DEVELOPMENT SERVICES DEPARTMENT
ENVIRONMENTAL COORDINATOR
450 110th Ave NE., P.O. BOX 90012
BELLEVUE, WA 98009-9012

OPTIONAL DETERMINATION OF NON-SIGNIFICANCE (DNS) NOTICE MATERIALS

The attached materials are being sent to you pursuant to the requirements for the Optional DNS Process (WAC 197-11-355). A DNS on the attached proposal is likely. This may be the only opportunity to comment on environmental impacts of the proposal. Mitigation measures from standard codes will apply. Project review may require mitigation regardless of whether an EIS is prepared. A copy of the subsequent threshold determination for this proposal may be obtained upon request.

File No. 15-106440-LO

Project Name/Address: Lot 3 Foresthill

Planner: Nick Whipple

Phone Number: 425-452-4578

Minimum Comment Period: April 9, 2015, 5 PM

Materials included in this Notice:

☒ Blue Bulletin
☒ Checklist
☒ Vicinity Map
☐ Plans
☒ Other: Geotechnical Report

OTHERS TO RECEIVE THIS DOCUMENT:
☐ State Department of Fish and Wildlife / Sterwart.Reinbold@dfw.gov; Christa.Heller@dfw.wa.gov;
☒ State Department of Ecology, Shoreline Planner N.W. Region / Jobu461@ecy.wa.gov; sepaunit@ecy.wa.gov
☐ Army Corps of Engineers Susan.M.Powell@nws02.usace.army.mil
☒ Attorney General ecyolyef@atg.wa.gov
☒ Muckleshoot Indian Tribe Karen.Walter@muckleshoot.nsn.us; Fisheries.fileroom@muckleshoot.nsn.us

4' wide x 2' deep trench for water, gas, power, phone, and cable lines.

SE 50th Pl

134th Pl SE

SOMERSET

Somerset Park

Streams Inside Bellevue
- Fish Bearing: Type F
- Shore: Type S
- Non-Fish Bearing: Type Np and Ns
- Potentially Fish Bearing
- Not Typed

Streams Outside Bellevue
Shoreline Associated Wetlands
Wetlands - National Wetlands Inventory
Wetlands - Sensitive Areas Notebook
Floodplain Boundaries
Annexations
City Parks
Parcels
Streams
2ft Contours
- Index Contours
- Interval Contours

Locator Map

Zhuo Residence

13515 SE 50th Pl

0 40 80

Scale 1: 480 Feet

Map Generated on: 03/24/2015

The City of Bellevue does not guarantee that the information on this map is accurate or complete. This data is provided on an "as is" basis and disclaims all warranties.

ENVIRONMENTAL CHECKLIST

10/9/2009

Thank you in advance for your cooperation and adherence to these procedures. If you need assistance in completing the checklist or have any questions regarding the environmental review process, please visit or call Development Services (425-452-6800) between 8 a.m. and 4 p.m., Monday through Friday (Wednesday, 10 to 4). Assistance for the hearing impaired: Dial 711 (Telecommunications Relay Service).

INTRODUCTION

Purpose of the Checklist:

The State Environmental Policy Act (SEPA), Chapter 43.21c RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the City of Bellevue identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the City decide whether an EIS is required.

Instructions for Applicants:

This environmental checklist asks you to describe some basic information about your proposal. Answer the questions briefly, with the most precise information known, or give the best description you can. You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer or if a question does not apply to your proposal, write "do not know" or "does not apply." Giving complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the Planner in the Permit Center can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. Include reference to any reports on studies that you are aware of which are relevant to the answers you provide. The City may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impacts.

Use of a Checklist for Nonproject Proposals: *A nonproject proposal includes plans, policies, and programs where actions are different or broader than a single site-specific proposal.*

For nonproject proposals, complete the Environmental Checklist even though you may answer "does not apply" to most questions. In addition, complete the Supplemental Sheet for Nonproject Actions available from Permit Processing.

For nonproject actions, the references in the checklist to the words *project*, *applicant*, and *property* or *site* should be read as *proposal*, *proposer*, and *affected geographic area*, respectively.

Attach an 8 ½" x 11 vicinity map which accurately locates the proposed site.

City of Bellevue Submittal Requirements	27a

ENVIRONMENTAL CHECKLIST

4/11/2013

If you need assistance in completing the checklist or have any questions regarding the environmental review process, please visit or call Development Services (425-452-6800) between 8 a.m. and 4 p.m., Monday through Friday (Wednesday, 10 to 4). Assistance for the hearing impaired: Dial 711 (Telecommunications Relay Service).

BACKGROUND INFORMATION

Property Owner: JIANQIANG ZHUO

Proponent:

Contact Person:
(If different from the owner. All questions and correspondence will be directed to the individual listed.)

Address: 5016 134TH PL SE, BELLEVUE, WA 98006

Phone: 425-443-4766

Proposal Title: Critical Area Land Use Permit

Proposal Location: 13515 SE 50TH PL, BELLEVUE, WA 98006
(Street address and nearest cross street or intersection) Provide a legal description if available.

Please attach an 8 ½" x 11" vicinity map that accurately locates the proposal site.

Give an accurate, brief description of the proposal's scope and nature:

1. General description: Dig channel for utility lines in the property entry.
2. Acreage of site: 3,300 SF **15,800 square feet**
3. Number of dwelling units/buildings to be demolished: 0
4. Number of dwelling units/buildings to be constructed: 0
5. Square footage of buildings to be demolished: 0
6. Square footage of buildings to be constructed: 0
7. Quantity of earth movement (in cubic yards): 0
8. Proposed land use: Bury utility lines. **Single-family Use**
9. Design features, including building height, number of stories and proposed exterior materials: N/A
10. Other None

