Gibbons Creek Watershed
Fecal Coliform
Total Maximum Daily Load
(Water Cleanup Plan)

Detailed Implementation Plan

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Prepared by:

Rusty Post
Washington State Department of Ecology
Water Quality Program

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Executive Summary

The Washington State Department of Ecology (Ecology) is the delegated authority for implementation of the federal Clean Water Act in the state of Washington. Water quality monitoring, conducted in the Gibbons Creek watershed by Ecology in 1991-92 and 1994-95, revealed fecal coliform bacteria levels in excess of state water quality standards. According to the requirements of the federal Clean Water Act, the Gibbons Creek watershed was placed on the list of water bodies that fail to meet water quality standards, known as the 303(d) list. Ecology is required to develop a Total Maximum Daily Load (TMDL), also known as a water cleanup plan, for each of the over 650 water bodies in Washington that fail to meet the standards. A study titled *Gibbons Creek Fecal Coliform Total Maximum Daily Load Assessment* was completed by Ecology's Environmental Investigations and Laboratory Services Program in 1996. The study reported monitoring results and land use conditions in the Gibbons Creek watershed that indicated which activities were likely to be responsible for the high levels of bacteria found in the creek.

In 2000, Ecology began the process of developing the water cleanup plan for Gibbons Creek, and completed the *Gibbons Creek Watershed Fecal Coliform Total Maximum Daily Load, Submittal Report*. The submittal report contains the summary implementation strategy, which is the general plan for identifying pollution sources, pollution control measures, responsible government programs, funding sources, and strategies to eliminate the pollution. A cooperative effort of numerous interested parties, supported by Ecology, resulted in the development of this strategy. The submittal report was submitted to and approved by the U.S. Environmental Protection Agency in August 2000.

This document, the *Gibbons Creek Watershed Detailed Implementation Plan for Fecal Coliform Bacteria*, provides detail on watershed activities intended to clean up bacteria contamination in the Gibbons Creek watershed. The goal of the TMDL is to ensure that the impaired water body will attain state water quality standards.

As required, under a 1997 Memorandum of Agreement between the United States Environmental Protection Agency and the Washington State Department of Ecology regarding the implementation of Section 303(d) of the federal Clean Water Act, Ecology has developed this detailed implementation plan (DIP) which describes how and when implementation activities will be conducted to achieve fecal coliform bacterial reductions. The reduction targets are specified in the TMDL submittal report. This DIP provides a framework for:

1. Identifying pollution sources.
2. Implementing best management practices (BMPs) and control measures.
3. Monitoring pollution levels.
4. Establishing performance measures, responsibilities, and timelines for implementation.
5. Identifying and aligning prospective financial and community resources for implementation.
6. Tracking compliance with TMDL targets.

Target reduction levels for fecal coliform bacteria are based on the water quality standards for surface waters of the state of Washington (Chapter 173-201A WAC). This plan intends to fully incorporate all DIP elements for this water quality parameter. The goal is to complete plan elements and achieve pollution reduction targets by 2010.

Adaptive management methods will include adjusting BMPs in accordance with new information, modifying stream sampling frequency and/or locations to further delineate fecal coliform bacteria sources, and conducting specific inspections in identified source areas. In addition, adaptive management initiatives will help to develop, fund, and conduct water quality projects that address bacterial pollution, local educational initiatives, and other means of conforming management measures to current watershed information.

Ecology continues to respond to environmental complaints, conduct inspections, and issue National Pollution Discharge Elimination System (NPDES) permits as part of its responsibilities under state and federal laws and regulations. Ecology will endorse implementation of farm plans and BMPs for small farms in cooperation with conservation districts and may use formal enforcement, including fines, if voluntary compliance is unsuccessful.

Sufficient reasonable assurance exists that the Gibbons Creek TMDL goals will be met by 2010. Among the elements of reasonable assurance for the TMDL are dedicated local funding for surface water monitoring and pollution control, health district successes in identifying and abating on-site septic system contamination in Clark County, and activity associated with a recently funded project to identify and correct bacterial pollution in Gibbons Creek. The most valuable assurance of Gibbons Creek cleanup success is the considerable local involvement and commitment to preserving water quality and natural resources of the watershed.

Introduction

Gibbons Creek and its tributaries are located in eastern Clark County and flow into the Columbia River just east of the town of Washougal. In the upper watershed, the creek and its tributaries flow through relatively steep, incised valleys as the water travels down the northern slope of the Columbia River Gorge. The gradient decreases considerably as the creek reaches the valley floor, near the Washington State Highway 14 crossing and the Columbia River.

Land use in the watershed consists largely of rural residential development and small farms along the slopes of the Columbia River. Many of the residents keep a small number of horses and/or cattle. The eastern portion of the town of Washougal extends into the western portion of the watershed and includes a school, a golf course, commercial operations, and new and existing residential development serviced by the local wastewater treatment plant. The remainder of the watershed lies in unincorporated Clark County where residences have on-site septic systems.

Gibbons Creek is classified for protection as a Class A water body (excellent) as defined in the state water quality standards (WAC 173-201A, 1996). Water quality of this class shall meet or exceed the requirements for all or substantially all of the following characteristic uses:

- Domestic, industrial, and agricultural water supply.
- Stock watering.
- Salmonid and other fish migration, rearing, spawning, and harvesting.
- Wildlife habitat, primary contact recreation, sport fishing, boating, and aesthetic enjoyment.

Gibbons Creek flows into and through the Steigerwald National Wildlife Refuge. The U.S. Fish and Wildlife Service (USFWS) staff at the Ridgefield National Wildlife Refuge has responsibility for management of the Steigerwald National Wildlife Refuge. They have identified native runs of cutthroat and rainbow trout, steelhead, and coho salmon that utilize Gibbons Creek south of Highway 14 for spawning and early rearing habitat. The USFWS believes that upstream migration by anadromous fish beyond the Evergreen Highway crossing is limited because of road culverts within the watershed that pose obstructions for these fish (USFWS, 1996). Several projects to remove these barriers are currently underway or proposed. Steelhead are listed as "threatened" and coho are proposed for listing as "threatened" under the Endangered Species Act.

In the early 1990s, water quality data were collected by the Washington State Department of Ecology (Ecology) on a monthly basis from October 1991 to September 1992 (Ehinger, 1993). A brief narrative description of the monitoring results from the report is given below.

> *"Total suspended solids and turbidity were variable. Nitrate concentration exceeded 1.5 mg/L in November and was rather high all year. Fecal coliform counts were high with ten of twelve samples exceeding the state standard of 100 colonies/100mL. Bacterial concentrations ranged from 37 to 910 colonies/100mL. The geometric mean of all measurements was 230 colonies/100mL, and 50 percent of the samples*

exceeded 200 colonies/100mL. Therefore, both parts of the water quality standard were violated. These data were the basis for Gibbons Creek's inclusion on the 303(d) list."

As a result of the Section 303(d) listing, the federal Clean Water Act specifies that where water quality standards are not met, a Total Maximum Daily Load (TMDL) must be developed. TMDLs define pollution loading limits required to meet water quality standards throughout the watershed. Ecology's Environmental Investigations and Laboratory Services Program, Watersheds Assessment Section, conducted a TMDL assessment for the Gibbons Creek watershed in 1994-95. The TMDL assessment, issued in 1996, recommended a phased TMDL for Gibbons Creek and pollution control measures that will reduce fecal coliform bacteria levels to those needed to meet water quality standards (Nocon and Erickson, 1996). Since there are no point source discharges in the basin, all pollution within the Gibbons Creek watershed is considered to be from many, diffuse (nonpoint) sources.

In 2000, development of the Gibbons Creek TMDL was initiated as a follow-up to the earlier assessment. A summary implementation strategy (SIS) was also developed and agreed upon by the participants in the water cleanup planning group, comprised of representatives from government, business, local organizations, and individuals. The SIS recommendations were documented and included in the *Gibbons Creek Watershed Fecal Coliform Total Maximum Daily Load Submittal Report* (Post, 2000). This TMDL package was submitted to and approved by the federal Environmental Protection Agency (EPA) in 2000. The SIS established the general goals, objectives, and tactics for achieving clean water in the Gibbons Creek watershed. The strategy also identified the types of activities and parties responsible for implementing the activities to achieve pollution reduction targets.

Since the TMDL submittal report was issued in 2000, new water temperature information has become available. It was believed during the development of the summary implementation strategy that there were some water temperature problems, but data were not available. In July 2003, the USFWS Columbia River Fisheries Program Office released a document titled *Determinates (sic) of Gibbons Creek Watershed Condition and Health: Results of the Gibbons Creek Watershed Analysis, 1997-1999.* The report is a summary of stream habitat and biological surveys conducted in the Gibbons Creek drainage. Under the physical habitat portion of the results section, the report summarizes temperature monitoring data in narrative and tabular form.

The data indicate extensive temperature levels in excess of the state Water Quality Standards in the Gibbons Creek drainage and in Campen Creek (CC) in particular: "Temperatures in CC were above 18^{o}C on 85 of 214 recorded days April to October 1998." These results indicate that temperatures violated standards 40 percent of the time. In contrast, Wooding Creek, the second largest tributary in the basin (only a very short distance from Campen Creek) went above 18^{o}C only twice on 204 recorded days. Gibbons Creek at river mile 6.4 (also nearby, just above Hans Nagel Road) went above 18^{o}C only once during 204 recorded days between April and October 1998. These data are currently being reviewed under guidelines of the 305(b) reporting requirements of the federal Clean Water Act and will likely qualify Gibbons Creek as a 303(d) listed water body, requiring development of a temperature TMDL. However, implementation of pollution source identification and control measures for temperature, as outlined in this DIP, is

likely to result in significant reductions in temperature violations. The pollution control measures outlined in this plan are also likely to qualify as a "pollution control plan" as defined in the 303(d) listing protocols.

As part of an agreement with the EPA, Ecology must prepare a detailed implementation plan (DIP) for each completed TMDL. The DIP must identify the specific roles and activities to be implemented and must include a monitoring plan, performance targets and measures of success, timelines, and funding sources. This document comprises the DIP for the Gibbons Creek watershed TMDL. Supportive documents related to the Gibbons Creek TMDL are available on the Ecology web site at: http://www.ecy.wa.gov/programs/wq/tmdl/watershed/tmdl_info-swro.html. This plan is based on the technical assessments and decisions contained in those documents.

The basic implementation concept for achieving pollution reductions in the Gibbons Creek watershed relies on continued and enhanced implementation of BMPs directed at controlling pollution sources. This document describes the various implementation activities, who will conduct them, and when they will be completed. It also describes how implementation activities and water quality monitoring will be used to track progress as well as indicate when adaptive management techniques need to be employed. Existing programs and requirements, if fully implemented, should result in meeting the Gibbons Creek TMDL targets. Implementation of the activities described in this plan will require the cooperation of many agencies, organizations, businesses, and individuals. Many of these people have already contributed to this process and remain committed to achieving the group's goals.

Approach

The general approach to meeting water quality standards in Gibbons Creek is to identify pollution sources, apply pollution control measures, continue water quality monitoring efforts, measure progress against targets, and apply adaptive management techniques where progress does not meet stated goals.

Site specific pollution sources will be identified by conducting surveys and inspections in the watershed and prioritizing the most likely or known sources. The people who participated in development of the summary implementation strategy for the Gibbons Creek Watershed TMDL dedicated a significant amount of time and energy into development of a plan that they believed would satisfy the regulatory requirements and achieve the goal of cleaner water in the Gibbons Creek Watershed.

There are no point source or permitted discharges of bacteria in the watershed. Thus, all of the sources are considered nonpoint in origin. While there are undoubtedly some natural sources of fecal coliform bacteria in the watershed, they are not likely to be the cause of consistently elevated bacteria levels. The two most likely sources of bacterial pollution that could cause violations of state water quality standards are failing septic systems and livestock. No other year-round sources of concentrated bacterial sources, such as flocks of waterfowl or herds of wildlife, have been identified. Thus, it is expected that identification of pollution sources from

failing septic systems and livestock will be a relatively straightforward process using standard procedures and methods. Since control of these two sources of pollution is also well understood, it follows that implementation of basic control measures will result in the desired reductions of bacterial pollution. Furthermore, the universe of potential sources is limited to the basin's human and livestock population, both of which are relatively small, on the order of perhaps a few dozen each.

There are no point sources or permitted discharges of warm water in the watershed; all elevated temperatures in the basin can be attributed to human-induced impacts from nonpoint sources. These high temperatures are likely caused by a combination of contributing factors such as lack of riparian shade, low flow volumes and rates, and the dynamics associated with shallow creek formations. It is also possible that specific warm water inputs from adjacent water bodies such as ponds, are contributing to the high temperature levels.

Once site specific pollution sources from anthropogenic sources have been identified through follow-up monitoring efforts, best management practices will be identified for implementation. The preferred method for addressing these pollution sources will be through technical assistance and education efforts to stimulate voluntary cleanup and prevention actions by the responsible parties. It is expected that while technical assistance and education efforts will be significant at the onset of implementation efforts, community awareness and word of mouth conversations among landowners will generate interest and commitment for water quality improvement. Compliance schedules and enforcement actions are available as tools for gaining control of pollution sources but are expected to be used only in situations where education and technical assistance efforts fail to bring successful pollution controls in place in a timely manner.

