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.	09-129666-XE
Project Name/Address:	Kelsey Creek Early World Stabilization and Enhancement 13831 Bel-Red Road
Planner:	Kevin LeClair
Phone Number:	425-452-2928
Minimum Comment Period:	**December 3, 2009**

Materials included in this Notice:

- ☒ Blue Bulletin
- ☒ Checklist
- ☒ Vicinity Map
- ☐ Plans
- ☒ Other: Existing Conditions Report; Critical Areas Report; Project Plans

ENVIRONMENTAL CHECKLIST

4/18/02

Thank you in advance for your cooperation and adherence to these procedures. If you need assistance in completing the checklist or have any questions regarding the environmental review process, please visit or call the Permit Center (425-452-6864) between 8 a.m. and 4 p.m., Monday through Friday (Wednesday, 10 to 4). Our TTY number is 425-452-4636.

INTRODUCTION
Purpose of the Checklist:

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

Instructions for Applicants:

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

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the Planner in the Permit Center can assist you.
The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. Include references to any reports or studies that you are aware of which are relevant to the answers you provide. The City may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impacts.

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

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

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

Attach an 8½" x 11" vicinity map which accurately locates the proposed site.

City of Bellevue Submittal Requirements	**27a**

ENVIRONMENTAL CHECKLIST

12/21/00

If you need assistance in completing the checklist or have any questions regarding the environmental review process, please visit or call the Permit Center (425-452-6864) between 8 a.m. and 4 p.m., Monday through Friday (Wednesday, 10 to 4). Our TTY number is 425-452-4636.

BACKGROUND INFORMATION

Property Owner: **Rosalind Simmons/Simca Limited Partnership**

Proponent: **City of Bellevue Utilities Department, Early World Children's School**

Contact Person: **Kenny Booth, The Watershed Company**

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

Address: **750 Sixth Street South, Kirkland, WA 98033**

Phone: **(425) 822-5242**

City of Bellevue Critical Areas Land Use Permit
File # 09-129666-XE
Bellevue Contact: Abe Santos 425-452-6456

Proposal Title: **Kelsey Creek Bank Stabilization – Early World Children's School**

Proposal Location (Street address and nearest cross street or intersection) Provide a legal description if available:

Address: 13831 and 13851 NE Bellevue-Redmond Road, Bellevue, WA 98005, King County
Parcels: 2725059185, 2725059195, 2725059323, 2725059202
S/T/R: SW/27/25/05
Legal Descriptions:
2725059185: POR OF W 100.00 FT OF E 657.00 FT MEAS ALG S LN OF N 1/4 OF NE 1/4 OF SW 1/4 LY SLY OF ST HWY # 2 D & W 100.00 FT OF E 657.00 FT OF N 100.00 FT OF S 1/2 OF N 1/2 OF SD NE ¼
2725059195: UND 1/2 INT IN FOLG DAF - W 80.00 FT OF E 557.00 FT OF POR OF N 1/2 OF N 1/2 OF NE 1/4 OF SW 1/4 LY SELY OF REDMOND BELLEVUE RD
2725059323: UND 1/2 INT IN FOLG DAF - W 80.00 FT OF E 557.00 FT OF POR OF N 1/2 OF N 1/2 OF NE 1/4 OF SW 1/4 LY SELY OF REDMOND BELLEVUE RD
2725059202: W 110 FT OF E 477 FT OF N QTR OF NE QTR OF SW QTR STR 27-25-5 LY SELY OF REDMOND-BELLEVUE RD TGW W 110 FT OF E 477 FT OF N 100 FT OF S HALF OF N HALF OF NE QTR OF SW QTR SD SEC 27

Please attach an 8½" 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 purpose of the proposed project is to repair and stabilize portions of Kelsey Creek stream bank that have been damaged in recent years. High water velocities in the area have eroded away portions of stream bank located adjacent to the Early World Children's School. With continued high water velocities and limited stabilization features in place, loss of additional property is probable. Therefore, in order to repair portions of the stream bank and prevent further damage to the property, the placement of large woody debris, large boulders, coir blocks, and native vegetation is proposed.

The restoration activities proposed are designed to stabilize the channel's steeper gradients. Large woody debris will be placed in the channel to reduce flow velocities and the potential for channel incision. Large woody debris placement will be centered on the southern bank of the stream as it makes a 90-degree turn to the west.

Three revetment logs will be buried at least 12 feet into the stream bank leaving the attached rootwads positioned in the stream. The logs will be positioned in the upstream portion of this area. Fourteen bank logs and three rootwads will be embedded into the stream bank or channel downstream of the revetment logs. All logs will be anchored to the bank and secured together with anchoring cables. A system of coir blocks will be installed above and behind (landward) the bank logs. The coir lifts are made of 100 percent biodegradable material and will be filled with topsoil to stabilize the stream bank. Two "digger (sill) logs" will be placed, one each at the upstream and downstream limits of this work area. These logs will also be buried into the stream bank; however, they will be angled slightly so that the waterward end (without a rootwad) is placed at or below the channel bed. The "digger logs" are intended to direct flow away from the stream bank in this area. Additionally, at least three bank logs will be positioned along the northern stream bank just upstream of this area to prevent further erosion of that bank.

Boulders are proposed downstream of the area of large woody debris placement to help increase channel roughness and reduce flow velocity, which will cause a rise in water surface elevation. The channel is sufficiently confined such that it cannot be easily widened to accommodate the proposed in-stream structures. However, the predicted rise in water surface elevations can be accommodated within the banks of the channel.

Invasive weeds, including English ivy, Japanese knotweed, English laurel, English holly, Himalayan blackberry, and evergreen blackberry, will be removed from areas along the north and south stream banks and upland areas in the vicinity of the large woody debris placement. Native species will be planted in those areas where invasive species are removed. Proposed native plantings include vine maple, paper birch, beaked hazelnut, Douglas-fir, western red cedar, salal, red-twig dogwood, tall Oregon grape, osoberry, wood's rose, snowberry, evergreen huckleberry, lady fern, deer fern and sword fern. Proposed plantings will help to provide additional habitat adjacent to and within the stream, including overwater shading, allocthonous input of detritus and insects, and future recruitment of large woody debris.

In addition to removal of invasive species, the upland areas just north of the main bend in the stream are also proposed for improvements. It is proposed that native species be planted throughout this area, while access is also retained for nature-viewing opportunities. Access to the area would be provided through a gate situated in the southeast corner of the parking lot located to the west of the revegetation area. Large boulder outcrops and a woodchip trail would be provided in this area to allow children the chance to view the stream and interact with nature. Additionally, a fence would be provided around the perimeter of the viewing area to prevent access into the stream.

2. Acreage of site: **The four parcels involved total approximately 1.4 acres. However, the actual project area is approximately 0.30 acre.**

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By Kevin LeClair at 4:05 pm, Nov 12, 2009

3. Number of dwelling units/buildings to be demolished: **None**

4. Number of dwelling units/buildings to be constructed: **None**

5. Square footage of buildings to be demolished: **N/A**

6. Square footage of buildings to be constructed: **N/A**

7. Quantity of earth movement (in cubic yards): **see response A.1.e.**

8. Proposed land use: **The site is currently occupied by a day care center called Early World Children's School. No changes are proposed to the existing land use.**

9. Design features, including building height, number of stories, and proposed exterior materials: **N/A**

10. Other

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

Once started, stream and buffer restoration is estimated to take approximately four weeks. Construction is likely to occur in the summer of 2010.

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.

The Watershed Company. October 22, 2009. Critical Areas Report: Kelsey Creek Bank Stabilization – Early World Children's School.

The Watershed Company. June 22, 2009. Existing Conditions Report: Kelsey Creek / Early World Stream Bioengineering Project.

The Watershed Company. October 22, 2009. Biological Evaluation for Sensitive Fish and Wildlife Species at the Proposed Kelsey Creek Bank Stabilization and Habitat Enhancement Project, Bellevue, King County, WA: NWS-2009-____-___.

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

No other proposals are pending at this time.

REVIEWED
By Kevin LeClair at 4:09 pm, Nov 12, 2009

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.

Jurisdiction/Agency	Application	Date Applied	File Number
Wash. Dept. of Fish & Wildlife	**Hydraulic Project Approval**	**Not yet applied**	
Army Corps of Engineers	**Section 404**	**Not yet applied**	
WA Department of Ecology	**Section 401/CZM**	**Not yet applied**	
City of Bellevue	**Critical Areas Land Use Permit**	**Submitted concurrently with this checklist**	
City of Bellevue	**Clearing and Grading Permit**	**Not yet applied**	

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

A clearing and grading permit will be required to complete the work. The permit type will be an XB.

☐ Building Permit (or Design Review)
Site plan
Clearing & grading plan

☐ Shoreline Management Permit
Site plan

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By Kevin LeClair at 4:10 pm, Nov 12, 2009

A. ENVIRONMENTAL ELEMENTS

1. EARTH

a. General description of the site (circle one): Flat Rolling Hilly Steep slopes Mountains Other:

The majority of the site is flat, while several areas of stream bank are nearly vertical.

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

The steepest slopes on-site are the nearly vertical portions of stream bank.

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

According to the Department of Agriculture Natural Resources Conservation Service Web Soil Survey, the entire site is mapped as Alderwood gravelly sandy loam, 6 to 15 percent slopes.

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

Several areas of stream bank have become undercut and therefore are considered unstable. Specifically, small 3-4-foot erosion pockets are located at both ends of the sheet piling locations before and after the bend on the north (right) bank of the stream. The north stream bank is also mildly undercut for a distance of 46 feet above the bend and eroded down to the hard clay substrate. Along the south bank, just below the bend, a segment of the boulder rip rap on the southern shoreline has given way and resulted in an undercut bank of roughly 15 feet in length immediately downstream of a large sandbag wall. The sandbag retention wall was a temporary erosion control measure that has deteriorated with age. The lower half of the retention wall is constructed of concrete-filled bags that appear to be relatively sound. However, the upper half of the wall is composed of sand-filled bags, many of which are beginning to deteriorate.

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

	FILL			CUT
Purpose	All cut and fill activities are planned to repair and enhance portions of Kelsey Creek and its buffer.			
Type and Quantity	**Logs**	**Quantity**	**Cubic Yards**	Excavation to place logs and excavate pools: 15 yd^3
	Revetment Logs	3	10.5	
	Digger Logs	2	11.5	
	Stacked Bank Logs	14	73.5	
	Rootwads	3	5	
	Boulders/Cobbles/Gravel			
	Boulders	33	35	
	Cobbles/Gravel		5	
	Soils			
	Coir Blocks	28	25	
	Topsoil	-	50	
	Compost	-	45	
Total	**Logs**	**22**	**100.5**	**15 yd^3**
	Boulders/Cobbles/Gravel	**33**	**40**	
	Soils	**-**	**120**	

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By Kevin LeClair at 4:22 pm, Nov 12, 2009

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

Erosion could occur if exposed soils are mobilized by rainfall. The measures described below would help minimize erosion.

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

No new impervious surfaces are proposed as part of this project.

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

All clearing would be in accordance with City of Bellevue Clearing & Grading Code (Chapter 23.76), permit conditions, and all other applicable codes, ordinances, and standards.

Temporary sedimentation control measures such as silt fencing would be installed around soil stockpile areas and exposed soils as necessary to prevent any silt- or mulch-laden water from reaching Kelsey Creek due to rainfall. During the wet weather season (October 1 through April 30), the time of disturbed soil exposure shall not exceed 24 hours. From May 1 to September 30, the time of exposure shall not be more than 5 days. Disturbed soils shall be covered with straw, hydroseeded, or otherwise revegetated with sod or native plants as soon after disturbance as possible. In all cases, exposed soil must be covered at the end of the construction week and also at the threat of rain.

2. AIR

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

Any air quality impacts from construction vehicle emissions and handheld power tools would be temporary and rapidly dissipated. After project completion, no further impacts to air would occur.

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

The only off-site source of emissions that may affect the project is NE Bellevue-Redmond Road.

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

Standard methods of reducing impacts to air would be utilized, and include keeping all machinery in good operating condition and managing disturbed soils as described above under 1h.

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.

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Kelsey Creek passes through the project site. Kelsey Creek is classified as a Type F (fish-bearing) stream and eventually flows into Mercer Slough and Lake Washington.

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.

The entire project takes place in and within 200 feet of Kelsey Creek. As previously described, proposed work includes the removal of invasive species and the placement of large woody debris, boulders, coir blocks and native vegetation. Detailed plans are attached.

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

	FILL	CUT
Purpose	All cut and fill activities are planned to repair and enhance portions of Kelsey Creek stream bank.	
Type and Quantity	• Logs: Portions or all of 22 logs will be placed below the OWHM, totaling ± 90 cubic yards. • Boulders: All boulders will be placed below OHWM, totaling 35 cubic yards • Cobble/gravel mix: 5 cubic yards to be placed behind logs. • Soil/Coir: The lowest course of coir lift will be below the OWHM, resulting in 10 cubic yards of soil and 5 cubic yards of coir below the OHWM • Compost: Approximately 1/5 of the compost will be applied to areas of the bank below the OHWM, resulting in 10 cubic yards of material below the OHWM.	• In-stream and bank excavation to place logs and excavate pools: 10 yd^3
Total	**± 155 yd^3**	**10 yd^3**
Fill Source	Local source	

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

Each work area will be isolated by constructing a sand bag and plastic barrier starting upstream of and on the same bank as the proposed work area and ending on the same bank downstream of the work area. Such a barrier would force active, low stream flow against the opposite bank from the proposed work activities. If desired, the work areas may be divided into smaller sub-areas for isolation, provided that all in-water work is isolated from the active flow at the time the work is undertaken and all sediment-laden water is pumped to upland areas for biofiltration/infiltration.

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

Yes. Portions of the proposed project are located within the 100-year floodplain of Kelsey Creek, and therefore are within the area of special flood hazard. However, no structures are proposed as part of this project and the project will not result in a significant rise of the existing base flood elevation. Under proposed restored conditions, predicted 100-year flood elevations range from 173.62 feet to 178.28 feet. This represents a rise in water surface of 0.68

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By Kevin LeClair at 4:24 pm, Nov 12, 2009

foot under existing conditions at the downstream end of the project area and an increase of 0.45 foot at the upstream end. The most significant increase in flood elevation was predicted to be 0.87 foot. Under proposed conditions, flow velocities were generally predicted to decrease by between 10 and 20 percent. Flood levels with the proposed in-stream mitigations are lower than those that were likely present in the channel prior to recent (e.g. past 5 to 10 years) degradation.

The proposed large woody debris and boulders are effective, in part, because they increase flow area and channel roughness, both of which cause a rise in water surface elevation. A rise in the water surface elevation is therefore expected to accompany reduced flow velocities and increased channel and bank stability provided by the restoration activity. The channel is sufficiently confined such that it cannot be easily widened to accommodate the proposed in-stream structures. However, the predicted rise in water surface elevations will be confined within the banks of the channel. Similarly, the water surface elevation at the time of sheet pile installation was in excess of the estimated restored stream's water surface elevation. Projected rises in the water surface elevation due to the restoration activity are less than the likely surface water elevations found in the project reach prior to the channel downcutting and erosion that initiated the need for this project. Therefore, there is anticipated to be no rise in the base flood elevation over pre-existing conditions.

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 intentional discharges of waste materials would occur during project construction. Measures would be taken as described above to insure that silt- or mulch-laden water from uplands does not reach the stream.

b. Ground

1. Will ground water be withdrawn, or will water be discharged to ground water? Give a general description, purpose, and approximate quantities if known.

There will be no withdrawal of or discharge to ground water associated with this project.

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.

There will be no waste material from septic tanks or other sources discharged into the ground as part of this project.

c. Water runoff (including stormwater):

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

Runoff from the immediate project site is not expected except at natural, near pre-project rates. In general, precipitation is expected to infiltrate into vegetated soils or flow directly into Kelsey Creek.

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

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During construction, fuel, lubricant or other material spills from equipment could enter surface waters.

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

The erosion control measures described under question 1h would help control impacts to surface and runoff water. In addition, equipment would be in good working order with no known leaks.

A storm water pollution prevention plan (swppp) is required for instream work. Turbidity monitoring is also required.

4. PLANTS

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

- ☒ deciduous tree: **alder**, **maple**, aspen, other: **paper birch**
- ☒ evergreen tree: fir, **cedar**, pine, other:
- ☒ shrubs: **Himalayan blackberry, Japanese knotweed, tall Oregon grape, osoberry, rhododendron**
- ☐ pasture
- ☐ crop or grain
- ☐ wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other:
- ☐ water plants: water lily, eelgrass, milfoil, other:
- ☒ other types of vegetation: English ivy, sword fern

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

Approximately 3,290 square feet of non-native, invasive species will be removed. On-site non-native and invasive species include Himalayan blackberry, English ivy, English laurel, and Japanese knotweed. No native vegetation will be removed from the site.

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

No threatened or endangered plant species are known to be on or near the site.

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

A detailed planting plan using only native species has been prepared for portions of the site (see attached plans). A total of 3,290 square feet of native plantings are proposed. Tree species include paper birch, Douglas-fir, and western red cedar. Shrubs and groundcover include vine maple, beaked hazelnut, salal, red-twig dogwood, tall Oregon grape, osoberry, wood's rose, snowberry, evergreen huckleberry, lady fern, deer fern and sword fern.

5. ANIMALS

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

birds: **hawk**, **heron**, **eagle**, **songbirds**, other:
mammals: deer, bear, elk, **beaver**, other:
fish: bass, **salmon**, **trout**, herring, shellfish, other:

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

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By Kevin LeClair at 4:28 pm, Nov 12, 2009

Adult and juvenile chinook salmon, steelhead trout and possibly bull trout (listed as Threatened under the Federal Endangered Species Act) migrate through Kelsey Creek. Adults migrate upstream to reach spawning grounds; juveniles migrate downstream from their natal streams to reach the ocean. Kelsey Creek also contains coho salmon (Species of Concern under the Federal Endangered Species Act).

Although no longer on the federal Endangered Species Act list, the bald eagle is still classified as Threatened by Washington State. Bald eagles likely occasionally forage in Kelsey Creek.

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

As described above, adult and juvenile salmon and trout migrate up and downstream, respectively, through Kelsey Creek.

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

A detailed planting plan using only native species has been prepared for the project area (see attached plans). 2,390 square feet of native plants are proposed. Tree species include paper birch, Douglas-fir, and western red cedar. Shrubs and groundcover include salal, vine maple, red-twig dogwood, beaked hazelnut, tall Oregon grape, osoberry, wood's rose, snowberry, evergreen huckleberry, lady fern, deer fern and sword fern. Native plantings will provide overhanging vegetation to supplement the stream with detritus and insects, benefiting aquatic species; filtered shade; future recruitment of large woody debris; and upland wildlife habitat.

6. ENERGY AND NATURAL RESOURCES

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

Fuel may be necessary for handheld power tools and heavy equipment during project construction. Otherwise no forms of energy are necessary for the completed project.

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

No.

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

No forms of energy are necessary for the completed project.

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.

Typical hazards related to power tools and equipment fuels are associated with construction of the proposed project.

1) Describe special emergency services that might be required.

Emergency services are not anticipated at the site. In the unlikely event that an accident (spill, fire, other exposure) occurs involving toxic chemicals or hazardous wastes, the local

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Fire Department's Hazardous Materials Team would respond. If necessary, local medical services might also be required. The full range of safety and accident response supplies would be on-site to treat any emergency during construction.

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

Standard precautions would be taken to ensure the safety of the work crew. The construction manager would be contacted by a crew member immediately upon discovery of a spill. The construction manager would then ensure that the spill is cleaned up in the manner dictated by the chemical use instructions and would contact the appropriate authorities.

SWPPP and Turbidity Monitoring is required.

b. Noise

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

NE Bellevue-Redmond Road is located adjacent to the project site and generates typical levels of noise associated with a busy roadway. However, the road noise will not affect the proposed project.

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

Noise associated with the proposed project would be restricted to the use of construction equipment and power tools during the construction phase. Construction noise would be limited to normal daytime working hours. There would be no long-term noise associated with the proposed project.

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

As mentioned above, noise would be limited to daylight weekday hours. All construction equipment and power tools would be in good repair. No other noise-control measures are necessary.

8. LAND AND SHORELINE USE

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

The site is currently occupied by a day care center called Early World Children's School. The Eastside Fitness Center is located to the east of the project site. The Belmont Condominiums are located south of the site. Areas of open space and commercial offices are located west of the site. Commercial and retail uses are located north of the site across NE Bellevue-Redmond Road.

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

No.

c. Describe any structures on the site.

Two separate buildings make up the childcare center. Both structures are located to the south of Kelsey Creek and are accessed from a total of three existing bridges over the creek.

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By Kevin LeClair at 4:29 pm, Nov 12, 2009

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

No.

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

O (Office). Site is zoned BR-ORT

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

O (Office) Comp. Plan designation is BR-ORT.

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

The project site is not located within shoreline jurisdiction.

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

Kelsey Creek has been classified as a Type F stream channel and is therefore considered by the City of Bellevue to be a critical area. Additionally the site is located within an area of special flood hazard, also considered by the City to be a critical area.

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

There will be no change in the number of people working at the project site as a result of the proposed stream improvements.

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

No person will be displaced as a result of this project.

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

Does not apply.

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

This project does not affect existing land use.

9. HOUSING

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

None.

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

None.

REVIEWED
By Kevin LeClair at 4:30 pm, Nov 12, 2009

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

Does not apply.

10. AESTHETICS

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

No structures are proposed.

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

Natural materials, such as large woody debris and boulders, will be added to the stream, while invasive species will be removed and replaced with native plantings. Therefore, views within the area may actually improve with implementation of the proposed project.

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

No measures are necessary.

11. LIGHT AND GLARE

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

No additional light or glare will be produced by the proposed project as compared to the existing project site.

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?

The only potential off-site source of glare is the stream itself. Kelsey Creek may reflect the sun during certain times of the day.

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

The potential reflections of glare off Kelsey Creek are natural and therefore no reduction measures will be necessary.

12. RECREATION

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

The project site offers passive wildlife viewing opportunities of Kelsey Creek. Additionally, Bellevue Highland Park is located approximately 0.25 mile east of the project site. The park offers baseball/softball fields, tennis courts, picnic tables, play areas and a skate park.

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

No.

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By Kevin LeClair at 4:32 pm, Nov 12, 2009

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

No measures are necessary. The proposed project would aesthetically improve viewing opportunities of Kelsey Creek from the project site.

13. HISTORIC AND CULTURAL PRESERVATION

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

No places or objects of this type are known to exist in the immediate vicinity.

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

There are no landmarks or evidence of such in the immediate vicinity.

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

Should historic, archeological, scientific or culturally significant items be encountered during implementation of this project, work would be temporarily stopped while the appropriate agencies are notified.

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.

The project site can be accessed from NE Bellevue-Redmond Road. Access needs or uses would not change as a result of the proposed project.

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

The nearest King County Metro transit stop is located at the corner of NE Bellevue-Redmond Road and 140th Avenue NE, approximately 0.12 mile east of the project site.

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

The completed site would have the same number of parking spaces as the existing site. Therefore, no spaces would be eliminated.

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).

This project will not affect public roads in any way.

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

Water, rail, or air transportation would not be utilized by the completed project.

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By Kevin LeClair at 4:32 pm, Nov 12, 2009

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

The proposed project would not create any additional vehicle trips above those already generated by the existing use. No increase in traffic generation is expected.

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

No measures are necessary.

15. PUBLIC SERVICES

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

No increase in public service needs will result from this project.

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

No measures are necessary.

16. UTILITIES

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

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

No new utilities are proposed as part of the project.

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.

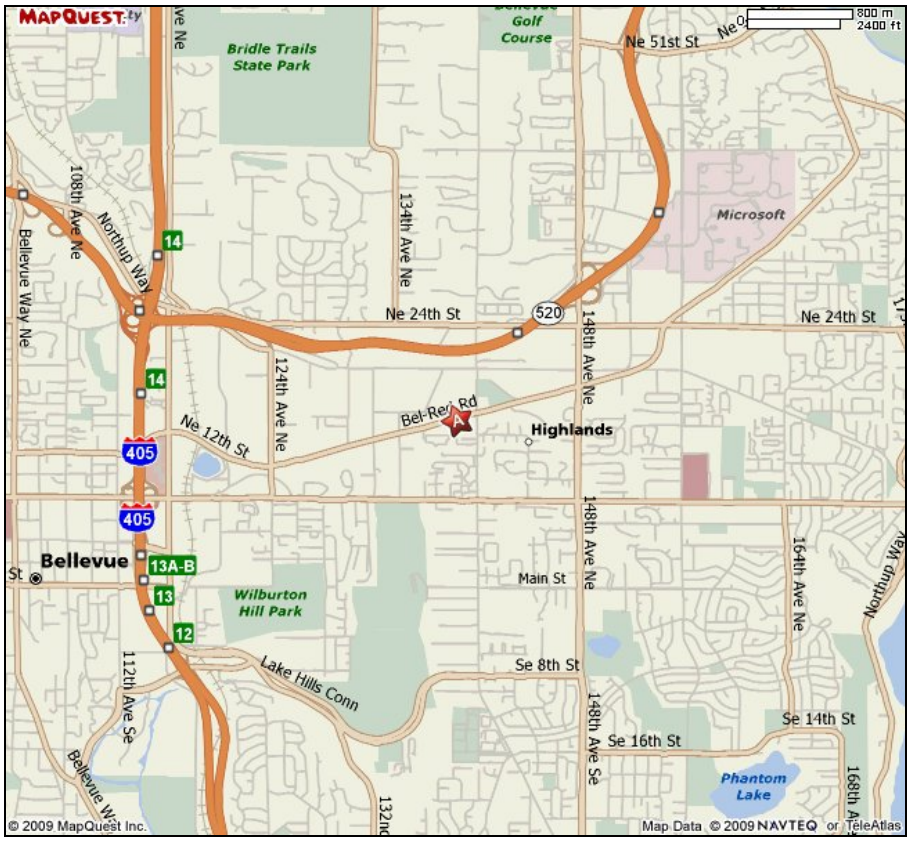
Signature

Kenny Booth, AICP
Associate Planner

Date Submitted: _____

REVIEWED
By Kevin LeClair at 4:32 pm, Nov 12, 2009

Vicinity Map from MapQuest (top) and iMap (bottom)



EXISTING CONDITIONS REPORT

Kelsey Creek / Early World Stream Bioengineering Project

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EXISTING CONDITIONS REPORT

KELSEY CREEK / EARLY WORLD STREAM BIOENGINEERING PROJECT

1 INTRODUCTION

This study was prepared for the City of Bellevue to evaluate and document the existing conditions of Kelsey Creek at the Early World Childcare site and facilitate the ongoing bioengineering project design process. This stream stabilization project was initiated to deal with continued stream bank erosion concerns that threaten both public and private property interests. The continued degradation of a sandbag retention wall designed to temporarily protect the steep south stream bank from further erosion during significant flood events posses a serious risk in the event of a failure. The project segment of Kelsey Creek is highly urbanized and constrained in many sections by sheet pile walls associate with Bel-Red Road to the north and the existing commercial property to the south. Additionally, multiple bridge crossings in the project area further constrain Kelsey Creek and add additional potential risk to the bioengineering design. Current stream conditions associated with stream bank erosion, the condition of the existing sand bag retention wall, high water velocities, channel downcutting, low quality fish and invertebrate habitat, and poor aesthetic appeal are documented in this report. A stream reach assessment, topographic survey, and a hydraulic review were preformed to document the existing conditions of this area and are intended to guide the design process.

The initial concept level design for this project was approved jointly by the City of Bellevue and the Early World Childcare landowner (Appendix A), and provides the backdrop and spatial extent for the proposed bioengineering project. An in-depth field reconnaissance of the existing stream channel, state of the sandbag retention wall, and proposed new bank stabilization was conducted and is detailed in this report. During the field reconnaissance, the Ordinary High Water Mark (OHWM) was identified and flagged, and a topographic survey was commissioned to provide a base map for hydraulic modeling and design purposes. Similarly, a number of perpendicular stream transect locations were identified and transects were conducted to document channel dimensions, water depths, substrate sizes, and thalweg locations. An eroding and undercut stream bank was identified and its location and dimensions documented. Water

velocities were estimated at the stream surface for comparison to estimates derived from the hydraulic model. Information collected in the field was used in a hydraulic review of the in-stream structure design configuration and bank stabilization using a HEC-RAS model incorporating the available reach-specific information. A detailed description of the project area is provided below.

2 PROJECT LOCATION AND EXTENT

The project stream reach extends along approximately 320 feet of the Kelsey Creek channel (Figure 1). The upstream end is located below a bridge providing access from Bel-Red Road to the upper parking area of the Early World Childcare complex (Tax parcel 272505-9202). The stream is contained on both banks with a sheet pile wall at the upper bridge. From this point, the stream flows south, southwest out of the sheet-piling-lined section, then bends 90 degrees and flows west toward Bel-Red Road. Below the bend, the stream is again constrained by sheet piling and crossed by two bridges that provide access to the lower Early World Childcare buildings from Bel-Red Road (Tax parcel 272505-9185). The stream channel begins to bend again between the bridges and flows west, south west, paralleling Bel-Red Road briefly before exiting the project site. The downstream end of the project is approximately 20 feet downstream of the lower bridge.

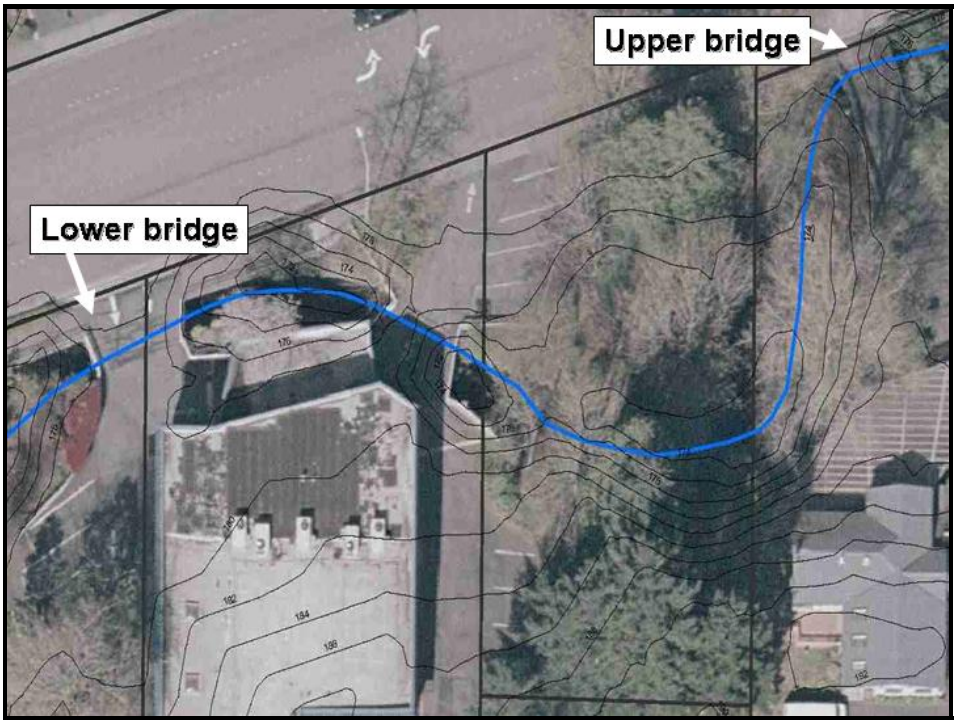

Figure 1. Aerial view and contours of project site with the approximate location of Kelsey Creek marked in blue. The project area is encompassed by the upper and lower bridges.

3 EXISTING STREAM AND RIPARIAN CONDITIONS

Kelsey Creek originates at Phantom Lake and flows in a westerly direction through the City of Bellevue and discharges into Lake Washington via the Mercer Slough. Kelsey Creek is characterized as a small stream with a mean daily discharge of 21.2 ft^3/s (0.6 m^3/s) and a moderate average gradient of 1.1% (Scott et al. 1986). Hydrology of the Kelsey Creek system has shifted from its historic pattern in conjunction with increases in urbanization and now displays characteristics of a typical urban stream, e.g. flashier hydrograph, elevated concentrations of nutrients and contaminants, altered channel morphology, and reduced biotic richness (Scott et al. 1986, Walsh et al. 2005).

The Early World project reach of Kelsey Creek is highly urbanized, with sheet piling constraining much of its stream bank, contributing to elevated water velocities, downcutting / scour, and stream bank instability in areas not contained by sheet pile. Large woody debris is absent from the stream corridor in this reach and current grade control is limited and associated with periodic large boulders. Thus, stream bank erosion in the project reach is a recurring

focus of concern, particularly where the thalweg (line along deepest stream points) meets the edge of the channel in areas devoid of piling.

3.1 Failing Stream Bank and Channel Downcutting

The failing stream banks in the project area were photographically documented and measured (Figure 2). Descriptive assignments were made of the proportion of stream composed of riffle, pool, or run habitat. Model runs of the reach-specific hydrologic regime were conducted using HEC-RAS, and the resulting water elevation and velocity estimates were used to assess the future risks of erosion in the identified areas of concern.

3.2 Stream Channel Measurements

Kelsey Creek at the Early World Childcare site was surveyed on December 31, 2008 using standard stream transect methods to provide information regarding channel morphology (McMahon et al. 1996). Channel cross sections were conducted at eight locations associated with proposed stabilization efforts and which were also used to facilitate hydrologic modeling within the study reach (Figure 3). Stream channel measurements of width, depth, and cross sectional area were recorded. Surface water velocity and discharge estimates were also made using three timed drift replicates and water velocity estimates were adjusted using the 0.8 multiplier for rough bottom channels proposed by McMahon et al. (1996). Velocity and discharge estimates are rough and are provided for comparison purposes only. The presence or absence of large woody debris (LWD) in the project reach was also noted.

