

SHORELINE MONITORING PLAN



Kitsap Public Health District
Water Pollution Identification & Correction Program
December 2018



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1. Introduction

The purpose of the Shoreline Monitoring Program is to effectively monitor and sample shoreline areas in Kitsap County on a rotating basis for fecal pollution in order to protect public health and shellfish growing areas. This plan details the goals, objectives, and methodologies of the plan and serves as a guide to Health District monitoring staff. As needed, this plan will be reviewed and amended in response to changes in monitoring goals, objectives, and practices.

Kitsap County has 228 miles of shoreline and its beaches are an important resource. Residents use the marine beaches for recreation, shellfish harvesting, fishing, boating, and various other activities. Fecal waste from warm-blooded animals can contain pathogenic bacteria and viruses that cause disease in humans.

A shoreline survey is the inventory and bacterial assessment of all flowing discharges to an area. If high bacteria counts are found in a discharge, Health District staff investigate, locate, and eliminate sources of contamination to protect public health. Closure of shellfish growing areas may also be required if nearby sources of pollution are impacting them.

Washington State Department of Health (DOH) is responsible for evaluating commercial shellfish growing areas to determine if the shellfish are safe to eat. DOH has designated approximately 207 miles of Kitsap's shoreline "Approved", or "Conditionally Approved" for shellfish harvest, and 21 miles "Prohibited", "Restricted", or "Unclassified". Documented fecal pollution or the threat of pollution has caused the closure and/or restricted use of commercial shellfish beds in Burley Lagoon, Dyes Inlet, Hood Canal, Liberty Bay, Port Orchard Bay, Port Gamble Bay, Sinclair Inlet, and Yukon Harbor. Monitoring has also provided a feedback mechanism for water quality projects, providing evidence of improvements, resulting in upgrades of shellfish harvest areas and removal of public health advisories.

Consistent with the Health District's goals and objectives, the primary focus of this monitoring plan is to detect the presence of human sewage and animal waste from nonpoint pollution sources on Kitsap's beaches and clean-up all sources of contamination. The Health District assesses water quality trends by analyzing bacteria data from streams, lakes, and marine waters throughout Kitsap County. Fecal coliform bacteria is used as the indicator organism in streams and marine water, and *E. coli* is the indicator organism used for lakes and shoreline discharges. *E. Coli* will be used as the indicator for all shoreline sampling conducted under this monitoring plan. *E. Coli* was selected as an indicator because analysis costs and time to analyze are less than for fecal coliform.

Because Kitsap County cities and the federal government properties do not participate in the Clean Water Kitsap (CWK) Program, no data will be collected within City boundaries, on tribal land, or on any of the naval installations for this project. Coordination with the appropriate agency or jurisdiction will occur to the extent necessary to meet the goals and objectives stated in this plan and in the CWK Program Annual Scope of Work.

This plan does not address monitoring conducted by the Health District for the following programs:

- Water Pollution Identification and Correction (PIC) Program Projects
- Recreational Shellfish Program
- Swimming Beach (Lake) Monitoring Program

- Trend Monitoring Program
- All other monitoring plans or projects

Monitoring plans for these programs are discussed in separate Health District documents and specific Quality Assurance Project Plans.

2. Monitoring Goals and Objectives

The goals and objectives of the monitoring program are provided below.

2.A. Monitoring Goals

The goal of this program is to develop and implement a marine shoreline survey program for unincorporated Kitsap County that will:

- Protect and preserve public health and the environment;
- Identify and correct sources of water pollution caused by human sewage and animal waste;
- Inform and educate the public, private industry, and governmental agencies on specific Kitsap County surface water quality issues;
- Provide the public, private industry, and governmental agencies with current surface water quality information in a timely and effective manner; and
- Promote stewardship of the County's waterways and their respective resources.