Additional water quality monitoring will be a key component in identifying specific pollution sources and documenting the success of pollution control measures. It will also indicate whether implementation of the plan has resulted in decreased pollution. Two types of success measures, quantitative numerical targets and qualitative social objectives, are included in this DIP. Some control activities may account for both types of success measures. The primary numerical success measure will be reductions in fecal coliform bacteria. Additional primary numerical targets will be reductions of temperature and turbidity. Secondary numerical targets will include the number of technical assistance visits, farm plans developed, number of BMPs implemented, reduction of in-stream sediment deposition, expansion of fish habitat, riparian habitat rehabilitation, and citizen participation in various educational, monitoring, and restoration activities.

Qualitative social objectives are more difficult to measure. However, they are likely in the long run to help reduce or control pollution. Surveys to determine educational and awareness levels about local water quality, proper stormwater and livestock management, proper septic system maintenance, and healthy riparian corridors can be good indicators. It is generally agreed that technical assistance visits, educational activities, workshops, mailings, and handouts also increase education and awareness levels.

It is not unreasonable to expect, given the size, nature and potential sources of the water quality problems, that significant reductions in fecal coliform bacteria can be accomplished within three

years, and full compliance with state water quality standards can be accomplished by 2010. Throughout the duration of the Gibbons Creek TMDL implementation process, progress will be routinely monitored to determine whether cleanup efforts should be changed. This process of implementation, evaluation, and change is generally referred to as adaptive management. In addition, if adaptive management analyses demonstrate that existing types of BMPs are not adequate, then new or additional BMPs will be employed.

The primary means of tracking and ensuring compliance with the Gibbons Creek TMDL is through annual comparisons of water quality monitoring data with the applicable TMDL target. Ecology will also track the implementation activity milestones to be achieved by a variety of parties contributing to the implementation plan. Several such activities have already begun in the Gibbons Creek watershed as part of the agreements forged in the TMDL development process, such as the on-site septic program being implemented by the Clark County Health Department.

The Gibbons Creek summary implementation strategy laid out the general approach to tackling bacterial pollution in the watershed. This DIP details who will take specific actions to identify specific pollution sources and the types of control measures that will be applied, when those activities will take place, and how it will be determined whether those actions are causing the desired effect. The plan also describes what actions will be taken in the event that control measures are not adequately effective.

Pollution Sources

This section describes the potential sources of pollution in the Gibbons Creek watershed, and the manner in which specific discrete sources of pollution will be identified. While fecal coliform bacteria are the primary focus of this DIP, information is also presented for temperature and turbidity/suspended sediment.

As described later in this plan, monitoring a will play a key role in narrowing the search for specific pollution sources. Should there be question as to whether or not a specific site location is a source, monitoring results will likely confirm or refute the existence of elevated bacteria levels or elevated temperature. The *Gibbons Creek Watershed Fecal Coliform Total Maximum Daily Load Submittal Report (Post, 2000)* identifies past monitoring activities and the potential pollution sources in the watershed.

Fecal Coliform Bacteria

The two most likely sources of bacteria in the watershed are failing septic systems and livestock.

Failing Septic Systems

The Clark County Health Department (CCHD) began prioritizing the identification of failing septic systems in the Gibbons Creek watershed in 2000. Under an interagency agreement with Ecology, the CCHD agreed to send notices to each of the property owners in the watershed requesting a basic check of septic system function. The notices asked owners to have their systems pumped and checked by certified contractors and to report back to the health

department. Property owners were provided with an information packet that included a handout describing septic systems, proper system functioning, and a list of certified contractors. Contact information for technical assistance was also provided.

Livestock

A preliminary livestock survey is planned for the summer of 2005. This survey will be conducted by Ecology with assistance from the Clark Conservation District (CCD). Property owners with livestock will be contacted and provided with information and technical assistance regarding the proper techniques for animal and animal waste management. Owners of livestock with significant potential for, or known to be, contributing to bacterial pollution of the watershed will be formally referred to the CCD for development of waste management plans or farm plans.

Temperature

Data from the USFWS indicate significant temperature problems in the lower Campen Creek tributary to Gibbons Creek (Barndt *et al.*, 2003). The lower Campen Creek basin is characterized by ditching, lawns, road culverts, a golf course, and low gradients. There is a lack of adequate shading, and ponds are believed to add warm water to the creek. The result has been elevated stream temperatures, low diversity of plants and aquatic invertebrates, and reductions in fish habitat (spawning and rearing areas). Future monitoring will quite likely identify specific sources and locations of heating and warm water inputs.

Riparian Shading

Where Campen Creek enters the Washougal city limits, the riparian areas along the creek become smaller and are characterized by less vegetation and reduced shading. This allows for an increase of solar heat gain in the creek. Further analysis of shading and cover coupled with continued monitoring should provide additional detail regarding specific locations where temperature increases occur.

Campen Creek Flows

Campen Creek flows year-round as the result of groundwater inputs in the basin. Increases in impervious surface area and changes to normal runoff and infiltration hydrology are considered likely causes of low summer flows. With increased runoff and reduced infiltration come greater erosion and sedimentation of the creek, and less groundwater recharge that augments summer flow rates. Groundwater inputs are considered a moderating influence on temperatures as well as flows. Historical and new data may provide some indication of changes to the hydrologic pattern.

Warm Water Inputs

Several ponds have been identified in the Campen Creek basin, but it has not yet been determined how much water, if any, is discharged to the creek from these ponds and when that discharge may occur. Basic observation techniques and monitoring of temperatures and flows will likely provide adequate data to determine any potential influences of these ponds on Campen Creek temperatures.

Turbidity/Suspended Sediment

Turbidity and suspended sediment in waters flowing through the watershed can mostly be attributed to various land clearing or land disturbing activities. Visual observation is considered the quickest, easiest, and most effective monitoring technique. Tracing suspended sediment back

to its source is a simple observational procedure that does not require a high level of scientific background or training.

Management Roles, Activities, and Schedules

There are a wide variety of pollution control measures or BMPs that can be applied to the known types and sources of pollution. The choice of control measures depends on the source of pollution and the associated conditions. For example, if a septic system is failing, then repair or replacement of the system would be appropriate. If the source is a manure pile, then removing or covering the pile would be appropriate. Since the types of pollution sources are known and since the control measures associated with these types of pollution sources are well recognized and have a history of success, it is anticipated that simple, direct solutions will result in direct improvements to water quality.

In addition, it is generally recognized that some control measures achieve improvements of multiple parameters. For example, excluding animals from access to a creek will usually result in reductions in bacterial pollution, reductions in bank sloughing (erosion) and sedimentation. Animal exclusion will also likely result in reductions in nutrients that contribute to high biological oxygen demand (BOD) and low dissolved oxygen levels, and reductions in temperatures by preserving riparian vegetation and its shading function.

Examples of control measures and activities applicable to the various pollution sources and types are outlined below. Each source of pollution requires the application of BMPs that are specific to that situation (Table 1). It is an integral part of this plan that in the event of failure of applied control measures to produce the intended reductions, additional actions will be taken. Taking these additional measures constitutes an adaptive management approach.

Table 1. Pollution Control Measures and Interim Targets and Reduction Goals.

Agency/ Organization	Activity	Interim Target/Goal	Target/Goal	Timeline/ Schedule	Success Measure
City of Washougal	Inspections * Stormwater/Erosion * Septic Systems Education/Technical Assistance * Distribute Educational Materials * Notify residents of sewer hookups Monitoring * Collect and/or analyze samples	* Conduct inspections of construction sites and septic systems * Distribute educational materials * Provide technical assistance * Encourage sewer system hookups * Collect samples * Analyze samples (monthly)	* Conduct inspections of all construction sites * Identify all septic systems * Distribute educational materials to all septic system owners * Eliminate septic systems and connect to city sewer system * Conduct monitoring and analysis	January 2004 to December 2006 January 2004 to December 2006 January 2004 to December 2006	* All construction sites inspected * All septic systems identified * Educational materials distributed * Increased conversions to sewer hookups within city limits * All samples collected * All samples analyzed
Clark Conservation District (and Natural Resources Conservation Service)	Education/Technical Assistance * Participate in public meetings * Landowner workshops * Distribute educational materials * Conduct site visits/consultations * Recommend BMPs	* Attend public meetings * Hold landowner workshops * Distribute educational materials * Conduct site visits/consultations * Recommend BMPs	* Provide livestock owners with educational materials * Conduct (5) workshops on livestock and farm management * Conduct (10) site visits/consultations	January 2004 to December 2006	* Educational materials distributed * 5 workshops conducted * 10 site visits/consultations
Clark County Health Department Clark County Code Enforcement and Water Programs	Education/Technical Assistance * Participate in public meetings * Conduct landowner workshops * Distribute educational materials * Conduct site visits * Recommend BMPs Education/Technical Assistance * Site Inspections * Distribute educational materials	* Attend public meetings * Conduct workshops * Distribute septic surveys to landowners * Provide technical assistance * Conduct septic inspections * Inspect construction sites * Provide technical assistance * Conduct enforcement * Set up monitoring program and identify volunteer monitors (Watershed Stewards Program) * Maintain monitoring equipment	* Participate in (5) workshops/events * Distribute septic survey to county residents in watershed * Conduct (10) site visits/inspections * Inspect construction sites * Provide technical assistance * Conduct enforcement (if necessary) * Establish volunteer monitoring program	January 2004 to December 2006 January 2004 to December 2006 January 2004 to December 2006	* Participation in workshops and events, # of attendees * Septic survey distribution * 10 site visits/ inspections * 10 site visits conducted * Inspections conducted * Technical assistance provided * Appropriate enforcement action taken * Volunteer Monitoring program developed

Agency/ Organization	Activity	Interim Target/Goal	Target/Goal	Timeline/ Schedule	Success Measure
Clark County Code Enforcement and Water Programs (continued)	* Recommend BMPs Monitoring * Develop volunteer monitoring program * Collect samples * Manage and distribute data	and monitoring center * Establish monitoring database	* Manage monitoring program and monitoring center * Ensure collection and entry of data -- Maintain database		* Monitoring Program implemented * Monitoring database established and functioning
Washington State Department of Ecology	Education/Technical Assistance * Conduct livestock survey * Refer livestock owners to the CCD/NRCS * Recommend BMPs * Participate in public meetings * Landowner workshops Monitoring * Complete monitoring plan * Conduct monitoring * Coordinate monitoring activities * Provide oversight and technical assistance Inspections/Enforcement * Inspect construction sites and other potential sources of pollution Grants and Funding * Assist local grant/funding efforts	* Complete livestock survey * Contact all livestock owners in watershed * Conduct site visits/consultations * Participate in workshops * Complete monitoring plan (QAPP) * Conduct monitoring * Review and analyze monitoring data * Conduct inspections of permitted and non-permitted activities * Provide assistance to local interests in obtaining grant and loan funds	* Complete livestock survey * Contact all livestock owners in watershed * Conduct site visits/consultations * Participate in workshops * Complete monitoring plan (QAPP) * Conduct monitoring * Review and analyze monitoring data * Conduct inspections of permitted and non-permitted activities * Provide assistance to local interests in obtaining grant and loan funds	January 2004 to June 2004 January 2004 to December 2006 January 2004 to December 2006 January 2004 to December 2006	* Completed livestock survey * Livestock owners contacted * Site visits conducted * Public meetings attended * Workshops attended * Completed monitoring plan * Monitoring activities coordinated * Monitoring data reviewed and analyzed * Inspections conducted *Assistance provided

Fecal Coliform Bacteria

The Clark County Health Department (CCHD) will implement the provisions of their on-site septic system (OSS) program. Ecology and CCHD have negotiated a Memorandum of Agreement (MOA) to prioritize the Gibbons Creek watershed in the county's workload planning. For on-site septic system failures identified through the maintenance and inspection program by CCHD, property owners will be given technical assistance to get the repairs or replacements completed. Education and outreach activities regarding proper operation and maintenance will contribute to increased prevention and likely reduce septic system failures.

Where livestock-related sources of fecal coliform bacteria pollution are identified, livestock owners will be given technical assistance and referred to the Clark Conservation District (CCD) for further assistance. If conditions warrant, the CCD (under the guidance of the federal Natural Resources Conservation Service (NRCS)) will assist landowners in developing or modifying a farm plan to eliminate the potential to pollute.

Common problems associated with livestock include runoff (leachate) from manure storage, animal access to streams and waterways, and surface water runoff from fields. Simple control measures can be employed include removing or covering manure piles, installing fencing to restrict livestock access to streams, and creating or enhancing buffer strips along riparian areas.

The CCD has access to financial assistance for implementation of these plans and for the protection and rehabilitation of wetlands and riparian areas. Where appropriate and feasible, the CCD will seek available funds. In addition, opportunities for local volunteer involvement in rehabilitation and enhancement activities on these projects will be explored with willing landowners.

Temperature

Temperature problems have been identified in the lower portion of the Gibbons Creek watershed, especially in lower Campen Creek, where it flows through the city of Washougal. In general, the primary causes of elevated temperature are a usual lack of shading and low flows coupled with low gradient. All of these conditions occur within the Washougal city limits. In addition, it is believed that warm water may be discharging into the creeks from the water hazards at the Orchard Hills Golf Course and at several other locations along the creek.

Typical control measures for this type of scenario include planting vegetation along the banks of the creek to provide additional shading and reducing the input of warm water from ponds by regulating their flow. Maintaining or increasing base flows in Campen Creek is desirable, but difficult to achieve and quantify. Residential land developments, which cause an increase in the amount of impervious surfaces, will be encouraged to provide additional infiltration and flow controls to maintain and increase groundwater levels and creek flow levels that tend to moderate stream temperatures. Alternatives to traditional impervious surfaces such as porous concrete and porous asphalt, porous pavers, and permeable interlocking concrete to reduce the amount of heated runoff reaching surface water can also be considered.

