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

## OPTIONAL DETERMINATION OF NON-SIGNIFICANCE (DNS) NOTICE MATERIALS

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

| | |
|---|---|
| File No. | 10-112326-XE |
| Project Name/Address: | Bellevue Botanical Garden Ravine Garden<br>12001 Main Street |
| Planner: | Kevin LeClair |
| Phone Number: | 425-452-2928 |
| **Minimum Comment Period:** | **June 10, 2010** |

Materials included in this Notice:

- [x] Blue Bulletin
- [x] Checklist
- [ ] Vicinity Map
- [ ] Plans
- [x] Other: Trail Layout, Project Narrative, Geotech Report(with Vicinity Map) and Habitat Study

# ENVIRONMENTAL CHECKLIST

5/19/2010

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

## BACKGROUND INFORMATION

Property Owner: **City of Bellevue Parks & Community Services**

Proponent: **Same**

Contact Person: **Scott Vander Hyden, Project Coordinator**

Address: **PO 90012, Bellevue WA 98008**

Phone: **452-452-4169**

***REVIEWED***
***By Kevin LeClair at 4:19 pm, May 19, 2010***

Bellevue File # 10-112326 XE

Proposal Title: **Ravine Garden at the Bellevue Botanical Gardens**

Proposal Location: **12001 Main Str. Bellevue, WA (Main Street/124th Ave NE)**
(Street address and nearest cross street or intersection) Provide a legal description if available.

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

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

1. General description: **The proposed Ravine Garden will take visitors along a loop trail which crosses a steep-sided ravine in the southeast corner of the Bellevue Botanical Garden. Garden construction will include a 75' long x 6' wide (rigid) bridge, and a 150' long x 5' wide pedestrian suspension bridge. Both bridges, which span the ravine in different locations and be connected by a pedestrian allowing for a loop connection starting and ending at an existing lost meadow trail. The project also includes 600lnft of new pedestrian trail surface. The design will allow close proximity and intimate views of the wildlife, native plants, and second growth forest growing along either side and inside the ravine. The basic design philosophy underlying this garden is to work with the natural features and processes of the site and interpret these to visitors as an educational experience while they experiencing the dramatic feeling of enclosure that containment within this small-scale landform offers.**

2. Acreage of site: **53 Acres**

3. Number of dwelling units/buildings to be demolished: **0**

4. Number of dwelling units/buildings to be constructed: **0**

5. Square footage of buildings to be demolished: **0**

6. Square footage of buildings to be constructed: **0**

7. Quantity of earth movement (in cubic yards):

8. Proposed land use: **Public Garden**

9. Design features, including building height, number of stories and proposed exterior materials:
**Garden construction will include a 75' long x 6' wide (rigid) bridge, and a 150' long x 5' wide pedestrian suspension bridge. The towers at each end of the suspension bridge will be approximately 23.0' above grade. Both bridges will be made predominantly of steel construction and will span the ravine in different locations, allow for a loop trail connection starting and ending at an existing main loop trail. The project will also include apprx. 600lnft of new trail surface, interpretive elements, and more than 15,000 sqft of new native plantings.**

10. Other

Estimated date of completion of the proposal or timing of phasing: **Construction is expected to begin in third quarter of 2010 and be complete by late 2010 or early 2011.**

Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. **No**

List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal. **Geotechnical Report (2010), Habitat Assessment (2008), Topographic survey (2010), Master Plan SEPA (2008)**

Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. List dates applied for and file numbers, if known. **None**

List any government approvals or permits that will be needed for your proposal, if known. If permits have been applied for, list application date and file numbers, if known. **Critical Areas Land Use and Building Permit w/ Clear& Grade. Not yet applied for.**

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

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

☐ Preliminary Plat or Planned Unit Development
Preliminary plat map

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

Building Permit (or Design Review)
Site plan

A critical areas land use permit is required for disturbance and/or modification of the critical area and critical area buffer. This then followed by a required building permit.

***REVIEWED***
***By Kevin LeClair at 4:19 pm, May 19, 2010***

Clearing & grading plan

☐ Shoreline Management Permit
Site plan

A. ENVIRONMENTAL ELEMENTS

**1. Earth**

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

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

c. What general types of soil are found on the site (for example, clay, sand, gravel, peat, and muck)? If you know the classification of agricultural soils, specify them and note any prime farmland. **Geptech borings encountered similar soil conditions in all areas explored. Apprx. ½ foot forest duff and topsoil underlain by soft to stiff sandy and silty soils.**

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.
**No**

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill. **Approx. 68 cu yards of disturbed volume in the critical area buffer for excavation of bridge abutments. Approx. 340 cu yards in non-buffer areas for bridge earth anchors. Approx. 4,000 sqft of clearing and grading work for new trail construction. Total soil amount of volume to be replaced with cast in place concrete in critical area buffer for bridge abutments 33.34 cu yards. Total in non-buffer area for earth anchors is 18 cuyds.**

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. **Erosion could occur if improper TESC techniques are not followed during project construction. In particular near the top of slope during excavation for bridge abutments. If proper TESC techniques are followed, chances of any significant erosion would be remote. Once the project is complete erosion is not likely as visitors will be encouraged to use defined trails and bridges. Strategically placed fencing, wing walls signage, and landscape buffering will also encourage visitors to use marked trails.**
Project is required to comply with clearing and grading rules and standards contained in BCC 23.76.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? **1,200 sqft bridge surfaces and 2,000sqft crushed rock trail surface. Total sq footage of impervious surface at the Bellevue Botanical Garden is less than 6%. The site is 53 acres of which approximatly 3-4 acres is currently impervious surface. The project will increase the impervious surface amount by apprx. 3,200sqft**

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: **Standard COB specifications for TESC during construction and restoration planting. Trail and bridge construction work will be consistent with COB clearing and grading code, permit conditions, and all other applicable standards and**



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**codes including *"Environmental Best Practices"*.**

**2. AIR**

a. What types of emissions to the air would result from the proposal (i.e. dust, automobile odors, and industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known. **Minimal odors emissions from gas or diesel powered equipment during construction and from ATV service vehicle after construction.**

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe. **No**

c. Proposed measures to reduce or control emissions or other impacts to the air, if any: **Turn off power equipment when not in use.**

**3. WATER**

a. Surface

(1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. **Both bridges will span a unnamed seasonal stream, of Class N non-fish bearing origin which flows into Kelsey Creek.**

(2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If Yes, please describe and attach available plans. **Bridges will span creek in two separate locations. Plan attached.**

Creeks are classified as Type N streams with seasonal flow. Construction of the bridges should be conducted during the summer dry season.

(3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. **None. Not applicable**.

(4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. **No**

(5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. **No**

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***By Kevin LeClair at 4:21 pm, May 19, 2010***

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

b. Ground

(1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description. **No**

(2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals...; agricultural; etc.) Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve. **None**

c. Water Runoff (Including storm water)

(1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. **None**

(2) Could waste materials enter ground or surface waters? If so, generally describe. **No**

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any: **Grading trails and using mulch surfacing to control surface run off and redirect water away from potential erosion/impact areas, restoration plantings in all disturbed areas, additional 15,000sqft native plantings, and proper TESC controls and monitoring during construction .**

**4. Plants**

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

**x** deciduous tree: alder, maple

**x** evergreen tree: fir, cedar, hemlock

**x** shrubs typical nw native varieties (full list included in habitat study)

☐ grass



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By Kevin LeClair at 4:22 pm, May 19, 2010

- ☐ pasture
- ☐ crop or grain
- ☐ wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other
- ☐ water plants: water lily, eelgrass, milfoil, other
- ☐ other types of vegetation

b. What kind and amount of vegetation will be removed or altered? **Apprx. 4,000 sqft native vegetation will be removed or transplanted for trail and bridge construction. Mainly sword fern, blackberry and a mix of other native shrubs and small trees. All sword fern will be replanted within project area.**

c. List threatened or endangered species known to be on or near the site. **A Habitat study was conducted on the site and no federally or state threatened and endangered species or sensitive species were identified within the BBG. Osprey, Bald Eagle, and Peregrine Falcon are known to nest next within 2 miles of the project site.**

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: **The plan proposes removing invasive plant species (mainly exotic blackberry) and planting over 15,000 sqft of additional native shrubs and trees for screening, buffering, aesthetic and wildlife enhancement.**

**5. ANIMALS**

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

- x Birds: **hawk, heron, eagle, red breasted sapsucker, osprey, peregrine falcon, song sparrow, pileated woodpecker…..complete list of those observed in completed habitat study**
- x Mammals: **deer, rabbit, raccoon, mole, gray squirrel**
- ☐ Fish: bass, salmon, trout, herring, shellfish, other:

b. List any threatened or endangered species known to be on or near the site. **None known to be on site.**

c. Is the site part of a migration route? If so, explain. **No**

d. Proposed measures to preserve or enhance wildlife, if any: **Installation of over 15,000 sqft of native tree and shrub plantings, 'snagging' any unhealthy significant trees or those identified hazardous for removal by certified arborist. Leaving wood debris in stream bed and other designated areas.**



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By Kevin LeClair at 4:23 pm, May 19, 2010

**6. Energy and Natural Resources**

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

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe. **No**

c. What kinds of energy conservation features are included in the plans of the proposal? List other proposed measures to reduce or control energy impacts, if any: **none**

**7. Environmental Health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe. **No**

(1) Describe special emergency services that might be required. **One vehicular access to the suspension will be created to accommodate an aid vehicle should the need arise**

(2) Proposed measures to reduce or control environmental health hazards, if any. **None**

b. Noise

(1) What types of noise exist in the area which may affect your project (for example, traffic, equipment, operation, other)? **None**

(2) What types and levels of noise would be created by or associated with the project on a short-term or long-term basis (for example, traffic, construction, operation, other)? Indicate what hours noise would come from the site. **Short term basis, construction equipment and power tool operation during duration of the project (3 months). Noise would be limited to M-F and COB code for construction hour of operation.**

(3) Proposed measures to reduce or control noise impacts, if any: **None**



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**8. Land and Shoreline Use**

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

b. Has the site been used for agriculture? If so, describe. **No**

c. Describe any structures on the site. **Visitor Center, pavilion, water feature, cabin, and two homes**

d. Will any structures be demolished? If so, what? **No**

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

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

g. If applicable, what is the current shoreline master program designation of the site? **Not applicable**

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify. **Two identified wetlands exist on the Botanical Garden site but are not located within the project area. A ravine with slopes exceeding 40% exists within the project area.**

I. Approximately how many people would reside or work in the completed project? **There are currently 3 full time COB employees that are responsible for all Botanical garden maintenance operations. This project area will now be included in their workload planning.**

j. Approximately how many people would the completed project displace? **None**

k. Proposed measures to avoid or reduce displacement impacts, if any: **N/A**

i. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any: **Master Plan SEPA for Garden issuance of non-project determination of non-significance in 2008**