2.B. Monitoring Objectives

The objectives of the monitoring program are:

- Implement a long-term monitoring program to measure, assess, and characterize conditions on Kitsap County shorelines with the primary focus on the impacts caused by human sewage and animal waste pollution.
- Compare and assess surface water quality results to applicable criteria and guidelines with the primary focus on the impacts caused by human sewage and animal waste pollution.
- Correct identified sources of fecal pollution to Kitsap's shorelines using a combination of education and enforcement.
- Provide data and comments to CWK and the State Department of Ecology to evaluate waterbodies included on the state's Clean Water Act Section 303(d) List for bacterial contamination.
- Provide data and comments to the State Department of Health and CWK to justify the upgrade, or prevent the downgrade, of commercial or recreational shellfish areas as applicable.
- Provide surface water information to CWK, the public, or other private or governmental entities by responding to data requests and by preparing summary reports.

3. Water Quality Standards and Criteria

The Washington State Department of Ecology (Ecology) establishes surface water quality standards in Chapter 173-201A Washington Administrative Code (WAC) for freshwater and marine water. Ecology recommends using *E. Coli* bacteria as an indicator for the protection of swimming and water contact recreation in freshwaters (lakes, rivers, and streams). The criterion for *E. Coli* is shown in **Table 1** below.

TABLE 1
Surface Water Quality Standard/Criteria

Parameter	Freshwater Standard-Part 1	Freshwater Standard-Part 2
Escherichia coli (<i>E. Coli</i>) Bacteria	≤126 colonies/100 mL (geomean) ¹	<10% of all samples >406 colonies/100 mL

¹ U.S. EPA criterion (U.S. EPA 1986A)

For the purposes of the shoreline survey program, all freshwater discharges exceeding 406 colonies of *E. Coli* per 100 milliliters will be resampled two times. If the geometric mean value of the three samples is greater than or equal to 406 colonies of *E. Coli* per 100 milliliters, the discharge will be considered a confirmed source of bacterial pollution, or “hotspot,” and will be investigated using KPHD’s Manual of Protocol (Appendix A).

4. Monitoring Strategy

The basis for the sampling process for this project will be the PIC program’s shoreline survey method. The procedures describing this process in detail are in Chapter 3, Conducting Shoreline Surveys, of KPHD’s Manual of Protocol: Pollution Source Identification and Correction (Appendix A). A shoreline survey is the inventory and bacterial assessment of all flowing discharges to the shoreline being surveyed.

During the shoreline survey, water samples are collected from all flowing discharge points, including stormwater outfalls, bulkhead drains, yard drains, pipes, drainage ditches, seeps and sheet flow. Composite samples are collected if there are multiple small discharges that emanate from one parcel or source, or are very close together.

Water samples are collected in sterile, 100-milliliter bottles and clearly labeled with the sample name or identification number. Additionally, staff record other pertinent information in water-resistant field notebooks. This information will include, but is not limited to, sample identification, sample time, date, field and weather conditions, GPS coordinates, site description, and inspector(s) name. It is important to include information about the site being sampled, including any unusual odors, temperatures, matting, vegetative growth, laundry lint, food waste, or other characteristics that can indicate an intermittent sewage or laundry source. When there are signs of bird or animal activity, this is recorded in the field notes.

E. Coli samples are analyzed at the Health District contract laboratory, which is accredited by the Department of Ecology. Weather and tidal information are collected through the use of published information and access to Internet sites. Rainfall data for Kitsap County is provided by the Kitsap Public

Utility District. If necessary, targeted parameters that cannot be analyzed by the Health District contract laboratory are sent to other Department of Ecology accredited laboratories.

5. Monitoring Parameters

The parameters monitored and analyzed under the shoreline monitoring component include the following:

- Biological: *E. Coli* bacteria
- Environmental: Rainfall amounts, tidal conditions, and flow estimates (hotspots only)

5.A. Biological

The analysis for *E. Coli* bacteria is the Health District’s primary indicator of nonpoint pollution on shorelines. The sample is collected in a 100-milliliter, sterile water bottle, stored at <10°C, and transported to the Health District’s contract laboratory for analysis.

The Health District’s contract laboratory uses the most probable number technique for *E. Coli* analysis of freshwater samples. This analysis follows APHA Procedure 9223-B, “Enzyme Substrate Coliform Test,” described in Standard Methods for the Examination of Water and Wastewater (APHA, 1998). This method of *E. Coli* analysis uses substrate media, Colilert-18.

