Quality Assurance Project Plan

Hood Canal Regional Pollution Identification and Correction Phase 2 - Implementation

February 2015
Prepared for:
Hood Canal Coordinating Council and
Washington State Department of Health

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This QAPP, monitoring results, and the final project report will be available on the Hood Canal Coordinating Council's website at: http://hccc.wa.gov/AquaticRehabilitation/Regional+PIC/default.aspx, or can be requested from Kitsap County Public Health District (leslie.banigan@kitsappublichealth.org).

Data for this project will also be available on EPA's STOrage and RETrieval (STORET) website at http://www.epa.gov/storet/

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Quality Assurance Project Plan

Hood Canal Regional PIC Program

February 2015

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2.0 Abstract

The Hood Canal Coordinating Council (HCCC) is a watershed-based council of governments with a mission to advocate for and implement regional and local actions to protect and enhance the environmental and economic health of Hood Canal. The HCCC includes representatives from Jefferson County, Kitsap County, Mason County, Port Gamble S'Klallam Tribe, and Skokomish Tribe.

The HCCC is the Local Integrating Organization of the Puget Sound Partnership for the Hood Canal Action Area. The LIO has identified eight near-term actions for the 2014/2015 Puget Sound Action Agenda. The third of these is development of a Hood Canal Regional Pollution Identification and Correction Program (HCRPIC).

This QAPP describes how HCRPIC partners Jefferson County Public Health, Kitsap Public Health District, Mason County Public Health, the Port Gamble S'Klallam Tribe, and the Skokomish Tribe will work in coordination with Washington State Department of Health Office of Shellfish and Water Protection (WSDOH) programs to implement a directed and coordinated shoreline monitoring and investigation program in high priority Hood Canal Action Area shorelines. It describes how shoreline areas are selected and prioritized for shoreline survey, and how shoreline "hotspots" will be confirmed, investigated, documented, and closed. The goal is to identify and correct fecal pollution sources on Hood Canal Action Area shorelines, with the overall outcome of water quality improvements that will result in safer, cleaner beaches and an increase in harvestable shellfish growing areas.

3.0 Background

Surface water quality can provide an early warning for determining whether development, land use, and other human activities are being managed to effectively protect public health and the environment. The HCRPIC program will use the proven, on-the-ground PIC approach to investigate and correct sources of fecal pollution along Hood Canal Action Area shorelines.

The primary focus of the HCRPIC program is to protect and restore shellfish growing areas and public recreational beaches by coordinating Hood Canal Action Area jurisdictions to prevent and reduce pathogens and nutrients flowing into Hood Canal's surface waters from failing onsite sewage systems (OSS), public sewer systems, and animal waste.

During this implementation phase, the HCRPIC team will conduct prioritized elements of the HCRPIC Work Plan (**Appendix A**). The HCRPIC Monitoring Plan (**Appendix B**) recommended the shoreline survey as the most effective way to identify fecal pollution discharges to the Hood Canal shoreline. In an effort to make the most of the available funding, work will be directed into shoreline surveys in priority areas identified in coordination with WSDOH.

3.1 Study area and surroundings

Hood Canal is a natural, glacier-carved fjord more than 60 miles long, which forms the westernmost waterway and margin of the Puget Sound basin. It is situated in Jefferson, Kitsap, and Mason Counties. It begins in the north in Admiralty Inlet between Tala Point and Foulweather Bluff and extends southwesterly about 45 miles to the Great Bend at Annas Bay. From there its "hook" extends northeasterly 15 miles to its head at the Union River estuary near Belfair (HCCC, 2012).

Marine water circulation in Hood Canal is naturally poor, particularly in the southern 20 miles. A relatively shallow, underwater sill south of the Hood Canal Bridge limits water exchange with incoming marine water from the Strait of Juan de Fuca. Preliminary research suggests that the floating Hood Canal Bridge has altered estuarine circulation (Khangaonkar, 2012). Hood Canal also has poor vertical mixing and fresh water entering from rivers and streams can form a distinct surface layer.

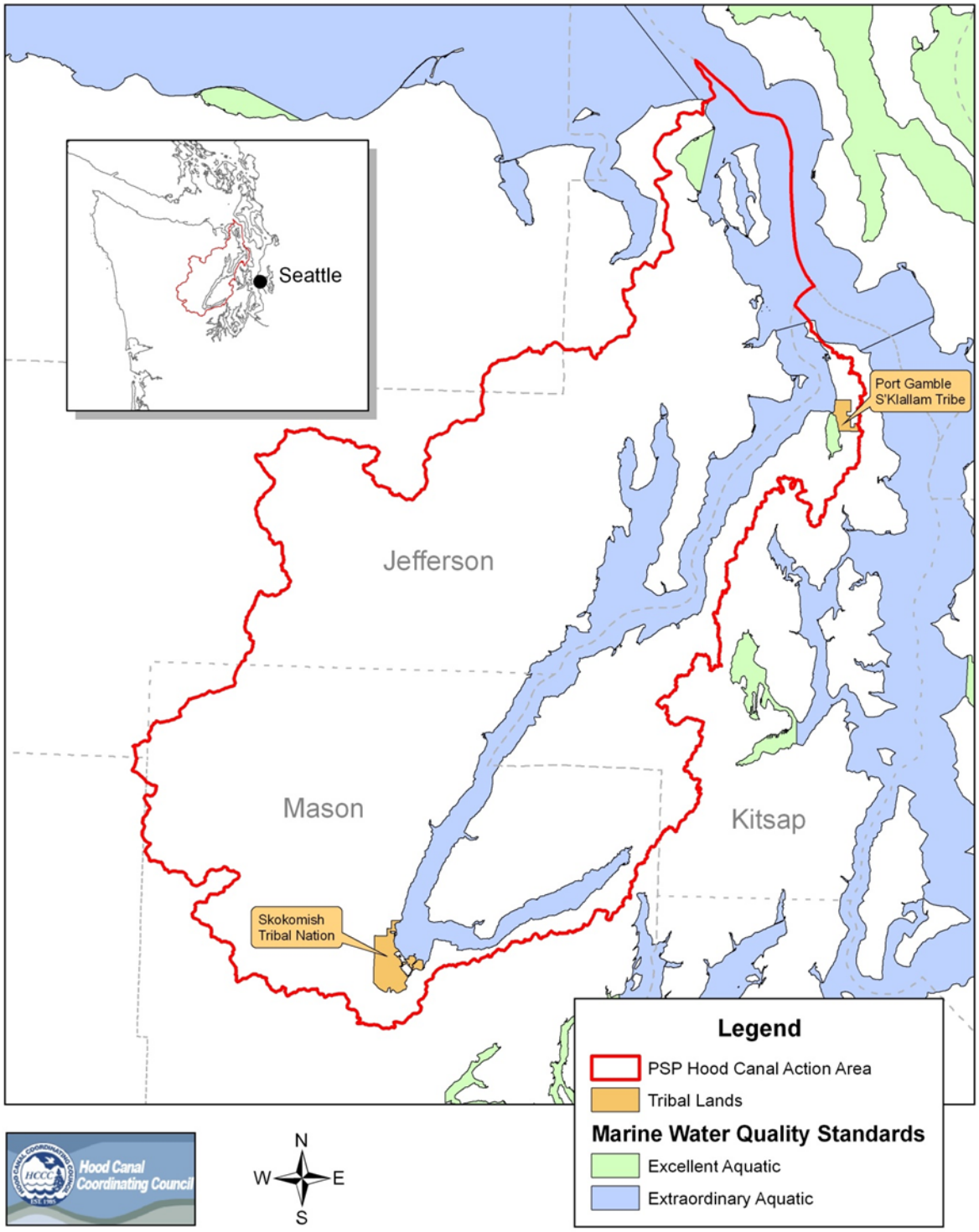
Hood Canal is a nitrogen-limited system and experiences eutrophication predominantly due to marine nitrogen inputs. Eutrophication results in reduced dissolved oxygen concentrations, at times to very low levels that are harmful to marine life. Dense algal blooms in the surface layer die off and decay, reducing dissolved oxygen in deeper layers and degrading water quality for many marine species. This has contributed to extensive fish kills in the region. Due to the low dissolved oxygen problems in Hood Canal, limiting additional nutrient contributions from human sources has been identified as a priority.

Hood Canal was identified as a particularly important and vulnerable part of Puget Sound and designated as an Aquatic Rehabilitation Zone by Revised Code of Washington (RCW) 90.88 (Herrera, June 23, 2010). It is also designated as a shoreline of Statewide Significance by RCW 90.58.030. Jefferson County, Kitsap County, and Mason County Local Management Plans designate Hood Canal as a Marine Recovery Area.

The Puget Sound Partnership's Leadership Council formally recognized the HCCC as the Hood Canal Action Area LIO in September 2010. From the south, the action area extends from Lynch Cove in Belfair (Mason County), through Skokomish Tribal lands, northeast to Port Gamble Bay (Kitsap County and Port Gamble S'Klallam Tribal lands) and northwest to Point Wilson in Port Townsend (Jefferson County). Major rivers on the west side of the canal (Skokomish, Dosewallips, and Big Quilcene) drop rapidly from the Olympic Mountains. Smaller streams from the Kitsap Peninsula (Dewatto and Tahuya) drain into the east side of the canal. Precipitation along the canal varies from 75 inches annually at Skokomish to only 19 inches in Port Townsend.

The PIC program described in this QAPP will be conducted in the Hood Canal Action Area (**Figure 1**).

Figure 1: Study Area



3.1.1 Logistical problems

There are five major jurisdictions in the Hood Canal watershed. Clockwise from the northwest are Jefferson County, Port Gamble S'Klallam Tribe, Kitsap County, Mason County and the Skokomish Tribe. The planning phase (Phase 1) of the HCRPIC project allowed the jurisdictions to form a regional work group that will grow into the implementation guidance group.

Logistics are not expected to impact the outcome of these grant commitments.

3.1.2 History of study area

The canal has great cultural, economic, and recreational value to Washington state residents and tribes. Several state parks are located in the area and a significant portion of the western Hood Canal upland watershed is located within the Olympic National Park and Olympic Forest.

Hood Canal is famous for its prime shellfish growing conditions. Rivers from the Olympic Mountains mix with brackish waters to support some of the most productive growing areas in the world. This area is very important for tribal subsistence and commercial and recreational fishing and shellfishing. Marine resources include many boat docks, several marinas, with popular shrimp and crab events and commercial and recreation clam and oyster harvesting.

The Skokomish, Port Gamble S'Klallam, Jamestown S'Klallam, Lower Elwha Klallam, and Suquamish Tribes retain treaty fishing rights in the Hood Canal region (Puget Sound Partnership, 2014). The Port Gamble S'Klallam Reservation is located at the north end of Hood Canal, and the Skokomish Reservation is located at the south end.

The eastern shore of Hood Canal is home to the U.S. Navy Submarine Base at Bangor, the largest industry and development on the canal. Populated centers in west Kitsap County include Port Gamble and Seabeck. Southern Hood Canal begins in Belfair and the Tahuya Peninsula and runs along lower Hood Canal toward the Skokomish estuary and Potlach.

Much of the west side of Hood Canal borders Olympic National Forest and Park. U.S. Highway 101 and the population centers of Quilcene, Brinnon, Hoodsport, and Potlatch lie along the narrow fringe of land on the west shore of the canal. The Hood Canal Bridge is a critical transportation link between the Kitsap and Olympic Peninsulas. The proximity to Olympic National Park and Forest; cultural attractions in Belfair, Seabeck, Port Townsend, Quilcene and Union; and hunting, fishing, and camping opportunities have generated significant tourism and recreational homes. Table 1 below summarizes Hood Canal Action Area demographics by jurisdiction.

Table 1: County Demographics

County	Population			Land Area square miles	Population Density population per square mile	Assessed Value per capita	Personal Income per capita
	Total	Unincorporated	Incorporated				
	2010	2010	2010		2010	2010	2009
Jefferson	30,050	20,870	9,180	1,803.70	16.66	181,481	$43,100
Kitsap	253,900	171,395	82,505	394.94	642.88	113,244	$43,404
Mason	61,100	51,245	9,855	959.42	63.68	132,814	$31,411

*(WSOFM, April 1, 2014)

The Hood Canal Aquatic Rehabilitation Program was created in 2005 by the Hood Canal Management Bill (ESHB 2097/RCW 90.88), designating the HCCC as the Local Management Board for Hood Canal. The focus of the Aquatic Rehabilitation Program is to work with the Aquatic Rehabilitation Technical Advisory Committee (TAC) to develop strategic actions to improve water quality in Hood Canal.

The TAC has two active workgroups: one for wastewater and onsite septic systems (OSS) and another for stormwater and land use practices. During 2010-11, the TAC Workgroups determined that the development of a Hood Canal Regional Pollution Identification and Correction Program (HCRPIC) was a priority initial action.

Water quality is critical to protecting and enhancing human and ecological health, as well as shellfish and finfish resources. PIC and other water quality programs have been essential to maintain and protect water quality in this watershed with nearly 30,000 onsite sewage systems, many in close proximity to water bodies, one third of which are past the average thirty-year life span.

Nonpoint pollution is a combination of discharges from many activities on many land parcels and as such is more difficult to identify and control. The identification and correction of nonpoint pollution on non-tribal jurisdictions is primarily the responsibility of local jurisdictions in Washington State. The Port Gamble S'Klallam Tribe and the Skokomish Tribe administer their own non-point programs.

The HCRPIC program was modeled on successful elements of Kitsap County's Pollution Identification and Correction program. These elements provide a framework for organizing and funding surface water assessment, protection, and restoration efforts related to nonpoint source pollution. They utilize existing local regulations and authority to address fecal pollution sources and enforce correction when necessary. The program incorporates a strong educational element to prevent future fecal pollution.

HCCC developed the HCRPIC program to conduct surveys and investigations in prioritized water quality problem areas in the Hood Canal Action Area. This NEP implementation funding will allow the regional partners to find and correct bacterial pollution sources that may not be located by other methods and programs.

3.1.3 Contaminants of concern

Fecal waste from warm-blooded animals can contain pathogenic bacteria and viruses that cause human diseases such as shigellosis, campylobacter enteritis, viral gastroenteritis, giardiasis, and cryptosporidiosis. During rain events, flowing surface water picks up pollutants, like fecal waste, and transports them to local streams, bays, and lakes. Impervious surfaces rapidly transport pollutants to receiving waters without treatment.

Fecal pollution is a threat to public health and has caused closures of commercial and recreational shellfish beds and swimming beaches. This QAPP describes monitoring for presence of fecal coliform (FC) or E. coli (EC) in drainages to Hood Canal shorelines, pursuant to the HCRPIC Guidance Document. Implementation project partners will choose whether to sample for FC or EC, based on sample location and purpose, cost, sample turbidity, and coordination with WSDOH. FC is often used in order to better coordinate with WSDOH shellfish data. EC is used because it is less expensive and is better correlated with common fresh water-borne illness in humans.

The combination of poor flushing, water stratification and oxygen depletion make Hood Canal particularly sensitive to nutrient pollution. In Hood Canal marine waters, these low dissolved oxygen events have resulted in significant fish kills (Herrera, July, 2010).

Hood Canal is a nitrogen-limited system. Due to the low dissolved oxygen problems in Hood Canal, limiting additional nutrient contributions from human sources has been identified as a priority (HCCC, Hood Canal Status Report). Pilot nutrient studies for this project will focus on assessing seepage pits within 150' of the shoreline by sampling nearby water flows for bacterial and nutrient concentrations; and conducting before and after correction investigations (BACI). These BACI investigations will be conducted based on work conducted by Kitsap County and Mason County between 2004 and 2008. They measured salinity and collected fecal coliform, ammonia nitrogen, nitrate+nitrite nitrogen, and ortho-phosphorous samples. (Kitsap Health, December 31, 2008; Mason Health, December 2008).

3.1.4 Results of previous studies

HCCC was granted National Estuaries Program funding from April 2012 through March 2014 to develop the planning phase of a regional Hood Canal PIC program to enable efficient, prioritized, and coordinated water quality work by Hood Canal jurisdictions. The HCRPIC planning phase was a unique opportunity to combine and share strengths of local PIC and water quality programs. A regional team was developed beginning with health department representatives from Jefferson, Kitsap, and Mason Counties, and natural resources representatives from the Port Gamble S'Klallam and the Skokomish Tribes. Local conservation districts and stormwater managers were folded into the regional team.

