Attachment 12

NE 4th Street/ 120th Avenue NE Corridor Project

Biological Resources Technical Report

prepared for
City of Bellevue

prepared by
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June 3, 2011

Attachment 12

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Acronyms and Abbreviations

the City	the City of Bellevue
Ecology	Washington Department of Ecology
ESA	Endangered Species Act
HI-RUN	Washington State Department of Transportation Highway Runoff Dilution subroutine
I-405	Interstate 405
MSA	Magnuson-Stevens Act
NE	Northeast
PB	Parsons Brinkerhoff
NMFS	National Marine Fisheries Services
WNHP	Washington Natural Heritage Program
WRIA 8	Watershed Water Resource Inventory Area No. 8

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Executive Summary

This *Biological Resources Technical Report* is being prepared for the City of Bellevue in support of the No Effect Letter for the Northeast (NE) 4th Street/120th Avenue NE Corridor Project. For this project, the City of Bellevue proposes to extend NE 4th Street from its existing terminus with 116th Avenue NE eastward to 120th Avenue NE and comprehensive widening and realignment of 120th Avenue NE from the proposed intersection with NE 4th Street northward to Northup Way.

The purpose of this assessment is to document expected effects on Endangered Species Act (ESA)-protected species and habitat and Magnuson-Stevens Act (MSA)-protected habitat from the project and any associated actions, such as mitigation.

The project corridor is located in two subbasins: the Sturtevant Creek subbasin to the south and the West Tributary of Kelsey Creek subbasin to the north. Light-industrial development, likely built in the last 40 years, currently dominates the environment. Much of this area was developed without stormwater control. The West Tributary of Kelsey Creek is the only stream located within the project boundary or its immediate vicinity and drains the northern third of the project corridor. The creek crosses under 120th Avenue NE at the northern end of the corridor and flows east and south approximately 3,5000 feet where passes through an approximately 2,000 foot pipe that is a fish barrier based on WDFW SalmonScape maps (WDFW, 2010) and the City's basin map (Bellevue, 2010b). Sturtevant Creek originates at Lake Bellevue west of 120th Avenue NE and drains the southern two-thirds of the project corridor.

A total of 15 species were identified as threatened or endangered within King County by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service and the U.S. Fish and Wildlife Service as of April 2011. Of the species listed as potentially present in King County, no terrestrial, plant, avian, or marine mammal species are documented or expected within the project's Action Area due to a lack of suitable habitat, though avian species are not precluded from flying over the site. Marine species and anadromous species potentially present in King County are precluded from the basin by downstream culverts that are documented as full barriers to upstream passage, one on each of the draining tributaries for the project. Critical Habitat is designated in King County for marbled murrelet, northern spotted owl, Chinook salmon, bull trout, and killer whale; however, northern spotted owl and killer whale are considered precluded from the Action Area due to lack of potential habitat.

In conclusion, the potential effects on ESA-listed species or designated critical habitat are as follows:

- No effect on terrestrial and plant species due to urban environment and lack of suitable wildlife corridors or habitat.

- No effect on avian species due to lack of appropriate nesting, foraging, or critical habitat in or near the Action Area.
- No effect on marine species due to lack of marine habitat.
- No effect on steelhead trout, Chinook salmon, or bull trout due to culverts located 3,000 to 5,500 feet downstream of the proposed project that are documented as full barriers to upstream passage and because potential project water quality impacts are not expected to reach salmonid fish populations.
- Would not adversely affect essential fish habitat due to the lack of such habitat in the Action Area.

1.0 Proposed Project

The Northeast (NE) 4th Street/120th Avenue NE Corridor Project extends from the intersection of NE 4th Street with 116th Avenue NE eastward to 120th Avenue NE and then northward along 120th Avenue NE to Northup Way. Key project elements include: the extension of NE 4th Street from its existing terminus with 116th Avenue NE eastward to 120th Avenue NE; widening of existing 120th Avenue NE from the proposed intersection with NE 4th Street northward to Northup Way; and the realignment of a new segment of 120th Avenue NE between NE 8th Street and Bel-Red Road (Figure 1-1).

The elements of the project include the following:

- Extend NE 4th Street as a five-lane roadway from 116th Avenue NE to 120th Avenue NE. There are two minor alignment options under consideration for this proposed roadway extension east of the BNSF corridor. Impacts of both options are considered in this analysis.
- Widen 120th Avenue NE to five travel lanes from the NE 300 block to the planned NE 15th Street intersection.
- Extend 120th Avenue NE south of Bel-Red Road to NE 8th Street. The existing section of Bel-Red Road between NE 8th Street east and 120th Avenue NE, roughly 300 feet long, would be abandoned.
- Widen 120th Avenue NE to four lanes north of NE 18th Street to just south of Northup Way with a transition section occurring between NE 15th and NE 18th Streets.
- Construct improvements that support the planned new intersections at NE 15th/16th and NE 18th Streets and Sound Transit's East Link light rail line that would pass under 120th Avenue NE.
- Install continuous sidewalks and bicycle facilities designed to arterial street standards on NE 4th Street and 120th Avenue NE north to NE 15th Street. North of NE 15th Street, a two-way bicycle trail would be located on the west side of the roadway to allow connection with planned regional trails west, north, and east of 120th Avenue NE. Sidewalks will still be present on both sides of 120th Avenue NE north of NE 15th Street.
- Install planting strip(s) on both sides of the roadways and create other green spaces where possible.
- Install stormwater conveyance, detention, water quality treatment facilities, and use natural drainage practices to the extent practicable.
- Connect with and minimize effects to wetlands and open space areas, including a planned community park near Northup Way.

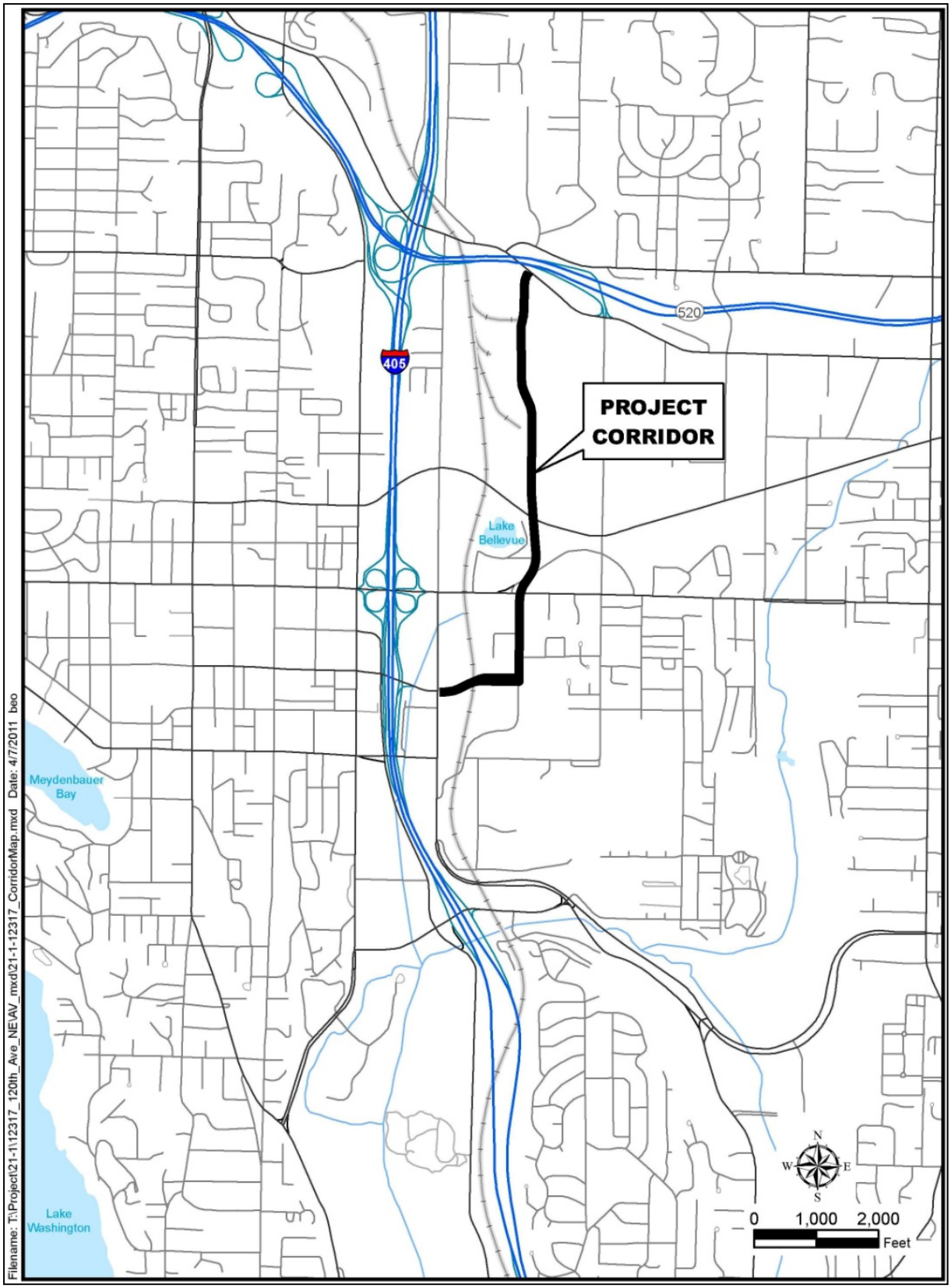

Figure 1-1. Project Vicinity Map

- Provide other project elements, including illumination, landscaping, structural retaining walls, traffic signals, and new and relocated utilities.

Four wetlands, labeled Wetlands A, B, C, and D, are adjacent to the project corridor (Figure 1-2). The proposed project would impact Wetlands A, B, and C. For project wetland and stream impacts, mitigation likely would occur offsite but upstream of known anadromous fish blockages. Wetland mitigation in the West Tributary of Kelsey Creek basin likely would occur upstream of an outlet-control structure on the waterway, located approximately 0.6 mile downstream of the project corridor (Figure 1-2). Wetland mitigation in the Lake Bellevue/ Sturtevant Creek basin likely would occur upstream of Interstate 405 (I-405); however, a mitigation site has not been identified.

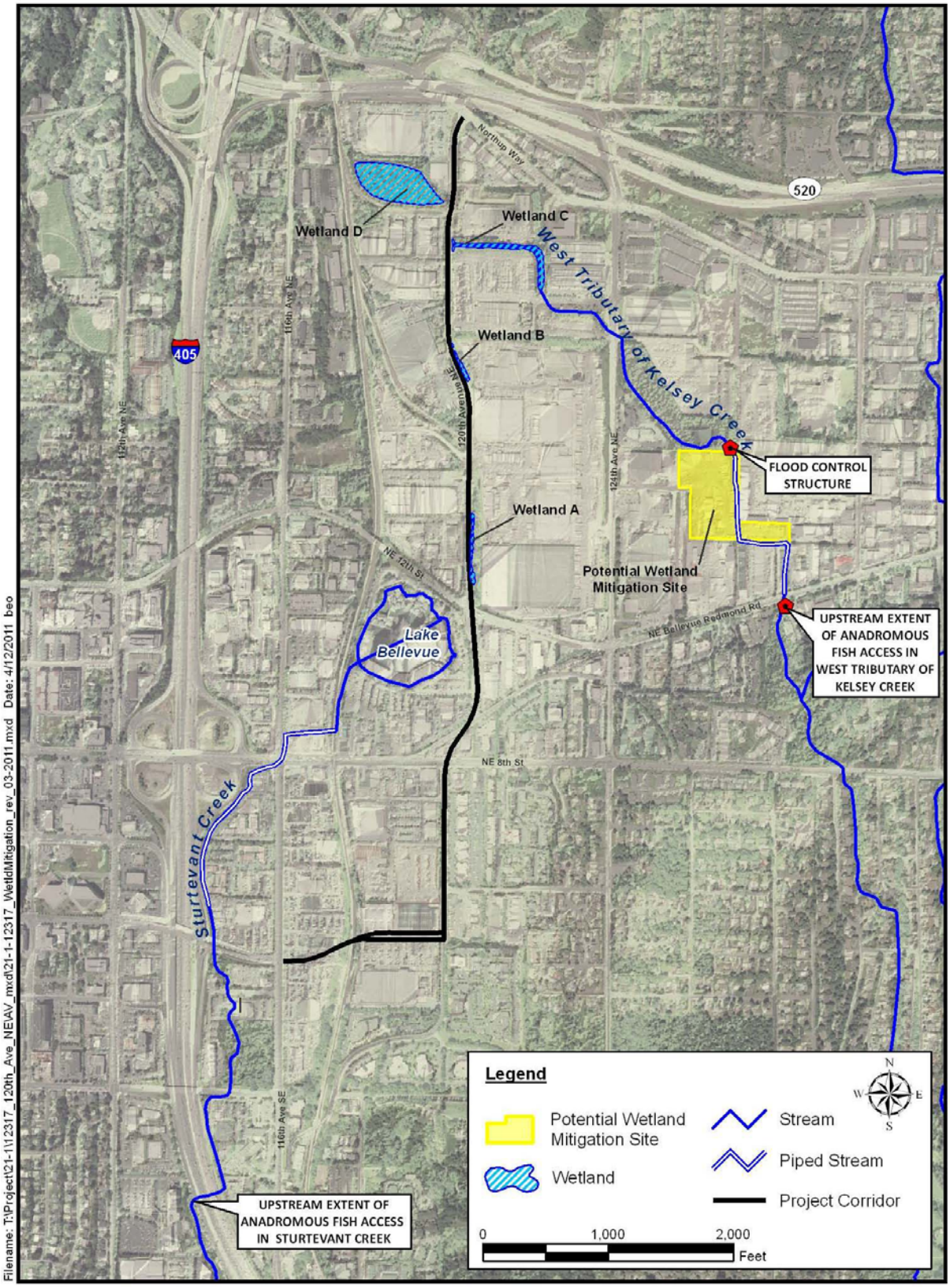

Figure 1-2. Potential Wetland Mitigation Site

2.0 Existing Conditions

The project corridor is located in two subbasins: the Sturtevant Creek subbasin to the south and the West Tributary of Kelsey Creek subbasin to the north. Light-industrial development, likely built in the last 40 years, currently dominates the environment. Much of this area was developed without stormwater control.