5.B. Environmental

Environmental parameters are collected from outside data sources to assess weather and tidal characteristics that can influence water quality. These conditions are reviewed when conducting water quality data analyses. During and immediately following storm events, samples will not be taken to avoid biased results. In addition, shoreline sampling events will not occur until January or February to ensure saturated, wet weather conditions. Flow will be estimated and recorded during confirmation sampling of sites that exceeded the threshold during the initial sampling event. See Appendix C for methods to estimate flow.

In summary, the analytical procedure, method detection limit, and method accuracy for the parameter of interest is summarized in **Table 2** below.

TABLE 2
Analysis Methods, Detection Limits, and Accuracy

Parameter	Method of Analysis	Method Detection Limits	Accuracy
Escherichia coli Bacteria	APHA Procedure 9223-B, Enzyme Substrate Coliform Test	<1 to 2419.2 colonies/100 mL	1 colony/100 mL

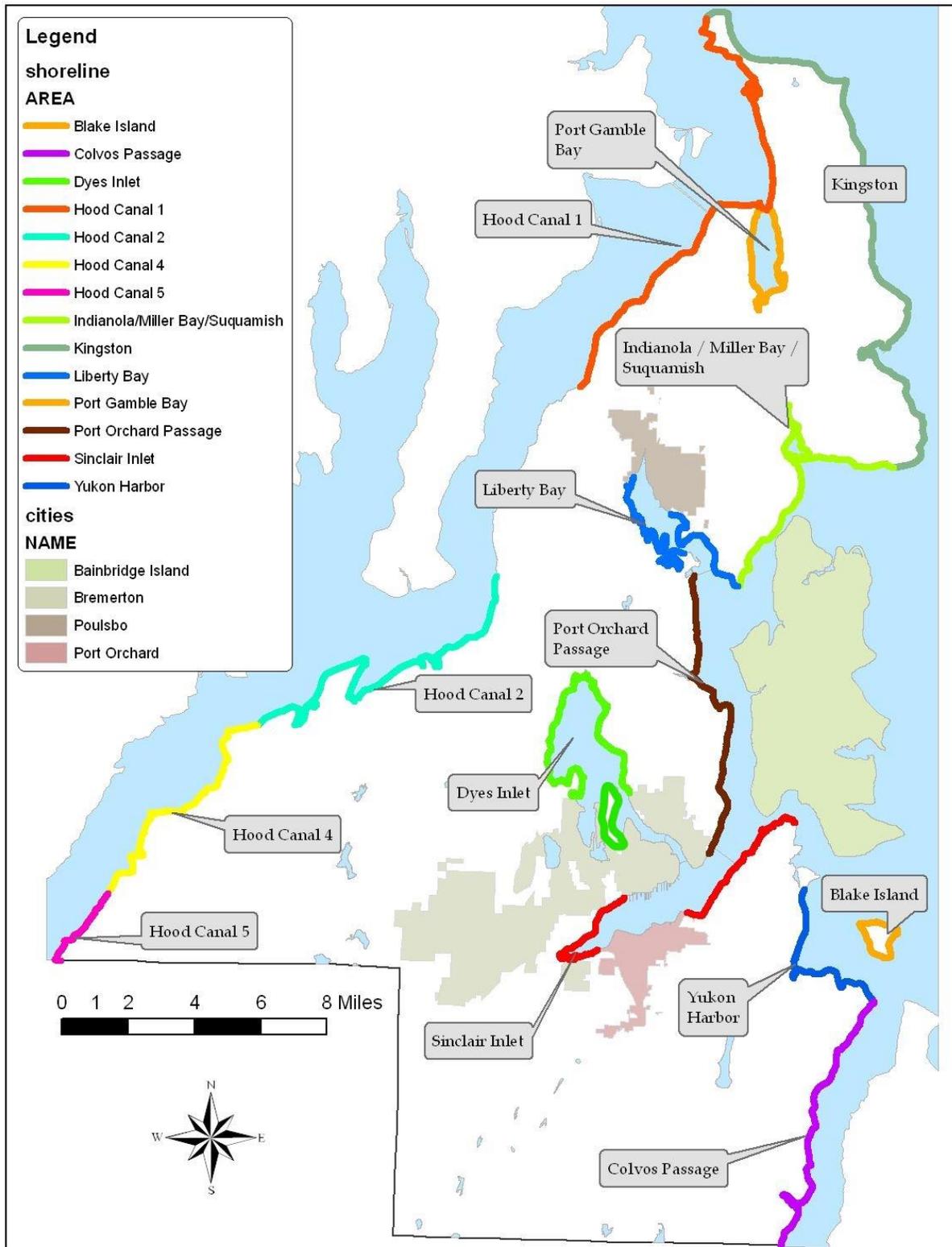
6. Monitoring Station Locations

Kitsap County has approximately 228 miles of shoreline, but a portion of the shoreline is within the city limits of Poulsbo, Port Orchard, Bremerton, or Bainbridge Island. In addition, areas that are naval installations have been excluded, but may be added at a later time when the Navy begins paying stormwater fees. Blake Island and tribal lands have also been excluded from the survey area. There are about 131 miles of shoreline in unincorporated Kitsap County that will be surveyed under this monitoring plan. See **Table 3** and **Figure 1** below for shoreline segments, descriptions, approximate length, and rainfall considered to be a storm event (threshold for sampling).

Table 3
Kitsap County Shoreline Segments

Shoreline Segment	Description	Length (Miles)	Storm Event (rainfall in 24 hours)
Liberty Bay	NUWC Keyport to Sam Snyder Creek (excluding City of Poulsbo)	9	0.25"
Port Gamble Bay	Interior of bay only (excluding Port Gamble S'Klallam reservation)	6	0.25"