The planning project: developed a summary report of water quality monitoring and PIC work conducted in the Hood Canal Action Area between 2005 and 2011; updated Hood Canal GIS OSS Maps; developed a regional PIC Monitoring Plan, regional PIC Protocol, and 5-year work plan; reviewed Jefferson, Kitsap, and Mason County OSS regulations and policies; developed a strategy for stormwater and animal waste management; and produced a sustainable funding strategy.

The summary report reflected the surprising amount of work accomplished by Hood Canal jurisdictions between 2005 and 2011 (HCCC, 2013).

- Nearly 194 shoreline miles surveyed – most during wet and dry weather season - resulted in identifying and correcting 43 OSS failures
- Nearly 1850 parcel surveys conducted – resulted in identifying and correcting 128 OSS failures

The comprehensive, coordinated, and robust HCRPIC program planning elements set the stage for successful regional PIC implementation to protect and restore Hood Canal water quality. The Hood Canal Action Area jurisdictions have demonstrated that they are committed and motivated to protect and restore this watershed.

Before and After Correction Investigation (BACI) studies were conducted by Kitsap County and Mason County between 2005 and 2008. FC, nitrate+nitrite nitrogen, ammonia nitrogen, and ortho-phosphorus samples were collected from FC contaminated drainage and similar control drainages before and after FC source correction. Salinity was measured and flows were measured where possible, or they were estimated. A minimum of three sets of samples were collected before correction and three sets after correction. (Kitsap Health, December 31, 2008; Mason Health, December 2008).

3.1.5 Regulatory criteria or standards

For this project, we will be using the HCRPIC Guidance Document that was developed during the planning phase (**Appendix C**). The monitoring and identification of pollution sources section details the regional team agreement that drainages with counts greater than or equal to 200 FC/100ml, or 100 EC/100 ml for EC are resampled two times to confirm. The database calculates a geometric mean value (GMV) of the three sample results. Further investigation is conducted when the GMV exceeds 500 FC/100ml or 320 EC/100ml.

4.0 Project Description

4.1 Project goals

The goals for this project are:

- Implement the Puget Sound Partnership's 2014/15 Action Agenda's Shellfish Strategic Initiative sub strategy 9.4 to "develop and implement local and tribal pollution identification and correction programs.
- Implement Hood Canal Integrated Watershed Plan focal components:
    - Commercial Shellfishing Goal – Provide opportunities throughout Hood Canal for the culture and harvest of shellfish on designated tidelands
    - Recreation Goal – Provide for ample opportunities and access to promote public recreational experiences and the tourism industry throughout the Hood Canal watershed.

    - Rivers and Stream Goal – Restore and protect dynamic river and stream systems throughout Hood Canal to ensure clean water, normative flows, normative sediment regimes, and high quality river and floodplain habitats
    - Shellfish Goal – Ensure healthy bi-valve populations throughout Hood Canal to provide ecological services and for recreational, subsistence, and ceremonial harvest on designated public and private tide lands
    - Water for Human Health and Prosperity Goal – Restore and protect water quality and quantity for human well-being and ecological health
- Coordinate Hood Canal Action Area jurisdictions to implement prioritized PIC work in priority areas to prevent, identify and correct pathogen and nutrient pollution sources.
- Protect the public from waterborne illness related to fecal pollution of surface waters and shellfish.
- Protect and restore shellfish growing areas and public recreational beaches.
- Address or assist with federal, state and county water quality mandates as required.

4.2 Project objectives

The objectives of this project follow. This QAPP addresses objectives #8, 9, and 12.

1. Conduct quarterly pilot guidance group meetings throughout the project.
2. Conduct the HCRPIC project pursuant to the HCRPIC Guidance Document (**Appendix C**)
3. Develop a consistent and coordinated regional approach to confirming, investigating, documenting, and closing shoreline fecal "hotspots"
4. Utilize a water quality database that has been developed and field-tested for trend and shoreline monitoring data management and reports unconfirmed and confirmed "hotspots" by weather season. Develop process for sending project data to STORET and/or EIM.
5. Update regional OSS GIS maps with current data from Jefferson, Kitsap and Mason County including OSS type, location, and age to identify OSS areas of concern. Analyze data to determine clusters of old or unknown OSS that could impact water quality to identify OSS areas of concern. Compare unknowns with prior update. Map OSS repairs and year repaired. Provide electronic versions to counties to help prioritize PIC implementation work.
6. Pilot guidance group will work with WSDOH to refine and prioritize Jefferson County shellfish growing area segments for shoreline survey based on the work areas specified in the regional Work Plan and WSDOH recommendations (Dosewallips/Brinnon, Duckabush, Pleasant Harbor, Dosewallips, and Chimacum/Irondale), and WSDOH referrals and emergency shellfish closure areas. Jefferson County Health Department will develop a HCRPIC implementation plan including: strategies to repair all currently failing OSS in the project area; investigate, report, and close 40 shoreline "hotspots"; conduct and report 125 parcel surveys in Hood Canal Action Area priority shorelines and WSDOH areas of concern including parcels specified in shoreline surveys.
7. Pilot guidance group will work with WSDOH to refine and prioritize Mason County shellfish growing area segments needing shoreline survey based on the work areas specified in the regional Work Plan and WSDOH recommendations in Hood Canal 6-9 (Hoodsport, Big Bend/Union, Summertide Resort, Forest Beach, 15851 SR 106, 8420 Northshore Road, South shore, Potlatch, and North shore west of Tahuya (summer only), and WSDOH referrals and emergency shellfish closure areas. Mason County Health Department will develop a HCRPIC implementation plan including: strategies to repair all

failing OSS in the project area; investigate, report, and close 40 shoreline "hotspots"; conduct and report 125 parcel surveys in Hood Canal Action Area priority shorelines and WSDOH areas of concern including parcels specified in shoreline surveys.

8. Assess fecal pollution of Hood Canal Action Area surface waters. Jefferson and Mason County will sample all flowing discharges to priority shoreline segments for FC or EC bacteria twice during this project - once during wet weather (October through April) and once during dry weather (May through September). They will collect two confirmation samples for drainages that exceed the confirmation threshold and will investigate all drainages that exceed the investigation threshold.
9. Shoreline "hotspot" investigations will be documented and reported to the guidance group for closure.
10. Identified fecal pollution sources will be corrected by property owners. Jurisdictions will provide education and free technical assistance and will ensure correction through enforcement if necessary.
11. Educate property owners and residents to proactively prevent pollution sources.
12. Develop and conduct pilot nutrient studies in conjunction with the TAC to further knowledge about bacterial and nutrient pollution sources. Mason County will assess drainages near seepage pits for bacterial and nutrient pollution. Jefferson County may assess drainages near seepage pits and "OSS in Violation", and may conduct before and after OSS correction studies.
13. Build on education and outreach efforts based on the social marketing process. Develop and conduct an education and outreach plan to determine how to better report successful Hood Canal Action Area efforts to the community and legislators with the goal of developing support for local and regional HCRPIC funding.
14. Provide data and comments to the Washington State Department of Health to justify the upgrade, or prevent the downgrade, of commercial or recreational shellfish areas, as applicable.

4.3 Information needed and sources

This project will be conducted pursuant to the HCRPIC Work Plan and Guidance Document (**Appendix A and C**).

4.4 Target population

The target populations for this project are the fresh water discharges to the Hood Canal Action Area shoreline, along with FC and EC in the sampled water. The targeted water sample population includes those fresh water drainages sampled during the wet weather season (November through April) and those sampled during the dry weather season (May through October).

Preventive education will be provided to the human population of Hood Canal and visitors who utilize the shorelines for the many, diverse recreational activities conducted in the Hood Canal Action Area. The resident population is about 54,000 (Ecology, 2011 Under the Hood)

4.5 Study boundaries

The study area is the Hood Canal Action Area shown in **Figure 1**.

4.6 Tasks required

The project will involve seven related tasks. This QAPP guides work conducted for Tasks 4 and 5.

Task 1: Project Administration/Management – Project oversight and tracking; preparation of project sub-contracts; preparation and submittal of progress reports, final report, and payment vouchers; preparation and submittal of Quality Assurance Project Plan. Facilitate data reporting to STORET. Administer the project in accordance with grant agreement and maintain project records.

Task 2: Regional Forum to Advance Collaborative Hood Canal PIC Work – Pilot Guidance Group – The guidance group will coordinate and facilitate PIC efforts in the Hood Canal Action Area through quarterly meetings. The group will provide oversight, guidance and structure for consistent procedures and technical assistance for the HCRPIC program; develop implementation and funding strategies in priority work areas; and develop a repository for regional resources. They will also provide coordination for National Estuary Program grant projects and related projects between Jefferson, Kitsap, and Mason Counties, and the natural resource departments of the Port Gamble S'Klallam and Skokomish Tribe.

Task 3: OSS GIS Mapping – Update regional OSS GIS maps including OSS type, location, and age to identify OSS areas of concern. Analyze data to determine clusters of old or unknown OSS that could impact water quality. Compare unknowns with prior update. Map OSS repaired during this project with repair type and repair date. Provide electronic versions to counties to help prioritize PIC implementation work.

Task 4: Pollution Identification and Correction –Kitsap Public Health District (Kitsap Health) is implementing a shoreline monitoring program under separate funding to conduct shoreline surveys rotating through Kitsap's shellfish growing areas every four years. Kitsap initiated an extensive shoreline survey program pilot in 2010 with funding from the United States Environmental Protection Agency. This formed the basis for establishing an ongoing shoreline monitoring program that is funded by Clean Water Kitsap (stormwater utility), and National Estuary Program. Kitsap's methods are provided in the Shoreline Monitoring Program Quality Assurance Program Plan that was approved by NEP in October 2014. Since 2010, Kitsap has conducted shoreline surveys in Hood Canal 1, 2 and in Port Gamble Bay. In 2015, shoreline surveys will be completed in Hood Canal 4 and Hood Canal 5.

Kitsap Health, met with the Port Gamble S'Klallam Tribe in September and again in October with HCCC to coordinate HCRPIC efforts in order to share resources and ideas and use resources effectively for National Estuary Program grant projects and other related projects.

WSDOH, Mason County, and the Skokomish Tribe began working together in July 2014 to coordinate PIC efforts in the Hoodsport area, following a tribal shellfish growing area reclassification request. WSDOH has initiated sampling in the Hoodsport area for the first time

since the area was *prohibited* based on potential stormwater and OSS fecal pollution concerns. A joint meeting was conducted on August 8, 2014 with a goal of opening some or all of the Prohibited shellfish harvesting area adjacent to Hoodsport. WSDOH and the tribe are conducting monitoring and Mason County prioritized the Hoodsport portion of the Hood Canal 6 growing area.

WSDOH, Jefferson County, Kitsap County, and Mason County will communicate and coordinate work efforts in the Hood Canal action area to avoid duplicating efforts, to share resources and information, and to encourage efficiency and effectiveness.

The pilot guidance group will work with WSDOH to refine and prioritize Jefferson County shellfish growing area segments for directed shoreline survey based on the work areas specified in the regional Work Plan and WSDOH recommendations: (Dosewallips/Brinnon, Duckabush, Pleasant Harbor, Chimacum/Irondale, and Paradise Bay), and WSDOH referrals and emergency shellfish closure areas. Jefferson County Health Department will develop a HCRPIC implementation plan including: strategies to repair all currently failing OSS in the project area; investigate, report, and close 40 shoreline "hotspots"; and conduct and document 125 parcel surveys in Hood Canal Action Area priority shorelines and WSDOH areas of concern including parcels specified in shoreline surveys.

The pilot guidance group will also work with WSDOH to refine and prioritize Mason County shellfish growing area segments needing shoreline survey based on the work areas specified in the regional Work Plan and WSDOH recommendations: (Hood Canal 6-9: Hoodsport, Big Bend/Union, Summertide Resort, Forest Beach, 15851 SR 106, 8420 Northshore Road, South shore, Potlatch, and North shore west of Tahuya (summer only). Work in Hoodsport began in September 2014 following a tribal reclassification request for the Hoodsport area from the Skokomish Tribe. Mason County Health Department will develop a HCRPIC implementation plan including strategies to: repair all failing OSS in the project area; investigate, report, and close 40 shoreline "hotspots"; and conduct and document 125 parcel surveys in Hood Canal Action Area priority shorelines and WSDOH areas of concern including parcels specified in shoreline surveys

HCRPIC work will be conducted pursuant to the HCRPIC Guidance Document, based on the WSDOH 2014 Pollution Identification and Correction (PIC) Program Guidance manual. This manual provides a consistent and coordinated regional approach. Work will also be standardized by using the process illustrated by the flowcharts in Figures 2-4 for fecal shoreline "hotspot" confirmation, investigation, and closure.

