City of Salem
National Pollutant Discharge Elimination System (NPDES)
Municipal Separate Storm Sewer System (MS4)

Summary of Water Quality Data
For Reporting Year 2012/2013

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1.0 Introduction

This document provides all monitoring data collected in accordance with the City of Salem's NPDES MS4 Permit for the reporting year of July 1, 2012, to June 30, 2013 (RY 2012/2013). A background narrative for each monitoring element is provided below, and all collected data are provided in the tables, figures, and attachments[1].

2.0 Monitoring Elements

Specific details for each monitoring element can be found in the City's "Stormwater and Surface Water Monitoring Plan". Progress toward meeting monitoring requirements defined in Table B-1 of the City's MS4 Permit is summarized in Table 1. Monitoring site locations and parameters for each monitoring element are described in Tables 2 and 3, respectively.

2.1 Monthly Instream Monitoring

Monthly Instream[2] monitoring of urban streams is conducted on a predetermined schedule. This monitoring element includes the collection of grab samples and field measurements on 11 of Salem's MS4 stormwater runoff receiving streams. Ten of these streams are paired with upstream (at or near where the stream enters the City's jurisdiction) and downstream (at or near where the stream exits the City's jurisdiction or enters a receiving stream) site locations. The eleventh stream, the West Fork Little Pudding River, only has a downstream site location, because the West Fork Little Pudding River starts in the greater Salem area and runs dry during the summer months. Figure 1 denotes the locations of each site.

Water quality parameters collected at all sites include:

- Temperature
- Turbidity
- Specific Conductivity
- pH
- Dissolved Oxygen (DO)
- Nitrate + Nitrite as Nitrogen (NO_3+NO_2-N)
- *Escherichia coli (E. coli)*
- Biochemical Oxygen Demand (BOD_{stream})

Additional water quality parameters were added for the sites within the Pringle Creek Watershed (PRI1, PRI5, CLA1, and CLA10; refer to Table 2 for a list of site locations) and the West Fork Little Pudding River (LPW1) to meet requirements of the MS4 Permit. These additional parameters include:

- Zinc -total recoverable and dissolved: (CLA1, CLA10, PRI1, PRI5)
- Copper -total recoverable and dissolved: (CLA1, CLA10, PRI1, PRI5)
- Lead -total recoverable and dissolved: (CLA1, CLA10, PRI1, PRI5)

[1] All tables, figures and attachments are at the end of this document and are not necessarily discussed in the order in which they appear.

[2] Identified as Urban Streams monitoring in the City of Salem Stormwater Management Plan 2010

- Hardness: (CLA1, CLA10, PRI1, PRI5)
- Total Suspended Solids (TSS): (LPW1)

Data for this monitoring element are provided as follows:

- Table 5 - Monthly medians for collected data
- Table 6 - Number of water quality criteria exceedances
- Table 7 - All raw monthly data
- Figure 2 - Graphs of mean value comparison for dry and rain conditions
- Figure 3 - Upstream/downstream comparison of *E. coli* data

2.2 Continuous Instream Monitoring

The City maintains a network of Continuous Instream water quality monitoring sites and stream gauging sites on seven different urban streams within the city. One Continuous Instream water quality monitoring site (SHE3) and two stream gauge-only sites (PRI4 and LPW1) were added to the network in July of 2012, bringing the total to eleven water quality monitoring sites and two stream gauging-only sites. Data from these new sites are included in this year's Annual Report. Figure 1 denotes the locations of each site.

The monitoring sites for this monitoring element are positioned in an upstream/downstream configuration. The upstream sites are adjacent to where the stream enters the City and the downstream sites are either above the confluence with another stream or where the stream exits the City's jurisdictional boundary.

Continuous data collected includes:

- Turbidity
- Specific Conductivity
- Temperature
- pH
- DO
- Stage

All data are recorded in 15-minute intervals. All continuous statistical data summaries presented in the various tables and figures were computed using grade A and/or grade B data. Qualification of what constitutes grade A and grade B data is provided in Table 8.

The Continuous Instream monitoring element incorporates an alarm system that supports the City's Illicit Discharge Detection and Elimination (IDDE) program. The alarm system is used to record, notify, and prompt investigation of water quality abnormalities that may be indicative of illicit discharges. It serves as an important tool to aid in the elimination of periodic illicit discharges, helps to prioritize dry weather outfall screening activities (see section 2.9), and serves as an outreach/education opportunity for residents.

Monthly medians for collected data are summarized in Table 9. Plots of continuous data and a summary of system alarms are provided in Figures 4 through 7.

2.3 Instream Storm Monitoring

Instream Storm refers to the monitoring of MS4 receiving streams during defined storm events. Sampling occurs at three sites in the Pringle Creek Watershed (continuous instream monitoring sites PRI12, PRI3, and CLK1). Data collected are intended to increase understanding of receiving waters within the Pringle Creek Watershed and help guide Salem's stormwater management strategies in watersheds throughout the city. This is a new monitoring element that is expected to continue beyond the current MS4 Permit cycle; ultimately providing a dataset for long-term trending and spatial analyses.

Sampling consists of flow weighted composite samples, grab samples, and field measurements. Parameters include:

- TSS
- BOD_{stream}
- Total Phosphorus (TP)
- Ortho Phosphorus
- NO_3+NO_2-N
- Ammonia Nitrogen (NH_3)
- Copper (Total Recoverable and Dissolved)
- Lead (Total Recoverable and Dissolved)
- Zinc (Total Recoverable and Dissolved)
- Hardness
- Specific Conductivity
- DO
- Temperature
- pH
- *E. coli*

Data for this monitoring element are provided in Table 10.

2.4 Stormwater Monitoring

The City has collected water quality samples from a number of sites throughout the MS4 system since 1995. Following the current monitoring plan and strategy, there are three monitoring sites: one each for residential, commercial, and industrial land use. The commercial and industrial sites are new sites for this permit, while the residential site was sampled during the previous MS4 Permit cycle. Data from this monitoring element will be aggregated with previous data collected from similar land use types. The aggregated datasets will be used to characterize MS4 stormwater runoff pollutant concentrations.

Sampling consists of flow weighted composite samples, grab samples, and field measurements. Parameters include:

- TSS
- $BOD_{5\text{-}day}$
- TP
- Ortho Phosphorus
- NH_3

- NO_3+NO_2-N
- Copper (Total Recoverable and Dissolved)
- Lead (Total Recoverable and Dissolved)
- Zinc (Total Recoverable and Dissolved)
- Hardness
- Specific Conductivity
- Temperature
- pH
- DO
- *E. coli*

Data for this monitoring element are provided in Table 11.

2.5 Pesticide Monitoring

Monitoring for the presence of pesticides in MS4 stormwater runoff is a new requirement of the MS4 Permit. Pesticide monitoring occurs at the same three sites where Stormwater monitoring is conducted. Consistent with Table B-1 of the MS4 Permit, halogenated pesticide and chlorinated herbicide screens are performed. For RY 2012/2013, two sets of pesticide samples were collected at each of the three sites and sent to Pacific Agricultural Laboratory for analysis. In addition to the screens required in Table B-1, additional analyses included: Organophosphorous, Organosulfur, Organonitrogen, Phenylurea, and Carbamate pesticide screens. This resulted in a screening for 188 different pesticides at each site.
Detected pesticides are summarized in Table 12, and the complete laboratory reports are provided as Attachment A.

2.6 Stormwater-Mercury Monitoring

Monitoring of low-level mercury and methyl mercury (total recoverable and dissolved) in MS4 discharges during storm events is a new requirement of the MS4 Permit. Monitoring occurs twice per year (summer and winter) at the same residential and commercial land use sites used for Stormwater and Pesticide monitoring. EPA Method 1669 ultra clean sampling protocols are followed to collect all samples.

Per the Department of Environmental Quality's (DEQ) request, additional grab samples were collected at the same time as the mercury samples and sent to CH2M Hill Applied Sciences Laboratory for analysis of:

- TSS
- Dissolved Organic Carbon (DOC)
- Total Organic Carbon (TOC)
- Sulfate
- Alkalinity

Field Measurements were taken for:

- Temperature
- pH
- Oxygen Reduction Potential (ORP)
- DO

- Specific Conductivity

Mercury data collected for this monitoring element are provided in Table 13 and additional data collected are provided in Table 14.

2.7 Benthic Macroinvertebrate Monitoring

Benthic Macroinvertebrate Monitoring is a new requirement of the City's MS4 Permit. Sampling for this monitoring element was conducted at sites along Pringle and Clark Creeks. The three sites, two on Pringle Creek and one on Clark Creek, were selected because of their close proximity to where benthic macroinvertebrate and physical habitat data were collected for two separate bioassessment collection events in 2000 and 2001.

The City utilized a consultant, Pacific Habitat Services, to collect benthic macroinvertebrates, physical habitat data, and conduct fish sampling. Data collection was performed in June 2012 and 2013 at the same sites, consequently satisfying this monitoring requirement. A summary of collected data are provided in Tables 15 through 17, and the complete data report is provided as Appendix B.

2.8 Willamette River Water Quality Data

Starting in 1990, Willamette River water quality data were collected by the City's Willow Lake Water Pollution Control Facility laboratory staff. This monitoring *is not* a requirement of the MS4 Permit, nor is it identified in the monitoring plan. However, collected data are being provided because the Willamette River water quality sampling program is referenced in the City of Salem Stormwater Management Plan 2010 (Best Management Practice MON1 Task 2).

Section 3.0 describes how this monitoring element will change for RY 2013/2014.

Willamette River water quality data are provided in Table 18.

2.9 Priority Dry Weather Outfall/Manhole Screening

For RY 2012/2013, dry weather inspections were completed at a total of 34 structures (outfalls and manholes), all of which were identified in the City of Salem's Dry Weather Outfall and Illicit Discharge Screening Plan. The plan had identified a total of 35 structures; however, staff were unable to locate one of the structures. Additionally, the plan identifies action levels (i.e. level that triggers a source investigation by City staff of a suspected illicit discharge) for all observed and analytical data collected.

<u>Observational Data</u>
Observational data collected did not produce any direct indication of the presence of an illicit discharge at any of the 34 priority structures.

<u>Field Screening Pollutant Parameters</u>
Field screening pollutant parameters include temperature, pH, specific conductivity, turbidity, and chlorine. Only chlorine had concentration levels above the action level, which occurred at

three of the 34 sites. However, further analytical testing of detergents, fluoride, potassium, sodium, and ammonia showed that these three sites did not show any conclusive evidence that an illicit discharge was present. See Table 19 for all data collected during inspections.

Laboratory Analysis Pollutant Parameters

As stated in the Dry Weather Outfall and Illicit Discharge Screening Plan, during the 2012 inspection season all observed flowing water at priority structures was tested for fluoride. This resulted in a total of 18 structures being tested for fluoride. Of the 18 structures screened, 15 had fluoride at or above the 0.1 mg/L action limit. When an aliquot had a presence of fluoride at or above the action limit, the laboratory tested for all other parameters identified in the screening plan (detergents, potassium, ammonia, and sodium). None of the other parameters were found to have concentrations above action levels.

Six of the structures did show ammonia to be present; however, concentrations were well below action levels. For an additional look at these structures, follow up samples were collected for *E. coli* testing. Two of the six structures sampled for *E. coli* had concentrations above the 406 acute water quality criteria. These two structures will have additional *E. coli* testing performed during the 2013 inspection season. See Table 19 for all data collected during inspections.

3.0 Revisions to the City of Salem Surface Water and Stormwater Monitoring Plan

3.1 Background

Historically, the laboratory staff at the City's Willow Lake Water Pollution Control Facility collected samples for the Willamette River water quality sampling program. However, due to budget reductions, this group was no longer able to fund the collection of these data. These data are of particular value to the MS4 monitoring program, and this program is referenced in the City's Stormwater Management Plan 2010. Therefore, it was decided that the program would be modified for integration into the Monthly Instream monitoring element identified in the City's Surface Water and Stormwater Monitoring Plan.

3.2 Correspondence with the DEQ

On March 1, 2013, the City submitted a letter to the DEQ requesting approval of revisions to the City's Surface Water and Stormwater Monitoring Plan, specifically the Monthly Instream monitoring element to include the Willamette River water quality sampling program. Stormwater staff had a phone conversation with Benjamin Benninghoff (Salem's Municipal MS4 Stormwater Coordinator) on March 7th, 2013 discussing the revisions, and received approval of the changes via email on March 15th, 2013.

A copy of the letter sent to the DEQ, a copy of the revised City of Salem Surface Water and Stormwater Monitoring Plan, and a copy of the email approval from the DEQ are included as Attachment C. Although changes to the monitoring plan and approval occurred during RY 2012/2013, the change was not implemented until July 1, 2013. Changes to data reporting will appear in the Annual Report Monitoring Appendix for RY 2013/2014.

4.0 Conclusion

The City completed all MS4 Permit monitoring requirements for this reporting year, and is on track to meet all of the minimum monitoring requirements outlined in the MS4 Permit before its expiration on December 29, 2015. Cumulatively, data collected throughout this MS4 Permit cycle will be utilized to meet monitoring objectives identified in the City's monitoring plan, while also supporting data analyses that will be conducted in preparation for an MS4 Permit renewal package.

Table 1.

Progress Towards Completion of Table B-1 Environmental Monitoring Elements

Monitoring Type	# of sites	Total "Events" Needed	Completed 2010/2011	Completed 2011/2012	Completed 2012/2013	Remaining "Events" Needed
Monthly Instream	21	48 / site	12[1]	12[1]	12[1]	12[1]
Continuous Instream	10	On going	NA	NA	NA	NA
Instream Storm	3	25 / site	0[3]	6	6	13
Stormwater (MS4)	3	15 / site	0[3]	4	4	7
Pesticides	3	4 / site	0[3]	1	2	1
Mercury	2	2 / site / year	0[3]	2	1	1[2]
Macroinvertebrates	3	2 / site	0[3]	1	1	COMPLETE

[1] 4 of the 21 sites had less than 12 data collection events due to no flow or access issues; however, all sites are on pace to meet the minimum permit requirements.

[2] Following Table B-1 Special Condition #6 of the City's NPDES MS4 permit, the City anticipates requesting that the Department eliminate the mercury and methyl mercury monitoring requirement after two years of monitoring.

[3] Because the City's monitoring plan was not approved by the Department until June 29th, 2011, no sampling was conducted for this element.

Table 2.
Site Locations for Each Monitoring Element

Monthly Instream	
Site ID	Site Location
BAT 1	Commercial St SE
BAT 12	Rees Hill Rd SE
CGT 1	Mainline Dr NE
CGT 5	Hawthorne St NE @ Hyacinth St NE
CLA 1	Bush Park
CLA 10	Ewald St SE
CRO 1	Courthouse Athletic Club
CRO 10	Ballantyne Rd S
GIB 1	Wallace Rd NW
GIB 15	Brush College Rd NW
GLE 1	River Bend Rd NW
GLE 10	Hidden Valley Dr NW
LPW 1	Cordon Rd NE
MIC 1	Front St Bridge
MIC 10	Turner Rd SE
MRA 1	High St SE
MRA 10	Mill Race Park
PRI 1	Riverfront Park
PRI 5	Bush Park
SHE 1	Church St SE
SHE 10	State Printing Office

Continuous Instream	
Site ID	Site Location
BAT3	Commercial St SE
BAT12	Lone Oak Rd SE
CLK1[3]	Bush Park
CLK12	Ewald St SE
GLE3	Wallace Rd NW
GLE12	Hidden Valley Dr NW
LPW1[2]	Cordon Rd
MIC3	North Salem High School
MIC12	Turner Rd SE
PRI3[3]	Pringle Park
PRI4[2]	Salem Hospital Footbridge
PRI12[3]	Trelstad Ave SE
SHE3[1]	Winter St. Bridge

[1] New water quality monitoring station (July 2012).

[2] New stage-only gauging station (July 2012).

[3] Instream Storm sampling done at these sites.

Stormwater / Pesticides / Mercury	
Site Id	Site Location
Electric[1]	Electric St. SE and Summer St. SE
Hilfiker[1]	Hilfiker Ln. SE and Commercial St. SE
Salem Industrial	Salem Industrial Dr. NE and Hyacinth St. NE

[1] Mercury monitoring done at these sites.

Willamette River	
Site ID	Site Location (Approx. River Mile)
Wheatland Ferry	71
Spongs Landing	77
WLTP[1]	78
Sunset Park	81
Mill Creek	82.9
Railroad Bridge[2]	83

[1] Willow Lake Treatment Plant (now called Willow Lake Water Pollution Control Facility)- 150 feet downstream from effluent diffuser.

[2] Field duplicates taken at this site.

BAT = Battle Creek, CGT = Claggett Creek, CLA and CLK = Clark Creek, CRO = Croisan, GIB = Gibson Creek, GLE = Glenn Creek, MIC = Mill Creek, MRA = Mill Race, PRI = Pringle Creek, SHE = Shelton Ditch, LPW = West Fork Little Pudding River

Table 3.
Parameters for Each Monitoring Element

Parameter	Units	Monitoring Element				
		Instream Storm	Stormwater	Monthly Instream	Continuous Instream	Willamette River
Alkalinity	mg/L					x
Biological Oxygen Demand (BOD_{stream})	mg/L	x		x		x
Biological Oxygen Demand (BOD_{5day})	mg/L		x			
Specific Conductivity	µS/cm	x	x	x	x	x
Copper (Total Recoverable and Dissolved)	mg/L	x	x	x[1]		
Dissolved Oxygen (DO)	mg/L	x	x	x	x	x
E. coli	MPN/100 mL	x	x	x		x
Hardness	mg/L	x	x	x[1]		
Lead (Total Recoverable and Dissolved)	mg/L	x	x	x[1]		
Ammonia Nitrogen (NH_3-N)	mg/L	x	x			x
Nitrate and Nitrite ($NO_{3+}NO_2$)	mg/L	x	x	x		x
pH	S.U.	x	x	x	x	x
Total Dissolved Solids (TDS)	mg/L					x
Temperature	˚C	x	x	x	x	x
Total Phosphorus (TP)	mg/L	x	x			x
Ortho Phosphorus	mg/L	x	x			
Total Solids (TS)	mg/L					x
Total Suspended Solids (TSS)	mg/L	x	x	x[2]		x
Turbidity	NTU			x	x	x
Zinc (Total Recoverable and Dissolved)	mg/L	x	x	x[1]		

[1] Pringle Creek Watershed sites only (PRI1, PRI5, CLA1, and CLA10).

[2] West Fork of Little Pudding River site only (LPW 1).

Table 4.
Water Quality Criteria for Monitored Streams

Parameter	Season	Criteria	Applicable Waterbody
Dissolved Oxygen	January 1-May 15	Spawning: Not less than 11.0 mg/L or 95% saturation	Battle Creek*, Claggett Creek*, Clark Creek*[3], Croisan Creek*, Glenn Creek*, West Fork Little Pudding River*
	October 1- May 31	Spawning: Not less than 11.0 mg/L or 95% saturation	Gibson Creek*□ , Glenn Creek
	October 15 - May 15	Spawning: Not less than 11.0 mg/L or 95% saturation	Mill Creek*, Pringle Creek*[1], Shelton Ditch*
	Year Around (Non-spawning)	Cold water: Not less than 8.0 mg/L or 90% saturation	Battle Creek*, Croisan Creek*, Clark Creek, Glenn Creek*[4], Pringle Creek[2]
		Cool water: Not less than 6.5 mg/L	Claggett Creek*, Glenn Creek*, Mill Creek, Pringle Creek[1], Shelton Ditch, West Fork Little Pudding River
pH	Year Around	Must be within the range of 6.5 to 8.5 pH units	All Monitoring Streams
Temperature	October 15 - May 15	Salmon and steelhead spawning: 13˚C 7-day average maximum	Mill Creek, Shelton Ditch
	October 1- May 31	Salmon and steelhead spawning: 13˚C 7-day average maximum	Gibson Creek□
	Year Around (Non-spawning)	Salmon and trout rearing and migration: 18˚C 7-day average maximum	All Monitoring Streams
E. coli	Fall-Winter-Spring	30 day log mean of 126 E. coli organisms per 100 ml (or) no single sample > 406 organisms per 100 ml	All Monitoring Streams
	Summer	30 day log mean of 126 E. coli organisms per 100 ml (or) no single sample > 406 organisms per 100 ml	All Monitoring Streams
Biological Criteria	Year Around	Waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.	Claggett Creek*, Clark Creek*, Croisan Creek*, Glenn Creek*, Pringle Creek Trib*
Copper	Year Around	Freshwater Acute and Chronic Criteria: 18 and 12 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*
Lead	Year Around	Freshwater Acute and Chronic Criteria: 82 and 3.2 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*
Zinc	Year Around	Freshwater Acute and Chronic Criteria: 120 and 110 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*

Note: All waterbodies in this table are included under the Willamette Basin or Molalla-Pudding Subbasin TMDL for Temperature and E. coli.

* Oregon's 2010 Integrated Report Section 303(d) listed.

□ Gibson Creek is referred as Gibson Gulch in Oregon's 2010 Integrated Report.

[1] Applies to Pringle Creek from river mile 0 to 2.6.

[2] Applies to Pringle Creek from river mile 2.6 to 6.2.

[3] Applies to Clark Creek from river mile 0 to 1.9.

[4] Applies to Glenn Creek from river mile 4.1 to 7.

Table 5.
Median Values for Monthly Instream Sites (RY 2012/13)

Station	Number of Samples	Temperature (C)	DO (mg/L)	Specific Conductivity (µS/cm)	Turbidity (NTUs)	pH (S.U.)	E. Coli (MPN/100 mL)	NO_3+NO_2-N (mg/L)	BOD_{stream} (mg/L)
BAT 1	12	12.5	9.3	48.5	8.3	6.9	172.0	0.76	1.06
BAT 12	12	11.5	9.9	43.1	6.9	7.0	64.5	0.49	0.93
CGT 1	12	14.9	9.3	207.3	6.6	7.2	204.5	0.23	1.92
CGT 5	12	13.4	7.9	143.3	12.6	7.1	205.0	0.28	1.77
CLA 1	12	13.5	9.9	88.8	4.1	7.3	428.0	0.97	1.18
CLA 10	12	13.6	9.3	66.6	4.2	6.9	258.0	1.43	0.92
CRO 1	12	11.7	9.9	74.7	5.6	7.1	226.5	0.57	1.06
CRO 10	11	10.4	9.5	49.8	7.1	7.1	34.0	0.50	0.98
GIB 1	12	12.6	9.5	94.8	8.5	7.2	98.0	1.09	1.14
GIB 15	12	13.0	9.6	94.7	7.9	7.2	163.0	2.02	1.16
GLE 1	12	12.7	9.8	99.4	6.9	7.3	181.5	1.05	1.25
GLE 10	11	11.0	10.2	68.2	6.2	7.3	55.0	1.18	1.12
LPW 1	9	11.7	9.1	204.5	10.1	7.0	276.0	0.62	1.27
MIC 1	12	12.7	10.1	79.3	5.8	7.2	276.0	1.30	1.13
MIC 10	12	12.1	10.0	72.8	5.9	7.2	163.5	1.43	1.05
MRA 1	12	12.1	10.4	77.3	6.1	7.2	241.0	1.27	1.10
MRA 10	12	12.2	10.0	77.4	5.8	7.1	299.5	1.34	1.03
PRI 1	11	13.5	10.1	75.9	5.7	7.2	276.0	1.29	1.10
PRI 5	12	13.4	9.7	86.1	4.0	7.4	138.0	0.66	1.29
SHE 1	12	12.1	10.4	75.0	5.1	7.2	103.0	1.39	0.88
SHE 10	12	12.3	10.3	78.5	5.5	7.2	180.0	1.39	1.09

Table 6.

Water Quality Criteria Exceedances for Monthly Instream Sites (RY 2012/13)

Station	Number of Samples	DO	pH	E. Coli			Copper		Lead		Zinc	
				Total #	Dry[2]	Rain[3]	Total	Dissolved	Total	Dissolved	Total	Dissolved
BAT 1	12	3	2	3	1	2						
BAT 12	12	3	2	1	0	1						
CGT 1	12	4	0	1	1	0						
CGT 5	12	4	0	3	2	1						
CLA 1	12	0	0	6	3	3	1	0	0	0	1	1
CLA 10	12	0	1	5	2	3	0	0	0	0	0	0
CRO 1	12	2	0	1	0	1						
CRO 10	11	1	1	1	1	0						
GIB 1	12	5[1]	0	0	0	0						
GIB 15	12	5[1]	0	3	2	1						
GLE 1	12	5	0	2	1	1						
GLE 10	11	6	0	1	1	0						
LPW 1	9	3	0	4	2	2						
MIC 1	12	4	2	4	2	2						
MIC 10	12	3	0	3	0	3						
MRA 1	12	NA	0	4	3	1						
MRA 10	12	NA	1	5	3	2						
PRI 1	11	2	0	4	2	2	1	0	0	0	1	0
PRI 5	12	3	0	3	2	1	0	0	0	0	0	0
SHE 1	12	3	0	3	1	2						
SHE 10	12	3	2	3	1	2						

Note: Copper, lead, and zinc collected at Pringle Creek Watershed sites only (PRI1, PRI5, CLA1, and CLA10).

NA = Not available (City staff was unable to find dissolved oxygen water quality criteria associated with this waterbody)

[1] City staff was unable to find year-round dissolved oxygen water quality criteria associated with this waterbody.

[2] Dry is < 0.05 inches of rainfall in previous 24 hours.

[3] Rain is ≥ 0.05 inches of rainfall in previous 24 hours.

Table 7.

Monthly Instream Data (RY 2012/13)

Site Name: BAT1
Site Description: Commercial St

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 11:20	18	8.75	50.4	8.5	7.21	727	0.5	0.67	0
8/21/2012 13:45	20.4	4.48	55.7	17.7	6.72	291	0.5	1.06	0
9/18/2012 10:35	14.5	7.63	58.4	13.1	7.11	345	0.4	1.11	0
10/16/2012 11:15	14.6	8.26	55.3	12.7	7.12	488	0.82	1.76	0.98
11/13/2012 11:10	11.5	9.48	52.2	8	7.16	152	0.7	1.18	0.04
12/11/2012 10:42	10	10.21	45.8	7.9	7.4	39	1.45	0.71	0
1/22/2013 11:26	4.6	12	44.3	7.5	7.21	39	1.21	1.05	0
2/19/2013 11:45	7.4	11.2	44.2	6.41	6.6	66	1.21	0.77	0.05
3/19/2013 11:35	7.7	11.27	44.1	7.42	6.42	64	0.95	1.27	0
4/16/2013 11:40	9.4	10.74	45	4.55	6.62	25	0.79	0.96	0.01
5/28/2013 11:35	13.4	9.14	47.2	9.15	6.46	866	0.72	0.94	0.12
6/18/2013 10:10	14.5	8.51	49.7	12.9	6.72	192	0.56	1.06	0
Median	**12.45**	**9.31**	**48.5**	**8.25**	**6.92**	**172**	**0.76**	**1.06**	

Site Name: BAT12
Site Description: Rees Hill Rd.

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 10:50	17.3	8.77	45.3	7.9	7.23	144	0.18	0.59	0
8/21/2012 11:40	17.2	6.94	56.1	11	6.96	172	0.16	0.95	0
9/18/2012 10:20	13.4	7.74	57.6	9.9	7.1	82	0.13	1.01	0
10/16/2012 11:00	13.4	8.67	58.1	12.4	7	866	0.29	1.98	0.98
11/13/2012 10:50	10.4	10.15	43.9	7	7.37	205	0.47	1.06	0.04
12/11/2012 10:30	9.6	10.28	42.2	4.4	7.31	11	1.39	0.5	0
1/22/2013 11:07	4.7	12.11	41.1	3.8	7.36	4	1.26	1.24	0
2/19/2013 11:25	7	11.31	40.6	4.17	6.49	8	1.23	0.9	0.05
3/19/2013 11:20	7.4	11.39	40.5	3.87	6.41	8	1.01	1.2	0
4/16/2013 11:30	8.9	10.84	40.2	4.34	6.73	35	0.76	0.6	0.01
5/28/2013 11:10	12.5	9.6	42.3	8.21	6.61	276	0.5	0.78	0.12
6/18/2013 9:50	14.6	8.93	44.4	6.81	6.76	47	0.33	0.83	0
Median	**11.45**	**9.88**	**43.10**	**6.91**	**6.98**	**64.5**	**0.49**	**0.93**	

Site Name: CGT1
Site Description: Mainline Dr S

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 13:50	23.6	11.18	230	4.8	7.22	161	0.17	1.59	0
8/21/2012 14:50	23.1	11.51	244	5.9	7.56	921	0.08	1.92	0
9/18/2012 13:15	19	7.01	238	55.3	7.11	345	0.08	1.74	0
10/16/2012 13:40	16.7	7.49	97.2	9	7.05	308	0.15	2.49	0.83
11/13/2012 13:55	11.4	6.05	132.8	13.5	6.85	313	0.22	2.32	0.02
12/11/2012 13:45	9.4	8.28	170.7	13.7	7.04	291	0.7	1.94	0
1/22/2013 14:00	5.1	10.02	211.7	6.2	6.72	46	0.77	1.91	0
2/19/2013 14:45	8.8	12.79	210.8	5.63	7.34	11	0.63	2.41	0.03
3/19/2013 13:35	9.9	10.27	203.8	5.82	7.19	144	0.67	1.83	0
4/16/2013 13:30	13.1	9.42	180.4	7.03	7.4	89	0.42	1.86	0.01
5/28/2013 13:30	17	9.14	139.6	8.16	7.39	248	0.23	1.76	0.06
6/18/2013 12:30	21	8.89	224	5.76	8.02	32	0.14	2.9	0
Median	**14.90**	**9.28**	**207.30**	**6.62**	**7.21**	**204.5**	**0.23**	**1.92**	

Note: Data in red exceed applicable water quality criteria (see Table 4).

Table 7.
Monthly Instream Data (RY 2012/13)

Site Name: CGT5
Site Description: Hawthorne Ave

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 13:30	19.1	1.76	172.7	13	7.01	58	0.05	1.6	0
8/21/2012 14:40	20.1	3.72	129.9	13.7	7.02	172	0.05	1.75	0
9/18/2012 13:00	15.9	2.52	117.1	19.4	7.18	2420	0.07	2.04	0
10/16/2012 13:30	15.8	6.73	55.5	10.8	6.86	579	0.27	2.41	0.83
11/13/2012 13:35	10.6	7.97	95.5	11.9	7.14	866	0.76	1.78	0.02
12/11/2012 13:25	9.9	9.65	149.1	32.7	7.02	326	1.09	3.92	0
1/22/2013 13:43	3	11.39	193.2	15.3	6.89	206	0.56	1.99	0
2/19/2013 14:30	7.7	11.2	191.4	11.4	7.39	58	0.6	9.59	0.03
3/19/2013 13:20	8.1	11.06	279	10.9	7.36	119	0.14	1.68	0
4/16/2013 13:20	11.5	10.01	184.7	7.21	7.41	89	0.28	1.43	0.01
5/28/2013 13:10	15.2	7.9	104.4	12.1	7.15	261	0.28	1.47	0.06
6/18/2013 12:10	17.3	5.88	137.4	15.8	7.43	204	0.18	1.49	0
Median	**13.35**	**7.94**	**143.25**	**12.55**	**7.15**	**205**	**0.28**	**1.77**	

Site Name: CLA1
Site Description: Bush Park

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/17/2012 14:30	17.4	9.44	87.4	5.4	7.67	291	0.71	0.76	0	0.0041	0.003	<0.0005	<0.0005	0.0049	0.0036	28
8/21/2012 11:30	17.6	9.29	91.2	4.3	7.44	55	0.61	1.21	0	<0.0025	<0.0025	<0.001	<0.001	0.0048	0.0047	26
9/18/2012 10:45	15.6	9.31	86.3	4.9	7.43	308	0.08	1.06	0	<0.0025	<0.0025	0.001	<0.001	0.0053	0.0044	26
10/16/2012 11:15	15.2	9.43	87.1	7.7	6.84	980	1.04	1.4	0.98	0.0063	0.0044	<0.0005	<0.0005	0.0181	0.0095	30
11/13/2012 12:00	13	10.21	91	3.8	7.66	1414	1.18	1.26	0.04	<0.0025	<0.0025	<0.001	<0.001	0.0132	0.0093	27
12/11/2012 10:40	11.2	10.45	96.2	2.4	7.34	248	1.4	0.63	0	0.0026	<0.0025	<0.0005	<0.0005	0.0084	0.0075	30
1/22/2013 13:45	6.6	11.92	90.2	19	7.21	548	1.07	1.22	0	<0.0025	<0.0025	0.0009	0.0007	0.0094	0.0086	26
2/19/2013 10:55	8.4	11.44	89.5	2.65	6.91	980	1.16	0.94	0.05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.3229	0.287	29
3/19/2013 10:35	9	11.35	87.9	3.93	7.24	199	0.98	4.36	0	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0112	0.0092	28
4/16/2013 10:40	10.4	11.01	88	2.42	7.25	84	0.95	1.14	0.01	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.016	0.0096	27
5/28/2013 11:15	13.9	9.64	86.7	5.07	7.27	1300	0.9	2.09	0.12	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0115	0.0093	27
6/18/2013 10:25	14.9	9.55	89.5	3	7.16	2420	0.74	1.11	0	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.012	0.0084	29
Median	**13.45**	**9.93**	**88.75**	**4.12**	**7.26**	**428**	**0.97**	**1.18**						**0.0114**	**0.0089**	**27.5**

Site Name: CLA10
Site Description: Ewald Ave

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/17/2012 10:00	15.5	9.09	66.4	4.4	7.17	1414	1.36	0.51	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0053	0.0039	18
8/21/2012 10:55	16.6	9.06	66.2	6.8	6.71	1414	1.17	0.62	0	<0.0025	<0.0025	<0.0005	<0.0010	0.004	0.0052	19
9/18/2012 9:40	15.2	9.02	65.8	5.4	7.33	1300	1.12	1.07	0	<0.0025	<0.0025	<0.0005	<0.0010	0.0044	0.0038	18
10/16/2012 10:04	15.2	8.81	66	12.6	7.1	1733	1.16	1.6	0.98	<0.0025	<0.0025	0.0006	<0.0005	0.0184	0.015	22
11/13/2012 10:05	13.6	9.4	70.1	3.4	7.06	135	1.44	0.61	0.04	<0.0025	<0.0025	<0.0010	<0.0010	0.0144	0.0118	19
12/11/2012 9:44	12.2	9.76	73.9	5	7.05	99	1.95	0.59	0	<0.0025	<0.0025	0.0005	<0.0005	0.0102	0.0076	23
1/22/2013 10:06	8.6	10.83	68.5	3.1	7.26	50	1.72	1.41	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0148	0.0137	20
2/19/2013 10:20	9.7	10.5	66.8	3.09	6.59	411	1.66	0.86	0.05	< 0.0025	< 0.0025	0.0005	< 0.0005	0.0134	0.0109	23
3/19/2013 9:46	9.9	10.55	66.4	2.79	6.62	225	1.57	0.97	0	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0085	0.0072	20
4/16/2013 9:50	11	9.88	67.1	5.01	6.6	291	1.44	1.07	0.01	< 0.0025	< 0.0025	0.0005	< 0.0005	0.0124	0.0074	20
5/28/2013 10:15	13.5	9.11	65.3	4.09	6.49	214	1.3	0.69	0.12	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.012	0.0109	19
6/18/2013 9:00	14.2	8.6	68.6	3.82	6.67	76	1.41	1.05	0	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0082	0.007	23
Median	**13.55**	**9.26**	**66.60**	**4.25**	**6.88**	**258**	**1.43**	**0.92**						**0.0111**	**0.0075**	**20**

Note: Data in red exceed applicable water quality criteria (see Table 4). Medians not calculated for copper and lead due to the large number of censored values.

Table 7.

Monthly Instream Data (RY 2012/13)

Site Name: CRO1
Site Description: River Rd S

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 10:15	16.1	8.48	89.3	4.7	7.2	387	0.32	0.59	0
8/21/2012 11:10	16.7	7.37	94.1	5.3	7.01	225	0.31	1.04	0
9/18/2012 9:55	13.8	6.91	96.3	6.1	7.14	345	0.29	1.24	0
10/16/2012 10:20	13.8	8.7	84.8	120	7.07	1046	0.69	2.1	0.98
11/13/2012 10:20	10.5	10.24	78.2	6.1	7.31	45	0.6	1.27	0.04
12/11/2012 10:00	9.7	10.72	60.1	5.8	7.35	153	1.13	0.65	0
1/22/2013 10:24	3.6	12.76	63.5	4	7.32	18	0.98	1.59	0
2/19/2013 10:40	6.6	11.77	68.4	5.08	6.94	14	0.91	0.9	0.05
3/19/2013 10:09	6.8	11.78	62.6	13.4	6.84	228	0.7	1.62	0
4/16/2013 10:05	8.4	11.02	65.15	5.09	7.01	142	0.54	0.97	0.01
5/28/2013 10:35	12.9	9.62	71.2	11.2	7.11	248	0.4	0.64	0.12
6/18/2013 9:15	14.15	8.57	80.3	4.82	7.11	365	0.35	1.08	0
Median	**11.70**	**9.93**	**74.70**	**5.55**	**7.11**	**226.5**	**0.57**	**1.06**	

Site Name: CRO10
Site Description: Ballantyne Rd.

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 10:35	15.5	8.55	58.5	12.6	7.22	68	0.33	0.59	0
8/21/2012 11:25	Dry, no sample								0
9/18/2012 10:10	13.3	8.12	71.2	11.6	7.05	54	0.25	1.13	0
10/16/2012 10:40	12.9	8.96	73.6	15.6	7.09	236	0.43	2.02	0.98
11/13/2012 10:35	10.4	9.52	51.8	7.1	7.19	39	0.5	0.98	0.04
12/11/2012 10:14	9.4	10.26	46.8	5.1	7.45	8	1.17	0.5	0
1/22/2013 10:45	4.1	12.13	46.1	4.2	7.14	7	1.1	1.57	0
2/19/2013 11:05	6.7	11.07	46.3	4.97	6.39	1	1.09	1.22	0.05
3/19/2013 10:50	7.3	11.05	46.4	5.85	6.55	34	0.74	1.26	0
4/16/2013 10:50	9.2	10.32	46.95	6.47	6.59	6	0.51	0.79	0.01
5/28/2013 10:50	12.6	9.28	49.8	11.6	6.66	34	0.26	0.75	0.12
6/18/2013 9:35	13.1	8.56	55.9	7.93	6.81	727	0.3	0.84	0
Median	**10.40**	**9.52**	**49.80**	**7.10**	**7.05**	**34**	**0.50**	**0.98**	

Site Name: GIB1
Site Description: Wallace Rd.

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 10:30	16.9	7.39	99.2	10.1	7.68	260	1.25	1.23	0
8/21/2012 13:50	20	7.08	108.9	7.3	7.28	152	0.35	1.06	0
9/18/2012 12:40	16.7	6.88	109.4	13.3	7.29	326	0.37	1.17	0
10/16/2012 12:45	14.5	7.93	101.9	11.6	7.11	313	0.87	1.85	0.64
11/13/2012 13:20	10.9	9.87	95.3	8.8	7.36	119	0.84	1.92	0
12/11/2012 11:20	9.4	10.68	77.3	9.1	7.12	37	1.88	0.61	0
1/22/2013 14:50	4.1	12.2	83	15.7	7.25	55	1.81	1.34	0
2/19/2013 13:05	7.1	11.33	82.1	6.35	7.2	23	1.64	0.96	0.04
3/19/2013 12:50	7.8	11.25	84	6.05	7.15	33	1.44	1.11	0
4/16/2013 12:00	10.8	10.66	82.6	5.82	7.26	28	1.3	0.97	0
5/28/2013 12:45	14.2	9.21	94.2	8.28	7.24	126	0.92	0.85	0.1
6/18/2013 12:00	15.6	8.03	98.9	6	7.07	77	0.72	1.21	0
Median	**12.55**	**9.54**	**94.75**	**8.54**	**7.25**	**98**	**1.09**	**1.14**	

Note: Data in red exceed applicable water quality criteria (see Table 4).

Table 7.

Monthly Instream Data (RY 2012/13)

Site Name: GIB15
Site Description: Brush College Rd.

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 11:00	16.1	8.98	71.5	7.4	7.05	276	1.63	0.76	0
8/21/2012 14:00	20	7.51	120.8	79	7.4	2420	1.15	3.87	0
9/18/2012 12:50	16.6	8.42	118.4	13.9	7.5	2420	1.32	1.24	0
10/16/2012 13:00	14.6	9.04	110.7	10.3	7.26	816	1.87	2.03	0.64
11/13/2012 13:40	10.6	9.8	101.6	4.7	7.2	238	1.7	1.08	0
12/11/2012 11:30	9.9	10.58	84.7	8.4	7.25	88	2.41	0.51	0
1/22/2013 15:10	4.8	11.99	92.2	11.6	6.9	34	2.75	1.26	0
2/19/2013 13:20	8.1	11.15	89	5.57	6.98	11	2.65	2.74	0.04
3/19/2013 13:05	8.4	11.21	89	5.77	7.38	4	2.27	1.3	0
4/16/2013 12:30	11.4	10.74	85.5	6.65	7.01	18	2.04	0.72	0
5/28/2013 13:00	14.5	9.42	97.2	8.69	7.25	59	1.99	0.81	0.1
6/18/2013 12:15	17	8.75	103.9	6	6.97	285	2.18	1	0
Median	**12.95**	**9.61**	**94.70**	**7.90**	**7.23**	**163**	**2.02**	**1.16**	

Site Name: GLE1
Site Description: River Bend Rd.

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 10:15	17.8	9.02	115	8.5	7.61	185	1.6	1.24	0
8/21/2012 13:30	19.3	7.89	122.2	7.9	7.36	727	0.63	1.2	0
9/18/2012 12:30	16	7.73	126.7	9.1	7.3	326	0.5	1.25	0
10/16/2012 12:30	15.4	9.01	94.2	13.2	7.07	866	0.8	1.72	0.64
11/13/2012 13:00	11.7	10.03	106.3	5.5	7.35	91	0.95	1.14	0
12/11/2012 11:00	10.3	10.58	84.6	6	7.34	61	1.77	0.76	0
1/22/2013 14:40	4.7	12.3	90.3	5.1	7.15	52	1.47	1.45	0
2/19/2013 12:50	7.9	11.22	91.6	6.06	6.92	328	1.4	1.13	0.04
3/19/2013 12:25	8.3	11.31	93	7.36	7.19	178	1.2	1.38	0
4/16/2013 11:20	9.5	10.89	94.1	4.48	7.25	178	1.15	1.35	0
5/28/2013 12:30	13.7	9.53	104.5	6.89	7.37	140	0.93	0.86	0.1
6/18/2013 11:45	16.1	8.38	110.5	7	7.07	236	0.79	1.25	0
Median	**12.70**	**9.78**	**99.35**	**6.95**	**7.28**	**181.5**	**1.05**	**1.25**	

Site Name: GLE10
Site Description: Hidden Valley Dr.

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 11:30	16.5	9.55	70	4	7.31	276	1.62	0.81	0
8/21/2012 14:20	17.2	7.77	96.4	9.2	7.29	517	0.16	1.28	0
9/18/2012 13:10	Dry, no sample								0
10/16/2012 13:30	14.5	9.16	85.3	8.1	7.05	124	0.1	1.69	0.64
11/13/2012 13:50	11	10.18	69.1	3.1	7.27	26	1.05	0.8	0
12/11/2012 11:45	9.7	10.67	56.3	6.1	7.35	33	1.67	0.65	0
1/22/2013 15:20	5	12	55.9			5	1.51	1.36	0
2/19/2013 13:35	8.1	11.13	57.2	5.53	7.21	24	1.53	0.84	0.04
3/19/2013 13:20	8.2	11.23	58.3	6.22	7.32	8	1.23	1.13	0
4/16/2013 12:45	9.8	10.96	59.3	5.89	7.12	55	1.18	0.8	0
5/28/2013 13:25	12.3	10.08	68.2	6.31	7.35	93	0.68	1.19	0.1
6/18/2013 12:35	13.1	9.8	72	7	7.3	81	0.62	1.12	0
Median	**11.00**	**10.18**	**68.20**	**6.16**	**7.30**	**55**	**1.18**	**1.12**	

Note: Data in red exceed applicable water quality criteria (see Table 4).

Table 7.

Monthly Instream Data (RY 2012/13)

Site Name:	LPW1									
Site Description:	Cordon Rd.									
Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	TSS
7/17/2012 13:10	Dry, no sample								0	
8/21/2012 14:25	Dry, no sample								0	
9/18/2012 11:30	Dry, no sample								0	
10/16/2012 13:05	16	6.35	55.8	5.1	6.5	1120	0.19	2.89	0.83	3
11/13/2012 13:15	12.4	7.48	119.2	10.1	6.94	276	0.74	1.27	0.02	18
12/11/2012 13:10	9.5	9.07	197.2	7.4	7.06	86	2.04	0.88	0	6
1/22/2013 13:20	4.6	12.93	238	84.2	7.04	107	1.46	2.17	0	133
2/19/2013 14:15	8.7	12.96	245	25.9	7.35	687	1.04	1.38	0.03	
3/19/2013 13:02	9.2	11.8	230	14.2	7.21	649	0.62	1.71	0	17.6
4/16/2013 12:40	11.7	12.38	204.5	10.2	7.37	134	0.56	1.25	0.01	11.2
5/28/2013 12:20	14.9	6.28	91.5	8.95	6.74	2420	0.17	1.23	0.06	6
6/18/2013 11:10	15.5	1.29	223	5.71	6.93	130	0.08	1.21	0	4
Median	**11.70**	**9.07**	**204.50**	**10.10**	**7.04**	**276**	**0.62**	**1.27**		**8.60**

Site Name:	MIC1								
Site Description:	Front St.								
Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 9:30	18.4	8.95	51.7	8	7.22	156	0.2	0.65	0
8/21/2012 10:10	19.1	8.98	50.5	5.6	6.18	276	0.18	0.89	0
9/18/2012 9:30	15.6	9.52	48.4	4.1	7.15	308	0.1	0.9	0
10/16/2012 9:35	14.4	9.71	73.7	9.2	7.34	866	1.12	1.78	0.83
11/13/2012 9:40	10.8	10.67	112.7	21	6.98	2420	3.66	1.76	0.02
12/11/2012 9:20	10	10.78	88.5	5.5	7.12	68	2.74	0.68	0
1/22/2013 9:30	3.2	13.05	95	3	7.25	86	2.03	1.44	0
2/19/2013 9:45	6.9	12.13	84.8	3.74	6.43	114	2.04	1.03	0.03
3/19/2013 9:20	8.6	11.43	90.3	4.17	7.22	276	1.34	1.3	0
4/16/2013 9:20	11.1	10.45	86.8	6.07	7.51	91	1.25	1.19	0.01
5/28/2013 9:56	14.2	9.4	70.3	19.4	6.96	579	1.37	1.33	0.06
6/18/2013 8:30	17.6	8.83	55.1	7.37	7.22	517	0.4	1.06	0
Median	**12.65**	**10.08**	**79.25**	**5.84**	**7.19**	**276**	**1.30**	**1.13**	

Site Name:	MIC10								
Site Description:	Turner Rd								
Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 11:40	18.5	9.39	49.5	5.6	7.21	172	0.17	0.73	0
8/21/2012 14:10	20	9.71	48.9	5.3	7.42	24	0.17	1.01	0
9/18/2012 10:55	14.3	9.93	45.4	5.8	7.24	155	0.09	1.04	0
10/16/2012 11:35	14.5	9.17	88.7	14.6	7.13	461	2.31	1.84	0.82
11/13/2012 11:25	10.8	10.1	110.7	17.2	7.01	770	3.76	1.69	0.07
12/11/2012 11:04	9.3	10.42	82.9	5.9	7.3	36	2.87	0.71	0.03
1/22/2013 11:48	3.2	12.92	76.7	5.2	7.16	225	2.08	1.33	0
2/19/2013 13:55	8.2	11.85	74.5	5.83	7.02	19	2.08	0.96	0.05
3/19/2013 12:40	8.1	11.71	71	5.37	7.22	98	1.36	1.56	0
4/16/2013 12:20	10	11.25	76.4	6.17	7.36	79	1.37	1.15	0.13
5/28/2013 12:00	13.3	9.73	68.9	18.8	7.05	411	1.48	1.06	0.16
6/18/2013 10:45	16.3	9.35	52	6.25	7.23	184	0.3	1.01	0
Median	**12.05**	**10.02**	**72.75**	**5.87**	**7.22**	**163.5**	**1.43**	**1.05**	

Note: Data in red exceed applicable water quality criteria (see Table 4).

Table 7.

Monthly Instream Data (RY 2012/13)

Site Name: MRA1
Site Description: High St.

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 15:00	17.9	9.36	49.3	6.4	6.89	32	0.2	0.5	0
8/21/2012 11:00	19.4	9.31	50.6	4	7.4	206	0.17	0.86	0
9/18/2012 10:20	16	9.63	48	3.5	7.39	201	0.08	0.89	0
10/16/2012 10:30	14.3	9.43	71.1	9.5	7.15	387	1.06	1.77	0.83
11/13/2012 10:20	10.5	10.57	114.9	21.3	7.18	1414	3.3	1.64	0.02
12/11/2012 10:00	9.6	11.09	88.3	5.8	7.18	172	2.64	0.64	0
1/22/2013 13:15	3.6	12.99	84.5	5.5	7.2	435	2.1	1.9	0
2/19/2013 10:25	6.6	12.13	83.2	4.36	7.18	102	2.02	0.77	0.03
3/19/2013 10:10	8.4	11.4	95.7	8.01	7.32	1733	1.33	3.26	0
4/16/2013 10:15	10.4	11.58	85.4	4.88	7.23	145	1.26	1.13	0.01
5/28/2013 10:50	13.7	10.16	71.4	22.8	7.36	866	1.27	1.2	0.06
6/18/2013 9:52	17.4	9.45	54.7	7	7.29	276	0.33	1.07	0
Median	**12.10**	**10.37**	**77.30**	**6.10**	**7.22**	**241**	**1.27**	**1.10**	

Site Name: MRA10
Site Description: 19th St.

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 9:40	18.6	8.8	48.8	5.9	6.68	119	0.2	0.67	0
8/21/2012 10:20	18.8	9	51.5	4.1	6.56	228	0.18	0.9	0
9/18/2012 9:30	15.2	9.18	48.7	4.9	7.09	308	0.08	0.93	0
10/16/2012 9:30	14.3	9.08	75	10.3	6.91	770	1.14	1.95	0.83
11/13/2012 9:30	10.8	10.37	114.8	20.1	7.24	1203	3.76	1.77	0.02
12/11/2012 9:25	9.7	10.73	88.2	5.5	7.17	58	2.73	0.58	0
1/22/2013 11:45	3	12.82	85	4.9	6.3	488	2.09	1.96	0
2/19/2013 9:41	6.3	12.04	79.7	5.03	7.31	56	2.1	0.79	0.03
3/19/2013 9:25	8.3	10.24	93.4	7.28	7.27	1414	1.41	2.84	0
4/16/2013 9:30	10	10.7	85.5	5.7	7.39	116	1.31	1.05	0.01
5/28/2013 10:00	13.5	9.78	71.7	22.8	7.25	1300	1.36	1.16	0.06
6/18/2013 8:50	17	8.99	54.9	8	7.08	291	0.26	1	0
Median	**12.15**	**10.01**	**77.35**	**5.80**	**7.13**	**299.5**	**1.34**	**1.03**	

Site Name: PRI1
Site Description: Waterfront Park

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/17/2012 9:55	18.9	9.29	55.5	4.9	6.69	143	0.21	0.64	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0046	<0.0025	37
8/21/2012 10:40	19	9.27	58.2	2.8	7.37	93	0.16	0.74	0	<0.0025	<0.0025	<0.0010	<0.0010	<0.0025	0.0037	21
9/18/2012 10:00	15.4	9.76	50.5	5.7	7.31	276	0.1	0.96	0	<0.0025	<0.0025	<0.0010	<0.0010	0.0041	0.0034	17
10/16/2012 9:40	14.5	9.76	75.9	11.7	7.1	816	1.13	2.02	0.98	0.0028	<0.0025	<0.0005	<0.0005	0.009	0.0054	32
11/13/2012 10:00	10.8	10.71	112.6	17.2	7.2	1120	3.35	1.71	0.04	0.003	0.0027	<0.0010	<0.0010	0.0096	0.007	39
12/11/2012 9:50	Flooded, unable to access site								0	Flooded, unable to access site						
1/22/2013 12:10	3.3	13.1	82.5	4.1	6.95	411	2.04	1.9	0	<0.0025	<0.0025	<0.0005	<0.0005	<0.0025	<0.0025	28
2/19/2013 10:02	6.6	12.16	81.7	4.67	7	35	1.99	0.96	0.05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0094	0.0063	27
3/19/2013 9:45	8.3	11.56	84.5	6.02	7.22	365	1.36	2.03	0	0.0048	0.0042	< 0.0005	< 0.0005	0.0059	0.0029	26
4/16/2013 9:55	10	11.23	84.8	5.24	7.26	76	1.29	1.1	0.01	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0053	0.0035	32
5/28/2013 10:25	13.5	10.1	72.1	21.4	7.34	816	1.36	1.19	0.12	0.0067	< 0.0025	< 0.0005	< 0.0005	0.023	0.0058	27
6/18/2013 9:25	17	9.52	58	6	7.1	272	0.35	1.06	0	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.064	0.0029	21
Median	**13.50**	**10.10**	**75.90**	**5.70**	**7.20**	**276**	**1.29**	**1.10**						**0.0090**	**0.0037**	**27**

Note: Data in red exceed applicable water quality criteria (see Table 4). Medians not calculated for copper and lead due to the large number of censored values.

Table 7.

Monthly Instream Data (RY 2012/13)

Site Name: PRI5
Site Description: Bush Park

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/17/2012 14:45	17.2	9.06	74.4	3.7	7.22	345	0.25	0.92	0	0.0049	0.0038	<0.0005	<0.0005	0.0059	0.0026	27
8/21/2012 11:40	19.4	8.75	85.4	2.9	7.5	313	0.24	1.11	0	<0.0025	<0.0025	<0.0010	<0.0010	<0.0025	<0.0025	29
9/18/2012 10:50	16.7	8.88	86.8	3.9	7.42	488	0.09	1.39	0	<0.0025	<0.0025	<0.0010	<0.0010	0.0036	0.003	28
10/16/2012 11:00	15.5	8.67	65.6	8.8	7.05	816	0.35	2.25	0.98	0.0025	<0.0025	<0.0005	<0.0005	0.0148	0.0101	28
11/13/2012 11:40	12	9.74	94.8	6.8	7.53	128	0.77	1.3	0.04	<0.0025	<0.0025	<0.0010	<0.0010	0.0102	0.0081	35
12/11/2012 10:30	10.3	10.4	86.3	4.6	7.35	46	1.39	0.76	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0083	0.0064	29
1/22/2013 13:45	4.8	12.61	87.5	4.3	7.39	38	1.28	1.57	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0044	0.0033	31
2/19/2013 11:00	7.4	12.48	89.1	3.53	7.1	82	1.28	1.26	0.05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0095	0.0057	36
3/19/2013 10:50	8.7	11.99	89.3	3.15	7.19	45	0.89	1.25	0	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0054	0.0036	32
4/16/2013 10:50	10.5	12.53	85.9	3.8	7.46	37	0.85	1.45	0.01	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0053	0.0035	30
5/28/2013 11:25	14.8	9.7	74.7	8.48	7.4	148	0.55	1.27	0.12	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0095	0.0054	26
6/18/2013 10:35	17.7	8.98	84.7	4	7.14	579	0.41	1.38	0	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0072	0.0051	29
Median	**13.40**	**9.72**	**86.10**	**3.95**	**7.37**	**138**	**0.66**	**1.29**						**0.0072**	**0.0051**	**29**

Site Name: SHE1
Site Description: Church St.

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 15:15	19	10.1	56.4	4.2	6.99	33	0.14	0.51	0
8/21/2012 11:15	19.1	9.27	54.3	2.4	7.55	40	0.17	0.71	0
9/18/2012 10:30	15.3	9.67	48.4	4.4	7.41	238	0.09	0.82	0
10/16/2012 10:45	14.4	9.59	78.5	12.5	7.02	816	1.36	1.86	0.98
11/13/2012 11:30	10.9	10.67	114.4	18.4	7.22	1120	3.77	1.49	0.04
12/11/2012 10:15	9.7	10.81	69.9	5.1	7.12	50	2.7	0.63	0
1/22/2013 13:30	3.4	13.11	80.2	3.9	7.5	158	1.99	1.67	0
2/19/2013 10:37	6.6	12.39	80.2	6.14	6.96	24	2.06	0.72	0.05
3/19/2013 10:15	8.2	11.63	79.9	5.19	7.26	121	1.45	1.71	0
4/16/2013 10:25	9.9	11.21	83.9	5.48	7.27	57	1.26	0.93	0.01
5/28/2013 11:00	13.3	9.94	71.4	21.9	7.3	548	1.41	1.09	0.12
6/18/2013 10:07	16.8	9.26	55.7	5	7.19	85	0.28	0.83	0
Median	**12.10**	**10.39**	**74.95**	**5.15**	**7.24**	**103**	**1.39**	**0.88**	

Site Name: SHE10
Site Description: Airport Road

Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/17/2012 9:15	18.7	9.12	52.2	4.9	6.4	194	0.19	0.71	0
8/21/2012 12:00	19.1	9.37	51.5	3.5	7.54	67	0.18	1.08	0
9/18/2012 9:15	15.1	9.69	47.9	6.4	6.98	276	0.08	1.07	0
10/16/2012 9:15	14.4	9.56	78.3	12.8	6.76	435	1.4	1.74	0.98
11/13/2012 11:15	11.2	10.44	113.6	19	7.22	921	3.66	1.45	0.04
12/11/2012 9:15	9.9	10.83	86.5	5.3	6.81	53	2.72	0.69	0
1/22/2013 11:25	3.3	13.02	78.8	4.1	5.12	152	2.04	1.39	0
2/19/2013 9:25	6.6	12.04	79.7	5.03	7.31	44	1.98	0.9	0.05
3/19/2013 9:10	8.1	11.31	78.6	5.96	7.28	166	1.45	1.65	0
4/16/2013 9:15	9.9	11.12	83.1	5.62	7.2	146	1.35	1.1	0.01
5/28/2013 9:45	13.3	10.07	71.7	22.6	7.24	649	1.37	1.23	0.12
6/18/2013 8:35	17	9.26	54.3	5	7.21	308	0.32	1.06	0
Median	**12.25**	**10.26**	**78.45**	**5.46**	**7.21**	**180**	**1.39**	**1.09**	

Note: Data in red exceed applicable water quality criteria (see Table 4). Medians not calculated for copper and lead due to the large number of censored values.

