, fill should not be placed west of the Lot 6 house, unless retained by an engineered wall that is reviewed by the project geotechnical engineer.

Lot 7

The boring conducted along the eastern property line in the area of the proposed residence encountered loose silty sand fill soils to a depth of 12 feet overlying very dense sandstone

bedrock. The upper fill soils were likely placed during the grading of the roadway in Tract C. Directly downslope, along the western end, of the proposed house and on the very steep slope, 6 to 9 feet of loose silty sand/weathered sandstone was encountered overlying very dense sandstone. These findings are similar to the conditions we observed during the installation of the drilled pile foundation system for the house under construction on the adjacent property to the north.

Based on the soil and topographic conditions, it appears that constructing the residence on the upper eastern end of the lot and elevating the house over the existing slope would be the most appropriate means to minimize the disturbance to the steep slope. We recommend the residence be supported on drilled, concrete-filled piles that are embedded into the hard bedrock that comprises the core of the steep slope, providing both vertical and lateral load resistance for the structure. The drilled piles should be at least 24 inches in diameter and be reinforced with rebar or wide-flange beams.

Based on our slope stability analysis, the potential for a deep-seated slope failure extending into the very dense bedrock is low. However, as with any steep slope in the Puget Sound area, there is always the potential for movement of the loose near-surface soils, particularly after periods with large amounts of precipitation. The recommendations in this report are intended to protect the proposed residence from damage in the event of future slope movement. The piles supporting the majority of the house only need to be embedded a minimum of 10 feet into the hard sandstone to accomplish this. The piles supporting the eastern edge of the house however, will need to be designed to retain the deeper fill soils under the east edge of the site and the adjacent roadway in the event of future soil movement on the steep manmade slope. To accomplish this, the eastern piles supporting the house and/or garage should be spaced no further than 3 feet edge-to-edge. These piles should be sufficiently reinforced to withstand lateral soil pressure acting to a depth of 12 feet below the road surface, and this will require that the piles are embedded into the underlying intact bedrock. This allows the closely-spaced piles to acts as a below-grade stabilization wall. Typically, a 2-foot-diameter drilled pile can be sufficiently reinforced to accomplish this. If the piles are exposed by future soil movement, then treated timber lagging can be installed between the piles.

If the grade between the house and the street is to be raised, this cannot be accomplished with compacted fill without adding substantial lateral loads to the foundations of the house. Any fill placed east of the house would have to consist of geofoam, which is self-supporting and does not add more lateral load against the foundations and walls. The geofoam can be covered with a non-woven filter fabric and up to 12 inches of compacted granular soil to provide a surface for walkways, planting, etc. It is important to note that any on-grade elements constructed outside of the pile-supported house will still experience long-term vertical settlement due to ongoing consolidation of the loose fill soils.

The steep natural slope west of the planned house should not be disturbed, and no fill should be placed on the slope to the west of the structure, unless it is retained by an engineered wall embedded into the intact sandstone.

The soils that underlie both lots have a low permeability. Considering this, the sloping topography and/or the presence of developed lots downslope, it is our professional opinion that onsite infiltration or dispersion of storm runoff is unfeasible.

The erosion control measures needed during the site development will depend heavily on the weather conditions that are encountered. We anticipate that a wire-backed silt fence will be needed around the downslope sides of any cleared areas. Additionally, a debris fence consisting of timber or plywood spanning between metal fence posts should be erected immediately downslope of the Lot 7 house footprint to collect spoils from the drilling of the foundation piles. Existing pavements, ground cover, and landscaping should be left in place wherever possible to minimize the amount of exposed soil. Rocked staging areas and construction access roads should be provided to reduce the amount of soil or mud carried off the property by trucks and equipment. Wherever possible, the access roads should follow the alignment of planned pavements. Trucks should not be allowed to drive off of the rock-covered areas. Cut slopes and soil stockpiles should be covered with plastic during wet weather. Following clearing or rough grading, it may be necessary to mulch or hydroseed bare areas that will not be immediately covered with landscaping or an impervious surface. On most construction projects, it is necessary to periodically maintain or modify temporary erosion control measures to address specific site and weather conditions.

The drainage and/or waterproofing recommendations presented in this report are intended only to prevent active seepage from flowing through concrete walls or slabs. Even in the absence of active seepage into and beneath structures, water vapor can migrate through walls, slabs, and floors from the surrounding soil, and can even be transmitted from slabs and foundation walls due to the concrete curing process. Water vapor also results from occupant uses, such as cooking and bathing. Excessive water vapor trapped within structures can result in a variety of undesirable conditions, including, but not limited to, moisture problems with flooring systems, excessively moist air within occupied areas, and the growth of molds, fungi, and other biological organisms that may be harmful to the health of the occupants. The designer or architect must consider the potential vapor sources and likely occupant uses, and provide sufficient ventilation, either passive or mechanical, to prevent a build up of excessive water vapor within the planned structure.

Geotech Consultants, Inc. should be allowed to review the final development plans to verify that the recommendations presented in this report are adequately addressed in the design. Such a plan review would be additional work beyond the current scope of work for this study, and it may include revisions to our recommendations to accommodate site, development, and geotechnical constraints that become more evident during the review process.

We recommend including this report, in its entirety, in the project contract documents. This report should also be provided to any future property owners so they will be aware of our findings and recommendations.

SEISMIC CONSIDERATIONS

In accordance with the International Building Code (IBC), the site soil profile within 100 feet of the ground surface is best represented by Site Class Type D (Stiff Site Class) for Lot 6 and Type C (Very dense soil/soft rock) for Lot 7. As noted in the USGS website, the mapped spectral acceleration value for a 0.2 second (S_s) and 1.0 second period (S_1) equals 1.39 and 0.53g, respectively.

The upper loose saturated site soils encountered on Lot 6 have a slight potential for seismic liquefaction during the Maximum Considered Earthquake (MCE), which has a probability of occurring once in 2,475 years (2 percent chance in 50 years). However, this report recommends the proposed buildings be supported on deep foundations embedded into the dense underlying soils. This is intended to prevent catastrophic foundation failure if liquefaction was to occur.

PIPE PILES

Four-inch-diameter pipe piles driven with a 650- or 800- or 1,100-pound hydraulic jackhammer to the following final penetration rates may be assigned the following compressive capacities.

INSIDE PILE DIAMETER	FINAL DRIVING RATE (650-pound hammer)	FINAL DRIVING RATE (800-pound hammer)	FINAL DRIVING RATE (1,100-pound hammer)	ALLOWABLE COMPRESSIVE CAPACITY
4 inches	20 sec/inch	15 sec/inch	10 sec/inch	10 tons

Note: The refusal criteria indicated in the above table are valid only for pipe piles that are installed using a hydraulic impact hammer carried on leads that allow the hammer to sit on the top of the pile during driving. If the piles are installed by alternative methods, such as a vibratory hammer or a hammer that is hard-mounted to the installation machine, numerous load tests to 200 percent of the design capacity would be necessary to substantiate the allowable pile load. The appropriate number of load tests would need to be determined at the time the contractor and installation method are chosen.

As a minimum, Schedule 40 pipe should be used. The site soils should not be highly corrosive. Considering this, it is our opinion that standard "black" pipe can be used, and corrosion protection, such as galvanizing, is not necessary for the pipe piles.

Pile caps and grade beams should be used to transmit loads to the piles. Isolated pile caps should include a minimum of two piles to reduce the potential for eccentric loads being applied to the piles. Subsequent sections of pipe can be connected with slip or threaded couplers, or they can be welded together. If slip couplers are used, they should fit snugly into the pipe sections. This may require that shims be used or that beads of welding flux be applied to the outside of the coupler.

Lateral loads due to wind or seismic forces may be resisted by passive earth pressure acting on the vertical, embedded portions of the foundation. For this condition, the foundation must be either poured directly against relatively level, undisturbed soil or be surrounded by level compacted fill. We recommend using a passive earth pressure of 300 pounds per cubic foot (pcf) for this resistance. If the ground in front of a foundation is loose or sloping, the passive earth pressure given above will not be appropriate. We recommend a safety factor of at least 1.5 for the foundation's resistance to lateral loading, when using the above ultimate passive value.

As discussed above in the ***General*** section, if lateral resistance from fill placed against the foundations is required for this project, the structural engineer should indicate this requirement on the plans for the general and earthwork contractor's information. Compacted fill placed against the foundations can consist of onsite that is tamped into place using the backhoe or is compacted using a jumping jack compactor. It is necessary for the fill to be compacted to a firm condition, but it does not need to reach even 90 percent relative compaction to develop the passive resistance recommended above. Due to their small diameter, the lateral capacity of vertical pipe piles is relatively small. However, if lateral resistance in addition to passive soil resistance is required, we recommend driving battered piles in the same direction as the applied lateral load. The lateral capacity of a battered pile is equal to one-half of the lateral component of the allowable compressive load, with a maximum allowable lateral capacity of 1,000 pounds. The allowable vertical capacity of battered piles does not need to be reduced if the piles are battered steeper than 1:5 (Horizontal:Vertical).

DRILLED CONCRETE PILES

An allowable compressive capacity of 30 tons can be attained by installing a 24-inch-diameter, concrete pile at least 10 feet into hard sandstone. This assumes that the bottoms of the drilled holes are cleaned of loosened soil and rock before pouring concrete. For transient loading, such as wind or seismic loads, the calculated allowable pile capacities may be increased by one-third. We can provide design criteria for different pile diameters and embedment lengths, if greater capacities are required.

We recommend reinforcing each pile for its entire length. This typically consists of a rebar cage extending a portion of the pile's length with a full-length center bar. Each pile located west of the easternmost line of piles should be assumed to have a point of fixity (point of maximum bending moment) at a depth of 12 feet below the top of the pile for design of the reinforcing. The reinforcing and minimum embedment into the hard bedrock for the eastern line of piles should be designed using the lateral earth pressures summarized on Plate 9.

We estimate that the total settlement of single piles installed as described above will be on the order of one-half inch. Most of this settlement should occur during the construction phase as the dead loads are applied. The remaining post-construction settlement would be realized as the live loads are applied. We estimate that differential settlements over any portion of the structures should be less than about one-quarter inch.

FOUNDATION AND RETAINING WALLS

Retaining walls backfilled on only one side should be designed to resist the lateral earth pressures imposed by the soil they retain. The following recommended parameters are for walls that restrain level backfill:

PARAMETER	VALUE
Active Earth Pressure *	40 pcf
Passive Earth Pressure	300 pcf
Coefficient of Friction	0.40
Soil Unit Weight	130 pcf

Where: pcf is Pounds per Cubic Foot, and Active and Passive Earth Pressures are computed using the equivalent fluid pressures.

*** For a restrained wall that cannot deflect at least 0.002 times its height, a uniform lateral pressure equal to 10 psf times the height of the wall should be added to the above active equivalent fluid pressure.**

The design values given above do not include the effects of any hydrostatic pressures behind the walls and assume that no surcharges, such as those caused by slopes, vehicles, or adjacent foundations will be exerted on the walls. If these conditions exist, those pressures should be added

to the above lateral soil pressures. Where sloping backfill is desired behind the walls, we will need to be given the wall dimensions and the slope of the backfill in order to provide the appropriate design earth pressures. The surcharge due to traffic loads behind a wall can typically be accounted for by adding a uniform pressure equal to 2 feet multiplied by the above active fluid density. Heavy construction equipment should not be operated behind retaining and foundation walls within a distance equal to the height of a wall, unless the walls are designed for the additional lateral pressures resulting from the equipment.

The values given above are to be used to design only permanent foundation and retaining walls that are to be backfilled, such as conventional walls constructed of reinforced concrete or masonry. It is not appropriate to use the above earth pressures and soil unit weight to back-calculate soil strength parameters for design of other types of retaining walls, such as soldier pile, reinforced earth, modular or soil nail walls. We can assist with design of these types of walls, if desired. The values for friction and passive resistance are ultimate values and do not include a safety factor. Restrained wall soil parameters should be utilized for a distance of 1.5 times the wall height from corners or bends in the walls. This is intended to reduce the amount of cracking that can occur where a wall is restrained by a corner.

Wall Pressures Due to Seismic Forces

The surcharge wall loads that could be imposed by the design earthquake can be modeled by adding a uniform lateral pressure to the above-recommended active pressure. The recommended surcharge pressure is 7**H** pounds per square foot (psf), where **H** is the design retention height of the wall. Using this increased pressure, the safety factor against sliding and overturning can be reduced to 1.2 for the seismic analysis.

Retaining Wall Backfill and Waterproofing

Backfill placed behind retaining or foundation walls should be coarse, free-draining structural fill containing no organics. This backfill should contain no more than 5 percent silt or clay particles and have no gravel greater than 4 inches in diameter. The percentage of particles passing the No. 4 sieve should be between 25 and 70 percent.

The onsite soils and bedrock are not free-draining, and should not be used for wall backfill.

The later section entitled ***Drainage Considerations*** should also be reviewed for recommendations related to subsurface drainage behind foundation and retaining walls.

The purpose of these backfill requirements is to ensure that the design criteria for a retaining wall are not exceeded because of a build-up of hydrostatic pressure behind the wall. Also, subsurface drainage systems are not intended to handle large volumes of water from surface runoff. The top 12 to 18 inches of the backfill should consist of a compacted, relatively impermeable soil or topsoil, or the surface should be paved. The ground surface must also slope away from backfilled walls to reduce the potential for surface water to percolate into the backfill. Water percolating through pervious surfaces (pavers, gravel, permeable pavement, etc.) must also be prevented from flowing toward walls or into the backfill zone. The compacted subgrade below pervious surfaces and any associated drainage layer should therefore be sloped away. Alternatively, a membrane and subsurface collection system could be provided below a pervious surface.

It is critical that the wall backfill be placed in lifts and be properly compacted, in order for the above-recommended design earth pressures to be appropriate. The wall design criteria assume that the backfill will be well-compacted in lifts no thicker than 12 inches. The compaction of backfill near the walls should be accomplished with hand-operated equipment to prevent the walls from being overloaded by the higher soil forces that occur during compaction. The section entitled ***General Earthwork and Structural Fill*** contains additional recommendations regarding the placement and compaction of structural fill behind retaining and foundation walls.

The above recommendations are not intended to waterproof below-grade walls, or to prevent the formation of mold, mildew or fungi in interior spaces. Over time, the performance of subsurface drainage systems can degrade, subsurface groundwater flow patterns can change, and utilities can break or develop leaks. Therefore, waterproofing should be provided where future seepage through the walls is not acceptable. This typically includes limiting cold-joints and wall penetrations, and using bentonite panels or membranes on the outside of the walls. There are a variety of different waterproofing materials and systems, which should be installed by an experienced contractor familiar with the anticipated construction and subsurface conditions. Applying a thin coat of asphalt emulsion to the outside face of a wall is not considered waterproofing, and will only help to reduce moisture generated from water vapor or capillary action from seeping through the concrete. As with any project, adequate ventilation of basement and crawl space areas is important to prevent a build up of water vapor that is commonly transmitted through concrete walls from the surrounding soil, even when seepage is not present. This is appropriate even when waterproofing is applied to the outside of foundation and retaining walls. We recommend that you contact an experienced envelope consultant if detailed recommendations or specifications related to waterproofing design, or minimizing the potential for infestations of mold and mildew are desired.

The ***General***, ***Slabs-On-Grade***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

FLOOR SLABS

If a slab is used for the lowest floor in the Lot 6 house it should be carried on the piles.

Even where the exposed soils appear dry, water vapor will tend to naturally migrate upward through the soil to the new constructed space above it. This can affect moisture-sensitive flooring, cause imperfections or damage to the slab, or simply allow excessive water vapor into the space above the slab. All interior slabs-on-grade should be underlain by a capillary break drainage layer consisting of a minimum 4-inch thickness of clean gravel or crushed rock that has a fines content (percent passing the No. 200 sieve) of less than 3 percent and a sand content (percent passing the No. 4 sieve) of no more than 10 percent. Pea gravel or crushed rock are typically used for this layer.

As noted by the American Concrete Institute (ACI) in the *Guides for Concrete Floor and Slab Structures*, proper moisture protection is desirable immediately below any on-grade slab that will be covered by tile, wood, carpet, impermeable floor coverings, or any moisture-sensitive equipment or

products. ACI also notes that vapor *retarders* such as 6-mil plastic sheeting have been used in the past, but are now recommending a minimum 10-mil thickness for better durability and long term performance. A vapor retarder is defined as a material with a permeance of less than 0.3 perms, as determined by ASTM E 96. It is possible that concrete admixtures may meet this specification, although the manufacturers of the admixtures should be consulted. Where vapor retarders are used under slabs, their edges should overlap by at least 6 inches and be sealed with adhesive tape. The sheeting should extend to the foundation walls for maximum vapor protection. If no potential for vapor passage through the slab is desired, a vapor *barrier* should be used. A vapor barrier, as defined by ACI, is a product with a water transmission rate of 0.01 perms when tested in accordance with ASTM E 96. Reinforced membranes having sealed overlaps can meet this requirement.

We recommend that the contractor, the project materials engineer, and the owner discuss these issues and review recent ACI literature and ASTM E-1643 for installation guidelines and guidance on the use of the protection/blotter material.

The ***General***, ***Permanent Foundation and Retaining Walls***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

EXCAVATIONS AND SLOPES

Excavation slopes should not exceed the limits specified in local, state, and national government safety regulations. Temporary cuts to a depth of about 4 feet may be attempted vertically in unsaturated soil, if there are no indications of slope instability. However, vertical cuts should not be made near property boundaries, or existing utilities and structures. Based upon Washington Administrative Code (WAC) 296, Part N, the near-surface soil at the subject site would generally be classified as Type C. Therefore, temporary cut slopes greater than 4 feet in height should not be excavated at an inclination steeper than 1.5:1 (Horizontal:Vertical), extending continuously between the top and the bottom of a cut. However, flatter cut slopes and/or shoring will be needed where cuts are made into the steep slope below the existing roadway, or where caving soil conditions are encountered.

The above-recommended temporary slope inclination is based on the conditions exposed in our explorations, and on what has been successful at other sites with similar soil conditions. It is possible that variations in soil and groundwater conditions will require modifications to the inclination at which temporary slopes can stand. Temporary cuts are those that will remain unsupported for a relatively short duration to allow for the construction of foundations, retaining walls, or utilities. Temporary cut slopes should be protected with plastic sheeting during wet weather. It is also important that surface runoff be directed away from the top of temporary slope cuts. Cut slopes should also be backfilled or retained as soon as possible to reduce the potential for instability. Please note that sand and/or loose soil can cave suddenly and without warning. Excavation, foundation, and utility contractors should be made especially aware of this potential danger. These recommendations may need to be modified if the area near the potential cuts has been disturbed in the past by utility installation, or if settlement-sensitive utilities are located nearby.

All permanent cuts into native soil should be inclined no steeper than 2.5:1 (H:V).

Water should not be allowed to flow uncontrolled over the top of any temporary or permanent slope. All permanently exposed slopes should be seeded with an appropriate species of vegetation to reduce erosion and improve the stability of the surficial layer of soil.

Any disturbance to the existing steep slopes outside of the building limits may reduce the stability of the slope. Damage to the existing vegetation and ground should be minimized, and any disturbed areas should be revegetated as soon as possible. Soil from the excavation should not be placed on the slope, and this may require the off-site disposal of any surplus soil.

DRAINAGE CONSIDERATIONS

Footing drains should be used where: (1) Crawl spaces or basements will be below a structure; (2) A slab is below the outside grade; or, (3) The outside grade does not slope downward from a building. Drains should also be placed at the base of all earth-retaining walls. These drains should be surrounded by at least 6 inches of 1-inch-minus, washed rock that is encircled with non-woven, geotextile filter fabric (Mirafi 140N, Supac 4NP, or similar material). At its highest point, a perforated pipe invert should be at least 6 inches below the bottom of a slab floor or the level of a crawl space. The discharge pipe for subsurface drains should be sloped for flow to the outlet point. Roof and surface water drains must not discharge into the foundation drain system. A typical drain detail is attached to this report as Plate 9. For the best long-term performance, perforated PVC pipe is recommended for all subsurface drains.

As a minimum, a vapor retarder, as defined in the ***Slabs-On-Grade*** section, should be provided in any crawl space area to limit the transmission of water vapor from the underlying soils. Crawl space grades are sometimes left near the elevation of the bottom of the footings. As a result, an outlet drain is recommended for all crawl spaces to prevent an accumulation of any water that may bypass the footing drains. Providing even a few inches of free draining gravel underneath the vapor retarder limits the potential for seepage to build up on top of the vapor retarder.

Groundwater was observed during our field work. If seepage is encountered in an excavation, it should be drained from the site by directing it through drainage ditches, perforated pipe, or French drains, or by pumping it from sumps interconnected by shallow connector trenches at the bottom of the excavation.

The excavations should be graded so that surface water is directed away from the tops of slopes. Water should not be allowed to stand in any area where foundations, slabs, or pavements are to be constructed. Final site grading in areas adjacent to buildings should slope away at least 2 percent, except where the area is paved. Surface drains should be provided where necessary to prevent ponding of water behind foundation or retaining walls. A discussion of grading and drainage related to pervious surfaces near walls and structures is contained in the ***Foundation and Retaining Walls*** section.

GENERAL EARTHWORK AND STRUCTURAL FILL

All building and pavement areas should be stripped of surface vegetation, topsoil, organic soil, and other deleterious material. The stripped or removed materials should not be mixed with any

materials to be used as structural fill, but they could be used in non-structural areas, such as landscape beds.

Structural fill is defined as any fill, including utility backfill, placed under, or close to, a building, behind permanent retaining or foundation walls, or in other areas where the underlying soil needs to support loads. All structural fill should be placed in horizontal lifts with a moisture content at, or near, the optimum moisture content. The optimum moisture content is that moisture content that results in the greatest compacted dry density. The moisture content of fill is very important and must be closely controlled during the filling and compaction process. As discussed in the ***General*** section, the on-site soils are not suitable for reuse as structural fill, due to their silty nature and high moisture contents.

