RADKE PRELIMINARY PLAT

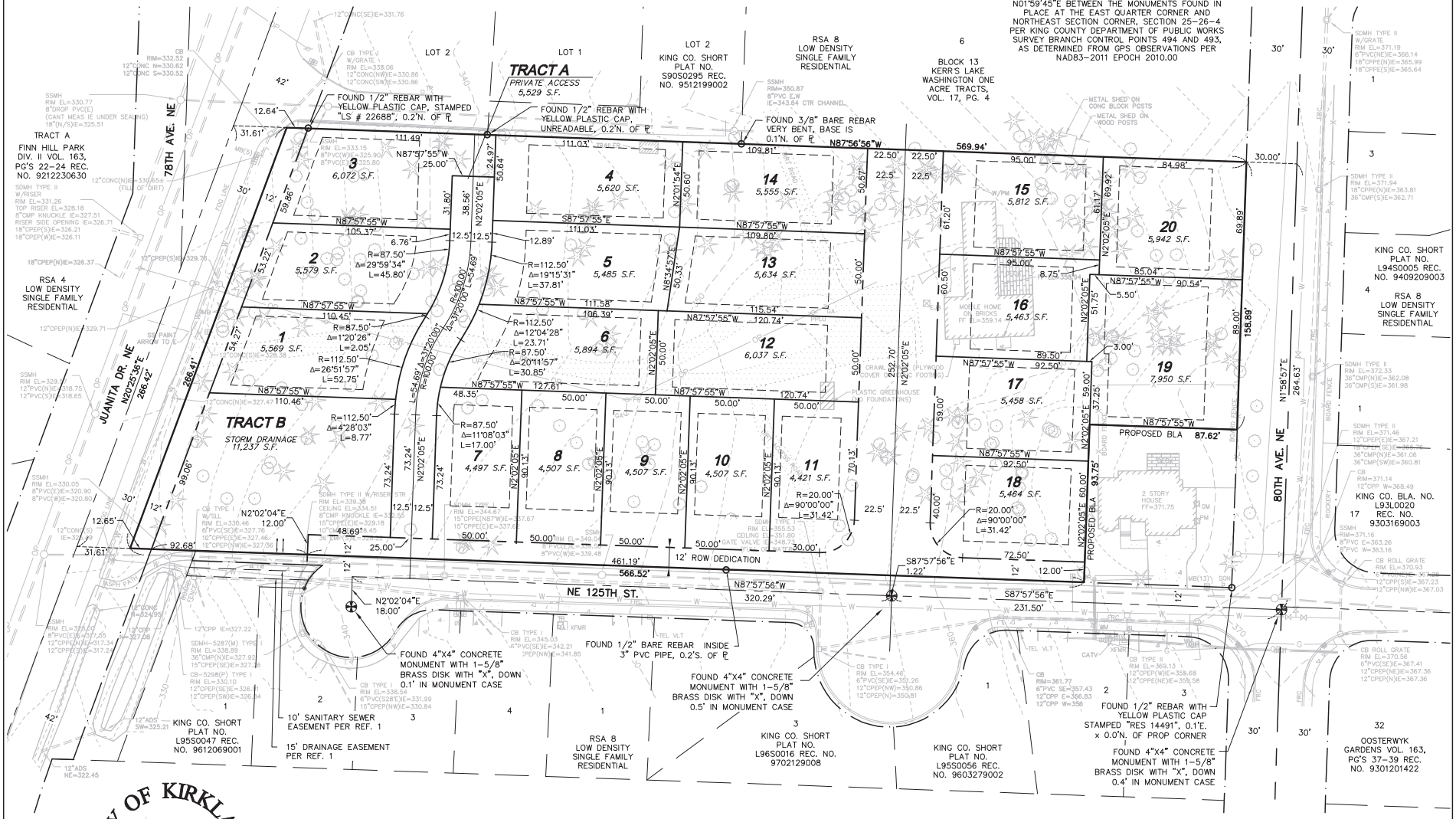
A PORTION OF THE SW. 1/4 OF THE NE. 1/4
SECTION 25, TOWNSHIP 26 NORTH, RANGE 4 EAST, W.M.,
CITY OF KIRKLAND, KING COUNTY, WASHINGTON

NORTH

GRAPHIC SCALE
0 20' 40' 80'
1 INCH = 40 FT.

BASIS OF BEARINGS:

N01°59'45"E BETWEEN THE MONUMENTS FOUND IN PLACE AT THE EAST QUARTER CORNER AND NORTHEAST SECTION CORNER, SECTION 25–26–4 PER KING COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY BRANCH CONTROL POINTS 494 AND 493, AS DETERMINED FROM GPS OBSERVATIONS PER NAD83–2011 EPOCH 2010.00



CITY OF KIRKLAND WASHINGTON

VERTICAL DATUM:
NAVD 88 PER CITY OF KING COUNTY VERTICAL CONTROL

BENCHMARK:
KING COUNTY CONTROL POINT NUMBER 493,
FOUND CONCRETE MONUMENT WITH 3" BRASS DISK, DOWN 1.3' IN MONUMENT CASE, STAMPED "KING COUNTY SURVEY" AND THE APPROPRIATE SECTIONS.
AT THE INTERSECTION OF NE. 132ND STREET AND 84TH AVENUE NE. AKA THE NORTHEAST CORNER OF SECTION 25–26–4, ELEVATION=419.90 FEET.

DRS
D.R. STRONG
CONSULTING ENGINEERS
ENGINEERS PLANNERS SURVEYORS
620 7TH AVENUE KIRKLAND, WA. 98033
O 425.827.3063 F 425.827.2423
www.drstrong.com

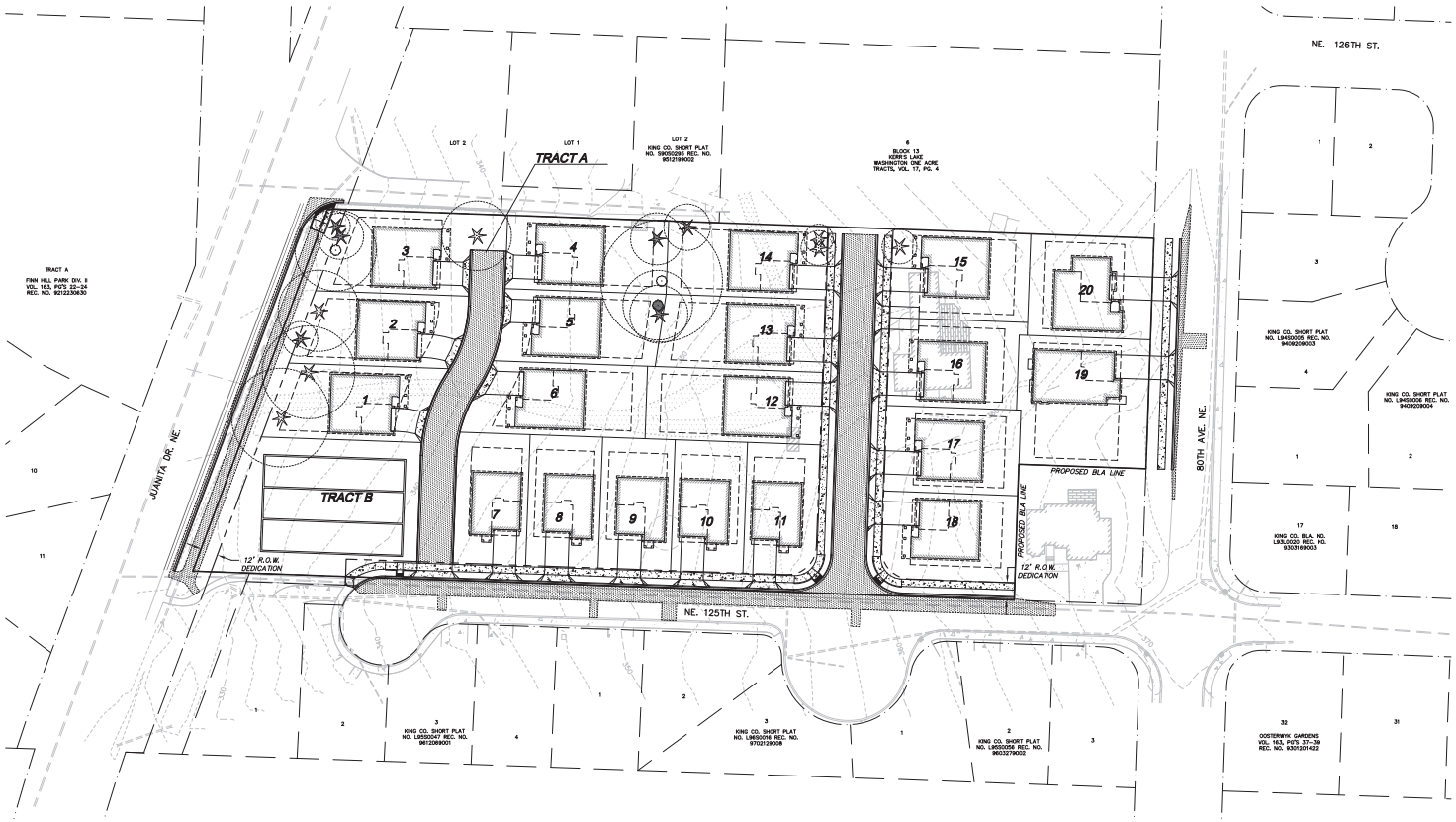
STEPHEN J. SCHMITZ
STATE OF WASHINGTON
37555
REGISTERED PROFESSIONAL LAND SURVEYOR
03-19-15

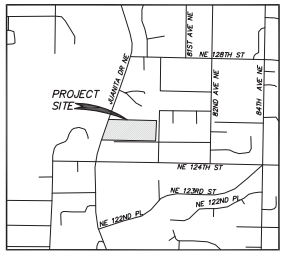
A PORTION OF
THE SOUTHWEST QUARTER OF THE NORTHEST QUARTER
OF SECTION 25, TOWNSHIP 26 NORTH, RANGE 4 EAST, W.M.
CITY OF KIRKLAND, KING COUNTY, WASHINGTON

DWN. BY	DATE	JOB NO.
DAS	03/18/15	15012
CHKD. BY	SCALE	SHEET
	1"=40'	2 OF 2

NE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 4 E, W.M.

RADKE SUBDIVISION





VICINITY MAP
SCALE 1"=750'

TYPICAL BUILDING SETBACKS

UNLESS OTHERWISE NOTED, BUILDING SETBACKS ARE AS FOLLOWS:

FRONT YARD SETBACK:	20 FEET
SIDE YARD SETBACK:	5 FEET
STREET SIDE YARD SETBACK:	5 FEET
REAR YARD SETBACK:	10 FEET

LEGAL DESCRIPTION

PARCEL A:
LOT 7 IN BLOCK 13, AND THAT PORTION OF LOT 7 IN BLOCK 14 OF KERR'S LAKE WASHINGTON ONE ACRE TRACTS, AS PER PLAT RECORDED IN VOLUME 17 OF PLATS, PAGE 4, RECORDS OF KING COUNTY AUDITOR, LYING EASTERLY OF KENMORE-JUANITA ROAD (NOW KNOWN AS JUANITA DRIVE NORTHEAST);

TOGETHER WITH THAT PORTION OF VACATED 78TH AVENUE NORTHEAST LYING BETWEEN SAID LOT 7 IN BLOCK 14 AND KENMORE-JUANITA ROAD (NOW KNOWN AS JUANITA DRIVE NORTHEAST);

PARCEL B:
LOT 8 IN BLOCK 14 OF KERR'S LAKE WASHINGTON ONE ACRE TRACTS, AS PER PLAT RECORDED IN VOLUME 17 OF PLATS, PAGE 4, RECORDS OF KING COUNTY AUDITOR;

TOGETHER WITH THAT PORTION OF VACATED 78TH AVENUE NORTHEAST LYING BETWEEN SAID LOT 8 AND KENMORE-JUANITA ROAD (NOW KNOWN AS JUANITA DRIVE NORTHEAST);

PARCEL C:
LOT 8 IN BLOCK 13 OF KERR'S LAKE WASHINGTON ONE ACRE TRACTS, AS PER PLAT RECORDED IN VOLUME 17 OF PLATS, PAGE 4, RECORDS OF KING COUNTY AUDITOR;

SITUATE IN THE CITY OF KIRKLAND, COUNTY OF KING, STATE OF WASHINGTON.

REFERENCES

1. THE PLAT OF KERR'S LAKE WASHINGTON ONE ACRE TRACTS, RECORDED IN VOLUME 17 OF PLATS, PAGE 4 UNDER RECORDING NUMBER 557768.

2. THE PLAT OF HIDDEN CREST, RECORDED IN VOLUME 95 OF PLATS PAGES 5 THROUGH 7 UNDER RECORDING NUMBER 7212050559.

3. THE PLAT OF OOSTERWYK GARDEN AS RECORDED IN VOLUME 63 OF PLATS, PAGES 37 THROUGH 39 UNDER RECORDING NUMBER 9301201422.

