

DEVELOPMENT REVIEW APPLICATION

For Office Use Only		
STAFF CONTACT <i>Peter Spiv</i>	PROJECT NO(S). <i>WA-16-02</i>	
NON-REFUNDABLE FEE(S) <i>2600+250 2850⁰⁰</i>	REFUNDABLE DEPOSIT(S)	TOTAL <i>2850⁻</i>

Type of Review (Please check all that apply):

- | | | |
|--|---|---|
| <input type="checkbox"/> Annexation (ANX) | <input type="checkbox"/> Historic Review | <input type="checkbox"/> Subdivision (SUB) |
| <input type="checkbox"/> Appeal and Review (AP) * | <input type="checkbox"/> Legislative Plan or Change | <input type="checkbox"/> Temporary Uses * |
| <input type="checkbox"/> Conditional Use (CUP) | <input type="checkbox"/> Lot Line Adjustment (LLA) */** | <input type="checkbox"/> Time Extension * |
| <input type="checkbox"/> Design Review (DR) | <input type="checkbox"/> Minor Partition (MIP) (Preliminary Plat or Plan) | <input type="checkbox"/> Variance (VAR) |
| <input type="checkbox"/> Easement Vacation | <input type="checkbox"/> Non-Conforming Lots, Uses & Structures | <input checked="" type="checkbox"/> Water Resource Area Protection/Single Lot (WAP) |
| <input type="checkbox"/> Extraterritorial Ext. of Utilities | <input type="checkbox"/> Planned Unit Development (PUD) | <input type="checkbox"/> Water Resource Area Protection/Wetland (WAP) |
| <input type="checkbox"/> Final Plat or Plan (FP) | <input type="checkbox"/> Pre-Application Conference (PA) */** | <input type="checkbox"/> Willamette & Tualatin River Greenway (WRG) |
| <input type="checkbox"/> Flood Management Area | <input type="checkbox"/> Street Vacation | <input type="checkbox"/> Zone Change |
| <input type="checkbox"/> Hillside Protection & Erosion Control | | |

Home Occupation, Pre-Application, Sidewalk Use, Sign Review Permit, and Temporary Sign Permit applications require different or additional application forms, available on the City website or at City Hall.

Site Location/Address: <i>1822 Carriage Way</i>	Assessor's Map No.:
	Tax Lot(s): <i>6801</i>
	Total Land Area: <i>0.49 Acres</i>

Brief Description of Proposal:
Submittal using the Alternative Review Process (32.070)

Applicant Name: <i>David Quinn</i> <small>(please print)</small>	Phone: <i>503-927-5153</i>
Address: <i>1829 NW Lovejoy St 409</i>	Email: <i>davidgordonquinn@yaho.com</i>
City State Zip: <i>Portland, OR 97209</i>	
Owner Name (required): <i>David & Laura Quinn</i> <small>(please print)</small>	Phone:
Address: <i>Same as above</i>	Email:
City State Zip: <i>Same as above</i>	
Consultant Name: <i>Terra Science Inc.</i> <small>(please print)</small>	Phone: <i>503-274-2100</i>
Address: <i>4710 S.W. Kelly Ave., Suite 100</i>	Email: <i>pscoles@terrascience.com</i>
City State Zip: <i>Portland, OR 97239</i>	

1. All application fees are non-refundable (excluding deposit). **Any overruns to deposit will result in additional billing.**
2. The owner/applicant or their representative should be present at all public hearings.
3. A denial or approval may be reversed on appeal. No permit will be in effect until the appeal period has expired.
4. **Three (3) complete hard-copy sets (single sided) of application materials must be submitted with this application.**
One (1) complete set of digital application materials must also be submitted on CD in PDF format.
If large sets of plans are required in application please submit only two sets.

* No CD required / ** Only one hard-copy set needed

The undersigned property owner(s) hereby authorizes the filing of this application, and authorizes on site review by authorized staff. I hereby agree to comply with all code requirements applicable to my application. Acceptance of this application does not infer a complete submittal. All amendments to the Community Development Code and to other regulations adopted after the application is approved shall be enforced where applicable. Approved applications and subsequent development is not vested under the provisions in place at the time of the initial application.

<i>David Quinn</i>	<i>2/4/2016</i>	<i>David Quinn</i>	<i>2/4/2016</i>
Applicant's signature	Date	Owner's signature (required)	Date

**Water Resource Area Protection/Single Lot Submittal
Alternative Review Process (paragraph 32.070 of WRA Protection Chapter 32)**

1822 Carriage Way, West Linn OR

Submitted by David Quinn and Laura Quinn (property owners)

Attachments:

1. Riparian Boundary Determination for 1822 Carriage Way created by Terra Science, Inc., January 2016 (submitted electronically to WL Planning Department on January xx, 2016)
2. Geotechnical Study Report for 1822 Carriage Way by GeoPacific Engineering, Inc.
3. Site Plan (showing proposed potential residential structure, driveway access and proposed Mitigation Plan)

This document and attachments are being submitted to the City of West Linn Planning Department in compliance with section 32.050 of the Chapter 32, Water Resource Area Protection document utilizing the 32.070 Alternative Review Process.

32.050 A.: This submittal addresses this requirement along with the Development Review Application.

32.050 B.: The pre-application conference has been completed.

32.050 C.: The required submittal documents are attached along with this written narrative addressing the requirements of Chapter 32.

32.050 D.: This paragraph is addressed by the attached Geotechnical Study Report which found the subject area to be stable. The report states "In our opinion, slopes on the subject property are relatively stable and the potential for damaging deep-seated slope instability is considered to be low."

32.050 E.: Not applicable because this submittal does not propose any streets or utilities that cross water resources nor any other development that modifies the water resource.

32.050 F.: This paragraph is addressed with the attached Site Plan (for subparagraphs 6 & 7) and the Riparian Boundary Determination report, Attachments A-D (for subparagraphs 1-5 and 8 & 9):

- Attachment A
 - Figure 1 Vicinity Map
 - Figure 2 Clackamas County Tax Assessor's Map
 - Figure 3 Plant Communities and Aerial Photograph
 - Figure 4 Riparian Boundary Map With Proposed 35-Ft Setback
- Attachment B- Plant Species Tabulation for 4 Sample Plots
- Attachment C- Slope Analysis Map

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Photographs

32.050 G.: The attached Site Plan which defines driveway and proposed building site footprint provides sufficient ingress/egress and areas for material storage and thus will not require TDA restoration to original grade nor re-vegetation. Subparagraphs 2 & 3 are addressed with the attached Riparian Boundary Determination report.

32.050 H.: This paragraph is addressed with the attached Site Plan which was created using the requirements of section 32.090. The Site Plan identifies the invasive species which will be removed (approximately 2500 Ft²) and the shown mitigation area of approximately 1575 Ft². The Mitigation Plan was developed using the square footage calculated by the difference of the proposed 35 Ft setback versus 50 Ft setback (15 Ft) and the distance of the building site shown on the attached Site Plan (105 Ft). The resultant square footage of 1575 Ft² is what is defined as the necessary mitigation area.

32.050 I.: This paragraph is addressed with the attached Site Plan where the re-vegetation plan is shown (1575 Ft²).

32.050 J.: This paragraph is not applicable because the submittal requirements have not been modified.

32.050 K.: This paragraph is addressed with the Riparian Boundary Determination report (for subparagraphs 1, 2 & 4) and the WRA boundary has been identified on the property with colored tape (subparagraph 3).

32.060 Approval Criteria (Standard Process)

This submittal is utilizing the 32.070 Alternative Review Process

32.060 A.: This paragraph is addressed with the attached Site Plan (for subparagraphs 2) and the Riparian Boundary Determination report (for subparagraphs 1).

32.060 B.: This submittal maintains the necessary WRA per the attached Riparian Boundary Determination report. Storm water facilities are not required (reference attached Riparian Boundary Determination report and the Geotechnical Study Report). Drainage of the proposed residential structure will have a private treatment system with approved planter boxes per the performance bond in place dated November 20, 2006.

32.060 C.: This paragraph does not apply to this submittal because this is a private property and public access is not necessary.

32.060 D.: This paragraph is addressed with the Riparian Boundary Determination report which proposes a WRA setback per 32.070.

32.060 E.: This paragraph does not apply to this submittal because the proposed driveway is outside of the WRA.

32.060 F.: This paragraph does not apply to this submittal because this is a private property and public access and passive recreation is not necessary.

32.060 G.: This paragraph does not apply to this submittal because there is no proposal to adjust or modify the existing stream adjacent to the property.

32.060 H.: The future residential builder shall incorporate habitat friendly development practices as identified in the subparagraphs to the degree possible.

32.070 Alternative Review Process

Attached Riparian Boundary Determination report is being submitted to address the necessary setback per a qualified professional.

32.080 Approval Criteria (Alternative Review Process)

See attached Riparian Boundary Determination report to address this paragraph in its entirety. The qualified professional recommends a WRA that is qualitatively equal, in terms of maintaining the level of functions allowed in the WRA standards.

32.090 Mitigation Plan

The Mitigation Plan was developed using the square footage calculated using the difference of the proposed 35 Ft setback versus 50 Ft setback (15 Ft) and the distance of the building site shown on the attached Site Plan (105 Ft). The resultant square footage of 1575 Ft² is what is defined as the necessary mitigation area.

32.100 Re-vegetation Plan Requirements

The re-vegetation will utilize native trees, shrubs and ground cover from the Portland Plant List. Plant size shall be compliant to subparagraph 2. Plant coverage shall be as follows and as approximately shown on the attached Site Plan.