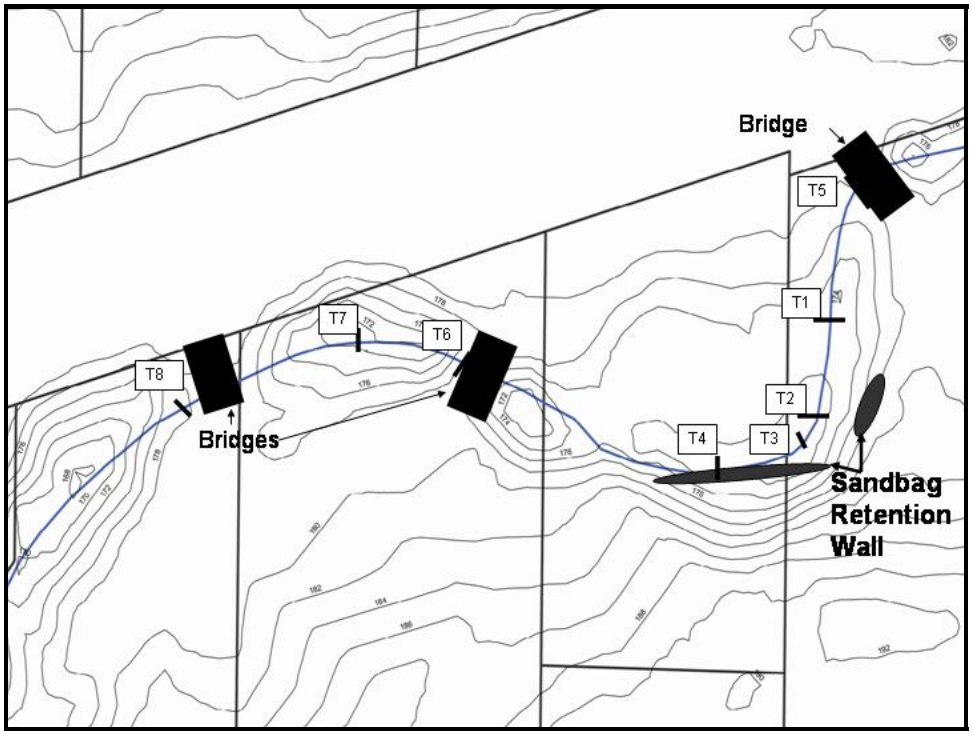

Figure 2. Location of eight channel cross sections (black bar crossing Kelsey Creek; T1-T8) used to assess habitat characteristics and hydrologic regime in the project reach.

3.3 Sediment Survey

A Wolman pebble count was conducted at transects T1 thru T4 to characterize substrate composition and diversity (Wolman 1954). Random grabs of sediment were distributed along the channel cross sections as outlined in McMahon et al. (1996). Sediment was measured and classified using the methods first developed by Wentworth and later modified by Cummins (1962; Table 1).

Table 1. Wentworth sediment classification scheme found in McMahon et al. (1996).

Classification	Particle size range (mm)
Boulder	>256
Cobble (rubble)	64–256
Pebble	32–64
	16–32
Gravel	8–16
	4–8
	2–4
Very coarse sand	1–2
Coarse sand	0.5–1
Medium sand	0.25–0.5
Fine sand	0.125–0.25
Very fine sand	0.0625–0.125
Silt	0.0039–0.0625
Clay	<0.0039

3.4 Fish Information

A fish survey was not conducted specifically as part of this stream reach assessment. However, information on fish utilization, species, and size structure are provided from an electrofishing survey conducted on Kelsey Creek approximately a half mile upstream by The Watershed Company in July of 2007 for the City of Bellevue (The Watershed Company 2008). Similarly, information pertaining to the types of adult salmon using the project reach for spawning and the current and previous locations of salmon redds within the stream channel is provided from a salmon spawner survey report conducted by The Watershed Company for the City of Bellevue (The Watershed Company 2009). Information regarding size-specific juvenile salmonid micro-habitat preferences is also provided (Keeley and Slaney 1996) as an indication of how habitat alterations may influence juvenile fish utilization of the project reach.

4 HABITAT MEASUREMENTS AND FISH RESULTS

4.1 Failing Stream Bank and Channel Downcutting

Small 3-4 foot erosion pockets are associated with the ends of the sheet piling at both of the locations before and after the bend on the north (right) bank of the stream (Figure 4). The north stream bank is also mildly undercut for a distance of 46 feet above the bend and eroded down to the hard clay substrate (Figure 5). The thalweg of Kelsey Creek is associated with the northern stream bank in this section of the project area. The thalweg shifts from the north bank to the south bank at the bend in the channel. Below the bend, a segment of the boulder rip rap on the southern shoreline has given way and resulted in an undercut bank of roughly 15 feet in length immediately downstream of the large sandbag wall (Figure 6). The sandbag retention wall was a temporary erosion control measure that has deteriorated with age. The lower half of the retention wall is constructed of concrete filled bags that appear to be relatively sound. However, the upper half of the wall is composed of sand filled bags, many of which are beginning to deteriorate. Similarly, bank instability above the large sandbag wall in the river bend combined with the deteriorating wall is a serious risk for potential future property loss from stream bank failure (Figures 7 and 8).

High water velocities and constrained channel walls potentially facilitate channel downcutting in portions of the lower segment of the project site (Figure 9). The stream channel is physically constrained by sheet piling on both banks (Figure 10). Water velocities and constrained channel characteristics associated with

bridge accesses points pose a potential risk of future property loss from channel downcutting or channel obstruction due to a debris jam between the sheet piling.

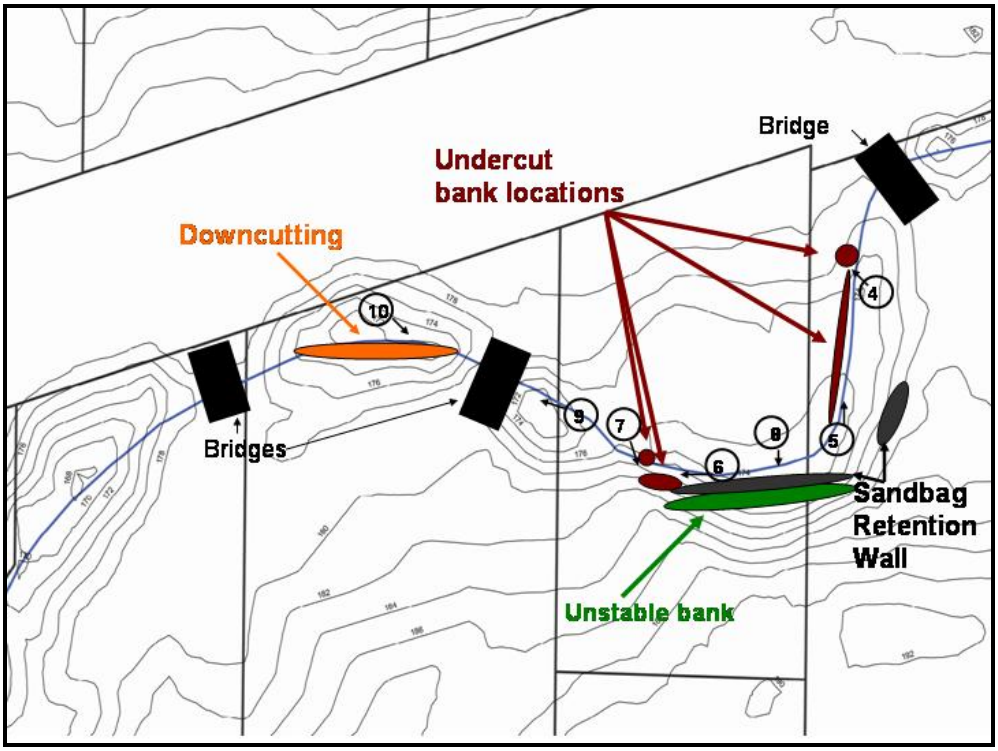

Figure 3. Locations of unstable bank (green), undercut stream banks (dark red), and an area of channel downcutting (orange). Locations of sandbag retention walls are shown in grey and bridges in black. The location and direction of photo points are represented by the numbered circles and arrows.

Figure 4. Erosion pocket located at the terminus of the sheet pile wall immediately below the upper bridge. Note exposure of hard clay layer.

Figure 5. Facing upstream, showing slight bank erosion of the north bank above the stream bend in the project site.

Figure 6. Undercut bank and failing boulder rip rap on the left bank (south) immediately below the large sand bag wall at the stream bend.

Figure 7. Stream bank erosion above sand bag wall and failing boulder rip rap at the bend of the project site.

Figure 8. Bank instability and failure above sand bag wall at the stream bend. Note that the lower half of the sandbag retention wall is composed of concrete while the upper half is made of sand which is beginning to show signs of deterioration.

Figure 9. Constrained channel with sheet piling at the middle bridge access point.

Figure 10. Constrained channel between the middle and lower bridge access points to the Early World Childcare facility. Note the scour marks on the sheet pile wall indicative of down-cutting.

4.2 Stream Channel Measurements

Results from the channel measurements made during the site visit at the eight cross sections (see Figure 3) are summarized in Table 2. Channel width measurements taken at the OHWM level were fairly consistent with a range of 10-14.5 feet associated with segments of the stream contained in sheet piling, and broader channel widths ranging between 17.4-23.8 feet for cross sections located in areas not contained by sheet piling.

Wetted stream widths followed the same pattern with sheet pile sections being narrower than less constrained segments (Figure 11). Depth measurements also followed the predicted pattern, with higher depths typically found in more constrained areas such as the lower segment between the bridges.

Stream segments above the bend (cross sections T5, T1, & T2) contain higher gradients, shallower water depths, and typically higher velocity water. The thalweg is often associated with the right bank in the section above the bend and there is a slight undercut to the streambank in this area. At the 90° bend in the stream (section T3) the thalweg crosses to the left bank and a scour pool is formed along the degrading riprap wall topped with sand bags. Whereas segments above the bend typically contain shallow fast water, segments at the bend transition into a more gradual slope, greater depths, and slower water

velocities. The scour pool and tailout segment is roughly 100 feet long prior to reentering the sheet piling below the middle bridge. The lower segment of Kelsey Creek in the project area (sections T6 thru T8) begins with a gradual gradient that becomes steeper as it progresses down the channel. Water depths in this area are relatively deep with a down cutting "pool" or run segment at section T7. Water velocities are moderate to high in the lower segment and are increasing as they leave the project area.

Table 2. Stream channel characteristics measured from cross channel transects at the project site.

Transect	Bankfull width (ft)	Wetted width (ft)	Max depth (ft)	Mean depth (ft)	Cross section area (ft^2)	Water velocity* (ft/s)	Discharge (cfs)	Gage comparison % gage discharge **
1	23.8	18	0.75	0.53	9.4		17.6	
2	19.4	15.3	0.9	0.53	7.9		14.8	
3	19.7	11.6	2.4	1.42	12.9		24.2	
4	17.4	15.7	1.35	0.81	12.5		23.5	
5	12.6	12	0.85	0.40	5.3		10.0	
6	10	10	1.75	1.10	12.3		23.1	
7	12	11.5	3.75	2.16	27.2		51.1	
8	14.5	12	1.2	0.73	9.3		17.4	
Reach	16.2	13.3	1.6	1.0	12.1	1.9 ft/s (57 cm/s)	23.00	60%

* water velocity was estimated using three replicate surface velocities and multiplying by 0.8 for a rough bottom (McMahon et al. 1996)
** Gage discharge from USGS Mercer Creek gage during survey (1100 hours, 12/31/08; 38 cfs)

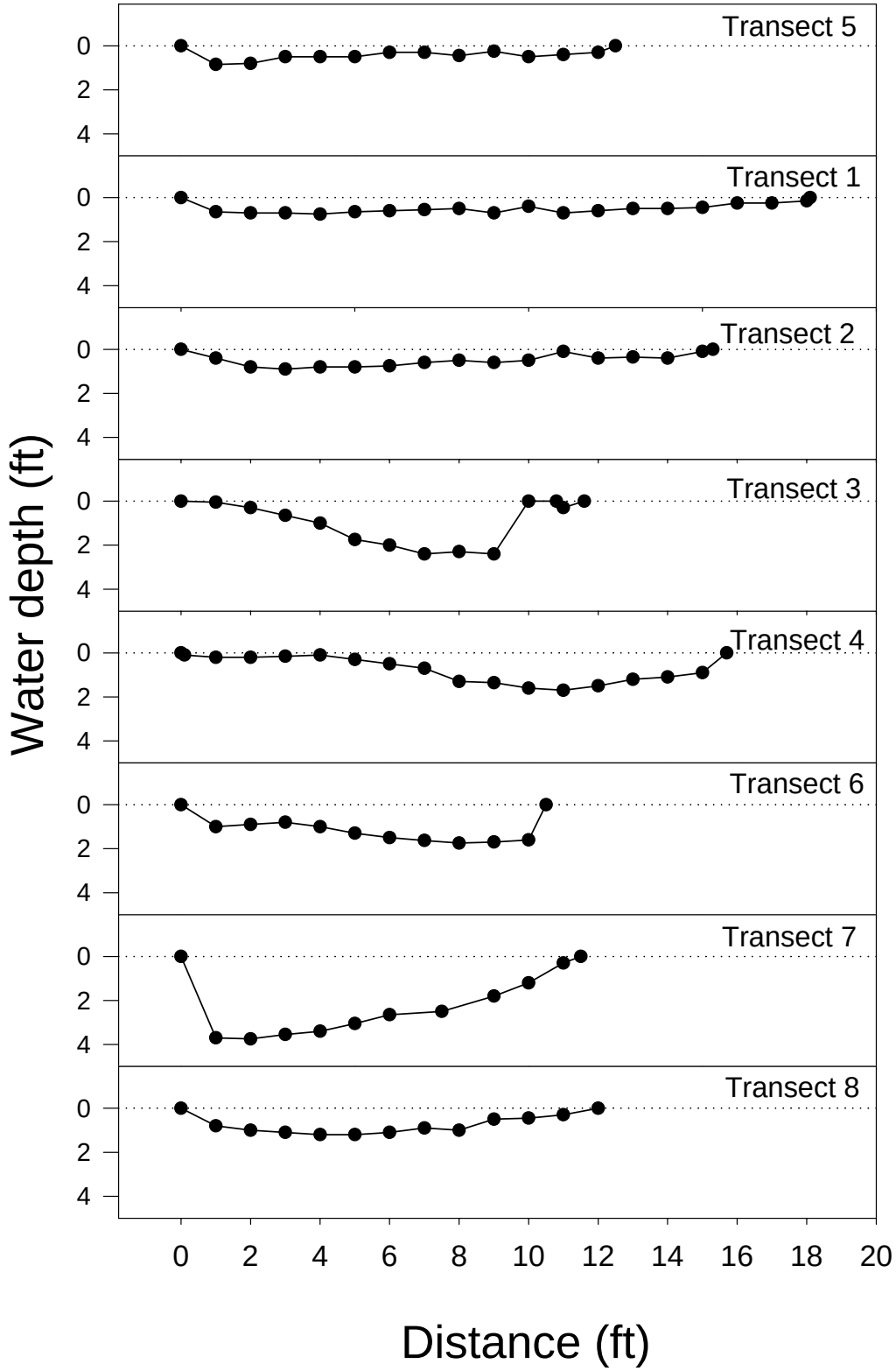

Figure 11. Stream depth transects from the most upstream transect (transect 5) down to the last transect in the project area (transect 8).

4.3 Sediment Survey

The sediment size and composition in the project area was assessed using a Wolman pebble count at those transects adjacent to the bend in the creek and most associated with areas of bank erosion and bank stabilization concerns (T1 thru T4). The diversity of substrate sizes among riffle, run, and pool habitats in the project area was relatively low (Table 3 & Figure 12). Cobble size particles dominated all transects and was highest in the riffle habitat prior to the stream bend and scour pool. Substrate sizes generally selected for by spawning salmon range between 13 and 102 mm (½ and 4 inches; Table 4) and are contained in the categories of gravel, pebble, and cobble. The project area contains an abundance of suitable spawning substrates.

Table 3. Substrate particle size observations from a Wolman pebble count in transects 1-4 at the project site.

Kelsey Creek Bioengineering and Bank Stabilization Project

Substrate particle size estimate (Wolman pebble count; McMahon et al. 1996) 12/31/2008

	Very Coarse Sand	Gravel			Pebble		Cobble	Boulder
Transect	1-2 mm	2-4 mm	4-8 mm	8-16 mm	16-32 mm	32-64 mm	64-256 mm	>256 mm
1	0%	0%	4%	12%	15%	27%	38%	4%
2	0%	0%	0%	4%	4%	21%	67%	4%
3	3%	3%	3%	9%	18%	21%	44%	0%
4	4%	0%	4%	7%	25%	25%	29%	7%
Reach	2%	1%	3%	8%	16%	23%	44%	4%

Table 4. Salmon spawning substrate size and habitat criteria table from Bjornn and Reiser (1991).

TABLE 4.5.—Water depth, velocity, and substrate size criteria for anadromous and other salmonid spawning areas.

Species	Depth (cm)	Velocity (cm/s)	Substrate size (cm)	Source
Fall chinook salmon	≥24	30–91	1.3–10.2[a]	Thompson (1972)
Spring chinook salmon	≥24	30–91	1.3–10.2[a]	Thompson (1972)
Summer chinook salmon	≥30	32–109	1.3–10.2[a]	Reiser and White (1981a)
Chum salmon	≥18	46–101	1.3–10.2[a]	Smith (1973)
Coho salmon	≥18	30–91	1.3–10.2[b]	Thompson (1972)
Pink salmon	≥15	21–101	1.3–10.2[a]	Collings (1974)
Sockeye salmon	≥15	21–101[b]	1.3–10.2[a]	[b]
Atlantic salmon	≥25	25–90		Beland et al. (1982)
Kokanee	≥6	15–73		Smith (1973)
Steelhead	≥24	40–91	0.6–10.2[c]	Smith (1973)
Rainbow trout	≥18	48–91	0.6–5.2	Smith (1973)
Cutthroat trout	≥6	11–72	0.6–10.2	Hunter (1973)
Brown trout	≥24	21–64	0.6–7.6[c]	Thompson (1972)

[a] From Bell (1986).
[b] Estimated from criteria for other species.
[c] From Hunter (1973).

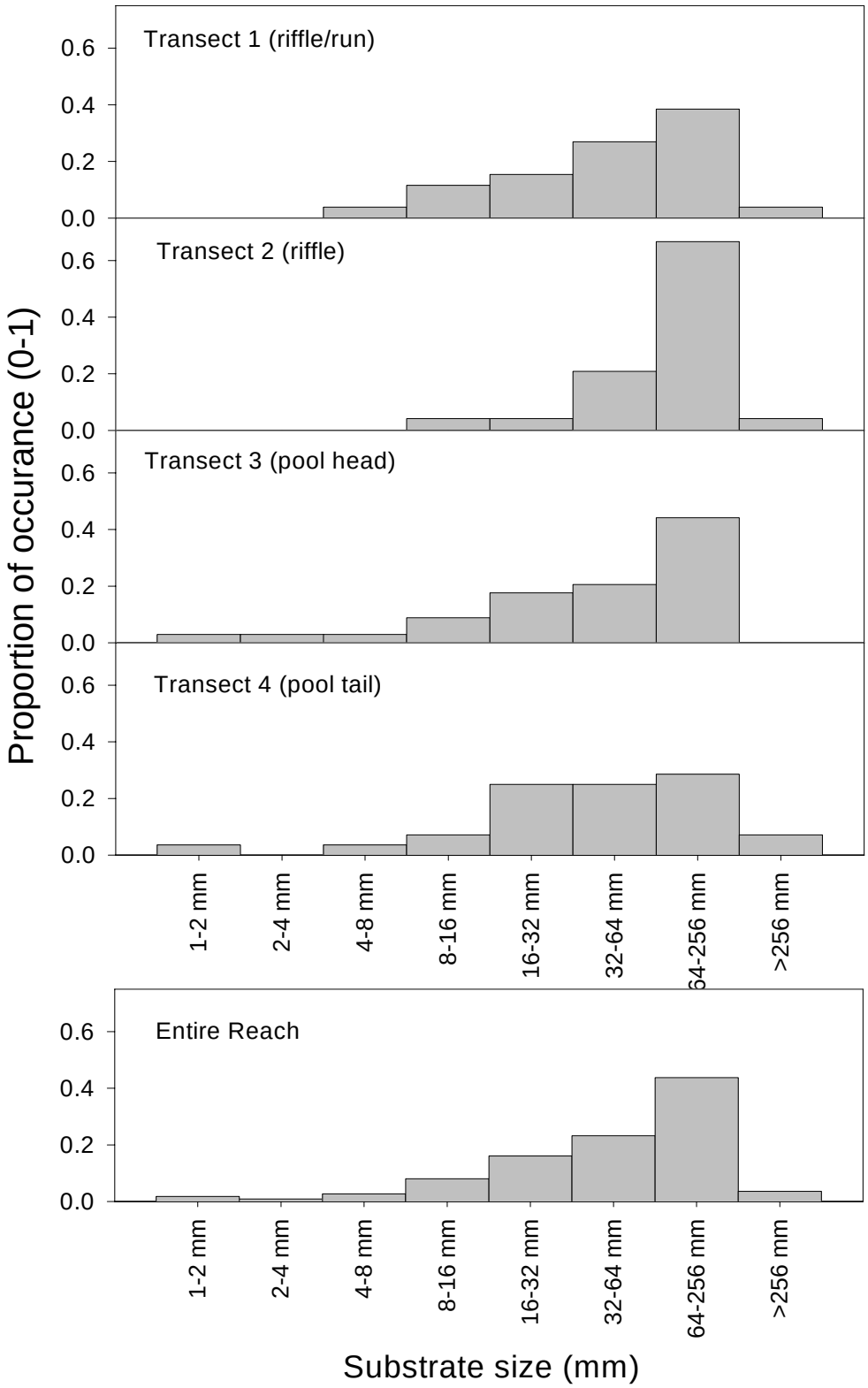

Figure 12. Proportional sediment size composition (mm) from Wolman pebble counts for transects 1-4 and the entire study reach combined.

4.4 Fish information

As stated previously, fish were not collected as part of this stream analysis. However, information regarding various fishes in the general location of the project area was available from previous work in the vicinity of the project site. That information is incorporated here to facilitate project design regarding fish utilization. Information regarding the species composition and body sizes of juvenile and adult fishes present in the project area and the broader Kelsey Creek system allows the bioengineering design to identify specific habitat preferences that would benefit local fish production (Keeley & Slaney 1996).

4.4.1 Juvenile fish

The length frequency of cutthroat trout captured upstream of the project area displays a bimodal distribution (Figure 13), with the most abundant length cohort ranging in size from 4 -10 cm (1.6-3.9 in) and a second less abundant size cohort of trout from 13-16 cm (5.1-6.3 in). The observed size distribution is typical of the cutthroat trout in streams of the Lake Washington basin, where trout generally migrate to Lake Washington to rear at age 2 during the late winter / early spring at body sizes larger than 150 mm (Nowak 2000). The size pattern observed near the project site in July of 2007 is consistent with information from the broader lake Washington basin (Nowak 2000) and data collected for Kelsey Creek previously during 1981 (Scott et al. 1986) and between 2002 and 2005 (The Watershed Company 2005).

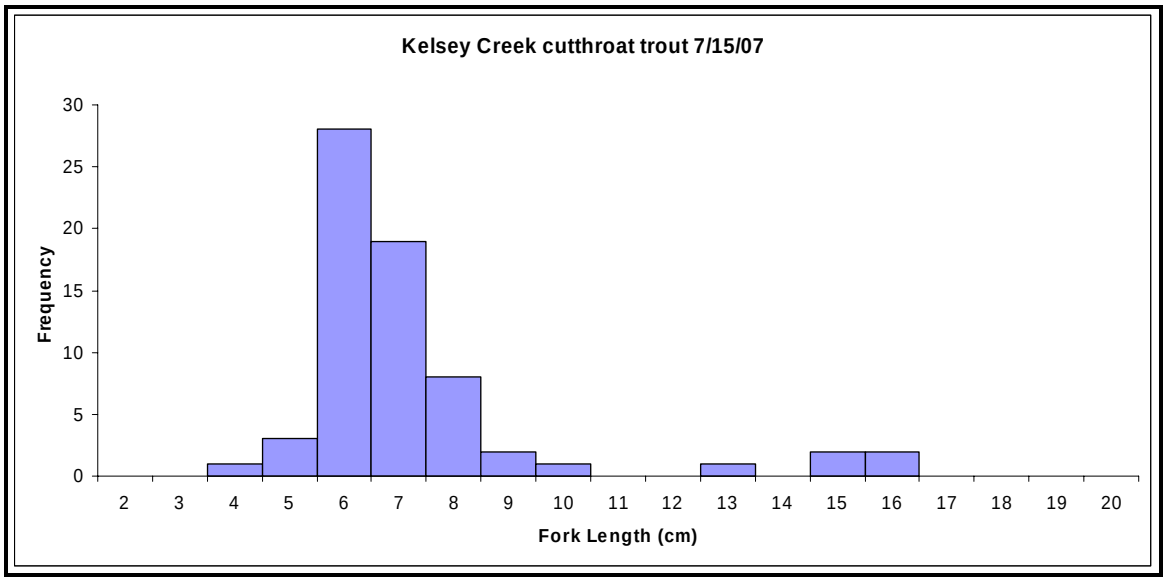

Figure 13. Cutthroat trout length frequency observed during an electrofishing sampling event on July 15th, 2007 upstream of the project site.

Information regarding juvenile coho and chinook salmon is less prevalent. The length of four coho salmon captured during electrofishing surveys in nearby Valley Creek ranged from 9 to 11 cm (3.5-4.3 inches) fork length (The Watershed

Company 2005) while juvenile coho leaving Kelsey Creek in 1981 had a mean length of 109 mm (4.25 inches; Scott et al. 1986). The Chinook salmon in the Lake Washington Basin are considered ocean-type chinook and primarily leave their natal streams after hatching or rear for a short two- to four-month period (Koehler et al. 2006). Ocean-type chinook in Kelsey Creek would likely have body sizes ranging between 1.5 and 3.0 cm (½ and 1.25 inches) prior to leaving the system for Lake Washington. The potential size structure of fish present at the project site suggests that bioengineering efforts should attempt to provide habitat that is consistent with juvenile salmonid fish use from hatch sizes of 1.5-1.8 cm to roughly 18 cm in length (½-7 inches; Keeley & Slaney 1996; Figure 14).

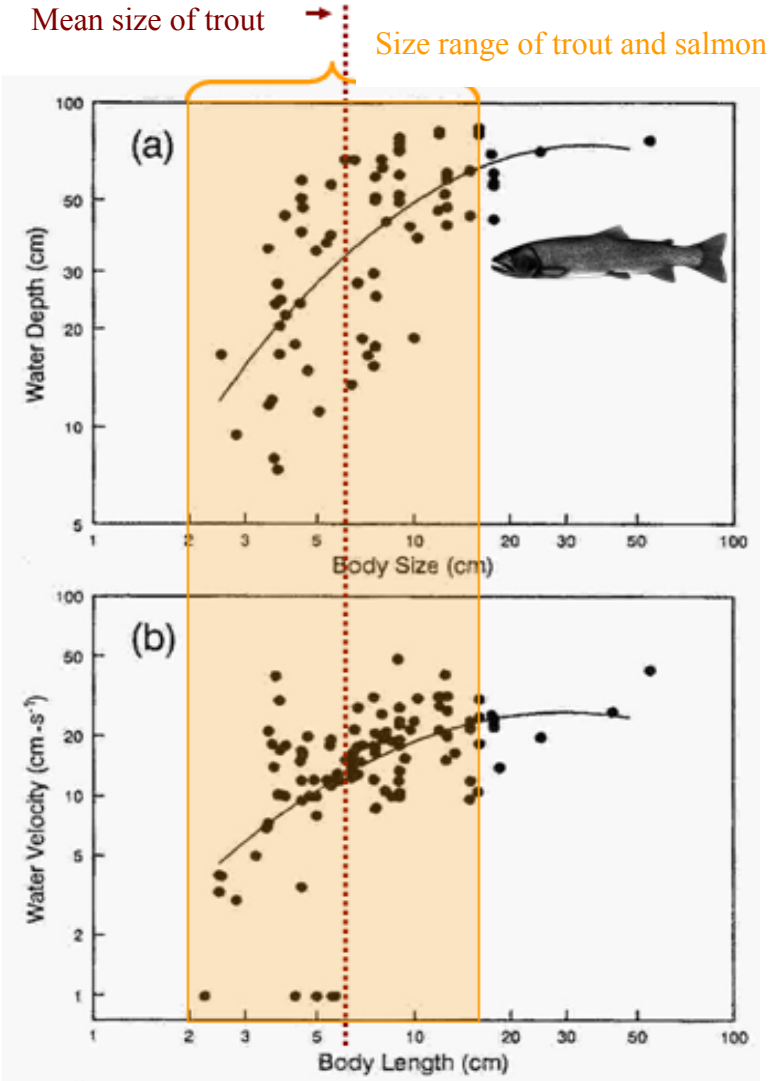

Figure 14. Salmonid body size and habitat utilization relationship from Keeley and Slaney 1996. The mean size of cutthroat trout (red dashed line) and cutthroat and coho size ranges (orange bracket) from hatch to sizes observed in Kelsey Creek during the July 2007 electrofishing survey.

Body size and preferred habitat relationships from Keeley and Slaney (1996), indicates that preferred juvenile salmonid habitat areas contain water velocities roughly between 0.16-1.0 ft/s (5-30 cm/s) and water depths of roughly 0.3-3.3 ft (10 – 100 cm; Figure 14).

4.4.2 Salmon Spawning Habitat

Observations of adult salmon using the project site for redd construction during spawning seasons is also documented (The Watershed Company 2009). Chinook salmon and sockeye salmon were observed during the 2007 salmon run constructing redds in the tail of the pool located below the bend and between the second and third bridges (The Watershed Company 2008, Figure 15). Similarly, a coho salmon constructed a redd near the right bank immediately above the 90° bend during 2008 (Figures 15 & 16).

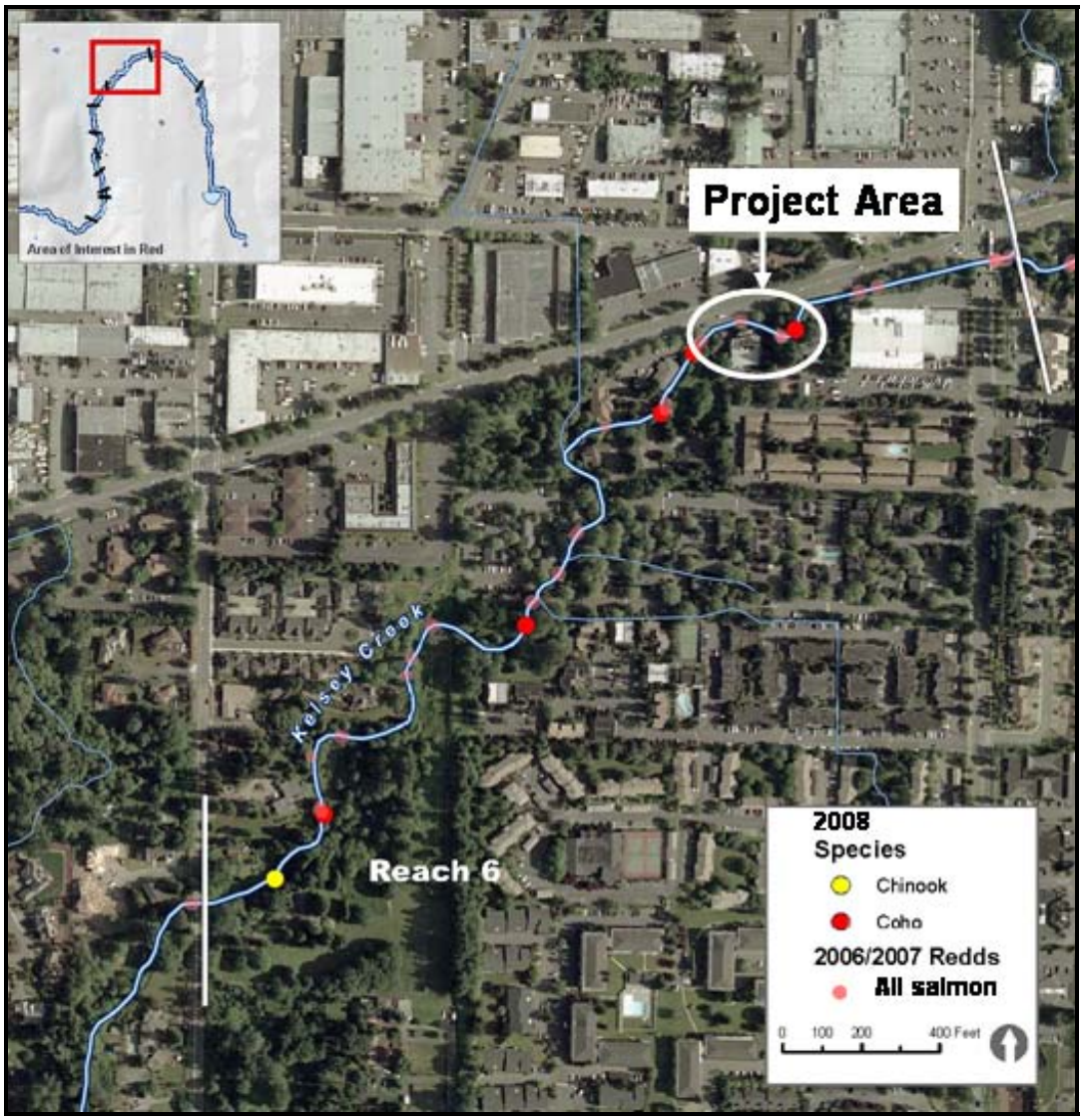

Figure 15. Salmon redds constructed at the project site during the 2006 - 2008 salmon season.

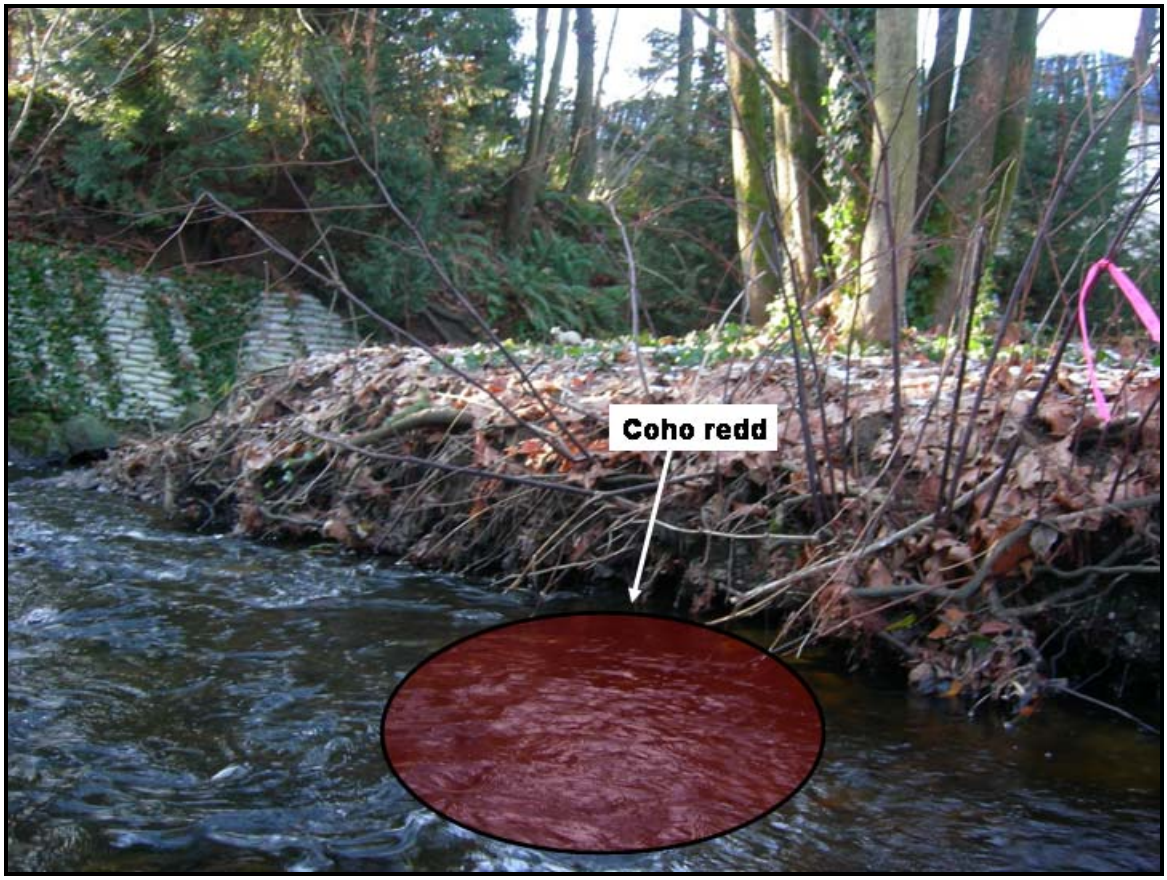

Figure 16. Location of a coho salmon redd (transparent redd oval) constructed during the 2008 salmon spawning season in the project site.