TITLE RESTRICTIONS

1. THIS SITE IS SUBJECT TO A NOTICE OF TAP OR CONNECTION CHARGES WHICH HAVE BEEN OR WILL BE DUE IN CONNECTION WITH DEVELOPMENT OR RE-DEVELOPMENT OF THE LAND AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 9207300895.

VERTICAL DATUM

NAVD 88 PER PER KING COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY BRANCH VERTICAL CONTROL

BENCHMARK

NORTHEAST CORNER OF SECTION 25-26-4, FOUND CONCRETE MONUMENT WITH 3" BRASS DISK STAMPED "KING COUNTY SURVEY", DOWN 1.3' IN MONUMENT CASE AT THE INTERSECTION OF NE. 132ND STREET AND 84TH AVENUE NE. KING COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY BARNCH VERTICAL CONTROL POINT NO. 493. ELEVATION = 419.897 FEET.

PROJECT DESCRIPTION:

ADDRESS OF THE PROPERTY:	7922 NE 125TH STREET & 12432 JUANITA DRIVE NE
PARCEL NUMBERS:	384070-0755, -0758, -0685
EXISTING ZONING:	RSA-8
PROPOSED DWELLING UNITS:	20
ACREAGE:	3.36 ACRES (146,473 S.F.) GROSS
R.O.W. AREA	19,734 S.F.
PROPOSED USE:	SINGLE FAMILY DETACHED HOUSING
SEWER DISTRICT:	NORTHSHORE UTILITY DISTRICT
WATER DISTRICT:	NORTHSHORE UTILITY DISTRICT
SCHOOL DISTRICT:	LAKE WASHINGTON NO. 414
TELEPHONE SERVICE:	VERIZON
POWER SOURCE:	PUGET SOUND ENERGY

PROJECT CONTACTS:

APPLICANT / AGENT	TOLL WA LP 9720 NE 120TH PLACE, SUITE 100 KIRKLAND, WASHINGTON 98034 (425) 825-5344 CONTACT: HANS CHRISTIANSEN HCHRISTIANSEN@TOLLBROTHERSINC.COM
CIVIL ENGINEER	D.R. STRONG CONSULTING ENGINEERS, INC. 620 7TH AVENUE KIRKLAND, WASHINGTON 98033 (425) 827-3063 CONTACT: MAHER A. JOUDI, P.E. MAHER.JOUDI@DRSTRONG.COM
SURVEYOR	D.R. STRONG CONSULTING ENGINEERS, INC. 620 7TH AVENUE KIRKLAND, WASHINGTON 98033 (425) 827-3063 CONTACT: STEPHEN J. SCHREI, P.L.S STEVE.SCHREI@DRSTRONG.COM
ARBORIST	GILLES CONSULTING P.O. BOX 2366 KIRKLAND, WASHINGTON 98033-2366 (425) 822-4994 CONTACT: BRIAN K. GILLES BKGILLES@COMCAST.NET

NORTH
GRAPHIC SCALE
0 20 40 80
1 INCH = 40 FT.

BASIS OF BEARINGS:

N01°59'45"E BETWEEN THE MONUMENTS FOUND IN PLACE AT THE EAST QUARTER CORNER AND NORTHEAST SECTION CORNER, SECTION 25-26-4 PER KING COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY BARNCH CONTROL POINTS 494 AND 493

SHEET INDEX

C1	OF 9	COVER SHEET
C2	OF 9	EXISTING CONDITIONS
C3	OF 9	INTEGRATED TREE PLAN
C4	OF 9	ROAD & GRADING PLAN
C5	OF 9	ROAD CROSS SECTIONS
C6	OF 9	DRAINAGE CONTROL PLAN
C7	OF 9	ROAD & UTILITY PROFILES
C8	OF 9	ROAD & UTILITY PROFILES
C9	OF 9	ROAD & UTILITY PROFILES

COPYRIGHT © 2015, D.R. STRONG CONSULTING ENGINEERS INC.

DRS
D.R. STRONG CONSULTING ENGINEERS
ENGINEERS PLANNERS SURVEYORS
620 - 7th AVENUE KIRKLAND, WA 98033
O 425.827.3063 F 425.827.3423

RADKE SUBDIVISION
IDP SUBMITTAL

COVER SHEET
12432 JUANITA DRIVE
KIRKLAND, WASHINGTON

TOLL WA, LP
9720 NE 120TH PLACE, #100
KIRKLAND, WA 98033
(425) 825-5344

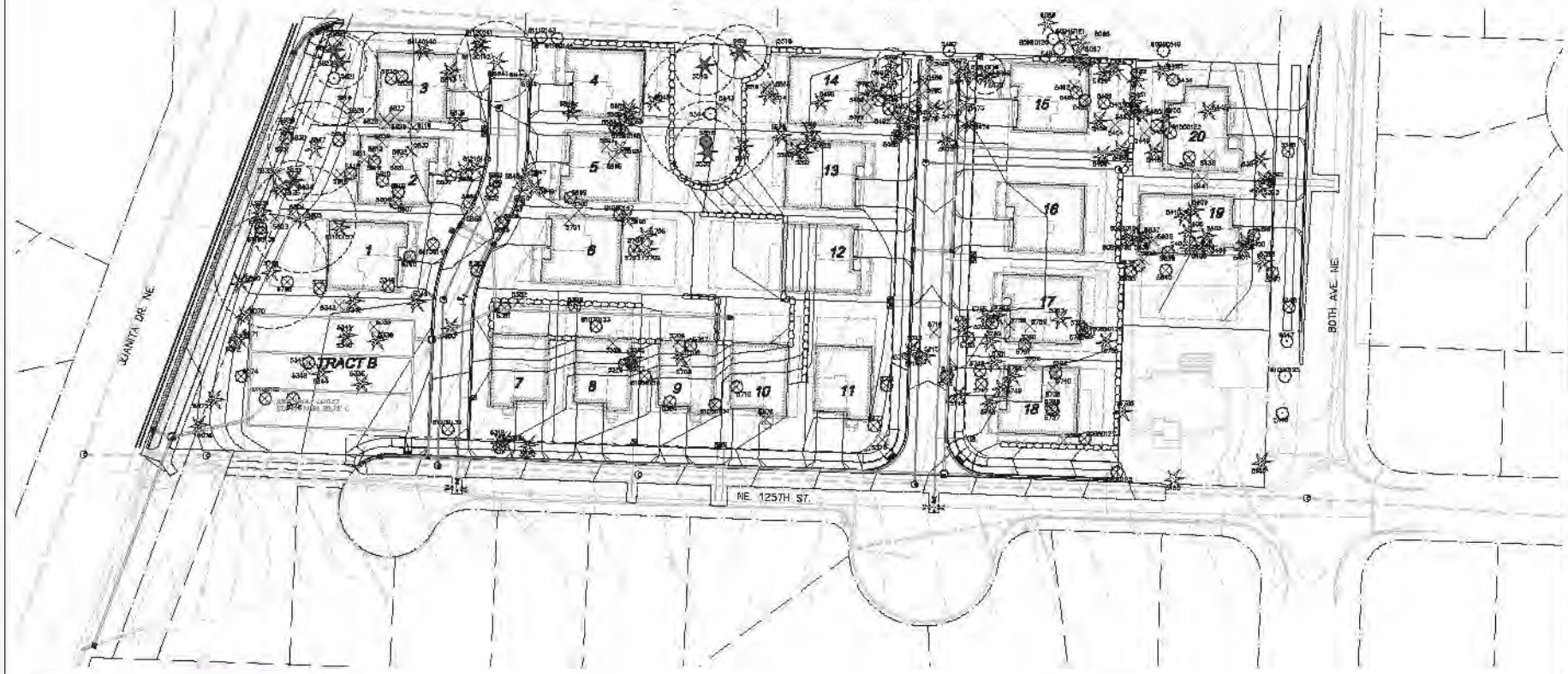
DATE	REVISION	APR

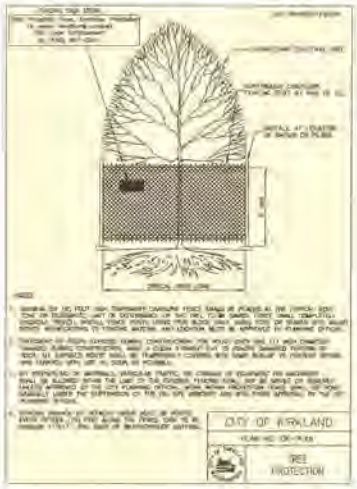
DRAFTED BY: MAJ
DESIGNED BY: MAJ/CSC
PROJECT ENGINEER: MAJ
DATE: 03.20.15
PROJECT NO.: 15012

DRAWING: C1
SHEET: 1 OF 9

NE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 4 E, W.M.

RADKE SUBDIVISION





TREE TABLE

TREE #	SPECIES	DBH (IN)	TREE CREDIT	DRIP LINE RADIUS (FT)	LIMITS OF DISTURBANCE (FT)	CURRENT HEALTH RATING	COMMENT
3C31	WESTERN RED CEDAR	33.4	7.0	18	18	EXCELLENT	SAVE
3C32	WESTERN RED CEDAR	37.7	8.0	18	18	EXCELLENT	SAVE
3C33	WESTERN RED CEDAR	30.8	8.0	20	20	EXCELLENT	SAVE
5C09	PACIFIC MADRONE	28.1	10.0	24	24	FAIR	SAVE
6B22	DOUGLAS FIR	18.6	5.0	16	16	GOOD	SAVE
6B23	DOUGLAS FIR	8.1	1.0	10	10	FAIR	SAVE
6B24	DOUGLAS FIR	10.1	1.0	12	12	FAIR	SAVE
6B49	WESTERN RED CEDAR	8.8	1.0	12	12	GOOD	RETAIN IF POSSIBLE
6B80	WESTERN RED CEDAR	14.8	3.0	12	12	VERY GOOD	RETAIN IF POSSIBLE
6B81	WESTERN RED CEDAR	8.8	1.0	10	10	GOOD	RETAIN IF POSSIBLE
6B44	BIG LEAF MAPLE	23.0	6.0	42	42	GOOD	RETAIN IF POSSIBLE
5T80	DOUGLAS FIR	31.8	11.0	34	34	VERY GOOD	RETAIN IF POSSIBLE
5B25	DOUGLAS FIR	26.6	9.0	30	30	GOOD	RETAIN IF POSSIBLE
5B27	DOUGLAS FIR	26.3	9.0	28	28	GOOD	RETAIN IF POSSIBLE
5B61	BIG LEAF MAPLE	26.4	9.0	28	28	GOOD	RETAIN IF POSSIBLE
5A41	DOUGLAS FIR	21.5	8.0	24	24	GOOD	RETAIN IF POSSIBLE

TREE DENSITY REQUIREMENT

THE REQUIRED MINIMUM TREE DENSITY IS 30 TREE CREDITS PER ACRE

TOTAL LOT AREA = 346,473 S.F. (8.38 AC)

TREE DENSITY REQUIRED = 8.38 X 30 = 251 TREE CREDITS

TREE DENSITY PROVIDED = 38 (SAVED TREES ONLY)

TREE DENSITY REPLACEMENT CREDITS REQUIRED = 213

TREE LEGEND

- SAVED TREE W/ TAG NUMBER
- RETAINED TREE IF POSSIBLE W/ TAG NUMBER (CREDIT TO BE DETERMINED AT FINAL HOME INSPECTION)
- TREE TO BE REMOVED
- 1019 NON-VIABLE TREE & TAG NUMBER (DECIDUOUS SHOWN)
- 1046 VIABLE TREE & TAG NUMBER (EVERGREEN SHOWN)
- 61050134 #105 / 134 SURVEY POINT NUMBER / ASSOCIATED TREE NUMBER

NOTES:

1. TREE LOCATIONS AND TAG NUMBERS PER FIELD SURVEY BY: MEND BULMAN AND ASSOCIATES.
2. VIABLE NON-VIABLE AND DRIPLINE DIMENSIONS PER ARBORIEAL REPORT PREPARED BY WILDS CONSULTING DATED 1/28/15.

NORTH

GRAPHIC SCALE
0 15 30 60
1 INCH = 30 FT.

BASIS OF BEARINGS:

INTERVISTA BETWEEN THE MONUMENTS FOUND IN PLACE AT THE EAST QUARTER CORNER AND NORTHEAST SECTION CORNER, SECTION 25-26-4 PER KING COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY MARKER CONTROL POINTS 499 AND 145

COPYRIGHT © 2015, D.R. STRONG CONSULTING ENGINEERS INC.