The allowable thickness of the fill lift will depend on the material type selected, the compaction equipment used, and the number of passes made to compact the lift. The loose lift thickness should not exceed 12 inches. We recommend testing the fill as it is placed. If the fill is not sufficiently compacted, it can be recompacted before another lift is placed. This eliminates the need to remove the fill to achieve the required compaction. The following table presents recommended relative compactions for structural fill:

LOCATION OF FILL PLACEMENT	MINIMUM RELATIVE COMPACTION
Beneath slabs or walkways	95%
Filled slopes and behind retaining walls	90%
Beneath pavements	95% for upper 12 inches of subgrade; 90% below that level

Where: Minimum Relative Compaction is the ratio, expressed in percentages, of the compacted dry density to the maximum dry density, as determined in accordance with ASTM Test Designation D 1557-91 (Modified Proctor).

Structural fill that will be placed in wet weather should consist of a coarse, granular soil with a silt or clay content of no more than 5 percent. The percentage of particles passing the No. 200 sieve should be measured from that portion of soil passing the three-quarter-inch sieve.

LIMITATIONS

The conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our exploration and assume that the soil and groundwater conditions encountered in the borings are representative of subsurface conditions on the site. If the subsurface conditions encountered during construction are significantly different from those observed in our explorations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. Unanticipated conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking samples in borings. Subsurface conditions can also vary between exploration locations. Such unexpected conditions frequently require making additional expenditures to attain a properly constructed

project. It is recommended that the owner consider providing a contingency fund to accommodate such potential extra costs and risks. This is a standard recommendation for all projects.

The recommendations presented in this report are directed toward the protection of only the proposed residences from damage due to slope movement. Predicting the future behavior of steep slopes and the potential effects of development on their stability is an inexact and imperfect science that is currently based mostly on the past behavior of slopes with similar characteristics. Landslides and soil movement can occur on steep slopes before, during, or after the development of property. The owner of any property containing, or located close to steep slopes must ultimately accept the possibility that some slope movement could occur, resulting in possible loss of ground or damage to the facilities around the proposed residences.

This report has been prepared for the exclusive use of GIS Development, and its representatives, for specific application to this project and site. Our conclusions and recommendations are professional opinions derived in accordance with our understanding of current local standards of practice, and within the scope of our services. No warranty is expressed or implied. The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. Our services also do not include assessing or minimizing the potential for biological hazards, such as mold, bacteria, mildew and fungi in either the existing or proposed site development.

ADDITIONAL SERVICES

In addition to reviewing the final plans, Geotech Consultants, Inc. should be retained to provide geotechnical consultation, testing, and observation services during construction. This is to confirm that subsurface conditions are consistent with those indicated by our exploration, to evaluate whether earthwork and foundation construction activities comply with the general intent of the recommendations presented in this report, and to provide suggestions for design changes in the event subsurface conditions differ from those anticipated prior to the start of construction. However, our work would not include the supervision or direction of the actual work of the contractor and its employees or agents. Also, job and site safety, and dimensional measurements, will be the responsibility of the contractor.

During the construction phase, we will provide geotechnical observation and testing services when requested by you or your representatives. Please be aware that we can only document site work we actually observe. It is still the responsibility of your contractor or on-site construction team to verify that our recommendations are being followed, whether we are present at the site or not.

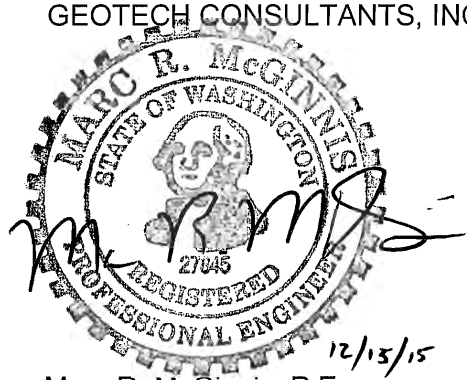
The following plates are attached to complete this report:

Plate 1	Vicinity Map
Plate 2	Site Exploration Plan
Plates 3 - 8	Boring Logs
Plate 9	Stabilization Wall Detail
Plate 10	Typical Footing Drain Detail

We appreciate the opportunity to be of service on this project. Please contact us if you have any questions, or if we can be of further assistance.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

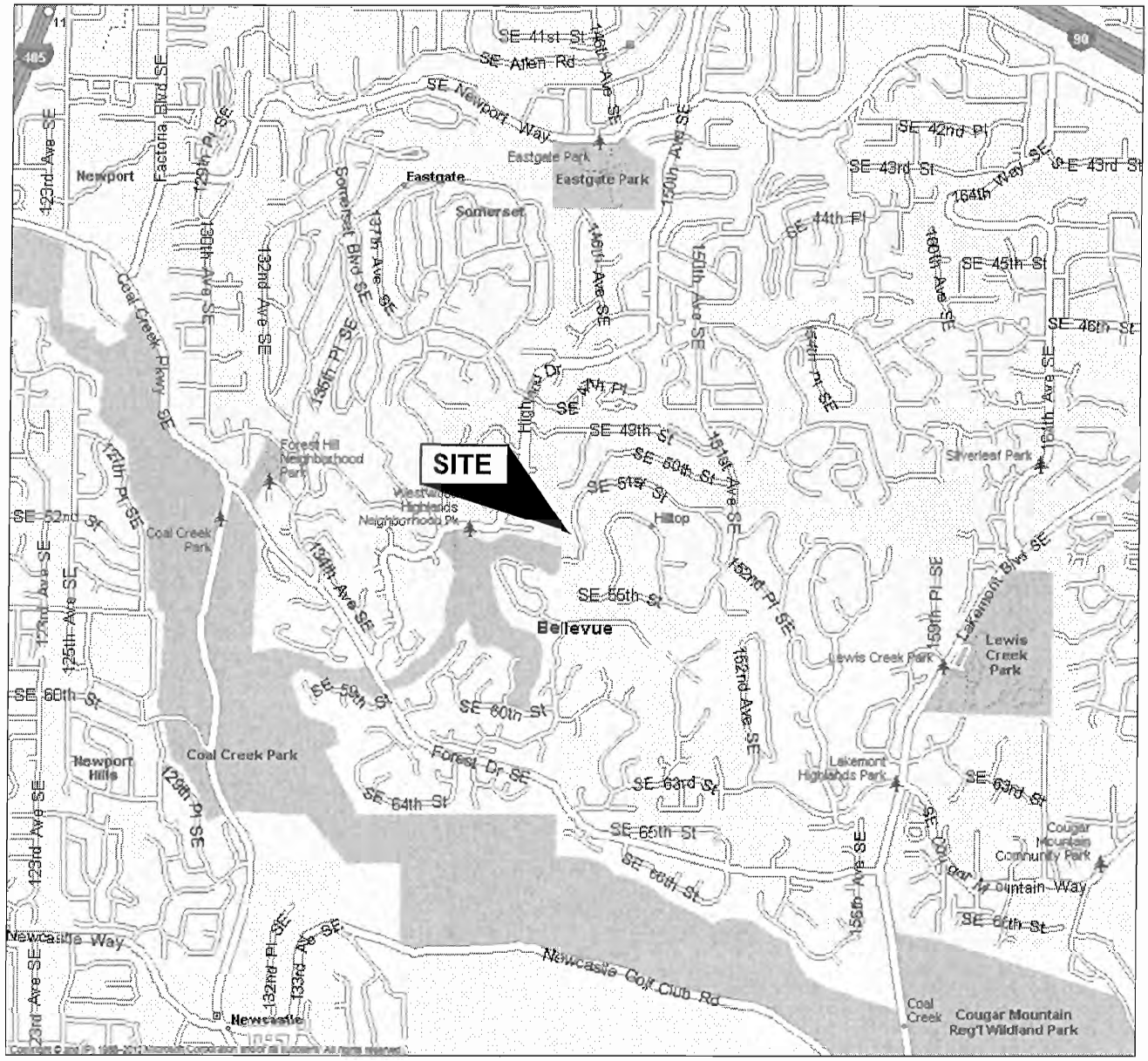


12/15/15

Marc R. McGinnis, P.E.
Principal

ASM/MRM:at

NORTH



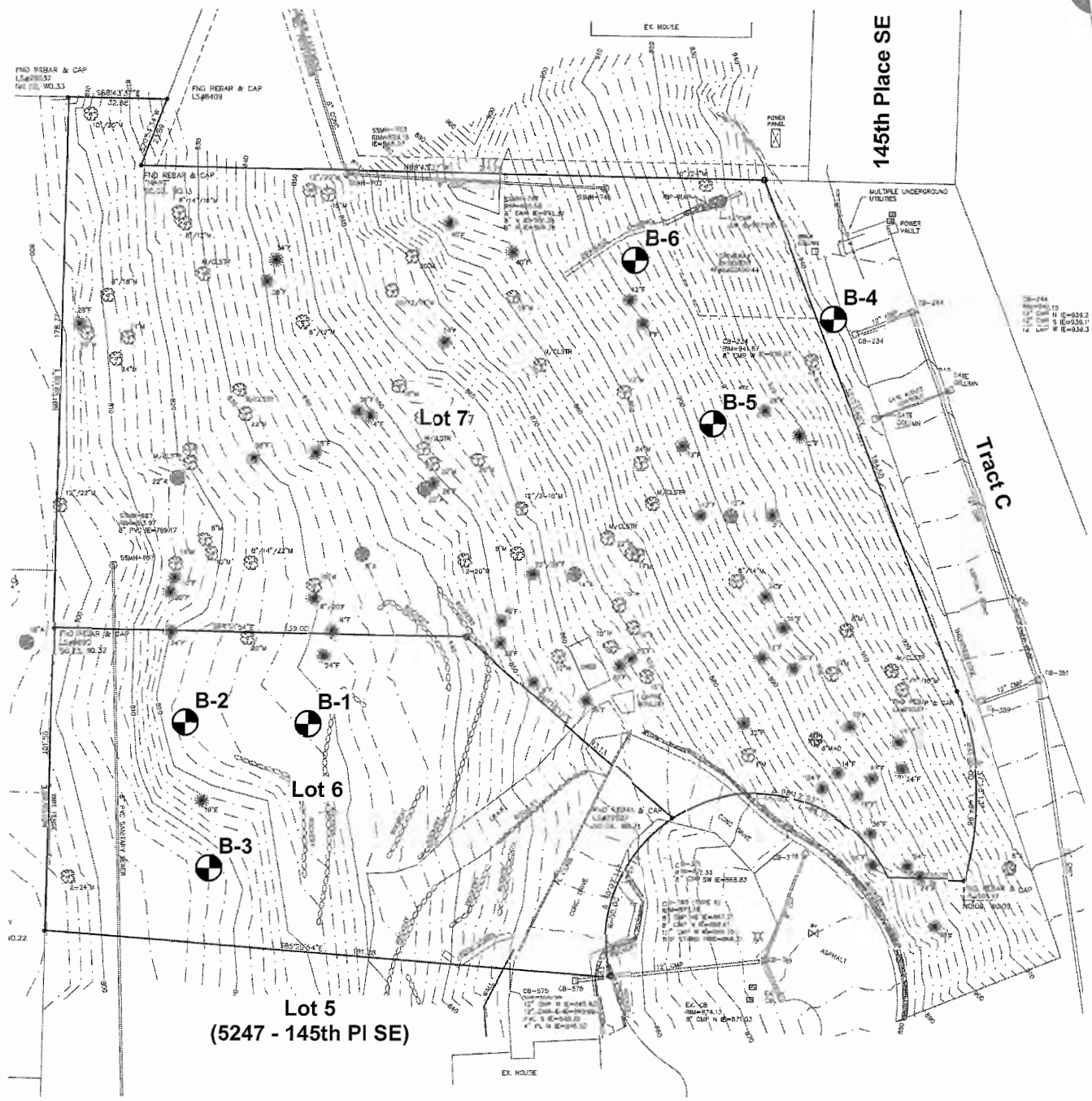
(Source: Microsoft MapPoint, 2013)

GEOTECH
CONSULTANTS, INC.

VICINITY MAP

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job No:	Date:		Plate:
15481	Dec. 2015		1



Legend:

Test Boring Location

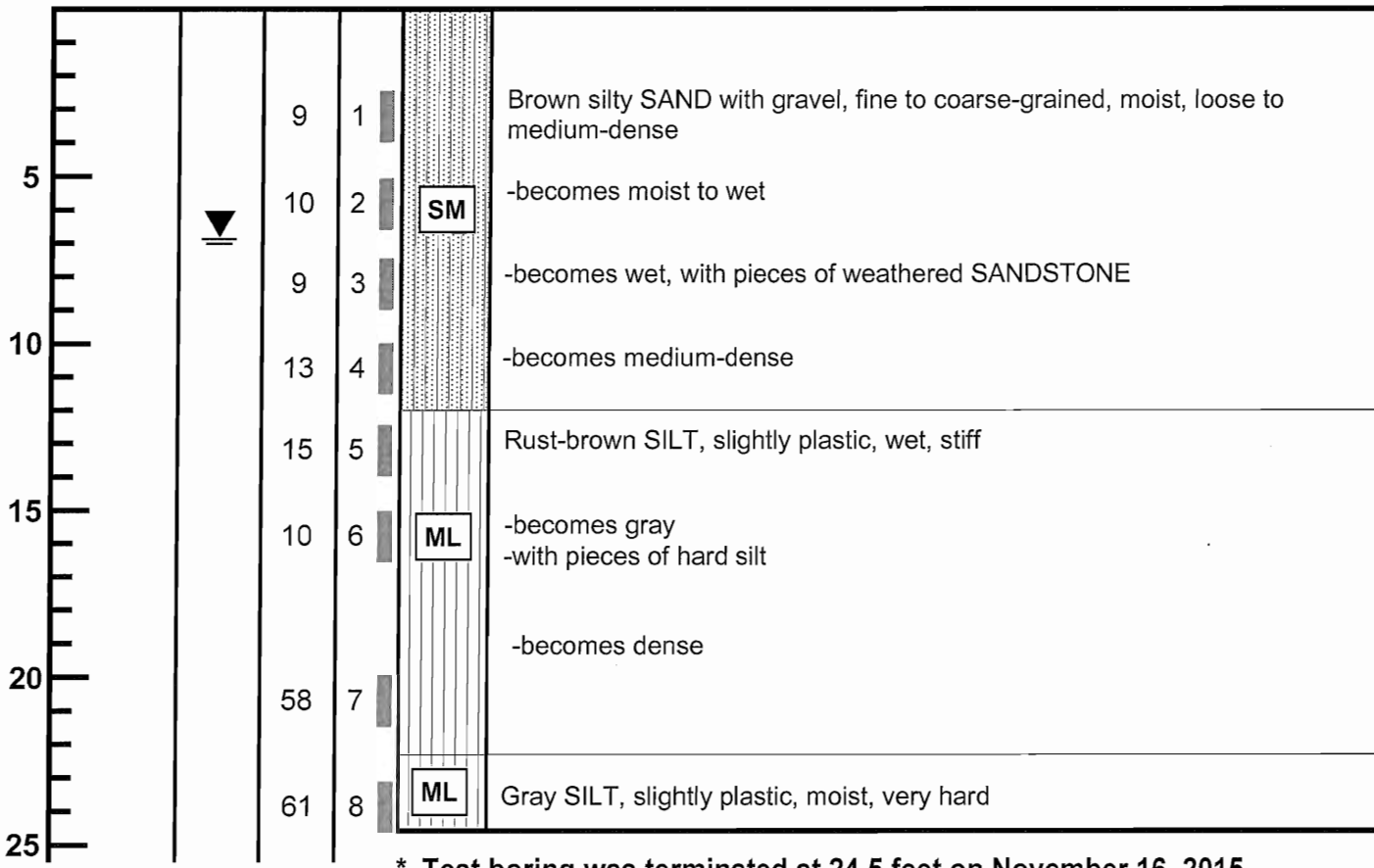
GEOTECH CONSULTANTS, INC.

SITE EXPLORATION PLAN

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job No:	Date:		Plate:
15481	Dec. 2015	No Scale	2

BORING 1



*** Test boring was terminated at 24.5 feet on November 16, 2015.**

*** Groundwater was encountered 7 feet during drilling.**

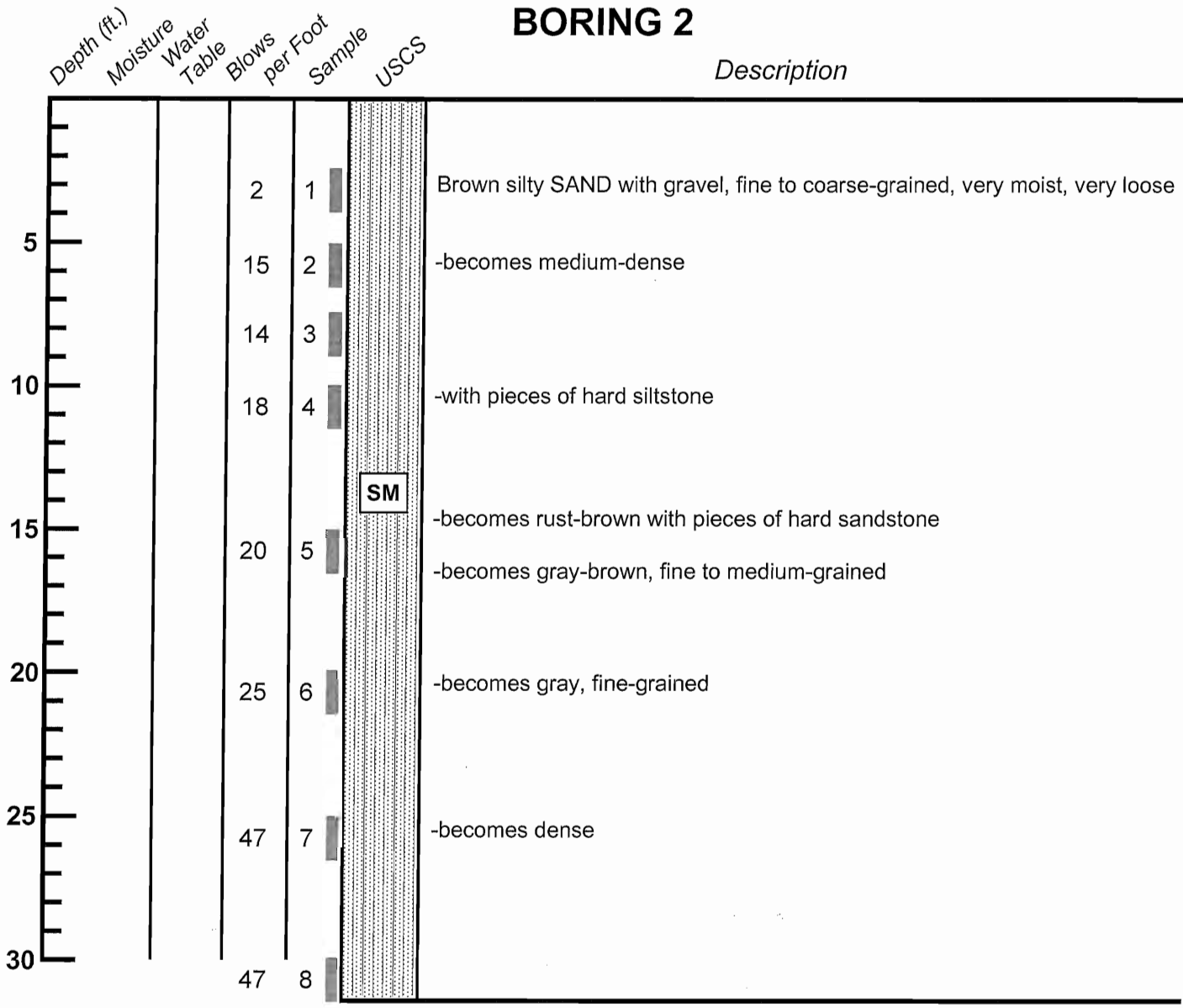
GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	3

BORING 2



*** Test boring was terminated at 31.5 feet on November 16, 2015.**
*** No groundwater was encountered during drilling.**

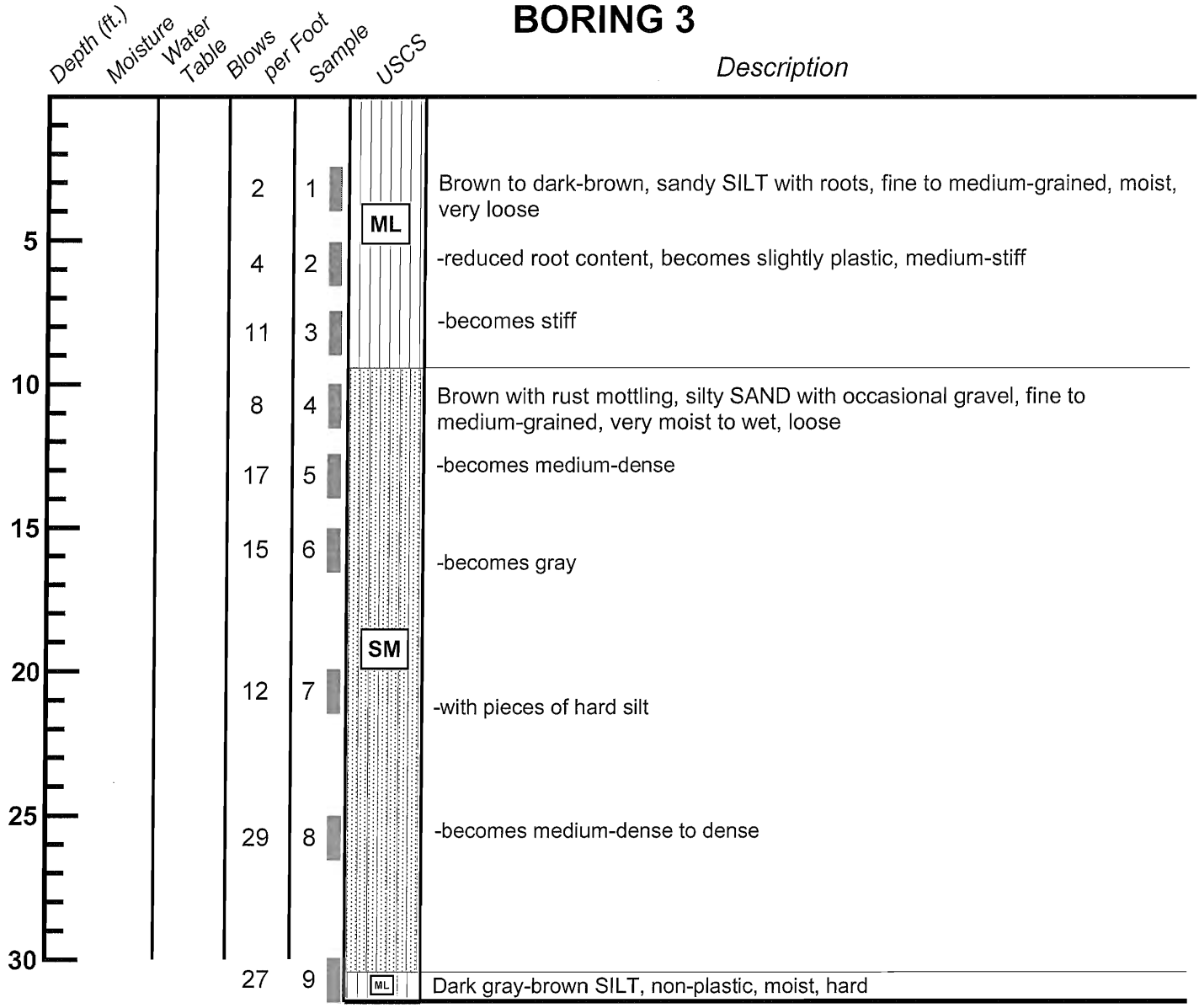
GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	4

