MONITORING PLAN

Phase II Stormwater Monitoring and Stormwater Management Program Effectiveness Monitoring

Prepared for

City of Renton

March 2011

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Prepared for

City of Renton
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Introduction

This monitoring plan summarizes site selection and the basic monitoring design for two components of the long-term monitoring program specified in the National Pollutant Discharge Elimination System (NPDES) Western Washington Phase II Municipal Stormwater permit (Ecology 2009a): stormwater monitoring (S8.C.1.a) and Stormwater Management Program Effectiveness (SWMP) monitoring (S8.C.1.b). The monitoring plan follows guidance provided by the Washington State Department of Ecology (Ecology) in *Monitoring and Reporting Guidance – Phase II Municipal Stormwater Permits* (Ecology 2010a). The plan is organized into two main sections to present information related to the stormwater monitoring sites and SWMP monitoring sites, respectively.

Stormwater Monitoring

This section of the monitoring plan is divided into four main sections:

1. Background
2. Preliminary Screening
3. Site Constraints
4. Drainage Basin Descriptions

Background

The City of Renton (City) has a population of 83,650 based on a 2009 estimate by the Office of Financial Management (OFM 2010). The Phase II Municipal Stormwater permit (Ecology 2009a) states that cities with populations greater than 75,000 shall identify three outfalls or conveyances for long-term stormwater monitoring. The monitoring sites should have drainage areas that represent the following three land uses:

1. Commercial
2. High-density residential
3. Industrial

One monitoring site should be selected for each type of land use listed above. In the case where basins have mixed land uses, the land use of highest single percentage can be considered representative of the general land use in that basin.

Preliminary Screening

There are seven defined watersheds in the City:

1. Black River
2. Duwamish
3. Lake Washington East
4. Lake Washington West
5. Lower Cedar River
6. May Creek
7. Soos Creek

These watersheds are comprised of 22 subbasins. As a first step in identifying specific subbasins for long-term monitoring, the City conducted a desktop screening assessment to prioritize receiving waters based on the following criteria:

- Known water quality concerns
- Stormwater outfall density
- Density of industrial NPDES stormwater permits
- Density of generating sites with storage of large quantities of potential spill materials
- Age of sub-watershed development
- 303(d)-listed receiving waters

Waterbodies in the City listed under category 5 (impaired waters) on Ecology's 303(d) list are summarized in Table 1.

Table 1. Waterbodies in the City of Renton on Ecology's 303(d) list.

Waterbody Name	Category 5 Parameter(s)
Black River	Fecal coliform
Cedar River	Dissolved oxygen, fecal coliform, pH, temperature
Lake Washington	Fecal coliform (near Johns Creek outlet)
May Creek	Fecal coliform
Springbrook (Mill) Creek	Dissolved oxygen, fecal coliform

Source: Category 5 listings are based on the 2008 Water Quality Assessment (Ecology 2011).

Site Constraints

Following the preliminary screening, the City identified a number of candidate sites in the stormwater conveyance systems draining to the receiving waters identified in Table 1 based on their representativeness for monitoring runoff from the land use categories identified in the Phase II Municipal Stormwater permit.

Next, the City conducted field visits to determine the feasibility of monitoring at these candidate sites given site-specific characteristics related to monitoring logistics such as the hydraulics in the conveyance system and access. Information obtained from these field visits helped to narrow down the list of monitoring sites to the three monitoring sites selected for long-term monitoring; these sites are described in Table 2 with any relevant monitoring constraints.

Drainage Basin Descriptions

The approximate drainage basin size, dominant land use, and other contributing land uses were determined for each of the three selected stormwater monitoring sites using Geographic Information System (GIS) data and are summarized in Table 2. The approximate drainage basin

Table 2. Drainage basin characteristics and monitoring constraints for the selected stormwater monitoring sites.