- 5 trees and 25 shrubs
for every 500 Ft² of mitigation area.
- For the proposed area
of 1575 Ft² (see section 32.090) of mitigation
 - 16 trees (planted 8-12
Ft spacing)
 - 80 shrubs (planted 4-5
Ft spacing)

Any bare ground exposed as a result of the removal of the invasive vegetation (see attached Riparian Boundary Determination report) will be planted or seeded with native grasses or herbs (non-native sterile wheat grass may also be planted or seeded). To enhance plant survival the guidelines defined in subparagraph 8. shall be used.

**RIPARIAN BOUNDARY DETERMINATION
FOR 1822 CARRIAGE WAY,
WEST LINN, CLACKAMAS COUNTY, OREG.**

Prepared for

DAVID G. QUINN
1829 N.W. Lovejoy Street, Suite 409
Portland, OR 97209

And

CITY OF WEST LINN
22500 Salamo Road
West Linn, Oregon 97068

Prepared by

TERRA SCIENCE, INC.
4710 S.W. Kelly Avenue, Suite 100
Portland, Oregon 97239

TSI Project 2015-1015

January 2016

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg.
Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD

Introduction

On behalf of David G. Quinn and Laura A. Quinn (property owners), Terra Science, Inc. (TSI) has prepared the following riparian boundary determination for the future development of Tax lot 6801, T. 02S, R. 01E, Sec. 23BD). The subject 0.49-acre lot is situated at 1822 Carriage Way, in the northeast part of West Linn, Oregon (Figure 1, Attachment A). This report describes the current, undeveloped conditions in order to differentiate the riparian corridor from adjacent lands. This report is intended to satisfy Chapter 32 of City of West Linn development code.

Existing Conditions

The subject property is an east-sloping lot, with more gentle (flatter) slopes to the west and steeper slopes to the east. The property lacks any channels or swales, and rainfall appears to infiltrate into the soil (no surface erosion). While ground cover is good, in most places the vegetative composition reflects a history of clearing and voluntary regeneration by introduced species. Where native vegetation remains, it typically consists of scattered trees and/or shrubs that have an understory of non-native species. The following table outlines the plant communities that occur within the lot. Sample plot data is included in Attachment B.

Table 1. Plant Communities for Tax lot 6801 (1822 Carriage Way, West Linn, Oregon).

Community Type And Sample Plots	Dominant Species	Comments
Upland Forest (SP-2 and SP-4)	Douglas-fir (FACU), Bigleaf maple (FACU), Serviceberry (FACU), Western hazelnut (FACU), English holly (FACU), Himalayan blackberry (FACU), Trailing blackberry (FACU), English ivy (FACU), Sword-fern, and Red-stem storksbill (UPL).	Native trees in understory, but mostly non-native species in understory. Tree shade reduces opportunity for Himalayan blackberry thickets.
Disturbed Upland (SP-1)	Pacific willow (FACW), Himalayan blackberry (FACU), Common velvetgrass (FAC), Canada thistle (FAC), and Common orchardgrass (FACU).	Himalayan blackberry composes >80% of plant community. Only scattered willows present. Same elevation as Upland Forest plant community.
Riparian Forest (SP-3)	Red alder (FAC), Bigleaf maple (FACU), Pacific willow (FACW), vine maple (FAC), sword-fern (FACU) and Trailing blackberry (FACU).	Unlike Disturbed Upland, willows occur throughout plant community. Lower portions of Riparian Forest include Salmonberry.
Landscape/Cleared Area (highest elevations, also adj. to Carriage Way)	Lawn, yard debris, ornamental trees, English laurel, Photinia, Common velvetgrass, tall fescue, Canada thistle, bedstraw, and wild geranium.	Highly disturbed; hence, variable plant community composition. Adjacent property owner has discarded yard debris in this vicinity.

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg.
Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD

In general, the plant communities separate into two categories based on past disturbance (no recent disturbance). The Landscape/Cleared Area and Disturbed Upland are dominated by non-native species. The Disturbed Upland consists of Himalayan blackberry (invasive species) that typically colonizes cleared ground and displaces other species due to fast growing vines that arch over plants. In contrast, the Landscape/Cleared Area appears occasionally mowed/trimmed such that blackberries are not dominant, but non-native grasses persist.

The Upland Forest and Riparian Forest plant communities have significantly less disturbance, but they are not pristine. The Upland Forest contains an overstory of native trees, with an understory of native and non-native species. The dense canopy results in a shady environment that makes it difficult for invasive species to dominate. Since the Disturbed Upland plant community occurs at the same elevations as the Upland Forest, it is reasonable to conclude both areas had similar plant communities prior to historical disturbances. The Riparian Forest is the least disturbed plant community with the highest degree of native species (and fewest invasives). The amount of woody debris on the steep slopes suggests this plant community has not been significantly disturbed for over 40 years; however, this area was likely thinned once or twice in the past 100 years.

Defining Riparian Boundary

Chapter 32 of West Linn’s Development Code specifies the Riparian Corridor extends 100 feet horizontally from the Ordinary High Water (OHW) line of adjacent water resource (unnamed creek). The OHW is approximately at the bottom of the slope, which is roughly 50 feet east of the subject tax lot. Chapter 32 also defines the Water Resource Area (WRA) as adjacent lands having slopes steeper than 25%, where the outer edge is 200 feet from OHW. Thus, the WRA can encompass the Riparian Corridor. Such specifications rely upon geomorphic features, such as OHW or slope breaks, to help define the Riparian Corridor and WRA. Plant community or composition is not part of such criteria.

When a WRA encumbers most or all of an entire lot, City development code allows for modified boundaries based on other characteristics, such as plant community, slope classes, past disturbance, etc. For the subject lot, the WRA overlays most of the property, since the east (lower) portion contains 25 to 35% slopes. The plant communities characterized in Table 1 generally have two slope classes, as calculated by Thurston & Associates (2015, Attachment C). Table 2 shows these plant communities and associated slope classes.

Table 2. Typical Slopes Associated with Plant Communities for Tax lot 6801.

Community Type And Sample Plots	Slope Range (from Thurston & Associates Slope Analysis, 2015)
Upland Forest	0 to 5% in vicinity of old road (below large Douglas-fir trees) 15 to 25% above and below Douglas-fir trees 25 to 35% adj. to large Douglas-fir trees
Disturbed Upland	5 to 15% in west part of lot 15 to 25% north-center part of lot
Riparian Forest	25 to 35% along east edge of lot 35 to 50% below old road (southeast lot corner)
Landscape/Cleared Area	5 to 15% along west edge of lot 15 to 25% northeast part of plant community

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg.
Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD

Given that the plant communities do not conform to specific slope classes, differences in the plant community species become that primary basis for defining the Riparian Boundary. In particular, the Riparian Forest contains species like Red alder, Pacific willow, Vine maple and Salmonberry that typically grow in close proximity to waterways. In contrast, the Upland Forest community contains more Bigleaf maple, Douglas-fir, Serviceberry and Western hazelnut as the distance and elevation from the drainage increase. Species like English hawthorn, Holly, Trailing blackberry, Himalayan blackberry, Sword-fern and non-native grasses/forbs typically grow in both plant communities; thus, they do not define a change in environmental conditions, such as increased shade and soil moisture (more prevalent in riparian areas). As such, the riparian boundary defined on Figure 5 reflects changes in the overall plant community, not just absence or presence of a few species.

Rationale for Riparian Corridor Setback

As described in Chapter 32, Section 32.070, the property owner can utilize an alternative review process to reduce the width of the WRA, without reducing protection of the water resource functions (stream, in this case). The functions of the plant communities are itemized in Table 3 (on following page), which are the same functions listed in Section 32.080 (City table 32-4). Overall, the Riparian Forest provides most of the listed functions, primarily due to the >75% canopy cover, moderate understory vegetation density, and contiguous connection to the downslope stream. The Upland Forest has somewhat less functioning for sediment or pollution control, organic material sources and stream flow recharge. The Upland Forest also lacks bank stabilization function and has diminished terrestrial habitat due to increased distance from and elevation above the stream. The Disturbed Upland plant community has lesser functioning overall than both the Riparian Forest and Upland Forest, due to the composition of invasive plants and scattered tree cover.

As natural resource professionals, Terra Science, Inc. looked for field evidence that current condition of the Upland Forest and Disturbed Upland has negatively affected the adjacent Riparian Forest. There are few scattered vines of Himalayan blackberry and a few volunteer English hawthorn shrubs growing in the Riparian Forest; however, existing canopy cover has greatly reduced colonization opportunity for those invasive species. Still, the lack of tree canopy in the Disturbed Upland has facilitated the establishment of dense blackberry thickets on the riparian boundary. There is no indication of eroded sediments moving from the Upland Forest or Disturbed Upland into the Riparian Forest (this is attributed to the lack of recent disturbance).

Future development (home construction) on the west (upper) part of Tax lot 6801 likely involve removal of blackberry thickets and few scattered willows in the construction vicinity. The loss of either should not have an adverse affect on the Riparian Forest. Sediment transport from the construction vicinity would avoid potential damage to soils and understory vegetation if appropriate Best Management Practices (BMPs) are installed and/or properly maintained. For example, vegetation should be trimmed, but ground scarification minimized wherever possible. Sediment fencing should be placed as close to the construction area as practical to reduce the potential disturbance zone on the downgradient side of new construction. All runoff should be re-directed to a temporary settling swale located above the sediment fence. The swale should be sized for at least a 10-year storm event, since construction sites have less opportunity for infiltration. Additionally, areas of vehicle traffic should be capped with crushed rock and replenished when the gravel is less than several inches thick. Foot traffic areas around the

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg.
Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD

construction area should utilize wood chips or similar material to avoid creating muddy surfaces.

Table 3. Ecological Functions for Riparian Forest and Upland Forest Plant Communities.