Spawning habitat requirements for Chinook, coho, sockeye, and cutthroat trout were borrowed from Bjornn and Reiser (1991, Table 4) and from Keeley and Slaney (1996). Based on these fish habitat review documents, increases in spawning habitat would result from increasing the amount of area with water velocities from 0.65-2.8 ft/s (20-85 cm/s) and water depths of 0.65-3.0 ft (20-90 cm). As stated previously, the current substrate sizes available at the project site are appropriate for salmonid spawning and relatively abundant. Salmon spawning activity in the project reach would likely increase with structural additions that slow water velocities and deepen the channel to provide adult salmon holding space. Similarly, egg to fry survival rates for fishes would likely benefit from reduced scour and an increase in substrate stability resulting from the addition of structure.

5 HYDRAULIC AND RISK ASSESSMENT

5.1 Background

This report documents the results of a hydraulic assessment conducted on a reach of Kelsey Creek that is adjacent to NE Bellevue-Redmond Road. The assessment evaluates the creek under existing conditions and also under proposed future conditions that will result from implementing a restoration plan. The restoration plan includes placement of boulders, large woody debris (LWD) installations, and bank stabilization plantings. The plan is intended to restore the channel, stabilize a failing streambank, and improve fish habitat.

5.2 Method of Assessment

The hydraulic model HEC-RAS (Version 4.0) was used to assess the hydraulics of the study reach under pre-existing, existing, and proposed restored conditions. Procedures outlined in the King County *Surface Water Design Manual* (King County Department of Natural Resources 1998) were generally followed in conducting the floodplain analysis. Inputs for the channel sections and alignment were based on surveyed information. The study reach extends a distance of 380 feet from STA 0+00 to STA 3+80. Channel cross sections were extended an additional 100 feet upstream of the project reach to STA 4+80 to investigate the influence of the project on the upstream hydrology. A detailed field survey of the creek was conducted by Concept Engineering, Inc. The downstream hydraulic boundary condition assumed normal flow at STA 0+00 with a channel gradient of 0.0125 foot/foot.

Photographs of the creek system are provided in Appendix B. A roughness coefficient of 0.045 was used for the main channel, representative of a channel with gravel and cobble substrate with some boulders. A roughness coefficient of 0.065 was used for brush covered overbank areas, representative of floodplains with medium to dense brush in winter months (French, Richard, H., 1985). Roughness coefficients are identified in the channel cross sections shown in Appendix C of this report.

The following is a summary of the analysis procedures that were used in preparing the hydraulic assessment:

1. Cross sections of the existing channel geometry were based on the topographic survey for the project site. Cross sections were spaced at a distance ranging from 25 to 80 feet along the study reach. The project study reach is represented by Sections 0+00 through 4+80 in the HEC-RAS model.
2. The geometry of the proposed stream channel was based on plans for the restoration project. The existing channel geometry was modified to represent changes that would be made to the channel during the restoration. Features from the restoration plan were represented in the HEC-RAS model by modifying the channel geometry (Table 5).

3. Flow rates ranging from 1.01-year to 500-year return periods were used in the calculations. The flow rates were based on results of the City of Bellevue's Kelsey Creek HSPF model and Pond Reach Analysis Tool (Northwest Hydraulic Consultants, 2002). Flow rates for the Base Case from Reach 37 of the City's model were used in this analysis (Table 6).

Table 5. Creek Restoration Features

HEC-RAS Section	Feature	Representation in HEC-RAS
0+00-1+60	Boulders	Channel bottom modified to reflect boulder placement
1+80	Sloped sill log	Represented by instream weir
2+30-2+85	Streambank stabilization – root wads, LWD, plantings	Channel cross sectional area reduced and channel roughness increased at bank stabilization locations
2+85	Sloped sill log	Represented by instream weir
3+10-3+80	Boulders	Channel bottom modified to reflect approximate boulder placement

Table 6. City of Bellevue HSPF Predicted Flow Rates (Northwest Hydraulic Consultants, 2002)

Peak Annual Flow Exceedance (CFS)

	Interval (yrs)	1.01	2	5	10	25	50	100	500
Reach 37	Base Case	112	189	244	284	337	380	425	540

5.3 Modeling Results

Under existing conditions, predicted 100-year flood elevations ranged from elevation 172.94 at Sta 0+00 to elevation 177.83 at Sta 3+80 (Appendix C). Flow velocities were predicted to range between 1.94 feet per second at Sta 2+55 and 8.17 feet per second at Sta 0+80 for the 2-year flow. Flow velocities were predicted to range between 2.19 feet per second at Sta 2+55 and 10.62 feet per second at Sta 0+80 for the 100-year flow.

Under proposed restored conditions, predicted 100-year flood elevations ranged from elevation 173.62 at Sta 0+00 to elevation 178.28 at Sta 3+80 (Appendix C). This represents a rise in water surface of 0.68 under existing conditions at the downstream end of the reach and an increase of 0.45 foot at the upstream end. The most significant increase in flood elevation was predicted to be 0.87 foot at Sta 1+60. Under proposed conditions, flow velocities were generally predicted to decrease by between 10 and 20 percent. Flood levels with the proposed instream mitigations are lower than those that were likely present in the channel prior to recent (e.g. past 5 to 10 years) degradation.

The boulders, log sills, and LWD are effective, in part, because they increase flow area and channel roughness, both of which cause a rise in water surface elevation. A rise in

the water surface elevations are therefore expected to accompany reduced flow velocities and increased channel and bank stability provided by the restoration activity. The channel is sufficiently confined such that it can not be easily widened to accommodate the proposed instream structures. However, the predicted rise in water surface elevations will be confined within the banks of the channel. Similarly, the water surface elevation at the time of sheet pile installation was in excess of the estimated restored streams water surface elevation (Figures 17 thru 19). Projected rises in the water surface elevation due to the restoration activity are less than the likely surface water elevations found in the project reach prior to the channel downcutting and erosion that initiated the need for this project.

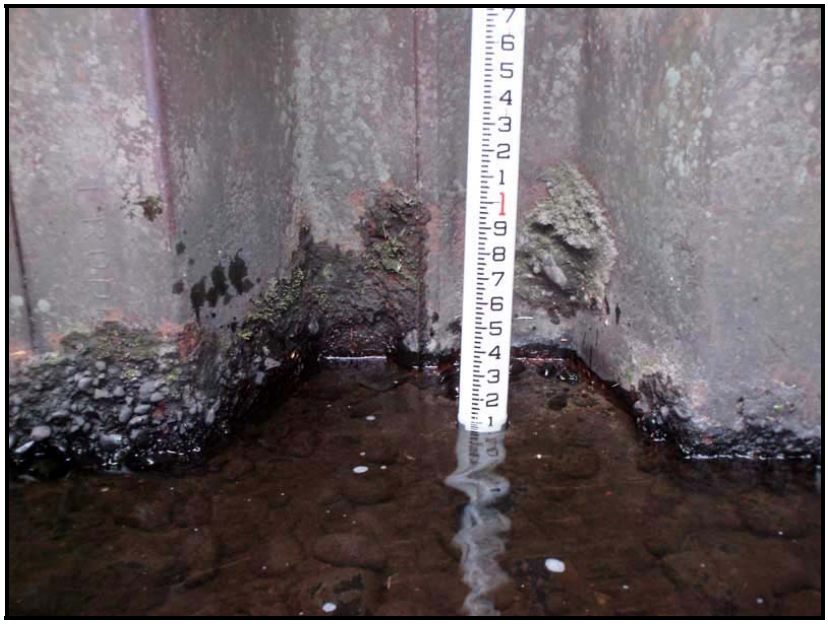

Figure 17. Channel incision of approximately 1.1 feet in the project reach as evident from imbedded gravel in the sheet piling.

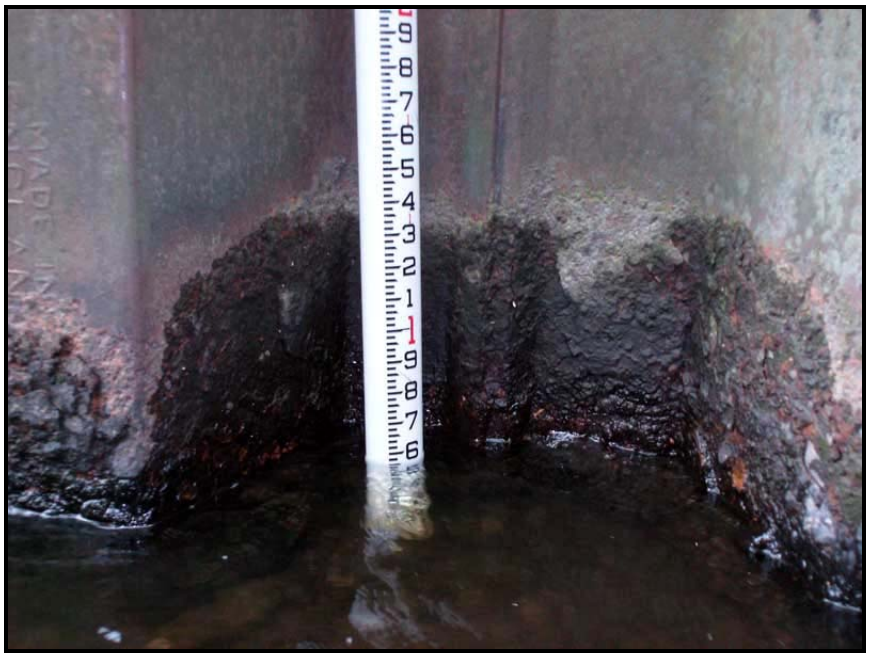

Figure 18. Channel incision of approximately 1.3 feet in the project reach as evident from gravel scour marks on sheet piling.

Figure 19. Channel incision of approximately 1.4 feet in the project reach as evident from imbedded gravel and scour marks on the sheet piling.

5.4 Risk Assessment

5.4.1 No Action Alternative

Without restoration efforts, the steeper gradient sections of channel, although well-armored, will likely continue to incise. The left bank of the channel that extends from Sta 2+30 to Sta 3+10 and contains the degrading sandbag retention wall will continue to be at risk of failure. A single large storm could undermine the existing bank protection on this reach of the channel and cause failure. This would result in high sediment loads to the creek. A bank failure could also result in the loss of large mature conifer trees from the bank. The resulting losses of the embankment and vegetation could create extensive damage to the existing building located at the top of the bank.

Increased sediment load from a bank failure of this proportion would create deposition downstream that could damage habitat and create flooding. Uncontrolled release of trees and vegetation from the failed bank could result in debris dams at downstream bridges and culverts. These catastrophic releases to the creek system could create road and property flooding as well as infrastructure damage.

5.4.2 Stream Restoration Alternative

The restoration activity is designed to stabilize the channel's steeper gradients and the left bank of the channel that extends from Sta 2+30 to Sta 3+10. LWD and boulders placed in the channel will reduce flow velocities and the potential for channel incision. While the release of LWD from the installations is possible, precautions will be taken to secure the LWD using conservative and redundant means to reduce the probability of this occurring.

The boulders, LWD, and bank restoration structures will result in an increase in water depths in the channel compared to existing conditions. However, flood levels are likely below those present in the channel prior too recent (e.g. past 5 to 10 years) degradation (Figures 16 thru 18; Appendix C). For the 100-year flow, the predicted increase in water surface elevation was predicted to be 0.45 foot at the upstream end of the study reach. The increase in flood elevation would be contained within the channel. Increases in the 100-year water surface of up to 0.87 foot were predicted within the study reach, but also would be contained within the banks of the channel and below levels prior to recent channel incision. Proposed instream mitigations raise flood levels on the project site up through Sta 4+05. At Sta 4+05 the proposed flood levels match existing flood levels and would not propagate upstream.

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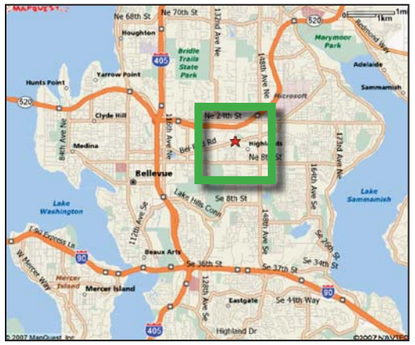
APPENDIX A

Initial approved concept design, 2007

KELSEY CREEK STREAMBANK STABILIZATION AND HABITAT ENHANCEMENT PROJECT AT EARLY WORLD CHILDCARE CENTER

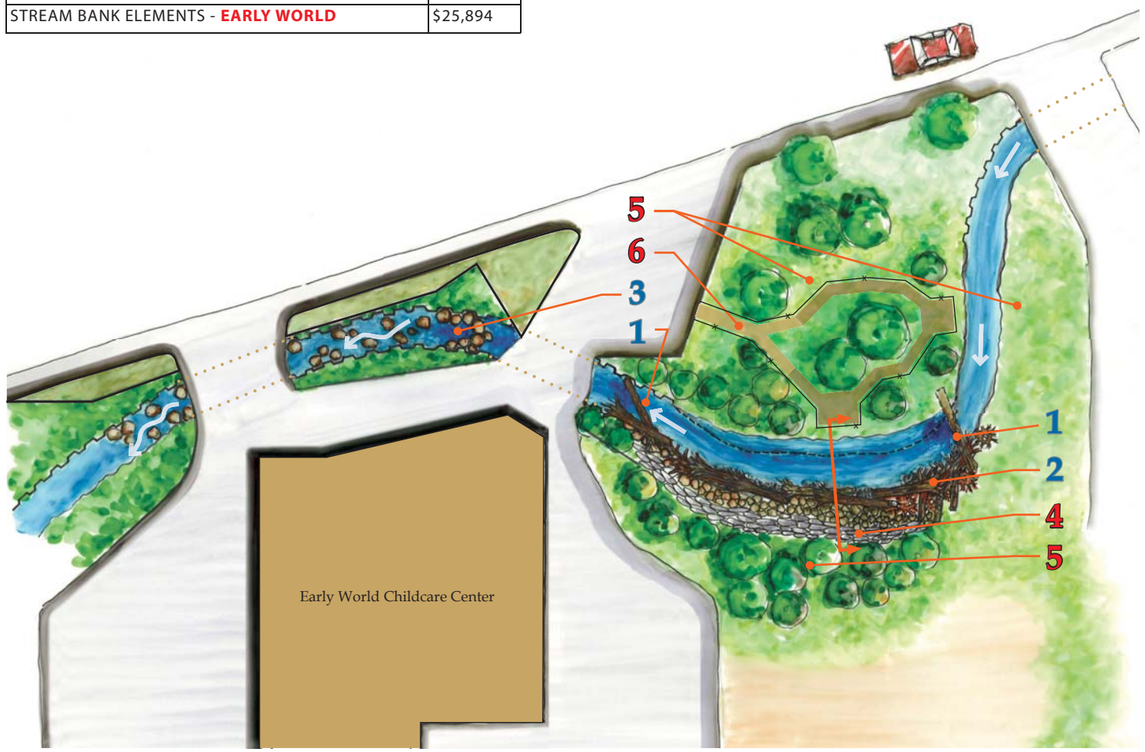
Project Partners: City of Bellevue and Early World Childcare Center

August 2007



VICINITY MAP [NTS]

ESTIMATED PROJECT COST	
IN-STREAM ELEMENTS - CITY OF BELLEVUE	$35,252
STREAM BANK ELEMENTS - EARLY WORLD	$25,894



PROPOSED CONCEPT PLAN

1" ~ 40'

CITY OF BELLEVUE

1 **Sloped Sill Log**: Placed at an angle to the flow, this type of log structure provides grade control, redirects flows away from unstable areas, and creates discrete scour pools that make excellent fish habitat.

2 **Streambank Stabilization**: Rootwads, interlocked with upright stumps and a bank log will slow/soften the water while armoring the streambank along the outside bend and providing habitat for fish.

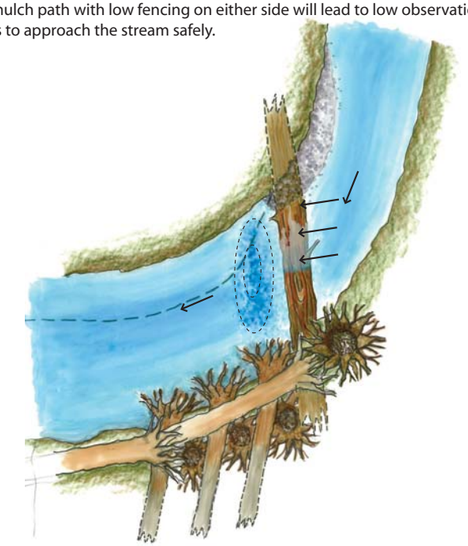
3 **Downcutting**: Large boulders, placed in an inverted V-weir configuration will slow high-velocity flows, reducing downcutting action without creating fish passage barriers or vertical drops. Randomly placed large boulders will be relatively easy to install and will further slow/disperse high velocity flows.

EARLY WORLD

4 **Slope Stabilization**: Sand bags will be removed from the upper portion of the wall, but not the lower portion. Topsoil, stabilized with coir wraps, will be tiered from the base up toward the top of the slope and subsequently planted with native riparian vegetation.

5 **Riparian Area Revegetation Plan**: Non-native invasive vegetation will be replaced using native riparian vegetation.

6 **Fenced Path**: A bark-mulch path with low fencing on either side will lead to low observation platforms, allowing school groups to approach the stream safely.



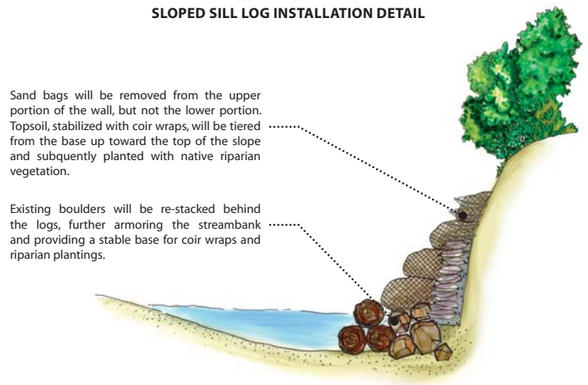
SLOPED SILL LOG INSTALLATION DETAIL

Unstable slope and sandbag wall (looking downstream)

Unstable slope and sandbag wall (looking upstream)

Channel downcutting area

ISSUES	PROPOSED SOLUTIONS	RESPONSIBLE PARTNER
Streambank Erosion		
Seasonal high flows in Kelsey Creek are eroding the streambanks along the base of a high, unstable slope. Rip-rap boulders and a sandbag wall previously used to armor the streambank and slope are beginning to fail.	Rootwads, interlocked with upright stumps and a bank log will slow/soften water velocities while armoring the streambank along the outside bend. Stacked logs with rootwads attached will interlock and armor the toe of the unstable slope, also slowing the water and providing cover for small fish. Existing boulders will be re-stacked behind the logs, further armoring the streambank and providing a stable base for coir wraps and riparian plantings. Placed at an angle to the flow, a sloped sill log will help turn the water and redirect scour to the inside of the bend rather than the base of the unstable slope.	CITY OF BELLEVUE EARLY WORLD
Channel Downcutting		
The heavily constrained channel and high water velocities are subjecting a short segment of the creek to downcutting.	Large boulders, placed in an inverted V-weir configuration will slow high-velocity flows, reducing downcutting action without creating fish passage barriers or vertical drops. Randomly placed large boulders will be relatively easy to install and large enough to further slow/disperse high velocity flows without being washed downstream.	CITY OF BELLEVUE
Low Quality Fish Habitat		
Chinook and sockeye salmon are known to use this area of the creek for spawning, and may utilize it for rearing habitat as well.	The sloped sill log will refocus scour action away from the unstable slope while promoting pool habitat formation at the head of this log structure sequence. Use of upright stumps, rootwads, and pieces of large wood to armor the streambank will add roughness elements to this segment of the creek, reducing water velocities and creating cover for juvenile salmonids.	CITY OF BELLEVUE
Low Aesthetic Appeal		
The deteriorating sand bag wall, combined with an abundance of non-native plant species decreased the aesthetic quality of this riparian area.	Removing a portion of the sand bag wall and fronting the remainder with topsoil in coir wraps will dramatically improve the appearance of the streambank. Replacing non-native plants with native vegetation will benefit fish and wildlife while enhancing the aesthetic quality of this riparian area. Riparian plantings along the top of the log structures and higher up the streambank will help stabilize the soil and eventually provide overhanging shade and cover for the stream channel.	EARLY WORLD



CROSS SECTION OF PROPOSED STREAMBANK AND SLOPE STABILIZATION

PROJECT GOAL: Streambank Stabilization and Habitat Enhancement
TECHNIQUES: Bioengineering using large wood
STREAM NAME: Kelsey Creek
LOCATION: Bellevue, WA

THE WATERSHED COMPANY
750 Sixth Street South . Kirkland . WA 98033 425.822.5242

APPENDIX B

Hydraulic Assessment Photographs

Photographs of the Study Area

▼ Photo Number 1	
Date of Photo:	1-08-09
Location:	HEC-RAS Sta 2+55 looking upstream
Description:	Bend in channel at Sta 2+30 through 2+85. Photo is taken from left bank.

▼ Photo Number 2	
Date of Photo:	1-08-09
Location:	HEC-RAS Sta 2+30 looking downstream
Description:	The channel crosses under two bridge access points on the site. Sheet piling lines both sides of the channel where the bridges are located.

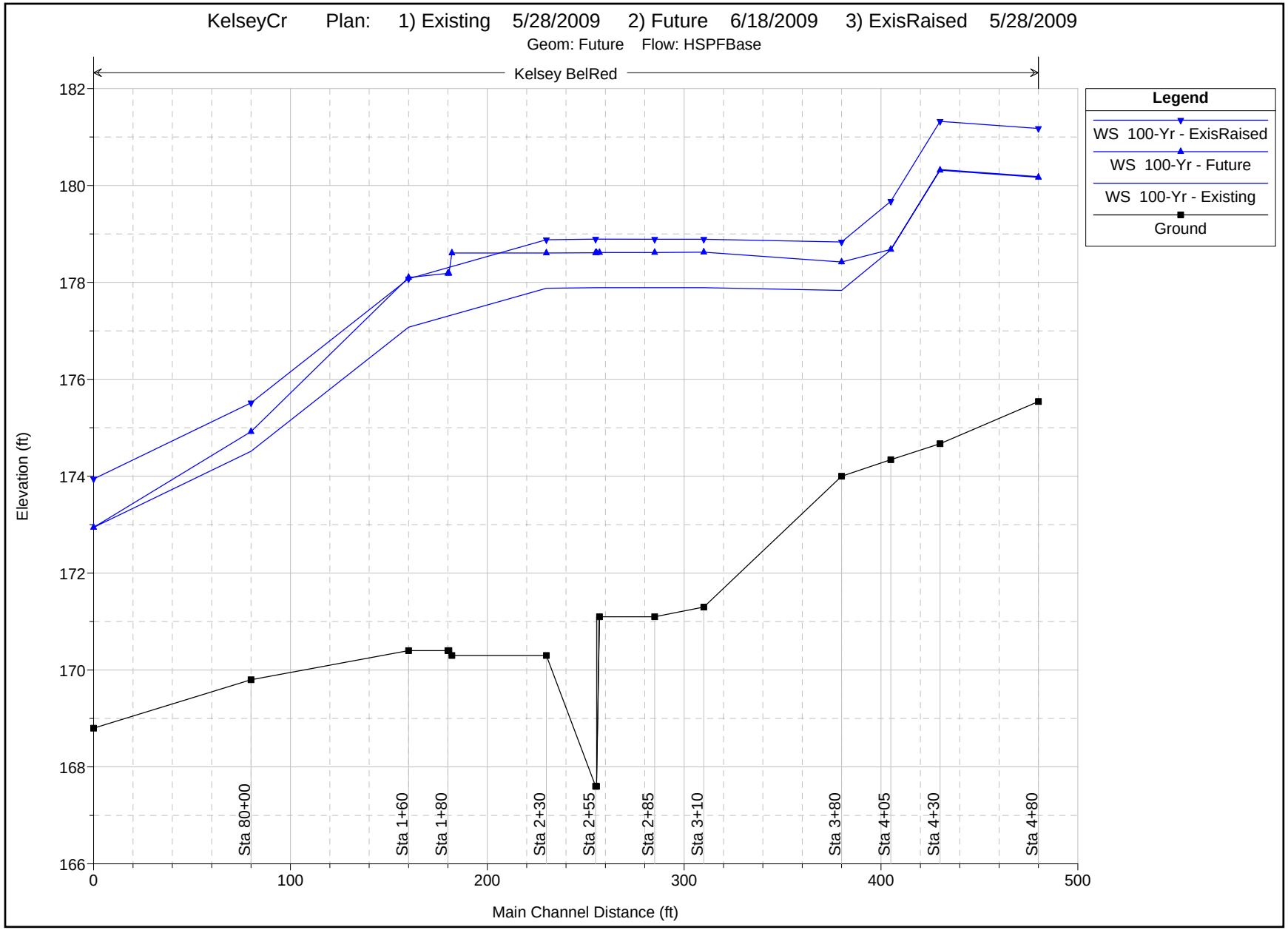
Photographs of the Study Area

▼ Photo Number 3	
Date of Photo:	1-08-09
Location:	HEC-RAS Sta 2+55 looking to left bank
Description:	The left bank from Sta 2+30 through 2+85 will be restored with bioengineering methods. The existing bank revetment, shown here, is showing signs of failure such as cracking and undercutting.

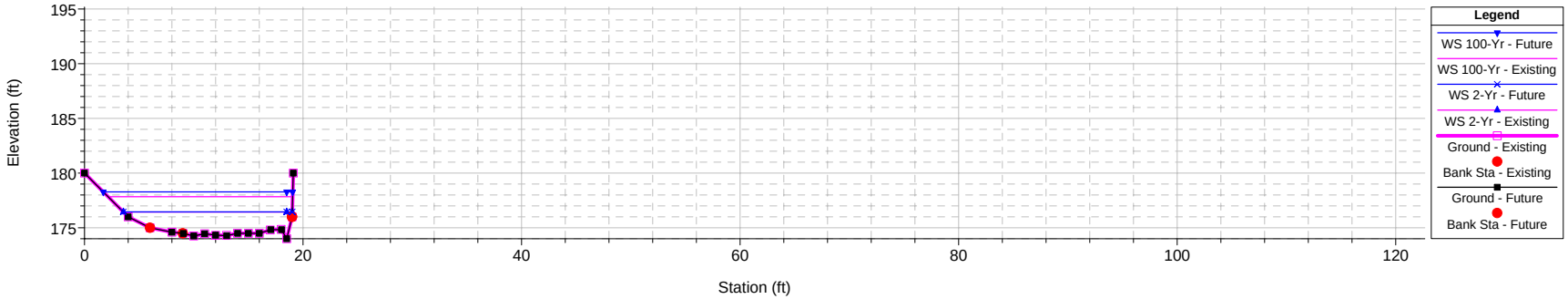
▼ Photo Number 4	
Date of Photo:	1-08-09
Location:	HEC-RAS Sta 3+10 looking upstream
Description:	This reach of creek is located at the upstream boundary of the project site.

APPENDIX C

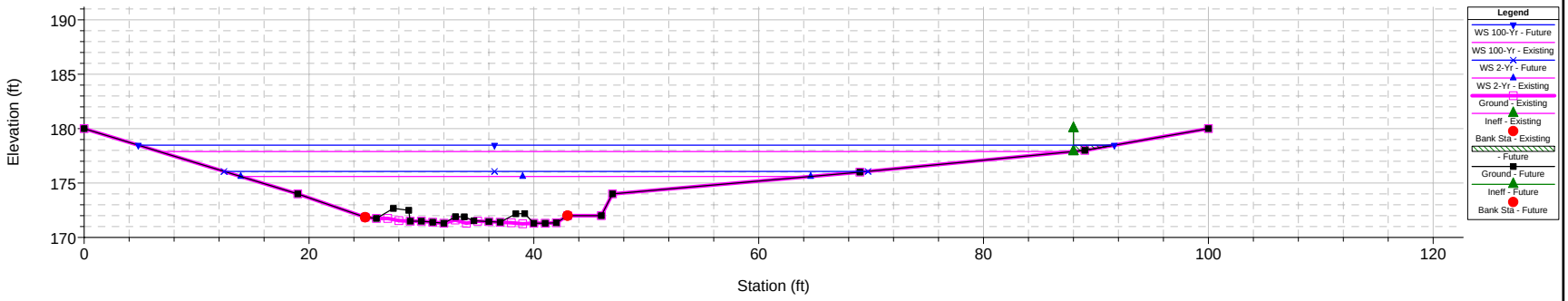
HEC-RAS Input and Results


KelseyCr Plan: 1) Existing 5/28/2009 2) Future 6/18/2009 3) ExisRaised 5/28/2009
Geom: Future Flow: HSPFBase
Kelsey BelRed
Legend
WS 100-Yr - ExisRaised
WS 100-Yr - Future
WS 100-Yr - Existing
Ground
Elevation (ft)
182
180
178
176
174
172
170
168
166
0
100
200
300
400
500
Main Channel Distance (ft)
Sta 80+00
Sta 1+60
Sta 1+80
Sta 2+30
Sta 2+55
Sta 2+85
Sta 3+10
Sta 3+80
Sta 4+05
Sta 4+30
Sta 4+80

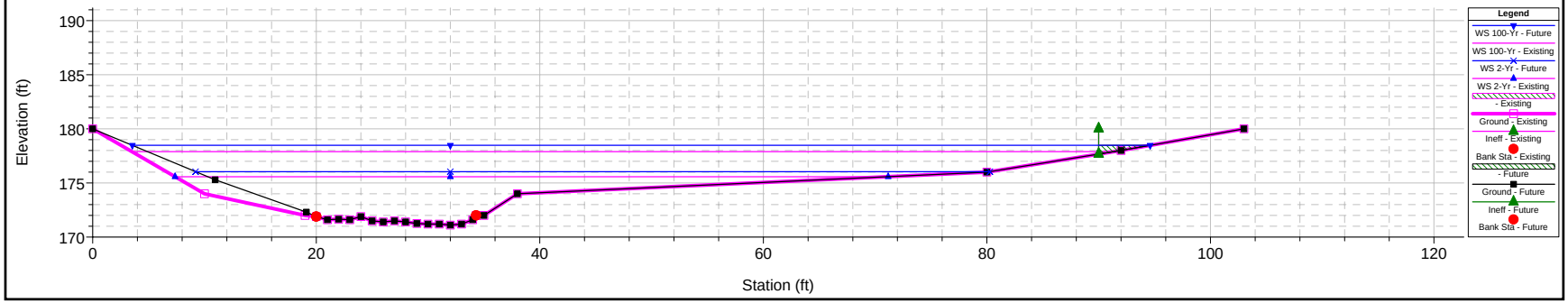
KelseyCr Plan: 1) Future 2) Existing
Sta 3+80