D.R. STRONG CONSULTING ENGINEERS

RADKE SUBDIVISION
IDP SUBMITTAL

INTEGRATED TREE PLAN
12432 JUANITA DRIVE
KIRKLAND, WASHINGTON

TOLL WA, LP
8720 NE 120TH PLACE, #100
KIRKLAND, WA 98033
(425) 825-5344

5/19/15

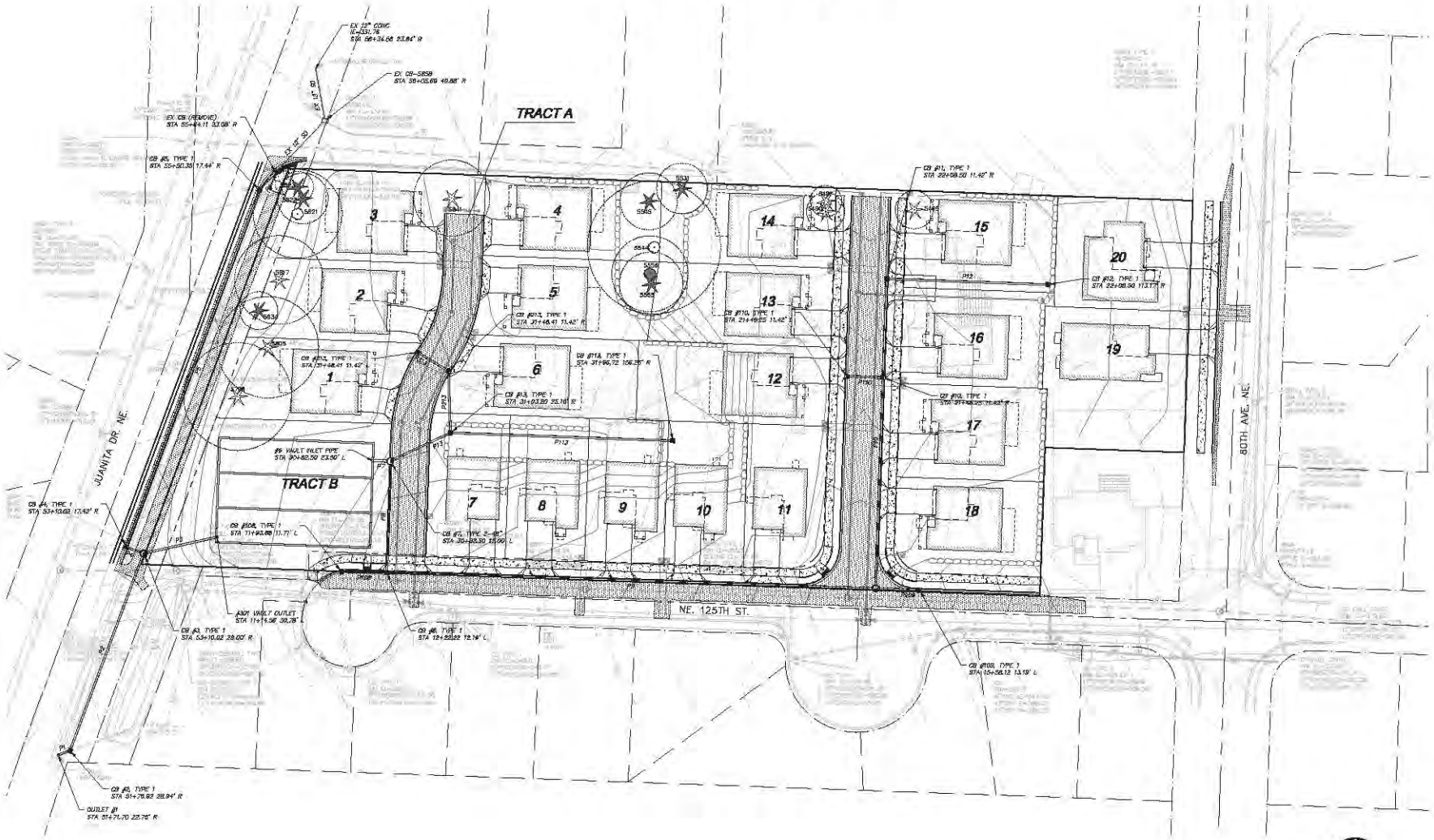
DATE	REVISION	APP

DRAFTED BY: MAJ
DESIGNED BY: MAJ/ESC
PROJECT ENGINEER: MAJ
DATE: 01.20.15
PROJECT NO.: 15012

DRAWING: C3
SHEET: 3 OF 9

NE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 4 E, W.M.

RADKE SUBDIVISION



NORTH

GRAPHIC SCALE
0 20 40 80
1 INCH = 40 FT.

BASIS OF BEARINGS:
N03°28'45"E BETWEEN THE MONUMENTS FOUND IN PLACE AT THE EAST QUARTER CORNER AND NORTHEAST SECTION CORNER, SECTION 25-26-4 PER KING COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY MARKER CONTROL POINTS 484 AND 483

COPYRIGHT © 2015, D.R. STRONG CONSULTING ENGINEERS INC.

DRS
D.R. STRONG CONSULTING ENGINEERS
ENGINEERS PLANNERS SURVEYORS

RADKE SUBDIVISION
IDP SUBMITTAL
DRAINAGE CONTROL PLAN
12432 JUANITA DRIVE
KIRKLAND, WASHINGTON

TOLL WA, LP
8720 NE 120TH PLACE, #100
KIRKLAND, WA 98033
(425) 825-5344

5/19/15

DATE	REVISION	APPR

DRAFTED BY: MAJ
DESIGNED BY: MAJ/CSC
PROJECT ENGINEER: MAJ
DATE: 03.20.15
PROJECT NO.: 15012

DRAWING: C6
SHEET: 6 OF 9

SEPA ENVIRONMENTAL CHECKLIST
UPDATED 2014

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

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. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:
Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. background

1. Name of proposed project, if applicable: **Radke Subdivision**

2. Name of applicant: **Toll WA LP**

3. Address and phone number of applicant and contact person:

Address: **9720 NE 120th Place, Suite 100, Kirkland, WA 98034**
Contact Person: **Hans Christiansen, Land Entitlement Manager**

4. Date checklist prepared: **3/25/2015**

5. Agency requesting checklist: **City of Kirkland**

6. Proposed timing or schedule (including phasing, if applicable):

No Phasing Proposed

Preliminary Plat Approval	**Approximately Fall 2015**
Engineering Plan (LSM) Approval	**Approximately Summer 2016**
Site Construction Start	**Approximately Summer/Fall 2016**
Site Construction Complete	**Approximately Winter 2017**

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

There are no proposed future additions or expansions of the proposed project. Construction of 20 detached single-family residences will follow site construction completion.

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

October 2, 2014	***Sensitive Areas Determination*, Acre Environmental Consulting, Inc.**
October 27, 2014	***Phase I Environmental Assessment*, Environmental Associates, Inc.**
October 28, 2014	***Addendum: Phase I Environmental Assessment*, Environmental Associates, Inc.**
November 6, 2014	***Subsurface Exploration, Geotechnical Hazard, and Geotechnical Engineering Report*, Associated Earth Sciences, Inc.**
March 5, 2015	***Transportation Impact Analysis (Memorandum)*, Transpo Group**
March 23, 2015	***Evaluation of Trees Amended for Preliminary Subdivision/Integrated Development Plan at, The Radke Property, Finn Hill, Kirkland, WA 98034*, Gilles Consulting**
March 23, 2015	***Final Tree Retention Discussion at, The Radke Property*, Gilles Consulting**

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

We are not aware of any pending applications or governmental approvals or proposals directly affecting the property covered by the proposed 20-Lot Radke Subdivision.

10. List any government approvals or permits that will be needed for your proposal, if known.

Preliminary Subdivision/Integrated Development Plan Approval – City of Kirkland;
SEPA Determination – City of Kirkland;
Lot Line Adjustment
Rodent Abatement Declaration – City of Kirkland;
LSM (Land Surface Modification) Permit – City of Kirkland;
Demolition Permit – City of Kirkland;
Retaining Wall Permit(s) – City of Kirkland;
Sign Permit – City of Kirkland;
Right of Way Use Permit – City of Kirkland;
Forest Practice Permit – Washington State Dept. of Natural Resources;
NPDES (National Pollutant Discharge Elimination System) General Permit – Washington State Department of Ecology;
Water & Sewer Construction Plan Approval – Northshore Utility District;
Storm Vault – Structural Permit – City of Kirkland;
Final Subdivision Approval & Recording – City of Kirkland

And any other permits typically associated with a project of this size.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The project proposes to subdivide three parcels (King County Parcel No. 384070-0755, -0758, and a portion of -0685) totaling approximately 3.36 acres into 20 single family lots with one home to be constructed on each lot following site development and final subdivision recording. A Lot Line Adjustment between parcels -0758 & 0685 will be processed concurrently to preserve the existing residence located on the easterly portion of parcel -0685. The dimensional requirements of the proposed lots and buildings will meet those set forth in KZC 18.10 for the RSA 8 zone. Construction of the site will result in approximately 90-95% of the site being developed.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The project site is located immediately north of NE 125th Street between Juanita Drive NE and 80th Avenue NE in Kirkland, WA, in the NE 1/4 of Section 25, Township 26 N,

Range 4 E., W.M and is comprised of King County Parcel No.'s 384070-0755, 384070-0758, and the westerly portion of 384070-0685. The legal description, a vicinity map and topographic survey have been included with the preliminary plat plan set.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site
(circle one): Flat, rolling, hilly, steep slopes, mountainous, other _____

The site generally slopes downhill from the east to the west, with a change in grade of approximately 40-feet from 80th Ave NE down to Juanita-Drive NE.

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

The steepest slope is approximately 35%.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Geotechnical explorations encountered native materials consisting of dense lodgement till and advance outwash sediments.

Non-native fill was discovered in two different areas. Existing fill was observed in the central part of the site near the existing circle driveway and along the south and east perimeters. These materials were determined to not be suitable for structural fill and will be exported from the site.

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

There are no indications or history of unstable soils in the immediate vicinity that we are aware of; however, City of Kirkland Critical Areas Maps, note Landslide Hazard Areas approximately 275-300' west-northwest of the site.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

The purpose of the grading is to construct the proposed roadways and install plat infrastructure as required. Additionally, substantial grading will be required to provide building pads for the residences due to the significant grade changes across the site. Approximately 90% of the site will be impacted by grading activities.

Export of excess topsoil:	**Approximately 220 cu.yds.**
Export Non-native (non-structural) fill soils:	**Approximately 5,600 cu.yds.**
Export (structural) for Lot Grading, Right-of-way and storm vault excavation:	**Approximately 8,400 cu.yds.**

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

Yes; Erosion control Best Management Practices (BMP's) will be used to minimize the effects of erosion during clearing and construction activities. BMP's such as perimeter protection, sediment retention, stockpiling and cover measures will be utilized to reduce potential erosion.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Approximately 55% once all roads, sidewalks, homes, driveways and patios are accounted for.

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

A temporary erosion and sedimentation control plan (TESC plan) will be prepared and implemented prior to commencement of construction activities. During construction, erosion control measures may include: silt fences, temporary sediment ponds, chemical treatment for water quality, stabilized construction entrances, and other measures in accordance with local and state requirements. At project completion, permanent measures will include storm detention and water quality facilities. The project will also comply with NPDES General Permit requirements for stormwater runoff.

2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Short-term emissions will be those associated with construction and site development activities. These will include dust and emissions from construction equipment. Long-term impacts will result from increased vehicle traffic, lawn equipment and others typical of a residential neighborhood.

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

Off-site sources of emissions or odors are those that are typical of residential neighborhoods. These will include automobile emissions from traffic on adjacent roadways, including Juanita Drive NE, and fireplace emissions from nearby homes.

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

The Washington Clean Air Act requires the use of all known, available, and reasonable means of controlling air pollution, including dust. Construction impacts will not be

significant and could be controlled by measures such as washing truck wheels before exiting the site and maintaining gravel construction entrances, if required. In addition, exposed soils will be watered during extended dry periods to control dust.

3. Water

a. Surface Water:

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.

   Denney Creek is approximately 750-900' west-northwest of the site. There are no surface water bodies on the site. Acre Environmental Consultants, Inc. completed a site visit and assessment and determined that there are no critical areas (streams, ponds, wetlands) on site. See Sensitive Areas Determination submitted with the Preliminary Subdivision Application.

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.

   Not Applicable.

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.

   Not Applicable.

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

   No, there will be no surface water withdrawals or diversions.

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, a public sanitary sewer system will be installed to serve the future homes.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

No groundwater will be withdrawn; public water mains will be installed as part of the plat construction. In order to fulfill the City of Kirkland 10% stormwater BMP requirement the project plans to utilize drywells on select lots to infiltrate stormwater from rooftop stormwater runoff, to the extent that the native soils will accommodate infiltration. The dry wells and overall storm drainage system will be sized according to the City of Kirkland sizing criteria for Small Site Drainage Review. The project will not be taking any flow control credits for said drywells.

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.

   The site will be served by sanitary sewer (piped). There will be no waste material discharged to the ground from the development. Post development stormwater runoff from roadways and home sites will be collected and conveyed to drainage facilities which will settle out and/or separate automobile petroleum and other household waste materials to acceptable levels, then discharged to the existing City conveyance system. City and State regulations for water quality and runoff control will be met.