**9. Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. **None**



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b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. **None**

c. Proposed measures to reduce or control housing impacts, if any: **N/A**

**10. Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? **Bridge towers at each entry point to the suspension bridge will be apprx. 23' above grade. Steel with be the principle building material of the bridges with some organic elements including natural stone and wood included in the design as aesthetic features.**

b. What views in the immediate vicinity would be altered or obstructed? **None**

c. Proposed measures to reduce or control aesthetic impacts, if any: **Architectural design of bridges, natural elements of stone, wood, pavers, and plantings will also be incorporated in the and around the structures.**

**11. Light and Glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur? **None**

b. Could light or glare from the finished project be a safety hazard or interfere with views? **No**

c. What existing off-site sources of light or glare may affect your proposal? **None**

d. Proposed measures to reduce or control light or glare impacts, if any: **None**

**12. Recreation**



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***By Kevin LeClair at 4:23 pm, May 19, 2010***

a. What designated and informal recreational opportunities are in the immediate vicinity? **Public Garden and Soccer Field**

The Bellevue Botanical Garden and Wilburton Hill Park consists of several miles of soft-surface nature trails with multiple bridge crossing of low topographic features.

b. Would the proposed project displace any existing recreational uses? If so, describe. **No**

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

**13. Historic and Cultural Preservation**

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe. **None**

b. Generally describe any landmarks or evidence of historic, archeological, scientific, or cultural importance known to be on or next to the site. **None known**

c. Proposed measures to reduce or control impacts, if any: **None**

**14. Transportation**

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any. **Single vehicular access to the Botanical Garden exists off of 124th Ave NE**

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop? **No. Approximately 1/4 mile**

c. How many parking spaces would be completed project have? How many would the project eliminate? **Currently the site has 53 existing parking spaces. The project would not add or eliminate parking.**

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not Including driveways? If so, generally describe (indicate whether public or private). **No**

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe. **No**

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur. **It is not known how many additional trips the project would generate but it is not expected to be significant**. **Peak volumes at the Garden occur on weekends between 9-5 and weekday evenings after 5PM in the summer months of June/July and August**



**REVIEWED**
***By Kevin LeClair at 4:25 pm, May 19, 2010***

g. Proposed measures to reduce or control transportation impacts, if any: **None**

**15. Public Services**

a. Would the project result in an increased need for the public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe. **No**

b. Proposed measures to reduce or control direct impacts on public services, if any. **None**

**16. Utilities**

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other**. All major utilities exist at different locations within the Botanical Garden, no utilities exist at, or near, the project area**.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed. **None proposed.**

**Signature**

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

Signature.....Submitted by Scott VanherHyden with Bellevue Parks & Community Services.....

Date Submitted.....Submitted on May 17, 2010.....

***REVIEWED***

***By Kevin LeClair at 4:25 pm, May 19, 2010***

Project Title:

# BELLEVUE BOTANICAL GARDEN
# RAVINE GARDEN

Design:

Title: **TRAIL ALIGNMENT PLAN**

Sheet No. 2A

CITY OF BELLEVUE WASHINGTON

PARKS & COMMUNITY SERVICES DEPARTMENT
PO BOX 90012
BELLEVUE, WA 98009-9012

5/10/10

# Permit 09-133926 XM

## Critical Areas Land Use Permit Narrative

## Bellevue Botanical Garden-Ravine Garden Project

### The BBG Masterplan Update:

The 2008 Botanical Garden Master Plan Update process was initiated to reassess previous planning efforts and to reconsider garden needs and goals. The planning process included a public process, an environmental review process (SEPA) with a determination of non-significance, and approval by Parks Board. The plan update was adopted by Bellevue City Council in January 2009. The revised Plan retains the goal of developing gardens which are small-scale so that visitors can apply the gardens' design lessons to their own yards by demonstrating successful uses of native plants and native plant communities in gardens. The BBG MP update included preliminary designs for two new 'garden rooms', the Ravine Garden and the Wetland-Sun Terraced Gardens.

### The Ravine Garden:

In 2009, the City of Bellevue selected the Ravine Garden for further design development and construction. The proposed garden takes visitors along a pedestrian trail through a second growth forest and a small steep-sided ravine in the southeast corner of the Botanical Garden; this site is within a larger reserve area named in the master plan as the Cascadia Experience. The project entails construction of one (1ea) 75' L x 6' W rigid bridge and one (1ea) 150' x 5' W suspension bridge, both made predominantly of steel construction. The bridges will span the ravine in locations approximately 200ft apart and will allow visitors close proximity and intimate views of the plants, wildlife, and second growth forest canopy. Construction will also include approximately adding 600 lnft pedestrian trail to the current ravine trail system. The new trail segments will form a pedestrian connection between the bridges and complete the ravine trail loop which will begin and end at the Lost Meadow Trail.

New trail segments will maintain a 6.0 ft standard park width and be overlaid with pervious mulch surfacing which will help with erosion in wet winter months. The exception will be a 200 lnft segment which will provide a shared ped/maintenance access to the suspension bridge from the lost meadow loop trail leading to the suspension bridges west entrance. The trail in this area will be 10.0 ft wide and receive an ADA compliant crushed rock surfacing to allow easier access for disabled and elder visitors wishing to experience the suspension bridge.

Although this section of trail will not be considered pervious surface, it is necessary to have one vehicular access point wide enough to accommodate a maintenance or emergency vehicle if the need arises. As well, although the proposed bridge decking will not be considered pervious, it only temporarily interrupts precipitation that would otherwise immediately enter the stream. Wing walls will be incorporated at the four bridge entry points to discourage visitors from drawing near the top of the slope which could cause erosion near bridge entry points. All trail and bridge construction work will be consistent with COB clearing and grading code and permit conditions, and all other applicable standards and codes including *"Environmental Best Practices*" to prevent any potential erosion problems during construction. The trails and bridges in the critical area buffer are well above the ordinary high water mark of the unnamed class D seasonal non-fish bearing stream associated within the project area. Design of the proposed trails and bridges will result in the least amount of critical area impacts possible and all impacts will take place in the critical areas buffers. There will be no change in flow peaks or storage capacity of the stream during or after construction is complete.

The project proposes planting of over 15,000 sqft of native vegetation to increase the habitat and aesthetic value of the project area and a mitigation plan will be prepared in accordance with Land Use requirements. The plan proposes some removal of invasive species from the critical area buffer (mainly Himilayan Blackberry), augmentation of the current understory vegetation and forest with more native trees, shrubs, and herbaceous plants to increase the ravine's biological diversity and avoid introducing non-native plants into the Cascadia Experience. All existing sword ferns impacted by trail and bridge construction will be transplanted on site. Signage will be installed to clearly convey to visitors they must remain on marked trails. Interpretive elements will be incorporated into the project and will compliment the Botanical Gardens existing interpretive program. Approximately 49 significant trees exist within the project area predominate species include Big Leaf Maple, Western Red Cedar, Douglas Fir, and Western Hemlock. All existing trees will be protected during construction. All significant trees within the project area will be remain with the exception of removal of one (1ea) 12" diameter Cedar near the west suspension bridge approach and one (1ea) 12" diameter Maple near the east rigid bridge approach to accommodate the abutment footing. Any significant trees designated for removal because of poor health or assessed as hazardous by a certified arborist will be 'snagged'; woody debris will be added to the stream bed and other appropriate areas.

Goals of the design include the desire to increase the ecological function of the project site and to make visitors familiar with, and appreciative of, the plant communities of the region while allowing interpretation of hydrologic processes of site. Around this, visitors will experience the dramatic feeling of enclosure that containment within this small-scale landform offers while interpretive programs will demonstrate and suggest how such delicate landform features might be preserved, conserved and augmented in other locations. The basic design philosophy underlying the garden is to work with its natural features and processes and interpret these to visitors as part of an educational program.

The proposed project will be served by adequate public facilities. No additional public facilities will be required with implementation of the proposed project. The proposed project complies with all other applicable City of Bellevue Land Use Codes.

**Report**
**Geotechnical Consultation**
**Proposed Bridges**
**Bellevue Botanical Garden**
**Bellevue, Washington**

**June 3, 2009**
**ICE File No. 0860-001**

DRAFT

**Prepared For:**
**Sahale, LLC**

**Prepared By:**
**Icicle Creek Engineers, Inc.**

ICICLE CREEK
ENGINEERS
Geotechnical, Geologic and Environmental Services

June 3, 2009

Carroll Vogel, Principal
Sahale, LLC
2501 Westlake Avenue North
Seattle, Washington 98109

Report
Geotechnical Consultation
Proposed Bridges
Bellevue Botanical Garden
Bellevue, Washington
ICE File No. 0860-001

DRAFT

## INTRODUCTION

Icicle Creek Engineers (ICE) is pleased to submit this report regarding our geotechnical consultation for two proposed bridges at the Bellevue Botanical Garden in Bellevue, Washington. Our services are described in our Scope of Services and Fee Estimate dated March 18, 2009 and were authorized in writing by Adam C. Peck of Sahale, LLC on May 18, 2009. The Bellevue Botanical Garden site is shown relative to nearby physical features on the Vicinity Map, Figure 1. The proposed locations of the bridges are shown on Site Plan A, Figure 2.

## PROJECT DESCRIPTION

Our understanding of the project is based on conversations and email correspondence with Carroll Vogel of Sahale, LLC. We understand that the project includes design and construction of two bridges, including a 140-foot span suspension bridge and a 70-foot span truss bridge. The suspension bridge will include insertion points for the main ground anchor cable behind the bridge abutments. Carroll Vogel of Sahale, LLC requested that ICE evaluate the site subsurface soil and groundwater conditions at each of the abutment and ground anchor points, and to provide an evaluation of slope stability in the vicinity of these structures. Details regarding the location of the proposed bridges are shown on Site Plan B, Figure 3

## SCOPE OF SERVICES

The purpose of our services was to observe the surface conditions and to explore the subsurface soil and groundwater conditions as a basis for evaluating slope stability and providing geotechnical criteria for bridge design. Specifically, our services included the following:

- Review readily available geologic and geotechnical information in the site vicinity.
- Complete a geologic reconnaissance of the bridge sites with particular emphasis on the abutments, ground anchors and steep slope areas.
- Explore subsurface soil and groundwater conditions by drilling six test borings to depths of about 11½ to 14 feet using portable, mini-track drilling equipment.
- Complete moisture content laboratory testing on soil samples obtained from the borings.

- Evaluate pertinent physical and engineering characteristics of the soils based on the results of the field explorations, laboratory testing and our experience.
- Evaluate the stability of steep slopes in the vicinity of the bridge abutments and provide recommendations for maintaining slope stability, as appropriate.
- Provide recommendations for earthwork including stripping and excavation of unsuitable soils, fill compaction and subgrade preparation requirements, and suitability of on-site soils for use in structural fills including an evaluation of the effects of weather and/or construction equipment on the workability of site soils.
- Provide a brief summary of recommendations for foundation and ground anchor design, including passive pressures and drainage considerations.