KelseyCr Plan: 1) Future 2) Existing
Sta 3+10

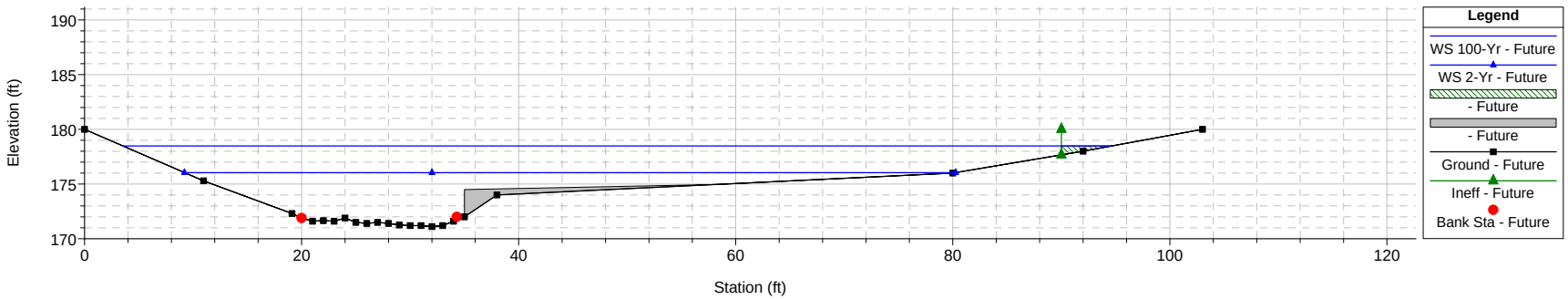


KelseyCr Plan: 1) Future 2) Existing
Sta 2+85



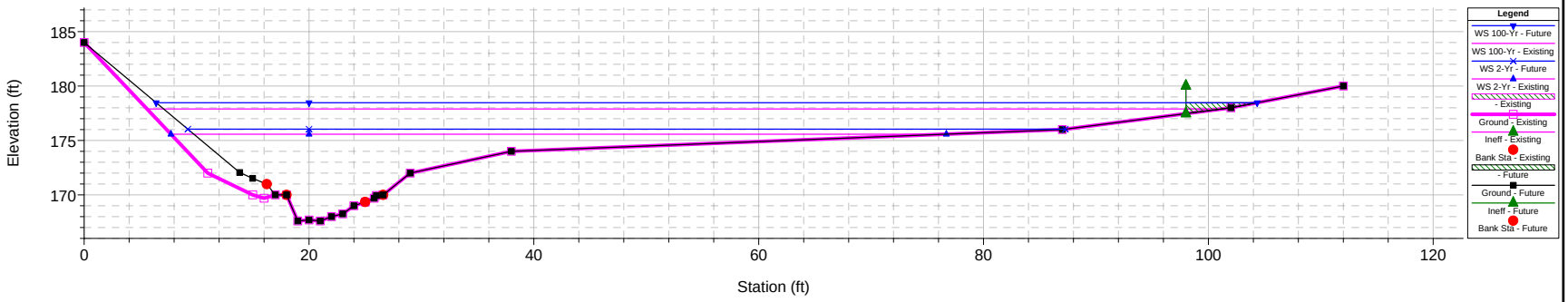
1 in Horiz. = 16 ft 1 in Vert. = 16 ft

KelseyCr Plan: 1) Future 2) Existing



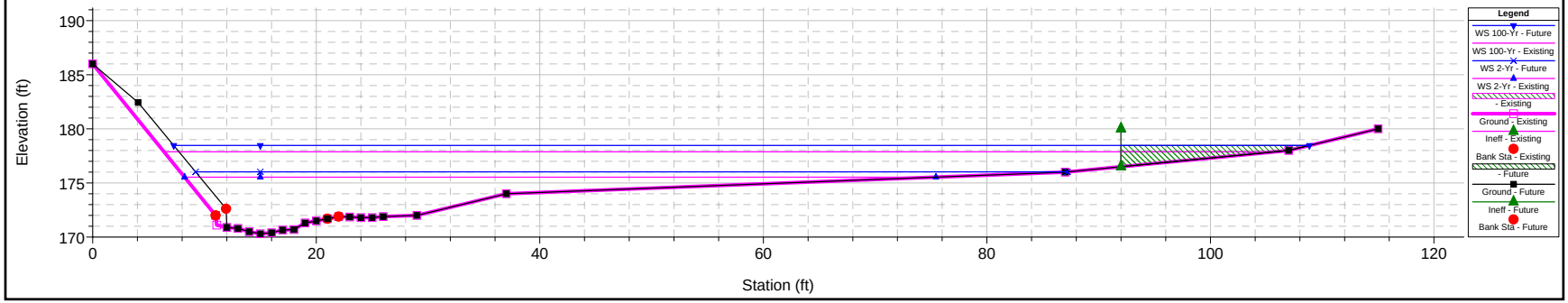
KelseyCr Plan: 1) Future 2) Existing

Sta 2+55



KelseyCr Plan: 1) Future 2) Existing

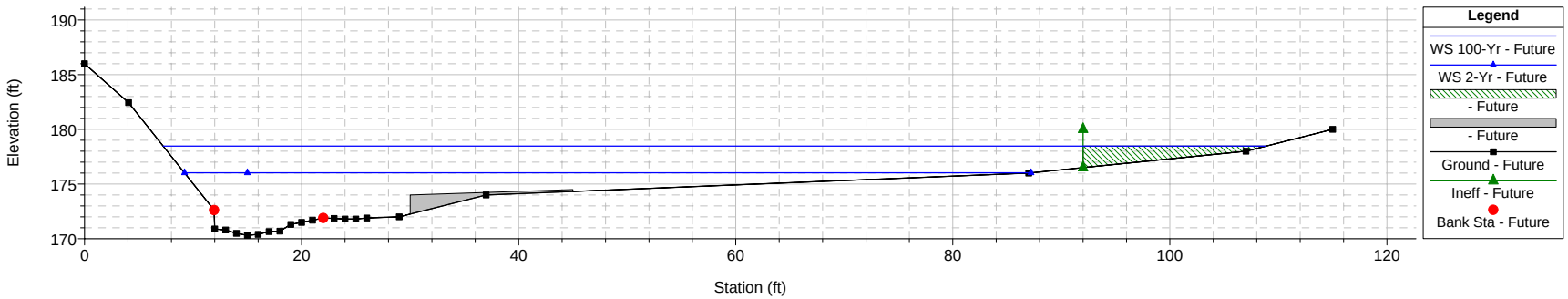
Sta 2+30



1 in Horiz. = 16 ft 1 in Vert. = 16 ft

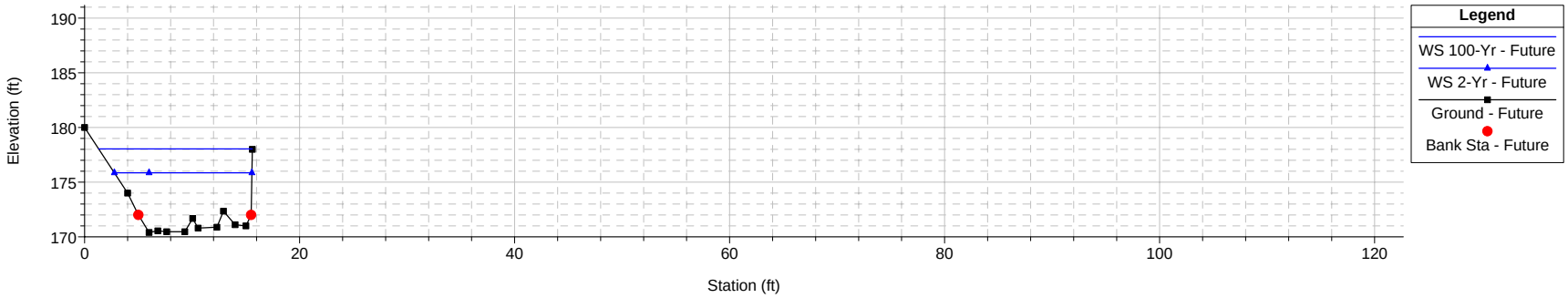
KelseyCr Plan: 1) Future 2) Existing

Log Weir



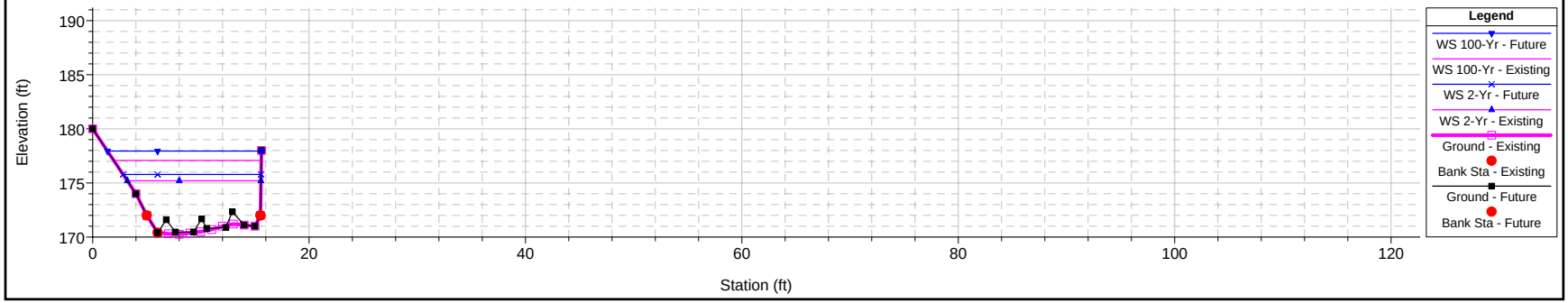
KelseyCr Plan: 1) Future 2) Existing

Sta 1+80

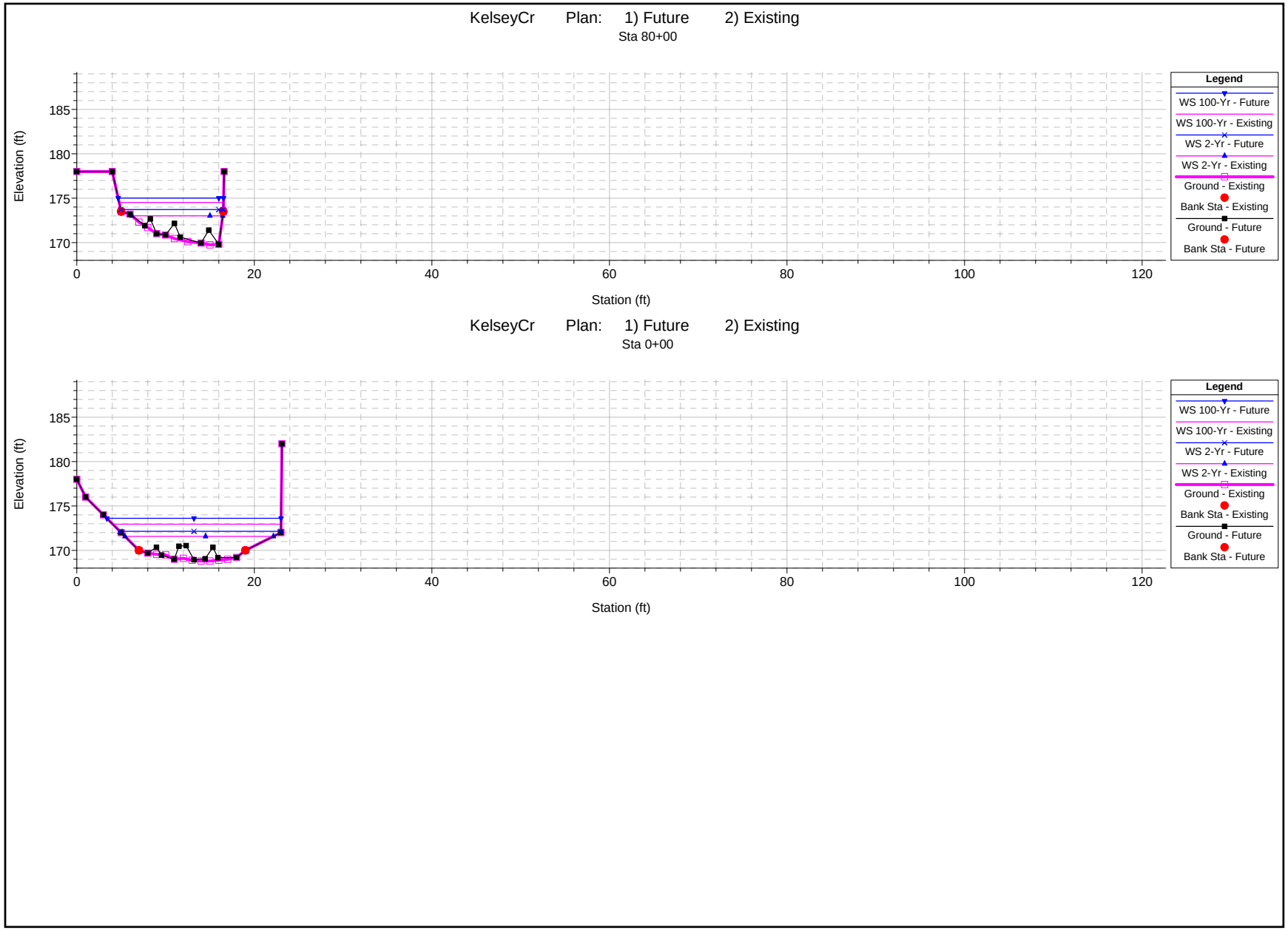


KelseyCr Plan: 1) Future 2) Existing

Sta 1+60



1 in Horiz. = 16 ft 1 in Vert. = 16 ft



1 in Horiz. = 16 ft 1 in Vert. = 16 ft

HEC-RAS River: Kelsey Reach: BelRed

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
BelRed	380	500-Yr	Existing	540.00	174.00	178.52		179.96	0.020497	10.48	60.89	17.58	0.92
BelRed	380	500-Yr	Future	540.00	174.00	179.19		180.18	0.009934	8.24	72.91	18.27	0.67
BelRed	380	100-Yr	Existing	425.00	174.00	177.83	177.71	179.19	0.024326	10.08	49.09	16.88	0.97
BelRed	380	100-Yr	Future	425.00	174.00	178.28		179.27	0.013088	8.18	56.75	17.34	0.75
BelRed	380	50-Yr	Existing	380.00	174.00	177.55	177.49	178.87	0.026412	9.91	44.40	16.59	1.00
BelRed	380	50-Yr	Future	380.00	174.00	177.93		178.90	0.014757	8.13	50.69	16.98	0.78
BelRed	380	25-Yr	Existing	337.00	174.00	177.29	177.29	178.55	0.028321	9.67	40.11	16.33	1.02
BelRed	380	25-Yr	Future	337.00	174.00	177.60		178.56	0.016504	8.03	45.17	16.64	0.81
BelRed	380	10-Yr	Existing	284.00	174.00	176.99	176.99	178.14	0.029880	9.21	35.26	16.02	1.03
BelRed	380	10-Yr	Future	284.00	174.00	177.17	176.95	178.11	0.019682	7.94	38.17	16.20	0.86
BelRed	380	5-Yr	Existing	244.00	174.00	176.77	176.77	177.81	0.030654	8.76	31.69	15.79	1.02
BelRed	380	5-Yr	Future	244.00	174.00	176.87	176.73	177.77	0.022319	7.78	33.23	15.89	0.90
BelRed	380	2-Yr	Existing	189.00	174.00	176.44	176.44	177.32	0.032015	8.05	26.49	15.45	1.02
BelRed	380	2-Yr	Future	189.00	174.00	176.45	176.40	177.28	0.026549	7.42	26.67	15.46	0.95
BelRed	380	1.01-Yr	Existing	112.00	174.00	175.90	175.90	176.54	0.034784	6.80	18.36	14.77	1.01
BelRed	380	1.01-Yr	Future	112.00	174.00	175.86	175.86	176.50	0.032390	6.46	17.83	14.69	0.99
BelRed	310	500-Yr	Existing	540.00	171.25	178.78		178.84	0.000410	2.49	346.56	89.39	0.16
BelRed	310	500-Yr	Future	540.00	171.30	179.50		179.55	0.000298	2.07	403.88	95.69	0.13
BelRed	310	100-Yr	Existing	425.00	171.25	177.89		177.96	0.000474	2.45	273.27	81.21	0.17
BelRed	310	100-Yr	Future	425.00	171.30	178.48		178.53	0.000361	2.08	317.21	86.83	0.14
BelRed	310	50-Yr	Existing	380.00	171.25	177.51		177.58	0.000498	2.41	243.35	76.21	0.17
BelRed	310	50-Yr	Future	380.00	171.30	178.06		178.11	0.000394	2.08	282.66	83.21	0.15
BelRed	310	25-Yr	Existing	337.00	171.25	177.14		177.21	0.000516	2.36	216.19	71.36	0.17
BelRed	310	25-Yr	Future	337.00	171.30	177.66		177.71	0.000421	2.05	250.19	78.18	0.15
BelRed	310	10-Yr	Existing	284.00	171.25	176.70		176.76	0.000523	2.24	185.77	65.51	0.17
BelRed	310	10-Yr	Future	284.00	171.30	177.11		177.16	0.000459	2.01	209.26	70.95	0.15
BelRed	310	5-Yr	Existing	244.00	171.25	176.30		176.36	0.000541	2.17	160.72	60.27	0.17
BelRed	310	5-Yr	Future	244.00	171.30	176.69		176.74	0.000482	1.95	180.66	65.43	0.15
BelRed	310	2-Yr	Existing	189.00	171.25	175.60		175.66	0.000616	2.08	122.00	50.69	0.18
BelRed	310	2-Yr	Future	189.00	171.30	176.07		176.11	0.000509	1.84	142.69	57.28	0.16
BelRed	310	1.01-Yr	Existing	112.00	171.25	174.45		174.50	0.000747	1.85	73.16	34.44	0.19
BelRed	310	1.01-Yr	Future	112.00	171.30	175.00		175.04	0.000552	1.58	89.53	42.22	0.15
BelRed	285	500-Yr	Existing	540.00	171.10	178.78		178.83	0.000375	2.36	382.84	94.25	0.15
BelRed	285	500-Yr	Future	540.00	171.10	179.50	175.04	179.54	0.000286	2.19	428.86	99.06	0.14
BelRed	285	100-Yr	Existing	425.00	171.10	177.89		177.94	0.000441	2.35	305.43	87.83	0.16
BelRed	285	100-Yr	Future	425.00	171.10	178.47	174.48	178.52	0.000346	2.20	339.16	91.05	0.15
BelRed	285	50-Yr	Existing	380.00	171.10	177.51		177.56	0.000479	2.35	272.56	84.90	0.17
BelRed	285	50-Yr	Future	380.00	171.10	178.05	173.99	178.10	0.000379	2.21	303.08	87.77	0.15
BelRed	285	25-Yr	Existing	337.00	171.10	177.14		177.19	0.000513	2.33	241.65	82.06	0.17
BelRed	285	25-Yr	Future	337.00	171.10	177.65	173.92	177.70	0.000414	2.22	268.60	84.41	0.16

HEC-RAS River: Kelsey Reach: BelRed (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
BelRed	285	10-Yr	Existing	284.00	171.10	176.69		176.74	0.000546	2.28	205.65	78.63	0.18
BelRed	285	10-Yr	Future	284.00	171.10	177.09	173.70	177.15	0.000467	2.21	223.19	79.81	0.16
BelRed	285	5-Yr	Existing	244.00	171.10	176.29		176.34	0.000600	2.26	174.63	75.54	0.18
BelRed	285	5-Yr	Future	244.00	171.10	176.67	173.50	176.72	0.000510	2.19	190.13	76.28	0.17
BelRed	285	2-Yr	Existing	189.00	171.10	175.58		175.64	0.000766	2.30	124.36	63.80	0.20
BelRed	285	2-Yr	Future	189.00	171.10	176.04	173.18	176.10	0.000585	2.16	143.92	71.06	0.18
BelRed	285	1.01-Yr	Existing	112.00	171.10	174.41		174.48	0.001099	2.21	65.35	37.36	0.23
BelRed	285	1.01-Yr	Future	112.00	171.10	174.97	172.69	175.02	0.000675	1.94	80.36	46.53	0.18
BelRed	255	500-Yr	Existing	540.00	167.60	178.78		178.82	0.000277	2.22	445.31	101.11	0.12
BelRed	255	500-Yr	Future	540.00	167.60	179.49		179.52	0.000216	2.01	490.97	104.23	0.11
BelRed	255	100-Yr	Existing	425.00	167.60	177.89		177.93	0.000304	2.19	362.87	95.58	0.13
BelRed	255	100-Yr	Future	425.00	167.60	178.47		178.50	0.000249	2.02	396.61	97.93	0.11
BelRed	255	50-Yr	Existing	380.00	167.60	177.51		177.55	0.000320	2.19	327.55	92.36	0.13
BelRed	255	50-Yr	Future	380.00	167.60	178.05		178.08	0.000266	2.02	358.27	95.35	0.12
BelRed	255	25-Yr	Existing	337.00	167.60	177.14		177.18	0.000328	2.15	293.90	89.24	0.13
BelRed	255	25-Yr	Future	337.00	167.60	177.64		177.68	0.000282	2.02	321.41	91.95	0.12
BelRed	255	10-Yr	Existing	284.00	167.60	176.69		176.73	0.000325	2.07	254.74	85.47	0.13
BelRed	255	10-Yr	Future	284.00	167.60	177.09		177.13	0.000304	2.02	271.99	87.16	0.12
BelRed	255	5-Yr	Existing	244.00	167.60	176.29		176.33	0.000330	2.02	221.03	82.08	0.13
BelRed	255	5-Yr	Future	244.00	167.60	176.66		176.70	0.000315	1.98	235.79	83.49	0.12
BelRed	255	2-Yr	Existing	189.00	167.60	175.58		175.62	0.000347	1.94	166.57	68.97	0.13
BelRed	255	2-Yr	Future	189.00	167.60	176.04		176.07	0.000326	1.91	185.03	78.05	0.12
BelRed	255	1.01-Yr	Existing	112.00	167.60	174.42		174.45	0.000292	1.58	103.55	39.42	0.11
BelRed	255	1.01-Yr	Future	112.00	167.60	174.96		174.99	0.000272	1.57	115.22	51.05	0.11
BelRed	230	500-Yr	Existing	540.00	170.30	178.77		178.81	0.000361	2.32	399.51	104.39	0.15
BelRed	230	500-Yr	Future	540.00	170.30	179.49	174.84	179.52	0.000254	1.95	450.65	106.52	0.12
BelRed	230	100-Yr	Existing	425.00	170.30	177.88		177.92	0.000424	2.32	323.04	99.41	0.15
BelRed	230	100-Yr	Future	425.00	170.30	178.46	173.98	178.49	0.000305	1.96	363.47	101.60	0.13
BelRed	230	50-Yr	Existing	380.00	170.30	177.50		177.54	0.000466	2.34	290.20	95.27	0.16
BelRed	230	50-Yr	Future	380.00	170.30	178.04	173.89	178.07	0.000333	1.97	327.97	99.59	0.13
BelRed	230	25-Yr	Existing	337.00	170.30	177.12		177.17	0.000513	2.37	258.40	91.24	0.17
BelRed	230	25-Yr	Future	337.00	170.30	177.64	173.77	177.67	0.000363	1.98	293.77	95.46	0.14
BelRed	230	10-Yr	Existing	284.00	170.30	176.67		176.72	0.000573	2.38	219.91	86.35	0.17
BelRed	230	10-Yr	Future	284.00	170.30	177.08	173.50	177.12	0.000427	2.03	247.26	89.47	0.14
BelRed	230	5-Yr	Existing	244.00	170.30	176.26		176.31	0.000655	2.42	185.66	81.94	0.18
BelRed	230	5-Yr	Future	244.00	170.30	176.66	173.31	176.69	0.000489	2.07	211.63	84.86	0.15
BelRed	230	2-Yr	Existing	189.00	170.30	175.54		175.60	0.000854	2.52	130.94	67.22	0.20
BelRed	230	2-Yr	Future	189.00	170.30	176.02	172.99	176.06	0.000594	2.11	160.05	78.00	0.16
BelRed	230	1.01-Yr	Existing	112.00	170.30	174.36		174.43	0.001081	2.33	69.71	36.89	0.22
BelRed	230	1.01-Yr	Future	112.00	170.30	174.93	172.50	174.98	0.000692	1.94	90.18	50.28	0.17

HEC-RAS River: Kelsey Reach: BelRed (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
BelRed	180	500-Yr	Future	540.00	170.40	178.94		179.50	0.003428	6.13	98.07	14.90	0.38
BelRed	180	100-Yr	Future	425.00	170.40	178.04		178.49	0.003236	5.50	84.84	14.29	0.36
BelRed	180	50-Yr	Future	380.00	170.40	177.66		178.07	0.003126	5.21	79.53	14.03	0.36
BelRed	180	25-Yr	Future	337.00	170.40	177.29		177.65	0.002998	4.91	74.36	13.78	0.34
BelRed	180	10-Yr	Future	284.00	170.40	176.80		177.11	0.002805	4.50	67.76	13.45	0.33
BelRed	180	5-Yr	Future	244.00	170.40	176.42		176.68	0.002615	4.16	62.67	13.19	0.31
BelRed	180	2-Yr	Future	189.00	170.40	175.85		176.05	0.002292	3.61	55.27	12.80	0.29
BelRed	180	1.01-Yr	Future	112.00	170.40	174.85		174.97	0.001760	2.72	42.82	12.12	0.24
BelRed	160	500-Yr	Existing	540.00	170.25	177.73		178.57	0.004326	7.57	82.75	14.08	0.50
BelRed	160	500-Yr	Future	540.00	170.40	178.84		179.42	0.004088	6.26	95.72	14.83	0.40
BelRed	160	100-Yr	Existing	425.00	170.25	177.07		177.72	0.003766	6.61	73.64	13.63	0.46
BelRed	160	100-Yr	Future	425.00	170.40	177.94		178.41	0.003890	5.63	82.63	14.23	0.38
BelRed	160	50-Yr	Existing	380.00	170.25	176.78		177.35	0.003550	6.22	69.64	13.43	0.45
BelRed	160	50-Yr	Future	380.00	170.40	177.57		178.00	0.003771	5.34	77.40	13.97	0.37
BelRed	160	25-Yr	Existing	337.00	170.25	176.49		176.99	0.003294	5.80	65.85	13.24	0.43
BelRed	160	25-Yr	Future	337.00	170.40	177.20		177.58	0.003628	5.04	72.30	13.72	0.36
BelRed	160	10-Yr	Existing	284.00	170.25	176.16		176.56	0.002867	5.20	61.49	13.01	0.39
BelRed	160	10-Yr	Future	284.00	170.40	176.72		177.05	0.003409	4.63	65.82	13.39	0.34
BelRed	160	5-Yr	Existing	244.00	170.25	175.83		176.17	0.002620	4.77	57.25	12.79	0.37
BelRed	160	5-Yr	Future	244.00	170.40	176.35		176.62	0.003188	4.27	60.83	13.14	0.33
BelRed	160	2-Yr	Existing	189.00	170.25	175.20		175.47	0.002473	4.24	49.27	12.35	0.35
BelRed	160	2-Yr	Future	189.00	170.40	175.79		176.00	0.002808	3.72	53.59	12.76	0.30
BelRed	160	1.01-Yr	Existing	112.00	170.25	174.14		174.30	0.002177	3.32	36.55	11.63	0.32
BelRed	160	1.01-Yr	Future	112.00	170.40	174.81		174.93	0.002184	2.81	41.38	12.08	0.26
BelRed	80	500-Yr	Existing	540.00	169.75	175.13	175.13	177.17	0.027663	11.44	47.45	11.90	1.00
BelRed	80	500-Yr	Future	540.00	169.80	175.50	175.50	177.55	0.039117	11.49	47.37	11.99	1.00
BelRed	80	100-Yr	Existing	425.00	169.75	174.51	174.51	176.27	0.029668	10.62	40.12	11.75	1.00
BelRed	80	100-Yr	Future	425.00	169.80	175.02	174.92	176.65	0.037157	10.28	41.55	11.87	0.96
BelRed	80	50-Yr	Existing	380.00	169.75	174.27	174.27	175.89	0.030157	10.21	37.29	11.69	1.00
BelRed	80	50-Yr	Future	380.00	169.80	174.80	174.66	176.29	0.036368	9.77	39.05	11.82	0.94
BelRed	80	25-Yr	Existing	337.00	169.75	174.02	174.02	175.52	0.030963	9.81	34.39	11.63	1.00
BelRed	80	25-Yr	Future	337.00	169.80	174.59	174.40	175.92	0.035595	9.25	36.53	11.77	0.92
BelRed	80	10-Yr	Existing	284.00	169.75	173.69	173.69	175.04	0.032883	9.33	30.46	11.55	1.01
BelRed	80	10-Yr	Future	284.00	169.80	174.31	174.08	175.45	0.034544	8.57	33.22	11.70	0.89
BelRed	80	5-Yr	Existing	244.00	169.75	173.43	173.43	174.65	0.033157	8.87	27.50	11.25	1.00
BelRed	80	5-Yr	Future	244.00	169.80	174.07	173.82	175.07	0.033853	8.01	30.48	11.64	0.87
BelRed	80	2-Yr	Existing	189.00	169.75	173.02	172.93	174.05	0.030920	8.17	23.13	10.23	0.96
BelRed	80	2-Yr	Future	189.00	169.80	173.72	173.44	174.52	0.032777	7.17	26.38	11.55	0.83
BelRed	80	1.01-Yr	Existing	112.00	169.75	172.35	172.20	173.06	0.027570	6.74	16.62	9.40	0.89

HEC-RAS River: Kelsey Reach: BelRed (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
BelRed	80	1.01-Yr	Future	112.00	169.80	173.06	172.69	173.59	0.030115	5.87	19.07	10.25	0.76
BelRed	0	500-Yr	Existing	540.00	168.80	173.48	173.02	174.76	0.012514	9.47	67.38	19.50	0.81
BelRed	0	500-Yr	Future	540.00	168.94	174.21	173.24	175.15	0.012501	8.29	77.13	20.23	0.68
BelRed	0	100-Yr	Existing	425.00	168.80	172.94	172.52	174.02	0.012525	8.66	56.97	18.95	0.79
BelRed	0	100-Yr	Future	425.00	168.94	173.62	172.76	174.41	0.012507	7.58	65.44	19.64	0.66
BelRed	0	50-Yr	Existing	380.00	168.80	172.72	172.31	173.71	0.012502	8.30	52.71	18.72	0.78
BelRed	0	50-Yr	Future	380.00	168.94	173.37	172.56	174.11	0.012512	7.27	60.61	19.39	0.66
BelRed	0	25-Yr	Existing	337.00	168.80	172.49	172.09	173.40	0.012504	7.93	48.45	18.49	0.77
BelRed	0	25-Yr	Future	337.00	168.94	173.12	172.37	173.80	0.012520	6.95	55.84	19.13	0.65
BelRed	0	10-Yr	Existing	284.00	168.80	172.19	171.78	173.00	0.012506	7.44	42.96	18.19	0.76
BelRed	0	10-Yr	Future	284.00	168.94	172.80	172.11	173.40	0.012502	6.51	49.72	18.81	0.64
BelRed	0	5-Yr	Existing	244.00	168.80	171.95	171.54	172.68	0.012512	7.03	38.57	17.84	0.75
BelRed	0	5-Yr	Future	244.00	168.94	172.54	171.86	173.08	0.012504	6.16	44.84	18.55	0.63
BelRed	0	2-Yr	Existing	189.00	168.80	171.58	171.19	172.19	0.012518	6.39	32.18	16.73	0.73
BelRed	0	2-Yr	Future	189.00	168.94	172.15	171.52	172.60	0.012500	5.60	37.69	18.15	0.62
BelRed	0	1.01-Yr	Existing	112.00	168.80	170.96	170.60	171.38	0.012504	5.23	22.45	14.88	0.69
BelRed	0	1.01-Yr	Future	112.00	168.94	171.50	170.97	171.81	0.012515	4.61	26.31	16.49	0.59

HEC-RAS River: Kelsey Reach: BelRed Profile: 100-Yr

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
BelRed	480	100-Yr	Existing	425.00	175.54	180.18	180.02	181.91	0.016344	10.75	43.71	12.21	0.92
BelRed	480	100-Yr	Future	425.00	175.54	180.17	180.02	181.91	0.016546	10.79	43.52	12.19	0.93
BelRed	480	100-Yr	ExisRaised	425.00	176.54	181.18	181.02	182.91	0.016407	10.76	43.65	12.21	0.92
BelRed	430	100-Yr	Existing	425.00	174.67	180.33		181.08	0.005025	7.05	65.19	13.57	0.54
BelRed	430	100-Yr	Future	425.00	174.67	180.31		181.07	0.005073	7.07	64.99	13.56	0.54
BelRed	430	100-Yr	ExisRaised	425.00	175.67	181.32		182.08	0.005040	7.06	65.13	13.57	0.54
BelRed	405	100-Yr	Existing	425.00	174.34	178.67	178.67	180.67	0.018724	11.69	39.90	10.65	1.01
BelRed	405	100-Yr	Future	425.00	174.34	178.68	178.68	180.66	0.018508	11.64	40.08	10.78	1.00
BelRed	405	100-Yr	ExisRaised	425.00	175.34	179.67	179.67	181.66	0.018669	11.67	39.94	10.68	1.01
BelRed	380	100-Yr	Existing	425.00	174.00	177.83	177.71	179.19	0.024326	10.08	49.09	16.88	0.97
BelRed	380	100-Yr	Future	425.00	174.00	178.42		179.33	0.011546	7.87	59.15	17.48	0.71
BelRed	380	100-Yr	ExisRaised	425.00	175.00	178.83	178.71	180.19	0.024326	10.08	49.09	16.88	0.97
BelRed	310	100-Yr	Existing	425.00	171.25	177.89		177.96	0.000474	2.45	273.27	81.21	0.17
BelRed	310	100-Yr	Future	425.00	171.30	178.62		178.66	0.000327	2.00	329.04	88.06	0.13
BelRed	310	100-Yr	ExisRaised	425.00	172.25	178.89		178.96	0.000474	2.45	273.27	81.21	0.17
BelRed	285	100-Yr	Existing	425.00	171.10	177.89		177.94	0.000441	2.35	305.43	87.83	0.16
BelRed	285	100-Yr	Future	425.00	171.10	178.62	174.48	178.66	0.000313	2.12	351.52	92.17	0.14
BelRed	285	100-Yr	ExisRaised	425.00	172.10	178.89		178.94	0.000441	2.35	305.43	87.83	0.16
BelRed	255	100-Yr	Existing	425.00	167.60	177.89		177.93	0.000304	2.19	362.87	95.58	0.13
BelRed	255	100-Yr	Future	425.00	167.60	178.61		178.64	0.000227	1.95	409.69	98.81	0.11
BelRed	255	100-Yr	ExisRaised	425.00	168.60	178.89		178.93	0.000304	2.19	362.87	95.58	0.13
BelRed	230	100-Yr	Existing	425.00	170.30	177.88		177.92	0.000424	2.32	323.04	99.41	0.15
BelRed	230	100-Yr	Future	425.00	170.30	178.61	173.98	178.63	0.000276	1.89	375.60	102.29	0.12
BelRed	230	100-Yr	ExisRaised	425.00	171.30	178.88		178.92	0.000424	2.32	323.04	99.41	0.15
BelRed	180	100-Yr	Future	425.00	170.40	178.19		178.62	0.003006	5.37	87.01	14.39	0.35
BelRed	160	100-Yr	Existing	425.00	170.25	177.07		177.72	0.003766	6.61	73.64	13.63	0.46
BelRed	160	100-Yr	Future	425.00	170.40	178.10		178.55	0.003592	5.49	84.91	14.33	0.36
BelRed	160	100-Yr	ExisRaised	425.00	171.25	178.07		178.72	0.003766	6.61	73.64	13.63	0.46
BelRed	80	100-Yr	Existing	425.00	169.75	174.51	174.51	176.27	0.029668	10.62	40.12	11.75	1.00
BelRed	80	100-Yr	Future	425.00	169.80	174.92	174.92	176.65	0.040658	10.57	40.42	11.85	1.00
BelRed	80	100-Yr	ExisRaised	425.00	170.75	175.51	175.51	177.27	0.029668	10.62	40.12	11.75	1.00
BelRed	0	100-Yr	Existing	425.00	168.80	172.94	172.52	174.02	0.012525	8.66	56.97	18.95	0.79

HEC-RAS River: Kelsey Reach: BelRed Profile: 100-Yr (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
BelRed	0	100-Yr	Future	425.00	168.80	172.94	172.52	174.02	0.012525	8.66	56.97	18.95	0.79
BelRed	0	100-Yr	ExisRaised	425.00	169.80	173.94	173.52	175.02	0.012525	8.66	56.97	18.95	0.79

CRITICAL AREAS REPORT

Kelsey Creek Bank Stabilization – Early World Children's School

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APPENDICES

Appendix A. Project Plans

CRITICAL AREAS REPORT

1 INTRODUCTION

The purpose of this report is to document potential critical area impacts associated with the proposed Kelsey Creek stream bank stabilization project located on the Early World Children's School property in the City of Bellevue, Washington. Kelsey Creek passes through the project site and has damaged portions of the stream bank in recent years. High water velocities in the area have eroded away portions of the bank located adjacent to several structures associated with the Early World Children's School. With continued high water velocities and limited stabilization features in place, loss of additional property is probable. Therefore, in order to repair portions of the stream bank and prevent further damage to the property, the placement of large woody debris, large boulders and coir lifts is proposed. Additionally, the project involves the removal of invasive species from within the stream buffer and the enhancement of the buffer with native plantings and a short interpretive trail.

