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TASK NO: 4.2 Water Quality Monitoring

(__) ANNUAL REPORT
(__) WORK PLAN
(__) PROGRESS REPORT No. 1 ☐ No. 2 ☐ No. 3
(__) FINAL PROGRESS REPORT
(__) PROJECT COMPLETION REPORT
(__) SUMMARY REPORT
(X) TECHNICAL REPORT
(__) PROTOCOL
(__) QUALITY ASSURANCE/QUALITY CONTROL

PERIOD COVERED: July 1, 2007 – June 30, 2008

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Water Quality Monitoring Project
Interim Report

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Whatcom County Public Works- Stormwater

June 16, 2008

for
Whatcom County Marine Resources Committee

This report was funded in part through a cooperative agreement with the National Oceanic and Atmospheric Administration.

Introduction

Shellfish - those both recreationally and commercially harvested - are a key marine resource for Whatcom County. Water quality degradation has been a concern for shellfish growing areas in Drayton Harbor, Birch Bay and Chuckanut Bay. Drayton Harbor has historically provided tribal and recreational shellfish harvesting opportunities, as well as commercial harvest. The current status for shellfish harvest is "Conditional" in portions of in Drayton Harbor and "Prohibited" in others. Birch Bay has been and is one of the largest and most productive recreational clamming areas in the state of Washington and is listed as a shellfish growing area of concern by the state Department of Health due to degrading water quality. In 1994 DOH closed Chuckanut Bay to recreational shellfish harvest based upon water quality and sewage disposal conditions in the area.

The MRC developed a water quality monitoring project to collect water quality information at freshwater discharges to Drayton Harbor, Birch Bay and Chuckanut Bay. The goals of the water quality monitoring project are:

- to collect fecal coliform bacteria data and loading estimates at priority freshwater inputs around the west shore of Drayton Harbor and at Chuckanut Bay in order to augment data collected by other programs;
- to collect baseline fecal coliform bacteria data and loading estimates for freshwater inputs to Birch Bay;
- to involve volunteers in the collection of water quality data;
- to assist in community outreach efforts emphasizing the need for clean marine waters for safe shellfish harvesting; and
- to assist in the selection of future clam enhancement projects;

The water quality monitoring project began in 2006 and is scheduled to continue through June, 2009. This interim report describes the procedures used to collect water quality data and presents a preliminary review of data collected between 2006 and 2008.

Background

In 2006, the MRC began a 3-year volunteer water quality monitoring project at Drayton Harbor, Birch Bay, and Chuckanut Bay. MRC members, Whatcom County staff, and volunteers were trained to collect grab surface water samples for fecal coliform analysis and estimate stream flow by time of travel or catchment method. Sample collection and flow measurement occurs monthly during a low tide at up to 5 sites in Drayton Harbor, 18 in Birch Bay, and 4 in Chuckanut Bay, dependent on flow conditions. Fecal coliform bacteria results are compared to water quality criteria to determine water quality status. Flow data are used to calculate fecal coliform loads.

The following two MRC members and thirteen volunteers assisted Whatcom County staff with sample collection:

- Gerald Larson (MRC)
- Susan Burke (MRC)
- Beverly Ashworth
- Mary Bradshaw
- Phil Buly
- Dave Church
- Katy Hicks
- Eugene Hoerauf
- Dick Myhre
- Becky Noble
- Katie Siegel
- Terry Sullivan
- Marcie Toby
- Bob Toby
- Lynn Trzynka

Sample dates, number of volunteers per event, and volunteer hours are presented in the table below.

Table 1. Water Quality Volunteer Information

Sample Date	Number of Volunteers	Volunteer Hours
July 11, 2007	9	10
August 8, 2007	10	13.5
September 5, 2007	8	9
October 3, 2007	11	15
November 5, 2007	11	12.5
December 4, 2007	11	14
January 14, 2008	9	11
February 13, 2008	10	13
March, 12, 2008	10	16
April 23, 2008	6	6
May 21, 2008	10	13
June 18, 2008	*Estimate 10*	*11*
Total Hours:	--	Estimate 144

Methods

Sample collection and flow measurement occur at freshwater tributaries and drainages to Drayton Harbor, Birch Bay, and Chuckanut Bay. A description of the sample locations is provided in Table 2.

