Status Report

Swamp Creek TMDL Monitoring - 2012

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Contents

INTRODUCTION 4
RESULTS 4
DISCUSSION 6
Figure 1 7
Appendix 1 8
Appendix 2 9

INTRODUCTION

Swamp Creek is located in Watershed Resource Inventory Area (WRIA) 8 and flows south, from Everett to its terminus in the City of Kenmore, where it discharges into the Sammamish River, just upstream of the river's union with Lake Washington. Swamp Creek is polluted by bacterial pollution from a variety of sources throughout the watershed. Although specific sources have not been identified, many of the potential sources are believed to come from humans and/or human activities, including pet wastes, failing septic tanks and illegal discharges. Swamp Creek was listed by the State of Washington under Section 303(d) of the federal Clean Water Act for failing to meet the U.S. Environmental Protection Agency (EPA) human health criteria for fecal coliform. A Total Maximum Daily Load (TMDL) Report and Implementation Plan for Swamp Creek was submitted by Washington State Department of Ecology (Ecology) and Approved by EPA in August 2006. This Implementation Plan and Appendix 2 of Ecology's Western Washington Phase II Municipal Permit (Permit) established water quality monitoring requirements for the City.

The goal of this monitoring is to estimate the concentration and loading of bacteria levels to Swamp Creek from stormwater within the City after five years of monitoring and to ultimately identify potential drainage areas within the City that may contain fecal coliform sources. To accomplish this, a Quality Assurance Project Plan (QAPP) to track fecal coliform levels and assess major drainage areas for potentially elevated fecal coliform levels within the City of Kenmore was submitted to Ecology in August 2008. Following are the results of the first four years of monitoring.

RESULTS

During the first year of monitoring (2009), bacterial levels in Swamp Creek and tributaries to Swamp Creek exceeded water quality standards. All sites exceeded the geometric mean standard of 50 colonies/100 ml and all samples exceeded the "not-more-than-10 percent" (90th percentile) standard of 100 colonies/100ml. This was the case for both the dry season (May to September) and the wet season (October to April) samples. Consistent with the TMDL report, the bacteria concentrations of the dry weather samples exceeded the standard by a larger margin than did the samples taken during the wet season.

During the second year of monitoring (2010), bacterial levels in Swamp Creek and tributaries to Swamp Creek continued to exceed water quality standards at some sites. Two of the five sites exceeded the geometric mean standard of 50 colonies/100 ml during the dry season and one of five during the wet season. Three of the five sites exceeded the "not-more-than-10 percent" (90th percentile) standard of 100 colonies/100 ml during both the wet and dry seasons. This was an improvement from 2009 where all sites exceeded water quality standards all year.

During the third year of monitoring (2011), bacterial levels in Swamp Creek and tributaries to Swamp Creek continued to exceed water quality standards at some sites. Four of the five sites exceeded the geometric mean standard of 50 colonies/100 ml during the dry season and two of five during the wet

season. Four of the five sites exceeded the "not-more-than-10 percent" (90th percentile) standard of 100 colonies/100 ml during the dry season and three of the five during the wet season.

During the fourth year of monitoring (2012), bacterial levels in Swamp Creek and tributaries to Swamp Creek continued to exceed water quality standards at some sites. All five sites exceeded the geometric mean standard of 50 colonies/100 ml during the dry season and four of the five during the wet season. All five sites exceeded the "not-more-than-10-percent" (90th percentile) standard of 100 colonies/100 ml during both the dry and wet season.

Sixteen replicates (a second grab sample simultaneously collected immediately following the first grab sample) at various sites were collected in order to calculate variability in 2012. Replicate grab samples varied between 3 – 171 percent with an average of 35 percent. The lab also performed duplicate analysis on random grab samples (total of ten grab samples in 2012) to determine variability within the same grab sample. In 2012, variability within same grab samples ranged between 0 – 33% with an average of 14%.

Appendix 1 summarizes data collected at each site from 2009 through 2012.

Appendix 2 summarizes the geometric mean and 90TH percentile statistics for each site from 2009 through 2012.

