ATTACHMENT L -
July 16 Letter from EKW Law

EKW LAW
EGLICK KIKER WHITED PLLC

Jane S. Kiker
kiker@ekwlaw.com

July 16, 2015

Via Email Plancom@shorelinewa.gov
And Hand Delivery

Planning Commission
City of Shoreline
17500 Midvale Avenue N
Shoreline, WA 98133

RE: 2015 Critical Areas Ordinance Update; Preliminary Comments Submitted By The Innis Arden Club

Dear Planning Commission:

The following comments concerning the City's proposed geologic hazard area amendments are submitted on behalf of the Innis Arden Club. Attached to this letter are comments prepared by the Club's geotechnical consultant, Garry Horvitz, P.E. LED, Senior Principal Geotechnical Engineer at Hart Crowser, regarding the same. Mr. Horvitz's resume is attached to his letter and details his extensive expertise in slope stability issues, particularly in this area. The Club anticipates submitting comments on other subchapters of the Critical Areas Ordinance (CAO), as draft language is proposed by Staff and considered by the Commission, throughout the Update process.

As a preliminary matter, it appears that the City is in a big hurry to adopt its critical area amendments on an expedited basis. However, Staff has already observed that such haste is unwarranted, at least based on State-adopted schedules for such periodic updates: "Shoreline would be considered to be in compliance if we are not more than twelve months past the deadline and can demonstrate substantial progress towards compliance." 6/18 Critical Areas Staff Report, at 12. The fact that the proposed amendments and supporting materials are voluminous further signals that careful consideration of them by the Planning Commission, the Council, and the public should not be hurried. To afford adequate time for meaningfully consideration of the substantial new language proposed in the CAO Update, the Innis Arden

Club joins with other groups in respectfully asking that the Planning Commission delay the public hearing until at least mid-September.

The proposed geologic hazard areas language contains a few noticeable improvements, such as increased clarity respecting the critical role played by site-specific geologic hazard critical area reports prepared by a qualified professional (e.g., a licensed geotechnical engineer or engineering geologist). However, the Club notes several significant inconsistencies, discussed below.

A. The Proposed Prohibition On All Development Activities In Very High Risk Landslide Hazard Areas Is Inconsistent With Best Available Science (BAS) Determined Through Professional, Site Specific Evaluations

In light of the amendments' increased reliance on site-specific evaluations of geologic hazard areas to determine appropriate activities, buffers, and mitigation, the draft regulations would improperly and unnecessarily distinguish between "very high risk" and "moderate to high risk" landslide hazard areas, flatly prohibiting any development in the former, regardless of what a professionally prepared, site specific evaluation might conclude or recommend. See, SMC 20.80.224.C ("Alteration of Very High Risk Landslide Hazard Areas").[1]

The BAS memo by City consultant Todd Wentworth of Amec Foster Wheeler does not support this blanket prohibition on all activities within a "Very High Risk Landslide Hazard Area." The City's consultant instead recommends that site-specific studies, which, he points out, constitute Best Available Science ("BAS"), be relied on to assess site conditions, identify a proposal's potential impacts in geologic hazard areas, evaluate the risks, and recommend mitigation. AMEC BAS Memo at 2. Further, as Staff acknowledged at the Planning Commission's June 18th meeting, the State does not specifically prohibit development in any geologic hazard area, including steep slopes. Planning Commission 6/18 Draft Minutes, at 4. In addition, the City's consultant acknowledged that the City of Seattle does not prohibit all development activity in the highest risk landslide hazard areas. Id. at 12. And, other municipalities' Codes we checked similarly do not impose blanket prohibitions on development activities in any particular classification of geologic hazard area.[2] Instead, they uniformly rely on reports and analyses prepared by qualified professionals to determine the site specific feasibility of any proposed activities, the appropriate buffers and mitigation required to address any potential impacts.

Hart Crowser's Garry Horvitz recommends that this arbitrary prohibition be replaced by the more "reasonable" (and BAS-supported) approach the City would apply to development

[1] This section of the draft ordinance contains typos in that there are two section C's and two section D's. The referenced section is on page 11 of the June 18th Agenda Attachment A.
[2] See, e.g., City of Edmonds (EMC 23.80-000 through -070); City of Bothell (BMC 14.04.800 through .880) and City of Kirkland (KMC 85.05 through .25).

proposed in the "moderate to high risk" landslide hazard areas: a requirement that a site specific geotechnical report support any proposed development with site specific mitigation designed to avoid any landslide hazards. Without such a provision, the Club is concerned that the arbitrary prohibition could prevent it from conducting necessary vegetation management on slopes that are barely 20 feet in height and barely 40% in grade, even where the soils are stable, there is no emergent water and the activity is otherwise supported by a geologic hazard report prepared by a qualified professional.

