



Memorandum

**Date:** October 19, 2011

**To:** Paul Krawczyk and Marina Arakelyan  
City of Bellevue Department of Transportation

**From:** Ken Oswell and Tye Simpson  
Parsons Brinckerhoff

**Subject:** Final Revisions to the NE 4<sup>th</sup> Street/120<sup>th</sup> Avenue NE Corridor Project SEPA Checklist – Request for Updated and Additional Information Regarding Potential Water Quality Impacts

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## INTRODUCTION

As documented in another letter report prepared by Parsons Brinckerhoff, new analysis has been conducted to identify potential stormwater impacts of the proposed NE 4<sup>th</sup> Street/120<sup>th</sup> Avenue NE Corridor Project. The updated information from this new analysis requires re-examination of the potential effects on water quality issues, including pollutant loadings and the possible effects the dissolved metals may have on fish that may be found in the West Tributary of Kelsey Creek and Sturtevant Creek.

The four major sections of the text that follow address these concerns and include a summary of the updated approach to stormwater drainage for the project corridor, updated analysis of potential water quality effects, updated analysis of dissolved metals, and conclusions concerning potential effects on fish in West Tributary of Kelsey Creek and Sturtevant Creek.

### A. SUMMARY OF THE UPDATED APPROACH TO STORMWATER DRAINAGE

The updated analysis of stormwater drainage issues was to determine required drainage thresholds and stormwater minimum requirements for the entire project corridor, rather than individual construction stages proposed for the project. The analysis also determined all proposed stormwater mitigation complies with current City of Bellevue Code.

The NE 4<sup>th</sup> Street/120<sup>th</sup> Avenue NE Corridor consists of four threshold discharge areas (TDAs). These include: West Tributary TDA, Lake Bellevue TDA, NE 8<sup>th</sup> Street TDA and 120<sup>th</sup> Avenue NE TDA. The most northern is the West Tributary TDA, which drains to the West Tributary of Kelsey Creek. The remaining three TDAs ultimately drain to Sturtevant Creek. The approximate limits of these TDAs are shown on Figure 1.

An analysis was performed for each TDA to determine the applicable minimum stormwater requirements. Because NE 8<sup>th</sup> Street TDA net new impervious surfaces are less than 5,000 sq. ft., neither flow control nor runoff treatment facilities are required for this TDA. However, both runoff treatment and flow control are required for the West Tributary, Lake Bellevue, and 120<sup>th</sup> Avenue NE

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TDA. Where runoff treatment is required, enhanced water quality will be provided. Where flow control is required, it will be met using an approved flow control facility.

While the results presented in this memorandum show an increase in dissolved metals, total metals and total suspended solids, the project is complying with the City's codes and standards for stormwater treatment. The City's stormwater standards were based upon Ecology's Stormwater Management Manual (Ecology SWMM). As a condition of approval of the City's NPDES Phase II State Waste Discharge Permit, the City's stormwater manual was required to match or be more restrictive than those requirements in the Ecology SWMM. The manual provides guidance for a municipality to develop a stormwater management strategy to apply that will bring it in compliance with all state and federal water quality requirements. The Ecology SWMM also recognizes that future degradation of our water bodies may continue even with the application of these requirements, but the use of stormwater management practices should minimize the damage.

Bioretention swales and proprietary bioretention systems (Filterra) would be used to provide runoff treatment within planting areas. Both systems provide the enhanced runoff treatment. Flow control would be provided using natural drainage practices (i.e. porous concrete sidewalks and bioretention systems) and underground stormwater storage systems (detention vaults and/or pipes).

**B. UPDATED POLLUTANT LOADING CALCULATIONS**

Currently, no stormwater treatment is provided for impervious surfaces within the study area. The project would provide stormwater treatment for 1.98 acres of new PGIS (see Table 1). Where runoff treatment is provided, enhanced treatment measures would be used.

**Table 1. Threshold Discharge Areas Build Alternative Modifications**

Discharge Location	TDA No.	Existing PGIS (acres)	New PGIS (acres)	Total Proposed Untreated PGIS (acres)	Total Treated PGIS <sup>3</sup> (acres)
116 <sup>th</sup> Avenue NE	TDA 1	4.70	0.92	4.70	0.92
NE 8 <sup>th</sup> Street	TDA 2	1.79	0.03	1.82	0.00
Lake Bellevue	TDA 3	3.38	0.58	3.38	0.58
West Tributary	TDA 4	4.23	0.48	4.23	0.48
	TOTALS	14.10	2.01	14.13	1.98

Notes:

1. TDA = Threshold Discharge Area; PGIS = Pollution Generating Impervious Surfaces; BMPs = best management practices.
2. These areas shown are approximate and may change as design progresses.
3. All treatment BMPs will be will provide enhanced treatment.