## GEOLOGIC SETTING

Based on regional geologic mapping by the U.S. Geological Survey (USGS – Waldron, H.H., Liesch, B.A., Mullinieaux, D.R., 1962, "Preliminary Geologic Map of Seattle and Vicinity, Washington," Map I-354), the bridge sites are underlain by "older clay, till and gravel." Older clay, till and gravel is described by the USGS as "silt, clay, fine sand and till, very compact." The "older clay, till and gravel" soil unit is referred to in this report as "older sediments." Older sediments were deposit by streams, lakes and directly by a glacier. Typically, the older sediments are in a dense to very dense or very stiff to hard condition as a result of being overridden by glacial ice.

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## SITE CONDITIONS

### SURFACE CONDITIONS

#### General

The proposed bridge sites are located within an upland area in the Puget Sound lowlands. The upland area is characterized by a nearly level to gently undulating topography, though locally dissected by steep-sided ravines and wide swales such as at the proposed bridge sites. These ravines and swales are typical indicators of where streams have eroded through the glacial till that caps the upland area and into the somewhat more erodible older sediments that underlie the glacial till.

The area of the Bellevue Botanical Garden property where the proposed bridge sites are located is undeveloped and forested though crossed by gravel- and bark-surfaced trails. A secondary trail that forks off of the Lost Meadow Trail crosses within a few feet of the southwest abutment of the proposed suspension bridge. The proposed truss bridge is in a more remote area and is not accessed directly by any existing trails.

#### Proposed Suspension Bridge

The proposed suspension bridge site occupies a narrow V-shaped ravine that is approximately 30-feet deep with sideslopes inclined at about 35 to 40 degrees (70 to 84 percent grade). The base of the ravine is occupied by a stream that is characterized by an incised channel with 4- to 5-foot near-vertical sides and a width of about 4 to 6feet. "Incised channels" are typically not considered a natural erosional feature. Usually a stream becomes incised because of increased high flows which cause the stream to downcut (incise) so rapidly that the sideslopes of the ravine do not have a chance to adjust to the natural level of the stream. The increase in high flows is usually because of an upgradient change in water runoff such as uncontrolled runoff from a parking lot, playfield or other man-created impervious surface.

The sideslopes of the ravine are relatively even-surfaced although the southwest slope is somewhat irregular. This irregularity in slope surface does not appear to be landslide related. Both sideslopes are vegetated with mature second-growth evergreen and deciduous trees. The evergreen trees

are relatively straight-trunked which is an indicator of stable slope conditions. We did not observe springs or seepage on the ravine sideslopes. We did not observe surface evidence of landsliding.

The bridge abutments are planned along the top of the ravine sideslopes which is gently sloping (less than 10 percent grade) toward the ravine on either side.

**Proposed Truss Bridge**

The proposed truss bridge site occupies a shallow swale that is approximately 10-feet deep with sideslopes inclined at about 20 to 25 degrees (36 to 47 percent grade). The base of the swale is occupied by a stream (same stream that occurs at the proposed suspension bridge site, though upgradient) that is characterized by an incised channel with 1- to 2-foot near-vertical sides and a width of about 3 to 4 feet. The origin of the incised channel is similar as previously described for the proposed suspension bridge. The lesser degree of incisement of the stream channel at the proposed truss bridge site, compared with the deeper incised channel at the proposed suspension bridge site, is likely because of 1) less gradient and/or 2) "siltier" (less erodible) soils.

The sideslopes of the swale are relatively even-surfaced. Both sideslopes are vegetated with mature second-growth evergreen and deciduous trees. The evergreen trees are relatively straight-trunked which is an indicator of stable slope conditions. We did not observe springs or seepage on the swale sideslopes. We did not observe surface evidence of landsliding.

The bridge abutments are proposed along the top of the swale sideslopes which is gently sloping (less than 10 percent grade) toward the swale on either side.

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## SUBSURFACE CONDITIONS

**General**

Subsurface conditions at the site were explored by drilling Borings B-1 through B-6 to depths ranging from about 11½ to 14 feet using portable drilling equipment (mini-track) owned and operated by Geologic Drill Exploration, Inc. of Spokane, Washington. The test borings were competed on May 20, 2009. The test borings locations as shown on Figure 3 were determined in the field by measuring distances from existing site features.

The test borings were continuously observed by a geologist from our firm who observed and classified the soils encountered, observed groundwater conditions, and prepared a detailed log of each boring. Soils were classified in general accordance with the classification system described in Figure 4. The logs of the test borings are presented in Figures 5 through 10. These logs are based on our interpretation of the field data and indicate the various types of soils encountered. They also indicate the depths at which the soils or their characteristics change, although the change might be gradual. Soil samples obtained from the test borings were tested for moisture content; the test results are included on the boring logs.

In general, the test borings encountered conditions consistent with regional geologic mapping by the USGS.

The following table summarizes the approximate thicknesses and depths of the primary soil layers at the proposed suspension bridge site.

| Test Boring Number | Location | Total Depth (feet) | Topsoil and Weathered Soil Thickness (feet) | Older Sediments Depth (feet) |
|---|---|---|---|---|
| B-1 | SW abutment | 13 | 2½ | 2½ |
| B-2 | SW ground anchor | 11½ | 2 | 2 |
| B-4 | NE abutment | 14 | 2 | 2 |
| B-5 | NE ground anchor | 11½ | 2½ | 2½ |

Notes: SW = southwest; NE = northeast

The following table summarizes the approximate thicknesses and depths of the primary soil layers at the proposed truss bridge site.

| Test Boring Number | Location | Total Depth (feet) | Topsoil and Weathered Soil Thickness (feet) | Older Sediments Depth (feet) |
|---|---|---|---|---|
| B-3 | West abutment | 11½ | 3 | 3 |
| B-6 | East abutment | 11½ | 3 | 3 |

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**Proposed Suspension Bridge**

Borings B-1 and B-4 were drilled at the proposed bridge abutment locations. Borings B-2 and B-5 were drilled at the proposed ground anchor locations. The borings generally encountered similar conditions consisting of up to about ½ foot of forest duff and topsoil underlain by about 1½ to 2 feet of weathered soil (soft to stiff sandy silt and silt with sand). Underlying the weathered soil at a depth of about 2 to 2½ feet, the borings encountered undisturbed, native older sediments to the completion depth of the test borings. The older sediments consisted of stiff to hard sandy silt with variable amounts of gravel and occasional thin layers of fine sand, medium dense to very dense silty fine sand with variable amounts of gravel, and gravel with sand. No groundwater was observed in Borings B-1, B-2, B-4 and B-5.

**Proposed Truss Bridge**

Borings B-3 and B-6 were drilled at the proposed bridge abutment locations. The borings generally encountered similar conditions consisting of up to about ½ foot of forest duff and topsoil underlain by about 2½ feet of weathered soil (soft to stiff sandy silt). Underlying the weathered soil at a depth of about 3 feet, the borings encountered undisturbed, native older sediments to the completion depth of the test borings. The older sediments consisted of stiff to hard sandy silt with variable amounts of gravel and occasional thin layers of fine sand and medium dense to very dense silty fine sand with variable amounts of gravel. No groundwater was observed in Borings B-3 and B-6.

**SEISMICITY**

The Puget Sound region is seismically active. Seismicity in this region is attributed primarily to the interaction between the Pacific, Juan de Fuca, and North American plates. The Juan de Fuca plate is subducting beneath the North American plate. It is thought that the resulting deformation and breakup of the Juan de Fuca plate might account for the large-magnitude deep-focus earthquakes in this region.

Thick deposits of glacial and non-glacial sediments occur throughout most of the Puget Sound Basin. Due to the thick sediment cover, little is known regarding the nature of faults in the underlying bedrock. The Seattle Fault, the Southern Whidbey Island Fault, the Tacoma Fault and Olympia Fault zones are the only known structural geology features that have indicated ground displacement in the Quaternary age glacial and interglacial sediments in the Puget Sound region. These faults are located several miles to tens of miles from the proposed substation site with the exception of the Seattle Fault Zone that passes directly through the proposed bridge sites.

An abbreviated listing of major (greater than 5.0 magnitude) earthquake events in the Puget Sound region according to the Pacific Northwest Seismograph Network is presented below.

**Summary of Major Earthquakes**

| Event | Date | Location | Richter Magnitude |
|---|---|---|---|
| North Cascade Earthquake | December 15, 1872 | Chelan, WA | 6.8 (est.) |
| Pickering Passage Earthquake | February 15, 1946 | Olympia, WA | 5.8 |
| Straight of Georgia Earthquake | June 23, 1946 | Courtenay, BC | 7.4 |
| Olympia Earthquake | April 13, 1949 | Olympia, WA | 7.1 |
| Seattle-Tacoma Earthquake | April 29, 1965 | SeaTac, WA | 6.5 |
| Duvall Earthquake | May 3, 1996 | Duvall, WA | 5.4 |
| Satsop Earthquake | July 3, 1999 | Satsop, WA | 5.8 |
| Nisqually Earthquake | February 28, 2001 | Olympia, WA | 6.8 |

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## CONCLUSIONS AND RECOMMENDATIONS

### SLOPE STABILITY

#### Proposed Suspension Bridge

Based on our site observations and test borings, we conclude that the sideslopes of the ravine are susceptible to surficial landslides (less than 5-feet thick). Under natural circumstances with no stream incisement (the stream is incised 5- to 6-feet deep at this location), the slopes would be adequately stable. However, the stream by its incisement has effectively undercut the toe of the slope causing the slope to be susceptible to landsliding. The primary reason that landsliding has not occurred is likely because of the dense vegetation which forms a cohesive root mat. Over time and with additional incisement (if not corrected), the slope will begin to fail; how much time this will take is difficult to predict.

For the purpose of mitigating the slope stability concerns, we recommend the following:

- Site preparation should be minimized to the extent that this is practical; maintaining existing vegetation.
- The abutment foundations, as currently located, should be embedded at least 2 feet into the native older sediments. The surficial 2 to 2½ feet of topsoil and weathered soil is prone to soil creep which could cause the foundation to laterally shift over time if not properly embedded.

#### Proposed Truss Bridge

Based on our site observations and test borings, we conclude that the sideslopes of the ravine are adequately stable with respect to potential landslides. As previously described, the stream channel at this location is incised, but not as deep as the suspension bridge stream channel, and the slopes are less steep. The slopes are densely vegetated which is a favorable condition for slope stability.

For the purpose of mitigating the slope stability concerns, we recommend the following:

- Site preparation should be minimized to the extent that this is practical; maintaining existing vegetation.
- The abutment foundations, as currently located, should be embedded at least 1 foot into the native older sediments. The surficial 3 feet of topsoil and weathered soil is prone to soil creep which could cause the foundation to laterally shift over time if not properly embedded.

