DEPARTMENT OF
ECOLOGY
State of Washington

Addendum to Gibbons Creek Watershed Fecal Coliform Total Maximum Daily Load

Implementation Monitoring Quality Assurance Project Plan

October 2011

Publication No. 11-03-117

Publication Information

Addendum

This addendum is an addition to an original Quality Assurance Project Plan. The addendum is not a correction (errata) to the original plan.

This addendum is available on the Department of Ecology's website at www.ecy.wa.gov/biblio/1103117.html

Ecology's Activity Tracker Code for this study is 12-021.

Original Publication

Gibbons Creek Watershed Fecal Coliform Total Maximum Daily Load: Implementation Monitoring Quality Assurance Project Plan. Publication No. 05-10-062 (Water Quality Program).

The above publication is an appendix in the publication, *Gibbons Creek Watershed Fecal Coliform Total Maximum Daily Load (Water Cleanup Plan): Detailed Implementation Plan*. Publication No. 05-10-078 (Water Quality Program). www.ecy.wa.gov/biblio/0510078.html

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DEPARTMENT OF ECOLOGY

Environmental Assessment Program

October 25, 2011

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Kim McKee, Unit Supervisor, Southwest Regional Office
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THROUGH: George Onwumere, Unit Supervisor, Environmental Assessment Program
Robert F. Cusimano, Section Manager, Environmental Assessment Program

FROM: George Onwumere and Scott Collyard, Environmental Assessment Program

SUBJECT: Addendum to Gibbons Creek Watershed Fecal Coliform Total Maximum Daily Load: Implementation Monitoring Quality Assurance Project Plan
Activity Tracker Code: 12-021
Publication No. 11-03-117

Past water quality sampling conducted by volunteers and Clark County, City of Washougal, and Ecology staff has documented high fecal coliform (FC) concentrations within and around the Gibbons Creek watershed. To determine whether FC bacteria TMDL implementation actions have met the TMDL target reductions set in the original TMDL and submittal report, a follow-up bacteria data collection is necessary.

This addendum to the original TMDL and Implementation Monitoring Quality Assurance Project Plan describes the 2011-2012 bacteria sampling plans for Gibbons Creek watershed. Sampling procedures will adhere to the protocols stated in the original QAPP. Included in this addendum are: background information, project goals and objectives, study design, field and laboratory procedures, quality control and objectives, project organization, schedule, and lab budget.

cc: Karol Erickson, Unit Supervisor, Modeling & Information Support Unit
Will Kendra, Section Manager, Statewide Coordination Section
Stuart Magoon, Lab Director, Manchester Environmental Laboratory
Bill Kammin, Ecology Quality Assurance Officer
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Background

Water quality sampling conducted by volunteers and Clark County, City of Washougal, and Ecology staff has documented high fecal coliform (FC) concentrations within and around the Gibbons Creek watershed. These findings led to the completion of an FC bacteria TMDL in 2000 (Post, 2000). Gibbons Creek, in eastern Clark County, flows into the Columbia River just east of the City of Washougal. The flow in the upper watershed and its tributaries is through relatively steep, incised valleys as the water travels down the northern slope of the Columbia River Valley. Near where the creek crosses under Washington State Highway 14, the gradient lessens considerably as the creek reaches the floor of the Columbia River Valley.

Possible sources of elevated FC bacteria, turbidity, and temperature are failing septic tanks, animal-keeping operations, construction/development projects, lack of riparian shading, and other warm water inputs (Post, 2005). Since the completion of the TMDL, more restoration work has been done on Gibbons Creek. Information on work done to date can be found on the project website at: www.ecy.wa.gov/programs/wq/tmdl/Gibbons Cr/GibbonsCrTMDL.html. It is believed that sufficient progress has been made to reduce FC concentrations within the watershed.

The water quality standards describe criteria for fecal coliform for the protection of characteristic uses within the Gibbons Creek watershed. Ecology will determine attainment of water quality standards using the following Washington State water quality standard for FC:

> *"Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/ 100 mL, with not more than 10% of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200/colonies mL" [WAC 173-201A].*

This addendum uses methods, sampling designs, and quality control procedures outlined in the original TMDL technical study (Erickson, 1994) and the Gibbons Creek Watershed Fecal Coliform Total Maximum Daily Load (Water Cleanup Plan): Detailed Implementation Plan (Post, 2005). Appendix B of the Detailed Implementation Plan includes an Implementation Monitoring Quality Assurance Project Plan that is the basis for this addendum. This sampling strategy will provide sufficient data to determine if Gibbons Creek is currently meeting the original TMDL target reductions for FC (Nocon and Erickson, 1996; Post, 2000).