Ecological Function	Riparian Forest (SP-3)	Upland Forest (SP-2, SP-4)	Disturbed Upland (SP-1)
Stream flow moderation and/or water storage	Moderate understory vegetation density and >75% tree canopy cover that slows water and increases infiltration opportunity.	Moderate understory vegetation density and >75% tree canopy cover that slows water and increases infiltration opportunity.	Moderate understory vegetation density that slows water and increases infiltration opportunity.
Sediment or pollution control	Slopes mostly >35% with fallen trees and limbs that slows runoff.	Slopes mostly 15 to 25% and lacking fallen trees/limbs that could slow runoff.	Slopes mostly 15 to 25% and lacking fallen trees/limbs that could slow runoff.
Bank stabilization	None within study area, slope becomes flatter at base of slope (sediment trapping opportunity).	None.	None.
Large wood recruitment for a fish-bearing section of stream	Not a fish-bearing stream.	Not a fish-bearing stream.	Not a fish-bearing stream.
Organic material sources	Moderate understory vegetation density and >75% tree canopy cover that can provide organic material to adjacent stream.	While Upland Forest has moderate understory vegetation density and >75% tree canopy, organic material like remains in place or moves slightly downslope into riparian forest.	Blackberry thickets lack significant leaf litter; organic material like remains in place or moves slightly downslope into riparian forest.
Shade (water temperature moderation) and microclimate	Riparian forest canopy (>75% cover) provides both shade and microclimate functions.	Upland forest canopy (>75% cover) provides both shade and microclimate functions.	Disturbed upland does not provide shade or microclimate functions.
Stream flow that sustains in-stream and adjacent habitats	Ground water discharge likely occurs at base of slope; hence, it helps sustain stream flow.	Hillside above riparian area has only incidental ground water contribution to stream during rainy season.	Hillside above riparian area has only incidental ground water contribution to stream during rainy season.
Other terrestrial habitat (within 100 to 300 ft.)	Riparian Forest is contiguous with stream; thus, unfractured habitat.	Upland Forest is contiguous with riparian forest, but historically disturbed; thus, slightly fractured habitat.	Disturbed Upland is contiguous with riparian forest, but historically disturbed; thus, somewhat fractured habitat.

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Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD

To minimize erosion opportunities (and subsequent damage to the Riparian Forest), the most important factor (aside from ground disturbance) is avoiding the steeper slopes. A 35-foot setback from the riparian boundary would encompass most of the steeper slopes that occur in the east part of the subject lot. A 35-foot setback would also provide protection for the Upland Forest in the south-center of the lot. The Upland Forest provides shade and microclimate functions that could affect the Riparian Forest if removed or significantly disturbed (trimming of dead branches/ multiple trunks is okay). Terra Science considered an option of a wider setback of 50 feet. The additional width expands into areas either dominated by Himalayan blackberry or non-natives like Canada thistle and Common velvetgrass. Such areas currently do not contribute positively or negatively to the Riparian Forest because they lack overstory vegetation and often occur on flatter slopes. Consequently, an additional 15 feet would not improve, nor degrade, the downgradient Riparian Forest.

Attachments

Attachment A – Report Figures

- Figure 1 Vicinity Map
- Figure 2 Clackamas County Tax Assessor's Map
- Figure 3 Plant Communities and Aerial Photograph
- Figure 4 Riparian Boundary Map With Proposed 35-Ft. Setback

Attachment B – Plant Species Tabulation for 4 Sample Plots

Attachment C – Slope Analysis Map (Thurston & Assoc., 2015)

Attachment D – Selected Photographs

TERRA SCIENCE, INC.

Soil, Water & Wetland Consultants

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg. Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD

Limitations of this Report

Terra Science, Inc. did not investigate or define riparian conditions beyond the study area as depicted on Figures 3 and 4, which consists mostly of Tax lot 6801 on Clackamas County Assessor's map Township 02S, Range 01E, Sec. 23BD, located at 1822 Carriage Way in West Linn, Oregon. This report makes no claim or conclusions about those conditions beyond the specified study area.

The data presented in this report was collected, analyzed and interpreted using standards of skill, care, and diligence ordinarily provided by a qualified professional using the 1987 Corps of Engineers Wetlands Delineation Manual, Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coastal Region (Version 2.0), as well as conducting riparian habitat analyses. The report findings are based on incidental information collected from the client, the observations of the project team, and limitations of the field study (conducted in winter when some plants not identifiable). The report findings and their significance should not be extrapolated beyond the immediate area of study. Terra Science, Inc. shall not be liable beyond the fees paid for its services for errors and omissions.

This report was generated for the express use of David G. Quinn, Laura A. Quinn and their designates. These parties shall not interpret the report findings or conclusions any differently than stated without prior discussion and consent from Terra Science, Inc.

Respectfully submitted,



Phil Scoles
Soil and Water Scientist

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg.
Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD

Attachment A. Report Figures

NOTE: The 0.49± acre study area is located at 1822 Carriage Way. The centroid of the study area is approximated at 45.382643° North and -122.655586° West.

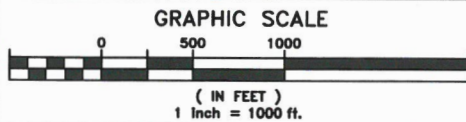


Source: Adapted from U.S. Geological Survey topographic quadrant.

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RIPARIAN BOUNDARY DETERMINATION
FOR 1822 CARRIAGE WAY
West Linn, Clackamas County, Oregon

VICINITY MAP



January 2016

FIGURE 1

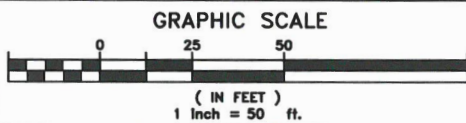


Source: Adapted from Google Earth.

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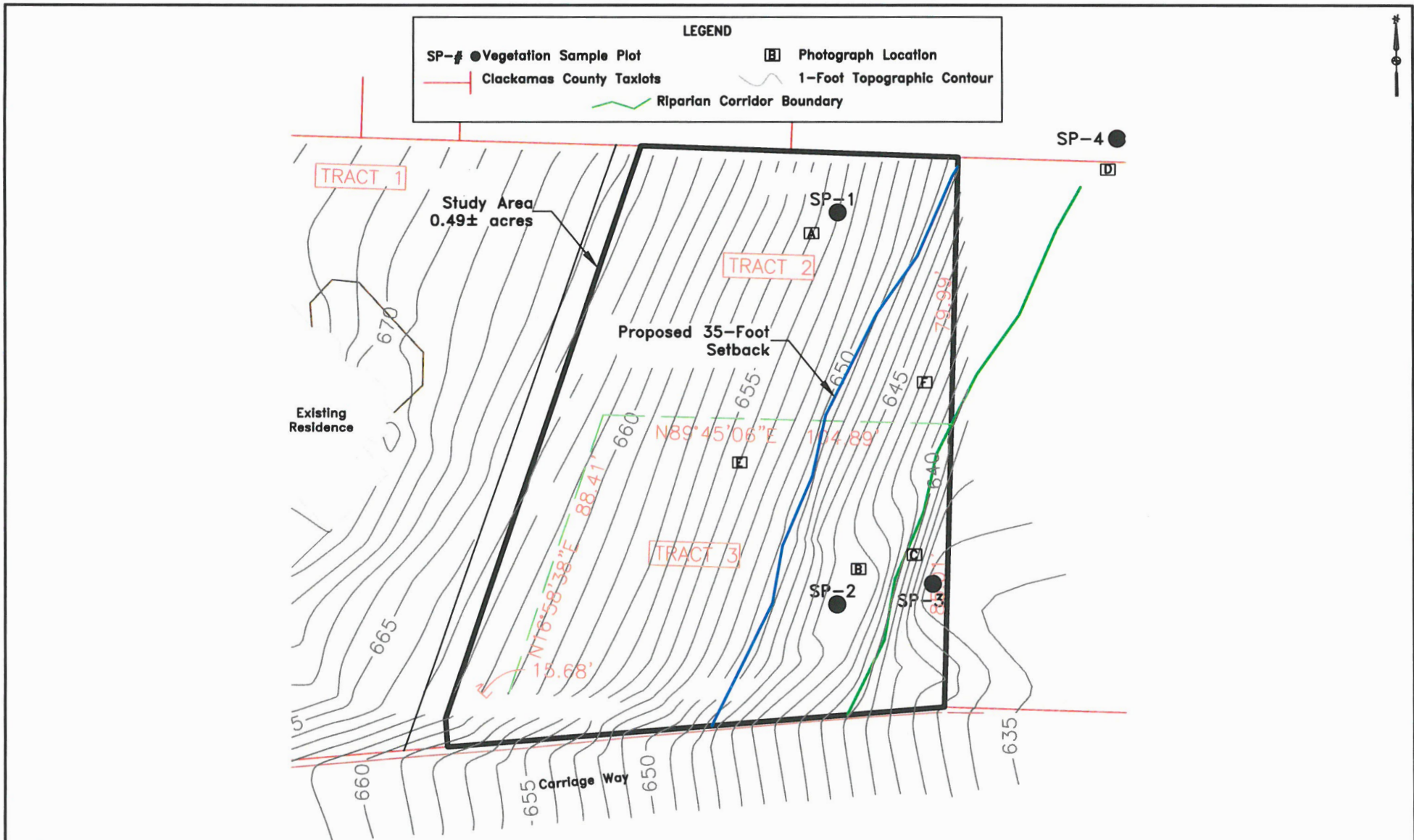
**RIPARIAN BOUNDARY DETERMINATION
FOR 1822 CARRIAGE WAY
West Linn, Clackamas County, Oregon**

**PLANT COMMUNITIES AND
AERIAL PHOTOGRAPH
(APRIL 17, 2015)**



January 2016

FIGURE 3



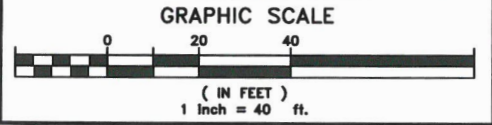
NOTE: Riparian boundary determined as per City of West Linn development code and professional assessment by Terra Science, Inc. Riparian boundary mapped using Ashtech 120 hand-held Global Navigation Satellite System (GNSS) receiver running ArcPad version 10.0 software. Presented boundaries and plots reflect sub-meter horizontal accuracy.