Bellevue Land Use Code (LUC) 20.25H.230 requires compliance with specific critical areas report criteria as part of any critical area or critical area buffer modification proposal. This report fulfills these criteria and documents how the proposed in-stream and buffer improvements can be achieved with no net loss of on-site or off-site ecological functions.

2 DESCRIPTION OF PROJECT AREA

The project site currently consists of portions of three adjacent parcels along the south side of NE Bellevue Redmond Road just west of 140th Avenue NE. Kelsey Creek flows in a south-southwesterly and then a west-northwesterly direction as it passes through the three parcels. The site is relatively flat, with the exception of the banks of Kelsey Creek, which in some areas are nearly vertical. This particular segment of Kelsey Creek is highly urbanized and constrained in many sections by sheet pile walls and multiple bridge crossings. Overall, this stream section is characterized by eroded stream banks, high water velocities, channel downcutting, low quality fish and invertebrate habitat, and poor aesthetics. Large woody debris is absent from the stream corridor in this reach and current grade control is limited and associated with periodic large boulders.

The upstream limit of work is located below a bridge providing access from NE Bellevue Redmond Road to the upper parking area of the Early World Children's School complex (Figure 1). In this location, the stream is contained on both banks with a sheet pile wall. From this point, the stream flows south-southwest out of the sheet-piling-lined section, then bends 90 degrees and flows west directly toward NE Bellevue Redmond Road. Below the bend, the stream is again constrained by sheet piling and crossed by two bridges that provide access to the lower Early World Children's School buildings from NE Bellevue Redmond Road. The stream channel begins to bend again between the bridges and flows west-southwest, paralleling NE Bellevue Redmond Road. The downstream limit of work is approximately 20 feet downstream of the lower bridge.

Small 3- to 4-foot erosion pockets are associated with the ends of the sheet piling in several locations. The north stream bank is also mildly undercut for a distance of 46 feet and eroded down to the hard clay substrate. Below the bend, a segment of the boulder riprap on the southern stream bank has given way and resulted in an undercut bank of roughly 15 feet in length immediately downstream of a large sandbag wall placed to help protect the bank (Figure 2).

Vegetation on the site consists primarily of non-native English ivy, Japanese knotweed, and Himalayan blackberry with an occasional stand of native big leaf maple, red alder, and western red cedar. Additional native vegetation found in limited quantities at the site includes sword fern, osoberry, paper birch, and tall Oregon grape.

Figure 1. An aerial view of the proposed development site.

Figure 2. View facing downstream of the upper portion of the project site on Kelsey Creek. Note the stream bank erosion currently contained behind the sand bag wall and English ivy.

Figure 3. View of the stream buffer, invasive English ivy with the sandbag retaining wall in the background.

Figure 4. View of the current stream buffer with Early World Children's School in the background.

Figure 5. View facing upstream of the project site parallel to Bel-Red Road.

2.1 Sensitive Species

A variety of fish species have been observed occupying habitats in Kelsey Creek and may be found at various times within the boundaries of the project site. The most abundant fishes currently residing in Kelsey Creek are from the salmon and trout family *salmonidae,* and include cutthroat trout, coho, sockeye/kokanee, and the federally listed chinook salmon. Other *salmonidae,* such as mountain whitefish, rainbow trout, federally listed bull trout, pink, and chum salmon, are found in the broader Lake Washington watershed, but are absent or rarely observed in Kelsey Creek. Additional species that are present in the broader Kelsey Creek system include western brook lamprey, three-spine stickleback, longnose dace, longfin smelt, peamouth chub, and many of the native sculpin species. However, the prevalence of these non-salmonidae species within the boundary of the project site is currently unknown and considered limited. Of the fish known to occupy the project site, chinook salmon are the only species currently listed under the Endangered Species Act (ESA) as threatened by the federal government.

Implementation of the stream project at the site will improve spawning and rearing habitat for the ESA-listed chinook salmon and other species of resident fishes. Adult spawning habitat for Puget Sound chinook will improve due to the projected reduction in water velocities and increased pool depths at the site, resulting in more stable gravel for redd construction and

deep water daytime holding habitat for adult salmon. Based on a review of fish habitat documents, increases in spawning habitat would result from increasing the amount of area with water velocities from 0.65-2.8 ft/s (20-85 cm/s) and water depths of 0.65-3.0 ft (20-90 cm). Similarly, reduced water velocities and increased large woody debris will greatly improve the site's ability to provide juvenile salmon with a variety of water velocities and overhead cover for rearing habitat. The addition of large wood into the bank and channel will also improve the diversity of substrate sizes available at the site and increase the variety of species and sizes of fish that can occupy the area.

3 REGULATIONS

3.1 Local Regulations

In Bellevue, streams are governed by Critical Areas Ordinance No. 5680. According to LUC 20.25H.075(B)(2), Kelsey Creek meets the designation criteria of a Type F water. According to LUC 20.25H.075(C)(1)(a), buffer width determinations for Type F streams are based on whether the subject parcel is developed or undeveloped. The project site contains several existing structures and is therefore developed. All Type F stream critical areas on developed sites require a 50-foot critical area buffer. Furthermore, according to the criteria established in 20.25H.075(D)(2)(a), developed sites also require a 50-foot stream critical area structure setback, measured from the edge of the stream critical area buffer.

Stabilization measures within stream critical areas are allowed pursuant to LUC 20.25H.055(C)(3)(m) and modifications of stream channels for habitat improvement purposes are allowed pursuant to LUC 20.25H.080(B)(1)(f). However, pursuant to LUC 20.25H.080(B)(2), stream channel modifications may only be approved through a critical areas report. The applicant must show that stream modifications will result in no net loss of ecological functions. Additionally, a restoration plan is required pursuant to LUC 20.25H.085. Restoration may involve removing invasive plant species, planting native vegetation, etc. An approved restoration plan would also require monitoring and maintenance in accordance with LUC 20.25H.220. Further, because the project site lies within an area of special flood hazard, pursuant to LUC 20.25H.180, "*All use, development or activity which is allowed is subject to the performance standards of this subsection and shall not result in a rise in the BFE* (base flood elevation)".

In addition to in-stream modifications discussed above, stream buffer alterations may also be allowed pursuant to LUC 20.25H.055. Specifically, LUC 20.25H.055(C)(3)(g)(i) allows new non-motorized trails within the stream buffer pursuant to the performance standards listed within that section and the general performance standards for streams listed in LUC 20.25H.080(A).

3.2 State and Federal Regulations

Streams are also regulated by the U.S. Army Corps of Engineers (Corps) under section 404 of the Clean Water Act. Any filling of Waters of the State would require notification and permits from the Corps. Application for Corps permits may also require an individual 401 Water Quality Certification and Coastal Zone Management Consistency determination from Ecology.

WDFW has jurisdiction over any project that may "use, divert, obstruct, or change the natural bed of any of the salt or freshwaters of the state" (RCW 77.55.011). Any proposal to conduct in-stream or over-stream work requires a Hydraulic Project Approval (HPA) from WDFW.

Kelsey Creek contains chinook salmon, which are federally listed as threatened. Federally permitted actions that could affect endangered species (i.e. salmon or bull trout) also require a biological assessment study and consultation with the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service.

In general, neither the Corps nor Ecology regulates stream buffers.

4 Project Description

This stream stabilization project was initiated to deal with continued stream bank erosion concerns along a section of Kelsey Creek adjacent to NE Bellevue Redmond Road. As previously mentioned, the stream channel is physically constrained by sheet piling on both banks in many areas. Water velocities and constrained channel characteristics associated with bridge access points pose a potential risk of future property loss from channel downcutting. Therefore, the placement of large woody debris, coir lifts, large boulders, and native vegetation is proposed. Improvements are proposed along approximately 320 feet of Kelsey Creek.

Large Woody Debris Placement

The restoration activities proposed are designed to stabilize the channel's steeper gradients. Large woody debris will be placed in the channel to reduce flow velocities and the potential for channel incision. Large woody debris placement will be centered on the southern bank of the stream as it makes a 90-degree turn to the west.

Three revetment logs will be buried at least 12 feet into the stream bank leaving the attached rootwads positioned in the stream. The logs will be positioned in the upstream portion of this area. Fourteen bank logs and three rootwads will be embedded into the stream bank or channel downstream of the revetment logs. All logs will be anchored to the bank and secured together with anchoring cables. A system of coir lifts will be installed above and behind (landward) the bank logs. The coir lifts are made of 100 percent biodegradable material and will be filled with

topsoil to stabilize the stream bank. Two "digger logs" will be placed, one each at the upstream and downstream limits of this work area. These logs will also be buried into the stream bank; however, they will be angled slightly so that the waterward end (without a rootwad) is placed at or below the channel bed. The "digger logs" are intended to direct flow away from the stream bank in this area. Additionally, at least three bank logs will be positioned along the northern stream bank just upstream of this area to prevent further erosion of that bank.

Boulder Placement

Boulders are proposed downstream of the area of large woody debris placement to help increase channel roughness and reduce flow velocity, which will cause a rise in water surface elevation. The channel is sufficiently confined such that it cannot be easily widened to accommodate the proposed in-stream structures. However, the predicted rise in water surface elevations can be accommodated within the banks of the channel.

Revegetation

Invasive weeds, including English ivy, Japanese knotweed, English laurel, English holly, Himalayan blackberry, and evergreen blackberry, will be removed from areas along the north and south stream banks and upland areas in the vicinity of the large woody debris placement. Native species, totaling 3,290 square feet, will be planted in those areas where invasive species are removed. Proposed native plantings include vine maple, paper birch, beaked hazelnut, Douglas-fir, western red cedar, salal, red-twig dogwood, tall Oregon grape, osoberry, wood's rose, snowberry, evergreen huckleberry, lady fern, deer fern and sword fern. Proposed plantings will help to provide additional habitat adjacent to and within the stream, including overwater shading, allocthonous input of detritus and insects, and a future recruitment of large woody debris.

Nature Viewing Area

The upland areas just north of the main bend in the stream are also proposed for improvements. This area is currently void of significant native understory. The limited vegetation found here is almost exclusively invasive. It is proposed that native species be planted throughout this area, while access is also retained for nature-viewing opportunities. Access to the area would be provided through a gate situated in the southeast corner of the parking lot located to the west of the revegetation area. Large boulder outcrops and a woodchip trail would be provided in this area to allow children the chance to view the stream and interact with nature. Additionally, a fence would be provided around the perimeter of the viewing area to prevent access into the stream.

5 CRITICAL AREAS REPORT CRITERIA

As previously mentioned, stream channel and buffer modifications may occur pursuant to LUC 20.25H.230. The Director may approve stream channel and buffer modifications if it can be shown that, through restoration, the modifications will result in no net loss of critical area or critical area buffer function. The existing project site contains a poorly functioning section of Type F stream (located within an area of special flood hazard) and areas of degraded stream buffer. Overall, the stream section is characterized by eroded stream banks, high water velocities, channel downcutting, low quality fish and invertebrate habitat, and poor aesthetics. Large woody debris is absent from the stream corridor in the reach and current grade control is limited and associated with periodic large boulders. The majority of the adjacent stream buffers are vegetated with invasive species including English ivy, Japanese knotweed, English laurel, English holly, Himalayan blackberry and evergreen blackberry.

The proposal includes the placement of large woody debris, large boulders, coir lifts and native vegetation to stabilize portions of stream bank as well to improve fish habitat within the stream. Additionally, restoration of the buffer area with native plantings is proposed. Restoration will involve the planting of 3,290 square feet of native vegetation (trees, shrubs, and groundcover) within the critical area buffer. The planting layout incorporates a diversity of native plant species configured in a naturalistic fashion. The restoration plan will provide for substantially improved critical area and buffer functions and values relative to the existing condition. A monitoring and maintenance plan for the proposed restoration area is also included in this report.

Furthermore, the critical areas report must meet specific decision criteria in order for the Director to approve a proposal to modify a stream channel. Compliance with the critical areas report criteria listed in LUC 20.25H.255(A) is addressed below.

1. *The modifications and performance standards included in the proposal lead to levels of protection of critical area functions and values at least as protective as application of the regulations and standards of this code.*

   A stream restoration plan that details the areas proposed for in-stream, stream bank and stream buffer improvements has been prepared. The plan proposes the placement of large woody debris, large boulders, coir lifts and native vegetation to stabilize portions of stream bank as well to improve fish habitat within the stream. Additionally, restoration of the stream buffer area with native plantings is proposed. Restoration will involve the planting of 3,290 square feet of native vegetation (trees, shrubs and groundcover) within the critical area buffer, along with the removal of approximately 3,290 square feet of

invasive and non-native species. The planting layout incorporates a diversity of native plant species configured in a naturalistic fashion.

Proposed buffer plantings will increase species diversity, providing a variety of forage species for wildlife. An increase in structural diversity over existing conditions will also result, providing more suitable summer and winter cover conditions for wildlife, particularly songbirds. The proposed native plantings will also improve stormwater functions within the buffer, allowing improved filtration of stormwater adjacent to the stream and also helping to remove pollutants from stormwater before entering the stream. Additionally, native plantings placed adjacent to the stream will help to provide overhanging vegetation, which will increase allochthonous input of detritus and insects and provide an overall benefit to fish habitat. The restoration plan will provide for substantially improved critical area and buffer functions and values relative to the existing condition. The monitoring and maintenance plan will ensure long-term success of the restoration plan.

2. *Adequate resources to ensure completion of any required mitigation and monitoring efforts.*

A comprehensive four-year maintenance and monitoring plan is included in this report. The plan details methods of invasive species removal, specifies appropriate species for planting and planting techniques, describes proper maintenance activities, and sets forth performance standards to be met yearly during monitoring. This will ensure that restoration plantings will be maintained, monitored and successfully established within the first four years following implementation. Furthermore, to ensure that the proposed plantings are installed and that the four-year maintenance and monitoring plan is implemented, the Early World Children's School will post an Installation Assurance Device and a Maintenance Assurance Device prior to permit issuance.

3. *The modifications and performance standards included in the proposal are not detrimental to the functions and values of critical area and critical area buffers off-site.*

No specific critical areas were found off-site during fieldwork (other than Kelsey Creek on adjacent properties). However, restoration of Kelsey Creek on the subject site will provide access to improved rearing habitat for fish and may increase fish abundance, size, and species diversity on adjacent properties. Furthermore, restoration of the on-site buffer will increase the overall habitat function of the area, thereby improving habitat functions on adjacent properties.

4. *The resulting development is compatible with other uses and development in the same land use district.*

No new development is planned as part of the proposed project. All proposed improvements are part of a stream restoration plan designed to stabilize portions of stream bank as well to improve fish habitat within the stream. The existing land uses are allowed within the land use district (pursuant to LUC 20.10.440) and will not change as a result of the proposed project. Restoration activities are allowed within all land use districts (pursuant to LUC 20.25H.055). Therefore, the proposed project is compatible with other uses and development in the same land use district.

The Director must find that a critical areas report includes discussion of compliance with the submittal requirements of LUC 20.25H.250. Compliance with the relevant sections listed in LUC 20.25H.250(B) is addressed below.

4. *An assessment of the probable cumulative impacts to critical areas resulting from development of the site and the proposed development.*

The proposed project includes the placement of large woody debris, large boulders, coir lifts and native vegetation to stabilize portions of stream bank as well to improve fish habitat within Kelsey Creek. Additionally, restoration of the stream buffer with native plantings is proposed.

The on-site critical area (Kelsey Creek) will be "impacted" by the placement of large woody debris and boulders below the ordinary high water mark. However, "impacts" associated with the proposed project will be beneficial to the critical area rather than detrimental. Large woody debris placed within the stream and along portions of stream bank will help to prevent further erosion while also providing increased habitat within the critical area. Woody debris will greatly improve the site's ability to provide juvenile salmon with a variety of water velocities and overhead cover for rearing habitat. The addition of large wood into the bank and channel will also improve the diversity of substrate sizes available at the site and increase the variety of species and sizes of fish that can occupy the area. Additionally, boulders are proposed downstream of the area of large woody debris placement to help increase channel roughness and reduce flow velocity, which will cause a rise in water surface elevation.

Overall, the proposed project will increase the habitat function of the area and add habitat complexity to the stream. Therefore, cumulative impacts to the critical area will not occur; rather, the proposal will result in ecological functions

that are more protective of the critical area than would be found if the proposed improvements were not implemented.

5. *An analysis of the level of protection of critical area functions and values provided by the regulations or standards of this Code, compared with the level of protection provided by the proposal. The analysis shall include:*

   a. *A discussion of the functions and values currently provided by the critical area and critical area buffer on the site and their relative importance to the ecosystem in which they exist;*

      Kelsey Creek flows in a south-southwesterly and then a west-northwesterly direction as it passes through the three parcels. The site is relatively flat, with the exception of the banks of Kelsey Creek, which in some areas are nearly vertical. This particular segment of Kelsey Creek is highly urbanized and constrained in many sections by sheet pile walls and multiple bridge crossings. Overall, this stream section is characterized by eroded stream banks, high water velocities, channel downcutting, low quality fish and invertebrate habitat, and poor aesthetics. Large woody debris is absent from the stream corridor in this reach and current grade control is limited and associated with periodic large boulders.

      Vegetation on the site consists primarily of non-native English ivy, Japanese knotweed, and Himalayan blackberry with an occasional stand of native big leaf maple, red alder, and red cedar. Additional native vegetation found in limited quantities at the site includes sword fern, osoberry, paper birch, and tall Oregon grape.

   b. *A discussion of the functions and values likely to be provided by the critical area and critical area buffer on the site through application of the regulations and standards of this Code over the anticipated life of the proposed development;*

      Deviations from the strict application of the regulations and standards of LUC 20.25H are not required to implement the proposed project. Rather, LUC 20.25H.055(C)(3)(m) and 20.25H.080(B)(1)(f) allow for stabilization of the stream banks and habitat improvement within the stream. Additionally, the proposed project is allowed within an area of special flood hazard, pursuant to the performance standards described in LUC 20.25H.180(C). Therefore, strict application of the regulations and standards of LUC 20.25H results in the same functions and values described in *c.* below.

   c. *A discussion of the functions and values likely to be provided by the critical area and critical area buffer on the site through the modifications and performance standards included in the proposal over the anticipated life of the proposed development.*

The proposed project would restore and enhance substantial portions of the stream buffer found on the project site, as well as add habitat complexity to the stream while helping to stabilize portions of existing eroded stream banks. The stream buffer has a high potential for enhancement to increase several important functions, as it presently contains large patches of non-native plants. To achieve this, approximately 3,290 square feet of invasive and non-native species would be removed from the site and 3,290 square feet of native trees, shrubs and groundcover would be planted within the stream buffer. Tree species include paper birch, Douglas-fir and western red cedar. Proposed shrubs include vine maple, beaked hazelnut, red-twig dogwood, tall Oregon grape, osoberry, and evergreen huckleberry. Groundcover species include salal, deer fern, lady fern and sword fern. Proposed plantings are consistent with the City of Bellevue's Critical Areas Handbook for stream environments. Plantings will help to provide additional habitat adjacent to and within the stream, including overwater shading, allocthonous input of detritus and insects, and future recruitment of large woody debris.

Also proposed as part of the project is the stabilization of the channel's steeper gradients. Large woody debris will be placed in the channel to reduce flow velocities and the potential for channel incision. Repair of the stream banks involving the placement of large woody debris, coir lifts and native vegetation will help to return the banks to their original size and configuration. In addition to repairing the stream banks, proposed large woody debris placement would also enhance ecological conditions on-site by providing additional in-stream habitat. Woody debris will greatly improve the site's ability to provide juvenile salmon with a variety of water velocities and overhead cover for rearing habitat. The addition of large wood into the bank and channel will also improve the diversity of substrate sizes available at the site and increase the variety of species and sizes of fish that can occupy the area. Additionally, boulders are proposed downstream of the area of large woody debris placement to help increase channel roughness and reduce flow velocity, which will cause a rise in water surface elevation.

Overall, the proposed project will increase the habitat function of the area and add habitat complexity to the stream. Therefore, implementation of the proposed project will result in a substantially higher level of critical areas functions and values than is provided by the site in its existing condition.

As previously mentioned, new non-motorized trails are allowed pursuant to LUC 20.25H.055(C)(3)(g)(i). However, the Director must find compliance with the performance

standards addressed in that section. Compliance with the standards listed in LUC 20.25H.055(C)(3)(g)(i) is addressed below.

(A) Trail location and design shall result in the least impacts on the critical area or critical area buffer.

Design of the proposed trail will result in the least amount of critical area impacts possible. All impacts will take place within critical area buffers. Additionally, invasive species within the critical area buffer will be removed and an extensive restoration plan will be implemented. The entire length of the trail is approximately 25 feet long, all of which will be located within a stream buffer. The project also proposes the removal of approximately 3,290 square feet of invasive plants and the planting of 3,290 square feet of native vegetation. Furthermore, to limit impacts within the critical area buffer, the proposed trail will be constructed of pervious materials. The woodchips proposed for the trail will help avoid erosion of the trail during wet weather.

(B) Trails shall be designed to compliment and enhance the environmental, educational, and social functions and values of the critical area with trail design and construction focused on managing and controlling public access and limiting uncontrolled access.

The proposed trail and restoration plantings have been designed to enhance several aspects of the critical area.

Environmentally, the critical area will be improved through implementation of an extensive restoration plan that includes removal of invasive species and plantings of native species within and adjacent to the critical area. Additionally, an existing gate will restrict access into the interpretive trail area and a fence will be placed adjacent to the trail prohibiting access into the critical area. Overall, ecological function within the critical area will improve as a result of the proposed project.

Educational and social values of the critical area and buffer will also be improved as a result of the proposed project. Currently, the critical area buffer within the project site is virtually inaccessible due to overgrown invasive species. Implementation of the proposed project will involve removal of these species, construction of a pedestrian trail, and the planting of native vegetation. Therefore, children on the project site would be provided with additional passive access opportunities, all while protecting the critical area and creating further awareness of the ecological sensitivity and uniqueness of the area.

(C) *Trails shall be designed to avoid disturbance of significant trees and to limit disturbance of native understory vegetation.*

Approximately 18 significant trees exist within the buffer area proposed for enhancement. All existing trees will be protected during invasive species removal and trail construction and will remain post-construction. Non-native vegetation dominates the area and will be removed. Therefore, no significant trees or native plant species will be permanently impacted by the proposed project.

(D) *Trails shall be designed to avoid disturbance of habitat used for salmonid rearing or spawning or by any species of local importance.*

The proposed trail varies in width from 6 feet to 10 feet and has been located above the ordinary high water mark of Kelsey Creek and set back from the top of bank. Additionally, a fence would separate the proposed trail from the on-site stream channel. Therefore, the project will not disturb any habitat used for salmonid rearing or spawning.

(E) *The trail shall be the minimum width necessary to accommodate the intended function or objective.*

The proposed trail has been designed at a width that varies from 6 feet to 10 feet. The proposed width is intended to provide adequate and safe capacity for expected use. The entire trail alignment has been located outside of the on-site stream channel and above the ordinary high water mark of the stream, and no native plants will be impacted by trail construction. Additionally, the trail will be constructed of pervious wood chips.

(F) *All work shall be consistent with the City of Bellevue's "Environmental Best Management Practices" and all applicable City of Bellevue codes and standards, now or as hereafter amended.*

All trail work shall be consistent with the City of Bellevue Clearing & Grading Code (Chapter 23.76), permit conditions, and all other applicable codes, ordinances, and standards, including the City of Bellevue "Environmental Best Management Practices."

(G) *The facility shall not significantly change or diminish overall aquatic area flow peaks, duration or volume or flood storage capacity, or hydroperiod.*

All impacts associated with the proposed trail are located above the ordinary high water mark of the on-site stream. Trail construction will not increase the overall base flood elevation within the area of special flood hazard. Additionally, the trail will be constructed of pervious materials, thereby eliminating any additional runoff from the area. Therefore, there will be no change in flow peaks or storage capacity within Kelsey Creek as a result of trail construction.

(H) *Where feasible and consistent with any accessibility requirements, any trail shall be constructed of pervious materials.*

The proposed trail will be covered with woodchips, and would therefore be considered 100% pervious.

(I) *Crossings over and penetrations into wetlands and streams shall be generally perpendicular to the critical area, and shall be accomplished by bridging or other technique designed to minimize critical area disturbance considering the entire trail segment and function.*

The proposed trail project is being constructed above the ordinary high water mark of Kelsey Creek. Therefore, all disturbances will take place outside of the on-site stream critical area.

(J) *Areas of new permanent disturbance and all areas of temporary disturbance shall be mitigated and/or restored pursuant to a mitigation and restoration plan meeting the requirements of LUC 20.25H.210.*

The project proposes to remove invasive species and construct a pervious pedestrian trail. The entire length of the trail is approximately 25 feet, all of which is located within the buffer of Kelsey Creek. The project also proposes the removal of approximately 3,290 square feet of invasive plants along the trail corridor and the planting of 3,290 square feet of native vegetation. These actions are included in a restoration plan prepared in accordance with LUC 20.25H.220(B). Monitoring and maintenance obligations are included in the restoration plan.

In addition to the specific performance standards for non-motorized trails, discussed above, the project also requires compliance with the general performance standards for streams, as documented in LUC 20.25H.080(A). The Director must find compliance with the performance

standards addressed in that section. Compliance with the standards listed in LUC 20.25H.080(A) is addressed below.

1. *Lights shall be directed away from the stream.*

   No new lights are planned as part of the proposed project. Proposed restoration plantings within the stream buffer will help to provide a vegetated buffer between the adjacent roadway/structures and the stream. Therefore, implementation of the proposed project should result in less direct light on the critical area.

2. *Activity that generates noise such as parking lots, generators, and residential uses shall be located away from the stream or any noise shall be minimized through use of design and insulation techniques.*

   No new development is planned as part of the proposed project. All proposed improvements are part of a stream restoration plan designed to stabilize portions of stream bank as well to improve fish habitat within the stream. Therefore, no new noise-generating uses are proposed. However, proposed buffer restoration plantings will help to provide a vegetated buffer between the adjacent roadway/structures which may result in less overall noise within the critical area.

3. *Toxic runoff from new impervious area shall be routed away from the stream.*

   No new impervious surfaces are planned as part of the proposed project. However, new native plantings within the stream buffer are proposed. The plantings will help to provide increased stormwater treatment and infiltration prior to runoff reaching the stream.

4. *Treated water may be allowed to enter the stream critical area buffer.*

   As indicated in the prior response, on-site stormwater runoff will be treated within the stream buffer prior to reaching the stream. Overall, a net improvement in stormwater treatment will result from the proposed restoration plan.

5. *The outer edge of the stream critical area buffer shall be planted with dense vegetation to limit pet or human use.*

   A stream buffer restoration plan has been prepared that details the areas proposed for enhancement. Specifically, dense, native vegetation will be planted within the stream buffer located south and east of the stream.

Additional native plantings are proposed within the stream buffer located to the north and west of the stream. A woodchip trail is also planned for this portion of buffer to allow for limited access by the Early World Children's School. The trail will provide a passive recreation area for the children and an opportunity to view the stream. Areas surrounding the trail will be planted with dense native vegetation. A fence along the outer edge of the buffer will prevent additional access into the restored buffer.

6. *Use of pesticides, insecticides and fertilizers within 150 feet of the edge of the stream critical area shall be in accordance with the City of Bellevue's "Environmental Best Management Practices," now or as hereafter amended.*

All usage of pesticides, insecticides and fertilizers within 150 feet of the on-site stream shall be in accordance with the City of Bellevue's "Environmental Best Management Practices."

The project is proposed within a stream critical area and an area of special flood hazard. The restoration activities are allowed within both critical areas pursuant to LUC 20.25H.055(C)(3)(m). Compliance with the performance standards addressed in LUC 20.25H.055(C)(3)(m) is addressed below.

i. *When Allowed. New or enlarged stabilization measures shall be allowed only to protect existing primary structures and infrastructure, or in connection with uses and development allowed pursuant to subsection B of this section. Stabilization measures shall be allowed only where avoidance measures are not technically feasible.*

The proposed stabilization measures are intended to protect existing structures located on the Early World Children's School site. High water velocities in the area have eroded away portions of stream bank located adjacent to the structures. With continued high water velocities and limited stabilization features in place, loss of additional property is probable. Therefore, in order to repair portions of the stream bank and prevent further damage to the property, the placement of large woody debris, large boulders, coir lifts, and native vegetation is proposed. Avoidance measures are not technically feasible, in that avoidance would lead to further bank erosion, resulting in continued loss of property and threats to existing structures.

ii. *Type of Stabilization Measure Used. Where a stabilization measure is allowed, soft stabilization measures shall be used, unless the applicant demonstrates that soft stabilization measures are not technically feasible. An applicant asserting that soft stabilization measures are not technically feasible shall provide the information relating to each of the factors set forth in subsection C.3.m.iii.(D) of this section for a determination of*

technical feasibility by the Director. Only after a determination that soft stabilization measures are not technically feasible shall hard stabilization measures be permitted.

The proposed project includes "soft stabilization measures." Large woody debris, coir lifts and native vegetation are proposed for bank stabilization and all meet the definition of "soft stabilization measures."

In addition to the performance standards discussed above, to allow in-stream modifications within an area of special flood hazard, the Director must find compliance with the performance standard requirements of LUC 20.25H.180. Compliance with the relevant sections listed in LUC 20.25H.180(C) is addressed below.

4. *No rise in the Base Flood Elevation (BFE). Any allowed use or development shall not result in a rise in the BFE.*

Portions of the proposed project are located within the 100-year floodplain of Kelsey Creek, and therefore are within the area of special flood hazard. Under proposed restored conditions, predicted 100-year flood elevations range from 173.62 feet to 178.28 feet. This represents a rise in water surface of 0.68 foot under existing conditions at the downstream end of the project area and an increase of 0.45 foot at the upstream end. The most significant increase in flood elevation was predicted to be 0.87 foot. Under proposed conditions, flow velocities were generally predicted to decrease by between 10 and 20 percent. Flood levels with the proposed in-stream mitigations are lower than those that were likely present in the channel prior to recent (e.g. past 5 to 10 years) degradation.

The proposed large woody debris and boulders are effective, in part, because they increase flow area and channel roughness, both of which cause a rise in water surface elevation. A rise in the water surface elevation is therefore expected to accompany reduced flow velocities and increased channel and bank stability provided by the restoration activity. The channel is sufficiently confined such that it cannot be easily widened to accommodate the proposed in-stream structures. However, the predicted rise in water surface elevations will be confined within the banks of the channel. Similarly, the water surface elevation at the time of sheet pile installation was in excess of the estimated restored stream's water surface elevation. Projected rises in the water surface elevation due to the restoration activity are less than the likely surface water elevations found in the project reach prior to the channel downcutting and erosion that initiated the need for this project. Therefore, there is anticipated to be no rise in the base flood elevation over pre-existing conditions.

5. *Modification of Stream Channel. Alteration of open stream channels shall be avoided, if feasible. If unavoidable, the following provisions shall apply to the alteration.*

   a. *Modifications shall only be allowed in accordance with the habitat improvement projects.*

      The proposed project includes the placement of large woody debris and boulders within the stream channel of Kelsey Creek. In addition to stabilizing portions of eroded stream bank, the in-stream activities will also improve habitat for native fish by reducing water velocities, stabilizing the stream bed substrates, increasing the diversity of substrate sizes, and providing overhead cover and an increased food supply.

   b. *Modification projects shall not result in blockage of side channels.*

      No side channels currently exist on or in close proximity to the project site.

   c. *The City of Bellevue shall notify adjacent communities, the state departments of Ecology and Fish and Wildlife, and the Federal Insurance Administration about the proposed modification at least 30 days prior to permit issuance.*

      The City shall notify all appropriate local, state and federal agencies prior to permit issuance for stream channel modifications.

   d. *The applicant shall maintain the altered or relocated portion of the stream channel to ensure that the flood-carrying capacity is not diminished. Maintenance shall be bonded for a period of five years, and be in accordance with an approved maintenance program.*

      The Utilities Department shall monitor and maintain the completed in-stream improvements to ensure that flood-carrying capacity is not diminished.

6. *Compensatory Storage. Development proposals must not reduce the effective base flood storage volume of the area of special flood hazard. Grading or other activity that would reduce the effective storage volume must be mitigated by creating compensatory storage on the site.*

   As explained in 20.25H.180(C)(4) above, there is anticipated to be no rise in the base flood elevation over pre-existing conditions. Therefore, no reduction in the effective base flood storage volume of the area is expected.

6 CRITICAL AREAS LAND USE PERMIT CRITERIA

Modification of a critical area or critical area buffer requires the applicant to apply for and obtain a Critical Areas Land Use Permit. Before issuing a Critical Areas Land Use Permit, the Director must find that the project meets specific decision criteria. Compliance with the applicable Critical Areas Land Use Permit decision criteria listed in LUC 20.30P.140 is addressed below.

A. *The proposal obtains all other permits required by the Land Use Code.*

The project applicant has applied for a Critical Areas Land Use Permit (LO), with SEPA review, to allow for improvements within Kelsey Creek and the adjacent stream buffer. A Clear and Grade Permit (GH) is also required and will be applied for at a later date. No other City of Bellevue permits will be required of the project.

B. *The proposal utilizes to the maximum extent possible the best available construction, design and development techniques, which result in the least impact on the critical area and critical area buffer.*

The proposed project includes the placement of large woody debris, large boulders, coir lifts, and native vegetation to stabilize portions of stream bank as well as to improve fish habitat within Kelsey Creek. Additionally, restoration of the stream buffer with native plantings is proposed.

The proposal includes use of the best available design and development techniques to stabilize portions of eroded stream banks and reduce overall water velocities through the site. Design incorporates the use of soft stabilization measures, including large woody debris, coir lifts, and vegetation; in-stream habitat improvement; and upland habitat restoration.

The development techniques mentioned above, coupled with approximately 3,290 square feet of stream buffer enhancement, will result in the least impact on the critical area and critical area buffer.

C. *The proposal incorporates the performance standards of Part 20.25H LUC to the maximum extent applicable.*

See previous section for discussion on compliance with performance standards for non-motorized trails [20.25H.055(C)(3)(g)(i)], streams [20.25H.080(A)], and areas of special flood hazard [LUC 20.25H.055(C)(3)(m) and LUC 20.25H.180(C)].

D. The proposal will be served by adequate public facilities including streets, fire protection, and utilities.

The project site is currently served by adequate public facilities. Proposed stream and stream buffer improvements will not cause the need for additional public facilities.

E. The proposal includes a mitigation or restoration plan consistent with the requirements of LUC 20.25H.210; except that a proposal to modify or remove vegetation pursuant to an approved Vegetation Management Plan under LUC 20.25H.055.C.3.i shall not require a mitigation or restoration plan.

A restoration plan has been prepared in accordance with the requirements of LUC 20.25H.210.

F. The proposal complies with other applicable requirements of this code.

The proposed project complies with all other applicable City of Bellevue Land Use Codes, including 20.25H and 23.76.