Hood Canal 1	Foulweather Bluff to Bangor fence (excluding Port Gamble Bay)	15	0.25"
Miller Bay	Terrace NE to Lera Ln (interior of bay, excluding tribal lands)	2.5	0.25"
Hood Canal 4	Hood Point to area north of Chinom Point	9	0.55"
Hood Canal 5	North of Chinom Point south to Mason County Line	1.5	0.55"
Yukon Harbor/Manchester	Southworth Ferry to Manchester Fuel Depot	5.5	0.55"
Colvos Passage	Pierce County Line to Southworth Ferry	10	0.55"
Hood Canal 2	Bangor fence (south) to Hood Point	14.5	0.40"
Kingston	Marine View Pl NE to Foulweather Bluff	21	0.25"
Port Orchard Passage	Bremerton to NUWC Keyport	9.5	0.40"
Dyes Inlet	Start and end at Port Washington Narrows (excluding City of Bremerton)	17.5	0.40"
Sinclair	Manchester State Park to Bremerton (excluding City of Port Orchard)	10	0.40"

Figure 1
Shoreline Areas in Kitsap County



During each shoreline survey, all flowing discharges to the shoreline will be sampled. Staff will walk along the shoreline, paying close attention to any conveyance that could be transporting water to the beach (i.e. pipes, washouts, bulkheads, etc.). Flow could be from seeps emanating from the beach, or from structures and conveyances near and above the median high tide. It is important to look and listen while walking so that no flows are overlooked.

7. Monitoring Schedule

Kitsap shorelines included in this plan will be surveyed once every six years with alternating wet and dry season surveys, in accordance with the schedule in **Table 4** below.

Table 4

Watershed	Distance	Year	Wet/Dry Survey	Total miles
Kingston	21	2018	Dry	21
HC1	15	2019	Dry	
Port Gamble	6	2019	Wet/Dry	27
Miller	2.5	2020	Dry	
Yukon Manchester	5.5	2020	Wet/Dry	13.5
HC 4&5	10.5	2021	Dry	
Liberty	9	2021	Wet/Dry	28.5
POP	9.5	2022	Dry	
Dyes	17.5	2022	Wet/Dry	44.5
HC2	14.5	2023	Dry	
Sinclair	10	2023	Wet/Dry	34.5
Colvos	10	2024	Dry	
Kingston	21	2024	Wet/Dry	52
HC1	15	2025	Wet/Dry	
Port Gamble	6	2025	Dry	36
Miller	2.5	2026	Wet/Dry	
Yukon Manchester	5.5	2026	Dry	10.5
HC 4&5	10.5	2027	Wet/Dry	
Liberty	9	2027	Dry	30
POP	9.5	2028	Wet/Dry	
Dyes	17.5	2028	Dry	36.5
HC2	14.5	2029	Wet/Dry	
Sinclair	10	2029	Dry	39
Colvos	10	2030	Wet/Dry	20