Turbidity/Suspended Sediment

Suspended sediment and high turbidity values typically indicate muddy water inputs from land clearing and land disturbing activities. Generally, this is associated with development and construction projects. There are several large existing and planned construction projects in the Washougal area. Development sites disturbing five acres or more and having a stormwater discharge are required to obtain a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit. In addition to meeting state permit requirements for controlling stormwater discharges, developers must also meet regulatory requirements of local ordinances. Development sites with NPDES permit coverage must have a stormwater pollution prevention plan (SWPPP). Periodic inspections of developments by city of Washougal, Clark County, and Ecology staff will determine compliance with permit conditions and local ordinances as well as implementation of the SWPPP. Identification of potential sources through simple visual observation and turbidity monitoring is standard inspection practice. Local citizens can also readily identify turbid water through visual observation and report those observations to government agencies with jurisdictional authority.

Technical assistance efforts to recommend BMPs for stormwater and erosion and sediment control will be provided by city, county, and Ecology staff. Examples of specific BMPs can be found in Ecology's stormwater guidance document (Ecology, 2001). Some examples from the guidance document include the proper use of silt fences, sediment ponds and traps, retaining native vegetation, mulching and covering exposed soils. All three governmental jurisdictions have organizational and regulatory mechanisms for inspection and enforcement of stormwater management and erosion control. Ultimately, additional control measures can include informal and formal enforcement to gain compliance with permit conditions and applicable regulations.

Performance Measures and Targets

Primary Quantitative Numerical Targets

Gibbons Creek is a Class A water as defined in the Washington State Water Quality Standards, Chapter 173.201A WAC. The load allocation for fecal coliform bacteria established in the Gibbons Creek TMDL has been set as the state water quality standard. The numerical targets of this DIP are both the interim percentage reductions of pollution over time and the ultimate goal of meeting the water quality standard/load allocation. The numerical targets for temperature and turbidity are also defined in the water quality standards. Since these two parameters were not included in the original TMDL assessment, specific reduction percentages were not defined. However, recent data evaluation led to development of specific interim targets with the end goal of meeting state standards by 2010. Reductions are expected over time as BMPs and control measures are implemented. Monitoring will provide specific detail as to the progress towards meeting state standards.

Fecal Coliform Bacteria

The load allocation for this basin for fecal coliform bacteria has been set at the state water quality standard. According to WAC 173-201A-030(2)(c)(i)(A), "Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100mL." Under WAC 173-201A-060(3), "In determining compliance with the fecal coliform criteria in WAC 173-201A-030, averaging of data collected beyond a thirty-day period or beyond a specific discharge event under investigations, shall not be permitted when such averaging would skew the data so as to mask non-compliance periods."

The following was taken from the *Gibbons Creek Fecal Coliform Total Maximum Daily Load Submittal Report* approved by EPA:

"The study results from the TMDL Assessment indicate two general problems:

1. *High fecal coliform levels throughout the basin in the late summer, and*
2. *Consistently high fecal coliform levels in Campen Creek.*

Sample data show two distinctly different seasonal log-normal distributions of fecal coliform concentrations (summer: April through October, and winter: November through March) (Note: See Table 7 from submittal report, below). Although these seasons were selected based on fecal coliform concentrations, they are consistent with the streamflow pattern of Gibbons Creek, with relatively low average monthly streamflows in the summer months and high flows in the winter months.

Table 7. Fecal ColiformGeometric Means and Recommended Percent Fecal Coliform Reductions for Gibbons Creek.

Station ID	Geometric Mean (#colonies/100 ml)			Load Allocation (#colonies/100 ml)	Percent Reduction Needed		
	Summer	Winter	Year-around		Summer	Winter	Year-around
GC1	453	101	-	100	78	1	-
GC2	-	-	590	100	-	-	83

Because of the seasonality of the data, percent reductions were calculated by season. In the winter, essentially no reductions are necessary. In the summer, however, a 78 percent reduction in fecal coliform bacteria concentrations is needed to meet the TMDL load allocation in Gibbons Creek. In Campen Creek, the first part of the water quality criterion was violated throughout the study period and there was insufficient data for determining seasonality. Therefore the percent reduction needed, 83 percent, was based on surveys from all dates."

The interim target (Year 3 - 2008) for fecal coliform bacteria concentration reductions will be 50 percent for both Gibbons and Campen Creeks, with the remaining 28 percent and 33 percent, respectively of the reduction to be accomplished within the next two years (Year 5 - 2010)."

Temperature

A temperature load allocation has not been established for Gibbons Creek. However, the state Water Quality Standards, WAC 173-201A-030(2), serve as the load allocations for the basin. The standard for temperature is stated as "Temperature shall not exceed 18.0^{o}C ... due to human activities. When natural conditions exceed 18.0^{o}C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3^{o}C."

Since the USFWS report was received well after the TMDL process and SIS were completed, it was not possible to include this information in planning specific pollution reductions. While the measures outlined in the SIS may be considered general in their approach, it is expected that the more detailed measures included in this DIP will adequately meet requirements for a TMDL and will ultimately achieve the desired reductions. Therefore, for the purposes of quantifying specific reduction targets and success measures, the proposed pollution reductions for temperature are as follows.

1. A 50 percent reduction in temperature levels in excess of standards by December 2011 as compared to the data in the USFWS report of 2003. This equates to having only 20 percent of all monitoring results exceed state water quality standards.

2. Elimination of temperature levels in excess of standards by December 2017 as compared to the data from the USFWS report of 2003. This equates to having all monitoring results in compliance with state water quality standards.

Turbidity/Suspended Sediment

A load allocation for turbidity has not been established for Gibbons Creek through the TMDL process. Therefore, the state Water Quality Standard 173-201A-030(2) for turbidity shall serve as the allocation. The turbidity standard is "Turbidity shall not exceed 5 NTU (Nephelometric Turbidity Units) over background when the background turbidity is 50 NTU or less, or have more than a 10 percent increase when the background turbidity is more than 50 NTU."

Secondary Quantitative Numerical Targets

In addition to the primary numerical targets based on the water quality standards as described above, other numerical targets have been established for fecal coliform bacteria as additional performance goals for this DIP. The following actions are quantifiable targets for implementation of the TMDL in identification of potential pollution sources and implementing control measures.

- **Fecal Coliform Bacteria**

For on-site septic system(OSS) programs, achievement of secondary numerical targets will be determined based upon the following:

1. Mailings/Contacts. Contact with each residence having an on-site septic system in the watershed will be made by December 2005.
2. Inspections/Maintenance Activities. Have each homeowner conduct inspection and maintenance activities and certify that inspections and maintenance activities have been done by December 2006.

3. Repairs/Replacements. Have homeowners conduct repairs and replacements of failing systems as necessary. Provide technical and financial assistance where possible.
4. Technical Assistance Activities. Provide technical assistance to homeowners as needed.

For livestock management programs, achievement of secondary numerical targets will be determined based upon the following:

1. Mailings/Contacts. Contact each livestock owner in the watershed regarding proper livestock management by December 2005.
2. Inspections/Technical Assistance Visits. Conduct a livestock survey in the watershed to identify potential sources of animal waste. Conduct inspections and technical assistance visits to determine potential for water quality impacts. Refer livestock owners to the CCD/NRCS for technical assistance when necessary. Track inspections and referrals. Complete by December 2006.
3. BMP Implementation. Track implementation activities conducted (manure piles moved/covered, fences installed, alternative stock watering stations installed, etc).

- **Temperature**

For temperature reduction efforts, achievement of secondary numerical targets will be determined based upon the following:

1. Riparian Enhancement. Linear feet or acres of trees/native plants installed in the stream corridor.

2. Stream Channel Connectivity. Off-channel (pond) inputs reduced or eliminated.

- **Turbidity/Suspended Sediment**

For sediment reduction efforts, achievement of secondary numerical targets will be determined based upon the following:

1. Discharge Complaints. Frequency and/or complaints of turbid water discharge.
2. Sediment Deposition. (At pre-selected sites/reaches.)
3. Stormwater Permit Compliance. Development sites meeting NPDES general stormwater permit and local ordinance requirements.

- **Other Actions**

For community education and participation, achievement of secondary numerical targets will be determined based upon the following:

1. Volunteer Citizen Monitoring. Monthly effort, periodic event sampling, and compliance monitoring.
2. Surveys. Including septic systems, livestock, biological/stream conditions, salmonid redd counts.

3. Outreach Events. Participation in five educational opportunities/events.
4. Organized Activities. Events such as stream cleanup, tree planting, riparian rehabilitation.

Qualitative Social Objectives

Measurement of education/awareness level before, during, and after implementation of various aspects of the DIP would provide a means of determining progress toward TMDL goals. Educational campaigns, surveys, or polls may be used to obtain a baseline level of resident understanding of water quality include bacteria, temperature, turbidity, nutrients, and chemistry. Additional information should be shared on the subjects of watersheds, monitoring, livestock and waste management, and septic system operation and maintenance.

Measuring Progress Toward Goals

On an annual basis, Ecology will convene a meeting in early spring of the partners identified in this DIP to review progress on action items and to review water quality data from the previous field season (if available). Discussion topics for this meeting will include a review by each DIP partner of implementation activities completed during the previous year, problems and implementation barriers, solutions employed, and planned accomplishments for the coming year.

In this same forum, the DIP partners will review available water quality data collected by Clark County and others to gauge whether the annual goals and targets established for this TMDL are being met or exceeded. Where additional water quality monitoring effort is warranted, the entity performing this monitoring will be approached to modify, supplement, or expand the current monitoring strategy, depending upon what is needed. Water quality data gathered by the partners will be conveyed to Ecology for incorporation into its information management system (IMS). This will allow all data to be available to the public via the Internet.

Water Quality Monitoring

Earlier water quality monitoring efforts in the Gibbons Creek watershed have revealed a pattern of bacterial pollution and elevated water temperatures that do not meet state water quality standards. These efforts include but are not limited to:

1. Ecology Ambient Monitoring Program, 1992.
2. Ecology TMDL Assessment, 1996-97.
3. USFWS Watershed Assessment, 1997-2003.
4. Ecology Ambient Monitoring Program, 2000-02.

Efforts to identify and control the sources of pollution have already been initiated by Clark County/Washington State University (WSU) and will continue for several years. In order to identify pollution sources and to determine if control measures result in pollution reductions, additional monitoring will be conducted.

Requirements for monitoring under the federal Clean Water Act for TMDLs include the development of a scientifically rigorous monitoring plan such as a quality assurance project plan

(QAPP). A preliminary QAPP for the Gibbons Creek TMDL has been developed (Appendix B). This QAPP draws on the basic elements of the QAPP that was developed and approved for the 1996 TMDL assessment, but is more focused in approach, includes two additional monitoring locations, and involves monthly ambient monitoring, specific source identification, compliance monitoring, and rain event monitoring. The QAPP will undergo a formal approval process within Ecology prior to implementation.

Recommended monitoring is essentially an ambient monitoring program with monthly sampling at approximately ten stations. This will be the primary indicator of program success or failure. Monitoring results will also be used to help identify specific sources by narrowing down the potential locations of sources. This monitoring will be conducted primarily by the Clark County Watershed Stewards, city of Washougal staff, and volunteers. Additional monitoring may be conducted by WSU students. All samplers will complete training on proper procedures and protocols. Ecology will periodically collect duplicate samples to ensure procedural and data quality assurances. Implementation monitoring includes source identification, ambient, compliance, and special short-duration efforts.

Implementation Monitoring

1. *Specific Source Identification Monitoring*. Site-specific source identification will be performed by Ecology. It is essential that any potential enforcement data and documents meet all substantive requirements for conducting an enforcement action according to agency rules. This does not preclude source identification efforts derived from ambient monitoring data collected by others and used to support voluntary control measures and compliance.

2. *Ambient Monitoring (Clark County/Washington State University)*. In the summer of 2002, Clark County received a grant from Ecology from the federal Clean Water Act Section 319 Nonpoint Source Grant Program to develop a monitoring resource center that would make resources, equipment and training available to local government staff and the public to conduct monitoring in the county. Gibbons Creek monitoring was included as a priority item in the grant proposal. Monitoring for Gibbons Creek includes several agencies and organizations in a cooperative effort. Monitoring training will be conducted by Clark County staff. Monitoring will be conducted by the county as well as local citizens and city of Washougal staff. Laboratory analysis of fecal coliform bacteria will be conducted by the city of Washougal and Ecology. The city of Washougal's wastewater treatment plan has a laboratory certified by Ecology for the analysis of fecal coliform bacteria. All monitoring activities will be completed according to the protocols and procedures established in the Gibbons Creek TMDL Quality Assurance Project Plan (QAPP) and approved by Ecology.

3. *Compliance Monitoring.* Compliance monitoring will be conducted by Ecology to determine compliance with implementation of control measures. Compliance monitoring will be site specific.

4. *Ad Hoc Monitoring*. It is also anticipated that some monitoring and analysis will be conducted by local school groups to provide students with educational opportunities to learn about water quality sampling and procedures. Although this monitoring will

not meet the criteria for quality assurance under TMDL requirements, it will nonetheless provide valuable educational experience and citizen involvement. It will also offer an opportunity for students to compare their results to the results of monitoring collected under rigorous quality assurance protocols and procedures.