Utilizing the WSDOT *Quantitative Procedures for Surface Water Impact Assessments* methodology an approximate 1.1 percent increase in total suspended solids (TSS), and a 7.0% and 9.3% increase in dissolved zinc and copper, respectively, have been calculated (see Table 2). The detailed pollutant loading calculations per TDA are included in Appendix A.

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**Table 2. Pollutant Loading Summary**

Pollutant Loading	TSS	Zinc		Copper	
		Total	Dissolved	Total	Dissolved
Load Rate					
Mean annual load from untreated surfaces (lbs/ac)	565	1.1	0.4	0.2	0.053
Mean annual load from treated surfaces (lbs/ac)	45	0.28	0.2	0.065	0.035
Project Total					
Annual effluent load from existing impervious surfaces prior to project (lbs)	7,967	15.51	5.64	2.82	0.75
Annual effluent load from new and existing impervious surfaces after project with treatment (lbs)	8,056	16.02	6.04	2.95	0.82
Net change in pollutant loads between pre- and post-project conditions with treatment (lbs)	89	0.55	0.40	0.13	0.07
Net Percentage Increase	1.1%	3.6%	7.0%	4.6%	9.3%

**C. UPDATED ANALYSIS OF LEVELS OF DISSOLVED METALS**

Parsons Brinckerhoff conducted dilution analyses to update the results presented in the *Water Quality Discipline Report*. This previous analysis indicated that “background levels of dissolved metals would be reached within a few feet of entering the project corridor’s water bodies (Sturtevant Creek, Lake Bellevue, and the West Tributary of Kelsey Creek)”.

This previous dilution analysis was based on available water quality data and proposed stormwater flow and treatment plans. Since the publication of that report, water quality data closer to the project corridor has been obtained (see Figure 2). Previous dissolved metal concentrations used in the analysis were taken from a location on the Mercer Slough much further downstream than the recently obtained data. Table 3 below lists the previous and updated median concentrations for zinc and copper that were used in the analyses.

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**Table 3. Dissolved Metals Results**

Drainage Basin and TDA	Previous Data		Updated Data	
	Zinc mg/l	Copper mg/l	Zinc mg/l	Copper mg/l
Sturtevant Creek	0.00612	0.0019	0.127	0.023
TDA 1	0.00612	0.0019	0.127	0.023
TDA 2	0.00612	0.0019	0.127	0.023
TDA 3	0.00612	0.0019	0.127	0.023
West Tributary	0.00612	0.0019	0.179	0.0335
TDA 4	0.00612	0.0019	0.179	0.0335

The updated dilution analyses used the WSDOT Highway Runoff Dilution and Loading Model, which is known as the HI-RUN Model. The model was run for each of the project TDA outfalls. The results of these new dilution analyses by TDA are included in Appendix B. The new results indicate that the “Distance Downstream in feet to Meet Biological Threshold” has either stayed the same (<1 foot) or been reduced in the case of TDA 4 (from <2 foot to <1 foot) in comparison to the previous analysis. Anything less than 1 foot indicates near instantaneous dilution. This contrasts to the threshold for impacts set at dilutions that occur at 1,000 feet or more from the discharge location.

**D. UPDATED ASSESSMENT OF POTENTIAL IMPACTS TO FISH**

The proposed project corridor is in proximity to two streams and a lake (see Figure 3). Lake Bellevue is west of the project corridor and is the headwaters of Sturtevant Creek. At the north end of the project corridor, the roadway crosses the West Tributary of Kelsey Creek.

The September 8, 2011 version of the City of Bellevue map of city streams titled *Streams - Fish and Non-Fish Bearing Streams* shows that both of these two streams are designated Type F, or fish-bearing streams. This designation does not confirm that there are fish found in these streams, but rather indicates that the streams have fish habitat.