Project Goals and Study Objectives

One project goal is to evaluate whether FC bacteria TMDL implementation actions met the TMDL target reductions set in the original TMDL and submittal report (Nocon and Erickson, 1996; Post, 2000). The second project goal is to support a systematic review of new water quality data to determine if water quality has improved. The project goals will be met through the following objectives:

- Determine if FC TMDL target reductions have been met.
- Determine if Washington State water quality standards for FC are being met.

An earlier QAPP included temperature and turbidity. This QAPP addendum focuses only on FC.

Study Design

Monitoring of FC bacteria is needed to assess if Gibbons Creek meets the target reductions set in the TMDL submittal report. To meet these goals, we will estimate FC concentrations biweekly from seven sites on Gibbons Creek from October 2011 to September 2012. Final results will be presented in a short report.

Sampling Locations

Sampling sites will be located at approximately the same sites used in the 1994 technical study, 1996 TMDL Assessment effort, and 2000 submittal report (Erickson, 1994; Nocon and Erickson, 1996; Post, 2000). Four Gibbons Creek sites and three Campen Creek sites, including tributaries, will be sampled (Figure 1 and Table 1). This arrangement of sampling sites helps achieve the monitoring goals by providing data that should clearly show what parts of the basin are meeting water quality standards.

Verification Sampling

During the project, sites and samples will be added and sampled at the project manager's discretion to provide information to help meet the goals and objectives of the project. The addition of verification samples will largely be determined by data currently being collected. This will help the project manager immediately verify unexpected laboratory results or provide source identification and resolution.

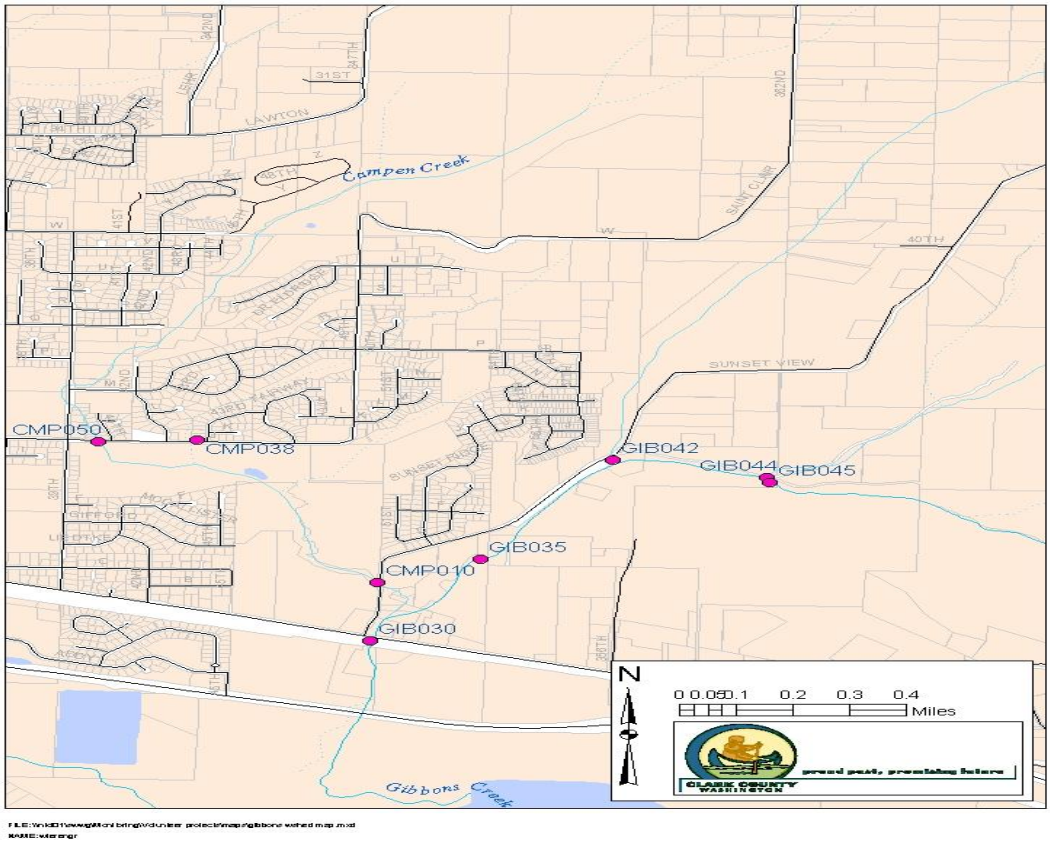

Figure 1. Map of sample site locations for Gibbons Creek and tributaries (Post, 2005).