Figure 2: Fecal Pollution Hotspot Confirmation

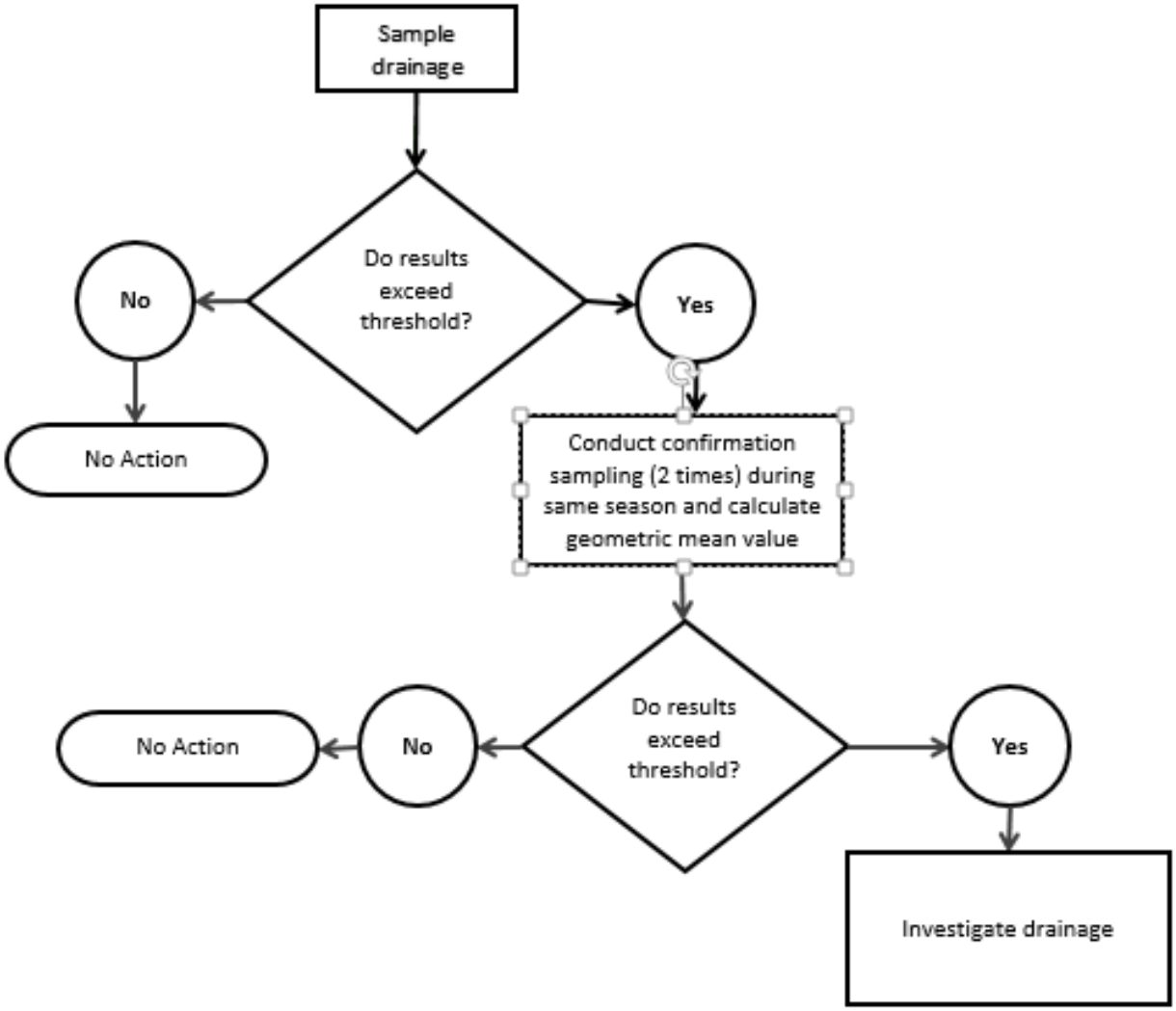
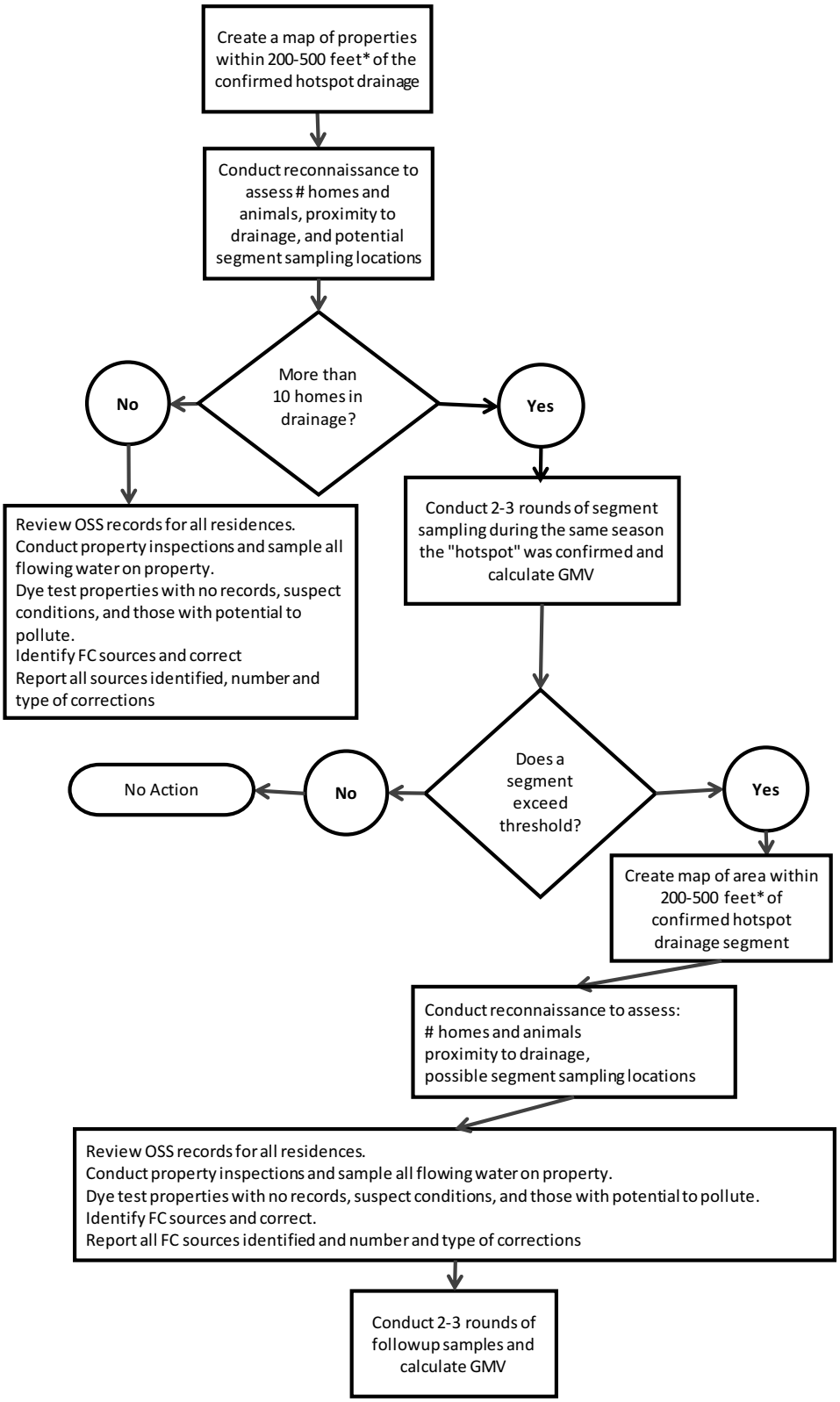
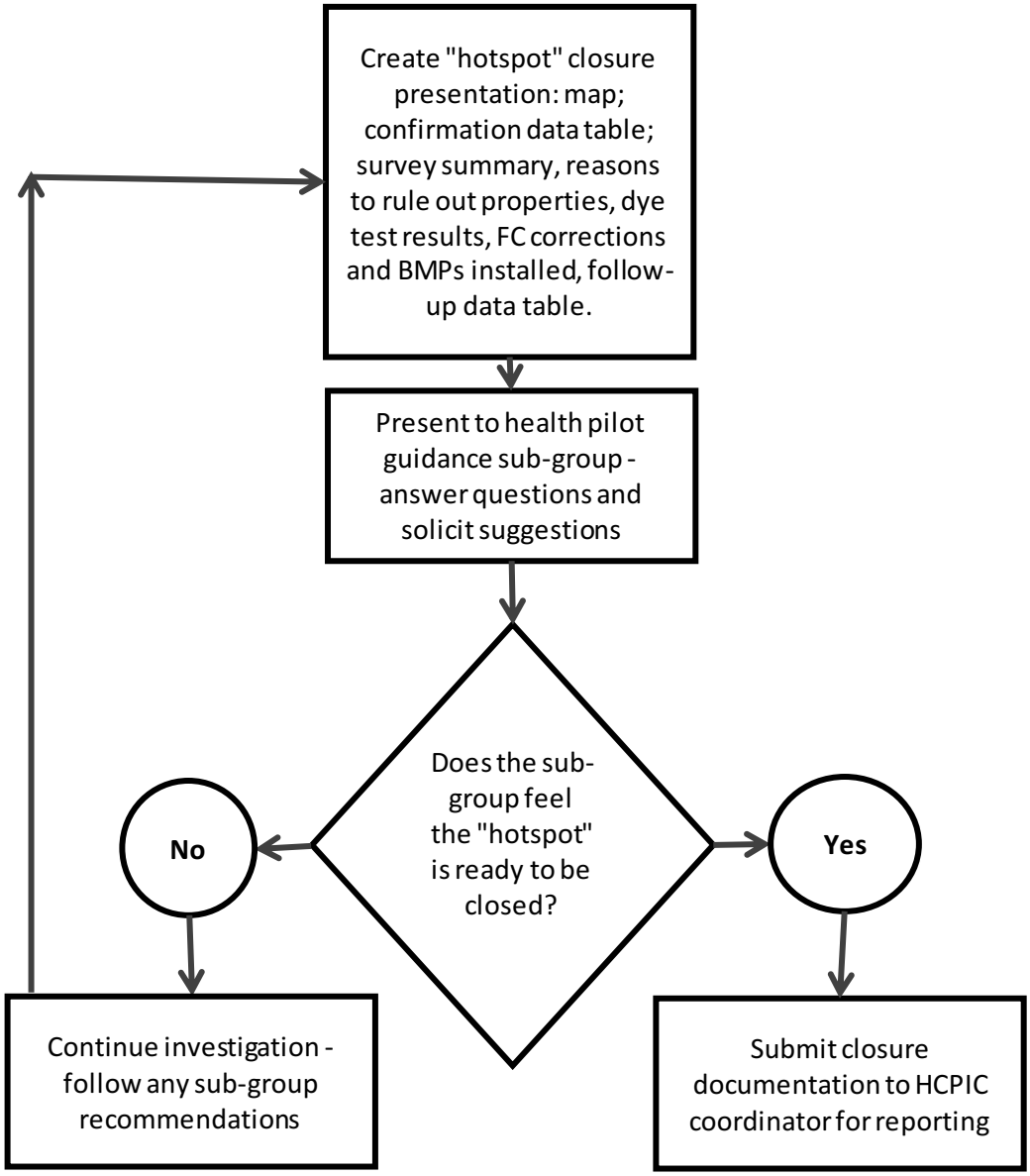


Figure 3: Fecal Pollution Hotspot Investigation



* depends on number and extent of water conveyances

Figure 4: Fecal Pollution Hotspot Closure

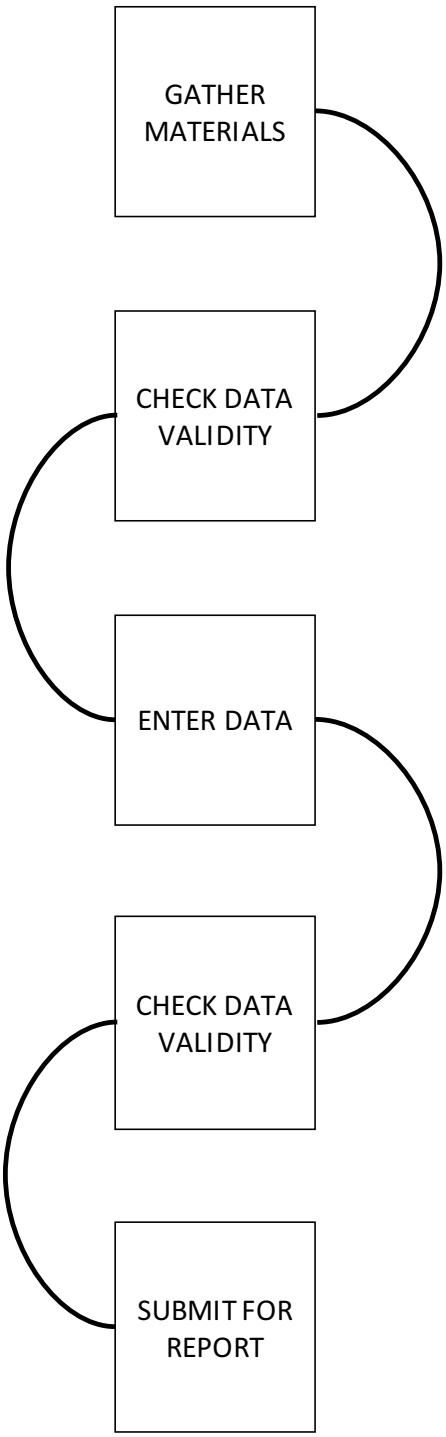


The HCRPIC guidance document specifies that Jefferson, Kitsap and Mason County staff will sample all flowing discharges to priority shoreline segments for FC or EC bacteria twice during the project – once during wet weather (October through April) and once during dry weather (May through .September). Note: Kitsap samples all flowing discharges to entire shellfish growing areas.

HCRPIC partners collect two confirmation samples for drainages that exceed the confirmation threshold of 200 FC/100ml or 100 EC/100ml. All sample results are entered into Kitsap Public Health District's Water Quality database as illustrated in the following Figure 5. This cloud-

based database calculates geometric mean values and produces unconfirmed and confirmed "hotspot" reports.

Figure 5: Shoreline Survey Data Management



Investigation is conducted on confirmed "hotspots" where the GMV exceeds 500 FC/100ml or 320 EC/100ml. Unconfirmed sites are reassessed during the dry weather season. Ideally, the HCRPIC program will be able to conduct rotating shoreline surveys every four years during wet and dry weather seasons. The guidance group can authorize investigation of drainages where the investigation threshold is not exceeded in the wet or dry season, at the request of the local jurisdiction.

Those drainages that exceed the investigation threshold are mapped and investigated by the jurisdiction to find fecal pollution sources pursuant to the HCRPIC Guidance Document. Fecal pollution sources are isolated and identified through segment sampling, individual parcel inspections, and sampling and dye tracing when necessary. Sewage or solid waste violations are corrected through education and enforcement when necessary. Property owners and residents are provided site specific recommendations to proactively prevent pollution sources.

Task 5: Pilot Nutrient Study – The pilot guidance group and the TAC will make recommendations for pilot nutrient work in the Jefferson County portion and the Mason County portion of the Hood Canal Action Area. The studies will be designed to further knowledge about bacterial and nutrient sources in the Hood Canal Action Area.

Mason County plans to assess seepage pits to determine bacterial and nutrient pollution contributions to Hood Canal. Jefferson County may: assess drainages near their seepage pits and "OSS in Violation"; conduct before and after correction studies on shoreline failures, or assess nutrient from pockets of agricultural/livestock and residential land uses.

Task 6: Education – Build on education and outreach efforts that incorporate social marketing strategies. Develop and carry out a regional outreach plan to determine how to better report Hood Canal Action Area successes to the community and legislators to further the goal of developing support for local and regional HCRPIC funding.

Task 7: PIC Workshops – Participate in PIC Workshops, training and events to share information and resources.

This QAPP focuses on Task 4 and Task 5 activities.

4.7 Practical constraints

Practical constraints associated with this project include time constraints, tidal height and shoreline access, parcel access, and the intermittent nature of OSS failures.

If this QAPP is approved in the first half of January 2015, then field work can be conducted during 2015 and 2016 and OSS failures will be corrected during summer 2015 and summer 2016. The two-year project timeline may make it difficult to document water quality improvements after failure correction, particularly for those systems found failing toward the project end.

Property access for surveys and sampling can be a challenge. Owners or residents can deny inspectors access or do not respond. When property owners or residents do not respond to

multiple contacts, the parcel is visited during wet weather conditions and water samples are collected leaving and entering the property to assess for fecal pollution sources.

Intermittent or seasonal OSS failures can be challenging to find.

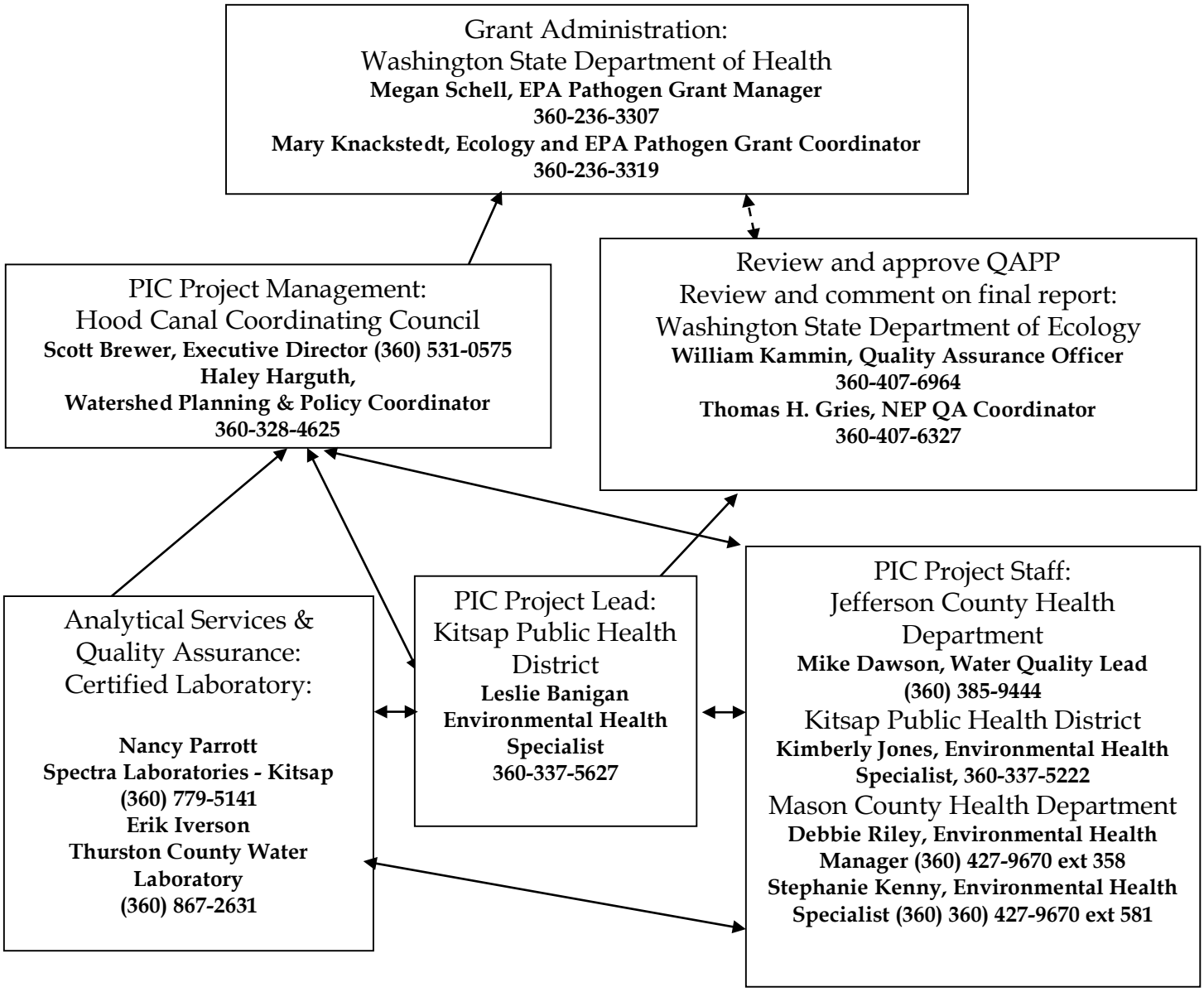
4.8 Systematic planning process

The systematic planning process used was the development of the Scope of Work (SOW), Financial and Ecosystem and Accounting Tracking System (FEATS), and the Quality Assurance Project Plan (QAPP).