In 2001, the City of Bellevue contracted with The Watershed Company to conduct a study of fish in the city’s many streams. This 2001 study documented the following:

- Sturtevant Creek – In 1975, the stream was known to support coho fish and other species the entire length of the stream. The new study identified poor fish habitat along the stream corridor and concluded it is unlikely fish are found above the I-405 crossing. The investigation did not find any fish in any of three segments investigated along the stream corridor. Lake Bellevue, however, is known to support a population of non-native goldfish.
- West Tributary of Kelsey Creek – City data indicates that Chinook, sockeye, and coho salmon as well as Dace and sucker are present in downstream segments of the stream, while cutthroat trout reach as far upstream as segment 4, which ends at the culvert under NE Bel-Red Road. Electro-fishing on both sides of the culvert and upstream reaches beyond 120<sup>th</sup> Avenue NE did not yield fish of any type. In fact, the WDFW SalmonScape Maps identify the culvert at NE Bel-Red Road as a fish barrier.

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TDA 4, the project's most northern TDA, location is at the 120<sup>th</sup> Avenue NE crossing of the West Tributary of Kelsey Creek (see Figure 3). This location is over 4,500 feet upstream of the identified limit of anadromus fish access to the creek, which is shown as Point A on Figure 3. The project's other three TDA discharge locations all ultimately drain to Sturtevant Creek and all are over 2,000 feet upstream of the identified limit of anadromus fish access to the creek, which is shown as Point B on Figure 3. As such and considering the results of the dissolved metals analyses, the near instantaneous dilutions of dissolved metals would not be expected to affect potential fish populations in either West Tributary of Kelsey Creek or Sturtevant Creek.

## References

Parsons Brinckerhoff. 2011. Water Quality Technical Report, Revised Draft. Prepared for the City of Bellevue. July, 2011.

Parsons Brinckerhoff. 2011. Final Revisions to the NE 4<sup>th</sup> Street/120<sup>th</sup> Avenue NE Corridor Project SEPA Checklist Request for Additional Information Regarding Corridor Drainage Approach, Letter Report. October 14, 2011.

Washington State Department of Ecology (Ecology). 2007. Water Resource Inventory Area (WRIA) Maps. URL: <http://www.ecy.wa.gov/services/gis/maps/wria/wria.htm> (last accessed August 9, 2010).

Washington Department of Transportation. 2009. Highway Runoff Dilution And Loading Model Documentation. Prepared by Herrera. January 2009

Washington State Department of Ecology (Ecology). 2010. *Surface Water Discipline Report Technical Guidance*. URL: <http://www.wsdot.wa.gov/NR/rdonlyres/8AB033CC-4C9C-42B4-A876-FBCD0CFA7108/0/SurfaceWtrDisciplineRptTechGuidance.pdf> (last accessed October 8, 2011).