   An existing septic system and drainfield associated with the residence at 12432 Juanita Drive NE will be decommissioned and removed when the residence is demolished.

c. Water runoff (including stormwater):

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.

   Stormwater runoff from the developed site will be collected and conveyed to the detention/water quality vault located in the southwest corner of the site. The vault will discharge to the natural drainage discharge location for the site which is to the drainage system at the east edge of Juanita Drive.

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

   Not anticipated. The storm drainage system will be designed to comply with City regulations to mitigate stormwater runoff. Temporary and permanent drainage facilities will be used to control quality and quantity of surface runoff during construction and after development.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

   The project will adhere to Core Requirement #1 of the King County Surface Water Design Manual as adopted by the City of Kirkland, and discharge at the natural location towards Juanita Drive NE. No drainage patterns are expected to altered.

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

The storm drainage system will be designed to comply with City regulations to mitigate stormwater runoff. The system will include temporary erosion control barriers during site construction. Treatment measures during construction could include treatment of turbid water through settling or other treatment as allowed by DOE (e.g. chitosan). The permanent system will ensure that prior to the release of stormwater into the downstream system, the system will have significantly reduced the potential impacts to ground and surface water.

4. Plants

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

_X_deciduous tree: alder, maple, aspen, other
_X_evergreen tree: fir, cedar, pine, other
_X_shrubs
_X_grass
____pasture
____crop or grain
____Orchards, vineyards or other permanent crops.
____wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____water plants: water lily, eelgrass, milfoil, other
____other types of vegetation

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

Due to the significant grading required for development of the site, the majority of the site will be cleared with the exception of trees identified to be saved as part of the City's tree retention regulations.

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

There are no threatened or endangered plant species know to be on or near the site.

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

The project will comply with the City's landscaping and tree retention regulations. This includes retention of existing trees where feasible and installing new trees to meet the City tree density requirements.

e. List all noxious weeds and invasive species known to be on or near the site.

Himalayan Blackberry is known to be onsite and will be removed with clearing and grading of the site.

5. Animals

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site. Examples include:
   birds: hawk, heron, eagle, songbirds, other: crows
   mammals: deer, bear, elk, beaver, other: gray squirrels, small rodents, and raccoon
   fish: bass, salmon, trout, herring, shellfish, other _____

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

   There are no threatened or endangered species know to be on or near the site.

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

   The Puget Sound is part of the Pacific Flyway and birds that inhabit the area vary seasonally, including a wide variety of non-tropical songbirds and waterfowl.

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

   No measures are proposed to preserve or enhance wildlife other that the saving of a select number of trees as part of the City's IDP process.

e. List any invasive animal species known to be on or near the site.

   There are no known invasive animal species know to be on or near the site.

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 needs? Describe whether it will be used for heating, manufacturing, etc.

   Electricity and/or natural gas will serve as the primary energy source for heating and cooling for each home. These forms of energy are immediately available to the site. Homes will be equipped with appropriate heating and cooling systems which will be energy efficient and cost effective for the home-buyer.

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 this proposal? List other proposed measures to reduce or control energy impacts, if any:

   The required measures of the International Residential Code and State Energy Code will be incorporated in the construction. Energy conservation fixtures and materials are encouraged in all new construction.

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. There are no known on-site environmental health hazards known to exist today and none will be generated as a direct result of this proposal.

1) Describe any known or possible contamination at the site from present or past uses.

Fill originating from an offsite construction site was placed on the site in the early 2000's in the center of the site, described earlier in the section *1. Earth*, as "fill ... in the central part of the site ". Environmental Associates, Inc. who prepared the Phase I Environmental Assessment of the property conducted additional sampling and laboratory testing of the site within the known fill areas and produced their findings in their Addendum: Phase I Environmental Assessment dated October 28, 2014. Soil samples were submitted for analysis of gasoline, heavy oil, and diesel range petroleum hydrocarbons, as well as benzene, toluene, ethylbenzene, and xylenes (BTEX) along with chlorinated volatile organic compounds (VOCs) and lead. No detections of petroleum, BTEX constituents, or chlorinated solvents were reported above the minimum laboratory detection limits. Lead was detected, however the concentration reported was well below the current Model Toxics Control Act (MTCA) Method A cleanup levels for that metal.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

None that we are aware of.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

There will be no toxic or hazardous chemicals stored or produced during the project's development or construction. Products used in association with residential construction such as paints, solvents, stains and sealers will be used. Fuel for heavy equipment used for site construction will be brought in as needed to refuel heavy equipment. There will be no "operations" associated with the development of the property as single-family residences thus no "operating life" matters to be addressed for this project.

4) Describe special emergency services that might be required.

No special emergency services will be required.

5) Proposed measures to reduce or control environmental health hazards, if any:

Materials used for residential construction such as paint, solvents, stains and sealers will not be stored onsite for prolonged periods and will be brought to the

site in quantities as needed for constructing and finishing each individual residence. Fuels for heavy construction equipment will not be stored onsite and spill prevention and clean-up measures will be in place for the duration of site construction. There will be no "operations" associated with the development of the property as single-family residences thus no "operating life" matters to be addressed as part of this project.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

The primary source of off-site noise in the area originates from vehicular traffic present on adjacent streets.

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

Short-term impacts will result from the use of construction equipment during construction. Construction will occur during the day-light hours, and in compliance with all noise ordinances and permitted hours of construction. Construction noise is generated by heavy equipment, hand tools and the transporting of construction materials and equipment. Long-term impacts will be those associated with typical urban residential areas and traffic.

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

Construction will be performed during normal daylight hours and/or per City of Kirkland requirements. Construction equipment will be equipped with noise mufflers and idling time will be encouraged to be kept at a minimum.

8. Land and shoreline use

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

Site: Single Family Residential
North: Single Family Residential
South: Single Family Residential
East: Single Family Residential
West: Single Family Residential

The proposal will not produce long term impacts on current land uses on nearby or adjacent properties. There may be limited impacts during site construction such as temporary road closures or lane closures for construction of frontage improvements and underground utilities.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

No. Remaining questions are not applicable.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

No. There are no existing working farms or working forest land adjacent to the property.

c. Describe any structures on the site.

The site is comprised of 3 tax parcels. The north parcel contains an existing single-family manufactured home (12432 Juanita Drive NE). The southwesterly parcel is vacant. The southeasterly parcel contains an existing single-family residence (7922 NE 125th Street).

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

The residence on the north parcel (12432 Juanita Drive NE) will be demolished.

e. What is the current zoning classification of the site? **RSA-8**

f. What is the current comprehensive plan designation of the site? **Low Density Residential**

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

Not applicable.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

There are no known critical areas onsite.

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

Approximately 50 people (20 x 2.5 persons per residence assumed)

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

No people will be displaced by the project. The residence to be demolished will be replaced by one of the new residences.

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

No measures are proposed as no people are anticipated to be displaced by the project.

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

The proposed development is compatible with the prescribed land use codes and designations for this site. Per the City Zoning Code, the development is consistent with the density requirements and land use of this property.

m. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any: **Not applicable.**

9. Housing

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

20 single-family, upper middle income units will be provided.

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

One middle income unit will be eliminated and replaced by one of the upper middle income units.

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

No measures proposed because no housing impacts are anticipated.

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?

The maximum building height will conform to City of Kirkland Standards. Currently the maximum height allowed by the RSA-8 zone is 30-feet, excluding chimneys. The exterior building materials may include any of the following: wood, hardwood, composite siding, masonry, stone/cultured stone, cedar shakes and/or asphalt shingles.

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

There are no views in the immediate vicinity.

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

Street trees and landscaping will be installed as part of site development and single-family home construction which will help to visually soften the development. Homes will be well designed and aesthetically pleasing and constructed with higher quality materials and finishes.

11. Light and glare

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

Light and glare will be produced from building lighting. Light will also be produced from vehicles using the site. The light and glare will occur primarily in the evening and before dawn.

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

Not to our knowledge.

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

The primary off-site source of light and glare will be from vehicles traveling along the area roadways. Also, the adjacent residential uses and streetlights may create light and glare.

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

No light or glare impacts are anticipated from the development or from off-site sources of light. Where street lighting is required to be installed it will be installed in a manner that directs light downward.

12. Recreation

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

Big Finn Hill Park and O.O. Denny Park are within a 1/2 mile to one mile of the site. Informal recreational opportunities are also available at the nearby Carl Sandburg Elementary and Finn Hill Middle School playfields.

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:

Park mitigation fees will be paid with building permit applications for each single family residence to be constructed as part of the project. A park fee credit for the existing residence will be applied to the first building permit.

13. Historic and cultural preservation

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers located on or near the site? If so, specifically describe.

None that we are aware of. The nearest site of historical significance is the Saint Edward Seminary.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

None that we are aware of. None were observed or encountered during our geotechnical excavations. The Washington State Department of Archeology and Historic Preservation's "WISAARD" online database was consulted and no results were returned for the site of immediate vicinity. The nearest site of historical significance found on the "WISAARD" online database is the Saint Edward Seminary.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

The Washington State Department of Archaeology and Historic Preservation's "WISAARD" online database was consulted.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

The project is not anticipated to have any impacts or disturbance to any historical sites or cultural resources. If any artifacts or resources are encountered during construction we will halt work and consult the Department of Archaeology and Historic Preservation.

14. Transportation

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

The existing home at 12432 Juanita Drive NE is currently accessed via Juanita Drive NE. The existing home at 7922 NE 125th Street is accessed via NE 125th Street. Once site development is completed the proposed subdivision will be accessed via 80th Ave NE and NE 125th Street. Two lots fronting 80th Ave NE will access directly onto 80th Avenue NE. Five lots fronting directly on NE 125th Street will have direct access to NE 125th Street. The remainder of the lots will access NE 125th Street indirectly via a public road extension north into the eastern half of the site and a private access tract extending north into the western half of the site.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

King County Metro provides bus service in the area. The nearest Metro bus stop is at 84th Avenue NE and NE 132nd Street, Route 234.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

The completed project will provide garage and driveway parking areas. City of Kirkland Zoning Code 105.47 requires a minimum 20' x 20' parking area in front of each residence's garage in low density residential zones. This will ensure each residence will have a minimum of two spaces, for a total minimum of 40 spaces. Additional street parking will be available on public streets as permitted by the City. The project will eliminate parking spaces associated with the existing single family residence at 12432 Juanita Drive NE, but these will be replaced with the construction of new residences.

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

The project will require frontage improvements along Juanita Drive NE including curb/gutter, planter and sidewalk. Striping of a bike lane may also be required along Juanita drive. Frontage improvements will be required along the project's frontages on NE 125th Street and 80th Ave NE including installation of minor road widening, curb/gutter, planter and sidewalk. The private access tract will include, minimum, 20-feet wide paving along the length of the access tract.. The public road extension into the project from NE 125th Street will include 24' of paving, and installation of curb/gutter, planter and sidewalk on both sides of the road and will extend to the north boundary of the site.

e. Will the project or proposal 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 or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

240 daily trips are projected during the weekdays. 24 AM Peak-Hour Trips and 25 PM Peak-Hour Trips are anticipated during weekdays.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

No.

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

No significant transportation impacts are anticipated. The project has passed the City's transportation concurrency test. The project will be paying transportation impact fees.

15. Public services

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

Yes. The need for public services such as fire, health, and police protection as well as public transit and schools will be typical of a residential development of this size. The school children originating from homes in this development will attend schools in the Lake Washington School District.

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

The roads and homes will be constructed to meet all applicable standards and codes of the City and the International Residential Code. The proposed development will contribute to the local tax base and provide additional tax revenue for the various public services. The impact to the schools, parks and traffic will be mitigated through the payment of impact fees.

16. Utilities

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

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.

Electricity and Natural Gas will be provided by Puget Sound Energy; Water and Sanitary Sewer service will be provided by Northshore Utility District. Frontier Communications is the local telephone provider. Cable providers include Comcast Cable, Frontier Communications, and Dish Network. Refuse service will be provided by Waste Management.

Power and gas mains will be required to be extended along 80th Ave NE to serve the two lots fronting 80th Ave NE. Gas and Power will also be extended into the site along the public road extension and private access tract. Phone and cable will follow the power trenching.

Street lighting is likely to be required to be installed along NE 125th and north along the public road extension.

Water and Sewer Mains will be extended into the subdivision from NE 125th Street along the public road extension and access tract. Sewer and Water will stub to the north boundary near the end of the public road extension.

Strom drainage improvements will be installed along the north side of NE 125th Street and along the East side of Juanita Drive NE; as well as along the public road extension and private access tract.