5.0 Organization and Schedule

5.1 Key individuals and their responsibilities

Figure 6: Project Organization Chart



5.2 Organization chart

Table 2: Organization of Project Staff and Responsibilities

Staff	Title	Responsibilities
Megan Schell Washington State Department of Health Phone: 360-236-3307	EPA Pathogens Grant Manager	Manages NEP grant. Ensures compliance with contract and QAPP. Reviews reports and billing.
Mary Knackstedt Washington State Department of Health Phone: 360-236-3319	EPA Pathogen Grant Coordinator	Coordinates Pathogen Reduction Program. Oversees compliance, reports and billing. Liaison with Ecology and EPA.
William Kammin Washington State Department of Ecology Phone: 360-407-6964	Ecology Quality Assurance Officer	Approves final QAPP.
Thomas Gries Washington State Department of Ecology Phone: 360-407-6327	NEP QA Coordinator	Reviews and recommends approval of QAPP, reviews and comments on draft project report.
Scott Brewer Hood Canal Coordinating Council Phone: 360-337-5674	Executive Director	PIC Project Oversight. Reviews reports and project products.
Haley Harguth Hood Canal Coordinating Council Phone: 360-328-4625	Watershed Planner & Policy Coordinator	PIC Project Co-Lead. Works with project manager to coordinate quarterly pilot guidance group meetings, facilitate implementation plan development, oversee project implementation, and prepare and submit quarterly and final reports.
Stuart Whitford Kitsap Public Health District Phone: 360-337-5674	Water Pollution Program Manager	Oversees PIC Program. Oversees Onsite Sewage Repair and Complaint Program.
Leslie Banigan Kitsap Public Health District Phone: 360-337-5627	Project Manager	PIC Project Co-Lead. Writes the QAPP. Works with HCCC to coordinate quarterly pilot guidance group meetings, facilitate implementation plan development, oversee project implementation, prepare and submit quarterly and final reports.
Debbie Riley Mason County Health Department Phone: 360-427-9670	Environmental Health Manager	Pilot guidance group member. Oversees field sampling and transportation of samples to the laboratory. Conducts QA review of data, analyzes and interprets data, and oversees data entry into the water quality database. Presents quarterly reports at the pilot guidance group meeting. Submits quarterly reports and final report. Oversees sampling and data entry. Oversees "hotspot" confirmation, investigation, documentation, and closure.

Staff	Title	Responsibilities
Mike Dawson Jefferson County Health Department Phone: 360-385-9444	Water Quality Lead	Pilot guidance group member. Oversees field sampling and transportation of samples to the laboratory. Conducts QA review of data, analyzes and interprets data, and oversees data entry into the water quality database. Presents quarterly reports at the pilot guidance group meeting. Submits quarterly reports and final report. Oversees sampling and data entry. Oversees "hotspot" confirmation, investigation, documentation, and closure.
Paul McCollum Port Gamble S'Klallam Tribe Phone: 360-297-4792 ext. 237	Natural Resources Director	Pilot Guidance group member. Coordinating NEP grants with Kitsap Health and HCCC.
Dave Herrera Skokomish Tribe Phone: 360-877-2210 ext. 2070	Fish and Wildlife Policy Advisor	Pilot Guidance group member. Coordinating with WSDOH and Mason County on Hoodsport harvest request.
Nancy Parrott Spectra Laboratories - Kitsap Phone : 360-779-5141 Erik Iverson Thurston County Water Laboratory (360) 867-2631	Laboratory Supervisor Laboratory Manager	Manages analytical contract. Oversees QA/QC compliance. Oversees reporting.

5.3 Project schedule

Table 3: Proposed Project Schedule and Timeline

Project Administration	Start date	End date	Objective	Deadline
Quality Assurance Project Plan (QAPP)	10/1/2014	2/1/2014	Fulfill EPA requirement	12/31/2014
Semi-annual Federal EPA FEATS Reports	10/1/2014	10/20/2016	Fulfill EPA requirement	10/15/2014 4/15/2015 10/15/2015 4/15/2016 10/15/2016
Final Performance Report	12/31/2016	4/1/2017	Fulfill EPA requirement	4/15/2017
Input data into STORET	12/31/2016	4/15/2017	Fulfill EPA requirement	4/15/2017
Regional Forum - Pilot Guidance Group	**Start date**	**End date**	**Objective**	**Deadline**
Quarterly guidance group meetings	November 2014	February 2017	Coordinate PIC efforts in the Hood Canal Action Area Shoreline hotspot investigation closure	November 21, 2014; February, May, August, & November 2015; February, May, August, & November 2016; February 2017
Develop consistent and coordinated regional approach to confirming, investigating, documenting, and closing shoreline fecal "hotspots"	November 2014	January 2015	Fulfill EPA requirement	January 15, 2015
Develop SOP for water quality data entry including a process for sending project data to STORET and EIM.	January 1, 2015	February 1, 2015	Fulfill EPA requirement	February 1, 2015
Provide coordination between HCRPIC, Kitsap Health, and Port Gamble S'Klallam Tribe PIC work	October 2014	April 15, 2017	Fulfill EPA requirement	April 15, 2017

OSS GIS Mapping	Start date	End date	Objective	Deadline
Facilitate submittal of Jefferson, Kitsap, and Mason County OSS GIS updates	January 2016	July 2016	Fulfill EPA requirement	July 1, 2016
Present draft data analysis at pilot guidance group meeting	July 2016	August 2016	Incorporate group comments	September 1, 2016
Jefferson, Kitsap and Mason submit final OSS ratings and OSS repair data for map overlays				December 31, 2016
Distribute updated OSS GIS data and analysis to partners	January 2016	February 2017	Assist PIC implementation	February 2017
Pollution Identification and Correction	**Start date**	**End date**	**Objective**	**Deadline**
Guidance group will work with WSDOH to refine and prioritize Jefferson County and Mason County shellfish growing area segments for shoreline survey	November 2014	January 2015	Conduct PIC work in high priority shellfish growing area segments	Top priority identified by January 2015 Prioritized list by March 2015
Jefferson County will develop an implementation plan to: facilitate repair of all currently failing OSS in the project area	November 2014	February 2015	Develop prioritized plan to meet grant requirements	February 28, 2015
Jefferson County will conduct prioritized shoreline surveys; confirm and investigate approximately 40 hotspots; conduct 125 parcel surveys in identified priority areas; and correct all fecal pollution sources.	January 2015	December 2016	Document investigation closure of 20 hotspots and 65 parcel surveys in 2015 and 20 hotspot investigations and 60 parcel surveys in 2016	December 31, 2016
Kitsap County will complete shoreline surveys and hotspot investigations in Hood Canal 4 and 5 growing areas	January 2015	December 2015	Identify and correct fecal pollution sources	October 2016
Mason County will develop an implementation plan to facilitate repair of all failing OSS in the project area.	November 2014	February 2015	Facilitate EPA requirement that all fecal sources	February 28, 2015

Pollution Identification and Correction	Start date	End date	Objective	Deadline
Mason County will conduct prioritized shoreline surveys; confirm and investigate approximately 40 hotspots; conduct 125 parcel surveys in identified priority areas; and correct all fecal pollution sources.	January 2015	December 2016	Document investigation closure of 20 hotspots and 65 parcel surveys in 2015; 20 hotspot investigations & 60 parcel surveys in 2016	December 31, 2016
Jefferson, Kitsap and Mason Counties enter Hood Canal growing area shoreline survey data into database	January 2015	December 2016	Data reporting	April 15, 2017
Pilot Nutrient Study	**Start date**	**End date**	**Objective**	**Deadline**
Pilot guidance group and TAC will make recommendations for pilot nutrient work in Jefferson County and in Mason County.	November 2014	January 2015	Develop nutrient studies that further knowledge about bacterial and nutrient sources to Hood Canal	February 28,, 2015
Jefferson and Mason conduct nutrient study	January 2015	June 2016	Fulfill EPA requirement	October 31, 2016
Jefferson and Mason review draft nutrient study	November 2016	December 2016		December 31, 2016
Education	**Start date**	**End date**	**Objective**	**Deadline**
Pilot guidance group will develop a regional outreach plan	November 2014	December 2015	Utilize research developed through social marketing methods to build a coordinated regional approach	July 2015
Conduct social marketing campaign elements	March 2016	September 2016	Conduct pilot campaign & effectiveness evaluation	November 2016
PIC Workshops	**Start date**	**End date**	**Objective**	**Deadline**
Participate in PIC workshops/events to share information	October 2014	April 2017	Share information, materials, and resources	April 15, 2017

5.4 Limitations on schedule

Limitations on the schedule may include severe weather, tidal access, lab capacity, and land owner access to property.

If this QAPP is approved by the middle of January 2015, then project field work can be conducted primarily between February 2015 and December 2016. OSS failures will be corrected during the summer and fall of 2015 and 2016. This may not allow adequate time to document water quality improvements, from fecal sources corrected late in the project, in the final report.

5.5 Budget and funding

Table 4: Budget

Category	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	TOTAL
Salaries	$25,573	$6,393						$31,966
Benefits	$10,530	$2,633						$13,163
Indirect costs								$0
Contracts (Hood Canal Coordinating Council)	$122,498	$57,502	$10,000	$290,000	$30,000	$35,000	$1,500	$546,500
Goods and Services								$0
Travel/training	$3,420	$855						$4,275
Equipment								$0
Supplies (Mason - print and mail)						$5,000		$5,000
Other (HCCC phone)	$477	$119						$596
GRAND TOTAL	$162,498	$67,502	$10,000	$290,000	$30,000	$40,000	$1,500	$601,500

BUDGET NARRATIVE

The implementation budget for the HCRPIC program was developed by utilizing budgets from similar work conducted in the Hood Canal region by Jefferson, Kitsap, and Mason County local health jurisdictions and by the HCCC's budget and experience during the regional HCRPIC planning phase (Phase 1).

Task 1: Project Administration/Management

Regional PIC project implementation will be facilitated by the PIC coordinators: Kitsap Health and HCCC. The coordinators will prevent duplication of efforts and reduce administrative costs by developing and implementing project contracts, quality assurance project plans, data management procedures, and project reporting. They will also oversee the tasks and timelines necessary to fulfill project commitments (by identifying pollution sources and correcting them in the two year project duration) and provide technical assistance for regional partners. The coordination task is anticipated to take 2,166 total hours (1,314 by Kitsap Health and 852 by HCCC) over the 30 month implementation project (72.2 total hours monthly).

Jefferson and Mason County Health jurisdictions will conduct project reporting under this task and anticipate utilizing 106 hours to prepare and submit ten quarterly reports.

This budget includes $10,000 for the Port Gamble S'Klallam Tribe and $10,000 for the Skokomish Tribe to provide them the option to develop and/or implement pilot projects consistent with the goals of the regional PIC program. Potential projects will be submitted to grant officers for approval.

Task 2: Pilot Guidance Group

Cost estimates are based on regional coordination work during Phase I, as the pilot guidance group will evolve from the regional team that was developed during the planning phase. The pilot guidance group will be organized and facilitated by the PIC coordinators.

The coordinators (Kitsap Health and HCCC) anticipate utilizing 459 total hours (246 by Kitsap Health and 213 by HCCC) to coordinate quarterly meetings, prepare materials, document meeting agreements and tasks, and facilitate work assignments. This represents 45.9 total hours for each quarterly pilot guidance group meeting.

The jurisdictions estimate using 748 hours to participate in the quarterly pilot guidance group meetings. This represents 74.8 total hours per meeting for the two local health jurisdictions, two local Tribes, and three local conservation districts. This represents approximately 10.7 hours per jurisdiction to prepare for, attend, and follow-up on each meeting. Kitsap Health and HCCC will be represented at these meetings through the coordinators.

Task 3: OSS GIS Mapping

The budget for this task was based on the OSS GIS mapping tasks conducted by the Hood Canal Coordinating Council in 2010 and the work conducted under the planning phase (Phase 1). Jurisdiction data updates are budgeted to be compiled and submitted by Mason and Jefferson Counties under Task 4. This estimate is based on past data compilation for regional GIS mapping.

Task 4: Pollution Identification and Correction

Pollution Identification and Correction field work is predominately conducted by local health jurisdiction staff. This task includes collecting water samples, analyzing water quality data to confirm water quality hotspots, investigating hotspots through monitoring and door-to-door parcel surveys, correcting pollution sources through education and enforcement when necessary, hotspot documentation and closure, and submitting OSS GIS updates for Task 3. The budget for this task is based on costs to jurisdictions to complete these tasks during Phase 1 of the regional PIC project and past PIC projects. While the number of hotspots identified may vary, these estimates are based on past results assessed in Phase I. Estimates for sample costs were based on contacting certified laboratories and requesting quotes for costs.

Jefferson and Mason County health jurisdictions estimate utilizing 4,913 hours to conduct Task 4. This represents 163.8 total hours each month. Laboratory analysis is estimated to cost $49,659 which represents $1,655.30 total per month over the 30-month project. It is estimated that each health jurisdiction will work in targeted areas to investigate and report closure documentation for 40 shoreline hotspots and conduct and document 125 door-to-door parcel surveys.

Task 5: Pilot Nutrient Study

PIC nutrient studies were conducted by the partner jurisdictions between 2005 and 2011 and provided important information to identify shoreline nutrient contributions. Estimates for sample collection and analysis are based on past PIC nutrient work and lab cost estimates. The pilot nutrient studies will be designed to further knowledge about bacterial and nutrient sources to

Hood Canal. Mason County will assess bacterial and nutrient contributions from seepage pits. Final study design and final report development are estimated based on past pilot projects.

Task 6: Education

Budget estimates are based on three components in Task 6. Mason County will conduct specific OSS and stormwater outreach to residents in priority areas in conjunction with PIC work in Task 4. Jefferson Conservation District has planned outreach to agricultural priority areas in the Hood Canal Action Area. The cost estimates for these efforts are based on past work. The Hood Canal Action Area has an outreach network that has been active for more than a decade. The Hood Canal Water Education Network (HCWEN) is comprised of local agencies, including WSU Extension, and provides a network for regional outreach messaging and facilitates implementation of grant-funded outreach projects. WSU Extension and HCWEN are extremely active in development and implementation of education and outreach that result in behavior change.

The remaining Task 6 budget, will build on a Puget Sound Partnership funded social marketing project in nearby Burley Lagoon, Rocky Bay, and Vaughn Bay. WSU Extension is working with Washington Conservation Commission through May 2015 to conduct marketing research with residential and livestock owners to determine: motivations and barriers to fixing failing septic systems and collecting and adequately disposing pet and livestock waste; effective incentives for behavior change; and the preferred messenger. They will conduct an outreach project based on their research and provide recommendations for future needs. The HCRPIC implementation project will utilize contract funds to implement priority recommendations or regional needs. It is exciting when projects of several organizations work together to better research, test and adapt strategies and materials to craft strong materials.

An effective regional outreach plan will help the regional partners report Hood Canal Action Area successes to the community and legislators with the goal of developing support for an ongoing package of local and regional HCRPIC funding.