**SITE PREPARATION AND EARTHWORK**

- We recommend that the foundation areas be stripped of vegetation and significant organic material. We expect that the stripping depths will be about 1 foot to remove the surficial forest duff and topsoil layer and weathered soil containing appreciable roots and other organic material. Greater depths may be necessary in areas with thick vegetation and trees. This material should be removed off-site or used for landscaping purposes.
- Fill placed in structure areas should be compacted to at least 95 percent of the maximum dry density (MDD) in general accordance with ASTM Test Method D 1557. Structural fill material should be free of debris, organic contaminants and rock fragments larger than 6 inches. The suitability of material for use as structural fill will depend on the gradation and moisture content of the soil. As the amount of fines (soil particles passing the U.S. Standard No. 200 sieve) increases, soil becomes increasingly more sensitive to small changes in moisture content and adequate compaction becomes more difficult to achieve. We recommend that structural fill contain no more than about 5 percent fines for placement in wet weather. The percent fines can be higher for placement in dry weather, providing that the fill material is moisture-conditioned as necessary for proper compaction.
- The on-site soils (weathered soil and older sediments) typically contain a high percentage of fines, are sensitive to moisture, and will be difficult to moisture-condition and adequately compact during wet weather. The topsoil is considered unsuitable for use as structural fill during any weather conditions.

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**FOUNDATIONS**

- **Foundation embedment:** We recommend that the footings adjacent to slopes be embedded at least 2 feet (proposed suspension bridge) or 1 foot (proposed truss bridge) into the native older sediments. This will result in a footing base about 4 feet below the existing ground surface. This minimum embedment depth will also provide for adequate passive earth pressure against the sides of each footing. In order to maximize both bearing capacity and passive pressure, we recommend that the footing subgrade consist of native older sediments and that all footings be cast neatly (without concrete forms) against the native soil.
- **Bearing Capacities:** Assuming foundation subgrades are prepared as previously described, the foundations can be designed for the following maximum net allowable soil bearing capacities. These values, presented in pounds per cubic foot (psf) incorporate static and transient (wind/lateral load or seismic) safety factors of at least 2.0 and 1.5, respectively.

| Design Parameter | Allowable Value |
|---|---|
| Static Bearing Capacity | 3,000 psf |
| Transient Bearing Capacity | 4,000 psf |

- **Settlement:** Based on the foundation design criteria given above, we estimate that total static settlement should be less than 1 inch.

- **Passive Earth Pressure:** A foundation that has been constructed as described above will resist static and transient (wind/lateral load or seismic) lateral movements by means of passive earth pressure and base friction. We recommend using the following design values, where passive pressure is given in pounds per cubic foot (pcf) of equivalent fluid weight. These values incorporate static and transient safety factors of at least 1.5 and 1.1, respectively.

| Design Parameter | Allowable Value |
|---|---|
| Static Passive Pressure (level foreslope) | 350 pcf |
| Static Passive Pressure (2H:1V foreslope) | 135 pcf |
| Static Passive Pressure (1.5H:1V foreslope) | 90 pcf |
| | |
| Transient Passive Pressure (level foreslope) | 475 pcf |
| Transient Passive Pressure (2H:1V foreslope) | 185 pcf |
| Transient Passive Pressure (1.5H:1V foreslope) | 125 pcf |

- **Base Friction:** We estimate that an allowable friction coefficient of 0.4 could be assumed for footing bases cast directly on the native older sediments.

## DRAINAGE CONSIDERATIONS

Areas disturbed by construction activities will be susceptible to erosion until effective protective cover is established. We recommend that bare soil areas be protected using an appropriate geotextile, such as North American Green C125, Anti-Wash Geojute, or an equivalent. Seeding and planting of these areas should be done before placing the geotextile or erosion control fabric.

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## SEISMIC CONSIDERATIONS

### General

As previously described, the Seattle Fault zone passes directly through the proposed bridge sites. Currently, no standards have been developed for mitigating potential affects of a Seattle Fault zone earthquake other than those standards listed in the 2009 International Building Code (IBC).

### IBC Seismic Design Criteria

Based on our review of available geologic information and the subsurface soil conditions encountered in the test boring explorations, we interpret the native soil conditions at the site to correspond to Seismic Site Class D, as defined by the 2009 IBC. This classification pertains to a stiff soil profile with Standard Penetration Test (SPT) value ranging from 15 to 50.

Additional IBC seismic design parameters obtained from the USGS Earthquake Hazards Program (Seismic Hazard Curves) include the following:

| | |
|---|---|
| Peak Ground Acceleration Coefficient* | 0.30 |
| Spectral Response Acceleration $S_s$ | 1.377 |
| Spectral Response Acceleration $S_1$ | 0.466 |
| Site Coefficient $F_a$ | 1.0 |
| Site Coefficient $F_v$ | 1.534 |

* earthquake having a 10-percent probability of exceedance in 50 years (corresponding to a return interval of 475 years)

**Liquefaction Analysis**

Our liquefaction analysis of the site was based on a Magnitude 7.5 earthquake occurring directly beneath the site, and a peak horizontal ground acceleration of 0.30g. Liquefaction is the phenomenon wherein soil strength is dramatically reduced when subjected to vibration or shaking. Liquefaction generally occurs in saturated, loose sand deposits, though recent studies have shown that silty sand or sandy silts are also susceptible to liquefaction. Our analyses indicate that the weathered soil and native older sediments encountered in our explorations have a very low susceptibility to liquefaction during the design earthquake.

## USE OF THIS REPORT

We have prepared this report for use by Sahale, LLC. The data and report should be provided to prospective contractors for bidding or estimating purposes, but our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

When the design has been finalized, we recommend that the final design drawings and specifications be reviewed by our firm to evaluate that our recommendations have been interpreted and implemented as intended.

There is the possibility that subsurface conditions could vary with location across the site, as well as with time. A contingency for unexpected conditions should be included in the project budget and schedule. Sufficient field observation, testing and consultation should be provided by our firm during construction to evaluate that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions encountered during the work differ from those anticipated, and to evaluate whether or not earthwork and foundation installation activities comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time the report was prepared. No warranty or other conditions, express or implied, should be understood.

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We hope this letter report meets your present needs. Please feel free to call if you have any questions or comments regarding concerning the project.

Yours very truly,
Icicle Creek Engineers, Inc.

Brian R. Beaman, PE, LHG
Principal Engineer/Hydrogeologist

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Kathy S. Killman, LEG
Principal Engineering Geologist

Document ID: 0860001.report
Three copies submitted
Attachments: Vicinity Map – Figure 1
Site Plan A – Figure 2
Site Plan B – Figure 3
Explanation for Boring Logs – Figure 4
Boring Logs – Figures 5 to 10

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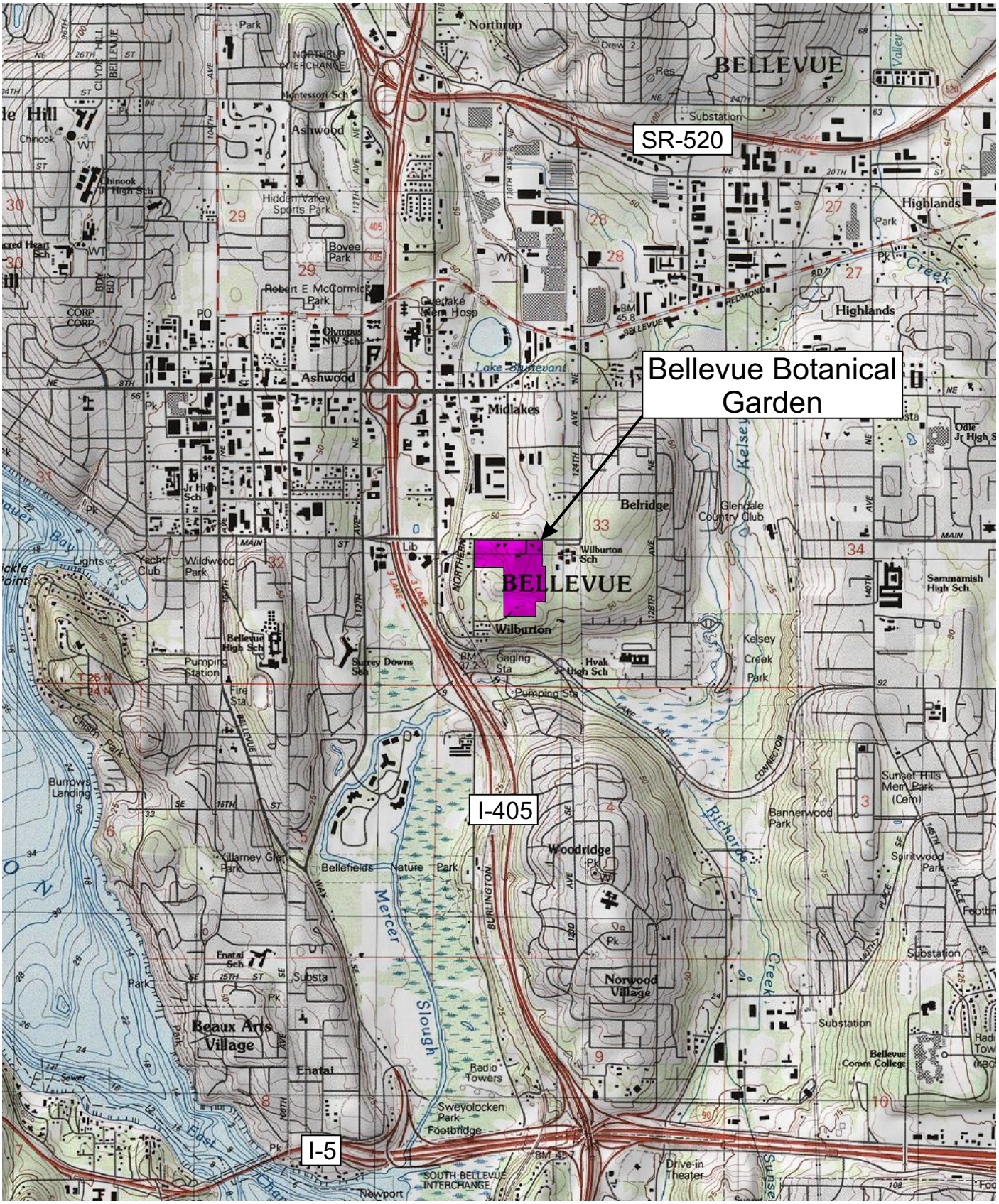