Staff's response to concerns voiced at the last meeting regarding this inconsistent approach has been that the Critical Area Reasonable Use and Special Use Permit processes set forth elsewhere in the Code will avoid unfairly burdening such property owners. However, these processes are not designed for situations where a private resident has been denied the right to remove and replant vegetation on a previously developed property, or property – such as the Innis Arden Reserve tracts – that is development-restricted. For starters, the Critical Area Special Use Permit applies only to public agency/utility proposals (e.g., a pipeline through a critical hazard area). SMC 20.30.333. In addition, the City's Critical Area Reasonable Use Permit process is primarily directed at permitting minimal site development ("reasonable economic use") where regulations would not otherwise allow it. Even if this process could be utilized for seeking approval of tree removal/ replanting activities in a "very high risk" landslide hazard area, requiring yet another permit process would unfairly burden an applicant whose proposed work includes no site development in the first place.

The June 18th meeting minutes reflect that Planning Commission Chair Scully returned to this issue three separate times during that meeting, and requested Staff to prepare alternative language to consider, that would allow activities in the "very high risk landslide hazard areas" where supported by a site-specific geotech report. However, the Staff Report prepared for the Commission's July 16th meeting indicates that staff is not yet prepared to provide or discuss this alternative language:

> These items are not yet ready for discussion so will be presented either at the scheduled August 6th or the August 20th meetings.

The August 20th meeting is to be the public hearing, and thus the last opportunity for the public to be heard by the Planning Commission. The Club is concerned that any delays in provision of the requested language are apt to frustrate, rather than facilitate, meaningful comment and deliberation on this critical issue.

B. <u>Best Available Science – and Common Sense – Do Not Support Removal of The Director's Discretion to Waive Requirement For Geologic Hazard Report For Activities In *Moderate* Risk Landslide Hazard Areas</u>

Proposed SMC 20.80.224.D ("Alteration to Moderate to High Risk Landslide Hazards") would eliminate the discretion currently afforded the Director to waive the requirement for a

geotechnical report for "proposals that include no development, construction or impervious surfaces" in "moderate to high risk" landslide hazard areas. This existing provision is entirely reasonable and avoids unnecessarily burdening property owners who seek permission to conduct minor site maintenance activities in a borderline moderate risk area (e.g., on a stable 15% slope). The only explanation offered for eliminating this discretion is to avoid the potential for claims of abuse. However, the background materials provide no support for this kind of speculation. Geotech Garry Horvitz addresses the elimination of the waiver in "moderate risk" areas, noting that, "the fact that these areas include modest (15%) slopes on relatively stable soils, where there is no emergent water or history of landslide activity, indicates that there may be instances where a determination could be made that no geologic investigation would be necessary."

Ironically, upon eliminating the Director's discretion to waive the report requirement as being subject to abuse claims, both consultant and Staff suggest that the required level of detail in geologic hazard reports can and should be varied at the Director's discretion, to reflect the relative complexity of a proposal, or sensitivity of the hazard area. No explanation is articulated for why this discretion would not subject the Director to similar claims of abuse or preferential treatment on a case by case basis. More importantly, Staff does not explain how this discretion would be exercised where the required elements of a full blown geotechnical evaluation have been codified to the very last detail, as is proposed in SMC 20.80.226. Will there be a variance process subsequently adopted to allow applicants to opt out of or "depart" from certain Code-required report details (e.g., identification of "all known faults within 200 feet" of a project to remove/replace a few trees, SMC 20.80.226.D (1)(g))? While the Club generally supports reliance on site specific evaluations for activities proposed in most geologic hazard areas, it appears that front-loading too much detail into the Code regarding mandatory report contents would interfere with the discretion urged by the Staff and consultant, and wind up unnecessarily burdening applicants – and the City.

C. Buffers And Setbacks; Slope Definitions

For the most part, the proposed geologic hazard buffer requirements appear consistent with the City's consultant's recommendation to allow the standard buffers to be reduced based on findings in site-specific studies, because "site specific conditions are unique and site-specific studies represent BAS." AMEC Memo at 4. However, nothing in the BAS memo directly supports the proposed minimum buffer of 15-feet found in SMC 20.80.230.C. In fact, the sample code provisions from the Department of Commerce suggest a narrower 10-foot minimum buffer where reductions are allowed pursuant to a site-specific study. Likewise, the City of Edmonds allows buffer reductions to 10-feet, on the same basis. The City's BAS supports buffer reductions to less than 15-feet based on a site specific evaluation, and SMC 20.80.230.C should be revised, accordingly.

The materials further provide no support, BAS or otherwise, for including a 15-foot horizontal distance at the top and toe of any slope greater than 15% as part of the regulated "landslide hazard area." The Code – like many other jurisdictions' codes – has long-defined the

top and bottom edge of the hazard area as "a distinct topographic break" in the slope. There is no scientific support for redefining this "distinct break" between hazardous and non-hazardous slopes to include a minimum 15-foot distance, horizontally. Although the proposed methodology is included in the AMEC memo, there is no scientific basis provided in support.