Representative Land Use	Monitoring Site Location	Drainage Basin Size (acres)	Dominant Land Use (% of Drainage Basin)	Other Contributing Land Uses (% of Drainage Basin)	Monitoring Constraints Based on Site Hydraulics	Monitoring Constraints Based on Site Access [a]
Residential	Edmonds and NE 7th Street	151	High-density residential (96%) [b]	Commercial (4%) [c]	No known issues with site hydraulics.	Not much room to locate an above ground equipment box without locating it on private property. [d]
Commercial	N. Park Avenue	61	Commercial (100%) [c]	None	The pipe system is relatively flat and close to the lake level, so there is potential for backwater issues.	No issues with site access. The catch basin is located in a grass strip adjacent to the power substation.
Industrial	Lind Avenue SW and SW 34th Street	110	Industrial (82%) [e]	Commercial (18%) [c]	The catch basin has two inlet pipes. The pipe of interest is approximately 60 inches in diameter.	No known issues with site access.

[a] Site access monitoring constraints include evaluating the suitability of the site for installation of and operation of flow-weighted composite sampling equipment.

[b] High-density residential land use includes residential areas with 8 to 10 dwelling units per acre.

[c] Commercial land use includes the Center Village, multi-family residential, commercial arterial, commercial office, and the Urban Center.

[d] Final residential site selection will be based on property access agreements. Alternatively, sampling equipment may be installed in a constructed below ground vault within the right-of-way.

[e] Industrial land use includes industrial – light, – medium, and – heavy.

boundaries are shown in Figures 1, 2, and 3 for the residential, commercial, and industrial sites, respectively. Prior to monitoring, field verification is recommended for final drainage basin delineation.

Since the land use with the dominant land use in each drainage basin matches the land use categories specified in the Phase II Municipal Stormwater permit, the three monitoring sites meet the requirements for site selection. The sites selected for residential and commercial monitoring are both part of the Lake Washington East drainage basin. The site selected for industrial stormwater monitoring is part of the Black River drainage basin. Both Lake Washington (near the outlet of the Lake Washington East drainage basin) and the Black River are on the 303(d) list for fecal coliform bacteria (Table 1).

The City will refer to the *Standard Operating Procedure for Automatic Sampling for Stormwater Monitoring* (Ecology 2009b) when developing the quality assurance project plan (QAPP) for conducting this monitoring.

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Figure 1. Residential stormwater monitoring location at the southwest corner of Edmonds and NE 7th Street in Renton, Washington.

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Figure 2. Commercial stormwater monitoring location on Park Avenue N. in Renton, Washington.

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Figure 3. Industrial stormwater monitoring location at the northwest corner of SW 34th Street and Lind Avenue SW in Renton, Washington.

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Stormwater Management Program Effectiveness Monitoring

The City is also required to develop two SWMP effectiveness questions to evaluate and improve the effectiveness of their stormwater program by collecting and applying the results of water quality sampling. Based on discussions with the City, the two aspects of the stormwater program that the City would like to focus on include the effectiveness of the new construction sediment and erosion control inspection program and public outreach efforts to address high fecal coliform bacteria concentrations in Johns Creek. The following two questions were prepared to address each of these issues:

1. How effective are the new construction inspection programs in reducing turbidity levels from construction sites?

2. How effective is a targeted public education program for pet waste in reducing fecal coliform bacteria concentrations in Johns Creek?

This section of the monitoring plan is divided into two subsections to provide more detailed information on each of these questions:

1. Monitoring plan for SWMP Question #1
2. Monitoring plan for SWMP Question #2

Monitoring Plan for SWMP Question #1

This section discusses the purpose and design of the monitoring plan for the following question and hypothesis related to the City's new construction inspection programs:

Question #1: How effective are the new construction inspection programs in reducing turbidity levels from construction sites?

Hypothesis: The new construction inspection programs will result in a significant reduction in turbidity levels downstream of active construction sites compared to baseline water quality data from construction sites that are not subject to similar inspection programs.