6.0 Quality Objectives

6.1 Decision Quality Objectives (DQOs)

The primary data quality objective is to identify drainages with the potential to impact human health through monitoring outfalls and stream locations to identify fecal pollution "hotspots" – locations where the results of three water samples exceeds the FC threshold of 500 colonies per 100 milliliters or the EC threshold of 320 EC per 100 milliliters (HCRPIC Guidance Document). Water quality results will be used to prioritize and direct efforts and to report water quality changes and improvements over the duration of the project.

6.2 Measurement Quality Objectives

Measurement quality objectives (MQO's) are dependent upon the parameter to be analyzed. Table 5, 6, 8 and 11 below show the MQO's for Fecal Coliform and E. coli monitoring. Laboratories for this project will follow the quality control guidelines set forth by the EPA under the Total Coliform Rule, as well as those listed specifically in Standard Methods for the Examination of Water and Wastewater 20th Edition.

The accredited laboratory will perform the following measures to ensure accurate results:

- Sterility controls are run on each batch of freshly-made media, buffer solution (new batch), and vessels.
- Preventive maintenance of equipment is performed.
- In the event of equipment failure/malfunction, no data will be reported and the chain of custody will be marked as "invalid test due to equipment failure." The incident will be discussed with the Project Manager and corrective action(s) will be taken.
- Laboratory and Project Manager will rely on analysis of field duplicates for an assessment of overall variability in sample results.

6.2.1 Targets for Precision, Bias, and Sensitivity

Table 5: Measurement Quality Objectives

Parameter	Field Blanks	Field Duplicates	Lab Medium Sterility	Negative Control	Positive Control	Lab Duplicates
Fecal coliform	1 per event	10% of samples	Tracked by lot	Daily	Daily	5%
E. coli	1 per event	10% of samples	Tracked by lot	Daily	Daily	5%
Nitrate+nitrite nitrogen	1 per event	10% of samples	NA	NA	NA	5%
Ammonia nitrogen	1 per event	10% of samples	NA	NA	NA	5%
Ortho-phosphorus	1 per event	10% of samples	NA	NA	NA	5%

Table 6: Measurement Methods

Analyte	Sample Matrix	Expected Range of Results	Reporting Limit	Sample Preparation Method	Analytical Method
Fecal coliform	Freshwater	10 - 2000 cfu/ 100 ml	10 - >2000 cfu/ 100 ml	1:10 dilution	Standard Method (SM) 9222-D membrane filtration
E. coli	Freshwater	1 - 2419.6 MPN/100 ml	1 – 2419.6	None	SM 9223, Colilert
Nitrate+nitrite nitrogen	Freshwater	0.01 – 2.0 mg/L	0.01 mg/L	None	SM 4500NO_3 (2000)
Ammonia nitrogen	Freshwater	0.02 - 0.40 mg/L	0.02 mg/L	None	SM 4500-NH_3G
Ortho-phosphorus	Freshwater	0.01 – 1.5 mg/L	0.01 mg/L	Filter	SM 4500-P-E, Manual Ascorbic Acid Reduction Method

6.2.1.1 Precision

Precision is a measure of the variability in the results of replicate measurements due to random error. Duplicate samples will be analyzed and the results applied as discussed below.

If duplicates are within 20% relative percent difference (RPD), they are acceptable. For duplicate RPD values that are greater than 20%, all data that exceed 20% RPD will be assessed to determine whether the following apply:

- RPD results may be misleading at low concentrations within five times the detection limit. If this is the case, the data will be accepted.

- Results with RPDs of greater than 35% for water samples will be considered for rejection.

6.2.1.2 Bias

Bias is the difference between the population mean and the true value. Bias within the project will be reduced to the extent practicable by the following:

- Strict adherence to the sampling procedures of the project work plan and protocols.
- Complete data collection and organization.
- Regular maintenance of field equipment.
- Periodic reviews and evaluations of field sampling procedures.
- Analyzing data in an appropriate manner based upon essential considerations, such as temporal variations.
- Accredited lab adhering to specific general policy on microbiological sample receipt, holding, preparation and analysis a specified in their sampling procedure, specifically, rejection criteria.

6.2.1.3 Sensitivity

Sensitivity is the measure of the capability of a test method to detect a substance. Sensitivity is assured primarily through the selection of appropriate analytical methods, equipment, and instrumentation, and is expressed in terms of method detection limits (MDL) and reporting limits (RL). The required reporting limit for E. coli is 1 MPN/100 ml.

6.2.2 Targets for Comparability, Representativeness, and Completeness

6.2.2.1 Comparability

Comparability is a measure of the confidence with which one data set can be compared to another. This is a qualitative assessment and is addressed primarily in sampling design through use of comparable sampling procedures or, for monitoring programs, through accurate resampling of stations over time. In the laboratory, comparability is assured through the use of comparable analytical procedures and ensuring that project staff are trained in the proper application procedures.

6.2.2.2 Representativeness

Representativeness is the degree to which data accurately and precisely represents a characteristic population. This is a qualitative assessment and is addressed primarily in the sample design, through the selection of sampling sites, and procedures that reflect the project goals and environment being sampled. It is ensured in the laboratory through proper handling of samples and analysis within specific holding times.

6.2.2.3 Completeness

Completeness is the amount of data collected as compared to the amount needed to ensure that the uncertainty or error is within acceptable limits. The goal for data completeness is 100% but 90% completeness will be acceptable.

7.0 Sampling Process Design (Experimental Design)

The study design is based on the HCRPIC Work Plan, Monitoring Plan, and Guidance Document (Appendix A, B and C). This project will utilize FC or EC sampling to find sources of fecal pollution within targeted shellfish growing areas. Sources will be confirmed through the dye test process per Guidance Document protocol. Non-participating properties will be evaluated by investigating water quality across the parcel or enforcement, when necessary.

The pilot nutrient studies are based on BACI studies conducted by Kitsap Health and Mason Health between 2004 and 2008 (Kitsap Health, December 31, 2008; Mason Health, December 2008).

7.1 Study Design

The basis for the sampling process for this project is the PIC shoreline survey and property investigation and inspection method. The detailed procedures describing this process are in the Conducting Shoreline Surveys and Property Inspections sections of the HCRPIC Guidance Document (Appendix C).

A shoreline survey is the inventory and bacterial assessment of all flowing discharges to the shoreline during low tide - in order to sample fresh water drainages to the shoreline. During the shoreline survey, water samples are collected from all flowing discharge points. Staff will walk along the shoreline, paying close attention to any conveyance that could be transporting water to the beach (i.e. pipes, washouts, bulkhead drains, stormwater outfalls, yard drains, drainage ditches, seeps and sheet flow. 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.

Composite samples are collected occasionally in areas where multiple small discharges obviously emanate from only one potential parcel or source. Because this technique can mask shoreline hotspots in situations when one polluted discharge is mixed with clean discharges, it is only utilized when absolutely necessary to achieve a specific goal in consultation with the jurisdiction and the guidance group.

Fecal pollution hotspots are confirmed and polluted drainages are investigated through water sampling and property inspections.

7.1.1 Field measurements

Field measurements will be conducted pursuant to the Shoreline Survey section of the Hood Canal Regional Pollution Identification and Correction Guidance Document (Appendix C). Staff will record station name, location, and 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. GPS Map datum is WGS 84 and coordinate format utilized is: hddd.ddddd°.

FC and EC samples will be analyzed at the jurisdiction's contract laboratory, accredited by the Department of Ecology. Weather and tidal information are collected through the use of published information and access to Internet sites. If necessary, targeted parameters that cannot be analyzed by the contract laboratory are sent to other Department of Ecology accredited laboratories.

Salinity measurements are measured in the field using a refractometer (0-19% salinity). Salinity values are used to distinguish between marine and freshwater which have different FC standards. Salinity values may also help determine the source of the flow (recharge from the beach vs. groundwater from an adjacent property). Refractometer calibration is checked using DI water at the beginning of each sampling event.

7.1.2 Sampling location and frequency

Kitsap County will conduct 10.5 miles of shoreline in Hood Canal 4 and 5 in 2015 and 14.5 miles of shoreline in Hood Canal 2 in 2016 under separate National Estuary Program grant funding, matched by Clean Water Kitsap, pursuant to the approved National Estuary Program grant Quality Assurance Project Plan.

Under the HCRPIC implementation grant, Jefferson and Mason Health have committed to identify, confirm, investigate, and correct sources in 40 shoreline hotspots and conduct 125 parcel surveys in identified priority drainages or WSDOH areas of concern. Shoreline sampling will be conducted in prioritized areas of Jefferson and Mason County growing areas.

The following maps were developed in partnership with WSDOH, based on prior hotspots, water quality concerns, and shellfish resources. Figures 7-9 show Jefferson County priority areas and Figure 10-11 shows Mason County priority areas. The dots show WSDOH sample stations.

Figure 7: Jefferson County Priority Shoreline Areas (north to south: Dosewallips/Brinnon, Pleasant Harbor, Duckabush)