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## **FIGURES**

# TDA ANALYSIS

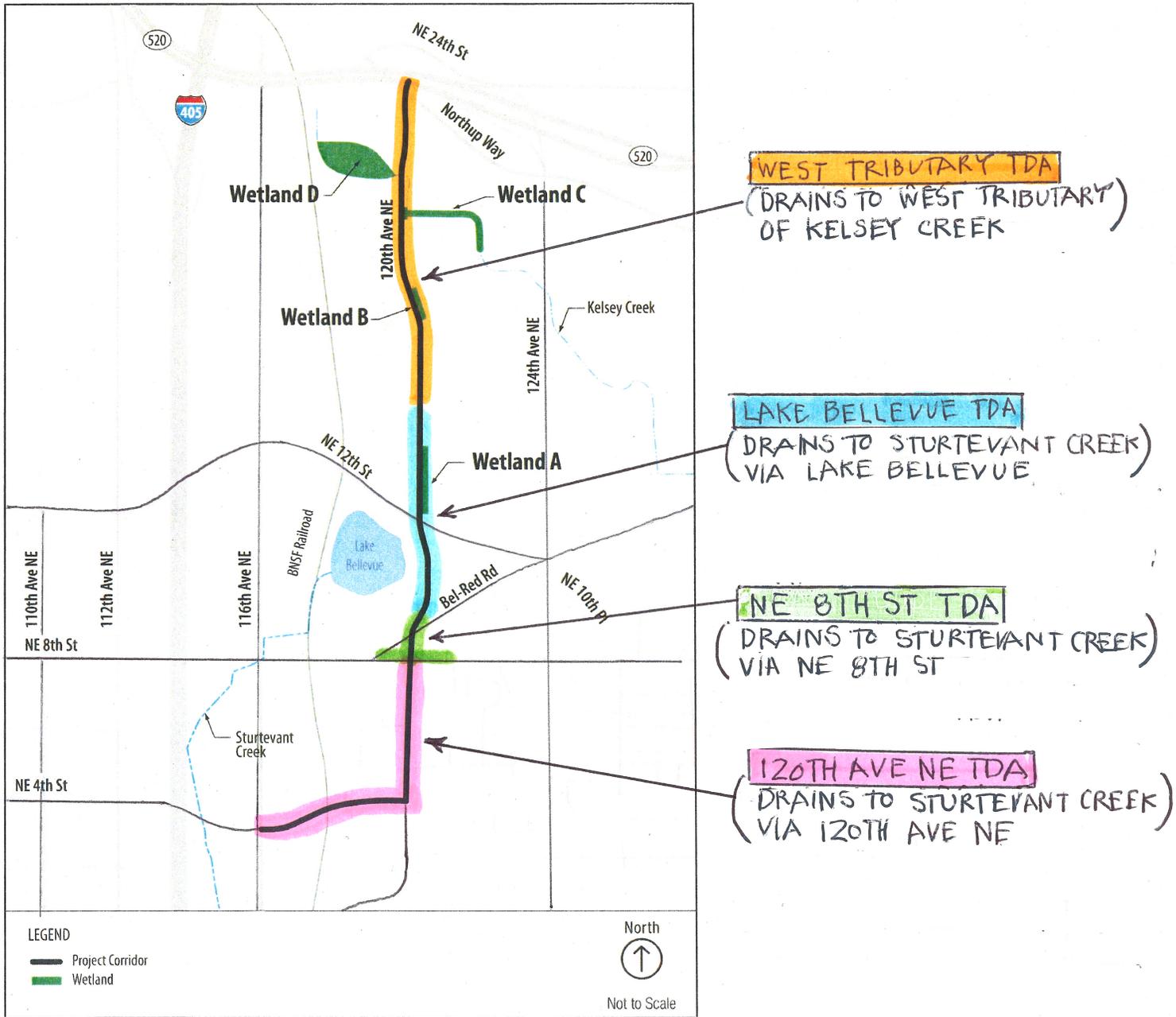
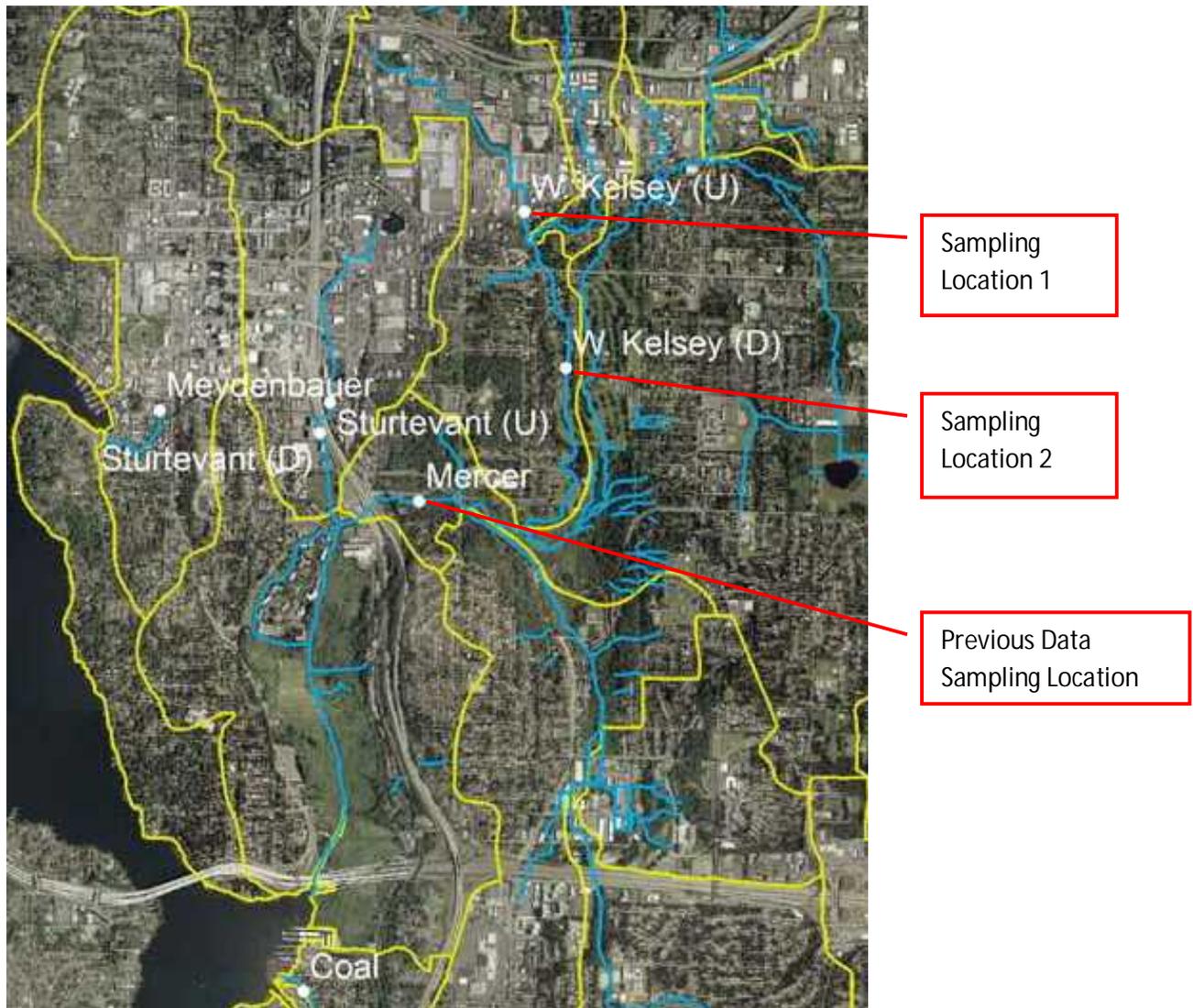