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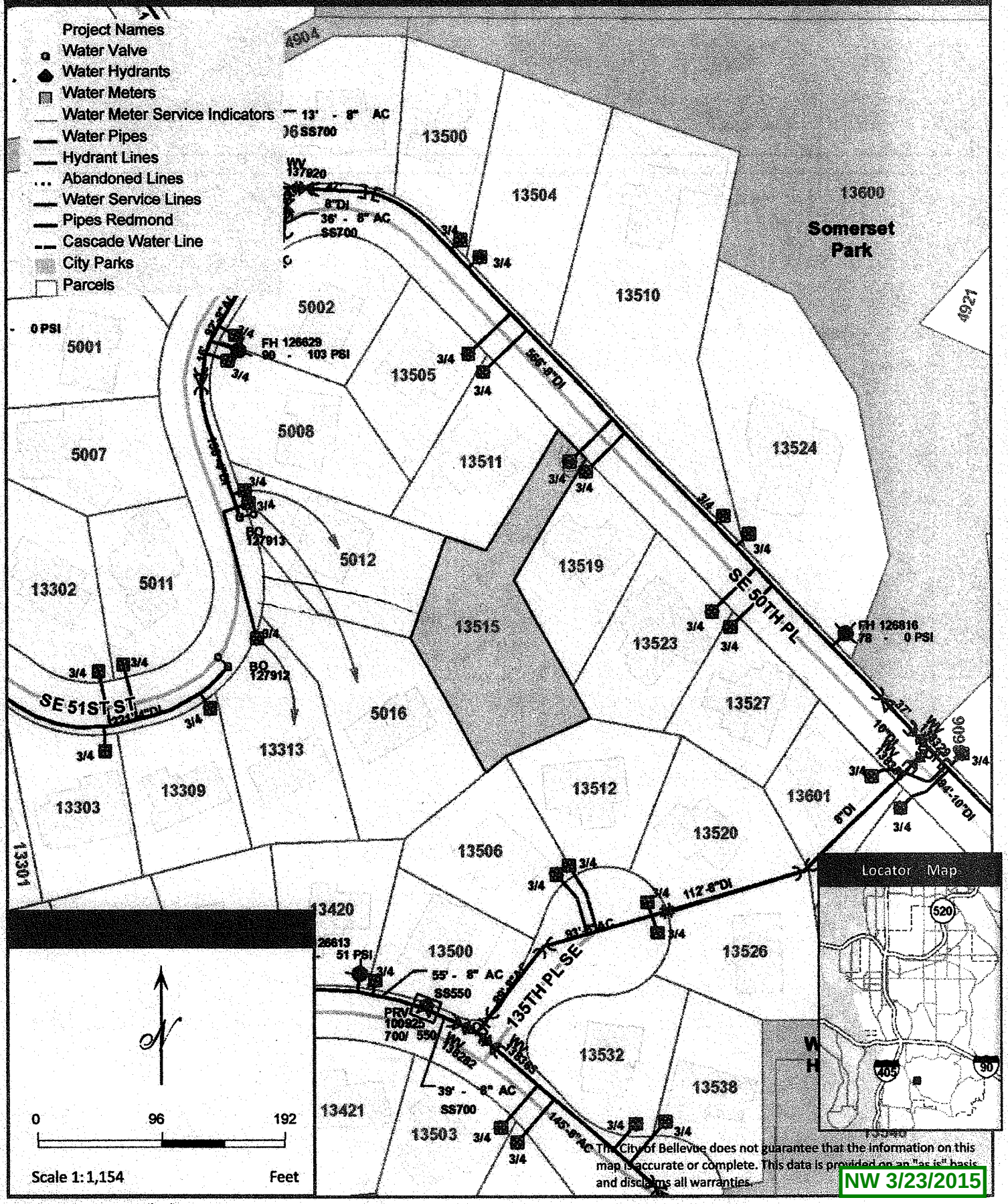
water



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Map Generated on: 02/28/2014

Estimated date of completion of the proposal or timing of phasing:

1 week

Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

NO

List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Geotechnical Investigation and Critical Areas Report attached.

Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. List dates applied for and file numbers, if known.

NO.

List any government approvals or permits that will be needed for your proposal, if known. If permits have been applied for, list application date and file numbers, if known.

13515 SE 50TH PL permit #: 09 113871 BS

Please provide one or more of the following exhibits, if applicable to your proposal.
(Please check appropriate box(es) for exhibits submitted with your proposal):

☐ Land Use Reclassification (rezone) Map of existing and proposed zoning

☐ Preliminary Plat or Planned Unit Development
Preliminary plat map

☐ Clearing & Grading Permit
Plan of existing and proposed grading
Development plans

☒ Building Permit (or Design Review) permit # 09 113871 BS
Site plan
Clearing & grading plan

☐ Shoreline Management Permit
Site plan

A. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site: ☐ Flat ☐ Rolling ☐ Hilly ☒ Steep slopes ☐ Mountains ☐ Other

b. What is the steepest slope on the site (approximate percent slope)? 40%

c. What general types of soil are found on the site (for example, clay, sand, gravel, peat, and muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Refer to the attached Geotechnical report.

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Refer to the attached Geotechnical report and permit # 09113871 BS

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? **No new impervious**

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Erosion Control per BCC 23.76

2. AIR

a. What types of emissions to the air would result from the proposal (i.e. dust, automobile odors, and industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

NO

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

NO

c. Proposed measures to reduce or control emissions or other impacts to the air, if any:

NO

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3. WATER Not applicable

a. Surface

(1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

None mapped

(2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If Yes, please describe and attach available plans.

No

(3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

N/A

(4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No

(5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No

(6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge. **No**

b. Ground

(1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description.

No

(2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals...; agricultural; etc.) Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

None

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c. Water Runoff (Including storm water)

(1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

No new impervious

(2) Could waste materials enter ground or surface waters? If so, generally describe.

No

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

Impacts minimized per BCC 23.76

4. Plants

a. Check or circle types of vegetation found on the site:

- [x] deciduous tree: alder, maple, aspen, other
- [ ] evergreen tree: fir, cedar, pine, other
- [ ] shrubs
- [ ] grass
- [ ] pasture
- [ ] crop or grain
- [ ] wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other
- [ ] water plants: water lily, eelgrass, milfoil, other
- [x] other types of vegetation ivy and blue berry.

b. What kind and amount of vegetation will be removed or altered?

No

Non-native shrubs will be removed at project location

c. List threatened or endangered species known to be on or near the site.

No

None mapped within vicinity

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Not applicable.

Native plants will be used to re-vegetate all areas of temporary disturbance.

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5. **ANIMALS**

a. Check or circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

☐ Birds: hawk, heron, eagle, songbirds, other:

NO ☐ Mammals: deer, bear, elk, beaver, other:

☐ Fish: bass, salmon, trout, herring, shellfish, other:

b. List any threatened or endangered species known to be on or near the site.

NO

c. Is the site part of a migration route? If so, explain.

NO

d. Proposed measures to preserve or enhance wildlife, if any:

NO

6. **Energy and Natural Resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy need? Describe whether it will be used for heating, manufacturing, etc.