Source: Adapted from Thurston & Associates (surveyors) and TSI GPS files.

Terra Science, Inc.
Soil, Water, & Wetland Consultants

**RIPARIAN BOUNDARY DETERMINATION
FOR 1822 CARRIAGE WAY
West Linn, Clackamas County, Oregon**

**EXISTING CONDITIONS AND
PROPOSED SETBACK**



January 2016

FIGURE 4

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg.
Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD

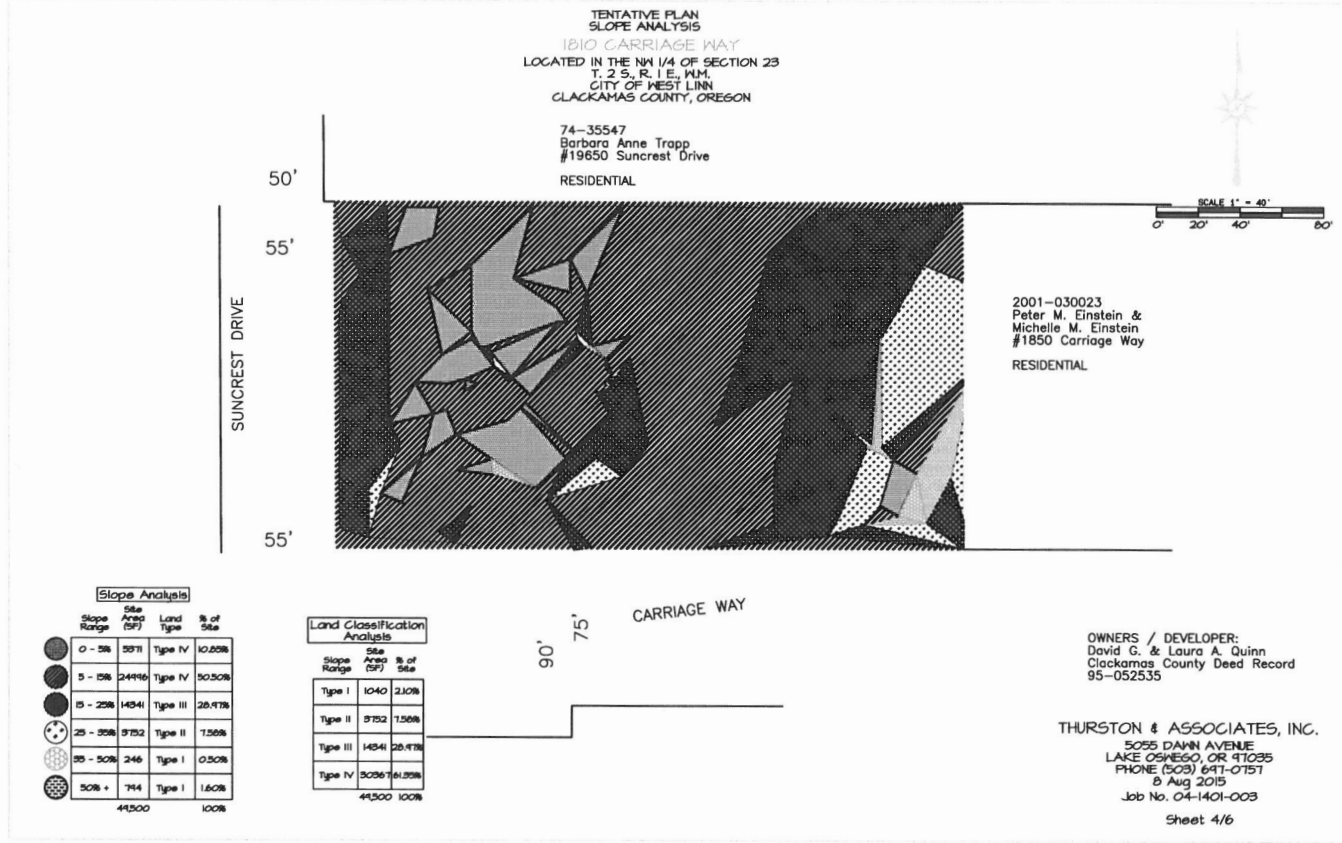
Attachment B. Areal Vegetative Cover of Species Observed at Sample Plots SP-1 to SP-4

Common Name	Scientific Name	Nativity Code ¹	Percent Cover			
			SP-1	SP-2	SP-3	SP-4
Vine maple	<i>Acer circinatum</i> , FAC	N			10	10
Bigleaf maple	<i>Acer macrophyllum</i> , FACU	N		25		50
Red alder	<i>Alnus rubra</i> , FAC	N			60	40
Serviceberry	<i>Amelanchier alnifolia</i> , FACU	N				20
Canada thistle	<i>Cirsium arvense</i> , FAC	I	5			
Western hazelnut	<i>Corylus cornuta</i> , FACU	N				10
English hawthorn	<i>Crataegus monogyna</i> , FAC	I		2	5	
Common orchardgrass	<i>Dactylis glomerata</i> , FACU	NNN	5	2		2
Red-stem storksbill	<i>Erodium cicutarium</i> , UPL	NNN		1		50
Bedstraw	<i>Galium aparine</i> , FACU	NNN	2			
Wild geranium	<i>Geranium molle</i> , FACU	NNN	2			
English ivy	<i>Hedera helix</i> , FACU	I		75		
Common velvetgrass	<i>Holcus lanatus</i> , FAC	NNN	10			
English holly	<i>Ilex aquifolium</i> , FACU	I		10	2	2
Phontinia (volunteer)	<i>Photinia sp.</i> , UPL	NNN		5		
Sword-fern	<i>Polystichum munitum</i> , FACU	N			10	5
English laurel	<i>Prunus laurocerasus</i> , FACU	I		2		
Douglas-fir	<i>Pseudotsuga menziesii</i> , FACU	N		60		
Himalayan blackberry	<i>Rubus armeniacus</i> , FACU	I	80	25		2
Trailing blackberry	<i>Rubus ursinus</i> , FACU	N		5	10	
Pacific willow	<i>Salix lucida</i> , FACW	N	25		30	
Tall fescue	<i>Schedonorus arundinaceus</i> , FAC	NNN	5			
Snowberry	<i>Symphoricarpos albus</i> , FACU	N		2		
Stinging nettle	<i>Urtica dioica</i> , FAC	N		2	1	5
Nearby vegetation (same elevation, outside of plot)			<i>Prunus laurocerasus</i> , <i>Rubus armeniacus</i> , <i>Cirsium arvense</i>	<i>Rubus armeniacus</i> , <i>Dactylis glomerata</i> , <i>Holcus lanatus</i> , <i>Galium aparine</i>	<i>Thuja plicata</i> (planted)	<i>Rubus spectabilis</i> , <i>Symphoricarpos albus</i> , <i>Polystichum munitum</i> , <i>Rubus ursinus</i>
Thatch / Dead Leaves			65	15	50	35
Total Herbaceous Cover:			24	85	21	62
Total Shrub Cover:			80	44	17	44
Total Tree Cover:			25	85	90	90
Total Cover (all stratum):			134	216	128	196
Total Native (Native Cover + Total Cover):			19	46	95	71
Total Hydrophytic (FAC+FACW + Total Cover):			34	2	83	28
Riparian Plant Community (>50% Hydrophytic)			No	No	Yes	No

¹NS=Native, NNN=Non-Native Naturalized, I=Invasive

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg.
Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD

Attachment C. Slope Analysis Map



TERRA SCIENCE, INC.

Soil, Water & Wetland Consultants

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg.
Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD

Attachment D. Selected Photographs

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg.
Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD



Photo Point A (above): View to northeast at vicinity of SP-1. The plot was situated mostly in Himalayan blackberry thicket, since the slope gets steeper to the right. The thicket has several willows growing up through the blackberry vines. The English laurel hedge is planted on the north property line. The grassy foreground in the left part of photo appears infrequently mowed or trimmed.



Photo Point B (above): View to southwest at vicinity of SP-2. This plot includes two large-diameter Douglas-fir trees, plus a multi-stem bigleaf maple tree. The understory is dominated by mostly non-natives, such as English ivy, holly and Himalayan blackberry. The trees are likely second- or third-growth, while the understory reflects a long history of disturbance (albeit little or not disturbance in several decades). There is an old road at the far left edge of photo that occurs on the west edge of the riparian boundary.

TERRA SCIENCE, INC.

Soil, Water & Wetland Consultants

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg. Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD



Photo Point C (above): View to south by southeast at vicinity of SP-3 (left side of photo). Blue flag near right edge of photo is riparian boundary. Area to right of blue flag is old road (possibly from past logging or clearing operations).



Photo Point D (above): View north at vicinity of SP-4. This location is offsite (northeast of subject lot) and it is relatively undisturbed. This vicinity is considered upland forest, rather than riparian forest, since it is dominated by bigleaf maple trees. Riparian area is the right part of photo (where red alder trees and willows become dominant).

Riparian Boundary Determination for 1822 Carriage Way, West Linn, Oreg.
Clackamas County Tax lot 6801, T. 02S, R. 01E, Sec. 23BD



Photo Point E (above): View to southwest upslope from SP-2. The western edge of Tax lot 6801 generally lacks trees (except along Carriage Way). This part of the site has the flattest slopes, typically 5 to 15 percent. The grassy areas appear infrequently mowed or trimmed. There are also small piles of yard debris from the neighboring property to the west. The upland forest plant community begins near the left edge of photo where the Douglas-fir are growing.