7 RESTORATION PLAN

The proposed restoration plan fulfills the requirements of LUC 20.25H.220(B). The plan seeks to restore and enhance substantial portions of the stream buffer found on the project site, as well as adds habitat complexity to the stream while helping to stabilize portions of existing eroded stream banks. The stream buffer has a high potential for restoration to increase several important functions, as it presently contains large patches of non-native plants. To achieve this, the plan calls for the removal of approximately 3,290 square feet of invasive and non-native species from the site and the planting of 3,290 square feet of native trees, shrubs and groundcover within the stream buffer. The restoration plan can be found in Appendix A. A combination of trees, shrubs, and groundcover are proposed. Trees species include paper birch, Douglas-fir, and western red cedar. Shrubs and groundcover include salal, vine maple, beaked hazelnut, red-twig dogwood, tall Oregon grape, osoberry, wood's rose, snowberry, evergreen huckleberry, lady fern, deer fern and sword fern. Proposed plantings are consistent with the City of Bellevue's Critical Areas Handbook for stream environments. Plantings will help to

provide additional habitat adjacent to and within the stream, including overwater shading, allocthonous input of detritus and insects, and future recruitment of large woody debris.

Also proposed as part of the restoration plan is the stabilization of the channel's steeper gradients. Large woody debris will be placed in the channel to reduce flow velocities and the potential for channel incision. Repair of the stream banks involving the placement of large woody debris, coir lifts, and native vegetation will help to return the banks to their original size and configuration. In addition to repairing the stream banks, proposed large woody debris placement would also enhance ecological conditions on-site by providing additional in-stream habitat. Additionally, boulders are proposed downstream of the area of large woody debris placement to help increase channel roughness and reduce flow velocity, which will cause a rise in water surface elevation.

8 MAINTENANCE AND MONITORING PLAN

A comprehensive four-year maintenance and monitoring plan is also included as part of the restoration plan. The plan details methods of invasive species removal, specifies appropriate species for planting and planting techniques, describes proper maintenance activities, and sets forth performance standards to be met yearly during monitoring. This will ensure that restoration plantings will be maintained, monitored and successfully established within the first four years following implementation. Further, the plan includes a monitoring plan for the constructed in-stream habitat features including all log structures.

Proposed restoration involves removing invasive weeds such as Himalayan blackberry, English ivy, holly and English laurel. Weed removal will be followed by installation of native species suitable to the site. Native plantings are intended to increase native plant cover, improve native species diversity, and provide food and other habitat resources for wildlife. In-stream improvements include the placement of large woody debris, coir lifts, and a mix of cobbles, boulders, and gravel. Improvements are intended to prevent further erosion while also providing increased habitat within the stream corridor.

Appendix A includes details of the four-year maintenance and monitoring plan, also detailed below.

8.1 Goals

1. Within the proposed restoration area of the stream buffer, establish dense native vegetation that is appropriate to the ecoregion and site.

2. Where indicated on the plan, areas within the stream buffer will remain substantially vegetated with a preponderance of native plants and will contain little invasive or noxious weed cover.
3. Increase habitat cover and refuge for amphibians, small mammals, and invertebrates.
4. Create the formation of scour pools, riffles and gravel tail outs in the vicinity of each log structure.
5. Create additional streambed complexity by adding gravel/cobble/boulder substrate.

8.2 Performance Standards

The standards listed below will be used to judge the success of the installation over time. If performance standards are met at the end of Year 4, the site will then be deemed successful and the performance security bond will be eligible for release by the City of Bellevue. [The bond applies only to native plantings and not in-stream improvements.]

1. Survival: Achieve 100% survival of installed plants by the end of Year 1. This standard can be met through plant establishment or through replanting as necessary to achieve the required numbers.
2. Native cover:
   a. Achieve 60% understory cover of native shrubs by Year 3. Native volunteer species may count towards this cover standard.
   b. Achieve 80% understory cover of native shrubs by Year 4. Native volunteer species may count towards this cover standard.
3. Species diversity: Establish at least three native shrub species by Year 4. Native volunteer species may count towards this standard.
4. Invasive cover: Aerial cover for all non-native, invasive and noxious weeds will not exceed 10% at any year during the monitoring period. Invasive plants include Himalayan blackberry (*Rubus armeniacus*), cut leaf blackberry (*Rubus laciniatus*), reed canarygrass (*Phalaris arundinacea*), cherry (hedge) laurel (*Prunus laurocerasus*), English holly (*Ilex aquifolium*), and ivy species (*Hedera* spp.).
5. For four years after the streambank stabilization and restoration efforts, all of the woody debris shall remain functional within the project area, and any channel migration will remain within the established floodplain area.
6. For four years after the streambank stabilization and restoration efforts, supplemental gravels shall continue to form riffles suitable for salmonid spawning and aquatic insect production. Riffles shall not become “notched” by eroding a narrow, distinct and abrupt channel through the supplemental substrate, resulting in incised channel sections and/or drained pools upstream.

8.3 Monitoring Methods

This monitoring program is designed to track the success of the restoration site over time and to measure the degree to which it is meeting the performance standards outlined in the preceding section.

An as-built plan will be prepared by the **restoration professional** (The Watershed Company [(425) 822-5242] personnel, or other persons qualified to evaluate environmental restoration projects) prior to the beginning of the monitoring period. The as-built plan will be a mark-up of the planting and in-stream modification plans included in this plan set. The as-built plan will document any departures in plant, LWD, or boulder placement or other components from the proposed plan.

Monitoring will take place twice annually for four years. A spring visit will occur each year to inspect the log structures and other in-stream improvements, while a fall visit will occur each year to monitor the areas of native revegetation. Year-1 monitoring will commence in the first fall subsequent to installation.

The formal spring monitoring visit shall record and report the following in an annual report submitted to the City of Bellevue:

1. Visual assessment of the overall site.
2. Photographic documentation from four fixed reference points.
3. Recommendations for maintenance or repair of any portion of the in-stream structures for the upcoming low-flow season.

The formal fall monitoring visit shall record and report the following in an annual report submitted to the City of Bellevue:

1. Visual assessment of the overall site.
2. Year-1 counts of live and dead plants by species.
3. Counts of dead plants where mortality is significant in any monitoring year.
4. Estimate of native shrub cover the cover class method site-wide.
5. Estimate of non-native, invasive weed cover using the cover class method site-wide.
6. Tabulation of established native species, including both planted and volunteer species.
7. Photographic documentation from four fixed reference points.
8. Any intrusions into or clearing of the planting areas, vandalism, or other actions that impair the intended functions of the mitigation area.
9. Recommendations for maintenance or repair of any portion of the mitigation area.

8.4 Construction Notes and Specifications

Note: specifications for items in **bold** can be found below under "Material Specifications and Definitions."

Note: The Watershed Company [(425) 822-5242] personnel, or other persons qualified to evaluate environmental restoration projects, will monitor:

1. Construction staging.
2. Temporary erosion control measures.
3. In-stream water diversions.
4. Fish removal (if necessary).
5. Horizontal boring activities.
6. Log, boulder, and coir lift placement.
7. Planting preparation
   a. Soil preparation.
   b. Mulch placement.
8. Plant material inspection
   a. Plant material delivery inspection.
   b. 100% plant installation inspection.

8.4.1 General Work Sequence

1. A planting sequence can be found on Sheet 6 of the project plans (Appendix A).
2. A work sequence (for in-stream improvements) can be found on Sheet 3 of the project plans (Appendix A).

8.4.2 Material Specifications and Definitions

1. **Fertilizer**: Slow release, granular PHOSPHOROUS-FREE fertilizer. Follow manufacturer's instructions for application. Keep fertilizer in a weather-tight container while on site. Note that fertilizer is to be applied only in Years 2, 3 and 4 and not in the first year.
2. **Irrigation system:** Automated system capable of delivering at least two inches of water per week from June 1 through September 30 for the first two years following installation.
3. **Stream Restoration Professional**: Watershed Company [(425) 822-5242] personnel, or other persons qualified to evaluate environmental restoration projects.
4. **Wood chip mulch**:
   a. Arborist chips (chipped woody material) approximately 1 to 3 inches in maximum dimension (not sawdust or coarse hog fuel). This material is commonly available in large quantities from arborists or tree-pruning companies. This material is sold as "Animal Friendly Hog Fuel" at Pacific Topsoils [(800) 884-7645]. Mulch must not contain appreciable quantities of

garbage, plastic, metal, soil, and dimensional lumber or construction/demolition debris. Quantity required: 35 cubic yards

5. Additional specifications/definitions related to in-stream improvements can be found on Sheet 7 of the project plans (Appendix A).

8.5 Contingencies

If there is a significant problem with the restoration areas meeting performance standards, a contingency plan will be developed and implemented. Contingency plans can include, but are not limited to: soil amendment; additional plant installation; plant substitutions of type, size, quantity, and location; additional watering, restabilization of stream banks or in-stream structures; and surveillance and/or protection to prevent site damage.

8.6 Vegetation Maintenance

The site will be maintained in accordance with the following instructions for four years following installation of all plantings.

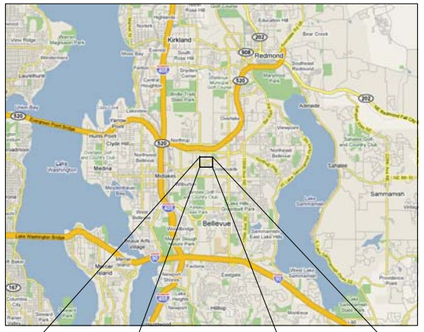
1. Follow the recommendations noted in the previous monitoring site visit.
2. General weeding for all planted areas.
3. At least twice yearly, remove all competing weeds and weed roots from beneath each installed plant and any desirable volunteer vegetation to a distance of 18 inches from the main plant stem. Weeding should occur at least twice during the spring and summer. Frequent weeding will result in lower mortality, lower plant replacement costs, and increased likelihood that the plan meets performance standards by Year 4.
4. More frequent weeding may be necessary depending on weed conditions that develop after plan installation.
5. Do not weed the area near the plant bases with string trimmer (weed whacker/weed eater). Native plants are easily damaged or killed, and weeds easily recover after trimming.
6. Apply slow release granular fertilizer to each installed plant annually in the spring (by June 1) of Years 2 through 4.
7. Replace mulch as necessary to maintain a 4-inch-thick layer, retain soil moisture, and limit weeds.
8. Replace each plant found dead in the summer monitoring visits during the upcoming fall dormant season (October 15 to March 1).
9. The property owner will ensure that water is provided for the entire planted area with a minimum of 2 inches of water provided per week from June 1 through September 30 for the first two years following installation through the operation of a temporary irrigation system. Less water is needed during March, April, May and October.

9 SUMMARY

The proposed in-stream improvements and buffer enhancements will stabilize portions of existing eroded stream banks and improve fish habitat within the stream. A stream buffer restoration plan has been prepared that details the areas proposed for restoration. Proposed restoration includes the removal of existing invasive species and the planting of 3,290 square feet of native vegetation within the stream critical area buffer. The planting layout incorporates a great diversity of native plant species configured in a naturalistic fashion. Proposed plantings include native trees, shrubs and groundcover. The restoration plan will provide significantly better protection of those critical area functions and values than is provided by existing conditions. The placement of large woody debris along portions of Kelsey Creek stream bank and adjacent native plantings will create new in-stream habitat, while also providing overwater shade, cover, and allocthonous input of detritus and insects. Therefore, an overall net gain in critical area and critical area buffer functions is proposed.

APPENDIX A

Project Plans



VICINITY MAPS

SHEET INDEX

SHEET	SHEET TITLE
1	EXISTING CONDITIONS & PROJECT AREA
2	INVASIVE WEED REMOVAL PLAN
3	STREAMBANK STABILIZATION PLAN
4	SITE DETAILS
5	SITE DETAILS
6	REVEGETATION PLAN
7	PLANT SPECS & CONSTRUCTION SEQUENCE

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CONTACT:	EARL CADITZ
PHONE:	(206) 947-3396
CLIENT:	CITY OF BELLEVUE
ADDRESS:	450 110TH AVE NE BELLEVUE, WA 98009
CONTACT:	ABE SANTOS, P.E. BELLEVUE UTILITIES/ENGINEERING
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PROJECT CONSULTANT:	THE WATERSHED COMPANY
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CONTACT:	MARK GARFF
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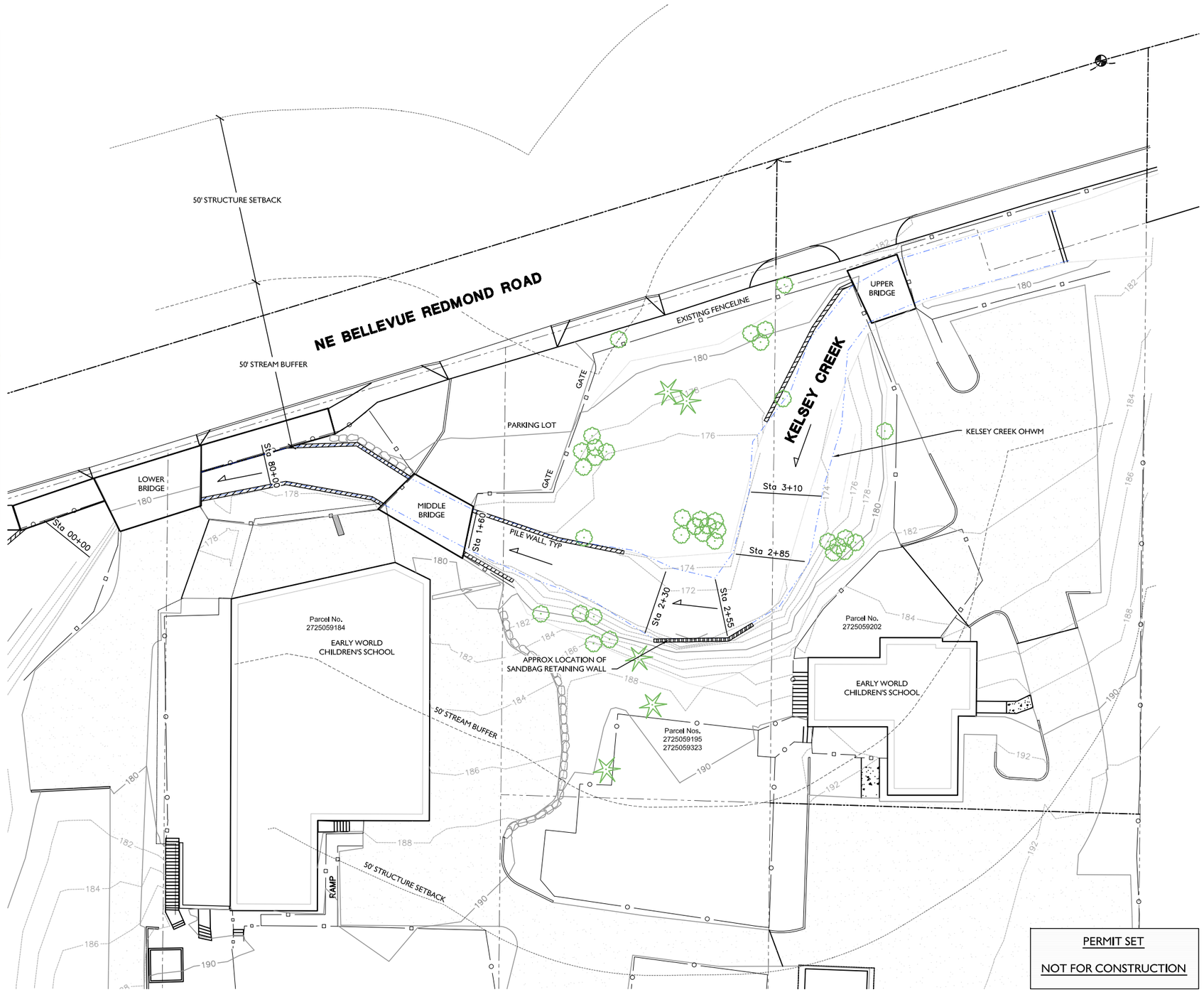
SURVEY CONDUCTED BY CONCEPT ENGINEERS



EXISTING CONDITIONS

SCALE: 1/16" = 1'-0"

0 16' 32' 64'

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Science & Design

KELSEY CREEK RESTORATION

STREAMBANK & HABITAT IMPROVEMENTS
PROJECT PARTNERS: CITY OF BELLEVUE & EARLY WORLD CHILDREN'S SCHOOL
13831 BEL-RED ROAD
BELLEVUE, WA

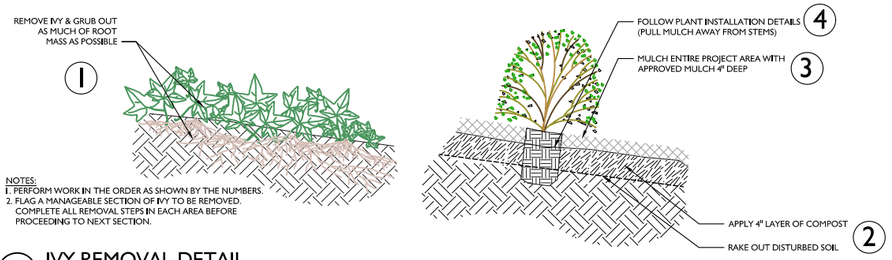
SUBMITTALS & REVISIONS

NO.	DATE	DESCRIPTION	BY
1	2-28-09	DRAFT LAYOUT	MI
2	04-08-09	PRE-APPLICATION MEETING	ZS
3	11-02-09	PERMIT SET	ZS

SHEET SIZE:
ORIGINAL PLAN IS 22" x 34". SCALE ACCORDINGLY.

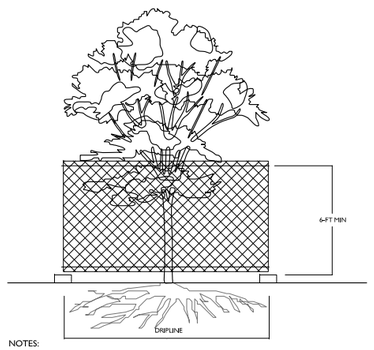
PROJECT MANAGER: MG
DESIGNED: MG/MI/ZS
DRAFTED: ZS
CHECKED: MG/MI/KB
JOB NUMBER: 060926
SHEET NUMBER: 1 OF 7

DATE 10/30/2009 | PRINTED BY MARK GARFF | FILENAME 060926-EARLYWORLD-3-SLIM.DWG



NOTES:
1. PERFORM WORK IN THE ORDER AS SHOWN BY THE NUMBERS.
2. FLAG A MANAGEABLE SECTION OF IVY TO BE REMOVED. COMPLETE ALL REMOVAL STEPS IN EACH AREA BEFORE PROCEEDING TO NEXT SECTION.

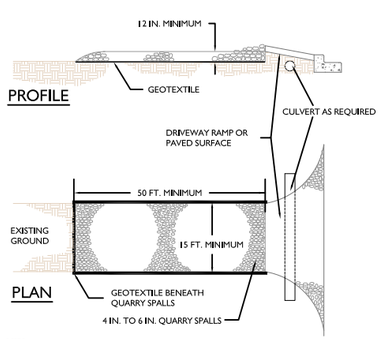
A IVY REMOVAL DETAIL
NTS



NOTES:

1. *6-FT. HIGH TEMPORARY CHAIN LINK FENCE SHALL BE PLACED AT THE DRIPLINE OF THE TREE TO BE SAVED. FENCE SHALL COMPLETELY ENCIRCLE THE TREE(S). INSTALL FENCE POSTS USING PIER BLOCKS ONLY. AVOID DRIVING POSTS OR STAKES INTO MAJOR ROOTS.*
2. *FOR ROOTS OVER 1-IN DIA. THAT ARE DAMAGED DURING CONSTRUCTION, MAKE A CLEAN, STRAIGHT CUT TO REMOVE THE DAMAGED PORTION. ALL EXPOSED ROOTS SHALL BE TEMPORARILY COVERED WITH DAMP BURLAP TO PREVENT DRYING, AND SHALL BE COVERED WITH SOIL AS SOON AS POSSIBLE.*
3. *WORK WITHIN PROTECTION FENCE SHALL BE DONE MANUALLY. NO STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, OR STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE LIMIT OF THE FENCING.*
4. *REPLACE CHAIN-LINK FENCING WITH ORANGE PLASTIC FENCING IF NO HEAVY EQUIPMENT IS TO BE USED ON PROJECT TO MINIMIZE DISTURBANCE.*

B TREE PROTECTION DETAIL
NTS



NOTES:
1. PAD SHALL BE REMOVED AND REPLACED WHEN SOIL IS EVIDENT ON THE SURFACE OF THE PAD OR AS DIRECTED BY THE CITY CLEARING AND GRADING INSPECTOR.
2. PAD SHALL BE INSTALLED IN PLANTING STRIP AS APPROPRIATE.
3. PAD THICKNESS SHALL BE INCREASED IF SOIL CONDITIONS DICTATE OR PER THE DIRECTION OF THE CITY CLEARING AND GRADING INSPECTOR.
4. MINIMUM DIMENSIONS MAY BE MODIFIED AS REQUIRED BY SITE CONDITIONS UPON APPROVAL OF THE CITY CLEARING AND GRADING INSPECTOR.

C CONSTRUCTION ENTRANCE DETAIL
NTS

INVASIVE WEED REMOVAL NOTES

GENERAL:
1. LOCATE ALL UTILITIES AND/OR SIGNIFICANT FEATURES BEFORE REMOVAL.
2. VERIFY WITH LANDSCAPE ARCHITECT NATIVE TREES AND NATIVE SHRUBS TO BE PROTECTED. VEGETATION TO REMAIN SHALL BE CLEARLY FLAGGED.
3. VERTICAL IVY VINES GROWING ON TREES ARE THE FIRST PRIORITY. SEE IVY REMOVAL TECHNIQUES BELOW.
4. THE ROOT SYSTEMS OF ALL INVASIVE WEEDS ON SITE SHALL BE REMOVED, PAYING EXTRA ATTENTION TO THOSE OF BLACKBERRY AND IVY SPECIES AS THEY CAN EASILY RESPROUT FROM ROOT FRAGMENTS.
5. KNOTWEED REMOVAL TECHNIQUES ARE DESCRIBED BELOW.

EROSION CONTROL & SOIL AMMENDMENT:
1. WHILE NOT ON SITE, COVER EXPOSED AREAS WITH PLASTIC TO PREVENT ANY EROSION.
2. AFTER EACH AREA OF IVY & ITS ROOT SYSTEM HAVE BEEN REMOVED, TOPDRESS EXISTING SOIL WITH A 4" MINIMUM LAYER OF COMPOST. IN AREAS SEVERELY COMPACTED DUE TO CONSTRUCTION, ROTOTILL A 6" LAYER INTO EXISTING SOIL.
3. AFTER THE ENTIRE SITE HAS BEEN SUCCESSFULLY CLEARED & AMMENDED WITH COMPOST, IT CAN BE PLANTED PER PLANTING PLAN.
4. MULCH SHOULD BE A MIX OF WEED FREE WOOD CHIPS & SHREDDED HARDWOOD TO BEST CONTROL IVY RE-PROPAGATION AND SLOPE STABILITY. APPLY A 4" DEEP LAYER OVER THE PROJECT AREA.

IVY REMOVAL TECHNIQUES:
VERTICAL VINES
1. CUT THROUGH VINES USING A PRUNING SAW OR SHEARS AT SHOULDER HEIGHT.
2. CUT VINES AGAIN AT BASE OF TREE.
3. REMOVE SECTION FROM TREE USING A PRY BAR OR WEED WRENCH.
4. IT IS IMPORTANT NOT TO WOUND TREE BARK. IT MAY BE NECESSARY TO USE A SMALL PIECE OF WOOD AT CONTACT POINT TO PROTECT TREE BARK.
5. AFTER IVY IS REMOVED FROM TRUNK, CLEAR AN AREA OF AT LEAST 6'-0" ON ALL SIDES OF TREE & REMOVE DEBRIS.

GROUND VINES
1. USE GAS POWERED HEDGE SHEARS TO MAKE A PASS THROUGH MAT OF VEGETATION.
2. CLEAR TOP LAYER OF DEBRIS. IT MAY BE NECESSARY TO MAKE A SECOND PASS TO CUT THROUGH STUBBORN ROOTS/VINES.
3. USE A SPADE /MADDOX/TROWEL TO CUT THROUGH ROOTS IN SOILS & A ROCK RAKE TO SEPARATE DEBRIS FROM SOIL.
4. REMOVE DEBRIS FROM SOIL.
5. IT MAY BE NECESSARY TO MAKE A SECOND PASS.
6. REGRADE SOIL & FOLLOW NOTES FOR SOIL PREPARATION.

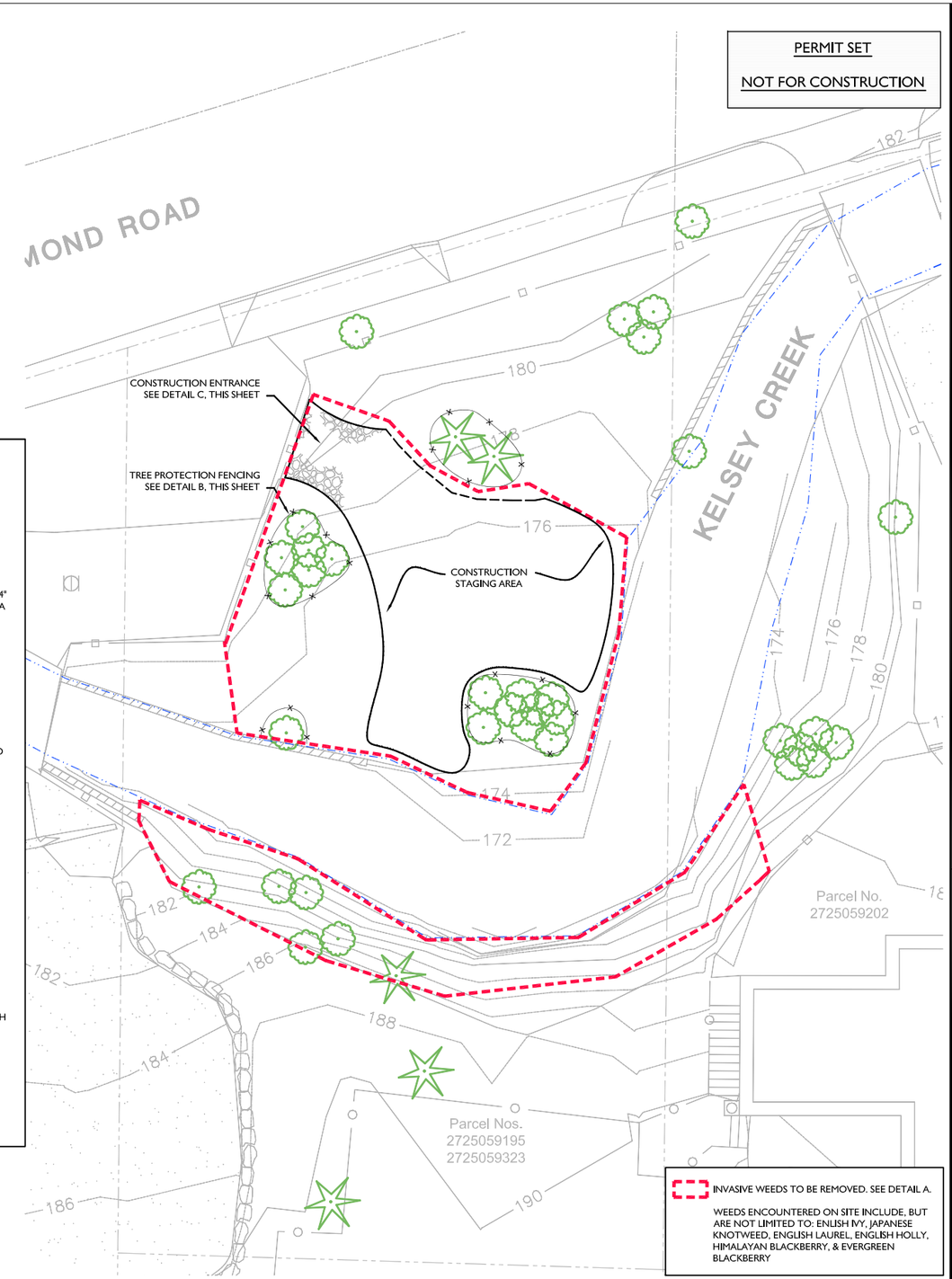
KNOTWEED REMOVAL TECHNIQUES:
* NOTES COMPILED FROM SOUND NATIVE PLANTS.

INVASIVE KNOTWEEDS SPREAD RHIZOMATOUSLY, UP TO 30' FROM THE MOTHER PLANT. MANUAL OR MECHANICAL CONTROL OF KNOTWEEDS WILL NOT WORK.

SERIOUS REMOVAL WILL REQUIRE HERBICIDE APPLICATION. THE MOST EFFECTIVE WAY TO CONTROL KNOTWEED IS TO INJECT 1.5 - 3 ml OF FULL-STRENGTH GLYPHOSPHATE CONCENTRATE DIRECTLY INTO EACH STEM, JUST ABOVE THE SECOND NODE. EACH STEM GREATER THAN $\frac{1}{2}$" IN DIA. MUST BE TREATED VIA INJECTION.

SMALLER CANES MAY BE TREATED WITH A 8% GLYPHOSPHATE SOLUTION APPLIED TO LEAVES WITH A BACKPACK SPRAYER. FOLIAR SPRAY HAS A HIGHER POTENTIAL FOR DRIFT OR RUNOFF AND MAY NOT APPLICABLE AT THIS SITE.

AQUAMASTER™ OR RODEO™ ARE TWO GLYPHOSPHATE FORMULATIONS APPROVED FOR USE NEAR WETLANDS OR STREAMS AND MUST BE APPLIED BY A LICENSED AQUATIC PESTICIDE APPLICATOR



INVASIVE WEED REMOVAL PLAN
SCALE: 1" = 10'-0"

0 10' 20' 40'

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Science & Design

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WORK SEQUENCE

CONSTRUCTION ACTIVITIES WOULD OCCUR IN THE FOLLOWING SEQUENCE:

1) A KEY COMPONENT OF THIS PROJECT IS HORIZONTAL BORING, WHICH REQUIRES AN EXPERIENCED CONTRACTOR AND SPECIALIZED EQUIPMENT. GIVEN THE ANTICIPATED TIME CONSTRAINTS OF THIS PROJECT AND THE PERMIT-ALLOWED TIMING OF IN-WATER WORK, IT IS HIGHLY RECOMMENDED THAT THE BORING CONTRACTOR BE IDENTIFIED AND CONTACTED AS EARLY AS POSSIBLE TO ENSURE THEIR AVAILABILITY DURING THE ALLOWABLE WORK WINDOW.
2) INSTALL ALL TEMPORARY EROSION CONTROL MEASURES, GENERAL AND SITE-SPECIFIC, AS NOTED ON THE PLANS AND SUPPORTING DOCUMENTS OR AS REQUIRED BY VARIOUS PERMITS AND AUTHORIZATIONS.
3) ISOLATE EACH WORK AREA BY CONSTRUCTING A SAND BAG AND PLASTIC BARRIER STARTING UPSTREAM OF AND ON THE SAME BANK AS THE PROPOSED WORK AREA AND ENDING ON THE SAME BANK DOWNSTREAM OF THE WORK AREA. SUCH A BARRIER WOULD FORCE ACTIVE, LOW STREAM FLOW AGAINST THE OPPOSITE BANK FROM THE PROPOSED WORK ACTIVITIES. IF DESIRED, THE WORK AREAS MAY BE DIVIDED INTO SMALLER SUB-AREAS FOR ISOLATION, PROVIDED THAT ALL IN-WATER WORK IS ISOLATED FROM THE ACTIVE FLOW AT THE TIME THE WORK IS UNDERTAKEN AND ALL SEDIMENT-LADEN WATER IS PUMPED TO UPLAND AREAS FOR BIOFILTRATION/INFILTRATION.
4) ANY FISH ISOLATED IN THE WORK AREAS WILL BE REMOVED BY THE STREAM RESTORATION CONSULTANT. GIVEN THE SIZE AND CHARACTERISTICS OF THIS SITE, IT IS EXPECTED THAT STRANDED FISH COULD BE LOCATED AND CAPTURED USING DIPNETS. CAPTURED FISH WOULD BE RELEASED IN UNAFFECTED REACHES UPSTREAM AND DOWNSTREAM OF THE PROJECT AREA.
5) AFTER FISH HAVE BEEN REMOVED FROM THE WORK AREA, ANY SILT-LADEN WATER THAT COLLECTS IN THE WORK AREA MAY BE PUMPED TO A NEARBY VEGETATED UPLAND LOCATION FOR BIOFILTRATION AND INFILTRATION. A SPRINKLER MAY BE USED TO BROADCAST THIS WATER.
6) UNDER THE GUIDANCE OF THE STREAM RESTORATION CONSULTANT, IDENTIFY THE LOCATIONS FOR HORIZONTAL BORING AND THE LOGS THAT WILL BE INSTALLED IN THE COMPLETED BORINGS. BORINGS SHALL BE SIZED TO MATCH THE SIZE OF THE LOGS AS CLOSELY AS POSSIBLE. EACH LOG SHALL BE PLACED IN ITS BORED HOLE AS SOON AS POSSIBLE AFTER THE BORING IS COMPLETE. CLOSE COORDINATION WITH THE BORING CONTRACTOR WILL BE NECESSARY.
7) UNDER THE GUIDANCE OF THE STREAM RESTORATION CONSULTANT, INSTALL, AND ANCHOR WHERE INDICATED, THE IN-STREAM LOG HABITAT FEATURES IN THE STREAM CHANNEL. MODIFY OR REMOVE SHORT SECTIONS OF FILTER FENCING AS NECESSARY TO ALLOW LOG STRUCTURE PLACEMENT. TYPICALLY, THE LOWER LOGS OF A LOG STRUCTURE ARE TO BE AT LEAST HALF SUBMERGED AT LOW STREAM FLOW, SUBJECT TO MODIFICATION AS SPECIFICALLY DIRECTED BY THE STREAM RESTORATION CONSULTANT.
8) LARGE ANGULAR ROCK FROM PREVIOUS BANK STABILIZATION EFFORTS WILL NEED TO BE MOVED TO INSTALL THE LOG HABITAT FEATURES. SUCH ROCK SHALL BE RE-USED IN AND AROUND THE INSTALLED LOGS AT THE DIRECTION OF THE STREAM RESTORATION CONSULTANT.
9) AFTER THE LOG STRUCTURES ARE IN PLACE, IN THOSE AREAS SPECIFIED, INSTALL BIO-D BLOCK (OR EQUIVALENT) MATERIAL PER MANUFACTURER'S SPECIFICATIONS [ROLANKA INTERNATIONAL, (800) 760-3215]. FILL BIO-D BLOCK WITH APPROVED TOPSOIL AND INSTALL CUTTINGS AS SHOWN IN APPROPRIATE DETAIL. WITH THE APPROVAL OF THE STREAM RESTORATION CONSULTANT, NATIVE TOPSOIL MAY BE USED, AMENDED AS NEEDED.
10) BOULDERS WILL BE PLACED IN THE STREAM CHANNEL WHERE INDICATED AT THE DIRECTION OF THE STREAM RESTORATION CONSULTANT.
11) IMMEDIATELY FOLLOWING TOPSOIL PLACEMENT AND/OR VERIFICATION, STABILIZE ALL EXPOSED SOILS BY HYDROSEEDING OR HAND-SOWING THE SPECIFIED GRASS SEED MIXTURE AND MULCHING WITH STRAW.
12) REMOVE SILT FENCING BY THE LATEST DATE ALLOWED BY THE HYDRAULIC PROJECT APPROVAL OR OTHER STATE OR FEDERAL APPROVALS FOR IN-STREAM WORK.
13) PRIOR TO PLANTING TREES AND SHRUBS IN THE GRADED, OTHERWISE DISTURBED, AND/OR TO-BE-REPLANTED AREAS AS SPECIFIED BY THE PLANTING PLAN, REMOVE ALL INVASIVE WEEDS AND THEIR ATTACHED ROOTS/RHIZOMES WITHIN THE PLANTING AREAS BY HAND DIGGING. TAKE CARE TO AVOID DAMAGE TO NATIVE TREES AND SHRUBS AND THEIR ROOT SYSTEMS.
14) REVEGETATE THE SPECIFIED PLANTING AREAS ACCORDING TO THE REVEGETATION PLANS DURING THE FIRST DORMANT SEASON (OCTOBER THROUGH MARCH) FOLLOWING LOG STRUCTURE PLACEMENT FOR BARE ROOT PLANTINGS:
    a) LAY OUT EACH PLANTING AREA BY FLAGGING THE LOCATIONS OF EACH TREE AND LARGE SHRUB PRIOR TO INSTALLATION.
    b) PREPARE THE PLANTING PITS AND INSTALL THE PLANTS PER THE PLANTING DETAIL SPECIFICATIONS.
    c) MULCH EACH TREE AND SHRUB AS SHOWN IN THE DETAILS (4 INCHES OF WOOD CHIP MULCH).
    d) FERTILIZE EACH TREE AND SHRUB AFTER IT HAS HAD A YEAR OF GROWTH.
14) MULCH AS NECESSARY TO REPAIR AREAS DISTURBED FOLLOWING PLANT PLACEMENT.
15) DESIGN AND INSTALL THE TEMPORARY IRRIGATION SYSTEM. OPERATE THE SYSTEM DURING SUMMER GROWING SEASON (MARCH 15TH - OCTOBER 1ST). SYSTEM SHOULD BE CAPABLE AND SET TO DELIVER ONE INCH OF WATER PER WEEK TO ALL PLANTED AREAS.