FIGURE 1

### Map of Sampling Locations

The map below shows the location of previous sampling data used for West Tributary of Kelsey Creek and the locations of the recently obtained sampling data.



**Figure 2**

Existing Stream Fish Barriers in the Project Area

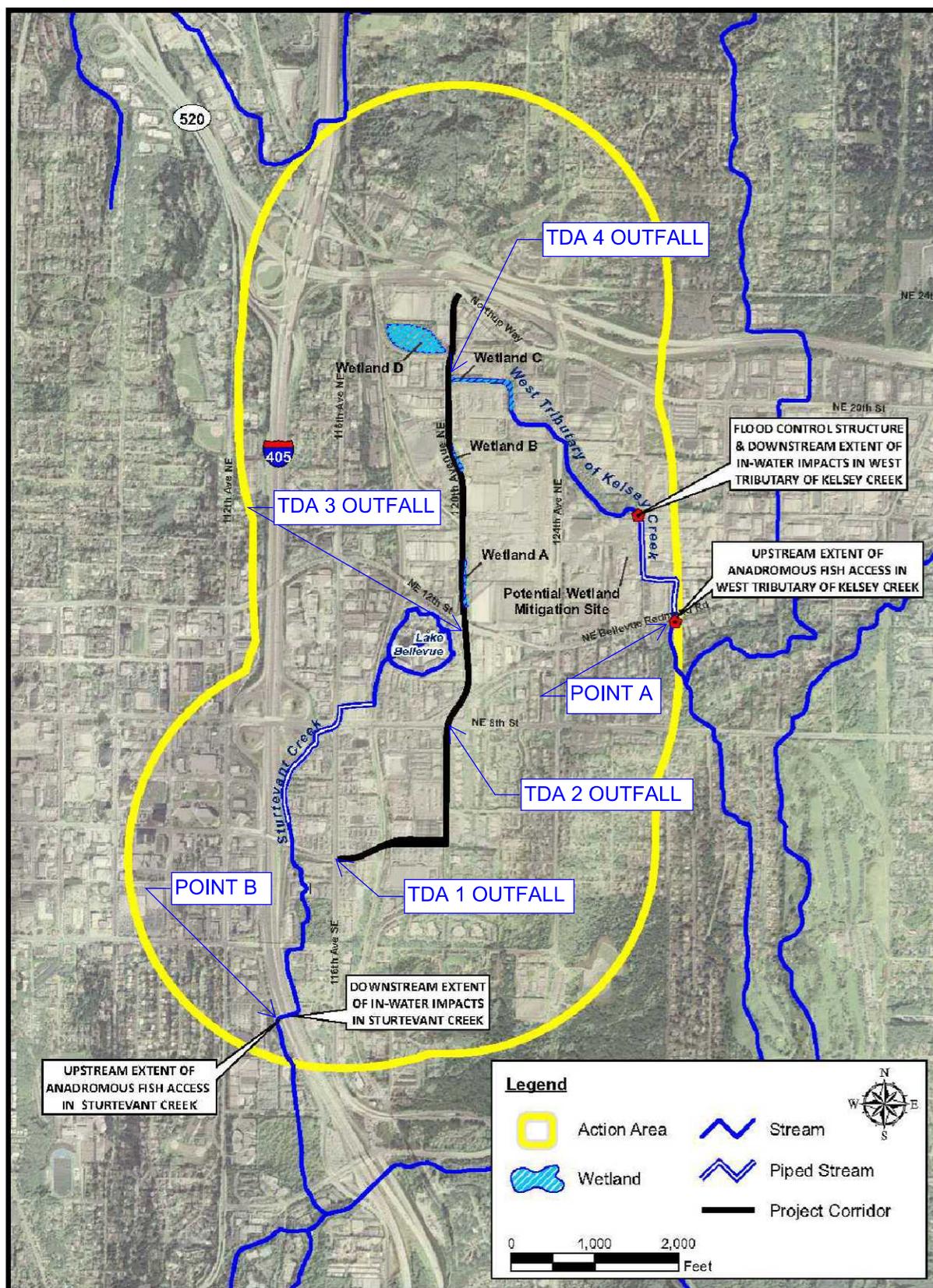


Figure 3

## **APPENDIX A**

Data Entry Table—Breakdown by TDA (Method 2)					
Diccharge Location	TDA No.	Amount Existing Impervious (acres)	Increase in PGIS Due to Build Alternative (net new) (acres)	Total PGIS to be Untreated (acres)	Total PGIS Treated by Bioretention BMPs(acres)
116th Ave NE	1	4.70	0.92	4.70	0.92
NE 8th Street	2	1.79	0.03	1.79	0.00
Lake Bellevue	3	3.38	0.58	3.38	0.58
West Tributary	4	4.23	0.48	4.23	0.48
Total		14.10	2.01	14.1	1.98

Load Calculations

	TSS	Zinc Total	Dissolved	Copper Total	Dissolved
Load Rates					
Mean annual load from untreated surfaces (lbs/acre)	565	1.1	0.4	0.2	0.053
Mean annual load from treated surfaces (lbs/acre)	45	0.28	0.2	0.065	0.035
Project Total					
Annual emment load from existing impervious surfaces prior to project (lbs)	7,967	15.51	5.64	2.82	0.75
Annual emment load from new and existing impervious surfaces after project (lbs) with treatment	8,056	16.06	6.04	2.95	0.82
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	89	0.55	0.40	0.13	0.07
Net Percentage Increase	1.1%	3.6%	7.0%	4.6%	9.3%

TDA Breakdown

TDA 1					
Annual emment load from existing impervious surfaces prior to project (lbs)	2,656	5.17	1.88	0.94	0.249
Annual emment load from new and existing impervious surfaces after project (lbs) with treatment	2,697	5.43	2.06	1.00	0.281
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	41	0.26	0.18	0.06	0.03

<i>TDA 2</i>					
Annual effluent load from existing impervious surfaces prior to project (lbs)	1,011	1.969	0.716	0.358	0.095
Annual effluent load from new and existing impervious surfaces after project (lbs) with treatment	1,011	1.97	0.72	0.36	0.095
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	0	0.00	0.00	0.00	0.00
<i>TDA 3</i>					
Annual effluent load from existing impervious surfaces prior to project (lbs)	1,910	3.718	1.352	0.676	0.179
Annual effluent load from new and existing impervious surfaces after project (lbs) with treatment	1,936	3.88	1.47	0.71	0.199
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	26	0.16	0.12	0.04	0.02
<i>TDA 4</i>					
Annual effluent load from existing impervious surfaces prior to project (lbs)	2,390	4.653	1.692	0.846	0.224
Annual effluent load from new and existing impervious surfaces after project (lbs) with treatment	2,412	4.79	1.79	0.88	0.241
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	22	0.13	0.10	0.03	0.02
<i>Summary</i>					
Annual effluent load from existing impervious surfaces prior to project (lbs)	7,967	16	6	3	1
Annual effluent load from new and existing impervious surfaces after project (lbs) with treatment	8,056	16	6	3	1
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	89	0.55	0.40	0.13	0.07

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## **APPENDIX B**



# Highway Runoff Dilution and Loading model (HI-RUN) Vers End of Pipe Loading Subroutine Report

This model is for stormwater analysis associated with biological assessments, and is not a design tool.