Table 7.
Monthly Instream Duplicates (RY 2012/13)

Site ID	Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	TSS	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
BAT12	07/17/2012 10:50	17.4	8.75	45.3	8.1	7.18	194	0.12	0.61								
GLE10	07/17/2012 11:30	16.5	9.55	70	4	7.31	172	1.63	0.63								
SHE10	08/21/2012 12:00	19.1	9.35	51.4	3.7	7.6	91	0.17	0.91								
BAT1	08/21/2012 13:45	20.4	4.48	55.7	17.7	6.72	238	0.48	1.02								
MRA10	09/18/2012 09:30	15.2	9.18	48.7	4.8	7.1	308	0.09	0.87								
MIC10	09/18/2012 10:55	14.3	9.93	45.5	5.3	7.24	172	0.09	0.99								
PRI1	10/16/2012 09:41	14.6	9.76	76	10.6	7.11	921	1.16	2.07		0.0029	0.0029	<0.0005	<0.0005	0.015	0.0104	33
LPW1	10/16/2012 13:05	16	6.32	55.7	5.1	6.5	727	0.18	2.81	3							
MRA1	11/13/2012 10:00	10.5	10.55	114.8	21.1	7.17	1986	3.23	1.65								
CGT5	11/13/2012 13:35	10.6	7.97	95.7	12.1	7.02	770	0.76	1.57								
SHE1	12/11/2012 10:15	9.7	10.81	69.7	5.1	7.1	34	2.65	0.66								
CGT1	12/11/2012 13:45	9.4	8.28	170.8	13.7	7.02	133	0.71	1.68								
MIC1	01/22/2013 09:30	3.1	13.06	95.1	3	7.25	96	2	1.61								
CLA1	01/22/2013 13:45	6.6	11.9	90.2	18.8	7.31	548	1.12	1.06		<0.0025	<0.0025	0.0009	0.0007	0.0088	0.0091	28
PRI5	02/19/2013 11:00	7.4	12.47	89.1	3.62	6.98	73	1.35	1.13		< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0095	0.0057	33
CLA10	02/19/2013 13:30	9.7	10.35	66	3.11	6.73	172	1.66	0.59		< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0106	0.0096	23
CRO1	03/19/2013 10:09	6.8	11.78	62.6	15	6.87	226	0.72	1.15								
GLE1	03/19/2013 12:25	8.3	11.31	93.2	7.9	7.09	210	1.24	0.9								
CRO10	04/16/2013 10:55	8.9	10.44	47	6.53	6.69	4	0.45	0.69								
GIB1	04/16/2013 12:05	10.3	10.95	82.7	6.04	6.75	30	1.28	0.88								
BAT12	05/28/2013 11:15	12.5	9.6	42.3	8.49	6.65	172	0.5	0.57								
GIB15	05/28/2013 13:05	14.5	9.42	97.2	9.49	7.25	68	2	0.85								
BAT1	06/18/2013 10:15	14.6	8.51	49.7	12.9	6.73	225	0.56	0.84								
GLE10	06/18/2013 12:40	13.8	8.93	71.4	7	7.26	56	0.59	0.78								

Note: Duplicate field measurements and duplicate grab samples are taken at 10 percent of the sites each month. These sites are selected prior to sampling.

Table 8.
Continuous Instream Grade A and Grade B Data Qualifications

Grade Values	Temperature (˚C)	pH	Specific Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
A	± < 0.5	± ≤ 0.30	≤ 10%	± ≤ 3 or 5% (whichever is greater)	± ≤ 0.3
B	± 0.51 to 2.00	± > 0.3 to 0.50	> 10% to ≤ 15%	± ≤ 5 or 30% (whichever is greater)	± > 0.3 to ± ≤ 1.0

Note: As stated in the "Continuous Water Quality Monitoring Program Quality Assurance Project Plan", data grades are a result of the absolute difference (value or percent) of station instrument reading and audit instrument reading at the time of site audit.

Table 9.
Monthly Medians Values for Continuous Instream Data (RY 2012/13)

Monthly Medians for **Turbidity** at Continuous Instream Sites

Station Name	Jul 2012 Turbidity (NTU)	Aug 2012 Turbidity (NTU)	Sep 2012 Turbidity (NTU)	Oct 2012 Turbidity (NTU)	Nov 2012 Turbidity (NTU)	Dec 2012 Turbidity (NTU)	Jan 2013 Turbidity (NTU)	Feb 2013 Turbidity (NTU)	Mar 2013 Turbidity (NTU)	Apr 2013 Turbidity (NTU)	May 2013 Turbidity (NTU)	Jun 2013 Turbidity (NTU)
BAT3	14.05	NA	NA	NA	NA	16.62	11.18	NA	10.63	NA	NA	NA
BAT12	7.76	5.54	5.34	6.76	7.43	8.34	4.96	5.82	7.01	7.68	7.72	7.63
CLK1	NA	NA	6.96	9.57	5.84	11.29	10.72	6.18	6.45	NA	5.05	4.84
CLK12	6.69	7.73	NA	NA	4.38	5.40	5.04	4.95	4.90	4.46	5.48	6.16
GLE3	6.70	7.30	NA	9.35	8.40	9.90	6.30	7.00	7.40	8.20	6.40	6.60
GLE12	4.10	4.40	5.80	5.60	4.60	7.50	4.90	9.10	7.00	5.90	5.20	5.90
MIC3	9.06	7.72	7.43	6.88	8.12	12.80	7.27	10.36	6.91	8.89	11.98	9.67
MIC12	10.21	10.35	7.73	7.22	12.68	12.54	8.79	10.44	8.98	9.34	10.73	10.04
PRI3	5.22	5.54	5.99	8.17	6.82	11.38	6.82	5.78	5.43	NA	5.46	5.28
PRI12	NA	10.80	9.15	9.80	7.86	9.02	8.91	7.37	6.81	11.48	8.70	9.83
SHE3	5.11	3.93	5.07	5.30	6.92	NA	8.84	8.74	8.68	7.14	7.87	9.27

Monthly Medians for **Specific Conductivity** at Continuous Instream Sites

Station Name	Jul 2012 Specific Conductivity (µS/cm)	Aug 2012 Specific Conductivity (µS/cm)	Sep 2012 Specific Conductivity (µS/cm)	Oct 2012 Specific Conductivity (µS/cm)	Nov 2012 Specific Conductivity (µS/cm)	Dec 2012 Specific Conductivity (µS/cm)	Jan 2013 Specific Conductivity (µS/cm)	Feb 2013 Specific Conductivity (µS/cm)	Mar 2013 Specific Conductivity (µS/cm)	Apr 2013 Specific Conductivity (µS/cm)	May 2013 Specific Conductivity (µS/cm)	Jun 2013 Specific Conductivity (µS/cm)
BAT3	52.4	57.3	59.3	55.1	55.2	45.8	44.4	45	44.8	45.5	48.5	49.4
BAT12	44.4	50.5	52.7	53.5	45.9	43.4	NA	41.9	41.1	40.7	41.2	42.7
CLK1	89.7	90	88.5	88.3	90.3	88.4	89.7	87.6	87.9	89.5	87.5	89.1
CLK12	68.3	67.6	67.3	70.55	67.3	71.2	67.9	65.9	65.8	65.6	64	65.3
GLE3	118	122	124	121	90	80	84	89	87	90	101	111
GLE12	74	101	NA	76	64	58	59	59	59	61	64	72
MIC3	54.1	53	49.6	63.6	96.3	84	82.3	81.3	76.9	79.6	55.7	55.3
MIC12	51.2	51.2	47.4	80.9	96.4	81.8	80.5	79.1	73.7	72.1	53.5	53.5
PRI3	89.1	93.7	96.6	83	89.7	80.5	88.2	91.5	90.8	NA	90	92.9
PRI12	59.4	56.5	51.9	96.5	95.3	75.8	81.2	80.7	81.2	79.2	64.8	63.1
SHE3	57	56.4	49.3	56.2	115.9	119.5	83.9	83.6	79.4	84.9	56	58.7

Presented median values consist of A and B grade data only.

NA = 60% of the continuous record for a given month is not represented by A and B grade data.

Table 9.
Monthly Medians Values for Continuous Instream Data (RY 2012/13)

Monthly Medians for **Temperature** at Continuous Instream Sites

	Jul 2012	Aug 2012	Sep 2012	Oct 2012	Nov 2012	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013
Station Name	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)
BAT3	17.26	18.68	15.94	12.82	10.87	9.08	6.70	7.74	9.03	11.01	13.45	15.49
BAT12	16.28	16.55	13.03	10.19	9.74	8.37	5.90	6.93	8.11	10.17	12.52	15.01
CLK1	16.58	17.49	16.00	13.77	12.23	10.51	7.97	8.95	10.21	11.78	13.87	15.17
CLK12	15.08	16.19	15.55	14.81	13.10	11.75	9.95	10.19	10.67	11.49	13.13	14.37
GLE3	16.70	17.41	14.89	12.57	11.01	9.18	6.38	8.05	9.43	11.64	13.67	15.60
GLE12	15.11	15.62	13.33	10.94	10.14	8.56	5.87	7.14	8.33	9.75	11.55	13.42
MIC3	19.05	19.83	15.90	11.61	10.23	7.64	4.55	7.22	8.99	12.16	14.37	17.08
MIC12	19.16	19.54	15.52	11.43	10.38	7.85	5.30	7.44	8.96	11.46	13.56	16.30
PRI3	18.75	18.62	16.48	13.51	13.54	8.99	6.50	8.09	9.71	NA	16.08	17.22
PRI12	18.63	19.22	15.62	12.56	11.10	9.04	6.45	7.82	9.36	11.34	13.90	16.58
SHE3	19.22	19.60	15.46	11.76	10.93	NA	5.41	7.46	9.07	12.23	14.02	16.98

Monthly Medians for **pH** at Continuous Instream Sites

	Jul 2012	Aug 2012	Sep 2012	Oct 2012	Nov 2012	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013
Station Name	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH
BAT3	6.82	6.84	6.94	6.61	6.31	6.41	6.75	6.85	6.87	6.76	6.69	6.78
BAT12	7.30	7.53	7.22	7.31	7.24	7.11	NA	7.42	7.23	7.43	7.46	7.15
CLK1	NA	7.11	7.12	NA	7.28	7.02	7.36	7.35	7.33	7.26	7.32	7.39
CLK12	7.00	7.16	7.10	7.06	6.93	NA	NA	6.48	6.47	NA	5.97	6.35
GLE3	7.47	7.57	7.64	7.18	6.94	6.85	7.08	7.14	7.18	7.27	7.37	7.38
GLE12	7.30	7.23	7.05	6.99	6.92	7.08	7.09	7.04	6.85	7.27	7.19	7.25
MIC3	7.67	7.70	7.73	NA	NA	NA	7.39	7.63	7.76	7.54	7.38	7.48
MIC12	7.11	7.12	7.15	6.88	6.95	7.06	7.30	7.42	7.43	7.32	7.56	7.38
PRI3	7.43	7.53	7.66	7.60	NA	7.05	7.13	7.02	7.87	NA	7.76	7.58
PRI12	7.19	7.23	7.03	NA	6.38	6.45	6.64	6.71	6.76	6.60	6.62	6.88
SHE3	7.46	7.55	7.73	7.60	7.45	NA	7.53	7.48	7.29	7.48	7.40	7.60

Presented median values consist of A and B grade data only.

NA = 60% of the continuous record for a given month is not represented by A and B grade data.

Table 9.
Monthly Medians Values for Continuous Instream Data (RY 2012/13)

Monthly Medians for **Dissolved Oxygen** at Continuous Instream Sites

	Jul 2012	Aug 2012	Sep 2012	Oct 2012	Nov 2012	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013
Station Name	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)
BAT3	8.22	7.42	7.59	8.49	9.50	10.47	11.50	11.25	10.92	10.13	9.23	8.66
BAT12	9.04	8.29	NA	9.93	10.87	11.33	11.96	11.85	11.55	10.96	10.21	9.50
CLK1	8.97	8.83	9.16	9.54	10.34	10.94	11.84	11.56	10.97	10.36	9.67	9.42
CLK12	8.88	9.00	9.04	8.93	9.44	9.81	10.74	10.66	10.57	10.18	9.49	9.32
GLE3	9.03	8.59	9.29	9.87	10.32	11.03	12.04	11.76	11.28	10.50	9.77	9.30
GLE12	9.40	8.64	NA	9.92	10.55	11.19	12.13	11.84	11.65	11.13	10.25	9.86
MIC3	8.95	8.75	9.57	10.37	10.97	12.01	12.84	11.96	11.38	10.61	10.01	9.50
MIC12	8.93	8.55	9.58	11.02	10.60	10.97	12.36	11.73	11.18	10.27	9.86	9.17
PRI3	8.04	8.09	8.72	9.24	9.04	10.87	11.93	11.44	10.85	NA	9.10	8.54
PRI12	8.33	8.15	9.04	7.85	8.69	9.81	11.06	10.72	10.51	9.91	9.24	8.74
SHE3	8.64	8.46	9.52	10.30	10.35	NA	12.50	11.87	11.32	10.50	10.00	9.23

Monthly Medians for **Stage** at Continuous Instream Sites

	Jul 2012	Aug 2012	Sep 2012	Oct 2012	Nov 2012	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013
Station Name	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)
BAT3	4.18	4.10	4.00	4.17	4.58	5.44	4.53	4.45	4.43	4.34	4.20	4.13
BAT12	4.70	4.60	4.55	4.68	4.95	5.31	5.02	4.98	4.98	4.91	4.79	4.74
CLK1	3.98	3.96	3.96	4.21	4.50	4.68	4.31	4.20	4.21	4.15	4.06	4.00
CLK12	3.95	3.94	3.92	4.07	4.26	4.39	4.11	4.11	4.11	4.10	4.05	4.03
GLE3	NA	NA	NA	NA	4.82	5.29	4.50	4.44	4.43	4.36	4.24	4.21
LPW1	No flow	No flow	No flow	No flow	1.68	1.97	1.49	No flow	No flow	No flow	No flow	No flow
GLE12	0.72	0.64	0.59	0.74	0.89	1.19	0.91	0.89	0.90	0.85	0.80	0.74
MIC3	5.91	5.88	5.59	5.55	5.90	6.62	5.47	5.45	5.23	5.24	5.35	5.59
MIC12	7.22	7.16	7.20	7.09	7.75	8.47	7.59	7.51	7.34	7.23	7.34	7.33
PRI3	4.24	4.20	4.20	4.35	4.60	4.93	4.53	4.51	4.47	4.45	4.38	4.37
PRI4	7.40	7.34	7.33	7.55	8.00	8.31	7.74	7.71	7.68	7.67	7.50	7.51
PRI12	4.25	4.15	4.1	4.06	4.44	4.76	4.34	4.32	4.29	4.3	4.3	4.37
SHE3	NA	NA	NA	NA	6.38	7.18	6.12	6.08	5.89	5.83	5.85	5.80

Presented median values consist of A and B grade data only.

NA = 60% of the continuous record for a given month is not represented by A and B grade data.

Table 10.
Instream Storm Monitoring Data (RY 2012/13)

Site Name:	CLK1																	
Site Description:	Lower Clark Creek just before confluence with Pringle Creek																	
Sample Collection Date/Time	**E. Coli**	**Diss. Oxygen**	**pH**	**temp**	**Sp. Cond, field**	**Sp. Cond, comp**	**Cu**	**Cu diss**	**Zn**	**Zn diss**	**Pb**	**Pb diss**	**Hardness**	**NH3**	**NO3+NO2**	**Ortho P**	**TP**	**BODs**	**TSS**
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/12/2012 14:23	>24196	9.43	6.62	14.1	52.81														
10/12/2012 14:23 - dup	>24196	9.42	6.63	14.1	53.2														
10/13/2012 10:20						76.5	0.066	0.0178	0.539	0.161	0.0519	0.0017	98	0.938	0.88	0.109	1.33	6	616
11/29/2012 8:28	1986	10.62	7.17	9.87	70.78														
11/30/2012 9:05						63	0.0056	0.0027	0.0829	0.0422	0.0033	0.0007	24	0.05	1	0.03	0.123	3.8	41.2
01/23/2013 12:39	7270	11.67	7.39	6.9	160.5														
1/23/2013 12:40 - dup	7700	11.66 (11.0)	7.38	6.87	168.2														
01/24/2013 09:00						127	0.0098	0.0042	0.3	0.223	0.0042	0.0005	40	0.266	0.95	0.023	0.071	6.8	48
3/5/2013 7:40	1203	11.41	7.23	7.85	128.6														
3/5/2013 13:15						80.3	0.0092	0.0033	0.0973	0.0329	0.0052	0.0005	27	QNS	0.79	0.02	0.203	3.8	72
3/19/2013 19:31	2420	10.93	7.15	9.73	35														
3/20/2013 12:14						30.4	0.013	0.0036	0.182	0.0644	0.0088	0.0006	15	0.045	0.26	0.022	0.298	4	126
4/4/2013 10:57	2420	10.17	7.03	12.77	79.26														
4/5/2013 8:43						80.6	0.0163	0.0082	0.961	0.677	0.0048	0.0007	67	0.198	0.92	0.033	0.273	8.99	110
Median	**4845**	**10.62**	**7.16**	**9.8**	**75.02**	**78.4**	**0.0114**	**0.0039**	**0.241**	**0.1127**	**0.005**	**0.00065**	**33.5**	**0.198**	**0.9**	**0.0265**	**0.238**	**5.00**	**91.0**

Site Name:	PRI3																	
Site Description:	Lower Pringle Creek in Pringle Park, just upstream of confluence with Shelton Ditch																	
Sample Collection Date/Time	**E. Coli**	**Diss. Oxygen**	**pH**	**temp**	**Sp. Cond, field**	**Sp. Cond, comp**	**Cu**	**Cu diss**	**Zn**	**Zn diss**	**Pb**	**Pb diss**	**Hardness**	**NH3**	**NO3+NO2**	**Ortho P**	**TP**	**BODs**	**TSS**
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/12/2012 15:05	24200	9.24	6.88	13.52	68.5														
10/13/2012 10:02						55.7	0.0252	0.0142	0.188	0.052	0.0144	0.001	68	0.379	0.38	0.095	0.662	> 7.4	216
11/29/2012 8:51	1414	10.54 (10.2)	7.22	9.37	76.66														
11/30/2012 9:15						69.2	0.0028	< 0.0025	0.0277	0.0193	< 0.0010	< 0.0010	28	< 0.050	1.43	0.018	0.055	2	11.6
1/23/2013 13:20	96	12.55	7.67	4.72	308.1														
1/24/2013 9:15						149	0.0031	< 0.0025	0.0711	0.0528	0.0008	< 0.0005	36	0.122	1.12	0.021	0.031	2.5	12
3/5/2013 8:30	291	11.2	7.5	7.73	88.26														
3/5/2013 13:28						88.3	< 0.0025	< 0.0025	0.0196	0.0133	0.0005	< 0.0005	29	QNS	0.99	0.014	0.047	1.84	8.4
3/19/2013 19:48	461	10.8	8.13	9.7	72.2														
3/20/2013 12:03						48.7	0.0104	< 0.0025	0.105	0.0241	0.0062	< 0.0005	25	0.011	0.36	0.013	0.308	3.7	126
4/4/2013 11:55	1553	10.37	7.42	13.22	94.53														
4/4/2013 11:56 - dup	4611	10.36	7.41	13.22	94.26														
4/5/2013 8:31						95.7	0.0029	0.0025	0.0286	0.0218	< 0.0005	< 0.0005	35	< 0.050	0.99	0.031	0.055	2.16	9.2
Median	**1414**	**10.59**	**7.42**	**9.7**	**88.26**	**78.75**	**0.0031**	**NA**	**0.04985**	**0.02295**	**0.0035**	**NA**	**32**	**0.122**	**0.99**	**0.0195**	**0.055**	**2.33**	**11.8**

Site Name:	PRI12																	
Site Description:	Upper East Fork Pringle Creek																	
Sample Collection Date/Time	**E. Coli**	**Diss. Oxygen**	**pH**	**temp**	**Sp. Cond, field**	**Sp. Cond, comp**	**Cu**	**Cu diss**	**Zn**	**Zn diss**	**Pb**	**Pb diss**	**Hardness**	**NH3**	**NO3+NO2**	**Ortho P**	**TP**	**BODs**	**TSS**
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/12/2012 15:57	3448	9.18	6.84	11.99	74.05														
10/13/2012 11:13						74.2	0.0059	0.005	0.0429	0.0219	0.0012	< 0.0005	37	0.11	1.04	0.087	0.242	> 8.0	32
11/29/2012 9:24	228	9.1	6.61	9.64	85.65														
11/30/2012 10:05						75.1	< 0.0025	< 0.0025	0.0124	0.0095	0.0005	< 0.0005	29	< 0.050	2.62	0.013	0.04	1.07	6.4
1/23/2013 13:52	83	11.42	6.99	5.17	88.74														
1/24/2013 9:46						91.3	< 0.0025	< 0.0025	0.0119	0.0053	< 0.0005	< 0.0005	30	< 0.050	2.05	< 0.010	0.018	< 1.00	8.2
3/5/2013 9:00	66	10.5 (10.35)	6.9	6.59	83.25														
3/5/2013 11:35						83	< 0.0025	< 0.0025	0.0118	0.0081	< 0.0005	< 0.0005	28	QNS	1.95	0.011	0.028	< 1.00	6.4
3/19/2013 20:13	435	9.69	6.6	8.96	75.7														
3/19/2013 20:14	345	9.68 (9.45)	6.6	8.96	76.9														
3/20/2013 13:13						73.5	0.0027	< 0.0025	0.0099	0.0063	0.0006	< 0.0005	30	0.166	1.01	< 0.010	0.099	<2	25
4/4/2013 12:36	435	10.22	6.95	12.12	77.85														
4/5/2013 9:32						81.1	< 0.0025	< 0.0025	0.0286	0.0106	< 0.0005	< 0.0005	31	< 0.050	1.63	0.024	0.041	1.43	13.6
Median	**345**	**9.69**	**6.84**	**8.96**	**77.85**	**78.1**	**NA**	**NA**	**0.01215**	**0.0088**	**0.0006**	**NA**	**30**	**NA**	**1.79**	**0.0185**	**0.0405**	**1.25**	**10.9**

QNS= Quantity Not Sufficient for analyzing a parameter. NA= Median not calculated because ≥ 50% of values were censored values. Data in red exceed applicable water quality criteria (see Table 4). Data in blue are QA/QC DO readings done using Winkler Titration.

Table 11.
Stormwater Monitoring Data (RY 2012/13)

Site Name:	Electric																	
Land use Type:	Residential																	
Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO3+NO2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/12/2012 13:10	17330	9.84	6.75	14.75	57.2														
10/13/2012 10:31						42.4	0.0163	0.0183	0.0802	0.0597	0.0023	0.0008	24	0.435	0.77	0.214	0.377	26.4	26
11/29/2012 8:00	3448	11.07	6.88	8.95	36.56														
11/30/2012 8:20						58.2	0.0062	0.0032	0.0415	0.0203	0.0024	< 0.0010	22	< 0.050	0.99	0.081	0.2	6.3	34
3/5/2013 8:52	921	11.6	6.85	8.04	60.71														
3/5/2013 13:07						99.1	0.0041	0.0029	0.0283	0.0182	0.0012	< 0.0005	32	NA	1.39	0.051	0.109	2.2	14.8
3/19/2013 18:35	866	10.98	7.04	10.05	42.42														
3/20/2013 12:24						50.4	0.0053	0.0042	0.0334	0.0227	0.0016	0.0007	19	< 0.004	0.57	0.081	0.131	2.4	22
Median	**2184.5**	**11.03**	**6.865**	**9.5**	**49.81**	**54.3**	**0.00575**	**0.0037**	**0.03745**	**0.0215**	**0.00195**	**0.00075**	**23**	**NA**	**0.88**	**0.081**	**0.1655**	**4.35**	**24**

Site Name:	Hilfiker																	
Land use Type:	Commercial																	
Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO3+NO2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/12/2012 11:50	548	9.85	6.4	13.75	47.01														
10/13/2012 10:57						31.3	0.019	0.0157	0.152	0.108	0.003	0.0007	15	0.648	0.65	0.099	0.247	18.9	45.5
11/29/2012 7:32	19860	11.33	6.45	7.56	30.77														
11/30/2012 8:00						29.4	0.0178	0.0059	0.216	0.0868	0.0054	< 0.0010	15	0.108	0.35	0.016	0.206	7.9	75.6
3/5/2013 7:28	41	11.87	6.99	6.18	89.89														
3/5/2013 7:29	16	11.85	6.96	6.1	90														
3/5/2013 12:02						57	0.0178	0.0081	0.157	0.0756	0.0043	0.0006	21	NA	0.35	0.015	0.18	7.3	74
3/19/2013 19:00	11	11.14	7.08	8.97	13.84														
3/20/2013 12:54						17.7	0.012	0.0042	0.129	0.0639	0.0037	< 0.0005	10	0.1	0.14	0.016	0.11	3.7	63
Median	**294.5**	**11.33**	**6.96**	**7.56**	**47.01**	**30.35**	**0.0178**	**0.007**	**0.1545**	**0.0812**	**0.004**	**0.00065**	**15**	**0.108**	**0.35**	**0.016**	**0.193**	**7.6**	**68.5**

Site Name:	Salem Industrial																	
Land use Type:	Industrial																	
Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO3+NO2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/12/2012 16:34	> 24200	9.29	6.37	14.15	39.45														
10/13/2012 11:44						73.2	0.0252	0.0119	0.327	0.187	0.0043	0.0006	58	0.398	1.09	0.194	0.864	21	201
11/29/2012 9:50	74	10.23	6.53	8.88	28.41														
11/29/2012 9:51	55	10.21	6.54	8.92	28.46														
11/30/2012 10:27						32.2	0.006	0.0043	0.0731	0.0517	0.001	< 0.0010	14	< 0.050	0.14	0.035	0.127	3	26.8
3/5/2013 9:45	8664	10.99	6.51	7.03	27.1														
3/5/2013 14:00						29.9	0.0061	0.0049	0.0905	0.07	0.0008	< 0.0005	24	NA	0.28	0.036	0.1	2.8	20
3/19/2013 20:41	52	10.17	6.88	8.75	32.25														
3/20/2013 13:35						22.7	0.011	0.0083	0.129	0.0913	0.0015	0.0006	13	< 0.004	0.1	0.049	0.26	5.6	61
Median	**64.5**	**10.21**	**6.53**	**8.88**	**28.46**	**31.05**	**0.00855**	**0.0066**	**0.10975**	**0.08065**	**0.00125**	**0.0006**	**19**	**NA**	**0.21**	**0.0425**	**0.1935**	**4.3**	**43.9**

NA= Median not calculated because ≥ 50% of values were censored values.

Table 12.
Pesticide Monitoring Data (RY 2012/13)

Site Name	Land Use Type	Sample Date	Time	Analyte	Type of Pesticide	Amount Detected (µg/L)	Limit of Quantitation (µg/L)
Electric	Residential	10/12/2012	13:01	2,4-D	Phenoxy Herbicide	1.5	0.08
				Dicamba	Phenoxy Herbicide	0.39	0.08
				MCPP	Phenoxy Herbicide	0.33	0.08
				Triclopyr	Phenoxy Herbicide	0.34	0.08
		6/18/2013	15:16	2,4-D	Phenoxy Herbicide	0.25	0.08
Hilfiker	Commercial	10/12/2012	12:05	2,4-D	Phenoxy Herbicide	0.49	0.08
				Dicamba	Phenoxy Herbicide	0.23	0.08
				Triclopyr	Phenoxy Herbicide	0.32	0.08
		6/18/2013	15:00	2,4-D	Phenoxy Herbicide	0.29	0.08
Hilfiker DUP	Commercial	6/18/2013	15:03	2,4-D	Phenoxy Herbicide	0.33	0.08
Salem Industrial	Industrial	10/12/2012	16:38	Simazine	Organonitrogen pesticide	1.3	0.60
				Propiconazole	Halogenated Pesticide	0.3	0.30
				2,4-D	Phenoxy Herbicide	1.7	0.08
				Dicamba	Phenoxy Herbicide	0.51	0.08
				Triclopyr	Phenoxy Herbicide	0.97	0.08
		6/18/2013	15:42	Propiconazole	Halogenated Pesticide	0.95	0.15
				Diuron	Phenylurea Pesticide	0.44	0.12
				2,4-D	Phenoxy Herbicide	1.3	0.08
				Triclopyr	Phenoxy Herbicide	1.4	0.08
Salem Industrial DUP	Industrial	10/12/2012	16:47	Simazine	Organonitrogen pesticide	1.1	0.60
				2,4-D	Phenoxy Herbicide	1.8	0.08
				Dicamba	Phenoxy Herbicide	0.58	0.08
				Triclopyr	Phenoxy Herbicide	0.95	0.08

Note: Results only given for those analytes that were detected. See Attachement A for full suite of compounds that were analyzed.

Table 13.
Mercury Monitoring Data (RY 2012/13)

Sample Date	Site Name	Time:	Analyte	Result (ng/L)	Detection Limit (ng/L)	Reporting Limit (ng/L)
3/5/2013	Electric-native	9:05	Total Hg	4.9	0.28	1.00
		9:05	Diss. Hg	2.6	0.28	1.00
		9:12	Total MeHg	0.13	0.014	0.05
		9:12	Diss. MeHg	0.06	0.014	0.05
	Hilfiker-blank	7:39	Total Hg	U	0.28	1.00
	Hilfiker-native	7:59	Total Hg	5.7	0.28	1.00
		7:59	Diss. Hg	2.8	0.28	1.00
		8:15	Total MeHg	0.18	0.014	0.05
		8:15	Diss. MeHg	0.11	0.014	0.05
	Hilfiker-dup	8:08	Total Hg	5.1	0.28	1.00
		8:08	Diss. Hg	2.8	0.28	1.00
		8:22	Total MeHg	0.15	0.014	0.05
		8:22	Diss. MeHg	0.11	0.014	0.05

Note: CH2MHill Applied Sciences Laboratory used for analysis. Samples were composited in the field by City staff to help eliminate discrepancies in data due to length of time between total and dissolved Hg and MeHg sample collection.

U= Not detected at specified reporting limit.

Table 14.
Mercury Monitoring - Additional Data (RY 2012/13)

Site Name:	Electric							
Sample Date/Time:	**TSS**	**DOC**	**Sulfate**	**Alkalinity**	**TOC**	**pH**	**ORP**	**Sp. Cond**
03/05/2013 08:55	9.00		3.11	16.00		6.85	0.23	60.71
03/05/2013 09:01		2.84			3.25			
Site Name:	**Hilfiker**							
Sample Date/Time:	**TSS**	**DOC**	**Sulfate**	**Alkalinity**	**TOC**	**pH**	**ORP**	**Sp. Cond**
03/05/2013 07:43	61.60					6.99	0.24	89.89
03/05/2013 07:45		5.27						
03/05/2013 07:46			0.86	8.40				
03/05/2013 07:48					6.94			
Site Name:	**Hilfiker-duplicate**							
Sample Date/Time:	**TSS**	**DOC**	**Sulfate**	**Alkalinity**	**TOC**	**pH**	**ORP**	**Sp. Cond**
03/05/2013 07:44	54.40					6.96	0.24	90.00
03/05/2013 07:46		5.22						
03/05/2013 07:47			0.86	7.72				
03/05/2013 07:49					6.38			
Reporting Limit:	**2.0 mg/L**	**0.5 mg/L**	**0.10 mg/L**	**4.0 mg/L**	**0.5 mg/L**			

Note: CH2MHill used for analysis; pH, Oxygen Reduction Potential (ORP) and specific conductivity are field measurements.

Table 15.

Benthic Macroinvertebrate Monitoring Data (RY 2012/13)

Benthic Invertebrate Index of Biological Integrity-BIBI (modified Karr 1998)

Metric	Clark Creek		East Fork Pringle Creek (PC1)		Pringle Creek (PC2)	
	Value	Score[a]	Value	Score[a]	Value	Score[a]
Total Number of Taxa[b]	28	3	39	3	31	3
Number of Ephemeroptera Taxa[b]	1	1	2	1	1	1
Number of Plecoptera Taxa[b]	0	1	0	1	0	1
Number of Trichoptera Taxa[b]	1	1	5	3	4	1
Number of Long-lived Taxa[b]	3	3	2	1	1	1
Number of Intolerant Taxa[b]	1	1	1	1	0	1
Percent Tolerant Taxa[c]	19.79	5	23.95	3	30.77	3
Percent Predators[b]	5.25	1	12.74	3	2.97	1
Number of Clinger Taxa[b]	6	1	14	3	8	1
Percent Dominance (3 Taxa)[c]	38.79	5	37.83	5	50.11	3
Total BIBI Score[d]:	**n/a**	**22**	**n/a**	**24**	**n/a**	**16**
Biological Condition:	**Low**		**Low**		**Low**	

Notes:

a. Each metric scored: 1 = Low; 3 = Moderate; 5 = High

b. Metric value generally decreases with declining biological integrity.

c. Metric value general increases with declining biological integrity.

d. Key to Total BIBI Scores:

BIBI scores 0 – 24 = Low biological integrity BIBI scores 25 – 39 = Moderate biological integrity BIBI scores 39 – 50 = High biological integrity

Source: "Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon", Pacific Habitat Services, Inc.; June 27, 2013. See Attachment B.

Table 16.

Benthic Macroinvertebrate Monitoring Data (RY 2012/13)

Other Community Composition Metrics that are Indicative of Biological Condition

Metric	Clark Creek		East Fork Pringle Creek (PC1)		Pringle Creek (PC2)	
	Value	Score[a]	Value	Score[a]	Value	Score[a]
Total Abundance[b]	1937	H	1132	H	2543	H
EPT Taxa Richness[b]	2	L	7	L	5	L
Predator Richness[b]	3	L	6	L	2	L
Scraper Richness[b]	1	L	7	L	6	L
Shredder Richness[b]	4	L	5	M	3	L
Percent Intolerant Taxa[b]	0.4	L	3.23	L	0	L
Percent *Baetis tricaudatus*[c]	16.36	M	3.23	H	16.56	M
Percent Collector[c]	77.58	L	60.27	L	64.12	L
Percent Parasite[c]	0.4	H	6.27	L	1.49	H
Percent Oligochaeta[c]	4.85	M	11.98	L	16.77	L
Number of Tolerant taxa[c]	6	H	11	L	11	L
Percent Simuliidae[c]	3.43	H	0.76	H	12.1	L
Percent Chironomidae	67.88	L	48.29	L	37.79	L

Notes:

a. Low (L), moderate (M), and high (H) scores compared with a Pacific Northwest montane stream with high biological integrity.

b. Metric value generally decreases with declining biological integrity.

c. Metric value generally increases with declining biological integrity.

Source: "Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon", Pacific Habitat Services, Inc.; June 27, 2013. See Attachment B.

Table 17.

Benthic Macroinvertebrate Monitoring Data (RY 2012/13)

Fish Sampling Results

Fish Species	Sampling Reach		
	East Fork Pringle Creek	Clark Creek	Pringle Creek[a]
Sculpin	37	34	-
Redside Shiner	40	24	-
Largescale Sucker	1	-	-
Cutthroat trout	2	7	-
Speckled Dace	9	7	-
Total	**89**	**82**	**-**

Notes: a. Reach not sampled because necessary permit from NMFS could not be obtained in time to meet schedule constraints.

Source: "Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon", Pacific Habitat Services, Inc.; June 27, 2013. See Attachment B.

Table 18.

Willamette River Water Quality Data (RY 2012/13)

Willamette at Railroad Bridge River Mile 83														
Date	**Temp**	**pH**	**Turb**	**DO**	**Cond**	**E.coli**	**BOD**	**Alk**	**TS**	**TSS**	**TDS**	**NO3+NO2**	**Tphos**	**NH3**
M/DD/YYYY	**°C**	**S.U**	**ntu**	**mg/l**	**uS/cm**	**#/100ml**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
7/10/2012	19.9	7.50	2.66	9.0	51.4	7	0.55	28	58	4	54	0.09	0.031	< 0.050
7/24/2012	18.1	7.37	2.75	9.0	51.7	8	0.52	31	66	4	62	0.12	0.038	< 0.050
8/14/2012	20.7	7.49	1.87	9.0	53.5	7	0.58	33	73	3.6	69	0.08	0.037	< 0.050
9/11/2012	15.6	7.48	3.31	10.0	46.0	12	0.65	26	70	5.6	64	0.08	0.032	< 0.050
9/25/2012	15.1	7.51	2.56	10.0	44.8	8	0.84	28	68	4	64	0.09	0.033	< 0.050
10/9/2012	12.9	7.49	4.64	10.0	45.2	15	0.74	27	67	5.6	61	0.09	0.036	< 0.050
10/23/2012	11.1	7.50	5.21	10.0	44.1	45	0.54	27	65	6.4	59	0.12	0.047	< 0.050
1/15/2013	4.1	7.31	6.52	13.0	47.6	3	0.91	27	45	3.6	41	0.46	0.039	< 0.050
2/12/2013	7.1	7.33	5.50	12.0	50.6	8	1.01	29	66	4	62	0.36	0.038	< 0.050
3/12/2013	8.5	7.40	5.42	12.0	50.3	8	0.84	27	70	4	66	0.33	0.037	< 0.050
4/9/2013	8.8	7.43	17.20	11.0	38.0	411	1.28	21	70	20.4	50	0.21	0.070	< 0.050
5/14/2013	15.2	7.53	2.69	10.0	45.4	6	0.73	28	58	4.4	54	0.10	0.032	< 0.050
6/11/2013	17.8	7.42	2.27	9.0	51.0	5	0.80	27	59	4.4	55	0.19	0.032	0.005
Median	**15.1**	**7.48**	**3.31**	**10.0**	**47.6**	**8**	**0.74**	**27**	**66**	**4**	**61**	**0.12**	**0.037**	**0.005**

DUPLICATE SITE- Willamette at Railroad Bridge River Mile 83														
Date	**Temp**	**pH**	**Turb**	**DO**	**Cond**	**E.coli**	**BOD**	**Alk**	**TS**	**TSS**	**TDS**	**NO3+NO2**	**Tphos**	**NH3**
MM/DD/YYYY	**°C**	**S.U**	**ntu**	**mg/l**	**uS/cm**	**#/100ml**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
7/10/2012	19.9	7.54	2.63	9.0	51.7	2	0.57	29	58	4.4	54	0.10	0.035	< 0.050
7/24/2012	18.0	7.38	2.16	9.0	51.8	8	0.54	28	71	3.6	67	0.11	0.042	< 0.050
8/14/2012	20.7	7.51	1.79	9.0	53.9	6	0.54	33	69	4	65	0.09	0.038	< 0.050
9/11/2012	15.5	7.49	3.10	10.0	46.1	13	0.56	28	68	5.6	62	0.08	0.036	< 0.050
9/25/2012	15.1	7.55	3.38	10.0	44.8	12	0.80	28	72	4.8	67	0.09	0.032	< 0.050
10/9/2012	12.9	7.50	4.56	10.0	45.2	20	0.67	27	66	6.4	60	0.09	0.040	< 0.050
10/23/2012	11.1	7.53	5.73	10.0	44.0	28	0.58	27	68	6	62	0.12	0.050	< 0.050
1/15/2013	4.1	7.34	6.02	13.0	47.4	16	0.86	26	54	3.6	50	0.47	0.038	< 0.050
2/12/2013	7.0	7.36	5.58	12.0	50.5	10	0.89	30	66	3.6	62	0.34	0.038	< 0.050
3/12/2013	8.5	7.46	5.49	12.0	50.5	6	0.87	27	68	4.4	64	0.35	0.035	< 0.050
4/9/2013	8.7	7.42	16.70	11.0	37.9	345	1.41	24	67	20.8	46	0.18	0.069	< 0.050
5/14/2013	15.2	7.52	2.72	10.0	45.9	9	0.78	28	64	4	60	0.11	0.034	< 0.050
6/11/2013	17.8	7.47	2.46	9.0	52.4	3	0.64	27	61	4	57	0.22	0.033	0.008
Median	**15.1**	**7.49**	**3.38**	**10.0**	**47.4**	**10**	**0.67**	**28**	**67**	**4.4**	**62**	**0.11**	**0.038**	**0.05**

Table 18.

Willamette River Water Quality Data (RY 2012/13)

Mill Creek Confluence at River Mile 82.9														
Date	**Temp**	**pH**	**Turb**	**DO**	**Cond**	**E.coli**	**BOD**	**Alk**	**TS**	**TSS**	**TDS**	**NO3+NO2**	**Tphos**	**NH3**
MM/DD/YYYY	**°C**	**S.U**	**ntu**	**mg/l**	**uS/cm**	**#/100ml**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
7/10/2012	19.4	7.45	6.77	9.0	46.7	144	0.53	29	62	6.8	55	0.22	0.055	< 0.050
7/24/2012	17.0	7.48	7.23	10.0	40.2	84	0.62	26	62	8	54	0.12	0.049	< 0.050
8/14/2012	19.9	7.55	3.61	9.0	44.0	172	0.50	30	59	3.6	55	0.21	0.048	< 0.050
9/11/2012	14.8	7.52	5.26	10.0	38.3	142	0.62	24	61	5.6	55	0.09	0.037	< 0.050
9/25/2012	14.1	7.58	4.54	10.0	37.9	921	0.82	27	68	4.4	64	0.16	0.030	< 0.050
10/9/2012	10.6	7.54	4.21	11.0	37.1	225	0.88	25	57	6	51	0.11	0.032	< 0.050
10/23/2012	9.7	7.56	4.96	11.0	67.7	365	0.93	35	83	5.2	78	1.12	0.044	< 0.050
1/15/2013	4.1	7.35	5.72	13.0	48.5	14	1.03	28	44	3.2	41	0.70	0.038	< 0.050
2/12/2013	7.1	7.36	5.51	12.0	56.6	6	1.13	29	79	3.6	75	0.44	0.039	< 0.050
3/12/2013	9.5	7.66	4.19	12.0	65.8	138	0.93	29	82	3.2	79	1.50	0.035	< 0.050
4/9/2013	No samples collected due to no boat access													
5/14/2013	14.0	7.43	5.23	10.0	43.6	178	0.88	28	62	5.2	57	0.26	0.053	< 0.050
6/11/2013	No samples collected due to no boat access													
Median	**14.0**	**7.52**	**5.23**	**10.0**	**44.0**	**144**	**0.88**	**28**	**62**	**5.2**	**55**	**0.22**	**0.039**	**0.05**

Sunset Park at River Mile 84														
Date	**Temp**	**pH**	**Turb**	**DO**	**Cond**	**E.coli**	**BOD**	**Alk**	**TS**	**TSS**	**TDS**	**NO3+NO2**	**Tphos**	**NH3**
MM/DD/YYYY	**°C**	**S.U**	**ntu**	**mg/l**	**uS/cm**	**#/100ml**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
7/10/2012	20.0	7.62	2.20	10.0	51.4	18	0.69	30	67	2.4	65	0.11	0.032	< 0.050
7/24/2012	18.1	7.49	3.68	10.0	51.5	16	0.71	30	66	4.4	62	0.12	0.042	< 0.050
8/14/2012	20.9	7.53	2.20	9.0	53.6	12	0.62	32	69	4.4	65	0.09	0.040	< 0.050
9/11/2012	15.6	7.43	3.24	10.0	45.1	17	0.68	26	63	5.2	58	0.08	0.032	< 0.050
9/25/2012	15.0	7.55	3.92	10.0	44.1	25	0.94	28	71	5.2	66	0.10	0.031	< 0.050
10/9/2012	12.6	7.53	4.66	10.0	44.9	37	0.76	27	68	7.2	61	0.09	0.036	< 0.050
10/23/2012	11.0	7.53	5.94	10.0	44.7	50	0.60	28	70	6	64	0.14	0.052	< 0.050
1/15/2013	4.1	7.35	6.34	13.0	48.7	12	1.24	27	48	3.6	44	0.56	0.039	< 0.050
2/12/2013	7.1	7.22	5.05	12.0	51.8	12	0.91	29	68	3.6	64	0.43	0.039	< 0.050
3/12/2013	8.7	7.47	5.40	12.0	51.5	10	0.84	28	73	4	69	0.39	0.037	< 0.050
4/9/2013	8.9	7.42	15.20	11.0	38.8	248	1.15	23	72	17.2	55	0.22	0.065	< 0.050
5/14/2013	14.8	7.64	2.50	11.0	45.3	10	0.82	29	63	3.6	59	0.10	0.032	< 0.050
6/11/2013	17.8	7.60	3.39	9.0	51.8	14	0.67	29	54	4.4	50	0.20	0.034	0.007
Median	**14.8**	**7.53**	**3.92**	**10.0**	**48.7**	**16**	**0.76**	**28**	**68**	**4.4**	**62**	**0.12**	**0.037**	**0.05**

Table 18.

Willamette River Water Quality Data (RY 2012/13)

Willamette River at Mile 78														
Date	**Temp**	**pH**	**Turb**	**DO**	**Cond**	**E.coli**	**BOD**	**Alk**	**TS**	**TSS**	**TDS**	**NO3+NO2**	**Tphos**	**NH3**
MM/DD/YYYY	**°C**	**S.U**	**ntu**	**mg/l**	**uS/cm**	**#/100ml**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
7/10/2012	20.0	7.49	2.73	9.0	55.1	12	0.78	30	64	4	60	0.12	0.068	0.156
7/24/2012	18.3	7.51	2.53	9.0	56.3	2	0.62	32	69	3.2	66	0.13	0.070	0.224
8/14/2012	21.1	7.43	1.69	9.0	58.6	4	0.68	35	68	3.2	65	0.10	0.056	0.163
9/11/2012	15.7	7.54	3.20	10.0	50.6	18	0.67	27	58	4.8	53	0.08	0.041	0.087
9/25/2012	15.1	7.53	3.02	10.0	47.5	16	0.90	30	64	4.8	59	0.10	0.048	0.131
10/9/2012	12.8	7.55	5.05	10.0	47.1	22	0.76	27	63	6	57	0.10	0.049	0.074
10/23/2012	11.2	7.40	5.42	10.0	45.8	30	0.66	26	69	6.4	63	0.14	0.056	0.057
1/15/2013	4.1	7.37	6.35	13.0	48.9	15	< 0.50	28	55	3.2	52	0.49	0.043	< 0.050
2/12/2013	7.1	7.37	5.18	12.0	52.3	5	1.09	31	66	3.6	62	0.38	0.055	0.125
3/12/2013	8.7	7.34	5.48	12.0	52.5	6	0.93	28	72	3.6	68	0.35	0.054	0.101
4/9/2013	8.9	7.46	16.40	11.0	39.3	236	1.26	24	72	21.2	51	0.19	0.071	0.066
5/14/2013	15.0	7.56	2.47	10.0	47.4	11	0.89	30	71	4.8	66	0.11	0.053	0.114
6/11/2013	17.9	7.48	3.16	9.0	54.5	10	0.80	30	60	4.4	56	0.22	0.059	0.19
Median	**15.0**	**7.48**	**3.20**	**10.0**	**50.6**	**12**	**0.79**	**30**	**66**	**4.4**	**60**	**0.13**	**0.055**	**0.1195**

Spongs Landing at River Mile 77														
Date	**Temp**	**pH**	**Turb**	**DO**	**Cond**	**E.coli**	**BOD**	**Alk**	**TS**	**TSS**	**TDS**	**NO3+NO2**	**Tphos**	**NH3**
MM/DD/YYYY	**°C**	**S.U**	**ntu**	**mg/l**	**uS/cm**	**#/100ml**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
7/10/2012	20.0	7.57	2.13	9.0	54.0	3	0.65	30	60	4	56	0.10	0.052	0.109
7/24/2012	18.3	7.53	2.81	10.0	55.0	7	0.61	32	65	3.2	62	0.13	0.054	0.128
8/14/2012	21.1	7.56	1.98	9.0	56.2	4	0.68	33	73	4	69	0.09	0.047	0.089
9/11/2012	15.7	7.54	3.40	10.0	48.0	12	0.74	25	66	6	60	0.08	0.049	0.122
9/25/2012	15.1	7.58	3.23	10.0	45.3	15	0.88	29	70	4.4	66	0.10	0.041	0.084
10/9/2012	12.8	7.57	5.09	10.0	45.7	11	0.82	27	67	6	61	0.09	0.047	0.06
10/23/2012	11.1	7.51	5.65	11.0	45.1	46	0.64	28	73	7.2	66	0.12	0.052	< 0.050
1/15/2013	4.2	7.38	5.82	13.0	48.2	12	1.33	29	55	4	51	0.50	0.045	0.05
2/12/2013	7.1	7.38	5.33	12.0	52.1	11	0.96	31	69	3.6	65	0.37	0.046	0.073
3/12/2013	8.7	7.46	5.58	12.0	51.9	8	1.11	29	71	4	67	0.33	0.043	0.054
4/9/2013	8.9	7.45	15.80	11.0	38.9	291	1.44	25	69	20.8	48	0.20	0.076	0.075
5/14/2013	15.0	7.80	2.90	11.0	46.2	5	0.98	30	63	4	59	0.10	0.041	0.058
6/11/2013	18.0	7.58	2.40	9.0	52.7	3	0.66	28	76	3.6	72	0.25	0.044	0.076
Median	**15.0**	**7.54**	**3.40**	**10.0**	**48.2**	**11**	**0.82**	**29**	**69**	**4**	**62**	**0.12**	**0.047**	**0.0755**

Table 18.
Willamette River Water Quality Data (RY 2012/13)

Willamette at Wheatland River Mile 71														
Date	**Temp**	**pH**	**Turb**	**DO**	**Cond**	**E.coli**	**BOD**	**Alk**	**TS**	**TSS**	**TDS**	**NO3+NO2**	**Tphos**	**NH3**
MM/DD/YYYY	**°C**	**S.U**	**ntu**	**mg/l**	**uS/cm**	**#/100ml**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
7/10/2012	20.2	7.52	3.40	9.0	54.3	4	0.78	32	63	4.4	59	0.15	0.052	0.067
7/24/2012	18.6	7.58	2.21	9.0	54.3	6	0.67	32	69	2.8	66	0.16	0.053	0.076
8/14/2012	21.3	7.54	1.66	9.0	55.2	3	0.71	34	73	3.6	69	0.13	0.046	0.05
9/11/2012	16.0	7.50	3.58	10.0	47.5	10	0.69	27	59	5.2	54	0.09	0.046	0.059
9/25/2012	15.2	7.48	3.69	10.0	45.0	4	0.96	29	68	4.8	63	0.11	0.040	< 0.050
10/9/2012	12.8	7.56	5.06	10.0	45.5	12	0.80	27	60	6	54	0.09	0.047	0.051
10/23/2012	11.2	7.43	5.08	10.0	45.6	27	0.71	28	65	6.8	58	0.16	0.054	< 0.050
1/15/2013	4.2	7.37	6.15	13.0	49.7	14	0.92	28	54	3.6	50	0.52	0.049	0.07
2/12/2013	7.1	7.19	5.21	12.0	52.3	10	1.08	31	68	3.2	65	0.40	0.048	0.067
3/12/2013	8.7	7.31	5.80	12.0	52.6	3	0.93	29	73	4	69	0.37	0.048	0.065
4/9/2013	8.9	7.46	17.40	11.0	38.9	411	1.40	25	77	20.8	56	0.20	0.079	0.081
5/14/2013	15.1	7.58	2.80	10.0	46.1	8	0.92	30	66	4.8	61	0.12	0.044	0.055
6/11/2013	18.3	7.41	3.58	9.0	53.6	3	0.83	31	67	5.2	62	0.23	0.047	0.065
Median	**15.1**	**7.48**	**3.69**	**10.0**	**49.7**	**8**	**0.83**	**29**	**67**	**4.8**	**61**	**0.16**	**0.048**	**0.065**

Note: Willamette River monitoring is not identified in the City's Surface and Stormwater Monitoring Plan, however, it is identified in the City of Salem Stormwater Management Plan 2010.

Table 19.

Priority Dry Weather Outfall/Manhole Screening Data (RY 2012/13)

Site Information				Flow		Physical Indicators		Field Screening					Laboratory Testing						Follow Up	
ID	location note	west, north, south	Date/time	Flow Present	Estimated flow	Flowing Outfalls	Flowing and non-flowing outfalls	Temp (C)	pH (S.U.)	Specific Conductivity (uS/cm)	Turbidity (NTU)	Chlorine (mg/L)	E. Coli	Detergents (mg/L)	Fluoride (mg/L)	K (mg/L)	Na (mg/L)	NH3 (mg/L)	Date/time of Follow up E.Coli Sample	notes
D51470203		north	8/6/12 10:30	n (stagnant water)			n	20.3	6.31	59		0			<0.10					
D54470205		north	8/6/12 11:10	y	1-3 gpm	n	n	17.8	6.43	136.9	3.2	0	119	<0.25	0.21	1.9	8.565	0.06	6/5/13 8:40	notified water department
D54486217		north	8/6/12 12:30	y	50 gpm	n	y (brown growth)	18.0	6.93	83.5	1.87	0	120	0.25	0.8	0.6	6.443	0.05	6/5/13 10:50	fish in pipe, notified water department
D51486216		north	8/6/12 13:00	y	1-2 gpm	y (trash)	y (green pipe growth)	18.3	6.75	174.7	4.47	0	33	0.25	0.71	2.5	13.1	0.22	6/5/13 10:40	notified water department
D51488236		north	8/7/12 8:55	n			n													
D51488203		north	8/7/12 9:15	n			n													
D51486211*	sub for 201	north	8/7/12 9:50	y	10 gpm	y (tan color)	y	20.5	6.56	227.5	7.64	0	461	0.25	0.33	2.9	11.4	0.21	6/5/13 9:35	notified water department
D48486207		north	8/7/12 10:20	y	10 gpm	y (tan color)	n	18.6	6.66	241	12.6	0	1414	0.25	0.32	2.9	11.5	0.22	6/5/13 9:45	notified water department
D45476217		north	8/7/12 11:05	y	15-20 gpm	n	n	19.4	7.1	223.7	1.02	0.5		<0.25	0.14	2.4	10.4	<0.050		ES investigated, water source not found, notify water department
D42476203		north	8/7/12 11:30	n			n													
D45476207		north	8/7/12 12:00	y	40 gpm	n	y (green pipe growth)	15.6	7.42	278.8	0.5	0		<0.25	0.11	2	9.189	<0.050		notified water department
D54494201		north	8/7/12 13:00	n			n													
D45466212		south	8/8/12 8:30	y	.5 gpm	n	n	18.3	7.76	240	10.1	0			0.07					
D48464249		south	8/8/12 9:00	n (stagnant water)			n													
D48464203		south	8/8/12 9:30	y	3 gpm	n	n	17.7	6.83	218.8	2.7	0	4	0.25	0.22	2.1	8.68	0.25	6/5/13 8:00	notified water department
D45464207		south	8/8/12 10:20	n (stagnant water)			n	18.2	7.24	98.4	unable to sample	0								
D42468235		south	8/8/12 10:30	n			n													
D48460229		south	8/8/12 11:00	y	10-20 gpm	n	n	18.2	7.5	297.3	unable to sample	0		0.12	0.16	3.5	11.4	<0.050		notified water department
D42468244		south	8/13/12 10:23	y	65 gpm	n	n	18.4	6.87	119.7	3.02	0.15		<0.25	0.09	0.55	7.36	<0.500		notified water department
D42468232		south	8/13/12 10:50	n			n													
D42466227*		South	8/13/12 11:03	y	2.5 gpm	n	n	20.4	6.97	131.1	7.8	0		<0.25	0.1	1.08	8.955	<0.500		
D39460252		south	8/13/12 11:32	y	20 gpm	n	n	17.8	6.83	58.2	3.64	0		<0.25	0.1	0.48	4.702	<0.500		
D39456229		south	8/13/12 12:05	y	10 gpm		n	16.0	6.3	65.4	1.93	0.5		<0.25	0.2	0.7	4.911	<0.500		notified water department
D42480223		north	8/14/12 9:20	y	15 gpm	n	n	16.4	7.33	117.6	2.5	0		<0.25	0.6	1.35	7.495	<0.5		notified water department
D42480214*	sub for 215	north	8/14/12 9:50	n			n													
D42480205		north	8/14/12 10:30	n			n													
D42482210	sub for 212	north	8/14/12 11:00	n			n													
D42482211*		north	8/14/12 11:30	n			n													
D42482228*	sub for 223	west	9/19/12 9:16	n			n													
D30470204*	sub for 203	west	9/19/12 9:30	n			n													
D36472227*	sub for 203	west	9/19/12 9:50	n (trickle)			n													
D39476232*	sub for 233	west	9/19/12 10:00	n			n													
D39478271		west	9/19/12 10:30	y	5-10 gpm	n	n	16.8	7.72	116.8	4.16	0		0.12	0.21	1.2	6.967	0.03		notified water department
D45468241		south	9/19/12 11:15	y	5-10 gpm	n	n	18.0	7.97	179.2	0.75	0			0.1					
D42456216	not found																			

Data in red exceed action levels, see Dry Weather Outfall and Illicit Discharge Screening Plan for more info.