Geotech Garry Horvitz calls this "15-foot rule" an arbitrary measurement and explains that the extent of a geologic hazard area depends entirely on site specific geologic conditions and any proposed site specific activities. Thus, he concludes, the definition of the top and toe of a hazardous slope should be determined through the site specific geotechnical report. As Horvitz points out, the City of Bellevue determines hazardous slope "toe" and "top" in this manner, expressly deferring to the geotechnical report.

Horvitz' approach is consistent with the City Hearing Examiner's findings in the 2011 Bear Reserves appeal, where, in reliance on expert testimony from the Innis Arden Club's engineering geologist, she found that, depending on site conditions, such a break can occur even where narrow 5-10-foot trails have been constructed through these areas, parallel to the slope.[3] As the Club's expert engineering geologist testified in the Bear Reserve appeal hearing, proper determination of a distinct topographic break is based on direct observation of slope characteristics and load factors and the extent to which a "break" reduces the weight bearing on a given slope. If a topographic break on the slope removes significant weight from the lower portion of the slope, that break is considered a distinct topographic break, regardless of its horizontal width. A minimum width of five feet (at the most) might conceivably be defensible, but only if coupled with a provision granting exceptions based on a professional evaluation of load factors.

Staff's proposed definition of the "top and toe of slope" based on Amec's 15-foot rule would effectively result in an additional 15 horizontal foot "buffer" for every geologic hazard area. BAS simply does not support this overreaching regulation, and it is not supported by other jurisdictions' Codes, such as Bellevue's (above), or even the Sample Code provided by Department of Commerce. There is no support for adopting an arbitrary requirement in preference to site specific interpretation and scientific analysis provided by qualified experts.

D. The Proposed Draft Regulations Fail To Reasonably Distinguish Between Project Types

Innis Arden has 50 acres of dedicated private Reserve Tracts containing almost 8,000 trees and countless other vegetation. Per the Innis Arden Mutual Restrictive Easements, these open space Reserves must be used for parks, bridle trails, playgrounds, or other community

[3] October 21, 2011 Findings, Conclusions and Decision, *In re Innis Arden Club, Inc. v. Dept. of Planning and Development Services, Project No. 115423* ("Bear Reserves Appeal"). In the Bear Reserves appeal, the Department tried to insist on a similar 15-foot rule. However, it soon became clear that the City's consulting engineer could not offer a scientific basis for a flat 15-foot standard and the Hearing Examiner declined to adopt it.

purposes (many residents currently use the Reserves for jogging, hiking, dog-walking, birding and the like). For over half a century, long before incorporation of the City of Shoreline, the Innis Arden Reserves and their trees have been managed for environmental stewardship, hazard reduction, recreational use, and view preservation. In managing the Reserves over just the past three and a half years, the Club has spent over $100,000 in planting over 1400 trees and approximately 2000 smaller plants and shrubs, and performing invasive plant removal, trail maintenance and hazardous tree management.

The City Code should facilitate such management rather than hamper it. The Club has always accepted reasonable municipal regulation as part of its Reserves management. However, like other private property owners, under the current and proposed CAO it must undergo an expensive and burdensome permit process in order to even remove one or two unhealthy trees or invasive vegetation from the Reserves. Garry Horvitz' attached comments emphasize the important distinction between new site development (or redevelopment) and site "maintenance", such as vegetation management, particularly where the latter is on an already developed site where further development is substantially – or in some cases completely -- restricted.[4] The latter is typically limited to tree/vegetation pruning, invasive plant removal and remedial re-planting activity and does not include any grading, excavation, construction, demolition or other activities that actually modify the slope itself. Further, the "alteration" is typically temporary in nature with full restoration of the slope surface (including vegetation) the common result, at least where Best Management Practices are employed. In fact, such management activities often incorporate critical area enhancement or restoration measures.

In contrast, Horvitz explains that site development activities often result in permanent modification to the site's structural stability and physically alter its fundamental stability. Based on this, Horvitz recommends that the critical areas regulations should differentiate between such project types. The Club urges the Planning Commission to consider establishing two separate tracks/processes under the geologic hazard (and other critical area) regulations that would recognize these important distinctions and provide for expedited review and approval of vegetation management proposals in such critical areas, based on a site specific study that includes appropriate BMPs and mitigation.

Means of establishing this distinction in the Code could be to include "vegetation management on previously developed or development-restricted lots" as a separate category of activities under "Allowed Activities." SMC 20.80.224.B.[5] Alternatively, the City could include such vegetation management activity as one of the "partial exemptions" listed under SMC 20.80.040. The record does not support that the demolition of structures in geologic hazard areas

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[4] The City's consultant acknowledges that it is property owners' increased attempts to "maximize the developable portions of their land within the constraints of the CAO code" that has led to landslide hazard areas becoming "a more contentious issue." Amec BAS Memo, at 2.