C. 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: _____

Name of signee HANS CHRISTIANSEN

Position and Agency/Organization LAND ENTITLEMENT MANAGER, TOLL WA LP

Date Submitted: 3/25/2015

associated
earth sciences
incorporated

November 6, 2014
Project No. KE140565A

Toll Brothers
9720 NE 120th Place, Suite 100
Kirkland, Washington 98034

Attention: Mr. Hans Christiansen

Subject: Subsurface Exploration, Geologic Hazard, and Geotechnical Engineering Report
Radke Short Plat
12432 Juanita Drive Northeast
Kirkland, Washington

Dear Mr. Christiansen:

We are pleased to present the enclosed copies of the referenced report. This report summarizes the results of our subsurface exploration, geologic hazard, and geotechnical engineering studies and offers recommendations for the design and development of the proposed project. This report is based on a project layout shown on a plan titled "Vault" by Land Development Advisors, LLC dated September, 2014, and on a site survey by Mead Gilman and Associates dated October 15, 2014. If project plans are changed from those on which this report is based, we should be allowed to review our recommendations and make any revisions that may be required as a result of the changes.

We have enjoyed working with you on this study and are confident that the recommendations presented in this report will aid in the successful completion of your project. If you should have any questions, or if we can be of additional help to you, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

Kurt D. Merriman, P.E.
Senior Principal Engineer

KDM/pc
KE140565A2
Projects\20140565\KE\WP

Kirkland Office | 911 Fifth Avenue | Kirkland, WA 98033 P | 425.827.7701 F| 425.827.5424
Everett Office | 2911 ½ Hewitt Avenue, Suite 2 | Everett, WA 98201 P | 425.259-0522 F | 425.252.3408
Tacoma Office | 1552 Commerce Street, Suite 102 | Tacoma, WA 98402 P | 253.722.2992 F | 253.722.2993
www.aesgeo.com

Geotechnical Engineering

Water Resources

Environmental Assessments and Remediation

Sustainable Development Services

Geologic Assessments

Associated Earth Sciences, Inc.

Serving the Pacific Northwest Since 1981

Subsurface Exploration, Geologic Hazard, and Geotechnical Engineering Report

RADKE SHORT PLAT

Kirkland, Washington

Prepared for

Toll Brothers

Project No. KE140565A
November 6, 2014

SUBSURFACE EXPLORATION, GEOLOGIC HAZARD, AND GEOTECHNICAL ENGINEERING REPORT

RADKE SHORT PLAT

Kirkland, Washington

Prepared for:
Toll Brothers
9720 NE 120th Place, Suite 100
Kirkland, Washington 98034

Prepared by:
Associated Earth Sciences, Inc.
911 5th Avenue
Kirkland, Washington 98033
425-827-7701
Fax: 425-827-5424

November 6, 2014
Project No. KE140565A

I. PROJECT AND SITE CONDITIONS

1.0 INTRODUCTION

This report presents the results of our subsurface exploration, geologic hazard, and geotechnical engineering study for the proposed new residential development. The site location is shown on the "Vicinity Map," Figure 1. The approximate locations of explorations completed for this study, along with planned site features, are shown on the "Site and Exploration Plan," Figure 2. Interpretive exploration logs and laboratory test results are included in the Appendix. The conclusions and recommendations contained in this report should be reviewed and modified, or verified, if project plans change substantially.

1.1 Purpose and Scope

The purpose of this study was to provide subsurface data to be used in the design of the project. Our study included a review of selected geologic literature, excavating exploration pits, and performing geologic studies to assess the type, thickness, distribution, and physical properties of the subsurface sediments and shallow ground water. Geotechnical engineering studies were completed to formulate our recommendations for site preparation, site grading, construction, and drainage. This report summarizes our current fieldwork and offers recommendations for development based on our present understanding of the project. We recommend that we be allowed to review any revisions to project plans to verify that our geotechnical engineering recommendations have been correctly interpreted and incorporated into the design.

1.2 Authorization

This report has been prepared for the exclusive use of Toll Brothers and its agents for specific application to this project. Our work was performed in accordance with our scope of work and cost proposal dated October 1, 2014. We were authorized to proceed by means of a consultant agreement.

Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering and engineering geology practices in effect in this area at the time our report was prepared. No other warranty, express or implied, is made.

2.0 PROJECT AND SITE DESCRIPTION

The subject site consists of three adjacent parcels that total approximately 3.5 acres. Topography slopes down to the west with overall vertical relief across the site on the order of 40 feet. The site appears to contain areas that meet the City of Kirkland definition for Moderate Landslide Hazard Areas as defined in *Kirkland Municipal Code* (KMC) section 85.13. The site is currently occupied by two homes, driveways, outbuildings, buried and overhead utilities, and wooded areas.

The proposed project will include construction of 18 new home sites and associated improvements. A below ground storm water detention vault is planned at the southwest site corner. Two additional new homes will be built on a short plat that is separated from the remainder of the project. No grading plans were available at the time this report was written. We anticipate that earthwork cuts and fills will be up to about 5 to 10 feet. The detention vault is expected to have an interior height of 12 feet, and may require excavation of up to approximately 17 feet below existing grade to construct.

3.0 SUBSURFACE EXPLORATION

Our field study included excavation of exploration pits with a tracked excavator. Initially seven exploration pits were planned. We identified existing loose fill on the site, and completed additional exploration pits to delineate the fill. A total of 28 exploration pits were completed. Some of the exploration pits were completed specifically for the purpose of identifying the depth of existing fill, and were completed using abbreviated exploration procedures and an abbreviated exploration log format. The locations of the exploration pits were estimated based on measurements with hand-held compass and string box tools from site features shown on the "Site and Exploration Plan" (Figure 2). The locations of these explorations should therefore be considered approximate. Interpretive exploration logs are presented in the Appendix.

The various types of sediments, as well as the depths where characteristics of the sediments changed, are indicated on the exploration logs presented in the Appendix. The depths indicated on the logs where conditions changed may represent gradational variations between sediment types in the field.

The conclusions and recommendations presented in this report are based on the explorations completed for this study. The number, locations, and depths of our explorations were completed within site and budget constraints. Because of the nature of exploratory work below ground, extrapolation of subsurface conditions between field explorations is necessary. It should be noted that differing subsurface conditions may sometimes be present due to the

random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of any variations between the field explorations may not become fully evident until construction. If variations are observed at that time, it may be necessary to re-evaluate specific recommendations in this report and make appropriate changes.

3.1 Exploration Pits

The exploration pits were excavated using a tracked excavator. The pits permitted direct, visual observation of subsurface conditions. Materials encountered in the exploration pits were studied and classified in the field by a geologist from our firm. All exploration pits were backfilled after examination and logging. Selected samples were then transported to our laboratory for further visual classification and testing, as necessary.

4.0 SUBSURFACE CONDITIONS

Subsurface conditions at the project site were inferred from the field explorations accomplished for this study, visual reconnaissance of the site, and review of selected geologic literature. The general distribution of geologic units is shown on the exploration logs. The explorations encountered native materials consisting of dense lodgement till and advance outwash sediments. Existing fill was also observed and is discussed in greater detail later in this report.

Our interpretations of subsurface conditions are generally consistent with the conditions shown on a published geologic map of the area. We reviewed the *Geologic Map of the Kirkland Quadrangle, Washington*, by James P. Minard, United States Geologic Survey (USGS) Miscellaneous Field Studies MF-1543, 1983. The referenced map indicates that the site is underlain by lodgement till sediments.

4.1 Stratigraphy

Grass/Topsoil

A surficial layer of grass and organic topsoil was encountered at the location of each of the exploration pits. This organic layer ranged from approximately 3 to 18 inches in thickness. Observed topsoil thickness is shown on the attached subsurface exploration logs. Due to their high organic content, these materials are not considered suitable for foundation, roadway, or slab-on-grade floor support, or for use in a structural fill.

Existing Fill

Existing fill was observed in two different areas. Existing fill was observed in the central part of the site near the existing circle drive, and along the south and east site perimeter.

Central Fill

Prior to the site visit, we were informed to expect existing fill in the area of the existing circle driveway near the center of the site. The fill was reportedly imported from a nearby gasoline station renovation project relatively recently. Toll Brothers hired an environmental consultant to observe and sample exploration pits in this central fill area and to complete analytical testing for possible contaminants. We observed items of geotechnical significance including moisture and density of the existing fill, presence of deleterious material such as organic debris and demolition waste, and the thickness of existing fill at the exploration locations. Our observations are documented in Table 1 below, in the interpretive subsurface exploration logs in the Appendix, and on the "Site and Exploration Plan," Figure 2. In general the central fill area was composed of loose silty sand with variable but generally small amounts of organic debris and demolition waste. The material comprising the central fill was above optimum moisture content for compaction purposes and would need to be dried during dry site and weather conditions to allow reuse in compacted fills. The central fill is not suitable for support of structures or paving. The existing fill in the central fill area should be removed from below foundations and paving, and replaced as needed with structural fill. Below paving areas it would be feasible to treat the existing fill material with Portland cement to reduce moisture content, followed by recompaction. Cement treatment, if used, should be planned for completion during dry site and weather conditions and should be included in project documents submitted to the City for review.

Perimeter Fill Areas

We observed existing fill in the areas of the south and east site perimeter. Anecdotal information from the property owner indicates that the neighboring properties to the east and south were owned in the past by a commercial landscape maintenance business. The neighboring landscape business reportedly disposed of waste from the landscape business on the adjacent properties, and the disposal areas extended onto the site. This anecdotal information is consistent with our observations. Along the south and east site perimeter, we observed existing surficial fill that typically consisted of topsoil, wood chips, and generally highly organic material. The material comprising the perimeter fill was also observed to contain substantial debris including plastic pots, irrigation system parts, landscaping equipment parts, car parts, metal debris, and similar materials. The existing fill at the site perimeter is described in further detail in Table 1 below, in interpretive subsurface exploration logs included in the Appendix, and on the "Site and Exploration Plan," Figure 2. The existing fill at

the site perimeter is not suitable for structural support or for reuse in compacted fill applications. Existing fill at the site perimeter should be removed from below planned structures and paving.

Vashon Lodgement Till

Twenty-five of the exploration pits encountered typically medium dense grading to very dense, silty sand with gravel, cobbles, and boulders interpreted as Vashon lodgement till. The lodgement till observed in our explorations graded from medium dense and brown in the weathered zone near the surface to gray to gray-brown at depth. Lodgement till was deposited at the base of an active continental glacier and was subsequently compacted by the weight of the overlying glacial ice. Lodgement till typically possesses high-strength and low-compressibility attributes that are favorable for support of foundations, floor slabs, and paving, with proper preparation. Lodgement till is silty and moisture-sensitive. In the presence of moisture contents above the optimum moisture content for compaction purposes, lodgement till can be easily disturbed by vehicles and earthwork equipment. Careful management of moisture-sensitive soils, as recommended in this report, will be needed to reduce the potential for disturbance of wet lodgement till soils and costs associated with repairing disturbed soils.

Vashon Advance Outwash

Five of the exploration pits encountered typically medium dense grading to very dense fine sand with variable but generally small components of silt and gravel interpreted as Vashon advance outwash. The advance outwash typically exhibited some degree of cementing expressed through excavation spoils remaining in relatively large and coherent pieces. Gradational stratification of the advance outwash was also common. Advance outwash was deposited by melt water streams from an advancing continental glacier, and was subsequently overridden and compacted by the weight of the glacial ice. Advance outwash sediments are suitable for support of structural loads and paving with proper preparation. Advance outwash contains some silt and is moisture sensitive. In the presence of moisture contents above the optimum moisture content for compaction purposes, advance outwash can be easily disturbed by vehicles and earthwork equipment. Careful management of moisture-sensitive soils, as recommended in this report, will be needed to reduce the potential for disturbance of wet soils and costs associated with repairing disturbed soils.

4.2 Hydrology

Ground water seepage was encountered in one exploration pit (EP-5) completed for this study and was interpreted to represent perched ground water. Perched ground water occurs where downward infiltration of surface water is impeded by low permeability soil layers, and the

ground water migrates laterally and generally down slope. Ground water conditions should be expected to vary in response to changes in season, weather, on- and off-site land use, and other factors.

4.3 Laboratory Test Results

Laboratory testing completed on selected soil samples is summarized below. Laboratory test data are included in the Appendix.