Achievement of the goals described in the performance measures and targets section will be measured by determining the level of progress towards interim targets and long-term goals. While the ultimate goal is achieving the state water quality standards in the watershed, it is not likely that there will be any large measurable progress in the primary numerical targets by the end of the first year. The secondary numerical targets are more likely to be achieved early in the implementation process.

An annual meeting will be held to compile a list of events and activities that have occurred and analyze data collected to determine progress. At least one representative of each agency or organization will attend the meeting to present and discuss progress made towards implementation of the various activities described in this DIP.

After review of the previous year's implementation activities, the group will decide which activities to continue, which to increase, and which to change or eliminate. The group may also decide to add new initiatives or activities to accomplish the goals of the detailed implementation plan.

Effectiveness Monitoring

Ecology is responsible for determining - through effectiveness monitoring - the status of water bodies subsequent to development and implementation of a TMDL. Ecology will continue to provide technical assistance and assist local partnerships to remain engaged. Ecology will perform effectiveness monitoring after sufficient implementation actions have occurred.

Adaptive Management

As described in the approach section above, basic tools for pollution source identification will be used. Upon identification of known or potential sources of pollution, technical assistance and education will be provided and control measures will be implemented. Over time, it is expected that this simple approach will result in reduced pollution levels. An adaptive management approach to this water cleanup plan would begin at the point where monitoring results indicate that control measures are not producing the anticipated pollution reductions. In that event, further analysis of monitoring data and pollution sources would likely identify additional controls that could be implemented to gain the desired pollution reductions. It could also point to data gaps which would give information about other potential pollution sources. Further source identification activities and control measures will follow the course described in this DIP. While adaptive management primarily focuses on necessary adjustments or revisions to implementation actions, it will also be used to draw attention and/or enhance measures that are working and achieving the desired results.

Should water quality standards be achieved before the load allocations are achieved, then the TMDL will be considered as satisfied.

Enforcement

The Water Pollution Control Act (Chapter 90.48 RCW) provides broad authority to issue permits and regulations for all discharges to water. The act openly declares that it is the policy of the state to maintain the highest possible standards to ensure the purity of all waters of the state and to require the use of all known, available, and reasonable means to prevent and control water pollution. The act defines waters of the state and pollution. It authorizes the Department of Ecology to control and prevent pollution and to make and enforce rules to include water quality standards. In addition, the act designates Ecology as the state water pollution control agency for all of the purposes of the federal Clean Water Act.

While it must be acknowledged that Ecology is authorized under Chapter 90.48 RCW to impose strict requirements or issue enforcement actions to achieve compliance with state water quality standards, it is the goal of all participants in the Gibbons Creek TMDL process to achieve clean water through voluntary control actions.

Reasonable Assurances

The EPA requires some assurances that TMDL implementation measures will actually occur. To that end, responsible parties, regulatory authorities, detailed implementation measures and schedules, and funding mechanisms must be identified. To provide this assurance, this DIP specifically details the people, actions, timelines, and funding to accomplish the stated goals.

Commitment to addressing the bacteria and temperature in the Gibbons Creek Watershed has been well demonstrated over the last few years. Interested and responsible organizations have worked together as demonstrated by the following.

- Agricultural sources are being addressed by on-going education, technical assistance, and cost-share programs. Clark Conservation District is working with landowners on best management practices and conducts water related workshops. The conservation district continues to pursue grant and loan funding opportunities through Ecology's funding cycles.

- Clark County has pursued grant and loan funding for on-site sewage system improvements. The county requested and was awarded grant and loan funds through Ecology's Fiscal Year 2005 Centennial Clean Water Fund and the Washington State Water Pollution Control Revolving Loan Fund programs. Grant Agreement G0500041 was awarded on August 16, 2004 and provided $93,500 of state assistance for development of programs for public involvement/information/education and on-site sewage system sanitary surveys. Loan Agreement L0500004 was also awarded on

August 16, 2004 and provided $100,000 of state assistance to develop a local loan fund for on-site sewage system repairs/replacements. Both agreements are in place until December 31, 2006.

- Clark Public Utilities continues to perform water quality monitoring with utility staff. The utility staff is involved with data management and reporting, quality assurance/project plan development, and agency coordination. The utility has also made other monitoring equipment available for field activities.

- The city of Washougal is performing bench testing and laboratory analysis services through its wastewater treatment plan laboratory. The city is also participating with data management and reporting and field sampling.

Public Involvement

In addition to the extensive public involvement that characterized development of the *Gibbons Creek TMDL Submittal Report* (SIS), additional opportunities have been provided for development of the DIP and continued involvement in implementation activities, such as volunteer monitoring. A major public involvement opportunity is participation in volunteer monitoring in the Gibbons Creek watershed. Several agencies and organizations are co-coordinating volunteer monitoring: Clark County, Washington State University, city of Washougal, and Ecology.

The Clark County Health Department and Clark Conservation District plan to host outreach workshops for the public on topics such as septic system maintenance, and livestock and manure management. It is anticipated that riparian enhancement projects will be identified as control measures for improving water quality. The public will be invited to participate in these projects.

Another component of public involvement includes education and awareness. Students from the Washougal school district have participated in classroom and outdoor learning activities regarding water quality in Gibbons and Campen Creeks. The goal is to increase the level of educational activities by working with the local teachers. Links to the source identification, control measures, monitoring, and enhancement efforts will be provided. Combined with the surveys mentioned above, articles in the local media will provide clear connections between activities conducted as part of the TMDL and activities conducted by local citizens and schoolchildren. The Gibbons Creek TMDL process has been covered by the local media during all facets of its development, including all workgroup meetings. This media coverage is expected to not only continue, but to increase as opportunities for public involvement grow and more members of the Washougal community participate in various activities.

During the entire implementation period, monitoring data and status reports will be available for public review via the Internet, and periodic updates will be provided to area media.

Funding Opportunities

Funding for the basic elements of this plan is already well established. Ecology routinely conducts site visits and compliance inspections for water quality issues in this region. The Clark County Health Department will continue to work with homeowners on proper operation, maintenance, and repair of septic systems. The monitoring resource center has been funded by a Centennial Clean Water Fund/Section 319 grant (CCWF/319) from Ecology. The Watershed Stewards Program is funded through Clark County. There are several additional sources of funding available from agencies mentioned in this document. The Natural Resource Conservation Service and Clark Conservation District both make money available to agricultural operators for farm plan implementation and conservation improvements on farms through grant and loan programs such as the Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP), and the CCWF/319 Grant.

An important aspect of gaining funding for these projects is acknowledgement of a clearly identified need. The Gibbons Creek watershed has been identified as having ESA listed salmonid species and is considered to be a likely candidate for salmonid reintroduction to the upper reaches of the basin by state and federal fish and wildlife agencies and the Lower Columbia Fish Recovery Board. As such, it qualifies for salmonid recovery funding from the Salmon Recovery Funding Board (SRFB).

The following is a brief summary of possible funding sources beyond the general fund sources of the partners.

Centennial Clean Water Fund/Clean Water Act Section 319 Nonpoint Source Fund/Washington State Water Pollution Control Revolving Loan Fund

These three funding sources are managed by Ecology through one combined application program. Funds are available to public entities as grants or low-interest loans. Grants require a 25 percent match. They may be used for education/outreach, technical assistance, specific water quality projects, or as seed money to establish various kinds of water quality related programs or program components. Grant funds may not be used for capital improvements on private property. However, riparian fencing and riparian re-vegetation projects on private property can be funded with grants.

Low-interest loans are available to public entities for all the above uses. They have also been used as “pass-through money” to provide low-interest loans to homeowners for agricultural best management practices. Loan money can be used for a wide range of improvements on private property, for instance.

Conservation Reserve Enhancement Program

This program provides incentives to restore and improve salmon and steelhead habitat on private land. This is a voluntary program to establish forested buffers along streams where streamside habitat is a significant limiting factor for salmonids. In addition to providing habitat, the buffers improve water quality and increase stream stability. Land enrolled in the Conservation Reserve

Enhancement Program is removed from production and grazing under 10 to15-year contracts. In return, landowners receive annual rental, incentives, maintenance, and cost-share payments. The annual payments can equal 100 percent of the weighted average soil rental rate (incentive is 110 percent in areas designated by Growth Management Act).

Conservation Reserve Program

This is a voluntary program that offers annual rental payments, incentive payments for certain activities, and cost-share assistance to establish approved cover on eligible cropland. Assistance is available in an amount up to 50 percent of the participant's costs in establishing approved practices for contracts of 10 to15 years. The Conservation Reserve Program is administered through the Clark Conservation District.

Environmental Quality Incentives Program

This federally funded program is administered by the U.S. Natural Resources Conservation Service. This program:

- Provides technical assistance, cost share payments, and incentive payments to assist crop and livestock producers with environmental and conservation improvements on the farm.
- Provides $5.8 billon over the next six years (nationally).
- Allows 75 percent cost-share but allows 90 percent if producer is a limited resource or beginning farmer or rancher.
- Distributes program funding 60 percent for livestock-related practices, 40 percent for cropland.
- Supports contracts that are one to ten years in duration.
- Sets no annual payment limitation; sum not to exceed $450,000 per individual or entity.

Forestry Riparian Easement Program

This voluntary program is administered through the Washington State Department of Natural Resources Small Forest Landowner Office. The easement program acknowledges the importance of small landowners and their contribution to protect wildlife habitat. The intent of the program is to help small forest landowners keep their land in forestry. The Forestry Riparian Easement Program (FREP) partially compensates landowners for not cutting or removing qualifying timber under a 50-year easement. The landowner still owns the property and retains full access, but has "leased" the trees and their associated riparian function to the state. Requirements for FREP include the following.

- Land is owned individually or as part of a partnership, corporation, or other nongovernmental legal entity.
- Parcels consist of more than 20 continuous acres, OR a parcel of less than 20 acres can be considered as part of a total ownership of multiple parcels in Washington State that together total more than 80 acres.
- Timber is next to a river, stream, lake, pond, or wetland that is proposed for harvest.

- The landowner has not harvested an average of more than 2 million board feet of timber each year for all land in ownership.
- The state has access to the property by foot or vehicle.
- There are no hazardous substances on the property.

Riparian Open Space Program

This is a voluntary program administered by the Washington State Department of Natural Resources (DNR) to acquire (through purchase or donation) an interest in lands within unconfined avulsing channel migration zones (CMZs). The DNR may acquire the fee interest of the CMZ land or a permanent conservation easement over such lands.

Wetland Reserve Program

This is a voluntary program to restore and protect wetlands on private property (including farmland that has become a wetland as a result of flooding). Landowners can receive financial incentives to enhance wetlands in exchange for retiring marginal agricultural land. Landowner limits future use of the land, but retains ownership, controls access, and may lease the land for undeveloped recreational activities and possibly other compatible uses.

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Appendix A
Clark County Health Department/Ecology MOA

MEMORANDUM OF AGREEMENT

Between the

SOUTHWEST WASHINGTON HEALTH DISTRICT

And the

WASHINGTON STATE DEPARTMENT OF ECOLOGY

To

IMPLEMENT PROVISIONS OF THE GIBBONS CREEK AND SALMON CREEK TMDLS

For

MEETING RESPONSIBILITIES UNDER THE FEDERAL CLEAN WATER ACT

This Memorandum of Agreement (MOA) is entered into by and between the Southwest Washington Health District (hereinafter referred to as the SWWHD) and the Washington State Department of Ecology (hereinafter referred to as Ecology). This MOA represents the intention to implement a plan for identification and control of sources of fecal coliform bacteria from residential on-site septic systems in the Gibbons Creek and Salmon Creek Watersheds in Clark County, Washington. The SWWHD and Ecology agree that this MOA is the formal agreement for execution of the implementation plans identified in the Gibbons Creek and Salmon Creek Total Maximum Daily Loads (TMDLs) as submitted to the federal Environmental Protection Agency (July 2000), and is a priority within their organizations. Timely implementation will prevent duplication of effort and provide coordination to meet federal Clean Water Act (CWA), state Water Pollution Control Act, and Health Act and the Washington Administrative Codes and the goals of both agencies.

PURPOSE

The purposes of this MOA are to:

1. Define the scope of work and roles and responsibilities of the respective agencies in identifying and controlling sources of fecal coliform bacteria from residential on-site septic systems in the Gibbons Creek and Salmon Creek Watersheds.

2. Attain joint Ecology and SWWHD commitment to the responsibilities to be performed by each agency to accomplish water quality protection, management, and restoration in the Gibbons Creek and Salmon Creek Watersheds.

3. Encourage and enhance communication, coordination and working relationships between Ecology and the SWWHD.

AUTHORITIES

The U.S. Environmental Protection Agency (EPA) delegated implementation of the CWA to the states. In the state of Washington, Chapter 90.48 Revised Code of Washington (RCW) gives Ecology authority and responsibility to protect and manage water quality.

Section 303(d) of the CWA lists water bodies and outlines a program for addressing water body segments having limitations on their quality that preclude them from meeting or exceeding standards designated for beneficial uses. Both Gibbons Creek and Salmon Creek fail to meet water quality standards for fecal coliform bacteria. Ecology is the lead agency for development of Total Maximum Daily Loads (TMDLs) for three 03(d) listed water bodies. Ecology has developed TMDLs for fecal coliform bacteria for the Gibbons Creek and Salmon Creek Watersheds. Those TMDLs identify failing septic systems as a likely source of fecal coliform bacteria found in the watersheds.