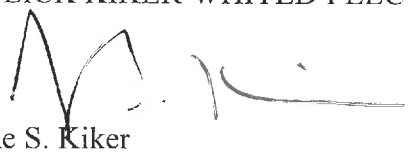
[5] Although the Club raises this critical issue in the context of its comments on geologic hazard areas, it applies equally to other critical areas such as streams/fish and wildlife habitat areas and wetlands.

– proposed as a "partial exemption" -- would have less of an impact on the surrounding area than a typical vegetation management project.

The Innis Arden Club thanks you for your consideration of the above comments.

Sincerely,

EGLICK KIKER WHITED PLLC



Jane S. Kiker
Attorney for The Innis Arden Club

cc: Client
Associate Planner Juniper Nammi: *jnammi@shorelinewa.gov*
PCD Director Rachel Markle: *rmarkle@shorelinewa.gov*
City Attorney Margaret King: *mking@shorelinewa.gov [per her request]*
City Manager Debbie Tarry: *dtarry@shorelinewa.gov*
Commissioner Chair Keith Scully: *kscully@shorelinewa.gov; keith@newmanlaw.com*
Commissioner Vice Chair Easton Craft: *ecraft@shorelinewa.gov*
Commissioner Donna Moss: *dmoss@shorelinewa.gov*
Commissioner William Montero: *wmontero@shorelinewa.gov*
Commissioner David Maul: *dmaul@shorelinewa.gov*
Commissioner Laura Mork: *lmork@shorelinewa.gov*
Commissioner Jack Malek: *jmalek@shorelinewa.gov*

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July 15, 2015

Mr. Rick Leary, President
Innis Arden Club, Inc.
17252 13th Avenue NW
Shoreline, WA 98177

Re: Geotechnical Engineering Review – Preliminary Comments On Proposed Revisions to City of Shoreline Critical Areas Ordinance
15-I-1140-043

Dear Rick:

This letter summarizes our initial review of the proposed changes to the City of Shoreline's Critical Areas Ordinance. Our preliminary review of these proposed changes relates specifically to the geotechnical/geological portion of the proposed changes. We have coordinated our efforts with Ms. Jane Kiker of Eglick Kiker Whited, counsel for the Innis Arden Club.

Summary of Findings

As discussed in greater detail below there are three main points that we would like to make with regard to the proposed Critical Areas Ordinance.

- A blanket prohibition on activities in "Very high risk landslide areas" is inconsistent and inappropriate;
- The determination of "top" and "toe" of hazard areas should be based on site specific analyses by a qualified professional rather than an arbitrary number;
- Geologic hazard area regulations should distinguish between site development activities and site maintenance activities.

Specifically, we have reviewed the following documents that are most pertinent to the discussion.

- Planning Commission Agenda Item from June 18, 2015, 6.a Critical Areas Ordinance Staff Report.
- Attachment A to that Report which presents proposed changes to Subchapter 2.
- Attachment B to that Report, Memorandum from Todd Wentworth of Amec Foster Wheeler, dated May 29, 2015.

1700 Westlake Avenue North, Suite 200
Seattle, Washington 98109-6212
Fax 206.328.5581
Tel 206.324.9530

- Attachment C to that Report, Attachment C, Appendix A, Example Code Provisions for Designating and Protecting Critical Areas.

The primary focus of our review was the Best Available Science discussion offered by Todd Wentworth of Amec. Within that discussion we have primarily addressed potential landslide hazards, reviewing how the draft proposed regulatory language incorporates Amec's discussion/recommendations. We offer the following comments and opinions regarding the proposed changes:

With a few notable exceptions, addressed below, we generally concur with the discussion and many of the recommendations presented by Amec. Development issues in landslide hazard areas are now most typically and appropriately addressed through the use of site specific geotechnical/geologic investigations and studies to identify the extent of the hazard, how the proposed development might impact the hazard, how the hazard might impact the development and the methods that will be used to mitigate those adverse impacts. Some jurisdictions have the ability and expertise in house to be able to review studies put forth by project proponents. In those jurisdictions that do not have the in house capability of performing these reviews, third parties are retained by the governing authority.

Requirement For Site Specific Evaluation By Qualified Professional

Significantly, Amec recommends that all projects within landslide hazard areas undergo site specific evaluation as opposed to the current situation whereby the City can waive that requirement at its sole discretion in "moderate" and "high" risk areas. We concur that these site specific evaluations should be made for all applications in "high" or "very high" risk landslide hazard areas; however, it would be reasonable to retain the Director's discretion to waive the requirement for a site specific evaluation for minor projects in "moderate" risk areas. The fact that these areas include modest (15%) slopes on relatively stable soils, where there is no emergent water or history of landslide activity, indicates that there may be instances where a determination could be made that no geologic investigation would be necessary.

Amec goes on to provide a list of specific items that should be contained within a geotechnical investigation for a landslide hazard area. We generally concur with Amec that the scope of the investigation should be varied depending on the nature and extent of the proposed development activity and the sensitivity of the hazard area. However, we do question the process by which the City plans to vary the scope of the investigation, if – as is proposed in draft SMC 20.80.226.A through G – every possible detail of a geotechnical investigation has been codified as a mandatory element of the same. In other words, it is not clear from the proposed language how the City would go about waiving certain listed elements of the required investigation for a reduced-scope project, as it has suggested will be done.