Table 1

Exploration Pit	Approximate Ground Surface Elevation (feet)	Depth to Bearing Soil (feet)	Approximate Bearing Soil Elevation[1] (feet)	Existing Moisture Content (percent)
EP-1	354	1.2	353	10.7 @ 3'*
				5.9 @ 5'
				11.0 @ 6.5'
EP-2	350	8	342	14.6 @ 5'*
				8.7 @ 10'
EP-3	354	6	348	11.6 @ 3'*
				11.3 @7'*
EP-4	354	1-5 (varies)**	349-353	NT
				NT
EP-5	357	.4	356	13.9 @ 8'*
EP-6	359	1	358	10.9 @3'
				12.4 @ 8'*
EP-7	368	2.5-5.5 (varies)**	362.5-365.5	8.4 @ 6'
				6.5 @ 8'
EP-8	372	.9	371	5.7 @ 3'
				6.5 @ 8'
EP-9	342	1	341	3.6 @ 3'
				5.9 @ 8'
EP-10	333	1	332	5.7 @ 3'
				5.0 @ 7'
EP-11	343	2	341	NT
EP-12	339	1	338	NT
EP-13	344	2	342	NT
EP-14	343	4	339	6.5 @ 4.5'
				7.3 @ 9'
EP-15	349	1-5 (varies)**	344-348	NT
EP-16	351	5	346	NT
EP-17	354	2	352	NT
EP-18	360	2	358	NT
EP-19	364	.5	363	NT

Exploration Pit	Approximate Ground Surface Elevation (feet)	Depth to Bearing Soil (feet)	Approximate Bearing Soil Elevation[1] (feet)	Existing Moisture Content (percent)
EP-20	366	.5	365	NT
EP-21	344	1-5 (varies)**	339-343	NT
EP-22	346	0-2 (varies)**	344-346	NT
EP-23	351	1-4 (varies)**	347-350	NT
EP-24	355	4.5	350	NT
EP-25	355	.5	354	NT
EP-26	340	1	339	NT
EP-27	342	1	341	NT
EP-28	344	1	343	NT

(1) Elevation Reference: Mead Gilman & Associates "Radke Boundary & Topo Survey 10/15/14."
* Samples more than 2 percent above optimum moisture content.
** Depth to bearing varies across exploration pit limits.
NT – Not Tested

For this project we completed two laboratory maximum density tests. The maximum dry density was determined using the modified Proctor test procedure (*American Society for Testing and Materials* [ASTM]:D 1557). The results are as follows in Table 2:

Table 2

Material	Maximum Dry Density (pcf)(1)	Optimum Moisture Content (percent)
Lodgement Till	122.0	9.0
Advance Outwash	120.0	12.0

(1) pcf = pounds per cubic foot.

4.4 Infiltration Feasibility

Most of the site is underlain at shallow depths by lodgement till sediments that are not a suitable infiltration receptor. Advance outwash was observed in five exploration pits at generally higher elevations on the east part of the site. Advance outwash is likely present at some depth below the western part of the site as well, at depths greater than our exploration pits completed to date. Advance outwash is often suitable for use as an infiltration receptor if it is unsaturated. Textural stratification, high density, and partial cementation of the advance outwash typically result in the use of pit drains or other similar strategies when an advance outwash receptor is used. Quantitative assessment of storm water infiltration potential is beyond the scope of this study.

II. GEOLOGIC HAZARDS AND MITIGATIONS

The following discussion of potential geologic hazards is based on the geologic, slope, and shallow ground water conditions as observed and discussed herein.

5.0 LANDSLIDE HAZARDS AND MITIGATIONS

It is our opinion that the risk of damage to the proposed structures by landsliding is low due to gentle slope inclinations and the presence of medium dense to dense soils observed at relatively shallow depths beneath the surface of the site. No detailed slope stability analyses were completed as part of this study, and none are warranted, in our opinion. Based on our review of the KMC, and the site topographic survey completed by Mead Gilman and Associates, it appears that the site may contain areas that meet the City definition for Moderate Landslide Hazard Areas. This report is intended to address the code-mandated geotechnical reporting requirements associated with Moderate Landslide Hazard Areas.

6.0 SEISMIC HAZARDS AND MITIGATIONS

Earthquakes occur regularly in the Puget Lowland. Most of these events are small and are not felt by people. However, large earthquakes do occur, as evidenced by the 2001, 6.8-magnitude event; the 1965, 6.5-magnitude event; and the 1949, 7.2-magnitude event. The 1949 earthquake appears to have been the largest in this region during recorded history and was centered in the Olympia area. Evaluation of earthquake return rates indicates that an earthquake of the magnitude between 5.5 and 6.0 is likely within a given 20-year period.

Generally, there are four types of potential geologic hazards associated with large seismic events: 1) surficial ground rupture, 2) seismically induced landslides, 3) liquefaction, and 4) ground motion. The potential for each of these hazards to adversely impact the proposed project is discussed below.

6.1 Surficial Ground Rupture

The nearest known fault traces to the project site are the South Whidbey Island-Lake Alice Fault located approximately 5 miles to the northeast, and the Seattle Fault located approximately 10 miles to the south. Recent studies of both the Seattle Fault and the South Whidbey Island-Lake Alice fault indicate that they are active faults capable of generating surface ruptures. The recognition of these faults is relatively new, and data pertaining to them are limited, with the studies still ongoing. According to the USGS studies, the recurrence

interval of movements along these faults is unknown, but is speculated to be on the order of 1,100 years. Due to the distance from the site to the known fault zones, the risk for damage to the project due to surface faulting is expected to be low, in our opinion.

6.2 Seismically Induced Landslides

It is our opinion that the risk of damage to the proposed structures by seismically induced landsliding is low due to gentle slope inclinations and the presence of medium dense to very dense soils observed at shallow depth beneath the surface of the site.

6.3 Liquefaction

Liquefaction is a temporary loss in soil shear strength that can occur when loose granular soils below the ground water table are exposed to cyclic accelerations, such as those that occur during earthquakes. The observed site soils were relatively dense and unsaturated and are not expected to be prone to liquefaction. A detailed liquefaction hazard analysis was not performed as part of this study, and none is warranted, in our opinion.

6.4 Seismic Site Class (2012 *International Building Code*)

In our opinion the subsurface conditions at the site are consistent with seismic Site Class C in accordance with the 2012 *International Building Code* (IBC), and the publication ASCE 7 referenced therein, the most recent version of which is ASCE 7-10.

6.5 Erosion Control

The existing soils on the site are considered moderately to highly prone to erosion when exposed to surface water in a sloping environment. Project plans should include implementation of temporary erosion controls in accordance with local standards of practice. Control methods should include limiting earthwork to seasonally drier periods, typically April 1 to October 31, use of perimeter silt fences, and straw mulch in exposed areas. Removal of existing vegetation should be limited to those areas that are required to construct the project, and new landscaping and vegetation with equivalent erosion mitigation potential should be established as soon as possible after grading is complete. During construction, surface water should be collected as close as possible to the source to minimize silt entrainment that could require treatment or detention prior to discharge. Timely implementation of permanent drainage control measures should also be a part of the project plans, and will help reduce erosion and generation of silty surface water on site.

III. DESIGN RECOMMENDATIONS

7.0 INTRODUCTION

Our exploration indicates that, from a geotechnical engineering standpoint, the proposed project is feasible provided the recommendations contained herein are properly followed. The bearing stratum is shallow and conventional shallow foundations should perform well with proper subgrade preparation. Two areas of existing fill depicted on Figure 2, and existing fill that is likely to exist around existing structures and buried utilities will require removal at the time of construction. Excavated existing fill from the central fill area would be reusable in compacted fill applications if any deleterious materials are removed, and if the moisture content is lowered through aeration or cement treatment prior to compaction.

8.0 SITE PREPARATION

Site preparation of building and paving areas should include removal of all grass, trees, brush, debris, and any other deleterious materials. All existing fill should be removed from below structural and paving areas. We recommend that any existing septic systems, wells, heating oil storage tanks, and other similar structures be decommissioned and removed in accordance with applicable regulations. Existing buildings, foundations, and any other buried structures should be removed from below foundation areas. Buried utilities should be removed from foundation areas, and should be abandoned in place or removed from below planned new paving. Any depressions below planned final grades caused by demolition activities should be backfilled with structural fill, as discussed under the “Structural Fill” section.

Existing topsoil should be stripped from structural areas. The actual observed in-place depth of topsoil and grass at the exploration locations is presented on the exploration logs in the Appendix. After stripping, remaining roots and stumps should be removed from structural areas. All soils disturbed by stripping and grubbing operations should be recompacted as described below for structural fill.

Once excavation to subgrade elevation is complete, the resulting surface should be proof-rolled with a loaded dump truck or other suitable equipment. Any soft, loose, yielding areas or areas exposing existing fill should be excavated to expose suitable bearing soils. The subgrade should then be compacted to at least 95 percent of the modified Proctor maximum dry density, as determined by the ASTM:D 1557 test procedure. Structural fill can then be placed to achieve desired grades, if needed.

8.1 Temporary Cut Slopes

In our opinion, stable construction slopes should be the responsibility of the contractor and should be determined during construction. For estimating purposes, however, temporary, unsupported cut slopes can be planned at 1.5H:1V (Horizontal:Vertical) in unsaturated weathered lodgement till and advance outwash, and at 1H:1V in dense, unweathered till and advance outwash. During site development planning, sufficient space should be allowed around excavations for construction of houses and the storm water vault while keeping temporary slopes inclined at the recommended angles on-site. If situations arise where temporary slopes at the recommended inclinations are not feasible, off-site easements or excavation shoring will be required. We should be allowed to offer situation–specific recommendations for excavation shoring, if shoring is added to the project.

The recommended temporary slope angles are for areas where ground water seepage is not present at the faces of the slopes, which may require temporary dewatering in the form of pumped sumps or other measures. If ground or surface water is present when the temporary excavation slopes are exposed, flatter slope angles may be required. As is typical with earthwork operations, some sloughing and raveling may occur, and cut slopes may have to be adjusted in the field. In addition, WISHA/OSHA regulations should be followed at all times.

8.2 Excavation Dewatering

Some excavations may encounter localized areas of perched ground water seepage. We anticipate that ground water seepage will be controllable with trenches and pumped sumps. We do not anticipate that pumped dewatering wells or similar measures will be required. If excavation is planned deeper than the subsurface explorations completed for this study, deeper subsurface explorations may be warranted. Deeper excavations have the potential to fully penetrate the lodgement till sediments and encounter advance outwash sediments. If saturated, advance outwash sediments would require a dewatering analysis and a dewatering system prior to excavation.

8.3 Site Disturbance

Most of the on-site soils contain fine-grained material, which makes them moisture-sensitive and subject to disturbance when wet. The contractor must use care during site preparation and excavation operations so that the underlying soils are not softened. If disturbance occurs, the softened soils should be removed and the area brought to grade with structural fill.

8.4 Winter Construction

The lodgement till sediments contain substantial silt and are considered highly moisture-sensitive. Approximately one-third of the samples we tested for moisture content were above optimum moisture content for compaction purposes. Advance outwash sediments are moisture sensitive to a lesser degree than lodgment till, but are still difficult to work during wet site and weather conditions. The samples were collected during October, and likely represent moisture conditions that are dryer than during other times of the year. Soils excavated on-site will require drying during favorable dry weather conditions to allow their reuse in structural fill applications. Care should be taken to seal all earthwork areas during mass grading at the end of each workday by grading all surfaces to drain and sealing them with a smooth-drum roller. Stockpiled soils that will be reused in structural fill applications should be covered whenever rain is possible.

If winter construction is expected, crushed rock fill could be used to provide construction staging areas. The stripped subgrade should be observed by the geotechnical engineer, and should then be covered with a geotextile fabric, such as Mirafi 500X or equivalent. Once the fabric is placed, we recommend using a crushed rock fill layer at least 10 inches thick in areas where construction equipment will be used.

9.0 STRUCTURAL FILL

We anticipate that cuts and fills of up to about 5 to 10 feet will be required to establish subgrades for roads and buildings. All references to structural fill in this report refer to subgrade preparation, fill type, placement, and compaction of materials, as discussed in this section. If a percentage of compaction is specified under another section of this report, the value given in that section should be used. For backfill of buried utilities in the right-of-way, the backfill should be placed and compacted in accordance with the City of Kirkland codes and standards.

After stripping, planned excavation, fill removal, and any required overexcavation have been performed to the satisfaction of the geotechnical engineer/engineering geologist, the surface of the exposed ground should be recompacted to a firm and unyielding condition. If the subgrade contains too much moisture, adequate recompaction may be difficult or impossible to obtain, and should probably not be attempted. In lieu of recompaction, the area to receive fill should be blanketed with washed rock or quarry spalls to act as a capillary break between the new fill and the wet subgrade. Where the exposed ground remains soft and further overexcavation is impractical, placement of an engineering stabilization fabric may be necessary to prevent contamination of the free-draining layer by silt migration from below.

After recompaction of the exposed ground is tested and approved, or a free-draining rock course is laid, structural fill may be placed to attain desired grades. Structural fill is defined as non-organic soil, acceptable to the geotechnical engineer, placed in maximum 8-inch loose lifts, with each lift being compacted to 95 percent of ASTM:D 1557. The top of the compacted fill should extend horizontally outward a minimum distance of 3 feet beyond the locations of the perimeter footings or roadway edges before sloping down at a maximum angle of 2H:1V.

The contractor should note that any proposed fill soils must be evaluated by Associated Earth Sciences, Inc. (AESI) prior to their use in fills. This would require that we have a sample of the material at least 72 hours in advance to perform a Proctor test and determine its field compaction standard. Two such tests on soils representative of the on-site native soils are included in this report.