Shoreline segment monitoring is conducted during the dry season every six years and will alternate wet season shoreline survey events every twelve years. Wet season events are conducted from October 1st through April 30th and dry season events occur from May 1st through September 30th. Wet season events can identify septic system failures caused by high seasonal groundwater and surface water drainage issues. Dry season events allow staff to identify problems in areas where stormwater flow masks fecal pollution sources or where residences are only occupied seasonally. All shoreline areas will be surveyed during wet and dry weather seasons during the year they are scheduled for survey.

Following the 2017 shoreline survey season, the program underwent a thorough review with CWK to evaluate the effectiveness of the program. The review indicated that sampling each shoreline during wet and dry seasons every four years, resulted in a very small percentage of “hotspots” found in the second sampling round. As “hotspots” are identified and resolved, the data indicates that staff time and resources could be used more efficiently. This prompted KPHD to identify the best balance of effectiveness and labor efficiency by decreasing the frequency of monitoring events.

8. Monitoring Procedures

The monitoring procedures provided herein were developed from Health District and other established monitoring protocols identified in this document. These procedures do not address every possible monitoring situation. As such, guidance from the program manager or field supervisor should be sought in determining the best course of action during unusual circumstances.

8.A. Monitoring Event Preparation

Prior to conducting a complete and successful monitoring event, certain preparations must be made. Monitoring event preparations are coordinated by program staff and shall include the following:

- Check tides (<http://ww.protides.com/washington>) and weather conditions for the area.
- Ensure that rainfall for the past 24 hours does not exceed the threshold for a storm event for the shoreline to be surveyed (these were estimated using historical rainfall data from Kitsap Public Utility District).
- Determine access location (s) to shoreline and length of shoreline to be surveyed.
- Identify and schedule field staff.
- Estimate the number of *E. Coli* samples to be collected.
- Obtain the correct type and number of sampling containers.
- Coordinate sample delivery and analysis/holding times with the receiving laboratory.

8.B. Equipment and Supplies Checklist

The Equipment and Supplies Checklist provided in **Table 5** below should be referenced by field staff prior to performing shoreline sampling events.

TABLE 5
Equipment and Supplies Checklist

General Monitoring Checklist
Cooler with Ice Packs
Sample Bottles (100-ml sterile)
Sampling Wand
Waterproof markers
Handheld GPS unit
Field book/pencil
Station List/Map
Cellular Phone
Digital Camera
Health District ID Badge
Health District Business Cards and Public Information Flyers
Pepper Spray
Dog Treats
Disposable Latex Gloves
Weather-appropriate clothing/shoes
Health District High Visibility Vest

8.C. Pre-Monitoring Activities

All field monitoring activities will be conducted in the same manner for all monitoring stations. The standard sequence of events for each monitoring site, where applicable, is as follows:

- Go to the endpoint of the shoreline to be surveyed that day and park a car in a safe, visible location that provides staff a safe exit from the vehicle. Leave a business card with cell phone number in a visible location on the vehicle. Do not block driveways or easements.
- Go to the starting point of the shoreline to be surveyed and park the other vehicle in a safe and clearly visible location that provides staff a safe exit from the vehicle. Place another business card on this vehicle.
- Put on field gear and protective clothing appropriate for the sampling event and weather conditions.
- Enter monitoring event information in field notebook.
- Gather all applicable field equipment and approach the shoreline to be surveyed.

8.D. Monitoring Activities

The following text summarizes the applicable monitoring protocols used for shoreline surveys. Variations from approved monitoring protocols, when necessary, are noted. For specific information related to a monitoring protocol, please refer to the published document.