N

0 ½ 1

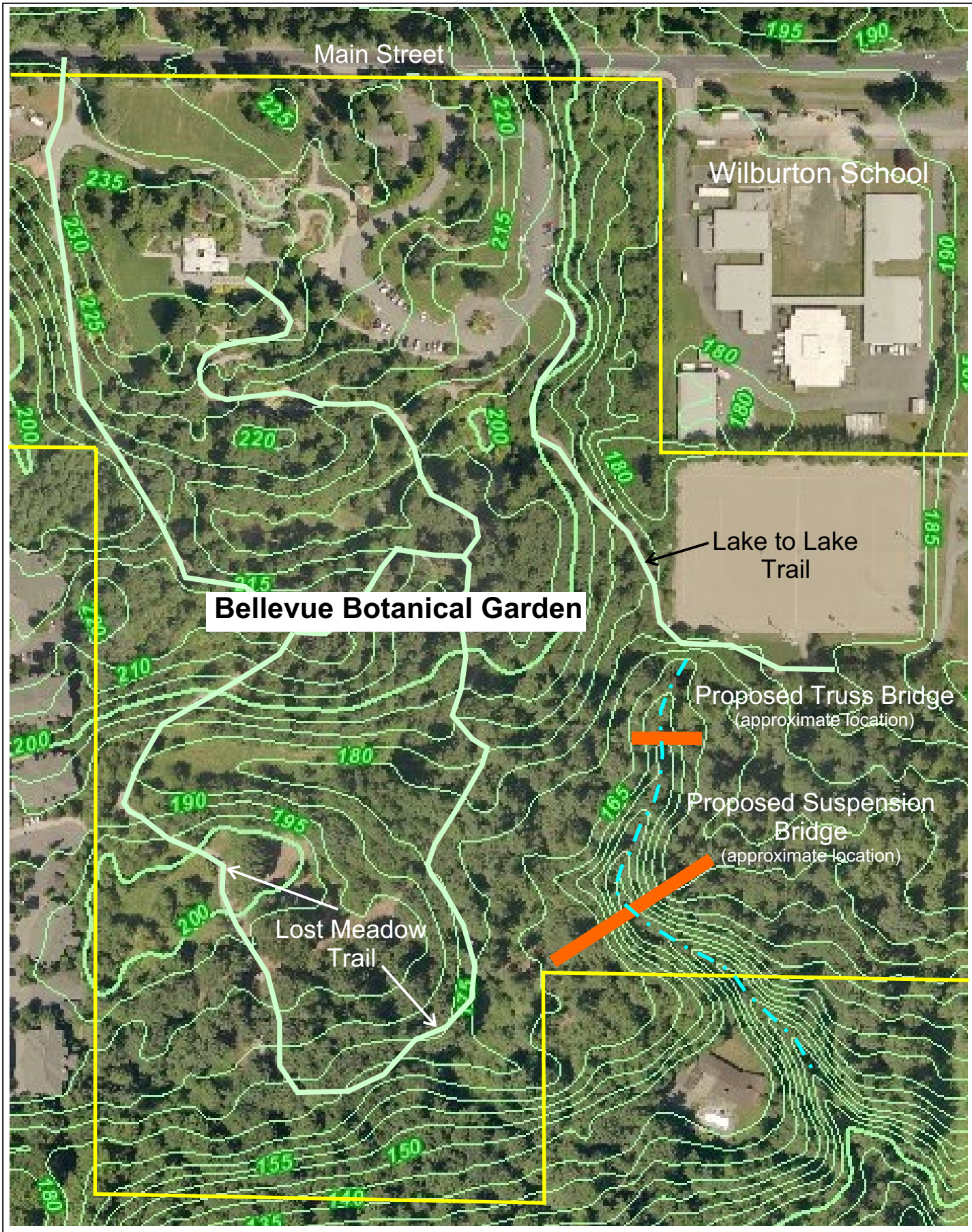
Scale in Miles

ICE File No. 0860-001

Icicle Creek Engineers

Vicinity Map - Figure 1

JMS:05/21/09




Base map reference: King County iMAP, aerial photograph dated 2007

0 200 400

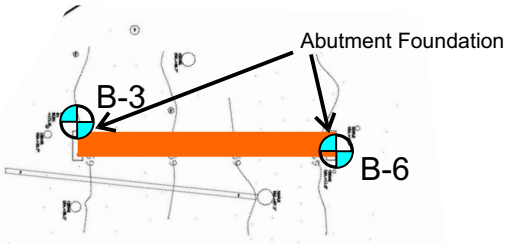
Scale in Feet

ICE File No. 0860-001

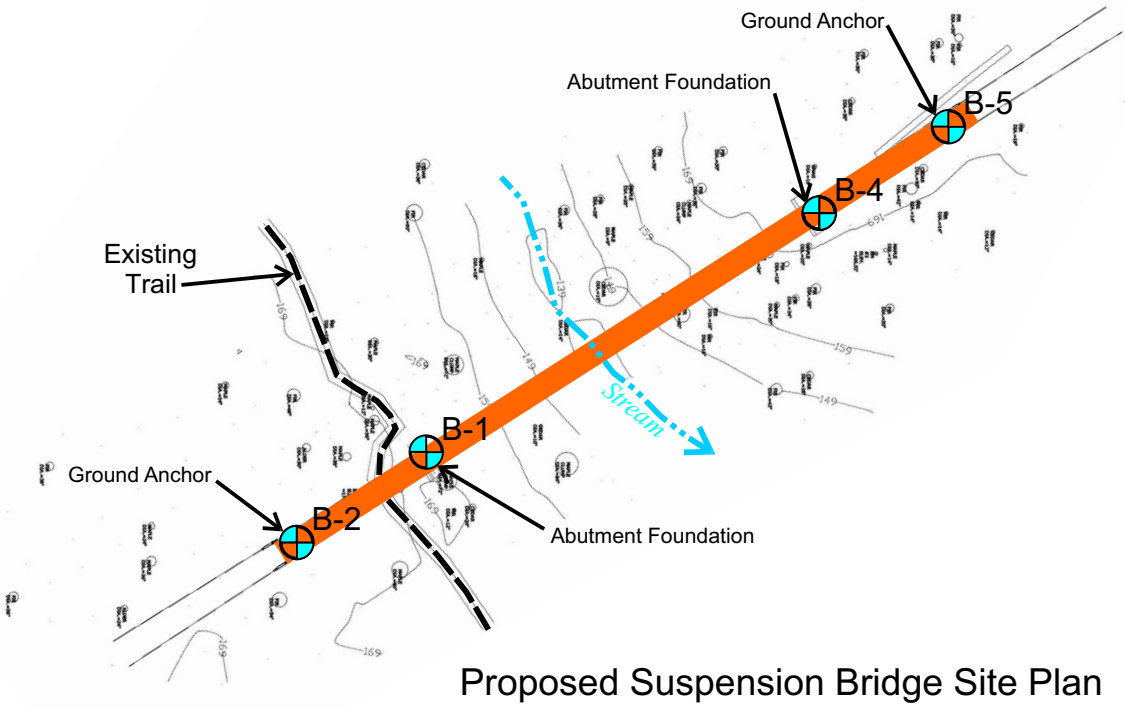
Icicle Creek Engineers

Site Plan A - Figure 2

JMS:05/21/09




Proposed Truss Bridge Site Plan




Proposed Suspension Bridge Site Plan

Base map reference: Sahale, LLC, May 19, 2009, "Bellevue Botanical, Relational Plan View", Page 1 of 3

N

0 60 120
Scale in Feet

EXPLANATION

B-3 Boring Location

ICE File No. 0860-001

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Site Plan B - Figure 3

## Unified Soil Classification System

| MAJOR DIVISIONS | | | Soil Classification and Generalized Group Description | |
|---|---|---|---|---|
| Coarse-Grained Soils | GRAVEL<br>More than 50% of coarse fraction retained on the No. 4 sieve | CLEAN GRAVEL | GW | Well-graded gravels |
| | | | GP | Poorly-graded gravels |
| | | GRAVEL WITH FINES | GM | Gravel and silt mixtures |
| | | | GC | Gravel and clay mixtures |
| | SAND<br>More than 50% of coarse fraction passes the No. 4 sieve | CLEAN SAND | SW | Well-graded sand |
| | | | SP | Poorly-graded sand |
| More than 50% retained on the No. 200 sieve | | SAND WITH FINES | SM | Sand and silt mixtures |
| | | | SC | Sand and clay mixtures |
| Fine-Grained Soils | SILT AND CLAY<br>Liquid Limit less than 50 | INORGANIC | ML | Low-plasticity silts |
| | | | CL | Low-plasticity clays |
| | | ORGANIC | OL | Low plasicity organic silts and organic clays |
| | SILT AND CLAY<br>Liquid Limit greater than 50 | INORGANIC | MH | High-plasticity silts |
| | | | CH | High-plasticity clays |
| More than 50% passing the No. 200 sieve | | ORGANIC | OH | High-plasticity organic silts and organic clays |
| Highly Organic Soils | Primarily organic matter with organic odor | | PT | Peat |

Notes: 1) Soil classification based on visual classification of soil is based on ASTM D2488-06.
2) Soil classification using laboratory tests is based on ASTM D2487-06.
3) Description of soil density or consistency is based on interpretation of blow count data and/or test data.

## Soil Particle Size Definitions

| Component | Size Range |
|---|---|
| Boulders | Coarser than 12 inch |
| Cobbles | 3 inch to 12 inch |
| Gravel | 3 inch to No. 4 (4.78 mm) |
| Coarse | 3 inch to 3/4 inch |
| Fine | 3/4 inch to No. 4 (4.78 mm) |
| Sand | No. 4 (4.78 mm) to No. 200 (0.074mm) |
| Coarse | No. 4 (4.78 mm) to No. 10 (2.0 mm) |
| Medium | No. 10 (2.0 mm) to No. 40 (0.42 mm) |
| Fine | No. 40 (0.42 mm) to No. 200 (0.074 mm) |
| Silt and Clay | Finer than No. 200 (0.074 mm) |

## Soil Moisture Modifiers

| Soil Moisture | Description |
|---|---|
| Dry | Absence of moisture |
| Moist | Damp, but no visible water |
| Wet | Visible water |

## Key to Boring Log Symbols

| Sampling Method | Boring Log Symbol | Description |
|---|---|---|
| Blows required to drive a 2.4 inch I.D. split-barrel sampler 12-inches or other indicated distance using a 300-pound hammer falling 30 inches. | 34 | Location of relatively undisturbed sample |
| | 12 | Location of disturbed sample |
| | 21 | Location of sample attempt with no recovery |
| Blows required to drive a 1.5-inch I.D. split barrel sampler (SPT - Standard Penetration Test) 12-inches or other indicated distance using a 140-pound hammer falling 30 inches. | 14 | Location of sample obtained in general accordance with Standard Penetration Test (ASTM D-1586) test procedures. |
| | 30 | Location of SPT sampling attempt with no recovery. |
| Pushed Sampler | P | Sampler pushed with the weight of the hammer or against weight of the drilling rig. |
| Grab Sample | G | Sample obtained from drill cuttings. |

Note: The lines separating soil types on the logs represents approximate boundaries only. The actual boundaries may vary or be gradual.