Soils in which the amount of fine-grained material (smaller than the No. 200 sieve) is greater than approximately 5 percent (measured on the minus No. 4 sieve size) should be considered moisture-sensitive. The lodgement till and advance outwash soils are estimated to contain substantially more than 5 percent fine-grained material. Use of moisture-sensitive soil in structural fills should be limited to favorable dry weather and dry subgrade conditions. Construction equipment traversing the site when the soils are wet can cause considerable disturbance.

Existing fill will be excavated from the site in two areas. Excavated existing fill from the vicinity of the central part of the site will be suitable for reuse in compacted fill applications if any deleterious materials such as organic debris and demolition waste are removed, and if the material is either aerated or cement treated to reduce moisture content. If cement treatment is planned, we recommend that it be included in project documents submitted for permit review.

Existing fill from the site perimeter on the south and east sides was observed to be composed primarily of organic material and contained substantial debris. Existing fill removed from the south and east site perimeter is not recommended for reuse in compacted fill applications.

If fill is placed during wet weather or if proper compaction cannot be obtained, a select, import material consisting of a clean, free-draining gravel and/or sand should be used. Free-draining fill consists of non-organic soil, with the amount of fine-grained material limited to 5 percent by weight when measured on the minus No. 4 sieve fraction, and at least 25 percent retained on the No. 4 sieve.

Laboratory testing completed for this study measured moisture levels in numerous soil samples collected from the exploration pits. Approximately one-third of the tested samples were above optimum moisture content for compaction purposes. Samples were collected during October,

typically the seasonally driest time of year, and wetter conditions may be present at the time of construction. In order to reuse excavated on-site soils in structural fill applications, it will be necessary to moisture-condition wet site soils by aeration and drying during favorable dry weather conditions. Alternatives to drying site soils include using imported granular soils suitable for use in structural fill, or treating wet soils with Portland cement.

10.0 FOUNDATIONS

Spread footings may be used for building support when they are founded on approved structural fill placed as described above, or on undisturbed natural soils that are prepared as recommended in this report. Based on our observations, suitable foundation bearing soils are expected approximately 1 foot below the existing ground surface in most places.

For residential structures, footings may be designed for an allowable foundation soil bearing pressure of 3,000 pounds per square foot (psf), including both dead and live loads. An increase of one-third may be used for short-term wind or seismic loading. Perimeter footings should be buried at least 18 inches into the surrounding soil for frost protection. However, all foundations must penetrate to the prescribed bearing strata, and no foundations should be constructed in or above loose, organic, or existing fill soils.

Anticipated settlement of footings founded as recommended should be on the order of ¾ inch or less, with differential settlement of ½ inch or less. However, disturbed material not removed from footing trenches prior to footing placement could result in increased settlements. All footing areas should be inspected by AESI prior to placing concrete to verify that the foundation subgrades are undisturbed and construction conforms to the recommendations contained in this report. Such inspections may be required by City of Kirkland. Perimeter footing drains should be provided as discussed under the “Drainage Considerations” section of this report.

It should be noted that the area bounded by lines extending downward at 1H:1V from any footing must not intersect another footing or intersect a filled area that has not been compacted to at least 95 percent of ASTM:D 1557. In addition, a 1.5H:1V line extending down and away from any footing must not daylight because sloughing or raveling may eventually undermine the footing. Thus, footings should not be placed near the edges of steps or cuts in the bearing soils.

11.0 FLOOR SUPPORT

If crawl-space floors are used, an impervious moisture barrier should be provided above the soil surface within the crawl space. Slab-on-grade floors may be used over medium dense to very dense native soils, or over structural fill placed as recommended in the "Site Preparation" and "Structural Fill" sections of this report. Slab-on-grade floors should be cast atop a minimum of 4 inches of washed pea gravel or washed crushed "chip" rock with less than 3 percent passing the U.S. No. 200 sieve to act as a capillary break. The floors should also be protected from dampness by covering the capillary break layer with an impervious moisture barrier at least 10 mils in thickness.

12.0 DRAINAGE CONSIDERATIONS

All footings, basement walls, and retaining walls should be provided with a drain at the footing elevation. Drains should consist of rigid, perforated, polyvinyl chloride (PVC) pipe surrounded by washed pea gravel. The level of the perforations in the pipe should be set downward and at the bottom of the footing at all locations, and the drain collectors should be constructed with sufficient gradient to allow gravity discharge away from the buildings. In addition, all foundation walls taller than 3 feet should be lined with a minimum, 12-inch-thick, washed gravel blanket drain provided to within 1 foot of finish grade that ties into the footing drain. A prefabricated drainage mat is not an acceptable alternative to the gravel blanket drain unless the entire excavation backfill consists of free-draining structural fill. Roof and surface runoff should not discharge into the footing drain system, but should be handled by a separate, rigid, tightline drain.

In planning, exterior grades adjacent to foundations should be sloped downward away from the structures to achieve surface drainage. These recommendations apply to conventional shallow foundation walls and landscape walls less than about 4 feet tall. One should refer to the following section for walls up to 10 feet tall.

13.0 CAST–IN–PLACE RETAINING WALLS AND BASEMENT WALLS

All backfill behind foundation walls or around foundation units should be placed as per our recommendations for structural fill and as described in this section of the report. Horizontally backfilled walls that are free to yield laterally at least 0.1 percent of their height may be designed using an equivalent fluid equal to 35 pounds per cubic foot (pcf). Fully restrained, horizontally backfilled, rigid walls that cannot yield should be designed for an equivalent fluid of 50 pcf. Walls with sloping backfill up to a maximum gradient of 2H:1V should be designed using an equivalent fluid of 55 pcf for yielding conditions or 75 pcf for fully restrained

conditions. If parking areas are adjacent to walls, a surcharge equivalent to 2 feet of soil should be added to the wall height in determining lateral design forces.

As required by the 2012 IBC, retaining wall design should include a seismic surcharge pressure in addition to the equivalent fluid pressures presented above. Considering the site soils and the recommended wall backfill materials, we recommend a seismic surcharge pressure of 5H and 10H psf, where H is the wall height in feet for the "active" and "at-rest" loading conditions, respectively. The seismic surcharge should be modeled as a rectangular distribution with the resultant applied at the midpoint of the walls.

The lateral pressures presented above are based on the conditions of a uniform backfill consisting of excavated on-site soils, or imported structural fill compacted to 90 percent of ASTM:D 1557. A higher degree of compaction is not recommended, as this will increase the pressure acting on the walls. A lower compaction may result in settlement of the slab-on-grade or other structures supported above the walls. Thus, the compaction level is critical and must be tested by our firm during placement. Surcharges from adjacent footings or heavy construction equipment must be added to the above values. Perimeter footing drains should be provided for all retaining walls, as discussed under the "Drainage Considerations" section of this report.

It is imperative that proper drainage be provided so that hydrostatic pressures do not develop against the walls. This would involve installation of a minimum 1-foot-wide blanket drain to within 1 foot of finish grade for the full wall height using imported, washed gravel against the walls. If situations exist where a footing drain is not feasible for a foundation wall or retaining wall, the wall should be designed for saturated lateral earth pressures and a hydrostatic surcharge. We should be allowed to offer situation-specific recommendations if this situation arises. The use of drainage improvements as recommended here does not alleviate the need for waterproofing where finished spaces are planned on the interior side of basement walls. Backfilled walls with finished interior space should be waterproofed in accordance with recommendations of the building designer.

14.0 PASSIVE RESISTANCE AND FRICTION FACTOR

Foundation design may assume a base friction coefficient of 0.30 for concrete footings cast against native sediments or structural fill as described in this report. Passive resistance against foundation elements backfilled with structural fill as described in this report may be assumed to be 250 pcf, expressed as an equivalent fluid. These are allowable values and include a factor of safety.

15.0 PAVEMENT RECOMMENDATIONS

Paving for the project is expected to include access road and driveway areas and is expected to be supported by lodgement till, advance outwash, and structural fill. The minimum City of Kirkland pavement section for residential access is feasible. Based on City of Kirkland plan sheet CK-R.09, the recommended pavement consists of 2 inches of Class ½-inch asphalt concrete pavement (ACP) underlain by 4 inches of asphalt treated base (ATB), underlain by 4 inches of crushed surfacing base course (CSBC) that meets Washington State Department of Transportation (WSDOT) Standard Specification 9-03.9(3). Asphalt treated base could be used for construction access followed by repair of any construction damage and final surfacing. All referenced thicknesses are in-place compacted thicknesses. All paving materials should be placed and compacted in accordance with City of Kirkland standard specifications and details.

All structural fill and all native subgrades less than 4 feet below finished grade for a planned roadway should be compacted to 95 percent of the modified Proctor maximum dry density as determined by ASTM:D-1557. Prior to structural fill placement or to placement of base course materials over native subgrades, the area should be proof-rolled under the observation of AESI with a loaded dump truck or other suitable equipment to identify any soft or yielding areas. Any soft or yielding areas should be repaired prior to continuing work.

For private driveways and parking areas not subject to City requirements for public streets, lighter pavement sections could be used. For passenger car driveway and parking areas, we recommend a paving section consisting of 2.5 inches of ACP above 4 inches of crushed surfacing top course. For areas that will be used by heavy traffic, such as delivery trucks and garbage trucks, we recommend a paving section consisting of 4 inches of ACP above 2 inches of crushed surfacing top course above 4 inches of CSBC.

16.0 DETENTION STRUCTURE CONSIDERATIONS

The detention vault foundations are expected to be supported entirely on unweathered lodgement till or advance outwash sediments, and may be designed using an allowable foundation soil bearing pressure of 5,000 psf. The detention vault may be designed to resist at-rest lateral earth pressures as described in Section 13.0 of this report assuming drained conditions. If it is not possible to construct the vault with a foundation drain, hydrostatic surcharges must be incorporated and a lateral earth pressure of 90 pcf (equivalent fluid) should be assumed. If paved surfaces are to be constructed above the backfill soils, a uniform traffic surcharge of 70 pcf should be added.

17.0 PROJECT DESIGN AND CONSTRUCTION MONITORING

This report is based on previously referenced plans that were current at the time it was written. We are available to provide additional geotechnical consultation as the project design develops and possibly changes from that upon which this report is based. We recommend that AESI perform a geotechnical review of the plans prior to construction. In this way, our earthwork and foundation recommendations may be properly interpreted and implemented in the design.

We are also available to provide geotechnical engineering and monitoring services during construction. The integrity of the foundations for buildings and of retaining walls depends on proper site preparation and construction procedures. In addition, engineering decisions may have to be made in the field in the event that variations in subsurface conditions become apparent. Construction monitoring services are not part of the current scope of work. If these services are desired, please let us know, and we will prepare a cost proposal.

We have enjoyed working with you on this study and are confident that these recommendations will aid in the successful completion of your project. If you should have any questions or require further assistance, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

KURT D. MERRIMAN
STATE OF WASHINGTON
23580
REGISTERED
PROFESSIONAL ENGINEER

11/6/14

Bruce W. Guenzler, L.E.G.
Senior Project Geologist

Kurt D. Merriman, P.E.
Senior Principal Engineer

Attachments:	Figure 1:	Vicinity Map
	Figure 2:	Site and Exploration Plan
	Appendix:	Exploration Logs
		Laboratory Testing Results