Not applicable

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

NO

c. What kinds of energy conservation features are included in the plans of the proposal? List other proposed measures to reduce or control energy impacts, if any:

Not applicabe

7. **Environmental Health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

NO

(1) Describe special emergency services that might be required.

(2) Proposed measures to reduce or control environmental health hazards, if any.

b. Noise

(1) What types of noise exist in the area which may affect your project (for example, traffic, equipment, operation, other)? NO

Traffic

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(2) What types and levels of noise would be created by or associated with the project on a short-term or long-term basis (for example, traffic, construction, operation, other)? Indicate what hours noise would come from the site.

NO

Use of any diesel, pneumatic, or gasoline-powered equipment that is not properly muffled or silenced is prohibited.

(3) Proposed measures to reduce or control noise impacts, if any:

NO

Sounds created by construction activity are limited to the hours between 7 a.m. to 6 p.m. on weekdays and 9 a.m. and 6 p.m. on Saturdays and prohibited on Sundays and other legal holidays (See BCC 9.18)

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties?

Single family residencial houses

b. Has the site been used for agriculture? If so, describe.

NO

c. Describe any structures on the site.

Single family residencial house

d. Will any structures be demolished? If so, what?

NO

e. What is the current zoning classification of the site?

R3 **R-3.5**

f. What is the current comprehensive plan designation of the site?

permit # 09113871 BS . **Single-family medium**

g. If applicable, what is the current shoreline master program designation of the site?

NO

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

NO **Yes. Steep slopes**

i. Approximately how many people would reside or work in the completed project?

Not applicable

j. Approximately how many people would the completed project displace?

Not applicable

Proposed measures to avoid or reduce displacement impacts, if any:

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

NO **Compliance with City of Bellevue Codes**

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9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

NO

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

NO

c. Proposed measures to reduce or control housing impacts, if any:

Not applicable.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

No structure will be built.

b. What views in the immediate vicinity would be altered or obstructed?

NO

c. Proposed measures to reduce or control aesthetic impacts, if any:

Not applicable

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

NO

b. Could light or glare from the finished project be a safety hazard or interfere with views?

NO

c. What existing off-site sources of light or glare may affect your proposal?

NO

d. Proposed measures to reduce or control light or glare impacts, if any:

NO

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12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

No

b. Would the proposed project displace any existing recreational uses? If so, describe.

No

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Not applicable

13. Historic and Cultural Preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

NO

b. Generally describe any landmarks or evidence of historic, archeological, scientific, or cultural importance known to be on or next to the site.

Not applicable.

c. Proposed measures to reduce or control impacts, if any:

NO

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Not applicable **Access gained from 134th Pl SE**

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

NO

c. How many parking spaces would be completed project have? How many would the project eliminate?

NO

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

NO

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

NO

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

NO

g. Proposed measures to reduce or control transportation impacts, if any:

NO

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15. Public Services

a. Would the project result in an increased need for the public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

NO

b. Proposed measures to reduce or control direct impacts on public services, if any.

NO

16. Utilities

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

NO

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Water, GAS, power, phone, cable

Signature

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature.....Zhuo Jiangtao.....

Date Submitted.....2-16-2015.....

NW 3/23/2015

February 11, 2009
Revised June 5, 2009
Project 1502-03

Michael Zhuo
G & M Construction
5016 134th Place SE
Bellevue, WA 98006

Subject: Geotechnical Investigation and Critical Areas Report
Proposed Single Family Residence
13515 SE 50th Place
Bellevue, WA 98006

Dear Mr. Zhuo:

At your request The Galli Group has performed a geotechnical investigation at the site referenced above. The location of the site is shown on Figure 1, the Vicinity Map. The site is located southwesterly of SE 50th Place and easterly of 134th Place SE. The lot has legal access to 134th Place SE and will not use the steep access from SE 50th Place. The purpose of our site visit was to identify the subsurface soil conditions, to address the performance standards in a critical areas report, and to provide geotechnical recommendations for a proposed single family residence. Our report below includes a summary of our findings and recommendations for the proposed addition.

1.0 PROJECT DESCRIPTION

1.1 Project History

The Galli Group previously presented a report for the proposed project on February 6, 2008. The purpose of the report was to explore the feasibility of constructing a single-family residence on the proposed site. The report was reviewed by the City of Bellevue (Letter from Christina Behar, dated April 17, 2008, to Jianquiang Zhuo regarding Project # 08-111686-DC). The letter requested additional information in order to review the proposal. Since that first submittal we have revised our report several times to address geotechnical aspects requested by the City and modifications to the original site plan. This report replaces previous reports.

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FEB 25 2015
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Specifically this report has been revised to include the topographic survey provided by the surveyor and site plan provided in Figure 2. The steep slope, standard buffers, and proposed building setback lines are shown on Figure 3, Site Features In Figure 4 we have presented the results of our slope stability analyses as well as including a section in the report summarizing the results and our conclusions.

The items mentioned in the initial review by Tom McFarlane (see Item 11 in review letter identified above) have been addressed by the surveyor and architect and are reflected in this revised report and the report figures. At the time of the first submittal the precise location and design of the house were not available. Subsequently the site plan has been generated and revised. This report includes the most recent site plan and shows revisions including the following that are addressed in this report:

1. The location of the house on the lot was reconfigured in order to avoid existing utility easements. This resulted in portions of the garage and the residence encroaching into the rockery setback we recommended. Foundations for building elements within this setback can be safely accommodated if the footing depths are below an imaginary line ascending from the back of the rockery upwards at 1½H:1V as shown in Figures 4 and 4B. Specific recommendations for foundations are provided in Section 3.3.1 of this report.
2. The water service for the proposed lot descends from SE 50th Place in a trench anticipated to be 12 inches wide and 24 inches deep. This trench will be located within a steep slope area on the site. This can be safely accommodated without adverse affects on the steep slope provided the backfill is properly compacted after placing the pipe. Specific recommendations for backfill and compaction are provided in Section 5.4 of this report.
3. In order to accommodate the grade change for the proposed driveway, the owner wished to construct a two-tiered rockery along the western edge of the proposed driveway. This can be allowed provided the material behind the rockery is first place and compacted and then the rocks are placed against the compacted material when it is excavated for the rockery. Specific recommendations for the rockery construction are provided in Section 5.4.2.