The Southwest Washington Health District is delegated authority to implement Washington Administrative Code 246-272, the On-Site Sewage System Rules and Regulations of the state Board of Health. Implementation of this program is likely to result in the reduction of failing septic systems in the Gibbons Creek and Salmon Creek watersheds.

EXISTING POLICIES AND DIRECTION

Ecology and the SWWHD recognize the need to address failing septic systems to reduce impacts to water resources and restore beneficial uses of water bodies in Washington State. It is current policy of the agencies to gain compliance through education and technical assistance. Both agencies take a cooperative approach to achieving this goal, yet maintain the right and ability to enforce applicable laws governing the discharge of polluting matter and proper maintenance and repair of septic systems.

SOUTHWEST WASHINGTON HEALTH DISTRICT RESPONSIBILITIES

The SWWHD will conduct the following activities as part of this agreement:

1. Mail maintenance notices to all property owners within each watershed that may have septic systems. Notices shall be sent within one year.

2. Process maintenance reports.

3. Develop and maintain an updated database of septic system locations, conditions and ownership.

4. Provide educational and technical assistance to septic system owners as appropriate.

5. Take appropriate corrective action to remedy instances where failing septic systems are identified and require septic system maintenance, repair or replacement as necessary.

6. Notify Ecology when water quality problems are noted.

7. Assist with presentations to the public and meetings or information sessions.

8. Provide a quarterly progress report and provide an annual report summarizing results.

ECOLOGY RESPONSIBILITIES

Ecology will conduct the following activities as part of this agreement.

1. Define the watersheds' boundaries.

2. Provide map(s) of tax lots within the watershed boundaries.

3. Provide listing of tax or parcel number, owner and address for those tax lots. Items 1-3 shall be completed by March 3 1, 2001.

4. Assist with presentations to the public and meetings or information sessions.

5. Review quarterly and annual reports.

Ecology reserves all of its authority to enforce state and federal laws concerning water quality, and nothing in this MOA shall be construed to limit that authority. Should SWWHD's efforts fail to gain compliance and correct failing septic systems, Ecology may use appropriate enforcement mechanisms under state and/or federal law to require compliance with water quality laws. This authority includes, but is not limited to, agency orders issued pursuant to RCW 90.48. and injunctive or other court-ordered relief, including penalties.

ADMINISTRATIVE

1. This MOA shall go into effect upon signing by both parties. This MOA will remain in effect unless replaced by another MOA, terminated by mutual written consent of the parties, or canceled by 30 days' written notice from one party to the other party.

2. This MOA may be periodically revised, updated, or refined as necessary, by mutual written agreement by both the SWWHD and Ecology.

3. Both agencies are committed to acquiring the resources necessary to implement this MOA. Nothing in this MOA shall be construed to obligate either party to payment of money in excess of appropriations authorized by law and administratively available, for the work. However, nothing in this MOA shall be construed as an agreement by either agency that lack of appropriations or funding excuses the other agency from compliance with any requirements of state or federal law.

4. Nothing in this MOA detracts from obligations of any other MOA by either agency.

5. This MOA does not constitute an explicit or implicit agreement by Ecology or SWWHD to subject itself to the jurisdiction of any state or federal Court. Nor shall this MOA be construed as creating any right or benefit, substantive or procedural, enforceable at law or in equity, by any person or entity against Ecology or SWWHD. This MOA shall not be

construed to create any right to judicial review involving the compliance or noncompliance of Ecology or SWWHD with this MOA.

We the undersigned officials responsible for implementing this MOA hereby commit the necessary resources to the extent possible to effectively implement all aspects of this MOA. We understand that successful implementation of the MOA will: 1) satisfy state and federal nonpoint source pollution control requirements; 2) contribute to water quality protection in the Gibbons Creek and Salmon Creek Watersheds; 3) will constitute the basis for successful implementation of the Gibbons Creek and Salmon Creek TMDLs, and 4) serve as a model for similar programs or activities within the agencies' overlapping jurisdictions as well as other areas iii Washington State.

This Memorandum of Agreement shall take effect immediately upon signing. All undesignated timeframes will begin as of the date of signing.

SOUTHWEST WASHINGTON HEALTH DISTRICT

(signed by Kay Koontz)
Kay Koontz
Executive Director
Water Quality Program

Date: 11-21-00

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

(signed by Kahle Jennings)
Kahle Jennings
Acting Southwest Region Manager

Date: November 8, 2000

Appendix B
Gibbons Creek Watershed Fecal Coliform Implementation Monitoring Quality Assurance Project Plan
August 2005

Gibbons Creek Watershed
Fecal Coliform
Total Maximum Daily Load

Implementation Monitoring
Quality Assurance Project Plan

by
Rusty Post
Water Quality Program
Washington State Department of Ecology

Preliminary QAPP Developed, June 2004
Final, August 2005
Publication Number 05-10-062

Gibbons Creek Watershed
Fecal Coliform
Total Maximum Daily Load

Implementation Monitoring
Quality Assurance Project Plan

by
Rusty Post
Water Quality Program
Washington State Department of Ecology

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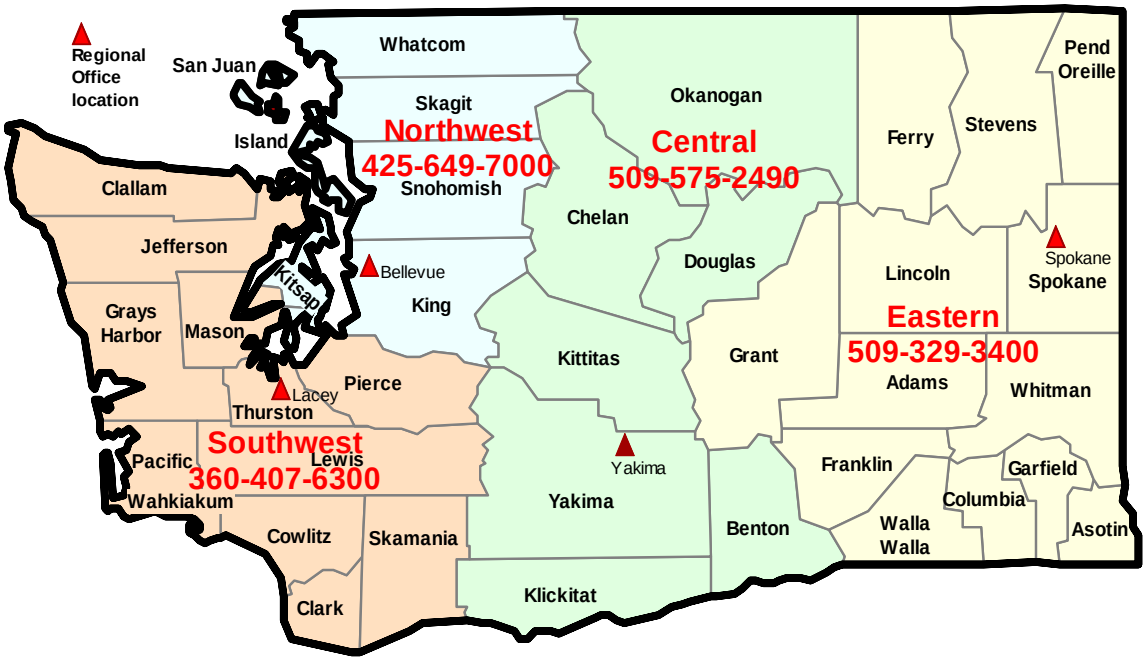

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Gibbons Creek Watershed
Fecal Coliform
Total Maximum Daily Load

Implementation Monitoring
Quality Assurance Project Plan

APPROVALS

Department of Ecology

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Rusty Post
Water Quality Program

_____

Kim McKee
Water Quality Program

_____

Kelly Susewind
Water Quality Program

_____

George Onwumere
Environmental Assessment Program

City of Washougal

_____

Monty Anderson
Planning Director

_____

Steve Roberts
Pubic Works

_____

Trevor Evers
Wastewater Treatment Plant

Clark County

_____

Ron Wierenga
Water Resources Program

_____

Rod Swanson
Water Resources Program

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Setting

Gibbons Creek is located in eastern Clark County and flows into the Columbia River just east of the town of Washougal (Figure 1). In the upper watershed, the creek and its tributaries flow through relatively steep, incised valleys as the water travels down the northern slope of the Columbia River Valley. The gradient lessens considerably as the creek reaches the floor of the Columbia River Valley, near where the creek crosses under Washington State Highway 14.

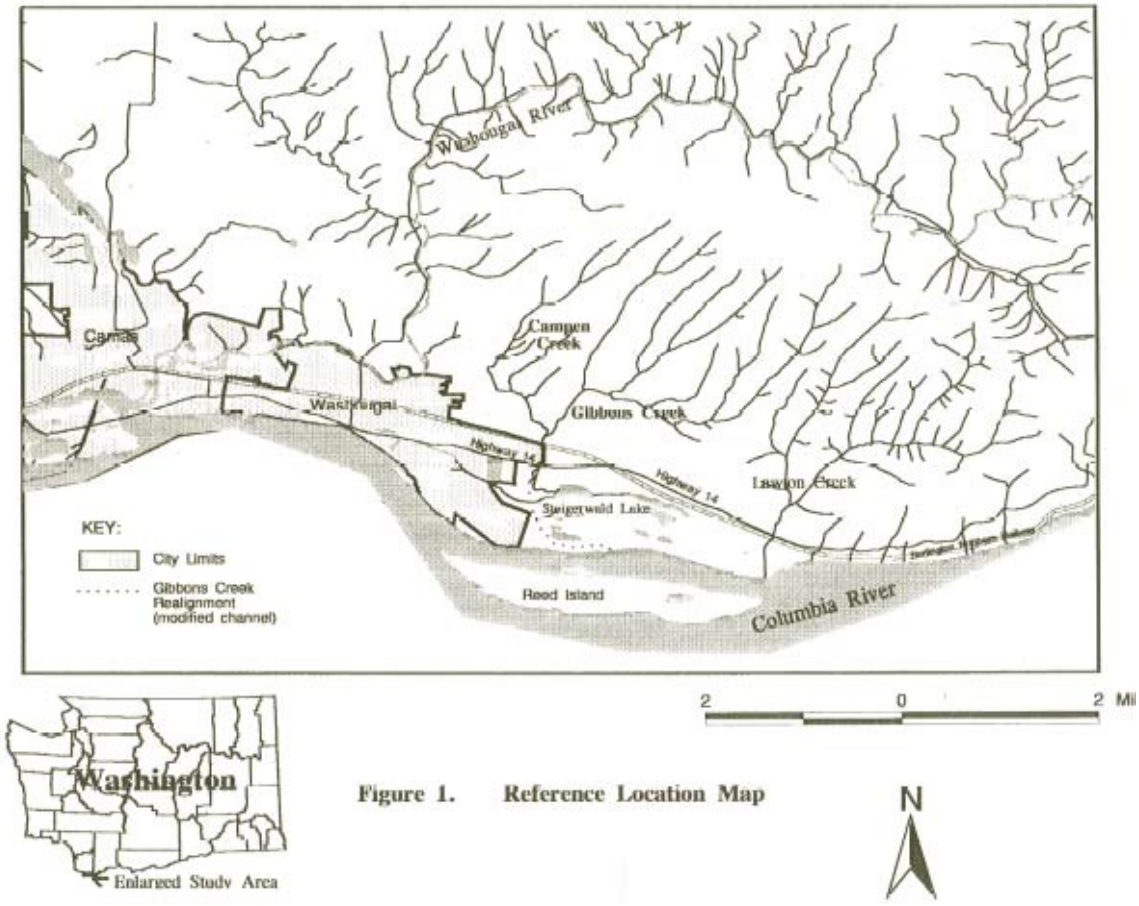

Figure 1. Reference Location Map

Prior to 1992, the lower reach of Gibbons Creek flowed westerly for the lower mile before discharging into the Columbia River. Since 1992, this channel has been significantly modified and drains nearly due south from the highway crossing, through the Steigerwald Lake Wildlife Refuge, to the Columbia River. For most of this lower mile, the creek flows through an artificial, elevated channel before discharging into the Columbia River through a fish ladder structure. Because this portion of the channel is elevated (built on a dike), the surrounding land does not drain into Gibbons Creek, but instead drains into the old remnant channel. Therefore, no land south of Highway 14, including the wildlife refuge, industrial park, and agricultural areas contributes runoff to Gibbons Creek. However, the U.S. Fish and Wildlife Service (USFWS) is considering the feasibility of removing the channel and reintroducing Gibbons Creek into the Steigerwald National Wildlife Refuge.

Land use in the watershed consists largely of rural residential development along the slopes of the Columbia River Valley. Many of these residences keep a small number of horses and/or cattle. The eastern fringe of the town of Washougal extends into the western portion of the watershed, including a school, golf course, and new residential development. Part of the area is serviced by city sewer, but the city plans to service all residents.

1.2 Beneficial Uses

Gibbons Creek is classified as Class A for water quality standards and therefore shall meet or exceed the requirements for all or substantially all of the following characteristic uses: domestic, industrial, and agricultural water supply; stock watering; salmonid and other fish migration, rearing, spawning, and harvesting; clam, oyster and mussel rearing, spawning, and harvesting (Ch. 173-201A WAC).