Purpose

The purpose of the new construction inspection programs is to ensure compliance with sections S5.C.4.b and S5.C.4.c of the Phase II Municipal Stormwater permit. The City is interested in determining if the construction inspection programs have an impact on the turbidity levels

observed downstream of active construction sites. The City will use this information to justify continued construction inspections on the same schedule or to increase or decrease the number of construction inspections to ensure that turbidity criteria are met. This issue is important to the City since there are a significant number of single family residential construction projects in the City and they would like to know if their construction inspections are benefitting the downstream water quality. Based on discussions at the January 2011 NPDES permit coordinators forum, construction site monitoring is a topic of interest to many Phase II jurisdictions, thus the results from this monitoring will be important on a regional scale. The results from this monitoring would be shared with other Phase I and Phase II jurisdictions to benefit their construction inspection programs.

Design

The monitoring design to address this particular monitoring question will involve selecting monitoring sites from active construction sites in the City. Stormwater samples would be collected using grab sampling techniques upstream (if feasible) and downstream of the construction sites and analyzed for turbidity in the field using a turbidimeter. The City will refer to the *Standard Operating Procedure for Collecting Grab Samples from Stormwater Discharges* (Ecology 2009c) when developing the QAPP for conducting this monitoring. The data collected from these construction sites will be compared to baseline water quality data from construction sites that are not subject to similar inspection programs that are compiled in the *Interim Report: Stormwater Quality Survey of Western Washington Construction Sites* (Ecology 2004) and/or data collected from construction sites as part of the Construction NPDES Stormwater General Permit (Ecology 2010b). Since proposed locations will vary depending on the active construction sites at the time, a map or diagram showing the monitoring locations has not been provided with this monitoring plan.

The anticipated schedule for the construction site SWMP effectiveness monitoring will involve selecting a subset (5 to 10 percent) of active construction monitoring sites at the beginning of the wet season (September or October). At least four monitoring sites would be sampled during five storm events to ensure a robust dataset for further analysis. Additional monitoring sites and storm events can be added as needed to build a more robust dataset. The monitored storm events should be targeted to meet the following storm event guidelines (Ecology 2008):

- **Minimum storm depth:** 0.15 inches
- **Antecedent dry-period:** 6 hours with less than 0.04 inches of rain
- **Minimum storm duration:** 1 hour

One sample should be collected prior to clearing and construction at the monitoring site, a second sample should be collected prior to the first construction inspection, and a third sample should be collected following the first construction inspection. The remaining two samples should be collected from each monitoring site during the remainder of the wet season. The data obtained from this sampling would be compared to baseline water quality data compiled in the *Interim Report: Stormwater Quality Survey of Western Washington Construction Sites* (Ecology 2004) and/or data collected from construction sites as part of the Construction NPDES

Stormwater General Permit (Ecology 2010b) to determine if the City's construction inspection programs are reducing turbidity levels in construction site runoff.

Monitoring Plan for SWMP Question #2

This section discusses the purpose and design of the monitoring plan for the following question and hypothesis related to a targeted public education program for pet waste:

> **Question #2:** How effective is a targeted public education program for pet waste in reducing fecal coliform bacteria concentrations in Johns Creek?
>
> **Hypothesis:** The targeted public education program for pet waste will have a minimal positive effect on reducing fecal coliform bacteria concentrations in Johns Creek.