1.2 Proposed Plan

We understand that you intend to construct a single-family residence on the proposed lot. The location of the footprint is shown on Figure 2, Site Plan and Topography. Because the house will be constructed on a slope, the proposed construction will include a daylight basement and other retaining elements. The proposed improvements will involve excavation on the order of about 200 yards of soil. Access to the residence will involve a shared driveway easement from the house at 5016 134th Place SE that ascends from 134th Place SE to the building site (see Figure 2, Topographic Survey.) We anticipate that conventional spread footings can be used for foundation support.

2.0 SITE AND SOIL CONDITIONS

2.1 SURFACE CONDITIONS

The site is located on the west-facing slope of a north-south trending ridge overlooking the Coal Creek area in Somerset. The slope descends at a declination of approximately 30 to 35 percent from SE 50th Place to the main portion of the lot (See Figure 2). Small portions of the lot appear steeper than 40 percent, but the adjacent lots do not appear to contain steep slopes. The lot is bordered by developed residential lots on all sides. The proposed building pad is located on the nose of a small topographic rise at the south end of the lot. The slope descends from the high point of the rise at approximately 30 percent declination and then flattens out toward the south and north. The west side of the proposed lot slopes downward toward a tall rockery estimated at about 10 feet high. The rockery is partly on the proposed lot and partly on the lot immediately west of the site.

Several trees dot the southerly side of the hillside as shown on Figure 3, Site Features. The site supports thick underbrush consisting primarily of blackberries. The site is not mapped as an historic landslide area. No visible signs of deep-seated slope movement were evident on the site. We did not observe any indications of springs or seepage on the property. Numerous rockeries are evident within the surrounding subdivision indicating stable cut slopes. We found no evidence of recent slope movement on the site or on surrounding sites. Seepage was evident at the time of our visit near the sidewalk along the driveway that would serve as a shared access to the site. No stream or natural drainage was located on or near the site. The subject lot contained no significant indications of slope movement.

2.2 GEOLOGIC CONDITIONS

Geologic mapping of the area indicates that the site is likely underlain by glacial till (*Geologic Map of King County, Washington, 2006,* GeoMap NW*)*. This unit generally consists of unsorted mixtures of silt, sand, clay and gravel deposited over the existing landscape in front of the advancing glacier thousands of years ago. The material was subsequently compacted by tons of ice. Glacial till is notable for its dense consistency, ability to stand unsupported in near vertical relief, and relative impermeability.

2.3 SUBSURFACE SOIL CONDITIONS

On December 28, 2007, a geotechnical engineer from The Galli Group visited the above site to conduct a site reconnaissance and subsurface investigation. During our site visit we excavated five test pits to depths varying from 4 feet to 6 feet. The purpose of the test pits was to identify the subsurface soils. The location of the test pits is provided on Figure 3, Site Features. The logs of the test pits are provided in the appendix.

Based upon observed conditions in the test pits the soil appears representative of glacial outwash or melt-out till, possibly underlain by an interglacial unit of dense silty SAND. We encountered

areas where the soil appeared to have been disturbed from previous grading activity, possibly in conjunction with the creation of the surrounding lots when developed. The areas of fill appeared mostly north of the proposed building pad in the vicinity of TP-4 and TP-5. Digging in the underlying outwash or till unit was difficult with the small excavator. We did not observe any seepage in the test pits on the rise, but TP-4 exhibited slight seepage from perched water above a silty layer in the test pit, and TP-5 exhibited seepage at about 6.5 feet below grade.

The rockery appeared comprised of 4 to 5-man rock and was approximately 10 feet high at its highest point. Based upon the test pits in the near vicinity the rockery is likely supporting dense, glacial outwash sand and gravel.

2.4 Slope Stability Analysis

We conducted a brief slope stability analyses on the site in order to evaluate the impact of the proposed improvements on the existing rockery, steep slopes, and surrounding properties. The site is underlain by dense stable soil as evidenced by the stable rockery on the west side of the property. We believe this rockery was constructed against a cut made during construction of the residence on Lot 6. The rockery did not move during the most recent Nisqually quake and the slopes remained stable. Combining information from observed subsurface conditions, our familiarity with similar soils in the region, and the performance of the slope and rockery during the 2001 earthquake we used the following soil parameters to model the slope as shown in Figure 4, Slope Stability Analyses.

TABLE 1
Soil Parameters

Soil Unit	Description	Moist Unit Weight, γ (pcf)	Saturated Unit Weight, γsat (pcf)	Internal Friction, ϕ	Apparent Cohesion, c' (psf)
1	Silty SAND	120	125	34	50
2	v. dense, glacial till	125	128	38	250

Using the above parameters we then modeled the slope to determine the factors of safety for the slope under existing conditions and proposed conditions with the recommended building setbacks. The results for both static conditions and seismic conditions are provided in Table 2, below. Seismic conditions tended to be the most critical.

TABLE 2
Slope Stability Analyses

File No.	FOS Static	FOS Seismic	Comments
1502R1A	--	1.2*	Failure existing conditions in upper loose soils above rockery
1502R1	--	1.3*	Failure existing conditions through face of rockery
1502R3A	2.9	1.2**	Upper slope failure with IBC design requirements for proposed conditions
1497R06A	1.7	1.2**	Lower slope and rockery with IBC design requirements for proposed conditions

Note: Refer to Figure 4 for depiction of theoretical failure surfaces on cross sections
* a = 0.18g to model ground accelerations representative of Nisqually quake in 2001
** a = 0.35g to represent 2% probability exceedance in 50 years

Our analyses indicate that the 15 foot setback combined with the requirement of supporting the footings on native dense glacial soil below the imaginary line of 1½H:1V extending upward from the toe of the rockery will result in no adverse impact on the existing rockery or adjacent slopes. The factor of safety (FOS) remains above 1.2 for seismic conditions and above 1.5 for static conditions.

3.0 CRITICAL AREAS REPORT

The City of Bellevue development Code (hereafter referred to as the "Code") requires that sites with slopes or other potential sensitive areas provide a Critical Areas Report (Section 20.25H.230 of Code) identifying and characterizing the possible critical areas on site. The sections below provide our assessment of the possible critical areas.

3.1 CRITICAL AREAS DESIGNATION

Based upon our site reconnaissance and our subsurface investigation described above, the site was evaluated to determine if it fits within the definition of a "Geologic Hazard" based upon the code definitions of landslide hazard and steep slopes. These are described in the sections below.