BORING 3



*** Test boring was terminated at 31.5 feet on November 16, 2015.**

*** No groundwater was encountered during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	5

BORING 4

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
			3	1	FILL	Dark brown with tan pieces, sandy SILT with gravel and organics, fine-grained, moist, loose **(FILL)**
5			6	2		
			11	3	FILL	Brown silty SAND with gravel and organics and pieces of SANDSTONE, fine to coarse-grained, moist, medium-dense **(FILL)**
10			17	4	SM/RX	Tan weathered SANDSTONE/silty SAND, fine-grained, moist, medium-dense
			97/11"	5	Rx	Gray SANDSTONE, fine-grained, moist, very dense
15			50/6"	6		

* **Test boring was terminated at 15 feet on November 16, 2015.**

* **No groundwater was encountered during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	6

BORING 5

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
			2	1	SM/RX	Light-brown weathered SANDSTONE/silty SAND, fine-grained, moist, loose
5			30	2		-becomes dark gray-brown
					Rx	Dark gray SANDSTONE, fine-grained, moist, dense
			93	3		-becomes very dense
10						

* **Test boring was terminated at 9 feet on November 17, 2015.**

* **No groundwater was encountered during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	7

BORING 6

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
			3	1	SM Rx	Brown weathered SANDSTONE/silty SAND, fine-grained, moist, loose
5			22	2		-becomes medium-dense
			46	3		Brown weathered SANDSTONE, fine-grained, moist, dense
10						
15						

*** Test boring was terminated at 8.5 feet due to refusal on November 17, 2015.**

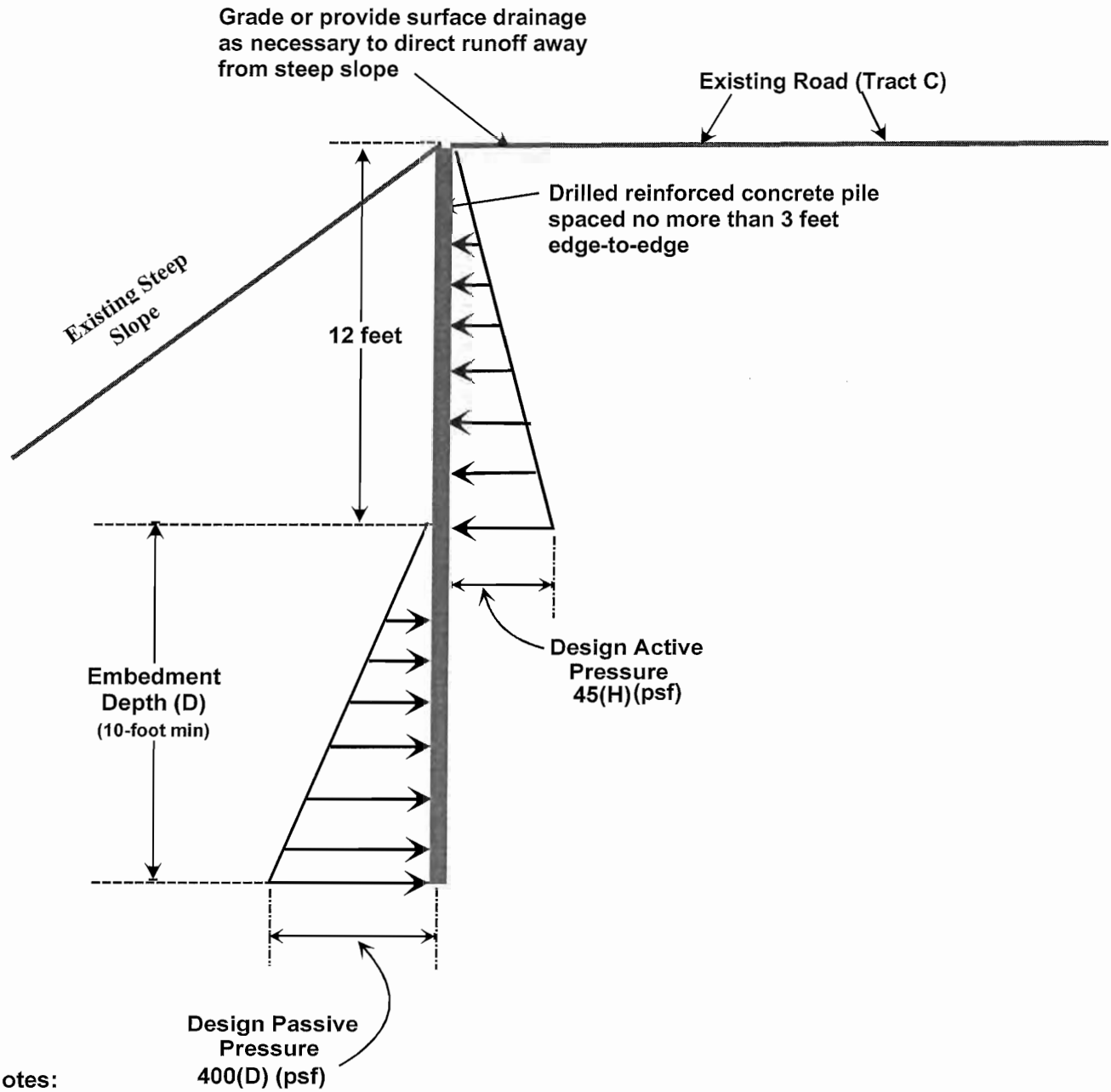
*** No groundwater was encountered during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	8



Notes:

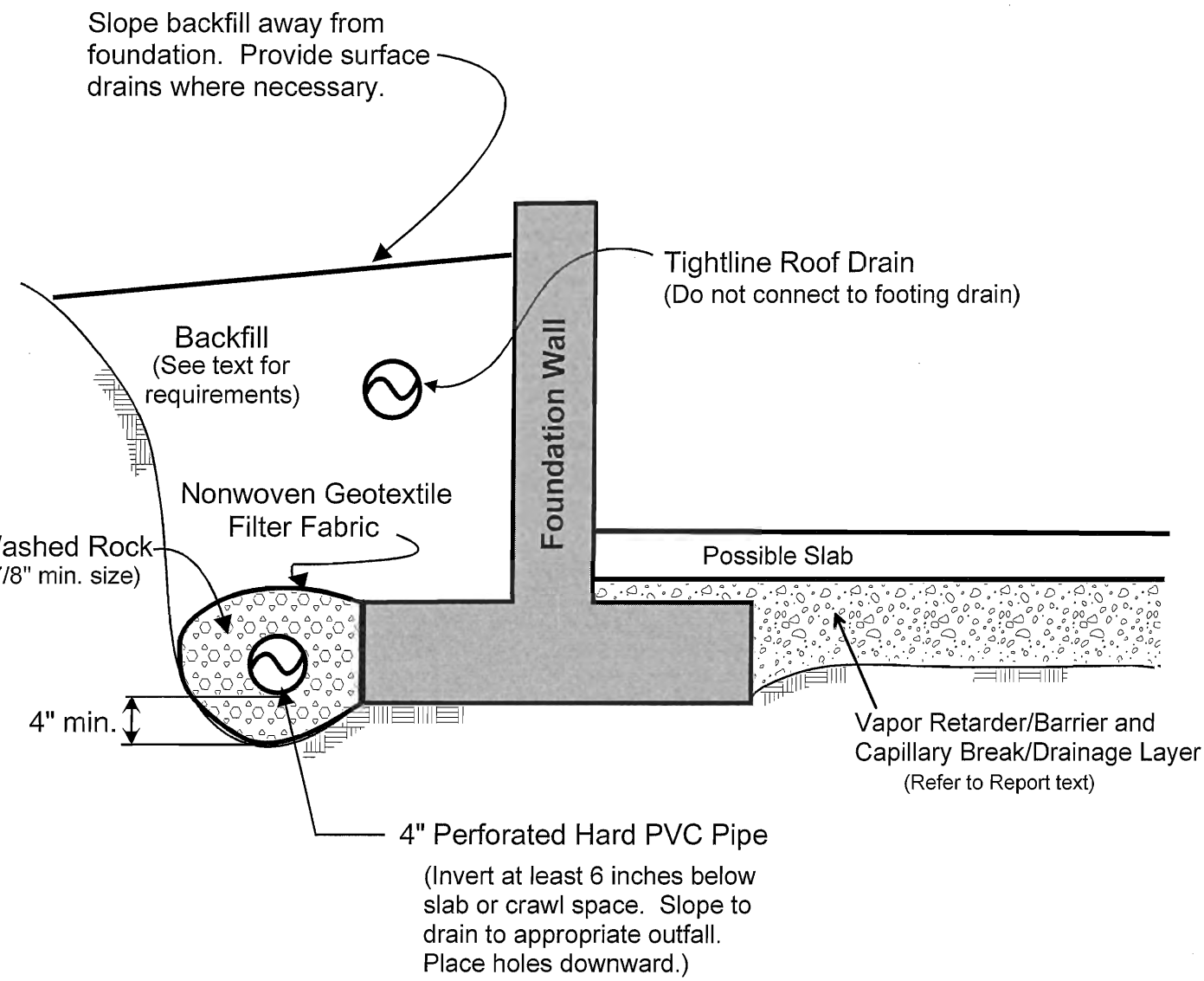
(1) The report should be referenced for specifics regarding design and installation.
(2) Active pressures act over the pile spacing.
(3) Passive pressures act on two times the pile diameter.
(4) It is assumed that no hydrostatic pressures act on the back of the wall.

GEOTECH
CONSULTANTS, INC.

STABILIZATION WALL DETAIL

5247 - 145th Place Southeast
Lot 7
Bellevue, Washington

Job No:	Date:		Plate:
15481	Dec. 2015		9



NOTES:

(1) In crawl spaces, provide an outlet drain to prevent buildup of water that bypasses the perimeter footing drains.

(2) Refer to report text for additional drainage, waterproofing, and slab considerations.

GEOTECH
CONSULTANTS, INC.

FOOTING DRAIN DETAIL

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job No:	Date:		Plate:
15481	Nov. 2015		10

Appendix B: Arborist Report

Greenforest Incorporated

Consulting Arborist

December 30, 2015

Ryan Grams, Director of Business Development
GIS International Group
600 Stewart Street, Suite 603
Seattle, WA 98101

RE: Arborist Report- Belvedere Lots 6 & 7.

Dear Mr. Grams:

You contacted me and contracted my services as a consulting arborist. GIS proposes to develop Lots 6 & 7 of the above referenced project. My assignment is to inspect, assess and inventory the significant trees on these two lots.

You provided me a topographic survey prepared by Tri-County Land Surveying Company, dated November 2015, showing the location of the significant trees on site. I visited the site 12/9/2015 and inspected the surveyed trees, which are the subject of this report.

Summary:

Lot 6	
Total Significant Trees	5
Total Diameter Inches	129

Lot 7	
Total Significant Trees	100
Total Diameter Inches	1936

Off Site Trees	4

Lot 6 has landscape improvements, including rockeries, gravel paths, stairs and lawn, which appear to be associated with the adjacent Lot 5. The lot has few established trees, and a western aspect.

Lot 7 is covered in native tree canopy. The lot has a steep western aspect, and many of the trees have been topped, or cut to grade in past, most likely to accommodate views from uphill residents.

TREE INSPECTION

I visually inspected each tree from the ground and rated both tree health and structure. A tree's structure is distinct from its health. This inspection identifies what is visible with both. Structure is the way the tree is put together or constructed, and identifying obvious defects can be helpful in determining if a tree is predisposed to failure. Health addresses disease and insect infestation. No invasive procedures were performed on any trees. The results of this inspection are based on what is visible at the time of the inspection. The trees are not tagged, and considerable effort was made to match the trees on the survey with those in the field.

The attached table provides the following information for each tree:

Tree number as shown on the attached exhibit.

Tree Species Common name.

Diameter Trunk diameter in inches measured 4 feet above existing grade.

Diameter Inches Diameter inches per tree adjusted for species and calculated for multiple trunks.[1]

Dripline Canopy radius measured in feet.

Health & Structure Rating '1' indicates no visible health-related problems or structural defects; '2' indicates minor visible problems or defects that may require attention or maintenance if the tree is retained, and/or the tree should only remain as a grove tree, and not stand alone; and '3' indicates significant visible problems or defects and tree removal is recommended.

Visible defects Obvious structural defects or diseases visible at time of inspection, which includes:

Asymmetric canopy– the tree has an asymmetric canopy from space and light competition from adjacent trees.

Deadwood – Large and/or multiple dead branches throughout canopy.

[1] Alders discounted 50%; for multiple-stemmed trees trunk diameter is found by taking the square root of the sum of all squared stem 4 feet from grade.

Decay – process of wood degradation by microorganisms resulting in weak and defective structure.
Decline – Tree is in an obvious state of declining vigor/vitality.
Dogleg in trunk – trunk with a bow or defective bend (90°) in trunk often half way or further up the trunk.
Double leader – the tree has multiple stem attachments, which may require maintenance or monitoring over time.
Oozing resin –resin oozing from trunk, indicating stress/decline.
Multiple leaders - the tree has multiple stem attachments, which may lead to tree failure and require maintenance or monitoring over time.
Previous failure – Tree trunk previously broken and defective.
Stumpsprout- Tree previously cut at grade with multiple stems and potentially weak attachments.
Suppressed – tree crowded by larger adjacent trees, with defective structure and/or low vigor. Retain tree only as a grove tree, not stand-alone.
Topped – the tree is previously topped and has poor structure and/or stem decay.
Tree leans – Trunk has significant lean from vertical.
Trunk decay - Wood decay is visible in the trunk.

Thank you very much for your business. This report completes my scope for this project. Please let me know if you have any questions.

Sincerely,

Greenforest, Inc.

By Favero Greenforest, M. S.

ISA Certified Arborist # PN -0143A
ASCA Registered Consulting Arborist® #379
ISA Tree Risk Assessment Qualified

Attachments:

1. Assumptions and Limiting Conditions
2. Significant Tree Inventory
3. Tree Number Exhibit

Attachment No. 1 - Assumptions & Limiting Conditions

1) A field examination of the site was made 12/09/15. My observations and conclusions are as of that date.

2) Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible; however, the consultant/arborist can neither guarantee nor be responsible for the accuracy of information provided by others.

3) Unless stated other wise: 1) information contained in this report covers only those trees that were examined and reflects the condition of those trees at the time of inspection; and 2) the inspection is limited to visual examination of the subject trees without dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied that problems or deficiencies of the subject tree may not arise in the future.

4) Sketches, drawings and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural report of surveys unless expressed otherwise.

5) The consultant/appraiser shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made.

6) Loss or alteration of any part of this report invalidates the entire report.

7) This report and any values/opinions expressed herein represent the opinion of the consultant/appraiser, and the consultant's/appraiser's fee is in no way contingent upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.

8) Construction activities can impact trees in unpredictable ways. All retained trees should be inspected at the competition of construction, and regularly thereafter as part of ongoing maintenance.

9) The consultant does not assume any liability for the subject tree and does not represent the transfer of such for any risks associated with the tree from the landowner to the consultant. **Risk management is solely the responsibility of the landowner**.

10) Trees are biological systems and change over time; therefore, future inspections are required and are the responsibility of the landowner to initiate.

Attachment No. 2 – Significant Tree Inventory

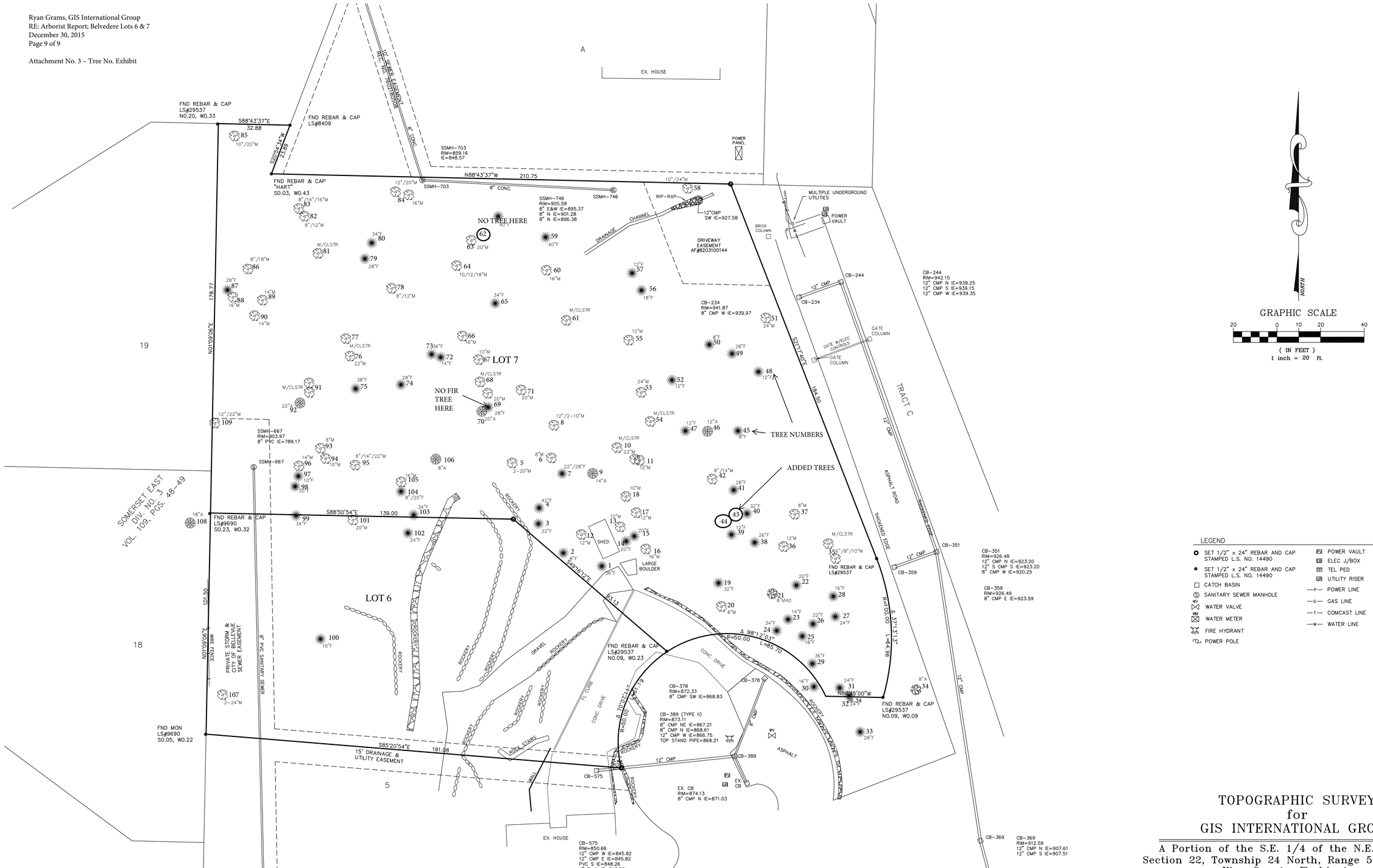
Location	Tree No.	Trunk Diameter	Diameter Inches	Tree Species	Dripline	Health	Structure	Visible Defects
LOT 7	1	36”	36”	Fir	18’	1	1	
LOT 7	2	8	8	Fir	8	1	1	
LOT 7	3	16	16	Fir	14	1	1	
LOT 7	4	22	22	Fir	14	1	1	
LOT 7	5	16,16	22	Maple	18	1	2	Double leader
LOT 7	6	8	8	Maple	14	1	2	Suppressed
LOT 7	7	22,28	35	Fir	16	1	2	Double leader
LOT 7	8	8,10,10	16	Maple	16	1	2	Multiple leader
LOT 7	9	18	9	Alder	12	2	3	Decay, decline
LOT 7	10	10,10,14	19	Maple	16	1	2	Asymmetric canopy
LOT 7	11	12	12	Maple	14	1	1	
LOT 7	12	14	14	Maple	16	1	1	
LOT 7	13	10	10	Maple	12	1	1	
LOT 7	14	14	14	Fir	12	1	1	
LOT 7	15	14	14	Fir	12	1	1	
LOT 7	16	12	12	Maple	14	1	2	Decline
LOT 7	17	12	12	Maple	12	1	1	
LOT 7	18	10	10	Maple	12	1	1	
LOT 7	19	32	32	Fir	18	1	1	
LOT 7	20	8	8	Maple	12	1	1	
LOT 7	21	8	8	Madrone	8	1	2	Lean
LOT 7	22	20	20	Fir	14	1	2	Topped
LOT 7	23	14	14	Fir	12	1	1	
LOT 7	24	34	34	Fir	16	1	1	
LOT 7	25	18	18	Fir	14	1	1	
LOT 7	26	16	16	Fir	14	1	1	
LOT 7	27	24	24	Fir	16	1	2	Topped
LOT 7	28	16	16	Fir	14	1	2	Suppressed
LOT 7	29	32	32	Fir	16	1	1	
OFF SITE	30	16		Fir	14	1	1	
LOT 7	31	24	24	Fir	16	1	1	
LOT 7	32	26	26	Fir	16	2	1	Trunk burr, oozing resin
OFF SITE	33	28		Fir	16	1	1	
OFF SITE	34	8		Alder	10	1	1	