Photo Point F (above): View south at interface of riparian area and disturbed upland. Himalayan blackberries are the dominant species in the disturbed upland plant community. The riparian boundary was flagged just on the right side of the willow in the center of the photo. In general, the riparian area is defined by 1) steeper slopes; 2) native trees/shrubs that are rated FAC and FACW; 3) native understory vegetation; and 4) land that is contiguous with downslope Water Resource Area (beyond left edge of photo).



Real-World Geotechnical Solutions
Investigation • Design • Construction Support

June 11, 2015
Project No. 15-3856

David Quinn
1829 NW Lovejoy St., #409
Portland, Oregon 97209
Via email: davidgordonquinn@yahoo.com

CC: Shawn Gentemann, Park Place Homes via email: shawn@parkplacehomes.net

SUBJECT: SLOPE SETBACK EVALUATION
1822 CARRIAGE WAY
WEST LINN, OREGON

This report presents the results of a geotechnical engineering study conducted by GeoPacific Engineering, Inc. (GeoPacific) for the above-referenced project. The purpose of our investigation was to evaluate subsurface conditions at the site and to provide geotechnical recommendations for slope setbacks for the existing partition, which was divided in 2007. A geotechnical evaluation of the slope is required to minimize slope setbacks for the eastern portion of the property, which is adjacent to a Water Resource Area delineated by the City of West Linn. This geotechnical study was performed in accordance with GeoPacific Proposal No. P-5240, dated May 18, 2015, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The subject site is located on the north side of Carriage Way in West Linn, Clackamas County, Oregon. The property is approximately 0.5 acres in size and topography is moderately to steeply sloping to the west, where a water resource protection area (ravine with creek) is present. Slopes are on the order of 15 to 30 percent with steeper slopes (up to 65 percent) immediately adjacent to the creek. The site is currently unimproved and vegetation consists primarily of brush and sparse trees.

It is our understanding that the lot was partitioned in 2007 and survey pins indicating the required 15 foot slope setback were placed at that time. Since 2007, the slope setback requirements have been revised. Chapter 32 of the West Linn Community Development Code addresses water resource area protection and defines easements and building setbacks depending on the type of resource area. The subject site is adjacent to a ravine, which requires a 50 foot setback from the top of slope. The setback can be reduced with a slope evaluation conducted by a geotechnical engineer.

It is our understanding that the proposed development will consist of the construction of one single family home, driveway, and associated underground utilities.

REGIONAL AND LOCAL GEOLOGIC SETTING

The subject site lies within the Willamette Valley/Puget Sound lowland, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. A series of discontinuous faults subdivide the Willamette Valley into a mosaic of fault-bounded, structural blocks (Yeats et al., 1996). Uplifted structural blocks form bedrock highlands, while down-warped structural blocks form sedimentary basins.

The site is located on an east facing slope at elevations of approximately 660 to 630 feet above sea level (Figure 1A). The subject site is underlain by Quaternary age (last 1.6 million years) loess, a windblown silt deposit that mantles older deposits, basalt bedrock, and elevated areas in the Portland region (Beeson et al., 1989; Madin, 1990). The loess generally consists of massive silt deposited following repeated catastrophic flooding events in the Willamette Valley, the last of which occurred about 10,000 years ago. In localized areas, the loess includes buried paleosols that developed between depositional events. Regionally, the total thickness of loess ranges from 5 feet to greater than 100 feet.

The loess is underlain by the Miocene aged (about 14.5 to 16.5 million years ago) Columbia River Basalt Formation, which are a thick sequence of lava flows which form the crystalline basement of the Tualatin Valley (Beeson et al., 1989). The basalts are composed of dense, finely crystalline rock that is commonly fractured along blocky and columnar vertical joints. Individual basalt flow units typically range from 25 to 125 feet thick and interflow zones are typically vesicular, scoriaceous, brecciated, and sometimes include sedimentary rocks.

REGIONAL SEISMIC SETTING

At least three major fault zones capable of generating damaging earthquakes are thought to exist in the vicinity of the subject site. These include the Portland Hills Fault Zone, the Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone.

Portland Hills Fault Zone

The Portland Hills Fault Zone is a series of NW-trending faults that include the central Portland Hills Fault, the western Oatfield Fault, and the eastern East Bank Fault. These faults occur in a northwest-trending zone that varies in width between 3.5 and 5.0 miles. The combined three faults vertically displace the Columbia River Basalt by 1,130 feet and appear to control thickness changes in late Pleistocene (approx. 780,000 years) sediment (Madin, 1990). The Portland Hills Fault occurs along the Willamette River at the base of the Portland Hills, and is about 3.5 miles northeast of the site. The Oatfield Fault occurs along the western side of the Portland Hills, and is about 2 miles northeast of the site. The Oatfield Fault is considered to be potentially seismogenic (Wong, et al., 2000). Madin and Mabey (1996) indicate the Portland Hills Fault Zone has experienced Late Quaternary (last 780,000 years) fault movement; however, movement has not been detected in the last 20,000 years. The accuracy of the fault mapping is stated to be within 500 meters (Wong, et al., 2000). No historical seismicity is correlated with the mapped portion of the Portland Hills Fault Zone, but in 1991 a M3.5 earthquake occurred on a NW-trending shear plane located 1.3 miles east of the fault (Yelin, 1992). Although there is no definitive evidence of recent activity, the Portland Hills Fault Zone is assumed to be potentially active (Geomatrix Consultants, 1995).

Gales Creek-Newberg-Mt. Angel Structural Zone

The Gales Creek-Newberg-Mt. Angel Structural Zone is a 50-mile-long zone of discontinuous, NW-trending faults that lies about 17.5 miles southwest of the subject site. These faults are recognized in the subsurface by vertical separation of the Columbia River Basalt and offset seismic reflectors in the overlying basin sediment (Yeats et al., 1996; Werner et al., 1992). A geologic reconnaissance and photogeologic analysis study conducted for the Scoggins Dam site in the Tualatin Basin revealed no evidence of deformed geomorphic surfaces along the structural zone (Unruh et al., 1994). No seismicity has been recorded on the Gales Creek Fault or Newberg Fault (the fault closest to the subject site); however, these faults are considered to be potentially active because they may connect with the seismically active Mount Angel Fault and the rupture plane of the 1993 M5.6 Scotts Mills earthquake (Werner et al. 1992; Geomatrix Consultants, 1995).

Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year (Goldfinger et al., 1996). A growing body of geologic evidence suggests that prehistoric subduction zone earthquakes have occurred (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). This evidence includes: (1) buried tidal marshes recording episodic, sudden subsidence along the coast of northern California, Oregon, and Washington, (2) burial of subsided tidal marshes by tsunami wave deposits, (3) paleoliquefaction features, and (4) geodetic uplift patterns on the Oregon coast. Radiocarbon dates on buried tidal marshes indicate a recurrence interval for major subduction zone earthquakes of 250 to 650 years with the last event occurring 300 years ago (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). The inferred seismogenic portion of the plate interface lies roughly along the Oregon coast at depths of between 20 and 40 miles.

SUBSURFACE CONDITIONS

Our site-specific exploration for this report was conducted on May 29, 2015. Three exploratory hand auger borings were drilled to depths of 3 to 5.5 at the approximate locations shown on Figure 2. It should be noted that hand auger locations were located in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate.

A GeoPacific geologist continuously monitored the field exploration program and logged the hand auger borings. Soils observed in the explorations were classified in general accordance with the Unified Soil Classification System. During exploration, our geologist also noted geotechnical conditions such as soil consistency, moisture and groundwater conditions. Logs of the hand auger borings are attached to this report. The following report sections are based on the exploration program and summarize subsurface conditions encountered at the site.

Undocumented Fill: Approximately 3.5 feet of undocumented fill was encountered in hand auger boring HA-3. The fill generally consisted of medium stiff to stiff, light brown, clayey SILT (ML). The fill contained trace charcoal fragments and was mottled orange and gray. Other areas of fill may be present at the site.

Topsoil Horizon: Directly underlying the ground surface in hand auger borings HA-1 and HA-2 was a topsoil horizon consisting of brown, low to moderately organic SILT (OL-ML). The topsoil horizon was generally loose, contained many fine roots, and extended to a depth of approximately 12 inches.

Buried Topsoil Horizon: A buried topsoil horizon was encountered directly beneath the fill in hand auger boring HA-3. The buried topsoil consisted of SILT (OL-ML) with a low organic content and extended to a depth of approximately 4 feet.

Loess: Underlying the topsoil horizon in hand auger borings HA-1 and HA-2 was windblown silt (loess) included as a member of the Willamette Formation. These soils generally consisted of medium stiff to very stiff, micaceous, light brown, clayey silt (ML) that displayed subtle to strong orange and gray mottling. In hand auger borings HA-1 and HA-2, the loess generally extended to a depth of 2 to 3 feet.

Residual Soil: Underlying the loess in hand auger borings HA-1 and HA-2 and the buried topsoil horizon in hand auger boring HA-3 was clayey SILT (ML) resulting from in-place weathering of the underlying Columbia River Basalt Formation. The light reddish brown clayey silt contained weathered basalt fragments and was generally characterized by a stiff to very stiff consistency. Practical refusal on basalt was encountered in explorations HA-1 through HA-3 at depths of 3.5, 3, and 5.5 feet respectively.

Soil Moisture and Groundwater

On May 29, 2015, neither static groundwater nor groundwater seepage was encountered in hand auger borings excavated to a maximum depth of 5.5 feet below the ground surface. Experience has shown that temporary storm related perched groundwater within the near surface soils often occur over fine-grained native deposits such as those beneath the site during the wet season and particularly in mottled soils such as were identified in the hand auger borings. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors.