Purpose

The purpose of the targeted public education is to provide education and outreach to the general public regarding proper disposal of pet waste and will be a component of the City's education and outreach program (S5.C.1.a.i of the Phase II Municipal Stormwater permit). The City is interested in determining if pet waste is a significant contributor to fecal coliform concentrations measured in Lake Washington near the swimming beach at Gene Coulon Memorial Beach Park and the outlet from Johns Creek. Pets are currently not allowed in Gene Coulon Memorial Beach Park, but are found in other portions of the Johns Creek watershed. The City will use this information to determine if the fecal coliform concentrations are originating from the primarily residential basin in the upper watershed or from another source (i.e., seagulls, illicit discharges). Where it can be determined that the fecal coliform bacteria contamination is primarily originating from pet waste, the City will implement targeted education programs in these areas in an effort to reduce the contamination. This issue is important to the City because there is a 303(d) listing for Lake Washington near the outlet to Johns Creek, although a total maximum daily load (TMDL) has not yet been assigned. Although this monitoring plan is targeted towards a specific drainage basin and water quality issue in the City, the monitoring results will be applicable on a regional scale to other cities and counties that are faced with fecal coliform bacteria TMDLs and would like to implement a targeted public education campaign in their watersheds. The results from this monitoring would be shared with other Phase I and Phase II jurisdictions to benefit their public education programs.

Design

The monitoring site to address this particular monitoring question will be the same residential site (Edmonds and NE 7th Street) used for the stormwater monitoring summarized previously (Figure 1). Stormwater samples would be collected using grab sampling techniques and submitted to a qualified laboratory to be analyzed for fecal coliform bacteria. The City will refer

to the *Standard Operating Procedure for Collecting Grab Samples from Stormwater Discharges* (Ecology 2009c) when developing the QAPP for conducting this monitoring.

Baseline water quality data will be collected before the targeted public education campaign begins. Monitoring data will also be compared to historical data collected by King County as part of the King County Swimming Beach Monitoring Program.

The anticipated schedule for the fecal coliform SWMP effectiveness monitoring will involve monthly monitoring for 12 months prior to initiating the targeted public education campaign and 12 months after the campaign. The monitored storm events should be targeted to meet the following storm event guidelines (Ecology 2008):

- **Minimum storm depth:** 0.15 inches
- **Antecedent dry-period:** 6 hours with less than 0.04 inches of rain
- **Minimum storm duration:** 1 hour

If significant rainfall does not occur during the summer months, a grab sample can still be collected if flow is present in the catch basin. If no flow is present, that observation will be recorded on a field form and no sample will be collected. Fecal coliform bacteria concentrations from this monitoring will be tracked over time to determine if there is a significant decreasing trend in the data that may be related to the targeted education program.

References

Ecology. 2004. Interim Report: Stormwater Quality Survey of Western Washington Construction Sites. Publication No. 04-03-036. Washington State Department of Ecology, Environmental Assessment Program and Water Quality Program. September 2004.

Ecology. 2008. Guidance for Evaluating Emerging Stormwater Treatment Technologies. Technology Assessment Protocol – Ecology (TAPE). Publication No. 02-10-037. Washington State Department of Ecology, Olympia, Washington.

Ecology. 2009a. Western Washington Phase II Municipal Stormwater Permit. Washington State Department of Ecology Water Quality Program. Issued January 17, 2007, modified June 17, 2009.

Ecology. 2009b. Standard Operating Procedure for Automatic Sampling for Stormwater Monitoring Version 1.0. Washington State Department of Ecology, Olympia, Washington. September 16, 2009.

Ecology. 2009c. Standard Operating Procedure for Collecting Grab Samples from Stormwater Discharges Version 1.0. Washington State Department of Ecology, Olympia, Washington. September 16, 2009.

Ecology. 2010a. Monitoring and Reporting Guidance Phase II Municipal Stormwater Permit. Publication No. 10-10-030. Washington State Department of Ecology, Municipal Stormwater Permit Team, Water Quality Program. May 2010.

Ecology. 2010b. Construction Stormwater General Permit. Washington State Department of Ecology Water Quality Program. Issued December 1, 2010.

Ecology. 2011. Washington State's Water Quality Assessment [303(d)]. Washington State Department of Ecology. Obtained from agency website on January 18, 2011: http://www.ecy.wa.gov/programs/wq/303d/2008/index.html.

OFM. 2010. 2010 Population Trends. State of Washington Office of Financial Management Forecasting Division. October 2010.