Quality Assurance Project Plan Addendum

Hood Canal Regional PIC Nutrient Study

Hood Canal Regional
Pollution Identification and Correction
Phase 2 – Implementation

Grant Number PC-00J326-01

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Hood Canal Coordinating Council and
Washington State Department of Health

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This addendum, the original approved QAPP (Hood Canal Coordinating Council, 2015), monitoring results, and the final project report will be available on the Hood Canal Coordinating Council's website at: http://hccc.wa.gov/content/pollution-identification-correction
or can be requested from the author at 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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2.0 Abstract

This is an addendum to the approved Quality Assurance Project Plan (QAPP) for the Hood Canal regional Pollution Identification and Correction Program (HCRPIC) (Banigan, February 2015). It provides specifics for Task 5: Pilot Nutrient Study.

The Hood Canal regional guidance group worked with Andy James of University of Washington, Tacoma to develop a pilot nutrient study for Mason County and one for Jefferson County to further knowledge and understanding about bacterial and nutrient sources to Hood Canal.

Jefferson Health and Jefferson Conservation District hosted Andy and the project coordinators for a tour of the Chimacum watershed on January 5, 2015. A nutrient sub-group was formed at the June 11, 2015 guidance meeting and the group met on July 20, 2015.

The Mason County nutrient study, Evaluation of Nutrient Loading from Seepage Pits, will utilize focused field sampling and water quality analysis to evaluate whether seepage pits located on near-shore parcels are a significant source of nitrogen or bacteria loading to Hood Canal.

The Jefferson County nutrient study, Evaluation of nutrient loading from three watersheds, will characterize the short and long-term in-stream nitrogen concentrations at three streams (Irondale Creek, Little Goose Creek, and Chimacum Creek.). These streams discharge into the Chimacum Creek Tidelands, closed to shellfish harvest due to elevated fecal coliform concentrations in Irondale Creek.

3.0 Background

3.1 Study area and surroundings

Jefferson County:

The Chimacum Creek watershed is located in the northeastern corner of the Olympic Peninsula in eastern Jefferson County. It comprises 37 square miles.

HCRPIC prioritized Chimacum Creek and the Irondale area for PIC work due to elevated bacteria levels. Jefferson County has conducted extensive monthly sampling in Chimacum Creek. Irondale Creek and Little Goose Creek are two nearby watersheds that are not well characterized in terms of nutrient concentrations or loading.

Mason County

A number of OSS were historically constructed without a drainfield, where the septic tank effluent was plumbed into a single pit. The soil treatment area was limited, often resulting in poor contaminant removal. These systems are known as seepage pits, seepage pits are no longer allowed in new construction or repairs. Mason County has identified approximately 30 parcels that are within 100 feet of the Hood Canal shoreline

and are served by household seepage pit systems. Mason County will assess nutrient and bacteria concentrations down gradient of seepage pits to determine whether they are discharging pollution to Hood Canal.

3.1.1 Logistical problems

Jefferson Health and Mason Health may experience logistical problems including tidal access and private property access. These will be minimized through advanced planning and preparation, scheduling around tidal access, and utilizing experienced staff who are familiar with the region.

3.1.2 History of study area

Jefferson County

Most of the forested lowlands in the Chimacum watershed were cleared at the turn of the 20th century and converted to pasture. To facilitate farming, much of the watershed was channelized and tile drains were installed.

Numerous dairy farms were operated in the Chimacum watershed. Only one of the dairies remains active today but most of the original dairy farms are still active in some form of agriculture. The most common agricultural activities today are pasturing beef cattle, horses and sheep, and growing hay and vegetable crops.

Until the 1980's, livestock had access to much of Chimacum creek. Since the 1980's, many miles of fencing have been installed along the banks of Chimacum Creek and its tributaries. Fenced buffers have been created on most of Chimacum Creek's agricultural land. Many of these have been planted with a variety of coniferous and deciduous trees and shrubs. Through fencing and other best management practices, progress has been made in reducing fecal coliform levels in Chimacum Creek.

Mason County

The land along the Mason County Hood Canal shoreline has been largely developed over the last century with single family houses. Nearly all of these are served by onsite sewage systems (OSS).

3.1.3 Contaminants of concern

Fecal coliform and E. coli pollution is a threat to public health because it indicates the presence of human and/or animal waste that may also contain disease-causing organisms.