2.1 Stream Crossings in the Project Corridor

The West Tributary of Kelsey Creek is the only stream located within the project boundary or its immediate vicinity. The on-site reach includes the stream's headwaters within Wetland D, where it gradually flows within a 5-foot-wide active channel with a bed comprised of 6 inches of silt before entering a 36-inch culvert under 120th Avenue NE. The stream daylights again within the project corridor approximately 260 feet downstream into a channel within Wetland C. The active channel in Wetland C is approximately 4 feet wide with a bed comprised of sand and well-rounded gravels. As the stream exits the 36-inch corrugated metal pipe under 120th Avenue NE, the ordinary high water mark for the stream quickly fans out above the banks of the active channel and encompasses much of Wetland C.

2.2 Receiving Waterbodies

2.2.1 Sturtevant Creek

Sturtevant Creek drains the southern two-thirds of the project corridor. This creek originates at Lake Bellevue and flows south in a ditch adjacent to railroad tracks for approximately 600 feet before going into an underground pipe at approximately NE 8th Street (Figure 2-1). Sturtevant Creek daylights again at NE 4th Street (Figure 2-2) and flows south to where it crosses under I-405.

After it crosses I-405, Sturtevant Creek flows south to its confluence with Kelsey Creek/Mercer Slough. I-405 is a fish passage barrier based on WDFW SalmonScape maps (WDFW, 2010) and the City's basin map for Sturtevant Creek (Bellevue, 2010a). Even if this fish barrier was removed, the piped portion of Sturtevant Creek would be considered another fish barrier (Figure 2-3).

Figure 2-1. Upstream Extent of Sturtevant Creek (Between NE 8th Street and Lake Bellevue)

Figure 2-2. Sturtevant Creek South of NE 4th Street.

2.2.2 West Tributary of Kelsey Creek

The West Tributary of Kelsey Creek drains the northern third of the project corridor (Figure 2-4).

Approximately 3,500 feet downstream of the project corridor, the West Tributary of Kelsey Creek passes through an outlet-control structure (Figure 2-5) and enters a culvert where it is conveyed below ground for approximately 2,000 feet to the south of Bel-Red Road (Figures 2-6 and 2-7). This 2,000-foot underground pipe has several bends and is a fish barrier based on WDFW SalmonScape maps (WDFW, 2010) and the City's basin map for the West Tributary of Kelsey Creek (Bellevue, 2010b).

Downstream of Bel-Red Road, the West Tributary of Kelsey Creek joins Goff Creek, which is tributary to Kelsey Creek. Goff Creek then connects to Kelsey Creek, which drains through Mercer Slough into Lake Washington.

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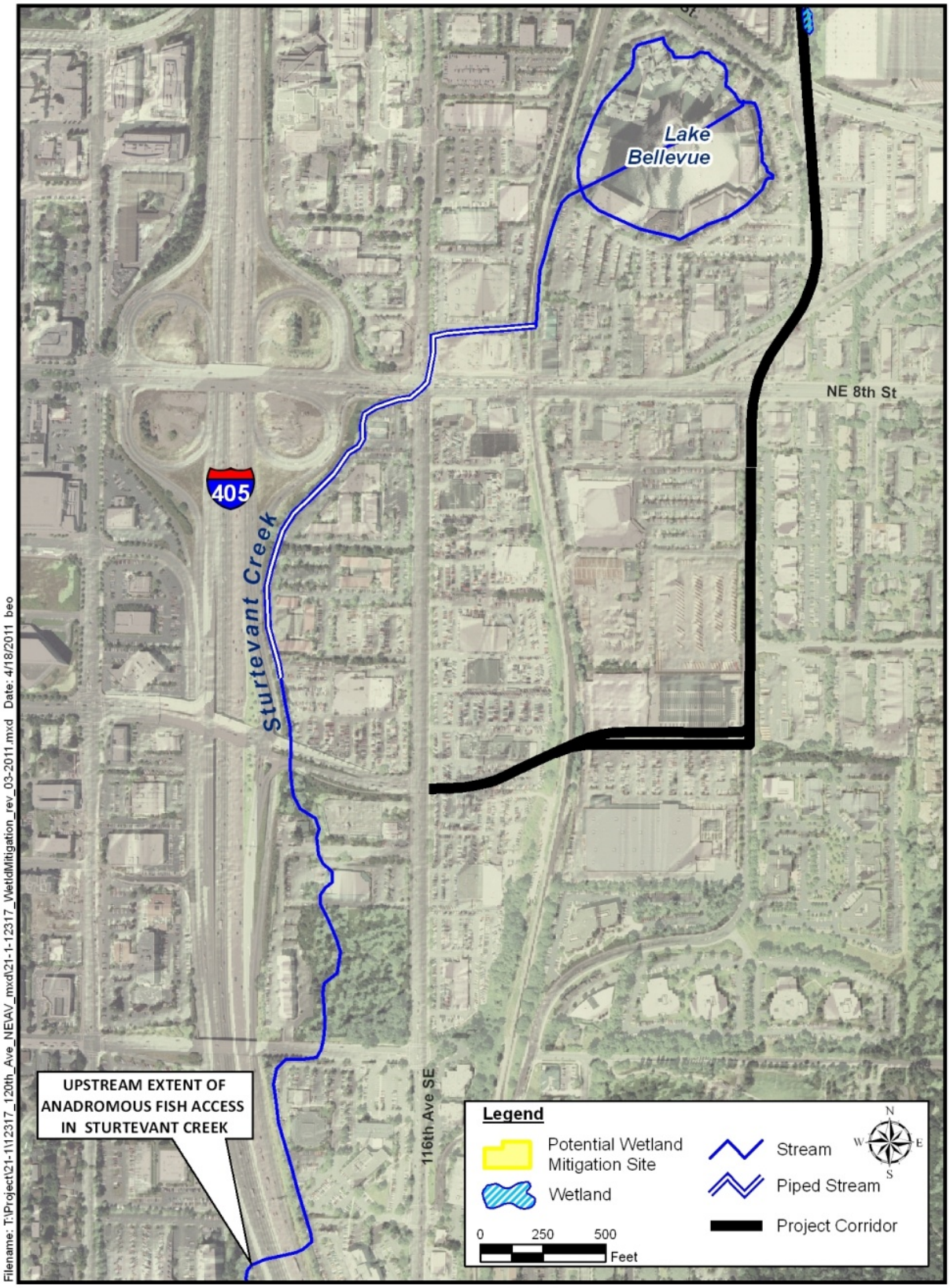

Figure 2-3. Sturtevant Creek Map.

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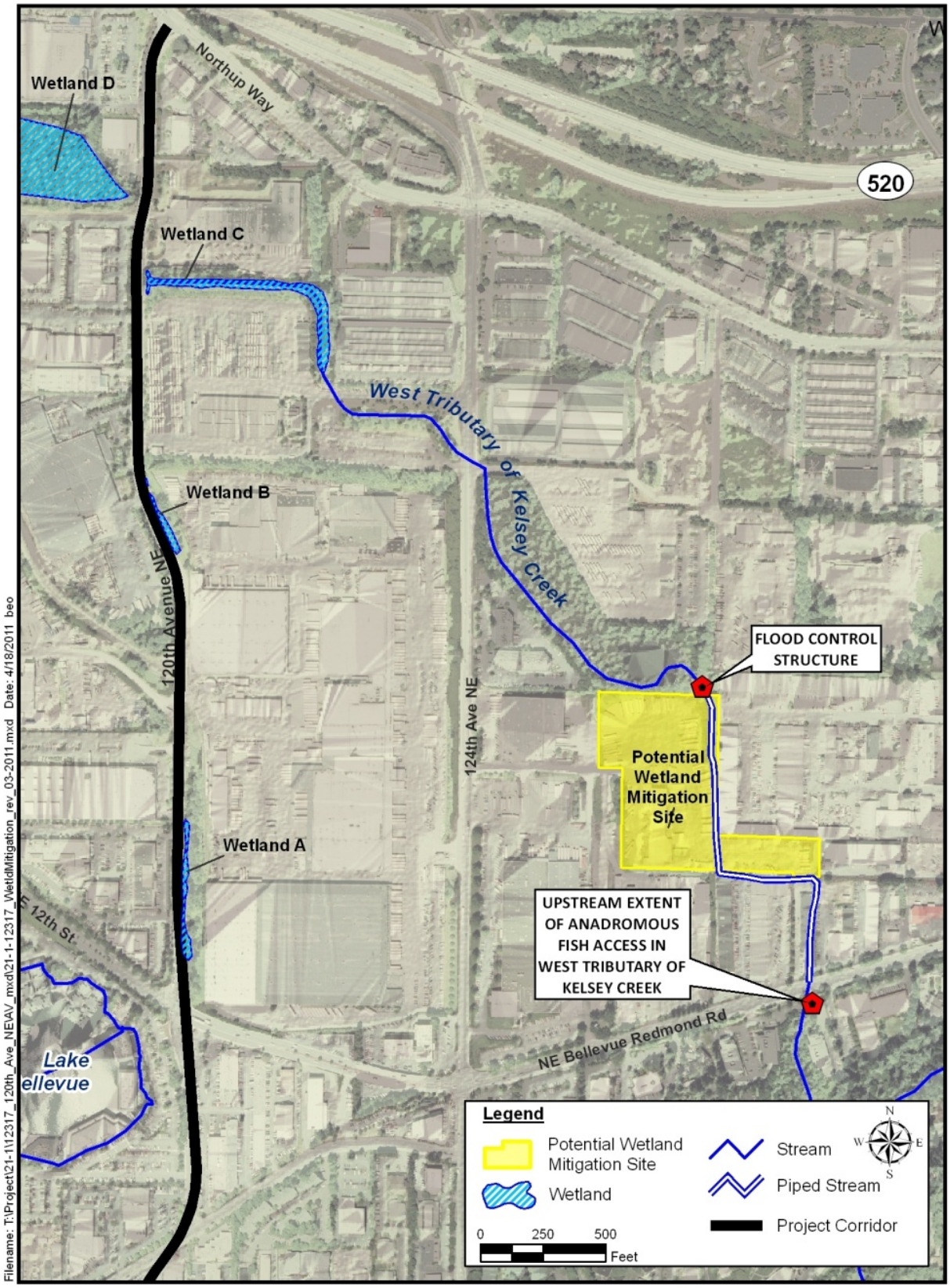

Figure 2-4. West Tributary of Kelsey Creek Map.

Figure 2-5. West Tributary of Kelsey Creek Outlet-Control Structure.

Figure 2-6. West Tributary of Kelsey Creek at the Upstream Extent of Anadromous Access (South of Bel-Red Road).

Figure 2-7. Off-site Stream Habitat at the Upstream Extent of Anadromous Access in the West Tributary of Kelsey Creek (South of Bel-Red Road).

3.0 Action Area

The Action Area for the NE 4th Street/120th Avenue NE project is depicted in Figure 3-1 and includes:

- The project corridor.
- A 2,500-foot radius around the corridor for construction noise associated with heavy equipment (see Appendix A for noise analysis).
- Sturtevant Creek as far downstream as its crossing under I-405 (approximately 3,000 feet downstream) in consideration of stormwater effects from the project. Wetland mitigation in the Lake Bellevue/Sturtevant Creek basin, if constructed, will be constructed in such a way that Endangered Species Act (ESA)-listed species below I-405 (approximately 0.5 mile downstream) are not affected by changes in turbidity.
- The West Tributary of Kelsey Creek as far downstream as the outlet-control structure (Figures 1-2 and 2-3) (approximately 3,200 feet downstream) in consideration of stormwater effects from the project and from the project's potential wetland mitigation work in the West Tributary of Kelsey Creek basin. Wetland mitigation in the West Tributary of Kelsey Creek , if constructed, will be constructed using the outlet-control structure in such a way that ESA-listed species below Bel-Red Road (approximately 5,500 feet downstream of the project corridor) are not affected by changes in turbidity.