2.0 HISTORICAL DATA REVIEW

2.1 Streamflow Data

Available streamflow measurements for Gibbons Creek are limited to those collected during the TMDL study period and are summarized in Table 1. Although rainfall and precipitation data specific to Gibbons Creek have not been collected, the city of Washougal's Wastewater Treatment Plant and other nearby weather stations have data that can be reviewed and analyzed in relation to climactic conditions in the Gibbons Creek watershed. Collecting flow data from Gibbons Creek will be an essential tool for determining relative contributions of bacteria from the various tributaries. Comparisons of load allocations between current conditions and those encountered during the project study phase will be used to determine the success of implementation actions.

Table 1. Antecedent Precipitation (inches) and Streamflow (cfs) for Sampling Events.

Survey Number	Date	Precip. *	Station GC-1	Station GC-2	Station GC-3	Station GC-4	Station GC-5	Station GC-6
1	9/8/94	0.04	3.5	0.9	1.1	1.2	0.7	0.6
2	11/9/94	1.19	35	8.3	5.5	5.4	6.1	6.1
3	1/17/94	0.00	58	15	10	10	11	-

Notes: GC-1, Gibbons Creek below confluence with Campen Creek at Evergreen Highway crossing.
GC-2, Campen Creek at mouth, above confluence with Gibbons Creek
GC-3, Campen Creek upstream site at J Street crossing.
GC-4, Unnamed Tributary #1, at mouth, above confluence with Gibbons Creek.
GC-5, Unnamed Tributary #2 (Wooding Road), at mouth, above confluence with Gibbons Creek.
GC-6, Gibbons Creek at confluence with two unnamed tributaries (uppermost Gibbons Creek site).

* Precipitation at the city of Washougal Wastewater Treatment Plant in 24 hour period preceding the sampling date.
- No data obtained.

2.2 Water Quality Data

Water quality data for the Gibbons Creek Watershed primarily consist of those measured by Ecology's Ambient Monitoring Program (1991-1992 and 2001-2002), those from the TMDL assessment (1994-1995), and data collected by the U.S. Fish and Wildlife Service (USFWS) (1997-1999).

Ecology 1991-1992 Data

Water quality data measured by Ecology's Ambient Monitoring Program consisted of monthly data from October 1991 to September 1992 and was collected at the Washington State Highway 14 crossing. These data were summarized by Ehinger (1993) as follows:

> *"The maximum temperature recorded was approximately 16°C. Dissolved oxygen and pH were unremarkable. Fecal coliform counts were high with ten of the twelve samples exceeding 100 colonies/100 ml. Total suspended solids and turbidity were variable. Total phosphorus and soluble reactive phosphorus were somewhat higher than either the Lewis River or the Washougal River, but not particularly high on an absolute scale. Nitrate concentration exceeded 1.5 mg/l in November and was rather high all year. The high nitrate concentration and elevated total phosphorus concentration (in comparison with the Lewis and Washougal Rivers) may indicate a point or nonpoint source of nutrients to the stream. Ammonia concentration was unremarkable."*

A review of the data shows that fecal coliform concentrations ranged from 37 to 910 colonies/100 mL. The Washington State water quality standard for Class A waters requires that fecal coliform levels shall 1) not exceed a geometric mean value of 100 colonies/100 mL, and 2) not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 mL (Ch. 173-201A WAC). The geometric mean for the 1991-1992 data is 230 colonies/100 mL and 50 percent of the samples exceeded 200 colonies/100 mL. Therefore, the water quality standard was not met for fecal coliform bacteria during this period.

Ecology 1994-1995 Data (TMDL Assessment)

The Gibbons Creek TMDL study was conducted as a result of a 1994 Gibbons Creek 303(d) listing. Data results were as follows:

- The Campen Creek basin was the geographic area with the greatest water quality problems.
- The maximum temperature and minimum dissolved oxygen levels were identified at GC3 and GC2, respectively. At station GC3, the maximum temperature of 18.5°C was recorded while dissolved oxygen levels measured 8.5 mg/L. At station GC2 the minimum dissolved oxygen level of 8.1 mg/L was measured at a stream temperature of 15.5°C.

- The greatest level of turbidity and total suspended solids (TSS) within the watershed was observed at station GC3 (400 NTU and 222 mg/L, respectively). Turbidity and TSS levels measured at station GC3 exceeded levels measured at the downstream station GC2 by over 2,200 percent and 1,300 percent, respectively.
- The highest levels of ammonia nitrogen were also found at GC2 (0.047 mg/L) and GC3 (0.045 mg/L) during Survey 1. Freshwater acute and chronic ammonia criteria were not violated at either location.
- The greatest total phosphorus concentrations were detected at GC2 (0.13 mg/L) and GC3 (0.506 mg/L) during Survey 1.

Potential sources of nutrients include urban runoff from new and existing residential development. Elevated ammonia and phosphorus levels detected in Campen Creek during Survey 1 may be due to contaminants attached to solids that are washed into receiving water as evidenced by increased TSS levels seen at GC3. The high values of turbidity and TSS at GC3 relative to other sites are indicative of loading sources further upstream and may be due, in part, to sample timing showing the effects of channel erosion from a rising hydrograph, or runoff of nearstream fines. However, construction activity in the upper basin above GC3 observed during this survey suggests the possibility of erosion from new construction sites. At station GC6, nitrate and nitrite nitrogen and total particulate nitrogen were measured at their highest concentration during Survey 2 (1.54 mg/L) and Survey 3 (1.62 mg/L), respectively (Nocon and Erickson, 1996).

Ecology 2001-2002 Data

Ecology's Ambient Monitoring Program performed fecal coliform monitoring in Gibbons Creek on five occasions between October, 2001 and July 2002. Data from those sampling events are shown in Table 2.

Table 2. Fecal Coliform Bacteria Exceeding State Water Quality Standards.

Fecal Coliform Bacteria Exceeding the Ten Percent Criterion					
Date	Time	Units	Criterion	Result	% Exceedence
10/31/2001	0852	#/100 ml	200	300	50%
11/25/2001	0815	#/100 ml	200	1300	550%
5/29/2002	0826	#/100 ml	200	320	60%
6/26/2002	0751	#/100 ml	200	660	230%
7/31/2002	0715	#/100 ml	200	410	105%

USFWS 1997-1999 Data

In July 2003, the USFWS issued a report titled *Determinates (sic) of Gibbons Creek Watershed Condition and Health: Results of the Gibbons Creek Watershed Analysis, 1997-1999*. The following observations were made. (Note: Text references to Tables 6 and 7 in this quotation are specific to the USFWS report, and correspond to Table 3 and Table 4, respectively, in this QAPP.)

> *"Water temperatures were about 4 degrees cooler on average during the summer months at GC Rkm 6.4 and WC Rkm 0.1 than other locations in the watershed (Table 6). During all months, stations in CC tended to be warmer than other stations and warmed quickest in spring (Table 6). Temperatures exceeded 18.0 C only once during 204 recorded days between April and October 1998 at GC Rkm 6.4 (just above Hans Nagle Road) whereas temperatures exceeded 18.0 C 37 times in 214 recorded days during the same months at GC Rkm 2.34, downstream of the CC confluence (Table 7). Temperatures in CC exceeded 18.0 C on 85 of 214 recorded days April to October 1998. Conversely, WC exceeded 18.0 C only twice on 204 recorded days during those months (Table 7). Point measurements of dissolved oxygen ranged from 9.81-10.31 mg/L, and pH ranged from 7.5-8.0."*
>
> *A review of 13 flow measurements taken during August and September 1997-1998 at the diversion structure revealed a mean base flow of 3.8 cfs (range, 1.5-9.7 cfs). When mainstem GC habitat measurements were surveyed in 1997, flow was 3.0 cfs. The maximum flow we measured in the elevated channel was 71 cfs in May 1998..."*

Stream temperatures measured during this study period are shown in Table 3 and monthly temperature values compared to state water quality standards are reflected in Table 4.

Table 3. Mean Monthly Temperatures and Range Values (May 1998–March 1999).

Location	May	July	September	November	January	March
GC-0.8	11.5	16.8	15.3	12.0	10.7	11.6
	(8.7-17.6)	(13.4-22.1)	(13.4-18.6)	(10.9-13.4)	(8.4-12.7)	(8.7-14.8)
CC-0.1	12.4	18.6	16.5	13.4	9.7	13.2
	(9.5-12.1)	(14.0-18.0)	(15.0-18.0)	(7.7-12.4)	(16.9-12.9)	(6.0-12.7)
CC-1.0	14.4	17.8	15.8	13.4	12.9	13.2
	(9.4-19.3)	(14.4-24.9)	(13.3-20.8)	(7.7-12.4)	(5.1-9.3)	(6.0-12.7)
WC-0.1	10.8	14.5	13.4	9.1	7.5	8.1
	(8.6-14.1)	(12.0-18.6)	(11.0-16.6)	(7.8-10.7)	(5.5-9.0)	(5.6-11.6)
GC-6.43	11.8	14.6	11.2	8.7	7.3	7.8
	(8.6-14.1)	(11.7-18.2)	(10.8-16.7)	(7.5-10.2)	(6.1-8.6)	(5.0-10.5)

Table 4. Monthly Exceedences of State Water Quality Temperature Standard (18 C), 1998.

Location	May	June	July	August	September	October	Total
GC-1.3	0	1	17	15	4	0	36
GC-2.3	0	1	17	16	4	0	37
CC-0.1	1	5	26	22	28	1	86
CC-1.0	2	7	26	31	15	1	85
WC-0.1	0	0	2	0	0	0	2
GC-6.43	0	0	1	0	0	0	1

3.0 PROBLEM DESCRIPTION/SOURCES OF POLLUTION

Based on a reconnaissance survey of land use in the watershed, the possible sources of elevated fecal coliform bacteria, turbidity, and temperature levels are failing septic tanks, animal-keeping operations, construction/development projects, lack of riparian shading, and other warm water inputs. The 1987 Water Quality Plan for Clark County (Intergovernmental Resource Center, 1987) states, "The water quality of Gibbons Creek is likely to be affected by septic system effluent in the upper reaches of the drainage basin and agricultural runoff in the lower reaches." Since that plan was written, additional residential development in the upper and lower parts of the basin has occurred and agricultural land uses have declined. Large farms in the lower part of the basin have ceased operations. Likely sources of observed turbidity are new development or land conversions within the basin. Elevated temperatures, usually associated with lack of shading and discharges from warmer water bodies such as ponds, appear to be continuing.

4.0 PROJECT OBJECTIVES

Under the TMDL requirements of the federal Clean Water Act, monitoring is required to track the effectiveness of implementation activities and to determine if pollution reduction targets are being met. Adequate quality assurance and quality control of the overall monitoring plan will be implemented to provide assurances that volunteer monitoring will result in credible data.
To meet this requirement, monitoring will be conducted in the Gibbons Creek watershed in three parts. The purpose of dividing the monitoring is to increase public participation, spread

monitoring costs among monitoring participants, and provide adequate data to determine the effectiveness of implementation activities. This division of responsibility also closely follows areas of expertise of the participants.

Part 1 -- Effectiveness and Trend Monitoring, Community Involvement (Volunteers/Clark County/City of Washougal)

Objectives

1. Initiate preliminary source identification.
2. Track relative contribution (loading) of various tributaries in the watershed. Plans to conduct flow measurements are currently being evaluated.
3. Involve community in water cleanup planning and monitoring.
4. Determine effectiveness of implementation activities on water quality.

Part 1 of the study will be an ongoing monitoring survey that includes seven survey locations sampled at approximately monthly intervals, except mid-September to mid-November which may have an additional storm event sampling to identify "first flush" characteristics within the basin. A total of thirteen surveys will be conducted per year.

The study design is intended to provide data representing seasonal variations and weather conditions. Data analysis may indicate to some degree whether the source of fecal coliform bacteria is from failing septic systems or livestock. It is anticipated that the data will also tend to indicate sources of turbidity and temperature. Part 1 of the study will be conducted by trained volunteer monitors and will last throughout the study period. Due to organizational and coordination constraints associated with volunteer monitoring, agency or municipality staff will likely conduct the storm event sampling. During the first two years, monitoring will be conducted monthly followed by two years of quarterly sampling. Clark County supports a watershed assessment monitoring site on lower Gibbons Creek as part of its Volunteer Monitoring Program.

Precipitation data will be collected at the city of Washougal's Wastewater Treatment Plant and will be used to better describe flow conditions during previous sampling as well as during this monitoring period.

Part 2 -- Source Identification and Compliance Monitoring (Ecology)

Objectives

1. Identify specific sources of pollution.
2. Determine compliance with state Water Quality Standards.

Part 2 of the study will be conducted by Ecology's Southwest Regional Office (SWRO) staff and will be comprised of two components. The first component is source identification. Based upon pre-existing and recently gathered data from Part 1 of this plan, Ecology will attempt to identify specific sources of pollution with site-specific grab samples. The second component will be compliance monitoring of identified (confirmed) pollution sources. It is expected that this sampling will be roughly equivalent to quarterly sampling in terms of the number of samples.

Part 3 – Quality Assurance/Quality Control and Ambient Monitoring (Ecology)

Objectives

1. Provide QA/QC oversight.
2. Perform long-term trend and effectiveness monitoring.

Part 3 of the study will be conducted by Ecology's Environmental Assessment Program and will include the following:

a. Semi-annual monitoring for fecal coliform, turbidity and temperature in the Gibbons Creek watershed and use the data for source identification and control effectiveness.
b. Side-by-side sampling coordination for the duration of this project, with volunteer and city staff to assess protocols, procedural, and laboratory accuracy.