Shoreline samples are collected and analyzed according to the following monitoring protocols (as cited or as amended):

- "Pollution Identification and Correction: Manual of Protocol" (KPHD, 2016); and
- "Guidance for Conducting Water Quality Assessments and Watershed Characterizations Under the Nonpoint Rule (Chapter 400-12 WAC)" (Ecology, 1995).

Shoreline stations will be monitored and sampled as follows:

- All stations shall be approached from a downstream direction. Care shall be taken to avoid disturbing bottom sediments near the sample location (in cases of streams or beach seeps).
- Once at the station location, label sample containers to be used at that site per Section 8.F.
- For beach seeps, streams, and other large flows, samples shall be collected while facing upstream (against the flow). To address the fact that bacteria concentrate in the surface micro layer, sample bottles will be filled using the "U" scoop motion, if the water is deep enough. If the water is shallow or dispersed over a large channel or area, the sample will be taken from the deepest portion. The "U" scoop motion ensures that the sample will not be biased with micro layer bacteria.
- For pipes or other similar discharges, hold the sample bottle under the flow, using the sampling wand, if necessary, to fill the bottle to the 100-milliliter mark.
- The sample will then be sealed, placed in a cooler and held at less than 10 degrees Celsius. Sample analysis will begin no later than 24 hours from collection.
- Record data describing the site, the GPS coordinates, along with any notes of interest in the field notebook.
- After the data is recorded, staff will take a photo of the sample site and save the GPS coordinates in the handheld GPS using the site identification.

8.E. Field Data Documentation Procedures

Water resistant field books will be used during every monitoring event. Entries shall be made in pencil. Field books will be used to record, at minimum, the following:

- Date of event;
- Field personnel present;
- Watershed or area being surveyed, including access points;
- General weather conditions (e.g., dry or rainy, windy or calm, cloudy or sunny, air temperature);
- Sampling location identification number, time, description, and GPS coordinates;
- Related field observations (e.g., color and/or smell of water, potential sources of pollution observed, notes on sampling collection, etc.).

Area-specific precipitation amounts are retrieved from local rainfall stations established by the Kitsap County PUD No. 1. Tidal stage readings are retrieved from localized tide charts.

8.F. Sample Container Identification and Labeling Procedures

All sample containers must be marked with the monitoring site identification code. There are several ways to name the sampling stations, but the identifier should be as short as possible and is typically the pound sign, then two letters followed by the site number. For example, #KI1, #KI2, #KI3, #KI4, etc. will be used for Kingston shoreline, or #SD1, #SD2, #SD3, #SD4, etc. for South Dyes shoreline.

Field duplicate samples always end with the letter "R" (e.g., field samples #SD18 and #SD18R). Refer to Section 9 below, "Quality Assurance and Quality Control," for additional information regarding field duplicate samples.

9. Quality Assurance and Quality Control

Quality assurance (QA) provides a process for ensuring the reliability and value of measured data (Lombard, 2001). Sound QA practices are essential to acquire data of the necessary type and quality for their intended use. To be scientifically and legally defensible, data must be of documented quality.

9.A. Data Quality Objective

The primary data quality objective of this monitoring program is to measure the concentration of *E. Coli* bacteria at freshwater outfalls and streams to identify and correct sources of fecal pollution. *E. Coli* is a specific indicator of fecal contamination and the associated pathogenic organisms that impact public health. These results will be used to report water quality status over a specific segment of shoreline.

9.A.1 Bias

Bias is considered the consistent deviation of measured values from the true value, caused by systematic errors in a procedure. Bias within the monitoring plan will be reduced to the extent practicable by the following:

- Strict adherence to the sampling procedures of this plan;
- Not sampling during the first significant rainfall after the dry season or following storm events;
- Complete data collection and organization;
- Periodic reviews and evaluations of field sampling procedures; and
- Analyzing data in an appropriate manner based upon essential considerations, such as temporal variations.

9.A.2 Precision

Precision is a measure of the variability in the results of replicate measurements due to random error (Lombard, 2001). Random errors are always present due to normal variability in the many factors affecting the measurement results. Precision will be determined by the following:

- Collection and analysis of field duplicates (not splits) for *E. Coli* will be conducted for a minimum of 10% of the samples collected each monitoring day or event. When possible, duplicates will be collected from sites with expected higher concentrations of *E. Coli* to determine variability of bacterial concentration.
- Calculation of the percent relative standard deviations (%RSD) of the pooled log transformed *E. Coli* measurement results. Results pooled by magnitude will be evaluated allowing the higher percentage %RSDs of low values to be taken into account.