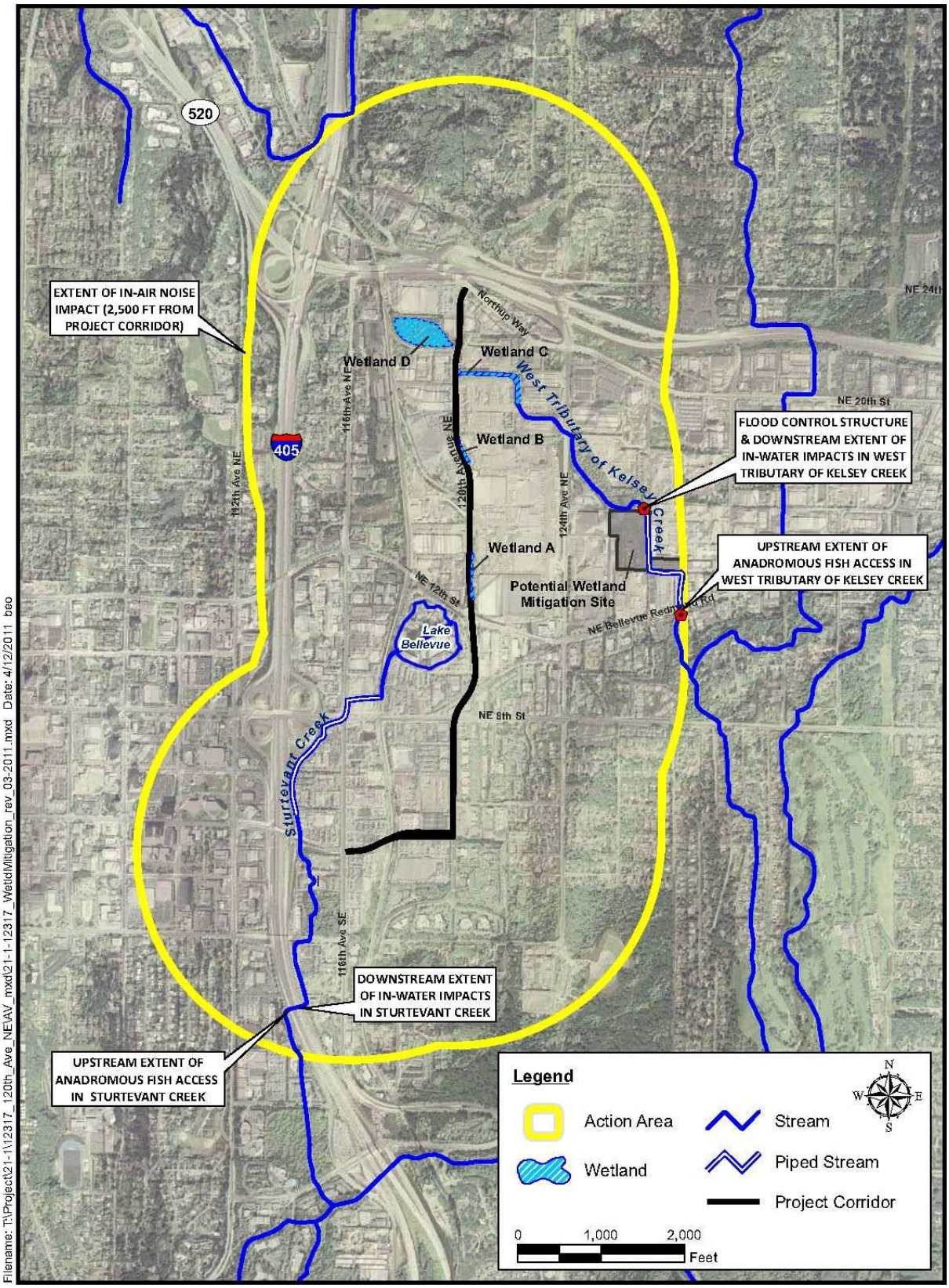

Figure 3-1. Action Area Map

4.0 Species and Habitat

4.1 Species

The following is a list of all species identified as threatened or endangered within King County by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service and the U.S. Fish and Wildlife Service as of April 2011.

1. Grizzly bear *(Ursus arctos = U. a. horribilis)*
2. Gray wolf *(Canis lupus)*
3. Canada lynx *(Lynx canadensis)*
4. Marbled murrelet (*Brachyramphus marmoratus*)
5. Northern spotted owl *(Strix occidentalis caurina)*
6. Golden paintbrush (*Castilleja levisecta)*
7. Puget Sound Chinook (*Oncorhynchus tshawytscha*)
8. Coastal-Puget Sound bull trout (*Salvelinus confluentus*)
9. Puget Sound steelhead (*Oncorhynchus mykiss*)
10. Humpback whale (*Megaptera novaeangliae*)
11. Southern resident killer whale (*Orcinus orca*)
12. Steller sea lion (*Eumetopias jubatus*)
13. Bocaccio (*Sebastes paucispinis*)
14. Canary rockfish (*Sebastes pinniger*)
15. Yelloweye rockfish (*Sebastes ruberrimus*)

Of the species listed as potentially present in King County, no terrestrial, plant, avian, or marine mammal species are documented or expected within the project's Action Area due to a lack of suitable habitat, though avian species are not precluded from flying over the site. Grizzly bear, gray wolf, Canada lynx, marbled murrelet, and northern spotted owl generally require less disturbed or more forested habitat than that present within the Action Area for the project. Golden paintbrush typically occupies open grasslands (Washington Natural Heritage Program [WNHP] 2010), which are not present in the Action Area.

Marine species and anadromous species potentially present in King County are precluded from the basin by downstream culverts that are documented as full barriers to upstream passage, one on each of the draining tributaries for the project. On the West Tributary of Kelsey Creek anadromous fish are documented approximately 0.8 mile downstream below the fully impassable Bel-Red Road culvert (Kit Paulsen, 2010; Bellevue, 2010a; Washington Department of Fish and Wildlife [WDFW], 2010) (Figure 2-3). Fish presence/absence surveys are conducted by the City of Bellevue (the City) every two years in the City's streams and no anadromous fish have been identified above the Bel-Red Road culvert in the West Tributary of Kelsey Creek system (Kit Paulsen, 2010). In Sturtevant Creek, anadromous access to Lake Bellevue is blocked by a fully impassable culvert under I-405 (Bellevue, 2010b).

Other sources of fish presence data confirm Bel-Red Road as the upstream extent of fish presence in the West Tributary of Kelsey Creek system and I-405 the upstream extent of fish presence in the Sturtevant Creek system. The Known Freshwater Fish Distribution of Salmon and Trout for Watershed Water Resource Inventory Area No. 8 (WRIA 8) maps are a series of maps and supporting tabular data of recent sightings for Chinook, coho, steelhead, sockeye, cutthroat trout, and kokanee species for the whole of WRIA 8. For the West Tributary of Kelsey Creek, these maps show that Chinook and cutthroat trout were observed up to Bel-Red Road. Coho and sockeye were observed up to NE 8th Street, approximately 1.1 river miles downstream of the site. Steelhead are not known to use the West Tributary of Kelsey Creek. According to the Known Freshwater Fish Distribution of Salmon and Trout for WRIA 8 maps, only coho occur in Sturtevant Creek from its mouth to I-405, approximately 0.5 river mile downstream of the site.

4.2 Critical Habitat

Critical Habitat is designated in King County for marbled murrelet, northern spotted owl, Chinook salmon, bull trout, and killer whale; however, northern spotted owl and killer whale are considered precluded from the Action Area due to lack of potential habitat.

4.2.1 Marbled Murrelet

No designated critical habitat for marbled murrelet is located in the project Township/Range.

4.2.2 Chinook Salmon & Steelhead Trout

According to the Federal Register, Volume 65, Number 32, pages 7764-7787, Puget Sound Chinook critical habitat has been designated to include all marine, estuarine, and river reaches accessible to Puget Sound Chinook. Because the Action Area is not accessible to Chinook, no designated critical habitat exists within the Action Area for this species.

Critical habitat has not been designated for steelhead; however, because of the similarities in Chinook and steelhead essential habitat needs, it is likely that the critical habitat designated for steelhead will be very similar to the critical habitat for Chinook. Because the Action Area is not accessible to salmonids, it is precluded from being critical habitat for steelhead.

4.2.3 Bull Trout

The Action Area streams are not listed as designated bull trout critical habitat.

5.0 Determination of Effect

5.1 Effects of Foreseeable Projects

One future City project was considered during the effects determination because it is reasonably foreseeable and was considered to have a potential influence on the effect analyses. The Bel-Red Living Streams project includes daylighting approximately 1,000 feet of the West Tributary of Kelsey Creek at the potential wetland mitigation site (Figure 3-1 and Appendix B). However, it is our understanding that approximately 1,000 feet would remain in an underground pipe with a 90-degree bend. Future daylighting of this remaining stretch of pipe is uncertain as it would be located on privately-owned property. Therefore, the West Tributary of Kelsey Creek was still considered a non-fish bearing stream above Bel-Red Road during the effects analyses.

5.2 Effects to Terrestrial and Plant Species

Grizzly bear, Canada lynx, and gray wolf habitat may occur in parts of eastern King County; however, no suitable habitat is located within the urban areas of King County. The Action Area does not contain any prairie habitat that would be suitable for golden paintbrush. Therefore, the proposed project would have no effect on grizzly bear, Canada lynx, gray wolf, or golden paintbrush.

5.3 Effects to Avian Species

No forested areas within the Action Area contain appropriate nesting, foraging, or critical habitat for either northern spotted owl or marbled murrelet, though avian species are not precluded from occasionally flying over the Action Area. Therefore, the proposed project would have no effect on northern spotted owl, marbled murrelet, or designated critical habitat for these species.

5.4 Effects to Aquatic Species

Marine species are precluded from the Action Area due to lack of marine habitat and the Ballard Locks in Seattle. Therefore, the proposed project would have no effect on humpback whale, southern resident killer whale, Steller sea lion, bocaccio, canary rockfish, or yelloweye rockfish.

Several factors suggest that the proposed project and associated mitigation work would not affect ESA-listed anadromous steelhead trout, Chinook salmon, and bull trout:

- **Preclusion**—There is no access to the Action Area for anadromous fish.
- **Lack of Prey**—The Action Area lacks resident fish use, with the possible exception of goldfish that are reportedly present in Lake Bellevue.

- **Stormwater Effects during Construction**—Best management practices would be used during construction to prevent soils from being conveyed to the action area wetlands and streams. In addition, Lake Bellevue and the large, ponded area above the flood control structure in the West Tributary of Kelsey Creek would likely insulate lower sections from construction stormwater effects.
- **Stormwater Effects during Operation**—Treatment is proposed for the new pollution-generating impervious surfaces of the project. Based on the *Water Quality Technical Report*, the project would result in increased levels of dissolved zinc and copper in stormwater (Parsons Brinkerhoff [PB], 2011).

Parsons Brinckerhoff (PB) used the Washington State Department of Transportation Highway Runoff Dilution subroutine (HI-RUN) to determine when these increased dissolved zinc and copper concentrations would dilute to below the biological threshold (where salmonids have a behavioral change) in the Action Area water bodies. Background dissolved zinc and copper concentrations were obtained for Kelsey Creek (downstream of its confluence with the West Tributary of Kelsey Creek) via Washington State Department of Ecology (Ecology) Environmental Information Management website (Ecology, 2011). No closer sources of baseline information for Sturtevant Creek or the West Tributary of Kelsey Creek were found. The HI-RUN calculations were completed for the months that salmon are expected to be in site streams (September through November). Based on these parameters, it appears likely (with 95 percent certainty) that Sturtevant Creek and West Tributary of Kelsey Creek would dilute to below the biological threshold for copper within 1 foot of stormwater discharge locations and within 1 to 6 feet of stormwater discharge locations for zinc (see Appendix C). Based on the HI-RUN calculations, the dissolved copper and zinc concentrations would decrease from existing conditions.

Due to fish barriers at Bel-Red Road (for the West Tributary of Kelsey Creek) and I-405 (Sturtevant Creek), salmonids are not likely present until approximately 3,000 feet downstream of the project corridor in Sturtevant Creek and 5,500 feet downstream of the project corridor in the West Tributary of Kelsey Creek. Based on these distances, it is expected that dissolved zinc and copper associated with this project would be diluted to baseline conditions before reaching salmonids populations.

Therefore, the proposed project would have no effect on Chinook salmon, steelhead trout, or bull trout. Moreover, due to a lack of critical habitat for these species in the Action Area, the proposed project would have no effect on Chinook salmon designated critical habitat or bull trout designated critical habitat.

6.0 Essential Fish Habitat Assessment

The habitat in the Action Area is freshwater habitat. No effects are expected on habitat for pelagic or groundfish species managed by the National Marine Fisheries Service (NMFS) due to the lack of marine habitat.

The proposed project is not expected to adversely affect habitat for NMFS-managed anadromous species (e.g., habitat for coho salmon) that is protected under the MSA due to the following factors, which are detailed in Section 5.3:

- Lack of fish access to the Action Area due to barriers downstream
- Lack of prey population in Action Area stream reaches
- Construction stormwater impacts would be avoided/minimized with BMPs
- Dissolved copper and zinc concentrations are expected to dilute to background levels before reaching salmonids populations.

Therefore, the proposed project would not have an adverse effect essential fish habitat.

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7.0 References

Bellevue 2010a City of Bellevue (Bellevue). 2010. http://www.bellevuewa.gov/drainage_basin_maps.htm. *Drainage Basin Maps, Sturtevant Creek Basin.*

Bellevue 2010b City of Bellevue (Bellevue). 2010. http://www.bellevuewa.gov/drainage_basin_maps.htm. *Drainage Basin Maps, West Tributary Basin.*

Ecology 2011 Washington State Department of Ecology (Ecology). 2011. *Environmental Information Management website*. User Location ID KCM-0444. http://apps.ecy.wa.gov/eimreporting/Results.asp?Type=LocationParameters&ID=35967547&LocationParametersSortColumn=PR_IDENTIFICATION_CD+ASC&RecordsPerPage=100&RecordPage=1.

Paulsen 2010 Kit Paulsen. August 9, 2010. *Personal Communication between Kit Paulsen and Web Pierce.*

PB 2011 Parsons Brinckerhoff (PB). April 15, 2011. *Bellevue 120th Avenue NE Corridor Project, Water Quality Technical Report (Draft).*

WDFW 2010 Washington State Department of Fish and Wildlife (WDFW). 2010. http://fortress.wa.gov/dfw/gispublic/apps/salmonscape/default.htm. *SalmonScape.*

WNHP 2010 Washington Natural Heritage Program Database http://www1.dnr.wa.gov/nhp/refdesk/fguide/htm/fgmain.htm.