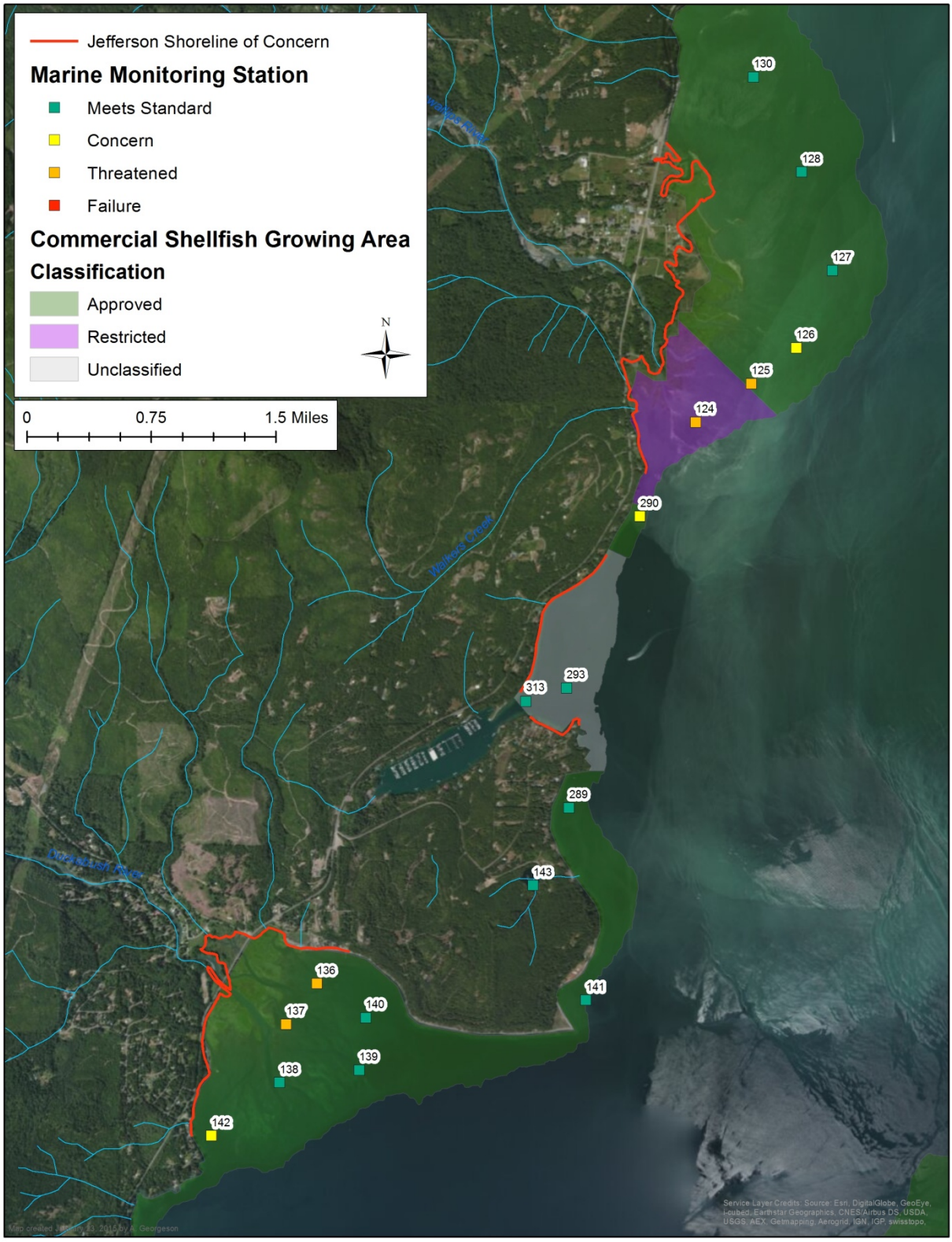


Figure 8: Chimacum Creek Tidelands & Irondale Beach Park

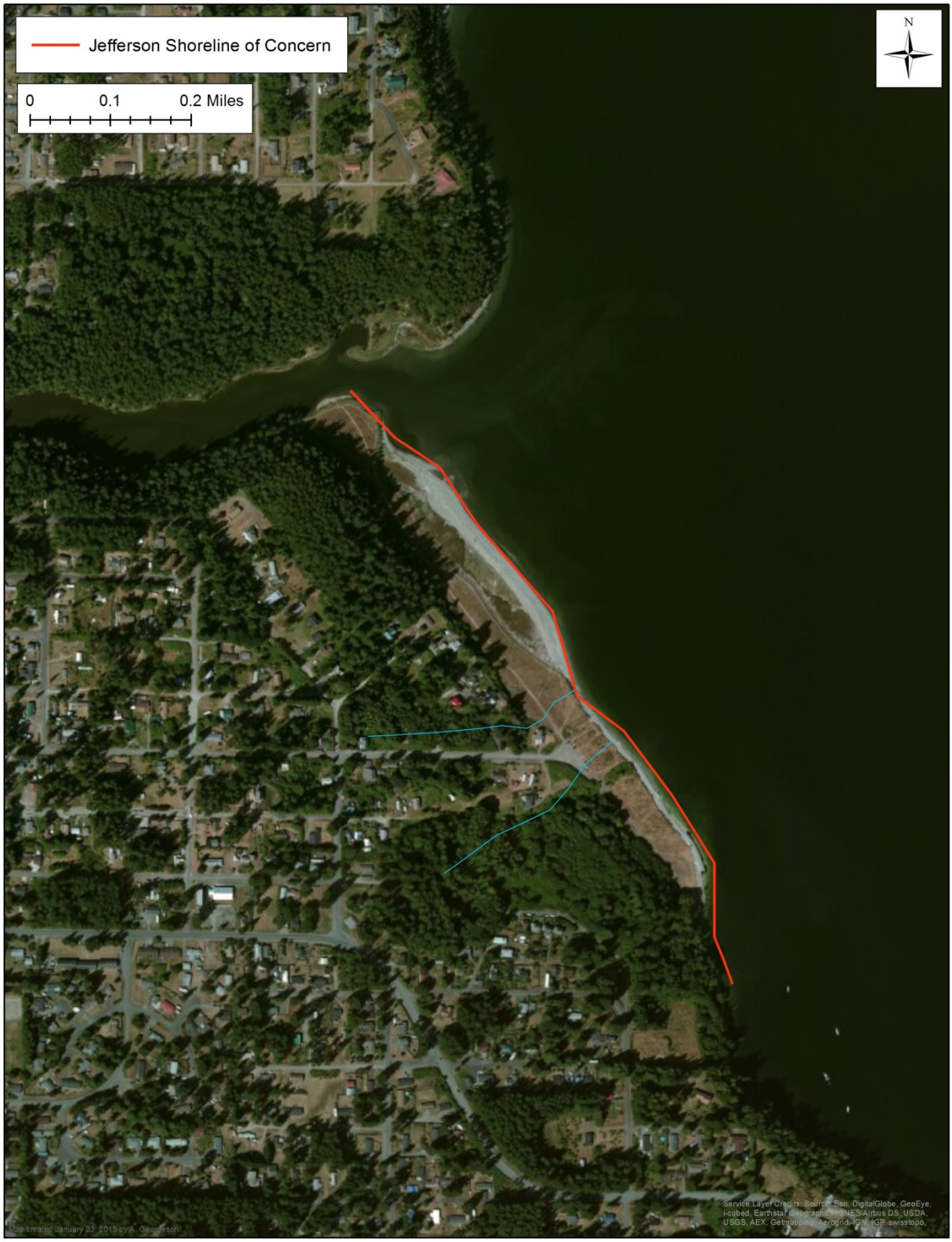


Figure 9: Paradise Bay

Figure 10: Mason County Priority Shorelines

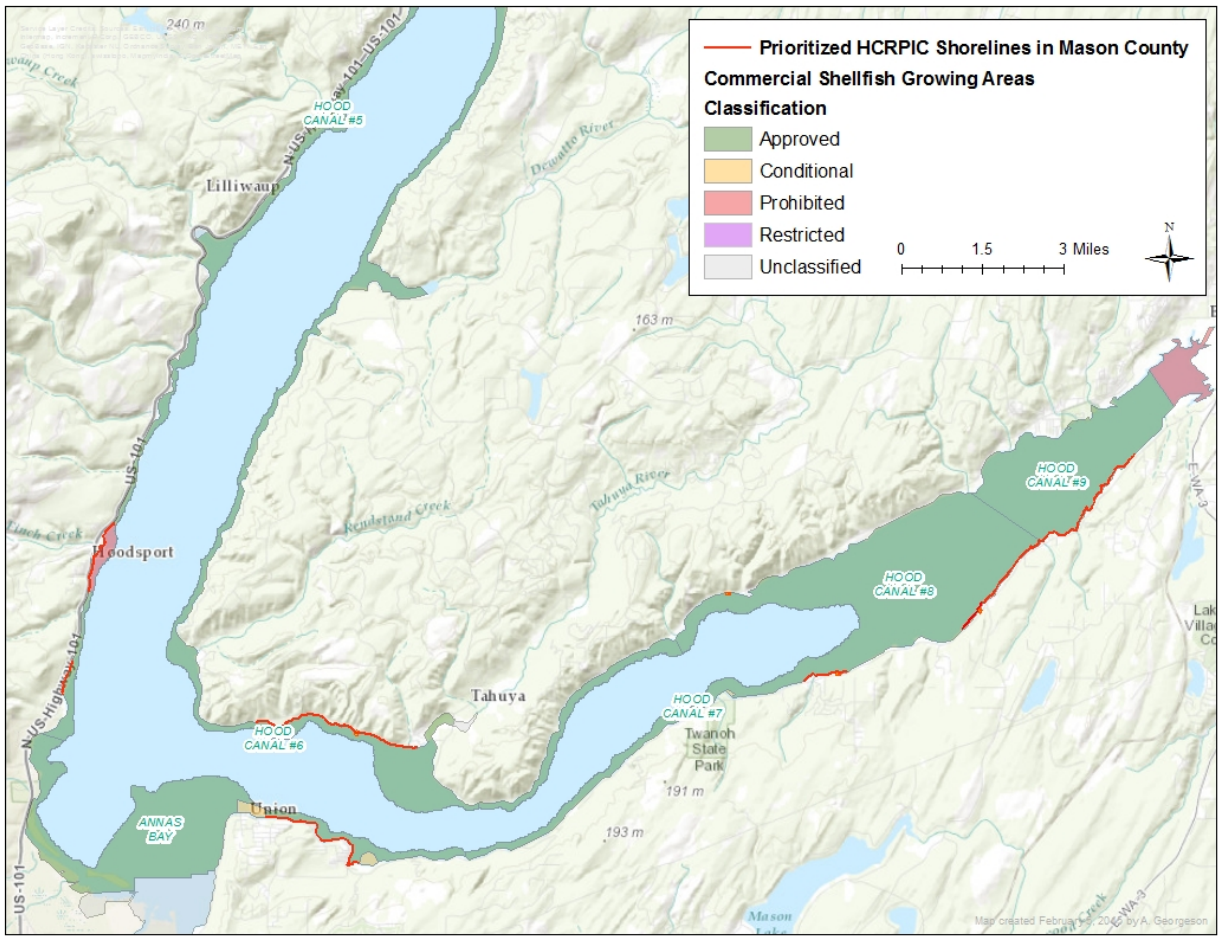
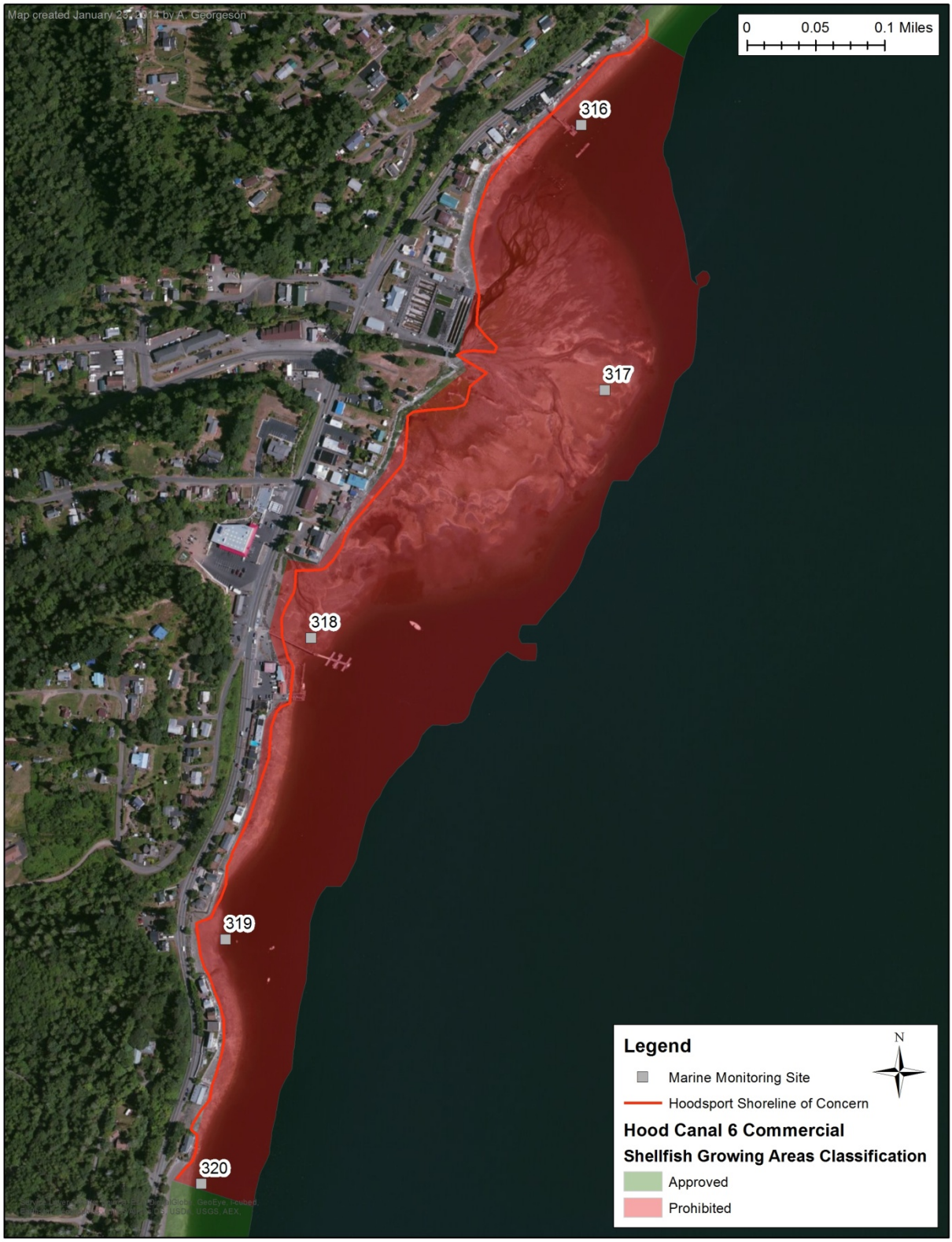


Figure 11: Hood Canal 6 - Hoodsport



Approximately 8 shoreline growing area miles were prioritized for shoreline survey in each county. Table 7 shows a list of the priority shoreline areas listed in priority order.

Table 7: Hood Canal Action Area Priority Shoreline Areas*

County	Growing Area	General Area	Location	Shoreline	WSDOH
				Miles	**Priority**
Jefferson	Hood Canal 3	Dosewallips/ Brinnon	State Park, Brinnon, south of estuary	3.0	1
Jefferson	Hood Canal 3	Duckabush	estuary shoreline	2.0	2
Jefferson	Hood Canal 3	Pleasant Harbor	shoreline outside of Pleasant Harbor	1.0	3
Jefferson	Port Townsend 2	Chimacum Creek Tidelands & Irondale Beach Park	Irondale	1.5	4
Jefferson	Hood Canal 1	Paradise Bay - north of Hood Head		1.0	5
			TOTAL MILES	8.5	
Mason	Hood Canal 6	West Shore	Hoodsport	1.0	1
Mason	Hood Canal 6	South Shore	Big Bend/Union	1.8	2
Mason	Hood Canal 6	North Shore	HC 6 – Summertide Resort	0.1	3
Mason	Hood Canal 8	South Shore	Forest Beach	0.5	4
Mason	Hood Canal 8	South Shore	15851 SR 106	0.4	5
Mason	Hood Canal 9	North Shore	HC 9 - west of 265	0.1	6
Mason	Hood Canal 8/9	South Shore	HC 8/9	1.5	7
Mason	Hood Canal 6	West Shore	HC 6 - Potlatch	0.5	8
Mason	Hood Canal 6	North Shore - Memorial Day to Labor Day	west of Tahuya	2.3	9
			TOTAL MILES	8.2	

*Priority areas may be added or amended based on recommendation from WSDOH or the pilot guidance group.

Shoreline survey work for this project will be conducted pursuant to the Conducting Shoreline Surveys section of the Hood Canal Regional PIC Guidance Document (HCCC, March 10, 2014). Each shoreline segment will be walked in its entirety by jurisdiction inspectors and all flowing

discharges to the shoreline will be inventoried and sampled for FC or EC bacteria. One sampling event will take place in wet weather (October through April) and one during dry weather (May through September).Confirmation samples will be collected during the same season that the elevated shoreline sample was collected.

Hood Canal regional partners will avoid conducting shoreline sampling when rainfall during the prior 24 hours has exceeded .5 inches to reduce the risk of sampling during abnormal conditions and biasing results. Each jurisdiction will select a representative rainfall station for use during this project. Rainfall data will be reviewed as part of the data management procedures in section 11.

7.1.3 Parameters to be determined

FC or EC bacteria will be the parameter used for shoreline assessment and hotspot confirmation and investigation for this project. Nitrate+nitrite nitrogen, ammonia nitrogen, and ortho-phosphorous will be utilized to assess drainages with seepage pits and to conduct before and after fecal source correction studies.

7.2 Maps or diagram

See Figure 1 for the overall project area and Figures 7-11 for prioritized growing areas and segments.

7.3 Assumptions underlying design

Monitoring is conducted during both dry season and wet season shoreline survey events. 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.

7.4 Relation to objectives and site characteristics

This study includes the following objectives:

- Assess fecal pollution in all flowing discharges to priority shoreline segments during wet and dry weather seasons
- Confirm and investigate hotspot drainages
- Identify and correct failing onsite sewage systems
- Proactively prevent pollution sources through effective education

Previous PIC project have demonstrated that thorough sampling, combined with door-to-door inspections, and observation by experienced staff are successful approaches to finding anthropogenic sources of fecal pollution.

7.5 Characteristics of existing data

No existing data will be used for this project. Areas of concern may be selected based on existing report recommendations or other regional data that is acceptable to the guidance group. All flowing discharges to the shoreline segment will be sampled.

8.0 Sampling Procedures

8.1 Field measurement and field sampling SOPs

The sampling methods for this project include the shoreline survey and the property inspection process. The procedures to be followed for conducting shoreline surveys and parcel inspections, and analyzing samples are described in the HCRPIC Guidance Document (Appendix C), the HCRPIC Monitoring Plan (Appendix B), 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).
- Use salinity refractometer to measure salinity of the drainage and record in field notebook.
- Water samples are collected in sterile, 125-milliliter bottles. Once at the station location, clearly label sample containers with the sample name or identification number.
- 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.
- Composite screening samples are collected if there are multiple small discharges that appear to emanate from one parcel, or source, or are close together. Collect the composite sample in a manner that best represents the drainage.
- The sample will then be sealed, placed in a cooler and held at 4 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.
- File field notes with water sample results and submit to HCCC for documentation.

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.

Water samples are collected in sterile 125-milliliter bottles. Each bottle will be clearly labeled with the sample name or identification number, collection time, and date. Site information is recorded in water-resistant field books and includes: drainage name, location, outfall description

(e.g. pipe, material, size, and distinguishing site features), inspector name, and weather conditions. Notes will be made to record any unusual odors, warm temperature, matting, unusual vegetative growth, laundry lint, food waste, or other characteristics that can indicate an intermittent sewage or laundry source. Animal waste or tracks near the sample point, unusual color, or any other information that could be relevant will be recorded. FC and EC sample analysis will begin no later than 24 hours from collection.

When initial bacteria sample results meet or exceed the threshold of 200 FC colonies or 100 EC colonies per 100 milliliters, two additional confirmation samples are collected within 30 days (or as soon as possible during the same weather season). When the geometric mean of these samples meets or exceeds 500 FC colonies or 320 EC colonies per 100 milliliters, an investigation is conducted to identify fecal pollution sources and implement corrective actions.

Jefferson and Mason County Public Health will each confirm and investigate 20 shoreline "hotspots" in 2015 and 20 in 2016. They will each conduct 65 related parcel inspections in 2015 and 60 in 2016. They will correct all fecal pollution sources found during the course of the project. Under separate NEP funding, Kitsap County will conduct shoreline surveys in Hood Canal 4 and Hood Canal 5 in 2015. Kitsap County recently completed a shoreline survey in the county portion of Port Gamble Bay and are working in partnership with the Port Gamble S'Klallam Tribe to conduct a shoreline survey in the tribal portion of Port Gamble Bay under separate NEP funding.

The exact number of samples is not known at this time, however based on previous shoreline survey work performed by the PIC program, it is estimated that there may be as many as 1,800 samples collected over the course of the project.

8.2 Containers, preservation methods, holding times

Table 8: Containers, Preservation Methods, and Holding Times

Parameter	Matrix	Minimum Quantity Required	Container	Preservative	Holding Time
Fecal coliform Bacteria	Freshwater	100 ml	125 ml sterile plastic bottle	4°C	24 hours
E. Coli Bacteria	Freshwater	100 ml	125 ml sterile plastic bottle	4°C	24 hours
Nitrate+nitrite nitrogen	Freshwater	100 ml	*	If >24 hrs + H_2SO_4 pH <2 (In the lab) and +4°C	48 hours
Ammonia nitrogen	Freshwater	500 ml	*	4° C *OR* -20° C or 4° C + H_2SO_4 pH <2 (In the lab)	24 hours
Ortho-phosphorous	Freshwater	100 ml	*	filter upon receipt at lab	24 hours

* Three subsamples will be collected from a 500 ml, pre-cleaned plastic bottle and delivered to the lab within 24 hours of collection. The lab will remove the ammonia nitrogen aliquot from the 500 ml bottle first and analyze it immediately or preserved as indicated above. The 100 ml nitrate+nitrite subsamples will be acidified to pH 2 in the lab and refrigerated if held more than 24 hours. Ortho-phosphorous subsamples will be filtered immediately following receipt at the lab and analyzed within 24 hours.

8.3 Invasive species evaluation

Invasive species in Jefferson, Kitsap, and Mason Counties are typically noxious weeds. All noxious weed sightings will be reported to the Jefferson, Kitsap, or Mason County Noxious Weed Program for investigation.

8.4 Equipment decontamination

Water sample bottles are sterile per laboratory quality assurance program. Refer to HCRPIC guidance for dye test cross-contamination avoidance.

8.5 Sample ID

Sample identification on specific properties will be labeled by address and sample locations (i.e. 123 Main Street by mailbox). Shoreline sampling stations will be identified using standard nomenclature in the HCRPIC Guidance Document (Appendix C). Sampling will occur in an orderly and easy to understand manner, i.e. #BT1, #BT2, #BT3…

8.6 Chain-of-custody, if required

Staff will deliver all samples to the jurisdiction's accredited contract laboratory. A laboratory services/chain-of-custody form is completed by project field staff. The information on the chain-of-custody form includes project area name, staff name and contact information, billing information, sample identification, time collected, method of analysis and any comments pertinent to the sample. The form is signed and dated by the project field staff, and also by lab staff who verify receipt of the samples and log temperature blank information. An example form is found in Appendix D.