Location	Tree No.	Trunk Diameter	Diameter Inches	Tree Species	Dripline	Health	Structure	Visible Defects
LOT 7	35	12,12, 12,12	24	Maple	16	1	3	Stumpsprout, decay
LOT 7	36	12	12	Maple	12	1	3	Stumpsprout, decay
LOT 7	37	10,12,12	19	Maple	14	1	3	Stumpsprout, decay
LOT 7	38	24	24	Maple	16	1	1	
LOT 7	39	12	12	Fir	12	1	1	
LOT 7	40	32	32	Fir	18	1	2	Topped
LOT 7	41	28	28	Fir	16	1	2	Topped
LOT 7	42	8,14	16	Maple	16	1	2	Multiple leader, asymmetric
LOT 7	43	16	16	Maple	18	1	2	Asymmetric
LOT 7	44	16	16	Maple	18	1	2	Asymmetric
LOT 7	45	8	8	Fir	10	1	1	
LOT 7	46	10	5	Alder	6	2	3	Decay, decline
LOT 7	47	12	12	Fir	14	1	1	
LOT 7	48	12	12	Fir	16	1	2	Topped
LOT 7	49	28	28	Fir	16	1	2	Topped
LOT 7	50	8	8	Fir	10	1	1	
LOT 7	51	24	24	Maple	18	2	3	Stumpsprout
LOT 7	52	12	12	Fir	10	1	1	
LOT 7	53	20	20	Maple	14	1	1	
LOT 7	54	(6) 10	24	Maple	18	1	2	Stumpsprout
LOT 7	55	12	12	Maple	14	1	1	
LOT 7	56	18	18	Fir	16	1	1	
LOT 7	57	12	12	Fir	10	1	1	
LOT 7	58	10,24	26	Maple	16	2	3	Stumpsprout, decay
LOT 7	59	40	40	Fir	20	1	2	Topped
LOT 7	60	16	16	Maple	14	1	1	
LOT 7	61	10,12, 14,18	27	Maple	18	1	2	Stumpsprout
LOT 7	62	10,14,20	26	Maple	18	1	2	Stumpsprout
LOT 7	63	20	20	Maple	16	1	2	Asymmetric
LOT 7	64	10,12,18	23	Maple	14	1	2	Stumpsprout
LOT 7	65	38	38	Fir	18	1	1	
LOT 7	66	16	16	Maple	16	1	1	
LOT 7	67	10	10	Maple	12	1	1	

Location	Tree No.	Trunk Diameter	Diameter Inches	Tree Species	Dripline	Health	Structure	Visible Defects
LOT 7	68	10,14	17	Maple	14	1	1	
LOT 7	69	20	20	Maple	16	1	1	
LOT 7	70	20	10	Alder	14	2	3	Decay, decline, previous failure
LOT 7	71	20	20	Maple	14	1	1	
LOT 7	72	14	14	Fir	12	2	3	Suppressed
LOT 7	73	36	36	Fir	14	3	1	Decline in canopy
LOT 7	74	28	28	Fir	18	1	1	
LOT 7	75	38	38	Fir	20	1	1	
LOT 7	76	22	22	Maple	16	1	1	
LOT 7	77	10,10,14	19	Maple	16	2	3	Stumpsprout
LOT 7	78	8,12	14	Maple	14	2	1	Decline
LOT 7	79	28	28	Fir	20	1	1	
LOT 7	80	34	34	Fir	20	1	1	
LOT 7	81	10,12, 18,20	31	Maple	16	1	2	Stumpsprout
LOT 7	82	8,12	14	Maple	14	1	2	Stumpsprout
LOT 7	83	8,14,16	22	Maple	14	1	2	Stumpsprout
LOT 7	84	12,20	23	Maple	16	1	1	
LOT 7	85	10,20	22	Maple	16	1	2	Stumpsprout
LOT 7	86	8,18	19	Maple	18	1	2	Stumpsprout
LOT 7	87	28	28	Fir	16	1	1	
LOT 7	88	16	16	Maple	14	1	3	Trunk decay
LOT 7	89	14	14	Maple	12	1	1	
LOT 7	90	8,10,14	18	Maple	16	1	3	Decay
LOT 7	91	(5) 10-18	31	Maple	16	1	3	Stumpsprout
LOT 7	92	18	9	Alder	14	1	3	Decay, decline
LOT 7	93	8	8	Maple	6	2	3	Decay, decline
LOT 7	94	10	10	Maple	6	2	3	Decay, decline
LOT 7	95	14,22	25	Maple	16	2	3	Deadwood, stumpsprout
LOT 7	96	12	12	Maple	10	1	2	Suppressed
LOT 7	97	10	10	Fir	12	1	1	
LOT 7	98	30	30	Fir	16	1	1	
LOT 6	99	34	34	Fir	18	1	1	
LOT 6	100	10	10	Fir	12	1	1	

Location	Tree No.	Trunk Diameter	Diameter Inches	Tree Species	Dripline	Health	Structure	Visible Defects
LOT 6	101	20,20	28	Maple	18	1	2	Double leader
LOT 6	102	24	24	Fir	16	1	1	
LOT 7	103	34	34	Fir	16	1	1	
LOT 7	104	18	18	Fir	14	1	2	Topped, dogleg in trunk
LOT 7	105	16	16	Maple	18	1	1	
LOT 7	106	8	4	Alder	14	1	2	Asymmetric
LOT 6	107	24,24	33	Maple	16	1	3	Topped, trunk decay
OFF SITE	108	18		Alder	16	1	1	
LOT 7	109	12,22	25	Maple	16	1	2	Stumpsprout
TOTAL DIAMETER INCHES =			2,065					

Attachment No. 3 – Tree No. Exhibit



LEGEND

- SET 1/2" x 24" REBAR AND CAP STAMPED L.S. NO. 14490
- SET 1/2" x 24" REBAR AND CAP STAMPED L.S. NO. 14490
- CATCH BASIN
- SANITARY SEWER MANHOLE
- WATER VALVE
- WATER METER
- FIRE HYDRANT
- POWER POLE
- POWER VAULT
- ELEC J/BOX
- TEL PED
- UTILITY RISER
- POWER LINE
- GAS LINE
- COMCAST LINE
- WATER LINE

TOPOGRAPHIC SURVEY
for
GIS INTERNATIONAL GROUP

A Portion of the S.E. 1/4 of the N.E. 1/4 of Section 22, Township 24 North, Range 5 East, W.M. King County, Washington

LEGAL DESCRIPTION:

LOTS 6 AND 7, BELVEDERE, DIVISION A, AS PER PLAT RECORDED IN VOLUME 152 OF PLATS, PAGES 40 AND 41, RECORDS OF KING COUNTY AUDITOR

SITUATE IN THE COUNTY OF KING, STATE OF WASHINGTON

SUBJECT TO CONDITIONS, RESTRICTIONS AND EASEMENTS OF RECORD.

BENCH MARK – DATUM (NAVD88)

MONUMENT IN CASE AT SE 51ST ST. & 151 AVE. SE
ELEV. 942.07

JACKIE H. SIEBERT STATE OF WASHINGTON 14490 REGISTERED PROFESSIONAL LAND SURVEYOR
DATE:_____

Tri-County
Land Surveying Company
4610 200th St. S.W. Suite A
Lynnwood, Wa. 98036 (425)776-2926 Fax: 776-2850

DRAWN BY B.H.	DATE NOVEMBER, 2015	JOB NO. 15-129
CHECKED BY R.S.	SCALE 1" = 20'	SHEET 1 OF 1

APPENDIX C: WETLAND RATING FORM AND FIGURES

Wetland name or number **Belevedere**

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Belevedere - GIS Development Date of site visit: 04/25/2016

Rated by MK Trained by Ecology? ✔ Yes ___No Date of training 03/2015

HGM Class used for rating SLOPE Wetland has multiple HGM classes? ___Y ✔ N

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.

Source of base aerial photo/map ESRI

OVERALL WETLAND CATEGORY III (based on functions ✔ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27

_____**Category II** – Total score = 20 - 22

✔ **Category III** – Total score = 16 - 19

_____**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality			Hydrologic			Habitat			TOTAL
	Circle the appropriate ratings									
Site Potential	H	M	[L]	H	M	[L]	H	M	[L]	
Landscape Potential	H	[M]	L	H	[M]	L	H	M	[L]	
Value	[H]	M	L	H	[M]	L	[H]	M	L	
Score Based on Ratings	**6**			**5**			**5**			**16**

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I** **II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I** **II**
Interdunal	**I** **II** **III** **IV**
None of the above	✔

Wetland name or number **Belevedere**

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	
Hydroperiods	D 1.4, H 1.2	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	1
Hydroperiods	H 1.2	1
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	N/A
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	N/A
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	2
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	3
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	4

Wetland name or number **Belevedere**

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

   NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

   1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

   NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
   *If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

   NO – go to 3 **YES** – The wetland class is **Flats**
   *If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
   The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
   At least 30% of the open water area is deeper than 6.6 ft (2 m).

   NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   ✔ The wetland is on a slope (*slope can be very gradual*),
   ✔ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
   ✔ The water leaves the wetland **without being impounded**.

   NO – go to 5 **YES –** The wetland class is **Slope**

   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
   ___The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   ___The overbank flooding occurs at least once every 2 years.

Wetland name or number **Belevedere**

NO – go to 6 **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number **Belevedere**

SLOPE WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

S 1.0. Does the site have the potential to improve water quality?	
S 1.1. Characteristics of the average slope of the wetland: *(a 1% slope has a 1 ft vertical drop in elevation for every 100 ft of horizontal distance*) ☐ Slope is 1% or less points = 3 ☐ Slope is > 1%-2% points = 2 ☐ Slope is > 2%-5% points = 1 ☑ Slope is greater than 5% points = 0	**0**
S 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions)*: Yes = 3 [No = 0]	**0**
S 1.3. Characteristics of the plants in the wetland that trap sediments and pollutants: Choose the points appropriate for the description that best fits the plants in the wetland. *Dense means you have trouble seeing the soil surface (>75% cover), and uncut means not grazed or mowed and plants are higher than 6 in.* ☐ Dense, uncut, herbaceous plants > 90% of the wetland area points = 6 ☐ Dense, uncut, herbaceous plants > ½ of area points = 3 ☐ Dense, woody, plants > ½ of area points = 2 ☐ Dense, uncut, herbaceous plants > ¼ of area points = 1 ☑ Does not meet any of the criteria above for plants points = 0	**0**
Total for S 1 Add the points in the boxes above	**0**

Rating of Site Potential If score is: ___ **12 = H** ___ **6-11 = M** ✔ **0-5 = L** *Record the rating on the first page*

S 2.0. Does the landscape have the potential to support the water quality function of the site?	
S 2.1. Is > 10% of the area within 150 ft on the uphill side of the wetland in land uses that generate pollutants? [Yes = 1] No = 0	**1**
S 2.2. Are there other sources of pollutants coming into the wetland that are not listed in question S 2.1? Other sources _____ Yes = 1 [No = 0]	**0**
Total for S 2 Add the points in the boxes above	**1**

Rating of Landscape Potential If score is: ✔ **1-2 = M** ___ **0 = L** *Record the rating on the first page*

S 3.0. Is the water quality improvement provided by the site valuable to society?	
S 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? [Yes = 1] No = 0	**1**
S 3.2. Is the wetland in a basin or sub-basin where water quality is an issue? *At least one aquatic resource in the basin is on the 303(d) list*. [Yes = 1] No = 0	**1**
S 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the basin in which unit is found.* [Yes = 2] No = 0	**2**
Total for S 3 Add the points in the boxes above	**4**

Rating of Value If score is: ✔ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number **Belevedere**

SLOPE WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream erosion

S 4.0. Does the site have the potential to reduce flooding and stream erosion?

S 4.1. Characteristics of plants that reduce the velocity of surface flows during storms: Choose the points appropriate for the description that best fits conditions in the wetland. *Stems of plants should be thick enough (usually > 1/8 in), or dense enough, to remain erect during surface flows.* ☐ Dense, uncut, **rigid** plants cover > 90% of the area of the wetland points = 1 ☑ All other conditions points = 0	**0**

Rating of Site Potential If score is: ___ **1 = M** ✔ **0 = L** *Record the rating on the first page*

S 5.0. Does the landscape have the potential to support the hydrologic functions of the site?

S 5.1. Is more than 25% of the area within 150 ft upslope of wetland in land uses or cover that generate excess surface runoff? Yes = 1 No = 0	**1**

Rating of Landscape Potential If score is: ✔ **1 = M** ___ **0 = L** *Record the rating on the first page*

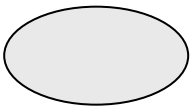
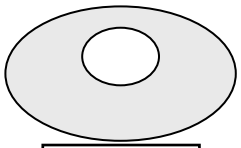
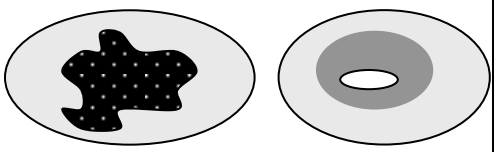
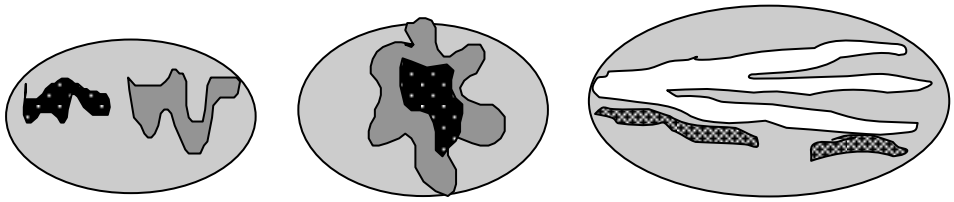
S 6.0. Are the hydrologic functions provided by the site valuable to society?

S 6.1. Distance to the nearest areas downstream that have flooding problems: ☐ The sub-basin immediately down-gradient of site has flooding problems that result in damage to human or natural resources (e.g., houses or salmon redds) points = 2 ☑ Surface flooding problems are in a sub-basin farther down-gradient points = 1 ☐ No flooding problems anywhere downstream points = 0	**1**
S 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	**0**
Total for S 6 Add the points in the boxes above	**1**

Rating of Value If score is: ___ **2-4 = H** ✔ **1 = M** ___ **0 = L** *Record the rating on the first page*

NOTES and FIELD OBSERVATIONS:

Wetland name or number **Belevedere**

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	
H 1.0. Does the site have the potential to provide habitat?	
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ____Aquatic bed — 4 structures or more: points = 4 __✔__Emergent — 3 structures: points = 2 ____Scrub-shrub (areas where shrubs have > 30% cover) — [2 structures: points = 1] __✔__Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	**1**
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). ____Permanently flooded or inundated — 4 or more types present: points = 3 ____Seasonally flooded or inundated — 3 types present: points = 2 ____Occasionally flooded or inundated — [2 types present: points = 1] __✔__Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland __✔__Seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	**1**
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*** If you counted: > 19 species — points = 2 [5 - 19 species] — [points = 1] < 5 species — points = 0	**1**
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  [**Low** = 1 point]  **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3points 	**1**

Wetland name or number **Belevedere**

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ✔ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). ✔ Standing snags (dbh > 4 in) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* ____At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	**2**
Total for H 1 Add the points in the boxes above	**6**

Rating of Site Potential If score is: ___ **15-18 = H** ___ **7-14 = M** ✔ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat 8 **+** [(% moderate and low intensity land uses)/2] 6 **=** 14 % If total accessible habitat is: ☐ > 1/3 (33.3%) of 1 km Polygon points = 3 ☐ 20-33% of 1 km Polygon points = 2 ✔ 10-19% of 1 km Polygon points = 1 ☐ < 10% of 1 km Polygon points = 0	**1**
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat 20 **+** [(% moderate and low intensity land uses)/2] 6 **=** 26 % ☐ Undisturbed habitat > 50% of Polygon points = 3 ☐ Undisturbed habitat 10-50% and in 1-3 patches points = 2 ✔ Undisturbed habitat 10-50% and > 3 patches points = 1 ☐ Undisturbed habitat < 10% of 1 km Polygon points = 0	**1**
H 2.3. Land use intensity in 1 km Polygon: If ✔ > 50% of 1 km Polygon is high intensity land use points = (- 2) ☐ ≤ 50% of 1 km Polygon is high intensity points = 0	**-2**
Total for H 2 Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: ___ **4-6 = H** ___ **1-3 = M** ✔ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 ✔ It has 3 or more priority habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan ☐ Site has 1 or 2 priority habitats (listed on next page) within 100 m points = 1 ☐ Site does not meet any of the criteria above points = 0	**2**

Rating of Value If score is: ✔ **2 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number **Belevedere**

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

☐ **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

☐ **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

☑ **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

☐ **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

☑ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

☐ **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

☑ **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

☐ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

☐ **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

☐ **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

☑ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

Wetland name or number **Belevedere**

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt Yes –Go to **SC 1.1** No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? Yes = **Category I** No - Go to **SC 1.2**	**Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? Yes **– Go to SC 2.2** No **– Go to SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? Yes **= Category I** No **= Not a WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf Yes **– Contact WNHP/WDNR and go to SC 2.4** No **= Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? Yes – Go to **SC 3.3** No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? Yes – Go to **SC 3.3** No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? Yes = **Is a Category I bog** No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? Yes = **Is a Category I bog** No **= Is not a bog**	**Cat. I**

Wetland name or number **Belevedere**

SC 4.0. Forested Wetlands — **Cat. I**

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.

☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

Yes **= Category I** | No **= Not a forested wetland for this section**

SC 5.0. Wetlands in Coastal Lagoons — **Cat. I**

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks

☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)*

Yes – Go to **SC 5.1** | No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions? — **Cat. II**

☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).

☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.

☐ The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2)

Yes = **Category I** No = **Category II**

SC 6.0. Interdunal Wetlands — **Cat I**

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

☐ Long Beach Peninsula: Lands west of SR 103

☐ Grayland-Westport: Lands west of SR 105

☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109

Yes – Go to **SC 6.1** | No = **not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? — **Cat. II**

Yes = **Category I** No – Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?

Yes = **Category II** No – Go to **SC 6.3** — **Cat. III**

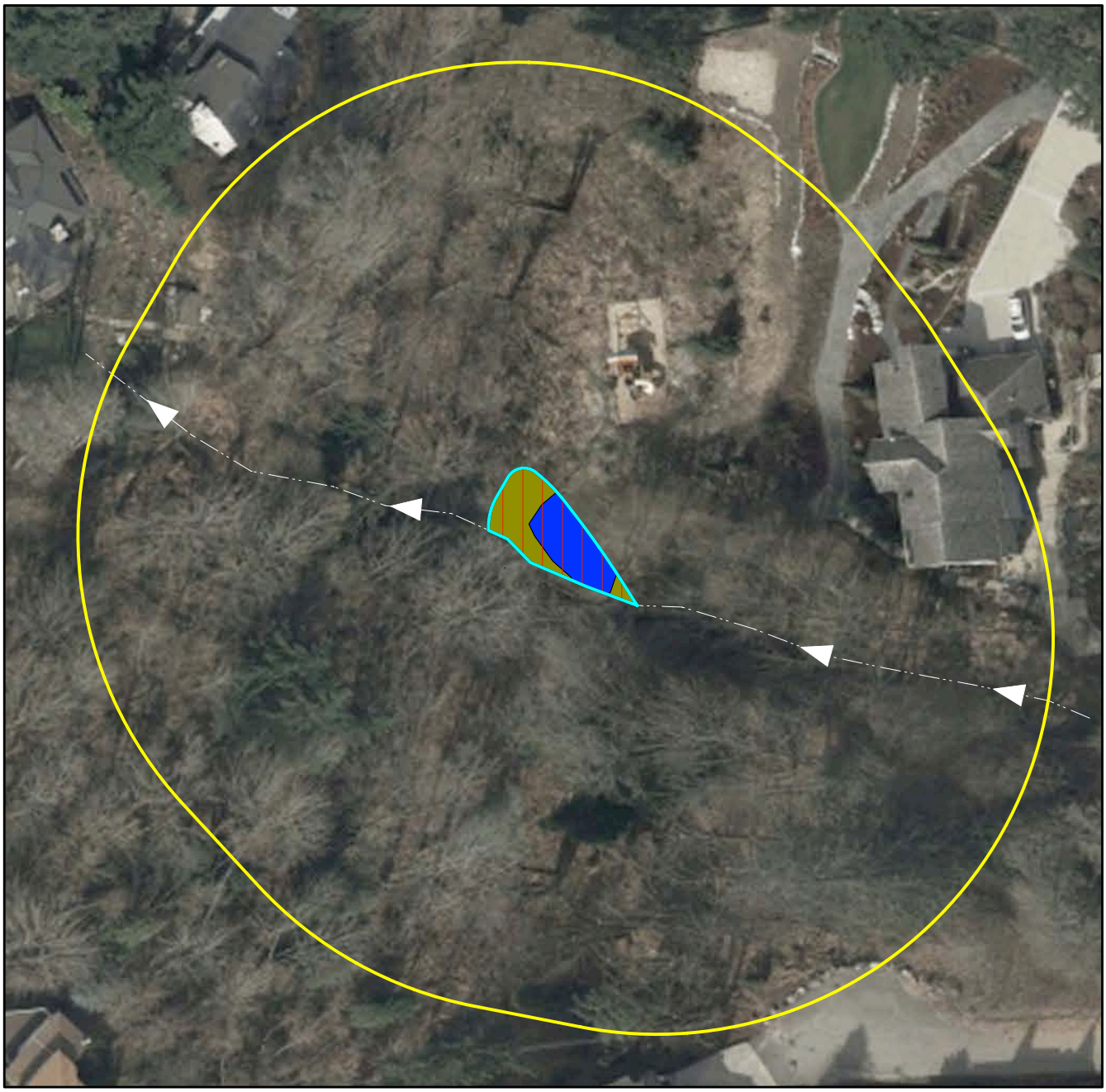
SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?