Procedures for sample collection and flow measurements are contained in the *Quality Assurance Project Plan-Whatcom County Volunteer Monitoring Program for Drayton Harbor, Birch Bay, and Chuckanut Bay Watersheds* (Hirsch Consulting Services, 2006). Care is taken to collect samples that represent flowing conditions; therefore, samples are not collected if water is stagnant. Water samples are collected directly into 100ml sterile plastic bottles by hand dipping in midstream. Samples are stored on ice in a cooler and delivered to the laboratory within 8 hours of sampling.

At the majority of sites, stream flow is estimated using the time of travel method, which uses area and velocity to calculate flow. Area is determined by measuring stream segment length, width, and depth. Velocity is estimated by timing a floatable object between two points. At some sites, piped flow measurements are estimated using the catchment method (time it takes to collect a known volume of water) or, if possible, time of travel through the culvert.

Table 2. Sample Point Descriptions

Watershed	Site Id	Location	Description	Water Quality	Flow	Flow Method*
Drayton Harbor	DH2	Harborview & Drayton Harbor Road (E)	Outfall	✓	✓	TT
	DH3	Harborview & Drayton Harbor Road (W)	Outfall	✓	✓	TT/CM
	DH4	~ 4985 Drayton Harbor Rd	Outfall	✓	✓	TT
	DH5	Semiahmoo Trail	Outfall	✓	✓	TT
	DH14	~1565 Drayton Harbor Rd	Ditch	✓	✓	TT
Birch Bay	BB1	Woolrich & Morrison	Barnes Ck	✓	✓	TT
	BB2	Leisure Park	Creek	✓	✓	TT
	BB3	Golf Course	Culvert on Beach	✓	✓	TT
	BB4	Mariner's Cove	Culvert on Beach	✓	✓	TT
	BB5	8045 Birch Bay Dr	Culvert on Beach	✓	✓	TT
	BB6	8124 Birch Bay Dr	Culvert on Beach	✓	✓	TT
	BB7	Beach Way & Birch Bay Dr	Culvert on Beach	✓	✓	TT
	BB8	Cedar St & Birch Bay Dr	Culvert on Beach	✓	✓	TT
	BB11	Deer Trail	Ditch	✓	✓	TT
	BB12	Shintaffer	Channel	✓	✓	TT
	BB17	Birch Bay State Park	Terrell Ck	✓	✓	TT
	BB22	Birch Point Rd	Creek	✓	✓	TT
Birch Bay Village	BB15	Marina pond	Outflow	✓		
	BB16	Beaver pond	Outflow	✓		
	BB18	N of Selder Rd	Ditch	✓		
	BB19	Selder Rd	Ditch	✓		
	BB20	Rogers Slough	Creek	✓		
	BB21	Skeena Way	Ditch	✓		
Chuckanut Bay	CB1	Woodstock Farm	Outfall	✓	✓	CM
	CB2	Arroyo Park	Upper Chuckanut Ck	✓	✓	TT
	CB3	18th St Alley	Chuckanut Ck	✓	✓	TT
	CB4	Chuckanut Bay	Lower Chuckanut Ck	✓	✓	TT

*TT = Time of travel
CM = Catchment

Water Quality Criteria

The Washington State Department of Ecology has classified freshwater tributaries discharging to Drayton Harbor and Chuckanut Bay as primary contact recreation and those discharging to Birch Bay as extraordinary primary contact recreation (WAC 173-201A).

The Water Contact Recreation Bacteria Criteria in Freshwater are:

- Extraordinary Primary Contact Recreation - Fecal coliform organism levels must not exceed a geometric mean value of 50 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.

- Primary Contact Recreation - Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.

Results

A preliminary review of the water quality results is provided in this section. The final data review will be performed on completion of this project in June 2009. A comparison of the water quality data to the Water Contact Recreation Bacteria Criteria in Freshwater is presented in Table 1. Water quality summary sheets for Drayton Harbor, Birch Bay, and Chuckanut Bay are provided in the Attachments.