Amec also comments about buffer areas and presents alternatives to the current definition and also recommends that exceptions to the stated buffers be allowed as these buffers should really be established on the basis of site specific conditions. We generally concur with Amec's recommendation that buffers should be determined through the site-specific geologic evaluation, and the proposed Code language's incorporation of that approach.

Blanket Prohibition of All "Uses and Activities" in "Very High Landslide Hazard Areas"

With respect to the "Very High Landslide Hazard Areas", the city's proposed regulations appear to take the Amec recommendations a step further than is appropriate, in our opinion. We read Amec's recommendation as requiring detailed geotechnical investigations of proposed development in all Landslide Hazard Areas, including those classified as "Very High Risk" areas. However, the City has included draft language that expressly **prohibits** development in these areas. SMC 20.80.224.C ("Alteration of Very High Risk Landslide Hazard Areas").[1] In our opinion the fact that an area has been designated to be a Very High Risk Area should not necessarily preclude development or maintenance activities in these areas. We recommend that this restriction be eliminated and that the language used in Section 20.80.224, GEOLOGIC HAZARDS – Development Standards, part C ("Alteration") be used for all classifications of landslide hazard area. In effect this section states that any development will need to be designed to mitigate any landslide hazard based on a qualified professional's evaluation and if that hazard cannot be mitigated then the proposal should be denied. This is by far a more reasonable approach.

Definition of Extent of Hazard Area

We take exception to Amec's proposed blanket use of a somewhat arbitrary definition of "distinct topographic break" as that phrase is used to define the extent of a particular hazard area. As noted above, in our opinion – and Amec's, otherwise -- the physical extent of a specific hazard area should be determined through a site-specific evaluation, not through arbitrary measurements adopted in the Code. The proposed change to the Code shown in Section 20.80.220, GEOLOGIC HAZARDS – Classification, Part A. Landslide Hazard Areas, presents a new methodology for defining the extent of the landslide hazard area that includes measuring an additional 15-feet horizontally from a slope to determine the "distinct topographic break" that defines its "toe" and "top" These dimensions — proposed to be applied to all situations, large or small -- are arbitrary and overly generalized. The extent of a landslide hazard area (when one is trying to define the extent of an area that is susceptible to landsliding) is a function of many geologic factors including the geologic nature of the soil deposits (i.e., till versus advance outwash sand versus lacustrine silts and clays), the stratigraphy of the various slope materials, the presence and abundance of groundwater, the erodibility of the site soils, the angle of the slope (greater than 40 percent? or 50 percent? or higher) and perhaps most importantly, the overall

[1] See p. 11 of 6/18 Agenda Attachment A. We note the 6/18 draft ordinance mistakenly includes in SMC 20.80.224 two "C" subsections and two "D" subsections. (Pp. 10-11). This should be corrected in the next draft.

height of the slope. Depending on the range of these factors and conditions, the area impacted by the potential instability of a potential landslide and the influence of activity on the stability of a high risk slope can extend much further away from the slope or much closer to the edge of the slope.

In other words, the 15-foot rule might be extremely NON-conservative in areas of very high slopes with abundant high groundwater. The opposite is also true where very light development or ground modification (e.g., tree removal and replacement) is done adjacent to very low slopes without any groundwater or other signs of instability. Our conclusion is that this definition should be based on an evaluation by a qualified geotechnical engineer or engineering geologist focused on the proposed site specific activities and site specific geologic conditions. The City of Bellevue has reasonably adopted such a provision:

> 20.50.048 T definitions.
>
> Toe of Slope. The lower boundary of the 40 percent slope as delineated on the slope category analysis; or in the case of landslide hazards, as delineated by the geotechnical report.
>
> Top of Slope. The upper boundary of the 40 percent slope as delineated on the slope category analysis; or in the case of landslide hazards, as delineated by the geotechnical report.

Differentiation Between Proposed Development of a Site and Maintenance of a Site

The City's Code defines "Use" as "An activity or function carried out in an area of land, or in a building or structure located thereon". Currently, the Code and proposed amendments do not differentiate between the potentially more intrusive activity of developing a site, (e.g., building a new residential or commercial building, side hill cuts and fills, retaining walls and roadways) as opposed to maintaining landscaping and vegetation on a slope (including tree removal). The former activity can result in permanent modification to the structural stability of the site and can physically alter the fundamental stability of the site whereas the latter activity is more likely to be temporary in nature and have no impact on the overall stability of a site provided it is done using Best Management Practices. The former is essentially "new construction" while the latter is "maintenance". In our opinion the Code should recognize the distinction between the two.

We appreciate the opportunity to provide you with these engineering services. Should you have any questions or wish to discuss any of these items in greater detail please don't hesitate to call.