8.7 Field log requirements

- Clearly record the sample name, collection time, location, drainage size, pipe diameter, and pipe material (if applicable) in the field notebook.
- Record detailed parcel-oriented sample descriptions in the field notebook so that outfalls can be resampled by different staff, if necessary.
- Note any characteristics that will help distinguish the property when accessed from upland so that the outfall can be easily found for resampling and the associated property address can be identified, if necessary.
- Record latitude and longitude of the discharge with a GPS unit and take digital photographs. Photographs are helpful for locating sampling stations during subsequent surveys.
- Enter the sample information in the field notebook.
- Print the project name at the top of the page, the start/end location, include the date, staff initials and the weather and tide conditions. See Table 8 below.

Table 9: Field Log Example

Miller Bay Shoreline Survey Staff Initials DATE Weather conditions, e.g. Rain, Temp 50F, wind S at 10 mph Start: Address and/or landmark and approximate distance					
Sample ID	**Time**	**Latitude**	**Longitude**	**Description**	**Comments**
#MI1	10:15	xx.xxxxx	xxx.xxxxx	6 in black flex in bulkhead	Matting at base of bulkhead
#MI2	10:25	xx.xxxxx	xxx.xxxxx	Beach seep	Raccoon tracks
#MI3	10:43	xx.xxxxx	xxx.xxxxx	4 in PVC pipe under dock	
#MI4	11:02	xx.xxxxx	xxx.xxxxx	Stormwater diffuser on hillside	

8.8 Other activities

There will be no special training or certification required for project personnel above and beyond what is required by the jurisdiction's job classifications. Project staff are trained to demonstrate competency in water quality monitoring and PIC tasks (Appendix B and C).

9.0 Measurement Methods

9.1 Field procedures table/field analysis table

Table 10: Field Procedures and Analysis

Parameter	Method	Range	Measurement Increment	Units
Salinity	Refractometer	0 - 100	1	ppt

9.2 Lab procedures table.

9.2.1 Analyte

Laboratory samples will be analyzed for FC or EC bacteria. Nitrate+nitrite nitrogen, ammonia nitrogen, and ortho-phosphorous will be added for BACI study locations.

Table 11: Laboratory Procedures and Measurement Methods

Analyte	Sample Matrix	Expected Range of Results	Reporting Limit	Sample Prep Method	Analytical (Instrumental) Method
Fecal coliform Bacteria (FC)	Freshwater	10 - 2000 cfu/100 ml	10 - 2000 cfu/100 ml	1:10 dilution	APHA Procedure 9222-D, G1cl, Fecal Coliform Membrane Filter
E. Coli Bacteria (EC)	Freshwater	1 - 2419.6 MPN/100 ml	1 - 2419.6	None	APHA Procedure 9223, Colilert
Nitrate+nitrite nitrogen	Freshwater	0.01-2.0 mg/L	0.01	None	SM 4500NO_3(2000)
Ammonia nitrogen	Freshwater	0.02-2.0 mg/L	0.02	None	SM 4500NH_3G
Ortho-phosphorus	Freshwater	0.01-1.5 mg/L	0.01 Mg/L	Filter	SM 4500-P-E

9.2.2 Matrix

The project matrix will be freshwater sources, including streams, creeks, stormwater outfalls, and any other freshwater flows from upland to shorelines in the Hood Canal Action Area.

9.2.3 Number of samples

Table 12: Number of Samples Expected

Plan Component	Matrix	# Stations expected	# Events*	Total # of Samples*
Dosewallips	Freshwater	150	2	300
Duckabush	Freshwater	100	2	200
Pleasant Harbor	Freshwater	50	2	100
Chimacum Creek tidelands & Irondale Beach Park	Freshwater	75	2	150
Paradise Bay	Freshwater	50	2	100
Hood Canal 6 – Hoodsport	Freshwater	40	2	80
Hood Canal 6 – Big Bend/Union	Freshwater	81	2	162
Hood Canal 8 - Summertide	Freshwater	2	2	4
Hood Canal 8 – Forest Beach	Freshwater	58	2	116
Hood Canal 8 – 15851 SR 106	Freshwater	47	2	94
Hood Canal 8 – 8420 North shore	Freshwater	2	2	4
Hood Canal 8/9 – South shore	Freshwater	160	2	320
Hood Canal 6 – Potlatch	Freshwater	86	2	172
Hood Canal 6 – North shore	Freshwater	26	1	26

*Not including confirmation samples

9.2.4 Expected range of results

See Table 11 above.

9.2.5 Analytical method

FC and EC samples will be analyzed at the jurisdiction's Ecology-accredited contract laboratory. The samples will be transported by project staff. The laboratories will use the membrane filtration method for FC analysis of freshwater samples, following Method 9222-D, as described in Standard Methods for the Examination of Water and Wastewater (APHA, 2005). Fresh water EC samples will be processed by the MPN option of Method 9223B, colilert 18 or 24 quanti-tray (APHA, 1998). This method of EC analysis uses commercially available, Colilert-18 hour or Colilert-24 hour media available from IDEXX Laboratories.

9.2.6 Sensitivity/Method Detection Limit (MDL)

Typically the MDL for a 100 milliliter sample submission would be <1. However, the MDL does not pertain to this analysis since it is dependent on the prepared volume which can vary from sample to sample. When a 1:10 dilution is used, the MDL becomes 10.

9.3 Sample preparation method(s)

9.3.1 Fecal coliform

- Confirm the water jacketed incubator or water bath temperature of 44.5°C (+/- 0.2°C).
- All equipment should be sterilized. This can be either from the manufacturer, or sterilized in an autoclave or hot air oven.

- Open media ampule and pour into a sterile petri dish. For most samples, mFC medium can be used without the 1% Rosolic Acid addition, provided there is no interference with background growth.
    - An mFC type media should be used for the identification of fecal coliforms from wastewater.
- Determine the volume to filter by consulting the lab microbiologist or following what is in accordance with the information in Table 9222:III of the Standard Method book. An ideal sample volume will yield 20 to 80 coliform colonies. Prepare appropriate dilutions and blanks using sterile dilution/rinse water. Prepare appropriate position and/or negative controls.

9.3.2 E. coli

- Clean and disinfect lab bench.
- Set-up Quanti-Tray sealer for use and turn on power.
- If not sampled directly into an appropriate vessel (non-compliance samples only), shake and aseptically add 100 milliliters of the parent sample to an appropriately labeled IDEXX 125 milliliter vessel followed by the appropriate Colilert media.
- Shake bottle vigorously 25 times prior to inoculation to assure adequate sample mixing. After inoculation, shake bottle until media is dissolved. Vortexing the bottle can help to minimize foaming.
- Use one hand to hold a Quanti-Tray upright with the well side facing the palm.
- Squeeze the upper part of the tray so that the tray bends toward the palm.
- Open the tray by pulling the foil tab away from the well slide.
- Avoid touching the inside of the foil or tray.
- Pour the reagent/sample mixture directly into the Quanti-Tray, avoiding contact with the foil tab. Allow foam to settle.
- Place the sample-filled Quanti-Tray onto the proper rubber tray carrier/insert with the well side of the Quanti-Tray facing down to fit into the carrier.
- Seal the tray according to sealer instructions.
- Label back (paper) side of tray along the edge with sample information.
- Place the tray in the incubator at 35°C +/- 0.5°C for 24 hours for Colilert-24 and 18 hours for Colilert-18. Record sample/preparation information on the Quanti-Tray sample bench sheet.

9.4 Special method requirements

There are no special method requirements associated with this project.

9.5 Lab(s) accredited for method(s)

The Hood Canal Coordinating Council will ensure that only labs accredited by Washington State Department of Ecology will be used to conduct the HCRPIC program, currently and in the future.

10.0 Quality Control (QC) Procedures

10.1 Table of field and lab QC required

Please refer to Tables 5, 6, and 11 for the MQO's.

Laboratory quality control samples will include laboratory duplicates, positive controls, negative controls, and medium sterility checks. The following laboratory quality control procedures apply to the entire data set for a given parameter measured during a specific laboratory "batch" or uninterrupted series of analyses and are summarized as follows:

- The quality control objective for the laboratory blank is to achieve a concentration less than the analyte detection limit. If the blank is greater than the field sample concentration, the results will be rejected or reanalysis will be requested, unless the field samples are below the non-detectable limit. The laboratory will review laboratory procedures and decide if samples should be re-analyzed if blank contamination is noted.
- A laboratory duplicate is one sample that has been split and analyzed twice. If both results are below laboratory reporting limits, no evaluation of duplicates is required. If duplicates are within 20% relative percent difference (RPD), they are acceptable. For duplicate RPD values that are greater than 20%, all data that exceed 20% RPD will be assessed to determine whether the following apply:
    - RPD results may be misleading at low concentrations within five times the detection limit. If this is the case, the data will be accepted.
    - RPD values that do not meet the above criteria but are less than 35% RPD for water samples and 50% for sediment samples will be considered for inclusion as an estimated value if all other lab QA for that parameter is acceptable.
    - Results with RPDs of greater than 35% for water samples and greater than 50% for sediment samples will be considered for rejection.

10.2 Corrective action processes

Control cultures are to be performed with each new media/medium lot. Known positive and negative cultures are used against new lot media/medium for the organism under test.

- Sterility and positive/negative controls are to be performed on all prepared media.
- If the media fails the sterility or growth control, the product is to be pulled from use and replaced (or held until the source of the problem is identified).

Dye tests must be conducted pursuant to Chapter 2 of the PIC Manual of Protocol (Appendix A-1) in order to be enforceable.

11.0 Data Management Procedures

11.1 Data recording/reporting requirements

Proper data management is essential for the successful completion of this project and for all water quality assessment and PIC activities. General data management procedures are described in the HCRPIC guidance (Appendix C). Kitsap Health has developed and tested a water quality monitoring database and reporting system that streamlines the process of hotspot confirmation

and investigation. They are in the process of expanding it for remote access by project partners. Data entry procedures will be available in early 2015. A data management flow chart is located in Figure 5 above.

This project will include the collection of data and/or information according to the following tasks:

Table 13: Data Collection Methods

Task	Type of Data or Information	Method of Data Collection/Storage
Shoreline sampling	Water sampling FC or EC bacteria results	Chain-of-custody Lab analytical results Water Quality Database
Stream segment (segmentation) sampling Parcel-specific sampling	Water sampling FC or EC bacteria results	Chain-of-custody Lab analytical results Water Quality Database
Parcel inspections	HCRPIC survey form	Project files, GIS map overlay

Data is reviewed prior to entry to ensure that all required data sets have been included, parameters monitored are characteristic of expected results, and laboratory analytical results are characteristic of expected results. When project staff determine the dataset is either incomplete or includes uncharacteristic results, the guidance group will be consulted for a decision regarding the validity of the data. Data may only be excluded with the approval of the guidance group. Once it is determined that the data is acceptable, staff export data and/or perform data entry. All data input to the database will have a 100% review after input is complete to ensure 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.

11.2 Laboratory data package requirements

The contract laboratory will review data and provide a completed chain-of-custody enumerating the FC or EC results and dates and times samples are received. It includes a review box for date and initials. QA records are retained for 10 years.

11.3 Electronic transfer requirements

Electronic transfer of data is not typically required for shoreline and property-specific sample results.

11.4 Acceptance criteria for existing data

No existing data will be used for this project.

11.5 EIM/STORET data upload procedures

Instructions for submitting data to EPA via STORET have been compiled by Kitsap Health staff. The following is a step by step procedure for submitting data using STORET:

1. Go to www.epa/gov/storet/wqx/wqxweb_downloads.html and DOWNLOAD a NEW TEMPLATE with each submittal. The templates are regularly updated by EPA, therefore to ensure use of the most current version this step will be followed.
2. Add current data to the new template. Be sure to save it as a Microsoft Excel file that will ENABLE MACROS. In Excel 2007 version, this is an .xlsm file, but check the template to be sure and match whatever file it is. It is probably an .xlsm, but check to be sure.
3. SAVE this to your HARD DRIVEe.
4. Double-check all your columns to make sure the format is correct, and make sure all the monitoring locations match the results.
5. Create a separate file (template) for EACH set of results (e.g. wet weather results, dry weather results, etc.). Do not combine all results into one spreadsheet with individual tabs.
6. When all data has been added you are ready to export.
7. Go to Export Tab and export the monitoring locations, then the results.
8. AFTER EXPORTING go to website for CDX. From www.google.com, type in CDX and this will take you to website.
9. Log In: User name: Your Name Password: Your password
10. See attached pages for web page screens and select each: WQX: WQX web.
11. Continue with an existing dataset.
12. Add new dataset.
13. Import file of monitoring locations
    - Import configuration: select KPHD_Monitoring locations.
    - Select ORG ID (KitsapCHD_WQX).
    - Import file by going to Browse and select the file you want.
14. If you get error messages during the import process, click on the log and you'll see what they are. If they can't be fixed, call the help desk. Help Desk contacts: Paul Andrews (andrewsp@rti.org) & Jimmy Bisese (jbisese@rti.org) Tel: 1 800-424-9067
15. After the Import, then you'll need to EXPORT the file and you're done.

Data will also be uploaded to Ecology's EIM (http://www.ecy.wa.gov/eim/index.htm) database.

12.0 Audits and Reports

12.1 Number, frequency, type, and schedule of audits

Laboratory quality control data will be reviewed monthly by the analysts and annually during the internal audit process. The internal audit evaluations will either be performed by the laboratory director or quality assurance officer. Verification of the quality control data will show count agreement within 10% by verified and duplicate analyses. Quality control samples that are out of acceptable limits will be addressed according to the lab's corrective action procedures.

12.2 Responsible personnel

Laboratory audits will be conducted monthly by the laboratory microbiology lead and annually by the laboratory director or quality assurance officer.

12.3 Frequency and distribution of report

Semi-annual FEATS reports will be submitted on October 23, 2014, April 15, 2015, October 15, 2015, April 15, 2016, and October 15, 2016. A final report will be submitted April 15, 2017.

12.4 Responsibility for reports

Project co-leads, Haley Harguth and Leslie Banigan, will prepare semi-annual and final reports, circulate them for review, and deliver them to the grant managers.

13.0 Data Verification

13.1 Field data verification, requirements, and responsibilities

Field staff calibrate field equipment and review field data during collection to ensure that all required data has been collected and that parameters monitored are characteristic of expected results.

Information collected during PIC property surveys are recorded on the PIC survey form. This information is reviewed for accuracy and completeness by project staff and is maintained electronically by transferring it to the PIC database. The hard copy of the property survey form is filed with the PIC project files. The front page of the form is scanned and can be made available electronically upon request. Component sketches, based on homeowner recollection, will be drawn on the back side of the property survey form and scanned into the OSS records for properties with "unknown" septic systems.

13.2 Lab data verification

- FC and EC bacteria data will be verified by the laboratory prior to submitting a completed chain-of-custody.

- Project staff will review the data and determine that whether the dataset is complete and whether the data meets the requirements of this QAPP.
- If results are not characteristic or are not complete, the jurisdiction lead will review all QC sample results and determine the validity of the data. Data may only be excluded with the approval of the guidance group.
- Once it is determined that the data is acceptable, staff export data and/or perform data entry. 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 and servers for spreadsheet files are automatically backed-up on a daily basis to minimize the loss of data caused by electrical or computer malfunctions.

- Charcoal pack duplicates from non-visual dye tests are sent to Ozark Underground Laboratory for spectrofluorophotometer analysis.

13.3 Validation requirements, if necessary

Data validation conducted external to the jurisdictions will not be conducted as part of this project.

14.0 Data Quality (Usability) Assessment

14.1 Process for determining whether project objectives have been met

The project lead will review the Statements of Work and FEATS tasks and deliverables and compare project progress to the due dates. Quarterly performance reports will include a comparison of actual accomplishments to the outputs/outcomes established in the assistance agreement work plan for the period. If established outputs/outcomes were not met, the report will include an explanation and a corrective action plan. The report will also include comments if additional tasks were accomplished during the reporting period.

14.2 Data analysis and presentation methods

Data generated for this project will be utilized exclusively for identifying fecal pollution hotspots and assessing OSS function.