Yes = **Category III** No = **Category IV** — **Cat. IV**

Category of wetland based on Special Characteristics
If you answered No for all types, enter "Not Applicable" on Summary Form — **N/A**

This page left blank intentionally

GIS DEVELOPMENT - BELLEVEDERE/145TH PL SE
WETLAND RATING FIGURE 1 - WETLAND A



LEGEND

- EMERGENT VEGETATION
- FORESTED VEGETATION
- SATURATED ONLY
- 150' FROM WL BOUNDARY
- INTERMITTENT STREAM

Scale 1" = 60'

0 30 60 90 120

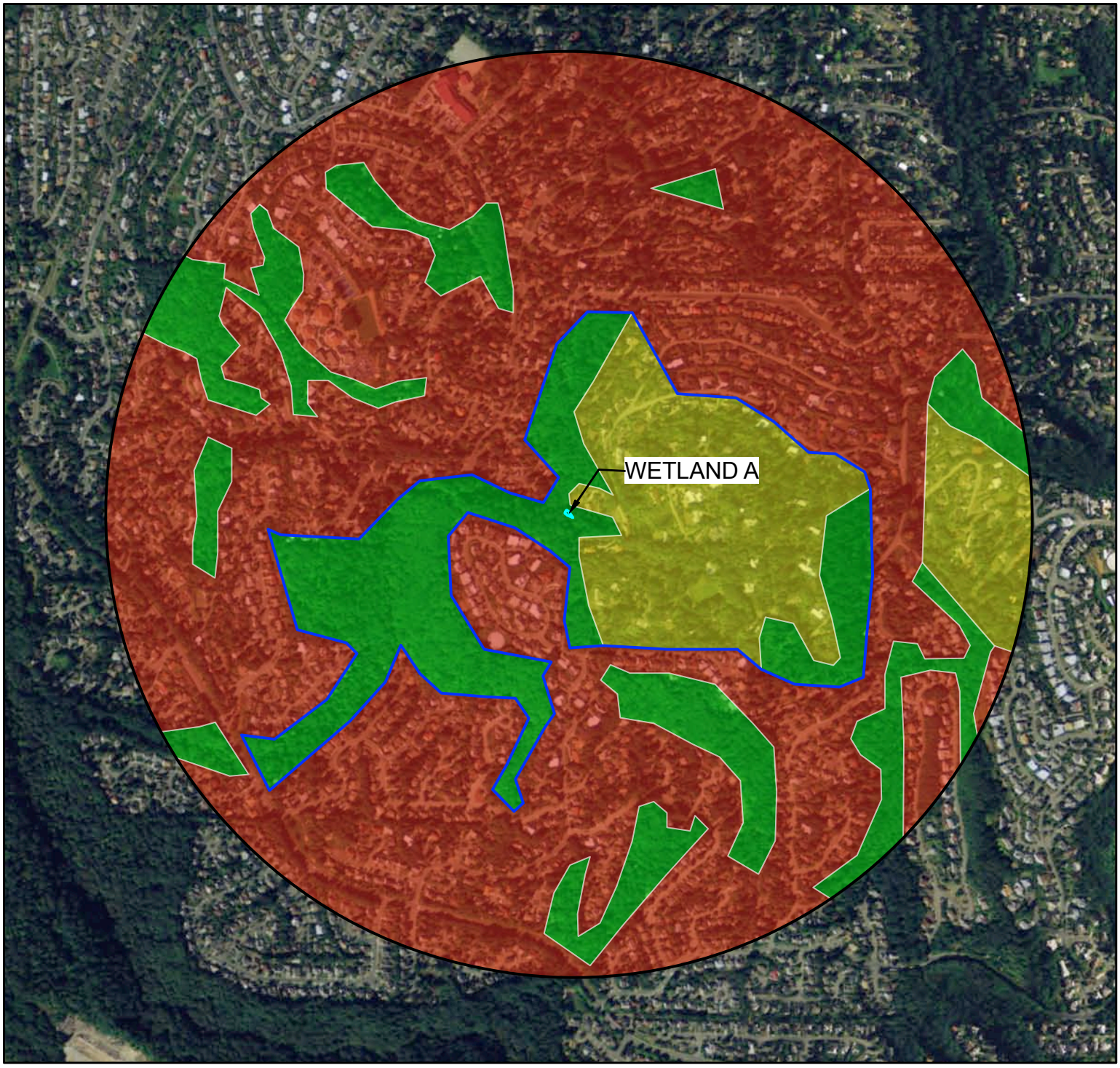
Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance
9505 19th Avenue S.E. Suite 106 Everett, Washington 98208
Phone: (425) 337-3174
Fax: (425) 337-3045
Email: mailbox@wetlandresources.com

WETLAND RATING MAP
Wetland A

GIS Development
Attn: Ryan Grams
600 Stewart St., #603
Seattle, WA 98006

Figure 1/4
WRI Job # 16102
Drawn by: JG

GIS DEVELOPMENT - BELLEVEDERE/145TH PL SE
WETLAND RATING FIGURE 2 - WETLAND A



Scale 1" = 1,000'

0 1,000 2,000

LEGEND

- RELATIVELY UNDISTURBED
- LOW/MOD. INTENSITY
- HIGH INTENSITY
- ACCESSIBLE HABITAT
- WETLAND
- 1 KM FROM WETLAND

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance
9505 19th Avenue S.E. Suite 106 Everett, Washington 98208
Phone: (425) 337-3174
Fax: (425) 337-3045
Email: mailbox@wetlandresources.com

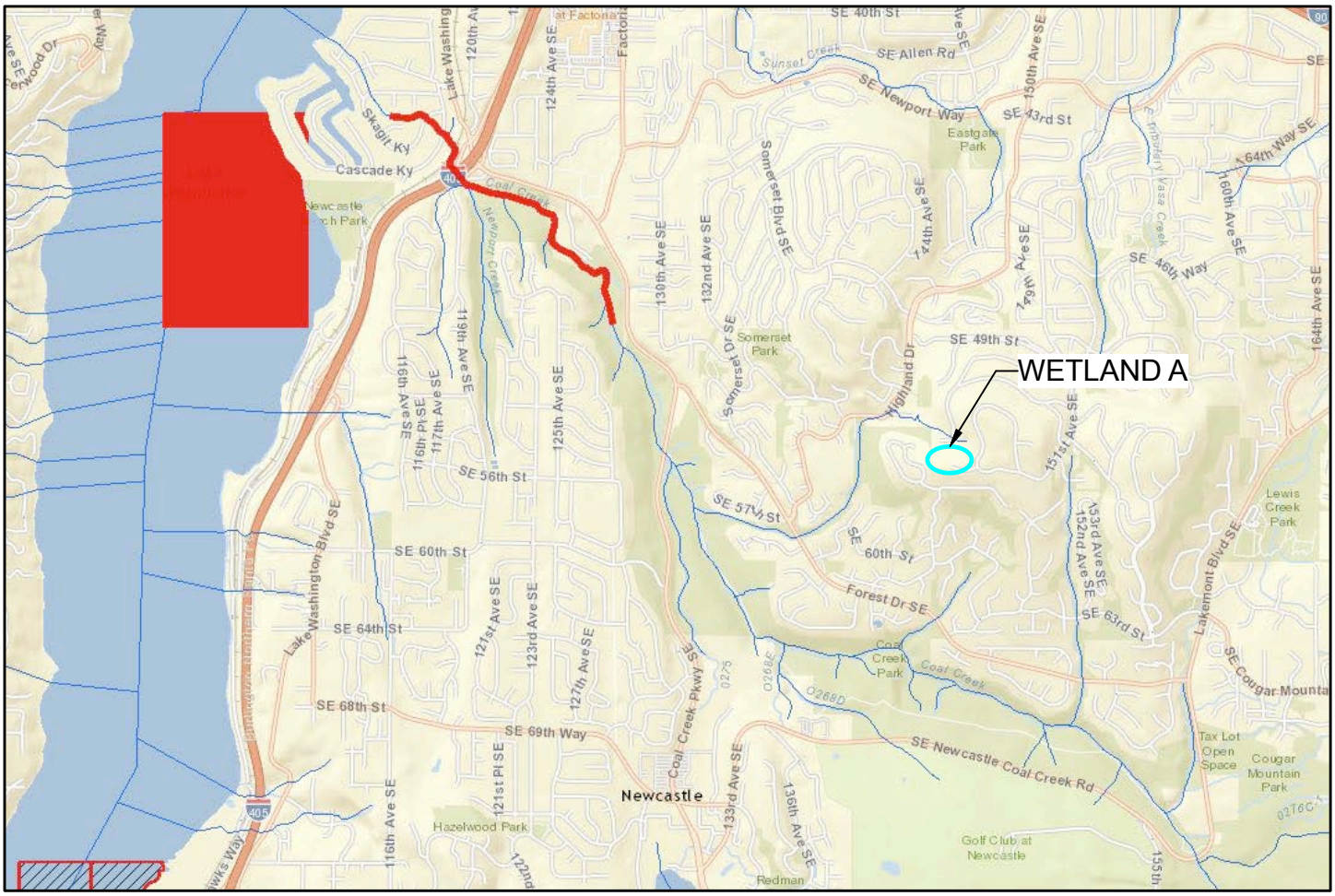
1 KM FROM WETLAND BOUNDARY MAP

Wetland A

GIS Development
Attn: Ryan Grams
600 Stewart St., #603
Seattle, WA 98006

Figure 2/4
WRI Job # 16102
Drawn by: JG

GIS DEVELOPMENT - BELLEVEDERE/145TH PL SE
WETLAND RATING FIGURE 3 - WETLAND A



NTS

LEGEND

WETLAND LOCATION

AQUATIC RESOURCES ON THE 303(d) LIST

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance
9505 19th Avenue S.E. Suite 106 Everett, Washington 98208
Phone: (425) 337-3174
Fax: (425) 337-3045
Email: mailbox@wetlandresources.com

Cat 5 - 303d Listed Waters Within Basin
Wetland A

GIS Development
Attn: Ryan Grams
600 Stewart St., #603
Seattle, WA 98006

Figure 3/4
WRI Job # 16102
Drawn by: JG

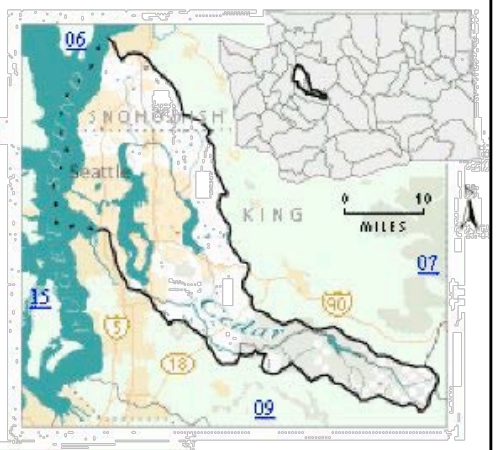
GIS DEVELOPMENT - BELLEVEDERE/145TH PL SE
WETLAND RATING FIGURE 4 - WETLAND A

WRIA 8: Cedar-Sammamish

The following table lists overview information for water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Counties

- King
- Snohomish



Waterbody Name	Pollutants	Status**	TMDL Lead
Ballinger Lake	Total Phosphorus	Approved by EPA	Tricia Shoblom 425-649-7288
Bear-Evans Creek Basin	Fecal Coliform	Approved by EPA	Joan Nolan 425-649-4425
	Dissolved Oxygen Temperature	Approved by EPA	
Cottage Lake	Total Phosphorus	Approved by EPA Has an implementation plan	Tricia Shoblom 425-649-7288
Issaquah Creek Basin	Fecal Coliform	Approved by EPA	Joan Nolan 425-649-4425
Little Bear Creek Tributaries: Trout Stream Great Dane Creek Cutthroat Creek	Fecal Coliform	Approved by EPA	Ralph Svrjcek 425-649-7036
North Creek	Fecal Coliform	Approved by EPA Has an implementation plan	Ralph Svrjcek 425-649-7036
Pipers Creek	Fecal Coliform	Approved by EPA	Joan Nolan 425-649-4425
Sammamish River	Dissolved Oxygen Temperature	Field work starts summer 2015	Ralph Svrjcek 425-649-7036
Swamp Creek	Fecal Coliform	Approved by EPA Has an implementation plan	Ralph Svrjcek 425-649-7036

** ***Status*** *will be listed as one of the following: Approved by EPA, Under Development or Implementation*

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance
9505 19th Avenue S.E. Suite 106 Everett, Washington 98208
Phone: (425) 337-3174
Fax: (425) 337-3045
Email: mailbox@wetlandresources.com

List of TMDLs for WRIA in which unit is located

Wetland A

GIS Development
Attn: Ryan Grams
600 Stewart St., #603
Seattle, WA 98006

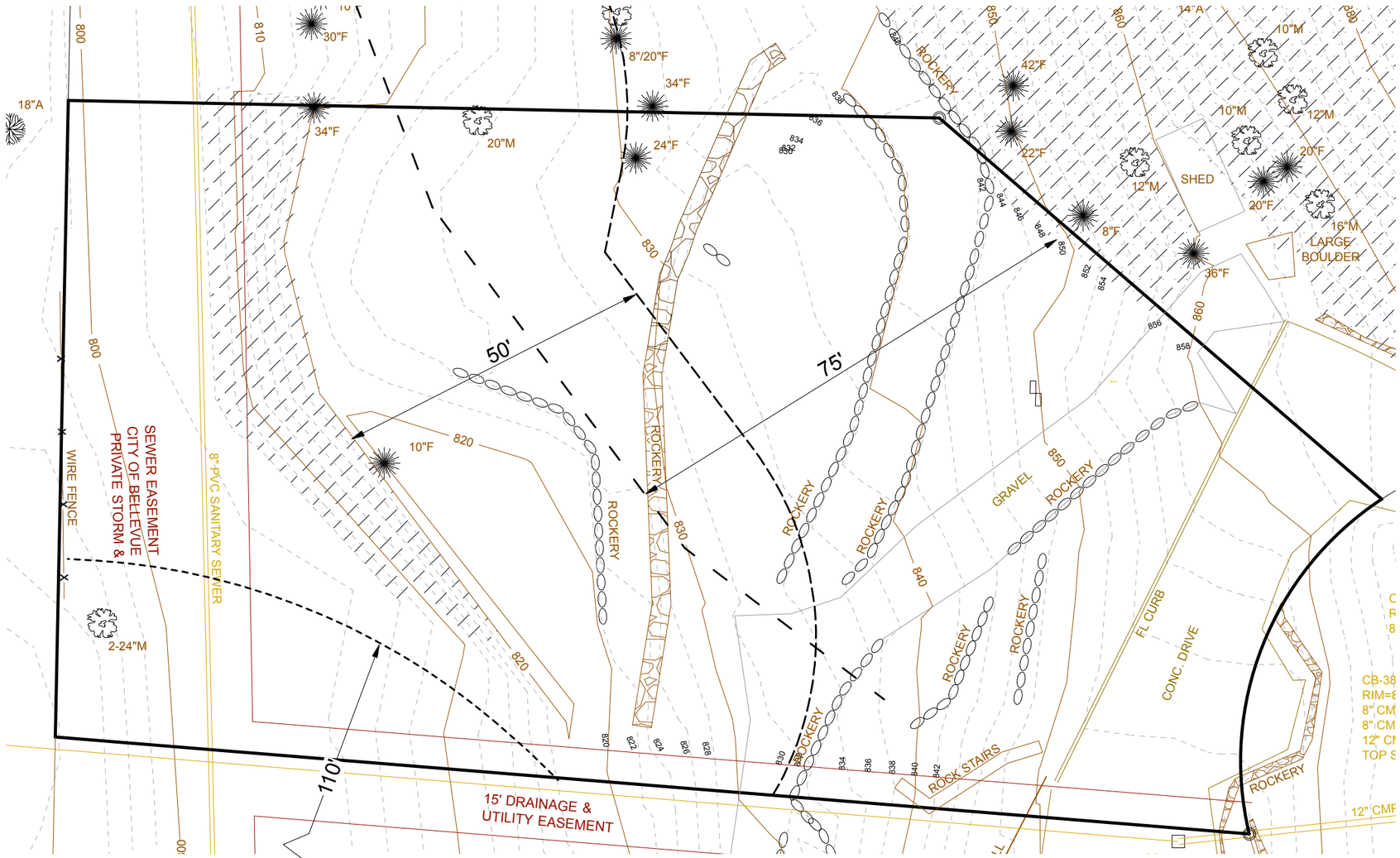
Figure 4/4
WRI Job # 16102
Drawn by: JG

APPENDIX D: CRITICAL AREAS REPORT MAPS

CRITICAL AREAS REPORT - CONCEPTUAL MITIGATION PLAN

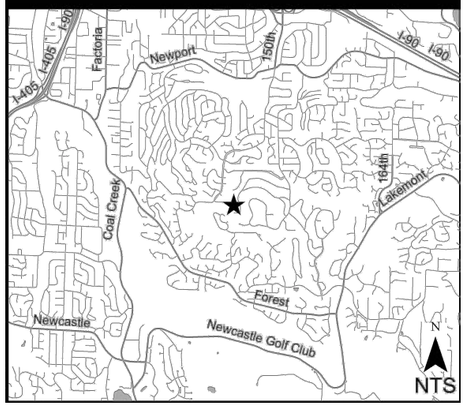
BELEVEDERE - 145TH PL SE, LOT 6

PORTION OF SECTION 22, TOWNSHIP 24N, RANGE 5E, W.M.



OFF-SITE WETLAND
CATEGORY III
110' BUFFER

VICINITY MAP



LEGEND

- SLOPE >40%
- TOP OF SLOPE BUFFER
- TOE OF SLOPE STRUCTURE SETBACK
- OFF-SITE WETLAND BUFFER

PLEASE NOTE: THIS MAP DEPICTS AN ***APPROXIMATE*** WETLAND BUFFER LOCATION FOR THE OFF SITE WETLAND.

Scale 1" = 20'

0 10 20 30 40

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance
9505 19th Avenue S.E. Suite 106 Everett,Washington 98208
Phone: (425) 337-3174
Fax: (425) 337-3045
Email: mailbox@wetlandresources .com

CRITICAL AREAS REPORT -
EXISTING CONDITIONS
BELEVEDERE - 145TH PL SE, LOT 6
Bellevue, Washington

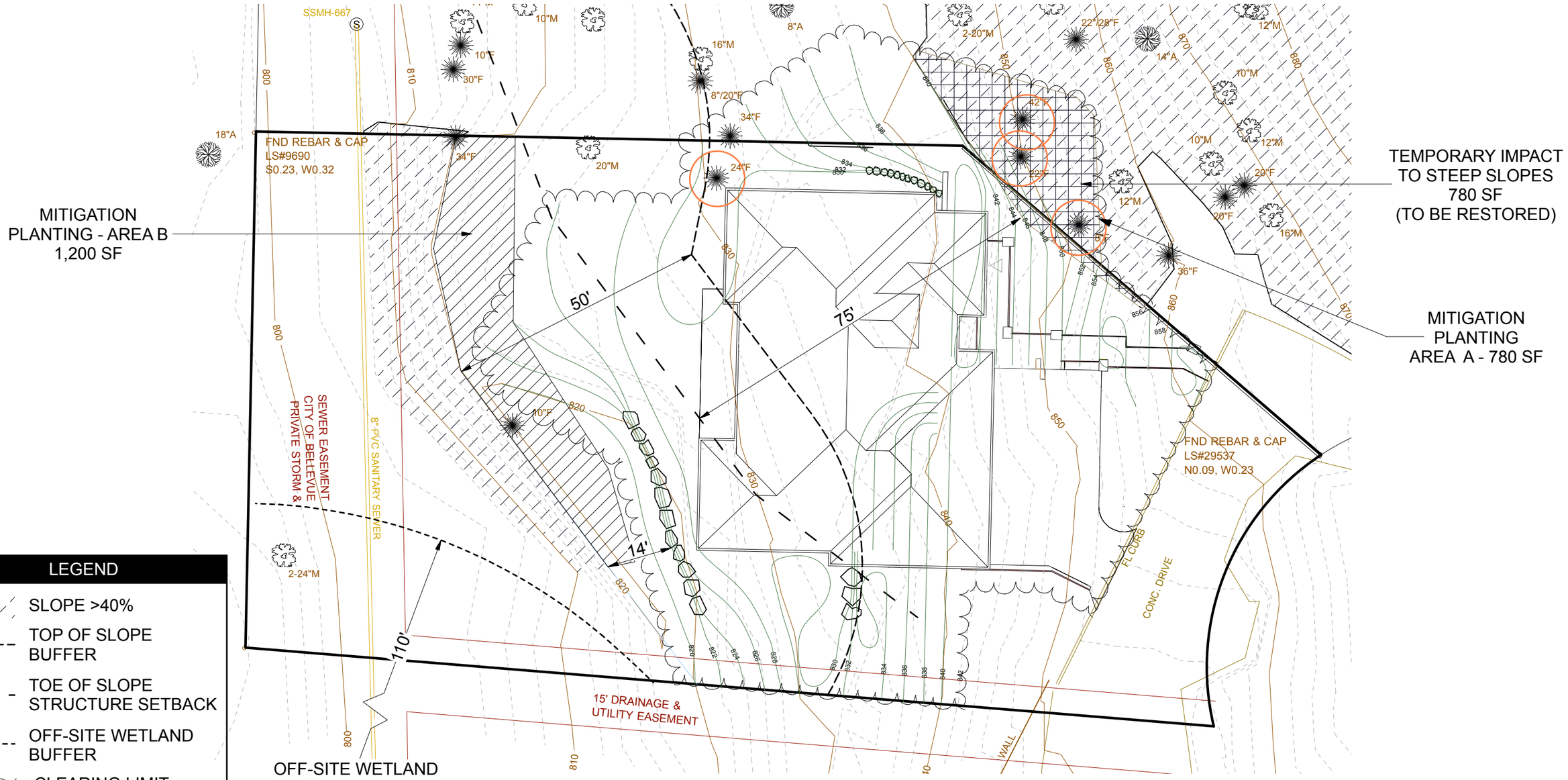
GIS Development
Attn: Ryan Grams
2737 152nd Ave NE, Suite 5D
Redmond, WA 98052

Sheet 1/2
WRI Job # 16102
Drawn by: MK
Date: January 12, 2017

CRITICAL AREAS REPORT - CONCEPTUAL MITIGATION PLAN

BELEVEDERE - 145TH PL SE, LOT 6

PORTION OF SECTION 22, TOWNSHIP 24N, RANGE 5E, W.M.



LEGEND

- SLOPE >40%
- TOP OF SLOPE BUFFER
- TOE OF SLOPE STRUCTURE SETBACK
- OFF-SITE WETLAND BUFFER
- CLEARING LIMIT
- IMPACT AREA (TO BE RESTORED)
- SIGNIFICANT TREE TO BE REMOVED
- ENHANCEMENT AREA

PLEASE NOTE: THIS MAP DEPICTS AN ***APPROXIMATE*** WETLAND BUFFER LOCATION FOR THE OFF SITE WETLAND.