Table 3. Comparison of Water Quality Data to Bacteria Criteria

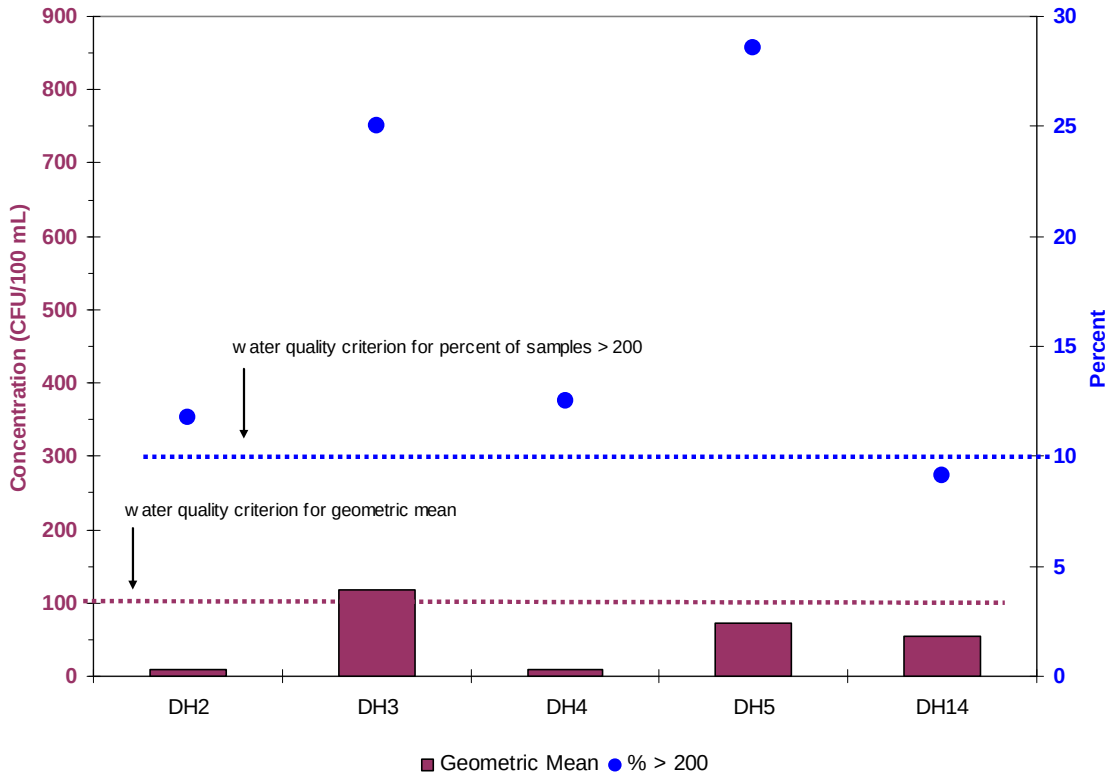
Site		N	Geometric Mean	% Exceeding	Status
Drayton Harbor	DH2	17	9	12	Partially meets standard
	DH3	16	118	25	Does not meet standard
	DH4	8	9	13	Partially meets standard
	DH5	14	73	29	Meets standard
	DH14	11	55	9	Partially meets standard
Birch Bay	BB1	14	209	64	Does not meet standard
	BB2	25	96	56	Does not meet standard
	BB3	14	34	36	Partially meets standard
	BB4	22	127	50	Does not meet standard
	BB5	22	73	41	Does not meet standard
	BB6	23	169	39	Does not meet standard
	BB7	17	237	65	Does not meet standard
	BB8	17	781	94	Does not meet standard
	BB11	10	85	40	Does not meet standard
	BB12	6	54	50	Does not meet standard
	BB15	15	23	20	Partially meets standard
	BB16	17	59	35	Does not meet standard
	BB17	25	76	44	Does not meet standard
	BB18	13	193	62	Does not meet standard
	BB19	10	18	20	Partially meets standard
	BB20	15	57	40	Does not meet standard
	BB21	13	107	46	Does not meet standard
	BB22	12	83	33	Does not meet standard