SLOPE STABILITY

For the purpose of evaluating the slope stability hazard at the study site, GeoPacific reviewed published geologic mapping and LIDAR based high resolution digital elevation maps, reviewed regional site topography, performed a reconnaissance evaluation of slope geomorphology and evaluated near surface soil conditions in exploratory hand auger borings. This evaluation also included review of selected geologic literature pertaining to the site vicinity and review of the site topographic survey.

Regional geologic hazard mapping of Clackamas County published by the Oregon Department of Geology and Mineral Industries (DOGAMI) does not indicate any landslide features on the subject site (Schlicker and Finlayson, 1979; Burns and Duplantis, 2010). According to the DOGAMI SLIDO website, two landslides are mapped to the northeast of the site, as indicated on Figure 1B. Relative slope instability hazard mapping by DOGAMI identifies moderate slope instability hazard levels on the steeper portions of the subject site (immediately adjacent to the

creek) and low hazard levels on the more gently sloping portions (Hoffmeister et al., 2003). Slopes in the area or the proposed home are on the order of 15 to 30 percent.

For the purpose of evaluating subsurface conditions, three exploratory hand auger borings were drilled to depths of 3 to 5.5 feet. Hand auger borings indicate that the site is underlain by windblown loess, and residual soil of the Columbia River Basalt Formation. Hard gray basalt was observed in the creek channel to the northeast of the site. The hand auger borings indicate that the site is underlain by stiff to very stiff loess and stiff to very stiff residual soil. These materials are generally characterized by moderate to high shear strength and a relatively high resistance to slope instability.

Field reconnaissance indicates that slope morphology is generally smooth and uniform, consistent with relatively stable slope conditions over the last 10,000 years. No evidence of active slope instability such as fresh scarps, hummocky and/or irregular topography, etc. was observed at the site. Minor instability involving the upper few feet of soil was observed approximately 50 feet northeast of the site - immediately adjacent to the incised drainage for the creek where slopes exceed 50% grade. In our opinion, slopes on the subject property are relatively stable and the potential for damaging deep-seated slope instability is considered to be low.

CONCLUSIONS AND RECOMMENDATIONS

Our investigation indicates that the proposed development is geotechnically feasible and the 25 foot slope setback from the top of the slope (as indicated on Figure 2) is adequate. A geotechnical engineer should be consulted for recommendations regarding earthwork if the proposed construction will incorporate grading or placement of fill. The attached "Maintenance of Hillside Homesites" provides some guidance for employing simple precautions that may help maintain slope stability.

Slope Stability and Slope Setbacks

The City of West Linn allows the required 50 foot slope setback (measured from the top of slope) to be reduced to 25 feet with a geotechnical engineer's review. GeoPacific's evaluation of the slope stability setback was based on review of published geologic mapping and LIDAR based high resolution digital elevation maps, review of regional site topography, geologic reconnaissance of slope geomorphology, and evaluated near surface soil conditions in exploratory hand auger borings performed along the slope. Visual criterion considered by the geologist when evaluating slope stability included topographic grade and smoothness or regularity; degree of creep; age, density, condition and degree on deformity of native trees; and evidence of erosion and past fill placement.

A small creek forms the eastern boundary of the site (see Figure 1A). Our reconnaissance of the steeply sloping eastern portion of the site (adjacent to the creek) indicates slopes are generally stable. One area of minor slope instability affecting the near surface soils (upper 4 feet) was observed approximately 50 feet northeast of the site and was limited to the steeply sloping area immediately adjacent to the creek. Hand auger borings indicate soils in the vicinity of the proposed building area are generally composed of stiff to very stiff silt that typically have a moderate resistance to slope instability on moderate to steep slopes. No springs or seeps were observed. Based on our reconnaissance, a 25 foot setback is adequate.

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and their consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. The checklist attached to this report outlines recommended geotechnical observations and testing for the project. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

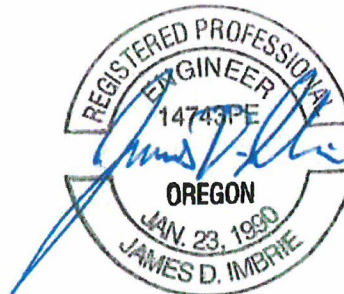
We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.



Beth K. Rapp, C.E.G.
Senior Engineering Geologist



James D. Imbrie, P.E., G.E.
Principal Geotechnical Engineer

Attachments: References
Checklist of Recommended Geotechnical Testing and Observation
Figure 1A – Vicinity Map
Figure 1B – Vicinity Map-Lidar
Figure 2 – Site and Exploration Plan
Hand Auger Logs (HA-1 – HA-3)
Maintenance of Hillside Homesites

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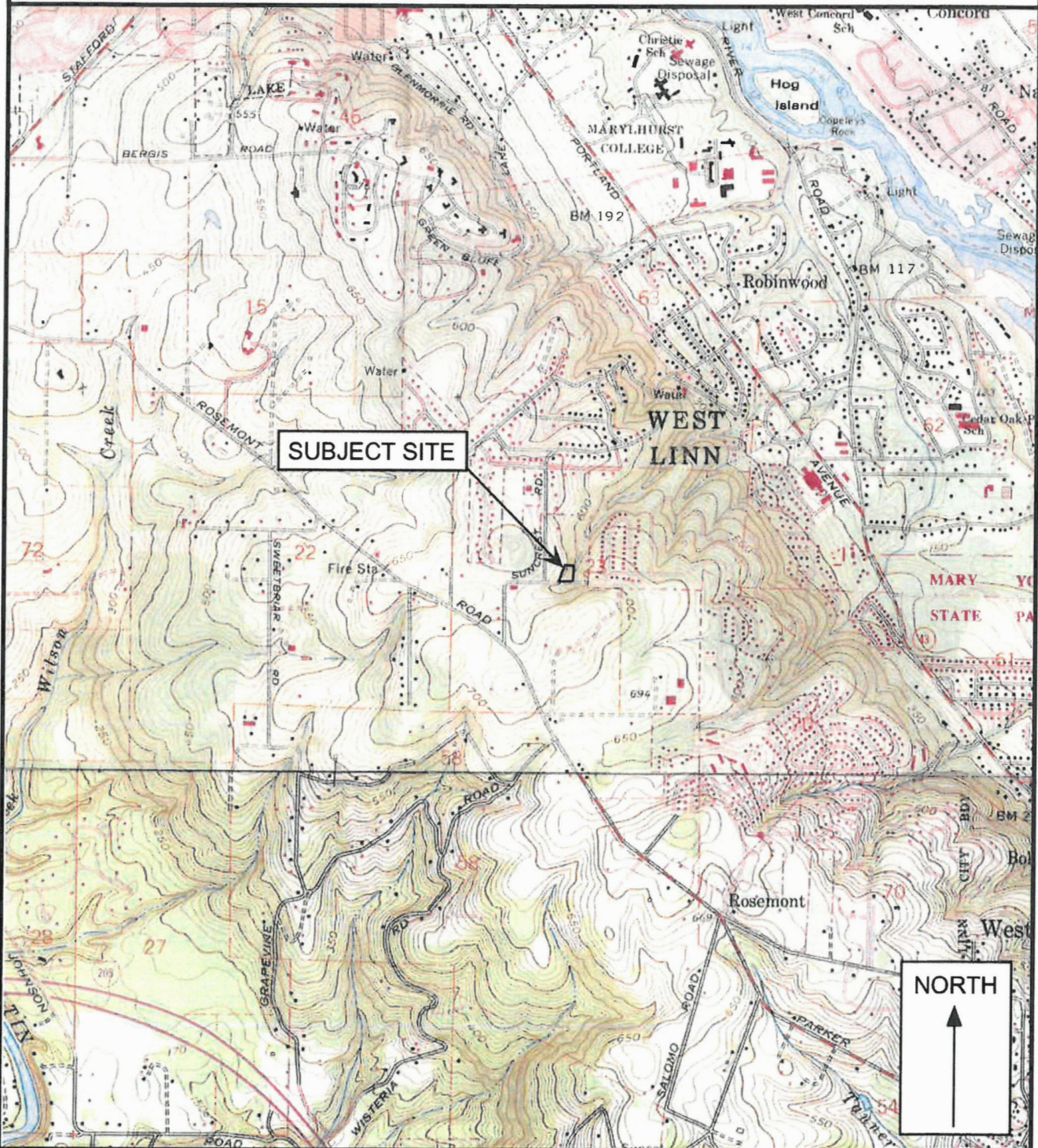
Carriage Way Partition Slope Evaluation
Project No. 15-3856

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14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

VICINITY MAP



Legend

Approximate Scale 1 in = 2,000 ft

Date: 6/11/2015

Drawn by: EKR

Base maps: U.S. Geological Survey 7.5 minute Topographic Map Series, Canby, Oregon Quadrangle, 1961 (Photorevised 1985) and Lake Oswego, Oregon Quadrangle, 1961 (Photorevised 1984).