Scale 1" = 20'

0 10 20 30 40

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance
9505 19th Avenue S.E. Suite 106 Everett,Washington 98208
Phone: (425) 337-3174
Fax: (425) 337-3045
Email: mailbox@wetlandresources .com

CRITICAL AREAS REPORT - CONCEPTUAL MITIGATION PLAN
BELEVEDERE - 145TH PL SE, LOT 6
Bellevue, Washington

GIS Development
Attn: Ryan Grams
2737 152nd Ave NE, Suite 5D
Redmond, WA 98052

Sheet 2/2
WRI Job # 16102
Drawn by: MK
Date: January 12, 2017

GEOTECH
CONSULTANTS, INC.

13256 Northeast 20th Street, Suite 16
Bellevue, Washington 98005
(425) 747-5618 | GEOTECHNW.COM

December 15, 2015

JN 15481

GIS Development
600 Stewart Street, Suite 603
Seattle, Washington 98101

Attention: Ryan Grams *via email: rg@gisinternational.com*

Subject: **Transmittal Letter – Geotechnical Engineering Study**
Proposed Two New Residences
Lots 6 & 7, 5247 – 145th Place Southeast
Bellevue, Washington

Dear Mr. Grams:

We are pleased to present this geotechnical engineering report for the proposed two new residences to be constructed in Bellevue. The scope of our services consisted of exploring site surface and subsurface conditions, and then developing this report to provide recommendations for general earthwork and design considerations for foundations, retaining walls, and slope stability. This work was authorized by your acceptance of our proposal, P-9274 dated September 16, 2015.

The attached report contains a discussion of the study and our recommendations. Please contact us if there are any questions regarding this report, or for further assistance during the design and construction phases of this project.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

Marc R. McGinnis, P.E.
Principal

ASM/MRM: at

GEOTECHNICAL ENGINEERING STUDY
Proposed Two New Residences
Lots 6 & 7, 5247 – 145th Place Southeast
Bellevue, Washington

This report presents the findings and recommendations of our geotechnical engineering study for the site of the proposed two new residences to be located in Bellevue.

We were provided with a preliminary site plan and a topographic map. SkB Architects developed this preliminary plan, which is dated August 14, 2015. Tri-County Land Surveying Company developed the topographic map which is dated November, 2015. No formal development plans had been prepared at the time of this report. However, based on our discussions with GIS Development, we understand that the development will consist of constructing a single-family residence one on both Lot 6 and Lot 7 on the residential development. The residence on Lot 6 will be located in the central portion of the lower, western end of the parcel. A new driveway will extend from the eastern end of the new residence to the existing paved driveway that serves the adjacent residence on Lot 5 (5247 – 145th Place Southeast). On Lot 7, the residence is proposed along the upper, eastern property line directly off of the private access road designated Tract C. It is our understanding that this residence will be elevated over the existing slope with a first-floor elevation similar to that of the adjacent roadway. This house siting and configuration is intended to minimize disturbance on the steep slope. Similar construction is being used for the new house being built on the lot immediately to the north of Lot 7.

If the scope of the project changes from what we have described above, we should be provided with revised plans in order to determine if modifications to the recommendations and conclusions of this report are warranted.

SITE CONDITIONS

SURFACE

The Vicinity Map, Plate 1, illustrates the general location of the site. The irregular-shaped subject site consists of two parcels; Lot 6 (King County Parcel #0713500060) and Lot 7 (King County Parcel #0713500070). The subject site as a whole slopes moderately to steeply downward from east to west. The site is bordered by a paved private access road to the east, and residential properties of similar size developed with single-family residences to the north, south, and west. Lot 5 (5247 – 145th Place Southeast) is developed to the south of Lot 6, and a new home is under construction on the lot to the north of Lot 7.

Lot 6: The irregular-shaped parcel has approximate dimensions of 210 feet in the east-west direction and 100 feet in the north-south direction. The lot slopes downward at a 32-percent slope from east to west and has been previously graded with multiple tiered 2- to 5-foot-tall rockeries with flat, grass lawn areas between them. This landscaping appears to have occurred in conjunction with development of Lot 5. The lower end of the lot becomes steeper, with a short, localized steep slope in the central portion of the lot. A paved driveway is located along the eastern end of the lot that provides access to the adjacent residence to the south (on Lot 5) from the roadway Tract C. It should be noted that a sanitary sewer easement runs north to south through the western end of Lot 6.

Lot 7: This 1.16-acre parcel is irregularly shaped with average dimensions of 313 feet in the east-west direction and 235 feet in the north-south direction. The eastern edge of this lot is close to the paved road that provides access to the neighborhood from the end of 145th Place Southeast. In general, the parcel can be divided into the very steep, upper, eastern half sloped at approximately a 70 percent grade and the less steeply inclined western half at approximately a 40-percent grade. The entire parcel is overgrown with brush and mature trees.

SUBSURFACE

The subsurface conditions were explored by drilling six borings at the approximate locations shown on the Site Exploration Plan, Plate 2. Our exploration program was based on the proposed construction, anticipated subsurface conditions and those encountered during exploration, and the scope of work outlined in our proposal.

The borings were drilled on November 16 and 17, 2015 using both a small track-mounted, hollow-stem auger drill and a portable Acker drill. The Acker drill system utilizes a small, gasoline-powered engine to advance a hollow-stem auger to the sampling depth. Samples were taken at approximate 5-foot intervals with a standard penetration sampler. This split-spoon sampler, which has a 2-inch outside diameter, is driven into the soil with a 140-pound hammer falling 30 inches. The number of blows required to advance the sampler a given distance is an indication of the soil density or consistency. A geotechnical engineer from our staff observed the drilling process, logged the test borings, and obtained representative samples of the soil encountered. The Test Boring Logs are attached as Plates 3 through 8.

Soil Conditions

Lot 6: The soils encountered in our borings generally consisted of loose to medium-dense silty sand and sandy silt which became dense to very dense below depths of 20 to 25 feet from the existing grade. Borings 1 and 3 encountered dense silt at depths of 23 and 30 feet respectively. This dense soil appears to have been glacially compressed, while the upper, loose soils have not been.

Lot 7: Boring 4, located at the top of the steep slope along the eastern property line encountered 11 feet of loose to medium-dense, silty sand fill soils which were likely placed during grading for the roadway. A thin layer of brown silty sand/weathered sandstone was encountered overlying very dense, dark gray sandstone at a depth of approximately 12.5 feet. This bedrock is typical for the area. We encountered similar fill over weathered sandstone during our work on the foundation piles for the house under construction to the north.

Borings 5 and 6 were located on the very steep slope, near the western end of the proposed residence. Loose silty sand/weathered sandstone was encountered overlying very dense sandstone at depths of 6 to 9 feet. It was impossible for the small Acker drill to auger more than a few feet into the sandstone, due to its density.

No obstructions were revealed by our explorations. However, debris, buried utilities, and old foundation and slab elements are commonly encountered on sites that have had previous development.

Groundwater Conditions

Perched groundwater seepage was observed at a depth of 7 and 8.5 feet in Borings 1 and 3 located on Lot 6. The borings were conducted relatively early in the winter, and were left open for only a short time period. Therefore, the seepage levels on the logs represent the location of transient water seepage and may not indicate the static groundwater level. Groundwater levels encountered during drilling can be deceptive, because seepage into the boring can be blocked or slowed by the auger itself.

It should be noted that groundwater levels vary seasonally with rainfall and other factors. We anticipate that groundwater could be found in more permeable soil layer and at the contact point between the loose upper weathered soils and the underlying dense bedrock.

The stratification lines on the logs represent the approximate boundaries between soil types at the exploration locations. The actual transition between soil types may be gradual, and subsurface conditions can vary between exploration locations. The logs provide specific subsurface information only at the locations tested. If a transition in soil type occurred between samples in the borings, the depth of the transition was interpreted. The relative densities and moisture descriptions indicated on the boring logs are interpretive descriptions based on the conditions observed during drilling.

SLOPE STABILITY ANALYSIS

To evaluate the steep slope on Lot 7 and provide recommendations for the proposed development, we conducted a slope stability analysis using the computer program SLOPE/W. We developed a cross section of the slope using the topographic survey of the site provided to us.

The analysis is largely dependent on the soil profile of the slope and the parameters of each soil type; the most notable parameter being the angle of internal friction. These values were determined from the soils and bedrock observed in the borings we conducted on the site. The existing slope was evaluated for both static and dynamic loading conditions. The dynamic loading condition was completed assuming a peak design ground acceleration of 0.37g. A potential slope failure surface with factors of safety of at least 1.5 under static conditions and 1.2 under seismic conditions would extend down to the contact between the weathered sandstone and the underlying dense sandstone. Shallower slides affecting the fill and loose, native soil are more likely to occur over time, particularly following extended wet weather.

The recommendations presented in this report are intended to prevent the planned development from adversely affecting stability of the steep slope. They are also intended to protect the residence from damage in the event of foreseeable slope movement.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

THIS SECTION CONTAINS A SUMMARY OF OUR STUDY AND FINDINGS FOR THE PURPOSES OF A GENERAL OVERVIEW ONLY. MORE SPECIFIC RECOMMENDATIONS AND CONCLUSIONS ARE CONTAINED IN THE REMAINDER OF THIS REPORT. ANY PARTY RELYING ON THIS REPORT SHOULD READ THE ENTIRE DOCUMENT.

Lot 6

The soils encountered in the upper 20 feet of our borings in the area of the proposed residence on Lot 6 consisted of loose soils that are not suitable to support the proposed house without the risk of excessive post-construction settlement. Therefore, we recommend supporting this residence on a deep foundation system consisting of small-diameter steel pipe piles that are driven into the dense underlying soils. The ***Pipe Piles*** section of this report should be reference for additional recommendations.

It is likely that some settlement of the ground surrounding pile-supported buildings will occur over time. In order to reduce the potential problems associated with this, we recommend the following:

- Fill to the desired site grades several months prior to constructing on-grade slabs, walkways, and pavements around the buildings. This allows the underlying soils to undergo some consolidation under the new soil loads before final grading is accomplished.

- Connect all in-ground utilities beneath the floor slabs to the pile-supported floors or grade beams. This is intended to prevent utilities, such as sewers, from being pulled out of the floor as the underlying soils settle away from the slab. Hangers or straps can be poured into the floors and grade beams to carry the piping. The spacing of these supporting elements will depend on the distance that the pipe material can span unsupported.

- Construct all entrance walkways as reinforced slabs that are doweled into the grade beam at the door thresholds. This will allow the walkways to ramp down and away from the building as they settle, without causing a downset at the threshold.

- Isolate on-grade elements, such as walkways or pavements, from pile-supported foundations and columns to allow differential movement.

Projects involving small-diameter pipe piles often include the need for lateral resistance from fill placed against the foundations. If this is the case for this project, it is important that the structural engineer indicate this requirement on the plans for the general and earthwork contractor's information. Compaction requirements for this fill are discussed below in ***Pipe Piles***. The building department may require that we verify suitable compaction of this fill prior to completion of the project.

A utility and drainage easement runs through the western end of the parcel which contains a sanitary sewer line. It would be prudent to determine the exact location of the sewer line prior to installing the pipe pile foundation system.

Due to the presence of homes downslope, fill should not be placed west of the Lot 6 house, unless retained by an engineered wall that is reviewed by the project geotechnical engineer.

Lot 7

The boring conducted along the eastern property line in the area of the proposed residence encountered loose silty sand fill soils to a depth of 12 feet overlying very dense sandstone

bedrock. The upper fill soils were likely placed during the grading of the roadway in Tract C. Directly downslope, along the western end, of the proposed house and on the very steep slope, 6 to 9 feet of loose silty sand/weathered sandstone was encountered overlying very dense sandstone. These findings are similar to the conditions we observed during the installation of the drilled pile foundation system for the house under construction on the adjacent property to the north.

Based on the soil and topographic conditions, it appears that constructing the residence on the upper eastern end of the lot and elevating the house over the existing slope would be the most appropriate means to minimize the disturbance to the steep slope. We recommend the residence be supported on drilled, concrete-filled piles that are embedded into the hard bedrock that comprises the core of the steep slope, providing both vertical and lateral load resistance for the structure. The drilled piles should be at least 24 inches in diameter and be reinforced with rebar or wide-flange beams.

Based on our slope stability analysis, the potential for a deep-seated slope failure extending into the very dense bedrock is low. However, as with any steep slope in the Puget Sound area, there is always the potential for movement of the loose near-surface soils, particularly after periods with large amounts of precipitation. The recommendations in this report are intended to protect the proposed residence from damage in the event of future slope movement. The piles supporting the majority of the house only need to be embedded a minimum of 10 feet into the hard sandstone to accomplish this. The piles supporting the eastern edge of the house however, will need to be designed to retain the deeper fill soils under the east edge of the site and the adjacent roadway in the event of future soil movement on the steep manmade slope. To accomplish this, the eastern piles supporting the house and/or garage should be spaced no further than 3 feet edge-to-edge. These piles should be sufficiently reinforced to withstand lateral soil pressure acting to a depth of 12 feet below the road surface, and this will require that the piles are embedded into the underlying intact bedrock. This allows the closely-spaced piles to acts as a below-grade stabilization wall. Typically, a 2-foot-diameter drilled pile can be sufficiently reinforced to accomplish this. If the piles are exposed by future soil movement, then treated timber lagging can be installed between the piles.

If the grade between the house and the street is to be raised, this cannot be accomplished with compacted fill without adding substantial lateral loads to the foundations of the house. Any fill placed east of the house would have to consist of geofoam, which is self-supporting and does not add more lateral load against the foundations and walls. The geofoam can be covered with a non-woven filter fabric and up to 12 inches of compacted granular soil to provide a surface for walkways, planting, etc. It is important to note that any on-grade elements constructed outside of the pile-supported house will still experience long-term vertical settlement due to ongoing consolidation of the loose fill soils.

The steep natural slope west of the planned house should not be disturbed, and no fill should be placed on the slope to the west of the structure, unless it is retained by an engineered wall embedded into the intact sandstone.

The soils that underlie both lots have a low permeability. Considering this, the sloping topography and/or the presence of developed lots downslope, it is our professional opinion that onsite infiltration or dispersion of storm runoff is unfeasible.

The erosion control measures needed during the site development will depend heavily on the weather conditions that are encountered. We anticipate that a wire-backed silt fence will be needed around the downslope sides of any cleared areas. Additionally, a debris fence consisting of timber or plywood spanning between metal fence posts should be erected immediately downslope of the Lot 7 house footprint to collect spoils from the drilling of the foundation piles. Existing pavements, ground cover, and landscaping should be left in place wherever possible to minimize the amount of exposed soil. Rocked staging areas and construction access roads should be provided to reduce the amount of soil or mud carried off the property by trucks and equipment. Wherever possible, the access roads should follow the alignment of planned pavements. Trucks should not be allowed to drive off of the rock-covered areas. Cut slopes and soil stockpiles should be covered with plastic during wet weather. Following clearing or rough grading, it may be necessary to mulch or hydroseed bare areas that will not be immediately covered with landscaping or an impervious surface. On most construction projects, it is necessary to periodically maintain or modify temporary erosion control measures to address specific site and weather conditions.

The drainage and/or waterproofing recommendations presented in this report are intended only to prevent active seepage from flowing through concrete walls or slabs. Even in the absence of active seepage into and beneath structures, water vapor can migrate through walls, slabs, and floors from the surrounding soil, and can even be transmitted from slabs and foundation walls due to the concrete curing process. Water vapor also results from occupant uses, such as cooking and bathing. Excessive water vapor trapped within structures can result in a variety of undesirable conditions, including, but not limited to, moisture problems with flooring systems, excessively moist air within occupied areas, and the growth of molds, fungi, and other biological organisms that may be harmful to the health of the occupants. The designer or architect must consider the potential vapor sources and likely occupant uses, and provide sufficient ventilation, either passive or mechanical, to prevent a build up of excessive water vapor within the planned structure.

Geotech Consultants, Inc. should be allowed to review the final development plans to verify that the recommendations presented in this report are adequately addressed in the design. Such a plan review would be additional work beyond the current scope of work for this study, and it may include revisions to our recommendations to accommodate site, development, and geotechnical constraints that become more evident during the review process.

We recommend including this report, in its entirety, in the project contract documents. This report should also be provided to any future property owners so they will be aware of our findings and recommendations.

SEISMIC CONSIDERATIONS

In accordance with the International Building Code (IBC), the site soil profile within 100 feet of the ground surface is best represented by Site Class Type D (Stiff Site Class) for Lot 6 and Type C (Very dense soil/soft rock) for Lot 7. As noted in the USGS website, the mapped spectral acceleration value for a 0.2 second (S_s) and 1.0 second period (S_1) equals 1.39 and 0.53g, respectively.

The upper loose saturated site soils encountered on Lot 6 have a slight potential for seismic liquefaction during the Maximum Considered Earthquake (MCE), which has a probability of occurring once in 2,475 years (2 percent chance in 50 years). However, this report recommends the proposed buildings be supported on deep foundations embedded into the dense underlying soils. This is intended to prevent catastrophic foundation failure if liquefaction was to occur.

PIPE PILES

Four-inch-diameter pipe piles driven with a 650- or 800- or 1,100-pound hydraulic jackhammer to the following final penetration rates may be assigned the following compressive capacities.

INSIDE PILE DIAMETER	FINAL DRIVING RATE (650-pound hammer)	FINAL DRIVING RATE (800-pound hammer)	FINAL DRIVING RATE (1,100-pound hammer)	ALLOWABLE COMPRESSIVE CAPACITY
4 inches	20 sec/inch	15 sec/inch	10 sec/inch	10 tons

Note: The refusal criteria indicated in the above table are valid only for pipe piles that are installed using a hydraulic impact hammer carried on leads that allow the hammer to sit on the top of the pile during driving. If the piles are installed by alternative methods, such as a vibratory hammer or a hammer that is hard-mounted to the installation machine, numerous load tests to 200 percent of the design capacity would be necessary to substantiate the allowable pile load. The appropriate number of load tests would need to be determined at the time the contractor and installation method are chosen.

As a minimum, Schedule 40 pipe should be used. The site soils should not be highly corrosive. Considering this, it is our opinion that standard "black" pipe can be used, and corrosion protection, such as galvanizing, is not necessary for the pipe piles.

Pile caps and grade beams should be used to transmit loads to the piles. Isolated pile caps should include a minimum of two piles to reduce the potential for eccentric loads being applied to the piles. Subsequent sections of pipe can be connected with slip or threaded couplers, or they can be welded together. If slip couplers are used, they should fit snugly into the pipe sections. This may require that shims be used or that beads of welding flux be applied to the outside of the coupler.

Lateral loads due to wind or seismic forces may be resisted by passive earth pressure acting on the vertical, embedded portions of the foundation. For this condition, the foundation must be either poured directly against relatively level, undisturbed soil or be surrounded by level compacted fill. We recommend using a passive earth pressure of 300 pounds per cubic foot (pcf) for this resistance. If the ground in front of a foundation is loose or sloping, the passive earth pressure given above will not be appropriate. We recommend a safety factor of at least 1.5 for the foundation's resistance to lateral loading, when using the above ultimate passive value.

As discussed above in the ***General*** section, if lateral resistance from fill placed against the foundations is required for this project, the structural engineer should indicate this requirement on the plans for the general and earthwork contractor's information. Compacted fill placed against the foundations can consist of onsite that is tamped into place using the backhoe or is compacted using a jumping jack compactor. It is necessary for the fill to be compacted to a firm condition, but it does not need to reach even 90 percent relative compaction to develop the passive resistance recommended above. Due to their small diameter, the lateral capacity of vertical pipe piles is relatively small. However, if lateral resistance in addition to passive soil resistance is required, we recommend driving battered piles in the same direction as the applied lateral load. The lateral capacity of a battered pile is equal to one-half of the lateral component of the allowable compressive load, with a maximum allowable lateral capacity of 1,000 pounds. The allowable vertical capacity of battered piles does not need to be reduced if the piles are battered steeper than 1:5 (Horizontal:Vertical).

DRILLED CONCRETE PILES

An allowable compressive capacity of 30 tons can be attained by installing a 24-inch-diameter, concrete pile at least 10 feet into hard sandstone. This assumes that the bottoms of the drilled holes are cleaned of loosened soil and rock before pouring concrete. For transient loading, such as wind or seismic loads, the calculated allowable pile capacities may be increased by one-third. We can provide design criteria for different pile diameters and embedment lengths, if greater capacities are required.

We recommend reinforcing each pile for its entire length. This typically consists of a rebar cage extending a portion of the pile's length with a full-length center bar. Each pile located west of the easternmost line of piles should be assumed to have a point of fixity (point of maximum bending moment) at a depth of 12 feet below the top of the pile for design of the reinforcing. The reinforcing and minimum embedment into the hard bedrock for the eastern line of piles should be designed using the lateral earth pressures summarized on Plate 9.

We estimate that the total settlement of single piles installed as described above will be on the order of one-half inch. Most of this settlement should occur during the construction phase as the dead loads are applied. The remaining post-construction settlement would be realized as the live loads are applied. We estimate that differential settlements over any portion of the structures should be less than about one-quarter inch.

FOUNDATION AND RETAINING WALLS

Retaining walls backfilled on only one side should be designed to resist the lateral earth pressures imposed by the soil they retain. The following recommended parameters are for walls that restrain level backfill:

PARAMETER	VALUE
Active Earth Pressure *	40 pcf
Passive Earth Pressure	300 pcf
Coefficient of Friction	0.40
Soil Unit Weight	130 pcf

Where: pcf is Pounds per Cubic Foot, and Active and Passive Earth Pressures are computed using the equivalent fluid pressures.

*** For a restrained wall that cannot deflect at least 0.002 times its height, a uniform lateral pressure equal to 10 psf times the height of the wall should be added to the above active equivalent fluid pressure.**

The design values given above do not include the effects of any hydrostatic pressures behind the walls and assume that no surcharges, such as those caused by slopes, vehicles, or adjacent foundations will be exerted on the walls. If these conditions exist, those pressures should be added

to the above lateral soil pressures. Where sloping backfill is desired behind the walls, we will need to be given the wall dimensions and the slope of the backfill in order to provide the appropriate design earth pressures. The surcharge due to traffic loads behind a wall can typically be accounted for by adding a uniform pressure equal to 2 feet multiplied by the above active fluid density. Heavy construction equipment should not be operated behind retaining and foundation walls within a distance equal to the height of a wall, unless the walls are designed for the additional lateral pressures resulting from the equipment.