Site		N	Geometric Mean	% Exceeding	Status
Chuckanut Bay	CB1	20	65	30	Partially meets standard
	CB2	22	31	9	Meets standard
	CB3	22	55	27	Partially meets standard
	CB4	19	52	16	Partially meets standard

Drayton Harbor

As of May, 2008, 17 samples have been collected at DH2, 16 at DH3, 8 at DH4, 14 at DH5, and 11 at DH14. The geometric mean at one site (DH3 - 118 colonies/100mL) exceeds the bacteria criteria of 100 colonies/100mL. The percent of samples with fecal coliform concentrations exceeding 200 colonies/100mL is greater than 10 percent at all sites, except DH14. DH14 meets the water quality standard. DH2, DH4, and DH5 partially meet the bacteria criteria. DH3 exceeds the bacteria criteria. A comparison of water quality data at Drayton Harbor to the bacteria criteria is presented in Figure 1.

Figure 1. Comparison of Drayton Harbor Data to Bacteria Criteria
(Red bars represent geometric mean at each site. Blue circles represent percent of samples exceeding 200)

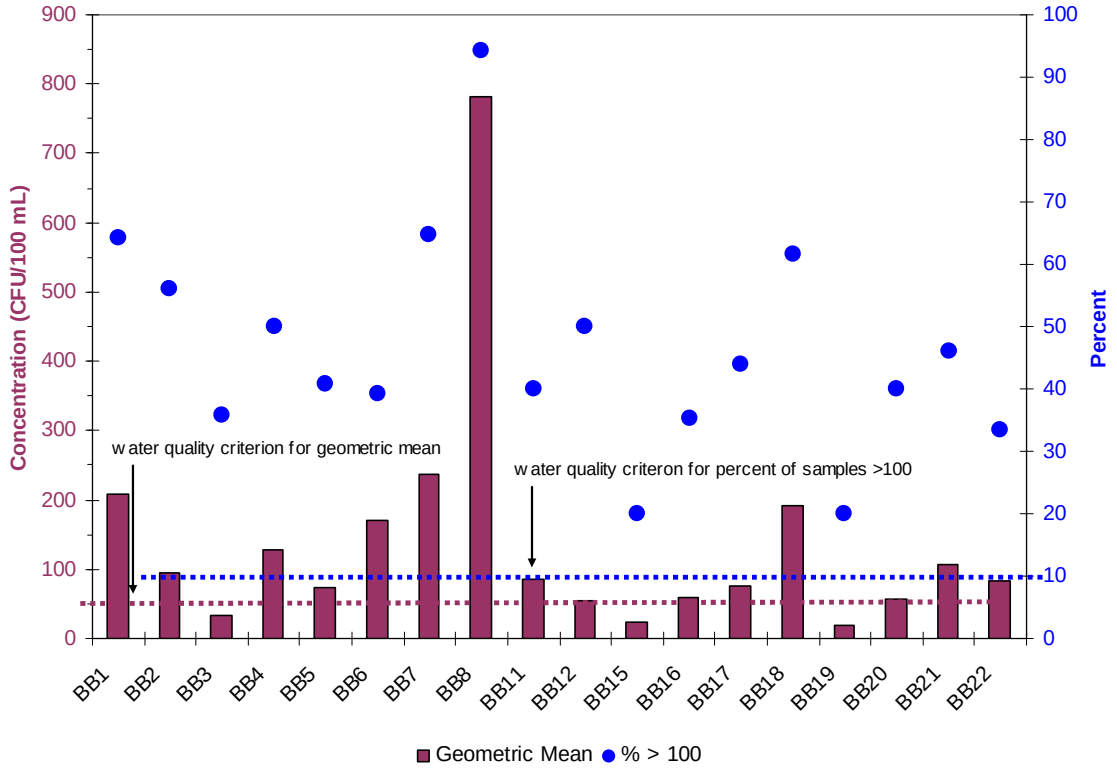


Birch Bay

As of May, 2008, 14 samples have been collected at BB1, 25 at BB2, 14 at BB3, 22 at BB4, 22 at BB5, 23 at BB6, 17 at BB7, 17 at BB8, 10 at BB11, 6 at BB12, 15 and BB15, 17 at BB16, 25 at BB17, 13 at BB18, 10 at BB19, 15 at BB20, 13 and BB21, and 12 at BB22. The geometric mean at all sites, except BB3, BB15, and BB19, exceeds the bacteria criteria of 50 colonies/100mL. The percent of samples with fecal coliform concentrations exceeding 100 colonies/100mL is greater than 10 percent at all sites. A comparison of water quality data at Birch Bay to the bacteria criteria is presented in Figure 2.