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. Due to the low dissolved oxygen problems in Hood Canal, limiting additional nutrient contributions from human sources has been identified as a priority. Nutrients are of concern in Hood Canal because it is susceptible to low dissolved oxygen events that can result in fish kills. Excess nutrients can result in algae blooms that use oxygen as they break down. The

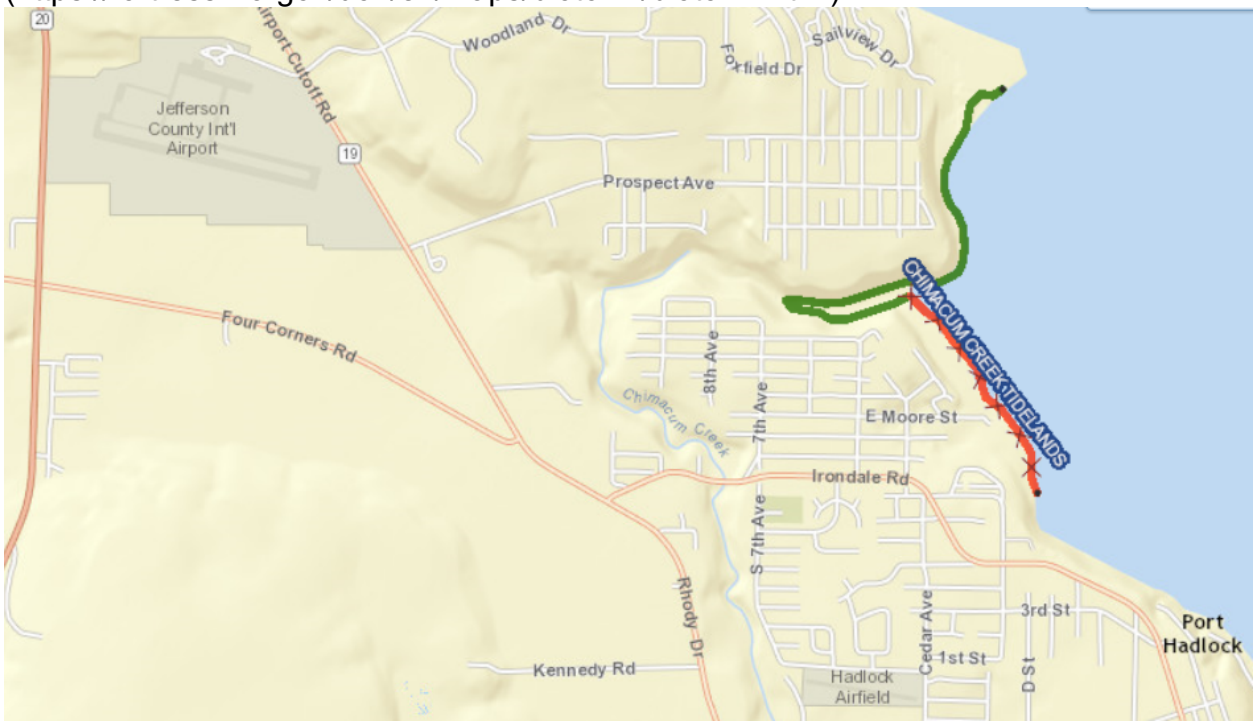
dissolved nutrients that will be analyzed for this pilot study are ammonia, nitrite and nitrate, and orthophosphate.

Jefferson County

Figure 1 from the Washington State Department of Health Shellfish Safety Information. The red area shows Chimacum Creek Tidelands south of Chimacum Creek, including Irondale Beach Park as *Closed* for recreational shellfish harvest due to elevated fecal coliform bacteria levels in Irondale Creek. The green area shows the *Open* beach north of Chimacum Creek.

Figure 1: Map showing Chimacum Creek Tidelands

Map produced by Washington State Department of Health (https://fortress.wa.gov/doh/eh/maps/biotoxin/biotoxin.html)