5.0 ORGANIZATION

Project Team

Department of Ecology

Dave Howard – Water Quality Specialist, (360) 690-4796, project coordinator.

Kim McKee – TMDL Unit Supervisor, (360) 407-6407, project approval.

George Onwumere – Water Quality Specialist, Environmental Assessment Program, (360) 407-6730, QAPP review.

Clark County

Ron Wierenga - Water Resources Scientist, (360) 397-6118 ext. 4264, QAPP development and review, agency coordination, data management and reporting, field sampling.

Jason Wolf - Water Resources Technician, (360) 397-6118 ext. 4282, volunteer coordination and training, equipment management and maintenance, field sampling.

City of Washougal

Monty Anderson – Planning Director, (360) 835-8501.

Trevor Evers - Wastewater Treatment Plant Laboratory, (360) 835-5011, water quality analyses, data management and reporting, field sampling.

Volunteers

Trained volunteers carry out scheduled field activities, including collecting samples and recording field measurements and observations. The volunteers document field activities on datasheets and forms and submit samples to the city of Washougal for lab analyses. Volunteer activities are coordinated by Ron Wierenga and Jason Wolf.

6.0 STUDY DESIGN

6.1 Sample Sites

Four Gibbons Creek sites and three Campen Creek sites, including tributaries, will be sampled. The sites were selected by identifying tributary confluences and the ability to access them. This arrangement of sampling sites helps achieve the monitoring goals by providing data that should clearly show what parts of the basin are contributing pollution. All sites are accessible by road. Permission to access private property will be acquired and maintained by Clark County staff.

6.2 Sample Locations

Sampling sites will be located at approximately the same sites used in the 1996 TMDL Assessment effort (Ecology, 2000). One additional location, CMP038 (Campen Creek Tributary at 'J" street) will be added. A physical description of the sampling locations can be found in Table 5 while site locations are shown in Figure 2.

Table 5. Description of Sampling Locations for Gibbons Creek Fecal Coliform Total Maximum Daily Load Implementation Monitoring Study, 1994-1995.

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			1N	4E	9

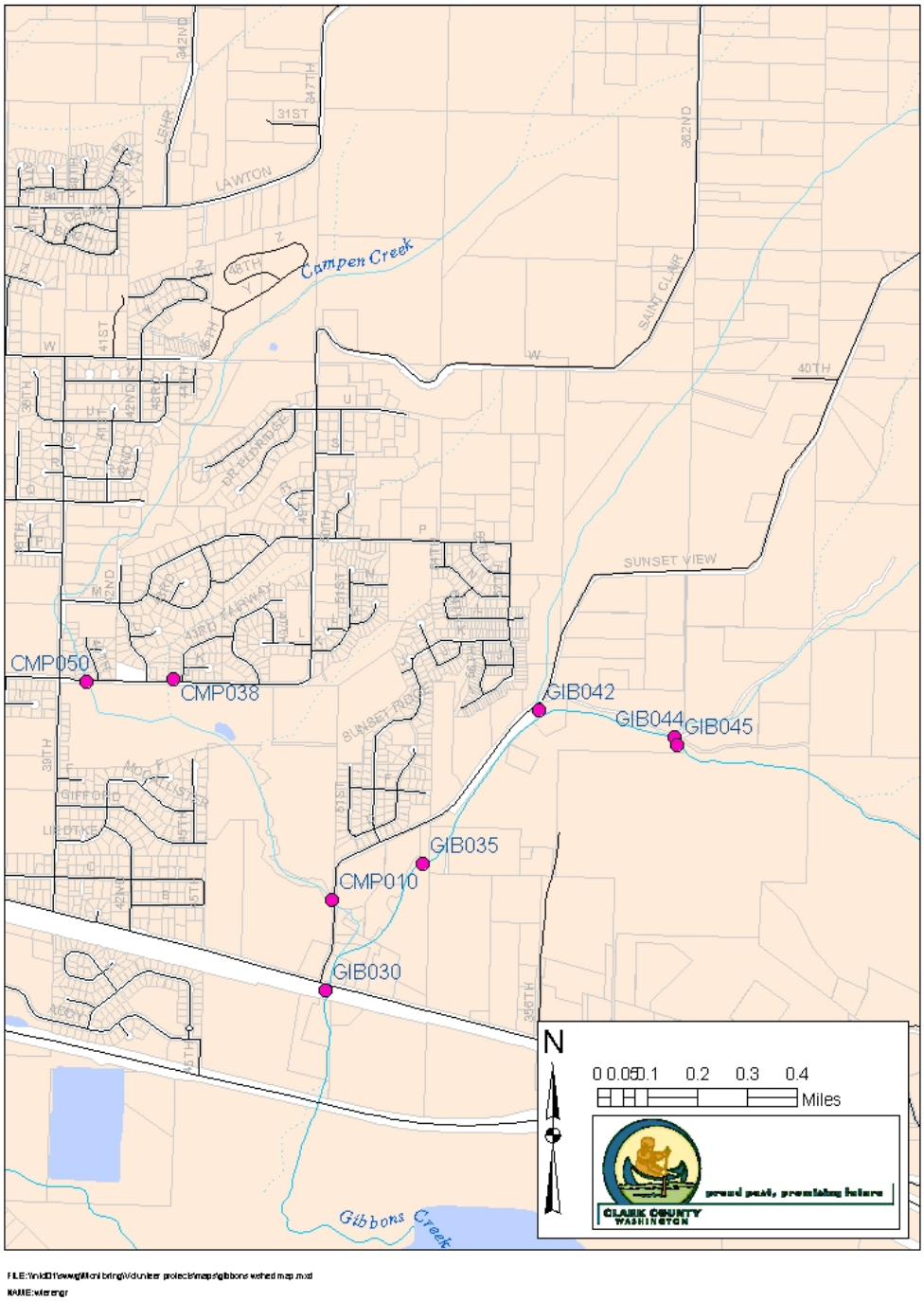

Figure 2. Map of volunteer sample site locations for Gibbons Creek and tributaries.

6.3 Parameters

The three primary parameters of concern in this study are fecal coliform bacteria, temperature, and turbidity. If possible and within the constraints of funding, time, equipment availability, and staffing, sampling may also include pH, conductivity, and dissolved oxygen measurements.

To properly calculate loading and to better characterize water quality in the watershed over time, flow measurements will become necessary at some point. However, no effort is being identified to collect flow monitoring data. At a minimum, stream stage/discharge measurements are recommended to be included in collection efforts.

6.4 Data Analysis

Monthly monitoring data will be shared with the monitoring group members and made available on the Internet. Data will be used to initiate source control activities in the basin.

6.5 Representativeness

The sample sites have been selected to represent conditions at the outlets of small tributaries and the watershed's primary outlet. The characteristics of the drainage as a whole are expected to shape the condition of the stream at the monitoring locations. Monthly sampling is intended to describe stream conditions during each major season and over time.

Sampling protocols are designed to facilitate the collection of representative samples. Water samples and measurements are made from well-mixed locations in the channel thalweg, avoiding influence of surface film or the bottom substrate. All instruments will be allowed to equilibrate prior to recording data. Continuous monitoring devices with data loggers will provide a detailed data set regarding specific water quality parameters.

6.6 Comparability

One of the objectives of this project is to record data that are comparable to other local and regional data. In volunteer monitoring, projects must balance 1) monitoring and data requirements on a regional scale, 2) the level of sophistication and effort associated with professionally collected data, and 3) a technique volunteers can utilize with a high likelihood of success. Utilizing comparable protocols and techniques that are less intense than more rigorous investigations, volunteers are capable of successfully collecting a number of types of data. Specifying standard procedures for data collection and analyses facilitates the long-term comparability of volunteer collected data. Furthermore, following examples of established volunteer monitoring procedures developed in consultation with experts, guards against generating data that will be irrelevant to natural resource managers or the public. To ensure the quality of data collected by volunteers (Part 1), Ecology will collect side-by-side samples (see Part 3 description).

Data collected by volunteers will be compared to Ecology's side-by-side sampling. Results will be examined and compared between years and project sites to determine whether applicable state standards and criteria for Washington State Class A waters are being met.

7.0 SCHEDULE

7.1 Schedule of Activities

For Part 1 of the sampling approach, volunteers will carry out monthly field activities. More detailed source assessment sampling is carried out by partnering agencies on a variable schedule. Samples collected by volunteers will be submitted to the city of Washougal laboratory according to the requirements prescribed by specific characteristic methodologies (i.e., within sample holding times). This information is detailed in the 'Field and Laboratory Procedures' sections of this document.

Samples collected prior to the approval date of this QAPP (shown in italics) will be deemed comparable to those collected after the approval date only if a written statement of comparable rigor to this plan is provided by the entity performing the data collection. In the absence of this statement, data collected prior to the approval date of this QAPP will be reflected with the lowest quality assurance designation in Ecology's Environmental Information Management (EIM) database.

Schedule - Part 1

Date	Milestone
April, 2004	*Monthly Sampling Event (Clark County)*
May, 2004	*Monthly Sampling Event (Volunteer Training Event)*
May, 2004	*Water Temperature Data loggers Deployed by Clark County*
June, 2004	*Monthly Sampling Event (Beginning of volunteer monitoring)*
July, 2004	*Monthly Sampling Event*
August, 2004	*Monthly Sampling Event*
September, 2004	*Monthly Sampling Event*
September, 2004	*Storm Sampling Event*
October, 2004	*Monthly Sampling Event*
October, 2004	*Storm Sampling Event*
November, 2004	*Monthly Sampling Event*
December, 2004	*Monthly Sampling Event*
January, 2005	*Monthly Sampling Event*
February, 2005	*Monthly Sampling Event*
March, 2005	*Monthly Sampling Event*
March, 2005	*Part 1 Monthly field data collection – Annual Review/Compilation*
April, 2005	*Monthly Sampling Event*
May, 2005	Monthly Sampling Event
June, 2005	Monthly Sampling Event
July, 2005	Monthly Sampling Event
August, 2005	Monthly Sampling Event
September, 2005	Monthly Sampling Event
September, 2005	Storm Sampling Event
October, 2005	Monthly Sampling Event

October, 2005	Storm Sampling Event
November, 2005	Monthly Sampling Event
December, 2005	Monthly Sampling Event
January, 2006	Monthly Sampling Event
February, 2006	Monthly Sampling Event
March, 2006	Monthly Sampling Event
March, 2006	Part 1 Monthly field data collection – Annual Review/Compilation
June, 2006	Part 1 Draft Data Analysis Report issued for internal Gibbons Creek Monitoring Group review
August, 2006	Data Analysis Report Issued, Revised QAPP (if necessary)
June, 2006	Quarterly Sampling Event
September, 2006	Quarterly Sampling Event
December, 2006	Quarterly Sampling Event
March, 2007	Quarterly Sampling Event
March, 2007	Part 1 Quarterly Field Data Collection – Annual Review/Compilation
June, 2007	Part 1 Draft Data Analysis Report issued for internal Gibbons Creek Monitoring Group review
June, 2007	Quarterly Sampling Event
August, 2007	Data Analysis Report Issued, Revised QAPP (if necessary)
September, 2007	Quarterly Sampling Event
December, 2007	Quarterly Sampling Event
March, 2008	Quarterly Sampling Event
March, 2008	Part 1 Quarterly Field Data Collection – Annual Review/Compilation
June, 2008	Part 1 Draft Data Analysis Report issued for internal Gibbons Creek Monitoring Group review
June, 2008	Quarterly Sampling Event
September, 2008	Quarterly Sampling Event
December, 2008	Quarterly Sampling Event, Monitoring Project Ends
March, 2009	Part 1 Draft Final Data Analysis Report issued for internal Gibbons Creek Monitoring Group review
June, 2009	Final Part 1 Data Analysis Monitoring Study Final Report Issued

For Part 2 of the sampling approach, Ecology will conduct periodic source identification and compliance monitoring. The amount of sampling would be roughly equivalent to quarterly sampling.

Schedule – Part 2

Date	Milestone
June, 2004	*Source Identification*
September, 2004	*Source Identification*
December, 2004	*Source Identification/Compliance Monitoring*
March, 2005	*Source Identification/Compliance Monitoring*
March, 2005	*Source Identification/Compliance Monitoring* *2004-5 Data Compilation/Review*
June, 2005	Source Identification/Compliance Monitoring
September, 2005	Source Identification/Compliance Monitoring
December, 2005	Source Identification/Compliance Monitoring
March, 2006	Source Identification/Compliance Monitoring
June 2006	Part 2 Source ID/Compliance Monitoring Data Review/Compilation
July, 2006	Part 2 Draft Data Analysis Report issued for internal Gibbons Creek Monitoring Group review
August, 2006	Data Analysis Report Issued, Revised QAPP (if necessary)
June, 2006 – 2008	Quarterly Sampling Events
June, 2008	Part 2 Quarterly field data collection ends
July, 2008	Part 2 Draft Data Analysis Report issued for internal Gibbons Creek Monitoring Group review
August, 2008	Data Analysis Report Issued

For Part 3 sampling, Ecology's Environmental Assessment program will conduct initial monitoring to validate sample locations, procedures, protocols, etc., and will follow with semi-annual monitoring. Ecology will lead an effort to coordinate the development of an annual data review and analysis to update the status of Gibbons Creek water quality, review implementation actions conducted, and determine if any changes to the monitoring plan are warranted.