DISCUSSION

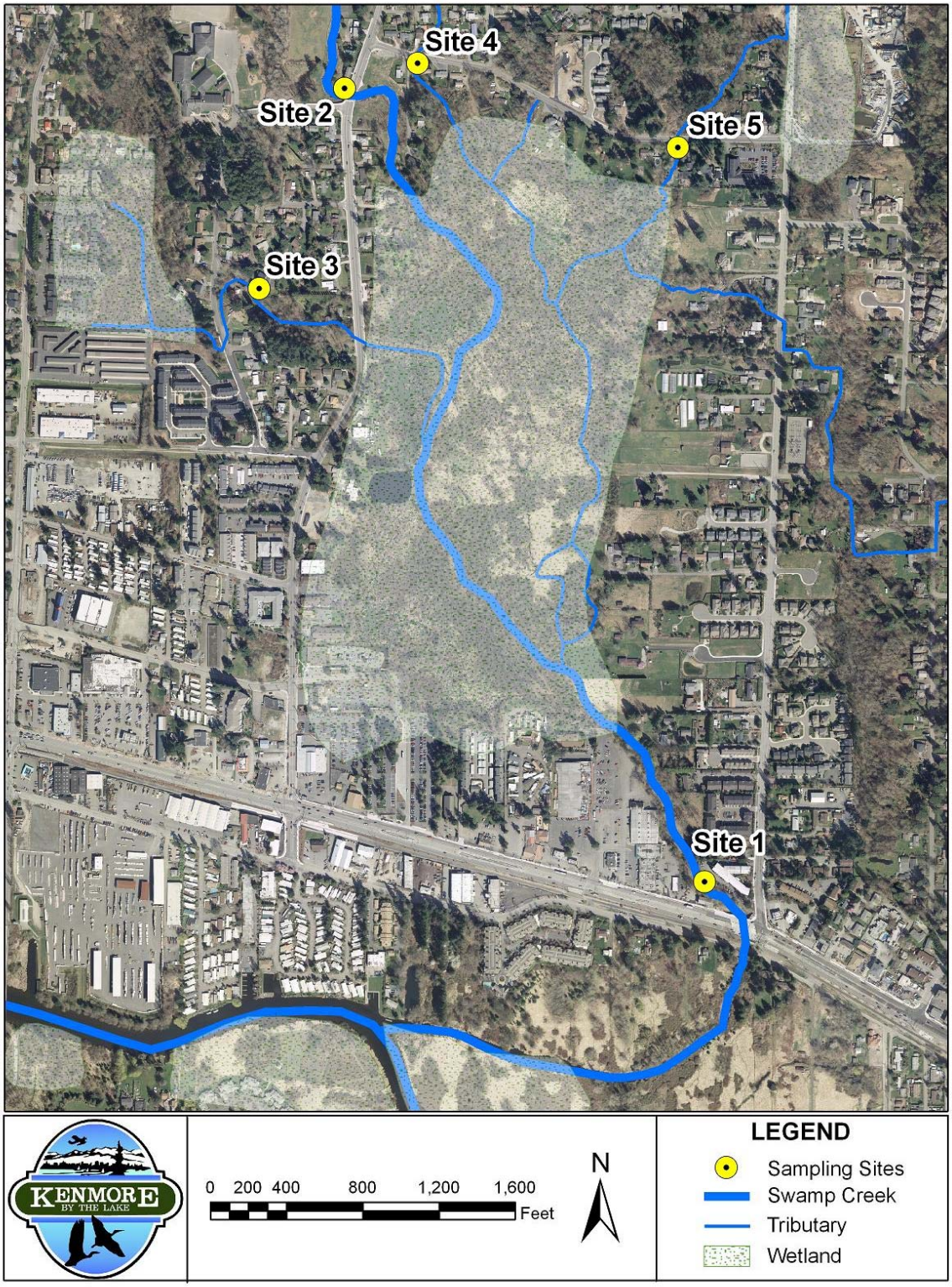
2012 was the fourth consecutive year of monitoring bacterial levels in Swamp Creek and tributaries to Swamp Creek. In total, there have been 83 dry season (May through September) sampling events and 138 wet season (October through April) sampling events during the four year period.

Next year (2013) will mark the fifth year of monitoring. Per the QAPP, after five years of monitoring the City will document trends in flow duration, and fecal coliform concentrations. Preliminary results from 2009 through 2012 indicate high variability of bacteria concentrations within sites over time which may make subsequent source tracking efforts difficult. Also, there does not appear to be a strong relationship between flow and bacteria concentration. There does appear to be a trend of higher bacteria concentrations during the dry season and during storm influenced events. An effort will be made during 2013, particularly the dry season, to capture more storm influenced events so that they can be analyzed in the 5-year report.

The 5-year report will coincide with the City's upcoming Permit (effective August 1, 2013) requirement to review fecal coliform data collected from existing QAPPs by February 2, 2014. Revised QAPPs will be due to Ecology by February 2, 2015.

Figure 1

Figure 1 shows the location of the five monitoring locations.



Appendix 1

2009 through 2012 monitoring results.