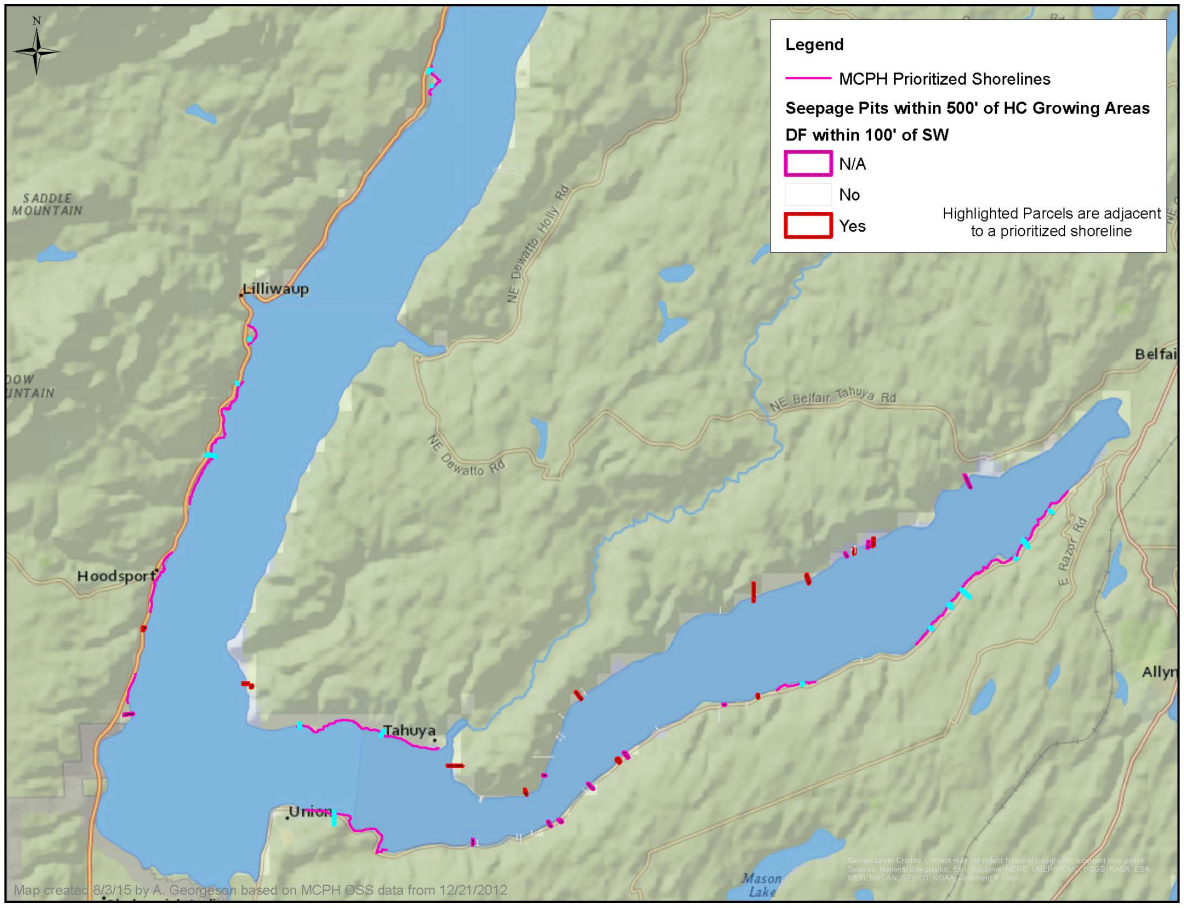


Mason County

Figure 2 shows Mason County seepage pits within 100 feet of Hood Canal. These will be the focus area of fecal coliform and nutrient sampling.

Figure 2: Approximate locations of Mason County seepage pits within 100 feet of the Hood Canal

Map produced by Washington State Department of Health



3.1.4 Results of previous studies

Jefferson County

Jefferson County Conservation District published the Chimacum Watershed Water Quality and Fishes, A Comprehensive Review report on May 1, 2015.

In 2007-2008 none of the twenty-eight monitoring stations on Chimacum Creek met Washington State's water quality standard for fecal coliform bacteria (FC standard) in fresh water. In 2009-2010, only two stations met the FC standard. In 2011-2012, only the three upstream control stations met the standard.

WDOH conducts monthly marine water monitoring in Port Townsend Bay at station 32, off the mouth of Chimacum Creek. Station 32 easily met the FC standard for marine

water, but had the next to highest geometric value of the 17 stations monitored in Port Townsend Bay and the highest 90th percentile. The report found a negative correlation between fecal coliform concentration and salinity because fecal coliform concentrations were higher when there was more fresh water in the sample. Samples collected on the outgoing tide had a higher average fecal coliform concentration than samples collected on the incoming tide.

Mason County

In 2007 & 2008, Mason County Public Health monitored 8.3 miles of Hood Canal Shoreline for ammonia, nitrite/nitrate, and orthophosphate. They collected over 580 shoreline samples from 514 individual monitoring locations. Washington State has not established a nutrient surface water standard. Mason Health established 90th percentiles based on all data collected for the project. Nutrient sites that exceeded the 90th percentile were designated above "level of concern". Mason Health identified 82 samples with at least one nutrient above the 90th percentile.

In 2011, Mason Health continued nutrient monitoring of shoreline discharges along the north shore of the Great Bend area, to determine whether anthropogenic sources were discharging excess nutrients to Hood Canal, and to determine if there is a connection between FC and nutrients. Some segments were monitored in both wet and dry seasons. Of the segments that were selected, two were selected for intensive nutrient analysis due to high development density. Data was utilized to establish a nutrient baseline.