## Laboratory Tests

| Test | Symbol |
|---|---|
| Moisture Content | MC |
| Density | DN |
| Grain Size | GS |
| Percent Fines | PF |
| Atterberg Limits | AL |
| Hydrometer Analysis | HA |
| Consolidation | CN |
| Compaction | CP |
| Permeability | PM |
| Unconfined Compression | UC |
| Unconsolidated Undrained TX | UU |
| Consolidated Undrained TX | CU |
| Consolidated Drained TX | CD |
| Chemical Analysis | CA |

# Boring B-1

JMS:05/21/09

Approximate Ground Surface Elevation: 169 Feet



Logged by:JMS

Project Name: Bellevue Botanical Gardens

ICE File No. 0860-001

| Depth in Feet | Soil Profile: Description | Graphic Log | Sample Data: Group Symbol | Blow Count | Sample Location | Penetration Resistance (Blows/foot - ●) / Moisture Content (Percent - ■) 20 40 60 80 | Laboratory Testing | Groundwater Information |
|---|---|---|---|---|---|---|---|---|
| 0 | Forest duff and topsoil | | | | | | | |
| 1 | Mottled brown and light brown sandy SILT (soft to stiff, moist to wet) (weathered soil) (drill cuttings) | | ML | | | | | |
| 2 | | | | | | | | |
| 3 | Mottled brown and light brown sandy SILT (very stiff, moist) (older sediments) | | ML | 25 | | ● | | |
| 4 | GRAVEL (older sediments) (drill action and cuttings) | | | | | | | |
| 5 | Mottled brown and light brown sandy SILT (hard, moist) (older sediments) | | | | | | | |
| 6 | | | ML | 44 | | ● | | |
| 7 | | | | | | | | |
| 8 | Mottled brown and light brown silty fine SAND with occasional gravel (very dense, moist) (older sediments) | | SM | 52 | | ● | | |
| 9 | Gray fine GRAVEL with sand (very dense, moist) (older sediments) | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | GP | 53 | | ● | | |
| 12 | | | | | | | | |
| 13 | | | GP | 50-6" | | | ● | No groundwater observed |
| | Boring completed at 13 feet on May 20, 2009 | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |

See Figure 4 for explanation of symbols

# Boring B-2

JMS: 05/21/09

Approximate Ground Surface Elevation: 170 Feet



Logged by:JMS

Project Name: Bellevue Botanical Gardens

ICE File No. 0860-001

| Depth in Feet | Soil Profile: Description | Graphic Log | Sample Data: Group Symbol | Blow Count | Sample Location | Penetration Resistance (Blows/foot - ●) 20 40 60 80 / Moisture Content (Percent - ■) 20 40 60 80 | Laboratory Testing | Groundwater Information |
|---|---|---|---|---|---|---|---|---|
| 0 | Forest duff and topsoil | | | | | | | |
| 1 | Mottled brown and light brown sandy SILT (soft to stiff, moist to wet) (weathered soil) (drill cuttings) | | ML | | | | | |
| 2 | Mottled brown and light brown sandy SILT and a trace of fine gravel (stiff, moist) (older sediments) | | | | | | | |
| 3 | | | ML | 15 | | ● | | |
| 4 | | | | | | | | |
| 5 | Mottled brown and light brown sandy SILT with thin layers of fine sand (hard, moist) (older sediments) | | | | | | | |
| 6 | | | ML | 40 | | ● | | |
| 7 | | | | | | | | |
| 8 | | | ML | 44 | | ● | | |
| 9 | Gray sandy SILT (hard, moist) (older sediments) | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | ML | 51 | | ● | | No groundwater observed |
| 12 | Boring completed at 11.5 feet on May 20, 2009 | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |

See Figure 4 for explanation of symbols

# Boring B-3

JMS:05/21/09

Approximate Ground Surface Elevation: 170 Feet



Logged by:JMS

Project Name: Bellevue Botanical Gardens

ICE File No. 0860-001

| Depth in Feet | Soil Profile: Description | Graphic Log | Sample Data: Group Symbol | Blow Count | Sample Location | Penetration Resistance (Blows/foot - ●) 20 40 60 80 / Moisture Content (Percent - ■) 20 40 60 80 | Laboratory Testing | Groundwater Information |
|---|---|---|---|---|---|---|---|---|
| 0 | Forest duff and topsoil | | | | | | | |
| 1 | Mottled brown and light brown sandy SILT (soft to stiff, moist to wet) (weathered soil) (drill cuttings) | | ML | | | | | |
| 2 | | | | | | | | |
| 3 | Mottled brown and light brown sandy SILT (very stiff, wet to moist) (older sediments) | | ML | 22 | | ● | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | ML | 19 | | ● | | |
| 7 | Gray sandy SILT with thin layers of fine sand (very stiff, moist) (older sediments) | | | | | | | |
| 8 | | | ML | 19 | | ● | | |
| 9 | Gray sandy SILT with thin layers of fine sand and fine gravel (hard, moist) (older sediments) | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | ML | 85/11" | | ● | | No groundwater observed |
| 12 | Boring completed at 11.4 feet on May 20, 2009 | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |

See Figure 4 for explanation of symbols

# Boring B-4

JMS:05/21/09

Approximate Ground Surface Elevation: 169 Feet



Logged by:JMS

Project Name: Bellevue Botanical Gardens

ICE File No. 0860-001

| Depth in Feet | Soil Profile: Description | Graphic Log | Sample Data: Group Symbol | Blow Count | Sample Location | Penetration Resistance (Blows/foot - ●) 20 40 60 80 / Moisture Content (Percent - ■) 20 40 60 80 | Laboratory Testing | Groundwater Information |
|---|---|---|---|---|---|---|---|---|
| 0 | Forest duff and topsoil | | | | | | | |
| 1 | Mottled brown SILT with fine sand (soft to stiff, moist to wet moist) (weathered soil) (drill cuttings) | | ML | | | | | |
| 2–3 | Mottled brown and light brown silty fine SAND with a trace of fine gravel (moist, medium dense) (older sediments) | | SM | 27 | | ● | | |
| 4–6 | Mottled brown and light brown silty fine SAND with thin layers of fine sand (moist, very dense) (older sediments) | | SM | 58 | | ● | | |
| 7–8 | Mottled brown and light brown silty fine SAND with thin layers of fine and coarse sand (moist, dense) (older sediments) | | SM | 47 | | ● | | |
| 9–11 | Gray sandy SILT (very stiff, moist) (older sediments) | | ML | 26 | | ● | | |
| 12–13 | grades to hard | | ML | 36 | | ● | | No groundwater observed |
| 14 | Boring completed at 14 feet on May 20, 2009 | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |

See Figure 4 for explanation of symbols

# Boring B-5

JMS:05/21/09

Approximate Ground Surface Elevation: 170 Feet



Logged by:JMS

Project Name: Bellevue Botanical Gardens

ICE File No. 0860-001

| Depth in Feet | Soil Profile: Description | Graphic Log | Sample Data: Group Symbol | Blow Count | Sample Location | Penetration Resistance (Blows/foot - ●) / Moisture Content (Percent - ■) 20 40 60 80 | Laboratory Testing | Groundwater Information |
|---|---|---|---|---|---|---|---|---|
| 0 | Forest duff and topsoil | | | | | | | |
| 1 | Mottled brown and light brown sandy SILT (soft to stiff, moist to wet) (weathered soil) (drill cuttings) | | ML | | | | | |
| 2 | | | | | | | | |
| 3 | Mottled brown and light brown sandy SILT and a trace of fine gravel (hard, moist) (older sediments) | | ML | 41 | | ● | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | ML | 52 | | ● | | |
| 7 | | | | | | | | |
| 8 | occasional thin layers of fine sand | | ML | 41 | | ● | | |
| 9 | Gray sandy SILT (very stiff, moist) (older sediments) | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | ML | 30 | | ● | | No groundwater observed |
| 12 | Boring completed at 11.5 feet on May 20, 2009 | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |

See Figure 4 for explanation of symbols

# Boring B-6

JMS:05/21/09

Approximate Ground Surface Elevation: 170 Feet



Logged by:JMS

Project Name: Bellevue Botanical Gardens

ICE File No. 0860-001

| Depth in Feet | Soil Profile: Description | Graphic Log | Sample Data: Group Symbol | Blow Count | Sample Location | Penetration Resistance (Blows/foot - ●) / Moisture Content (Percent - ■) 20 40 60 80 | Laboratory Testing | Groundwater Information |
|---|---|---|---|---|---|---|---|---|
| 0 | Forest duff and topsoil | | | | | | | |
| 1 | Mottled brown and light brown sandy SILT (soft to stiff, moist to wet) (weathered soil) (drill cuttings) | | ML | | | | | |
| 2 | occasional charcoal fragments at 2 feet | | | | | | | |
| 3 | Mottled brown and light brown silty fine SAND with thin layers of fine gravel (medium dense, moist) (older sediments) | | SM | 28 | | ● | | |
| 4 | | | | | | | | |
| 5 | grades to very dense | | SM | 57 | | ● | | |
| 6 | | | | | | | | |
| 7 | Brown sandy SILT with occasional thin layers of fine ‘ sand (hard, moist) (older sediments) | | | | | | | |
| 8 | | | ML | 41 | | ● | | |
| 9 | Gray sandy SILT (hard, moist) (older sediments) | | ML | | | | | |
| 10 | | | | | | | | |
| 11 | Mottled brown and light brown silty fine SAND with occasional gravel (very dense, moist) (older sediments) | | SM | 90/11” | | ● | | No groundwater observed |
| 12 | Boring completed at 11.5 feet on May 20, 2009 | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |

See Figure 4 for explanation of symbols

# Bellevue Botanical Gardens

## Habitat Assessment

**April 23, 2008**

***Prepared for:***
City of Bellevue

***Prepared by:***
Brian Missildine
Skillings Connolly, Inc.

SKILLINGS CONNOLLY ENVIRONMENTAL

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# Executive Summary

The Bellevue Botanical Garden (BBG) is a horticultural center and natural reserve that is adjacent to Wilburton Park in Bellevue, Washington. BBG recently purchased a plot to the south of the park and would like to incorporate the newly purchased property by adding trails and bridges, removing invasive vegetation, and planting additional native vegetation. The newly purchased property is primarily inhabited by Douglas fir, alder, and native understory but does have some non-natives such as English Ivy. In addition, the BBG would like to improve the northwest corner of the property into a garden room which would entail removing invasive Himalayan blackberry and other vegetation. Bellevue Municipal Code (BMC) stipulates that on developments of this size, a habitat assessment be conducted in order to identify species of concern or ecological communities of concern that may be affected by project construction (BMC 20.25H.165).

This habitat assessment was conducted to analyze the flora and fauna species that utilize the BBG and areas adjacent to it. Washington Department of Natural Resources (DNR) and Washington Department of Fish and Wildlife (WDFW) databases and other literature were analyzed to determine if threatened or endangered species or ecosystems have been identified in the area. Two Skillings Connolly biologists visited the site to assess habitat in mid February 2008. During this site visit, many common bird species were observed and egg masses of two amphibian species were found. It was determined the BBG has many quality habitat features and many species that were not observed could utilize the area if access or migratory corridors were present. No federal or state species of concern were identified in the BBG, but various birds of prey nest within 3 miles of the BBG and salmon spawn in nearby Richards Creek and Kelsey Creek. However, evidence of one local species of concern, the pileated woodpecker, was observed during the field visit.

The BBG plans to expand its trail system into the new acquisition which should not cause significant impacts to any habitat attributes. Skillings Connolly recommends that the BBG remove invasive species like Himalayan blackberry and English Ivy throughout the entire park, especially the northwest corner of the park. Skillings Connolly also recommends enhancing the buffer of wetland “B”.