* Manhole

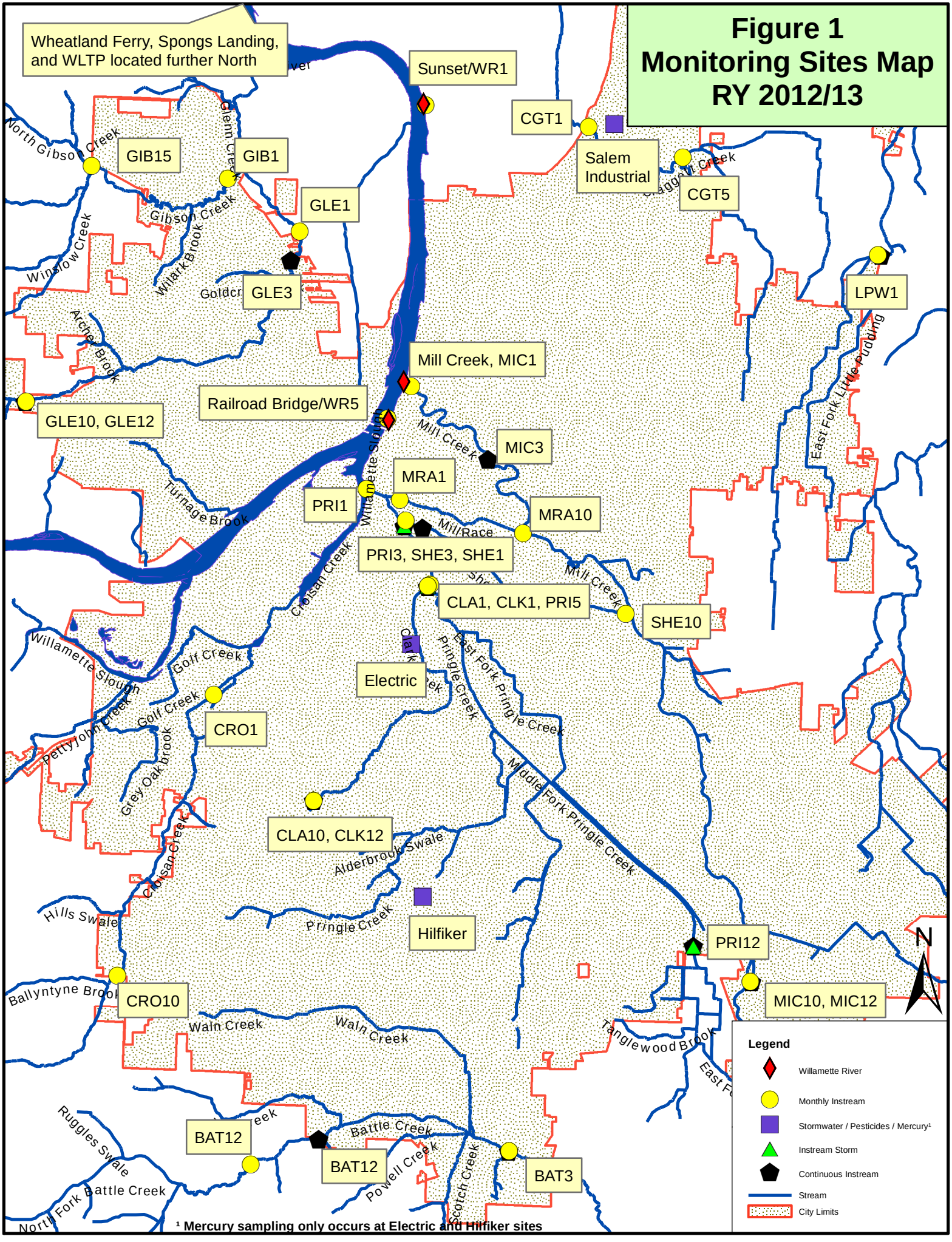
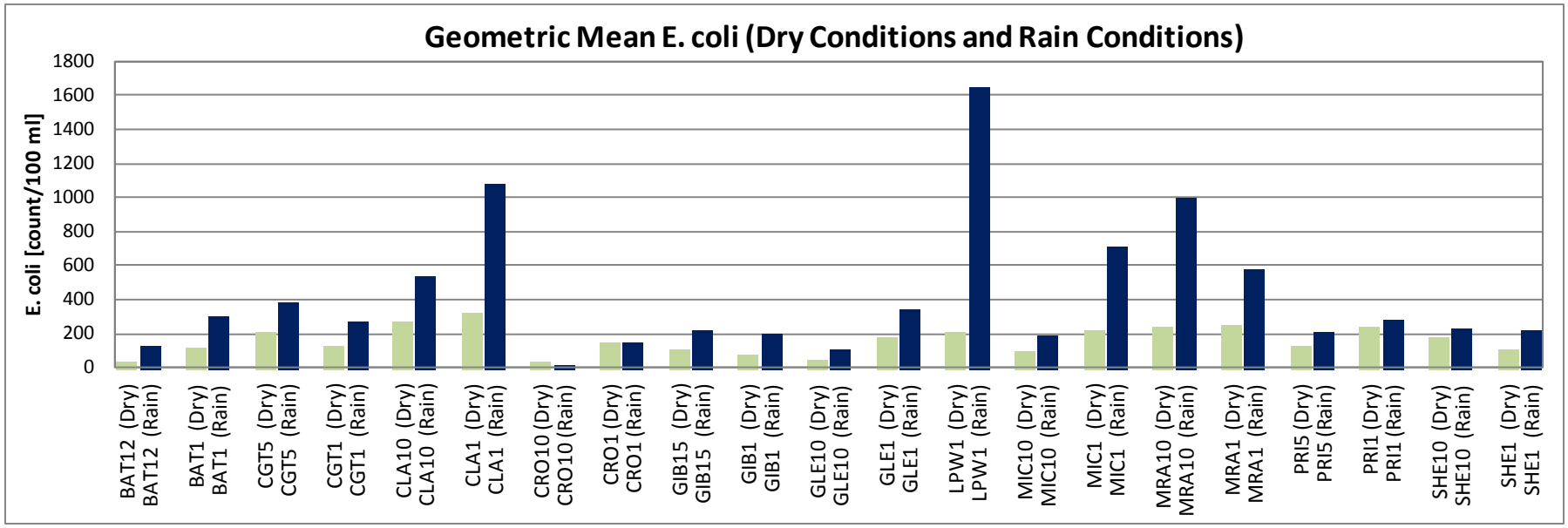
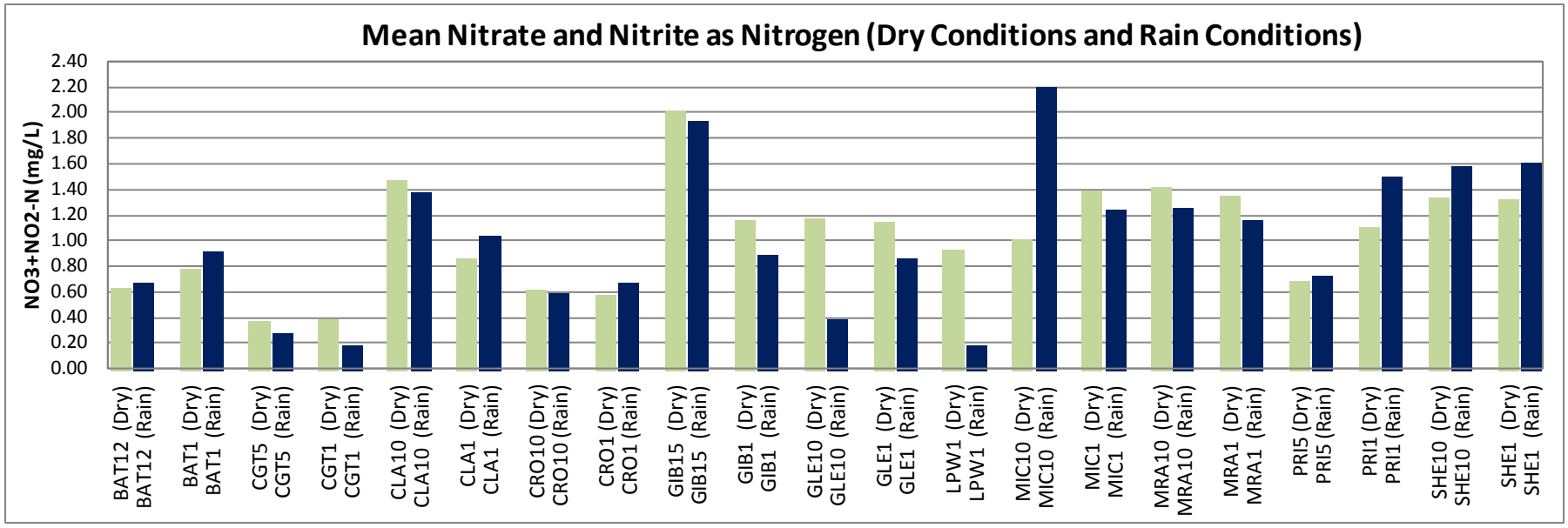


Figure 1
Monitoring Sites Map
RY 2012/13
Wheatland Ferry, Spongs Landing, and WLTP located further North
Sunset/WR1
CGT1
Salem Industrial
CGT5
GIB15
GIB1
GLE1
GLE3
LPW1
Mill Creek, MIC1
Railroad Bridge/WR5
GLE10, GLE12
MIC3
MRA1
PRI1
MRA10
PRI3, SHE3, SHE1
CLA1, CLK1, PRI5
SHE10
Electric
CRO1
CLA10, CLK12
Hilfiker
PRI12
MIC10, MIC12
CRO10
BAT12
BAT12
BAT3
North Gibson Creek
Gibson Creek
Glenn Creek
Winslow Creek
Wilark Brook
Archer Brook
Turnage Brook
Willamette Slough
Mill Creek
Mill Race
Croisan Creek
East Fork Little Pudding
Golf Creek
Pettyjohn Creek
Grey Oak brook
Pringle Creek
East Fork Pringle Creek
Middle Fork Pringle Creek
Alderbrook Swale
Hills Swale
Ballyntyne Brook
Waln Creek
Tanglewood Brook
Ruggles Swale
Battle Creek
North Fork Battle Creek
Powell Creek
Scotch Creek
N
Legend
Willamette River
Monthly Instream
Stormwater / Pesticides / Mercury¹
Instream Storm
Continuous Instream
Stream
City Limits
¹ Mercury sampling only occurs at Electric and Hilfiker sites

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (RY 2012/13)

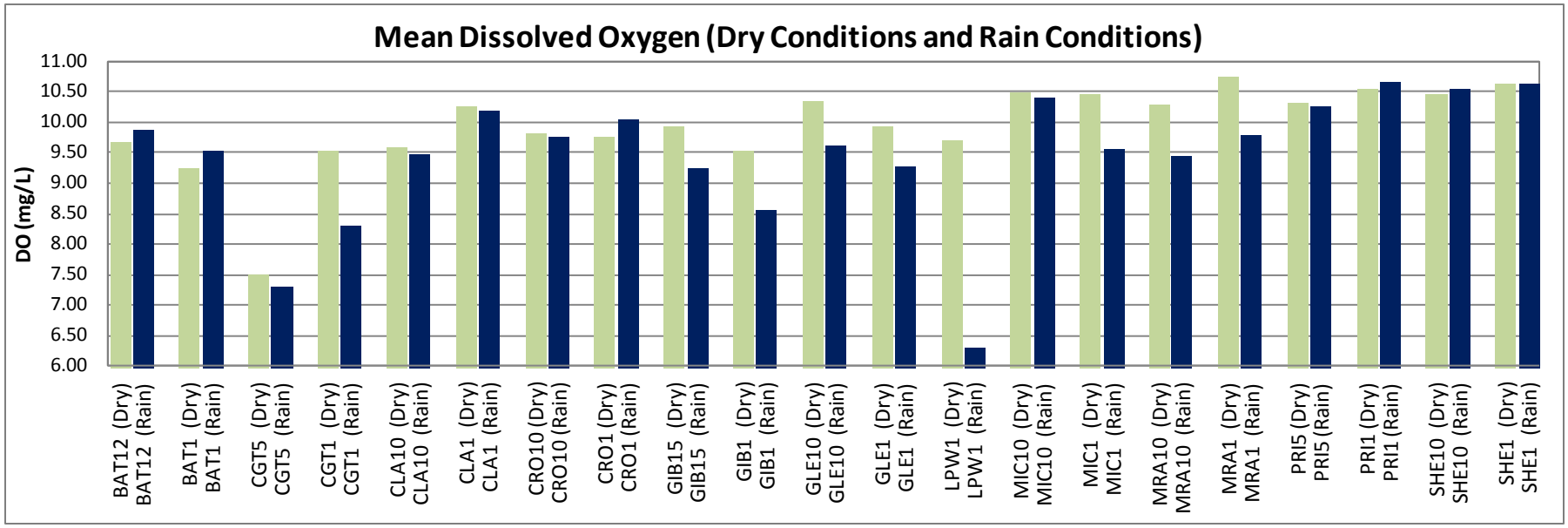


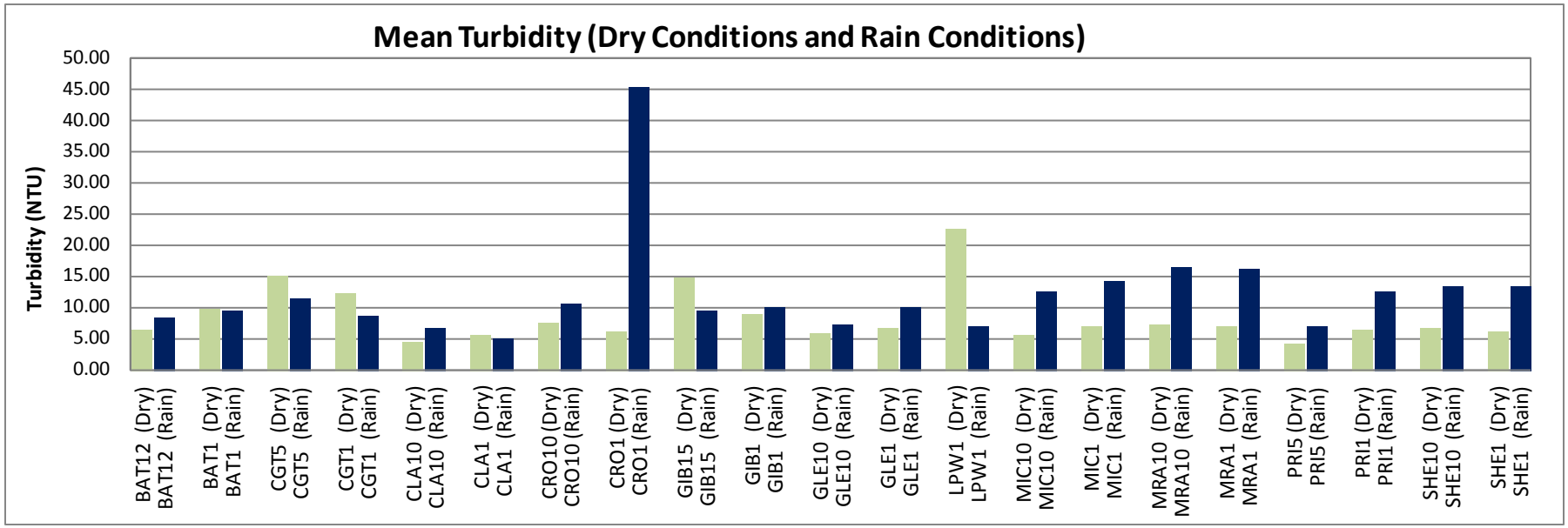


Dry conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; rain conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (RY 2012/13)

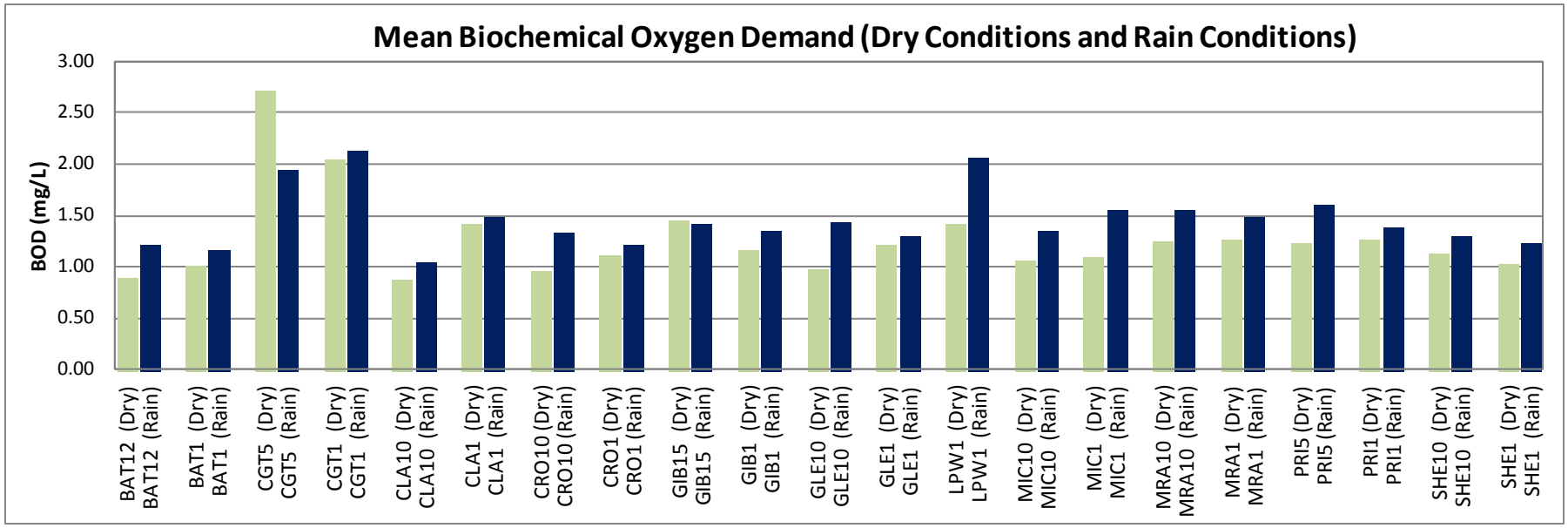


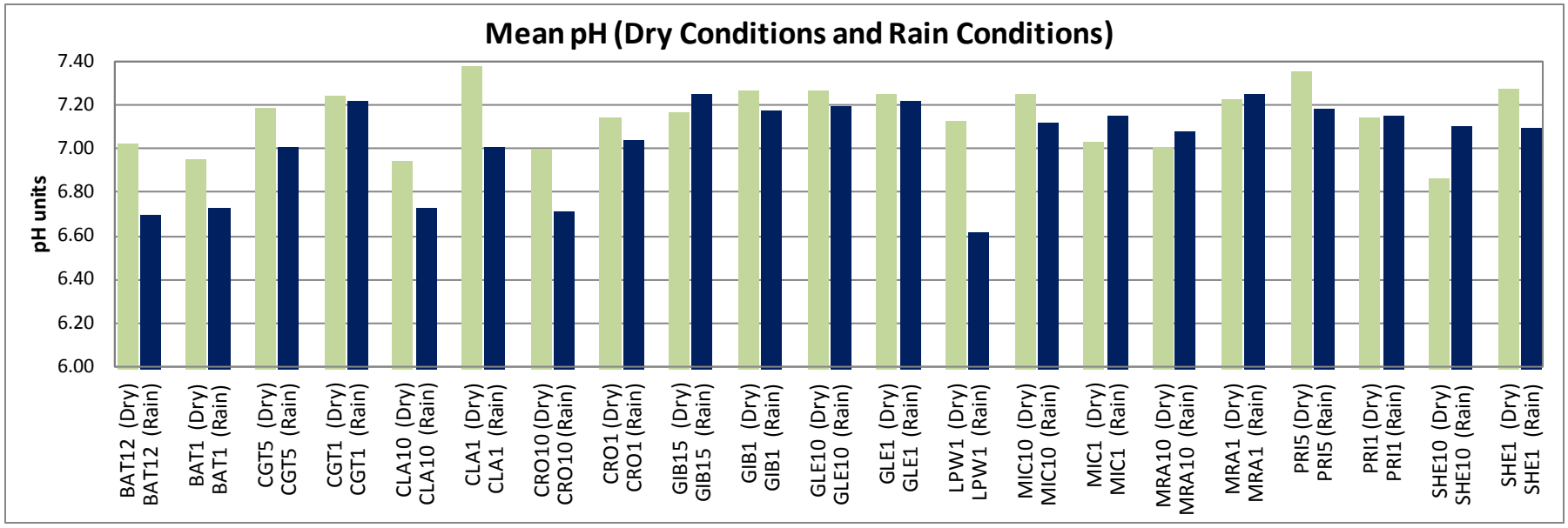


Dry conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; rain conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (RY 2012/13)

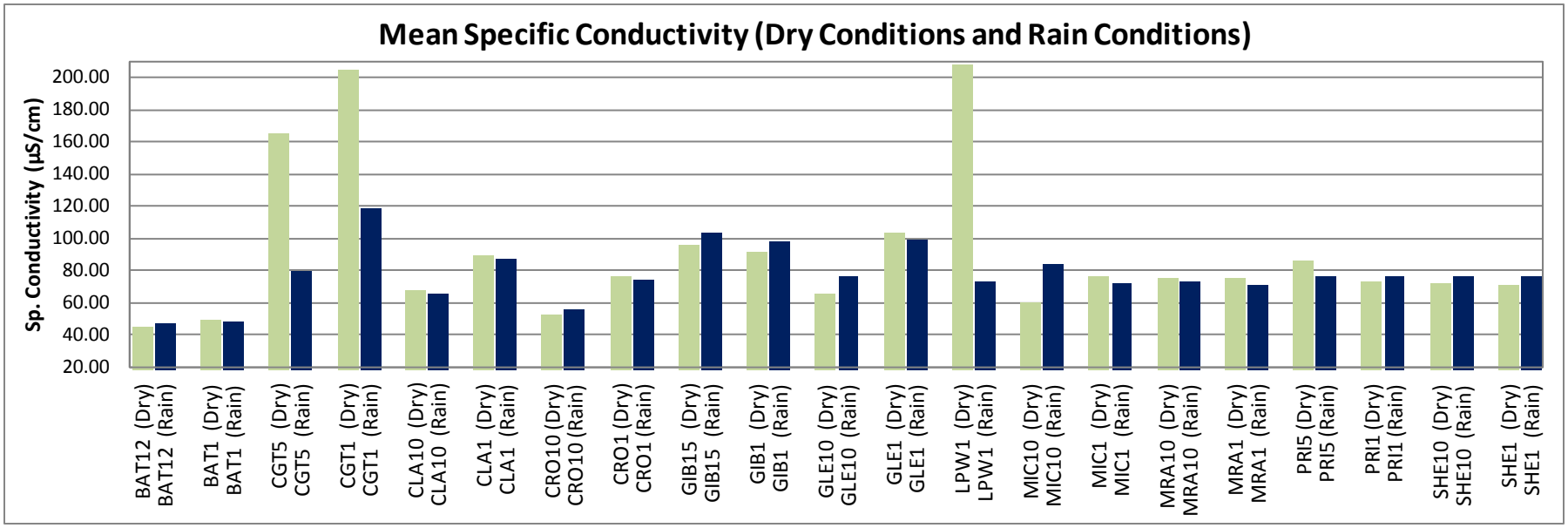




Dry conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; rain conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

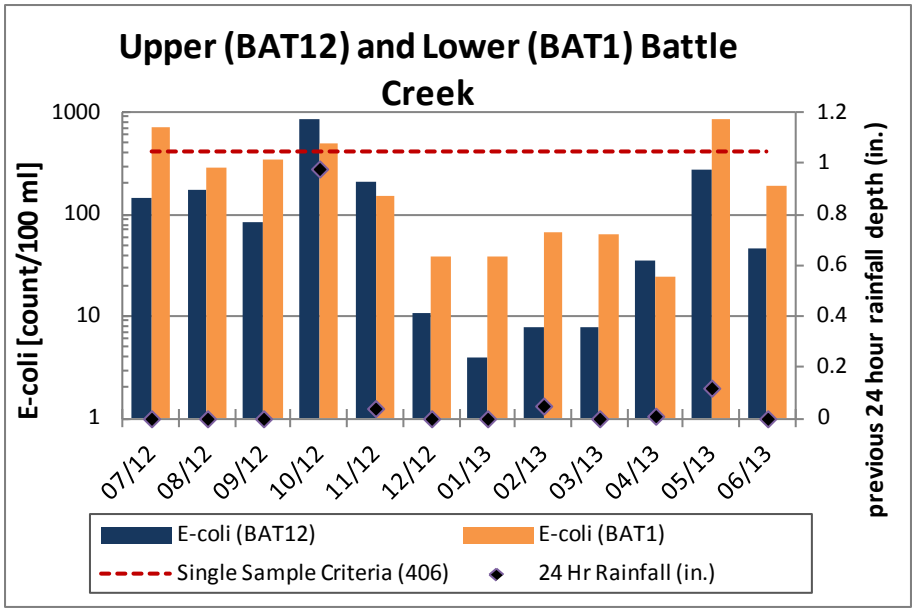
Monthly Instream Mean Value Comparison for Dry and Rain Conditions (RY 2012/13)

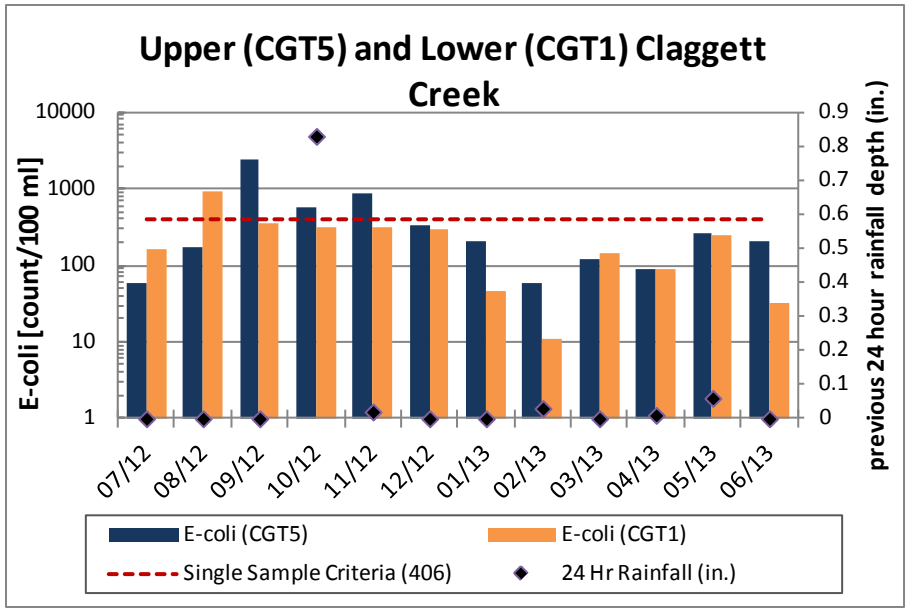


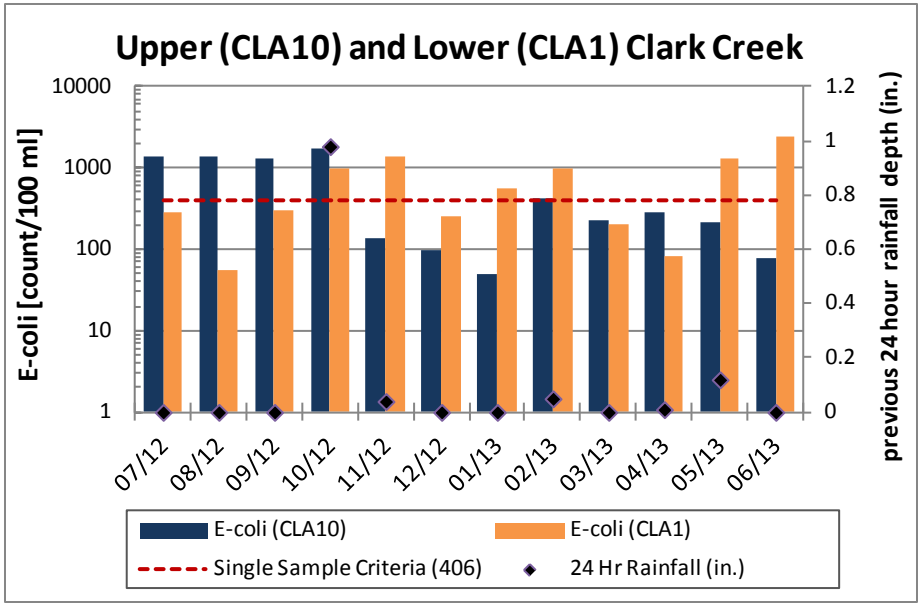
Dry conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; rain conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

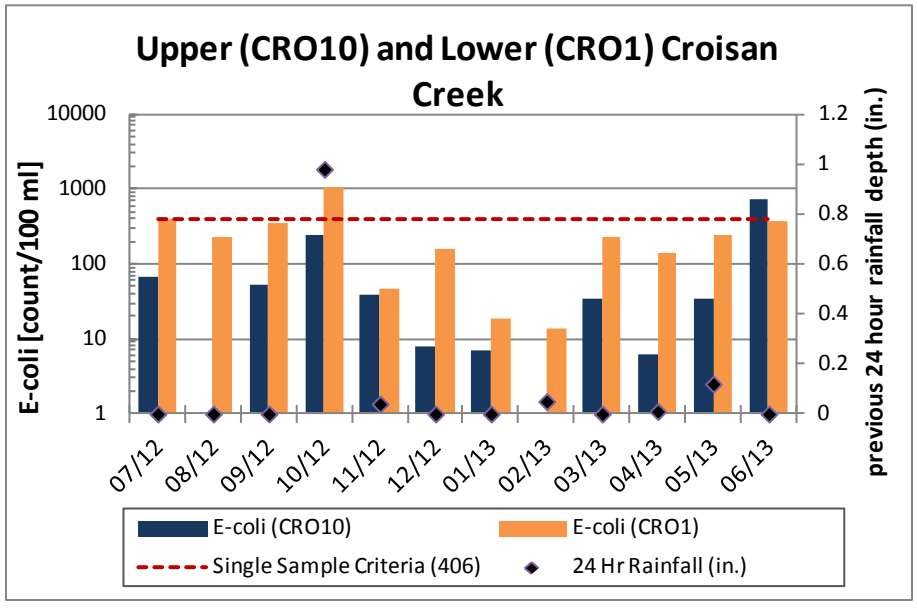
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (RY 2012/13)





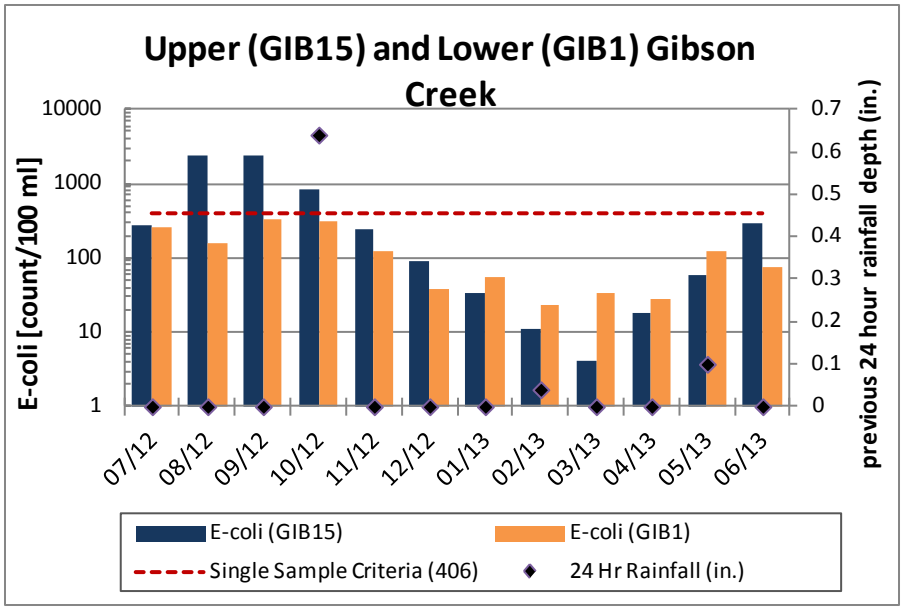


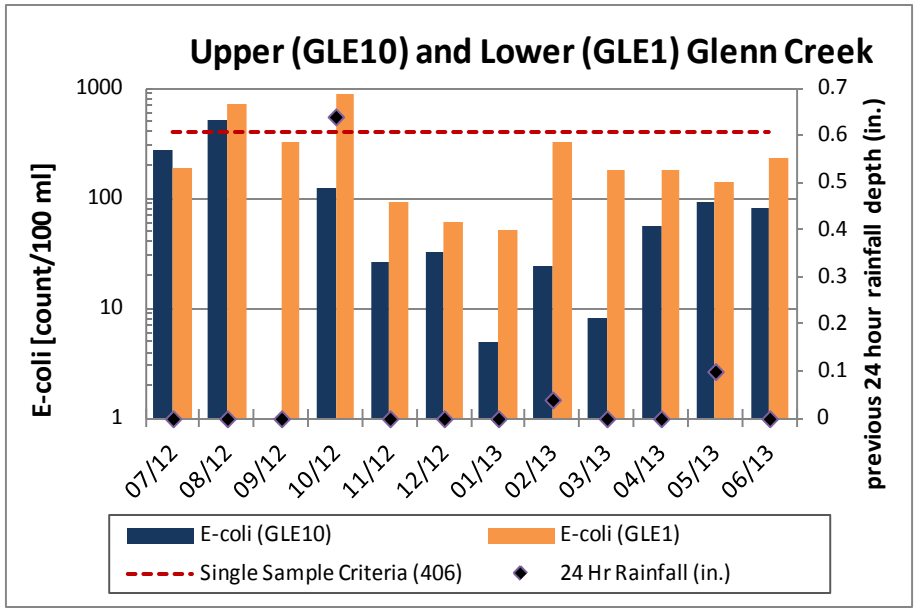


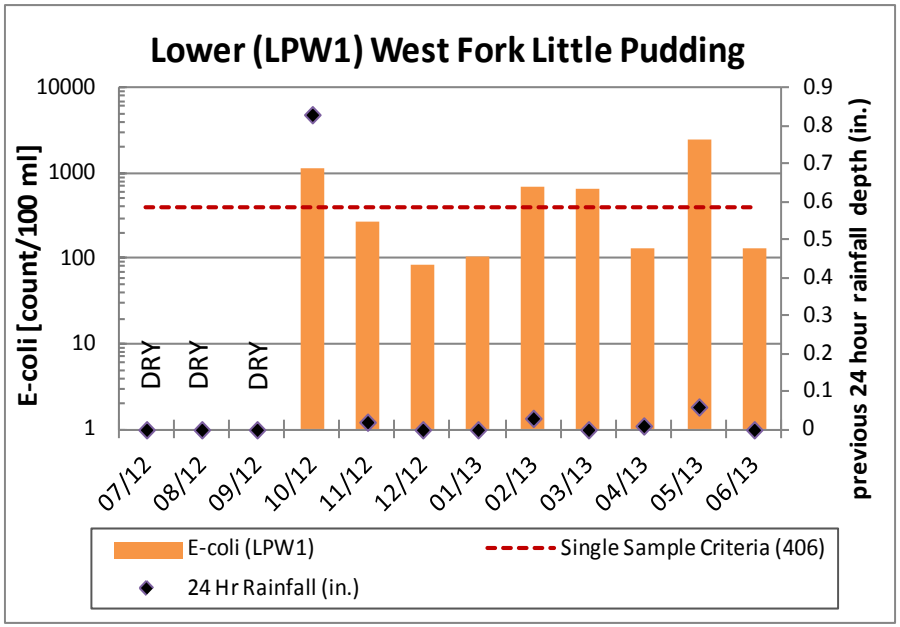
If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall was used.

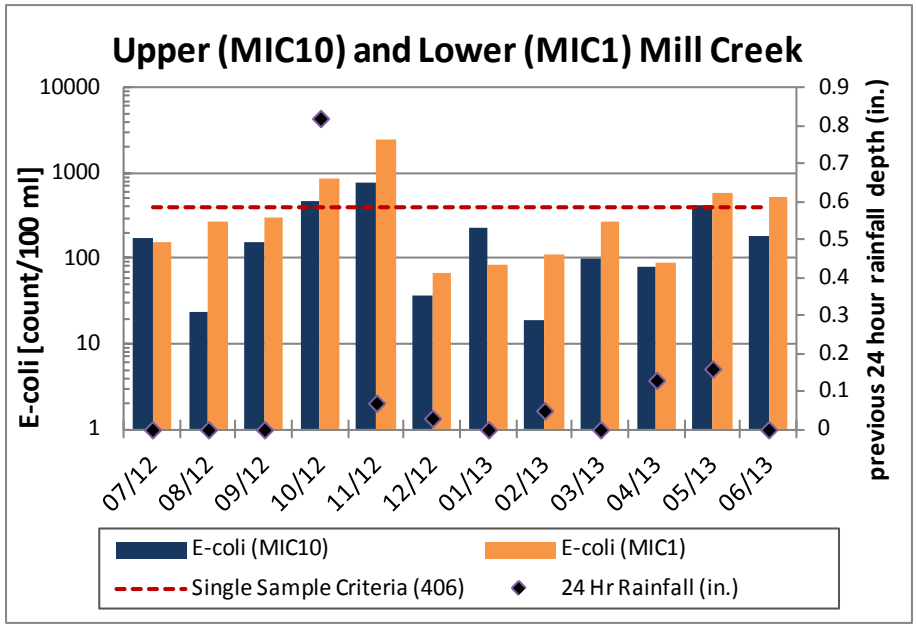
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (RY 2012/13)





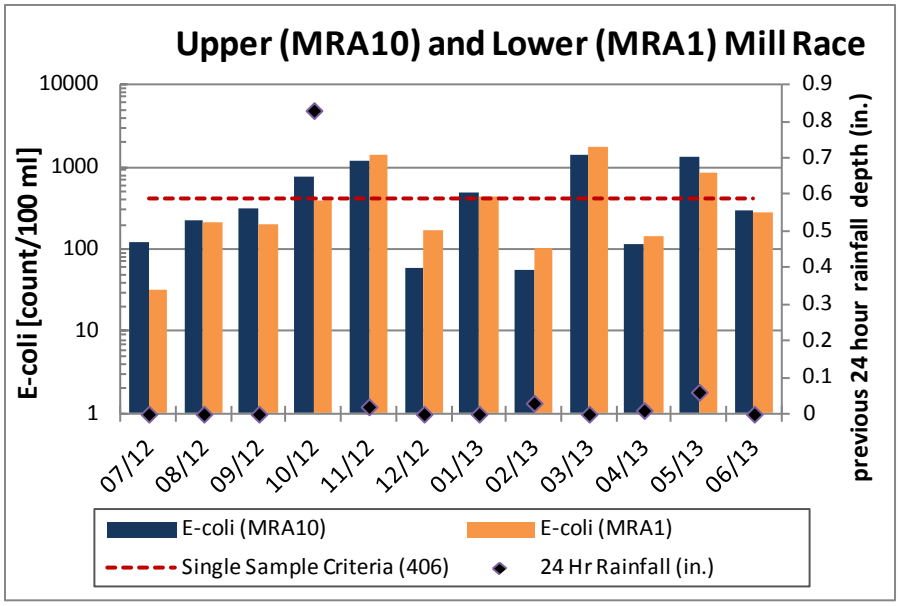


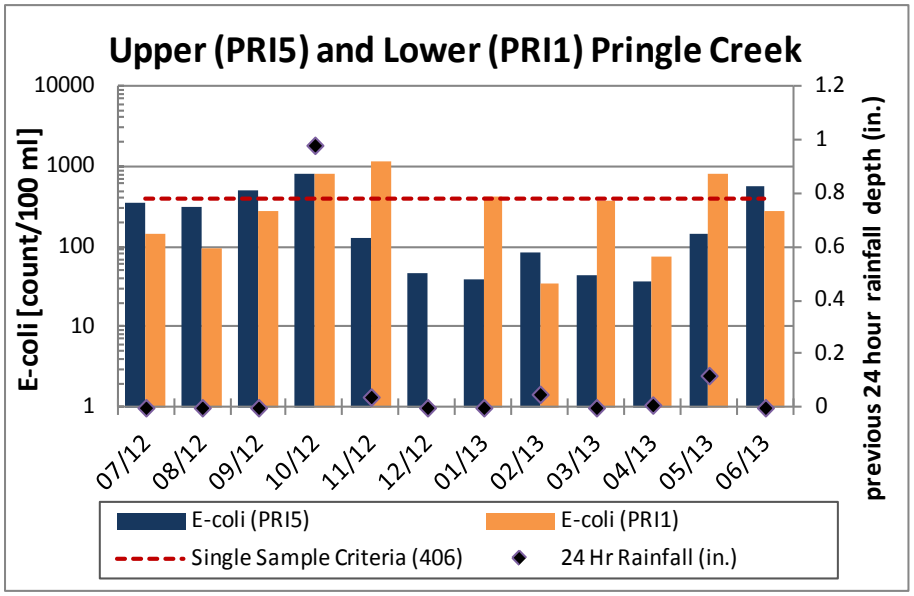


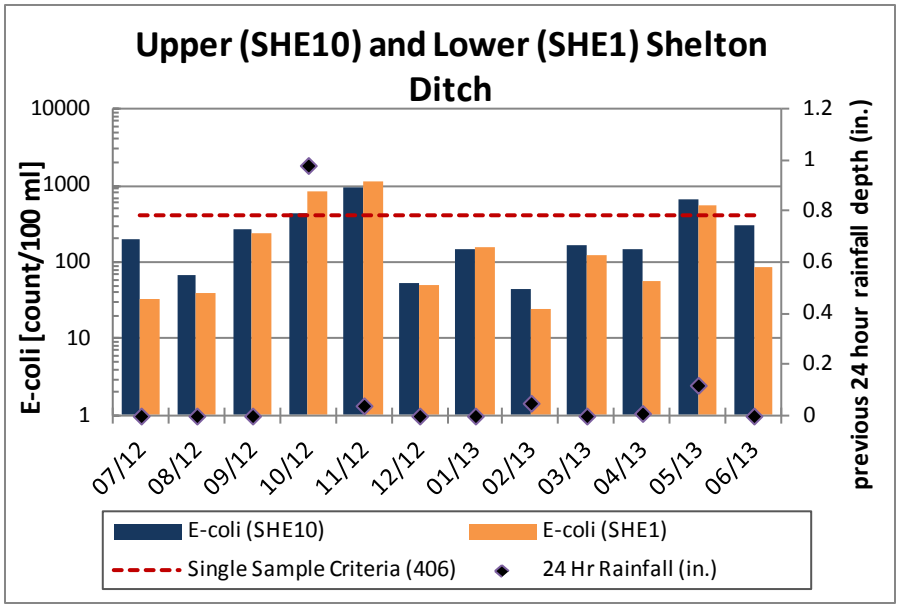
If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall was used.

Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (RY 2012/13)



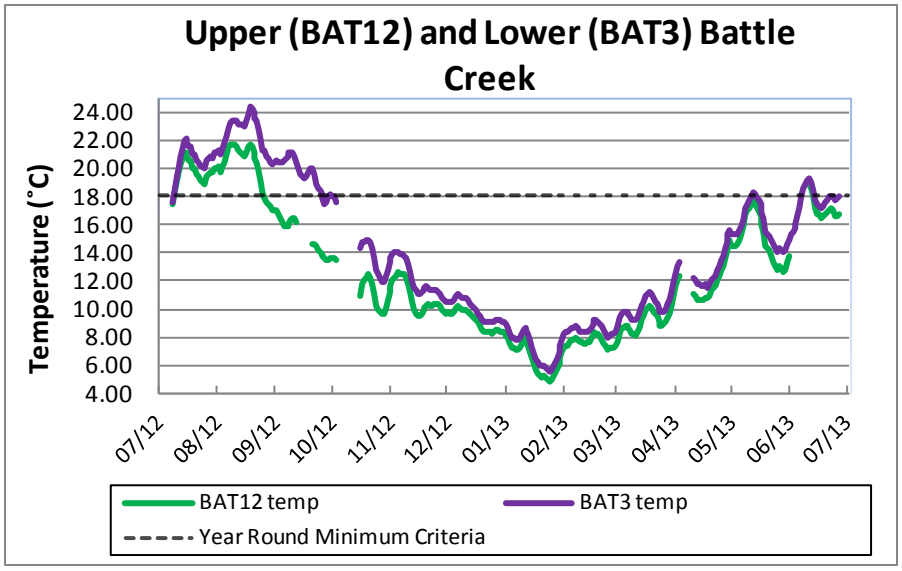


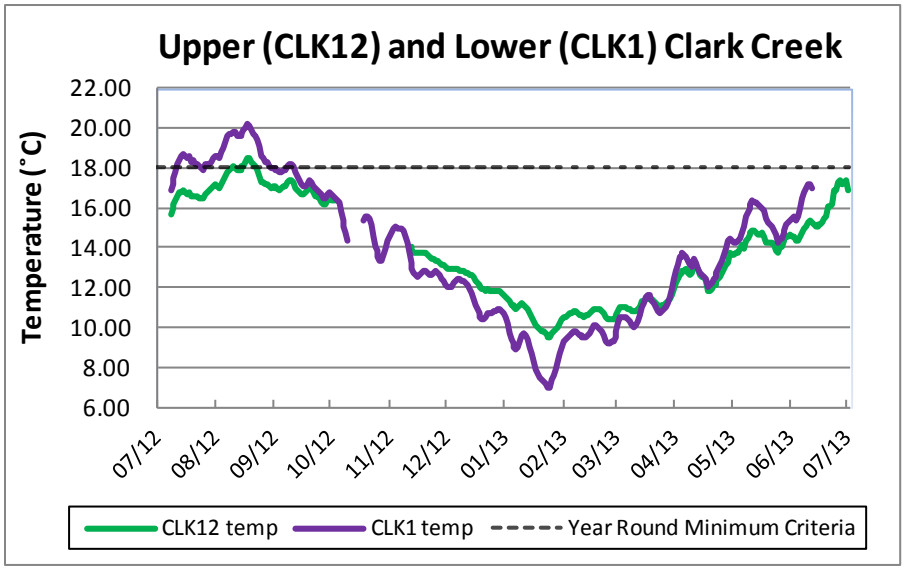


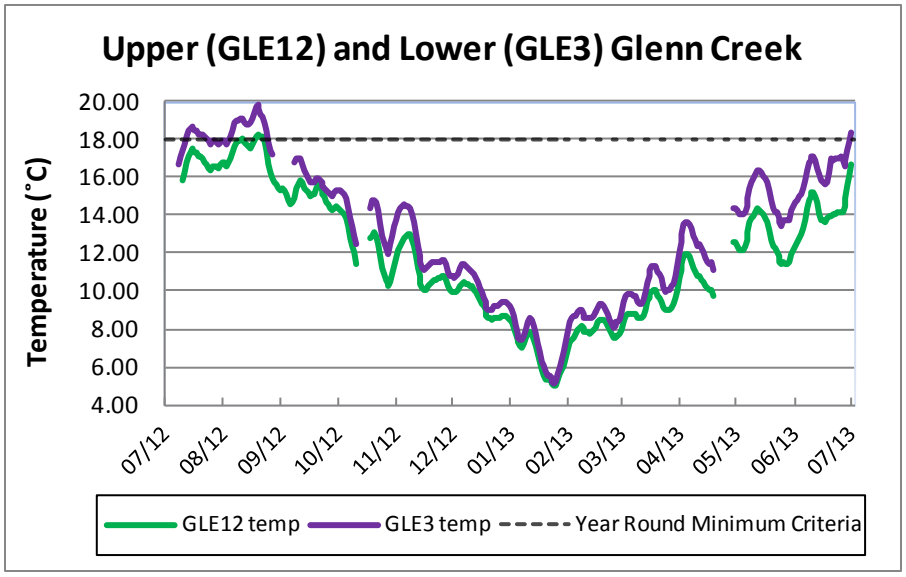
If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall was used.

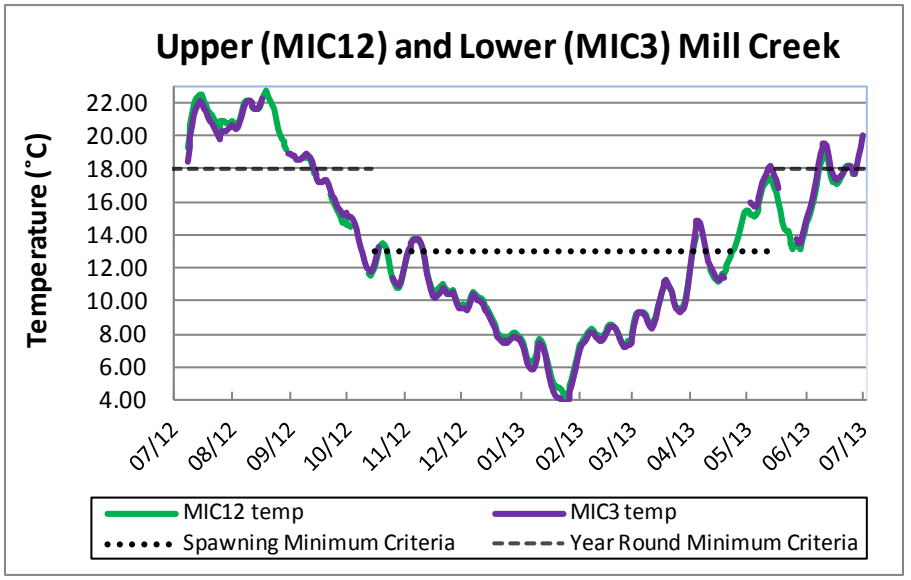
Figure 4

Continuous Instream Temperature 7-Day Moving Average Maximum (RY 2012/13)









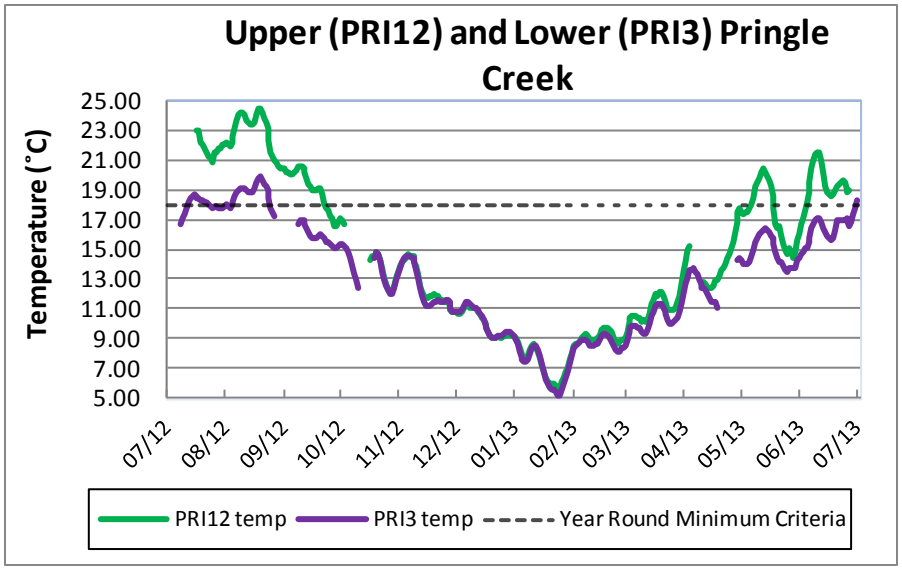
Presented temperature data consists of A grade data with greater than 80% of data points collected per day.

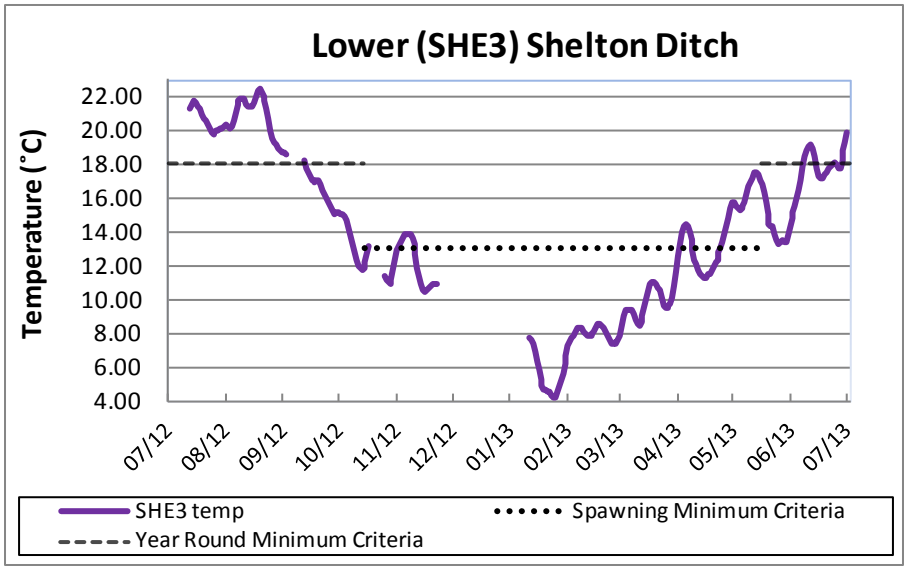
Temperature Criteria as defined in OAR 340-041-0028 and OAR-340-0340, Tables 340A and 340B.

- Spawning Minimum Criteria for applicable streams may not exceed 7-day average maximum of 13˚C.
- Year Round Minimum Criteria may not exceed 7-day average maximum of 18˚C.

Figure 4

Continuous Instream Temperature 7-Day Moving Average Maximum (RY 2012/13)



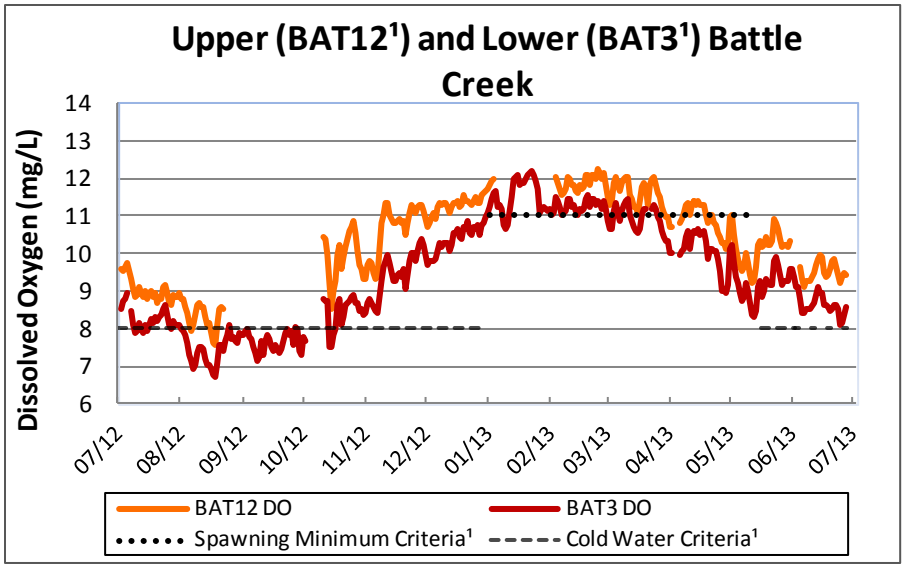


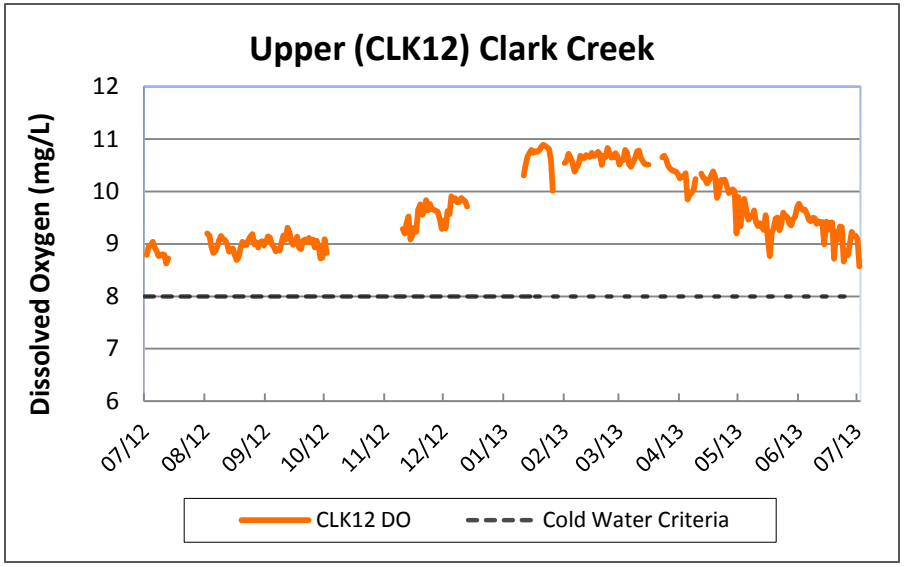
Presented temperature data consists of A grade data with greater than or equal to 80% of data points collected per day.
Temperature Criteria as defined in OAR 340-041-0028 and OAR-340-0340, Tables 340A and 340B.

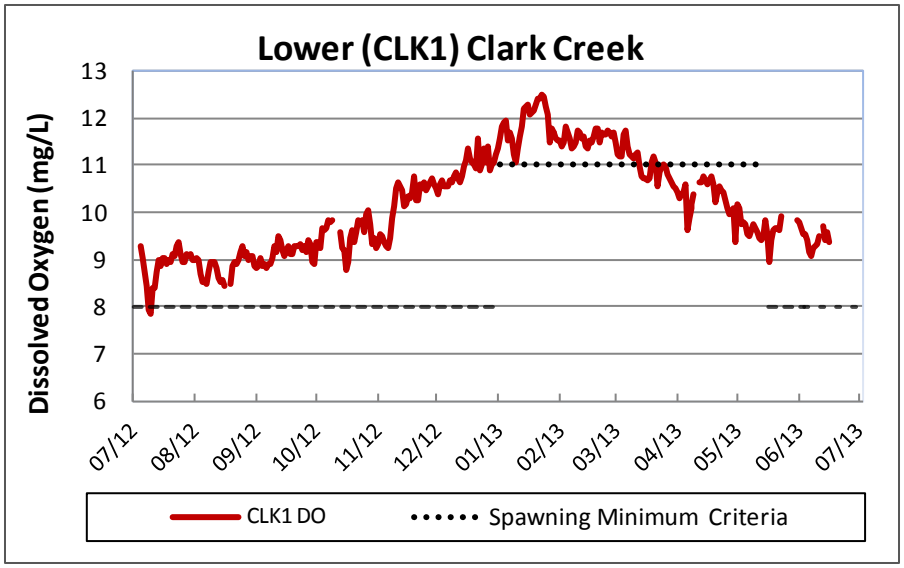
- Spawning Minimum Criteria for applicable streams may not exceed 7-day average maximum of 13˚C.
- Year Round Minimum Criteria may not exceed 7-day average maximum of 18˚C.

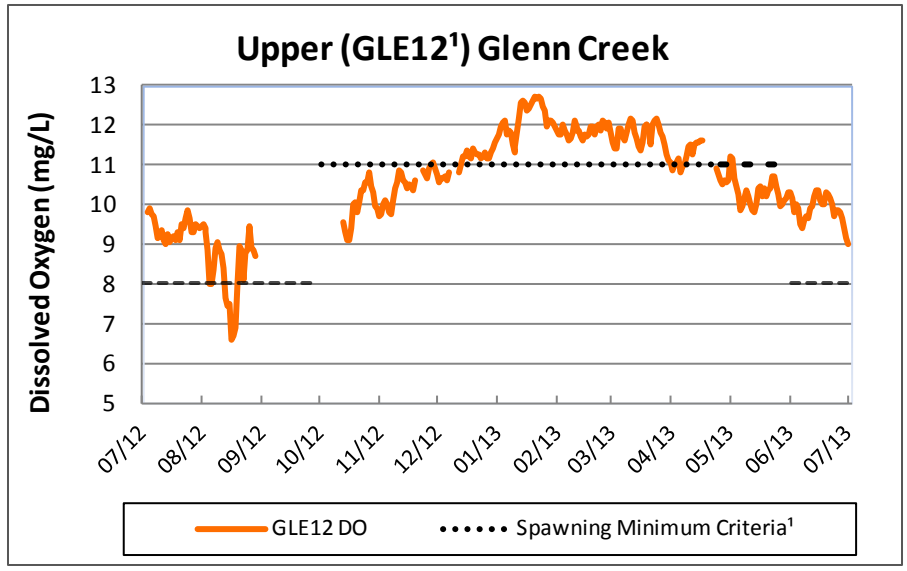
Figure 5

Continuous Instream Dissolved Oxygen Daily Mean (RY 2012/13)









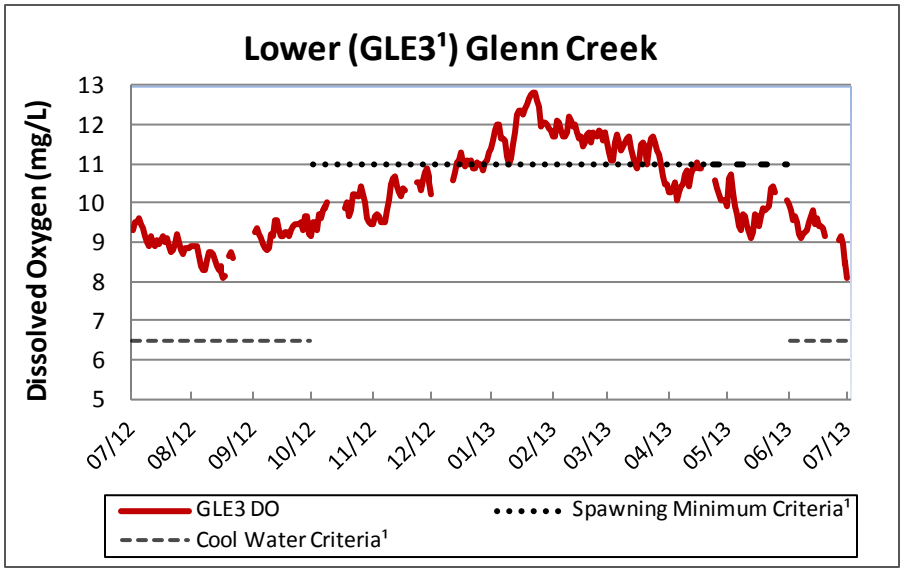
Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day.
DO Criteria as defined in OAR 340-041-0016 and OAR-340-0340, Tables 340A and 340B.

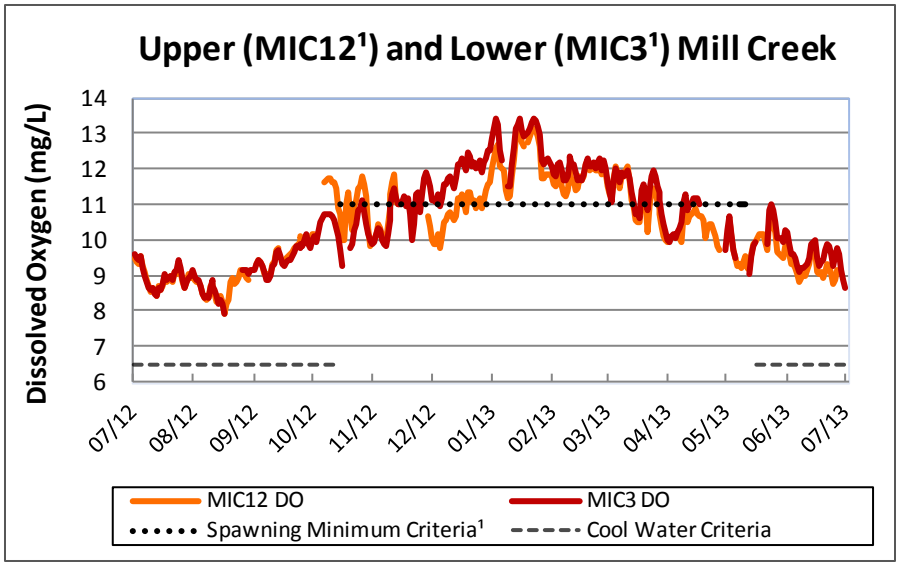
- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L .
- Cold Water Criteria for applicable streams may not be less than 8 mg/L.