Sincerely,

HART CROWSER, INC.

GARRY E. HORVITZ, PE, LEG
Senior Principal Geotechnical Engineer

GARRY E. HORVITZ, PE, LEG

Senior Principal Geotechnical Engineer

EDUCATION

MS, Civil (Geotechnical) Engineering, Massachusetts Institute of Technology, 1975

BS, Civil Engineering, State University of New York at Buffalo, 1973

REGISTRATIONS

Professional Engineer,
OR, 2004, #75506
WA, 1981, #19478
AK, 1983, #5255
HI, 1992, #7705

Licensed Engineering Geologist, WA
2002, #2201

Transportation Worker Identification Credential

AFFILIATIONS

American Society of Civil Engineers (ASCE); Coasts, Ocean, Ports, and Rivers Institute (COPRI)

Society of American Military Engineers (SAME)

With 39 years of experience, Garry is one of Hart Crowser's most senior engineers. Garry has provided project management and senior-level review for soil and foundation studies and engineering design on hundreds of developments and redevelopments—from preliminary siting through final design and construction. His expertise includes slope and embankment design; geotechnical engineering design of roadways, utilities, and elevated structures (bridges, piers, and wharves); engineering for pavement and roads, dredging, breakwaters and piers, seismic projects, and landslide stabilization; and foundation design for a wide range of industrial, commercial, and infrastructure projects. Representative examples of Garry's landslide/slope stability projects are listed below.

SLOPE STABILITY PROJECTS

Helsell Residence Landslide Repair, Greater Seattle (Shoreline), WA. Garry was geotechnical Project Manager for geologic/hydrogeologic assessments and design for repair of a major landslide in the Highlands area of Greater Seattle. The Helsell landslide involved a significant volume of slide debris which ultimately covered a 100-foot span of the BN railroad tracks at an elevation of about 200 feet below the residence. An estimated 10,000 to 15,000 cubic yards of material were involved in the event which involved three separate properties. The escarpment was up to 90 feet high and more than 200 feet long. Garry worked with the design team and owner to assess a wide variety of slope stabilization alternatives, considering not only the technical feasibility, but also constructability issues, relative cost, aesthetics, and logistics. An enhanced drainage/geosynthetic-reinforced soil slope was selected as the most cost-effective and constructible repair solution to provide stability long-term stability for the residence. Drainage design and surface erosion control were important elements of the repair.

Beach Drive Residence Landslide Repair, Shoreline, WA. Project Manager for multiple solutions at this residence based on the different site development needs. The work included designing stabilization methods for retention of a high bluff along Puget Sound. In areas where the top of steep slope was close to the new house, Garry designed a structural wall that could be retrofitted with permanent tieback anchors in the event of loss of ground in front of the wall. Based on a thorough review of past slide activity in the area, including aerial photos dating back to 1940, he assessed the rate of loss of the top of bank over time and then developed design parameters for the wall system that were not overly conservative in the assumptions of how much material might be lost in front of the wall over the life of the project.

In other areas that were not close to planned structures, he identified the geologic hazard so the owner could plan for future development. In these areas, installation of

enhanced subsurface drainage provided the greatest cost benefit to maintain the edge of bluff in its position. The use of structural alternatives was not considered appropriate due to the high cost and low potential for increasing the stability of the bluff.

Bonair Drive SW Slide Stabilization, West Seattle, WA. Garry provided senior-level technical review for fast-track work to stabilize portions of Bonair Drive SW which was experiencing accelerated movement, slipping approximately 1 to 3.5 feet downward, leaving an exposed scarp along 125 feet of Bonair Drive. At the same time, near-surface landsliding or mud flows occurred farther down the slope, causing damage to homes along Alki Avenue. The project included a site reconnaissance and deep borings in the slide area to assess soil and groundwater conditions. A key element was the identification of groundwater seepage zones about half-way down the slope face and saturated sands above hard silts. The project team worked with the contractor to design a trench drainage system to extend through the sand and into the underlying silt, thereby intercepting groundwater that was tending to flow along the top of the hard silt and daylighting about halfway down the slope face, causing the instability. In order to improve the stability for a longer segment of Bonair Drive, the trench drain was extended several hundred feet, toward the northeast. Even during construction, a significant amount of water was being picked up by the drainage system. To handle discharge of the water (another significant challenge), the design used an existing manhole, a new tightline on the face of a steep slope, and a new manhole installed at a critical location on the slope that was connected to the system using directional drilling.