Kitsap Public Health has *E. Coli* duplicate data from a previous shoreline project. The percent relative standard deviation for the log-transformed concentrations of 219 duplicates collected between September 2010 and August 2013 was found. These were grouped by the magnitude of the larger of the two samples and the time of year. The wet season included samples taken between October 1 and April 30. The dry season included samples taken between May 1 and September 30. **Table 6** below is to clarify the meaning of the logarithmic notation.

TABLE 6
Logarithmic Notation

<i>E. Coli</i>	Log(<i>E. Coli</i>)	Notation
$0.1 \leq E. Coli < 1$	$-1 \leq \text{Log}(E. Coli) < 0$	
$1 \leq E. Coli < 10$	$0 \leq \text{Log}(E. Coli) < 1$	[0,1)
$10 \leq E. Coli < 100$	$1 \leq \text{Log}(E. Coli) < 2$	[1,2)
$100 \leq E. Coli < 1000$	$2 \leq \text{Log}(E. Coli) < 3$	[2,3)
$1000 \leq E. Coli < 10,000$	$3 \leq \text{Log}(E. Coli) < 4$	[3,4)

The object of this analysis is to establish a baseline of the variation that exists in duplicate samples. Greater variation is expected for lower concentrations. The %RSDs are shown in **Table 7** below.

Table 7
% Relative Standard Deviation for *E. Coli*

		Magnitude			
		[0,1)	[1,2)	[2,3)	[3,4)
Season	All Year	76.17	16.33	16.50	19.83
	Wet Season	103.05	22.25	3.59	27.21
	Dry Season	45.25	10.23	19.47	4.19

The variation shown in these tables and graphs will serve as a benchmark against which future duplicate analyses can be compared. The sources of the variation could include the variation in the concentration of *E. Coli*, along with possible variation as a result of the sampling protocol or the laboratory tests. As these last two items are subject to strict protocols, it is most likely the source of variation is with the *E. Coli* in the water.

The total precision for field duplicate measurements should not exceed 10% RSD for results at or above 10 times the reporting limit. Precision up to 50% of the RSD for any lower field replicate

results, and for the *E. Coli* duplicates, is acceptable. At levels close to the method detection limit, %RSDs greater than 50% are to be expected and are acceptable.

Using this methodology, the overall variability will be calculated. Overall variability includes the natural environmental variability of the measured parameter, sampling variability, and lab variability (lab method and lab analyst). The overall variability of the parameter will be taken into consideration in the interpretation of the results.

9.B. Data Representativeness, Completeness, and Comparability

Representativeness of the analytical data is simply described as completely walking the entire segment of shoreline and sampling every single flow encountered to the beach. This will characterize the entire length of a given shoreline. It is important to note that the number of samples will vary based on time of year and changing conditions.

- Strict adherence to the specific procedures of this plan including the selection of correct sample locations and methods;
- Thorough documentation of applicable environmental factors (e.g., weather and tidal conditions, observable changes, birds and animals present, etc.); and
- Entering all applicable environmental information for each monitoring station into the water quality database for use in reporting data collected under this plan.

Completeness is considered and will be expressed as the percent of valid data obtained as compared to the amount of data planned (100% of existing flows on the day of each sampling event) for each particular reporting period.

Comparability of the data will be attained through strict adherence to the plan and thorough documentation of that adherence. The plan has been based on accepted protocols and procedures, and has been made consistent with other applicable monitoring efforts.

9.C. Field Quality Assurance

Quality assurance for the field monitoring activities covered under this plan will be achieved through documentation of the following:

- Consistent adherence to monitoring protocols identified within this plan; and
- A determination of whether the project objectives and data quality objectives have been met for a specific set of data and information at the time of reporting.

9.C.1. Personnel Training

All field personnel will be trained in, and be required to demonstrate competency of, the monitoring components contained herein. The Program Manager or field supervisor will ensure that personnel are given first-hand field and data management training. The Program Manager

will ensure that only trained personnel having demonstrated competency are allowed to perform the work contained in this plan.