Project: Carriage Way Partition
West Linn, Oregon

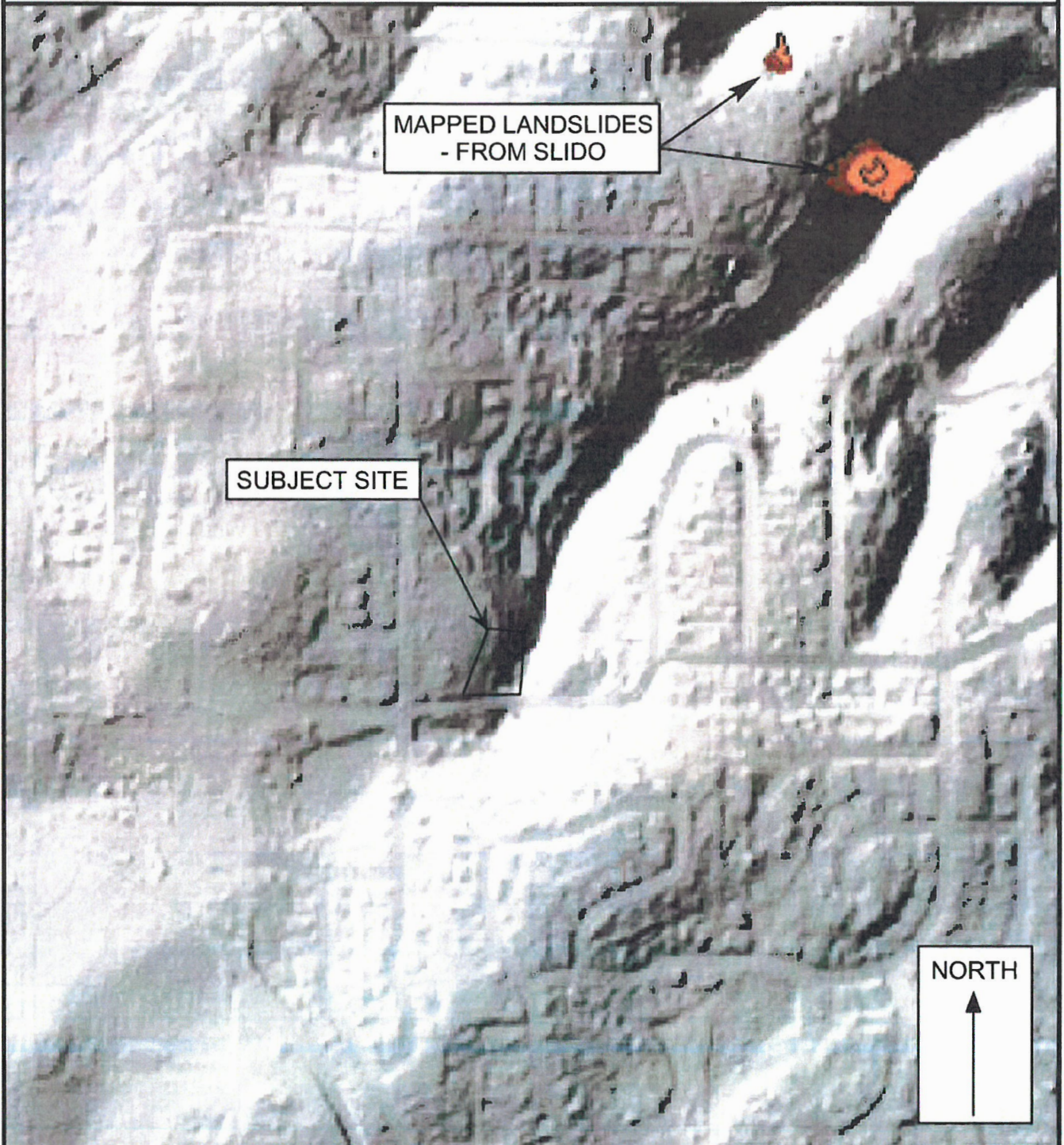
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FIGURE 1A



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VICINITY MAP - LIDAR



Legend

Approximate Scale 1 in = 500 ft

Date: 6/11/2015

Drawn by: EKR

Base map: Oregon Department of Geology and Mineral Industries, 2015, Statewide Landslide Information Database for Oregon (SLIDO): <http://www.oregongeology.org/slido/index.html>

Project: Carriage Way Partition
West Linn, Oregon

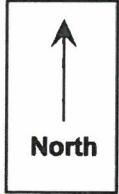
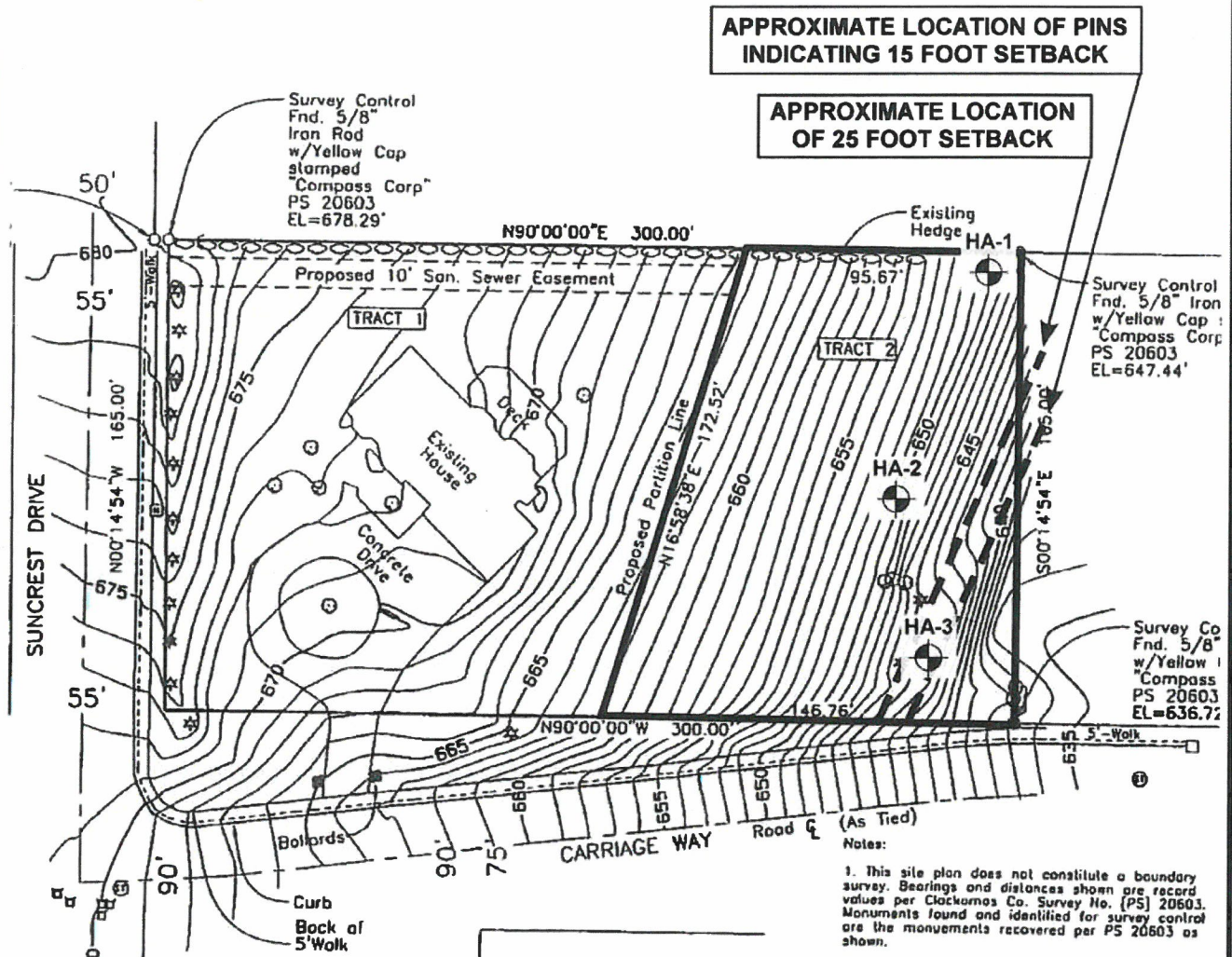
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FIGURE 1B



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SITE PLAN AND HAND AUGER LOCATIONS



Legend

HA-1
 Hand Auger Boring Designation and Approximate Location

Date: 6/11/2015
 Drawn by: EKR

 APPROXIMATE SCALE 1"=60'

Project: Carriage Way Partition
 West Linn, Oregon

Project No. 15-3856

FIGURE 2



14835 SW 72nd Avenue
 Portland, Oregon 97224
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HAND AUGER LOG

Project: Carriage Way Partition
 West Linn, Oregon

Project No. 15-3856

Boring No. HA-1

Depth (ft)	Pocket Penetrometer (tons/ft ²)	Sample Type	In-Situ Dry Density (lb/ft ³)	Moisture Content (%)	Water Bearing Zone	Material Description
1						Moderately organic SILT (OL-ML), dark brown, roots throughout, bioturbated, moist (Topsoil)
2						Medium stiff to very stiff, clayey SILT (ML), light brown, micaceous, subtle orange and gray mottling, moist (Loess)
3						Very stiff, clayey SILT (ML), trace gray basalt fragments, light reddish brown, trace black staining, subtle orange and gray mottling, moist (Residual Soil)
4						Practical Refusal on Gray Basalt Fragment at 3.5 Feet.
5						Note: No seepage or groundwater encountered.
6						
7						
8						

LEGEND



100 to 1,000 g
Bag Sample



5 Gal Bucket
Bucket Sample



Shelby Tube Sample



Seepage



Water Bearing Zone



Water Level at Abandonment

Date Excavated: 5/29/2015

Logged By: B. Rapp

Surface Elevation:



14835 SW 72nd Avenue
 Portland, Oregon 97224
 Tel: (503) 598-8445 Fax: (503) 941-9281

HAND AUGER LOG







Project: Carriage Way Partition
 West Linn, Oregon

Project No. 15-3856

Boring No. HA-2

Depth (ft)	Pocket Penetrometer (tons/ft ²)	Sample Type	In-Situ Dry Density (lb/ft ³)	Moisture Content (%)	Water Bearing Zone	Material Description
1						Low to moderately organic SILT (OL-ML), brown, roots throughout, loose, damp (Topsoil)
2						Stiff to very stiff, clayey SILT (ML), light brown, micaceous, subtle orange and gray mottling, trace roots, moist (Loess)
3						Very stiff, clayey SILT (ML), trace gray basalt fragments, light reddish brown, trace black staining, subtle orange and gray mottling, moist (Residual Soil)
4						Practical Refusal on Gray Basalt Fragment at 3 Feet.
5						Note: No seepage or groundwater encountered.
6						
7						
8						