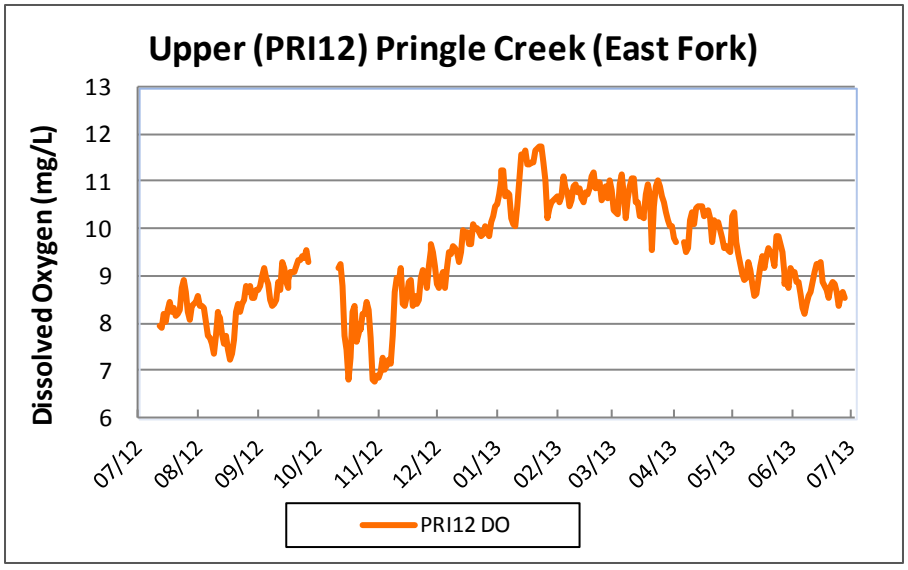
[1] Oregon's 2010 Integrated Report Section 303(d) listed.

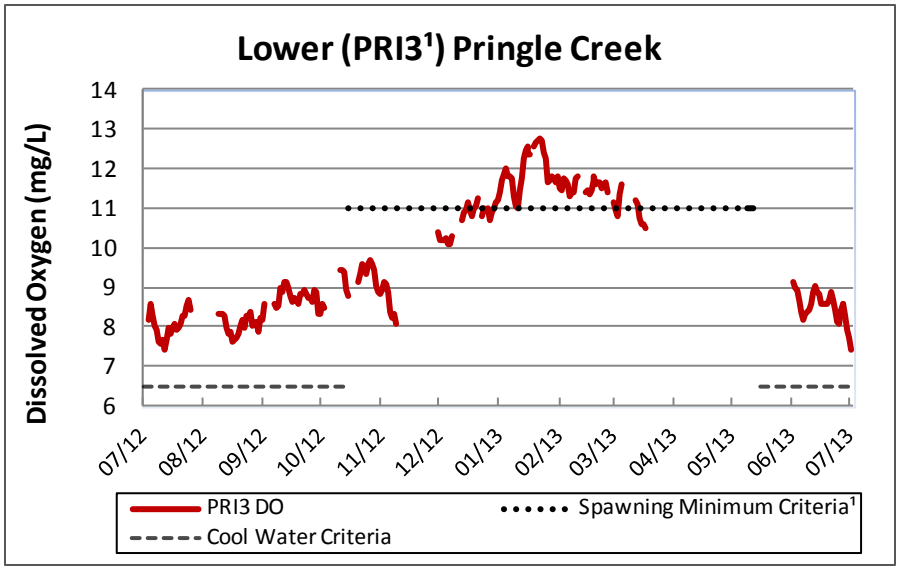
Figure 5

Continuous Instream Dissolved Oxygen Daily Mean (RY 2012/13)









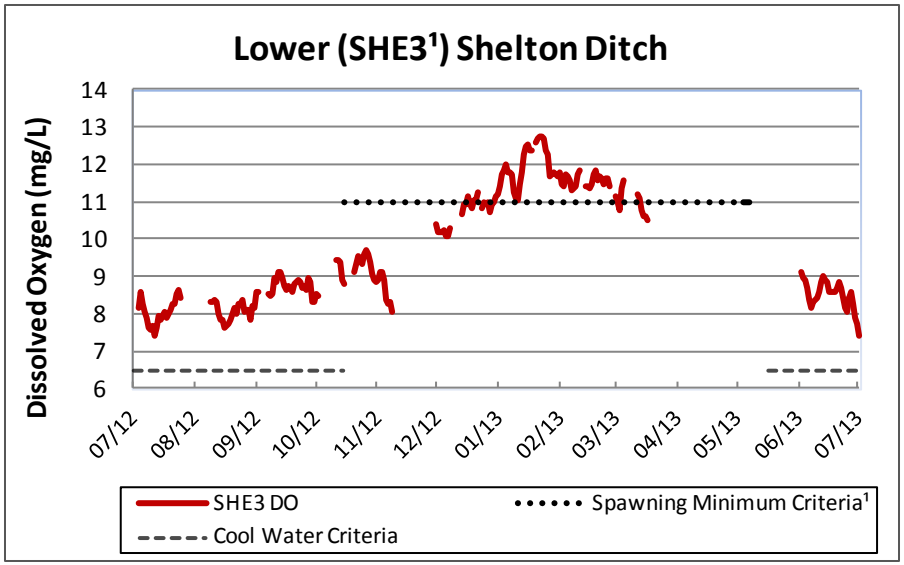
Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day.

DO Criteria as defined in OAR 340-041-0016 and OAR-340-0340, Tables 340A and 340B.

- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L .
- Cool Water Criteria for applicable streams may not be less than 6.5 mg/L.

[1] Oregon's 2010 Integrated Report Section 303(d) listed.

Figure 5
Continuous Instream Dissolved Oxygen Daily Mean (RY 2012/13)

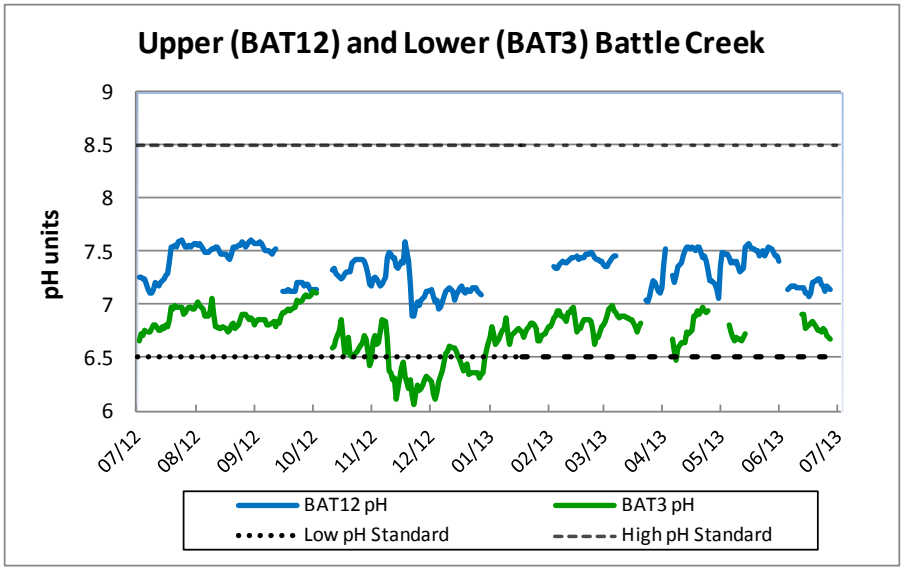


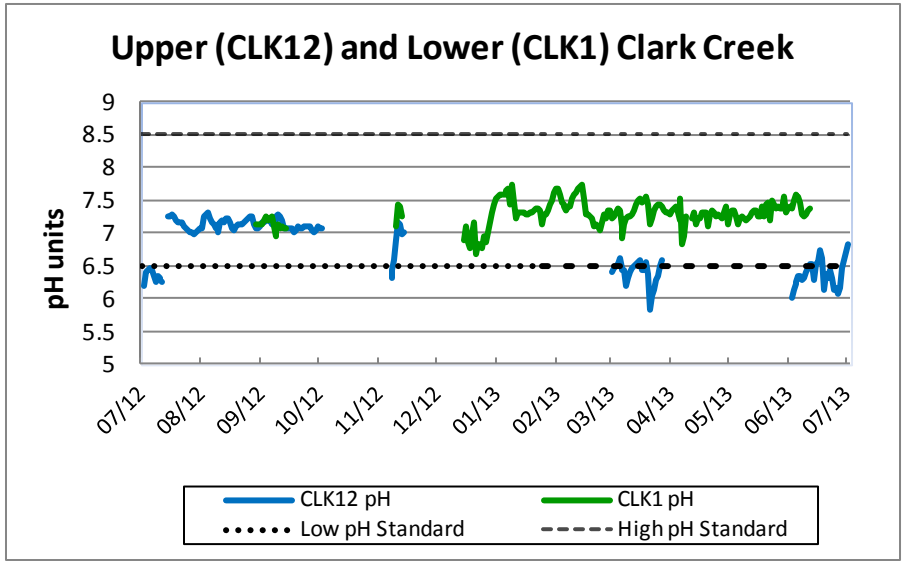
Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day.
DO Criteria as defined in OAR 340-041-0016 and OAR-340-0340, Tables 340A and 340B.

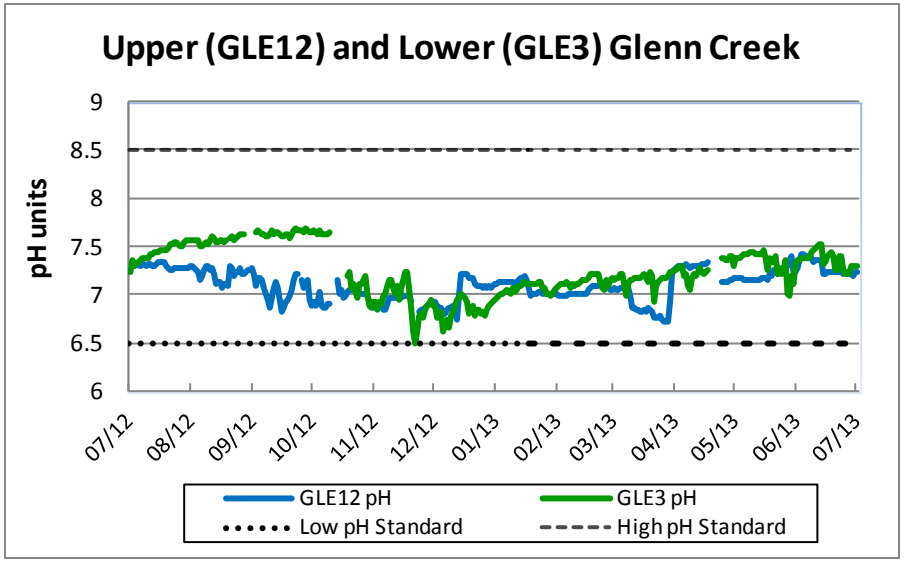
- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L .
- Cool Water Criteria for applicable streams may not be less than 6.5 mg/L.

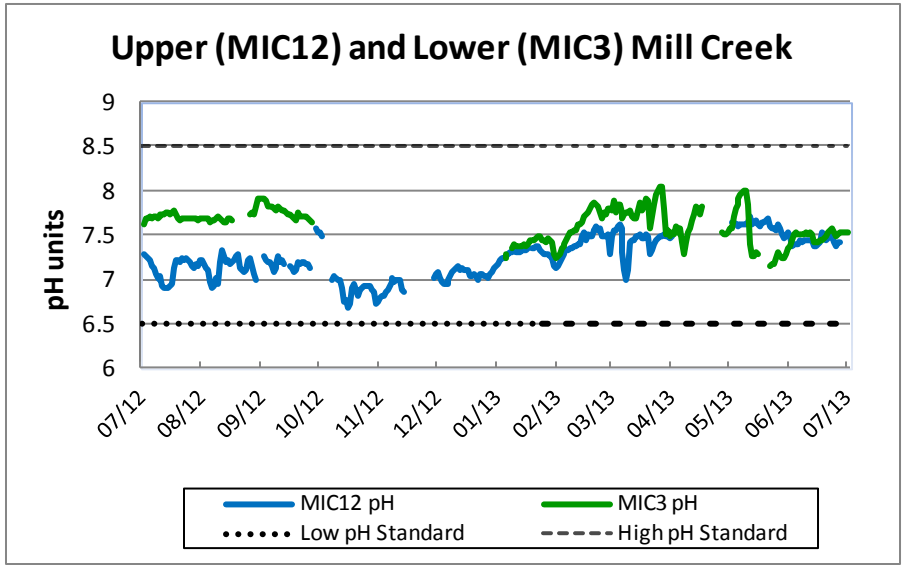
[1] Oregon's 2010Integrated Report Section 303(d) listed.

Figure 6
Continuous Instream pH Daily Mean (RY 2012/13)



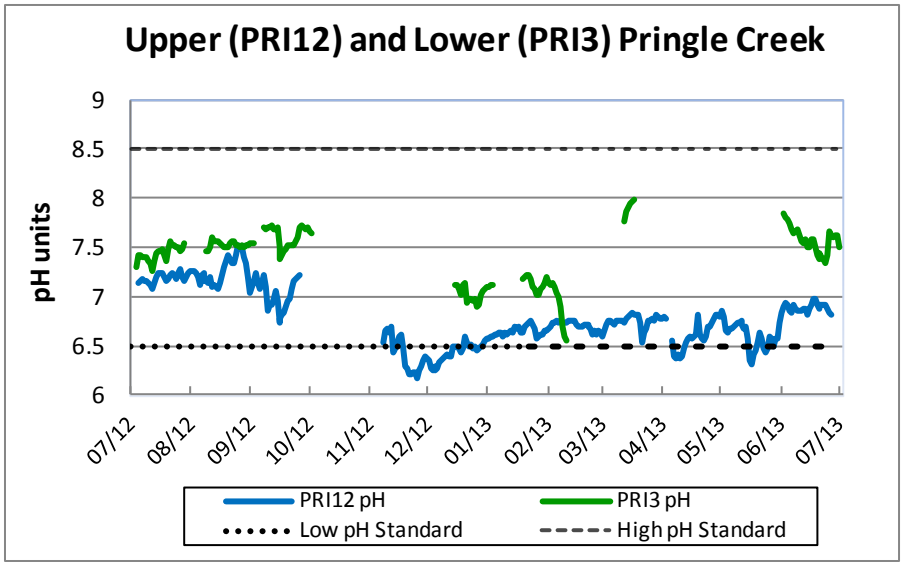


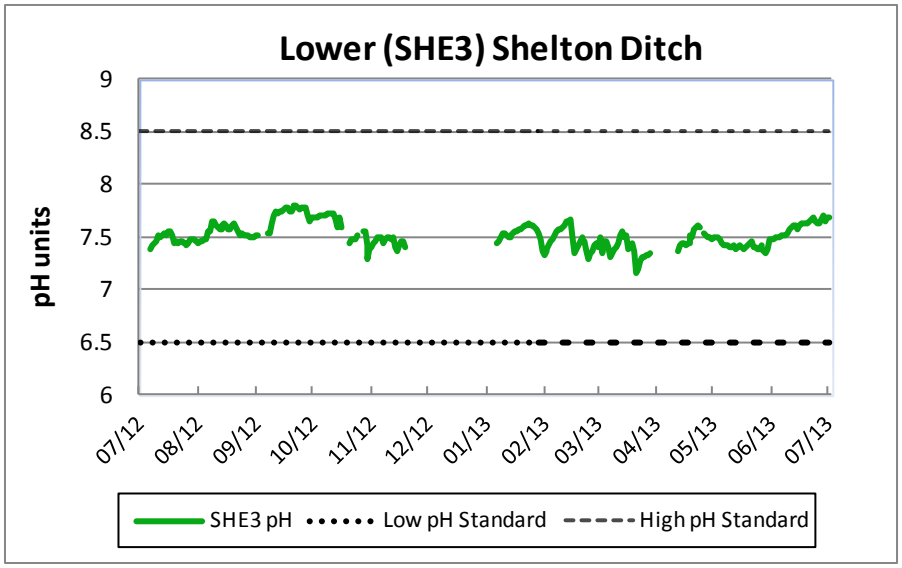




Presented pH data consists of A and B grade data with greater than or equal to 80% of data points collected per day.
As defined in OAR 341-041-0035, Water Quality Standards for the Willamette Basin, pH may not fall outside the ranges of 6.5 to 8.5.

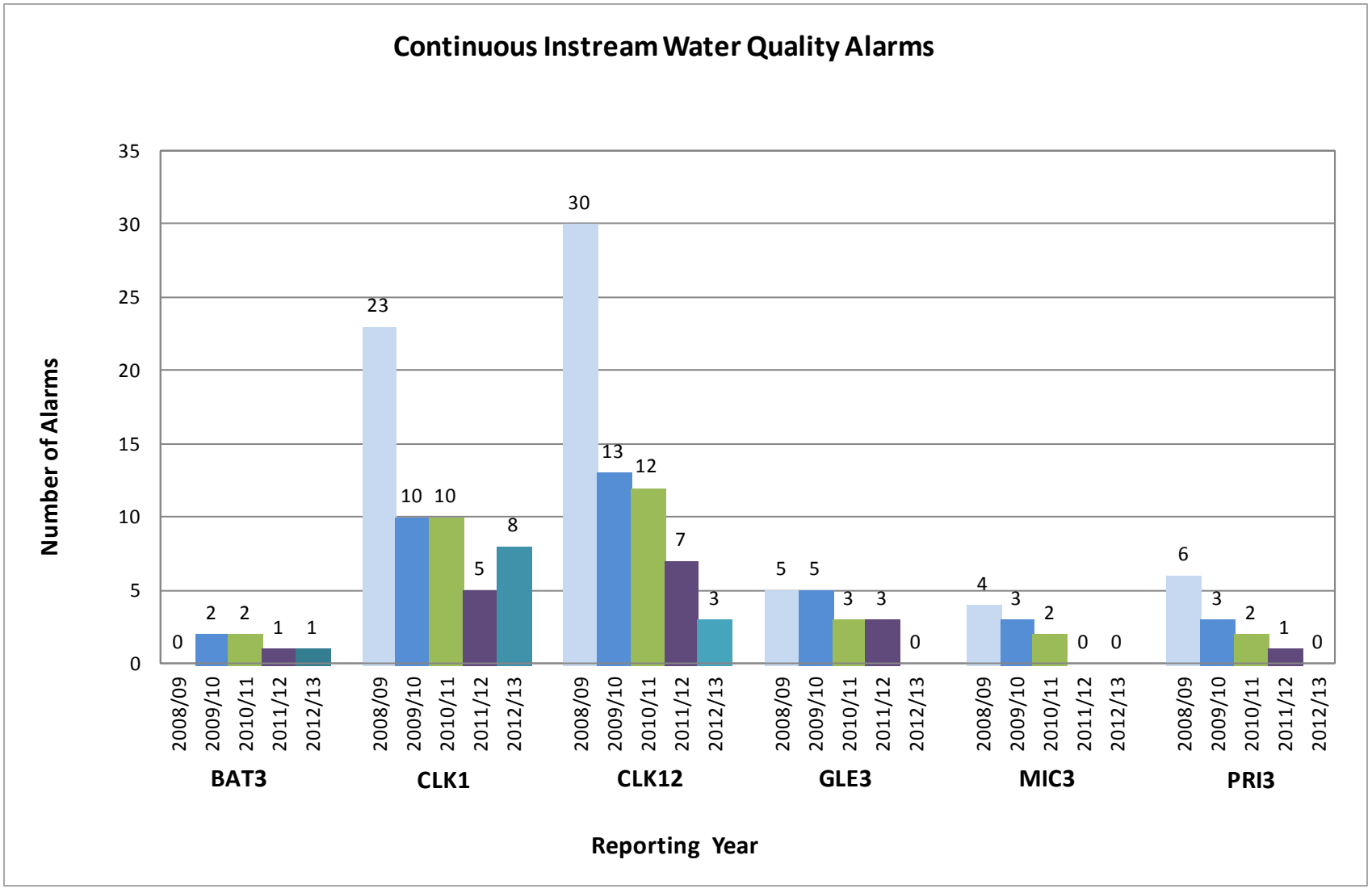
Figure 6
Continuous Instream pH Daily Mean (RY 2012/13)





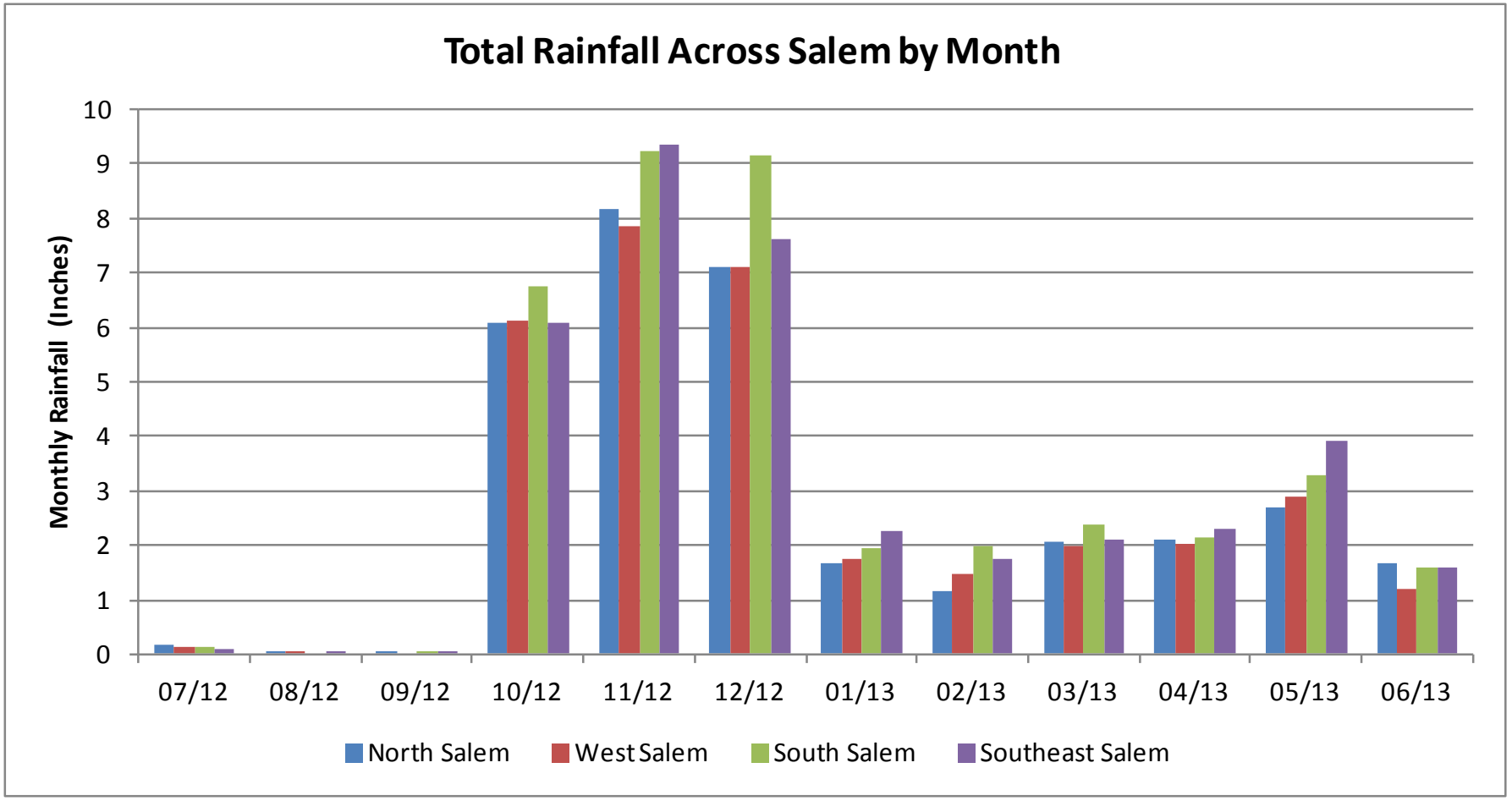
Presented pH data consists of A and B grade data with greater than or equal to 80% of data points collected per day.
As defined in OAR 341-041-0035, Water Quality Standards for the Willamette Basin, pH may not fall outside the ranges of 6.5 to 8.5.

Figure 7
Continuous Instream Water Quality Alarms (RY 2008/09 to 2012/13)



Note: The alarm counts have been filtered, based on best professional judgment, to remove alarms resulting from: rain events, non-prohibited activities identified in Schedule A.4.a.xii in the City's NPDES MS4 permit, permitted activities during the in-water work period, and wildlife activity.

Figure 8
Total Rainfall Across Salem by Month (RY 2012/13)



Rainfall data are from 4 rain gauges maintained by City of Salem that best represent each section of town.

ATTACHMENT A. Analytical Reports for Pesticide Screening, Pacific Agricultural Laboratory (October 12, 2012 and June 18, 2013).

Pacific Agricultural Laboratory
12505 N.W. Cornell Rd. • Portland, OR 97229-5651 • Ph 503.626.7943 • Fx 503.641.0644

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Electric
Matrix: water

PAL Sample ID: P121441-01
Sample Date: 10/12/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
10/18/12	10/25/12	MR Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 66 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

Client Sample ID: Hilfiker
Matrix: water

PAL Sample ID: P121441-02
Sample Date: 10/12/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
10/18/12	10/25/12	MR Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 52 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

Client Sample ID: Salem Industrial
Matrix: water

PAL Sample ID: P121441-03
Sample Date: 10/12/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
10/18/12	10/24/12	Simazine	1.3 ug/L	0.60 ug/L	
10/18/12	10/25/12	Propiconazole	0.30 ug/L	0.30 ug/L	
10/18/12	10/25/12	Other Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 81 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

Steve Thun For Rick Jordan, Laboratory Manager

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City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Salem Industrial-DUP
Matrix: water

PAL Sample ID: P121441-04
Sample Date: 10/12/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
10/18/12	10/24/12	Simazine	1.1 ug/L	0.60 ug/L	
10/18/12	10/25/12	Other Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 78 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

Steve Thun For Rick Jordan, Laboratory Manager

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City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Quality Assurance

Method Blank Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
Method: Multiresidue Profile						
10/18/12	10/25/12	2101801-BLK1	MR Pesticides	Not Detected	<LoQ	

Blank Spike Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
10/18/12	10/21/12	2101801-BS1	Bendiocarb	64	11-100	
10/18/12	10/21/12	2101801-BSD1	Bendiocarb	62	11-100	
10/18/12	10/24/12	2101801-BS1	Diazinon	85	34-145	
10/18/12	10/24/12	2101801-BSD1	Diazinon	85	34-145	
10/18/12	10/25/12	2101801-BS1	Dieldrin	97	48-152	
10/18/12	10/25/12	2101801-BSD1	Dieldrin	101	48-152	
10/18/12	10/21/12	2101801-BS1	Monuron	79	46-122	
10/18/12	10/21/12	2101801-BSD1	Monuron	83	46-122	
10/18/12	10/25/12	2101801-BS1	Oxadiazon	111	71-129	
10/18/12	10/25/12	2101801-BSD1	Oxadiazon	110	71-129	
10/18/12	10/23/12	2101801-BS1	Paclobutrazol	79	40-120	
10/18/12	10/23/12	2101801-BSD1	Paclobutrazol	79	40-120	
10/18/12	10/24/12	2101801-BS1	Parathion methyl	68	40-120	
10/18/12	10/24/12	2101801-BSD1	Parathion methyl	66	40-120	
10/18/12	10/23/12	2101801-BS1	Propiconazole	90	40-120	
10/18/12	10/23/12	2101801-BSD1	Propiconazole	87	40-120	

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City of Salem
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Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Project Information

Methodology Employed

Modified EPA 8081B (GC-ECD)
Modified EPA 8270D (GC-MS SIM)
Modified EPA 8321B (HPLC-MS)

Analyte Information

Method: Modified EPA 8321B (HPLC-MS)
DCPMU is the primary breakdown product of Diuron.

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Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Multiresidue Analyte List

Organophosphorous and Organosulfur Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Chlorpyrifos	0.12 ug/L	Aspon	0.30 ug/L
Azinphos-methyl	0.30 ug/L	Carbofenothion	0.30 ug/L
Chlorfenvinphos	0.30 ug/L	Chlorpyrifos-methyl	0.30 ug/L
Coumaphos	0.30 ug/L	Demeton	0.30 ug/L
Diazinon	0.30 ug/L	Dichlorofenthion	0.30 ug/L
Dichlorvos	0.30 ug/L	Dimethoate	0.30 ug/L
Disulfoton	0.30 ug/L	EPN	0.30 ug/L
Ethion	0.30 ug/L	Ethoprop	0.30 ug/L
Famphur	0.30 ug/L	Fenamiphos	0.30 ug/L
Fenitrothion	0.30 ug/L	Fensulfothion	0.30 ug/L
Fenthion	0.30 ug/L	Malathion	0.30 ug/L
Merphos	0.30 ug/L	Propargite	0.60 ug/L
Methidathion	0.30 ug/L	Mevinphos	0.30 ug/L
Parathion	0.30 ug/L	Parathion methyl	0.30 ug/L
Phorate	0.30 ug/L	Phosmet	0.30 ug/L
Phosphamidon	0.30 ug/L	Pirimiphos-methyl	0.30 ug/L
Ronnel	0.30 ug/L	Sulprofos	0.30 ug/L
Terbufos	0.30 ug/L	Tetrachlorvinphos	0.30 ug/L
Tokuthion	0.30 ug/L	Trichloronate	0.30 ug/L

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Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Halogenated Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Acetochlor	0.30 ug/L	Alachlor	0.30 ug/L
Aldrin	0.12 ug/L	Benfluralin	0.12 ug/L
Bifenthrin	0.12 ug/L	a-BHC	0.12 ug/L
b-BHC	0.12 ug/L	d-BHC	0.12 ug/L
g-BHC	0.12 ug/L	Captafol	0.12 ug/L
Captan	0.30 ug/L	Chlordane	0.60 ug/L
Chlorobenzilate	0.30 ug/L	Chloroneb	0.30 ug/L
Chlorothalonil	0.12 ug/L	Cyfluthrin	0.60 ug/L
Cyhalothrin	0.60 ug/L	Cypermethrin	1.2 ug/L
p,p'-DDD	0.12 ug/L	p,p'-DDE	0.12 ug/L
p,p'-DDT	0.12 ug/L	Dacthal	0.12 ug/L
Deltamethrin	1.2 ug/L	Dichlobenil	0.12 ug/L
Dicloran	0.12 ug/L	Dicofol	0.30 ug/L
Dieldrin	0.12 ug/L	Dithiopyr	0.12 ug/L
Endosulfan I	0.12 ug/L	Endosulfan II	0.12 ug/L
Endosulfan sulfate	0.12 ug/L	Endrin	0.12 ug/L
Endrin aldehyde	0.12 ug/L	Endrin ketone	0.12 ug/L
Esfenvalerate	0.12 ug/L	Ethalfluralin	0.12 ug/L
Etridiazole	0.12 ug/L	Fenarimol	0.12 ug/L
Fenvalerate	0.12 ug/L	Flutolanil	1.2 ug/L
Folpet	0.12 ug/L	Heptachlor	0.12 ug/L
Heptachlor epoxide	0.12 ug/L	Hexachlorobenzene	0.12 ug/L
Iprodione	0.12 ug/L	Methoxychlor	0.12 ug/L
Metolachlor	0.30 ug/L	Mirex	0.12 ug/L
Norflurazon	0.12 ug/L	Ovex	0.12 ug/L
Oxadiazon	0.12 ug/L	Oxyfluorfen	0.12 ug/L
PCNB	0.12 ug/L	Permethrin	1.2 ug/L
Prodiamine	0.12 ug/L	Pronamide	0.12 ug/L
Propachlor	0.30 ug/L	Propanil	0.12 ug/L
Propiconazole	0.30 ug/L	Terbacil	0.12 ug/L
Toxaphene	6.0 ug/L	Trifloxystrobin	0.12 ug/L
Triflumizole	0.12 ug/L	Trifluralin	0.12 ug/L
Vinclozalin	0.12 ug/L		

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Organonitrogen Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Ametryn	0.30 ug/L	Amitraz	0.60 ug/L
Atrazine	0.30 ug/L	Azoxystrobin	0.12 ug/L
Bensulide	0.12 ug/L	Boscalid	0.12 ug/L
Bromacil	0.12 ug/L	Bromopropylate	0.60 ug/L
Carfentrazone-ethyl	0.12 ug/L	Clothianidin	0.12 ug/L
Cyanazine	0.60 ug/L	Diclofop-methyl	0.60 ug/L
Dimethenamid	0.30 ug/L	Diphenylamine	0.12 ug/L
Ethofumesate	0.30 ug/L	Fenbuconazole	0.60 ug/L
Fenoxaprop-ethyl	0.60 ug/L	Fipronil	0.60 ug/L
Fluazifop-p-butyl	0.60 ug/L	Fludioxonil	0.60 ug/L
Flumioxazin	0.12 ug/L	Fluometuron	0.12 ug/L
Fluroxypyr-meptyl	0.30 ug/L	Hexazinone	0.30 ug/L
Imidacloprid	0.12 ug/L	Isoxaben	0.12 ug/L
Mefenoxam	0.30 ug/L	Metalaxyl	0.30 ug/L
Metribuzin	0.60 ug/L	Myclobutanil	0.60 ug/L
Napropamide	0.60 ug/L	Pendimethalin	0.12 ug/L
Pirimicarb	0.30 ug/L	Prometon	0.60 ug/L
Prometryn	0.30 ug/L	Propazine	0.30 ug/L
Pyraclostrobin	0.12 ug/L	Pyridaben	0.60 ug/L
Pyrimethanil	0.12 ug/L	Sethoxydim	6.0 ug/L
Simazine	0.60 ug/L	Simetryn	0.30 ug/L
Sulfentrazone	0.12 ug/L	Tebuconazole	0.60 ug/L
Tebuthiuron	0.60 ug/L	Thiabendazole	0.12 ug/L
Triadimefon	0.60 ug/L		

Phenylurea Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
DCPMU	0.12 ug/L	Diuron	0.12 ug/L
Fenuron	0.12 ug/L	Linuron	0.12 ug/L
Monuron	0.12 ug/L	Neburon	0.12 ug/L
Siduron	0.12 ug/L		

Carbamate Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
3-Hydroxycarbofuran	0.12 ug/L	Aldicarb	0.12 ug/L
Aldicarb Sulfone	0.12 ug/L	Aldicarb Sulfoxide	0.12 ug/L
Bendiocarb	0.12 ug/L	Carbaryl	0.12 ug/L
Carbofuran	0.12 ug/L	Fenobucarb	0.12 ug/L
Methiocarb	0.12 ug/L	Methomyl	0.12 ug/L
Oxamyl	0.12 ug/L	Propoxur	0.12 ug/L
Thiobencarb	0.12 ug/L		

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Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Electric
Matrix: water

PAL Sample ID: P121441-01
Sample Date: 10/12/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)					
10/18/12	10/27/12	2,4,5-T	Not Detected	0.080 ug/L	
10/18/12	10/27/12	2,4,5-TP	Not Detected	0.080 ug/L	
10/18/12	10/27/12	2,4-D	1.5 ug/L	0.080 ug/L	
10/18/12	10/27/12	2,4-DB	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Acifluorfen	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Bentazon	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Clopyralid	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Dicamba	0.39 ug/L	0.080 ug/L	
10/18/12	10/27/12	Dichlorprop	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Dinoseb	Not Detected	0.080 ug/L	
10/18/12	10/27/12	MCPA	Not Detected	0.080 ug/L	
10/18/12	10/27/12	MCPP	0.33 ug/L	0.080 ug/L	
10/18/12	10/27/12	Picloram	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Quinclorac	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Triclopyr	0.34 ug/L	0.080 ug/L	

Surrogate Recovery: 87 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

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Report Number: P121441
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Client Project ID: [none]

Analytical Report

Client Sample ID: Hilfiker
Matrix: water

PAL Sample ID: P121441-02
Sample Date: 10/12/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)					
10/18/12	10/27/12	2,4,5-T	Not Detected	0.080 ug/L	
10/18/12	10/27/12	2,4,5-TP	Not Detected	0.080 ug/L	
10/18/12	10/27/12	2,4-D	0.49 ug/L	0.080 ug/L	
10/18/12	10/27/12	2,4-DB	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Acifluorfen	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Bentazon	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Clopyralid	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Dicamba	0.23 ug/L	0.080 ug/L	
10/18/12	10/27/12	Dichlorprop	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Dinoseb	Not Detected	0.080 ug/L	
10/18/12	10/27/12	MCPA	Not Detected	0.080 ug/L	
10/18/12	10/27/12	MCPP	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Picloram	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Quinclorac	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Triclopyr	0.32 ug/L	0.080 ug/L	

Surrogate Recovery: 95 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

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Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Salem Industrial
Matrix: water

PAL Sample ID: P121441-03
Sample Date: 10/12/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)					
10/18/12	10/27/12	2,4,5-T	Not Detected	0.080 ug/L	
10/18/12	10/27/12	2,4,5-TP	Not Detected	0.080 ug/L	
10/18/12	10/27/12	2,4-D	1.7 ug/L	0.080 ug/L	
10/18/12	10/27/12	2,4-DB	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Acifluorfen	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Bentazon	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Clopyralid	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Dicamba	0.51 ug/L	0.080 ug/L	
10/18/12	10/27/12	Dichlorprop	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Dinoseb	Not Detected	0.080 ug/L	
10/18/12	10/27/12	MCPA	Not Detected	0.080 ug/L	
10/18/12	10/27/12	MCPP	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Picloram	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Quinclorac	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Triclopyr	0.97 ug/L	0.080 ug/L	

Surrogate Recovery: 106 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

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Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Salem Industrial-DUP
Matrix: water

PAL Sample ID: P121441-04
Sample Date: 10/12/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)					
10/18/12	10/27/12	2,4,5-T	Not Detected	0.080 ug/L	
10/18/12	10/27/12	2,4,5-TP	Not Detected	0.080 ug/L	
10/18/12	10/27/12	2,4-D	1.8 ug/L	0.080 ug/L	
10/18/12	10/27/12	2,4-DB	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Acifluorfen	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Bentazon	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Clopyralid	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Dicamba	0.58 ug/L	0.080 ug/L	
10/18/12	10/27/12	Dichlorprop	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Dinoseb	Not Detected	0.080 ug/L	
10/18/12	10/27/12	MCPA	Not Detected	0.080 ug/L	
10/18/12	10/27/12	MCPP	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Picloram	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Quinclorac	Not Detected	0.080 ug/L	
10/18/12	10/27/12	Triclopyr	0.95 ug/L	0.080 ug/L	

Surrogate Recovery: 99 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

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Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Quality Assurance

Method Blank Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
10/18/12	10/27/12	2101804-BLK1	2,4,5-T	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	2,4,5-TP	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	2,4-D	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	2,4-DB	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	Acifluorfen	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	Bentazon	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	Clopyralid	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	Dicamba	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	Dichlorprop	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	Dinoseb	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	MCPA	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	MCPP	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	Picloram	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	Quinclorac	Not Detected	< 0.080 ug/L	
10/18/12	10/27/12	2101804-BLK1	Triclopyr	Not Detected	< 0.080 ug/L	

Blank Spike Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
10/18/12	10/27/12	2101804-BS1	2,4-D	107	41-133	
10/18/12	10/27/12	2101804-BSD1	2,4-D	114	41-133	
10/18/12	10/27/12	2101804-BS1	Dicamba	112	38-122	
10/18/12	10/27/12	2101804-BSD1	Dicamba	115	38-122	
10/18/12	10/27/12	2101804-BS1	Triclopyr	110	46-111	
10/18/12	10/27/12	2101804-BSD1	Triclopyr	117	46-111	R1

Analyte Information

Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)
Chlorinated acids were converted to free acids. Residues were quantitated as free acids.

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Report Number: P121441
Report Date: November 05, 2012
Client Project ID: [none]

Project Notes

Notes	Definition
R1	Spike recovery is outside of control limits.

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Report Number: P130608
Report Date: July 09, 2013
Client Project ID: [none]

Analytical Report

Client Sample ID: Electric
Matrix: water

PAL Sample ID: P130608-01
Sample Date: 6/18/13

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
6/24/13	7/3/13	MR Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 75 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

Client Sample ID: Hilfiker
Matrix: water

PAL Sample ID: P130608-02
Sample Date: 6/18/13

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
6/24/13	7/3/13	MR Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 72 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

Client Sample ID: Hilfiker DUP
Matrix: water

PAL Sample ID: P130608-03
Sample Date: 6/18/13

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
6/24/13	7/3/13	MR Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 67 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

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Report Number: P130608
Report Date: July 09, 2013
Client Project ID: [none]

Analytical Report

Client Sample ID: Salem Industrial
Matrix: water

PAL Sample ID: P130608-04
Sample Date: 6/18/13

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
6/24/13	6/29/13	Propiconazole	0.95 ug/L	0.15 ug/L	
6/24/13	7/3/13	Diuron	0.44 ug/L	0.12 ug/L	
6/24/13	7/3/13	Other Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 70 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

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Report Number: P130608
Report Date: July 09, 2013
Client Project ID: [none]

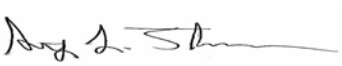
Quality Assurance

Method Blank Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
Method: Multiresidue Profile						
6/24/13	7/3/13	3062401-BLK1	MR Pesticides	Not Detected	<LoQ	

Blank Spike Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
6/24/13	6/27/13	3062401-BS1	Atrazine	73	49-100	
6/24/13	6/27/13	3062401-BSD1	Atrazine	75	49-100	
6/24/13	6/28/13	3062401-BS1	Chlorpyrifos	133	51-138	
6/24/13	6/28/13	3062401-BSD1	Chlorpyrifos	130	51-138	
6/24/13	7/3/13	3062401-BS1	Clothianidin	68	40-120	
6/24/13	7/3/13	3062401-BSD1	Clothianidin	66	40-120	
6/24/13	6/29/13	3062401-BS1	Diazinon	115	34-145	
6/24/13	6/29/13	3062401-BSD1	Diazinon	109	34-145	
6/24/13	6/28/13	3062401-BS1	Dieldrin	87	48-152	
6/24/13	6/28/13	3062401-BSD1	Dieldrin	86	48-152	
6/24/13	6/27/13	3062401-BS1	Ethofumesate	83	51-101	
6/24/13	6/27/13	3062401-BSD1	Ethofumesate	85	51-101	
6/24/13	7/3/13	3062401-BS1	Fluometuron	118	40-120	
6/24/13	7/3/13	3062401-BSD1	Fluometuron	113	40-120	
6/24/13	6/27/13	3062401-BS1	Napropamide	82	40-120	
6/24/13	6/27/13	3062401-BSD1	Napropamide	83	40-120	
6/24/13	6/28/13	3062401-BS1	Oxadiazon	128	71-129	
6/24/13	6/28/13	3062401-BSD1	Oxadiazon	131	71-129	R3
6/24/13	6/29/13	3062401-BS1	Parathion methyl	114	60-140	
6/24/13	6/29/13	3062401-BSD1	Parathion methyl	110	60-140	
6/24/13	7/3/13	3062401-BS1	Thiobencarb	85	40-120	
6/24/13	7/3/13	3062401-BSD1	Thiobencarb	80	40-120	



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Report Number: P130608
Report Date: July 09, 2013
Client Project ID: [none]

Project Information

Methodology Employed

Modified EPA 8081B (GC-ECD)
Modified EPA 8141B (GC-FPD)
Modified EPA 8270D (GC-MS SIM)
Modified EPA 8321B (HPLC-MS)

Analyte Information

Project Notes

Notes	Definition
R3	Spike recovery above control limit. Sample results are not detected, data quality has not been affected.

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Client Project ID: [none]

Multiresidue Analyte List

Organophosphorous and Organosulfur Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Chlorpyrifos	0.060 ug/L	Aspon	0.30 ug/L
Azinphos-methyl	0.30 ug/L	Carbofenothion	0.30 ug/L
Chlorfenvinphos	0.30 ug/L	Chlorpyrifos-methyl	0.30 ug/L
Coumaphos	0.30 ug/L	Demeton	0.30 ug/L
Diazinon	0.30 ug/L	Dichlorofenthion	0.30 ug/L
Dichlorvos	0.30 ug/L	Dicrotophos	0.30 ug/L
Dimethoate	0.30 ug/L	Disulfoton	0.30 ug/L
EPN	0.30 ug/L	Ethion	0.30 ug/L
Ethoprop	0.30 ug/L	Famphur	0.30 ug/L
Fenamiphos	0.30 ug/L	Fenitrothion	0.30 ug/L
Fensulfothion	0.30 ug/L	Fenthion	0.30 ug/L
Malathion	0.30 ug/L	Merphos	0.30 ug/L
Methidathion	0.30 ug/L	Mevinphos	0.30 ug/L
Monocrotophos	0.30 ug/L	Parathion	0.30 ug/L
Parathion methyl	0.30 ug/L	Phorate	0.30 ug/L
Phosmet	0.30 ug/L	Phosphamidon	0.30 ug/L
Pirimiphos-methyl	0.30 ug/L	Ronnel	0.30 ug/L
Sulprofos	0.30 ug/L	Terbufos	0.30 ug/L
Tetrachlorvinphos	0.30 ug/L	Tokuthion	0.30 ug/L
Trichloronate	0.30 ug/L	Propargite	0.60 ug/L

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Report Date: July 09, 2013
Client Project ID: [none]

Halogenated Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Acetochlor	0.15 ug/L	Alachlor	0.15 ug/L
Aldrin	0.060 ug/L	Benfluralin	0.060 ug/L
Bifenthrin	0.060 ug/L	a-BHC	0.060 ug/L
b-BHC	0.060 ug/L	d-BHC	0.060 ug/L
g-BHC	0.060 ug/L	Captafol	0.060 ug/L
Captan	0.15 ug/L	Chlordane	0.30 ug/L
Chlorobenzilate	0.15 ug/L	Chloroneb	0.15 ug/L
Chlorothalonil	0.060 ug/L	Cyfluthrin	0.30 ug/L
Cyhalothrin	0.30 ug/L	Cypermethrin	0.30 ug/L
p,p'-DDD	0.060 ug/L	p,p'-DDE	0.060 ug/L
p,p'-DDT	0.060 ug/L	Dacthal	0.060 ug/L
Deltamethrin	0.30 ug/L	Dichlobenil	0.060 ug/L
Dicloran	0.060 ug/L	Dicofol	0.15 ug/L
Dieldrin	0.060 ug/L	Dithiopyr	0.060 ug/L
Endosulfan I	0.060 ug/L	Endosulfan II	0.060 ug/L
Endosulfan sulfate	0.060 ug/L	Endrin	0.060 ug/L
Endrin aldehyde	0.060 ug/L	Endrin ketone	0.060 ug/L
Esfenvalerate	0.060 ug/L	Ethalfluralin	0.060 ug/L
Etridiazole	0.060 ug/L	Fenarimol	0.060 ug/L
Fenvalerate	0.060 ug/L	Flutolanil	0.60 ug/L
Folpet	0.060 ug/L	Heptachlor	0.060 ug/L
Heptachlor epoxide	0.060 ug/L	Hexachlorobenzene	0.060 ug/L
Iprodione	0.060 ug/L	Methoxychlor	0.060 ug/L
Metolachlor	0.15 ug/L	Mirex	0.060 ug/L
Norflurazon	0.060 ug/L	Ovex	0.060 ug/L
Oxadiazon	0.060 ug/L	Oxyfluorfen	0.060 ug/L
PCNB	0.060 ug/L	Permethrin	0.30 ug/L
Prodiamine	0.060 ug/L	Pronamide	0.060 ug/L
Propachlor	0.15 ug/L	Propanil	0.060 ug/L
Propiconazole	0.15 ug/L	Terbacil	0.060 ug/L
Toxaphene	3.0 ug/L	Trifloxystrobin	0.060 ug/L
Triflumizole	0.060 ug/L	Trifluralin	0.060 ug/L
Vinclozalin	0.060 ug/L		

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Salem, OR 97302

Report Number: P130608
Report Date: July 09, 2013
Client Project ID: [none]

Organonitrogen Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Ametryn	0.30 ug/L	Amitraz	0.60 ug/L
Atrazine	0.30 ug/L	Azoxystrobin	0.12 ug/L
Bensulide	0.12 ug/L	Boscalid	0.12 ug/L
Bromacil	0.12 ug/L	Bromopropylate	0.60 ug/L
Carfentrazone-ethyl	0.12 ug/L	Clothianidin	0.12 ug/L
Cyanazine	0.60 ug/L	Diclofop-methyl	0.60 ug/L
Dimethenamid	0.30 ug/L	Diphenylamine	0.12 ug/L
Ethofumesate	0.30 ug/L	Fenbuconazole	0.60 ug/L
Fenoxaprop-ethyl	0.60 ug/L	Fipronil	0.60 ug/L
Fluazifop-p-butyl	0.60 ug/L	Fludioxonil	0.60 ug/L
Flumioxazin	0.12 ug/L	Fluometuron	0.12 ug/L
Fluroxypyr-meptyl	0.30 ug/L	Hexazinone	0.30 ug/L
Imidacloprid	0.12 ug/L	Isoxaben	0.12 ug/L
Mefenoxam	0.30 ug/L	Metalaxyl	0.30 ug/L
Metribuzin	0.60 ug/L	Myclobutanil	0.60 ug/L
Napropamide	0.60 ug/L	Pendimethalin	0.060 ug/L
Pirimicarb	0.30 ug/L	Prometon	0.60 ug/L
Prometryn	0.30 ug/L	Propazine	0.30 ug/L
Pyraclostrobin	0.12 ug/L	Pyridaben	0.60 ug/L
Pyrimethanil	0.12 ug/L	Sethoxydim	6.0 ug/L
Simazine	0.60 ug/L	Simetryn	0.30 ug/L
Sulfentrazone	0.12 ug/L	Tebuconazole	0.60 ug/L
Tebuthiuron	0.60 ug/L	Thiabendazole	0.12 ug/L
Triadimefon	0.60 ug/L		

Phenylurea Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
DCPMU	0.12 ug/L	Diuron	0.12 ug/L
Fenuron	0.12 ug/L	Linuron	0.12 ug/L
Monuron	0.12 ug/L	Neburon	0.12 ug/L
Siduron	0.12 ug/L		

Carbamate Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
3-Hydroxycarbofuran	0.12 ug/L	Aldicarb	0.12 ug/L
Aldicarb Sulfone	0.12 ug/L	Aldicarb Sulfoxide	0.12 ug/L
Bendiocarb	0.12 ug/L	Carbaryl	0.12 ug/L
Carbofuran	0.12 ug/L	Fenobucarb	0.12 ug/L
Methiocarb	0.12 ug/L	Methomyl	0.12 ug/L
Oxamyl	0.12 ug/L	Propoxur	0.12 ug/L
Thiobencarb	0.12 ug/L		

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Report Number: P130608
Report Date: July 09, 2013
Client Project ID: [none]

Analytical Report

Client Sample ID: Electric
Matrix: water

PAL Sample ID: P130608-01
Sample Date: 6/18/13

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)					
6/25/13	6/28/13	2,4,5-T	Not Detected	0.080 ug/L	
6/25/13	6/28/13	2,4,5-TP	Not Detected	0.080 ug/L	
6/25/13	7/5/13	2,4-D	0.25 ug/L	0.080 ug/L	
6/25/13	6/28/13	2,4-DB	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Acifluorfen	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Bentazon	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Clopyralid	Not Detected	0.080 ug/L	
6/25/13	7/5/13	Dicamba	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Dichlorprop	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Dinoseb	Not Detected	0.080 ug/L	
6/25/13	6/28/13	MCPA	Not Detected	0.080 ug/L	
6/25/13	6/28/13	MCPP	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Picloram	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Quinclorac	Not Detected	0.080 ug/L	
6/25/13	7/5/13	Triclopyr	Not Detected	0.080 ug/L	

Surrogate Recovery: 68 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

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Report Number: P130608
Report Date: July 09, 2013
Client Project ID: [none]

Analytical Report

Client Sample ID: Hilfiker
Matrix: water

PAL Sample ID: P130608-02
Sample Date: 6/18/13

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)					
6/25/13	6/28/13	2,4,5-T	Not Detected	0.080 ug/L	
6/25/13	6/28/13	2,4,5-TP	Not Detected	0.080 ug/L	
6/25/13	7/5/13	2,4-D	0.29 ug/L	0.080 ug/L	
6/25/13	6/28/13	2,4-DB	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Acifluorfen	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Bentazon	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Clopyralid	Not Detected	0.080 ug/L	
6/25/13	7/5/13	Dicamba	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Dichlorprop	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Dinoseb	Not Detected	0.080 ug/L	
6/25/13	6/28/13	MCPA	Not Detected	0.080 ug/L	
6/25/13	6/28/13	MCPP	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Picloram	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Quinclorac	Not Detected	0.080 ug/L	
6/25/13	7/5/13	Triclopyr	Not Detected	0.080 ug/L	

Surrogate Recovery: 70 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

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Report Number: P130608
Report Date: July 09, 2013
Client Project ID: [none]

Analytical Report

Client Sample ID: Hilfiker DUP
Matrix: water

PAL Sample ID: P130608-03
Sample Date: 6/18/13

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)					
6/25/13	6/28/13	2,4,5-T	Not Detected	0.080 ug/L	
6/25/13	6/28/13	2,4,5-TP	Not Detected	0.080 ug/L	
6/25/13	7/5/13	2,4-D	0.33 ug/L	0.080 ug/L	
6/25/13	6/28/13	2,4-DB	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Acifluorfen	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Bentazon	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Clopyralid	Not Detected	0.080 ug/L	
6/25/13	7/5/13	Dicamba	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Dichlorprop	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Dinoseb	Not Detected	0.080 ug/L	
6/25/13	6/28/13	MCPA	Not Detected	0.080 ug/L	
6/25/13	6/28/13	MCPP	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Picloram	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Quinclorac	Not Detected	0.080 ug/L	
6/25/13	7/5/13	Triclopyr	Not Detected	0.080 ug/L	

Surrogate Recovery: 65 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

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Report Number: P130608
Report Date: July 09, 2013
Client Project ID: [none]

Analytical Report

Client Sample ID: Salem Industrial
Matrix: water

PAL Sample ID: P130608-04
Sample Date: 6/18/13

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)					
6/25/13	6/28/13	2,4,5-T	Not Detected	0.080 ug/L	
6/25/13	6/28/13	2,4,5-TP	Not Detected	0.080 ug/L	
6/25/13	7/5/13	2,4-D	1.3 ug/L	0.080 ug/L	
6/25/13	6/28/13	2,4-DB	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Acifluorfen	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Bentazon	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Clopyralid	Not Detected	0.080 ug/L	
6/25/13	7/5/13	Dicamba	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Dichlorprop	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Dinoseb	Not Detected	0.080 ug/L	
6/25/13	6/28/13	MCPA	Not Detected	0.080 ug/L	
6/25/13	6/28/13	MCPP	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Picloram	Not Detected	0.080 ug/L	
6/25/13	6/28/13	Quinclorac	Not Detected	0.080 ug/L	
6/25/13	7/5/13	Triclopyr	1.4 ug/L	0.080 ug/L	

Surrogate Recovery: 83 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

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Report Number: P130608
Report Date: July 09, 2013
Client Project ID: [none]

Quality Assurance

Method Blank Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
6/25/13	6/28/13	3062501-BLK1	2,4,5-T	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	2,4,5-TP	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	2,4-D	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	2,4-DB	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	Acifluorfen	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	Bentazon	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	Clopyralid	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	Dicamba	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	Dichlorprop	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	Dinoseb	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	MCPA	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	MCPP	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	Picloram	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	Quinclorac	Not Detected	< 0.080 ug/L	
6/25/13	6/28/13	3062501-BLK1	Triclopyr	Not Detected	< 0.080 ug/L	

Blank Spike Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
6/25/13	6/28/13	3062501-BS1	2,4-D	96	41-133	
6/25/13	6/28/13	3062501-BSD1	2,4-D	93	41-133	
6/25/13	6/28/13	3062501-BS1	Dicamba	108	38-122	
6/25/13	6/28/13	3062501-BSD1	Dicamba	97	38-122	
6/25/13	6/28/13	3062501-BS1	Triclopyr	94	46-111	
6/25/13	6/28/13	3062501-BSD1	Triclopyr	91	46-111	

Analyte Information

Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)
Chlorinated acids were converted to free acids. Residues were quantitated as free acids.

Steve Thun For Rick Jordan, Laboratory Manager

ATTACHMENT B. Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon; Pacific Habitat Services, Inc. (June 27, 2013).

Results of
Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon

Prepared for

City of Salem
Attn: Anita Panko
Public Works Department
555 Liberty Street SE
Salem, Oregon 97301

Prepared by

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PHS Project Number: 5244

June 27, 2013

TABLE OF CONTENTS

1.0 INTRODUCTION

This report describes the results of the benthic macroinvertebrate sampling, fish sampling, and physical habitat characterization conducted in May and June 2013, fulfilling the "Benthic Macroinvertebrate Monitoring" requirements listed in Table B-1 of the City of Salem's NPDES MS4 Permit. The field methodology and parameter collection used during this study follow procedures identified in the "Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment" (Pacific Habitat Services, Inc., March 21, 2011). Benthic macroinvertebrate sampling was conducted on May 15, 2013; fish sampling was conducted on June 14, 2013; and physical habitat characterization was conducted on June 17, 19, and 25, 2013. Benthic macroinvertebrates, fish and physical habitat parameters were collected along the same reaches and using the same methodology as in May and June 2012. This memorandum provides the data from the 2013 sampling effort.

2.0 STUDY AREA DESCRIPTION

In May and June 2013, PHS collected data on benthic macroinvertebrate communities, fish presence, and physical habitat characteristics at three sample reaches within the City of Salem. These reaches are the same reaches sampled by PHS in May and June 2012, and are in close proximity to a previous macroinvertebrate sampling effort that was conducted during 2000 and 2001 (Pringle Creek Watershed Bioassessment Project). General locations of each of the sampling reaches are as follows:

- East Fork Pringle Creek where the stream enters the City (2000/2001 sampling site PR00-15),
- Pringle Creek below the confluence with Clark Creek and upstream of confluence with Shelton Ditch (2000/2001 sampling site PR00-02), and
- Clark Creek in Gilmore Field (2000/2001 sampling site PR00-24).

The East Fork Pringle Creek sampling reach is located downstream (north) of Trelstad Avenue SE, near the Salem city limits (Figure 1, see Appendix A for all figures). The upstream end of the reach begins just north of the riprap apron of the culverts that carry the stream under Trelstad Avenue and extends for 150 meters downstream. In this area, East Fork Pringle Creek has been channelized and straightened with a berm of discharged dredge material along the bank. A short concrete sluice is present near the downstream end of the reach. The substrate of the stream is generally dominated by fine gravel and smaller sediments.

The Pringle Creek sampling reach is located within Bush's Pasture Park, approximately 10 meters downstream of the confluence of Clark Creek and Pringle Creek (Figure 2), and extends for 292.5 meters downstream. Within this reach, Pringle Creek is gently meandering. The stream banks are generally low and gently to moderately sloped, though vertical and undercut, eroding banks are present in some areas. A vertical concrete wall is present along the right bank near the upstream limits of the sampling reach, where private residences occur in close proximity to the stream. Substrates within the channel are generally dominated by cobbles and coarse gravel.

The Clark Creek sampling reach is located within Gilmore Field, just south of Hoyt Street SE (Figure 3). The downstream end of the project reach begins upstream of the detention structure south of Hoyt Street SE and continues upstream for 150 meters along the west side of Gilmore Field. In general, the stream banks are steep and the stream channel is incised. Substrates within the channel are generally dominated by silt and fine gravel, with areas of exposed clay hardpan.

3.0 METHODOLOGY

As recommended in the "Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment", dated March 21, 2011, PHS followed the Oregon Department of Environmental Quality's *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*) (June 2010) transect sampling approach for collecting benthic macroinvertebrate samples and the methodologies found in the Environmental Protection Agency's *Environmental Monitoring and Assessment Program - Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams* (EMAP-SW) for collecting physical habitat data within the project area. Both protocols require the collection of data at evenly spaced transects within the sampling reach. Therefore, prior to the initiation of sampling and data collection, PHS established permanent transects within each of the three sampling reaches.

Both the MOMs and EMAP-SW protocols specify that the length of the sampling reach is forty times the average wetted width of the channel or a minimum of 150 meters long, when the average wetted width is less than four meters. Because the average wetted widths of East Fork Pringle and Clark Creeks are less than four meters, PHS determined that the reach length for each of the reaches on these streams is 150 meters. PHS measured the wetted width of Pringle Creek at five representative locations and determined that the average wetted width is approximately 7.31 meters and the total reach length is 292.5 meters.