REFERENCE: USGS, KING CO

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

associated earth sciences incorporated

VICINITY MAP

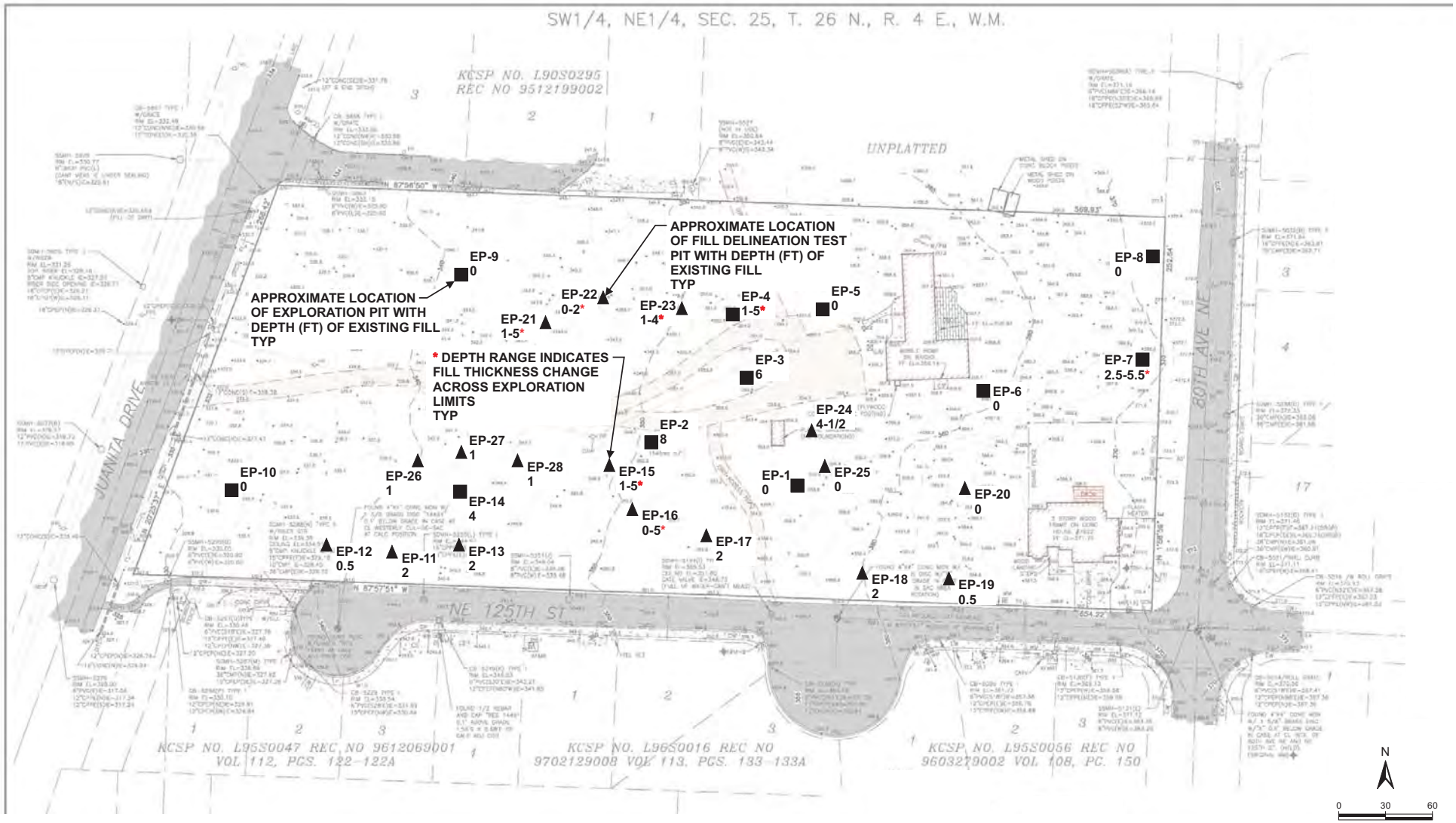
RADKE SHORT PLAT
KIRKLAND, WASHINGTON

FIGURE 1

DATE 10/14

PROJ. NO. KE140565A

Document Path: H:\GIS_Projects\aTemplates\aVM_Template\ProjectVicinity_King.mxd



REFERENCE: MEAD GILMAN & ASSOC.

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

140565 Radke Short Plat\140565 Site and Exploration Plan.cdr

associated earth sciences incorporated

SITE AND EXPLORATION PLAN
RADKE SHORT PLAT
KING COUNTY, WASHINGTON

FIGURE 2
DATE 10/14
PROJ. NO. KE140535A

APPENDIX

Exploration Logs
Laboratory Testing Results

Coarse-Grained Soils - More than 50% (1) Retained on No. 200 Sieve	Gravels - More than 50% (1) of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines (5)	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≥12% Fines (5)	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50% (1) or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines (5)	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≥12% Fines (5)	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50% (1) or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diatomaceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

Coarse-Grained Soils

Density	SPT(2) blows/foot
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	>50

Fine-Grained Soils

Consistency	SPT(2) blows/foot
Very Soft	0 to 2
Soft	2 to 4
Medium Stiff	4 to 8
Stiff	8 to 15
Very Stiff	15 to 30
Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

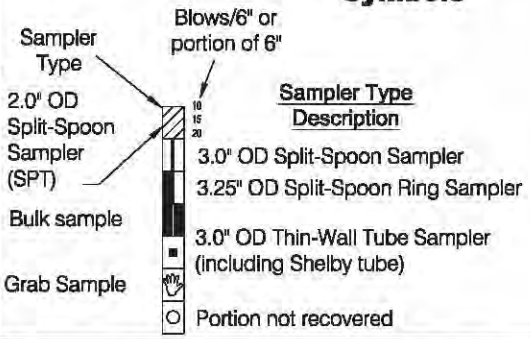
(3) Estimated Percentage

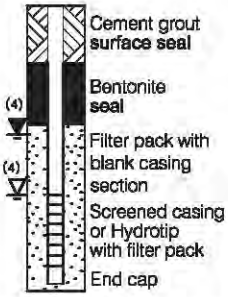
Component	Percentage by Weight
Trace	<5
Some	5 to <12
Modifier (silty, sandy, gravelly)	12 to <30
Very *modifier* (silty, sandy, gravelly)	30 to <50

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

Symbols





(1) Percentage by dry weight
(2) (SPT) Standard Penetration Test (ASTM D-1586)
(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)
(4) Depth of ground water
ATD = At time of drilling
Static water level (date)
(5) Combined USCS symbols used for fines between 5% and 12%

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

associated earth sciences incorporated

EXPLORATION LOG KEY

FIGURE A1

blocks \ dwg \ log_key.dwg LAYOUT: Layout 4 -2014 Qty Chng

LOG OF EXPLORATION PIT NO. EP-1

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION	Elev: 354
	Topsoil	
1		
	Vashon Lodgement Till	
2	Medium dense, moist, reddish brown, silty fine SAND, some fine gravel, scattered roots; nonstratified (SM).	
3	Dense, moist, mottled gray, silty, fine gravelly fine to coarse SAND; nonstratified (SM).	
4		
5		
6	**Vashon Advance Outwash**	
7	Dense, very moist, brown with mottled zones, fine SAND, some silt to silty (SP-SM); some clasts in spoils (cemented).	
8		
9		
10		
11		
12	Bottom of exploration pit at depth 11.5 feet No seepage. No caving.	
13		
14		
15		
16		
17		
18		
19		
20		

KCTP3 140565.GPJ November 3, 2014

Radke Short Plat
King County, WA

Logged by: BWG

Approved by

associated earth sciences incorporated

Project No. KE140565A

10/24/14

LOG OF EXPLORATION PIT NO. EP-2

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: 350
	Topsoil
1	**Fill**
2	Loose, very moist to wet, dark brown, brown, and gray (mixed), silty fine to medium SAND, trace gravel to fine gravelly, trace logs, trace roots, trace topsoil-like organics; organic odor (SM).
3	
4	
5	
6	
7	
8	**Vashon Lodgement Till**
9	Dense, very moist, mottled gray, silty, fine gravelly, fine to coarse SAND; nonstratified (SM).
10	Bottom of exploration pit at depth 9.5 feet No seepage. No caving.
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Radke Short Plat
King County, WA

Logged by: BWG
Approved by:

associated earth sciences incorporated

Project No. KE140565A
10/24/14

KCTP3 140565.GPJ November 3, 2014

LOG OF EXPLORATION PIT NO. EP-3

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

DESCRIPTION **Elev: 354**

Topsoil

Fill

1 Loose, very moist to wet, brown, dark brown, and mottled brown (mixed), silty fine SAND, some fine gravel, trace topsoil-like organics, trace roots; organic odor (SM).

2

3

4

5

6 **Vashon Lodgement Till**

Dense, very moist, reddish brown, silty fine SAND, some fine gravel; nonstratified (SM).

7

8 Bottom of exploration pit at depth 7 feet
No seepage. No caving.

9

10

11

12

13

14

15

16

17

18

19

20

KCTP3 140565.GPJ November 3, 2014

Radke Short Plat
King County, WA

Logged by: BWG

Approved by:

associated earth sciences incorporated

Project No. KE140565A

10/24/14

LOG OF EXPLORATION PIT NO. EP-4

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: 354
	Topsoil
	Fill
1	Fill thickness varies (1 to 5 feet); tapers to ~1 foot at west edge of pit; visually evident edge.
2	Very loose, wet, gray, silty fine SAND, trace fine gravel, trace organics (SM).
3	
4	
5	**Vashon Lodgement Till**
	Dense, very moist, reddish brown, silty fine SAND, some fine gravel; nonstratified (SM).
6	
7	Bottom of exploration pit at depth 6 feet No seepage. No caving.
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Radke Short Plat
King County, WA

Logged by: BWG
Approved by:

associated earth sciences incorporated

Project No. KE140565A
10/24/14

KCTP3 140565.GPJ November 3, 2014

LOG OF EXPLORATION PIT NO. EP-5

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: 357
	Topsoil
	Vashon Lodgement Till
1	Medium dense, moist, mottled light brown, silty, fine gravelly, fine to medium SAND, trace roots; nonstratified (SM).
2	
3	
4	
	Vashon Advance Outwash
5	Medium dense to dense, very moist, brown, silty fine SAND, trace fine gravel; some gradational stratification; some clasts in spoils (cemented).
6	
7	
8	
9	
10	
11	
12	Bottom of exploration pit at depth 11 feet Perched seepage zone 9.5 to 10 feet (in coarser advance outwash stratum). No caving.
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 140565.GPJ November 3, 2014

Radke Short Plat
King County, WA

Logged by: BWG

Approved by:

associated earth sciences incorporated

Project No. KE140565A

10/24/14

LOG OF EXPLORATION PIT NO. EP-6

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION — **Elev: 359**
	Topsoil
1	**Vashon Advance Outwash**
2	Medium dense grading to dense, very moist, gray, silty (content varies), fine gravelly fine SAND; stratified; primarily Qva-like with some till-like strata; clasts in spoils (cemented) (SM / SP).
3	
4	Grades without till-like strata. Otherwise similar to upper 4 feet (SP).
5	
6	
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No seepage. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 140565.GPJ November 3, 2014

Radke Short Plat
King County, WA

Logged by: BWG

Approved by:

associated earth sciences incorporated

Project No. KE140565A

10/24/14

LOG OF EXPLORATION PIT NO. EP-7

Depth (ft)	DESCRIPTION — Elev: 368
	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	Fill
1	Loose, moist, brown, fine SAND, some silt to silty, trace organics, debris (including buckets, pipe, plastic straps, concrete, sheet plastic); fill thickness varies from 5.5 feet at east edge to 2.5 feet at west edge (SM).
2	
3	
4	
5	
	Vashon Advance Outwash
6	Medium dense, moist, reddish brown grading to light brown with mottled zones, fine SAND, some silt ranging to silty, trace fine gravel; gradational stratification (SP-SM).
7	
8	
9	
10	Bottom of exploration pit at depth 9.5 feet No seepage. No caving.
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 140565.GPJ November 3, 2014

Radke Short Plat
King County, WA

Logged by: BWG

Approved by:

associated earth sciences incorporated

Project No. KE140565A

10/24/14

LOG OF EXPLORATION PIT NO. EP-8

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: 372
	Topsoil
1	**Vashon Advance Outwash**
2	Medium dense, moist, light brown, fine SAND, some silt to silty, some fine gravel; some gradational stratification. (SP-SM).
3	
4	Becoming more dense, gravel fraction becoming fine to coarse; clasts in spoils (cemented).
5	
6	
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No seepage. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 140565.GPJ November 3, 2014

Radke Short Plat
King County, WA

Logged by: BWG
Approved by:

associated earth sciences incorporated

Project No. KE140565A
10/24/14

LOG OF EXPLORATION PIT NO. EP-9

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION — Elev: 342
	Topsoil
1	**Vashon Lodgement Till**
2	Dense, moist, reddish brown to light brown, silty, fine gravelly fine to coarse SAND; nonstratified (SM).
3	Becomes very dense, mottled brown to brownish gray; slow progress (SM).
4	
5	
6	
7	
8	Bottom of exploration pit at depth 7 feet No seepage. No caving.
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 140565.GPJ November 3, 2014

Radke Short Plat
King County, WA

Logged by: BWG
Approved by:

associated earth sciences incorporated

Project No. KE140565A
10/24/14

LOG OF EXPLORATION PIT NO. EP-10

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: 333
	Topsoil
1	**Vashon Lodgement Till**
2	Medium dense, very moist, light brown, silty, fine gravelly, fine to coarse SAND (SM).
3	Less silty, more gravelly zone (~6 inches thick) at 3.5 feet; does not extend across pit limits, east side only.
4	Becomes very dense, gray; nonstratified at 4 feet.
5	
6	
7	
8	
9	
10	
11	
12	
13	Becomes bluish gray; slow progress.
14	
15	
16	Bottom of exploration pit at depth 15 feet No seepage. No caving.
17	
18	
19	
20	

KCTP3 140565.GPJ November 3, 2014

Radke Short Plat
King County, WA

Logged by: BWG
Approved by:

associated earth sciences incorporated

Project No. KE140565A
10/24/14

LOG OF EXPLORATION PIT NO. EP-11

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** **Elev: 343**
	Fill
1	Sawdust, chipper waste, plastic containers, metal pipe, plastic pipe, metal drum, cinder blocks.
2	**Vashon Lodgement Till**
3	Bottom of exploration pit at depth 2.5 feet No seepage. No caving.
4	
5	**NOTE: Abbreviated test pit for observation of fill depth only. No laboratory samples taken.**
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 140565.GPJ November 3, 2014

Radke Short Plat
King County, WA

Logged by: BWG

Approved by:

associated earth sciences incorporated

Project No. KE140565A

10/24/14