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Appendix A
Noise Analysis

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Construction In-Air Noise[1]

Equipment	**Lmax at 50 ft (dBA)**
Chainsaw	84
Soil compactor	83
Bulldozer	82
Vacuum street sweeper	82
Excavator	81
Crane	81
Front end loader	79
Air compressor for impact wrench	78
Dump truck	76
Combined Lmax:	**88**

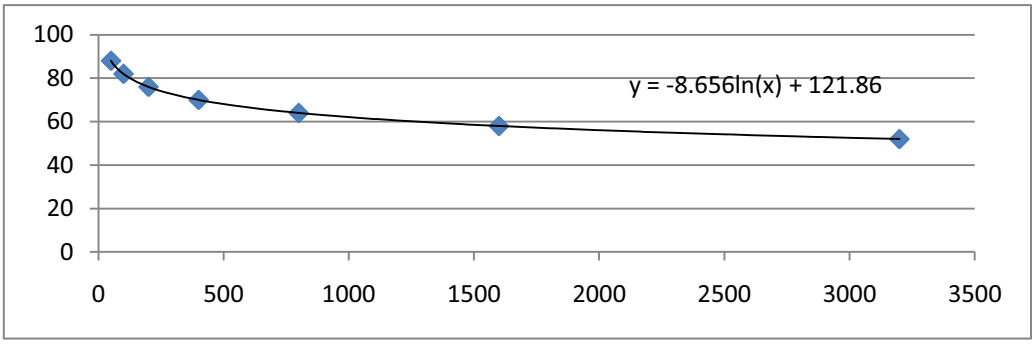
Background Noise[2]

Background Noise Measurements	54-63 dBA
Lowest Background Leq	**54 dBA**

Attentuation rate for soft site 6 dB

Distance from Construction (ft)	Construction Noise (dBA)	Lowest Background Noise (dBA)
50	88	54
100	82	54
200	76	54
400	70	54
800	64	54
1600	58	54
3200	52	54

Trendline equation: y=-8.656ln(x) + 121.86



Distance at which construction noise equals 54 dBA: 2,539 feet

Marbled Murrelet -- Noise thresholds

Detect	44
Alert	57
Disturb	70
Injure	92

Distance from site where noise attentuates to 70 dB: 426 ft

[1] Lmax from WSDOT biological assessment preparation advanced training manual Table 7-4.
[2] Background noise measurements taken by Parsons Brinkerhoff in August 2010.

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Appendix B
Bel-Red Living Streams Document

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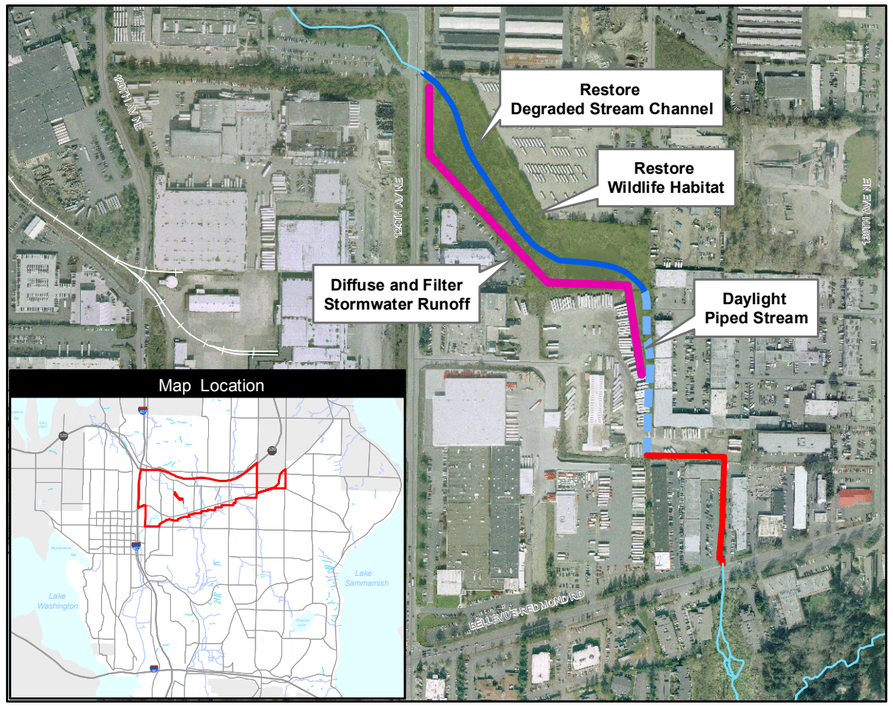
Bel-Red Living Streams
West Tributary of Kelsey Creek



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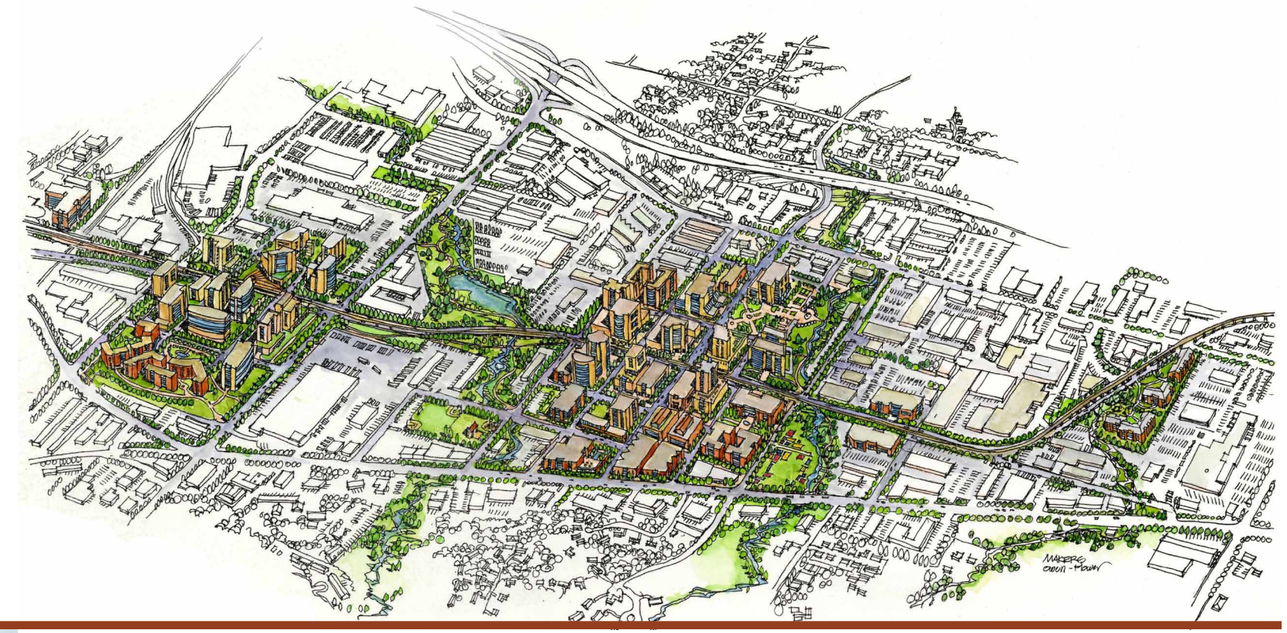
Bel-Red Living Streams

Location:	West Tributary (Kelsey Basin) between Bel-Red Rd and 124th Ave NE
Estimated Cost:	$1.1 million
Request:	$500,000
Account:	Interior-Environment, EPA STAG



The newly zoned Bel-Red area is slated to transition from an older industrial area to transit-oriented, multiple use development. However, the area has few existing amenities to attract the 5,000 dwelling units. Also, uncontrolled historical development caused substantial damage to the streams, wetlands and forests. Storm-water runoff flows untreated directly into the West Tributary of Kelsey Creek from multiple sources. Green infrastructure, such as bioswales and diffusion channels will immediately reduce pollution from these sources. The vision for the area will require public-private partnerships to realize the full environmental recovery. This grant resource will help the City show how streams can become an amenity, allowing businesses to see the value of restored fish and wildlife habitat, regional trail linkages, and verdant open space.

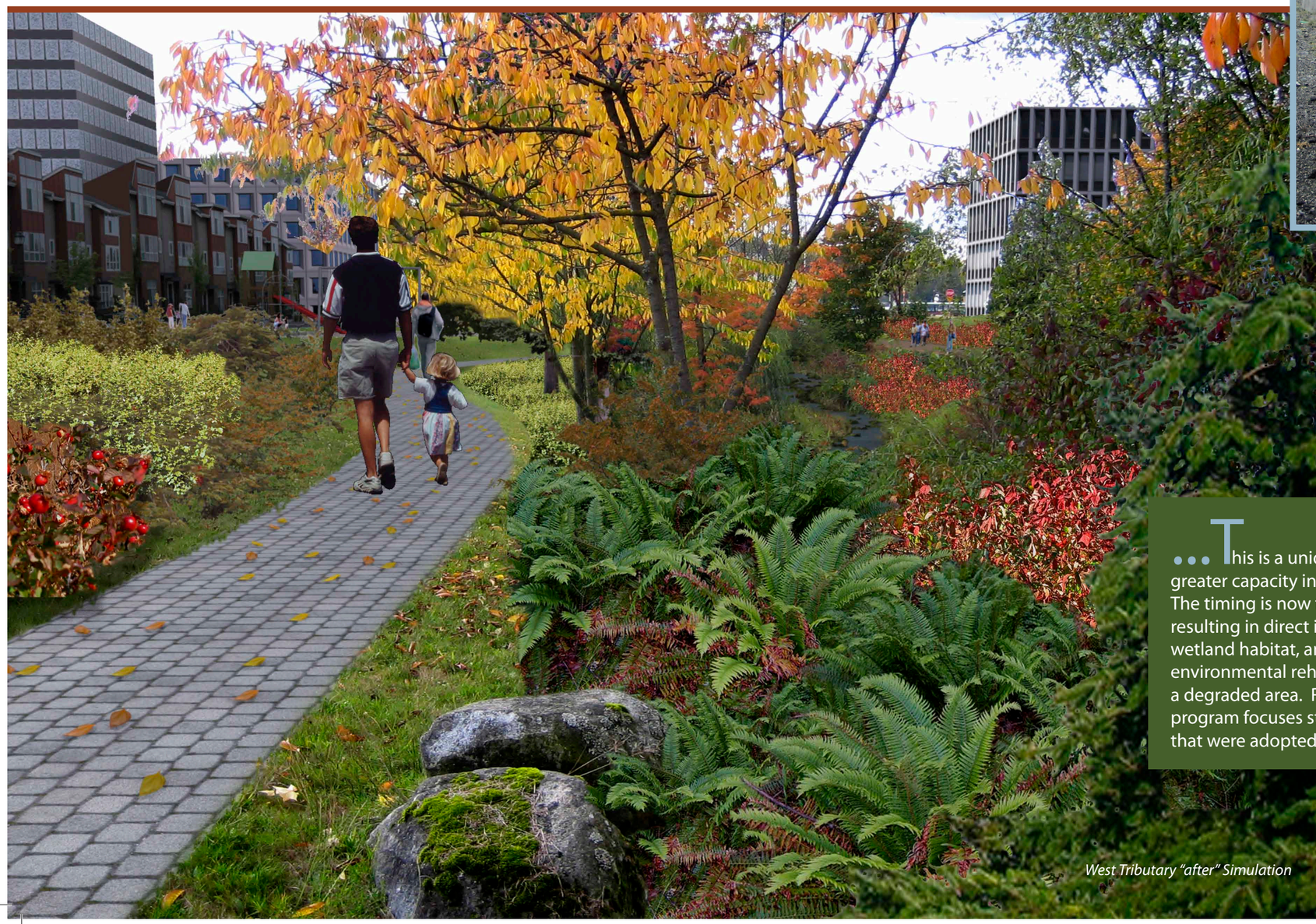
The goals of this project are to

- create bioswales, diffusion channels and other green infrastructure,
- design and restore approximately 1,800 feet of stream,
- remove invasive weeds,
- design and construct 7 acres of diverse, attractive native landscaping,
- promote private development incentive programs using restored areas, and
- model new, environmentally sensitive urban redevelopment.

PROJECT BENEFITS

The Bel-Red plan creates the potential for thousands of new housing units and entirely new residential and mixed use neighborhoods in close proximity to jobs, services, and transit. New residential development in Bel-Red will include a percentage of units affordable to low or moderate income households. The immediate project area is also anticipated to provide 15,000 jobs in new office towers surrounding a Sound Transit East Link light rail station. This will allow residents throughout the region easy transit access to jobs and amenities.

New urban residential neighborhoods planned for Bel-Red will require investments such as stream restoration and open spaces that support high quality, livable places. Public investment in these improvements paves the way for pioneer housing development in a transitioning area. Focusing growth in urban areas in transit-oriented developments such as the Bel-Red area helps protect intact rural and suburban habitats, reduces traffic, and lowers carbon footprints.



West Tributary "after" Simulation

...This is a unique opportunity to try something new and build greater capacity in local governments for environmental restoration. The timing is now for new approaches for environmental programs, resulting in direct improvements to water quality, stream and wetland habitat, and new jobs. This project is a new approach to environmental rehabilitation and compliance for redevelopment in a degraded area. Rather than relying on regulatory restrictions, this program focuses strongly on incentives for planned developments that were adopted by the Bellevue City Council.