14.3 Treatment of non-detects

The low end of the expected range of results for the FC APHA Procedure 9222-D, fecal coliform membrane filter with a 1:10 dilution is <10 FC/100ml. These will be treated as 4 for data entry purposes.

The low end of the expected range of results for the EC APHA Procedure 9223, Colilert, E. coli is <1 EC/100 milliliters. These will be treated as 0.5 for data entry purposes.

Charcoal packs from dye tests will be sent to Ozark Underground Lab for analysis of non-visual dye concentrations. OSS with non-visual positive dye tests but 10 times the background are rated as suspect and require a follow-up dye test.

14.4 Sampling design evaluation

Sampling design will be evaluated in conjunction with lab data verification. The results will be reported in semi-annual and final reports.

14.5 Documentation of assessment

Project assessments will be documented in the final report.

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16.0 Appendices (available separately)

Appendix A. HCRPIC Work Plan

Appendix B. HCRPIC Monitoring Plan

Appendix C. HCRPIC Guidance Document

Appendix D. Example Laboratory Chain of Custody

Appendix E. Glossaries, Acronyms, and Abbreviations

Glossary of General Terms

Clean Water Act: A federal act passed in 1972 that contains provisions to restore and maintain the quality of the nation's waters. Section 303(d) of the Clean Water Act establishes the TMDL

Effluent: An outflowing of water from a natural body of water or from a man-made structure. For example, the treated outflow from a wastewater treatment plant.

Fecal coliform (FC): That portion of the coliform group of bacteria which is present in intestinal tracts and feces of warm-blooded animals as detected by the product of acid or gas from lactose in a suitable culture medium within 24 hours at 44.5 plus or minus 0.2 degrees Celsius. Fecal coliform bacteria are "indicator" organisms that suggest the possible presence of disease-causing organisms. Concentrations are measured in colony forming units per 100 milliliters of water (cfu/100 mL).

Geometric mean: A mathematical expression of the central tendency (an average) of multiple sample values. A geometric mean, unlike an arithmetic mean, tends to dampen the effect of very high or low values, which might bias the mean if a straight average (arithmetic mean) were calculated. This is helpful when analyzing bacteria concentrations, because levels may vary anywhere from 10 to 10,000 fold over a given period. The calculation is performed by either: (1) taking the nth root of a product of n factors, or (2) taking the antilogarithm of the arithmetic mean of the logarithms of the individual values.

National Pollutant Discharge Elimination System (NPDES): National program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements under the Clean Water Act. The NPDES program regulates discharges from wastewater treatment plants, large factories, and other facilities that use, process, and discharge water back into lakes, streams, rivers, bays, and oceans.

Nonpoint source: Pollution that enters any waters of the state from any dispersed land-based or water-based activities, including but not limited to atmospheric deposition, surface-water runoff from agricultural lands, urban areas, or forest lands, subsurface or underground sources, or discharges from boats or marine vessels not otherwise regulated under the NPDES program. Generally, any unconfined and diffuse source of contamination. Legally, any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act.

Pathogen: Disease-causing microorganisms such as bacteria, protozoa, viruses.

Point source: Source of pollution that discharges at a specific location from pipes, outfalls, and conveyance channels to a surface water. Examples of point source discharges include municipal wastewater treatment plants, municipal stormwater systems, industrial waste treatment facilities, and construction sites that clear more than 5 acres of land.

Pollution: Contamination or other alteration of the physical, chemical, or biological properties of any waters of the state. This includes change in temperature, taste, color, turbidity, or odor of

the waters. It also includes discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state. This definition assumes that these changes will, or are likely to, create a nuisance or render such waters harmful, detrimental, or injurious to (1) public health, safety, or welfare, or (2) domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or (3) livestock, wild animals, birds, fish, or other aquatic life.

Stormwater: The portion of precipitation that does not naturally percolate into the ground or evaporate but instead runs off roads, pavement, and roofs during rainfall or snow melt. Stormwater can also come from hard or saturated grass surfaces such as lawns, pastures, playfields, and from gravel roads and parking lots.

Surface waters of the state: Lakes, rivers, ponds, streams, inland waters, salt waters, wetlands and all other surface waters and water courses within the jurisdiction of Washington State.

Total Maximum Daily Load (TMDL): A distribution of a substance in a water body designed to protect it from not meeting (exceeding) water quality standards. A TMDL is equal to the sum of all of the following: (1) individual wasteload allocations for point sources, (2) the load allocations for nonpoint sources, (3) the contribution of natural sources, and (4) a margin of safety to allow for uncertainty in the wasteload determination. A reserve for future growth is also generally provided.

Watershed: A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

303(d) list: Section 303(d) of the federal Clean Water Act, requiring Washington State to periodically prepare a list of all surface waters in the state for which beneficial uses of the water – such as for drinking, recreation, aquatic habitat, and industrial use – are impaired by pollutants. These are water quality-limited estuaries, lakes, and streams that fall short of state surface water quality standards and are not expected to improve within the next two years.

Acronyms and Abbreviations

Following are acronyms and abbreviations used frequently in this report.

BMP	Best management practice
Cfu	colony forming units
EC or E.coli	*Escherichia coli* bacteria
Ecology	Washington State Department of Ecology
e.g.	For example
EIM	Environmental Information Management database
EPA	U.S. Environmental Protection Agency
et al.	And others
FC	fecal coliform bacteria
FEATS	Financial and Ecosystem Accounting Tracking System
GIS	Geographic Information System software
GPS	Global Positioning System
HCCC	Hood Canal Coordinating Council

HCRPIC	Hood Canal Regional Pollution Identification and Correction Program
i.e.	In other words
LIO	Local Integrating Organization
Mpn	most probably number
MQO	Measurement quality objective
NEP	National Estuary Program
NPDES	(See Glossary above)
OSS	Onsite sewage system
PIC	Pollution Identification and Correction
QA	Quality assurance
QC	Quality control
RPD	Relative percent difference
RSD	Relative standard deviation
SOP	Standard operating procedures
TAC	Technical Advisory Committee
TMDL	(See Glossary above)
WAC	Washington Administrative Code
WQA	Water Quality Assessment
WSDOH	Washington State Department of Health
WRIA	Water Resource Inventory Area

Units of Measurement

°C	degrees centigrade
mg/L	milligrams per liter (parts per million)
mL	milliliter

Quality Assurance Glossary

Accreditation: A certification process for laboratories, designed to evaluate and document a lab's ability to perform analytical methods and produce acceptable data. For Ecology, it is "Formal recognition by (Ecology)…that an environmental laboratory is capable of producing accurate analytical data." [WAC 173-50-040] (Kammin, 2010)

Accuracy: The degree to which a measured value agrees with the true value of the measured property. USEPA recommends that this term not be used, and that the terms precision and bias be used to convey the information associated with the term accuracy. (USGS, 1998)

Analyte: An element, ion, compound, or chemical moiety (pH, alkalinity) which is to be determined. The definition can be expanded to include organisms, e.g., fecal coliform, Klebsiella. (Kammin, 2010)

Bias: The difference between the population mean and the true value. Bias usually describes a systematic difference reproducible over time, and is characteristic of both the measurement system, and the analyte(s) being measured. Bias is a commonly used data quality indicator (DQI). (Kammin, 2010; Ecology, 2004)

Blank: A synthetic sample, free of the analyte(s) of interest. For example, in water analysis, pure water is used for the blank. In chemical analysis, a blank is used to estimate the analytical response to all factors other than the analyte in the sample. In general, blanks are used to assess possible contamination or inadvertent introduction of analyte during various stages of the sampling and analytical process. (USGS, 1998)

Calibration: The process of establishing the relationship between the response of a measurement system and the concentration of the parameter being measured. (Ecology, 2004)

Check standard: A substance or reference material obtained from a source independent from the source of the calibration standard; used to assess bias for an analytical method. This is an obsolete term, and its use is highly discouraged. See Calibration Verification Standards, Lab Control Samples (LCS), Certified Reference Materials (CRM), and/or spiked blanks. These are all check standards, but should be referred to by their actual designator, e.g., CRM, LCS. (Kammin, 2010; Ecology, 2004)

Comparability: The degree to which different methods, data sets and/or decisions agree or can be represented as similar; a data quality indicator. (USEPA, 1997)

Completeness: The amount of valid data obtained from a project compared to the planned amount. Usually expressed as a percentage. A data quality indicator. (USEPA, 1997)

Continuing Calibration Verification Standard (CCV): A QC sample analyzed with samples to check for acceptable bias in the measurement system. The CCV is usually a midpoint calibration standard that is re-run at an established frequency during the course of an analytical run. (Kammin, 2010)

Control chart: A graphical representation of quality control results demonstrating the performance of an aspect of a measurement system. (Kammin, 2010; Ecology 2004)

Control limits: Statistical warning and action limits calculated based on control charts. Warning limits are generally set at +/- 2 standard deviations from the mean, action limits at +/- 3 standard deviations from the mean. (Kammin, 2010)

Data Integrity: A qualitative DQI that evaluates the extent to which a data set contains data that is misrepresented, falsified, or deliberately misleading. (Kammin, 2010)

Data Quality Indicators (DQI): Data Quality Indicators (DQIs) are commonly used measures of acceptability for environmental data. The principal DQIs are precision, bias, representativeness, comparability, completeness, sensitivity, and integrity. (USEPA, 2006)

Data Quality Objectives (DQO): Data Quality Objectives are qualitative and quantitative statements derived from systematic planning processes that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.
(USEPA, 2006)

Data set: A grouping of samples organized by date, time, analyte, etc. (Kammin, 2010)

Data validation: An analyte-specific and sample-specific process that extends the evaluation of data beyond data verification to determine the usability of a specific data set. It involves a detailed examination of the data package, using both professional judgment, and objective criteria, to determine whether the MQOs for precision, bias, and sensitivity have been met. It may also include an assessment of completeness, representativeness, comparability and integrity, as these criteria relate to the usability of the data set. Ecology considers four key criteria to determine if data validation has actually occurred. These are:

- Use of raw or instrument data for evaluation.
- Use of third-party assessors.
- Data set is complex.
- Use of EPA Functional Guidelines or equivalent for review.

Examples of data types commonly validated would be:

- Gas Chromatography (GC).
- Gas Chromatography-Mass Spectrometry (GC-MS).
- Inductively Coupled Plasma (ICP).

The end result of a formal validation process is a determination of usability that assigns qualifiers to indicate usability status for every measurement result. These qualifiers include:

- No qualifier, data is usable for intended purposes.
- J (or a J variant), data is estimated, may be usable, may be biased high or low.
- REJ, data is rejected, cannot be used for intended purposes (Kammin, 2010; Ecology, 2004).

Data verification: Examination of a data set for errors or omissions, and assessment of the Data Quality Indicators related to that data set for compliance with acceptance criteria (MQOs). Verification is a detailed quality review of a data set. (Ecology, 2004)

Detection limit (limit of detection)**:** The concentration or amount of an analyte which can be determined to a specified level of certainty to be greater than zero. (Ecology, 2004)

Duplicate samples: Two samples taken from and representative of the same population, and carried through and steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variability of all method activities including sampling and analysis. (USEPA, 1997)

Field blank: A blank used to obtain information on contamination introduced during sample collection, storage, and transport. (Ecology, 2004)

Initial Calibration Verification Standard (ICV): A QC sample prepared independently of calibration standards and analyzed along with the samples to check for acceptable bias in the measurement system. The ICV is analyzed prior to the analysis of any samples. (Kammin, 2010)

Laboratory Control Sample (LCS): A sample of known composition prepared using contaminant-free water or an inert solid that is spiked with analytes of interest at the midpoint of the calibration curve or at the level of concern. It is prepared and analyzed in the same batch of regular samples using the same sample preparation method, reagents, and analytical methods employed for regular samples. (USEPA, 1997)

Matrix spike: A QC sample prepared by adding a known amount of the target analyte(s) to an aliquot of a sample to check for bias due to interference or matrix effects. (Ecology, 2004)

Measurement Quality Objectives (MQOs)**:** Performance or acceptance criteria for individual data quality indicators, usually including precision, bias, sensitivity, completeness, comparability, and representativeness. (USEPA, 2006)

Measurement result: A value obtained by performing the procedure described in a method. (Ecology, 2004)

Method: A formalized group of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, data analysis), systematically presented in the order in which they are to be executed. (EPA, 1997)

Method blank: A blank prepared to represent the sample matrix, prepared and analyzed with a batch of samples. A method blank will contain all reagents used in the preparation of a sample, and the same preparation process is used for the method blank and samples. (Ecology, 2004; Kammin, 2010)

Method Detection Limit (MDL): This definition for detection was first formally advanced in 40CFR 136, October 26, 1984 edition. MDL is defined there as the minimum concentration of

an analyte that, in a given matrix and with a specific method, has a 99% probability of being identified, and reported to be greater than zero. (Federal Register, October 26, 1984)

Percent Relative Standard Deviation (%RSD): A statistic used to evaluate precision in environmental analysis. It is determined in the following manner:

$$\%RSD = (100 * s)/x$$

where s is the sample standard deviation and x is the mean of results from more than two replicate samples (Kammin, 2010)

Parameter: A specified characteristic of a population or sample. Also, an analyte or grouping of analytes. Benzene and nitrate + nitrite are all "parameters." (Kammin, 2010; Ecology, 2004)

Population: The hypothetical set of all possible observations of the type being investigated. (Ecology, 2004)

Precision: The extent of random variability among replicate measurements of the same property; a data quality indicator. (USGS, 1998)

Quality Assurance (QA): A set of activities designed to establish and document the reliability and usability of measurement data. (Kammin, 2010)

Quality Assurance Project Plan (QAPP): A document that describes the objectives of a project, and the processes and activities necessary to develop data that will support those objectives. (Kammin, 2010; Ecology, 2004)

Quality Control (QC): The routine application of measurement and statistical procedures to assess the accuracy of measurement data. (Ecology, 2004)

Relative Percent Difference (RPD): RPD is commonly used to evaluate precision. The following formula is used:

$$[Abs(a-b)/((a + b)/2)] * 100$$

where "Abs()" is absolute value and a and b are results for the two replicate samples. RPD can be used only with 2 values. Percent Relative Standard Deviation is (%RSD) is used if there are results for more than 2 replicate samples (Ecology, 2004).

Replicate samples: Two or more samples taken from the environment at the same time and place, using the same protocols. Replicates are used to estimate the random variability of the material sampled. (USGS, 1998)

Representativeness: The degree to which a sample reflects the population from which it is taken; a data quality indicator. (USGS, 1998)

Sample (field): A portion of a population (environmental entity) that is measured and assumed to represent the entire population. (USGS, 1998)

Sample (statistical): A finite part or subset of a statistical population. (USEPA, 1997)

Sensitivity: In general, denotes the rate at which the analytical response (e.g., absorbance, volume, meter reading) varies with the concentration of the parameter being determined. In a specialized sense, it has the same meaning as the detection limit. (Ecology, 2004)

Spiked blank: A specified amount of reagent blank fortified with a known mass of the target analyte(s); usually used to assess the recovery efficiency of the method. (USEPA, 1997)

Spiked sample: A sample prepared by adding a known mass of target analyte(s) to a specified amount of matrix sample for which an independent estimate of target analyte(s) concentration is available. Spiked samples can be used to determine the effect of the matrix on a method's recovery efficiency. (USEPA, 1997)

Split Sample: The term split sample denotes when a discrete sample is further subdivided into portions, usually duplicates. (Kammin, 2010)

Standard Operating Procedure (SOP): A document which describes in detail a reproducible and repeatable organized activity. (Kammin, 2010)

Surrogate: For environmental chemistry, a surrogate is a substance with properties similar to those of the target analyte(s). Surrogates are unlikely to be native to environmental samples. They are added to environmental samples for quality control purposes, to track extraction efficiency and/or measure analyte recovery. Deuterated organic compounds are examples of surrogates commonly used in organic compound analysis. (Kammin, 2010)

Systematic planning: A step-wise process which develops a clear description of the goals and objectives of a project, and produces decisions on the type, quantity, and quality of data that will be needed to meet those goals and objectives. The DQO process is a specialized type of systematic planning. (USEPA, 2006)

References for QA Glossary

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