Field Procedures

Field sampling and measurement protocols will follow those used in the original TMDL technical study and the Environmental Assessment Program guidance manuals for TMDL development (Ecology, 1993; Cusimano, 1994).

Grab samples will be collected directly into pre-cleaned, sterilized containers supplied by Manchester Environmental Laboratory (MEL) and described in the MEL User's Manual (2008). Sample parameters, containers, volumes, preservation requirements, and holding times are listed in Table 2. Bacteria samples for laboratory analysis will be stored on ice and delivered via Ecology courier to MEL within 24 hours of collection.

The Environmental Assessment Program (EAP) policy to prevent the spread of invasive species will be followed for this project. Procedures are described on EAP's "Aquatic Invasive Species" web page: www.ecy.wa.gov/programs/eap/InvasiveSpecies/AIS-PublicVersion.html

Table 1. Gibbons Creek Sampling Locations (Post, 2005).

Ecology Station ID: Clark County Station Code	Description	Latitude	Longitude	Township	Range	Section
GC1; GIB030	**Gibbons Creek** - below confluence with Campen Creek at Evergreen Highway crossing	45°34'29"	122°18'51"	1N	4E	16
GC2; CMP010	**Campen Creek** - mouth, above confluence with Gibbons Creek	45°34'40"	122°18'52"	1N	4E	16
GC3; CMP050	**Campen Creek** - upstream site at J Street crossing	45°35'07"	122°19'32"	1N	4E	9
GC4; GIB042	**Unnamed Tributary** #1 - mouth, above confluence with Gibbons Creek	45°35'00"	122°18'21"	1N	4E	10
GC5; GIB044	**Unnamed Tributary** #2 - (Wooding Road) mouth, above confluence with Gibbons Creek	45°34'58"	122°17'55"	1N	4E	10
GC6; GIB045	**Gibbons Creek** - at confluence with two unnamed tributaries (uppermost Gibbons Creek site)	45°34'43"	122°16'45"	1N	4E	11
GC7; CMP038	**Campen Creek** - tributary at 'J' Street	45 35' 0"	122 19' 33"	1N	4E	9

Laboratory Procedures and Analysis

Samples will be analyzed following the MEL Lab User's Manual and the standard method for FC-MF (MEL, 2008; APHA, 1998). Table 2 shows laboratory procedures and responsibilities.

Table 2. Analytical methods, preservation, and holding times.

Parameter	Description	Method	Lab	Container	Preservation	Holding Time
Fecal coliform	Membrane filter	SM 9222 D	MEL	PE, 250 mL, sterile	10˚C, dark	Max 24 hours

SM: Standard Methods
PE: polyethylene

All samples will be analyzed at MEL. The laboratory's measurement quality objectives and quality control procedures are documented in the MEL Quality Assurance Manual (MEL, 2006). MEL will follow standard quality control procedures (MEL, 2006).

Quality Control

Total variation from field sampling and analytical processes will be assessed by collecting and analyzing replicate samples. Sample precision will be assessed by collecting replicates for approximately 10-20% of samples in each survey. MEL routinely duplicates sample analyses in the laboratory to determine the presence of bias in analytical methods. The difference between field variability and laboratory variability is an estimate of the sample field variability.

Field sampling and measurements will follow quality control protocols described in Ecology's field sampling protocols. If any of these quality control procedures are not met, the associated results will be qualified and used with caution, or not used at all.

Quality Objectives

Field sampling procedures and laboratory analysis inherently have associated error. Measurement quality objectives state the allowable error for a project.

Table 3 outlines analytical methods, expected precision of sample replicates, and method reporting limits and resolution. The targets for analytical precision of laboratory analyses are based on historical performance by MEL for environmental samples taken around the state by EAP (Mathieu, 2006). The reporting limits of the methods listed in the table are appropriate for the expected range of results and the required level of sensitivity to meet project objectives. The laboratory's measurement quality objectives and quality control procedures are documented in the MEL Lab Users Manual (MEL, 2008).

Table 3. Measurement quality objectives (MQO) for precision in field measurements and laboratory analysis.

Analysis	Method/ Equipment	Field Replicate MQO (median)	Lab Duplicate MQO	Reporting Limits and Resolution
FC Membrane Filter (MF)	SM 9222D	50% of replicate pairs < 20% RSD 90% of replicate pairs <50% RSD	40% RPD	1 cfu/100 mL

Data Management Procedures

Staff will record field measurement data in the field, entering data into a field book with waterproof paper and then entering into Excel® spreadsheets (Microsoft, 2007) as soon as practical after returning from the field. This database will be used for preliminary analysis and to create a table to upload data into Ecology's Environmental Information Management (EIM) System.