MCPH collected 351 nutrient samples and found that 40 (12%) were associated with FC results greater than100 FC/100ml. Results from the North Shore project had lower overall nutrient levels than found in the Hood Canal PIC project. MCPH recommended further investigation of monitoring locations with nutrient results above the 90th percentile level of concern. Thirty of the 347 samples had at least one nutrient above the level of concern.

3.1.5 Regulatory criteria or standards

As discussed in the Hood Canal Regional PIC project approved QAPP, we will be using the HCRPIC Guidance Document that was developed during the planning phase. 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.

Currently, there are no regulatory criteria to which nutrient results can be compared.

4.0 Project Description

4.1 Project goals

The goal of the nutrient studies is to further knowledge about bacterial and nutrient pollution sources to the Hood Canal.

Jefferson County
Evaluate dissolved nutrient loading from three watersheds: Chimacum Creek, Irondale Creek, and Little Goose Creek.

Mason County
Evaluate bacteria and nutrient loading from seepage pits located within 100 feet of the Hood Canal shoreline. Confirm, investigate, identify, and correct fecal pollution sources.

4.2 Project objectives

Jefferson County
Characterize the concentrations of dissolved nutrients and fecal bacteria in three creeks, including two which have not yet been evaluated.

Compare and contrast bacterial and nutrient results in the three watersheds.

Compare and contrast nitrate and ammonium laboratory sample results with field readings from YSI ProDSS Nitrate and Ammonium probes that Jefferson Health will purchase with this grant for use with their existing YSI ProDSS Multiparameter Sampling Instrument.

Characterize accuracy and uncertainty utilizing existing testing regiment.

Characterize the short term temporal patterns.

Mason County
Utilize focused field sampling and water quality analysis to investigate potential impacts of nutrient and bacteria loading from seepage pits in Mason County.

4.3 Information needed and sources

This project will be conducted pursuant to the HCRPIC Guidance Document (https://hcccwagov.app.box.com/s/cdwwkhy84rqo0h3tfn2h).

Jefferson County
This project will generate new data through two sampling approaches to characterize baseline and short-term dissolved nutrient concentrations in Chimacum Creek, Irondale Creek, and Little Goose Creek. Monthly sampling will occur at one or two locations in each system. In addition, grab samples and real-time monitoring with a field probe and

data logger will be performed during 1-2 storm events at each locations to characterize the spatial and method variations

Mason County
This project will include analysis of nutrient data that Mason County collected and reported in the Hood Canal Pollution Identification and Correction Project (Georgeson, Mathews, Orth, & Hyatt, 2008) and the North Shore Hood Canal Pollution Identification and Correction Project (Georgeson, 2011).

4.4 Target population

Please refer to the approved HCRPIC QAPP for the target population. Target populations also include the nutrient parameters identified below and in Section 9.

4.5 Study boundaries

Please refer to the approved HCRPIC QAPP for the Study boundaries. Also see Figure 1 and Figure 2.

4.6 Tasks required

Jefferson County
Monthly sampling at one or two locations in Chimacum Creek, Irondale Creek, and Little Goose Creek watersheds. Samples will be sent to the University of Washington Analytical Service Center Laboratory and analyzed for orthophosphate (PO4), nitrate (NO3), nitrite (NO2, and ammonia (NH3).

Each sample station will be monitored, with a field probe and data logger during one or two storm events, to characterize temporal variation. Grab samples will be collected during each probe deployment to verify accuracy and precision of the field instrument.

Mason County
A University of Washington student will be well-trained to assist Mason Health staff with field sampling of selected shoreline locations associated with known seepage pits within 100 feet of the Mason County Hood Canal shoreline. An estimated six sampling events will be coordinated. Three sample sets will be collected from each location in March and April, and three sample sets between July and September to account for seasonal differences. Samples from one event will be analyzed for Total Nitrogen (TN).

Sample locations and collection dates will be selected based on full-time occupancy. Multiple sampling locations will be selected at each seepage pit site to increase probability of detecting a seepage pit signal

Mason staff will deliver bacteria samples to Thurston Water Lab and the UW student will deliver dissolved nutrient samples to UW Analytical Services Center Laboratory. The sample collected for analysis of TN will be delivered to the University of Washington Marine Chemistry Laboratory for analysis.

4.7 Practical constraints

Please refer to the approved HCRPIC QAPP for practical constraints.

4.8 Systematic planning process used

The nutrient studies were designed by the nutrient sub-group of the Hood Canal regional PIC guidance group in partnership with Andy James of University of Washington, Tacoma. This QAPP addendum is the final result of the process.