3.1.1 Landslide Hazard

The Code defines Landslide Hazards as "Areas of slopes of 15 percent or more with more than 10 feet of rise, which also display any of the following characteristics:" (Section 20.25H.120)

- Areas of historic failures
- Holocene slope movement
- Slopes parallel to weak planes

- Slopes exhibiting past failures
- Areas with seeps indicating shallow groundwater table on or adjacent to the slope face
- Areas of stream incision or other undercutting elements

The site has slopes exceeding 15 percent but does not include any of the above elements. There is seepage evident farther downslope approximately 120 feet westerly of the proposed project or building footprint near the access from 134th Place, but there was no seepage surfacing on the site or evidence of any of the other dynamics described above. The observed seepage might well be a result of buried utility trenches that intersect groundwater seepage zones and direct them to daylight near the street cut. We do not believe the site should be classified as a "Landslide Hazard" by code. Generally, the site appears underlain by dense, stable, glacial outwash soils or glacially consolidated material with the exception of areas disturbed by previous grading activity that might include fill.

3.1.2 Steep Slopes

The Code defines Steep Slopes as "slopes of 40 percent or more that have a rise of at least 10 feet and exceed 1000 square feet in area." The site contains isolated portions where the slope inclination exceeds 40 percent. These are shown on Figure 2 and again on Figure 3, with the detailed area calculations for each isolated area shown. Areas 1 and 2 along the West and Southern property line respectively, are each less than 1000 square feet. For this reason, these two areas were excluded by definition from the critical areas designation. The isolated Area 3 on the "handle" portion of the lot totals 1208 square feet and therefore meets the definition of a steep slope critical area.

While the site contains isolated areas with slopes exceeding 40 percent, most of these areas were created by previous grading activity associated with construction of the surrounding lots. Most areas apart from the rockery along the southwestern end of the property appear flatter than 40 percent slope. The prescriptive buffer of 75 feet from the toe of the 40 percent slope defined as Area 3 does not impact the proposed building footprint. The proposed improvements will not encroach on this buffer.

3.2 Performance Standards for Geologic Hazard Areas

The site contains an area (Area 3 on Figure 2) that fits the technical description of a geologic hazard due to steep slopes. It contains elements that require attention during construction in order to protect the site, the slopes, and the surrounding properties. Therefore the performance standards described in section 20.25H.125 of the code and summarized below should be addressed during site development. Below we have identified the standards and provided a brief discussion of how the proposed project will satisfy the specific performance standard.

- *Minimize alterations to natural contours and tier foundations to conform to existing topography.* The proposed residence is planned as a daylight basement that opens out to the north and retains soil with basement walls to the south, east, and west. This creates a lower profile visible to the adjacent houses and conforms to the topography of the site. The proposal includes no alterations to the critical area (Area 3) or buffer.

- *Locate structures to preserve critical portions of the site.* The portion of the site with the best foundation soil and subsurface conditions is located on the southerly portion of the lot where the residence is planned. The residence is also sited toward the east side of the lot to avoid impact to the existing rockery. Improvements are outside the buffer to steep slope critical area defined as Area 3.
- *Avoid greater risk to neighboring properties.* Primary risk to the neighbors would be if the existing rockery was adversely impacted. By lowering the grade of the house and pushing it easterly the impact on the rockery is removed (see Figure 4.) Construction fencing and erosion control fences (see Section 5.1 of the report) should be used to protect the area above the rockery, slopes, and downslope neighbors.
- *Use tiered retaining walls instead of fill slopes.* Grade changes where the slope exceeds 3H:1V will be handled by use of rockeries in cut slopes and by using retaining walls in filled areas. No walls or fill will be placed within the critical area or buffer.
- *Minimize impervious surfaces within critical areas and buffers.* The multi-level house plan with attached garage decreases the overall footprint of the residence compared to other plans. The critical area has no increase in impervious area.
- *Minimize topographic modification outside of the footprint.* The access to the residence is planned from 134th Place in order to minimize disturbance from grading required to create access to the lot and to avoid the steep slope critical area.
- *Use building foundations to retain soil rather than rockeries separate from building.* The proposed daylight basement will use basement retaining walls to retain the soils and to conform to the site topography.
- *Use pole-type construction on slopes exceeding 40 percent.* No foundations are planned within slopes exceeding 40 percent inclination. Driveway access might cut across a corner of one slope area created by existing rockeries.
- *Use pile supported foundations for deck support on steep slopes.* Where necessary, deck supports on slopes will be supported on poles or piles and isolated small footings as described in Section 3.3.1 of the report.
- *Restore all disturbed areas.* See site stabilization recommendations provided in Section 5.6 of this report.

3.3 Modifications and Mitigation to Performance Standards

The standard buffers for steep slope areas are 75 feet from the toe of the slope; the critical area buffer widths are 50 feet from the top of the slope for steep slopes. The proposed improvements are located beyond the 75-foot toe buffer of Area 3, the site's critical area.

3.3.1 Setbacks and Mitigation for Rockery and Steep Slopes

We have recommended a building setback from the top of the rockery of at least 15 feet. The proposed residence will have a finish grade of 406 feet and the excavation depth for footings will be another 1½ to 2 feet deeper. The soil behind the rockery was identified as dense glacially

consolidated sand and gravel. An imaginary line from the bottom of the proposed foundation loads to the toe of the rockery would be inclined at about 1½H:1V (see Figure 4, Generalized Cross Section A-A'.) Foundations should be supported below this line to avoid impacting the stability of the rockery face.

We have recommended a 25-foot building setback from the south property line. The area above the slope greater than 40 percent should remain vegetated and the slope should remain undisturbed except for maintenance or restoration. These building setbacks and vegetation requirements are intended to preserve the current stability of the existing slope areas on site. For clarification the setbacks are shown on Figures 3 and 4 and 5. The lines referred to as the BSBL (building setback line) or setback from rockery represent the recommended setbacks.

Isolated deck footings or pier footings may be supported within the slopes greater than 40 percent and the rockery setback provided that they are constructed as augered pier foundations (i.e., not as strip footings and not constructed with a backhoe that disturbs too much soil) and that the base of the pier is situated below the imaginary line ascending from the toe of the rockery or slope at 1½H:1V as illustrated on Figure 4. Similarly, spread footings may be used to support building elements, however the temporary excavation required for construction of foundation elements should not encroach into the steep slope areas as shown on the "No Disturb" areas in Figure 4B. The installation of these footings must be monitored by the geotechnical engineer. The primary concern is to avoid influence on the existing rockery.