Sample result data received from MEL by Ecology's Laboratory Information Management System (LIMS) will be exported before entry into EIM and added to a cumulative spreadsheet for laboratory results. This spreadsheet will be used to informally review and analyze data during the course of the project.

An EIM user study (GONW0001) has been created for this study and all monitoring data will be available via the internet once the project data has been validated. The URL address for this geospatial database is: www.ecy.wa.gov/eim/. All data will be uploaded to EIM by the EIM data engineer once it has been reviewed for quality assurance and finalized.

All spreadsheet files, paper field notes, and GIS products created as part of the data analysis will be kept with the project data files.

Project Organization

Ecology employees involved in this project are listed in Table 4.

Table 4. Organization of project staff and responsibilities.

Staff	Title	Responsibilities
Scott Collyard Directed Studies Unit WOS, EAP (360) 407-6455	Project Manager and Co-Principal Investigator	Conducts QA review of data, analyzes and interprets data, prepares data for upload to EIM, and writes the draft technical memo/report and final report.
Marcus Van Prause Directed Studies Unit WOS, EAP (360) 407-6000	EIM Data Engineer and Field Assistant	Uploads data into EIM. Collects samples and records field information. Transports samples to Manchester Laboratory.
Brett Raunig Water Quality Program SWRO-VFO (360) 690-4660	EAP Client	Clarifies scope of the project, provides internal review of the draft QAPP Addendum, reviews and approves draft and final report.
Kim McKee Water Cleanup/Tech SWRO (360) 407-6407	EAP Client and Unit Supervisor	Clarifies scope of the project, provides internal review of the draft QAPP Addendum, reviews and approves draft and final report.
Bob Bergquist Water Quality Program SWRO (360) 407-0643	EAP Client and Section Manager	Approves QAPP Addendum.
George Onwumere Directed Studies Unit WOS, EAP (360) 407-6730	Co-Principal Investigator and Project Manager's Unit Supervisor	Writes the QAPP Addendum. Reviews and approves the QAPP Addendum, draft technical memo, and draft report. Approves the project budget.
Robert F. Cusimano WOS, EAP (360) 407 - 6596	Western Operations Section Manager	Approves the QAPP Addendum, technical memo and draft report.
Stuart Magoon EAP, Manchester Environmental Laboratory (360) 871-8801	Manchester Environmental Laboratory Director	Approves the final QAPP Addendum.
William R. Kammin EAP (360) 407-6964	Ecology Quality Assurance Officer	Reviews and approves the draft QAPP Addendum.

EAP: Environmental Assessment Program
WOS: Western Operations Section
SWRO-VRO: Southwest Regional Office, Vancouver Regional Office
EIM: Environmental Information Management system
QAPP: Quality Assurance Project Plan

Project Schedule and Budget

The project schedule is presented in Table 5.

Table 5. Proposed schedule for completing field and laboratory work, data entry into EIM, and reports.

Field and Laboratory work	
Field Work	Biweekly: October 2011 – September 2012
Laboratory analyses completed	October 2012
Environmental Information System (EIM) Data Set	
EIM Data Engineer	Marcus Von Prause
EIM User Study ID	GONW0001
EIM Study Name	Gibbons Creek Effectiveness Monitoring
EIM Completion Due	December 2012
Final Report	
Author Lead	Scott Collyard
Schedule	
Draft due to supervisor	February 2013
Draft due to client/peer reviewer	March 2013
Draft due to external reviewer	April 2013
Final report due on web	May 2013

Sampling Schedule

The tentative field sampling schedule is listed below for the period October 2011 to September 2012. Some dates will likely change due to unanticipated circumstances.

- October 11, 2011
- October 25, 2011
- November 15, 2011
- November 29, 2011
- December 06, 2011
- December 20, 2011
- January 17, 2012
- January 31, 2012
- February 14, 2012
- February 21, 2012
- March 13, 2012
- March 27, 2012
- April 10, 2012
- April 24, 2012
- May 08, 2012
- May 22, 2012
- June 05, 2012
- June 19, 2012
- July 10, 2012
- July 24, 2012
- August 14, 2012
- August 28, 2012
- September 11, 2012
- September 25, 2012

Budget

Table 6. Budget.

Number of scheduled sample events	24
Number of sites	7
Sub-total number of samples	168
Number of replicates	24
Total number of samples	192
Cost per sample	$23.88
Sub-total cost	**$4,585.00**
Source tracking (20%)	$917.00
Total Project Cost	**$5,502.00**

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