PHS identified the upstream end of the East Fork Pringle Creek reach (PC1) downstream of the pool below the culverts under Trelstad Avenue SE and flagged it as Transect "K". One-half-inch-diameter PVC pipe was pounded into the ground at the top of the bank on either side of the stream so that the transect crosses the stream perpendicular to the stream flow at the transect location. The PVC pipe was marked with "K" to indicate Transect K. Using a tape measure, PHS measured 15 meters downstream from Transect K and marked this spot as Transect J. PHS proceeded downstream with the tape measure and flagged the positions of 9 additional transects labeled "I" through "A", with Transect A being the transect marking the downstream limits of the sampling reach. PHS used the same general procedure to mark transects along the Clark Creek and mainstem Pringle Creek sample reaches. For Clark Creek, measurement began at Transect A, the downstream end of the reach, at a point approximately 50 meters upstream of the detention basin control structure, which is located north of Hoyt Street SE, and transects were located every 15 meters along the reach. At the mainstem Pringle Creek reach, Transect K was located approximately 10 meters downstream of the confluence of Clark Creek and Pringle Creek, and transects were located every 29.25 meters. Following the identification of all transects along all sampling reaches, PHS located the endpoints of each transect using a handheld GPS. An electronic file of the transect locations will be provided to the City of Salem for future reference. Figure 4 shows representative transect layout along the East Fork Pringle Creek Reach.

3.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrates were sampled using a transect sampling approach, as described in the Oregon Department of Environmental Quality's *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*) (June 2010).

One kick-net sample was collected at each of the eleven transects on the reach beginning at Transect A, which is located at the downstream end of the reach. The Transect A sample was collected from the middle of the left one-third of the stream; the Transect B sample was collected from the middle of the center one-third of the stream; and the Transect C sample was collected from the middle of the right one-third. For transect D, the sample was collected from the left one-third, and the cycle was repeated for all 11 transects. Samples were not collected from the stream margins.

At each sampling location, a D-frame kick net with 500 µm mesh net was placed in the stream with the flat part of the hoop resting on the streambed and perpendicular to the stream flow. Substrate preventing the flat part of the kicknet from sitting flush with the bottom was removed, when necessary.

Macroinvertebrate samples were collected from a one-square-foot sample area immediately upstream of the net. Before disturbing the substrate, this area was inspected for large macroinvertebrates such as mussels, and any such organisms were picked by hand and placed directly into the sieve. Within the sample area, all substrate particles larger than approximately five centimeters were carefully rubbed by hand in front of the net to dislodge any clinging macroinvertebrates. After rubbing, the substrate materials were placed outside of the sample plot. After all large substrate materials within the sample area were scrubbed by hand and removed from the sample area, the remaining substrate in the sample area was disturbed with the hands or feet for one minute. When samples were collected in slow-moving water where the water current was not strong enough to carry any dislodged organisms into the net, the net was pulled through the water as the substrate is disturbed to capture suspended organisms. After the sample was collected and the net removed from the stream, large substrate was returned to the sample area. Following collection of each sample, the contents of the net were placed in a 500µm mesh sieve, and the procedure was repeated at each transect, working from downstream (Transect A) to upstream (Transect K). The samples from each transect were composited into the sieve.

After the samples from all transects on the reach were completed and transferred to the sieve, large organic material and rocks were rinsed, carefully inspected for clinging macroinvertebrates, and removed. Fine sediment was washed away to the extent possible. The composite sample was placed in a jar labeled with the date and reach name and preserved with 95% denatured ethanol for transport to the lab for sorting and subsampling. A label with site information written in pencil on Rite in the Rain paper was placed inside the container. After all samples were collected, they were delivered to Aquatic Biology Associates, Inc. in Corvallis for sorting, subsampling, and data analysis.

3.2 Fish Sampling

An Oregon Scientific Take Permit (STP) must be obtained from the Oregon Department of Fish and Wildlife (ODFW) to conduct fish sampling within the State. Prior to conducting the fish sampling within the project area, PHS completed the online permit application (https://apps.nmfs.noaa.gov/) and obtained the necessary Oregon STP from ODFW. Due to the potential presence of salmonid species listed under the Endangered Species Act in the mainstem Pringle Creek reach, a permit from the National Marine Fisheries Service (NMFS) must also be obtained. Correspondence with NMFS personnel in 2012 indicated that the turn-around time for such a permit would require a minimum of six months. Because of time constraints, PHS did not pursue the permit from the NMFS, and therefore, fish sampling was not conducted on the mainstem Pringle Creek reach. Fish sampling was conducted on the East Fork Pringle Creek and Clark Creek sampling reaches.

Starting at the downstream end of the sampling reach and working upstream along the reach, fish sampling was conducted using a Smith-Root backpack electrofishing unit. A second person followed the operator of the electrofishing unit with a dip net to retrieve stunned fish. All retrieved fish were transferred to a five-gallon bucket equipped with an aerator for later processing. Following completion of electrofishing at the upstream end of the sampling reach, all captured fish were identified and counted before being returned to the stream.

Following completion of the fish sampling, PHS completed the follow-up reporting required by the Oregon STP.

3.3 Physical Habitat Characterization

The EMAP-SW protocol was used to collect physical habitat data for the three stream reaches. The habitat characterization portion of the EMAP-SW protocol includes five components: thalweg profile; woody debris tally; channel and riparian characterization; assessment of channel constraint, debris torrents, and major floods; and discharge. While the characterization of all of these components is not especially useful for a hydromodification assessment, collection of certain data prescribed by the protocol may be useful. The following additional data, as described by the EMAP-SW habitat characterization protocol, were collected for future hydromodification analysis:

- Water Depth - The water depth is determined along the thalweg profile at low flow for 10 uniformly spaced intervals between transects.
- Wetted Width - The wetted width is determined at the 11 transects also used for macroinvertebrate sampling and at the mid-points of the intervals between those transects for a total of 21 measurements. In addition, the stream substrate is assessed at each of these transects at 5 points: left and right edge of water, midpoint of channel, and the two points midway between center of channel and water's edge. The substrate at these 5 points is characterized by size as boulders (> 250 mm), cobbles (>64 to 250 mm), coarse gravel (>16 to 64 mm), fine gravel (>2 to 16 mm), sand (>0.06 to 2 mm), and fines (<2 mm). Indications of burial around substrate particles at each of the substrate locations within a radius of 5 cm are used to assess the embeddedness as a fraction of the sediment particles surrounded by sand or finer particles.

- Water Surface Slope – Water surface slope is calculated for each of the ten intervals between transects within the assessment reach.
- Channel Morphology - The channel morphology is measured at the 11 transects also used for macroinvertebrate assays. The bank angles from the edge of water to the top of the stream bank are recorded. The distance of bank overhang (if occurring) is measured from the edge of water to the vertical projection of the edge of bank. The vertical distance from the water surface to the lowest floodplain terrace is recorded for each transect as well as the vertical distance to the bankfull elevation. The bankfull width is also recorded at each transect.

In addition to the information described above, PHS collected data related to riparian habitat condition. The methodologies used to collect the physical habitat data within the sampling reaches are described below. More detailed descriptions of the methodologies can be found in the EMAP-SW document.

Thalweg Profile

Beginning at the downstream end of the reach, measurement stations were established at intervals between transects. As recommended by the EMAP-SW protocol procedures for streams with a wetted width less than 2.5 meters wide. Stations were numbered “0” through “14” at one-meter intervals beginning at the downstream end of the first transect (Transect “A”) and measuring upstream to the next transect. The wetted width of the stream was measured to the nearest 0.1 m at stations “0” and “7”. At station 7 the substrate particle size at the tip of the depth measuring rod was classified at the left wetted margin and at positions 25%, 50%, 75%, and 100% of the distance across the wetted width of the stream. Because the average wetted width of Pringle Creek is greater than 2.5 meters, stations numbered “0” through “9” were spaced at 2.9-meter intervals (one-tenth the distance between transects), as recommended by the EMAP-SW protocol procedures. The wetted width of the stream was measured at stations 0 and 5, and the substrate particle size was measured at station 5.

The procedure for determining substrate particle size at the mid-way station is identical to the substrate size evaluation procedure described for regular channel cross-sections A through K, except that for these mid-way supplemental cross-sections, substrate size is entered on the Thalweg Profile side of the field form.

At each thalweg profile station, a meter ruler was used to locate the deepest point (the “thalweg”), and the thalweg depth was measured to the nearest cm. The depth was read on the side of the ruler to avoid inaccuracies due to the wave formed by the rod in moving water. At the point where the thalweg depth was measured, the presence or absence of “soft/small sediment” (defined as fine gravel, sand, silt, clay or muck readily apparent by "feeling" the bottom with the staff) was noted.

The channel unit code and pool forming element codes for the station were determined and recorded on the field data form using the standard codes provided on the form. According to the EMAP-SW protocol, the unit should be at least as long as the channel is wide to be recorded. The same measurements were recorded for all stations upstream to the next transect and for all stations to the upstream end of the sampling reach (Transect “K”).

Large Woody Debris Tally

Large woody debris (LWD), defined by this methodology as woody material with a small end diameter of at least 10 cm and a length of at least 1.5 m, within the reach was tallied while working upstream to collect the thalweg profile data. All pieces of LWD that were at least partially in the baseflow channel, the "active channel" (flood channel up to bankfull stage), or spanning above the active channel were included in the tally. LWD in the active channel was tallied over the entire length of the reach, including the area between the channel cross-section transects. The procedure for tallying LWD is presented in more detail in Table 7-5 of the EMAP-SW methodology.

All pieces of LWD within the segment that are at least partially within the bankfull channel were tallied by class based on the diameter of the large end (0.1 m to < 0.3 m, 0.3 m to <0.6 m, 0.6 m to <0.8 m, or >0.8 m, and the class based on the length of the piece (1.5m to <5.0m, 5m to <15m, or >15m). A tally mark was placed in the appropriate box in the “Pieces All/Part In Bankfull Channel” section of the Thalweg Profile and Woody Debris Form.

All pieces of LWD within the segment that are not actually within the bankfull channel, but are at least partially spanning (bridging) the bankfull channel were tallied by class based on the diameter of the large end (0.1 m to < 0.3 m, 0.3 m to <0.6 m, 0.6 m to <0.8 m, or >0.8 m), and the length of the piece (1.5 m to <5.0 m, 5 m to <15 m, or >15 m). For each piece observed, a tally mark was placed in the appropriate box in the “Pieces Bridge Above Bankfull Channel” section of the Thalweg Profile and Woody Debris Form.

After all pieces within the segment were tallied and marked on the form, the total number of pieces for each class were written in the small box at the lower right-hand corner of each tally box.

Water Surface Slope

The water surface slope was measured by "backsighting" downstream between transects (e.g., transect “K” to “J”, “J” to “I”, etc.). The EMAP-SW protocol recommends using a clinometer to measure slope. However, because of the very shallow slopes of the streams within the project area, a clinometer was not used for this project.

For this project, the water surface slope was measured by two people, each with a surveyor’s rod held vertically in the center of the stream at the upstream cross section and the next cross section downstream. The elevation of the water surface was measured to the nearest 0.01 feet and later converted to the metric equivalent for both the upstream and downstream transects. The person at the upstream cross section placed a level against the surveyor’s rod and backsighted to the downstream rod, recording the elevation of the level on the upstream rod and the corresponding elevation on the downstream rod. These readings were then used to calculate the water surface slope between the transects. If it was not possible to see from one transect to the next due to the stream curvature, streamside vegetation, distance, or low light levels, supplementary slope measurements were taken between the transects.

Substrate Size/Channel Dimensions

The wetted channel width was divided into four equal segments to locate substrate measurement points on the cross-section. The distances corresponding to 0% (Left), 25% (LCtr), 50% (Ctr), 75% (RCtr), and 100% (Right) of the measured wetted width were recorded in the "DistLB" fields of the form. The distance recorded for the right bank was the same as the wetted channel width. At each measurement point on the cross section, (Left, LCtr, Ctr, RCtr, Right), the depth of the water was recorded. Because the left and right measurement points were at the limits of the wetted width of the stream, the water depth at these points was recorded as "0".

Substrate size and embeddedness were evaluated at each of the 11 cross-section transects. A substrate particle was picked up at each measuring point (unless the substrate was bedrock or consolidated hardpan material), and the size of the particle was visually estimated, according to the table on the Channel/Riparian Cross-section Form. The substrate embeddedness was also evaluated according to the guidelines on the form and in the EMAP-SW protocol and the value was recorded on the data form. By definition, sand and fine-grained sediments were considered 100 percent embedded; bedrock and hardpan were considered 0 percent embedded.

Bank Characteristics

Bank angle and bank undercut distance were determined on the left and right banks at each cross section transect. To measure bank angle, the surveyor's rod was laid against the bank, with one end at the water's edge. A clinometer was placed on the rod, and the bank angle in degrees was read from the external scale on the clinometer. The angle was recorded in the field for the left bank in the "Bank Measurement" section of the Channel/ Riparian Cross-section Form. If the bank was undercut, the horizontal distance of the undercutting (defined as the distance from the water's edge out to the point where a vertical plumb line from the bank would hit the water's surface) was measured to the nearest 0.01 m, and the distance was recorded on the field data form.

The incised height of the stream was measured by holding the surveyor's rod vertically, with its base at the water's edge. Using the surveyor's rod as a guide while examining both banks, the channel incision as the height up from the water surface to elevation of the first terrace of the valley floodplain was visually estimated, and the value was recorded in the "Incised Height" field of the bank measurement section on the field data form.

At each transect, both banks were examined to estimate and record the height of bankfull flow above the thalweg elevation. The EMAP-SW protocol calls for bankfull height to be measured relative to the water surface elevation at the time of sampling; however, recording bankfull height relative to the thalweg elevation allows for comparison from year to year without the need to account for differing flow conditions. Potential bankfull indicators looked for included the following:

- An obvious slope break that differentiates the channel from a relatively flat floodplain terrace higher than the channel;
- A transition from exposed stream sediments to terrestrial vegetation;
- Moss growth on the banks;

- Presence of drift material caught on overhanging vegetation; and/or
- Transition from flood- and scour-tolerant vegetation to that which is relatively intolerant of these conditions.

The procedure for obtaining bank and channel dimension measurements is presented in more detail in Table 7-8 of the EMAP-SW protocol.

Canopy Cover

Canopy cover over the stream was determined at each of the 11 cross-section transects using a Convex Spherical Densiometer taped as shown in the procedures outlined in the EMAP-SW protocol. The EMAP-SW protocol recommends obtaining six measurements at each cross-section transect (four measurements in four directions at mid-channel and one at each bank). The mid-channel measurements are used to estimate canopy cover over the channel. The two bank measurements complement your visual estimates of vegetation structure and cover within the riparian zone itself, and are particularly important in wide streams, where riparian canopy may not be detected by the densiometer when standing midstream. Because the stream channels within the project area are relatively narrow, only the four mid-channel measurements were collected for this project.

Facing upstream at mid-channel at each cross-section transect and with the densitometer held level at 0.3 m (1 ft.) above the surface of the stream the number of grid intersection points covered by either a tree, a leaf, or a high branch were counted. The value (0 to 17) was recorded in the “CenUp” field of the canopy cover measurement section of the Channel/Riparian Cross-section and Thalweg Profile Form. Canopy cover values were then determined for the left bank, downstream, and right bank and recorded in the appropriate spaces of the field data form.

Riparian Vegetation Structure

Riparian vegetation observations were made for a distance of 5 meters upstream and downstream of each of the 11 cross-section transects. The riparian vegetation observations were made for the visible area from the stream back a distance of 10m (30 ft.) shoreward from both the left and right banks, creating a 10 m × 10 m riparian plot on each side of the stream. The riparian plot dimensions were estimated and not measured.

Standing mid-channel at a cross-section transect, a 5-meter distance upstream and downstream was estimated for the purpose of assessing riparian vegetation cover. For one bank and then the other, a distance of 10 meters back into the riparian vegetation was estimated. Within this 10 m × 10 m area, the riparian vegetation was conceptually divided into three layers: a CANOPY LAYER (>5m high), an UNDERSTORY (0.5 to 5 m high), and a GROUND COVER layer (<0.5 m high), and the dominant vegetation type for the CANOPY LAYER (vegetation > 5 m high) was determined to be either Deciduous, Coniferous, broadleaf Evergreen, Mixed, or None.

The areal cover class of large trees (> 0.3 m [1 ft.] diameter at breast height [DBH]) and small trees (< 0.3 m DBH) within the canopy layer was determined separately, and the appropriate cover class was recorded on the field data form ("0"=absent: zero cover, "1"=sparse: <10%, "2"=moderate: 10-40%, "3"=heavy: 40-75%, or "4"=very heavy: >75%). Next, the dominant vegetation type for the understory layer was determined as described above for the canopy layer.

The areal cover class for woody shrubs and saplings was determined separately from non-woody vegetation within the understory. Similarly, the areal cover class for woody shrubs and seedlings, non-woody vegetation, and the amount of bare ground present in the ground cover layer was determined as described above.

In stream Fish Cover, Algae, and Aquatic Macrophysics

The areal cover of all of the fish cover and other listed features that are in the water and on the banks 5 meters upstream and downstream of the cross-section were recorded in the "Fish Cover/Other" section of the Channel /Riparian Cross-section Form.

Standing mid-channel at a cross-section transect, a 5-meter distance upstream and downstream (10 m total length) was estimated for the purpose of evaluating fish cover. The water and the banks within the 10-m segment of stream were examined for the following features and types of fish cover:

- filamentous algae - long streaming algae that often occur in slow moving waters;
- aquatic saprophytes - are water-loving plants, including mosses, in the stream that could provide cover for fish or macroinvertebrates;
- large woody debris – the larger pieces of wood that can influence cover and stream morphology (i.e., those pieces that would be included in the large woody debris tally);
- brush and small woody debris – smaller wood pieces that primarily affect cover but not morphology;
- in-channel live trees or roots - living trees that are within the channel -- estimate the areal cover provided by the parts of these trees or roots that are inundated;
- overhanging vegetation - includes tree branches, brush, twigs, or other small debris that is not in the water but is close to the stream (within 1 m of the surface) and provides potential cover;
- undercut banks;
- boulders - typically basketball- to car-sized particles; and
- artificial structures - include those designed for fish habitat enhancement, as well as in-channel structures discarded (e.g., cars or tires) or purposefully placed for diversion, impoundment, channel stabilization, or other purposes.

For each cover type, the areal cover was estimated as follows and recorded in the "FISH COVER/OTHER" section of the Channel/Riparian Cross-section Form. According to the EMAP-SW protocol the cover classes of in stream fish cover features were estimated as follows:

"0"=absent: zero cover,
"1"=sparse: <10%,
"2"=moderate: 10-40%,
"3"=heavy: 40-75%, or
"4"=very heavy: >75%.

Human Influence

For the left and right banks at each of the 11 detailed Channel and Riparian Cross-Sections, the presence/absence and the proximity of 11 categories of human influences were evaluated.

Standing mid-channel at each cross-section transect, a 5-meter distance was estimated upstream and downstream (10 m total length), and a distance of 10 meters back into the riparian zone from each bank was estimated to define a riparian plot area. The channel, bank and riparian plot area adjacent to the defined stream segment were examined for the following human influences:

(1) walls, dikes, revetments, riprap, and dams;
(2) buildings;
(3) pavement/cleared lot (e.g., paved, graveled, dirt parking lot, foundation);
(4) roads or railroads,
(5) inlet or outlet pipes;
(6) landfills or trash (e.g., cans, bottles, trash heaps);
(7) parks or maintained lawns;
(8) row crops;
(9) pastures, rangeland, hay fields, or evidence of livestock;
(10) logging; and
(11) mining (including gravel mining).

For each type of influence, its presence or absence and its proximity to the stream and riparian plot area was determined. The human disturbance items were considered to be present if they were visible from the cross-section transect. For each type of influence, the appropriate proximity class was recorded in the "Human Influence" part of the "Visual Riparian Estimates" section of the Channel/Riparian Cross-section Form. The proximity classes are defined by the EMAP-SW protocol as follows:

B ("Bank") - Present within the defined 10 m stream segment and located in the stream or on the stream bank.
C ("Close") - Present within the 10 × 10 m riparian plot area, but away from the bank.
P ("Present") - Present, but outside the riparian plot area.
O ("Absent") - Not present within or adjacent to the 10 m stream segment or the riparian plot area at the transect

A particular influence may be observed outside of more than one riparian observation plot (e.g., at both transects "D" and "E"). In such situations, the influence was recorded as present at every transect from which it was observed without having to site through another transect or its 10 m × 10 m riparian plot.

Riparian "Legacy" Trees and Invasive Alien Plants

One tree was identified as a "legacy" tree at each transect, and at transect K, the legacy tree was identified as the largest tree within 4 channel widths upstream of the transect location. For each legacy tree, which was defined as the largest tree within sight of the transect, the following information was recorded:

- type of tree, and, the taxonomic group, as defined on the field data form and Table 7-13 of the EMAP-SW protocol;
- estimated height,
- diameter at breast height (dbh), and
- distance from the wetted margin of the stream.

At each transect, the presence of listed invasive plant species within the 10 m x 10 m riparian plots on either bank was recorded on the Riparian "Legacy" Trees and Invasive Alien Plants field form. In accordance with the EMAP-SW protocol, only the presence of plants which are targets in the state (as identified in the EMAP-SW protocol) were recorded, even though other invasive species may be present.

4.0 RESULTS AND DISCUSSION

4.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrate sampling was conducted on May 15, 2013, and the benthic macroinvertebrate samples were processed by Aquatic Biology Associates, Inc. (ABA) in Corvallis, Oregon. Data and results from ABA's analysis are provided in Appendix B. A summary of the results of the analysis are present in the following sections.

4.1.1 Benthic Index of Biological Integrity

Each sample was scored according to the Benthic Index of Biological Integrity (BIBI), modified from Karr 1998, which is a quantitative method for determining and comparing the biological condition of streams. The BIBI scoring system is composed of the 10 metrics:

- Total number of taxa;
- Number of Ephemeroptera taxa;
- Number of Plecoptera taxa;
- Number of Trichoptera taxa;
- Number of long-lived taxa;
- Number of intolerant taxa;
- Percent tolerant taxa;
- Percent predators;
- Number of clinger taxa; and
- Percent dominant taxa.

Each individual metric is given a score of 1 through 5, with higher numbers given to conditions representative of streams unaltered by anthropogenic influence and exhibiting higher biological integrity. These metrics are then added together for the single, integrated overall BIBI score.

The results of the BIBI scoring for each of the sample reaches are summarized in Table 1 and the text below. The descriptions of metrics that follow are summarized from The Puget Sound Stream Benthos website (www.pugetsoundstreambenthos.org).

Table 1. Benthic Invertebrate Index of Biological Integrity – BIBI (modified Karr 1998)

Metric	Clark Creek		East Fork Pringle Creek (PC1)		Pringle Creek (PC2)	
	Value	Score[a]	Value	Score[a]	Value	Score[a]
Total Number of Taxa[b]	28	3	39	3	31	3
Number of Ephemeroptera Taxa[b]	1	1	2	1	1	1
Number of Plecoptera Taxa[b]	0	1	0	1	0	1
Number of Trichoptera Taxa[b]	1	1	5	3	4	1
Number of Long-lived Taxa[b]	3	3	2	1	1	1
Number of Intolerant Taxa[b]	1	1	1	1	0	1
Percent Tolerant Taxa[c]	19.79	5	23.95	3	30.77	3
Percent Predators[b]	5.25	1	12.74	3	2.97	1
Number of Clinger Taxa[b]	6	1	14	3	8	1
Percent Dominance (3 Taxa)[c]	38.79	5	37.83	5	50.11	3
Total BIBI Score[d]:	**n/a**	**22**	**n/a**	**24**	**n/a**	**16**
Biological Condition:	**Low**		**Low**		**Low**	

Notes: a. Each metric scored: 1 = Low; 3 = Moderate; 5 = High
b. Metric value generally decreases with declining biological integrity
c. Metric value general increases with declining biological integrity
d. Key to Total BIBI Scores:
BIBI scores 0 – 24 = Low biological integrity
BIBI scores 25 – 39 = Moderate biological integrity
BIBI scores 39 – 50 = High biological integrity

Total Number of Taxa

The total number of taxa, or total taxa richness, is the total number of unique taxa identified within the sample. All types of invertebrates (mayflies, caddisflies, stoneflies, true flies, midges, clams, snails, and worms) collected from the sampling reach are included in this metric. The biodiversity of a stream declines as flow regimes are altered, habitat is lost, chemicals are introduced, energy cycles are disrupted, and alien taxa invade. The moderate scores given for total number of taxa in each of the sampling reaches indicates some level of disturbance within the assessment reaches.

Number of Ephemeroptera Taxa

The number of Ephemeroptera taxa, or Ephemeroptera taxa richness, is the total number of unique mayfly (Family Ephemeroptera) taxa identified within the sample. Typically, the

diversity of mayflies declines in response to most types of human influence. Only one mayfly taxon was recorded within the Clark Creek and Pringle Creek sample reaches, while only two taxa were recorded in the East Fork Pringle Creek reach. Such low numbers are indicative of disturbed systems.

Number of Plecoptera Taxa

The number of Plecoptera taxa, or Plecoptera taxa richness, is the total number of unique stonefly (Family Plecoptera) taxa identified within the sample. In general, stoneflies are among the most sensitive benthic macroinvertebrates, and they are among the first macroinvertebrates to disappear from a stream as human disturbance increases. Many stoneflies are predators that stalk their prey and hide around and between rocks, and these hiding places are lost as sediment washes into a stream and the stream substrates become embedded. Like salmonids, most stoneflies require cool, well-oxygenated water, and increased stream temperatures adversely affect the stream's ability to support stoneflies. The absence of stonefly taxa recorded within the sampling reaches is indicative of disturbed systems.

Number of Trichoptera Taxa

The number of Trichoptera taxa, or Trichoptera taxa richness, is the total number of unique caddisfly (Family Trichoptera) taxa identified within the sample. Caddisflies are a diverse family of insect. Various caddisfly taxa feed in a variety of ways: some spin nets to trap food, others collect or scrape food from the tops of exposed rocks. Many caddisflies build gravel or wood cases to protect them from predators, and others are predators themselves. Although caddisflies are a diverse family, taxa richness of caddisflies declines steadily as the variety and complexity of stream habitats decline. The number of caddisfly taxa recorded in the East Fork Pringle Creek and Pringle Creek sampling reaches were higher than in Clark Creek. Even so, the low numbers of caddisfly taxa recorded within all of the sampling reaches are indicative of disturbed systems.

Number of Long-Lived Taxa

The number of long-lived taxa is the total number of unique taxa that require more than one year to complete their life cycles. Because of their longer life cycles, these taxa are exposed to cumulatively more stream disturbances than taxa with shorter life cycles. If the stream is dry part of the year or subject to flooding, taxa with longer life cycles may disappear from the stream. Loss of long-lived taxa from a system may indicate an on-going problem that repeatedly interrupts their life cycles. The moderate to low scores given for total number of long-lived taxa in each of the sampling reaches indicates some level of disturbance within the assessment reaches.

Number of Intolerant Taxa

The number of intolerant taxa is the total number of unique taxa that are intolerant of stream pollution. Chironomids are not included in this metric. Benthic macroinvertebrates identified as intolerant are the most sensitive taxa and represent approximately five to ten percent of the taxa present in the region. These taxa are the first to disappear as stream degradation increases. The low scores for the number of intolerant taxa in each of the sampling reaches indicate disturbance within the assessment reaches.

Percent Tolerant Taxa

The percent tolerant taxa is the total number of individuals belonging to taxa tolerant to stream degradation, divided by the total number of individuals within the sample, multiplied by 100. Chironomids are not included in this metric. Tolerant taxa are present within most streams, but as disturbance increases, tolerant taxa represent an increasingly large percentage of the total macroinvertebrate community. The moderate scores for the percent tolerant taxa in the East Fork Pringle Creek and Pringle Creek sampling reaches indicate some level of disturbance within the assessment reaches.

Percent Predators

The percent predators metric is the total number of predator individuals identified within the sample, divided by the total number of individuals within the sample, multiplied by 100. Predator taxa represent the peak of the food web and depend on a reliable source of other invertebrates that they can eat. The percentage of animals that are obligate predators provides a measure of the trophic complexity supported by a site. Less disturbed sites generally support a greater diversity of prey items and, therefore, a larger diversity of predators to feed on them. The low to moderate scores for percent predators in each of the sampling reaches indicates some level of disturbance within the assessment reaches.

Number of Clinger Taxa

This metric is the total number of unique clinger taxa within the sample. “Clingers” have physical adaptations that allow them to hold onto smooth substrates in fast water. These macroinvertebrates typically occupy the open areas between rocks and cobbles along the bottom of the stream; thus, they are particularly sensitive to fine sediments that fill these spaces and eliminate the variety and complexity of these small habitats. Sediment also prevents clingers from accessing the hyporheic zone of the stream bed. The low to moderate numbers of clinger taxa recorded within the assessment reaches are indicative of disturbed systems.

Percent Dominance

Percent dominance is the sum of the individuals of the three most abundant taxa in the sample, divided by the total number of individuals in the sample, multiplied by 100. In general, as diversity declines, a fewer number of taxa make up a larger percentage of the total macroinvertebrate community. In contrast to most other metrics examined, the scores for percent dominance within all of the sample reaches were within the “moderate” or “high” categories.

Total BIBI Score

Scores for all ten metrics are added together to arrive at a total BIBI score. The stream’s total BIBI score is a measure of the stream’s biological condition. Because there are ten metrics and each metric is scored 1 to 5, the total BIBI score can range from 10 to 50. A score closer to 50 indicates a high biotic condition similar to that found in a “natural” reference stream, which in the Willamette Valley Region is a relatively undisturbed Pacific Northwest montane stream. A score closer to 10 indicates a severely degraded stream with poor biological integrity. Total BIBI scores for the project area sampling reaches ranged from 16 to 24, in the low range for biological integrity.

4.1.2 Other Stream Assessment Metrics

ABA provided scores for thirteen other metrics that may be useful in assessing the biological integrity of the project area streams. Values and biological integrity scores for each of these metrics are provided in Table 2. For the first six metrics listed in Table 2 (total abundance, EPT taxa richness, predator richness, scraper richness, shredder richness, and percent intolerant taxa), the metric value generally decreases as biological integrity decreases. For the project-area sampling reaches, these metrics generally scored low overall, indicating low biological integrity for project area streams.

For the last seven metrics listed in Table 2 (percent *Baetis tricaudatus*, percent collector, percent parasite, percent Oligochaeta, number of tolerant taxa, percent Simuliidae, and percent Chironomidae), the metric value generally increases as biological integrity decreases. Though scores for these metrics were variable for the project-area sampling reaches, approximately half of the scores were in the moderate to high range, indicating impaired biological integrity for project-area streams.

Table 2. Other Community Composition Metrics that are Indicative of Biological Condition

Metric	Clark Creek		East Fork Pringle Creek (PC1)		Pringle Creek (PC2)	
	Value	Score[a]	Value	Score[a]	Value	Score[a]
Total Abundance[b]	1937	H	1132	H	2543	H
EPT Taxa Richness[b]	2	L	7	L	5	L
Predator Richness[b]	3	L	6	L	2	L
Scraper Richness[b]	1	L	7	L	6	L
Shredder Richness[b]	4	L	5	M	3	L
Percent Intolerant Taxa[b]	0.40	L	3.23	L	0.00	L
Percent *Baetis tricaudatus*[c]	16.36	M	3.23	H	16.56	M
Percent Collector[c]	77.58	L	60.27	L	64.12	L
Percent Parasite[c]	0.40	H	6.27	L	1.49	H
Percent Oligochaeta[c]	4.85	M	11.98	L	16.77	L
Number of Tolerant taxa[c]	6	H	11	L	11	L
Percent Simuliidae[c]	3.43	H	0.76	H	12.10	L
Percent Chironomidae	67.88	L	48.29	L	37.79	L

Notes:
a. Low (L), moderate (M), and high (H) scores compared with a Pacific Northwest montane stream with high biological integrity.
b. Metric value generally decreases with declining biological integrity
c. Metric value generally increases with declining biological integrity

4.2 Fish Sampling

Table 3 summarizes the results of the fish sampling efforts within the project-sample reaches. As noted above, the purpose of this sampling was to document the types of fish inhabiting the project-area streams. The sampling effort was not designed to document the number of fish within the project-area reaches. As noted above, mainstem Pringle Creek was not sampled because it was not possible to get the necessary permits from the NMFS within the time constraints associated with this sampling effort.

Five fish taxa were identified within the two reaches in which fish were surveyed. All fish collected at both reaches were native to the Willamette River watershed, and all appeared healthy. Both cutthroat trout collected on East Fork Pringle Creek were adults. Two adult and five juvenile cutthroat trout were collected in the Clark Creek Reach, confirming that a breeding population is present in that stream.

Table 3. Results of Fish Sampling for Project Area Sampling Reaches

Fish Species	Sampling Reach		
	East Fork Pringle Creek	Clark Creek	Pringle Creek[a]
Sculpin	37	34	-
Redside Shiner	40	24	-
Largescale Sucker	1	-	-
Cutthroat trout	2	7	-
Speckled Dace	9	7	-
Total	**89**	**82**	**-**

Notes: a. Reach not sampled because necessary permit from NMFS could not be obtained in time to meet schedule constraints.

4.3 Physical Habitat Characterization

As in 2012, PHS collected data related to thalweg profile, stream and riparian cross sections, substrate type, and presence of large woody debris for each of the sampling reaches. These data are provided on data forms derived from those provided in the EMAP-SW protocol, and the data forms for each of the sampling reaches are in Appendices C, D, and E, respectively.

Because of the shallow slope of the project area streams, PHS determined the water surface slope using a level and surveyor's rods rather than a clinometer, as described in the methodology section above. Therefore, the EMAP-SW data sheet for slope measurement was not used. Slope data for the four sampling reaches are presented in Table 4, below.

Table 4. Water Surface Slopes for the Three Project-Area Sampling Reaches

Transect	Water Surface Slope (Percent)		
	Clark Creek	East Fork Pringle Creek	Pringle Creek
A to B	0.45	0.04	0.02
B to C	0.14	0.41	0.68
C to D	0.93	1.73	1.20
D to E	1.24	1.30	1.37
E to F	0.55	0.47	0.83
F to G	0.53	0.61	0.97
G to H	0.71	0.61	0.16
H to I	0.53	0.96	1.04
I to J	0.96	1.04	0.39
J to K	0.87	1.06	0.01
Reach Average	**0.69**	**0.82**	**0.77**

The slope of the stream reach may be useful in three different ways. First, the overall stream gradient gives an indication of potential water velocities and stream power, which are in turn important controls on aquatic habitat and sediment transport within the reach. Second, the spatial variability of stream gradient is a measure of habitat complexity, as reflected in the diversity of water velocities and sediment sizes within the stream reach. Lastly, the water surface slope allows computation of residual pool depths and volumes from the multiple depth and width measurements taken in the thalweg profile.

The EMAP-SW protocol for physical habitat characterization is useful for longitudinal studies of changes in channel morphology due to urban changes in the stream hydrograph. Water depths at regular intervals along the thalweg are provided on the "Thalweg Profile & Woody Debris Form" for each of the sampled reaches. With the assumption of linear water surface slope between the 11 sample transects within the reach, a detailed longitudinal profile of the stream bed thalweg can be drawn from the assessment data. Such a profile could be compared to profiles drawn from subsequent year's data to assess changes in the stream profile over time. Downstream discharge can be correlated with mean water depths over the sample reach to yield an average relative rating curve for the reach. Thalweg and water surface slope profiles for each sampling reach are provided in Figures 5, 6, and 7.

Changes in the flow regime are likely to alter the longitudinal relations of bedforms within a sampled reach, so that repeated monitoring will record the changes in bed geometry as the stream bed is altered. Further analysis of the inferred relative bed elevations will reveal changes in the distribution of streambed features resulting from changes in the hydrograph.

Wetted width data are listed on the "Thalweg Profile & Woody Debris Form" and on the "Channel/Riparian Cross-Section Form" for each of the sampled reaches. Changes in the low-flow wetted width can be expected to result from hydrograph changes resulting from changes in surface properties of the watershed. While not so detailed as the bedform data, these data can be expected to show channel changes resulting from altered flow regimes. Comparison of the data contained in this report to data obtained in subsequent monitoring efforts can document changes in the stream over time. However, comparison of data collected in 2013 to that of 2012 was beyond the scope of this project.

Substrate size is one of the most important determinants of habitat character for fish and macroinvertebrates in streams. Substrate data for each transect within the sampled reaches are provided on the "Channel/Riparian Cross-Section Form". Along with bedform (e.g., riffles and pools), substrate influences the hydraulic roughness and consequently the range of water velocities in the channel. It also influences the size range of interstices that provide living space and cover for macroinvertebrates, salamanders, and sculpins. Substrate characteristics are often sensitive indicators of the effects of human activities on streams. Within the sampled reaches, substrates were quite variable. Substrates in Clark and East Fork Pringle Creek were dominated by fine gravels, sands, and finer sediments. In portions of the Clark Creek reach, substrates were dominated by hardpan consisting of consolidated clay layers, with fine silt dominating the substrate composition in deeper, slower-moving portions of the stream. PHS noted that gravel bars appeared to be more extensive in Clark Creek in 2013 than in 2012. Additionally, rock/cobble "dams" presumably created by children playing in the stream were noted at several locations during earlier sight visits. Comparison of data collected in the two years would be needed to determine the extent of any such changes; however, such a comparison was beyond the scope of this project. Substrates in mainstem Pringle Creek were dominated by gravels and cobbles, with varying degrees of embeddedness throughout the reach.

Other channel morphology data, including bank angles, undercut measurements, bankfull heights, and incision heights are provided on the "Channel/Riparian Cross-Section Form" for each of the sampled reaches. The recorded bank angles from the edge of the low-flow wetted channel will show changes to the banks resulting from flows at or in excess of the bankfull discharge. If the channel is not greatly incised, bankfull channel height and incision height will be the same. However, if the channel is incised greatly, the bankfull level will be below the level of the first terrace of the valley floodplain, making bankfull channel height smaller than incision height. Throughout the East Fork Pringle Creek and Clark Creek reaches, the channels are relatively deeply incised under current conditions.

Qualitative assessments of riparian vegetation and land use characteristics along each of the sampled reaches are provided on the "Channel/Riparian Cross-Section Form" and the "Riparian 'Legacy' Trees and Invasive Alien Plants" forms. While these data cannot be used to directly describe hydromodification of the stream, the visual estimations of riparian condition are useful for evaluating the health and level of disturbance of the stream corridor. They also provide an indication of the present and future potential for various types of organic inputs and shading, which are important contributors to water quality and the aquatic ecosystem.

Riparian canopy cover over a stream is important not only in its role in moderating stream temperatures through shading, but also as an indicator of conditions that control bank stability and the potential for inputs of coarse and fine particulate organic material. Organic inputs from riparian vegetation become food for stream organisms and structure to create and maintain complex channel habitat.

The field evaluation of the presence and proximity of various important types of human land use activities in the stream riparian area may be used in combination with mapped watershed land use information to assess the potential degree of disturbance of the sample stream reaches.

4.4 Summary

This report presents the results of the second year of sampling on three reaches in the vicinity of existing monitoring stations operated by the City of Salem. PHS also sampled these three reaches (East Fork Pringle Creek, Pringle Creek, and Clark Creek) in 2012. These data will be compared against data collected in other sampling efforts to assess the changes and trends in water quality and hydromodification.

Benthic Invertebrate Index of Biological Integrity (BIBI) scores derived from the benthic macroinvertebrate sampling effort indicate some level of water quality degradation in each of the three sampled reaches. Low biological integrity scores are often recorded in streams located within urban environments. Fish species were recorded during fish sampling efforts of Clark Creek and East Fork Pringle Creek. The presence of adult and juvenile cutthroat trout in the Clark Creek reach indicates that cutthroat are breeding in the watershed. No non-native fish species were recorded.

Physical habitat characteristics of the three stream reaches appear largely similar to that observed during the 2012 monitoring effort. Comparison of data between the two years would be needed to detect specific changes in physical characteristics; however, such an analysis was beyond the scope of this project. All three of the reaches shows the effects of human influence. The East Fork Pringle Creek and Clark Creek reaches appear to have been channelized into the current alignments. Channels within both reaches show some degree of incision. A control structure downstream of the reach turns Clark Creek and the adjacent Gilmore Field into a detention facility, preventing flooding of downstream neighborhoods, during high-flow events. Mainstem Pringle Creek is less incised than the other two reaches; however, portions of the bank are constrained by concrete and block retaining walls where the stream occurs in close proximity to private residences. Rock/cobble “dams” presumably created by children playing in the stream were noted at several locations during earlier sight visits. These features were gone, however, at the last site visit of this monitoring effort, after rains had caused water levels in the stream to rise.

Substrates within the three reaches vary, as would be expected of streams of different sizes. Substrates within East Fork Pringle Creek and Clark Creek are dominated by fine gravel and other fine sediments. In portions of the Clark Creek reach, substrates were dominated by hardpan consisting of consolidated clay layers, with fine silt dominating the substrate composition in deeper, slower-moving portions of the stream. PHS noted that gravel bars appeared to be more extensive in Clark Creek in 2013 than in 2012. The substrate within mainstem Pringle Creek is dominated by coarse gravel and cobbles.

In addition to substrate size class, data was collected on water depth, wetted width, bankfull height, bankfull width, bank angle, surface water slope and other measurements, as described above. Comparison of the results of this monitoring effort with future monitoring events and data collected in 2012 is necessary to determine changes in the physical characteristics of the stream.

5.0 REFERENCES

Oregon Department of Environmental Quality. June 30, 2010. *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*), Version 3.3, DEQ03-LAB-0036-SOP, Laboratory and Environmental Assessment Division, Hillsboro, Oregon.

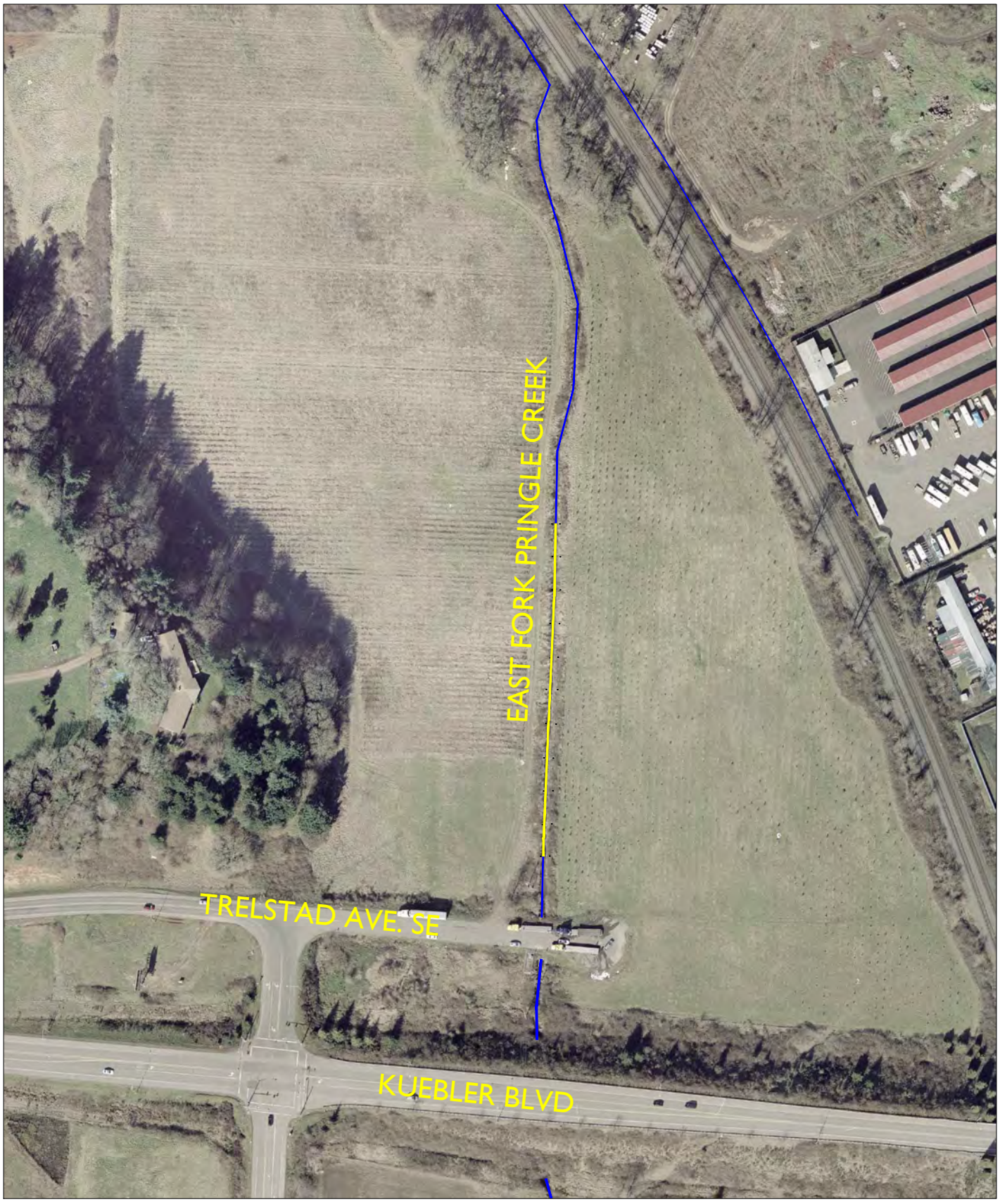
Peck, D.V., J.M. Lazorchak, and D.J. Klemm (editors). Unpublished draft. *Environmental Monitoring and Assessment Program -Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams.* EPA/XXX/X-XX/XXXX. U.S. Environmental Protection Agency, Washington, D.C.

Pacific Habitat Services, Inc. March 21, 2011. *Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment*

Puget Sound Stream Benthos Website. www.pugetsoundstreambenthos.org. Accessed February 2012.+

Appendix A

Figures



6/26/2013
PHS #5244

Location of East Fork Pringle Creek Sampling Reach, Salem, Oregon.

FIGURE 1

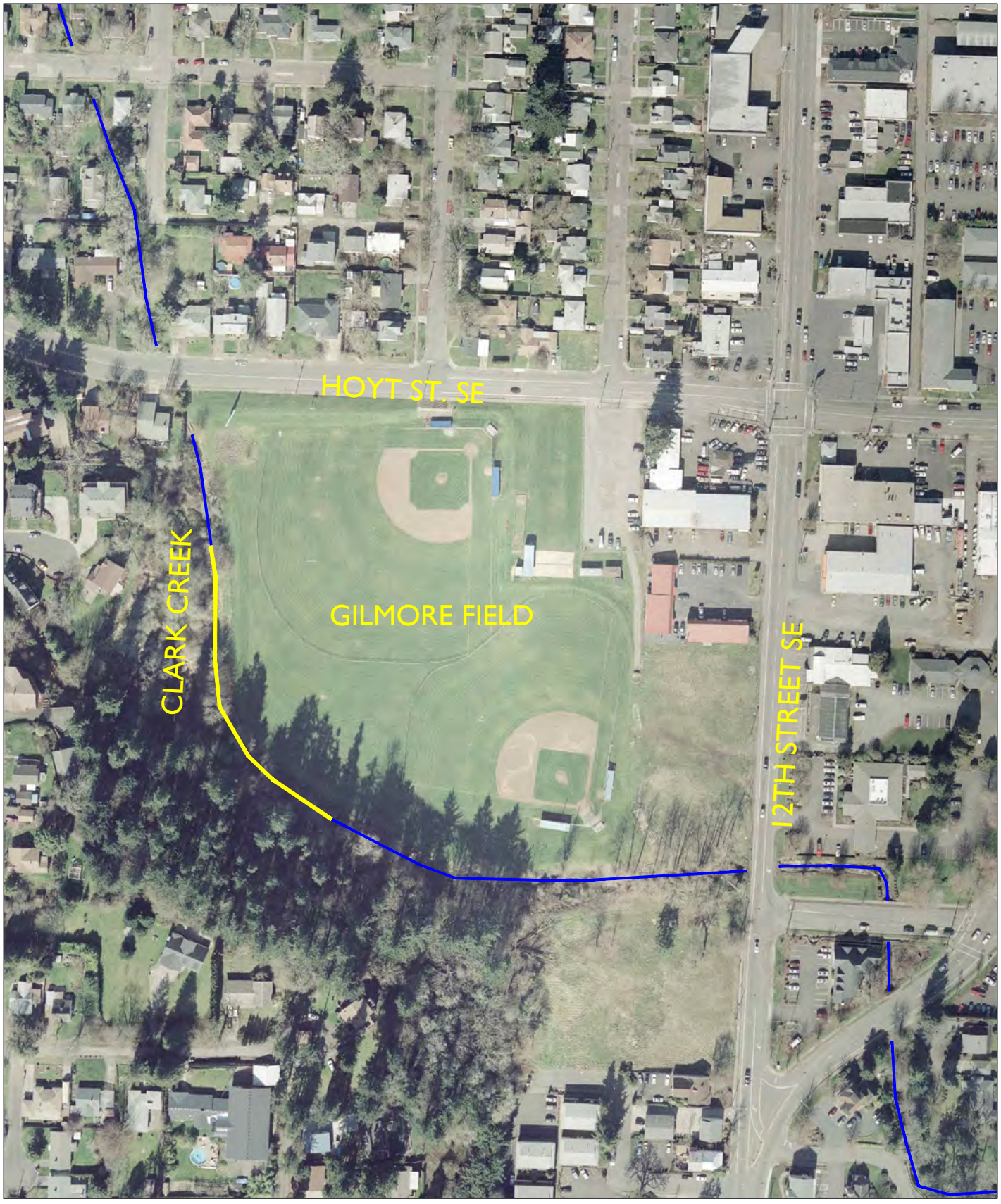
Pacific Habitat Services, Inc.

6/26/2013
PHS #5244

Location of Pringle Creek Sampling Reach, Salem, Oregon.

FIGURE
2

Pacific Habitat Services, Inc.



6/26/13
PHS #5244

Location of Clark Creek Sampling Reach, Salem, Oregon.

FIGURE 3

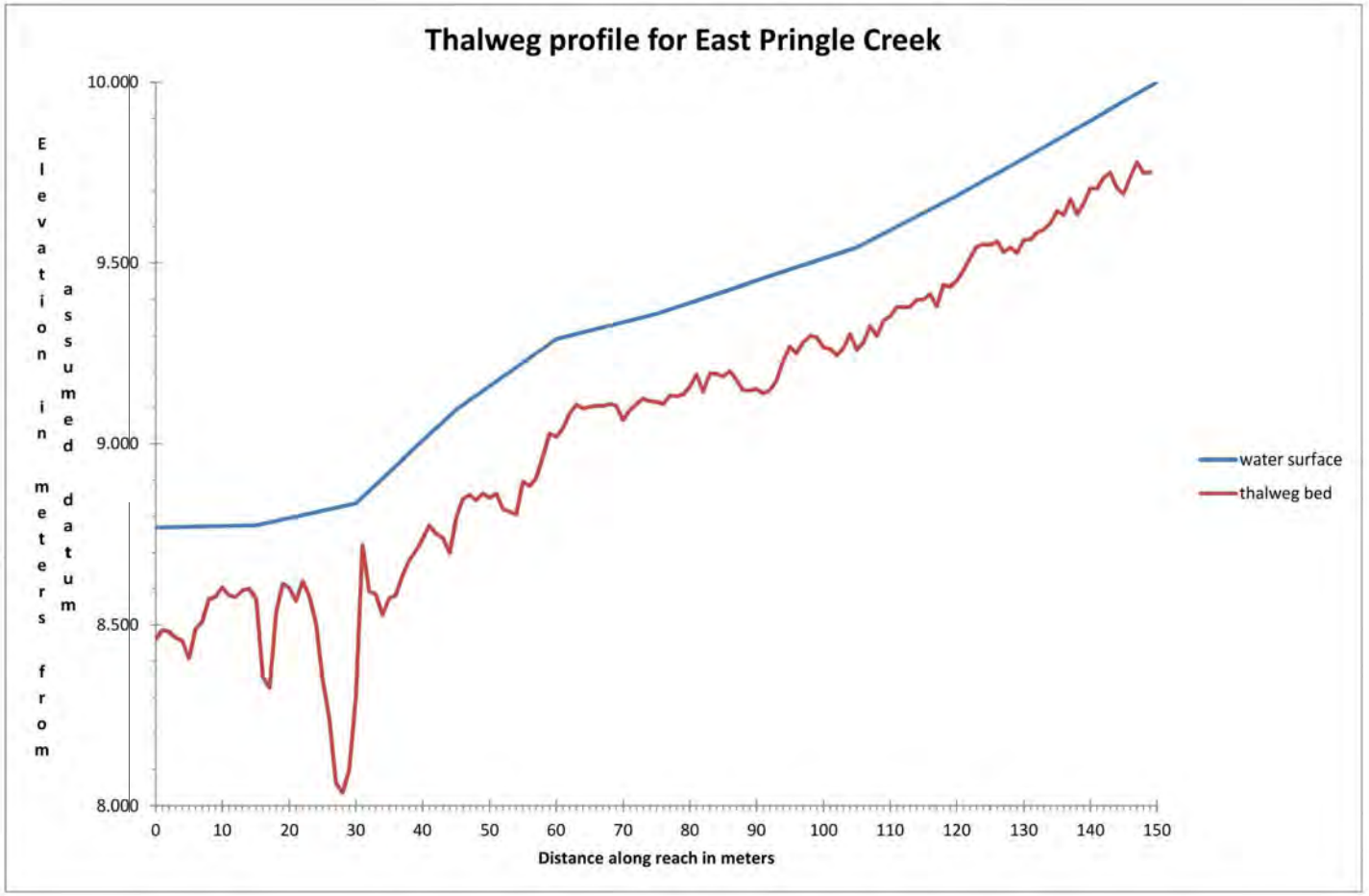
Pacific Habitat Services, Inc.

6/26/2013
PHS #5244

Transect Layout along East Fork Pringle Creek, Salem, Oregon.

FIGURE 4

Pacific Habitat Services, Inc.



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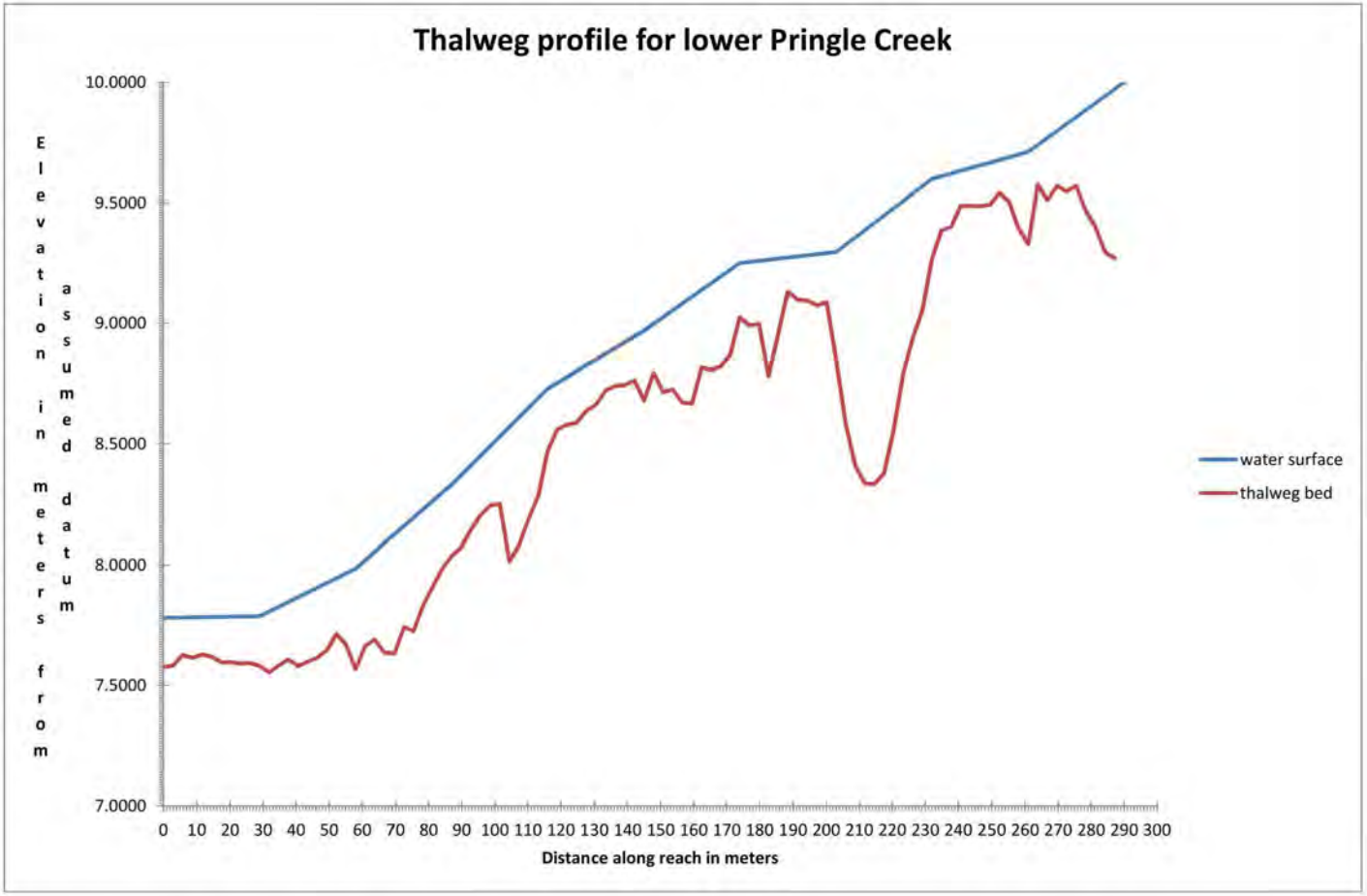
Phone: (503) 570-0800 Fax (503) 570-0855

Thalweg and Water Surface Profile

East Fork Pringle Creek Sampling Reach - Salem, Oregon

FIGURE 5

6/26/2013



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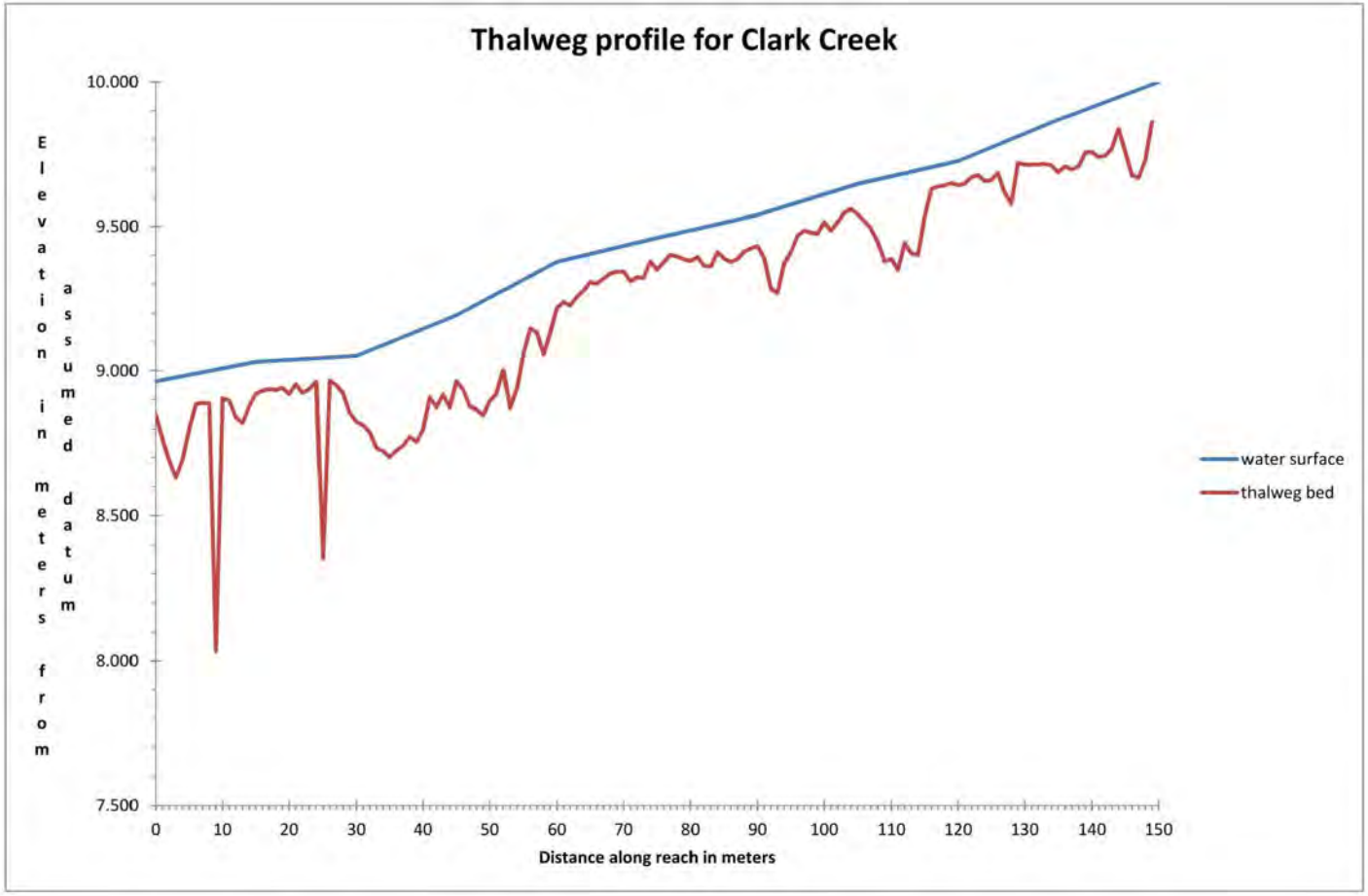
Thalweg and Water Surface Profile

Pringle Creek Sampling Reach - Salem, Oregon

FIGURE 6

6/26/2013



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Thalweg and Water Surface Profile
Clark Creek Sampling Reach - Salem, Oregon

FIGURE
7

6/26/2013

Appendix B

Benthic Macroinvertebrate Sampling Data

Explanation of Sheets

• This explanation is included as a reference for the conventions used in the data analysis.
• Refer to the "Documentation" sheet for specifics about the project.
• Short descriptions will be written at the top of metrics and summary sheets where clarification is needed.
• Bolded titles in this document correspond to sheet names. The exact sheet names differ based on the type of analysis performed, whether or not replicates were present, and whether or not biomass was calculated.