5.0 Organization and Schedule

5.1 Key individuals and their responsibilities (project team, decision-makers, stakeholders, lab, etc.)

This QAPP addendum covers nutrient samples, most of which will be analyzed by the University of Washington Analytical Service Center (http://www.sefs.washington.edu/research/analytical_lab/). A sample for TN analysis will be collected during one Mason County sample event and will be analyzed by the University of Washington Seattle Marine Chemistry Laboratory (http://www.ocean.washington.edu/story/Marine+Chemistry+Laboratory).

The UW Analytical Service Center is an independent chemical analysis center that performs sample analyses for research and education related to environment, forest, ecology and agriculture. The center is certified by the State of Washington, Department of Ecology and services customers on and off the UW campus. The University of Washington Marine Chemistry Laboratory at the School of Oceanography provides marine and freshwater analytical services to the University and oceanographic communities. They will analyze one TN sample for the Mason County study.

5.2 Organization chart

Please add the following laboratory contact to Table 2: Organization Chart in the approved HCRPIC QAPP.

Table 2 Addition: Organization of Project Staff and Responsibilities

Erik Iverson Thurston County Water Laboratory	Laboratory Manager	Manages analytical contract. Oversees QA/QC compliance. Oversees reporting.
Dongsen Xue University of Washington Analytical Service Center Laboratory	Laboratory Manager	Manages analytical contract. Oversees QA/QC compliance. Oversees reporting.
Katherine A. Krogslund University of Washington Seattle Marine Chemistry Laboratory	Laboratory Manager	Manages analytical contract. Oversees QA/QC compliance. Oversees reporting.

5.3 Project schedule

Table 3 Update: Proposed Nutrient Study Schedule and Timeline

Pilot Nutrient Study	Start date	End date	Objective	Deadline
Pilot guidance group and TAC make recommendations for pilot nutrient work in Jefferson County and in Mason County.	November 2014	February 2016	Develop nutrient studies to further knowledge about bacterial & nutrient sources to Hood Canal	February 28, 2015
Jefferson and Mason conduct nutrient study	April 2016	December 31, 2016	Fulfill EPA/contractual requirement	December 31, 2016
Submit draft Project Report to NEP Quality Coordinator	March 1, 2017	March 15, 2017	Review draft report to determine if QAPP work was accomplished.	March 15, 2017
Jefferson and Mason review Draft Project Report	March 15 2017	March 21 2017		March 21, 2017
Final Project Report	March 21, 2017	March 31, 2017	Fulfill EPA/contractual requirement	March 31, 2017

5.4 Limitations on schedule

Limitations on the schedule may include severe weather, tidal access, lab capacity, and property access. Field work will began as soon as this QAPP addendum is approved.

5.5 Budget and funding

This project is funded by a National Estuary Program grant through the United States Environmental Protection Agency and administered by Washington State Department of Health (State Health) and Washington State Department of Ecology.

Table 4 Update: Nutrient Study budget

Category	Task 5	TOTAL
Salaries		$0
Benefits		$0
Indirect costs		$0
Contracts (Hood Canal Coordinating Council)	$30,000	$30,000
Goods and Services		$0
Travel/training		$0
Equipment		$0
Supplies (Mason - print and mail)		$0
Other (HCCC phone)		$0
GRAND TOTAL	$30,000	$30,000

6.0 Quality Objectives

6.1 Decision Quality Objectives (DQOs)

The primary data quality objective is to conduct bacterial and nutrient monitoring of priority drainages in the Hood Canal action area. Those with fecal coliform pollution will be investigated and sources identified and corrected with PIC methods. Those with nutrient pollution will be investigated for potential nutrient sources.

6.2 Measurement Quality Objectives

Measurement quality objectives (MQO's) are dependent upon the parameter to be analyzed. Refer to the approved HCRPIC QAPP Tables 5, 6, 8 and 11 for 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. Field and lab duplicates have been waived for the single TN sample.

- 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 Update: Nutrient Measurement Quality Objectives

Parameter	Field Blanks	Field Duplicates	Lab Medium Sterility	Negative Control	Positive Control	Lab Duplicates
Ortho phosphate (PO4)	1 per event	10% of samples	NA	NA	NA	5%
Nitrate (NO3)	1 per event	10% of samples	NA	NA	NA	5%
Nitrite (NO2)	1 per event	10% of samples	NA	NA	NA	5%
Ammonia (NH3)	1 per event	10% of samples	NA	NA	NA	5%
Total Nitrogen (TN)	NA	NA	NA	NA	NA	NA