DATE	SITE 1		SITE 2		SITE 3		SITE 4		SITE 5	
	MAIN CHANNEL 522 BRIDGE		MAIN CHANNEL 73RD BRIDGE		MUCK CREEK 71ST AVE NE		TRIBUTARY NE 192ND ST		LITTLE SWAMP CREEK NE 192ND ST	
	Fecal Coliform	Flow	Fecal Coliform	Flow	Fecal Coliform	Flow	Fecal Coliform	Flow	Fecal Coliform	Flow
	CFU/100mL	*CFS*	*CFU/100mL*	*CFS*	*CFU/100mL*	*CFS*	*CFU/100mL*	*CFS*	*CFU/100mL*	*CFS*
20090102	90		66		56		62		54	
20090223	1060	58.26	47	38.73	258	0.4	72	0.17	20	1.20
20090323	2101	143.48	150	129.79	440	0.87	148	0.31	148	4.05
20090423	310	40.53	60	38.2	130	0.36	30	0.13	310	1.36
20090508	1100	88.17	130	86.77	72	0.73	18	0.28	210	3.81
20090618	78	13.52	150	14.31	230	NM	NM	NF	520	0.22
20090717	240	13.71	180	NM	350	NM	NM	NF	150	NM
20090814	1400	27.52	530	25.7	7100	0.2	4900	NM	2700	1.14
20090902	380	9.39	220	Bypass	1400	NM	280	NM	210	NM
20091002	330	21.9	220	19.82	540	NM	210	NM	180	0.5
20091104	260	52.07	90	50.41	150	0.18	40	NM	10	1.32
20091211	36	35.72	46	30.66	18	0.28	14	NM	180	1.08
20100119	18	145.57	24	120.32	20	1.36	2	0.86	24	5.91
20100218	30	92.20	8	85.11	6	0.83	6	0.54	10	4.05
20100311	120	89.11	56	75.36	88	2.13	1700	0.89	250	6.91
20100414	22	45.63	32	43.57	48	0.59	2	NM	36	1.76
20100521	110	36.10	120	33.01	100	0.22	10	NM	140	1.11
20100623	40	38.09	5	34.25	220	0.24	20	NM	95	1.19
20100709	38	15.96	22	17.39	42	NM	28	NM	6	0.43
20100813	40	13.79	25	13.61	60	NM	5	NM	40	0.24
20100915	94	18.73	22	18.73	220	NM		NM	46	0.47
20101013	140	35.84	4	33.21	110	NM	16	NM	6	0.98
20101202	130	NM	8	NM	10	NM	2	NM	4	NM
20101230	190	NM	12	NM	2	NM	2	NM	16	NM
20110131	200	NM	14	NM	8	NM	2	NM	6	NM
20110304	470	46.95	8	46.45	20	NM	2	0.26	86	2.82
20110408	260	60.9	58	58.42	34	0.5	2	0.29	54	2.14
20110503	440	73.46	190	73.56	120	0.43	26	0.19	200	1.7
20110617	90	13.36	40	13.7	220	0.13	15	0.11	460	1.34
20110728	180	8.99	160	9.65	80	NM		NF	200	0.28
20110912	380	5.82	170	7.37	75	NM		NF	70	0.22
20111018	580	5.96	120	8.1	210	NM		NF	50	0.26
20111205	580	18.51	35	18.16	70	0.19	10	0.1	15	1.03
20111228	2700	38.48	320	35.47	380	0.44	110	0.1	90	1.59
1/31/2012	60	61.79	10	61.75	10	0.45	10	0.34	60	2.35
3/5/2012	52	40.84	42	40.09	14	0.88	20	0.38	44	2.97
3/27/2012	20	27.85	35	26.2	10	0.42	10	0.47	10	1.14
4/20/2012	550/530	65.73	1200/1100	67.58	1600	1.52	340	0.63	1300	4.13
5/16/2012	350/360	14.81	70/50	14.14	360	0.10	440/350	0.03	190	0.43
6/27/2012	210/200	35.92	110/140	39.45	230	0.18	350	0.21	110	0.90
8/1/2012	220/340	NM	220/250	NM	24	NM		NF	110/150	NM
9/6/2012	35/95	4.77	370/100	6.24	140	NM		NF	200	0.10
10/15/2012	200/220	16.57	260/100	17.56	560/360	0.16		NF	160/180	0.40
12/20/2012	240	NM	750	NM	950	6.07	980	4.94	1400	24.59
12/21/2012	320	NM	410	NM	80	NM	10	NM	50	
12/28/2012	100	120.40	160	107.28	120	1.00	10	0.55	50	3.75

Dry Season (May – September)

Wet Season (October – April)

NM: No Measurement NF: No Flow Bypass: Flows Bypassed For Construction

Appendix 2

Table 2 shows the water quality statistics for samples taken in 2009 through 2012, including the geometric mean and 90th percentile for fecal coliform concentrations each calendar year.

SITE	YEAR	Dry Season (May – Sept)			Wet Season (Oct – April)		
		# of Samples	Geometric Mean	90th Percentile	# of Samples	Geometric Mean	90th Percentile
SITE 1	2009	5	405	1280	7	294	1476
SITE 2	2009	5	210	406	7	82	178
SITE 3	2009	5	565	4820	7	143	480
SITE 4	2009	3	291	3976	7	58	173
SITE 5	2009	5	392	1828	7	108	245
SITE 1	2010	5	58	104	7	65	160
SITE 2	2010	5	24	82	7	14	42
SITE 3	2010	5	104	220	7	20	97
SITE 4	2010	4	13	26	7	8	690
SITE 5	2010	5	43	122	7	19	122
SITE 1	2011	4	228	422	6	530	1640
SITE 2	2011	4	120	184	6	45	220
SITE 3	2011	4	112	190	6	90	295
SITE 4	2011	2	20	25	5	6	70
SITE 5	2011	4	189	382	6	35	88
SITE 1	2012	4	184	353	8	151	532
SITE 2	2012	4	135	286	8	174	1110
SITE 3	2012	4	129	295	8	117	1080
SITE 4	2012	2	378	422	7	35	596
SITE 5	2012	4	147	196	8	115	1320