In addition a construction fence should be erected 15 feet away from the top of the rockery to prevent heavy equipment and foot traffic from disturbing the existing rockery. The fence should continue along the border of the slope areas greater than 40 percent to protect the slopes during construction. Stockpiled soil should not be allowed between the proposed excavation and the top of the rockery.

3.3.2 Discussion of Functions and Values of Critical Area Buffers

The proposed improvements are outside of the prescriptive toe buffer to the critical area on the site (Area 3.) Buffers for other slopes are intended to prevent damage to the slope from dynamics such as denuding the slope, destabilizing the slope, increasing erosion, or adversely impacting adjacent neighbors or the rest of the steep slope system. Setbacks are provided as a means of avoiding these adverse impacts to the slope or to the proposed residence in the event of a destabilized slope. The project lot is surrounded by previously developed homes. The slope areas greater than 40 percent are limited in size and extent, often bordered with existing rockeries. The primary issues determining the size of the buffer and building setbacks are therefore those that would adversely impact the proposed building, adjacent neighbors, or site features. It is our opinion that these issues can be safely addressed through typical Best Management Practices applied to site development on a sloped lot. The risk to the slopes or adjacent properties will not be increased as a result of the proposed improvements. The report sections that follow identify these elements in more detail but for sake of review, we have also summarized them below.

- *Site Soil Conditions.* The site is underlain by dense, glacially consolidated sand and gravel. This formation is generally stable and can tolerate slopes on the order of about 80 to 100 percent inclination. However, the soil should be protected when vegetation is removed from erosion. The site soils are dense enough so that construction below an imaginary line of 1½H:1V project from the toe of the slope will not adversely impact adjacent structures or foundations. The proposed house will be below that line, estimated at 1½H:1V from the toe of the adjacent rockery (the closest structure.)
- *Denuding the slope.* A construction fence will prohibit equipment from damaging the slope above the rockery. Access is provided through a shared easement allowing the access from 50th Place to remain undisturbed. The proposed access will be a concrete driveway and then a construction entrance to the building pad.
- *Erosion.* Silt Fencing and other erosion control methods are described in our report sections that follow. These will prevent construction erosion from adversely impacting adjacent sites and public right-of-way. The site must be permanently stabilized prior to project completion.
- *Geotechnical construction monitoring.* We recommend geotechnical monitoring of all sites on slopes to verify that our recommendations are incorporated and enforced during design and construction.

One area that might improve as a result of the proposed construction or that could be addressed during the construction is the seepage evident at the common entrance to the proposed site and 5016 134th Place SE. This seepage zone could be improved by installation of a cutoff trench drain during extension of the driveway to the new residence.

4.0 GENERAL GEOTECHNICAL CONCLUSIONS

Based upon our site reconnaissance, research, and subsurface investigation it appears the site is underlain by dense glacial till or dense silty sand and gravel blanketed by approximately 2 to 4 feet of loose silty SAND. The lot contains slopes inclined at 15 to 30 percent with isolated portions inclined steeper than 40 percent (particularly the area including the existing rockery.). The site appeared stable at the time of our site reconnaissance. Apart from conventional mitigation measures used to preserve slope cuts and prevent erosion, it does not appear that additional mitigation efforts will be required to proceed with the proposed construction. Recommendations for mitigation measures as well as other site development recommendations are provided in the sections below.

Geotechnical issues that should be addressed during construction include the following:

- The site lends itself well to conventional spread footings supported on the dense glacial soil.
- Temporary cuts into the hillside for construction of the basement retaining walls must be properly shaped or benched to protect workers.

- Excavated soil from within the existing footprint will likely consist of silty SAND derived from glacial till. The silt content of the soil can make compaction difficult without proper moisture control and can result in unworkable soil under wet conditions. If the site soil is intended as fill, compaction and moisture control should be exercised during grading activities.
- Collected surface water runoff should be directed to an approved stormwater collection system or discharge point.
- Portions of the lot that are mapped as exceeding 40 percent inclination. We have recommended setbacks appropriate to the site specific soil conditions.

5.0 RECOMMENDATIONS

Recommendations for site development, foundation support, and drainage are included in the sections below.

5.1 Temporary Erosion Control

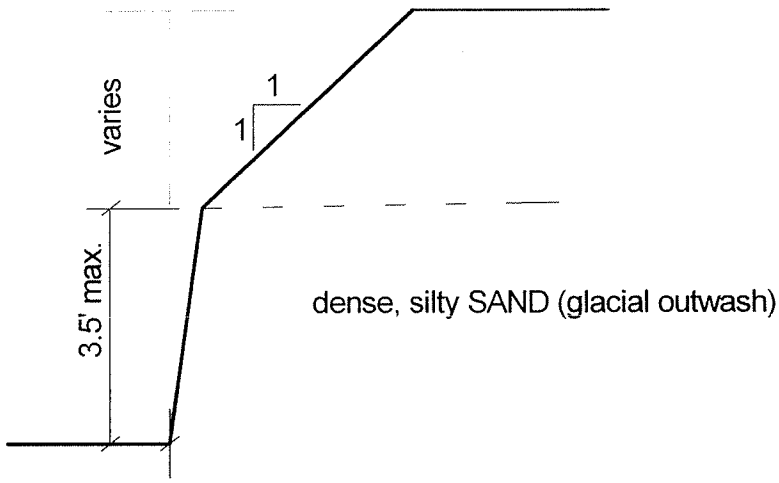
Best Management Practices commonly observed should be employed during construction. We anticipate these will include the following:

1. Construction equipment access will be from 134th Place. This will require construction of a temporary construction entrance for equipment to and from the existing driveway. The construction entrance should be comprised of 4"-6" quarry spalls placed over filter fabric laid on properly prepared subgrade. The construction entrance might later be incorporated into the proposed driveway if approved by the geotechnical engineer.
2. Maintain the street free of sediment during excavation and hauling and when mobilizing equipment to and from the site. Mud and silt tracked from the site should be removed or cleaned by the contractor daily or more often if needed.
3. Erect a silt fence along the perimeter and lower limits of disturbed areas to prevent migration of soil and sediment off of the project site. A highly visible construction fence should be erected along the border of the vegetative buffer.
4. Disturbed soils on the site should be protected with mulch once the excavation and backfill are completed. Temporary measures such as straw or mulching may be used until construction is completed or until vegetation is established. We recommend mulching exposed soils with straw before the end of September and maintaining the mulch through the winter months.
5. Upon completion, the site should be mulched with a two to three inch layer of compost such as Steerco or Cedar Grove. Future plantings can be planted through the compost. The compost can be worked into the soil with other amendments where a lawn is planned.
6. Stockpiles must not remain uncovered for more than 2 days during the wet season.