Table 6 Update: Nutrient Measurement Methods

Parameter	Sample Matrix	Expected Range of Results	Reporting Limit	Sample Preparation Method	Analytical Method
Ortho phosphate (PO4)	Fresh water	0.0009 - 1.5 mg P/L	0.0009 mg P/L	Filter in field with 0.45 um syringe filter	EPA 300.0
Nitrate (NO3)	Fresh water	0.0021 - ? mg N/L	0.0021 mg N/L	Filter in field with 0.45 um syringe filter	EPA 300.0
Nitrite (NO2)	Fresh water	0.0003 - ? mg N/L	0.0003 mg N/L	Filter in field with 0.45 um syringe filter	EPA 300.0
Ammonium (NH3)	Fresh water	0.0017 - 2.0 mg N/L	0.0017 mg N/L	Filter in field with 0.45 um syringe filter	EPA 350.1
Total Nitrogen (TN)	Fresh water	0.0062 – 0.42 mg N/L	0.0062 Mg N/L	NA	SM 4500-P J

6.2.1.1 Precision
Please refer to the approved HCRPIC QAPP.

6.2.1.2 Bias
Please refer to the approved HCRPIC QAPP.

6.2.1.3 Sensitivity
Please refer to the approved HCRPIC QAPP

6.2.2 Targets for Comparability, Representativeness, and Completeness:
Please refer to the approved HCRPIC QAPP

7.0 Sampling Process Design (Experimental Design)

7.1 Study Design
The NEP implementation grant is mostly pollution identification and correction field work with a small amount ($30,000) set aside for pilot nutrient studies. Ten thousand dollars was budgeted to design nutrient studies for Jefferson County and Mason County that further the Hood Canal Dissolved Oxygen Project nutrient studies, produce useful results, and to effectively use limited funding.

Ten thousand dollars was budgeted for Mason County to evaluate shoreline seepage pits to satisfy the Near Term Action established by their Local Implementing Organization. Ten thousand dollars was budgeted for Jefferson County.

HCRPIC contracted with Andy James of University of Washington Center for Urban Waters to design the nutrient studies. Jefferson Health and Jefferson Conservation District hosted Andy and the project coordinators for a tour of the Chimacum watershed on January 5, 2015. A nutrient sub-group was formed at the June 11, 2015 HCRPIC guidance group meeting to design pilot nutrient studies for Jefferson County and Mason County that will further the Hood. The group met on July 20, 2015.

The Jefferson County nutrient study, Evaluation of nutrient loading from three watersheds, will characterize the short and long-term in-stream dissolved nitrogen concentrations at three streams (Irondale Creek, Little Goose Creek, and Chimacum Creek.). These streams discharge into the Chimacum Creek Tidelands, closed to shellfish harvest due to elevated fecal coliform concentrations in Irondale Creek.

The Mason County nutrient study, Evaluation of Nutrient Loading from Seepage Pits, will utilize focused field sampling and water quality analysis to evaluate whether seepage pits located on near-shore parcels are a significant source of nitrogen or bacteria loading to Hood Canal.

7.1.1 Sampling location and frequency

Jefferson County

Nutrient samples will be delivered to the University of Washington Analytical Service Center Laboratory.

Monthly sampling will be conducted for phosphate (PO4), nitrate (NO3), nitrite (NO2), and ammonia (NH3) at one or two locations in each of the three priority watersheds: Chimacum Creek, Irondale Creek, and Little Goose Creek. Jefferson County Public Health (Jefferson Health) may also collect coordinated fecal coliform and/or E. coli samples under their PIC project task. These will be transported to and run by Spectra Laboratory per the approved HCRPIC QAPP.

Each location will be sampled during one or two storm events for phosphate, nitrate, nitrite, and ammonia to characterize variations. Jefferson Health may also collect coordinated fecal coliform and/or E. coli samples under their PIC project task. Grab samples will be collected and field probe and data logger will be deployed to verify accuracy and precision of the field instrument.

Mason County

See Figure 2 for approximately seepage pit locations.
Mason Health will conduct field work with a University of Washington student intern. The intern will transport the nutrient samples to the University of Washington Analytical Services Center Laboratory. A single sample will be collected during one sample event and delivered to University of Washington's Marine Chemistry Laboratory for analysis of

TN. Mason Health will transport the bacteria samples to Thurston Water Laboratory per the approved HCRPIC QAPP.

Locations will be prioritized based on the following 2016 shoreline area priority developed in partnership with State Health.