# Introduction

The Bellevue Botanical Garden (BBG) is comprised of display gardens, woodlands, meadows and wetlands that are located in an urban environment. The mission of the BBG is to perpetuate and further enhance the BBG as a learning resource in partnership with the City of Bellevue. The BBG hosts many annual and perennial plant species for public viewing throughout the year and is well known to local horticulture and gardening groups. The City of Bellevue purchased/acquired two approximate 17-acre parcels (adjacent to BBG) in 2006. The objective of this acquisition was to protect existing wildlife habitat, maintain seclusion from encroaching urban sprawl and expand opportunities for public education and enjoyment in the park.

As part of the BBG expansion, the City of Bellevue requested Skillings Connolly, Inc. to provide a habitat assessment of the BBG, inclusive of the new parcels. Skillings Connolly conducted a habitat assessment survey on February 27, 2008, to evaluate and inventory wildlife and to provide management recommendations for existing habitat types located within the BBG.

*Project Settings*
The Bellevue Botanical Gardens are situated within the City of Bellevue (pop. 117,000), King County Washington. The BBG is surrounded by urbanization and is within 0.5 miles of the highly developed Interstate 405 corridor (Exhibit 1: Vicinity Map). The study area encompasses the entire BBG which is located within Township 25 North, Range 05 East, Section 33.

The topography of site is irregular. Much of northern and central section of the site is flat or gently rolling but the southern section of the site is on a hillside and includes a ravine.

*Project History*
The BBG was the site of the Wilburton settlement until it was logged in the early 1900's. The land was never replanted and was left to regenerate. In the early 1930's, the VonBuskirk's from Montana built a log cabin and farm at the site where the visitors' center exists. The cabin and farm was eventually overcome by insects and age and was replaced by a more modern home complete with atrium and recirculating pond. The site was eventually deeded to the City of Bellevue in 1984 for the purpose of becoming a public park. Also, in 1984 the Bellevue Botanical Garden Society was formed to promote the use of the property as a botanical garden. By 1989, almost 40 acres was set aside by the Bellevue City Council for a botanical park and reserve. After several years of construction and planning, the park was finally opened in 1992. Since 1992, the BBG has undergone many improvements including the acquisition of two approximately 17 acre lots in 2006 that will be incorporated into the BBG.
(Source: http://www.bellevuebotanical.org)

BELLEVUE BOTANICAL GARDEN

N

SKILLINGS CONNOLLY ENVIRONMENTAL

Bellevue Botanical Gardens

Exhibit 1-1 - Vicinity Map

March 28, 2008

## Objectives

The objectives of the habitat assessment are as follows:

- Create and/or update site inventory of habitat common to the BBG, paying particular attention to the identification of priority and/or keystone species.
- Identification and description of habitat-types represented in the BBG and a portrayal of each habitat type in terms of attributes, constraints, and potential opportunities for restoration and/or enhancement.
- Develop list/matrix of species of local importance (as listed in the Bellevue Municipal Code).
- Provide specific habitat enhancement recommendations for the newly acquired parcels.

## Methodology

Wildlife and habitat surveys were conducted on February 27, 2008, between the hours of 0930 and 1430. Initially the weather was overcast with sporadic rain but turned to overcast with sun breaks by the afternoon. Temperatures during the survey ranged from $48^0$ to $54^0$ Fahrenheit.

Terrestrial surveys were conducted by: 1) meandering through the park on and off trail noting habitat types and species present (plant and animal); 2) observing the ground for tracks; and, 3) listening for auditory clues of species present but not readily visible. Aquatic surveys were conducted visually along the edges of the wetlands as well as wading through the wetland taking note of any amphibian egg masses that were present.

In addition to the physical survey of the BBG, information was collected from reviewing the following documents for information on vegetation, topography, sensitive species, and habitats in the project vicinity.

- U.S. Geologic Survey (USGS) 7.5 minute topographical map
- Bellevue Botanical Garden Wetland Delineation Report 2007
- Priority Habitat and Species Maps
- Endangered Species Act lists from USFWS and NOAA
- WDFW Habitats and Species Report
- Bellevue Botanical Gardens website
- City of Bellevue Critical Areas Ordinance
- King County Noxious weed list

## Habitats

The BBG consisted of five habitat types. Forest is the primary habitat followed by wetlands, open meadows/grassy areas, Himalayan blackberry, and the botanical garden (not in any specific order). While streams were observed on-site, they did not represent typical stream type habitats. We were unable to locate the head or the channel in some places of the stream in the northwest

corner due to the tremendous over-story of Himalayan blackberries. This stream ended in a roadside ditch where it went sub-surface. The other stream was located in the ravine, which we were not able to successfully access. Below is a description of the habitat types and species of local importance that were observed within those habitats (Exhibit 2 Primary habitats).

The forested habitat is somewhat atypical of northwest forests and can be described as a Westside Lowlands conifer-deciduous forest. The forest is heterogeneous with no species having overall dominance. Typical northwest forests are mainly dominated by Douglas Fir. This is primarily a result of past logging practices that included replanting Douglas fir as the only species. However, the BBG is unique in the sense it was logged in the early 1900's but was never replanted and left to restore naturally. Furthermore, many snags and downed woody debris have been left as key habitat components. Bull (2002) mentions that snags and downed woody debris is a critical portion of a diverse forest. Thomas (1979) found over 57 percent of the vertebrates in Pacific Northwest forest associate with snags and downed woody debris.

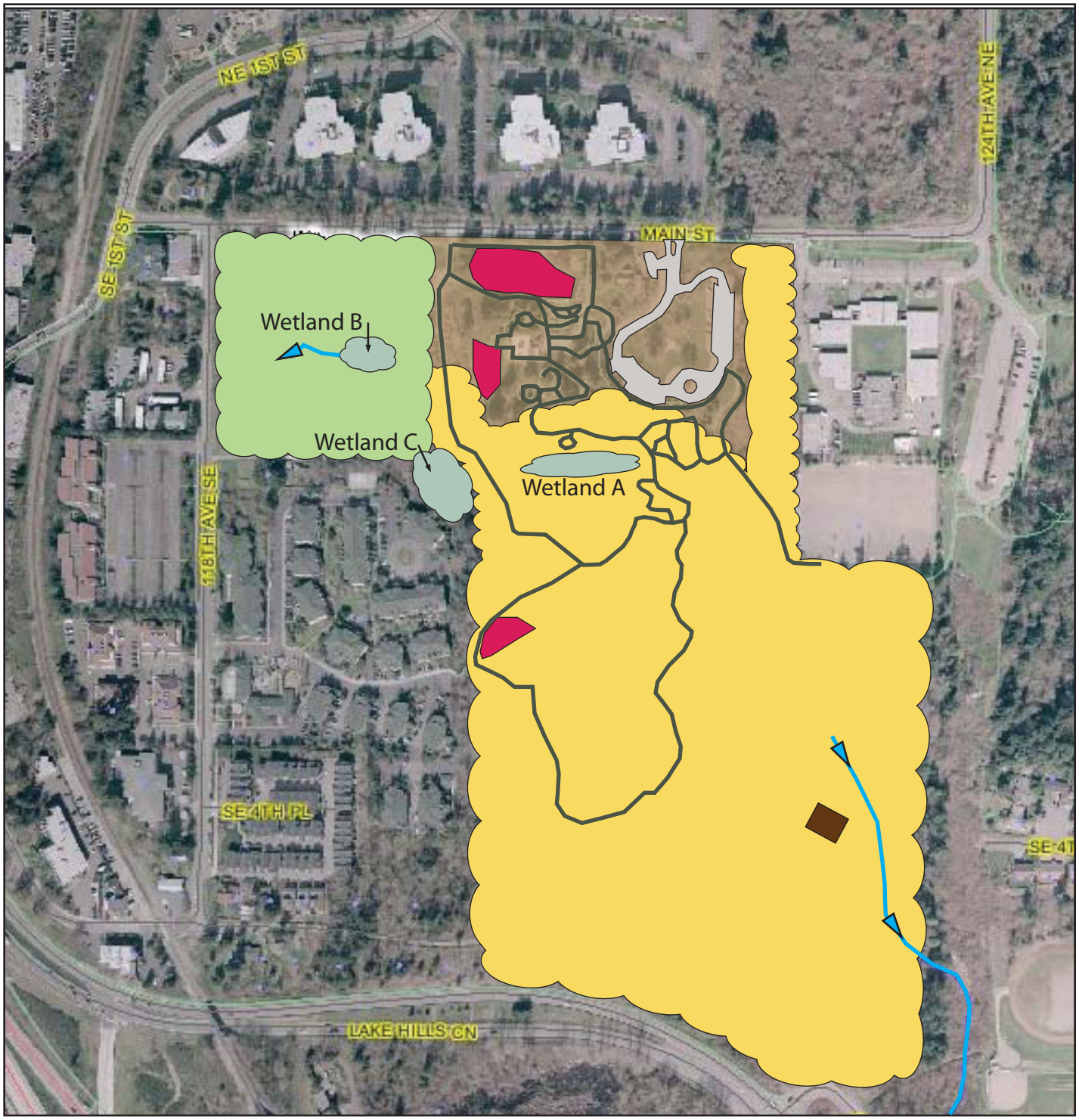
No species of local importance (BMC 20.25H.150-165) was observed in the forested habitat; however, evidence of pileated woodpecker was noted at multiple locations. In addition, the forested area most likely supports species of local importance such as bald eagle perching habitat, red-tailed hawk perching and foraging habitat, and year round habitat for bats (*Myotis* and *Plecotus* spp.) (See Exhibit 2 for habitat map). Lastly, a large nest was observed in the lower branches of a large cottonwood approximately 70 feet off the ground. The nest was monitored for over 10 minutes but no species were observed in or around the nest. The nest could have been from a red-tailed hawk but the surveyors were unable to confirm this through visual observation.

Three wetlands exist on site and were previously delineated by Skillings Connolly Inc. (2006; 2007). Primary vegetation found in the wetlands included sedges, cat tails, soft rushes, and skunk cabbage. No species of local importance were observed in the wetlands, however, Great Blue Herons and bats would be expected to use wetland habitat for foraging. Egg masses from long-toed salamanders and Pacific chorus frogs were observed in the wetlands.

Two meadow/grassy areas were observed within the forested area of the park. No species of local importance were observed in any of the meadows/grassy area. However, open meadow/grassy area habitat could be used by raptors such as red-tailed hawks, peregrine falcon, and merlin as foraging habitat.

The main interior of the complex is a botanical garden with a variety of native and non-native plant species and man-made structures such as buildings and impervious surface. Vegetation surveys were not conducted within the main complex due to the fact it was a cultivated garden. However, wildlife was noted when observed.