Attachment 12

Appendix C
Highway Runoff Dilution Analysis

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Attachment 12

Highway Runoff Dilution Summary Results

Project: TDA1, Subbasin 1 (East)
Precipitation Series: Puget East 40
Description:

Background Concentrations (mg/L)
Dissolved Copper: 0.0019
Dissolved Zinc: 0.00612

Baseline Conditions: 2.12 acres
No Treatment Infiltration 0% - 2.12 acres

Proposed Conditions: 2.645 acres
Enhanced Treatment Infiltration 0% - 0.525 acres with detention
No Treatment Infiltration 0% - 0 acres with detention
No Treatment Infiltration 0% - 2.12 acres

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Depth (ft)										0.5	0.5	0.5	
Velocity (fps)										1	1	1	
Width (ft)										3	3	3	
Slope										0.02	0.02	0.02	
Discharge Distance (ft)										0	0	0	
Distance Downstream in feet to Meet Biological Threshold													
Dissolved C	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	
Dissolved Z	Baseline									< 1	2	2	
	Proposed									< 1	< 1	2	

Attachment 12

Highway Runoff Dilution Detailed Results

Dissolved Copper - September probability of occurrence for baseline conditions downstream distance = 1 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.006	0.001	0.002	0.002	0.001	0.000	0.000	0.000
0019 - 0.00	0.780	0.063	0.232	0.294	0.153	0.034	0.003	0.000
0 - 0.0019	0.214	0.017	0.064	0.081	0.042	0.009	0.001	0.000
		0.081	0.298	0.377	0.196	0.044	0.004	0.000

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.007	0.000	0.001	0.002	0.002	0.002	0.001	0.000
0019 - 0.00	0.844	0.013	0.077	0.203	0.268	0.190	0.074	0.016
0 - 0.0019	0.149	0.002	0.014	0.036	0.047	0.034	0.013	0.003
		0.016	0.092	0.241	0.318	0.225	0.088	0.019

Discharge Duration (hrs)

Dissolved Copper - September probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.008	0.001	0.002	0.003	0.002	0.000	0.000	0.000
0019 - 0.00	0.775	0.063	0.229	0.293	0.153	0.033	0.003	0.000
0 - 0.0019	0.217	0.018	0.064	0.082	0.043	0.009	0.001	0.000
		0.081	0.296	0.378	0.198	0.043	0.004	0.000

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.005	0.000	0.001	0.001	0.002	0.001	0.000	0.000
0019 - 0.00	0.845	0.013	0.079	0.202	0.270	0.190	0.073	0.016
0 - 0.0019	0.150	0.002	0.014	0.036	0.048	0.034	0.013	0.003
		0.016	0.093	0.239	0.319	0.225	0.086	0.019

Discharge Duration (hrs)

Dissolved Zinc - September probability of occurrence for baseline conditions downstream distance = 1 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.036	0.003	0.011	0.014	0.007	0.002	0.000	0.000
.006 - 0.01	0.906	0.073	0.269	0.344	0.177	0.040	0.004	0.000
0 - 0.00612	0.058	0.005	0.017	0.022	0.011	0.003	0.000	0.000
		0.080	0.297	0.380	0.195	0.044	0.004	0.000

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.026	0.000	0.003	0.006	0.008	0.006	0.002	0.001	0.000
.006 - 0.01	0.951	0.015	0.089	0.227	0.303	0.214	0.083	0.019	0.002
0 - 0.00612	0.023	0.000	0.002	0.005	0.007	0.005	0.002	0.000	0.000
		0.016	0.093	0.238	0.318	0.225	0.087	0.020	0.002

Discharge Duration (hrs)

Dissolved Zinc - September probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.029	0.002	0.009	0.011	0.006	0.001	0.000	0.000
.006 - 0.01	0.914	0.072	0.273	0.345	0.180	0.040	0.004	0.000
0 - 0.00612	0.057	0.005	0.017	0.022	0.011	0.003	0.000	0.000
		0.079	0.299	0.378	0.197	0.043	0.004	0.000

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.032	0.001	0.003	0.008	0.010	0.007	0.003	0.001	0.000
.006 - 0.01	0.945	0.014	0.087	0.229	0.301	0.212	0.083	0.018	0.002
0 - 0.00612	0.023	0.000	0.002	0.006	0.007	0.005	0.002	0.000	0.000
		0.015	0.092	0.242	0.318	0.224	0.088	0.019	0.002

Discharge Duration (hrs)

Dissolved Copper - October probability of occurrence for baseline conditions downstream distance = 1 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.009	0.001	0.002	0.003	0.002	0.001	0.000	0.000	0
0019 - 0.00	0.775	0.054	0.209	0.291	0.172	0.044	0.005	0.000	0
0 - 0.0019	0.216	0.015	0.058	0.081	0.048	0.012	0.001	0.000	0
		0.069	0.270	0.376	0.222	0.056	0.007	0.000	0

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.007	0.000	0.000	0.001	0.002	0.002	0.001	0.001	0.000
0019 - 0.00	0.843	0.006	0.037	0.119	0.218	0.233	0.152	0.061	0.017
0 - 0.0019	0.150	0.001	0.007	0.021	0.039	0.041	0.027	0.011	0.003
		0.007	0.044	0.141	0.258	0.277	0.180	0.073	0.021

Discharge Duration (hrs)

Attachment 12

Dissolved Copper - October probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.0039	0.009	0.001	0.002	0.003	0.002	0.001	0.000	0.000	0	> 0.0039	0.007	0.000	0.000	0.001	0.002	0.002	0.001	0.001	0.000
0019 - 0.00	0.777	0.053	0.208	0.294	0.172	0.045	0.005	0.000	0	0019 - 0.00	0.843	0.006	0.037	0.118	0.218	0.234	0.153	0.061	0.017
0 - 0.0019	0.215	0.015	0.057	0.081	0.047	0.012	0.001	0.000	0	0 - 0.0019	0.149	0.001	0.007	0.021	0.039	0.041	0.027	0.011	0.003
		0.069	0.268	0.379	0.221	0.057	0.007	0.000	0			0.007	0.044	0.140	0.258	0.277	0.182	0.072	0.020
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - October probability of occurrence for baseline conditions downstream distance = 2 feet

Conc. (mg/L)

Baseline Conditions										Proposed Conditions									
> 0.012	0.035	0.002	0.009	0.013	0.008	0.002	0.000	0.000	0	> 0.012	0.017	0.000	0.001	0.002	0.004	0.005	0.003	0.001	0.000
.006 - 0.01	0.909	0.062	0.246	0.343	0.200	0.051	0.006	0.000	0	.006 - 0.01	0.960	0.007	0.042	0.135	0.244	0.268	0.175	0.070	0.019
0 - 0.00612	0.057	0.004	0.015	0.022	0.013	0.003	0.000	0.000	0	0 - 0.00612	0.023	0.000	0.001	0.003	0.006	0.006	0.004	0.002	0.001
		0.068	0.270	0.378	0.220	0.057	0.007	0.000	0			0.007	0.044	0.140	0.254	0.279	0.182	0.073	0.020
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - October probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.012	0.030	0.002	0.008	0.011	0.007	0.002	0.000	0.000	0.000	> 0.012	0.046	0.000	0.002	0.007	0.012	0.013	0.008	0.003	0.001
.006 - 0.01	0.913	0.064	0.244	0.344	0.202	0.053	0.006	0.000	0.000	.006 - 0.01	0.932	0.007	0.041	0.132	0.239	0.257	0.170	0.067	0.019
0 - 0.00612	0.058	0.004	0.015	0.022	0.013	0.003	0.000	0.000	0.000	0 - 0.00612	0.022	0.000	0.001	0.003	0.006	0.006	0.004	0.002	0.001
		0.070	0.268	0.377	0.221	0.058	0.007	0.000	0.000			0.007	0.044	0.141	0.257	0.276	0.182	0.072	0.021
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - November probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)

Baseline Conditions										Proposed Conditions									
> 0.0039	0.011	0.001	0.003	0.004	0.003	0.001	0.000	0.000	0.000	> 0.0039	0.007	0.000	0.000	0.001	0.001	0.002	0.002	0.001	0.000
0019 - 0.00	0.773	0.055	0.203	0.283	0.175	0.050	0.007	0.001	0.000	0019 - 0.00	0.840	0.002	0.014	0.063	0.158	0.232	0.209	0.114	0.049
0 - 0.0019	0.216	0.015	0.057	0.079	0.049	0.014	0.002	0.000	0.000	0 - 0.0019	0.152	0.000	0.003	0.011	0.029	0.042	0.038	0.021	0.009
		0.071	0.262	0.367	0.226	0.065	0.009	0.001	0.000			0.002	0.017	0.075	0.188	0.276	0.248	0.136	0.058
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - November probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.0039	0.009	0.001	0.002	0.003	0.002	0.001	0.000	0.000	0	> 0.0039	0.009	0.000	0.000	0.001	0.002	0.003	0.002	0.001	0.001
0019 - 0.00	0.777	0.056	0.204	0.283	0.176	0.051	0.007	0.001	0	0019 - 0.00	0.839	0.002	0.014	0.063	0.155	0.231	0.208	0.116	0.049
0 - 0.0019	0.215	0.016	0.056	0.078	0.049	0.014	0.002	0.000	0	0 - 0.0019	0.151	0.000	0.003	0.011	0.028	0.042	0.038	0.021	0.009
		0.072	0.262	0.364	0.227	0.065	0.009	0.001	0			0.002	0.017	0.075	0.185	0.275	0.248	0.138	0.059
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Attachment 12

Dissolved Zinc - November probability of occurrence for baseline conditions downstream distance = 2 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.041	0.003	0.011	0.015	0.009	0.003	0.000	0.000	0.000
0.006 - 0.01	0.903	0.066	0.237	0.330	0.203	0.059	0.008	0.001	0.000
0 - 0.00612	0.057	0.004	0.015	0.021	0.013	0.004	0.001	0.000	0.000
		0.073	0.262	0.366	0.225	0.066	0.009	0.001	0.000

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.016	0.000	0.000	0.001	0.003	0.005	0.004	0.002	0.001
0.006 - 0.01	0.961	0.002	0.016	0.071	0.178	0.267	0.240	0.131	0.056
0 - 0.00612	0.023	0.000	0.000	0.002	0.004	0.006	0.006	0.003	0.001
		0.002	0.017	0.074	0.185	0.278	0.250	0.136	0.058

Discharge Duration (hrs)

Dissolved Zinc - November probability of occurrence for proposed conditions downstream distance = 2 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.019	0.001	0.005	0.007	0.004	0.001	0.000	0.000	0.000
0.006 - 0.01	0.924	0.065	0.241	0.336	0.211	0.061	0.008	0.001	0.000
0 - 0.00612	0.057	0.004	0.015	0.021	0.013	0.004	0.001	0.000	0.000
		0.071	0.261	0.364	0.229	0.066	0.009	0.001	0.000

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.038	0.000	0.001	0.003	0.007	0.010	0.009	0.005	0.002
0.006 - 0.01	0.940	0.002	0.017	0.070	0.175	0.257	0.236	0.128	0.055
0 - 0.00612	0.022	0.000	0.000	0.002	0.004	0.006	0.006	0.003	0.001
		0.002	0.018	0.075	0.186	0.273	0.251	0.136	0.059

Discharge Duration (hrs)

Attachment 12

Highway Runoff Dilution Summary Results

Project: TDA1, Subbasin 2 (West)
Precipitation Series: Puget East 40
Description:

Background Concentrations (mg/L)
Dissolved Copper: 0.0019
Dissolved Zinc: 0.00612

Baseline Conditions: 2.12 acres
No Treatment Infiltration 0% - 2.12 acres

Proposed Conditions: 2.645 acres
Enhanced Treatment Infiltration 0% - 0.525 acres with detention
No Treatment Infiltration 0% - 0 acres with detention
No Treatment Infiltration 0% - 2.12 acres

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Depth (ft)										1	1	1	
Velocity (fps)										0.2	0.2	0.2	
Width (ft)										7.5	7.5	7.5	
Slope										0.01	0.01	0.01	
Discharge Distance (ft)										0	0	0	
Distance Downstream in feet to Meet Biological Threshold													
Dissolved C	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	
Dissolved Z	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	