Table 7 Update: Hood Canal Action Area Mason County Priority Shoreline Areas

County	Growing Area	General Area	Location	Miles	Priority
Mason	Hood Canal 6	West Shore site 45	Hoodsport	1.0	1
Mason	Hood Canal 6	West Shore bulkhead drainages 33, 35 ,36, HS036 and HS039	HC 6 – Hoodsport		
Mason	Hood Canal 6	South Shore site 99	HC 6 – Union**	0.2	2
Mason	Hood Canal 6	South Shore site 106	HC 6 – Big Bend West		
Mason	Hood Canal 6	North Shore	HC 6 – Summertide	0.1	3
Mason	Hood Canal 8	South Shore	HC 8 – west of 254	0.5	4
Mason	Hood Canal 8	South Shore	HC 8 – east of 256	0.4	5
Mason	Hood Canal 9	North Shore	HC 9 – west of 265 (HC8?)	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	HC 6 – west of Tahuya	2.3	9
			TOTAL MILES	6.6	

Seepage pit screening will be coordinated for full-time occupancy.

Multiple sampling locations will be selected for each seepage pit to increase the probability of detection of seepage pit signal.

Dissolved phosphate, nitrate, nitrite, and ammonia samples will be collected during three sampling events per season (January – April, July – September).

7.1.2 Parameters to be determined

FC or EC bacteria will be the parameter used for shoreline assessment and hotspot confirmation and investigation for this project pursuant to the approved HCRPIC QAPP.

Orthophosphate (PO4), nitrate (NO3), nitrite (NO2), and ammonia (NH3N) will be utilized to characterize priority stream segments in Jefferson County and to assess drainages with seepage pits in Mason County.

7.1.3 Field measurements

Field measurements will be conducted in Jefferson County with an YSI ProDSS Multiparameter Sampling Instrument with nitrate and ammonia field probes and data logger per manufacturer calibration, maintenance, and operation instructions.

7.2 Maps or diagram

Please refer to Figure 1 and Figure 2 above.

7.3 Assumptions underlying design

Please refer to the approved HCRPIC QAPP.

7.4 Relation to objectives and site characteristics

Please refer to the approved HCRPIC QAPP.

7.5 Characteristics of existing data

This project will use existing data from Jefferson Health and Mason Health water quality grant projects with a QAPP approved by Washington State Department of Ecology Centennial Clean Water Fund (CCWF) program or the United State Environmental Protection Agency National Estuary Program.

Jefferson County

Jefferson County Conservation District recently completed their Chimacum Watershed Water Quality and Fishes, A Comprehensive Review for Washington State Conservation Commission (JCD, May 1, 2015)

Data from this project will be used to characterize:

- The nitrogen and flow relationship for Chimacum Creek
- Nitrogen loading to Hood Canal from Chimacum Creek and estimate loads for Irondale Creek and Little Goose Creek based on predicted flows.

Mason County

Mason Health conducted the Hood Canal Pollution Identification and Correction Project (Georgeson, 2008) between July 2005 and August 2008. They conducted the North Shore Hood Canal Pollution Identification and Correction Project between October 2009 and December 2011 (Georgeson, 2011)

Data from these projects will be used to:

- Evaluate existing data spatially to determine if there is existing data from locations near known seepage pits.
- Characterize the general condition of fresh water entering the Hood Canal by season.

- Evaluate the extent and strength of difference between data groups.

8.0 Sampling Procedures

8.1 Field measurement and field sampling SOPs

Please refer to the approved HCRPIC QAPP and to the YSI ProDSS Multiparameter Sampling Instrument specifications and User Manual.
https://www.ysi.com/File%20Library/Documents/Specification%20Sheets/YSI-ProDSS-W83-03-0715-Spec-Sheet.pdf
https://www.ysi.com/File%20Library/Documents/Manuals/YSI-ProDSS-110714-Rev-B-626973-User-Manual.pdf

8.2 Containers, preservation methods, holding times

Table 8: Nutrient Study Containers, Preservation Methods, and Holding Times

Parameter	Matrix	Minimum Quantity Required	Container	Preservative	Holding Time
Ortho phosphate (PO4)	Fresh water	50 ml	50 ml centrifuge tubes	Filter on site with 0.45 um syringe filter	48 hours
Nitrate (NO3)	Fresh water	50 ml	50 ml centrifuge tubes	Filter on site with 0.45 um syringe filter	48 hours
Nitrite (NO2)	Fresh water	50 ml	50 ml centrifuge tubes	Filter on site with 0.45 um syringe filter	48 hours
*Ammonia (NH3)	Fresh water	50 ml	50 ml centrifuge tubes	Filter on site with 0.45 um syringe filter	7-28 days
**Total Nitrogen (TN)	Fresh water	60 ml	60 ml PP bottle (HCL washed)	None	

*Ammonia samples will need to be acidified if not filtered
**The one sample will be run with at least a six point standard curve and check standards. The sample needs to be kept cold and in the dark.

All samples need to be held on ice.

8.3 Invasive species evaluation

Please refer to the approved HCRPIC QAPP.

8.4 Equipment decontamination

Please refer to the approved HCRPIC QAPP.