Habitat in the northwest corner of the park was primarily dominated by Himalayan blackberry. Alder, big leaf maple, cottonwood, Oregon ash, hawthorn, and orchard trees were also present. Himalayan blackberry is so thick in this section of the park no other vegetation can establish itself. This portion was not well surveyed because of the difficulty migrating through the Himalayan blackberry. In addition, a small (<8 inches wide) stream was observed




Botanical Garden

Himalayan Blackberry/ Common Hawthorn

Grass/ Open Meadows

Forest

Wetlands

Existing residence

Streams

SKILLINGS CONNOLLY ENVIRONMENTAL

Bellevue Botanical Gardens

Exhibit 2-1 - Habitat Types

April 16, 2008

within this area and is most likely an outlet from Wetland B (Skillings Connolly 2007).

## Vegetation

The following vegetation was observed during the survey. It is important to note that there is more species present but because of the time of year the survey was conducted, some vegetation may still be dormant and/or unidentifiable. This includes horsetails, bracken fern and other seasonal plants. No vegetation with sensitive status or local importance was noted during the site visit. The Department of Natural Resources Natural heritage program website was consulted in order to ascertain if any of the native plant communities at BBG are considered rare. None of the plant communities at BBG seemed to match the plant communities recognized by the Natural Heritage Program. The website notes that recognized plant communities tend to be biased toward areas that have been undisturbed by people. Noxious and non-native plants are discussed in a dedicated section on page 7.

**Table 1. Vegetation Species Observed During Survey.**

| | |
|---|---|
| Douglas Fir | *Pseudotsuga menziesii* |
| Red Alder | *Alnus rubra* |
| Western Red Cedar | *Thuja plicata* |
| Western Hemlock | *Tsuga heterophylla* |
| Big leaf Maple | *Acer macrophyullum* |
| Salal | *Gaultheria shallon* |
| Oregon Grape | *Mahonia nervosa* |
| Sword Fern | *Polystichum munitum* |
| Licorice Fern | *Polypodium glycyrrhiza* |
| Madrona | *Arbutus menziesii* |
| Cascara | *Rhamnus purshiana* |
| Pacific Yew | *Taxus brevifolia* |
| Indian Plum | *Oemleria cerasiformis* |
| Holly | *Ilex aquifolium* |
| English Ivy | *Hedera helix* |
| Himalayan Black berry | *Rubus discolor* |
| Trailing Blackberry | *Rubus ursinus* |
| Laural | *Laurus noblis* |
| Sitka Spruce | *Picea sp* |
| Red Huckleberry | *Vaccinium parvifolium* |
| Snowberry | *Symphoricarpos albus* |
| Slough Sedges | *Carex obnupta* |
| Weeping Willow | *Salix sp* |
| Soft Rush | *Juncus effusus* |
| Cattail | *Typha latifolia* |
| Skunk Cabbage | *Lysischiton americanum* |
| Creeping Buttercup | *Ranunculus repens* |
| Oregon Ash | *Fraxinus latifolia* |
| Watson’s Willowherb | *Epilobium ciliatum* |

| | |
|---|---|
| Common Hawthorn | *Crataegus monogyna* |
| Water Parsley | *Oenanthe sarmentosa* |
| Black Cottonwood | *Populus balsamifera* |
| Bitter cherry | *Prunus emarginata* |

## Wildlife

The Washington Department of Fish and Wildlife (WDFW) furnished Skillings Connolly with a Habitat and Species Report for the section, township and range that includes the BBG. In addition, U.S. Fish and Wildlife Service and National Marine Fisheries Service Endangered Species Act lists were reviewed to determine the presence of federally threatened or endangered species. No federally or state threatened and endangered species or sensitive species were identified within the BBG. Osprey, bald eagle and peregrine falcon, all state species of concern, are known to nest in certain locations that are within a 2 mile radius of the BBG. Richards Creek, Goff Creek and Kelsey Creek are occupied by priority anadromous fish and priority resident fish.

Avian species were the most abundant within the park (Table 2). Very few mammals were observed and this is most likely due to the daily presence of human activity and the urban setting that exists outside of the park boundaries (Table 3). Eastern gray squirrels, a non-native species, were observed foraging in the park. Finally, a pair of mallards was observed in the wetland within the garden. The mallards were accustomed to human activity and have probably been hand fed in the past based on their behavior towards the surveyors. Other wildlife that was not observed but could be present in the park includes owls, opossums, deer, rabbits, numerous species of rodents (voles, mice, and rats), skunks, bats, and coyotes.

Two amphibian species, Pacific chorus frog and long-toed salamanders were observed by either vocalization or egg mass identification during the site visit. Other amphibians such as red-legged frogs could use the wetland habitat. Avian species tolerant of isolated patches of mature forest could use the park as year-round habitat or during migration. This includes many passerines (perching birds) and birds of prey. Because of the time of year the surveys were conducted many potential species present in the summer were not observed.

**Table 2. Avian Species Observed During Field Survey**

| | |
|---|---|
| Song Sparrow | *Melospiza melodia* |
| Varied Thrush | *Ixoreus naevius* |
| American Robin | *Turdis migratorius* |
| Mallard | *Anas platyrhynchos* |
| Red Breasted Sapsucker | *Sphyrapicus ruber* |
| Bushtit | *Psaltriparus minimus* |
| Black-Capped Chickadee | *Parus atricapilus* |
| Oregon Junco | *Junco hyemalis* |
| American Crow | *Corvus brachyrhynchos* |
| European Starling | *Sturmus vulgaris* |

| | |
|---|---|
| Golden Crown Kinglet | *Regulus satrapa* |
| Anna's Hummingbird | *Calypte anna* |
| Northern Flicker | *Colaptes auratus* |
| Pileated Woodpecker | *Cryocopus pileatus* |
| House Sparrow | *Passer domesticus* |
| Steller's Jay | *Cyanocitta stelleri* |

**Table 3. Mammals Observed During Field Survey**.

| | |
|---|---|
| Eastern Gray Squirrel | *Sciurius carolinensis* |
| Raccoon | *Procyon lotor* |
| mole | *Talpidae spp.* |

**Table 4. Amphibians Observed During Field Survey.**

| | |
|---|---|
| Pacific Chorus Frog | *Pseudacris regilla* |
| Long-toed Salamander | *Ambystoma macrodactylum* |

## Noxious and Non-native Vegetation

Himalayan Blackberry was observed sparsely throughout the park, primarily in areas that had been previously disturbed. However, the northwest corner of the park has the largest concentration with over 80 percent of the ground being covered with Himalayan blackberry.

English ivy was observed climbing several trees on the recently purchased parcel close to the house. English ivy has been used as decorative ground cover but has become an ecological threat to native species.

Other non-native species that were observed in very sparse numbers included laurel, English holly and creeping buttercup; the latter two are on the King County noxious weeds of concern list (King County 2008).

## Management Recommendations

Overall, the habitat in the park is fairly diverse. The park also contains habitat features like standing snags, downed woody debris, open spaces and a wide range in tree sizes. The new addition in to the south end of the park will generally stay in its current state with the exception of the construction of trails and a bridge over the ravine. The new addition in the northwest side of the park will likely undergo blackberry removal, native plantings and trail construction. Since much of the BBG is devoted to horticulture, herbicides and pesticides are used sparingly. BBG gardener Jan Beck informed Chris Holcomb, a staff scientist with Skillings Connolly, that integrated pest management is practiced and that insecticides and herbicides are not applied within 50 feet of the edge of the wetlands. Herbicides like Garlon™ and Roundup™ are applied sparingly to control Himalayan blackberry. Although herbicides and insecticides may harm amphibians, the level of application seems to be minimal. The following is a description of the management recommendations.

**Eliminate Himalayan Blackberry**
Removal of the Himalayan blackberry and selective retention of other trees in the northwest corner of the park should occur in order to re-establish a more natural vegetation setting. Select healthy big-leaf maple, alder, and other native species could be left in place in the northwest corner along with planting other trees and shrubs to improve habitat conditions. Removal could be conducted using heavy equipment, or potentially by goats, however, a small stream meanders through the Himalayan blackberry and it should be marked before any work commences in that area. In addition, the area could be replanted with native vegetation. The smaller patches of Himalayan blackberry within the forested area could be removed by hand or by applying herbicide.

**Eliminate English Ivy**
English ivy should be removed in its entirety, especially where it is climbing up trees. English ivy is a threat to the integrity of the forested area of the park. English ivy can form thick layers on the forest floor thereby smothering native vegetation and inhibiting tree seedling growth (National Park Service 2002). The ivy can be killed by cutting the vines at the base of the tree then removing the roots in their entirety. Monitoring will have to be conducted to ensure the ivy does not re-grow.

**Enhance the Buffer of Wetland B**
A portion of the wetland buffer of Wetland B can be enhanced by planting more shrubs and trees. There is a grassy hillside between the eastern edge of this wetland and the trail that would be an appropriate area for shrubs and trees. Currently, this area is dominated by non-native grass species and shrubs would improve the wetland's hydrologic and water quality functions. Since this area is within a wetland buffer, a Critical Areas Land Use Permit (BMC 2030P) will need to be obtained. Generally, the City of Bellevue does not permit the planting of exotic plants in critical area buffers but exceptions can be made for public parks (Kevin LeClair pers. comm.). Since amphibians breed in the wetland, care should be taken to maintain current levels of sunlight on the seasonal pond. A planting plan incorporating low-lying native shrubs near the wetland buffer and exotic shrubs or trees near the trail may be suitable. The addition of large woody debris would also enhance this area for the amphibians.

**Species of Local Importance Recommendations**
*Pileated woodpecker*
Pileated woodpeckers were not observed in the park, however evidence of nesting and foraging was observed during the field reconnaissance surveys. It appears the BBG is already providing adequate habitat for this species by maintaining snag and stump habitat. Larson et al. (2004) recommends maintaining a sufficient number of large snags and decaying trees for nest and foraging habitat. Larson et al. 2004 also recommends that hard trees with evidence of foraging or nesting cavities should be retained.

*Great Blue Heron*
Great Blue Herons were not observed on-site; however, the wetlands within the BBG do provide foraging habitat for this species. Management recommendations for Great Blue Heron revolve primarily around nesting habitat. Human disturbance is identified as one of the largest impacts on Great Blue Herons and minimization of this disturbance is a management recommendation.

*Myotis* and *Plecotus*
No bats were observed during the field survey; however, this was expected since the surveys were conducted during the day and bats are nocturnal. The habitat in the BBG is conducive to bats, especially hibernacula habitat with the abundance of snags with cavities. Furthermore, the wetlands provide optimum foraging habitat because of insect production from the ponds. There are no specific management plans for bats, but maintaining snags and wetland habitat will help maintain their survival. Bat boxes could also be used in place of snags if necessary. If bat boxes are used, the following is recommended.

> Place the house in full sun, preferably on its own pole; the next-best location is on the southern side of a building in full sun. The optimal temperature range is between 85 and 104 degrees F. Don't put it on a tree, as it will be in too much shade and too close to perch sites used by hawks and owls. Keep the area around the entrance clear of obstructions for 20 feet (WDFW).

In conclusion, after review of the BBG Tree Management Plan (2007) and the Habitat Assessment, it appears that both documents are in relative agreement regarding management recommendations. The inclusion of the Tree Management Plan recommendations and management recommendations from the Habitat Assessment will improve habitat features in the BBG.

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