LEGEND

 100 to 1,000 g
 5 Gal Bucket
 Shelby Tube Sample
 Seepage
 Water Bearing Zone
 Water Level at Abandonment

Date Excavated: 5/29/2015
 Logged By: B. Rapp
 Surface Elevation:



14835 SW 72nd Avenue
 Portland, Oregon 97224
 Tel: (503) 598-8445 Fax: (503) 941-9281

HAND AUGER LOG

Project: Carriage Way Partition
 West Linn, Oregon

Project No. 15-3856

Boring No. HA-3

Depth (ft)	Pocket Penetrometer (tons/ft ²)	Sample Type	In-Situ Dry Density (lb/ft ³)	Moisture Content (%)	Water Bearing Zone	Material Description
1						Medium stiff to stiff, clayey SILT (ML), trace charcoal fragments, light brown, trace black staining, subtle to strong orange and gray mottling, trace roots, moist (Fill)
2						
3						
4						Low organic SILT (OL-ML), brown, roots throughout, moist (Buried Topsoil)
5						Very stiff, clayey SILT (ML), trace gray basalt fragments, light reddish brown, trace black staining, subtle orange and gray mottling, moist (Residual Soil)
6						Practical Refusal on Gray Basalt Fragment at 5.5 Feet. Note: No seepage or groundwater encountered.
7						
8						

LEGEND



Bag Sample



Bucket Sample



Shelby Tube Sample



Seepage



Water Bearing Zone



Water Level at Abandonment

Date Excavated: 5/29/2015

Logged By: B. Rapp

Surface Elevation:



Real-World Geotechnical Solutions
Investigation • Design • Construction Support

MAINTENANCE OF HILLSIDE HOMESITES

All homes require a certain level of maintenance for general upkeep and to preserve the overall integrity of structures and land. Hillside homesites require some additional maintenance because they are subject to natural slope processes, such as runoff, erosion, shallow soil sloughing, soil creep, perched groundwater, etc. If not properly controlled, these processes could adversely affect your or neighboring properties. Although surface processes are usually only capable of causing minor damage, if left unattended, they could possibly lead to more serious instability problems.

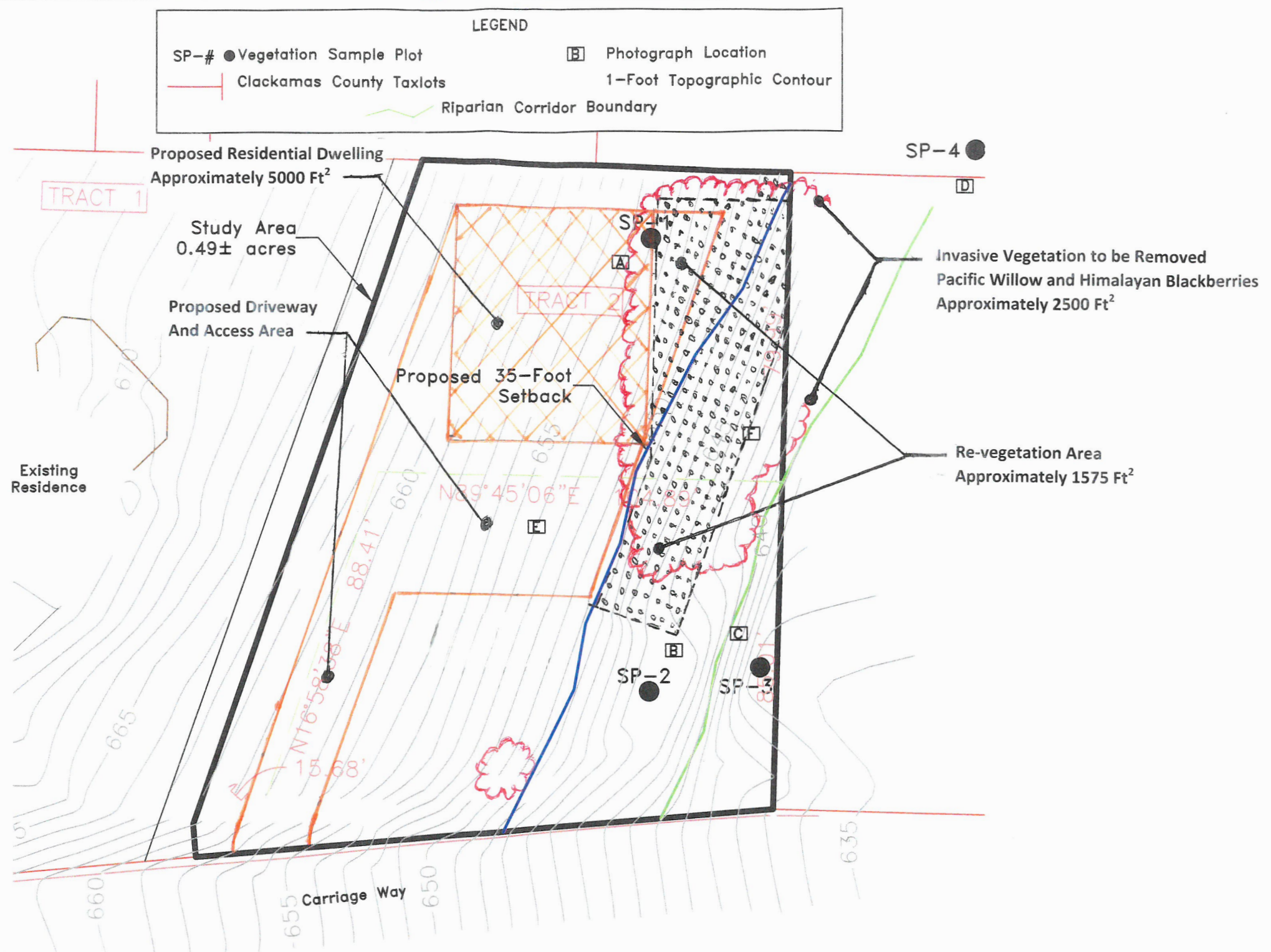
The primary source of problems on hillsides is uncontrolled surface water runoff and blocked groundwater seepage which can erode, saturate and weaken soil. Therefore, it is important that drainage and erosion control features be implemented on the property, and that these features be maintained in operative condition (unless changed on the basis of qualified professional advice). By employing simple precautions, you can help properly maintain your hillside site and avoid most potential problems. The following is an abbreviated list of common Do's and Don'ts recommended for maintaining hillside homesites.

Do List

1. Make sure that roof rain drains are connected to the street, local storm drain system, or transported via enclosed conduits or lined ditches to suitable discharge points away from structures and improvements. In no case, should rain drain water be discharged onto slopes or in an uncontrolled manner. Energy dissipation devices should be employed at discharge points to help prevent erosion.
2. Check your roof drains, gutters and spouts to make sure that they are clear. Roofs are capable of producing a substantial flow of water. Blocked gutters, etc., can cause water to pond or run off in such a way that erosion or adverse oversaturation of soil can occur.
3. Make sure that drainage ditches and/or berms are kept clear throughout the rainy season. If you notice that a neighbor's ditches are blocked such that water is directed onto your property or in an uncontrolled manner, politely inform them of this condition.
4. Locate and check all drain inlets, outlets and weep holes from foundation footings, retaining walls, driveways, etc. on a regular basis. Clean out any of these that have become clogged with debris.
5. Watch for wet spots on the property. These may be caused by natural seepage or indicate a broken or leaking water or sewer line. In either event, professional advice regarding the problem should be obtained followed by corrective action, if necessary.
6. Do maintain the ground surface adjacent to lined ditches so that surface water is collected in the ditch. Water should not be allowed to collect behind or flow under the lining.

Don't List

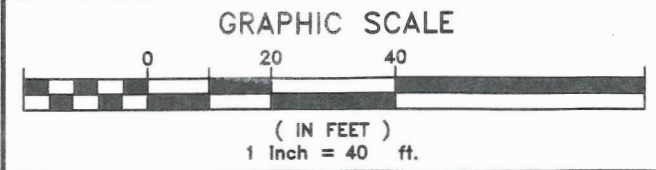
1. Do not change the grading or drainage ditches on the property without professional advice. You could adversely alter the drainage pattern across the site and cause erosion or soil movement.
2. Do not allow water to pond on the property. Such water will seep into the ground causing unwanted saturation of soil.
3. Do not allow water to flow onto slopes in an uncontrolled manner. Once erosion or oversaturation occurs, damage can result quickly or without warning.
4. Do not let water pond against foundations, retaining walls or basements. Such walls are typically designed for fully-drained conditions.
5. Do not connect roof drainage to subsurface disposal systems unless approved by a geotechnical engineer.
6. Do not irrigate in an unreasonable or excessive manner. Regularly check irrigation systems for leaks. Drip systems are preferred on hillsides.



NOTE: Riparian boundary determined as per City of West Linn development code and professional assessment by Terra Science, Inc. Riparian boundary mapped using Ashtech 120 hand-held Global Navigation Satellite System (GNSS) receiver running ArcPad version 10.0 software. Presented boundaries and plots reflect sub-meter horizontal accuracy.

Source: Adapted from Thurston & Associates (surveyors) and TSI GPS files.

Site Plan
1822 Carriage Way
David Quinn 503-927-5153



January 2016