Figure 2. Comparison of Birch Bay Data to Bacteria Criteria

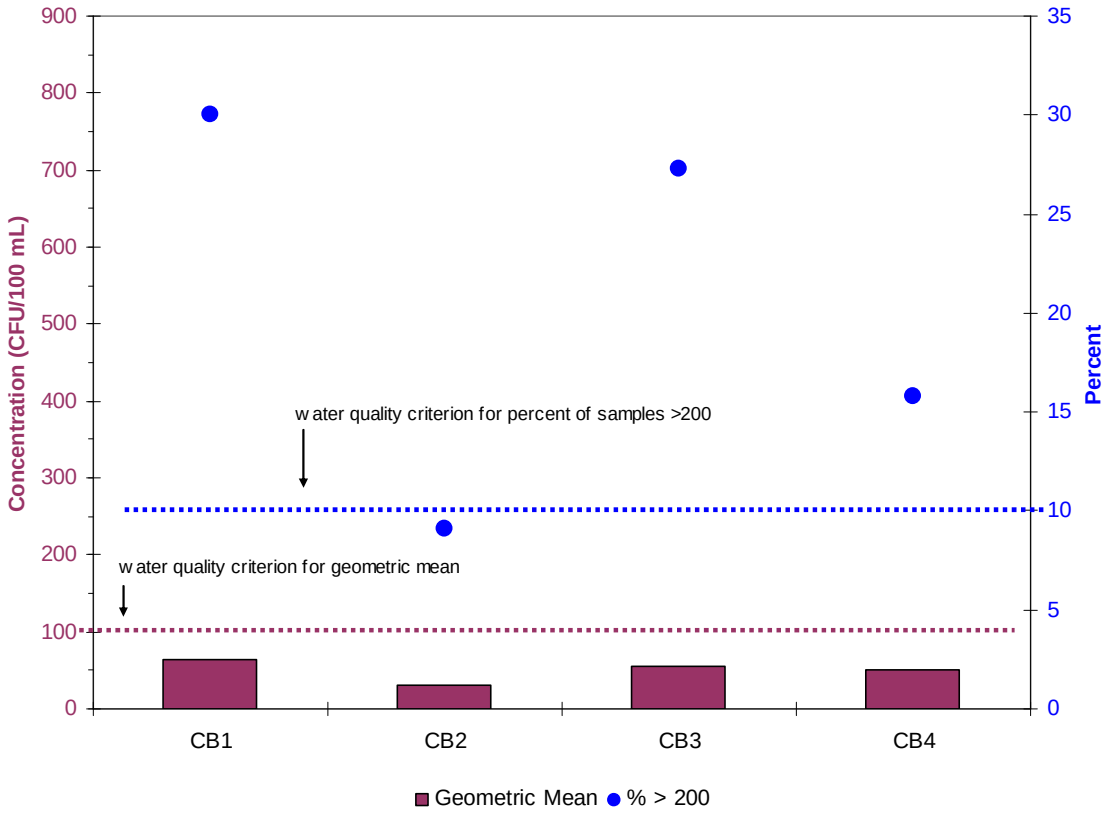
(Red bars represent geometric mean at each site. Blue circles represent percent of samples exceeding 100)



Chuckanut Bay

As of May, 2008, 20 samples have been collected at CB1, 22 at CB2, 22 at CB3, and 19 at CB4. The geometric mean at all sites is less than the bacteria criteria of 100 colonies/100mL. The percent of samples with fecal coliform concentrations exceeding 200 colonies/100mL is greater than 10 percent at CB1, CB3, and CB4. CB2 meets the bacteria criteria; whereas, CB1, CB3, and CB4 partially meet the bacteria criteria. A comparison of water quality data at Chuckanut Bay to the bacteria criteria is presented in Figure 3.