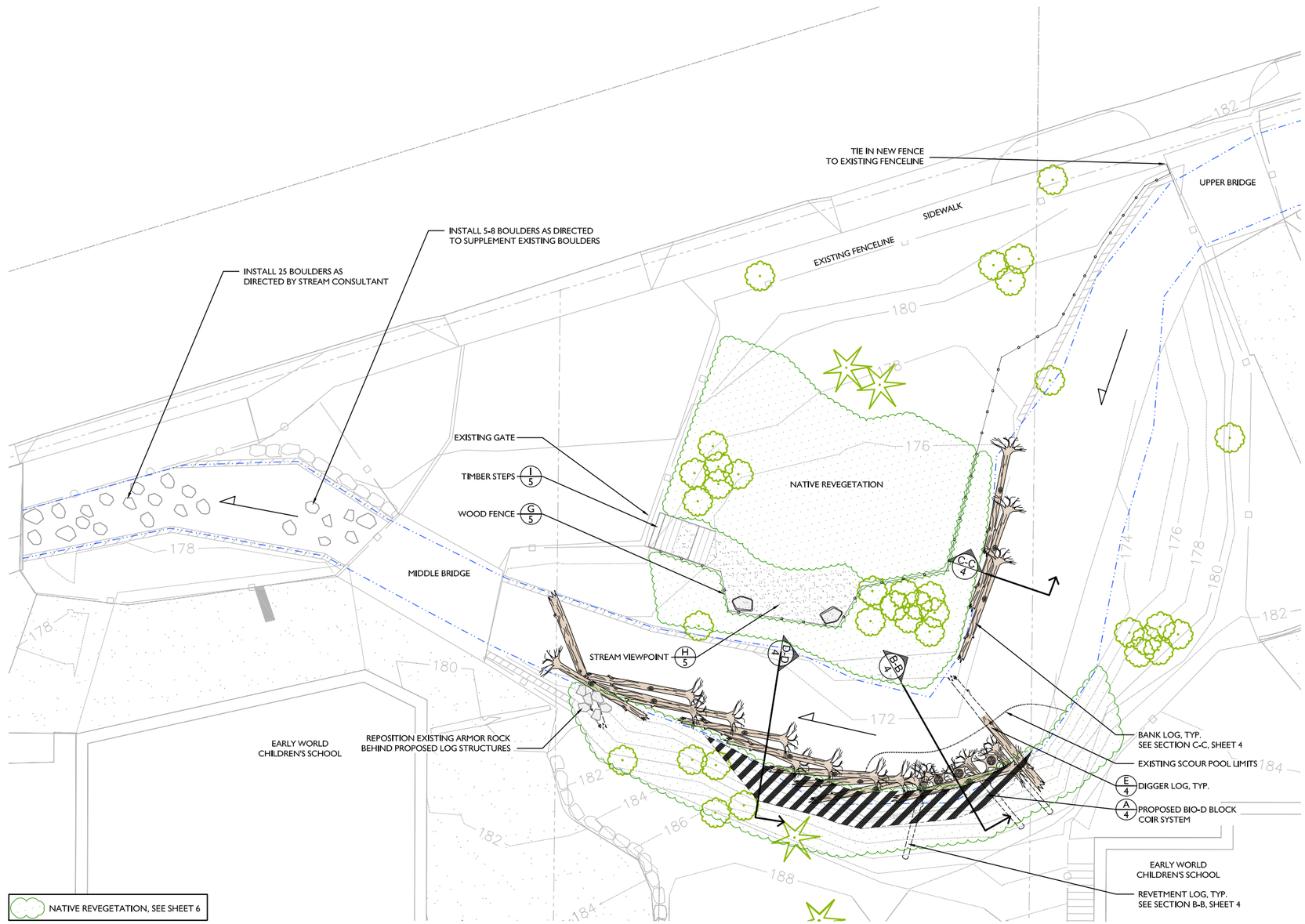
LOG QUANTITIES

TYPE	COUNT
REVETMENT	3
DIGGER	2
BANK	14
ROOTWAD	3
TOTAL	22

SEE SHEET 7 FOR ALL CONSTRUCTION SPECIFICATIONS INCLUDING LOG STRUCTURES

PERMIT SET

NOT FOR CONSTRUCTION



STREAMBANK STABILIZATION PLAN

SCALE: 1" = 10'-0"

0 10' 20' 40'

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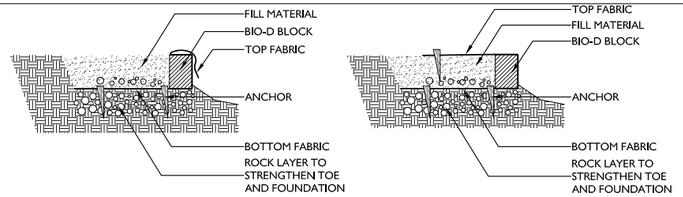
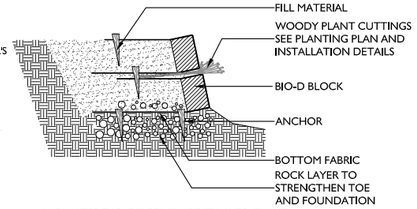


1. BEFORE INSTALLATION, CLEAN AND GRADE BASE OF STREAMBANK. STRENGTHEN TOE AND FOUNDATION USING ROCKS IF NECESSARY. PLACE UNIT ON LEVEL SURFACE, KEEPING FEMALE END TOWARDS DIRECTION OF EXTENDING, AND SPREAD THE BOTTOM FABRIC. ANCHOR DOWN BOTTOM FABRIC AND FILL WITH SOIL TO HEIGHT OF UNIT.

2. COVER THE FILL MATERIAL WITH TOP FABRIC AND ANCHOR IT.

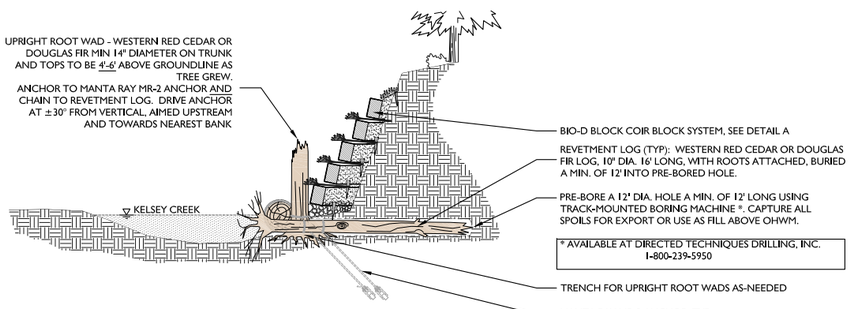
NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
2. DO NOT SCALE DRAWINGS.
3. FABRIC EXTENDING BEYOND FIBER BLOCK AT FEMALE END PROVIDES STRUCTURAL SUPPORT FOR INSERTED MALE END.
4. CONTRACTORS NOTE: FOR PRODUCT AND COMPANY INFORMATION VISIT WWW.CADDETAILS.COM/INFO. REFERENCE NUMBER 084-009.

BIO-D BLOCK MANUFACTURER:
ROLANKA INTERNATIONAL INC.
155 ANDREW DRIVE
STOCKBRIDGE, GEORGIA 30281
PHONE: (770) 506 - 8211
FAX: (770) 506 - 0391
www.rolanka.com



3. IF WATER TABLE IS BELOW FIRST LAYER, PLANT WOODY PLANT CUTTINGS ON THE BIO-D BLOCK. REPEAT EARLIER PROCEDURE AND INSTALL ANOTHER LAYER OF BIO-D BLOCK.

A BIO-D BLOCK COIR BLOCK SYSTEM DETAIL
NTS



* AVAILABLE AT DIRECTED TECHNIQUES DRILLING, INC. 1-800-239-5950

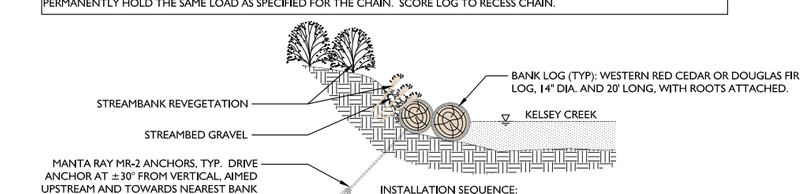
NOTES:
CHAIN REVETMENT LOGS AND ROOTWADS TO MANTA RAY MR-2 ANCHORS 7' MIN. INTO GROUND AND LOAD TESTED TO A MINUM 5,000 LBS USING 5/16"Ø MIN. GRADE 40 GALV. STEEL CHAIN MAKING TWO COMPLETE WRAPS AROUND LOGS. SECURE W/ SHACKLES OR OTHER APPROVED CONNECTION DEVICE RATED TO PERMANENTLY HOLD THE SAME LOAD AS SPECIFIED FOR THE ANCHOR. SCORE ROOT WAD/LOGS TO RECESS CHAIN.

CHAIN LOGS & ROOTWADS TOGETHER WHERE THEY CROSS OR ARE NEARLY PARALLEL USING 5/16"Ø MIN. GRADE 40 GALV. STEEL CHAIN MAKING TWO COMPLETE WRAPS AROUND LOGS IN A FIGURE 8 PATTERN. SECURE W/ SHACKLES OR OTHER APPROVED CONNECTION DEVICE RATED TO PERMANENTLY HOLD THE SAME LOAD AS SPECIFIED FOR THE CHAIN. SCORE ROOTWAD/LOG TO RECESS CHAIN.

B-B REVETMENT LOG CROSS SECTION
NTS

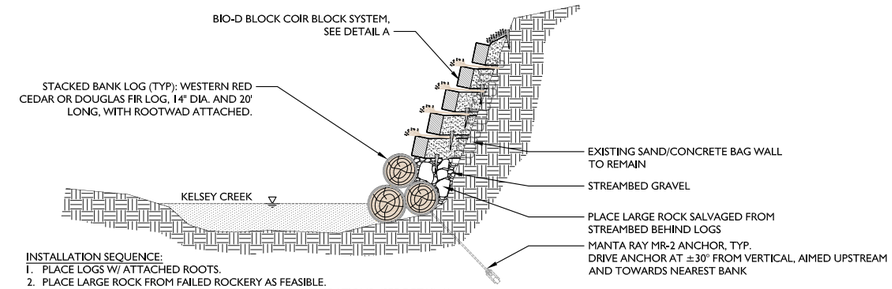
NOTES:
CHAIN BANK LOGS TO MANTA RAY MR-2 ANCHORS 7' MIN. INTO GROUND AND LOAD TESTED TO A MINUM 5,000 LBS USING 5/16"Ø MIN. GRADE 40 GALV. STEEL CHAIN MAKING TWO COMPLETE WRAPS AROUND LOGS. SECURE W/ SHACKLES OR OTHER APPROVED CONNECTION DEVICE RATED TO PERMANENTLY HOLD THE SAME LOAD AS SPECIFIED FOR THE ANCHOR. SCORE LOGS TO RECESS CHAIN. EACH LOG TO BE ATTACHED TO 2 ANCHORS MIN.

CHAIN EACH BANKLOG TO TWO OTHER BANK LOGS USING 5/16"Ø MIN. GRADE 40 GALV. STEEL CHAIN MAKING TWO COMPLETE WRAPS AROUND LOGS IN A FIGURE 8 PATTERN. SECURE W/ SHACKLES OR OTHER APPROVED CONNECTION DEVICE RATED TO PERMANENTLY HOLD THE SAME LOAD AS SPECIFIED FOR THE CHAIN. SCORE LOG TO RECESS CHAIN.



INSTALLATION SEQUENCE:
1. PLACE LOGS W/ ATTACHED ROOTS (SEE SPECIFICATIONS)
2. PLACE STREAMBANK GRAVEL BACKFILL.
3. PLANT CUTTINGS AND SHRUBS.
(SEE PLANT INSTALLATION DETAILS, SHEET 7)

C-C BANKLOG CROSS SECTION
NTS



INSTALLATION SEQUENCE:
1. PLACE LOGS W/ ATTACHED ROOTS.
2. PLACE LARGE ROCK FROM FAILED ROCKERY AS FEASIBLE.
3. INSTALL BIO-D BLOCK PER MANUFACTURER RECOMMENDATIONS. (SEE DETAIL A)
4. PLANT CUTTINGS AND SHRUBS.

NOTES:
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D-D STACKED BANKLOG CROSS SECTION
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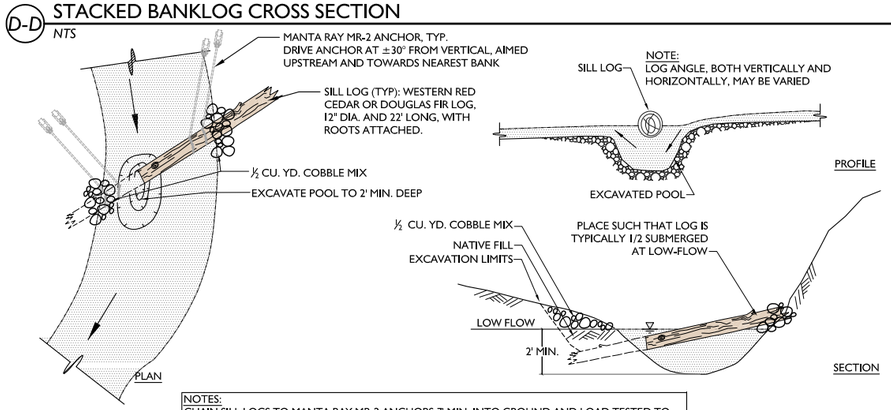

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E DIGGER LOG DETAIL
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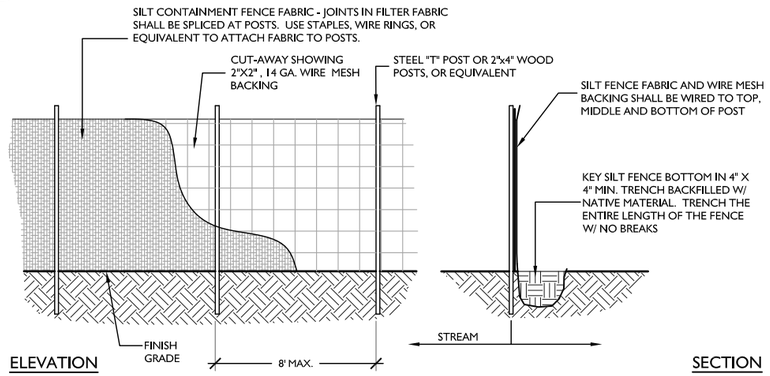

PERMIT SET

NOT FOR CONSTRUCTION

SILT FENCE MAINTENANCE STANDARDS:
1. ANY DAMAGE SHALL BE REPAIRED IMMEDIATELY.
2. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATION EXCEEDS 6" IN DEPTH.

F SILT FENCE DETAIL
NTS

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4 OF 7

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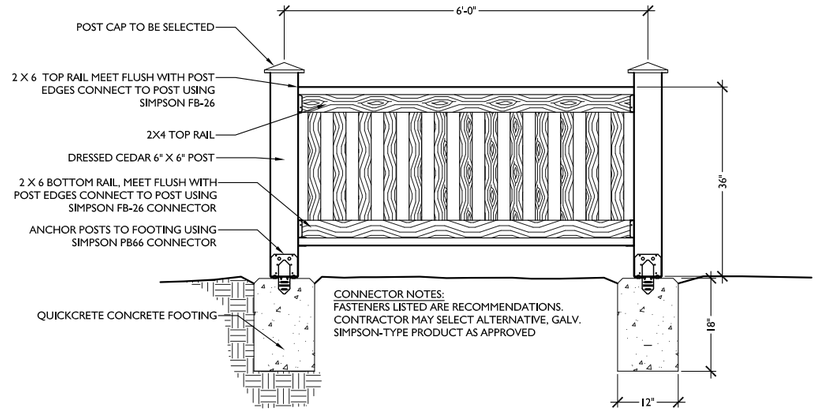

G WOOD PICKET FENCE DETAIL
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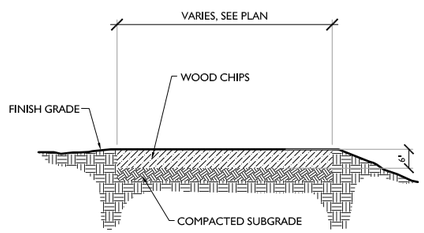

H STREAM VIEWPOINT DETAIL
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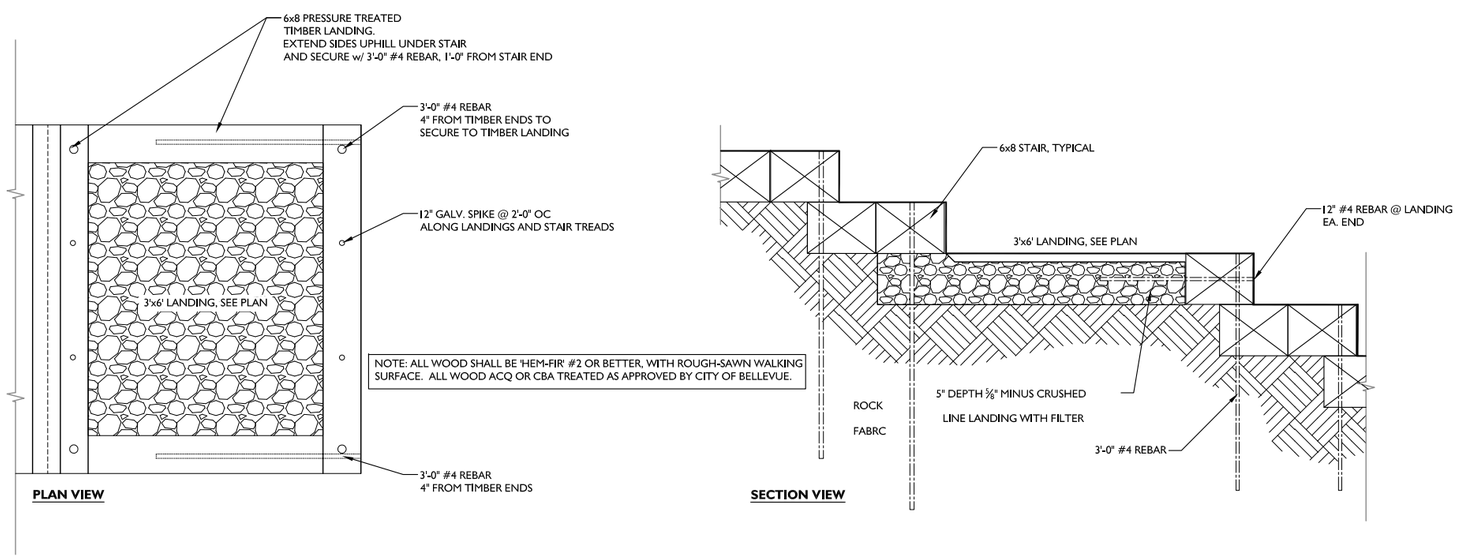

I TIMBER STEPS DETAIL
NTS

PERMIT SET

NOT FOR CONSTRUCTION

THE WATERSHED COMPANY
750 Sixth Street South
Kirkland WA 98033
p 425.822.5242 f 425.827.8136
www.watershedco.com
Science & Design

KELSEY CREEK RESTORATION

STREAMBANK & HABITAT IMPROVEMENTS
PROJECT PARTNERS: CITY OF BELLEVUE & EARLY WORLD CHILDREN'S SCHOOL
13831 BEL-RED ROAD
BELLEVUE, WA

SUBMITTALS & REVISIONS

NO.	DATE	DESCRIPTION	BY
1	2-28-09	DRAFT LAYOUT	MI
2	04-08-09	PRE-APPLICATION MEETING	ZS
3	11-02-09	PERMIT SET	ZS

SHEET SIZE:
ORIGINAL PLAN IS 22" x 34" .
SCALE ACCORDINGLY.

PROJECT MANAGER: MG
DESIGNED: MG/MI/ZS
DRAFTED: ZS
CHECKED: MG/MI/KB
JOB NUMBER:
060926

SHEET NUMBER:
5 OF 7

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PLANTING LEGEND

	SCIENTIFIC / COMMON NAME	QTY	SIZE / NOTES
	***TREES** - ALL TREES TO BE FULL, WELL-BRANCHED & HEALTHY*		
AC	ACER CIRCINATUM VINE MAPLE	6	5 GAL / MULTI-TRUNKED
BP	BETULA PAPYRIFERA PAPER BIRCH	4	5 GAL
CC	CORYLUS CORNUTA BEAKED HAZELNUT	19	5 GAL
PM	PSUEDOTSUGA MENZEISII DOUGLAS-FIR	3	5 GAL
TP	THUJA PLICATA WESTERN RED CEDAR	2	5 GAL
	***SHRUBS** - ALL SHRUBS TO BE VIGOROUS & HEALTHY*		
cs	CORNUS SERICEA REDTWIG DOGWOOD	23	2 GAL
g	GAULTHERIA SHALLON SALAL	59	2 GAL
ma	MAHONIA AQUIFOLIUM TALL OREGON GRAPE	7	2 GAL
oc	OEMLARIA CERASIFORMIS OSOBERRY	5	2 GAL
rw	ROSA WOODSII WOOD'S ROSE	6	2 GAL
sa	SYMPHORICARPOS ALBUS SNOWBERRY	23	2 GAL
vo	VACCINIM OVATUM EVERGREEEN HUCKLEBERRY	5	2 GAL
	PERENNIALS & GROUNDCOVERS		
	ATHYRIUM FILIX-FEMINA LADY FERN	48	1 GAL @ 18" OC
	BLECHNUM SPICANT DEER FERN	72	1 GAL @ 18" OC
	POLYSTICHUM MUNITUM SWORD FERN	60	1 GAL @ 24" OC
	BIO-D BLOCK SLOPE STABILIZATION AREA AREA TO BE PLANTED WITH REDTWIG DOGWOOD (*CORNUS SERICEA*) FASCINE BUNDLES. CUTTINGS SHALL BE INSTALLED PER BIO-D BLOCK INSTALLATION SPECIFICATION. DETAIL A, SHEET 4		
	CORNUS SERICEA FASCINE BUNDLES	350	½" - ¾" MIN DIA 36' IN LENGTH 12 - 18 BRANCHES PER BUNDLE

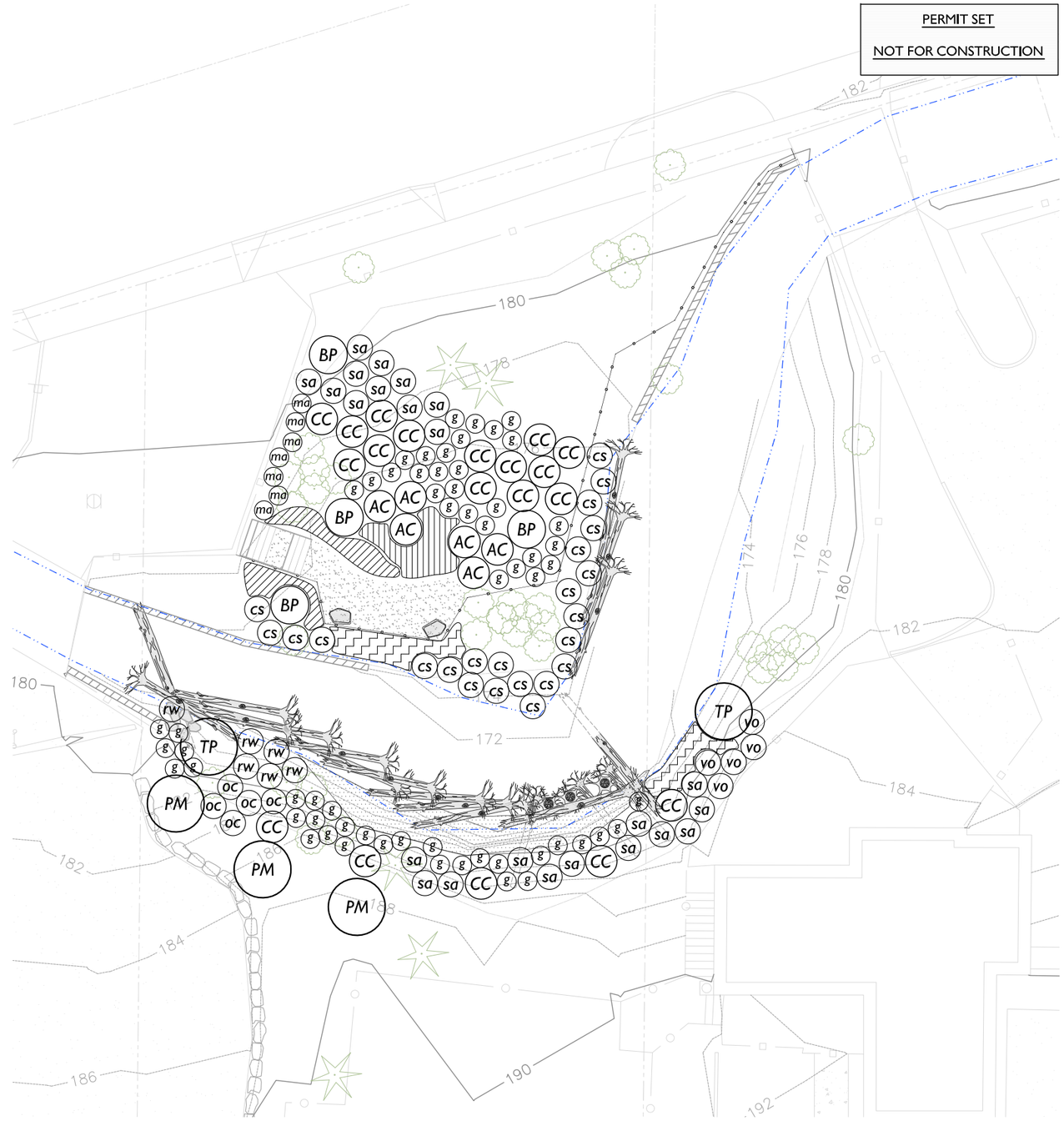
PLANTING NOTES

1. Native plant installation shall occur between October 15th and December 15th during frost-free periods only.
2. Locate all existing utilities within the limit of work. The contractor is responsible for any utility damage as a result of the landscape construction.
3. Remove any and all invasive weeds and their roots from the planting area. Species targeted for removal include Himalayan blackberry, Evergreen blackberry, English holly, English ivy, Scot's broom, Japanese knotweed, English laurel, and morning glory. See sheet 2 for specific removal notes on heavily present weeds on site.
4. Upon satisfactory completion of weed & root removal, soil shall be top-dressed with 4" of compost. In areas severely compacted by construction, a 6" layer of compost shall be rototilled into existing subsoil.
5. Loosen any compacted soils in the planting area.
6. Layout plant material per plan for inspection by the Landscape Architect. Plant substitutions will NOT be allowed without the approval of the Landscape Architect.
7. Where groundcover or perennials meet with proposed trees, the area shall be underplanted. Adjust planting to avoid tree roots.
8. Install plants per planting details. See next sheet for planting details, installation specifications, and construction sequence.
9. Water each plant thoroughly to remove air pockets.
10. Install a 4" depth, coarse wood-chip mulch throughout the entire planting area.
11. Install a temporary irrigation system capable of delivering 2" of water per week to the entire planted area. Maintain irrigation system in working condition for two (2) summers after initial plant installation.
12. One year after initial plant installation, apply organic, slow-release fertilizer such as Osmocote or Perfect Blend 4-4-4 to each plant **outside of Kelsey Creek OHWM mark only.**

The landscape contractor shall maintain all plant material until final inspection and approval by the Owner or Owner's representative. All plantings and workmanship shall be guaranteed for one year following final owner acceptance

PERMIT SET

NOT FOR CONSTRUCTION



REVEGETATION PLAN

SCALE: 1" = 10'-0"

0 10' 20' 40'

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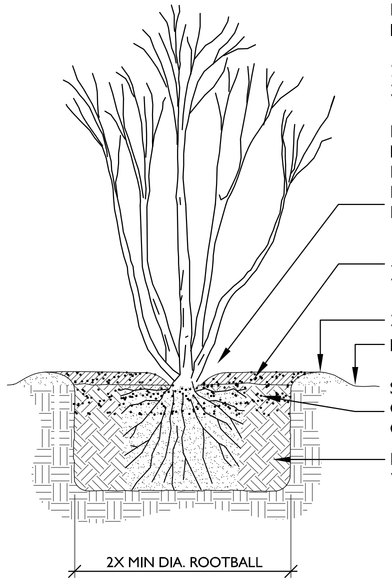
JOB NUMBER: 060926
SHEET NUMBER: 6 OF 7

DATE: 10/30/2009
PRINTED BY: MARK GARFF
FILENAME: 060926-EARLYWORLD-3-SUM.DWG

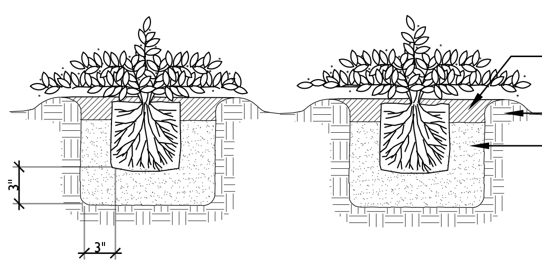
NOTES:
1. PLANTING PIT SHALL NOT BE LESS THAN (2) TIMES THE WIDTH OF THE ROOT BALL DIA.
2. LOOSEN SIDES AND BOTTOMS OF PLANTING PIT
3. SOAK PLANTING PIT AFTER PLANTING



(A) TREE & SHRUB PLANTING DETAIL

NTS

NOTES:
1. PLANT GROUNDCOVER AT SPECIFIED DISTANCE ON-CENTER (O.C.) USING TRIANGULAR SPACING, TYP.
2. LOOSEN SIDES AND BOTTOM OF PLANTING PIT AND REMOVE DEBRIS
3. LOOSEN ROOTBOUND PLANTS BEFORE INSTALLING
4. SOAK PIT BEFORE AND AFTER INSTALLING PLANT



(B) GROUNDCOVER & PERENNIAL PLANTING DETAIL

NTS

PLANT INSTALLATION SPECIFICATIONS

NOTE: THESE SPECIFICATIONS ARE A LEGALLY BINDING CONTRACT

GENERAL NOTES

QUALITY ASSURANCE
1. PLANTS SHALL MEET OR EXCEED THE SPECIFICATIONS OF FEDERAL, STATE, AND LOCAL LAWS REQUIRING INSPECTION FOR PLANT DISEASE AND INSECT CONTROL.
2. PLANTS SHALL BE HEALTHY, VIGOROUS, AND WELL-FORMED, WITH WELL DEVELOPED, FIBROUS ROOT SYSTEMS, FREE FROM DEAD BRANCHES OR ROOTS. PLANTS SHALL BE FREE FROM DAMAGE CAUSED BY TEMPERATURE EXTREMES, LACK OR EXCESS OF MOISTURE, INSECTS, DISEASE, AND MECHANICAL INJURY. PLANTS IN LEAF SHALL BE WELL FOLIATED AND OF GOOD COLOR. PLANTS SHALL BE HABITUATED TO THE OUTDOOR ENVIRONMENTAL CONDITIONS INTO WHICH THEY WILL BE PLANTED (HARDENED-OFF).
3. TREES WITH DAMAGED, CROOKED, MULTIPLE OR BROKEN LEADERS WILL BE REJECTED. WOODY PLANTS WITH ABRASIONS OF THE BARK OR SUNSCALD WILL BE REJECTED.

DEFINITIONS
1. PLANTS/PLANT MATERIALS. PLANTS AND PLANT MATERIALS SHALL INCLUDE ANY LIVE PLANT MATERIAL USED ON THE PROJECT. THIS INCLUDES BUT IS NOT LIMITED TO CONTAINER GROWN, B&B OR BAREROOT PLANTS; LIVE STAKES AND FASCINES (WATTLES); TUBERS, CORMS, BULBS, ETC.; SPRIGS, PLUGS, AND LINERS.
2. CONTAINER GROWN. CONTAINER GROWN PLANTS ARE THOSE WHOSE ROOTBALLS ARE ENCLOSED IN A POT OR BAG IN WHICH THAT PLANT GREW.