Project Information

Documentation

• Includes project information, client and laboratory contact information, overview of specifications, notes on missing or empty samples, and any irregularities encountered.

Metrics and Summaries

Metrics

• Provides an overview of relevant sample descriptors broken down by site.
• If replicates are present in the data, then this sheet will use the mean values for a given site calculated from the total number of replicates present for that site.
• A replicate is considered present if it is listed as empty, in which case it will be included in the mean calculations as zeros for all taxa.
• A replicate that is missing, decayed, or otherwise damaged will be omitted from the mean calculations.

(Mean) Summary Sheets:
• Named with "Mean" if replicates are present in the data set.
• Provides summaries of all the taxa found at each site.
• The rules for calculating the means are the same as those for the metrics sheet.

Mean abundance or **Abundance**

• Abundances are converted to a full sample basis (if subsampled) and to a standard area or volume unless otherwise specified. Refer to the bolded header line at the top of the sheet for the units used to express abundances.
• For benthic analysis, the abundances will be expressed as per m^2.
• For drift analysis, the abundances will be expressed as per 100 m^3 of water filtered.

Mean percent abundance or **Percent abundance**

• Summarizes the percentage of each taxa in the sample based on the abundance of the taxa.

Mean biomass or **Biomass**

• Biomass is calculated via length-weight regression of the form (dry mass in mg) = a*(body length in mm)^b.
• To verify the coefficients used for this particular analysis, see the "Traits" sheet columns "a" and "b".
• See the "Documentation" sheet for details on the length measurements.
• Biomass values are expressed in milligrams (mg) on a full sample basis (if subsampled) and converted to a standard area or volume unless otherwise specified. Refer to the bolded header line at the top of the sheet for the units used to express biomass.
• For benthic analysis, the biomass values are expressed as (mg) per m^2.
• For drift analysis, the biomass values are expressed at (mg) per 100 m^3 water filtered.

Mean percent biomass or **Percent biomass**

• Summarizes the percentage of each taxon in the sample based on the biomass of the taxa.

If the data set includes replicates:

Replicate metrics

• Provides an overview of relevant sample descriptors broken down by site and replicate.
• Any site for which the entire column below the sample identification is blank represents a sample that was empty. It is included here for reference and to facilitate the checking of the mean calculations.

Replicate Summary Sheets:
• Included when replicates are present in the data set, except for the case of Diet analyses.
• Provides summaries of all the taxa found at each site broken down by the individual replicates.
• If a column is entirely blank below the site identification, then it represents a sample that was empty. It is included here for reference and to facilitate the checking of the mean calculations.
• Sheets are otherwise the same as the Summary Sheets listed above.

Replicate abundance

Replicate percent abundance

Replicate biomass

Replicate percent biomass

Formats for database importation

Long output

• Provides a format that is easier to import to a database than the summary sheets.
• The "Abundance" column here may represent a raw count, an abundance per m^2 in the case of a benthic analysis, or an abundance per 100 m^3 water filtered in the case of a diet analysis. See the summary sheets for details.
• The "Biomass" column (if present) is reported in the same manner as the abundance (raw, per m^2, or per 100 m^3) in milligrams (mg). See the summary sheets for details.
• No rounding is performed on this sheet other than the number of decimals Excel maintains.

Long mean output
• Virtually identical to the "Long output" sheet with the values reported being mean values for the site across all the replicates.
• "MeanAbun" is the mean abundance, and "MeanBiom" is the mean biomass value reported in the same manner as in "Long output". The standard deviations are included for both of these values.

Further documentation

Traits
• Provides a snapshot of the coded life-history traits that were used to calculate the metrics for all of the taxa present in the data set.
• The "a" and "b" columns are the coefficients used to calculate biomass. See the explanation above for the "Mean Biomass" sheet for further details.

Metric explanation
• Provides a more detailed description of what each metric is calculating.

Record file
• This is the raw data as it was entered.
• Of note is the "Incidental" column (if present). This column denotes taxa that were identified in the sample yet omitted from the remainder of the analysis (these taxa will not appear on any other sheet in the file).
• Also of note is the "Unique" column (if present) indicating whether a taxa that was identified at a higher classification level is believed to represent a taxa that is already listed in the sample. If a taxa is marked as not unique (N), then it is not counted in any of the richness metrics.

Taxa notes
• Lists taxa identified in the sample that are excluded from the analysis (incidental taxa).
• Lists taxa identified to a higher classification level than the standard specification because of the specimen condition that are not believed to be unique from other taxa identified in the sample.
• May not be present in a data set.

Client
Pacific Habitat Services

Client contact	Craig Tumer, ct@pacifichabitat.com
Project	Pringle/Clark Creek Monitoring
Project location	Pringle and Clark Creek, Salem OR
Project objectives	Trend monitoring

Laboratory
Aquatic Biology Associates, Inc. (ABA)
3490 NW Deer Run Street, Corvallis, OR 97330
http://www.aquaticbio.com/

Contact

Robert Wisseman	James DiGiulio	Jon Lee
General taxonomy	Chironomidae taxonomy	Mite taxonomy
bobwisseman@mac.com	digiulio@peak.org	jlee@humboldt1.com

Sampling protocol

Sampling gear	D-frame net
Mesh size	500 micron
Square area sampled	8 square feet
Habitat sampled	erosional

Laboratory protocol

Mesh size	500 micron
Subsampling target count	500 organism minimum
Subsampling device	Caton tray
Sorting efficacy	95+%
Taxa abundances	converted to a full sample and 1 square meter basis

Identification protocol

Standard taxonomic effort	Pacific Northwest level 2 (unpublished)
Chironomidae (midges)	genus/species group
Oligochaeta (segmented worms)	class Oligochaeta
Acari (mites)	subclass Acari

Life stages:

U	unknown (for non-insects)
L	larvae
LE	Larval exuvia
P	pupae
PE	pupal exuvia
A	adult
E	egg

Biomass determination
Published length weight regressions used to calculate biomass.
Length of all macroinvertebrates measured to nearest 0.5 mm if individual <5 mm, or nearest 1 mm if > 5 mm.
Reported as the biomass corresponding to the taxa abundances (see laboratory protocol above).

Data analysis

Standard taxonomic effort (STE)	Version 2 ABA
Taxa traits (e.g. feeding group, etc.)	Version 2 ABA (see "Traits" tab in this output for documentation)

Programmed in R by Adam and Robert Wisseman
Version 2 of ABA STE and taxa traits is a draft version still under development.
Abundances converted to a standard full sample (if subsampled) and one square meter basis.

Date run:
Thu Jun 6 11:46:48 2013
Analysis program in developmental phase.

Benthic Invertebrate Index of Biological Integrity-BIBI (modified Karr 1998)

OR: City of Salem, for Pacific Habitat Services, Inc., Wilsonville, OR. By Aquatic Biology Associates, Inc.

Sampling method: riffle habitat, D-frame net, composite sample, 8 square foot area, 500 micron mesh.
Subsampling: 500 organism minimum or entire sample. Level 2 PNW standard taxonomic effort.
Abundances adjusted to a full sample and square meter basis.

	Site	Clark Creek CC1		EF Pringle Creek PC1		Pringle Creek PC2	
	Date	5/14/2013		5/14/2013		5/14/2013	
	METRIC	Value	Score	Value	Score	Value	Score
D	Total number of taxa	28	3	39	3	31	3
D	Number Ephemeroptera taxa	1	1	2	1	1	1
D	Number Plecoptera taxa	0	1	0	1	0	1
D	Number Trichoptera taxa	1	1	5	3	4	1
D	Number of long-lived taxa	3	3	2	1	1	1
D	Number of intolerant taxa	1	1	1	1	0	1
I	% Tolerant taxa	19.79	5	23.95	3	30.77	3
D	% Predator	5.25	1	12.74	3	2.97	1
D	Number of clinger taxa	6	1	14	3	8	1
I	% Dominance (3 taxa)	38.79	5	37.83	5	50.11	3
	TOTAL SCORE		22		24		16
	BIOLOGICAL CONDITION CATEGORY						

Maximum score of 50. Each metric scored: 1=low, 3=moderate, 5=high

OTHER COMMUNITY COMPOSITION METRICS THAT ARE INDICATIVE OF BIOLOGICAL CONDITION

	Total abundance (m2)	1937		1132		2543	
D	EPT taxa richness	2		7		5	
D	Predator richness	3		6		2	
D	Scraper richness	1		7		6	
D	Shredder richness	4		5		3	
D	%Intolerant taxa	0.4		3.23		0	
I	*% Baetis tricaudatus*	16.36		3.23		16.56	
I	%Collector	77.58		60.27		64.12	
I	%Parasite	0.4		6.27		1.49	
I	%Oligochaeta	4.85		11.98		16.77	
I	Number tolerant taxa	6		11		11	
I	%Simuliidae	3.43		0.76		12.1	
I	%Chironomidae	67.88		48.29		37.79	

L,M & H comparisons with a Pacific Northwest montane stream with high biological integrity.

I= Metric value generally increases with declining biological integrity.
D= Metric value generally decreases with declining biological integrity.

L= Low biological integrity.		BIBI scores between 0-24.
M= Moderate biological integrity.		BIBI scores between 25-39.
H= High biological integrity.		BIBI scores >40.

Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.

Waterbody	Clark Creek	EF Pringle Creek	Pringle Creek
Station	CC1	PC1	PC2
Date	5/14/13	5/14/13	5/14/13
Subsample count	495	526	471
Subsample correction factor to full sample	2.91	1.6	4
Area correction factor to square meter	1.345	1.345	1.345
SUMMARY METRICS			
Total taxa richness	28	39	31
Total abundance	1937	1132	2534
EPT taxa richness	2	7	5
EPT abundance	399	62	473
Hilsenhoff Biotic Index (WY DEQ version)	5.86	5.95	5.94
DOMINANCE AND DIVERSITY			
% Dominant taxa	16.36	15.02	16.77
% Subdominant taxa	14.75	11.98	16.77
% Top 3 taxa	38.79	37.83	50.11
% Top 5 taxa	52.53	54.18	68.58
% Top 10 taxa	76.36	71.86	84.71
Shannon-Weaver Diversity (loge)	2.79	3.03	2.6
Shannon-Weaver Diversity (log2)	4.03	4.38	3.75
TOLERANT AND INTOLERANT TAXA			
% Total tolerant taxa	4.65	21.48	15.71
Total tolerant taxa richness	5	11	10
Total tolerant taxa abundance	90	243	398
% Highly tolerant taxa	1.82	0.95	0.85
Highly tolerant taxa richness	1	1	2
Highly tolerant taxa abundance	35	11	22
% Moderately tolerant taxa	2.83	20.53	14.86
Moderately tolerant taxa richness	4	10	8
Moderately tolerant taxa abundance	55	232	377
% Total intolerant taxa	0.4	3.23	0
Total intolerant taxa richness	1	1	0
Total intolerant taxa abundance	8	37	0
% Highly intolerant taxa	0	0	0
Highly intolerant taxa richness	0	0	0
Highly intolerant taxa abundance	0	0	0
% Moderately Intolerant taxa	0.4	3.23	0
Moderately intolerant taxa richness	1	1	0
Moderately intolerant taxa abundance	8	37	0
VOLTINISM (length of life cycle)			
% Semivoltine (> 1 year life cycle)	1.41	24.71	2.97
% Univoltine (1 year life cycle)	9.29	16.16	21.44
% Multivoltine (< 1 year life cycle)	89.29	59.13	75.58

Waterbody	Clark Creek	EF Pringle Creek	Pringle Creek
Station	CC1	PC1	PC2
Date	5/14/13	5/14/13	5/14/13
Semivoltine taxa abundance	27	280	75
Univoltine taxa abundance	180	183	543
Multivoltine taxa abundance	1730	669	1915
Semivoltine taxa richness	4	5	2
Univoltine taxa richness	3	8	5
Multivoltine taxa richness	21	26	24
GROWTH AND DEVELOPMENT			
% Fast seasonal life cycle	87.88	53.8	66.45
% Slow seasonal life cycle	10.91	35.93	31.63
% Nonseasonal life cycle	1.21	10.27	1.91
OCCURRENCE IN DRIFT			
% Rare in drift	11.92	40.87	31.21
% Common in drift	0.4	6.84	2.34
% Abundant in drift	87.68	52.28	66.45
SIZE AT MATURITY			
% Small size at maturity	87.07	67.49	69.85
% Medium size at maturity	12.53	17.3	28.03
% Large size at maturity	0.4	15.21	2.12
Small size at maturity abundance	1687	764	1770
Medium size at maturity abundance	243	196	710
Large size at maturity abundance	8	172	54
Small size at maturity taxa richness	19	28	21
Medium size at maturity taxa richness	7	9	9
Large size at maturity taxa richness	2	2	1
RHEOPHILY AND HABITAT AFFINITY			
% Depositional only	9.49	3.61	17.41
% Depositional and erosional	87.07	95.25	69.43
% Erosional	3.43	1.14	13.16
THERMAL PREFERENCE			
% Cold stenothermal and cool eurythermal	2.63	3.42	0
% Cool/warm eurythermal	97.37	96.58	99.79
% Warm eurythermal	0	0	0.21
NON-INSECT AND INSECT ORDERS			
% Non-insect invertebrates	7.27	43.35	31
% Ephemeroptera (mayflies)	16.36	3.8	16.56
% Odonata (damsel- and dragonflies)	0	0	0.42
% Plecoptera (stoneflies)	0	0	0
% Hemiptera (true bugs)	0	0	0
% Megaloptera (alderflies and hellgramites)	0	0	0
% Trichoptera (caddisflies)	4.24	1.71	2.12
% Lepidoptera (moths)	0	0	0
% Coleoptera (beetles)	0.2	1.14	0
% Diptera (total)(true flies)	71.92	50	49.89

Waterbody	Clark Creek	EF Pringle Creek	Pringle Creek
Station	CC1	PC1	PC2
Date	5/14/13	5/14/13	5/14/13
% Chironomidae (true flies- midges)	67.88	48.29	37.79
Non-insect taxa richness	5	8	9
Ephemeroptera taxa richness	1	2	1
Odonata taxa richness	0	0	1
Plecoptera taxa richness	0	0	0
Hemiptera taxa richness	0	0	0
Megaloptera taxa richness	0	0	0
Trichoptera taxa richness	1	5	4
Lepidoptera taxa richness	0	0	0
Coleoptera taxa richness	1	3	0
Diptera (total) taxa richness	20	21	16
Chironomidae taxa richness	16	19	15
Non-insect abundance	141	491	785
Ephemeroptera abundance	317	43	420
Odonata abundance	0	0	11
Plecoptera abundance	0	0	0
Hemiptera abundance	0	0	0
Megaloptera abundance	0	0	0
Trichoptera abundance	82	19	54
Lepidoptera abundance	0	0	0
Coleoptera abundance	4	13	0
Diptera (total) abundance	1393	566	1264
Chironomidae abundance	1315	547	958
INDICATOR TAXA			
Mollusca (snails and bivalves) taxa richness	1	4	5
Crustacea taxa richness	2	1	1
Baetidae (mayfly) taxa richness	1	2	1
Ephemerellidae (mayfly) taxa richness	0	0	0
Heptageniidae (mayfly) taxa richness	0	0	0
Nemouridae (stonefly) taxa richness	0	0	0
Rhyacophilidae (caddisfly) taxa richness	0	0	0
Hydropsychidae (caddisfly) taxa richness	0	1	1
Elmidae (riffle beetle) taxa richness	1	2	0
Oligochaeta (segmented worms) abundance	94	136	425
Mollusca abundance	16	280	199
Crustacea abundance	23	4	124
Acari (mites) abundance	8	56	27
Baetidae abundance	317	43	420
Baetis tricaudatus (mayfly) abundance	317	37	420
Ephemerellidae abundance	0	0	0
Heptageniidae abundance	0	0	0
Nemouridae abundance	0	0	0
Rhyacophililidae abundance	0	0	0
Hydropsychidae taxa abundance	0	4	22

Waterbody	Clark Creek	EF Pringle Creek	Pringle Creek
Station	CC1	PC1	PC2
Date	5/14/13	5/14/13	5/14/13
Elmidae abundance	4	11	0
Simuliidae abundance	67	9	307
Tanytarsini midge abundance	286	15	32
% Oligochaeta (segmented worms)	4.85	11.98	16.77
% Mollusca	0.81	24.71	7.86
% Crustacea	1.21	0.38	4.88
% Acari	0.4	4.94	1.06
% Baetidae	16.36	3.8	16.56
% Baetis tricaudatus	16.36	3.23	16.56
% Ephemerellidae	0	0	0
% Heptageniidae	0	0	0
% Nemouridae	0	0	0
% Rhyacophilidae	0	0	0
% Hydropsychidae	0	0.38	0.85
% Elmidae	0.2	0.95	0
% Simuliidae	3.43	0.76	12.1
% Tanytarsini	14.75	1.33	1.27
FEEDING GROUPS			
Predator taxa richness	3	6	2
Parasite taxa richness	1	2	2
Collector-gatherer taxa richness	16	16	15
Collector-filterer taxa richness	2	4	3
Collector (total) taxa richness	18	20	18
Piercer herbivore taxa richness	0	1	1
Macrophyte herbivore taxa richness	1	1	1
Shredder taxa richness	3	3	1
Scraper taxa richness	1	5	5
Omnivore taxa richness	1	1	1
Unknown taxa richness	0	0	0
Predator abundance	102	144	75
Parasite abundance	8	71	38
Collector-gatherer abundance	1421	570	1275
Collector-filterer abundance	82	112	350
Collector (total) abundance	1503	682	1625
Piercer herbivore abundance	0	6	11
Macrophyte herbivore abundance	82	15	161
Shredder abundance	90	15	16
Scraper abundance	149	28	554
Omnivore abundance	4	170	54
Unknown abundance	0	0	0
% Predator	5.25	12.74	2.97
% Parasite	0.4	6.27	1.49
% Collector-gatherer	73.33	50.38	50.32
% Collector-filterer	4.24	9.89	13.8

Waterbody	Clark Creek	EF Pringle Creek	Pringle Creek
Station	CC1	PC1	PC2
Date	5/14/13	5/14/13	5/14/13
% Collector (total)	77.58	60.27	64.12
% Piercer herbivore	0	0.57	0.42
% Macrophyte herbivore	4.24	1.33	6.37
% Shredder	4.65	1.33	0.64
% Scraper	7.68	2.47	21.87
% Omnivore	0.2	15.02	2.12
% Unknown	0	0	0
HABIT			
Skater taxa richness	0	0	0
Planktonic taxa richness	0	0	0
Diver taxa richness	0	0	0
Swimmer taxa richness	2	2	2
Clinger taxa richness	6	15	13
Sprawler taxa richness	15	15	10
Climber taxa richness	1	2	2
Burrower taxa richness	4	5	4
Unknowns taxa richness	0	0	0
Skater abundance	0	0	0
Planktonic abundance	0	0	0
Diver abundance	0	0	0
Swimmer abundance	27	60	151
Clinger abundance	904	325	1566
Sprawler abundance	697	448	291
Climber abundance	82	6	27
Burrower abundance	227	293	500
Unknowns abundance	0	0	0
% Skater	0	0	0
% Planktonic	0	0	0
% Diver	0	0	0
% Swimmer	1.41	5.32	5.94
% Clinger	46.67	28.71	61.78
% Sprawler	35.96	39.54	11.46
% Climber	4.24	0.57	1.06
% Burrower	11.72	25.86	19.75
% Unknown	0	0	0
STATE OF CALIFORNIA DESIGNATIONS			
CA % Sensitive EPT	4.24	0.76	0.85
CA % Intolerant individuals	8.48	3.99	1.06
CA % Tolerant individuals	4.24	15.02	3.18
CA weighted tolerance value	5.84	5.96	5.86
CA % Predators	5.66	19.01	4.46
CA % Collector-gatherers	69.9	46.39	46.92
CA % Filterers	4.24	9.51	13.8
CA % Scrapers	7.68	17.3	23.99

Waterbody	Clark Creek	EF Pringle Creek	Pringle Creek
Station	CC1	PC1	PC2
Date	5/14/13	5/14/13	5/14/13
CA % Shredders	6.87	2.85	2.55

BIOTIC CONDITION INDEX

CTQa- Community Tolerance Quotient actual	100.32	97.79	101.23
CTQd-Community Tolerance Quotient dominance	100.65	103.14	102.37

Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.

							Waterbody	Clark Creek	EF Pringle Creek	Pringle Creek
							Station	CC1	PC1	PC2
							Date	2013-05-14	2013-05-14	2013-05-14
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	Abundance	Abundance	Abundance
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms		15	11
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	94	136	425
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails		11	81
Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails			38
Gyraulus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails			5
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails		170	54
Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	16	95	22
Sphaerium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams		4	
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp		4	
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	20		124
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	4		
Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	8	56	27
Argia	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Coenagrionidae	damselflies			11
Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	317	37	420
Diphetor hageni	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies		6	
Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies			5
Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies		4	22
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies		6	11
Lepidostoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	82	4	16
Lepidostoma-turret case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies		2	
Dicosmoecus gilvipes	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Limnephilidae	caddisflies		2	
Lara	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	4	9	
Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles		2	
Brychius	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles		2	
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	4	11	
Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	4		
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	67	9	307
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	4		
Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	78	22	27
Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	43	17	48
Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	35		16
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	117	43	5
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		26	5
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges		6	
Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		28	
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	23	4	38
Heterotrissocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	8	37	
Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	8		
Macropelopia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges		11	
Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	286	15	32
Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges			5
Nilotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges		15	
Orthocladius complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	8	15	16
Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	149	123	86
Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges		22	
Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	149	11	425
Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	82	15	161
Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges		11	

Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.

							Waterbody	Clark Creek	EF Pringle Creek	Pringle Creek
							Station	CC1	PC1	PC2
							Date	2013-05-14	2013-05-14	2013-05-14
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	Abundance	Abundance	Abundance
Pseudodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	43		
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	110		16
Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	74		5
Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	8	15	5
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	94	90	65
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		22	

Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.

							Waterl
							Station
							Date
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Comm
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segme
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails
Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails
Gyraulus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails
Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea cl
Sphaerium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea cl
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed s
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfis
Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites
Argia	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Coenagrionidae	damse
Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayfli
Diphetor hageni	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayfli
Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddis
Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddis
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddis
Lepidostoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddis
Lepidostoma-turret case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddis
Dicosmoecus gilvipes	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Limnephilidae	caddis
Lara	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle b
Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle b
Brychius	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawlir
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see
Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black f
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane
Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midge
Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midge
Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midge
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midge
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midge
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midge
Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midge
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midge
Heterotrissocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midge
Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midge

Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.

							Waterb
							Station
							Date
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Comm
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges
Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges
Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges

Waterbody	Station	Date	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Clark Creek	CC1	2013-05-14	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	66.53715
Clark Creek	CC1	2013-05-14	Lepidostoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	82.19295
Clark Creek	CC1	2013-05-14	Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	3.91395
Clark Creek	CC1	2013-05-14	Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	3.91395
Clark Creek	CC1	2013-05-14	Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	3.91395
Clark Creek	CC1	2013-05-14	Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	317.02995
Clark Creek	CC1	2013-05-14	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	78.279
Clark Creek	CC1	2013-05-14	Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	35.22555
Clark Creek	CC1	2013-05-14	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	148.7301
Clark Creek	CC1	2013-05-14	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	82.19295
Clark Creek	CC1	2013-05-14	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	285.71835
Clark Creek	CC1	2013-05-14	Pseudodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	43.05345
Clark Creek	CC1	2013-05-14	Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	43.05345
Clark Creek	CC1	2013-05-14	Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	117.4185
Clark Creek	CC1	2013-05-14	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	23.4837
Clark Creek	CC1	2013-05-14	Heterotrissocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	7.8279
Clark Creek	CC1	2013-05-14	Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	7.8279
Clark Creek	CC1	2013-05-14	Orthocladius complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	7.8279
Clark Creek	CC1	2013-05-14	Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	148.7301
Clark Creek	CC1	2013-05-14	Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	109.5906
Clark Creek	CC1	2013-05-14	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	74.36505
Clark Creek	CC1	2013-05-14	Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	7.8279
Clark Creek	CC1	2013-05-14	Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	93.9348
Clark Creek	CC1	2013-05-14	Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	7.8279
Clark Creek	CC1	2013-05-14	Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	3.91395
Clark Creek	CC1	2013-05-14	Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	15.6558
Clark Creek	CC1	2013-05-14	Lara	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	3.91395
Clark Creek	CC1	2013-05-14	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	19.56975
Clark Creek	CC1	2013-05-14	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	93.9348
EF Pringle Creek	PC1	2013-05-14	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	8.608
EF Pringle Creek	PC1	2013-05-14	Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	4.304
EF Pringle Creek	PC1	2013-05-14	Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	6.456
EF Pringle Creek	PC1	2013-05-14	Lepidostoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	4.304
EF Pringle Creek	PC1	2013-05-14	Lepidostoma-turret case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	2.152
EF Pringle Creek	PC1	2013-05-14	Dicosmoecus gilvipes	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Limnephilidae	caddisflies	2.152
EF Pringle Creek	PC1	2013-05-14	Brychius	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	2.152
EF Pringle Creek	PC1	2013-05-14	Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	36.584
EF Pringle Creek	PC1	2013-05-14	Diphetor hageni	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	6.456
EF Pringle Creek	PC1	2013-05-14	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	21.52
EF Pringle Creek	PC1	2013-05-14	Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	6.456
EF Pringle Creek	PC1	2013-05-14	Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	21.52
EF Pringle Creek	PC1	2013-05-14	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	10.76
EF Pringle Creek	PC1	2013-05-14	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	15.064
EF Pringle Creek	PC1	2013-05-14	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	15.064
EF Pringle Creek	PC1	2013-05-14	Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	17.216
EF Pringle Creek	PC1	2013-05-14	Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	43.04
EF Pringle Creek	PC1	2013-05-14	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	25.824
EF Pringle Creek	PC1	2013-05-14	Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	27.976
EF Pringle Creek	PC1	2013-05-14	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4.304
EF Pringle Creek	PC1	2013-05-14	Heterotrissocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	36.584
EF Pringle Creek	PC1	2013-05-14	Orthocladius complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	15.064
EF Pringle Creek	PC1	2013-05-14	Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	122.664
EF Pringle Creek	PC1	2013-05-14	Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	15.064
EF Pringle Creek	PC1	2013-05-14	Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	21.52
EF Pringle Creek	PC1	2013-05-14	Macropelopia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	10.76
EF Pringle Creek	PC1	2013-05-14	Nilotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	15.064
EF Pringle Creek	PC1	2013-05-14	Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	10.76
EF Pringle Creek	PC1	2013-05-14	Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	90.384
EF Pringle Creek	PC1	2013-05-14	Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	55.952

Waterbody	Station	Date	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
EF Pringle Creek	PC1	2013-05-14	Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	10.76
EF Pringle Creek	PC1	2013-05-14	Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	94.688
EF Pringle Creek	PC1	2013-05-14	Sphaerium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	4.304
EF Pringle Creek	PC1	2013-05-14	Lara	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	8.608
EF Pringle Creek	PC1	2013-05-14	Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	2.152
EF Pringle Creek	PC1	2013-05-14	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	15.064
EF Pringle Creek	PC1	2013-05-14	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	4.304
EF Pringle Creek	PC1	2013-05-14	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	135.576
EF Pringle Creek	PC1	2013-05-14	Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails	10.76
EF Pringle Creek	PC1	2013-05-14	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	170.008
Pringle Creek	PC2	2013-05-14	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	306.66
Pringle Creek	PC2	2013-05-14	Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	5.38
Pringle Creek	PC2	2013-05-14	Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	21.52
Pringle Creek	PC2	2013-05-14	Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	10.76
Pringle Creek	PC2	2013-05-14	Lepidostoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	16.14
Pringle Creek	PC2	2013-05-14	Argia	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Coenagrionidae	damselflies	10.76
Pringle Creek	PC2	2013-05-14	Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	419.64
Pringle Creek	PC2	2013-05-14	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	26.9
Pringle Creek	PC2	2013-05-14	Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	16.14
Pringle Creek	PC2	2013-05-14	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	425.02
Pringle Creek	PC2	2013-05-14	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	161.4
Pringle Creek	PC2	2013-05-14	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	32.28
Pringle Creek	PC2	2013-05-14	Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	48.42
Pringle Creek	PC2	2013-05-14	Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38
Pringle Creek	PC2	2013-05-14	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38
Pringle Creek	PC2	2013-05-14	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	37.66
Pringle Creek	PC2	2013-05-14	Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38
Pringle Creek	PC2	2013-05-14	Orthocladius complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	16.14
Pringle Creek	PC2	2013-05-14	Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	86.08
Pringle Creek	PC2	2013-05-14	Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	16.14
Pringle Creek	PC2	2013-05-14	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38
Pringle Creek	PC2	2013-05-14	Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38
Pringle Creek	PC2	2013-05-14	Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	64.56
Pringle Creek	PC2	2013-05-14	Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	26.9
Pringle Creek	PC2	2013-05-14	Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	21.52
Pringle Creek	PC2	2013-05-14	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	10.76
Pringle Creek	PC2	2013-05-14	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	123.74
Pringle Creek	PC2	2013-05-14	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	425.02
Pringle Creek	PC2	2013-05-14	Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails	80.7
Pringle Creek	PC2	2013-05-14	Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	37.66
Pringle Creek	PC2	2013-05-14	Gyraulus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	5.38
Pringle Creek	PC2	2013-05-14	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	53.8

Taxon	Stage	Insect.	Origin	Higher.classification	Order	Family	Common.name	Range	Feeding.Group	CA.feeding.group	Habit	Tolerance	WY.HBI	PSSB.tole	CA.tolerar	HDG.toler	BCI.TV	PSSB.long	Voltinism	Developm	Occurrenc	Size.at.ma	Rheophily	Thermal.p	a	b
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	0	CG	CG	BU	0.0	5	0	5	0	108	0	2	2	1	2	2	2	0.0758	0.74
Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	0	CF	CF	BU	0.0	8	0	8	0	108	0	1	3	1	2	2	2	0.0163	2.477
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	0	CG	CG	SW	MT	11	0	4	0	108	0	3	2	1	2	2	2	0.0058	3.015
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	0	OM	OM	SP	0.0	6	0	6	0	108	0	1	3	1	3	2	2	0.0147	3.626
Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	0	PA	PR	SW	0.0	5	0	5	0	108	0	3	2	2	1	2	2	0.053	2.494
Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	0	CG	CG	CL	0.0	6	0	6	0	72	0	3	1	3	1	2	2	0.0053	2.875
Lepidostoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	0	SH	SH	CM	0.0	1	0	1	0	18	0	2	2	1	2	2	2	0.0079	2.649
Lara	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	0	SH	SH	CL	0.0	4	0	4	0	104	0	1	3	1	2	2	2	0.0074	2.879
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	0	PR	PR	SP	0.0	6	0	6	0	108	0	2	1	1	2	2	2	0.0025	2.469
Hemerodromia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	0	PR	PR	SP	MT	6	0	6	0	95	0	3	2	1	2	2	2	0.0054	2.546
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	0	CF	CF	CL	0.0	6	0	6	0	108	0	3	1	3	1	3	2	0.002	3.011
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	0	SH	SH	BU	0.0	4	0	4	0	36	0	1	2	1	3	2	2	0.0029	2.681
Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	0	CG	CG	BU	0.0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	SH	SP	0.0	5	0	5	0	108	0	3	1	3	1	2	2	0.0018	2.617
Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	CG	CG	BU	HT	10	0	10	0	108	0	3	1	3	2	1	2	0.0018	2.617
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	7	0	7	0	108	0	3	1	3	1	2	2	0.0018	2.617
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	OM	SP	MT	8	0	8	0	108	0	3	1	3	1	2	2	0.0018	2.617
Heterotrissocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	MI	0	0	0	0	108	0	3	1	3	1	2	1	0.0018	2.617
Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	MT	8	0	8	0	108	0	3	1	3	1	2	2	0.0018	2.617
Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	0	CG	CG	CL	0.0	7	0	7	0	108	0	3	1	3	1	2	2	0.0018	2.617
Orthocladius complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	5	0	5	0	108	0	3	1	3	1	2	2	0.0018	2.617
Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	SC	SC	CL	0.0	7	0	7	0	108	0	3	1	3	1	1	2	0.0018	2.617
Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	MH	MH	CL	0.0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Pseudodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	0	CG	CG	SP	0.0	6	0	6	0	108	0	3	1	3	1	2	1	0.0018	2.617
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	2	0	2	0	108	0	3	1	3	1	2	2	0.0018	2.617
Thienemanniella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0	PR	PR	SP	0.0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	0	PA	PR	BU	0.0	5	0	6	0	108	0	2	2	1	2	2	2	0.0758	0.74
Sphaerium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	0	CF	CG	BU	MT	6	0	8	0	108	0	1	3	1	2	2	2	0.0163	2.477
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	0	OM	SC	CL	MT	7	0	7	0	108	0	1	2	1	3	2	2	0.0208	3.03
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	0	CG	CG	SW	0.0	8	0	6	0	108	0	3	2	1	1	2	2	0.006753	2.27
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails	0	SC	SC	CL	MT	4	0	5	0	108	0	2	2	1	2	2	2	0.0208	3.03
Diphetor hageni	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	0	CG	CG	CL	0.0	5	0	5	0	72	0	3	1	2	1	2	2	0.0053	2.875
Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	0	CF	CF	CL	MT	8	0	5	0	108	0	3	3	2	2	3	2	0.0046	2.926
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	0	PH	PH	CL	MT	6	0	6	0	108	0	3	2	2	1	2	2	0.0056	2.839
Lepidostoma-turret case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	0	SH	SH	CM	0.0	1	0	1	0	18	0	2	2	1	2	1	1	0.0079	2.649
Dicosmoecus gilvipes	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Limnephilidae	caddisflies	0	SC	SC	CL	0.0	2	0	2	0	24	0	2	2	1	3	2	2	0.004	2.933
Optioservus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	0	SC	SC	CL	MT	4	0	4	0	104	0	1	3	2	1	2	2	0.0074	2.879
Brychius	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	0	SC	MH	CL	MT	5	0	5	0	54	0	2	3	2	1	2	2	0.0077	2.91
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	CL	0.0	7	0	7	0	108	0	3	1	3	1	2	2	0.0018	2.617
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	PR	PR	SP	MT	8	0	8	0	108	0	3	1	3	1	1	2	0.0018	2.617
Eukiefferiella brehmi group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	OM	SP	0.0	8	0	8	0	108	0	3	1	3	1	2	2	0.0018	2.617
Macropelopia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0	PR	PR	SP	0.0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Nilotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0	PR	PR	SP	0.0	6	0	6	0	108	0	3	1	3	1	2	2	0.0018	2.617
Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	CG	CG	BU	MT	8	0	8	0	108	0	3	1	3	1	1	2	0.0018	2.617
Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0	PR	PR	SP	HT	9	0	9	0	108	0	3	1	3	1	2	2	0.0018	2.617
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	5	0	5	0	108	0	3	1	3	1	2	2	0.0018	2.617
Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	0	SC	SC	CL	MT	6	0	6	0	108	0	3	2	1	1	2	2	0.0208	3.03
Gyraulus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	0	SC	SC	CL	HT	8	0	8	0	108	0	3	2	1	1	2	3	0.0208	3.03
Argia	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Coenagrionidae	damselflies	0	PR	PR	CM	MT	7	0	7	0	108	0	2	2	1	2	2	2	0.0051	2.785
Glossosoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Glossosomatidae	caddisflies	0	SC	SC	CL	0.0	1	0	1	0	24	0	3	3	1	2	3	2	0.0082	2.958
Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	3	0	3	0	108	0	3	1	3	1	2	2	0.0018	2.617

Explanation of metrics	All abundances and biomass converted to a full sample and 1 square meter basis.
Subsample count (raw)	Total count of subsample prior to correction factors being applied for subsampling and conversion to a 1 square meter basis.
Subsample correction factor to full sample	Multiplier to convert subsample abundances to a full sample basis, e.g. if 1/2 the sample was sorted, then the subsample correction is
Area correction factor to square meter	Converts abundances of full sample to a 1 square meter basis, e.g. if 8 square feet was sampled, then the conversion to 1 square mete
SUMMARY METRICS	
Total taxa richness	Total count of unique taxa in sample.
Total abundance	Total abundance in sample converted to a full sample and 1 square meter basis.
Total biomass (mg)	Total biomass in full sample adjusted to a 1 square meter basis as calculated by length/mass regressions.
EPT taxa richness	Taxa richness in the insect orders Ephemeroptera+Plecoptera+Trichoptera, or mayflies+stoneflies+caddisflies.
EPT abundance	
EPT biomass (mg)	
DOMINANCE AND DIVERSITY	Metrics that examine how dominated the community is by a single or few taxa.
% Dominant taxa	The % contribution of the most numerous taxon.
Biomass dominant taxa (mg)	
% Top 3 taxa	The % contribution of the 3 most numerous taxa.
Biomass top 3 taxa (mg)	
Shannon-Weaver Diversity (loge)	Information theory index that examines how evenly abundance is allocated among the taxa present in the community.
Shannon-Weaver Diversity (log2)	
TOLERANT AND INTOLERANT TAXA	Based on habitat association and best professional judgement (Wisseman unpublished). Water temperature and dissolved oxygen are
% Total tolerant taxa	Sum of the moderately and highly tolerant taxa. Taxa found frequently in habitats with warm water temperature and low dissolved oxyg
Total tolerant taxa richness	
Total tolerant taxa abundance	
Total tolerant taxa biomass (mg)	
% Highly tolerant taxa	Taxa highly tolerant of warm water and very low dissolved oxygen. Found often in stagnant and highly eutrophic habitat.
Highly tolerant taxa richness	
Highly tolerant taxa abundance	
Highly tolerant taxa biomass (mg)	
% Moderately tolerant taxa	Taxa moderately tolerant of warm water and low dissolved oxygen.
Moderately tolerant taxa richness	
Moderately tolerant taxa abundance	
Moderately tolerant taxa biomass (mg)	
% Total intolerant taxa	Sum of moderately intolerant and highly intolerant taxa. Cool and cold water biota found in habitats with high dissolved oxygen.
Total intolerant taxa richness	
Total intolerant taxa abundance	
Total intolerant taxa biomass (mg)	
% Highly intolerant taxa	Taxa generally found in habitats with year-round cold water temperatures and very high dissolved oxygen. Indicative of bull trout zone.
Highly intolerant taxa richness	
Highly intolerant taxa abundance	

Explanation of metrics	All abundances and biomass converted to a full sample and 1 square meter basis.
Highly intolerant taxa biomass (mg)	
% Moderately intolerant taxa	Taxa generally found in cool water habitats, cold to cool water eurythermal. Indicative of general salmonid zone.
Moderately intolerant taxa richness	
Moderately intolerant taxa abundance	
Moderately intolerant taxa biomass (mg)	
VOLTINISM (length of life cycle)	Modified from Poff et al. 2006
% Semivoltine (> 1 year life cycle)	Taxa where a significant proportion of individuals require more than one year to complete their life cycle.
% Univoltine (1 year life cycle)	Taxa where most individuals exhibit a one year life cycle.
% Multivoltine (< 1 year life cycle)	Taxa where a significant proportion of the population has more than one generation a year.
Semivoltine taxa abundance	
Univoltine taxa abundance	
Multivoltine taxa abundance	
Semivoltine taxa richness	
Univoltine taxa richness	
Multivoltine taxa richness	
Semivioltine taxa biomass (mg)	
Univoltine taxa biomass (mg)	
Multivoltine taxa biomass (mg)	
GROWTH AND DEVELOPMENT	Modified from Poff et al. 2006
% Fast seasonal life cycle	Taxa that grow and mature over a few months or a single season.
% Slow seasonal life cycle	Taxa where growth and maturation extends over several seasons.
% Nonseasonal life cycle	Taxa that exhibit asynchronous seasonal development, with multiple life stages present during most of the year.
OCCURRENCE IN DRIFT	Modified from Poff et al. 2006
% Rare in drift	Found rarely in stream drift. Drift occurs during catastrophic events (e.g. floods).
% Common in drift	Found commonly in stream drift.
% Abundant in drift	Dominant in stream drift, behavioral drifters.
SIZE AT MATURITY	Modified from Poff et al. 2006
% Small size at maturity	<9 mm long at maturity
% Medium size at maturity	9-16 mm long at maturity
% Large size at maturity	> 16 mm long at maturity
Small size at maturity abundance	
Medium size at maturity abundance	
Large size at maturity abundance	
Small size at maturity taxa richness	
Medium size at maturity taxa richness	
Large size at maturity taxa richness	
Small size at maturity taxa biomass (mg)	

Waterbody	Station	Date	Taxon	Stage	Abundance	Subsample.correction.factor	Area.correction.factor	Unique	Incidental	Comments
Clark Creek	CC1	5/14/2013	Oligochaeta	U	24	2.91	1.345			
Clark Creek	CC1	5/14/2013	Pisidium	U	4	2.91	1.345			
Clark Creek	CC1	5/14/2013	Crangonyx	U	5	2.91	1.345			
Clark Creek	CC1	5/14/2013	Pacifastacus	U	1	2.91	1.345			
Clark Creek	CC1	5/14/2013	Acari	U	2	2.91	1.345			
Clark Creek	CC1	5/14/2013	Baetis tricaudatus	L	81	2.91	1.345			
Clark Creek	CC1	5/14/2013	Lepidostoma	L	21	2.91	1.345			
Clark Creek	CC1	5/14/2013	Lara	L	1	2.91	1.345			
Clark Creek	CC1	5/14/2013	Ceratopogoninae	L	1	2.91	1.345			
Clark Creek	CC1	5/14/2013	Hemerodromia	L	1	2.91	1.345			
Clark Creek	CC1	5/14/2013	Simulium	L	17	2.91	1.345			
Clark Creek	CC1	5/14/2013	Tipula	L	1	2.91	1.345			
Clark Creek	CC1	5/14/2013	Chironomidae	P	20	2.91	1.345	N		
Clark Creek	CC1	5/14/2013	Brillia	L	11	2.91	1.345			
Clark Creek	CC1	5/14/2013	Chironomus	L	9	2.91	1.345			
Clark Creek	CC1	5/14/2013	Corynoneura	L	30	2.91	1.345			
Clark Creek	CC1	5/14/2013	Eukiefferiella claripennis group	L	6	2.91	1.345			
Clark Creek	CC1	5/14/2013	Heterotrissocladius	L	2	2.91	1.345			
Clark Creek	CC1	5/14/2013	Limnophyes	L	2	2.91	1.345			
Clark Creek	CC1	5/14/2013	Micropsectra	L	73	2.91	1.345			
Clark Creek	CC1	5/14/2013	Orthocladius complex	L	2	2.91	1.345			
Clark Creek	CC1	5/14/2013	Parametriocnemus	L	38	2.91	1.345			
Clark Creek	CC1	5/14/2013	Phaenopsectra	L	38	2.91	1.345			
Clark Creek	CC1	5/14/2013	Polypedilum	L	21	2.91	1.345			
Clark Creek	CC1	5/14/2013	Pseudodiamesa	L	11	2.91	1.345			
Clark Creek	CC1	5/14/2013	Rheocricotopus	L	28	2.91	1.345			
Clark Creek	CC1	5/14/2013	Synorthocladius	L	19	2.91	1.345			
Clark Creek	CC1	5/14/2013	Thienemanniella	L	2	2.91	1.345			
Clark Creek	CC1	5/14/2013	Thienemannimyia complex	L	24	2.91	1.345			
EF Pringle Creek	PC1	5/14/2013	Nemata	U	7	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Oligochaeta	U	63	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Pisidium	U	44	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Sphaerium	U	2	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Juga	U	79	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Ostracoda	U	2	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Fluminicola	U	5	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Acari	U	26	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Baetis tricaudatus	L	17	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Diphetor hageni	L	3	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Cheumatopsyche	L	2	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Hydroptila	L	3	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Lepidostoma	L	2	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Lepidostoma-turret case larvae	L	1	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Dicosmoecus gilvipes	L	1	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Lara	L	4	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Optioservus	L	1	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Brychius	L	1	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Ceratopogoninae	L	5	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Simulium	L	4	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Chironomidae	P	10	1.6	1.345	N		
EF Pringle Creek	PC1	5/14/2013	Brillia	L	8	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Corynoneura	L	20	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Cricotopus	L	12	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Cryptochironomus	L	3	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Eukiefferiella brehmi group	L	13	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Eukiefferiella claripennis group	L	2	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Heterotrissocladius	L	17	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Macropelopia	L	5	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Micropsectra	L	7	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Nilotanypus	L	7	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Orthocladius complex	L	7	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Parametriocnemus	L	57	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Paratendipes	L	10	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Phaenopsectra	L	5	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Polypedilum	L	7	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Procladius	L	5	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Thienemanniella	L	7	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Thienemannimyia complex	L	42	1.6	1.345			
EF Pringle Creek	PC1	5/14/2013	Tvetenia bavarica group	L	10	1.6	1.345			
Pringle Creek	PC2	5/14/2013	Nemata	U	2	4	1.345			
Pringle Creek	PC2	5/14/2013	Oligochaeta	U	79	4	1.345			
Pringle Creek	PC2	5/14/2013	Pisidium	U	4	4	1.345			
Pringle Creek	PC2	5/14/2013	Ferrissia	U	7	4	1.345			
Pringle Creek	PC2	5/14/2013	Gyraulus	U	1	4	1.345			
Pringle Creek	PC2	5/14/2013	Juga	U	10	4	1.345			
Pringle Creek	PC2	5/14/2013	Fluminicola	U	15	4	1.345			
Pringle Creek	PC2	5/14/2013	Crangonyx	U	23	4	1.345			
Pringle Creek	PC2	5/14/2013	Acari	U	5	4	1.345			
Pringle Creek	PC2	5/14/2013	Argia	L	2	4	1.345			
Pringle Creek	PC2	5/14/2013	Baetis tricaudatus	L	78	4	1.345			
Pringle Creek	PC2	5/14/2013	Glossosoma	L	1	4	1.345			
Pringle Creek	PC2	5/14/2013	Cheumatopsyche	L	4	4	1.345			
Pringle Creek	PC2	5/14/2013	Hydroptila	L	2	4	1.345			
Pringle Creek	PC2	5/14/2013	Lepidostoma	L	3	4	1.345			
Pringle Creek	PC2	5/14/2013	Simulium	L	57	4	1.345			
Pringle Creek	PC2	5/14/2013	Chironomidae	P	5	4	1.345	N		
Pringle Creek	PC2	5/14/2013	Brillia	L	9	4	1.345			
Pringle Creek	PC2	5/14/2013	Chironomus	L	3	4	1.345			
Pringle Creek	PC2	5/14/2013	Corynoneura	L	1	4	1.345			
Pringle Creek	PC2	5/14/2013	Cricotopus	L	1	4	1.345			
Pringle Creek	PC2	5/14/2013	Eukiefferiella claripennis group	L	7	4	1.345			
Pringle Creek	PC2	5/14/2013	Micropsectra	L	6	4	1.345			
Pringle Creek	PC2	5/14/2013	Nanocladius	L	1	4	1.345			
Pringle Creek	PC2	5/14/2013	Orthocladius complex	L	3	4	1.345			
Pringle Creek	PC2	5/14/2013	Parametriocnemus	L	16	4	1.345			
Pringle Creek	PC2	5/14/2013	Phaenopsectra	L	79	4	1.345			
Pringle Creek	PC2	5/14/2013	Polypedilum	L	30	4	1.345			
Pringle Creek	PC2	5/14/2013	Rheocricotopus	L	3	4	1.345			
Pringle Creek	PC2	5/14/2013	Synorthocladius	L	1	4	1.345			

Waterbody	Station	Date	Taxon	Stage	Abundance	Subsample.correction.factor	Area.correction.factor	Unique	Incidental	Comments
Pringle Creek	PC2	5/14/2013	Thienemanniella	L	1	4	1.345			
Pringle Creek	PC2	5/14/2013	Thienemannimyia complex	L	12	4	1.345			

Incidental taxa rejected from the analysis, non-unique taxa omitted from richness metrics.

Waterbody	Station	Date	Taxon	Stage	Abundance	Subsample.correction.factor	Area.correction.factor	Unique	Incidental	Comments
Clark Creek	CC1	05/14/2013 00:00:00	Chironomidae	P	20	2.91	1.345	N		
EF Pringle Creek	PC1	05/14/2013 00:00:00	Chironomidae	P	10	1.6	1.345	N		
Pringle Creek	PC2	05/14/2013 00:00:00	Chironomidae	P	5	4	1.345	N		

Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.

% Tolerant taxa

		Waterbody	Clark Creek	EF Pringle Creek	Pringle Creek
		Station	CC1	PC1	PC2
		Date	2013-05-14	2013-05-14	2013-05-14
Taxon	Stage	Common name	% abundance	% abundance	% abundance
Fluminicola	U	snails		0.95	3.18
Ferrissia	U	snails			1.49
Gyraulus	U	snails			0.21
Juga	U	snails		15.02	2.12
Crangonyx	U	scuds	1.01		4.88
Argia	L	damselflies			0.42
Baetis tricaudatus	L	mayflies	16.36	3.23	16.56
Cheumatopsyche	L	caddisflies		0.38	0.85
Hydroptila	L	caddisflies		0.57	0.42
Optioservus	L	riffle beetles		0.19	
Brychius	L	crawling water beetles		0.19	
Hemerodromia	L	dance flies	0.2		
Chironomus	L	midges	1.82		0.64
Cryptochironomus	L	midges		0.57	
Limnophyes	L	midges	0.4		
Paratendipes	L	midges		1.9	
Procladius	L	midges		0.95	
		% Tolerant taxa	19.79	23.95	30.77

Appendix C

Physical Habitat Data – East Fork Pringle Creek

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/17/13

TRANSECT: ☒ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE — For Transect A-B ONLY — Increment (m)x.x: 1.0m — Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[1] Present (Y/ N)	BAR WIDTH[1] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	30.7	2.6	N		N	GL	N	N	N		
1	28.4		N		N	GL	N	N	N		
2	28.8		N		N	GL	N	N	N		
3	30.4		N		N	GL	N	N	N		
4	31.3		N		N	GL	N	N	N		
5	36.1	-	N	-	N	GL	N	N	N		
6	28.2		N		N	GL	N	N	N		
7	26.3	2.06	N	N/A	N	GL	N	N	N		
8	20.0		N		N	RI	N	N	N		
9	19.4		N		N	RI	N	N	N		
10	16.8		N		N	RI	N	N	N		
11	19.1		N		N	RI	N	N	N		
12	19.6		N		N	RI	N	N	N		
13	17.8		N		N	RI	N	N	N		
14	17.4		N		N	RI	N	N	N		Yellow jacket nest at transect B in dense vegetation.