Input Summary	
-----	
Run Date/Time: 10/17/11 19:37	
Outfall ID: TDA1, Subbasin 1 (East)	
Rain Gauge: Puget East 40	
Description:	
-----	
Discharge Areas	
Subbasin 1 - Baseline Conditions - 2.35 acres	
no treatment - 0% infiltration - 2.35 acres	
Subbasin 1 - Proposed Conditions - 2.81 acres	
enhanced treatment - 0% infiltration - 0.46 acres	
no treatment - 0% infiltration - 2.35 acres	

## Load Analysis

	Dissolved Zinc Load (lb/yr)	
	Baseline	Proposed
Max	25.5	22
75th Percentile	0.91	0.98
Median	0.476	0.54
25th Percentile	0.247	0.31
Min	0.009	0.036
P (exceed)		<b>0.554</b>

### Highway Runoff Dilution Summary Results

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

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Background Concentrations (mg/L)  
 Dissolved Copper: 0.023  
 Dissolved Zinc: 0.127

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Baseline Conditions: 2.35 acres  
 No Treatment Infiltration 0% - 2.35 acres

Proposed Conditions: 2.81 acres  
 Enhanced Treatment Infiltration 0% - 0.46 acres with detention  
 No Treatment Infiltration 0% - 0 acres with detention  
 No Treatment Infiltration 0% - 2.35 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	
<b>Distance Downstream in feet to Meet Biological Threshold</b>													
Dissolved Copper	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	
Dissolved Zinc	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	

# Highway Runoff Dilution and Loading model (HI-RUN) Version 2.0

## End of Pipe Loading Subroutine Report

This model is for stormwater analysis associated with biological assessments, and is not a design tool.

Input Summary	
-----	
Run Date/Time: 10/17/11 20:51	
Outfall ID: TDA1, Subbasin 2 (West)	
Rain Gauge: Puget East 40	
Description:	
-----	
Discharge Areas	
Subbasin 1 - Baseline Conditions - 2.35 acres	
no treatment - 0% infiltration - 2.35 acres	
Subbasin 1 - Proposed Conditions - 2.81 acres	
enhanced treatment - 0% infiltration - 0.46 acres	
no treatment - 0% infiltration - 2.35 acres	

### Load Analysis

	Dissolved Zinc Load (lb/yr)	
	Baseline	Proposed
Max	24.1	27
75th Percentile	0.873	0.97
Median	0.47	0.55
25th Percentile	0.251	0.32
Min	0.006	0.039
P (exceed)		<b>0.556</b>

### Highway Runoff Dilution Summary Results

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

---

Background Concentrations (mg/L)  
 Dissolved Copper: 0.023  
 Dissolved Zinc: 0.127

---

Baseline Conditions: 2.35 acres  
 No Treatment Infiltration 0% - 2.35 acres

Proposed Conditions: 2.81 acres  
 Enhanced Treatment Infiltration 0% - 0.46 acres with detention  
 No Treatment Infiltration 0% - 0 acres with detention  
 No Treatment Infiltration 0% - 2.35 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	
<b>Distance Downstream in feet to Meet Biological Threshold</b>													
Dissolved Copper	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	
Dissolved Zinc	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	

# Highway Runoff Dilution and Loading model (HI-RUN) Vers End of Pipe Loading Subroutine Report

This model is for stormwater analysis associated with biological assessments, and is not a design tool.