SUBSTITUTIONS
1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN SPECIFIED MATERIALS IN ADVANCE IF SPECIAL GROWING, MARKETING OR OTHER ARRANGEMENTS MUST BE MADE IN ORDER TO SUPPLY SPECIFIED MATERIALS.
2. SUBSTITUTION OF PLANT MATERIALS NOT ON THE PROJECT LIST WILL NOT BE PERMITTED UNLESS AUTHORIZED IN WRITING BY THE LANDSCAPE ARCHITECT / CONSULTANT.
3. IF PROOF IS SUBMITTED THAT ANY PLANT MATERIAL SPECIFIED IS NOT OBTAINABLE, A PROPOSAL WILL BE CONSIDERED FOR USE OF THE NEAREST EQUIVALENT SIZE OR ALTERNATIVE SPECIES, WITH CORRESPONDING ADJUSTMENT OF CONTRACT PRICE.
4. SUCH PROOF WILL BE SUBSTANTIATED AND SUBMITTED IN WRITING TO THE CONSULTANT AT LEAST 30 DAYS PRIOR TO START OF WORK UNDER THIS SECTION.

INSPECTION
1. PLANTS SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE CONSULTANT FOR CONFORMANCE TO SPECIFICATIONS, EITHER AT TIME OF DELIVERY ON-SITE OR AT THE GROWER'S NURSERY. APPROVAL OF PLANT MATERIALS AT ANY TIME SHALL NOT IMPAIR THE SUBSEQUENT RIGHT OF INSPECTION AND REJECTION DURING PROGRESS OF THE WORK.
2. PLANTS INSPECTED ON SITE AND REJECTED FOR NOT MEETING SPECIFICATIONS MUST BE REMOVED IMMEDIATELY FROM SITE OR RED-TAGGED AND REMOVED AS SOON AS POSSIBLE.
3. THE CONSULTANT MAY ELECT TO INSPECT PLANT MATERIALS AT THE PLACE OF GROWTH. AFTER INSPECTION AND ACCEPTANCE, THE CONSULTANT MAY REQUIRE THE INSPECTED PLANTS BE LABELED AND RESERVED FOR PROJECT. SUBSTITUTION OF THESE PLANTS WITH OTHER INDIVIDUALS, EVEN OF THE SAME SPECIES AND SIZE, IS UNACCEPTABLE.

MEASUREMENTS OF PLANTS
1. PLANTS SHALL CONFORM TO SIZES SPECIFIED UNLESS SUBSTITUTIONS ARE MADE AS OUTLINED IN THIS CONTRACT.
2. HEIGHT AND SPREAD DIMENSIONS SPECIFIED REFER TO MAIN BODY OF PLANT AND NOT BRANCH OR ROOT TIP TO TIP. PLANT DIMENSIONS SHALL BE MEASURED WHEN THEIR BRANCHES OR ROOTS ARE IN THEIR NORMAL POSITION.
3. WHERE A RANGE OF SIZE IS GIVEN, NO PLANT SHALL BE LESS THAN THE MINIMUM SIZE AND AT LEAST 50% OF THE PLANTS SHALL BE AS LARGE AS THE MEDIAN OF THE SIZE RANGE. (EXAMPLE: IF THE SIZE RANGE IS 12" TO 18", AT LEAST 50% OF PLANTS MUST BE 15" TALL.)

SUBMITTALS

PROPOSED PLANT SOURCES
1. WITHIN 45 DAYS AFTER AWARD OF THE CONTRACT, SUBMIT A COMPLETE LIST OF PLANT MATERIALS PROPOSED TO BE PROVIDED DEMONSTRATING CONFORMANCE WITH THE REQUIREMENTS SPECIFIED. INCLUDE THE NAMES AND ADDRESSES OF ALL GROWERS AND NURSERIES.

PRODUCT CERTIFICATES
1. PLANT MATERIALS LIST - SUBMIT DOCUMENTATION TO CONSULTANT AT LEAST 30 DAYS PRIOR TO START OF WORK UNDER THIS SECTION THAT PLANT MATERIALS HAVE BEEN ORDERED. ARRANGE PROCEDURE FOR INSPECTION OF PLANT MATERIAL WITH CONSULTANT AT TIME OF SUBMISSION.
2. HAVE COPIES OF VENDOR'S OR GROWERS' INVOICES OR PACKING SLIPS FOR ALL PLANTS ON SITE DURING INSTALLATION. INVOICE OR PACKING SLIP SHOULD LIST SPECIES BY SCIENTIFIC NAME, QUANTITY, AND DATE DELIVERED (AND GENETIC ORIGIN IF THAT INFORMATION WAS PREVIOUSLY REQUESTED).

DELIVERY, HANDLING, & STORAGE

NOTIFICATION
1. CONTRACTOR MUST NOTIFY CONSULTANT 48 HOURS OR MORE IN ADVANCE OF DELIVERIES SO THAT CONSULTANT MAY ARRANGE FOR INSPECTION.

PLANT MATERIALS
1. TRANSPORTATION - DURING SHIPPING, PLANTS SHALL BE PACKED TO PROVIDE PROTECTION AGAINST CLIMATE EXTREMES, BREAKAGE AND DRYING. PROPER VENTILATION AND PREVENTION OF DAMAGE TO BARK, BRANCHES, AND ROOT SYSTEMS MUST BE ENSURED.
2. SCHEDULING AND STORAGE - PLANTS SHALL BE DELIVERED AS CLOSE TO PLANTING AS POSSIBLE. PLANTS IN STORAGE MUST BE PROTECTED AGAINST ANY CONDITION THAT IS DETRIMENTAL TO THEIR CONTINUED HEALTH AND VIGOR.
3. HANDLING - PLANT MATERIALS SHALL NOT BE HANDLED BY THE TRUNK, LIMBS, OR FOLIAGE BUT ONLY BY THE CONTAINER, BALL, BOX, OR OTHER PROTECTIVE STRUCTURE, EXCEPT BAREROOT PLANTS SHALL BE KEPT IN BUNDLES UNTIL PLANTING AND THEN HANDLED CAREFULLY BY THE TRUNK OR STEM.
4. LABELS - PLANTS SHALL HAVE DURABLE, LEGIBLE LABELS STATING CORRECT SCIENTIFIC NAME AND SIZE. TEN PERCENT OF CONTAINER GROWN PLANTS IN INDIVIDUAL POTS SHALL BE LABELED. PLANTS SUPPLIED IN FLATS, RACKS, BOXES, BAGS, OR BUNDLES SHALL HAVE ONE LABEL PER GROUP.

WARRANTY

PLANT WARRANTY
1. PLANTS MUST BE GUARANTEED TO BE TRUE TO SCIENTIFIC NAME AND SPECIFIED SIZE, AND TO BE HEALTHY AND CAPABLE OF VIGOROUS GROWTH.

REPLACEMENT
1. PLANTS NOT FOUND MEETING ALL OF THE REQUIRED CONDITIONS MUST BE REMOVED FROM SITE AND REPLACED IMMEDIATELY AT THE CONSULTANT'S DISCRETION.
2. PLANTS NOT SURVIVING AFTER ONE YEAR TO BE REPLACED AT THE CONTRACTOR'S EXPENSE.

PLANT MATERIAL

GENERAL
1. PLANTS SHALL BE NURSERY GROWN IN ACCORDANCE WITH GOOD HORTICULTURAL PRACTICES UNDER CLIMATIC CONDITIONS SIMILAR TO OR MORE SEVERE THAN THOSE OF THE PROJECT SITE.
2. PLANTS SHALL BE TRUE TO SPECIES AND VARIETY OR SUBSPECIES. NO CULTIVARS OR NAMED VARIETIES SHALL BE USED UNLESS SPECIFIED AS SUCH.

QUANTITIES
SEE PLANT LIST ON ACCOMPANYING PLANS.

ROOT TREATMENT
1. CONTAINER GROWN PLANTS (INCLUDES PLUGS): PLANT ROOT BALLS MUST HOLD TOGETHER WHEN THE PLANT IS REMOVED FROM THE POT, EXCEPT THAT A SMALL AMOUNT OF LOOSE SOIL MAY BE ON THE TOP OF THE ROOTBALL.
2. PLANTS MUST NOT BE ROOT-BOUND; THERE MUST BE NO CIRCLING ROOTS PRESENT IN ANY PLANT INSPECTED.
3. ROOTBALLS THAT HAVE CRACKED OR BROKEN WHEN REMOVED FROM THE CONTAINER SHALL BE REJECTED.

CONSTRUCTION SPECIFICATIONS

1) **STREAM RESTORATION CONSULTANT:** REPRESENTATIVE FROM THE WATERSHED COMPANY (425) 822-5242, OR OTHER QUALIFIED ENVIRONMENTAL CONSULTING FIRM FAMILIAR WITH THESE PLANS.
2) **LOGS:**
   a) ROOT WADS: ROOT WADS SHOULD BE SOUND, NATIVE CEDAR OR FIR, SUPPLIED WITH ATTACHED TRUNKS 4 TO 6 FEET IN LENGTH ABOVE THE GROUND LINE AS THE TREE GREW AND A MINIMUM OF 14 INCHES IN DIAMETER AT THE SMALLEST POINT. ROOT MASSES SHOULD BE FULL AND DENSE TO A MINIMUM OF 4 FEET IN DIAMETER. ANCHOR TO ONE MANTA RAY ANCHOR AND CHAIN TO A REVETMENT LOG.
   b) REVETMENT LOGS: REVETMENT LOGS SHOULD BE SOUND, NATIVE CEDAR OR FIR, A MINIMUM OF 14 FEET IN LENGTH, AND 12 INCHES IN DIAMETER AT THE SMALLER END. ATTACHED ROOT WADS ARE TO BE FULL AND DENSE TO A MINIMUM OF 6 FEET IN DIAMETER. EACH REVETMENT LOG SHALL HAVE MIN. 8' BURIED INTO BANK IN PRE-BORED HOLE. ANCHOR WITH ONE MANTA RAY ANCHOR.
   c) BANK LOG: BANK LOGS SHOULD BE SOUND, NATIVE CEDAR OR FIR, A MINIMUM OF 20 FEET IN LENGTH, AND 14 INCHES IN DIAMETER AT THE SMALLER END. ATTACHED ROOT WADS ARE TO BE FULL AND DENSE TO A MINIMUM OF 4 FEET IN DIAMETER. ANCHOR WITH TWO MANTA RAY ANCHORS PER LOG AND ATTACH EACH LOG TO AT LEAST TWO OTHER LOGS.
   d) DIGGER LOGS: DIGGER LOGS ARE TO BE SOUND, NATIVE CEDAR OR FIR, A MINIMUM OF 22 FEET IN LENGTH AND A MINIMUM OF 12 INCHES IN DIAMETER AT THE SMALL END. BURY MIN. 4 FEET AT EACH END INTO THE BANK AND/OR STREAMBED. ANCHOR WITH MIN. TWO ANCHORS AT EACH END.
3) **ANCHOR:** ANCHORS SHALL CONSIST OF MANTA RAY MR-2 EARTH ANCHORS (FORESIGHT PRODUCTS, LLC 1-800-325-5360, AVAILABLE LOCALLY AT MCDOWELL NW PILE KING, 425-251-8535) OR EQUIVALENT. ANCHORS TO BE DRIVEN MINIMUM 7 FEET (84 INCHES) INTO GROUND (OR PER MANUFACTURER'S RECOMMENDATIONS) AT AN ANGLE APPROXIMATELY 15° TO 30° FROM VERTICAL AIMED AWAY FROM THE CENTER OF THE CHANNEL AND UPSTREAM. ALL ANCHORS SHALL BE SET AND LOAD TESTED TO APPROXIMATELY 5,000 LBS. IF MR-2 ANCHORS ARE UNABLE TO ACHIEVE SPECIFIED LOAD RATING, THEN A LARGER ANCHOR (MR-1) SHALL BE SUBSTITUTED THAT MEETS SPECIFIED LOAD RATING. ALTERNATIVELY, IF MR- ANCHORS ARE UNABLE TO BE DRIVEN TO DESIRED LEVEL, A SMALLER ANCHOR (MR-3 OR MR-4) SHALL BE USED AND SET TO THE SAME LOAD RATING. ATTACH LOGS TO ANCHOR USING MIN. 5/8 INCH GALVANIZED STEEL CHAIN, MAKING TWO COMPLETE WRAPS OF EACH LOG, "CHOCKER" STYLE. SCORE LOG APPROXIMATELY 1 INCH DEEP AND TWO INCHES WIDE TO PARTIALLY RECESS CHAIN.
4) **BIO-D BLOCK:** BIO-D BLOCK 16-200, AVAILABLE FROM RO LANKA, INTERNATIONAL, (1-800-760-3215). COIR FABRIC BLOCK SYSTEM CONSISTING OF 100% BIODEGRADABLE MATERIAL SUITABLE FOR USE IN A STREAM ENVIRONMENT INSTALLED PER MANUFACTURERS SPECIFICATIONS.
5) **BIO-D-BLOCK STAKES:** 2" X 2" X 18" WOODEN STAKES CUT DIAGONALLY TO MAKE TWO WEDGES. INSTALL MIN. 4 EVENLY SPACED STAKES ALONG FRONT EDGE OF UNIT (I.E. NEAREST THE BLOCK) AND MIN. 2 STAKES ALONG BACK (LANDWARD) EDGE OF UNIT. MIN. 2 STAKES SHALL BE USED AT OVERLAP FROM ADJACENT UNITS. DRIVE STAKES BETWEEN STRANDS OF WEAVE AS MUCH AS POSSIBLE TO REDUCE TEARING.
6) **BOULDER**: BOULDERS TO BE SOUND ROCK FREE OF OBVIOUS PLANES OF WEAKNESS (I.E. SEDIMENTARY LAYERING, FOLIATION, OR FRACTURES) MIN. 36" MEASURED ON THE INTERMEDIATE DIAMETER. BOULDERS SHALL BE PLACED INDIVIDUALLY IN THE STREAM AT THE DIRECTION OF THE STREAM RESTORATION CONSULTANT.
7) **TOPSOIL:** TOPSOIL SHALL CONSIST OF A NATURAL FRIABLE SURFACE SOIL WITHOUT ADMIXTURES OF UNDESIRABLE SUBSOIL, REFUSE, OR FOREIGN MATERIALS. IT SHALL BE REASONABLY FREE FROM ROOTS, HARD CLAY, COARSE GRAVEL, STONES LARGER THAN ONE INCH IN ANY DIMENSION, NOXIOUS WEEDS, TALL GRASS, BRUSH, STICKS, STUBBLE OR OTHER MATERIAL WHICH WOULD BE DETRIMENTAL TO THE PROPER DEVELOPMENT OF VEGETATIVE GROWTH. TOPSOIL SHALL CONTAIN NOT LESS THAN 3%, OR MORE THAN 20% ORGANIC MATTER.
8) **CUTTINGS:** CUTTINGS SHALL CONSIST OF RED-TWIG DOGWOOD (CORNUS SERICEA) FACINES CONFORMING TO THE FOLLOWING:
   - 1/4" TO 3/4" DIAMETER W/ AT LEAST 75% OF THE CUTTINGS BEING WITHIN THE 1/2" TO 3/4" RANGE
   - 36" IN LENGTH
   - 12 BRANCHES PER FACINE OR BUNDLE
9) GRASS SEED: SOW PRO-TIME 840 NATIVE BIO-FILTER GRASS SEED AT THE RATE OF 1 POUND PER 1,000 SQUARE FEET AND MULCH WITH 3" OF STRAW (OR HYDROSEED) IN AREAS AS FINAL GRADING IS ACCOMPLISHED. PRO-TIME 840 NATIVE BIO-FILTER SEED MIX IS AS FOLLOWS:
   - ELYMUS GLAUCUS / BLUE WILDRYE 47%
   - FESTUCA RUBRA RUBRA / RED FESCUE 40%
   - DESCHAMPSIA CAESPITOSA / TUFTED HAIRGRASS 10%
   - GLYCERIA OCCIDENTAILS / WESTERN MANNAGRASS 2%
   - BECKMANNIA SYZIGACHNE / AMERICAN SLOUGHGRASS 1%
10) **COMPOST:** COMPOST SHALL BE CEDAR GROVE OR EQUAL PRODUCT (TYPE A) CONTAINING 100% COMPOSTED VEGETABLE MATTER AND NO VIABLE WEED SEEDS OR PARTS.
11) **WOOD CHIP MULCH:** CHIPPED WOODY MATERIAL APPROXIMATELY 1 TO 4 INCHES IN MAXIMUM DIMENSION (NOT SAWDUST OR HOG FUEL). ALSO KNOWN AS ARBORIST CHIPS.
12) **FERTILIZER:** THE SLOW RELEASE, GRANULAR FERTILIZER APPLICATIONS OF OSMOCOTETM OR EQUAL PRODUCT SHOULD BEGIN AFTER THE SHRUBS AND GROUNDCOVERS HAVE HAD A YEAR OF GROWTH. EARLY APPLICATION OF FERTILIZER BENEFITS INVASIVE WEEDS TO THE DISADVANTAGE OF THE NEWLY INSTALLED NATIVE PLANTS. FOLLOW MANUFACTURERS' INSTRUCTIONS FOR APPLICATION. KEEP ALL FERTILIZERS IN WEATHER-TIGHT CONTAINERS WHILE ON SITE.

MAINTENANCE & MONITORING NOTES

A COMPREHENSIVE FOUR-YEAR MAINTENANCE AND MONITORING PLAN IS ALSO INCLUDED AS PART OF THE RESTORATION PLAN. THE PLAN DETAILS METHODS OF INVASIVE SPECIES REMOVAL, SPECIFIES APPROPRIATE SPECIES FOR PLANTING AND PLANTING TECHNIQUES, DESCRIBES PROPER MAINTENANCE ACTIVITIES, AND SETS FORTH PERFORMANCE STANDARDS TO BE MET YEARLY DURING MONITORING. THIS WILL ENSURE THAT RESTORATION PLANTINGS WILL BE MAINTAINED, MONITORED AND SUCCESSFULLY ESTABLISHED WITHIN THE FIRST FOUR YEARS FOLLOWING IMPLEMENTATION. FURTHER, THE PLAN INCLUDES A MONITORING PLAN FOR THE CONSTRUCTED IN-STREAM HABITAT FEATURES INCLUDING ALL LOG STRUCTURES.

PROPOSED RESTORATION INVOLVES REMOVING INVASIVE WEEDS SUCH AS HIMALAYAN BLACKBERRY, ENGLISH IVY, HOLLY AND ENGLISH LAUREL. WEED REMOVAL WILL BE FOLLOWED BY INSTALLATION OF NATIVE SPECIES SUITABLE TO THE SITE. NATIVE PLANTINGS ARE INTENDED TO INCREASE NATIVE PLANT COVER, IMPROVE NATIVE SPECIES DIVERSITY, AND PROVIDE FOOD AND OTHER HABITAT RESOURCES FOR WILDLIFE. IN-STREAM IMPROVEMENTS INCLUDE THE PLACEMENT OF LARGE WOODY DEBRIS, COIR LIFTS, AND A MIX OF COBBLES, BOULDERS, AND GRAVEL. IMPROVEMENTS ARE INTENDED TO PREVENT FURTHER EROSION WHILE ALSO PROVIDING INCREASED HABITAT WITHIN THE STREAM CORRIDOR.

GOALS
1. WITHIN THE PROPOSED RESTORATION AREA OF THE STREAM BUFFER, ESTABLISH DENSE NATIVE VEGETATION THAT IS APPROPRIATE TO THE ECOREGION AND SITE.
2. WHERE INDICATED ON THE PLAN, AREAS WITHIN THE STREAM BUFFER WILL REMAIN SUBSTANTIALLY VEGETATED WITH A PREPONDERANCE OF NATIVE PLANTS AND WILL CONTAIN LITTLE INVASIVE OR NOXIOUS WEED COVER.
3. INCREASE HABITAT COVER AND REFUGE FOR AMPHIBIANS, SMALL MAMMALS, AND INVERTEBRATES.
4. CREATE THE FORMATION OF SCOUR POOLS, RIFFLES AND GRAVEL TAIL OUTS IN THE VICINITY OF EACH LOG STRUCTURE.
5. CREATE ADDITIONAL STREAMBED COMPLEXITY BY ADDING GRAVEL/COBBLE/BOULDER SUBSTRATE.

PERFORMANCE STANDARDS
THE STANDARDS LISTED BELOW WILL BE USED TO JUDGE THE SUCCESS OF THE INSTALLATION OVER TIME. IF PERFORMANCE STANDARDS ARE MET AT THE END OF YEAR 4, THE SITE WILL THEN BE DEEMED SUCCESSFUL AND THE PERFORMANCE SECURITY BOND WILL BE ELIGIBLE FOR RELEASE BY THE CITY OF BELLEVUE. [THE BOND APPLIES ONLY TO NATIVE PLANTINGS AND NOT IN-STREAM IMPROVEMENTS.]

1. SURVIVAL: ACHIEVE 100% SURVIVAL OF INSTALLED PLANTS BY THE END OF YEAR 1. THIS STANDARD CAN BE MET THROUGH PLANT ESTABLISHMENT OR THROUGH REPLANTING AS NECESSARY TO ACHIEVE THE REQUIRED NUMBERS.
2. NATIVE COVER:
   a. ACHIEVE 60% UNDERSTORY COVER OF NATIVE SHRUBS BY YEAR 3. NATIVE VOLUNTEER SPECIES MAY COUNT TOWARDS THIS COVER STANDARD.
   b. ACHIEVE 80% UNDERSTORY COVER OF NATIVE SHRUBS BY YEAR 4. NATIVE VOLUNTEER SPECIES MAY COUNT TOWARDS THIS COVER STANDARD.
3. SPECIES DIVERSITY: ESTABLISH AT LEAST THREE NATIVE SHRUB SPECIES BY YEAR 4. NATIVE VOLUNTEER SPECIES MAY COUNT TOWARDS THIS STANDARD.
4. INVASIVE COVER: AERIAL COVER FOR ALL NON-NATIVE, INVASIVE AND NOXIOUS WEEDS WILL NOT EXCEED 10% AT ANY YEAR DURING THE MONITORING PERIOD. INVASIVE PLANTS INCLUDE HIMALAYAN BLACKBERRY (RUBUS ARMENIACUS), CUT LEAF BLACKBERRY (RUBUS LACINIATUS), REED CANARYGRASS (PHALARIS ARUNDINACEA), CHERRY (HEDGE) LAUREL (PRUNUS LAUROCERASUS), ENGLISH HOLLY (ILEX AQUIFOLIUM), AND IVY SPECIES (HEDERA SPP.).
5. FOR FOUR YEARS AFTER THE STREAMBANK STABILIZATION AND RESTORATION EFFORTS, ALL OF THE WOODY DEBRIS SHALL REMAIN FUNCTIONAL WITHIN THE PROJECT AREA, AND ANY CHANNEL MIGRATION WILL REMAIN WITHIN THE ESTABLISHED FLOODPLAIN AREA.
6. FOR FOUR YEARS AFTER THE STREAMBANK STABILIZATION AND RESTORATION EFFORTS, SUPPLEMENTAL GRAVELS SHALL CONTINUE TO FORM RIFFLES SUITABLE FOR SALMONID SPAWNING AND AQUATIC INSECT PRODUCTION. RIFFLES SHALL NOT BECOME "NOTCHED" BY ERODING A NARROW, DISTINCT AND ABRUPT CHANNEL THROUGH THE SUPPLEMENTAL SUBSTRATE, RESULTING IN INCISED CHANNEL SECTIONS AND/OR DRAINED POOLS UPSTREAM.

MONITORING METHODS
THIS MONITORING PROGRAM IS DESIGNED TO TRACK THE SUCCESS OF THE RESTORATION SITE OVER TIME AND TO MEASURE THE DEGREE TO WHICH IT IS MEETING THE PERFORMANCE STANDARDS OUTLINED IN THE PRECEDING SECTION.

AN AS-BUILT PLAN WILL BE PREPARED BY THE STREAM RESTORATION PROFESSIONAL (THE WATERSHED COMPANY [(425) 822-5242] PERSONNEL, OR OTHER PERSONS QUALIFIED TO EVALUATE ENVIRONMENTAL RESTORATION PROJECTS) PRIOR TO THE BEGINNING OF THE MONITORING PERIOD. THE AS-BUILT PLAN WILL BE A MARK-UP OF THE PLANTING AND IN-STREAM MODIFICATION PLANS INCLUDED IN THIS PLAN SET. THE AS-BUILT PLAN WILL DOCUMENT ANY DEPARTURES IN PLANT, LWD, OR BOULDER PLACEMENT OR OTHER COMPONENTS FROM THE PROPOSED PLAN.

MONITORING WILL TAKE PLACE TWICE ANNUALLY FOR FOUR YEARS. A SPRING VISIT WILL OCCUR EACH YEAR TO INSPECT THE LOG STRUCTURES AND OTHER IN-STREAM IMPROVEMENTS, WHILE A FALL VISIT WILL OCCUR EACH YEAR TO MONITOR THE AREAS OF NATIVE REVEGETATION. YEAR-1 MONITORING WILL COMMENCE IN THE FIRST FALL SUBSEQUENT TO INSTALLATION.

THE FORMAL SPRING MONITORING VISIT SHALL RECORD AND REPORT THE FOLLOWING IN AN ANNUAL REPORT SUBMITTED TO THE CITY OF BELLEVUE:

1. VISUAL ASSESSMENT OF THE OVERALL SITE.
2. PHOTOGRAPHIC DOCUMENTATION FROM FOUR FIXED REFERENCE POINTS.
3. RECOMMENDATIONS FOR MAINTENANCE OR REPAIR OF ANY PORTION OF THE IN-STREAM STRUCTURES FOR THE UPCOMING LOW-FLOW SEASON.

THE FORMAL FALL MONITORING VISIT SHALL RECORD AND REPORT THE FOLLOWING IN AN ANNUAL REPORT SUBMITTED TO THE CITY OF BELLEVUE:

1. VISUAL ASSESSMENT OF THE OVERALL SITE.
2. YEAR-1 ONLY COUNTS OF LIVE AND DEAD PLANTS BY SPECIES.
3. COUNTS OF DEAD PLANTS WHERE MORTALITY IS SIGNIFICANT IN ANY MONITORING YEAR.
4. ESTIMATE OF NATIVE SHRUB COVER THE COVER CLASS METHOD SITE-WIDE.
5. ESTIMATE OF NON-NATIVE, INVASIVE WEED COVER USING THE COVER CLASS METHOD SITE-WIDE.
6. TABULATION OF ESTABLISHED NATIVE SPECIES, INCLUDING BOTH PLANTED AND VOLUNTEER SPECIES.
7. PHOTOGRAPHIC DOCUMENTATION FROM FOUR FIXED REFERENCE POINTS.
8. ANY INTRUSIONS INTO OR CLEARING OF THE PLANTING AREAS, VANDALISM, OR OTHER ACTIONS THAT IMPAIR THE INTENDED FUNCTIONS OF THE MITIGATION AREA.
9. RECOMMENDATIONS FOR MAINTENANCE OR REPAIR OF ANY PORTION OF THE MITIGATION AREA.

CONSTRUCTION NOTES AND SPECIFICATIONS
NOTE: SPECIFICATIONS FOR ITEMS IN BOLD CAN BE FOUND BELOW UNDER "MATERIAL SPECIFICATIONS AND DEFINITIONS."

NOTE: THE WATERSHED COMPANY [(425) 822-5242] PERSONNEL, OR OTHER PERSONS QUALIFIED TO EVALUATE ENVIRONMENTAL RESTORATION PROJECTS, WILL MONITOR:

1. CONSTRUCTION STAGING.
2. INSTALLATION OF TEMPORARY EROSION CONTROL MEASURES.
3. INSTALLATION OF IN-STREAM WATER DIVERSIONS.
4. FISH REMOVAL (IF NECESSARY).
5. HORIZONTAL BORING ACTIVITIES.
6. LOG, BOULDER, AND COIR LIFT PLACEMENT.
7. PLANTING PREPARATION
   a. SOIL PREPARATION.
   b. MULCH PLACEMENT.
8. PLANT MATERIAL INSPECTION
   a. PLANT MATERIAL DELIVERY INSPECTION.
   b. 100% PLANT INSTALLATION INSPECTION.

PERMIT SET

NOT FOR CONSTRUCTION

GENERAL WORK SEQUENCE
1. A PLANTING SEQUENCE CAN BE FOUND ON SHEET 6.
2. A WORK SEQUENCE (FOR IN-STREAM IMPROVEMENTS) CAN BE FOUND ON SHEET 3.

MATERIAL SPECIFICATIONS AND DEFINITIONS
1. **FERTILIZER**: SLOW RELEASE, GRANULAR PHOSPHOROUS-FREE FERTILIZER. FOLLOW MANUFACTURER'S INSTRUCTIONS FOR APPLICATION. KEEP FERTILIZER IN A WEATHER-TIGHT CONTAINER WHILE ON SITE. NOTE THAT FERTILIZER IS TO BE APPLIED ONLY IN YEARS 2, 3 AND 4 AND NOT IN THE FIRST YEAR.
2. **IRRIGATION SYSTEM**: AUTOMATED SYSTEM CAPABLE OF DELIVERING AT LEAST TWO INCHES OF WATER PER WEEK FROM JUNE 1 THROUGH SEPTEMBER 30 FOR THE FIRST TWO YEARS FOLLOWING INSTALLATION.
3. **STREAM RESTORATION PROFESSIONAL**: WATERSHED COMPANY [(425) 822-5242] PERSONNEL, OR OTHER PERSONS QUALIFIED TO EVALUATE ENVIRONMENTAL RESTORATION PROJECTS.
4. **WOOD CHIP MULCH**:
   ARBORIST CHIPS (CHIPPED WOODY MATERIAL) APPROXIMATELY 1 TO 3 INCHES IN MAXIMUM DIMENSION (NOT SAWDUST OR COARSE HOG FUEL). THIS MATERIAL IS COMMONLY AVAILABLE IN LARGE QUANTITIES FROM ARBORISTS OR TREE-PRUNING COMPANIES. THIS MATERIAL IS SOLD AS "ANIMAL FRIENDLY HOG FUEL" AT PACIFIC TOPSOILS [(800) 884-7645]. MULCH MUST NOT CONTAIN APPRECIABLE QUANTITIES OF GARBAGE, PLASTIC, METAL, SOIL, AND DIMENSIONAL LUMBER OR CONSTRUCTION/DEMOLITION DEBRIS. QUANTITY REQUIRED: 35 CUBIC YARDS
5. ADDITIONAL SPECIFICATIONS/DEFINITIONS RELATED TO IN-STREAM IMPROVEMENTS CAN BE FOUND ON SHEET 7.

CONTINGENCIES
IF THERE IS A SIGNIFICANT PROBLEM WITH THE RESTORATION AREAS MEETING PERFORMANCE STANDARDS, A CONTINGENCY PLAN WILL BE DEVELOPED AND IMPLEMENTED. CONTINGENCY PLANS CAN INCLUDE, BUT ARE NOT LIMITED TO: SOIL AMENDMENT; ADDITIONAL PLANT INSTALLATION; PLANT SUBSTITUTIONS OF TYPE, SIZE, QUANTITY, AND LOCATION; ADDITIONAL WATERING, RESTABILIZATION OF STREAM BANKS OR IN-STREAM STRUCTURES; AND SURVEILLANCE AND/OR PROTECTION TO PREVENT SITE DAMAGE.

VEGETATION MAINTENANCE
THE SITE WILL BE MAINTAINED IN ACCORDANCE WITH THE FOLLOWING INSTRUCTIONS FOR FOUR YEARS FOLLOWING INSTALLATION OF ALL PLANTINGS.
1. FOLLOW THE RECOMMENDATIONS NOTED IN THE PREVIOUS MONITORING SITE VISIT.
2. GENERAL WEEDING FOR ALL PLANTED AREAS.
3. AT LEAST TWICE YEARLY, REMOVE ALL COMPETING WEEDS AND WEED ROOTS FROM BENEATH EACH INSTALLED PLANT AND ANY DESIRABLE VOLUNTEER VEGETATION TO A DISTANCE OF 18 INCHES FROM THE MAIN PLANT STEM. WEEDING SHOULD OCCUR AT LEAST TWICE DURING THE SPRING AND SUMMER. FREQUENT WEEDING WILL RESULT IN LOWER MORTALITY, LOWER PLANT REPLACEMENT COSTS, AND INCREASED LIKELIHOOD THAT THE PLAN MEETS PERFORMANCE STANDARDS BY YEAR 4.
4. MORE FREQUENT WEEDING MAY BE NECESSARY DEPENDING ON WEED CONDITIONS THAT DEVELOP AFTER PLAN INSTALLATION.
5. DO NOT WEED THE AREA NEAR THE PLANT BASES WITH STRING TRIMMER (WEED WHACKER/WEED EATER). NATIVE PLANTS ARE EASILY DAMAGED OR KILLED, AND WEEDS EASILY RECOVER AFTER TRIMMING.
6. APPLY SLOW RELEASE GRANULAR FERTILIZER TO EACH INSTALLED PLANT ANNUALLY IN THE SPRING (BY JUNE 1) OF YEARS 2 THROUGH 4.
7. REPLACE MULCH AS NECESSARY TO MAINTAIN A 4-INCH-THICK LAYER, RETAIN SOIL MOISTURE, AND LIMIT WEEDS.
8. REPLACE EACH PLANT FOUND DEAD IN THE SUMMER MONITORING VISITS DURING THE UPCOMING FALL DORMANT SEASON (OCTOBER 15 TO MARCH 1).
9. THE PROPERTY OWNER WILL ENSURE THAT WATER IS PROVIDED FOR THE ENTIRE PLANTED AREA WITH A MINIMUM OF 2 INCHES OF WATER PROVIDED PER WEEK FROM JUNE 1 THROUGH SEPTEMBER 30 FOR THE FIRST TWO YEARS FOLLOWING INSTALLATION THROUGH THE OPERATION OF A TEMPORARY IRRIGATION SYSTEM. LESS WATER IS NEEDED DURING MARCH, APRIL, MAY AND OCTOBER.

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KELSEY CREEK RESTORATION

STREAMBANK & HABITAT IMPROVEMENTS
PROJECT PARTNERS: CITY OF BELLEVUE & EARLY WORLD CHILDREN'S SCHOOL
13831 BEL-RED ROAD
BELLEVUE, WA

SUBMITTALS & REVISIONS

NO.	DATE	DESCRIPTION	BY
1	2-28-09	DRAFT LAYOUT	MI
2	04-08-09	PRE-APPLICATION MEETING	ZS
3	11-02-09	PERMIT SET	ZS

SHEET SIZE:
ORIGINAL PLAN IS 22" x 34". SCALE ACCORDINGLY.

PROJECT MANAGER: MG
DESIGNED: MG/MI/ZS
DRAFTED: ZS
CHECKED: MG/MI/KB
JOB NUMBER: 060926

SHEET NUMBER:

FILENAME: 060926-EARLYWORLD-3-SLIM.DWG
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