Sunset Avenue SW/45th Avenue SW Emergency Slide Stabilization, West Seattle, WA. Garry provided senior technical review for geotechnical assessment and design services for emergency stabilization of a mass movement of soil and water that occurred on the northwest side of Sunset Avenue SW. Much of the slide material continued down a narrow drainage gully to the base of the slope and impacted a number of homes along Alki Avenue SW. The slide scarp was about 30 to 40 feet wide, about 20 feet horizontally from the northwest edge of Sunset Avenue, and about 75 feet wide at its base. Immediately below the crest of the scarp at Sunset Avenue was an oversteepened slope, about 30 to 40 feet high, with a more gradual slope below that. Total elevation difference between the street and the toe of this upper portion of the project was about 70 feet. After performing a site reconnaissance and subsurface explorations, the team designed and constructed a permanent tied-back soldier pile wall at the toe of the upper slope. A free-draining fill material and subsurface drainage system were then placed behind the wall at a relatively stable 2 horizontal to 1 vertical (2H:1V) angle up to Sunset Avenue. In the lower portion of the ravine, control of drainage from above was the main issue, more so than slope failure. The team identified sources of water that were feeding the ravine flows. This included unmapped drainage line discharges from private properties above, as well as natural flows. The team designed a series of catch basins and a drain line in the lower portion of the ravine to collect and tightline groundwater flows to a suitable discharge at Alki Avenue.

Hood Canal Bridge Information Review, WA. As Project Manager, Garry reviewed documents and reports pertaining to the cause of landslide at a residence near the Hood Canal Bridge. The owner alleged the movement was due to vibrations associated with pile driving for work completed for the Washington State Department of Transportation (WSDOT). Garry also visited the site. He provided an opinion paper specifying how damage from pile driving usually occurs, and the likelihood of the cause given the geological conditions at the site, the distance of the property from the construction, and the type of pile driving instruments used by WSDOT's contractor.

Slope Instability and Erosion, Seattle, WA. Garry provided geotechnical engineering consultation regarding slope instability and erosion at a residential property. The work included providing technical review of legal documents regarding the potential for construction on an adjoining property to have caused the landslide.

Diablo Lake Barge Facility, North Cascades National Park, WA. A rock slope failed, sending 16,000 cubic yards of rock and soil debris onto barge landing facilities and a road. As Project Manager for geotechnical services, Garry is helping Seattle City Light evaluate options for constructing a new barge landing facility and road. Tasks include seismic design, evaluation of slope stability, evaluation of constraints on earth moving operations, assessment of alternatives for foundation design and construction including shallow foundations, structural slabs use of micropiles and/or driven piles, gravity systems, and tieback anchors.

Interstate-90 Beacon Hill Section, Seattle, WA. Garry was geotechnical Project Manager working with the Washington State Department of Transportation on design of the Seattle section of I-90 to the Mt. Baker Ridge tunnel. A major portion of the project wraps around the steep side slopes of Beacon Hill. Hart Crowser's detailed design geotechnical studies included sophisticated laboratory and field testing, and innovative approaches to slope retention and stabilization that led to a total redesign of the project. The "value engineering" approach established by Hart Crowser resulted in extensive excavations by open cut methods with local and effective slope retention structures, as opposed to the costly multiple cylinder pile wall approach. Combined with the use of earth-reinforced structures, the majority of the roadway was designed to be an on-grade facility. Project cost savings of over $30 million were attributed to Hart Crowser's efforts on this section of I-90.

Belroy Apartments Steep Slope Development, Seattle, WA. Project Manager and Principal in Charge for a preliminary geotechnical engineering study for a proposed residential development on Bellevue Avenue. The City of Seattle Department of Planning and Development considers the Belroy site to contain an area of "steep slope" under the city's Environmentally Critical Areas regulations. Our work is supporting the Master Use permit process. Existing structures will be replace with a three- to four-story (with a portion as much as six to seven stories) residential building. Our services included geologic reconnaissance observations to identify obvious signs of potential instability. We provided recommendations regarding subsurface conditions, seismic considerations, shoring, groundwater control, slope stability, and the design phase study. We also provided conclusions regarding the impact of development on the existing slope, and whether the existing slope was created as a result of legal grading.

On-Call Permit Application Review Contract, City of Gresham, OR. Principal in Charge and QA Reviewer for an on-call contract for the City of Gresham Community Development related to third-party review of permit applications. Since August 2004, he has reviewed over 10 development applications for properties in hillside hazard areas designated by the City.

Upgrade of Miller Creek Wastewater Treatment Plant, Southwest Suburban Sewer District, King County, WA. Garry was the Geotechnical Project Manager for foundation engineering, slope stability issues, shoring for deep excavations, and construction dewatering. This project also called for design of buried utility lines within steeply sloping terrain.

Martin Luther King, Jr., Memorial Park, Seattle Parks Department, WA. Garry was Hart Crowser's Project Manager for site explorations, slope stability evaluation, cut and fill design, and foundation design for a memorial and reflecting pool located in a potentially hazardous slope area.