Attachment 12

Highway Runoff Dilution Detailed Results

Dissolved Copper - September probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.0039	0.005	0.000	0.001	0.002	0.001	0.000	0.000	0.000	0.000	> 0.0039	0.005	0.000	0.000	0.001	0.002	0.001	0.000	0.000	0.000
0019 - 0.00	0.781	0.063	0.233	0.296	0.152	0.034	0.003	0.000	0.000	0019 - 0.00	0.846	0.013	0.078	0.204	0.267	0.192	0.074	0.016	0.002
0 - 0.0019	0.215	0.017	0.064	0.082	0.042	0.009	0.001	0.000	0.000	0 - 0.0019	0.150	0.002	0.014	0.036	0.047	0.034	0.013	0.003	0.000
		0.080	0.298	0.380	0.194	0.044	0.004	0.000	0.000			0.015	0.093	0.241	0.315	0.226	0.088	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - September probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.0039	0.006	0.001	0.002	0.002	0.001	0.000	0.000	0.000	0	> 0.0039	0.004	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000
0019 - 0.00	0.779	0.062	0.232	0.295	0.153	0.033	0.004	0.000	0	0019 - 0.00	0.847	0.013	0.078	0.203	0.269	0.191	0.074	0.016	0.002
0 - 0.0019	0.215	0.017	0.064	0.082	0.042	0.009	0.001	0.000	0	0 - 0.0019	0.150	0.002	0.014	0.036	0.048	0.034	0.013	0.003	0.000
		0.080	0.298	0.379	0.196	0.042	0.005	0.000	0			0.016	0.092	0.240	0.318	0.226	0.087	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - September probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions									
> 0.012	0.027	0.002	0.008	0.010	0.005	0.001	0.000	0.000	0	> 0.012	0.020	0.000	0.002	0.005	0.006	0.005	0.002	0.000	0.000
.006 - 0.01	0.915	0.075	0.271	0.347	0.180	0.039	0.004	0.000	0	.006 - 0.01	0.957	0.015	0.088	0.231	0.302	0.217	0.084	0.018	0.002
0 - 0.00612	0.058	0.005	0.017	0.022	0.011	0.002	0.000	0.000	0	0 - 0.00612	0.023	0.000	0.002	0.006	0.007	0.005	0.002	0.000	0.000
		0.081	0.296	0.379	0.196	0.042	0.004	0.000	0			0.015	0.092	0.241	0.316	0.227	0.088	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - September probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.012	0.022	0.002	0.006	0.008	0.004	0.001	0.000	0.000	0.000	> 0.012	0.023	0.000	0.002	0.006	0.007	0.005	0.002	0.000	0.000
.006 - 0.01	0.921	0.074	0.275	0.348	0.180	0.040	0.004	0.000	0.000	.006 - 0.01	0.954	0.015	0.088	0.228	0.304	0.216	0.083	0.018	0.002
0 - 0.00612	0.058	0.005	0.017	0.022	0.011	0.003	0.000	0.000	0.000	0 - 0.00612	0.023	0.000	0.002	0.005	0.007	0.005	0.002	0.000	0.000
		0.080	0.299	0.378	0.196	0.043	0.004	0.000	0.000			0.016	0.093	0.239	0.318	0.226	0.087	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - October probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions									
> 0.0039	0.007	0.000	0.002	0.003	0.001	0.000	0.000	0.000	0	> 0.0039	0.005	0.000	0.000	0.001	0.001	0.001	0.001	0.000	0.000
0019 - 0.00	0.775	0.053	0.209	0.292	0.170	0.045	0.005	0.000	0	0019 - 0.00	0.846	0.006	0.037	0.119	0.218	0.235	0.152	0.061	0.018
0 - 0.0019	0.219	0.015	0.059	0.083	0.048	0.013	0.002	0.000	0	0 - 0.0019	0.149	0.001	0.007	0.021	0.038	0.041	0.027	0.011	0.003
		0.068	0.270	0.377	0.220	0.058	0.007	0.000	0			0.007	0.044	0.141	0.258	0.277	0.180	0.072	0.021
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Attachment 12

Dissolved Copper - October probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.0039	0.005	0.000	0.001	0.002	0.001	0.000	0.000	0.000	0	> 0.0039	0.005	0.000	0.000	0.001	0.001	0.001	0.001	0.000	0.000
0019 - 0.00	0.780	0.053	0.210	0.295	0.173	0.044	0.005	0.000	0	0019 - 0.00	0.844	0.006	0.037	0.119	0.218	0.234	0.153	0.061	0.017
0 - 0.0019	0.214	0.015	0.058	0.081	0.047	0.012	0.002	0.000	0	0 - 0.0019	0.151	0.001	0.007	0.021	0.039	0.042	0.027	0.011	0.003
		0.068	0.269	0.378	0.221	0.056	0.007	0.000	0			0.007	0.044	0.141	0.258	0.277	0.181	0.072	0.020
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - October probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)

Baseline Conditions										Proposed Conditions									
> 0.012	0.039	0.003	0.010	0.015	0.009	0.002	0.000	0.000	0	> 0.012	0.020	0.000	0.001	0.003	0.005	0.006	0.004	0.001	0.000
.006 - 0.01	0.905	0.062	0.244	0.340	0.201	0.053	0.006	0.000	0	.006 - 0.01	0.958	0.006	0.042	0.134	0.248	0.265	0.173	0.070	0.019
0 - 0.00612	0.056	0.004	0.015	0.021	0.012	0.003	0.000	0.000	0	0 - 0.00612	0.022	0.000	0.001	0.003	0.006	0.006	0.004	0.002	0.000
		0.068	0.269	0.376	0.222	0.058	0.007	0.000	0			0.007	0.044	0.140	0.259	0.277	0.181	0.073	0.019
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - October probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.012	0.022	0.002	0.006	0.008	0.005	0.001	0.000	0.000	0.000	> 0.012	0.036	0.000	0.002	0.005	0.009	0.010	0.007	0.003	0.001
.006 - 0.01	0.922	0.063	0.248	0.347	0.205	0.053	0.006	0.000	0.000	.006 - 0.01	0.941	0.007	0.042	0.132	0.239	0.263	0.171	0.068	0.019
0 - 0.00612	0.057	0.004	0.015	0.021	0.013	0.003	0.000	0.000	0.000	0 - 0.00612	0.023	0.000	0.001	0.003	0.006	0.006	0.004	0.002	0.001
		0.069	0.269	0.376	0.222	0.057	0.007	0.000	0.000			0.007	0.045	0.140	0.254	0.279	0.182	0.072	0.020
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - November probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)

Baseline Conditions										Proposed Conditions									
> 0.0039	0.008	0.001	0.002	0.003	0.002	0.001	0.000	0.000	0.000	> 0.0039	0.005	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.000
0019 - 0.00	0.778	0.056	0.206	0.282	0.176	0.051	0.007	0.000	0.000	0019 - 0.00	0.844	0.002	0.014	0.064	0.156	0.230	0.211	0.118	0.050
0 - 0.0019	0.214	0.016	0.057	0.078	0.048	0.014	0.002	0.000	0.000	0 - 0.0019	0.150	0.000	0.002	0.011	0.028	0.041	0.038	0.021	0.009
		0.072	0.265	0.363	0.226	0.066	0.008	0.001	0.000			0.002	0.016	0.076	0.184	0.273	0.250	0.140	0.059
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - November probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.0039	0.006	0.001	0.002	0.002	0.001	0.000	0.000	0.000	0.000	> 0.0039	0.007	0.000	0.000	0.001	0.001	0.002	0.002	0.001	0.000
0019 - 0.00	0.778	0.056	0.205	0.283	0.175	0.051	0.007	0.001	0.000	0019 - 0.00	0.841	0.002	0.015	0.063	0.157	0.232	0.209	0.116	0.048
0 - 0.0019	0.216	0.016	0.057	0.079	0.049	0.014	0.002	0.000	0.000	0 - 0.0019	0.152	0.000	0.003	0.011	0.028	0.042	0.038	0.021	0.009
		0.072	0.264	0.364	0.225	0.065	0.010	0.001	0.000			0.002	0.017	0.075	0.187	0.276	0.248	0.138	0.057
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Attachment 12

Dissolved Zinc - November probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.012	0.046	0.003	0.012	0.017	0.011	0.003	0.000	0.000	0.000	> 0.012	0.020	0.000	0.000	0.002	0.004	0.006	0.005	0.003	0.001
.006 - 0.01	0.896	0.066	0.236	0.327	0.202	0.058	0.008	0.001	0.000	.006 - 0.01	0.957	0.002	0.017	0.072	0.178	0.265	0.236	0.132	0.056
0 - 0.00612	0.058	0.004	0.015	0.021	0.013	0.004	0.001	0.000	0.000	0 - 0.00612	0.022	0.000	0.000	0.002	0.004	0.006	0.006	0.003	0.001
		0.073	0.263	0.365	0.226	0.065	0.009	0.001	0.000			0.002	0.018	0.075	0.185	0.277	0.246	0.138	0.059
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - November probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.012	0.022	0.002	0.006	0.008	0.005	0.001	0.000	0.000	0.000	> 0.012	0.044	0.000	0.001	0.003	0.008	0.012	0.011	0.006	0.003
.006 - 0.01	0.922	0.067	0.241	0.337	0.208	0.060	0.009	0.001	0.000	.006 - 0.01	0.933	0.002	0.016	0.070	0.172	0.259	0.232	0.128	0.053
0 - 0.00612	0.056	0.004	0.015	0.021	0.013	0.004	0.001	0.000	0.000	0 - 0.00612	0.023	0.000	0.000	0.002	0.004	0.006	0.006	0.003	0.001
		0.073	0.262	0.365	0.226	0.065	0.009	0.001	0.000			0.002	0.017	0.075	0.185	0.278	0.248	0.137	0.057
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Attachment 12

Highway Runoff Dilution Summary Results

Project: TDA 2
Precipitation Series: Puget East 40
Description:

Background Concentrations (mg/L)
Dissolved Copper: 0.0019
Dissolved Zinc: 0.00612

Baseline Conditions: 3.38 acres
No Treatment Infiltration 0% - 3.38 acres

Proposed Conditions: 4.33 acres
Enhanced Treatment Infiltration 0% - 0.95 acres with detention
Enhanced Treatment Infiltration 0% - 1.83 acres
No Treatment Infiltration 0% - 1.55 acres

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Depth (ft)										0.3	0.3	0.3	
Velocity (fps)										0.5	0.5	0.5	
Width (ft)										3.3	3.3	3.3	
Slope										0.01	0.01	0.01	
Discharge Distance (ft)										150	150	150	
Distance Downstream in feet to Meet Biological Threshold													
Dissolved C	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	
Dissolved Z	Baseline									6	11	16	
	Proposed									3	5	6	

Attachment 12

Highway Runoff Dilution Detailed Results

Dissolved Copper - September probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.0039	0.030	0.002	0.009	0.011	0.006	0.001	0.000	0.000	0.000	> 0.0039	0.023	0.000	0.002	0.006	0.007	0.005	0.002	0.000	0.000
0019 - 0.00	0.756	0.061	0.225	0.287	0.147	0.033	0.003	0.000	0.000	0019 - 0.00	0.873	0.013	0.081	0.211	0.275	0.198	0.077	0.017	0.002
0 - 0.0019	0.215	0.017	0.064	0.082	0.042	0.009	0.001	0.000	0.000	0 - 0.0019	0.104	0.002	0.010	0.025	0.033	0.024	0.009	0.002	0.000
		0.080	0.298	0.380	0.194	0.044	0.004	0.000	0.000			0.015	0.093	0.241	0.315	0.226	0.088	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - September probability of occurrence for proposed conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.0039	0.040	0.003	0.012	0.015	0.008	0.002	0.000	0.000	0	> 0.0039	0.015	0.000	0.001	0.004	0.005	0.003	0.001	0.000	0.000
0019 - 0.00	0.745	0.060	0.222	0.282	0.146	0.032	0.003	0.000	0	0019 - 0.00	0.880	0.014	0.081	0.211	0.280	0.199	0.077	0.017	0.002
0 - 0.0019	0.215	0.017	0.064	0.082	0.042	0.009	0.001	0.000	0	0 - 0.0019	0.105	0.002	0.010	0.025	0.033	0.024	0.009	0.002	0.000
		0.080	0.298	0.379	0.196	0.042	0.005	0.000	0			0.016	0.092	0.240	0.318	0.226	0.087	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - September probability of occurrence for baseline conditions downstream distance = 6 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.012	0.049	0.004	0.014	0.019	0.010	0.002	0.000	0.000	0	> 0.012	0.019	0.000	0.002	0.005	0.006	0.004	0.002	0.000	0.000
.006 - 0.01	0.894	0.073	0.265	0.339	0.175	0.038	0.004	0.000	0	.006 - 0.01	0.970	0.015	0.090	0.234	0.307	0.220	0.085	0.018	0.002
0 - 0.00612	0.058	0.005	0.017	0.022	0.011	0.002	0.000	0.000	0	0 - 0.00612	0.011	0.000	0.001	0.003	0.003	0.002	0.001	0.000	0.000
		0.082	0.296	0.379	0.196	0.042	0.004	0.000	0			0.015	0.092	0.241	0.316	0.227	0.088	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - September probability of occurrence for proposed conditions downstream distance = 3 feet

Baseline Conditions										Proposed Conditions								
> 0.012	0.059	0.005	0.018	0.023	0.012	0.003	0.000	0.000	0.000	> 0.012	0.040	0.001	0.004	0.010	0.013	0.009	0.004	0.001	0.000
.006 - 0.01	0.883	0.071	0.264	0.334	0.173	0.038	0.004	0.000	0.000	.006 - 0.01	0.949	0.015	0.088	0.227	0.302	0.215	0.083	0.018	0.002
0 - 0.00612	0.058	0.005	0.017	0.022	0.011	0.003	0.000	0.000	0.000	0 - 0.00612	0.011	0.000	0.001	0.003	0.003	0.002	0.001	0.000	0.000
		0.080	0.299	0.378	0.196	0.043	0.004	0.000	0.000			0.016	0.093	0.239	0.318	0.226	0.087	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - October probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.0039	0.041	0.003	0.011	0.016	0.009	0.002	0.000	0.000	0	> 0.0039	0.023	0.000	0.001	0.003	0.006	0.006	0.004	0.002	0.001
0019 - 0.00	0.740	0.050	0.200	0.279	0.163	0.043	0.005	0.000	0	0019 - 0.00	0.875	0.006	0.038	0.123	0.226	0.242	0.158	0.063	0.018
0 - 0.0019	0.219	0.015	0.059	0.083	0.048	0.013	0.002	0.000	0	0 - 0.0019	0.103	0.001	0.005	0.015	0.027	0.029	0.019	0.007	0.002
		0.068	0.270	0.377	0.220	0.058	0.007	0.000	0			0.007	0.044	0.141	0.258	0.277	0.180	0.072	0.021
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Attachment 12

Dissolved Copper - October probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192	Proposed Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.040	0.003	0.011	0.015	0.009	0.002	0.000	0.000	0	> 0.0039	0.023	0.000	0.001	0.003	0.006	0.006	0.004	0.002	0.001
0019 - 0.00	0.746	0.051	0.201	0.282	0.165	0.042	0.005	0.000	0	0019 - 0.00	0.872	0.006	0.038	0.123	0.225	0.242	0.158	0.063	0.018
0 - 0.0019	0.214	0.015	0.058	0.081	0.047	0.012	0.002	0.000	0	0 - 0.0019	0.104	0.001	0.005	0.015	0.027	0.029	0.019	0.008	0.002
		0.068	0.269	0.378	0.221	0.056	0.007	0.000	0			0.007	0.044	0.141	0.258	0.277	0.181	0.072	0.020