7. The geotechnical engineer might require additional measures as site conditions warrant.

5.2 Temporary Excavation

The proposed basement will require temporary cuts on the order of about 8 to 10 feet deep (See Figure 4, Generalized Section.) Excavation can be accomplished with conventional excavating equipment. The following recommendations are provided for temporary basement cuts.



Temporary Construction Cut

Generally the cuts can be contained within the property limits provided the steeper cuts are not within 10 feet of the property limits or the vegetative buffers. If temporary excavations as shown will migrate onto adjacent property then you must either obtain permission from that property owner or else shore the cuts. We can provide additional shoring recommendations if needed at that time.

The geotechnical engineer should monitor the initial excavation and make recommendations as needed to maintain the stability of temporary cuts. If different soil conditions are encountered than expected we will make recommendations at that time to provide safe excavations and support of adjacent properties.

Ongoing safety of open excavations is the responsibility of the contractor. Temporary excavations should be flattened as necessary in order to maintain safety for the workers. Surface runoff should be directed around the excavation. Conditions that might necessitate flattening the excavation include encountering soil conditions different from those observed in our test pits, finding water seepage in the sides of the excavation, or extreme weather and runoff conditions.

5.3 Foundation Recommendations

The project site appears underlain by dense competent soils at depth. The proposed foundation system must be supported within the firm undisturbed glacial soils. Where soft or loose soils are encountered they must be overexcavated to expose native bearing soil approved by the geotechnical engineer.

5.3.1 Footings

We anticipate that conventional spread footings can be used for foundation support of the proposed residence. Below are recommendations for spread footings formed against native undisturbed soil:

1. The proposed foundation system must be supported on native, undisturbed glacial soils. The soils must be free from organics and undisturbed by previous excavation activity. For planning purposes the contractor should assume that these soils would be exposed at depths on the order of about 3 feet in most locations.
2. An allowable bearing of 2,000 psf may be used for design of the footings.
3. Lateral passive pressures of 300 pcf may be used for determining the lateral resistance.
4. We recommend 0.4 for the coefficient of friction for slabs against the soil.

5.3.2 Basement Retaining Walls

Once excavation is completed, basement retaining walls will be constructed along the west, east, and south sides of the residence. A schematic is provided in Figure 6, Basement Retaining Wall Schematic. Below are our recommendations for the new walls:

1. The wall footings shall conform to the recommendations described above.
2. The footing must bear on native undisturbed soils and the top of the footing should be at least 4 inches below finish grade of the slab so that a capillary gravel break can be provided between the top of the footing and the base of the slab.
3. The walls should be designed to resist an active earth pressure equivalent to 35 pcf per foot of retained soil height. This assumes no backslope behind the wall and no structures or embankments within 5 feet of the wall.
4. For walls supporting inclined backfill or supporting embankments or structures within 5 feet, we recommend using 58 pcf for lateral earth pressure.
5. A backwall drainage system must be supplied for all newly constructed walls. The drainage system shall include at a minimum, a 4-inch perforated, smooth-walled pipe, enveloped in ¾" to 1½" washed gravel, and wrapped in Mirafi 140N filter fabric (AOS 0.212 mm.) for separation from adjacent soils. The zone of drain rock must be at least 12 inches wide.
6. Additional drainage measures for the basement should include filling all snaptie holes, waterproofing the concrete face, and placing sheet drains against the walls on the east, south, and west sides. We recommend sheet drains such as Delta Drain, AmerDrain, or

Mirafi G100N. The sheet drains should direct water toward the backwall drainage system.

7. The geotechnical engineer should verify that the drainage system, bearing conditions, and backfill compaction are in accordance with the report recommendations.

5.4 Site Grading and Compaction Requirements

Imported fill soils used as backfill behind walls and under slabs should be moisture conditioned to within 3 percent of optimum moisture content, placed in loose, horizontal lifts less than 8 inches in thickness, and compacted to at least 92 percent of the maximum dry density, as determined using ASTM D1557 (Modified Proctor). The 92 percent compaction criteria should apply to any material intended to support pavement or intended as backfill behind walls. If structures will be supported on the structural fill the compaction criteria should be 95 percent of the Modified Proctor. In areas not constructed as fill slopes or not intended to support pavement or structures, fill material should be placed in loose lifts less than 12 inches in thickness and compacted to at least 90 percent of the maximum dry density.

The soil sampled in our test pits appeared as silty sand with about 15 to 20 percent silt content. Silty soils can become unworkable when wet and are difficult to dry out again in our NW climate. We do not recommend using these soils for drainage backfill, or for structural fill.

5.4.1 Fill and Compaction Requirements

Generally we do not recommend placing fill on the site except where it is properly retained or compacted against firm unyielding native soils. No fill slopes should be steeper than 3H:1V except for small areas between retaining elements that are sufficiently stabilized with landscaping. Where fill is intended for the site we recommend the following:

1. The soil intended to receive the fill must first be grubbed removing all organic matter, stumps, roots, and wet soil. Organic soils can be stockpiled and used as topsoil later in the grading process.
2. All excavated material should be placed and compacted during dry weather conditions.
3. Stockpiled soil should be covered to protect the natural moisture content of the soil.
4. The soil should be placed in no more than 10-inch loose lifts and then compacted with multiple passes of a walk-behind or driven steel wheeled roller. The soil must be placed against horizontal surfaces. Compacted soil should be protected during wet weather with plastic sheeting.
5. Fill walls such as modular block walls with geogrids (Segmental Retaining Walls) can be constructed as the soil is placed. We can provide additional recommendations for the geogrid walls if these are selected for use on the site.
6. Early on in the process the geotechnical engineer should monitor the placement and compaction in order to establish a method that will achieve proper results.

5.4.2 Rockery Construction Guidelines

Rockeries are typically used as facing material for dense stable cuts. The proposed tiered rockeries will be used as landscape walls to provide grade change and should retain less than 4 feet of soil. The slope behind the rockery must not exceed 2H:1V and must be adequately protected against temporary erosion by erosion control mats and permanent erosion by suitable landscaping. In order to construct the rockeries we recommend overbuilding the area so that the fill material may be placed and compacted prior to constructing the rockery. The fill should extend at least 4 feet beyond the face of the proposed rockery and compacted as described in the section above. After compaction the rockeries may then be constructed by excavating the keyway and placing the rocks.