The values given above are to be used to design only permanent foundation and retaining walls that are to be backfilled, such as conventional walls constructed of reinforced concrete or masonry. It is not appropriate to use the above earth pressures and soil unit weight to back-calculate soil strength parameters for design of other types of retaining walls, such as soldier pile, reinforced earth, modular or soil nail walls. We can assist with design of these types of walls, if desired. The values for friction and passive resistance are ultimate values and do not include a safety factor. Restrained wall soil parameters should be utilized for a distance of 1.5 times the wall height from corners or bends in the walls. This is intended to reduce the amount of cracking that can occur where a wall is restrained by a corner.

Wall Pressures Due to Seismic Forces

The surcharge wall loads that could be imposed by the design earthquake can be modeled by adding a uniform lateral pressure to the above-recommended active pressure. The recommended surcharge pressure is 7**H** pounds per square foot (psf), where **H** is the design retention height of the wall. Using this increased pressure, the safety factor against sliding and overturning can be reduced to 1.2 for the seismic analysis.

Retaining Wall Backfill and Waterproofing

Backfill placed behind retaining or foundation walls should be coarse, free-draining structural fill containing no organics. This backfill should contain no more than 5 percent silt or clay particles and have no gravel greater than 4 inches in diameter. The percentage of particles passing the No. 4 sieve should be between 25 and 70 percent.

The onsite soils and bedrock are not free-draining, and should not be used for wall backfill.

The later section entitled ***Drainage Considerations*** should also be reviewed for recommendations related to subsurface drainage behind foundation and retaining walls.

The purpose of these backfill requirements is to ensure that the design criteria for a retaining wall are not exceeded because of a build-up of hydrostatic pressure behind the wall. Also, subsurface drainage systems are not intended to handle large volumes of water from surface runoff. The top 12 to 18 inches of the backfill should consist of a compacted, relatively impermeable soil or topsoil, or the surface should be paved. The ground surface must also slope away from backfilled walls to reduce the potential for surface water to percolate into the backfill. Water percolating through pervious surfaces (pavers, gravel, permeable pavement, etc.) must also be prevented from flowing toward walls or into the backfill zone. The compacted subgrade below pervious surfaces and any associated drainage layer should therefore be sloped away. Alternatively, a membrane and subsurface collection system could be provided below a pervious surface.

It is critical that the wall backfill be placed in lifts and be properly compacted, in order for the above-recommended design earth pressures to be appropriate. The wall design criteria assume that the backfill will be well-compacted in lifts no thicker than 12 inches. The compaction of backfill near the walls should be accomplished with hand-operated equipment to prevent the walls from being overloaded by the higher soil forces that occur during compaction. The section entitled ***General Earthwork and Structural Fill*** contains additional recommendations regarding the placement and compaction of structural fill behind retaining and foundation walls.

The above recommendations are not intended to waterproof below-grade walls, or to prevent the formation of mold, mildew or fungi in interior spaces. Over time, the performance of subsurface drainage systems can degrade, subsurface groundwater flow patterns can change, and utilities can break or develop leaks. Therefore, waterproofing should be provided where future seepage through the walls is not acceptable. This typically includes limiting cold-joints and wall penetrations, and using bentonite panels or membranes on the outside of the walls. There are a variety of different waterproofing materials and systems, which should be installed by an experienced contractor familiar with the anticipated construction and subsurface conditions. Applying a thin coat of asphalt emulsion to the outside face of a wall is not considered waterproofing, and will only help to reduce moisture generated from water vapor or capillary action from seeping through the concrete. As with any project, adequate ventilation of basement and crawl space areas is important to prevent a build up of water vapor that is commonly transmitted through concrete walls from the surrounding soil, even when seepage is not present. This is appropriate even when waterproofing is applied to the outside of foundation and retaining walls. We recommend that you contact an experienced envelope consultant if detailed recommendations or specifications related to waterproofing design, or minimizing the potential for infestations of mold and mildew are desired.

The ***General***, ***Slabs-On-Grade***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

FLOOR SLABS

If a slab is used for the lowest floor in the Lot 6 house it should be carried on the piles.

Even where the exposed soils appear dry, water vapor will tend to naturally migrate upward through the soil to the new constructed space above it. This can affect moisture-sensitive flooring, cause imperfections or damage to the slab, or simply allow excessive water vapor into the space above the slab. All interior slabs-on-grade should be underlain by a capillary break drainage layer consisting of a minimum 4-inch thickness of clean gravel or crushed rock that has a fines content (percent passing the No. 200 sieve) of less than 3 percent and a sand content (percent passing the No. 4 sieve) of no more than 10 percent. Pea gravel or crushed rock are typically used for this layer.

As noted by the American Concrete Institute (ACI) in the *Guides for Concrete Floor and Slab Structures*, proper moisture protection is desirable immediately below any on-grade slab that will be covered by tile, wood, carpet, impermeable floor coverings, or any moisture-sensitive equipment or

products. ACI also notes that vapor *retarders* such as 6-mil plastic sheeting have been used in the past, but are now recommending a minimum 10-mil thickness for better durability and long term performance. A vapor retarder is defined as a material with a permeance of less than 0.3 perms, as determined by ASTM E 96. It is possible that concrete admixtures may meet this specification, although the manufacturers of the admixtures should be consulted. Where vapor retarders are used under slabs, their edges should overlap by at least 6 inches and be sealed with adhesive tape. The sheeting should extend to the foundation walls for maximum vapor protection. If no potential for vapor passage through the slab is desired, a vapor *barrier* should be used. A vapor barrier, as defined by ACI, is a product with a water transmission rate of 0.01 perms when tested in accordance with ASTM E 96. Reinforced membranes having sealed overlaps can meet this requirement.

We recommend that the contractor, the project materials engineer, and the owner discuss these issues and review recent ACI literature and ASTM E-1643 for installation guidelines and guidance on the use of the protection/blotter material.

The ***General***, ***Permanent Foundation and Retaining Walls***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

EXCAVATIONS AND SLOPES

Excavation slopes should not exceed the limits specified in local, state, and national government safety regulations. Temporary cuts to a depth of about 4 feet may be attempted vertically in unsaturated soil, if there are no indications of slope instability. However, vertical cuts should not be made near property boundaries, or existing utilities and structures. Based upon Washington Administrative Code (WAC) 296, Part N, the near-surface soil at the subject site would generally be classified as Type C. Therefore, temporary cut slopes greater than 4 feet in height should not be excavated at an inclination steeper than 1.5:1 (Horizontal:Vertical), extending continuously between the top and the bottom of a cut. However, flatter cut slopes and/or shoring will be needed where cuts are made into the steep slope below the existing roadway, or where caving soil conditions are encountered.

The above-recommended temporary slope inclination is based on the conditions exposed in our explorations, and on what has been successful at other sites with similar soil conditions. It is possible that variations in soil and groundwater conditions will require modifications to the inclination at which temporary slopes can stand. Temporary cuts are those that will remain unsupported for a relatively short duration to allow for the construction of foundations, retaining walls, or utilities. Temporary cut slopes should be protected with plastic sheeting during wet weather. It is also important that surface runoff be directed away from the top of temporary slope cuts. Cut slopes should also be backfilled or retained as soon as possible to reduce the potential for instability. Please note that sand and/or loose soil can cave suddenly and without warning. Excavation, foundation, and utility contractors should be made especially aware of this potential danger. These recommendations may need to be modified if the area near the potential cuts has been disturbed in the past by utility installation, or if settlement-sensitive utilities are located nearby.

All permanent cuts into native soil should be inclined no steeper than 2.5:1 (H:V).

Water should not be allowed to flow uncontrolled over the top of any temporary or permanent slope. All permanently exposed slopes should be seeded with an appropriate species of vegetation to reduce erosion and improve the stability of the surficial layer of soil.

Any disturbance to the existing steep slopes outside of the building limits may reduce the stability of the slope. Damage to the existing vegetation and ground should be minimized, and any disturbed areas should be revegetated as soon as possible. Soil from the excavation should not be placed on the slope, and this may require the off-site disposal of any surplus soil.

DRAINAGE CONSIDERATIONS

Footing drains should be used where: (1) Crawl spaces or basements will be below a structure; (2) A slab is below the outside grade; or, (3) The outside grade does not slope downward from a building. Drains should also be placed at the base of all earth-retaining walls. These drains should be surrounded by at least 6 inches of 1-inch-minus, washed rock that is encircled with non-woven, geotextile filter fabric (Mirafi 140N, Supac 4NP, or similar material). At its highest point, a perforated pipe invert should be at least 6 inches below the bottom of a slab floor or the level of a crawl space. The discharge pipe for subsurface drains should be sloped for flow to the outlet point. Roof and surface water drains must not discharge into the foundation drain system. A typical drain detail is attached to this report as Plate 9. For the best long-term performance, perforated PVC pipe is recommended for all subsurface drains.

As a minimum, a vapor retarder, as defined in the ***Slabs-On-Grade*** section, should be provided in any crawl space area to limit the transmission of water vapor from the underlying soils. Crawl space grades are sometimes left near the elevation of the bottom of the footings. As a result, an outlet drain is recommended for all crawl spaces to prevent an accumulation of any water that may bypass the footing drains. Providing even a few inches of free draining gravel underneath the vapor retarder limits the potential for seepage to build up on top of the vapor retarder.

Groundwater was observed during our field work. If seepage is encountered in an excavation, it should be drained from the site by directing it through drainage ditches, perforated pipe, or French drains, or by pumping it from sumps interconnected by shallow connector trenches at the bottom of the excavation.

The excavations should be graded so that surface water is directed away from the tops of slopes. Water should not be allowed to stand in any area where foundations, slabs, or pavements are to be constructed. Final site grading in areas adjacent to buildings should slope away at least 2 percent, except where the area is paved. Surface drains should be provided where necessary to prevent ponding of water behind foundation or retaining walls. A discussion of grading and drainage related to pervious surfaces near walls and structures is contained in the ***Foundation and Retaining Walls*** section.

GENERAL EARTHWORK AND STRUCTURAL FILL

All building and pavement areas should be stripped of surface vegetation, topsoil, organic soil, and other deleterious material. The stripped or removed materials should not be mixed with any

materials to be used as structural fill, but they could be used in non-structural areas, such as landscape beds.

Structural fill is defined as any fill, including utility backfill, placed under, or close to, a building, behind permanent retaining or foundation walls, or in other areas where the underlying soil needs to support loads. All structural fill should be placed in horizontal lifts with a moisture content at, or near, the optimum moisture content. The optimum moisture content is that moisture content that results in the greatest compacted dry density. The moisture content of fill is very important and must be closely controlled during the filling and compaction process. As discussed in the ***General*** section, the on-site soils are not suitable for reuse as structural fill, due to their silty nature and high moisture contents.

The allowable thickness of the fill lift will depend on the material type selected, the compaction equipment used, and the number of passes made to compact the lift. The loose lift thickness should not exceed 12 inches. We recommend testing the fill as it is placed. If the fill is not sufficiently compacted, it can be recompacted before another lift is placed. This eliminates the need to remove the fill to achieve the required compaction. The following table presents recommended relative compactions for structural fill:

LOCATION OF FILL PLACEMENT	MINIMUM RELATIVE COMPACTION
Beneath slabs or walkways	95%
Filled slopes and behind retaining walls	90%
Beneath pavements	95% for upper 12 inches of subgrade; 90% below that level

Where: Minimum Relative Compaction is the ratio, expressed in percentages, of the compacted dry density to the maximum dry density, as determined in accordance with ASTM Test Designation D 1557-91 (Modified Proctor).

Structural fill that will be placed in wet weather should consist of a coarse, granular soil with a silt or clay content of no more than 5 percent. The percentage of particles passing the No. 200 sieve should be measured from that portion of soil passing the three-quarter-inch sieve.

LIMITATIONS

The conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our exploration and assume that the soil and groundwater conditions encountered in the borings are representative of subsurface conditions on the site. If the subsurface conditions encountered during construction are significantly different from those observed in our explorations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. Unanticipated conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking samples in borings. Subsurface conditions can also vary between exploration locations. Such unexpected conditions frequently require making additional expenditures to attain a properly constructed

project. It is recommended that the owner consider providing a contingency fund to accommodate such potential extra costs and risks. This is a standard recommendation for all projects.

The recommendations presented in this report are directed toward the protection of only the proposed residences from damage due to slope movement. Predicting the future behavior of steep slopes and the potential effects of development on their stability is an inexact and imperfect science that is currently based mostly on the past behavior of slopes with similar characteristics. Landslides and soil movement can occur on steep slopes before, during, or after the development of property. The owner of any property containing, or located close to steep slopes must ultimately accept the possibility that some slope movement could occur, resulting in possible loss of ground or damage to the facilities around the proposed residences.

This report has been prepared for the exclusive use of GIS Development, and its representatives, for specific application to this project and site. Our conclusions and recommendations are professional opinions derived in accordance with our understanding of current local standards of practice, and within the scope of our services. No warranty is expressed or implied. The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. Our services also do not include assessing or minimizing the potential for biological hazards, such as mold, bacteria, mildew and fungi in either the existing or proposed site development.

ADDITIONAL SERVICES

In addition to reviewing the final plans, Geotech Consultants, Inc. should be retained to provide geotechnical consultation, testing, and observation services during construction. This is to confirm that subsurface conditions are consistent with those indicated by our exploration, to evaluate whether earthwork and foundation construction activities comply with the general intent of the recommendations presented in this report, and to provide suggestions for design changes in the event subsurface conditions differ from those anticipated prior to the start of construction. However, our work would not include the supervision or direction of the actual work of the contractor and its employees or agents. Also, job and site safety, and dimensional measurements, will be the responsibility of the contractor.

During the construction phase, we will provide geotechnical observation and testing services when requested by you or your representatives. Please be aware that we can only document site work we actually observe. It is still the responsibility of your contractor or on-site construction team to verify that our recommendations are being followed, whether we are present at the site or not.

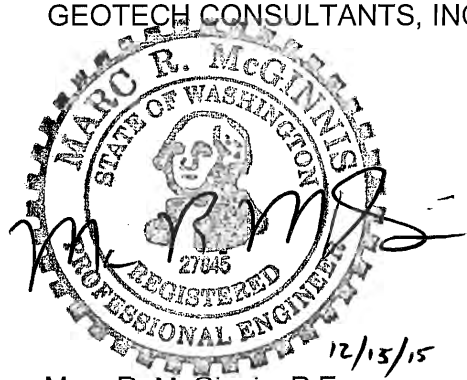
The following plates are attached to complete this report:

Plate 1	Vicinity Map
Plate 2	Site Exploration Plan
Plates 3 - 8	Boring Logs
Plate 9	Stabilization Wall Detail
Plate 10	Typical Footing Drain Detail

We appreciate the opportunity to be of service on this project. Please contact us if you have any questions, or if we can be of further assistance.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

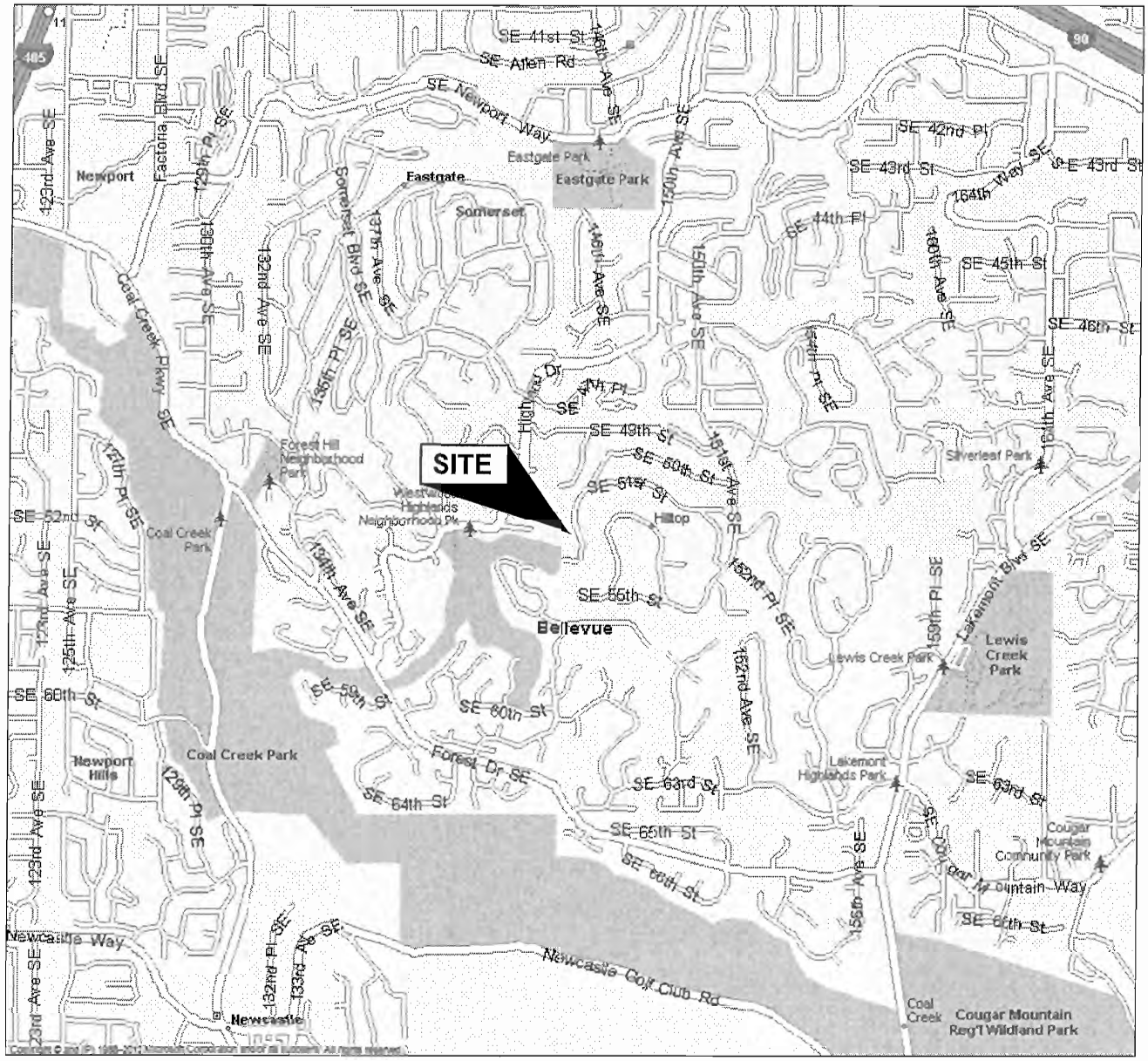


12/15/15

Marc R. McGinnis, P.E.
Principal

ASM/MRM:at

NORTH



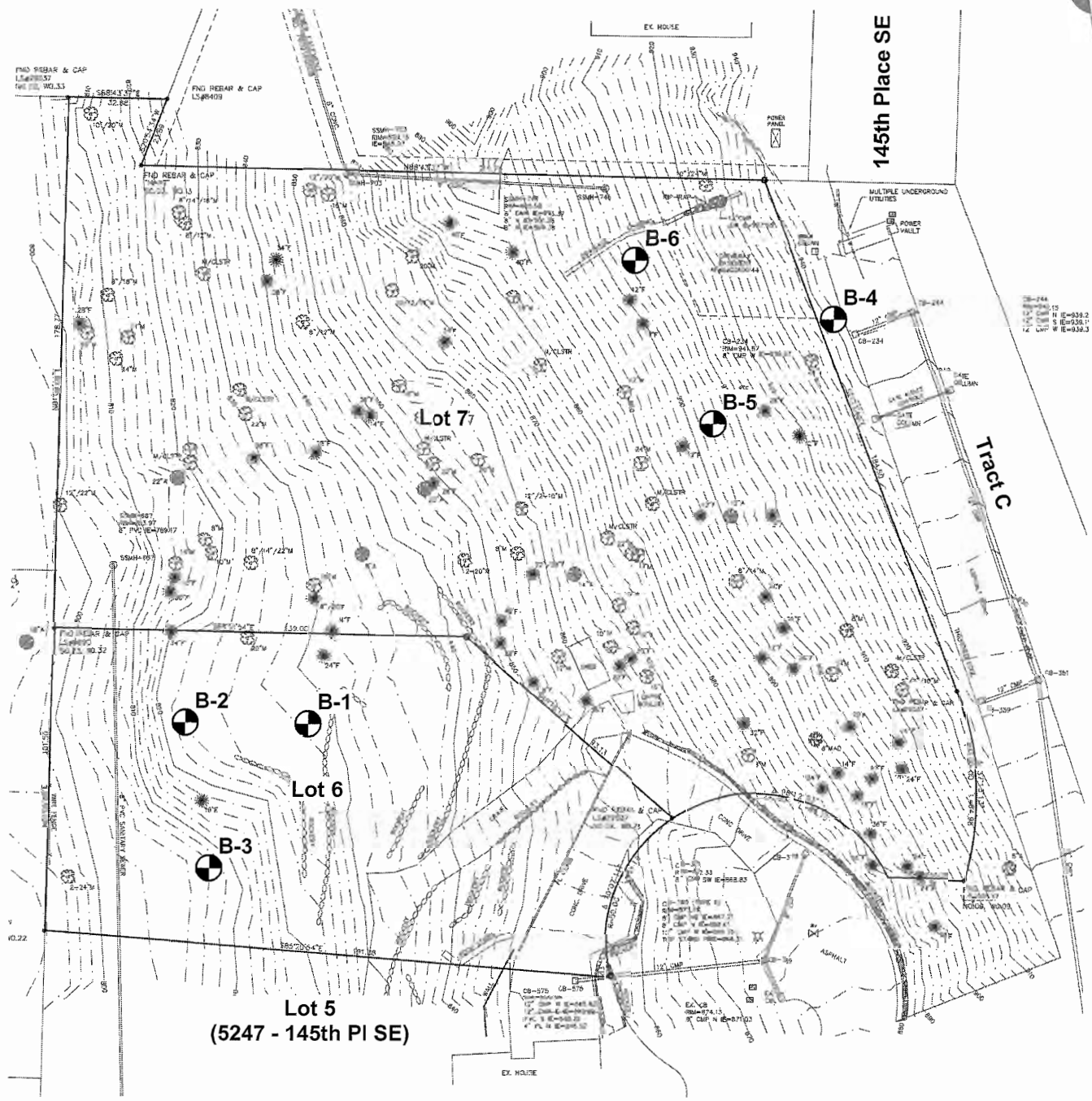
(Source: Microsoft MapPoint, 2013)

GEOTECH
CONSULTANTS, INC.