<p>Input Summary</p> <p>-----</p> <p>Run Date/Time: 10/17/11 20:04                  Outfall ID: TDA 2                  Rain Gauge: Puget East 40                  Description:</p> <p>-----</p> <p>Discharge Areas</p> <p>Subbasin 1 - Baseline Conditions - 1.79 acres                  no treatment - 0% infiltration - 1.79 acres</p> <p>Subbasin 1 - Proposed Conditions - 1.82 acres                  no treatment - 0% infiltration - 1.82 acres</p>
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## Load Analysis

	Dissolved Zinc Load (lb/yr)	
	Baseline	Proposed
Max	18.4	21
75th Percentile	0.665	0.7
Median	0.358	0.37
25th Percentile	0.191	0.19
Min	0.004	0.007
P (exceed)		<b>0.511</b>

## Highway Runoff Dilution Summary Results

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

---

Background Concentrations (mg/L)  
 Dissolved Copper: 0.023  
 Dissolved Zinc: 0.127

---

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

Proposed Conditions: 1.82 acres  
 No Treatment Infiltration 0% - 0.03 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)										150	150	150	
<b>Distance Downstream in feet to Meet Biological Threshold</b>													
Dissolved Copper	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	
Dissolved Zinc	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	

# Highway Runoff Dilution and Loading model (HI-RUN) Vers End of Pipe Loading Subroutine Report

This model is for stormwater analysis associated with biological assessments, and is not a design tool.

Input Summary	
-----	
Run Date/Time: 10/17/11 20:15	
Outfall ID: TDA 3	
Rain Gauge: Puget East 40	
Description:	
-----	
Discharge Areas	
Subbasin 1 - Baseline Conditions - 3.38 acres	
no treatment - 0% infiltration - 3.38 acres	
Subbasin 1 - Proposed Conditions - 3.96 acres	
enhanced treatment - 0% infiltration - 0.58 acres	
no treatment - 0% infiltration - 3.38 acres	

## Load Analysis

	Dissolved Zinc Load (lb/yr)	
	Baseline	Proposed
Max	34.7	38
75th Percentile	1.26	1.4
Median	0.677	0.78
25th Percentile	0.361	0.44
Min	0.008	0.052
P (exceed)		<b>0.551</b>

## Highway Runoff Dilution Summary Results

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

---

Background Concentrations (mg/L)  
 Dissolved Copper: 0.023  
 Dissolved Zinc: 0.127

---

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

Proposed Conditions: 3.96 acres  
 Enhanced Treatment Infiltration 0% - 0.58 acres with detention  
 Enhanced Treatment Infiltration 0% - 0 acres  
 No Treatment Infiltration 0% - 3.38 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	
<b>Distance Downstream in feet to Meet Biological Threshold</b>													
Dissolved Copper	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	
Dissolved Zinc	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	

## Highway Runoff Dilution and Loading model (HI-RUN) Version 2.0

### End of Pipe Loading Subroutine Report

This model is for stormwater analysis associated with biological assessments, and is not a design tool.

Input Summary	
-----	
Run Date/Time: 10/17/11 20:18	
Outfall ID: TDA 4	
Rain Gauge: Puget East 40	
Description:	
-----	
Discharge Areas	
Subbasin 1 - Baseline Conditions - 4.23 acres	
no treatment - 0% infiltration - 4.23 acres	
Subbasin 1 - Proposed Conditions - 4.71 acres	
enhanced treatment - 0% infiltration - 0.48 acres	
no treatment - 0% infiltration - 4.23 acres	

### Load Analysis

	Dissolved Zinc Load (lb/yr)	
	Baseline	Proposed
Max	43.4	48
75th Percentile	1.57	1.7
Median	0.847	0.94
25th Percentile	0.451	0.52
Min	0.01	0.05
P (exceed)		<b>0.538</b>

### Concentration Analysis

Subbasin 1	Dissolved Zinc Conc (mg/L)	
	Baseline	Proposed
Max	0.833	1.042
75th Percentile	0.052	0.048
Median	0.028	0.026
25th Percentile	0.015	0.015
Min	0.001	0.002
P (exceed)		0.494

## Highway Runoff Dilution Summary Results

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

---

Background Concentrations (mg/L)  
 Dissolved Copper: 0.0335  
 Dissolved Zinc: 0.179

---

Baseline Conditions: 4.23 acres  
 No Treatment Infiltration 0% - 4.23 acres

Proposed Conditions: 4.71 acres  
 Enhanced Treatment Infiltration 0% - 0.48 acres with detention  
 No Treatment Infiltration 0% - 0 acres with detention  
 No Treatment Infiltration 0% - 4.23 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	
<b>Distance Downstream in feet to Meet Biological Threshold</b>													
Dissolved Copper	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	
Dissolved Zinc	Baseline									< 1	< 1	< 1	
	Proposed									< 1	< 1	< 1	

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