Discharge Duration (hrs)

Dissolved Zinc - October probability of occurrence for baseline conditions downstream distance = 11 feet

Conc. (mg/L)

Baseline Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192	Proposed Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.049	0.003	0.013	0.019	0.011	0.003	0.000	0.000	0	> 0.012	0.012	0.000	0.001	0.002	0.003	0.003	0.002	0.001	0.000
.006 - 0.01	0.895	0.061	0.241	0.336	0.198	0.052	0.006	0.000	0	.006 - 0.01	0.977	0.007	0.043	0.137	0.253	0.271	0.177	0.071	0.019
0 - 0.00612	0.056	0.004	0.015	0.021	0.012	0.003	0.000	0.000	0	0 - 0.00612	0.011	0.000	0.001	0.002	0.003	0.003	0.002	0.001	0.000
		0.068	0.269	0.376	0.222	0.058	0.007	0.000	0			0.007	0.044	0.140	0.259	0.277	0.181	0.073	0.019

Discharge Duration (hrs)

Dissolved Zinc - October probability of occurrence for proposed conditions downstream distance = 5 feet

Baseline Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192	Proposed Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.045	0.003	0.012	0.017	0.010	0.003	0.000	0.000	0.000	> 0.012	0.043	0.000	0.002	0.006	0.011	0.012	0.008	0.003	0.001
.006 - 0.01	0.899	0.062	0.242	0.338	0.200	0.051	0.006	0.000	0.000	.006 - 0.01	0.947	0.007	0.042	0.133	0.240	0.265	0.172	0.069	0.019
0 - 0.00612	0.057	0.004	0.015	0.021	0.013	0.003	0.000	0.000	0.000	0 - 0.00612	0.011	0.000	0.001	0.002	0.003	0.003	0.002	0.001	0.000
		0.069	0.269	0.376	0.222	0.057	0.007	0.000	0.000			0.007	0.045	0.140	0.254	0.279	0.182	0.072	0.020

Discharge Duration (hrs)

Dissolved Copper - November probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)

Baseline Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192	Proposed Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.050	0.004	0.013	0.018	0.011	0.003	0.000	0.000	0.000	> 0.0039	0.022	0.000	0.000	0.002	0.004	0.006	0.006	0.003	0.001
0019 - 0.00	0.736	0.053	0.195	0.267	0.166	0.048	0.006	0.000	0.000	0019 - 0.00	0.874	0.002	0.014	0.067	0.161	0.239	0.219	0.122	0.052
0 - 0.0019	0.214	0.016	0.057	0.078	0.048	0.014	0.002	0.000	0.000	0 - 0.0019	0.103	0.000	0.002	0.008	0.019	0.028	0.026	0.014	0.006
		0.072	0.265	0.363	0.226	0.066	0.008	0.001	0.000			0.002	0.016	0.076	0.184	0.273	0.250	0.140	0.059

Discharge Duration (hrs)

Dissolved Copper - November probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192	Proposed Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.041	0.003	0.011	0.015	0.009	0.003	0.000	0.000	0.000	> 0.0039	0.030	0.000	0.001	0.002	0.006	0.008	0.007	0.004	0.002
0019 - 0.00	0.743	0.054	0.196	0.270	0.167	0.048	0.007	0.001	0.000	0019 - 0.00	0.866	0.002	0.015	0.065	0.162	0.239	0.215	0.120	0.050
0 - 0.0019	0.216	0.016	0.057	0.079	0.049	0.014	0.002	0.000	0.000	0 - 0.0019	0.104	0.000	0.002	0.008	0.019	0.029	0.026	0.014	0.006
		0.072	0.264	0.364	0.225	0.065	0.010	0.001	0.000			0.002	0.017	0.075	0.187	0.276	0.248	0.138	0.057

Discharge Duration (hrs)

Attachment 12

Dissolved Zinc - November probability of occurrence for baseline conditions downstream distance = 16 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.012	0.049	0.004	0.013	0.018	0.011	0.003	0.000	0.000	0.000	> 0.012	0.008	0.000	0.000	0.001	0.002	0.002	0.002	0.001	0.001
.006 - 0.01	0.894	0.065	0.235	0.326	0.202	0.058	0.008	0.001	0.000	.006 - 0.01	0.980	0.002	0.017	0.074	0.182	0.272	0.241	0.135	0.058
0 - 0.00612	0.058	0.004	0.015	0.021	0.013	0.004	0.001	0.000	0.000	0 - 0.00612	0.011	0.000	0.000	0.001	0.002	0.003	0.003	0.002	0.001
		0.073	0.263	0.365	0.226	0.065	0.009	0.001	0.000			0.002	0.018	0.075	0.185	0.277	0.246	0.138	0.059
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - November probability of occurrence for proposed conditions downstream distance = 6 feet

Baseline Conditions										Proposed Conditions									
> 0.012	0.040	0.003	0.011	0.015	0.009	0.003	0.000	0.000	0.000	> 0.012	0.049	0.000	0.001	0.004	0.009	0.014	0.012	0.007	0.003
.006 - 0.01	0.904	0.066	0.236	0.330	0.204	0.059	0.008	0.001	0.000	.006 - 0.01	0.941	0.002	0.016	0.071	0.174	0.262	0.234	0.129	0.054
0 - 0.00612	0.056	0.004	0.015	0.021	0.013	0.004	0.001	0.000	0.000	0 - 0.00612	0.010	0.000	0.000	0.001	0.002	0.003	0.003	0.001	0.001
		0.073	0.262	0.365	0.226	0.065	0.009	0.001	0.000			0.002	0.017	0.075	0.185	0.278	0.248	0.137	0.057
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Attachment 12

Highway Runoff Dilution Summary Results

Project: TDA 3
Precipitation Series: Puget East 40
Description:

Background Concentrations (mg/L)
Dissolved Copper: 0.0019
Dissolved Zinc: 0.00612

Baseline Conditions: 1.79 acres
No Treatment Infiltration 0% - 1.79 acres

Proposed Conditions: 1.8 acres
No Treatment Infiltration 0% - 0.01 acres with detention
No Treatment Infiltration 0% - 1.79 acres

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Depth (ft)										0.3	0.3	0.3	
Velocity (fps)										0.5	0.5	0.5	
Width (ft)										3.3	3.3	3.3	
Slope										0.01	0.01	0.01	
Discharge Distance (ft)										1000	1000	1000	
Distance Downstream in feet to Meet Biological Threshold													
Dissolved C	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	
Dissolved Z	Baseline									2	4	5	
	Proposed									2	4	5	

Attachment 12

Highway Runoff Dilution Detailed Results

Dissolved Copper - September probability of occurrence for baseline conditions downstream distance = 1 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.014	0.001	0.004	0.005	0.003	0.001	0.000	0.000	0
0019 - 0.00	0.773	0.062	0.230	0.292	0.152	0.034	0.003	0.000	0
0 - 0.0019	0.214	0.017	0.064	0.081	0.042	0.009	0.001	0.000	0
		0.081	0.298	0.377	0.196	0.044	0.004	0.000	0

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.018	0.000	0.002	0.004	0.006	0.004	0.002	0.000	0.000
0019 - 0.00	0.766	0.012	0.070	0.185	0.244	0.172	0.067	0.014	0.002
0 - 0.0019	0.216	0.003	0.020	0.052	0.069	0.049	0.019	0.004	0.001
		0.016	0.092	0.241	0.318	0.225	0.088	0.019	0.002

Discharge Duration (hrs)

Dissolved Copper - September probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.019	0.002	0.006	0.007	0.004	0.001	0.000	0.000	0
0019 - 0.00	0.765	0.062	0.227	0.290	0.150	0.032	0.003	0.000	0
0 - 0.0019	0.216	0.018	0.064	0.082	0.042	0.009	0.001	0.000	0
		0.081	0.297	0.379	0.196	0.042	0.004	0.000	0

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.013	0.000	0.001	0.003	0.004	0.003	0.001	0.000	0.000
0019 - 0.00	0.772	0.012	0.072	0.183	0.245	0.175	0.069	0.015	0.002
0 - 0.0019	0.215	0.003	0.020	0.051	0.068	0.049	0.019	0.004	0.001
		0.016	0.093	0.238	0.318	0.226	0.089	0.019	0.002

Discharge Duration (hrs)

Dissolved Zinc - September probability of occurrence for baseline conditions downstream distance = 2 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.045	0.004	0.013	0.017	0.009	0.002	0.000	0.000	0
.006 - 0.01	0.898	0.073	0.267	0.339	0.175	0.040	0.004	0.000	0
0 - 0.00612	0.057	0.005	0.017	0.022	0.011	0.003	0.000	0.000	0
		0.082	0.297	0.378	0.195	0.044	0.004	0.000	0

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.037	0.001	0.004	0.009	0.012	0.008	0.003	0.001	0.000
.006 - 0.01	0.906	0.014	0.085	0.217	0.288	0.204	0.078	0.017	0.002
0 - 0.00612	0.057	0.001	0.005	0.014	0.018	0.013	0.005	0.001	0.000
		0.016	0.094	0.239	0.318	0.226	0.086	0.019	0.003

Discharge Duration (hrs)

Dissolved Zinc - September probability of occurrence for proposed conditions downstream distance = 2 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.037	0.003	0.011	0.014	0.007	0.002	0.000	0.000	0.000
.006 - 0.01	0.907	0.075	0.268	0.343	0.176	0.041	0.004	0.000	0.000
0 - 0.00612	0.056	0.005	0.017	0.021	0.011	0.003	0.000	0.000	0.000
		0.082	0.296	0.378	0.195	0.045	0.005	0.000	0.000

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.044	0.001	0.004	0.011	0.014	0.010	0.004	0.001	0.000
.006 - 0.01	0.900	0.014	0.083	0.217	0.285	0.202	0.079	0.017	0.002
0 - 0.00612	0.057	0.001	0.005	0.014	0.018	0.013	0.005	0.001	0.000
		0.016	0.093	0.241	0.317	0.225	0.088	0.019	0.002

Discharge Duration (hrs)

Dissolved Copper - October probability of occurrence for baseline conditions downstream distance = 1 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.020	0.001	0.005	0.008	0.004	0.001	0.000	0.000	0
0019 - 0.00	0.766	0.053	0.207	0.290	0.168	0.044	0.005	0.000	0
0 - 0.0019	0.214	0.015	0.058	0.081	0.047	0.012	0.001	0.000	0
		0.069	0.270	0.379	0.219	0.057	0.007	0.000	0

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.019	0.000	0.001	0.003	0.005	0.005	0.004	0.001	0.000
0019 - 0.00	0.766	0.005	0.034	0.108	0.196	0.214	0.139	0.055	0.015
0 - 0.0019	0.215	0.002	0.009	0.030	0.055	0.060	0.039	0.016	0.004
		0.007	0.044	0.141	0.256	0.279	0.182	0.072	0.020

Discharge Duration (hrs)

Attachment 12

Dissolved Copper - October probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.0039	0.019	0.001	0.005	0.007	0.004	0.001	0.000	0.000	0.000	> 0.0039	0.020	0.000	0.001	0.003	0.005	0.006	0.004	0.002	0.000
0019 - 0.00	0.768	0.052	0.208	0.290	0.169	0.043	0.005	0.000	0.000	0019 - 0.00	0.762	0.005	0.034	0.108	0.195	0.212	0.139	0.056	0.014
0 - 0.0019	0.214	0.015	0.058	0.081	0.047	0.012	0.001	0.000	0.000	0 - 0.0019	0.217	0.002	0.010	0.031	0.056	0.060	0.040	0.016	0.004
		0.068	0.271	0.378	0.220	0.056	0.007	0.000	0.000			0.007	0.044	0.141	0.256	0.278	0.183	0.073	0.019
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - October probability of occurrence for baseline conditions downstream distance = 4 feet

Conc. (mg/L)

Baseline Conditions										Proposed Conditions									
> 0.012	0.043	0.003	0.012	0.016	0.009	0.002	0.000	0.000	0.000	> 0.012	0.025	0.000	0.001	0.004	0.006	0.007	0.005	0.002	0.001
.006 - 0.01	0.901	0.062	0.242	0.340	0.199	0.052	0.006	0.000	0.000	.006 - 0.01	0.918	0.006	0.040	0.128	0.237	0.255	0.167	0.066	0.019
0 - 0.00612	0.057	0.004	0.015	0.021	0.013	0.003	0.000	0.000	0.000	0 - 0.00612	0.057	0.000	0.003	0.008	0.015	0.016	0.010	0.004	0.001
		0.069	0.269	0.377	0.221	0.057	0.007	0.000	0.000			0.007	0.044	0.140	0.258	0.278	0.182	0.072	0.020
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - October probability of occurrence for proposed conditions downstream distance = 4 feet

Baseline Conditions										Proposed Conditions									
> 0.012	0.025	0.002	0.007	0.009	0.006	0.001	0.000	0.000	0	> 0.012	0.043	0.000	0.002	0.006	0.011	0.012	0.008	0.003	0.001
.006 - 0.01	0.918	0.063	0.247	0.347	0.204	0.051	0.006	0.000	0	.006 - 0.01	0.899	0.006	0.040	0.126	0.228	0.251	0.163	0.066	0.018
0 - 0.00612	0.058	0.004	0.016	0.022	0.013	0.003	0.000	0.000	0	0 - 0.00612	0.057	0.000	0.003	0.008	0.015	0.016	0.010	0.004	0.001
		0.068	0.269	0.378	0.222	0.055	0.007	0.000	0			0.007	0.044	0.140	0.254	0.279	0.182	0.073	0.020
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - November probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)