The Program Manager and field supervisor will conduct periodic performance checks to ensure that staff adhere to the procedures described herein. The performance checks will be performed, at minimum, concurrent with the standard employee performance evaluation process.

9.C.2. Monitoring Procedures

Consistent and properly implemented monitoring procedures are an essential element to collecting scientifically valid and defensible data of known precision and accuracy. Staff will reference Section 8 for detailed instructions regarding monitoring activities.

9.D. Laboratory Quality Assurance

Laboratory QA/QC for the work covered under this plan will be assured through the lab's participation in the Washington State Department of Ecology accreditation program. The laboratory will follow the QA/QC requirements specified in standard analytical methods. See Appendix B for a description of the contract laboratory's Standard Operating Procedures including QA procedures.

9.E. Data Management Quality Assurance

As discussed in Section 10 below, only acceptable high quality data will be entered into the water quality database and used for reporting purposes. Data will be reviewed by field staff for acceptance prior to being entered into the database. Health District staff should reference Appendix A, Manual of Protocol (Appendix D), "Water Quality Database Data Entry and QA/QC Procedures," for a detailed explanation of the QA process for data entry.

10. Data Management, Assessment, and Reporting

Proper data management is essential to water quality assessment activities necessary for the completion of written reports. In-house data management activities include the following:

10.A. Data Review, Reduction, Database Entry, and Storage

All water quality data will be reviewed by staff prior to being accepted and entered into the Health District's Water Quality Access™ database. Data review requires that staff review all field notes and laboratory results prior to entering the data electronically. Staff will review this information to ensure the following:

- All required data sets have been included;
- Parameters monitored are characteristic of expected results; and
- Laboratory analytical results are characteristic of expected results.

Should Health District staff determine the dataset is either incomplete or includes uncharacteristic results, the Program Lead, field supervisor, or Program Manager will be consulted for a decision regarding the validity of the data. Data may only be excluded with the approval of the Program Lead or Program Manager. Once it is determined that the data is acceptable, staff may begin performing data entry procedures. Health District staff should reference Appendix A of this document for specific data entry procedures.

For each monitoring event the following documentation will be entered into the hardcopy files:

- The printed database record entry sheet;
- Original copy of the "Chain Of Custody/Laboratory Analytical Results" form; and
- Original field notes from the field book.

The water quality database serves as the repository for acceptable data. Only data that meets the data quality objectives and quality assurance and control requirements (see Section 9) will be entered into the database. In this way, only valid data will be retrievable from the database. All data input to the database will have a 100% review after input is complete to assure no transcription errors have occurred. The Water Quality database is automatically backed-up on a daily basis to minimize the loss of data caused by electrical or computer malfunctions.

10.B. Data Assessment and Reporting

Once data is entered into the database, it will be assessed by running standardized reports and exporting, if needed, the desired information from the water quality database to a spreadsheet. Specific information that will be reported to CWK on a yearly basis includes:

- Number of stations sampled and sample sites per mile of shoreline
- Number of stations identified as hotspots
- Number of failing onsite sewage systems identified/corrected
- Number of animal waste management violations identified/corrected
- Number of public/side sewer leaks identified/corrected
- Number of hotspots closed

Annual Water Quality Monitoring Reports and project reports are prepared by Health District staff and distributed to CWK, the local press, and other interested parties. More specific data summaries are available upon request.

The Annual Water Quality Monitoring Report provides information to meet the monitoring objectives listed in Section 2.B. These reports include discussions of the following for the eleven watersheds in Kitsap County:

- Watershed Background Information
- Watershed Focus Areas (State 303(d) listed waterbodies, shellfish classifications, and specific watershed water quality improvement projects)
- Annual Stream Monitoring Data and Long-Term FC Trends
- Trend Monitoring Station Maps

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Appendix A-Pollution Identification & Correction: Manual of Protocol

Appendix B- Laboratory Quality Assurance Plan, Standard Operating Procedures

Appendix C-Washington State Department of Health Shoreline Survey Guidance Document