VICINITY MAP

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job No:	Date:		Plate:
15481	Dec. 2015		1



Legend:

Test Boring Location

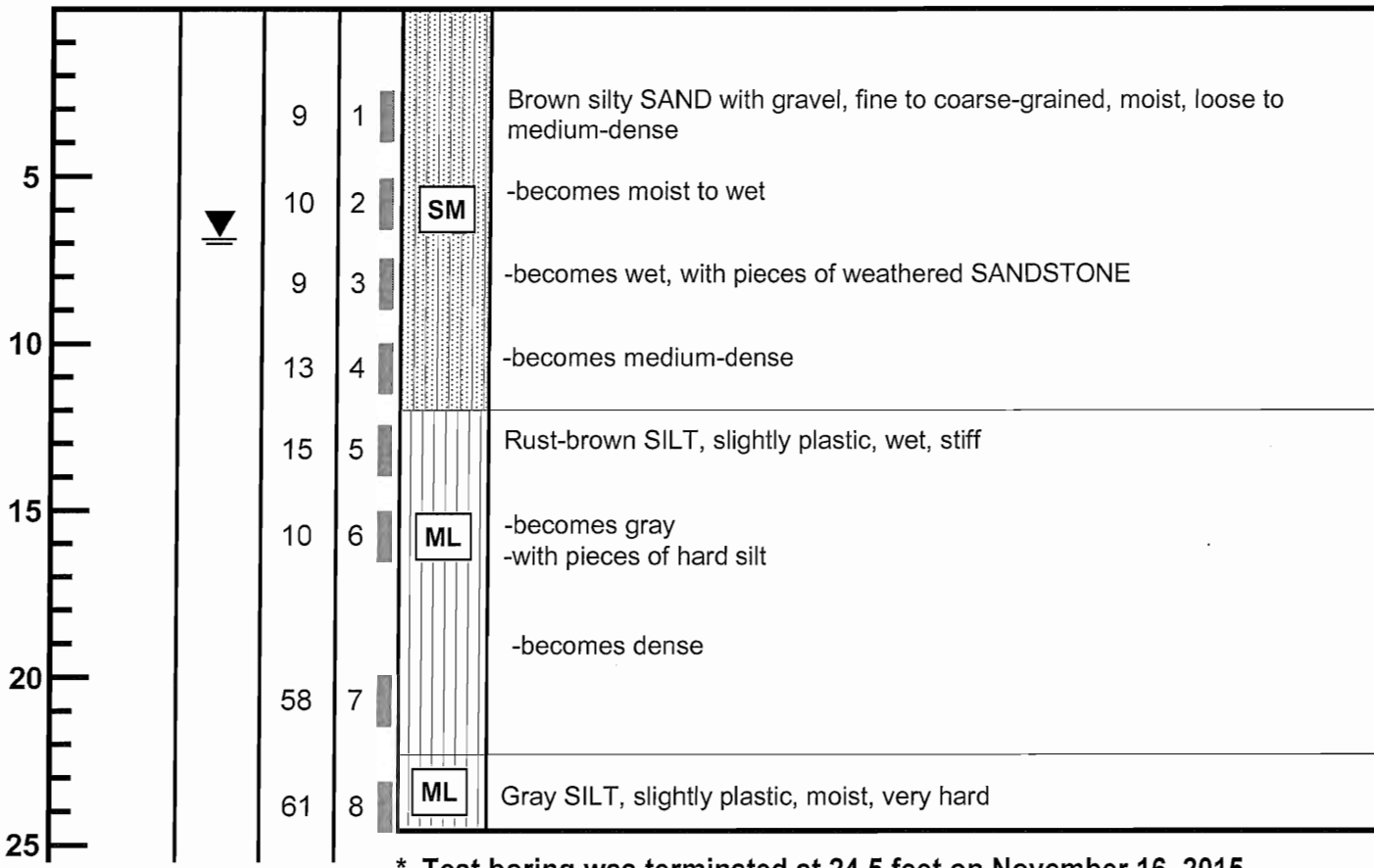
GEOTECH CONSULTANTS, INC.

SITE EXPLORATION PLAN

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job No:	Date:		Plate:
15481	Dec. 2015	No Scale	2

BORING 1



*** Test boring was terminated at 24.5 feet on November 16, 2015.**

*** Groundwater was encountered 7 feet during drilling.**

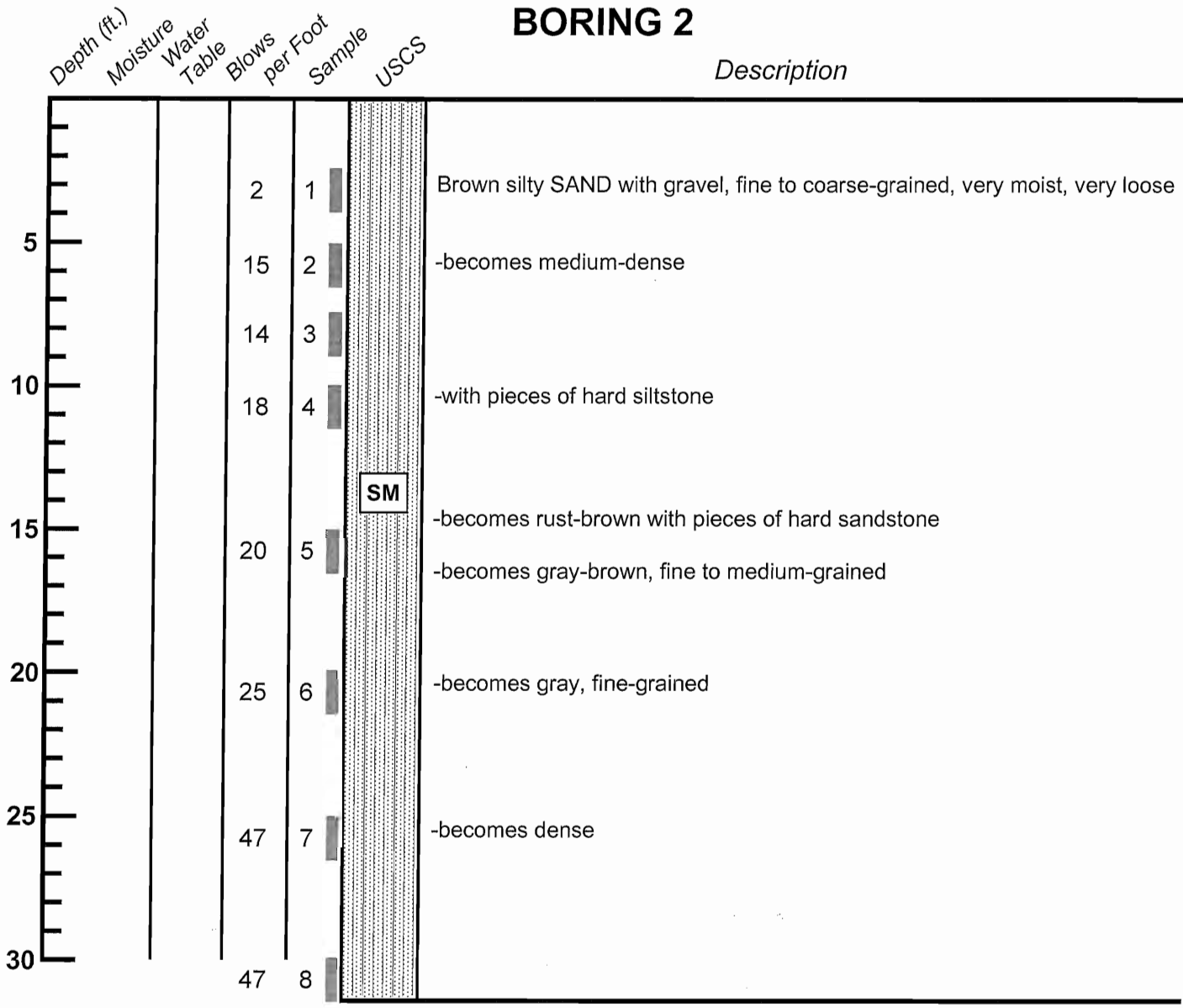
GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	3

BORING 2



*** Test boring was terminated at 31.5 feet on November 16, 2015.**
*** No groundwater was encountered during drilling.**

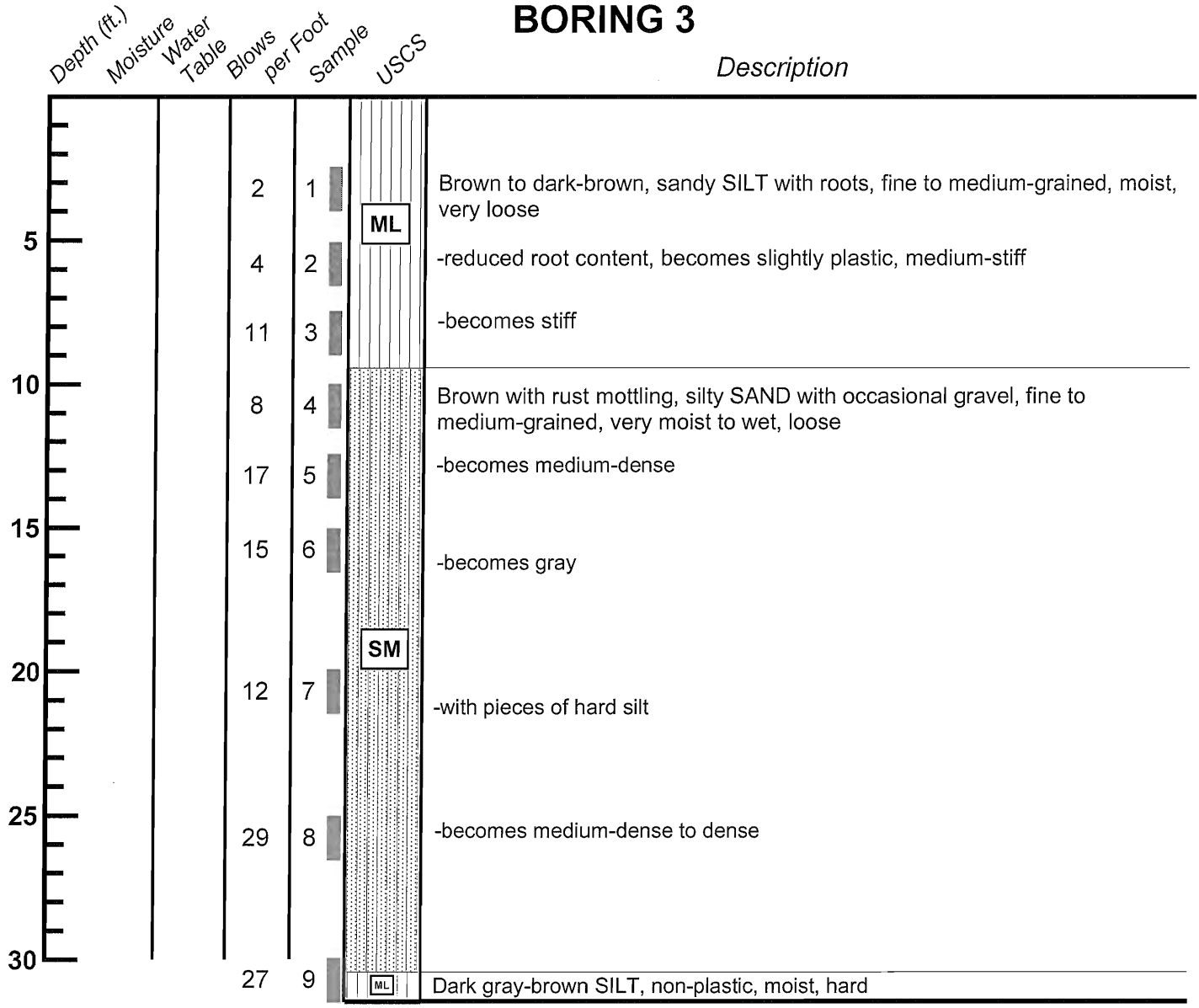
GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	4

BORING 3



*** Test boring was terminated at 31.5 feet on November 16, 2015.**

*** No groundwater was encountered during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	5

BORING 4

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
			3	1	FILL	Dark brown with tan pieces, sandy SILT with gravel and organics, fine-grained, moist, loose **(FILL)**
5			6	2		
			11	3	FILL	Brown silty SAND with gravel and organics and pieces of SANDSTONE, fine to coarse-grained, moist, medium-dense **(FILL)**
10			17	4	SM/RX	Tan weathered SANDSTONE/silty SAND, fine-grained, moist, medium-dense
			97/11"	5	Rx	Gray SANDSTONE, fine-grained, moist, very dense
15			50/6"	6		

* **Test boring was terminated at 15 feet on November 16, 2015.**

* **No groundwater was encountered during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	6

BORING 5

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
			2	1	SM/RX	Light-brown weathered SANDSTONE/silty SAND, fine-grained, moist, loose
5			30	2		-becomes dark gray-brown
					Rx	Dark gray SANDSTONE, fine-grained, moist, dense
			93	3		-becomes very dense
10						

* **Test boring was terminated at 9 feet on November 17, 2015.**

* **No groundwater was encountered during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	7

BORING 6

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
			3	1	SM Rx	Brown weathered SANDSTONE/silty SAND, fine-grained, moist, loose
5			22	2		-becomes medium-dense
			46	3		Brown weathered SANDSTONE, fine-grained, moist, dense
10						
15						

*** Test boring was terminated at 8.5 feet due to refusal on November 17, 2015.**

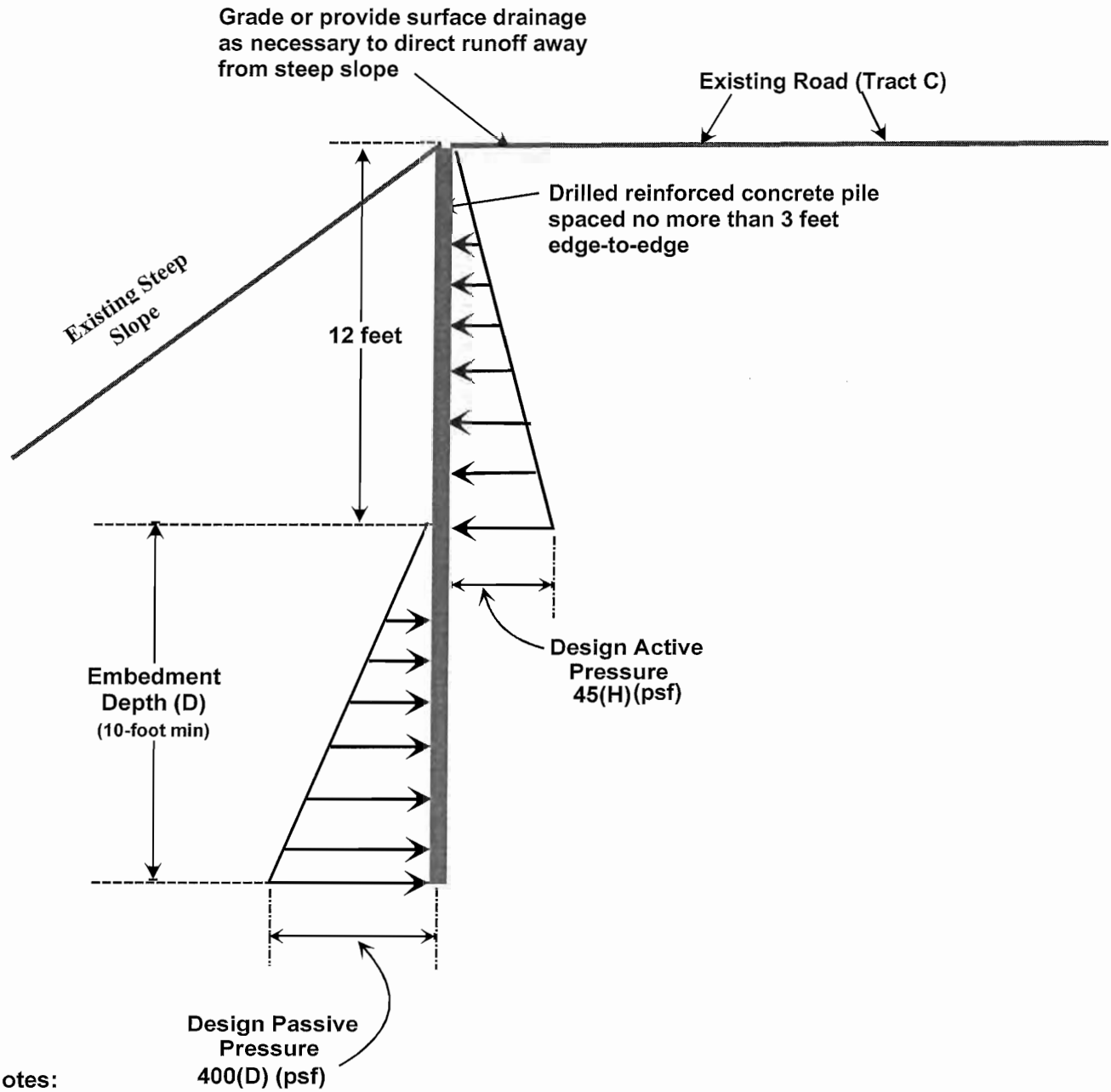
*** No groundwater was encountered during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job	Date:	Logged by:	Plate:
15481	Dec. 2015	ASM	8



Notes:

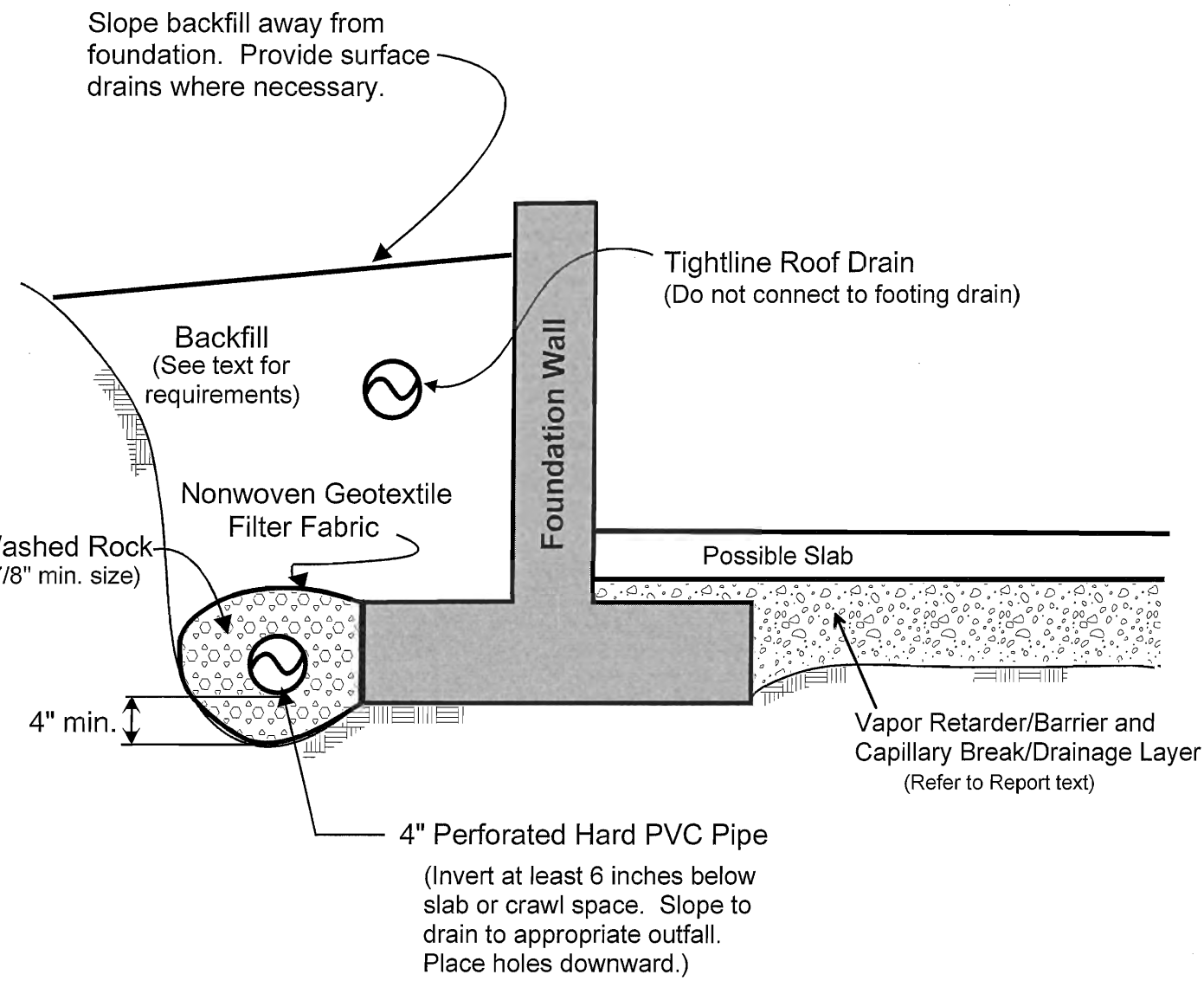
(1) The report should be referenced for specifics regarding design and installation.
(2) Active pressures act over the pile spacing.
(3) Passive pressures act on two times the pile diameter.
(4) It is assumed that no hydrostatic pressures act on the back of the wall.

GEOTECH
CONSULTANTS, INC.

STABILIZATION WALL DETAIL

5247 - 145th Place Southeast
Lot 7
Bellevue, Washington

Job No:	Date:		Plate:
15481	Dec. 2015		9



NOTES:

(1) In crawl spaces, provide an outlet drain to prevent buildup of water that bypasses the perimeter footing drains.

(2) Refer to report text for additional drainage, waterproofing, and slab considerations.

GEOTECH
CONSULTANTS, INC.

FOOTING DRAIN DETAIL

5247 - 145th Place Southeast
Lots 6 and 7
Bellevue, Washington

Job No:	Date:		Plate:
15481	Nov. 2015		10