ASARCO Ore Dock and Copper Dock Demolition Slope Stability Evaluation, Ruston and Tacoma, WA. Project Manager and Principal in Charge for geotechnical engineering analysis and recommendations related to the slopes behind two docks, and the timber piles supporting the docks, as part of the proposed ASARCO Docks Demolition. The demolition work involves three docks supported by 2,300 creosote-treated timber piles, and the steep shoreline adjacent to the docks consists of slag fill that is not fully stabilized. Historical seismic slope failures have been reported in the general area. As a result, the long-term stability of the shoreline slope and the environmental cap adjacent to the docks is a matter of key concern when considering whether the piles should be removed as part of the dock demolition. The work included:

- Assessing the existing geotechnical information;
- Evaluating static and seismic stability with and without the timber piles using SLOPE/W computer modeling
- Based on the results of SLOPE/W modeling, using Newmark Sliding Block analysis to evaluate potential for displacement of the slope due to inertial loading under earthquake shaking
- Comparing predicted impacts to the proposed upland development plan and noting potential impacts to improvements such as buildings, a promenade, and other surface and subsurface construction.

Hart Crowser determined that keeping the piles in place would contribute to the stability of slopes and a potential reduction in settlement and lateral displacement, which would be directly beneficial to proposed upland development.

Geotechnical Engineering Conclusions Regarding Rock Fall, Ketchikan, AK. Garry reviewed records and information regarding a rock fall, which caused damage to a house and injured an individual. Conducted a site visit and took geometric measurements. Provided professional opinion regarding the cause of the slide and appropriate measures to take during construction to provide for a safe slope situation.

Retaining Wall Failure, Renton, WA. A retaining wall failed on an office property, which damaged a driveway, parking lot, and waterline. Garry reviewed project documents and provided an expert opinion on the cause of the failure.

Litigation Support for Building Development, Snohomish County, WA. Garry provided professional opinion for litigation regarding a residential development. Technical issues included site grading, site material quality, general area geology, and earthwork efficiency.

Slope Stability Evaluation, Naval Radio Station Jim Creek, WA. Principal in Charge of evaluations and recommendations for mitigation of slope stability issues at the Jim Creek Radio Station. The Station consists of wire mesh placed over an entire valley with a series of large support towers holding the radio array suspended over the valley.

PUBLICATIONS

Frank, Ian, Adam Bergman, Garry Horvitz, and Derek Koellmann. 2013. Replacement of a Failing Bulkhead Wall with Inches to Spare. Presented at ASCE Ports 2013 Conference, Seattle, Washington.

Tripp, Howard, Bob Riley, Ben Upsall, and Garry Horvitz. August 2013. Structural Design of Deep Water Pontoon Mooring Anchors. Presented at ASCE Ports 2013 Conference, Seattle, Washington.

Upsall, Ben, Garry Horvitz, Bob Riley, Tripp Howard, Kimball Olsen, and James R. Struthers. August 2013. Geotechnical Design: Deep Water Pontoon Mooring Anchors. Presented at ASCE Ports 2013 Conference, Seattle, Washington.

Watson, Nathan, David Myers, Leslee Conner, Michaella Kozak, and Garry Horvitz. August 2013. Place of Circling Waters - Industrial Land to Habitat Site. Presented at ASCE Ports 2013 Conference, Seattle, Washington.

Lindquist, D., B. Upsall, and G.E. Horvitz. August 2010. Cutter Soil Mixing Excavation and Shoring in Seattle's Pioneer Square District. Presented at the Earth Retention 2010 conference, Bellevue, Washington.

Winter, David G.; Horvitz, Garry E.; and Armour, Tom A., April 2010. Innovations and Advances in Tied-Back Soldier Pile Shoring in Seattle. Prepared for Earth Retention Conference 3, Bellevue, Washington.

Lindquist, D., G.E. Horvitz, and S. Asavareungchai, March 2007. Prediction and Impacts of Pile Driving on Port Terminal Facilities. Presented at ASCE Ports 2007 Conference, San Diego, CA.

Horvitz, G.E., S. Carroll, and P. LaRosa, May 2004. Design and Construction of a Nearshore Confined Disposal Facility. Presentation to the ASCE Ports 2004 Conference.

Horvitz, G.E., D. Lindquist, and M. Whelan, June 2000. Deepening and Seismic Rehabilitation of the Terminal 5 Wharf, Port of Seattle. Presented at the Western Dredging Association, Texas A&M University Dredging Seminar, Warwick, Rhode Island.

Kleppe, j., M. Kormann, G.E. Horvitz, and M. Dalton, April 1987. Material Properties of Landfilled Primary Waste. Presented at TAPPI Environmental Conference, TAPPI, Portland, Oregon.

Zipper, J.E., G.E. Horvitz, and P. Fuglevand, August 1985. Ground Anchor Creep in Glacially Consolidated Clay. Presented at the Eleventh International Conference on Soil Mechanics and Foundation Engineering, San Francisco, California.

Horvitz, G.E., D.R. Stettler, and J.C. Crowser, 1981. Comparison of Predicted and Observed Pile Capacity. Presented at the ASCE Symposium on Cone Penetration and Testing, 1981 National Convention.

Horvitz, G.E., 1975. Swelling and Shrinkage Behavior of Compacted Clay Shales. Master's Thesis. MIT Engineering Archives, Cambridge, Massachusetts.