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GF	GC	GC	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☒ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[2] Present (Y/ N)	BAR WIDTH[2] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	20.3	2.1	N	-	N	RI	N	N	N		
1	42.1		N		N	GL	N	N	N		
2	45.6		N		N	GL	N	N	N		
3	25.1		N		N	RI	N	N	N		
4	17.7		N		N	RI	N	N	N		
5	19.3	-	N		N	RI	N	N	N		
6	23.3		N		N	RI	N	N	N		
7	18.2	2.0	N		N	GL	N	N	N		
8	22.8		N		N	GL	N	N	N		
9	30.8		N		N	PL	N	N	N		
10	46.6		N		N	PL	N	N	N		
11	57.7		N		N	PL	N	N	N		
12	76.0		N		N	PL	N	N	N		
13	79.2		N		N	PL	N	N	N		
14	73.1		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GC	GC	GC	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☒ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE — For Transect A-B ONLY — Increment (m)x.x: 1.0m — Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[3] Present (Y/ N)	BAR WIDTH[3] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	53.4	3.5	N		N	GL	N	N	N		Below concrete sluice
1	13.1		N		N	GL	N	N	N		Concrete sluice
2	27.8		N		N	GL	N	N	N		Immediately upstream of concrete sluice
3	30.3		N		N	GL	N	N	N		
4	37.7		N		N	GL	N	N	N		
5	34.9	-	N	-	N	GL	N	N	N		
6	35.6		N		N	GL	N	N	N		
7	31.9	2.2	N		N	GL	N	N	N		
8	29.5		N		N	GL	N	N	N		
9	28.5		N		N	GL	N	N	N		
10	27.1		N		N	GL	N	N	N		
11	25.2		N		N	GL	N	N	N		
12	29.1		N		N	GL	N	N	N		
13	32.2		N		N	GL	N	N	N		
14	37.8		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	FN	GF	GF	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length) — **CHECK IF ALL UNMARKED BOXES ARE ZERO** X — **FLAG**

Diameter Large End	Pieces All/Part in Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m	Pieces Bridge Above Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☒ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[4] Present (Y/ N)	BAR WIDTH[4] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	29.8	2.2	N	-	N	GL	N	N	N		
1	25.9		N		N	GL	N	N	N		
2	26.2		N		N	GL	N	N	N		
3	28.9		N		N	GL	N	N	N		
4	28.4		N		N	GL	N	N	N		
5	30.9	-	N	-	N	GL	N	N	N		
6	31.0		N		N	GL	N	N	N		
7	36.6	2.4	N	-	N	GL	N	N	N		
8	38.6		N		N	GL	N	N	N		
9	40.7		N		N	GL	N	N	N		
10	32.9		N		N	GL	N	N	N		
11	35.4		N		N	GL	N	N	N		
12	34.5		N		N	GL	N	N	N		
13	30.0		N		N	GL	N	N	N		
14	24.9		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GF	GC	GC	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☒ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE — For Transect A-B ONLY — Increment (m) x.x: 1.0m — Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[5] Present (Y/ N)	BAR WIDTH[5] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	27.1	1.7	N	-	N	RI	N	N	N		
1	25.2		N		N	RI	N	N	N		
2	21.6		N		N	RI	N	N	N		
3	19.6		N		N	RI	N	N	N		
4	21.0		N		N	RI	N	N	N		
5	21.2	-	N	-	N	RI	N	N	N		
6	21.3		N		N	RI	N	N	N		
7	21.8	2.5	N	-	N	RI	N	N	N		
8	21.8		N		N	RI	N	N	N		
9	22.6		N		N	RI	N	N	N		
10	27.1		N		N	RI	N	N	N		
11	24.8		N		N	RI	N	N	N		
12	23.6		N		N	RI	N	N	N		
13	22.6		N		N	GL	N	N	N		
14	23.8		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	CB	CB	GC	FN		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length) — **CHECK IF ALL UNMARKED BOXES ARE ZERO** X — **FLAG**

Diameter Large End	Pieces All/Part in Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m	Pieces Bridge Above Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☒ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE — For Transect A-B ONLY — Increment (m) x.x: 1.0m — Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[6] Present (Y/ N)	BAR WIDTH[6] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	24.4	1.7	N	-	N	GL	N	N	N		
1	25.6		N		N	GL	N	N	N		
2	23.9		N		N	GL	N	N	N		
3	24.7		N		N	GL	N	N	N		
4	24.8		N		N	GL	N	N	N		
5	23.3	-	N	-	N	GL	N	N	N		
6	20.5		N		N	GL	N	N	N		
7	25.8	2.1	N	-	N	GL	N	N	N		
8	21.4		N		N	GL	N	N	N		
9	22.1		N		N	GL	N	N	N		
10	23.5		N		N	GL	N	N	N		
11	22.6		N		N	GL	N	N	N		
12	25.7		N		N	GL	N	N	N		
13	29.1		N		N	GL	N	N	N		
14	29.9		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GC	GC	GC	FN		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length) — **CHECK IF ALL UNMARKED BOXES ARE ZERO** X — **FLAG**

Diameter Large End	Pieces All/Part in Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m	Pieces Bridge Above Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☒ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE — For Transect A-B ONLY — Increment (m) x.x: 1.0m — Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[7] Present (Y/ N)	BAR WIDTH[7] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	30.0	2.6	N	-	N	GL	N	N	N		
1	31.8		N		N	GL	N	N	N		
2	31.6		N		N	GL	N	N	N		
3	29.6		N		N	GL	N	N	N		
4	24.8		N		N	GL	N	N	N		
5	21.3	-	N	-	N	GL	N	N	N		
6	23.7		N		N	GL	N	N	N		
7	21.4	2.6	N		N	GL	N	N	N		
8	20.1		N		N	GL	N	N	N		
9	21.1		N		N	GL	N	N	N		
10	24.5		N		N	GL	N	N	N		Downstream of 12” RCP discharge, likely drain from field
11	25.6		N		N	GL	N	N	N		
12	27.9		N		N	GL	N	N	N		
13	26.6		N		N	GL	N	N	N		
14	23.3		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GC	GC	GC	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**	**X**	**FLAG**	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☒ H-I ☐ I-J ☐ J-K

THALWEG PROFILE — For Transect A-B ONLY — Increment (m) x.x: 1.0m — Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[8] Present (Y/ N)	BAR WIDTH[8] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	28.2	2.9	N	-	N	GL	N	N	N		
1	27.1		N		N	GL	N	N	N		
2	23.5		N		N	GL	N	N	N		
3	27.2		N		N	GL	N	N	N		
4	24.0		N		N	GL	N	N	N		
5	23.7	-	N	-	N	GL	N	N	N		
6	22.1		N		N	GL	N	N	N		
7	23.1	2.4	N	-	N	GL	N	N	N		
8	24.0		N		N	GL	N	N	N		
9	22.9		N		N	GL	N	N	N		
10	23.9		N		N	GL	N	N	N		
11	23.3		N		N	GL	N	N	N		
12	27.6		N		N	GL	N	N	N		
13	22.8		N		N	GL	N	N	N		
14	24.2		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GC	GC	GC	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☒ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m) x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[9] Present (Y/ N)	BAR WIDTH[9] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	23.6	2.9	N	-	N	RI	N	N	N		
1	21.9		N		N	RI	N	N	N		
2	19.4		N		N	RI	N	N	N		
3	17.3		N		N	GL	N	N	N		
4	17.6		N		N	GL	N	N	N		
5	18.8	-	N	-	N	GL	N	N	N		
6	18.9		N		N	GL	N	N	N		
7	22.9	3.0	N		N	GL	N	N	N		
8	22.6		N		N	GL	N	N	N		
9	25.2		N		N	GL	N	N	N		
10	22.6		N		N	GL	N	N	N		
11	23.5		N		N	GL	N	N	N		
12	22.6		N		N	GL	N	N	N		
13	22.9		N		N	GL	N	N	N		
14	22.1		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	GC	GC	GC	GC	GC		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☒ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[10] Present (Y/ N)	BAR WIDTH[10] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	19.8	2.7	N	-	N	GL	N	N	N		
1	21.9		N		N	GL	N	N	N		
2	18.6		N		N	GL	N	N	N		
3	23.8		N		N	GL	N	N	N		
4	21.9		N		N	GL	N	N	N		
5	18.7	-		-	N	GL	N	N	N		
6	19.9		N		N	GL	N	N	N		
7	17.9		N		N	GL	N	N	N		
8	17.6		N		N	GL	N	N	N		
9	22.9		N		N	GL	N	N	N		
10	25.6		N		N	GL	N	N	N		
11	22.0		N		N	GL	N	N	N		
12	18.9		N		N	GL	N	N	N		
13	22.9		N		N	GL	N	N	N		
14	23.8		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GC	GC	GC	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/26/13	**TRANSECT:**	☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.66	31.3	GF	30	
Ctr	1.32	30.4	GF	60	
RCtr	1.98	32.0	GF	10	
Right	2.64	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	0 **1** 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	76	0	
Right	302	0.16	
Wetted Width xxx.x m		2.64	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.6	
Bankfull Height xx.x m		0.75	
Incised Height xx.x m		1.02	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	3		CenR	2	
CenL	3		Left	K	
CenDwn	0		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	**0** 1 2 3 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 **4**	0 1 2 **3** 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	**0** 1 2 3 4	0 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 3 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE:	**TRANSECT:**	☐ **A** ☒ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.52	16.1	GC	90	
Ctr	1.04	16.1	GF	2	
RCtr	1.56	19.0	GC	2	
Right	2.08	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	**0** 1 2 3 4	**0** 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 **4**	0 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	**0** 1 2 3 4	**0** 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 **4**	0 1 2 3 **4**	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	82	0.0	
Right	298	0.35	
Wetted Width xxx.x m		2.08	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.62	
Bankfull Height xx.x m		0.43	
Incised Height xx.x m		0.69	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	16		CenR	9	
CenL	15		Left	K	
CenDwn	11		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☒ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.88	58.4	GC	80	
Ctr	1.76	50.4	GF	20	
RCtr	2.64	44.6	GC	95	
Right	3.52	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	0 1 **2** 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 **3** 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	**0** 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 **3** 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	0 P C **B**	0 P C **B**	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 **P** C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	74	0.15	
Right	82	0.0	
Wetted Width xxx.x m		3.5	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.44	
Bankfull Height xx.x m		0.68	
Incised Height xx.x m		1.09	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	14	
CenL	17		Left	K	
CenDwn	9		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☒ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.54	17.2	FN	100	
Ctr	1.08	27.4	GF	20	
RCtr	1.62	28.1	FN	100	
Right	2.17	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	**0** 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 3 **4**	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	76	0.0	
Right	56	0.0	
Wetted Width xxx.x m		2.2	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.71	
Bankfull Height xx.x m		0.66	
Incised Height xx.x m		1.07	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	11		CenR	10	
CenL	0		Left	K	
CenDwn	5		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

RM

SITE ID: E. Fork Pringle Crk DATE: 6/25/13	**TRANSECT:**	☐ A ☐ B ☐ C ☐ D ☒ E ☐ F ☐ G ☐ H ☐ I ☐ J ☐ K	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.42	26.4	GF	10	
Ctr	0.84	25.6	GC	40	
RCtr	1.26	22.1	FN	100	
Right	1.69	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	0 **1** 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	0 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	**0** 1 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 3 **4**	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	**0** P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	64	0.0	
Right	61	0.0	
Wetted Width xxx.x m		1.69	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.19	
Bankfull Height xx.x m		0.56	
Incised Height xx.x m		1.11	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	7		CenR	7	
CenL	7		Left	K	
CenDwn	3		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☒ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.43	19.0	GC	10	
Ctr	0.86	25.2	GF	10	
RCtr	1.29	22.4	GF	15	
Right	1.71	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	0 **1** 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	66	0.0	
Right	58	0.0	
Wetted Width xxx.x m		1.71	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.62	
Bankfull Height xx.x m		0.58	
Incised Height xx.x m		0.96	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	6		CenR	9	
CenL	10		Left	K	
CenDwn	5		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 **1** 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 **3** 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☒ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.64	27.8	GF	10	
Ctr	1.28	30.0	GC	25	
RCtr	1.92	29.8	FN	100	
Right	2.57	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	0 1 **2** 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	**0** 1 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 3 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	74	0.0	
Right	76	0.0	
Wetted Width xxx.x m		2.57	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.29	
Bankfull Height xx.x m		0.66	
Incised Height xx.x m		1.05	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	3		CenR	0	
CenL	13		Left	K	
CenDwn	5		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☒ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.72	21.4	GF	60	
Ctr	1.44	25.8	GF	80	
RCtr	2.16	26.1	GF	90	
Right	2.87	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 **3** 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	79	0.0	
Right	57	0.0	
Wetted Width xxx.x m		2.87	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.20	
Bankfull Height xx.x m		0.73	
Incised Height xx.x m		1.11	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	8		CenR	5	
CenL	11		Left	K	
CenDwn	1		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	**0** 1 2 3 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	**0** 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 **3** 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	0 **1** 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☒ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.73	20.3	FN	100	
Ctr	1.46	23.6	GC	30	
RCtr	2.19	18.3	GC	10	
Right	2.93	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	61	0.0	
Right	59	0.0	
Wetted Width xxx.x m		2.93	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.87	
Bankfull Height xx.x m		0.57	
Incised Height xx.x m		1.26	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	15		CenR	11	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 **3** 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☒ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.67	19.8	FN	100	
Ctr	1.34	19.3	GF	20	
RCtr	2.01	23.1	GC	10	
Right	2.66	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	0 **1** 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	0 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M N	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	**0** 1 2 3 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	**0** 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 2 **3** 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	57	0.0	
Right	281	0.15	
Wetted Width xxx.x m		2.66	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.41	
Bankfull Height xx.x m		0.43	
Incised Height xx.x m		1.09	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	9		CenR	9	
CenL	14		Left	K	
CenDwn	4		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☒ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.74	14.4	GF	20	
Ctr	1.48	18.2	GF	40	
RCtr	2.22	18.6	GC	20	
Right	2.96	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	0 1 **2** 3 4	
Overhanging Veg. = <1 m of Surface	**0** 1 2 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	K	
Right	K	K	
Wetted Width xxx.x m		2.96	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.35	
Bankfull Height xx.x m		0.65	
Incised Height xx.x m		1.22	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

	Flag				Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 2 **3** 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	0 **1** 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 **3** 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

RIPARIAN "LEGACY" TREES AND INVASIVE ALIEN PLANTS

SITE ID: E. Fork Pringle Crk DATE: 6/25/13

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS	
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present	
A	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
B	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt CEd ☐Hblack ☐G Reed ☐Engl Ivy ☒Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
C	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	0	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☒RC Grass ☐Salt Ced ☐Hblack ☐G Reed ☐Engl Ivy ☐Can This ☒Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol

INSTRUCTIONS

Legacy trees are defined as the largest tree within your search area, which is as far as you can see, but within maximum limits as follows:

Wadeable Streams: Confine search to no more than 50 m from left and right bank and extending upstream to next transect (for 'K' look upstream 4 channel widths)

Non-wadeable Rivers: Confine search to no more than 100 m from left and right bank and extending both upstream and downstream as far as you can see confidently.

Alien Plants: Confine search to riparian plots on left and right bank

Wadeable Streams: 10 m x 10 m

Non-wadeable Rivers: 10 m x 20 m

Not all aliens are to be identified in all states. See Field Manual and Plant Identification Guide.

TAXONOMIC CATEGORIES
Acacia/Mesquite
Alder/Birch
Ash
Maple/Box elder
Oak
Poplar/Cottonwood
Sycamore
Willow
Unknown or Other Deciduous
Cedar/Cypress/Sequoia
Fir (including Douglas Fir and Hemlock)
Juniper
Pine
Spruce
Unknown or Other Deciduous
Unknown or Other Broadleaf Evergreen
Snag (Dead tree of any species)

ALIEN SPECIES		
RC Grass	Reed Canarygrass	*Phalaris arundinacea*
Engl Ivy	English Ivy	*Hedera Helix*
ChGrass	Cheat Grass	*Bromus tectorum*
Salt Ced	Salt Cedar	*Tamarix spp.*
Can This	Canada thistle	*Cirsium arvense*
M This	Musk thistle	*Carduus nutans*
Hblack	Himalayan blackberry	*Rubus discolor*
Teasel	Teasel	*Dipsacus fullonum*
Spurge	Leafy spurge	*Euphorbia esula*
G Reed	Giant Reed	*Arundo donax*
C Burd	Common burdock	*Arctium minus*
Rus Ol	Russian-olive	*Elaeagnus angustifolia*

COMMENTS

Transects D to K continued on next page

RIPARIAN "LEGACY" TREES AND INVASIVE ALIEN PLANTS

SITE ID: E. Fork Pringle Crk DATE: 6/25/13

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS	
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present	
D	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30		☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
E	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30		☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☒RC Grass ☐Salt CEd ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
F	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	10m	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
G	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	20m	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
H	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	10m	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
I	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	1	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Maple	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
J	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	2	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Oak	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
K	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Willow	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol

Appendix D

Physical Habitat Data – Clark Creek

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/17/13

TRANSECT: ☒ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE — For Transect A-B ONLY — Increment (m)x.x: 1.0m — Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[1] Present (Y/ N)	BAR WIDTH[1] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	11.4	2.0	N	-	N	GL	N	N	N		
1	20.4		N		N	PL	F	N	N		
2	28.2		N		N	PL	F	N	N		
3	34.5		N		N	PL	F	N	N		
4	28.9		N		N	PL	F	N	N		
5	18.7	-	N	-	N	GL	N	N	N		
6	10.6		N		N	RI	N	N	N		
7	10.6	1.0	Y	1.1	N	RI	N	N	N		
8	11.2		Y		N	RI	N	N	N		
9	9.7		Y		N	RI	N	N	N		
10	10.3		Y		N	RI	N	N	N		
11	11.6		Y		N	GL	N	N	N		
12	17.7		N		N	PL	F	N	N		
13	20.1		N		N	PL	F	N	N		
14	14.8		Y		N	RI	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GF	GF	GF	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☒ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[2] Present (Y/ N)	BAR WIDTH[2] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	11.0	1.4	Y	1.4	N	RI	N	N	N		
1	10.1		Y		N	RI	N	N	N		
2	9.6		Y		N	RI	N	N	N		
3	10.2		N		N	RI	N	N	N		
4	9.5		N		N	RI	N	N	N		
5	11.8	-	N	-	N	RI	N	N	N		
6	8.6		N		N	RI	N	N	N		
7	11.7	2.5	N	-	N	RI	N	N	N		
8	10.6		N		N	RI	N	N	N		
9	8.2		N		N	R1	N	N	N		
10	6.9		N		N	GL	N	N	N		
11	8.0		N		N	GL	F	N	N		
12	9.8		N		N	GL	F	N	N		
13	12.7		N		N	GL	F	N	N		
14	19.5		N		N	GL	F	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GF	GF	GF	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☒ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[3] Present (Y/ N)	BAR WIDTH[3] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	22.7	2.2	N	-	N	PL	F	N	N		
1	24.8		N		N	PL	F	N	N		
2	28.3		N		N	PL	F	N	N		
3	34.7		N		N	PL	F	N	N		
4	36.5		N		N	PL	F	N	N		
5	39.6	-	N	-	N	PL	F	N	N		
6	38.3		N		N	PL	F	N	N		
7	37.6	1.6	N	-	N	GL	N	N	N		
8	35.4		N		N	GL	N	N	N		
9	38.0		N		N	GL	N	N	N		
10	34.6		N		N	GL	N	N	N		
11	24.7		N		N	GL	N	N	N		
12	28.9		N		N	PL	F	N	N		
13	25.6		N		N	PL	F	N	N		
14	30.9		N		N	PL	F	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	HP	HP	FN	FN	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☒ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[4] Present (Y/ N)	BAR WIDTH[4] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	22.9	1.7	N	-	N	PL	F	N	N		
1	26.9		N		N	PL	F	N	N		
2	33.9		N		N	PL	F	N	N		
3	36.2		N		N	GL	N	N	N		
4	39.5		N		N	GL	N	N	N		
5	35.9	-	N		N	GL	N	N	N		
6	34.6		N		N	GL	N	N	N		
7	27.7	1.50	N		N	GL	N	N	N		
8	42.0		N		N	GL	N	N	N		
9	36.4		N		N	GL	N	N	N		
10	25.2		N		N	GL	N	N	N		
11	18.1		N		N	GL	N	N	N		
12	20.9		N		N	GL	N	N	N		
13	29.6		N		N	GL	N	N	N		
14	23.2		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	HP	HP	FN	FN	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m				1		
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☒ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE For Transect A-B ONLY | Increment (m) x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[5] Present (Y/ N)	BAR WIDTH[5] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	16.0	1.8	N	N	N	RI	N	N	N	N	
1	14.6		N		N	RI	N	N	N	N	
2	16.3		Y		N	RI	N	N	N	N	
3	13.8		Y		N	RI	N	N	N	N	
4	12.2		Y		N	RI	N	N	N	N	
5	9.8	-	Y		N	RI	N	N	N	N	
6	10.9		Y		N	RI	N	N	N	N	
7	9.7	2.2	Y	0.6	N	RI	N	N	N	N	
8	8.4		N		N	RI	N	N	N	N	
9	8.4		N		N	RI	N	N	N	N	
10	8.9		N		N	RI	N	N	N	N	
11	12.8		N		N	RI	N	N	N	N	
12	12.0		N		N	RI	N	N	N	N	
13	12.7		N		N	RI	N	N	N	N	
14	7.6		N		N	RI	N	N	N	N	

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GF	GF	GF	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☒ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE — For Transect A-B ONLY — Increment (m) x.x: 1.0m — Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[6] Present (Y/ N)	BAR WIDTH[6] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	10.9	2.0	Y	0.3	N	RI	N	N	N		
1	8.9		N		N	RI	N	N	N		
2	6.9		N		N	RI	N	N	N		
3	7.9		N		N	RI	N	N	N		
4	9.4		N		N	RI	N	N	N		
5	10.6	-	N	-	N	GL	N	N	N		
6	9.8		N		N	GL	N	N	N		
7	13.3	2.8	N	-	N	GL	N	N	N		
8	14.1		N		N	GL	N	N	N		
9	9.7		N		N	GL	N	N	N		
10	12.4		N		N	GL	N	N	N		
11	14.1		N		N	GL	N	N	N		
12	13.6		N		N	GL	N	N	N		
13	11.6		N		N	GL	N	N	N		
14	11.0		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GF	GF	GF	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☒ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE For Transect A-B ONLY | Increment (m) x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[7] Present (Y/ N)	BAR WIDTH[7] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	10.7	2.8	N	-	N	GL	N	N	N		
1	15.6		N		N	PL	F	N	N		
2	26.9		N		N	PL	F	N	N		
3	29.1		N		N	PL	F	N	N		
4	19.6		N		N	GL	N	N	N		
5	16.5	-	N	-	N	GL	N	N	N		
6	11.5		N		N	GL	N	N	N		
7	10.4	2.6	N		N	GL	N	N	N		
8	11.8		N		N	GL	N	N	N		
9	12.9		N		N	GL	N	N	N		
10	9.6		N		N	GL	N	N	N		
11	13.2		N		N	RI	N	N	N		
12	11.1		N		N	RI	N	N	N		
13	8.6		N		N	RI	N	N	N		
14	7.9		N		N	RI	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GF	GF	GF	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
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Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☒ H-I ☐ I-J ☐ J-K

THALWEG PROFILE — For Transect A-B ONLY — Increment (m) x.x: 1.0m — Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[8] Present (Y/ N)	BAR WIDTH[8] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	10.4	2.6	N		N	GL	N	N	N		
1	13.2		N		N	GL	N	N	N		
2	16.3		N		N	GL	N	N	N		
3	21.6		N		N	PL	F	N	N		
4	28.8		N		N	PL	F	N	N		
5	28.5	-	N	-	N	PL	F	N	N		
6	32.8		N		N	PL	F	N	N		
7	24.1	2.4	N	-	N	PL	F	N	N		
8	28.1		N		N	PL	N	N	N		
9	29.2		N		N	PL	N	N	N		
10	16.3		N		N	GL	N	N	N		
11	7.5		N		N	RI	N	N	N		
12	7.2		N		N	RI	N	N	N		
13	7.4		N		N	RI	N	N	N		
14	7.1		N		N	RI	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GF	GF	GF	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m				1		
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☒ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m) x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[9] Present (Y/ N)	BAR WIDTH[9] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	8.4	2.9	N	-	N	RI	N	N	N		
1	8.8		N		N	RI	N	N	N		
2	7.5		Y		N	GL	N	N	N		
3	7.8		Y		N	GL	N	N	N		
4	10.8		Y		N	GL	N	N	N		
5	11.4	-	Y	-	N	GL	N	N	N		
6	9.9		Y		N	GL	N	N	N		
7	17.5	3.2	N	-	N	PL	N	N	N		
8	22.3		N		N	PL	N	N	N		
9	9.3		Y		N	GL	N	N	N		
10	10.8		Y		N	GL	N	N	N		
11	11.8		Y		N	GL	N	N	N		
12	12.7		Y		N	GL	N	N	N		
13	13.4		Y		N	GL	N	N	N		
14	14.9		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	GF	GF	GF	HP		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m				2		
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/17/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☒ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[10] Present (Y/ N)	BAR WIDTH[10] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	18.2	2.5	N	-	N	GL	N	N	N		
1	17.1		N		N	GL	N	N	N		
2	19.0		N		N	GL	N	N	N		
3	18.8		N		N	GL	N	N	N		
4	14.9		N		N	GL	N	N	N		
5	15.5	-	N	-	N	GL	N	N	N		
6	18.2		Y		N	GL	N	N	N		
7	18.6	2.5	N		N	GL	N	N	N		
8	17.0		N		N	GL	N	N	N		
9	11.0		N		N	GL	N	N	N		
10	19.9		N		N	GL	N	N	N		
11	28.9		N		N	PL	R	N	N		
12	30.6		N		N	PL	R	N	N		
13	25.3		Y		N	PL	R	N	N		
14	12.9		Y		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	GF	GF	GF	GF	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/25/13	**TRANSECT:**	☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.50	7.6	GF	20	
Ctr	1.00	6.5	GF	30	
RCtr	1.50	7.4	GF	100	
Right	2.00	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 **1** 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	0 1 **2** 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 **2** 3 4	0 1 **2** 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 **2** 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 **3** 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	0 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	48	0	
Right	62	0	
Wetted Width xxx.x m		2.00	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.54	
Bankfull Height xx.x m		0.81	
Incised Height xx.x m		1.05	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	16		CenR	17	
CenL	16		Left	K	
CenDwn	15		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/25/13	**TRANSECT:**	☐ **A** ☒ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.69	2.2	GF	50	
Ctr	1.39	8.9	GF	20	
RCtr	2.07	6.6	GF	10	
Right	2.76	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	0 1 **2** 3 4	
Brush/Woody Debris <0.3 (Small)	0 **1** 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	66	0	
Right	74	0	
Wetted Width xxx.x m		2.76	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.51	
Bankfull Height xx.x m		0.80	
Incised Height xx.x m		1.20	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	15		CenR	14	
CenL	17		Left		
CenDwn	17		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 **1** 2 3 4	0 **1** 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 **2** 3 4	0 1 **2** 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 2 **3** 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	**0** 1 2 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 **3** 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	0 **1** 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☒ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.56	25.8	SA	100	
Ctr	1.12	21.3	GF	90	
RCtr	1.68	17.3	GF	50	
Right	2.23	0	HO	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 **1** 2 3 4	
Live Trees or Roots	0 **1** 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 2 **3** 4	0 1 2 **3** 4	
Small Trees (Trunk <0.3 m DBH)	0 1 **2** 3 4	0 1 **2** 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 **1** 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 **2** 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 **3** 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	71	0	
Right	304	0.18	
Wetted Width xxx.x m		2.23	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.29	
Bankfull Height xx.x m		0.80	
Incised Height xx.x m		0.96	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	16		CenR	17	
CenL	17		Left		
CenDwn	17		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/25/13	**TRANSECT:**	☐ A ☐ B ☐ C ☒ D ☐ E ☐ F ☐ G ☐ H ☐ I ☐ J ☐ K	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.43	24.8	GF	50	
Ctr	0.86	24.1	GF	50	
RCtr	1.29	22.8	HP	0	
Right	1.73	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 **2** 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 **1** 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	284	0.17	
Right	57	0	
Wetted Width xxx.x m		1.73	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.59	
Bankfull Height xx.x m		0.66	
Incised Height xx.x m		1.17	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	10		CenR	10	
CenL	11		Left	K	
CenDwn	7		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/25/13	**TRANSECT:**	☐ A ☐ B ☐ C ☐ D ☒ E ☐ F ☐ G ☐ H ☐ I ☐ J ☐ K	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.44	19.7	FN	100	
Ctr	0.88	16.5	GF	10	
RCtr	1.32	19.2	GF	70	
Right	1.76	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 **1** 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 **3** 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	0 **1** 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 2 3 **4**	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	**0** 1 2 3 4	0 1 2 **3** 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	**0** 1 2 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	**0** 1 2 3 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	0	F1
Right	303	0.21	
Wetted Width xxx.x m		1.76	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.74	
Bankfull Height xx.x m		0.60	
Incised Height xx.x m		0.99	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	14		CenR	15	
CenL	13		Left	K	
CenDwn	13		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Dense blackberry on left bank

RM

SITE ID: Clark Crk	DATE: 6/25/13	**TRANSECT:**	☐ A ☐ B ☐ C ☐ D ☐ E ☒ F ☐ G ☐ H ☐ I ☐ J ☐ K	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.49	12.5	GF	50	
Ctr	0.98	10.0	GF	30	
RCtr	1.47	11.0	GF	20	
Right	1.97	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	0 1 2 **3** 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 **1** 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 2 **3** 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	0 **1** 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	80	0	
Right	75	0	
Wetted Width xxx.x m		1.97	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.90	
Bankfull Height xx.x m		0.68	
Incised Height xx.x m		0.71	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☒ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.70	19.3	GF	10	
Ctr	1.40	18.1	GF	20	
RCtr	2.10	14.0	GF	90	
Right	2.80	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 **1** 2 3 4	
Live Trees or Roots	0 **1** 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 2 **3** 4	0 1 **2** 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 **2** 3 4	0 1 2 **3** 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	0 **1** 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	291	0.12	
Right	69	0	
Wetted Width xxx.x m		2.80	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.56	
Bankfull Height xx.x m		0.67	
Incised Height xx.x m		1.01	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	14	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/25/12	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☒ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.64	14.8	GF	10	
Ctr	1.28	12.1	GF	30	
RCtr	1.92	4.8	GF	70	
Right	2.57	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 **1** 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 **2** 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 2 **3** 4	0 1 **2** 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 2 **3** 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	0 P C B	0 P C B	
Buildings	0 P C B	0 P C B	
Pavement/Cleared Lot	0 P C B	0 P C B	
Road/Railroad	0 P C B	0 P C B	
Pipes (Inlet/Outlet)	0 P C B	0 P C B	
Landfill/Trash	0 P C B	0 P C B	
Park/Lawn	0 P C B	0 P **C** B	
Row Crops	0 P C B	0 P C B	
Pasture/Range/Hay Field	0 P C B	0 P C B	
Logging Operations	0 P C B	0 P C B	
Mining Activity	0 P C B	0 P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	56	0	
Right	65	0.06	
Wetted Width xxx.x m		2.57	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.20	
Bankfull Height xx.x m		0.66	
Incised Height xx.x m		1.08	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/25/12	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☒ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.72	7.6	GF	10	
Ctr	1.44	6.5	GF	30	
RCtr	2.16	7.4	GF	40	
Right	2.87	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 **1** 2 3 4	
Live Trees or Roots	0 **1** 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	61	0	
Right	301	0.14	
Wetted Width xxx.x m		2.87	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.75	
Bankfull Height xx.x m		0.46	
Incised Height xx.x m		1.08	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 **2** 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 **2** 3 4	0 1 2 **3** 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	0 **1** 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 2 **3** 4	**0** 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	0 1 **2** 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/25/13	**TRANSECT:**	☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☐ H ☐ I ☒ J ☐ K	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.64	21.2	GF	20	
Ctr	1.28	20.4	GF	20	
RCtr	1.92	12.1	SA	100	
Right	2.54	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 **2** 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	34	0	
Right	74	0	
Wetted Width xxx.x m		2.54	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		4.11	
Bankfull Height xx.x m		0.57	
Incised Height xx.x m		1.17	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E **M** N	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	0 1 **2** 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 **2** 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	0 **1** 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☒ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	1.02	17.0	GF	0	
Ctr	2.04	0	GF	50	F1
RCtr	3.06	6.0	GF	70	
Right	4.06	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E **M** N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 **2** 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 2 **3** 4	0 1 **2** 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	D C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	0 1 2 **3** 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	0 **1** 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	90	0.15	F1
Right	62	0	
Wetted Width xxx.x m		4.06	
Bar Width xx.x m		0.80	
Bankfull Width xxx.x m		5.06	
Bankfull Height xx.x m		0.61	
Incised Height xx.x m		1.15	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	16		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Gravel bar

RIPARIAN "LEGACY" TREES AND INVASIVE ALIEN PLANTS

SITE ID: Clark Crk DATE: 6/25/13

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS				
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present				
A	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	1	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cherry	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
B	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Maple	☐ None	☒RC Grass ☐Salt CEd ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
C	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	20	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cherry	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			

INSTRUCTIONS

Legacy trees are defined as the largest tree within your search area, which is as far as you can see, but within maximum limits as follows:

Wadeable Streams: Confine search to no more than 50 m from left and right bank and extending upstream to next transect (for 'K' look upstream 4 channel widths)

Non-wadeable Rivers: Confine search to no more than 100 m from left and right bank and extending both upstream and downstream as far as you can see confidently.

Alien Plants: Confine search to riparian plots on left and right bank

Wadeable Streams: 10 m x 10 m

Non-wadeable Rivers: 10 m x 20 m

Not all aliens are to be identified in all states. See Field Manual and Plant Identification Guide.

TAXONOMIC CATEGORIES
Acacia/Mesquite
Alder/Birch
Ash
Maple/Box elder
Oak
Poplar/Cottonwood
Sycamore
Willow
Unknown or Other Deciduous
Cedar/Cypress/Sequoia
Fir (including Douglas Fir and Hemlock)
Juniper
Pine
Spruce
Unknown or Other Deciduous
Unknown or Other Broadleaf Evergreen
Snag (Dead tree of any species)

ALIEN SPECIES		
RC Grass	Reed Canarygrass	*Phalaris arundinacea*
Engl Ivy	English Ivy	*Hedera Helix*
ChGrass	Cheat Grass	*Bromus tectorum*
Salt Ced	Salt Cedar	*Tamarix spp.*
Can This	Canada thistle	*Cirsium arvense*
M This	Musk thistle	*Carduus nutans*
Hblack	Himalayan blackberry	*Rubus discolor*
Teasel	Teasel	*Dipsacus fullonum*
Spurge	Leafy spurge	*Euphorbia esula*
G Reed	Giant Reed	*Arundo donax*
C Burd	Common burdock	*Arctium minus*
Rus Ol	Russian-olive	*Elaeagnus angustifolia*

COMMENTS

Transects D to K continued on next page

RIPARIAN "LEGACY" TREES AND INVASIVE ALIEN PLANTS

SITE ID: Clark Crk DATE: 6/25/13

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS	
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present	
D	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	20	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
E	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	1	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☐RC Grass ☐Salt CEd ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
F	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	1	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Maple	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
G	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	1	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
H	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	25	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
I	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	25	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☒Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
J	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☒>30	10	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
K	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☐15-30 ☒>30	20	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☒Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol

Appendix E

Physical Habitat Data – Pringle Creek

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/19/13 **TRANSECT:** ☒ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE For Transect A-B ONLY | Increment (m)x.x: 2.9 m | Total Reach Length (m) 292.68 m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[1] Present (Y/ N)	BAR WIDTH[1] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	20.5	10.52	Y	4.27	N	RI	N	N	N		
1	20.0		Y		N	RI	N	N	N		
2	15.6		Y		N	RI	N	N	N		
3	16.8		Y		N	RI	N	N	N		
4	15.6		Y		N	RI	N	N	N		
5	16.5	13.72	N	-	N	GL	N	N	N		
6	18.9		N		N	GL	N	N	N		
7	18.9	-	N	-	N	GL	N	N	N		
8	19.5		N		N	GL	N	N	N		
9	19.4		N		N	GL	N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										Yellow jacket nest at transect B in dense vegetation.

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	5	FN	CB	CB	CB	FN		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**	X	**FLAG**	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/19/13 **TRANSECT:** ☐ A-B ☒ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE For Transect A-B ONLY | Increment (m)x.x: | Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[2] Present (Y/ N)	BAR WIDTH[2] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	20.6	9.14	N	-	N	GL	N	N	N		
1	25.3		N		N	GL	N	N	N		
2	24.4		N		N	GL	N	N	N		
3	23.9		N		N	GL	N	N	N		
4	28.7		N		N	GL	N	N	N		
5	28.8	9.60	N	-	N	RI	N	N	N		
6	29.1		N		N	RI	N	N	N		
7	28.0	-	N	-	N	GL	N	N	N		
8	23.2		N		N	GL	N	N	N		
9	29.6		N		N	GL	N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**		**FLAG**
	5	FN	CB	CB	CB	FN		

FLAG	**COMMENTS**

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**	**X**	**FLAG**	

	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/19/13

TRANSECT: ☐ A-B ☐ B-C ☒ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE — For Transect A-B ONLY — Increment (m)x.x: 1.0 — Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[3] Present (Y/ N)	BAR WIDTH[3] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	41.8	9.30	N	-	N	PL	F	N	N		
1	35.7		N		N	PL	F	N	N		
2	36.4		N		N	PL	F	N	N		
3	45.3		N		N	PL	F	N	N		
4	49.1		N		N	PL	F	N	N		
5	41.7	7.32	N	-	N	PL	F	N	N		
6	46.7		N		N	PL	F	N	N		
7	39.6	-	N	-	N	PL	F	N	N		
8	35.4		N		N	PL	F	N	N		
9	31.2		N		N	PL	F	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	5	GF	GC	GC	CB	WD		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length) — **CHECK IF ALL UNMARKED BOXES ARE ZERO** X — **FLAG**

Diameter Large End	Pieces All/Part in Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m	Pieces Bridge Above Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	1 / 1					
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/19/13 **TRANSECT:** ☐ A-B ☐ B-C ☐ C-D ☒ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE For Transect A-B ONLY | Increment (m)x.x: | Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[4] Present (Y/ N)	BAR WIDTH[4] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	29.4	8.23	N	-	N	GL	N	N	N		
1	29.9		N		N	GL	N	N	N		
2	26.9		N		N	GL	N	N	N		
3	24.9		N		N	GL	N	N	N		
4	24.7		N		N	GL	N	N	N		
5	28.2	7.32	N	-	N	PL	N	N	N		
6	55.5		N		N	PL	N	N	N		
7	53.1	-	N	-	N	PL	N	N	N		
8	46.3		N		N	PL	N	N	N		
9	40.7		N		N	PL	N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	5	GC	GC	GC	CB	GC		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**	X	**FLAG**	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/19/13 **TRANSECT:** ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☒ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE For Transect A-B ONLY | Increment (m) x.x: | Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[5] Present (Y/ N)	BAR WIDTH[5] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	25.8	6.71	N	-	N	RI	N	N	N		
1	19.4		N		N	RI	N	N	N		
2	19.7		N		N	RI	N	N	N		
3	21.4		N		N	GL	N	N	N		
4	19.0		N		N	GL	N	N	N		
5	18.4	9.60	N	-	N	GL	N	N	N		
6	15,2		N		N	RI	N	N	N		
7	15.6	-	N	-	N	RI	N	N	N		
8	17.8		N		N	RI	N	N	N		
9	18.1		N		N	GL	N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	5	GC	CB	CB	GC	CB		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**	X	**FLAG**	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	11 2					
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/19/13 **TRANSECT:** ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☒ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE For Transect A-B ONLY | Increment (m) x.x: | Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[6] Present (Y/ N)	BAR WIDTH[6] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	29.0	7.77	N	-	N	GL	N	N	N		
1	20.4		N		N	GL	F	N	N		
2	31.0		N		N	PL	F	N	N		
3	32.8		N		N	PL	F	N	N		
4	41.0		N		N	PL	F	N	N		
5	44.3	5.79	N	-	N	PL	N	N	N		
6	32.2		N		N	PL	N	N	N		
7	35.9	-	N	-	N	PL	N	N	N		
8	37.4		N		N	PL	N	N	N		
9	35.4		N		N	GL	N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	5	GF	GC	GC	GC	FN		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
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Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length) | **CHECK IF ALL UNMARKED BOXES ARE ZERO** X | **FLAG**

Diameter Large End	Pieces All/Part in Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m	Pieces Bridge Above Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	1					
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/19/13

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☒ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE For Transect A-B ONLY | Increment (m) x.x: | Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[7] Present (Y/ N)	BAR WIDTH[7] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	22.6	8.69	Y	2.13	N	RI	N	N	N		
1	26.4		Y		N	RI	N	Y	N		
2	26.2		Y		N	GL	N	Y	N		
3	48.2		Y		N	GL	N	Y	N		
4	31.7		Y		N	RI	N	Y	N		
5	14.3	19.51	Y	12.34	N	RI	N	Y	N		
6	18.1		Y		N	RI	N	Y	N		
7	18.8	-	Y	*	N	RI	N	Y	N		
8	21.3		Y		N	RI	N	Y	N		
9	20.5		Y		N	GL	N	Y	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	5	GC	CB	FN	CB	FN		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length) | **CHECK IF ALL UNMARKED BOXES ARE ZERO** X | **FLAG**

Diameter Large End	Pieces All/Part in Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m	Pieces Bridge Above Bankfull Channel: Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	1 / 1					
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/19/13 **TRANSECT:** ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☒ H-I ☐ I-J ☐ J-K

THALWEG PROFILE For Transect A-B ONLY | Increment (m) x.x: | Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[8] Present (Y/ N)	BAR WIDTH[8] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	44.6	11.58	N	-	N	PL	N	N	N		Concrete wall on right bank
1	74,1		N		N	PL	F	N	N		Concrete wall on right bank
2	94.9		N		N	PL	F	N	N		Concrete wall on right bank
3	105.1		N		N	PL	F	N	N		Concrete wall on right bank
4	108.3		N		N	PL	F	N	N		Concrete wall on right bank
5	107.0	5.18	N	-	N	PL	F	N	N		Concrete wall on right bank
6	92.2		N		N	PL	F	N	N		Concrete wall on right bank
7	71.6	-	N	-	N	PL	F	N	N		Concrete wall on right bank
8	59.8		N		N	PL	N	N	N		Concrete wall on right bank
9	51.6		N		N	PL	N	N	N		Concrete wall on right bank
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	5	FN	GC	GC	GF	OT		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
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LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/19/13 **TRANSECT:** ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☒ I-J ☐ J-K

THALWEG PROFILE For Transect A-B ONLY Increment (m) x.x: Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[9] Present (Y/ N)	BAR WIDTH[9] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	33.1	8.23	N	-	N	GL	N	N	N		Concrete wall on right bank
1	22.3		N		N	RI	N	N	N		Concrete wall on right bank
2	21.9		N		N	RI	N	N	N		Concrete wall on right bank
3	14.4		N		N	RI	N	N	N		No wall
4	15.5		N		N	RI	N	N	N		
5	16.8	12.04	N	-	N	RI	N	N	N		
6	17.3				N	GL	N	N	N		
7	13.6	-	N	-	N	GL	N	N	N		
8	18.4		N		N	GL	N	N	N		Under pedestrian bridge
9	30.6		N		N	GL	N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	5	FN	CB	CB	CB	FN		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/26/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☒ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0 | Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[10] Present (Y/ N)	BAR WIDTH[10] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	38.1	8.53	N	-	N	GL	N	N	N		
1	16.4		N		N	RI	N	N	N		Immediately down from manmade cobble dam
2	25.7		N		N	GL	N	N	N		
3	22.8		Y		N	GL	N	N	N		
4	28.0		Y		N	GL	N	N	N		
5	28.6	7.77	N	-	N	PL	F	N	N		
6	41.6		N		N	PL	F	N	N		
7	51.1	-	N	-	N	PL	F	N	N		
8	64.6		N		N	PL	F	N	N		
9	70.1		N		N	PL	F	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	5	GF	GC	CB	GC	FN		

FLAG	COMMENTS

LARGE WOODY DEBRIS ((10 cm small end diameter; ⟨1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/25/13	**TRANSECT:**	☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.63	23.4	CB	10	
Ctr	5.26	0	CB/GC	0	F1
RCtr	7.89	0	CB/GC	0	F1
Right	10.52	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	0 1 **2** 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	296	0.24	
Right	68	0	
Wetted Width xxx.x m		10.52	
Bar Width xx.x m		4.27	
Bankfull Width xxx.x m		10.82	
Bankfull Height xx.x m		0.67	
Incised Height xx.x m		1.04	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	13		CenR	13	
CenL	12		Left	K	
CenDwn	12		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**
F1	Cobble bar

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 **2** 3 4	0 1 **2** 3 4	
Small Trees (Trunk <0.3 m DBH)	0 **1** 2 3 4	0 1 **2** 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	**0** 1 2 3 4	**0** 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 **1** 2 3 4	
Barren, Bare Dirt or Duff	0 **1** 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/25/13	**TRANSECT:**	☐ **A** ☒ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.29	22.9	CB	0	
Ctr	4.58	19.8	CB	0	
RCtr	6.87	32.0	CB	0	
Right	9.14	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 **1** 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 **2** 3 4	0 1 2 **3** 4	
Small Trees (Trunk <0.3 m DBH)	0 **1** 2 3 4	0 1 **2** 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 2 **3** 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 **1** 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 2 3 4	0 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 4	0 1 2 3 4	
Barren, Bare Dirt or Duff	0 1 2 3 4	0 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	67	0	
Right	74	0	
Wetted Width xxx.x m		9.14	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		9.91	
Bankfull Height xx.x m		0.67	
Incised Height xx.x m		0.67	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	9		CenR	13	
CenL	11		Left	K	
CenDwn	13		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☐ A ☐ B ☒ C ☐ D ☐ E ☐ F ☐ G ☐ H ☐ I ☐ J ☐ K	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.32	19.8	CB	0	
Ctr	4.65	19.8	CB	0	
RCtr	6.97	41.1	CB	0	
Right	8.89	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	0 **1** 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 **1** 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 2 **3** 4	0 1 2 **3** 4	
Small Trees (Trunk <0.3 m DBH)	0 1 **2** 3 4	0 1 **2** 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	**0** 1 2 3 4	**0** 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	**0** 1 2 3 4	
Barren, Bare Dirt or Duff	0 1 **2** 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P **C** B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	40	0	
Right	75	0	
Wetted Width xxx.x m		9.30	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		9.78	
Bankfull Height xx.x m		0.70	
Incised Height xx.x m		0.70	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	16	
CenL	17		Left	K	
CenDwn	15		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☐ A ☐ B ☐ C ☒ D ☐ E ☐ F ☐ G ☐ H ☐ I ☐ J ☐ K	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.06	38.4	CB	0	
Ctr	4.12	36.9	CB	0	
RCtr	6.18	35.1	GC	0	
Right	8.23	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 **1** 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	0 1 **2** 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	0 1 **2** 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	**0** 1 2 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	**0** 1 2 3 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 P **C** B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	0	F1
Right	49	0	
Wetted Width xxx.x m		8.23	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		9.30	
Bankfull Height xx.x m		0.70	
Incised Height xx.x m		0.70	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	7		CenR	11	
CenL	10		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Dense blackberries on left bank.

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/25/13	**TRANSECT:**	☐ A ☐ B ☐ C ☐ D ☒ E ☐ F ☐ G ☐ H ☐ I ☐ J ☐ K	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	CB	50	
LCtr	1.68	35.1	GC	0	
Ctr	3.36	31.4	CB	0	
RCtr	5.04	26.2	GC	0	
Right	6.71	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D **C** E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 **2** 3 4	0 1 2 **3** 4	
Small Trees (Trunk <0.3 m DBH)	0 **1** 2 3 4	0 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	0 **1** 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	**0** 1 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	0 **1** 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 P **C** B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	85	0	
Right	283	0.17	
Wetted Width xxx.x m		6.71	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		7.62	
Bankfull Height xx.x m		0.73	
Incised Height xx.x m		0.79	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	12		CenR	12	
CenL	14		Left	K	
CenDwn	8		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

RM

SITE ID: Pringle	DATE: 6/25/13	**TRANSECT:**	☐ A ☐ B ☐ C ☐ D ☐ E ☒ F ☐ G ☐ H ☐ I ☐ J ☐ K	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	CB	50	
LCtr	1.94	25.9	GC	10	
Ctr	3.88	16.8	GC	0	
RCtr	5.82	22.9	CB/GC	0	
Right	7.77	0	GC	70	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	0 1 **2** 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)

D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D **C** E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 **2** 3 4	0 1 2 **3** 4	
Small Trees (Trunk <0.3 m DBH)	0 1 **2** 3 4	0 **1** 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	**0** 1 2 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	0 **1** 2 3 4	0 **1** 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 P **C** B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	23	0	
Right	54	0	
Wetted Width xxx.x m		7.77	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		9.24	
Bankfull Height xx.x m		0.70	
Incised Height xx.x m		0.76	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	14		CenR	14	
CenL	13		Left	K	
CenDwn	12		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☒ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.17	7.0	GC	0	
Ctr	4.34	18.3	GC	0	
RCtr	6.51	29.3	CB	0	
Right	8.69	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D **C** E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 **1** 2 3 4	0 **1** 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	0 **1** 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 1 **2** 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 2 **3** 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	0 **1** 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	0 **1** 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 P **C** B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	320	0.37	
Right	K	0	F1
Wetted Width xxx.x m		8.69	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		9.68	
Bankfull Height xx.x m		0.66	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	4		CenR	6	
CenL	6		Left	K	
CenDwn	4		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Dense blackberry on left bank.

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☒ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.90	15.2	GF	10	
Ctr	5.80	12.1	GC	20	
RCtr	8.70	38.1	CB	5	
Right	11.58	0	OT	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 **3** 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	0 1 **2** 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	D C **E** M N	
Woody Shrubs and Saplings	0 1 2 **3** 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	**0** 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 **2** 3 4	**0** 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	**0** 1 2 3 4	
Barren, Bare Dirt or Duff	0 **1** 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 P **C** B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	294	0.16	
Right	90	0	
Wetted Width xxx.x m		11.58	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		11.58	
Bankfull Height xx.x m		0.85	
Incised Height xx.x m		0.85	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	12		CenR	15	
CenL	3		Left	K	
CenDwn	8		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Concrete wall

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☒ **I** ☐ **J** ☐ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.06	24.4	CB/GC	0	
Ctr	4.12	30.5	CB	0	
RCtr	3.18	39.6	CB	0	
Right	8.23	0	OT	0	F1

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	0 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 **2** 3 4	0 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	D C **E** M N	
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	**0** 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	**0** 1 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 **3** 4	0 **1** 2 3 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 P **C** B	0 P **C** B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	302	0.210	
Right	90	0	
Wetted Width xxx.x m		8.23	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		8.53	
Bankfull Height xx.x m		0.70	
Incised Height xx.x m		0.70	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	10		CenR	3	
CenL	9		Left	K	
CenDwn	1		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Concrete and block wall

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/25/13	**TRANSECT:**	☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☐ H ☐ I ☒ J ☐ K	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	GF	80	
LCtr	2.13	25.6	CB	5	
Ctr	4.26	24.4	GF	20	
RCtr	6.39	18.0	GC	40	
Right	8.53	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	0 **1** 2 3 4	
Overhanging Veg. = <1 m of Surface	0 **1** 2 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 2 **3** 4	0 1 **2** 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	0 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 2 **3** 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	0 1 **2** 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	**0** 1 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 **2** 3 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	0 1 2 **3** 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 P **C** B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	322	0.58	
Right	55	0	
Wetted Width xxx.x m		8.53	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		8.69	
Bankfull Height xx.x m		0.73	
Incised Height xx.x m		0.73	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	16		CenR	16	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/25/13	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☒ **K**	**X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.28	73.2	GF	80	
Ctr	4.56	71.9	GC	10	
RCtr	6.84	50.6	GC	20	
Right	7.49	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)

		FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	**0** 1 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)
D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	0 1 **2** 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 2 **3** 4	0 1 **2** 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	D C E M N	
Woody Shrubs and Saplings	0 1 2 **3** 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	0 **1** 2 3 4	0 1 2 **3** 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 **1** 2 3 4	0 1 **2** 3 4	
Non-Woody Herbs, Grasses, Forbs	**0** 1 2 3 4	0 1 **2** 3 4	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 **P** C B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	-	F1
Right	39	0	
Wetted Width xxx.x m		7.49	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		8.29	
Bankfull Height xx.x m		1.07	
Incised Height xx.x m		1.37	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	12		CenR	14	
CenL	17		Left	K	
CenDwn	12		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Dense blackberries

RIPARIAN "LEGACY" TREES AND INVASIVE ALIEN PLANTS

SITE ID: Pringle DATE: 6/25/13

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS				
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present				
A	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	10	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Oak	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☒Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
B	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	5	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt CEd ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
C	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	1	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			

INSTRUCTIONS

Legacy trees are defined as the largest tree within your search area, which is as far as you can see, but within maximum limits as follows:

Wadeable Streams: Confine search to no more than 50 m from left and right bank and extending upstream to next transect (for 'K' look upstream 4 channel widths)

Non-wadeable Rivers: Confine search to no more than 100 m from left and right bank and extending both upstream and downstream as far as you can see confidently.

Alien Plants: Confine search to riparian plots on left and right bank

Wadeable Streams: 10 m x 10 m

Non-wadeable Rivers: 10 m x 20 m

Not all aliens are to be identified in all states. See Field Manual and Plant Identification Guide.

TAXONOMIC CATEGORIES
Acacia/Mesquite Alder/Birch Ash Maple/Box elder Oak Poplar/Cottonwood Sycamore Willow Unknown or Other Deciduous
Cedar/Cypress/Sequoia Fir (including Douglas Fir and Hemlock) Juniper Pine Spruce Unknown or Other Deciduous
Unknown or Other Broadleaf Evergreen
Snag (Dead tree of any species)

ALIEN SPECIES		
RC Grass	Reed Canarygrass	*Phalaris arundinacea*
Engl Ivy	English Ivy	*Hedera Helix*
ChGrass	Cheat Grass	*Bromus tectorum*
Salt Ced	Salt Cedar	*Tamarix spp.*
Can This	Canada thistle	*Cirsium arvense*
M This	Musk thistle	*Carduus nutans*
Hblack	Himalayan blackberry	*Rubus discolor*
Teasel	Teasel	*Dipsacus fullonum*
Spurge	Leafy spurge	*Euphorbia esula*
G Reed	Giant Reed	*Arundo donax*
C Burd	Common burdock	*Arctium minus*
Rus Ol	Russian-olive	*Elaeagnus angustifolia*

COMMENTS

Transects D to K continued on next page

RIPARIAN "LEGACY" TREES AND INVASIVE ALIEN PLANTS

SITE ID: Pringle DATE: 6/25/13

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS				
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present				
D	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☐15-30 ☒>30	7	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
E	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☒>30	2	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☒RC Grass ☐Salt CEd ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
F	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	10	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☒Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
G	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	10	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☒Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
H	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30		☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Maple	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
I	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☒>30		☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☐Hblack ☐G Reed ☒Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
J	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	2	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Maple	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			
K	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☒>30	15	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☐RC Grass ☐Salt Ced ☐Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol			

ATTACHMENT C. City of Salem Surface Water and Stormwater Monitoring Plan Revision Packet (cover letter, revised monitoring plan, and approval email) (March 1, 2013).

March 1, 2013

Benjamin Benninghoff
Stormwater Coordinator
Oregon Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390

SUBJECT: City of Salem National Pollutant Discharge Elimination System (NPDES)
Municipal Separate Storm Sewer System (MS4)
Permit No.101513; File No.108919
30-day Notice of Proposed Modification to the City of Salem Surface Water and Stormwater Monitoring Plan

Dear Mr. Benninghoff:

The City of Salem has implemented a water quality sampling program on the Willamette River since 1990 at a number of sites within the greater Salem area. Data from this sampling effort have been submitted to the Department of Environmental Quality (DEQ) each year as part of the City's MS4 Annual Report because it is identified in the City's 2010 Stormwater Management Plan, (Best Management Practice MON1 Task 2, "continue the urban stream and Willamette River water quality sampling program…").

The Willamette River water quality sampling program began as part of a study of the mixing zone at the Willow Lake Water Pollution Control Facility (WLWPCF) outfall. The sampling program started in 1990 with eleven sites. Four sites were decommissioned in 1995 and one was decommissioned in 2005, leaving six sites distributed between downtown Salem and downstream to Wheatland Ferry. Data is no longer needed by the WLWPCF because needs for the study have been met. Additionally, due to budget reductions the City proposes revising this sampling program.

The City proposes the following program modifications:

1. Data will be collected and maintained by the Stormwater Services group instead of WLWPCF laboratory staff. Sample analysis will continue to be performed by the WLWPCF laboratory staff.
2. The sampling program will be combined with the Monthly Instream monitoring element identified in Table B-1 of the City's NPDES MS4 permit. Willamette River data will be collected once a month, at the same time -Monthly Instream samples are collected (previously the Willamette River samples were collected the week prior, and twice a month from May to November).
3. Sampling sites and methods will be revised:

a. Reduction from six sites to three (retaining two of the current sites and adding one upstream of the City's jurisdictional boundary).
b. Instead of sampling by boat, samples will be collected from the east bank of the river. Due to safety concerns, the boat had not been used when the Willamette gauge at Salem surpassed 15 feet. Sampling from the bank is anticipated to allow sample collection up to a stage of 36 feet (the 100 year flood level).

These modifications to the existing program will ensure that the City's longest running set of water quality data continue to be collected, although slightly modified in methodology. By adding the upstream site to the program, collected data are anticipated to better describe the influence of MS4 discharges to the Willamette River, particularly during rain events. These modifications would also result in Willamette River sampling being conducted on the same day as Instream Monthly sampling, by the same staff, adding consistency to instrumentation use and sampling protocol.

The City's *Surface Water and Stormwater Monitoring Plan* has been revised to reflect changes summarized in this letter, specifically Section 4.0 Monthly Instream (see Enclosure). Revisions to the plan are underlined so they are readily identifiable.

Notification of these revisions to the City of Salem's monitoring program are being provided to the DEQ consistent with Schedule B.2.e of the City's NPDES MS4 Permit. The City requests written approval of the revisions from the DEQ. If you have any questions or request additional information please contact Anita Panko, Flow Monitoring Analyst, at ampanko@cityofsalem.net or 503-589-2188.

Sincerely,

Anita Panko
Flow Monitoring Analyst

Enclosures:
Attachment A. Surface Water and Stormwater Monitoring Plan

cc: Sam Kidd, Stormwater and Wastewater Collections Services Manager
Jon Nottage, Stormwater Quality Supervisor
Paul Mitchell, Willow Lake Laboratory Supervisor
Anita Panko, Flow Monitoring Analyst

File:

City of Salem
National Pollutant Discharge Elimination System (NPDES)
Municipal Separate Storm Sewer System (MS4)

Surface Water and Stormwater Monitoring Plan

Prepared by: City Salem Public Works Department
Stormwater Services

November 1, 2011
Revised February 20, 2013

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Attachments

1.0 Introduction

On December 30, 2010, the Oregon Department of Environmental Quality (DEQ) issued the City of Salem a renewed National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit. As a condition of the renewed NPDES MS4 permit the City of Salem developed this "Surface Water and Stormwater Monitoring Plan". This plan implements multiple monitoring elements designed to meet the objectives identified in Schedule B of the NPDES MS4 permit.

Data collected through the implementation of this monitoring plan will undergo review and analysis before becoming an integral component of the NPDES MS4 Annual Reporting and Permit Renewal process. Statistical summaries of monitoring data will assist the City in an ongoing assessment of the effectiveness of the Best Management Practices (BMPs) that have been identified in the City's Stormwater Management Plan (SWMP). The City will ultimately utilize the collected data to evaluate and adaptively manage its Stormwater Management Program, thereby limiting the amount of pollutants entering receiving streams from the MS4 to the Maximum Extent Practicable (MEP). The long-term goal of this monitoring plan is to maintain permit compliance while providing high quality data to assist in decision making and the adaptive management process.

2.0 Permit Requirements

2.1 Monitoring Objectives

Requirements of the monitoring program are listed in Schedule B of the City's NPDES MS4 permit, and monitoring activities must address the following six objectives (Schedule B.1.a):

i. Evaluate the source(s) of the 2004/2006 303 (d) listed pollutants applicable to the co-permittees' permit area;
ii. Evaluate the effectiveness of Best Management Practices (BMPs) in order to help determine BMP implementation priorities;
iii. Characterize stormwater based on land use type, seasonality, geography or other catchment characteristics;
iv. Evaluate status and long-term trends in receiving waters associated with MS4 stormwater discharges;
v. Assess the chemical, biological, and physical effects of MS4 stormwater discharges on receiving waters; and,
vi. Assess progress towards meeting TMDL pollutant load reduction benchmarks.

This monitoring plan describes eight different monitoring elements the City of Salem will utilize to meet these objectives, including the following: Instream Storm, Monthly Instream, Continuous Instream, Macroinvertebrate, Stormwater, Pesticide, Stormwater - Mercury , and Dry Weather Outfall monitoring. The City of Salem Stormwater Monitoring Matrix (Attachment 1) identifies how each monitoring element will be used to address the objectives listed in Schedule B.1.a. The City will implement these monitoring elements during the current NPDES MS4 permit term (December 2010 - December 2015).

2.2 Adaptive Management

By adaptively managing (e.g., implementing, evaluating, and adjusting) its stormwater management program, the City of Salem continues to reduce the discharge of pollutants from its stormwater sewer system to the maximum extent practicable.

Stormwater quality data are characteristically highly variable, limiting the ability to conduct statistical analyses with small datasets. As a result, there is limited ability for data analyses to support short-term (*within* the NPDES MS4 permit cycle) decision making and adaptive management processes. However, the City recognizes that monitoring activities described in this plan may provide some opportunity to do so. For example, pesticide monitoring data may identify the presence of particular compounds only applied by particular users. That data could potentially be used to target outreach efforts to those identified users. Additionally, short-term trends in continuous water quality monitoring data could indicate the presence of discharges that potentially require follow-up through illicit discharge detection or erosion control investigation.

Data collected through implementation of this monitoring plan will largely contribute to the preparation of the City's NPDES MS4 permit renewal application (due July 1, 2015), where the City of Salem will evaluate the overall effectiveness of its Stormwater Management Program. Specifically, collected data will contribute to the following analyses: 1) an evaluation of 303(d) listed parameters (Schedule D.2), 2) preparation of a Total Maximum Daily Load (TMDL) wasteload allocation attainment assessment (Schedule D.3.b), 3) conducting a TMDL pollutant load reduction evaluation, including water quality trend analyses (Schedule D.3.c), and 4) if necessary, the establishment of TMDL benchmarks (Schedule D.3.d). These analyses will support decision-making and proposed improvements to the SWMP, and its BMPs, for the upcoming NPDES MS4 permit cycle.

Also, consistent with Schedule D.4 of the current NPDES MS4 permit, by November 1, 2011, the City of Salem will provide the DEQ with a description of the adaptive management approach/process that will be followed through expiration of the permit on December 29, 2015.

3.0 Instream Storm

3.1 Project / Task Organization

Instream Storm refers to the monitoring of MS4 receiving streams, where sampling is to occur during defined storm events ('storm event' criteria are discussed in Section 3.4.5). The City's Stormwater Monitoring Analyst will serve as the Project Manager and the Responsible Sampling Coordinator. The City's Stormwater Services workgroup will perform sampling and collect field data. The City's Willow Lake Laboratory will perform all analytical laboratory analyses.

3.2 Monitoring Objectives

Instream Storm monitoring will contribute, at least in part, to monitoring objectives i, ii, iii, iv, v, and vi, as identified in Schedule B.1 of the City of Salem's NPDES MS4 Permit. Refer to the City of Salem Surface Water and Stormwater Monitoring Matrix (Attachment 1) for a more detailed explanation of how this monitoring element addresses each objective.

3.3 Background

Instream Storm monitoring is a new monitoring strategy. It was developed to help the City expand its understanding of receiving waters within the Pringle Creek Watershed during storm events. Three separate sites were selected for sampling, as described in 3.4.3.

3.4 Study Design / Sampling Process

3.4.1 Study Design

The study design is a spatial layout of the three different sites that are to be monitored during storm events only. The name of each site, the receiving stream, and location are included in Table 1, and are identified in Figure 1. Relevant characteristics for each site are as follows:

- **PRI12-** This site is located at the City's jurisdictional boundary, where Pringle Creek enters city limits, and represents an upstream catchment area with little influence from the City's MS4 system.

- **CLK1-** This site on Clark Creek represents an older portion of town, with the majority of the catchment being built-out and having limited stormwater structural controls. As identified in the City's 2008 NPDES MS4 Permit Renewal Application, 0.7% of the CLK1 catchment had structural controls in 2008.

- **PRI3-** This site on Pringle Creek represents a portion of the city with a larger percentage of catchment being treated by stormwater structural controls. As identified in the City's 2008 NPDES MS4 Permit Renewal Application, 3.9% of the catchment area had structural controls in 2008, and the coverage was estimated to rise to 8.1% by 2013.

Data collected by way of this monitoring element will help guide Salem's stormwater management strategies in the Pringle Creek Watershed and watersheds throughout the city.

3.4.2 Frequency and Duration

Instream Storm monitoring will be conducted during twenty-five storm events at each of the three sites throughout the duration of the permit term.

3.4.3 Sites

The receiving streams to be monitored are East Fork Pringle Creek, Pringle Creek and Clark Creek. PRI12 is where the East Fork Pringle Creek enters the City's jurisdiction and PRI3 is located on Pringle Creek just before the confluence of Shelton Ditch with Pringle Creek. CLK1 is located on Clark Creek just upstream of the confluence with Pringle Creek. These sites are identified in Figure 1 and described in Table 1.

Table 1: Instream Storm Monitoring Sites

Site ID	Creek Name	Site Location
PRI3	Pringle Creek	Pringle Park
PRI12	East Fork Pringle Creek	Trelstad Ave SE
CLK1	Clark Creek	Bush Park

3.4.4 Sample Collection Method

Sample collection methods will include grab samples, field measurements, and flow-weighted composites[1] (Table 2). All grab samples will be collected and field measurements will be taken during the first three hours of the sampled storm event. Portable sampling units will be programmed to collect a flow-weighted composite sample based on the predicted rainfall depth. The predicted rainfall depth will be calculated prior to the sampling event using a local forecast, with cessation of the event being identified by the first predicted 6 hour dry period or at the end of 24 hours, whichever comes first. The portable sampling units will remain in the field until the program is completed or 24 hours from the start of the event, whichever comes first.