We recommend the following for construction of the rockeries.

1. The keyway must be excavated from native undisturbed glacial soil. The width of the keyway shall conform to the width B of the base rock plus one foot for the drainage material as shown on the plan detail.
2. Stability of temporary cut slopes is the ongoing responsibility of the contractor.
3. The long rock dimension should be placed perpendicular to the slope during rock placement. The height of the rocks shall not exceed the width.
4. The dimensions of the rock shall conform to those provided on the plans and the size of the rocks shall conform generally to the sections provided on the plans. The base rocks should slope down towards (into) the slope at a declination of at least 5 percent.
5. Each rock should bear on at least two other rocks. Each rock should have at least three bearing points-- two in front and one in back. The outermost point of contact between an upper and lower rock should be within 6 inches of the face of the rockery.
6. The rear of the rocks should be aligned along an imaginary vertical plane. If rocks larger than the minimum specified B (base width) are used, they can extend beyond this imaginary line, provided they do not interfere with drainage.
7. The tops of each successive face rock should be sloped back toward the backcut at a declination of at least 5% as described above.
8. Cap rocks must meet the minimum dimension shown on the plans and must not be movable my hand. If cap rocks are less than 200 pounds they must be grouted into place.
9. Voids greater than 6 inches should be chinked and chinking rocks should not be moveable by hand.
10. At least 12 inches of 2-4 inch clean crushed rock drainage material (less than 5% passing the #4 sieve, and less than 2% passing the #200 sieve) should be placed behind the rocks as a drainage zone. The zone may be wider and the contractor may elect to use the drainage material for all backfill behind the rockery.
11. The drainage material must be separated from the retained soil using a geotextile fabric (Mirafi 160N or approved equal.) A 4-inch diameter perforated PVC drain pipe

enveloped in drain rock shall be placed at the lower limit of the drainage rock and shall drain to daylight.

12. The project geotechnical engineer should inspect the rockery construction following preparation of the keyway, after placement of the base rock layer, before backfilling the drainage pipe, during compaction of structural fill under rockeries, periodically during rockery placement, prior to backfilling above the drainage material, and upon completion of the rockery prior to the contractor demobilizing equipment.

5.5 Drainage Considerations

The proposed improvements will increase the total impervious area for the site. The collected runoff should be directed away from the foundations toward a collection system. We advise against using infiltration systems, rain gardens, or dry wells on the site unless accompanied by a retention system. The stormwater should be discharged to a suitable outlet approved by the City of Bellevue.

At the time of our site visit, we noticed significant seepage emerging from pipes and the ground near the north side of the existing driveway. This seepage can present a hazard during freezing weather since it discharges across the sidewalk. It is hard to say what or where the source of the seepage is. However, to prevent contributing to the problem, we recommend constructing a cutoff trench along the uphill side of the proposed driveway access to capture seepage water. The trench should be deep enough to intercept the seepage zone and must consist of a 4-inch perforated pipe enveloped in washed rock and wrapped with Mirafi 160N filter fabric. The drainage zone should continue upward in the trench until at least 18 inches above the seepage zone. The perforated pipe should direct the water to the existing stormwater collection system.

5.6 Permanent Site Stabilization

Following backfill of the retaining walls, installation of the subsurface utilities and drainage system, and completion of the flat work, the site must be permanently stabilized. All exposed soils on site must either be covered with a thick layer of mulch (2-3 inches) that is incorporated into the final landscaping plan or vegetated with lawn or other groundcover. If completion is scheduled for the wet season then the contractor should provide erosion control mats such as SC150 by North American Green to cover the mulch or seeded areas on slopes inclined greater than 3H:1V. The contractor shall contact The Galli Group to verify that the site has been permanently stabilized prior to the final inspection on the permit.

6.0 LIMITATIONS AND ADDITIONAL SERVICES

The above recommendations are based upon soil conditions observed during our limited geotechnical reconnaissance and subsurface investigation. Soil conditions can vary significantly especially on older lots where the soil has been disturbed due to prior grading activities. If conditions are encountered during construction that vary significantly from those anticipated we

should be advised so that we can revise our recommendations if necessary. This report is not intended as a warranty of the subsurface conditions.

Additional services by the geotechnical engineer are important to help insure that report recommendations are correctly interpreted in final project design and to help verify compliance with project specifications during the construction process. For this project we anticipate additional services might include the following:

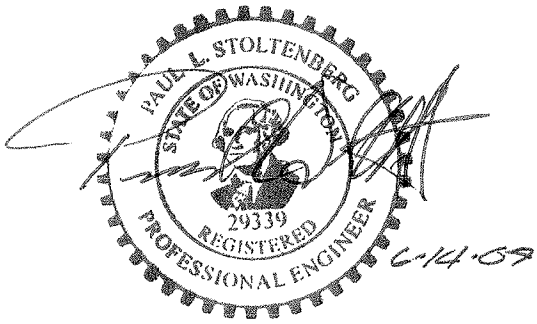
1. Review final design and construction drawings for conformance with geotechnical recommendations, particularly the temporary cuts and retaining features.
2. Provide additional design assistance for geotechnical elements such as segmental retaining walls or rockeries if needed.
3. Monitor temporary excavation.
4. Monitor compaction of backfill and drainage behind the retaining walls.
5. Monitor drainage installation, and erosion control measures.
6. Provide periodic construction field reports, as requested by the client and required by the building department.

We would provide these additional services on a time-and-expense basis in accordance with our Standard Fee Schedule and General Conditions already in place for this project. If our firm is not utilized to provide these services or if the contractor fails to notify us or request construction monitoring we cannot be held responsible for performance of the geotechnical design elements.

We trust that this helps you move forward in your plans for the project. Please do not hesitate to contact us if you have any questions about this report or the procedures we have recommended.

Sincerely,

THE GALLI GROUP



Paul L. Stoltenberg, P.E.
Project Geotechnical Engineer

Attachments: Figure 1: Vicinity Map
Figure 2: Topographic Survey (entire lot)
Figure 3: Site Features (portion of lot)
Figure 4: Generalized Cross Section and Slope Stability Analyses
Figure 4A, B: Site Sections
Figure 5: Basement Retaining Wall Schematic
Appendix: Logs of Test Pits