Monitoring results will be made available to all participants on a regular and ongoing basis, so that source identification, implementation measures and effectiveness monitoring can be used to adaptively manage the project. Results will be posted on the Clark County web site and reported to Ecology's EIM database.

Schedule - Part 3

Date	Milestone
May, 2004	*QA/QC Sampling Event*
June, 2004	*Quarterly Effectiveness Monitoring*
September, 2004	*Quarterly Effectiveness Monitoring*
December, 2004	*Quarterly Effectiveness Monitoring*
March, 2005	*Quarterly Effectiveness Monitoring*
March, 2005	*2004-5 Data Compilation/Review*
June, 2005	Semi-Annual Effectiveness Monitoring
September, 2005	Semi-Annual Effectiveness Monitoring
December, 2005	Semi-Annual Effectiveness Monitoring
March, 2006	Semi-Annual Effectiveness Monitoring, Part 3 Quarterly field data collection ends
July, 2006	Part 3 Draft Data Analysis Report issued for internal Gibbons Creek Monitoring Group review
August, 2006	Data Analysis Report Issued, Revised QAPP (if necessary)
June, 2006 – 2008	Semi-Annual Sampling Events
June, 2008	Part 1 Semi-Annual field data collection ends
July, 2008	Part 1 Draft Data Analysis Report issued for internal Gibbons Creek Monitoring Group review
August, 2008	Data Analysis Report Issued

7.2 Schedule Limitations

In the volunteer monitoring portion of the project, schedule limitations are to be expected. Factors such as weather and high flows may affect the timing of field activities. As a result, the timing of field activities may be affected by volunteer availability. Equipment will need to be borrowed from Clark County to perform field activities and is also subject to availability.

7.3 Project Duration

Monitoring associated with this project will extend from April 2004 through December 2008.

8.0 PROCEDURES AND PROTOCOLS

8.1 Data Quality Objectives

The measurement quality objectives (MQO) for this project are shown in Table 6. The MQOs for the project are set at generally accepted targets for ambient water quality monitoring projects. Assessing data quality for parameters not listed in Table 6, such as for the flow/stage monitoring, is discussed in the quality control section of this document. Data quality objectives and quality control procedures for laboratory parameters are detailed in the Washougal Wastewater Treatment Plant's laboratory quality assurance documents.

Table 6. Summary Measurement Quality Objectives (MQOs) of laboratory and field parameters.

Parameter	Accuracy	Precision	Bias	Required Reporting Limit
	Percent (%) deviation from true value or units of measurement	Relative Standard Deviation	Percent (%) of true value	Concentration units
Temperature, Water	0.1°C	NA	NA	1°C to 25°C
Turbidity	25%	10%	5%	1 NTU
Fecal Coliform	NA	25% (log transformed)	NA	2 MPN/100mL
Dissolved Oxygen	0.3 mg/L 2% saturation	NA	NA	0.1 mg/L to 15 mg/L
Conductivity	3 uS/cm	NA	NA	1 uS/cm
pH	0.2 SU	NA	NA	1-14 SU

Collection, preservation, transportation, and storage of samples follow standard procedures designed to reduce most sources of sampling bias. Analytical bias is minimized by adherence to the methods shown in Table 6. The laboratory employs quality control procedures appropriate to the analytical procedures, including analysis of method blanks, matrix spikes, and check standards.

8.2 Field Procedures

This project uses a volunteer field procedure manual put together by Clark County Water Resources that was modeled after the procedures of the streamkeepers in Clallam County (Wierenga, personnel communication). Changes were made in the various sections to reflect project goals and available resources of the Clark County Volunteer Monitoring Program. Table 7 identifies the field procedures and the sampling requirements for each characteristic that have been approved by Ecology's Environmental Assessment Program.

Table 7. Field procedures and sampling requirements of the Volunteer Stream Project.

Field Activity Type	Sampling Frequency	Method	Equipment	Sample Size	Container Preservation	Holding Time
Flow/Stage	Monthly	Mid-section incremental flow method	Marsh-McBirney model 201D current meter	At 15-20 points across stream	NA	NA
Fecal Coliform	Monthly	Grab sample	NA	100-mL	250-mL sterile HDPE/ sodium thiosulfate	30 hours
Turbidity	Monthly	EPA 180.1 Nephelometric	Hach 2100P	10-mL	15-mL glass vial	48 hours
Temperature	Continuous 1-hr interval	EPA 170.1	Hobo Water Temp Pro data logger	NA	NA	NA
Temperature	Monthly	EPA 170.1 Thermistor	YSI 85 multimeter	NA	NA	In-situ
Dissolved Oxygen	Monthly	EPA 360.1 Membrane Electrode	YSI 85 multimeter	NA	NA	In-situ
Specific Conductance	Monthly	EPA 120.1 Conductivity meter	YSI 85 multimeter	NA	NA	24 hours
pH	Monthly	EPA 150.1 Electrometric	YSI 85 multimeter	NA	NA	In-situ

NA – Not Applicable.

8.2.1 Calibrating Field Instruments

Field instruments are calibrated by Clark County Water Resources staff prior to checkout by volunteers. The calibration and maintenance procedures, as described in instrument operation manuals, are followed. Continuously recording water temperature data loggers are checked for accuracy pre- and post-deployment following Clark County Water Resources procedures.

8.2.2 Flow of Field Activities

Volunteers are trained to follow a general flow of sampling procedures. Monitoring dates are arranged by the team and confirmed with Water Resources staff to ensure equipment availability. Volunteers report to the Washougal WWTP to pick up field equipment kits. Volunteers inspect field kits for completeness given the parameters to be monitored on each trip. Reaches are visited from lowest to highest in the watershed (when applicable) during any given sampling event. Gibbons Creek sample sites are visited first, followed by Campen Creek sample sites. Water

samples and turbidity measurements are taken after a site assessment is completed. Volunteers verify that the tasked work has been completed before leaving the site and returning the equipment to Clark County Water Resources staff.

8.2.3 Sample Identification and Handling

The site name, sample date, and time of collection uniquely identify samples collected by volunteers. Unique sample bottle identification numbers are assigned by the lab. Volunteers record on the field data sheet the identification number of the sample bottle used for the specific site sampled. The lab tracks bacteria samples and data by the sample bottle number. Sample bottles are stored in large coolers with an appropriate amount of ice packs to keep them cold. Prior to sampling, arrangements are made with the lab to drop off water samples, allowing sufficient time to analyze them within holding-time requirements. Arrangements need to be made for staff to work according to volunteer's schedules, which often include weekends.

8.2.4 Data Management and Field Activity Logs

Data sheets will be developed and volunteers will fill in the appropriate fields on the sheets, including the checklists detailing the actions required to verify the data, and submit it to staff for review and entry into the database. Volunteers will be directed to review all of the sheets and then initial appropriate fields indicating that the forms are complete. A sample tracking sheet will be filled in by volunteers indicating the samples that were collected, sample times, and personnel. County staff will confirm that the data were received and reviewed for completeness, before entering data into the Water Resources database. All field data sheets and sample tracking forms will be bound and stored at the Water Resources office as a log of field activities.

8.3 Laboratory Procedures

The Washougal Wastewater Treatment Plant Laboratory will provide volunteers with sterile, pre-washed sample bottles and will perform the analysis for fecal coliform bacteria. Fecal coliform samples are analyzed utilizing the Standard Methods Number 9222D Membrane Filtration procedure. The laboratory filters a single volume of water after estimating the bacteria level based on the conditions at the time of sampling. The treatment plant maintains laboratory accreditation with Washington Department of Ecology. Lab contact information is provided in the project organization section of this document.

9.0 QUALITY CONTROL

9.1 Laboratory QC

Laboratory QC samples are analyzed in accordance with the Washougal Wastewater Treatment Plant Laboratory's QA plan. All QC results are reported to Water Resources and Ecology staff along with sample data. Laboratory data reduction, review, and reporting are performed according to the lab's quality assurance program. Data are assessed and reported according to the methods described in the quality assurance program.

9.2 Field QC

Field QC sample types, frequencies, and definitions for water quality samples are found in Table 8. Laboratory water quality samples and field meter measurements are duplicated at one sample site during each monthly survey.

Table 8. QC sample types, frequencies, and definitions required for the project.

Field QC Sample Type	Frequency	Definition
Field measurement replicate	One per monthly survey	repeat field meter measurements
Sample duplicate	One per monthly survey	duplicate sample collected for laboratory analysis

All meters will be calibrated and maintained by Clark County Water Resources staff in accordance with the manufacturer's instructions. Secondary standards for turbidity are used to verify the calibration of field meters. An NIST-certified thermometer is used to verify the accuracy of temperature sensors. Calibration logs are completed during each calibration and are archived in Clark County Water Resources files. Calibration drift in pH meters is checked against pH buffer solutions and dissolved oxygen measurements are verified using a modified Winkler titration in the field. These activities are used to confirm that field instruments are attaining stated accuracy and resolution specifications.

9.3 Corrective Actions

Data quality problems encountered in the analysis of QC samples are addressed as needed through re-calibration, modifications to the field procedures, increased volunteer training, or by qualifying results appropriately. Documentation of corrective action steps includes problem identification, investigation procedures, corrective action taken, and effectiveness of the corrective action.

10.0 DATA MANAGEMENT, REVIEW, AND REPORTING

10.1 Data Management Procedures

Volunteers will record field data on standardized data sheets. The data sheets will be used to record all of the field data as well as to track samples submitted to the lab. Additional data sheets will detail activities producing samples for analysis or photos for archiving.

Volunteers review field data sheets for errors and then submit a completed package to staff for entry into a database and archiving in bound notebooks. Ultimately the data sheets are digitally imaged and stored electronically on the county's digital imaging system.

Laboratories can submit data electronically in Excel spreadsheets and in paper reports. Hard copies of laboratory reports are stored in a project binder. Digital files are backed up on CD on

an annual basis, and laboratory data packets are also archived on the county's digital imaging system.

After review, data will be entered or imported into the Clark County Water Resource water quality database, developed by Water Resources staff. The database is in a SQL Server format, utilizing Access for data entry, editing, analysis, and reporting. A routine is built into the utilities of the database for reporting following the data standard and submittal requirements of Ecology's Environmental Information Management (EIM) system.

10.2 Audits and Reports

10.2.1 Audits

Ecology, Clark County, and city of Washougal staff will periodically review the field data, methods, lab results, and data management activities to make an assessment of the program and identify corrective actions or method revisions.

10.2.2 Reports

Ecology will collect the annual reports from Parts 1-3 of the monitoring program and compile and summarize them in preparation of an annual meeting of the Gibbons Creek Monitoring Group.

A data summary detailing field activity and preliminary data will be completed and submitted annually. Data summaries may address project methods, present data, summarize data accuracy and completeness, describe any significant data quality problems, and suggest modifications for future monitoring. Reports are reviewed by partnering agencies. The summary will be made available to volunteers and the public via newsletters and via the internet.

10.2.3 Verification and Validation

During each sample trip, volunteers will review field data sheets to confirm that all necessary field measurements and samples have been collected. Laboratory QC results are reviewed and verified by staff and documented in data reports to partnering agencies. Upon receipt, laboratory data are reviewed for errors, omissions, and data qualifiers prior to data entry.

Data verification involves examination of QC results analyzed during the project to provide an indication of whether the precision and bias MQOs have been met. To evaluate whether precision targets have been met, pairs of duplicate sample results are pooled and an estimate of standard deviation is calculated. This estimate divided by the mean concentration of the duplicate results and converted to percent can be used to judge whether the percent RSD target has been met.

To evaluate whether bias targets have been met, the mean percent recovery of the check standards should be within +/- %bias target of the true value (e.g., true value +/- 10%). Unusually high blank results indicate bias due to contamination that may affect low-level results.

To evaluate whether the target for reporting limits has been met, results will be examined to determine if any of the values exceed the required reporting limits.

Data validation consists of a detailed examination of the complete data package using professional judgment to assess whether the procedures in the volunteer methods manual and QAPP have been followed. Data validation is performed by the project manager and QC coordinator during the preparation of annual reports.

10.2.4 Data Quality Assessment

Taking into account the results of data review, verification, and validation, an assessment will be made as to whether the data are of sufficient quality to attain project objectives.

ANALYTICAL BUDGET/FUNDING

Funding for monitoring activities has been included within the budgets of the three governmental agencies contributing to the monitoring plan. Approval of this document demonstrates approval of budget expenditures to conduct monitoring.

Part 1 Analytical Budget (City of Washougal, Clark County)

Laboratory Analysis		
Fecal Coliform	$ 55	cost per sample
Turbidity	$ 0	Clark Co Hach 2100P turbidimeter ($900)
Temperature	$ 0	Clark Co. Water temperature data logger ($700)
Subtotal	$ 55	cost per location
	x 7	locations
	$ 385	per event
	x 13	events/year
	$5,005	cost per year

Part 2 Budget (Ecology Water Quality)

Fecal Coliform	$ 55	cost per sample
Turbidity	$ 0	turbidimeter ($1300)
Temperature	$ 0	
Subtotal	$ 55	cost per location
	x 7	locations
	$ 385	per event
	x 4	events/year
	$1,540	cost per year

Part 3 Budget (Ecology Environmental Assessment)

Fecal Coliform	$ 55	cost per sample
Turbidity	$ 0	turbidimeter ($1300)

Temperature	$	0	
Subtotal	$	55	cost per location
	x	7	locations
	$	385	per event
	x	2	events/year
	$	770	cost per year

REFERENCES

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