Baseline Conditions										Proposed Conditions									
> 0.0039	0.024	0.002	0.006	0.009	0.005	0.002	0.000	0.000	0.000	> 0.0039	0.019	0.000	0.000	0.001	0.004	0.005	0.005	0.003	0.001
0019 - 0.00	0.761	0.055	0.200	0.276	0.172	0.050	0.007	0.000	0.000	0019 - 0.00	0.765	0.002	0.013	0.058	0.141	0.211	0.191	0.106	0.044
0 - 0.0019	0.215	0.016	0.057	0.078	0.049	0.014	0.002	0.000	0.000	0 - 0.0019	0.215	0.000	0.004	0.016	0.040	0.059	0.054	0.030	0.012
		0.073	0.263	0.363	0.226	0.066	0.009	0.001	0.000			0.002	0.017	0.075	0.185	0.276	0.250	0.139	0.057
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - November probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions										Proposed Conditions									
> 0.0039	0.018	0.001	0.005	0.007	0.004	0.001	0.000	0.000	0.000	> 0.0039	0.023	0.000	0.000	0.002	0.004	0.006	0.006	0.003	0.001
0019 - 0.00	0.765	0.056	0.201	0.278	0.172	0.051	0.007	0.001	0.000	0019 - 0.00	0.762	0.002	0.013	0.057	0.142	0.209	0.189	0.106	0.045
0 - 0.0019	0.217	0.016	0.057	0.079	0.049	0.014	0.002	0.000	0.000	0 - 0.0019	0.214	0.000	0.004	0.016	0.040	0.059	0.053	0.030	0.013
		0.073	0.263	0.364	0.224	0.066	0.010	0.001	0.000			0.002	0.018	0.075	0.186	0.274	0.248	0.139	0.059
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Attachment 12

Dissolved Zinc - November probability of occurrence for baseline conditions downstream distance = 5 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.046	0.003	0.012	0.017	0.010	0.003	0.000	0.000	0
0.006 - 0.01	0.898	0.065	0.237	0.329	0.200	0.059	0.008	0.001	0
0 - 0.00612	0.056	0.004	0.015	0.021	0.013	0.004	0.001	0.000	0
		0.072	0.264	0.366	0.223	0.065	0.009	0.001	0

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.022	0.000	0.000	0.002	0.004	0.006	0.006	0.003	0.001
0.006 - 0.01	0.920	0.002	0.016	0.068	0.171	0.253	0.230	0.128	0.053
0 - 0.00612	0.057	0.000	0.001	0.004	0.011	0.016	0.014	0.008	0.003
		0.002	0.018	0.074	0.186	0.274	0.250	0.139	0.058

Discharge Duration (hrs)

Dissolved Zinc - November probability of occurrence for proposed conditions downstream distance = 5 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.022	0.002	0.006	0.008	0.005	0.001	0.000	0.000	0.000
0.006 - 0.01	0.922	0.067	0.244	0.335	0.207	0.060	0.008	0.001	0.000
0 - 0.00612	0.057	0.004	0.015	0.021	0.013	0.004	0.001	0.000	0.000
		0.073	0.264	0.364	0.225	0.065	0.009	0.001	0.000

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.046	0.000	0.001	0.004	0.009	0.013	0.011	0.006	0.003
0.006 - 0.01	0.896	0.002	0.015	0.068	0.167	0.245	0.223	0.125	0.051
0 - 0.00612	0.058	0.000	0.001	0.004	0.011	0.016	0.014	0.008	0.003
		0.002	0.017	0.076	0.187	0.274	0.249	0.139	0.057

Discharge Duration (hrs)

Attachment 12

Highway Runoff Dilution Summary Results

Project: TDA 4
Precipitation Series: Puget East 40
Description:

Background Concentrations (mg/L)
Dissolved Copper: 0.0019
Dissolved Zinc: 0.00612

Baseline Conditions: 4.7 acres
No Treatment Infiltration 0% - 4.7 acres

Proposed Conditions: 5.54 acres
Enhanced Treatment Infiltration 0% - 0.83 acres with detention
No Treatment Infiltration 0% - 0.01 acres with detention
No Treatment Infiltration 0% - 4.7 acres

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Depth (ft)										1.5	1.5	1.5	
Velocity (fps)										0.62	0.62	0.62	
Width (ft)										6.5	6.5	6.5	
Slope										0.05	0.05	0.05	
Discharge Distance (ft)										900	900	900	
Distance Downstream in feet to Meet Biological Threshold													
Dissolved C	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	
Dissolved Z	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	

Attachment 12

Highway Runoff Dilution Detailed Results

Dissolved Copper - September probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0	> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0019 - 0.00	0.786	0.064	0.234	0.297	0.154	0.035	0.003	0.000	0	0019 - 0.00	0.836	0.013	0.077	0.202	0.266	0.188	0.073	0.016	0.002
0 - 0.0019	0.214	0.017	0.064	0.081	0.042	0.009	0.001	0.000	0	0 - 0.0019	0.164	0.003	0.015	0.040	0.052	0.037	0.014	0.003	0.000
		0.081	0.298	0.377	0.196	0.044	0.004	0.000	0			0.016	0.092	0.241	0.318	0.225	0.088	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - September probability of occurrence for proposed conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0019 - 0.00	0.783	0.064	0.232	0.296	0.155	0.034	0.003	0.000	0.000	0019 - 0.00	0.836	0.013	0.078	0.200	0.267	0.188	0.072	0.016	0.002
0 - 0.0019	0.217	0.018	0.064	0.082	0.043	0.009	0.001	0.000	0.000	0 - 0.0019	0.164	0.003	0.015	0.039	0.052	0.037	0.014	0.003	0.000
		0.081	0.296	0.378	0.198	0.043	0.004	0.000	0.000			0.016	0.093	0.239	0.319	0.225	0.086	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - September probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.012	0.003	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0	> 0.012	0.002	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000
.006 - 0.01	0.939	0.075	0.279	0.357	0.183	0.041	0.004	0.000	0	.006 - 0.01	0.970	0.015	0.091	0.231	0.309	0.219	0.085	0.019	0.002
0 - 0.00612	0.058	0.005	0.017	0.022	0.011	0.003	0.000	0.000	0	0 - 0.00612	0.028	0.000	0.003	0.007	0.009	0.006	0.002	0.001	0.000
		0.080	0.297	0.380	0.195	0.044	0.004	0.000	0			0.016	0.093	0.238	0.318	0.225	0.087	0.020	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Zinc - September probability of occurrence for proposed conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.012	0.002	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0	> 0.012	0.002	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000
.006 - 0.01	0.940	0.075	0.281	0.355	0.185	0.041	0.004	0.000	0	.006 - 0.01	0.970	0.015	0.089	0.235	0.309	0.217	0.085	0.018	0.002
0 - 0.00612	0.057	0.005	0.017	0.022	0.011	0.003	0.000	0.000	0	0 - 0.00612	0.028	0.000	0.003	0.007	0.009	0.006	0.002	0.001	0.000
		0.079	0.299	0.378	0.197	0.043	0.004	0.000	0			0.015	0.092	0.242	0.318	0.224	0.088	0.019	0.002
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Dissolved Copper - October probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)	Baseline Conditions									Proposed Conditions								
> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0	> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0019 - 0.00	0.784	0.054	0.212	0.294	0.174	0.044	0.005	0.000	0	0019 - 0.00	0.835	0.006	0.037	0.118	0.216	0.231	0.150	0.061	0.017
0 - 0.0019	0.216	0.015	0.058	0.081	0.048	0.012	0.001	0.000	0	0 - 0.0019	0.164	0.001	0.007	0.023	0.042	0.045	0.030	0.012	0.003
		0.069	0.270	0.376	0.222	0.056	0.007	0.000	0			0.007	0.044	0.141	0.258	0.277	0.180	0.073	0.021
		0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192			0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192

Discharge Duration (hrs)

Attachment 12

Dissolved Copper - October probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
0019 - 0.00	0.785	0.054	0.210	0.297	0.174	0.045	0.005	0.000	0
0 - 0.0019	0.215	0.015	0.057	0.081	0.047	0.012	0.001	0.000	0
		0.069	0.268	0.379	0.221	0.057	0.007	0.000	0

Proposed Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0019 - 0.00	0.836	0.006	0.037	0.117	0.216	0.232	0.152	0.060	0.017
0 - 0.0019	0.164	0.001	0.007	0.023	0.042	0.045	0.030	0.012	0.003
		0.007	0.044	0.140	0.258	0.277	0.182	0.072	0.020

Discharge Duration (hrs)

Dissolved Zinc - October probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)

Baseline Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.004	0.000	0.001	0.002	0.001	0.000	0.000	0.000	0
.006 - 0.01	0.939	0.064	0.254	0.355	0.207	0.053	0.007	0.000	0
0 - 0.00612	0.057	0.004	0.015	0.022	0.013	0.003	0.000	0.000	0
		0.068	0.270	0.378	0.220	0.057	0.007	0.000	0

Proposed Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.002	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000
.006 - 0.01	0.970	0.007	0.043	0.136	0.246	0.271	0.176	0.071	0.020
0 - 0.00612	0.028	0.000	0.001	0.004	0.007	0.008	0.005	0.002	0.001
		0.007	0.044	0.140	0.254	0.279	0.182	0.073	0.020

Discharge Duration (hrs)

Dissolved Zinc - October probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.002	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000
.006 - 0.01	0.940	0.066	0.252	0.355	0.208	0.055	0.006	0.000	0.000
0 - 0.00612	0.058	0.004	0.015	0.022	0.013	0.003	0.000	0.000	0.000
		0.070	0.268	0.377	0.221	0.058	0.007	0.000	0.000

Proposed Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.004	0.000	0.000	0.001	0.001	0.001	0.001	0.000	0.000
.006 - 0.01	0.969	0.007	0.042	0.137	0.249	0.268	0.177	0.070	0.020
0 - 0.00612	0.028	0.000	0.001	0.004	0.007	0.008	0.005	0.002	0.001
		0.007	0.044	0.141	0.257	0.276	0.182	0.072	0.021

Discharge Duration (hrs)

Dissolved Copper - November probability of occurrence for baseline conditions downstream distance = 1 feet

Conc. (mg/L)

Baseline Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0019 - 0.00	0.784	0.056	0.205	0.287	0.177	0.051	0.007	0.001	0.000
0 - 0.0019	0.216	0.015	0.057	0.079	0.049	0.014	0.002	0.000	0.000
		0.071	0.262	0.367	0.226	0.065	0.009	0.001	0.000

Proposed Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0019 - 0.00	0.832	0.002	0.014	0.062	0.156	0.230	0.206	0.113	0.048
0 - 0.0019	0.167	0.000	0.003	0.013	0.031	0.046	0.042	0.023	0.010
		0.002	0.017	0.075	0.188	0.276	0.248	0.136	0.058

Discharge Duration (hrs)

Dissolved Copper - November probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0
0019 - 0.00	0.785	0.057	0.206	0.286	0.178	0.051	0.007	0.001	0
0 - 0.0019	0.215	0.016	0.056	0.078	0.049	0.014	0.002	0.000	0
		0.072	0.262	0.364	0.227	0.065	0.009	0.001	0

Proposed Conditions	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.0039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0019 - 0.00	0.833	0.002	0.014	0.063	0.154	0.229	0.206	0.115	0.049
0 - 0.0019	0.166	0.000	0.003	0.013	0.031	0.046	0.041	0.023	0.010
		0.002	0.017	0.075	0.185	0.275	0.248	0.138	0.059

Discharge Duration (hrs)

Attachment 12

Dissolved Zinc - November probability of occurrence for baseline conditions downstream distance = 1 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.005	0.000	0.001	0.002	0.001	0.000	0.000	0.000
0.006 - 0.01	0.938	0.069	0.246	0.343	0.211	0.062	0.008	0.001
0 - 0.00612	0.057	0.004	0.015	0.021	0.013	0.004	0.001	0.000
		0.073	0.262	0.366	0.225	0.066	0.009	0.001

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.002	0.000	0.000	0.000	0.000	0.001	0.001	0.000
0.006 - 0.01	0.970	0.002	0.016	0.072	0.179	0.270	0.242	0.132
0 - 0.00612	0.028	0.000	0.001	0.002	0.005	0.008	0.007	0.004
		0.002	0.017	0.074	0.185	0.278	0.250	0.136

Discharge Duration (hrs)

Dissolved Zinc - November probability of occurrence for proposed conditions downstream distance = 1 feet

Baseline Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.002	0.000	0.001	0.001	0.000	0.000	0.000	0.000
0.006 - 0.01	0.941	0.067	0.246	0.342	0.215	0.062	0.009	0.001
0 - 0.00612	0.057	0.004	0.015	0.021	0.013	0.004	0.001	0.000
		0.071	0.261	0.364	0.229	0.066	0.009	0.001

Proposed Conditions

Conc. (mg/L)	0 - 3	3 - 6	6 - 12	12 - 24	24 - 48	48 - 96	96 - 192	>192
> 0.012	0.004	0.000	0.000	0.000	0.001	0.001	0.001	0.000
0.006 - 0.01	0.968	0.002	0.017	0.072	0.180	0.264	0.243	0.132
0 - 0.00612	0.028	0.000	0.001	0.002	0.005	0.008	0.007	0.004
		0.002	0.018	0.075	0.186	0.273	0.251	0.136

Discharge Duration (hrs)