Table 2: Instream Storm Parameter List and Collection Method

Instream (Storm Only) Parameters	Collection Method
TSS	Composite
BOD ('stream')	Composite
Total Phosphorus	Composite
Nitrate+Nitrite as Nitrogen	Composite
Ammonia Nitrogen	Composite
Copper (Total Recoverable & Dissolved)	Composite
Lead (Total Recoverable & Dissolved)	Composite
Zinc (Total Recoverable & Dissolved)	Composite
Hardness	Composite
Specific Conductivity	Field and Composite
Dissolved Oxygen	Field
Temperature	Field
pH	Field
E. coli	Grab

Note: BOD 'stream' analytical method is not identified in 40 CFR 136; however, this method has been identified as an acceptable method under Table B-1 Special Condition #5 in the City's NPDES MS4 permit.

3.4.5 Storm Event Criteria

The following criteria will be used to select storm events to conduct sampling (Schedule B.3):

- Storm event must be greater than 0.1 inch of rainfall
- A minimum of 50% of the water quality sample events must be collected during the wet season (October 1 to April 30)
- Each unique sample event must occur at a minimum of 14 days apart

3.5 Data Quality Criteria

3.5.1 Data Quality Objectives

The data quality objectives for field measurements are detailed in Table 3. Analytical methods for composite and grab samples analyzed at Willow Lake Laboratory will follow methods identified in 40 CFR 136 or otherwise identified in Table B-1 Special Conditions of the NPDES MS4 permit.

[1] If stream gauging equipment fails and it is infeasible to repair equipment before a targeted storm event starts, a time-composite sample will be collected in place of flow paced sample.

Table 3: Instream Storm Field Quality Objectives

Parameters	Accuracy	Precision	Analytical Methods
Temperature	± 0.5 °C	± 0.5 °C	NIST Temperature checks
pH	± 0.2 SU	± 0.3 SU	EPA-NERL 150.1
Dissolved Oxygen	± 0.2 mg/L	± 0.3 mg/L	ASTM D888-09
Specific Conductivity	± 7% of standard value	± 10%	EPA-NERL 120.1

3.5.2 Representativeness

All samples will be collected during storm events described in Section 3.4.5. Samples will be collected where the water is well mixed and representative of the ambient conditions. Grab samples will be collected and field measurements will be taken within the first three hours of the storm.

3.5.3 Comparability

Field, grab, and composite samples will utilize the same handling requirements and laboratory procedures that are used for the Stormwater, Monthly Instream, and Continuous Instream monitoring elements. This uniformity increases the validity of the data for analyses and comparisons with other data collected within the scope of this plan.

3.5.4 Completeness

It is anticipated that twenty-five samples from each of the three sites will be collected over the five year permit term. However, unanticipated circumstances including, but not limited to, personnel illness and turnover, vehicular malfunction, equipment malfunction, and various safety issues could prevent the collection of all of the samples. If such a situation exists, Oregon DEQ will be informed following notification procedures in Schedule B. 2.e of the NPDES MS4 permit.

3.6 Quality Assurance / Quality Control / Record Keeping

3.6.1 Duplicate and Blank Samples

Duplicates will be taken for a minimum of ten percent of the total number of grab samples and field measurements. For composite sampling, an equipment blank (involving suction line tubing, pump tubing, strainer, and sample container vessel) will be done prior to the first sampling event of each sampling season.

3.6.2 Instrument Calibration

Instrument calibration will be completed prior to each sampled storm event. Instrument calibration procedures are documented in the City's "Stormwater and Instream (Storm Only) Monitoring Standard Operating Procedures" (2011).

3.6.3 Instrument Inspection and Maintenance

Instrument inspection and maintenance procedures are documented and will be followed according to the City's "Stormwater and Instream (Storm Only) Monitoring Standard Operating Procedures" (2011).

3.6.4 Mobilization / Handling / Custody Procedures

The City contracts with a weather service that provides a detailed precipitation forecast that is updated daily. The Responsible Sampling Coordinator will monitor this weather forecast and make the final decision to sample. Once it has been decided to sample a storm, Willow Lake

Laboratory will be notified, a two person team will deploy portable samplers filled with ice, and all other relevant equipment and forms will be prepared. The contracted weather service will provide notification prior to the start of the storm event, ensuring the collection of grab samples and field measurements during the first 3 hours of the storm event.

The City has four staff that are trained on proper handling procedures to collect samples during a storm event. Field measurements will be taken using a sterilized beaker for sample collection. These measurements will be completed immediately after collection of the water sample. Grab samples will be collected using a sterilized beaker, transferred to appropriate bottles, put on ice, and transported immediately to Willow Lake Laboratory. As soon as the portable samplers have completed their programs, the flow-weighted composite sample(s) will be put on ice and taken to Willow Lake Laboratory. All grab and composite samples will have a chain of custody form associated with them.

3.6.5 Documentation and Records

A field data sheet will be filled out for each sampling event. All field measurements and pertinent information will be put on this sheet, including the details identified in Table 4.

Table 4: Instream Storm Field Data Sheet

Sampler's name	Number of samples collected by portable sampler
Project name	Total volume during sampling event
Site name	Baseline cfs at start of storm
Date/time of each field measurement	cfs when last sample was taken
Number of samples programmed	Total rainfall during event
Field measurement readings	Rainfall intensity during event
Current rating curve (equation)	Antecedent dry period (as defined in permit)
Portable sampler start and end date/time	Total rainfall in previous 7, 14, and 30 day periods

3.6.6 Data Management

All laboratory analytical results will be kept in Willow Lake Laboratory's Laboratory Information Management System (LIMS) database and Stormwater Services' Aquarius database. In addition, applicable data from the field sheet will be entered into the Aquarius database.

3.6.7 Data Validation and Verification

The Project Manager will review all field and laboratory data. It will be the responsibility of the Project Manager to perform the final review and verification of information on the field data sheets and chain of custody forms. In addition, the Project Manager will follow up with Willow Lake Laboratory on any laboratory-generated data that has fallen outside an expected range. Decisions to accept, qualify, or reject any data collected under this monitoring element will be made by the Project Manager.

3.7 Long-term Strategy

This monitoring element supports the long-term monitoring program strategy by providing data that will contribute to the understanding of the relationship between post-construction stormwater controls (stormwater design standards) and receiving stream water quality. The sites selected for sampling in this monitoring element have catchments with various levels of stormwater controls. Evaluating data by these catchment characteristics is intended to provide

the City a basis to assess the aggregate effectiveness of stormwater controls. Understanding this effectiveness will help the City prioritize its stormwater retrofit efforts and evaluate progress towards pollutant reduction in MS4 receiving streams. This is a new monitoring element, and it is expected that this element will continue beyond the current permit cycle; ultimately providing a dataset for long-term and spatial analyses.

4.0 Monthly Instream

4.1 Project / Task Organization

Monthly Instream refers to the monitoring of MS4-receiving streams, where sampling is to occur once a month on a schedule that is determined at the beginning of each calendar year. The City's Stormwater Administrative Analyst will serve as the Project Manager and Responsible Sampling Coordinator. The City's Stormwater Administrative Analyst and Flow Monitoring Technician will take the lead on sampling and collection of field and in-situ data. The City's Willow Lake Laboratory will perform all analytical laboratory analyses.

4.2 Monitoring Objectives

Monthly Instream monitoring will contribute, at least in part, to monitoring objectives i, ii, iii, iv, v, and vi, as identified in Schedule B.1 of the City of Salem's NPDES MS4 Permit. Refer to the City of Salem Surface Water and Stormwater Monitoring Matrix (Attachment 1) for a more detailed explanation of how this monitoring element addresses each objective.

4.3 Background

The Monthly Instream monitoring element was initiated in 2001 and has been implemented since then. Since 2001 there have been twenty-one sampling sites on local streams and all but one has remained at the same location. The exception is the upstream Battle Creek site which was moved in 2003 due to lack of access.

Beginning July 1st, 2013, the City added three sampling sites on the Willamette River to this monitoring element, thus bringing the total number of sites to twenty-four. The three new Willamette River sampling sites are described in Table 5, and are generally located at:

- upstream of the Salem city limits (new site)
- mid-way through Salem (since 1990)
- downstream of Salem city limits (since 1990)

Monthly sampling has been completed as part of a combined effort to assess the impacts of the city's wastewater effluent and MS4 discharges on receiving water bodies.

4.4 Study Design / Sampling Process

4.4.1 Study Design

The study design for this monitoring element is a paired design, where samples are collected monthly at upstream and downstream sites (except for on the Willamette River where there is a third, mid-way sampling point) on ten of Salem's local streams that receive MS4 discharges and the Willamette River. There is also a downstream monitoring site on the West Fork Little Pudding River. The Little Pudding River starts within Salem city limits, but runs dry during the summer months, so an upstream site was not selected. Dates for sampling are determined at the beginning of each calendar year and are therefore independent of weather conditions.

Due to the number of sites and limited personnel resources, a narrowed set of parameters were chosen for this monitoring element. When initiated in 2001, this monitoring element was intended to produce a dataset that could provide an index of stream quality, as well as spatial and trend analysis. For this permit cycle, 303(d) and TMDL listed parameters were added to the study design. Refer to Table 6 for a list of parameters for all sites.

4.4.2 Frequency and Duration

The sampling frequency will be once a month at twenty-four sites. Two of the sites (LPW1 and CGT5) typically run dry during the summer months resulting in fewer samples at these sites. Per Table B-1, the original twenty-one Monthly Instream sites must be monitored for a total of forty eight events per site; the three Willamette River sites will be in addition to this monitoring requirement and not be counted towards the monitoring frequency requirement.

4.4.3 Monitoring Sites

The receiving water bodies to be monitored include Glenn Creek, Gibson Creek, Croisan Creek, Pringle Creek, Clark Creek, Battle Creek, Mill Creek, Mill Race, Shelton Ditch, Claggett Creek, West Fork Little Pudding River, and the Willamette River. These sites are identified in Figure 1 and described in Table 5.

Table 5: Monthly Instream Monitoring Sites

Site ID	Creek Name	Site Location
PRI1	Pringle Creek	Riverfront Park
PRI5	Pringle Creek	Bush Park
SHE1	Shelton Ditch	Church St SE
SHE10	Shelton Ditch	State Printing Office
MRA1	Mill Race	High St SE
MRA10	Mill Race	Mill Race Park
MIC1	Mill Creek	Front St Bridge
MIC10	Mill Creek	Turner Rd SE
BAT1	Battle Creek	Commercial St SE
BAT12	Battle Creek	Rees Hill Rd SE
CRO1	Croisan Creek	Courthouse Athletic Club
CRO10	Croisan Creek	Ballantyne Rd S
CLA1	Clark Creek	Bush Park
CLA10	Clark Creek	Ewald St SE
CGT1	Claggett Creek	Mainline Dr NE
CGT5	Claggett Creek	Hawthorne St NE @ Hyacinth St NE
GLE1	Glenn Creek	River Bend Rd NW
GLE10	Glenn Creek	Hidden Valley Dr NW
GIB1	Gibson Creek	Wallace Rd NW
GIB15	Gibson Creek	Brush College Rd NW
LPW1	West Fork Little Pudding River	Cordon Rd NE
WR1 (WR8104)	Willamette River	Sunset Park (Keizer)-River Mile 81
WR5 (WR8303)	Willamette River	Railroad Bridge-River Mile 83
WR10 (WR8602)	Willamette River	Halls Ferry-River Mile 91

4.4.4 Sample Collection Method

The sample collection method will vary by parameter, as described in Table 6.

Table 6: Monthly Instream Parameter List and Collection Method

Monthly Instream Constituents	Collection Method	Site
BOD ('stream')	Grab	All
Nitrate+Nitrite as Nitrogen	Grab	All
E. coli	Grab	All
Total Phosphorus	Grab	WR1, WR5, WR10
Alkalinity	Grab	WR1, WR5, WR10
Ammonia	Grab	WR1, WR5, WR10
Copper (Total & Dissolved)	Grab	PRI1[1], PRI5[1], CLA1[1], CLA10[1]
Lead (Total & Dissolved)	Grab	PRI1[1], PRI5[1], CLA1[1], CLA10[1]
Zinc (Total & Dissolved)	Grab	PRI1[1], PRI5[1], CLA1[1], CLA10[1]
Hardness	Grab	PRI1[1], PRI5[1], CLA1[1], CLA10[1]
TSS	Grab	LPW 1[1], WR1, WR5, WR10
TS	Grab	WR1, WR5, WR10
TDS, calc.	Grab	WR1, WR5, WR10
Dissolved Oxygen	In-Situ	All
Temperature	In-Situ	All
Specific Conductivity	In-Situ	All
pH	Field	All
Turbidity	Field	All

Note: BOD 'stream' analytical method is not identified in 40 CFR 136; however; this method has been identified as an acceptable method under Table B-1 Special Condition #5 in the City's NPDES MS4 permit.
[1]New parameter for this location, added this permit term

4.5 Data Quality Criteria

4.5.1 Data Quality Objectives

The data quality objectives for field measurements are detailed in Table 7. Analytical methods for grab samples analyzed at Willow Lake Laboratory will follow 40 CFR 136.

Table 7: Monthly Instream Field and In-Situ Quality Objectives

Parameters	Accuracy	Precision	Analytical Methods
Temperature	± 0.5 °C	± 0.5°C	Standard Method 2500 B
pH	± 0.2 SU	± 0.3 SU	Standard Method 4500 H^+ B
Dissolved Oxygen	± 0.2 mg/L	± 0.3 mg/L	Standard Method 4500 O G
Turbidity	± 5%	± 5%	Standard Method 2130 B
Specific Conductivity	± 7% of standard value	± 10%	Standard Method 2510 B

4.5.2 Representativeness

For monitoring sites on local streams, sampling will be performed at or near the center of the stream channel where the water is well mixed and representative of the ambient conditions. For the three Willamette River sites, samples will be collected from within fifty feet of the bank of the Willamette River (west bank for new upstream site, east bank for the midway and downstream sites).

4.5.3 Comparability

Field and grab samples for this monitoring element will utilize the same handling requirements and laboratory procedures that are used for the Instream Storm, Stormwater, and Continuous

Instream monitoring. This uniformity increases the validity of the data for analyses and comparisons with other data collected within the scope of this plan.

4.5.4 Completeness

Per Table B-1 in the City's NPDES MS4 permit, a minimum of forty-eight samples, from each of the twenty-one stream sites, will be collected. However, Table B-1 Special Condition #3 states that the minimum number of samples may be reduced to thirty-six if insufficient flow does not allow for sample collection. In addition, personnel illness and turnover, vehicular malfunction, equipment malfunction, and various safety issues, including flooding and/or high flows and debris (in particular on the Willamette River) could prevent the collection of all of the samples. If such a situation exists, Oregon DEQ will be informed following notification procedures in Schedule B. 2.e of the NPDES MS4 permit.

4.6 Quality Assurance / Quality Control / Record Keeping

4.6.1 Duplicate Samples

Duplicate field measurements and duplicate grab samples will be taken at ten percent of the sites each month. These sites will be randomly selected prior to the sampling event.

4.6.2 Instrument Calibration

All field meters will be calibrated prior to collecting samples. Each meter will be calibrated according to procedures outlined in its user manual. Willow Lake Laboratory performs all required laboratory equipment calibrations following their QA/QC protocols to maintain lab certifications.

4.6.3 Instrument Inspection and Maintenance

Field equipment will be checked prior to each sampling event. Routine maintenance will be performed before going into the field. Basic replacement parts will be kept on hand or made available. Willow Lake Laboratory maintains and operates all laboratory test equipment in accordance with requirements to maintain laboratory certifications.

4.6.4 Handling / Custody Procedures

Field measurements will be collected using a sterilized beaker for sample collection. These measurements will be completed immediately after collection of the water sample. Grab samples will be collected using a sterilized beaker, transferred to appropriate bottles, and taken to Willow Lake Laboratory after each day's sampling event.

4.6.5 Documentation and Records

Field data sheets will be completed for each monthly sampling event. Information to be recorded on these field data sheets includes project name, time of sample collection, site ID, sampler's name, and sample date. Results obtained in the field will be recorded on the field data sheets.

4.6.6 Data Management

The sampling person is responsible for completion of the field data sheets. The Laboratory Manager at the Willow Lake Laboratory will provide laboratory results. Field and laboratory data will be entered into the Aquarius database managed by Stormwater Services.

4.6.7 Data Validation and Verification

The Project Manager will do a review of all information on field data sheets. Once the data have been entered into the database, the Project Manager will print a paper copy of the data and proofread it against the original field data sheets, and then have the secondary lead do the same. Errors in data entry will be corrected at that time. Outliers and inconsistencies will be flagged for further review. It is the responsibility of the Project Manager to investigate further and determine validity of the data. Data quality problems will be addressed as they occur, and will be identified in the final report to data users.

4.7 Long-term Strategy

By providing the oldest continuous dataset of instream water quality, the Monthly Instream monitoring element is central to the long-term monitoring program strategy. Data collected through this monitoring element has been used (and will continue to be used) for long-term trending, spatial analysis, and observations of seasonal differences. It is expected that by the end of this permit term, there will be sufficient data to create a sub-dataset that represents stream conditions during storm events; thus, allowing for spatial analysis and long-term trending analyses based on storm conditions only.

5.0 Continuous Instream

5.1 Project / Task Organization

Continuous Instream monitoring refers to the continuous monitoring of MS4 receiving streams at fixed sites. The City's Stormwater Monitoring Analyst will serve as the Project Manager. The City's Stormwater Services workgroup will perform all operation/maintenance and quality assurance/quality control procedures.

5.2 Monitoring Objectives

Continuous Instream monitoring will contribute, at least in part, to monitoring objectives i, ii, iii, iv, v, and vi, as identified in Schedule B.1 of the City of Salem's NPDES MS4 Permit. Refer to the City of Salem Surface Water and Stormwater Monitoring Matrix (Attachment 1) for a more detailed explanation of how this monitoring element addresses each objective.

5.3 Background

Continuous Instream monitoring began in 2006 with a total of six sites, including: two on Mill Creek, two on Pringle Creek, and two on Clark Creek. In 2007, three sites were added, two on Glenn Creek, and one on Mill Creek. In 2008, two sites were added on Battle Creek. Due to concerns with data quality and maintenance, a site on Mill Creek, MIC1, is scheduled for removal in 2012 and therefore was not included as part this monitoring element.

5.4 Study Design / Sampling Process

5.4.1 Study Design

The study design is a paired design with two stations positioned in an upstream/downstream configuration on each monitored stream. The upstream sites are adjacent to where the stream enters the City, and the downstream sites are either above the confluence with another stream or where the stream exits the City's jurisdictional boundary. All monitoring equipment was installed to collect a representative dataset that describes the stream conditions during both

storm and non-storm conditions. This study design allows for both spatial analysis as well as long-term trend analysis.

An addition to the study design of this monitoring element was to aid in the Illicit Discharge Detection and Elimination (IDDE) program by utilizing the near real time monitoring capabilities. This was accomplished in 2008 through the development of a water quality alarm system designed to detect readings that may be a result from an illicit discharge.

5.4.2 Frequency and Duration

The City's network of ten continuous monitoring sites are designed to run 24 hours a day, 365 days a year. The data collection interval is every 15 minutes. Infrequent disruptions to data collection can result from power outages or equipment failures, creating 'gaps' in the continuous data time series record.

5.4.3 Sites

A total of ten continuous monitoring sites are currently installed on Pringle, Clark, Mill, Battle, and Glenn Creeks. The positioning of these sites are identified in Figure 1 and described in Table 8.

Table 8: Continuous Instream Monitoring Sites

Site ID	Creek Name	Site Location
PRI3	Pringle Creek	Pringle Park
PRI12	Pringle Creek	Trelstad Ave SE
MIC3	Mill Creek	North Salem High School
MIC12	Mill Creek	Turner Rd SE
BAT3	Battle Creek	Commercial St SE
BAT12	Battle Creek	Lone Oak Rd SE
CLK1	Clark Creek	Bush Park
CLK12	Clark Creek	Ewald St SE
GLE3	Glenn Creek	Wallace Rd NW
GLE12	Glenn Creek	Hidden Valley Dr NW

5.4.4 Collection Method

Data are collected in-situ using automated datasondes for the following water quality parameters: temperature, pH, dissolved oxygen, specific conductivity, and turbidity. Stage readings are measured in-situ. Provisional flow measurements will be computed using a polynomial equation in real time. Finalized flow measurements will be computed using proprietary rating curve software. Table 9 details each of the parameters and the sample collection method.

Table 9: Continuous Instream Parameter List and Collection Method

Continuous Instream Parameters	Collection Method
Temperature	In-situ
pH	In-situ
Dissolved Oxygen	In-situ
Specific Conductivity	In-situ
Turbidity	In-situ
Stage	In-situ

5.5 Data Quality Criteria

5.5.1 Data Quality Objectives

The data quality objectives for continuous in-situ measurements are detailed in Table 10.

Table 10: Continuous Instream In-Situ Quality Objectives

Parameters	Accuracy	Precision	Analytical Methods	
			In-Situ	YSI
Temperature	± 0.5 °C	± 0.5 °C	NIST Temperature checks	
pH	± 0.2 SU	± 0.3 SU	EPA-NERL 150.1	Standard Method 4500-H
Dissolved Oxygen	± 0.3 mg/L	± 0.5 mg/L	Method 1002-8-2009	ASTM D888-09
Turbidity	± 5% or 2 NTU (whichever is greater)	± 5% or 3 NTU (whichever is greater)	EPA-NERL 180.1	Standard Method 2130B
Specific Conductivity	± 7% of standard value	± 10%	EPA-NERL 120.1	Standard Method 2510

5.5.2 Representativeness

The datasondes are positioned to capture representative readings of ambient conditions for each site.

5.5.3 Comparability

In-situ measurements utilize the same type of instrumentation for all stations except for the two Glenn Creek sites (GLE3 and GLE12). Despite this difference in instrumentation, internal tests have shown that temperature, pH, dissolved oxygen, and specific conductivity readings are comparable. The one exception to this is turbidity. Turbidimeter comparison tests have shown a significant variation of the data at the upper range of sensor readings. In order to develop a comparable understanding of the data the City is working to develop a regression that explains the relationship between the two different types of turbidimeters. Once this regression has been established, data from all stations will be comparable.

5.5.4 Completeness

The continuous monitoring stations are maintained following the “Continuous Water Quality Monitoring Program Quality Assurance Project Plan (QAPP)”, revised in 2011. Power outages or unanticipated equipment malfunctions can occur and may contribute to data gaps within the continuous data sets.

5.6 Quality Assurance / Quality Control / Record Keeping

5.6.1 Instrument Calibration

All datasonde sensors will be calibrated according to documented procedures in the “Continuous Water Quality Monitoring Program QAPP”.

5.6.2 Instrument Inspection and Maintenance

Station instrumentation will be inspected and maintained according to the “Continuous Water Quality Monitoring Program QAPP”.

5.6.3 Documentation and Records

Separate field sheets will be completed for each station visit. Information to be recorded on these field sheets is described in the "Continuous Water Quality Monitoring Program QAPP".

5.6.4 Data Management

Field technicians are responsible for completion of the field sheets. Data will be stored in the Stormwater Services Aquarius database.

5.6.5 Data Validation and Verification

The Stormwater Monitoring Analyst will do a review of all information provided on the field sheets following procedures documented in the "Continuous Water Quality Monitoring Program QAPP". All collected data will be audited and assigned a grade value to describe the quality of each datum recorded. A verification process of all data collected between audit periods is completed on a quarterly basis. Once the verification process is complete, the data can be distributed to data users.

5.7 Long-Term Strategy

All monitoring sites for this element are at fixed locations that are either on City-owned property or locations where the City has obtained easements. This ensures that sites will continue to be operated and maintained for stream discharge and water quality monitoring into the future.

This monitoring element provides data that will support multiple long-term monitoring program strategies. Examples for intended use of the data include: aiding and showing progress in the IDDE program (by use of station alarms); studying the impacts relating to hydromodification and strategies to address hydromodification (stream flow/stage data); continued evaluation of receiving stream status (water quality data); examining the cumulative effects (chemical, physical, and biological) of the City's MS4 stormwater runoff on receiving streams; and assessing progress towards meeting TMDL load reduction benchmarks.

6.0 Macroinvertebrate

6.1 Project / Task Organization

Macroinvertebrate monitoring will consist of sampling benthic macroinvertebrates at fixed sites in the Pringle Creek and/or Clark Creek subwatersheds. The City's Stormwater Monitoring Analyst will serve as the Project Manager. The City's Stormwater Services workgroup will be responsible for the completion of this monitoring effort.

6.2 Monitoring Objectives

Macroinvertebrate monitoring will contribute, at least in part, to monitoring objectives iv and v as identified in Schedule B of the City of Salem's NPDES MS4 Permit. Refer to City of Salem Stormwater Monitoring Matrix (Attachment 1) for a more detailed explanation of how this monitoring element addresses each objective.

6.3 Background

Macroinvertebrate monitoring is a new environmental monitoring element of the City's NPDES MS4 permit designed to help the City assess the biological effects of MS4 discharges on receiving waters. The City collected macroinvertebrate data within the Pringle Watershed in

2000 and 2001. To expand on these data, three targeted sites will be selected within the Pringle Creek and/or Clark Creek subwatersheds for monitoring during this permit cycle.

6.4 Study Design / Sampling Process

6.4.1 Study Design

The study design for this monitoring element is a targeted approach, where macroinvertebrates will be collected at three fixed sites within the Pringle Creek Watershed. Selected sites will be on Clark Creek, East Fork Pringle Creek, and the main stem of Pringle Creek. Sites selected for sampling will be in proximity to previous macroinvertebrate sampling sites (conducted in summer of 2000 and 2001) and, where possible, near other instream monitoring sites identified in this plan. The intent of this study design is to collect macroinvertebrate community data that can be compared with sites sampled in previous studies. Additionally, physical habitat data of the sampled stream site will be collected during macroinvertebrate sampling events. Data from other monitoring elements and the physical data collected will aid in the interpretation of the results and comparison analysis.

6.4.2 Frequency and Duration

Macroinvertebrate sample collection will be completed during two of the five permit years for a total of two samples per site. Sampling will occur at a similar time of year for each collection event.

6.4.3 Sites

Three targeted macroinvertebrate sampling sites will be selected in the Pringle and/or Clark Creek subwatersheds. Whenever possible, sites will be chosen that are in the vicinity of a continuous instream monitoring site.

6.4.4 Sample Collection Method

The Oregon DEQ Benthic Macroinvertebrate Protocol for Wadeable Rivers and Streams will be followed for each monitoring event. A qualified taxonomist will process all macroinvertebrate samples.

6.5 Quality Criteria

6.5.1 Representativeness

Targeted macroinvertebrate sites will be selected to represent MS4 receiving waters within the Pringle and/or Clark Creek subwatersheds.

6.5.2 Comparability

Targeted sampling at the same time of year at the same three sites using recognized sampling procedures will reduce the potential for spatial and temporal sample variation while increasing the comparability of data in the long term. Data collection methods used during this permit cycle will be comparable to those used in 2000 and 2001.

6.5.3 Completeness

Physical habitat data, including both quantitative and qualitative variables, will be collected at the same targeted sites. As applicable, water quality data collected from nearby continuous instream and/or monthly instream monitoring sites will supplement the data record. This

combined data set will provide information of stream conditions that will be used to assist in the identification of limitations and/or stressors to existing macroinvertebrate assemblages.

6.6 Quality Assurance / Quality Control / Record Keeping

6.6.1 Duplicate Samples

Field and laboratory duplicates will be collected for 10% of all samples.

6.6.2 Handling / Custody Procedures

All samples will be preserved in the field using a 70-95% ethanol concentration and labeled with sample collection information. This information will also be documented in pencil on waterproof paper and placed inside the preserved sample jar. If the sample is not immediately sent off to the lab for identification, the preservative will be replaced with fresh solution within one week of sample collection. Chain of custody forms will be completed for each monitoring event.

6.6.3 Documentation and Records

Field sheets documenting the site, date, and sampling personnel will be completed for each macroinvertebrate sampling event. This information will be combined with a set of additional field sheets designed to document the associated physical habitat data. It is the responsibility of the Project Manager to ensure that these documents are correctly completed during each monitoring event.

6.6.4 Data Management

All field documents and data received from the laboratory will be entered into the Stormwater Services Aquarius database by the Project Manager.

6.6.5 Data Validation and Verification

Macroinvertebrate samples will be preserved in the field, with sorting and identification conducted by a qualified taxonomist. Identification of organisms will be performed following the Oregon DEQ Benthic Macroinvertebrate Protocol for Wadeable Rivers and Streams.

6.7 Long-term Strategy

The macroinvertebrate monitoring that will be completed this permit term will provide a measure of the biological conditions at targeted sites within the Pringle Creek Watershed. This data will be compared with data collected during the summers of 2000 and 2001, providing a long-term assessment of changes in macroinvertebrate communities, and helping to evaluate the overall effectiveness of the City's Stormwater Management Program. Performing macroinvertebrate monitoring at or near the same sites during subsequent permit cycles will continue to be a key element of the long-term monitoring program strategy.

7.0 Instream Assessment

To fulfill the permit monitoring objectives and to help the City understand the effectiveness of its Stormwater Management Plan (SWMP); Instream Storm, Monthly Instream, Continuous Instream, and Macroinvertebrate data will be used to address the following assessment questions.

Question: **(Trend Analysis, Spatial)** What are the influences of City MS4 discharges on receiving stream water quality and flow during storm events?

Assumptions: City MS4 discharges are assumed to have some level of affect on water quality and flow of a receiving stream during storm events. The rationale is that the amount of impervious surface, differences in land use, and traffic volume will contribute to spatial changes in water quality parameters.

Question: **(Trend Analysis, Time)** Does data for the monitored water quality parameters change over time?

Assumption: The assumption is that water quality results will change over time. Through implementation of the City's SWMP, in-stream water quality results may change at different rates and at different points of SWMP implementation.

Question: **(Seasonal Observation)** Are there seasonal differences in the frequency that specific parameters exceed water quality criteria?

Assumption: The assumption is that certain water quality results will have more frequent exceedances of water quality standards during the dry season (summer), while others will have more frequent exceedances during the wet season (fall-winter-spring). The rationale is that some water quality parameters are more impacted by stormwater runoff while others are more subject to climatic conditions, flow volume, and land use activity outside of the City's jurisdictional area (e.g., agricultural land use adjacent to Mill Creek).

7.1 Analysis Methodology

Data mining will be used to organize the data to account for variables such as rainfall, stream levels, and seasonality. Once data have been organized into data sub sets, a normality test will be done to select a proper statistical hypothesis test to address trend analysis for both time and spatial questions. Seasonal observations will be addressed using descriptive statistics and graphical illustration.

8.0 Stormwater

8.1 Project / Task Organization

Stormwater monitoring refers to the monitoring of MS4 stormwater runoff during defined storm events. The City's Stormwater Monitoring Analyst(s) will serve as the Project Manager and the Responsible Sampling Coordinator. The Stormwater Services workgroup will perform sampling and collect field measurements. The City's Willow Lake Laboratory will perform all analytical laboratory analyses.

8.2 Monitoring Objectives

Stormwater monitoring will contribute, at least in part, to monitoring objectives i, ii, iii, iv, v, and vi, as identified in Schedule B.1 of the City of Salem's NPDES MS4 Permit. Refer to the City of Salem Surface Water and Stormwater Monitoring Matrix (Attachment 1) for a more detailed explanation of how this monitoring element addresses each objective.

8.3 Background

The City of Salem began collecting stormwater samples from four land use based monitoring sites (Redleaf, Edgewater, Cottage, Commercial) in January 1995. The City's first NPDES MS4 permit was subsequently issued in 1997. Annual stormwater sampling continued at these four sites through the winter of 2005. In 2006, the City discontinued these sites and began to

sample four new stormwater sites. These new sites were selected to represent stormwater discharges to 303(d) listed streams and have been identified by the associated stream name (Clark Storm, Mill Storm, Pringle Storm, Glenn Storm).

During this NPDES MS4 permit term (December 2010 - December 2015) the City will resume land use based stormwater sampling from three sites which represent residential, commercial, and industrial land use in Salem. Two of the sites, commercial and industrial, are new sites. These sites are discussed in Section 8.5.3 of this document.

8.4 Stormwater Assessment

Question: **(Pollutant Concentrations)** How does weather and/or other environmental conditions serve as a predictor of pollutant concentration levels in stormwater discharges from the MS4 system?

Assumptions: The assumption is that multiple factors contribute to the variability typically observed in stormwater pollutant data. Over time, it may be possible to identify key factors and further refine the SWMP to address those factors.

Question: **(Comparison)** Is there a statistical difference between the City's land use event mean concentrations (EMCs) and the Oregon Association of Clean Water Agencies (ACWA) EMCs that were used for the 2008 permit renewal process (ACWA data; modified 2008)?

Assumptions: The assumption is that there is a statistical difference between the City's land use EMCs and the ACWA land use EMCs. The rationale is that the ACWA EMCs are based on pre-SWMP data from all Oregon Phase 1 municipalities. While the City did contribute to the ACWA data set, the City has since collected a significant number of data points post implementation of the City's SWMP and therefore would expect to see a decreasing trend in the data.

8.4.1 Analysis Methodologies

To answer the assessment questions historic and data collected this permit term will be used for analyses. Regression analysis may be used to address the pollutant concentration question. To address the comparison question, analysis may include a non-parametric statistical test.

8.5 Study Design / Sampling Process

8.5.1 Study Design

The study design for this monitoring element provides for the characterization of MS4 stormwater runoff as a result of implementation of the City's SWMP. This will be done for commercial, industrial, and residential land uses. To acquire a more representative dataset for both commercial and industrial land use, the monitoring sites will differ from those sampled during the first two MS4 permit cycles. The residential land use monitoring will be at the same site sampled during the last MS4 permit cycle (2004 – 2010). Through this monitoring element, stormwater sampling data collected from similar land uses will be aggregated, with the intent to produce representative pollutant load concentration values.

8.5.2 Frequency and Duration

Stormwater monitoring will be conducted during fifteen storm events at each of the three sites throughout the duration of the permit term.

8.5.3 Sites

Three sites will be monitored over the course of the permit cycle. These sites are storm sewer manholes and represent residential, industrial, and commercial land use activity within the City. The residential and commercial catchments are within the Pringle Creek Watershed. The industrial catchment resides within the Upper Claggett Watershed. These sites are identified in Figure 1 and described in Table 11.

Table 11: Stormwater Monitoring Sites

Dominant Land Use	Residential	Industrial	Commercial
Site Identifier	Electric	Salem Industrial	Hilfiker
Manhole Number	D42466227	D51488226	D42456231
Number of Monitoring Events	3/year or 15/permit cycle	3/year or 15/permit cycle	3/year or 15/permit cycle
Watershed	Pringle Creek	Upper Claggett	Pringle Creek
Receiving Stream	Clark Creek	Claggett Creek	West Fork Pringle Creek

8.5.4 Sample Collection Method

Sample collection methods will include grabs samples, field measurements, and flow-weighted composites[2] (Table 12). All grab samples will be collected and all field measurements will be taken during the first three hours of the sampled storm event. Portable sampling units and flow modules will be programmed to perform a flow-weighted composite sample based on the predicted rainfall depth. The predicted rainfall depth will be calculated prior to the sampling event using a local forecast, with cessation of the event being identified by the first predicted 6 hour dry period or at the end of 24 hours, whichever comes first. The portable sampling units will remain in the field until the program is completed or 24 hours from the start of the event, whichever comes first

Table 12: Stormwater Parameter List

Pollutant Parameter	Collection Method
TSS	Composite
$BOD_{5\text{-day}}$	Composite
Total Phosphorus	Composite
Nitrate+Nitrite as Nitrogen	Composite
Ammonia Nitrogen	Composite
Copper (Total Recoverable & Dissolved)	Composite
Lead (Total Recoverable & Dissolved)	Composite
Zinc (Total Recoverable & Dissolved)	Composite
Hardness	Composite
Sp. Conductivity	Field and Composite
Temperature	Field
pH	Field
Dissolved Oxygen	Field
E. coli	Grab

[2] If flow equipment fails and it is infeasible to repair equipment before a targeted storm event starts, samplers will be programmed to take a time-composite sample in place of a flow paced sample.

8.5.5 Storm Selection Criteria

The following criteria will be used to select storm events for sampling:

- Storm event must be greater than 0.1 inch of rainfall
- When possible, samples must be collected after an antecedent dry period of a minimum of 24 hours

8.6 Data Quality Criteria

8.6.1 Data Quality Objectives

The quality objectives for field measurements are detailed in Table 13. Analytical methods for composite and grab samples analyzed at Willow Lake Laboratory will follow 40 CFR 136.

Table 13: Stormwater Field Measurement Quality Objectives

Parameters	Accuracy	Precision	Analytical Methods
Temperature	± 0.5 °C	± 0.5 °C	NIST Temperature checks
pH	± 0.2 SU	± 0.3 SU	EPA-NERL 150.1
Dissolved Oxygen	± 0.2 mg/L	±0.3 mg/L	ASTM D888-09
Specific Conductivity	± 7% of standard value	± 10%	EPA-NERL 120.1

8.6.2 Representativeness

All samples will be collected under a specific 'storm event' condition detailed in 8.5.5. Grab samples will be collected and field measurements will be taken within the first three hours of the storm.

8.6.3 Comparability

Field measurements and grab samples for this monitoring element will utilize the same handling requirements and laboratory procedures that are used for the Instream (Storm Only), Monthly Instream, and Continuous Instream monitoring elements. This uniformity increases the validity of the data for analyses and comparisons with other data collected within the scope of this plan.

8.6.4 Completeness

It is anticipated that fifteen samples from each of the three sites will be collected over the five year permit term. However, unanticipated circumstances including but not limited to; personnel illness and turnover, vehicular malfunction, equipment malfunction, and various safety issues could prevent collection of a hundred percent of the samples. If such a situation exists, Oregon DEQ will be informed following notification procedures in Schedule B.2.e of the NPDES MS4 permit.

8.7 Quality Assurance / Quality Control / Record Keeping

8.7.1 Duplicates and Blank Samples

Duplicate samples for grab samples and field measurements will be taken for a minimum of ten percent of the total number of samples. For composite sampling, an equipment blank (involving suction line tubing, pump tubing, strainer, and sample container vessel) will be done prior to the first sampling event of each sampling season.

8.7.2 Instrument Calibration

Calibration procedures are detailed in the City's "Stormwater and Instream (Storm Only) Monitoring Standard Operating Procedures" (2011).

8.7.3 Instrument Inspection and Maintenance

Instrument calibration will be completed prior to each sampled storm event. Instrument inspection and maintenance procedures will be followed according to the City's "Stormwater and Instream (Storm Only) Monitoring Standard Operating Procedures" (2011).

8.7.4 Mobilization / Handling / Custody Procedures

The City contracts with a weather service that provides a detailed precipitation forecast that is updated daily. The Responsible Sampling Coordinator will monitor this weather forecast and make the final decision to sample. Once it has been decided to sample a storm, Willow Lake Laboratory will be notified, a two person team will deploy portable samplers filled with ice, and all other relevant equipment and forms will be prepared. The contracted weather service will provide notification prior to the start of the storm event, ensuring the collection of grab samples and field measurements during the first 3 hours of the storm event.

The City has four staff that are trained on proper handling procedures to collect samples during a storm event. Field measurements will be taken using a sterilized beaker for sample collection. These measurements will be completed immediately after collection of the water sample. Grab samples will be collected using a sterilized beaker, transferred to appropriate bottles, put on ice, and transported immediately to Willow Lake Laboratory. As soon as the portable samplers have completed their programs, the flow-weighted composite sample(s) will be put on ice and taken to Willow Lake Laboratory. All grab and composite samples will have a chain of custody form associated with them.

8.7.5 Documentation and Records

A field data sheet will be filled out for each sampling event. All field measurements will be put on this sheet. Additional information recorded on the sheet is described in Table 14.

Table 14: Stormwater Field Data Sheet

Sampler's name	Predicted rainfall for sampling event
Project name	Predicted runoff volume for sampling event
Site name	Flow quantity interval
Date/time of each field measurement	Number of samples programmed
Portable sampler start and end date/time	Actual number of sample collected
Total volume during sampling event	Presence/absence of base flow before sampling
Presence of base flow after sampling	Total rainfall during event
Total rainfall prior to grab and field measurements	Average rainfall intensity during event
Rainfall intensity prior to grab collection and field measurements	Time of concentration
Antecedent dry period (as defined in permit)	Total rainfall in previous 7, 14, and 30 day periods
Field measurement reading(s)	Baseline CFS, start of storm

8.7.6 Data Management

All composite and grab sample data from each wet-weather sampling event will be entered into Willow Lake Laboratory's LIMS database. Stormwater personnel receive hard and electronic copies of these data. All data will be imported into Stormwater Services Aquarius database.

8.7.7 Data Validation and Verification

The Project Manager will review all field and laboratory data. It will be the responsibility of the Project Manager to perform the final review and verification of the data reported on the field data sheet. In addition, the Project Manager will follow up with Willow Lake Laboratory on any laboratory-generated data that has fallen outside an expected range. Decisions to accept, qualify or reject any data collected under this monitoring element will be made by the Project Manager.

8.8 Long-term Strategy

This element contributes to the long-term monitoring program strategy by providing data that characterizes the quality of MS4 discharges, and supports long-term evaluation of the effectiveness of the City's Stormwater Management Program. Datasets can be utilized for comparison between ACWA concentration values used for estimating total annual pollutant loads and benchmark analysis completed as part of the 2008 permit renewal package; thus, providing a gauge of the effectiveness of both structural and non-structural stormwater controls. Additionally, seasonal and geographic characterization will also be evaluated to help identify future stormwater control facility implementation priorities.

9.0 Pesticide

9.1 Project / Task Organization

Pesticide monitoring refers to the monitoring of pesticides in MS4 stormwater discharges during defined storm events. The City's Stormwater Monitoring Analyst(s) will serve as the Project Manager and the Responsible Sampling Coordinator. The Stormwater Services workgroup will perform sampling. The City will have a contracted laboratory perform all analytical laboratory analyses.

9.2 Monitoring Objectives

Pesticide monitoring will contribute, at least in part, to monitoring objectives ii, iii, iv, and v, as identified in Schedule B.1 of the City of Salem's NPDES MS4 Permit. Refer to the City of Salem Surface Water and Stormwater Monitoring Matrix (Attachment 1) for a more detailed explanation of how this monitoring element addresses each objective.

9.3 Background

This will be the first time the City has monitored for pesticides within MS4 discharges. This sampling will provide the City with information to determine if pesticides are present in the City's storm sewer system and discharging to receiving streams.

9.4 Pesticide Assessment

Question: **(Presence)** Are there pesticides present in residential, commercial, or industrial MS4 stormwater runoff in concentrations that are measureable using the identified pesticide screening method(s) in this plan? If so, does presence or type of pesticide vary by land use?

***Assumptions*:** The assumption is that pesticide compounds will be found within MS4 stormwater runoff from the monitored sites in concentrations that are measureable using the identified pesticide screening methods in this plan. An additional assumption is that samples from the residential land use site will have more frequent detection of pesticide compounds at

higher concentrations—resulting from relatively uncontrolled pesticide application by household applicators and larger areas of green space.

9.4.1 Analysis Methodology

Analysis methodology will include graphical representation of pesticide compounds detected. If pesticides are detected a source review of the specific pesticide compound will be done to determine whether the pesticide was most likely applied by a commercial applicator or a household applicator.

9.5 Study Design / Sampling Process

9.5.1 Study Design

The study design for this monitoring element is a land use-based design that will identify the presence of specifically-identified pesticides (or lack of) in MS4 stormwater discharges. The land use types to be monitored include residential, commercial, and industrial. Following the collection of data through this monitoring element, the City anticipates being able to evaluate and potentially modify its outreach efforts based on various pesticide user groups.

9.5.2 Frequency and Duration

Pesticide sampling will be completed during two of the five permit years for a total of four storm events at each of the three sites.

9.5.3 Sites

The storm sewer sites to be monitored for this element are the same land use based sites as the Stormwater monitoring sites. The residential and commercial sites are within the Pringle Creek Watershed. The industrial catchment resides within the Upper Claggett Watershed. These sites are identified in Figure 1 and described in Table 15.

Table 15: Pesticide Monitoring Sites

Dominant Land Use	Residential	Industrial	Commercial
Site Identifier	Electric	Salem Industrial	Hilfiker
Manhole Number	D42466227	D51488226	D42456231
Number of Monitoring Events	4/permit cycle	4/permit cycle	4/permit cycle
Watershed	Pringle Creek	Upper Claggett	Pringle Creek
Receiving Stream	Clark Creek	Claggett Creek	West Fork Pringle Creek

9.5.4 Sample Collection Method

The sample collection method will be grab samples. The City will collect pesticide samples when application rates are assumed heaviest.

9.5.5 Pesticide Parameters

Two separate screens will be done for pesticide sampling events, including a halogenated pesticide screen and a chlorinated herbicide screen. There are sixty-two different compounds in the halogenated pesticide screen and sixteen different compounds in the chlorinated herbicide screen (Attachment 2).

9.5.6 Pesticide Storm Selection Criteria

The following criteria will be used to select storm events to conduct sampling:

- Storm event must be greater than 0.1 inch of rainfall
- When possible, samples must be collected after an antecedent dry period of a minimum of 24 hours

9.6 Quality Criteria

9.6.1 Measurement Quality Objectives

It is anticipated that analytical method EPA SW-846, 8081B (GC-ECD) will be used for the halogenated pesticide screen and analytical method EPA SW-846, 8321B (HPLC-MS) will be used for the chlorinated herbicide screen. The expected reporting limits for each compound within these screens are included in Attachment 2.

9.6.2 Representativeness

All pesticide monitoring will be done under defined storm events with a target of capturing a sample from the most intense period of the defined storm event. All grab samples will be collected from the middle of the water column of the inflow pipe.

9.6.3 Comparability

To ensure comparability between the different land use sites, attempts will be made to collect samples at all three sites during each pesticide monitored storm event. If possible, the same laboratory and analytical methods will be used for all sampling.

9.6.4 Completeness

It is anticipated that pesticide samples will be collected from one hundred percent of selected sites during a minimum four sampling events per site.

9.7 Quality Assurance / Quality Control / Record Keeping

9.7.1 Duplicate, Blank, and Replicate Samples

Duplicate, blank, and replicate samples will be done according to the contracted laboratory's specifications. Duplicate samples will be collected and analyzed for a minimum of ten percent of total samples. All results from these samples will be included within the data records.

9.7.2 Mobilization / Handling / Custody Procedures

The City contracts with a weather service that provides a detailed precipitation forecast that is updated daily. The Responsible Sampling Coordinator will monitor this weather forecast and make the final decision to sample. Once it has been decided to sample a storm, the contracted laboratory for pesticide analysis will be notified and all other relevant equipment and forms will be prepared. The contracted weather service will provide notification prior to the start of the storm event, ensuring the collection of grab samples and field measurements during the first 3 hours of the storm event.

The City has four staff that are trained on proper handling procedures to collect pesticide samples during a storm event. Grab samples will be collected using sterilized beakers and then transferred to bottles provided by the laboratory. A separate beaker will be used for each site.

Beakers will be triple rinsed before each sample is collected. All samples will have a chain of custody form.

9.7.3 Documentation and Records

A field data sheet will be filled out for each sampling event. Information to be recorded on the field sheet is described in the Table 16 below.

Table 16: Pesticide Field Data Sheet

Sampler's name	Rainfall intensity prior to grab sample
Project name	Time of concentration
Site name	Antecedent dry period (as defined in permit)
Date/time of each field measurement	Total rainfall in previous 7, 14, and 30 day periods
Total rainfall prior to grab sample	Field measurement readings

9.7.4 Data Management

All analytical results and applicable field measurements including field data sheet information will be stored in the Stormwater Services Aquarius database.

9.7.5 Data Validation and Verification

It will be the responsibility of the Project Manager to perform the final review and verification of the data reported on the field data sheet. In addition, the Project Manager will follow up with the contracted laboratory on any laboratory-generated data that has fallen outside an expected range. Decisions to accept, qualify, or reject any data collected under this monitoring element will be made by the Project Manager.

9.8 Long-term Strategy

This pesticide monitoring element will guide future pesticide monitoring and outreach efforts by first identifying the scope of pesticide use. With these data, trends of particular pesticides/compounds may be identified that can guide future pesticide monitoring efforts. Furthermore, data collected will help guide outreach efforts to target specific pesticide users. It is anticipated that pesticide monitoring will not continue in this same study design in upcoming MS4 permit cycles as trends are identified.

10.0 Stormwater – Mercury

10.1 Project / Task Organization

Stormwater – Mercury monitoring refers to the monitoring of low level mercury and methyl mercury (total recoverable and dissolved) in MS4 discharges during defined storm events. The City's Stormwater Monitoring Analyst will serve as the Project Manager and Responsible Sampling Coordinator. The City will have a contracted laboratory to perform all analytical laboratory analyses.

10.2 Monitoring Objectives

Stormwater – Mercury monitoring will contribute, at least in part, to monitoring objectives ii, iii, iv, and v, as identified in Schedule B.1 of the City of Salem's NPDES MS4 Permit.

10.3 Background

This will be the first time the City has monitored MS4 stormwater runoff for low level mercury and methyl mercury (total recoverable and dissolved).

10.4 Study Design / Sampling Process

10.4.1 Study Design

The study design for this monitoring element is to provide modeling efforts by the DEQ with low level total and dissolved mercury and methyl mercury data from MS4 discharges that is representative residential and commercial land use catchments. Storms to be sampled include one summer storm and one winter storm from each site for a minimum of two years.

10.4.2 Frequency and Duration

Stormwater– Mercury monitoring will be conducted at two sites two times per year, one summer and one winter storm event. Following NPDES MS4 permit Table B-1 Special Condition #6, after two years of monitoring the City may request from the DEQ that this monitoring element be eliminated.

10.4.3 Sites

The sampling sites are the same commercial and residential land use based sites identified in the Stormwater monitoring element. These sites are within the Pringle Creek Watershed and are identified in Figure 1 and described in Table 17.

Table 17: Stormwater – Mercury Monitoring Sites

Dominant Land Use	**Residential**	**Commercial**
Site Identifier	Electric	Hilfiker
Manhole Number	D42466227	D42456231
Number of Monitoring Events	2/year; one summer and one winter storm event	2/year; one summer and one winter storm event
Watershed	Pringle Creek	Pringle Creek
Receiving Stream	Clark Creek	West Fork Pringle Creek

Note: Per Table B-1 Special Condition #6 of the City's NPDES MS4 permit after two years of monitoring the City may request from the DEQ that this monitoring element be eliminated.

10.4.4 Sample Collection Method

The sample collection method will be grab samples. EPA method 1669 ultra clean sampling protocol will be used to collect samples under this monitoring element.

10.4.5 Stormwater- Mercury Storm Selection Criteria

The following criteria will be used to select storm events to conduct sampling:

- Storm event must be greater than 0.1 inch of rainfall
- When possible, samples must be collected after an antecedent dry period of a minimum of 24 hours

10.5 Quality Criteria

10.5.1 Measurement Quality Objectives

The analytical method for total recoverable and dissolved mercury is US EPA method 1631E with a quantitation limit of 0.5 ng/L. The analytical method for total recoverable and dissolved methyl mercury is US EPA method 1630 with a quantitation limit of 0.05 ng/L.

10.5.2 Representativeness

All samples will be collected under a specific storm criteria identified in Section 10.4.5 of this document. Sample collection will follow EPA Method 1669 ultra clean sampling protocol.

10.5.3 Comparability

If possible, the same laboratory will be used for all mercury sample analyses. Attempts will be made to collect samples from both sites during the same storm events. Rainfall data from the nearest applicable rain gauge station will accompany the data set for each monitoring event.

10.5.4 Completeness

Stormwater - Mercury monitoring will be conducted two times per year, one summer and one winter storm event, at two sites. However, unanticipated circumstances including but not limited to; personnel illness and turnover, vehicular malfunction, equipment malfunction, and various safety issues could prevent the collection of all of the samples. If such a situation exists, Oregon DEQ will be informed following notification procedures in Schedule B.2.e of the NPDES MS4 permit. Following NPDES MS4 permit Table B-1 Special Condition #6, after two years of monitoring the City may request from the DEQ that this monitoring element be eliminated.

10.6 Quality Assurance / Quality Control / Record Keeping

10.6.1 Duplicate and Blank Samples

Duplicate and blank samples will be collected according to EPA Method 1669 ultra clean sampling protocol and sent to the laboratory for analysis following methods identified in 10.5.1. All results from these samples will be included within the data records.

10.6.2 Mobilization / Handling / Custody Procedures

The City contracts with a weather service that provides a detailed precipitation forecast that is updated daily. The Responsible Sampling Coordinator will monitor this weather forecast and make the final decision to sample. Once it has been decided to sample a storm, the contracted laboratory for mercury analysis will be notified and all other relevant equipment and forms will be prepared. The contracted weather service will provide notification prior to the start of the storm event, ensuring the collection of grab samples and field measurements during the first 3 hours of the storm event.

The City has four staff that are trained on the collection procedures outlined in EPA Method 1669 ultra clean sampling protocol prior to sampling. All samples will be collected and handled according to EPA Method 1669 ultra clean sampling protocol. Samples will be put on ice immediately and shipped overnight to the laboratory. All samples will have a chain of custody form.

10.6.3 Documentation and Records

After each sample is collected, field documentation will be recorded in a sampling log and any unusual observations concerning the sample and sampling will be documented.

10.6.4 Data Management

All analytical results including field documentation recorded during sampling will be stored in the Stormwater Services Aquarius database.

10.6.5 Data Validation and Verification

It will be the responsibility of the Project Manager to perform the final review and verification of the data reported on the field data sheet. Decisions to accept, qualify, or reject any data collected under this monitoring element will be made by the Project Manager.

10.7 Long-term Strategy

The study design for monitoring of mercury in MS4 discharges is unlikely to be similar to this approach in future efforts. The current study design is largely driven by data needs for modeling by DEQ. Future mercury monitoring will likely be guided by Willamette River TMDL requirements that at this time are uncertain.

11.0 Dry Weather Outfall

In support of the IDDE program and to satisfy requirements of the City's NPDES MS4 permit (Schedule A.4.a), the City will continue to conduct annual dry-weather outfall inspections. These inspections will be based on a prioritization process following a standard operating procedure. Stormwater Services field staff will work cooperatively with Environmental Services Compliance Specialists for this monitoring element.

12.0 Coordinated Environmental Monitoring

The City's NPDES MS4 permit allows for the opportunity to coordinate environmental monitoring with other MS4-permitted municipalities (Schedule B.4). City staff recognizes that there are potential benefits to such a coordinated effort (e.g., cost savings, data set size, efficiency). If a coordinated environmental monitoring strategy is developed, the City would modify this monitoring plan and notify the DEQ in accordance with NPDES MS4 permit Schedule B.2.e.

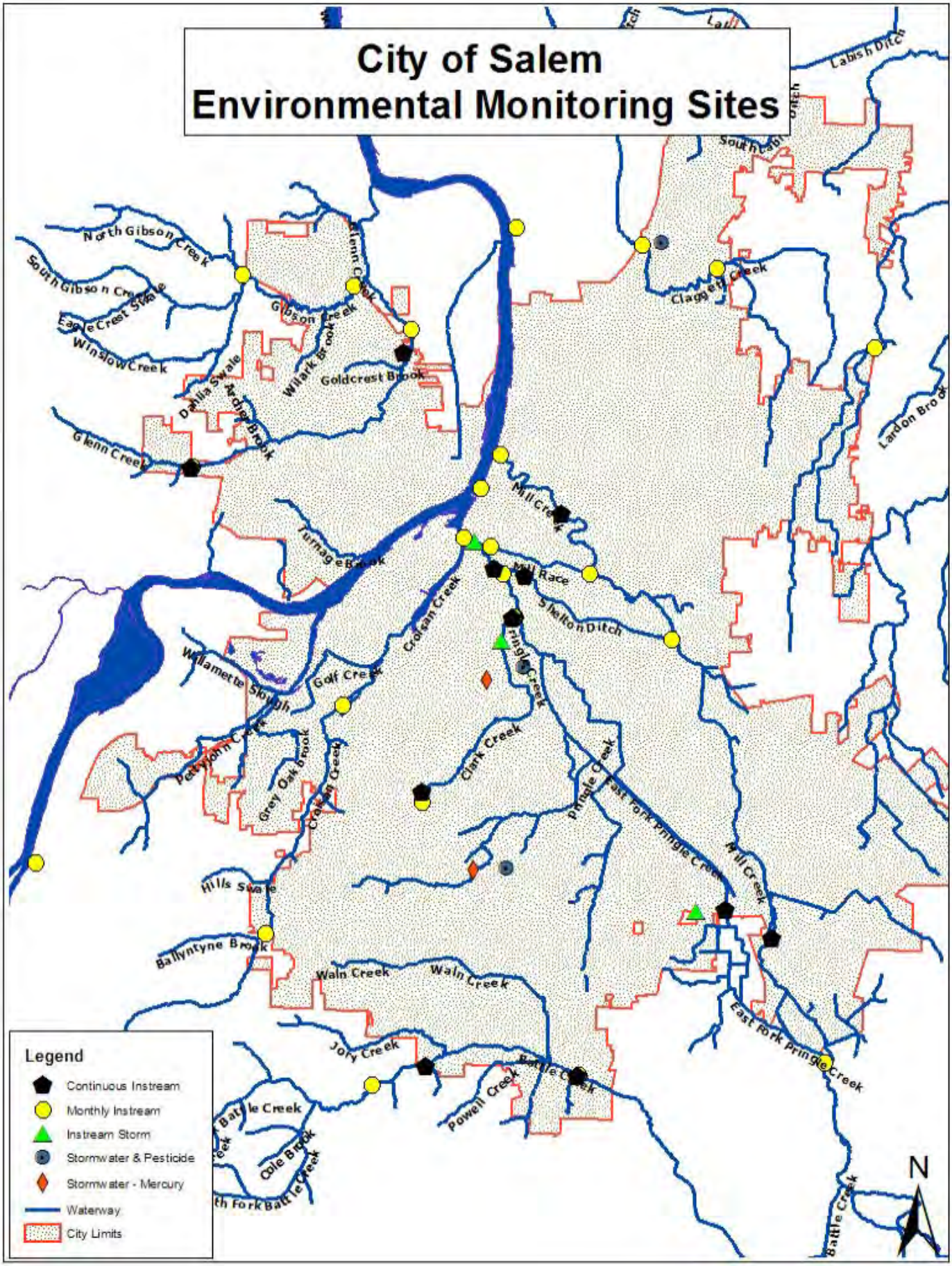

Figure 1: Surface Water and Stormwater Monitoring Sites

From: BENNINGHOFF Benjamin <BENNINGHOFF.Benjamin@deq.state.or.us>
To: 'Anita Panko' <ampanko@cityofsalem.net>
Date: 3/15/2013 8:20 AM
Subject: RE: Revision to City of Salem Surface Water and Stormwater Monitoring Plan

Anita-
Based on my review of the monitoring plan submittal and our discussion last week, the proposed modifications to the stormwater monitoring plan are acceptable. The modifications to the monitoring plan do not appear to trigger a permit modification, but please review the changes to ensure that the modifications do not alter Salem's BMP commitment in the Stormwater Management Plan.

Please do not hesitate to contact me if you have any questions. Thank you!

Ben

Benjamin Benninghoff | Municipal (MS4) Stormwater Coordinator
Oregon Department of Environmental Quality | 811 SW Sixth Ave., Portland, OR 97204
Phone: 503-229-5185 | Fax: 503-229-6037

-----Original Message-----
From: Anita Panko [mailto:ampanko@cityofsalem.net]
Sent: Thursday, March 14, 2013 2:06 PM
To: BENNINGHOFF Benjamin
Subject: Revision to City of Salem Surface Water and Stormwater Monitoring Plan

Benjamin,

After our phone discussion on Thursday, March 7th, I wanted to confirm that you were ok with all of the revisions the City of Salem has made to the Surface Water and Stormwater Monitoring Plan (attached to the letter sent to you dated March 1, 2013) and that we can move forward as expected.

These revisions included combining the Willamette River water sampling program (formerly done by Willow Lake Pollution Control Facility staff) with the Monthly Instream sampling (formerly done by Environmental Services staff) and having Stormwater Services take over the program. This would include 3 locations on the Willamette River being sampled at the same time as the Monthly Instream (once a month), and all samples will be collected from the bank.

Please respond to acknowledge the Department's approval of the proposed modifications.

Thank you,

Anita

Anita Panko
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