8.5 Sample ID
Please refer to the approved HCRPIC QAPP.

8.6 Chain-of-custody, if required
Please refer to the approved HCRPIC QAPP.

8.7 Field log requirements
Please refer to the approved HCRPIC QAPP.

8.8 Other sampling-related activities
Please refer to the approved HCRPIC QAPP.

9.0 Measurement Methods

9.1 Field procedures table/field analysis table
The YSI ProDSS Multiparameter Sampling Instrument nutrient probe and data logger will be calibrated, maintained, and operated pursuant to the manufacturer's recommendations.

9.2 Lab Procedures Table

9.2.1 Analyte
Laboratory samples will be analyzed for nutrients including: phosphate, nitrate, nitrite, and ammonia.

Table 11 Update: Nutrient Study Laboratory Procedures and Measurement Methods

Parameter	Sample Matrix	Expected Range of Results	Reporting Limit	Sample Prep Method	Analytical (Instrumental) Method
Orthophosphate	Fresh water	0.0009 -1.5 mg P/L	0.0009 mg P/L	None	EPA 300.0
Nitrate	Fresh water	0.0021 - 2.0 mg N/L	0.0021 mg N/L	None	EPA 300.0
Nitrite	Fresh water	0.0003 - ? mg N/L	0.0003 mg N/L	None	EPA 300.0
Ammonia	Fresh water	0.0017 - 2.0 mg N/L	0.0017 mg N/L	None	EPA 350.1
Total Nitrogen (TN)	Fresh water	0.0062 – 0.42 Mg N/L	0.0062 mg N/L	None	SM 4500-P J

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

9.2.3 Number of samples

Table 12: Number of Nutrient Samples Expected

Plan Component	Matrix	# Stations expected	# Events*	Total # of Samples*
Jefferson monthly	Fresh water	6	10	60
Jefferson storm event	Fresh water	6	2	12
Mason seepage pits March - April	Fresh water	30 sites x 4 samples	3	360
Mason seepage pits July - September	Fresh water	30 sites x 4 samples	3	360

9.2.4 Expected range of results
Please see Table 11 above.

9.2.5 Analytical method
The University of Washington Analytical Services Center Laboratory is accredited by the State of Washington. The lab is an independent chemical analysis center performing sample analyses for research and education related to environment, forest, ecology and agriculture. Samples will be run for dissolved nutrients (orthophosphate, nitrate, nitrite, and ammonia) following the protocols of the WOCE Hydrographic Program using a Technicon AAII system. Please refer to Table 11 above for methods.

9.2.6 Sensitivity/Method Detection Limit (MDL)
Please refer to the Reporting Limit section of Table 11 above.

9.3 Sample preparation method(s)
Samples collected for the analysis of dissolved nutrients will be filtered through a syringe-mounted 0.45 micron filter while still in the field.

9.4 Special method requirements
There are no special method requirements associated with this project.

9.5 Lab(s) accredited for method(s)
The University of Washington Marine Chemistry Laboratory is accredited by Washington State for the nutrient analyses proposed.

10.0 Quality Control (QC) Procedures

10.1 Table of lab and field QC required

Please refer to Tables 5, 6, and 11 for the MQOs.

10.2 Corrective action processes

Please refer to the approved HCRPIC QAPP.

11.0 Data Management Procedures

Please refer to the approved HCRPIC QAPP.

12.0 Audits and Reports

Please refer to the approved HCRPIC QAPP.

13.0 Data Verification

Please refer to the approved HCRPIC QAPP.

14.0 Data Quality (Usability) Assessment

Please refer to the approved HCRPIC QAPP.

15.0 References

Georgeson, Mathews, Orth, Hyatt, 2008. Hood Canal Pollution Identification and Correction Project. https://www.co.mason.wa.us/forms/Env_Health/hcpic_final.pdf

Georgeson, 2011. North Shore Hood Canal Pollution Identification and Correction Project. http://www.co.mason.wa.us/health/environmental/water_quality/reports/northshore/2011_Final_G1000122_NSPIC.pdf

Hood Canal Coordinating Council, February 2015. Quality Assurance Project Plan, Hood Canal Regional Pollution Identification and Correction, Phase 2 – Implementation.

Jefferson Conservation District, May 1, 2015, Chimacum Watershed Water Quality and Fishes, A Comprehensive Review. http://www.jeffersoncd.org/wp-content/uploads/2015/05/Chimacum-Report-with-appendices_4-24-15.pdf

YSI, ProDSS User Manual, Document #626973-01REF https://www.ysi.com/File%20Library/Documents/Manuals/YSI-ProDSS-110714-Rev-B-626973-User-Manual.pdf