Figure 3. Comparison of Chuckanut Bay Data to Bacteria Criteria
(Red bars represent geometric mean at each site. Blue circles represent percent of samples exceeding 200)



Discussion

The preliminary data suggest that fecal coliform is a pollutant of concern in freshwater tributaries and discharges to Drayton Harbor, Birch Bay, and Chuckanut Bay. The data also indicate that Birch Bay is of particular concern and should be a high priority area for follow-up action.

The MRC water quality monitoring project is currently funded through June 2009. The MRC is working with Whatcom County to continue fecal coliform monitoring beyond this date and to develop outreach and response strategies to identify and control fecal coliform sources.

References

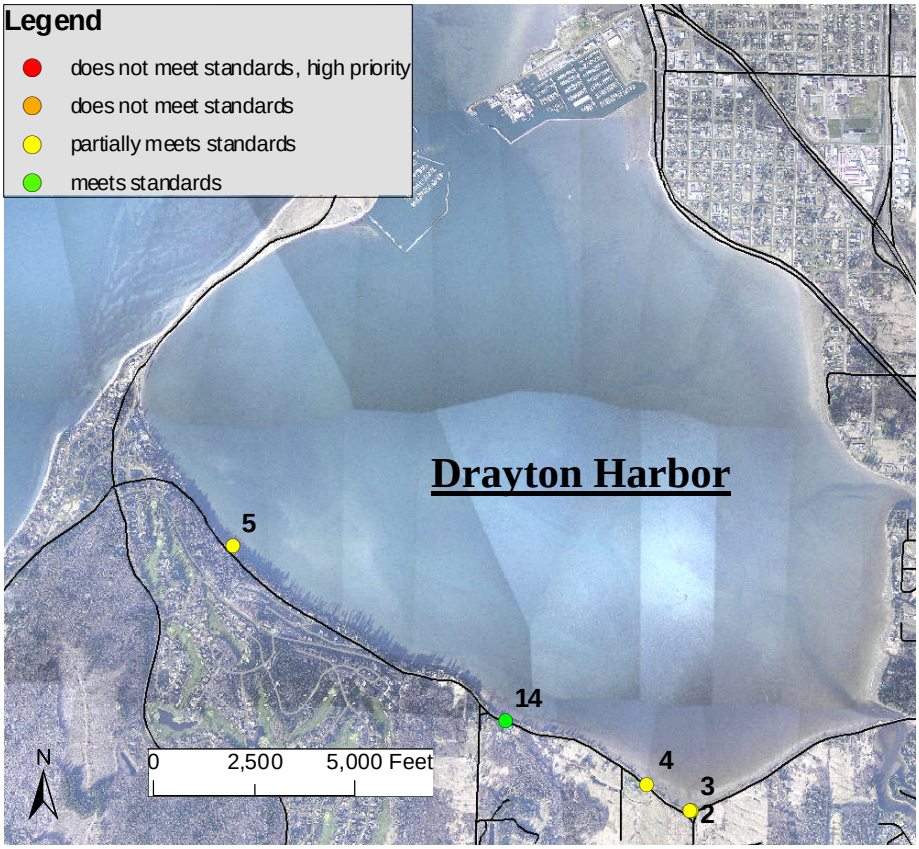
Hirsch Consulting Services. 2006. Quality Assurance Project Plan-Whatcom County Volunteer Monitoring Program for Drayton Harbor, Birch Bay, and Chuckanut Bay Watersheds.

Attachments

Water Quality Summary – Drayton Harbor
Water Quality Summary – Birch Bay
Water Quality Summary – Chuckanut Bay

Drayton Harbor Water Quality Monitoring Summary

Water Quality Status 6/22/06-5/21/08



Site	Number of samples	GeoMean	Minimum	Maximum	% > 200	Status
DH2	17	9	1	740	12	○
DH3	16	118	25	4700	25	○
DH4	8	9	1	201	13	○
DH5	14	73	9	1010	29	○
DH14	11	55	7	250	9	○

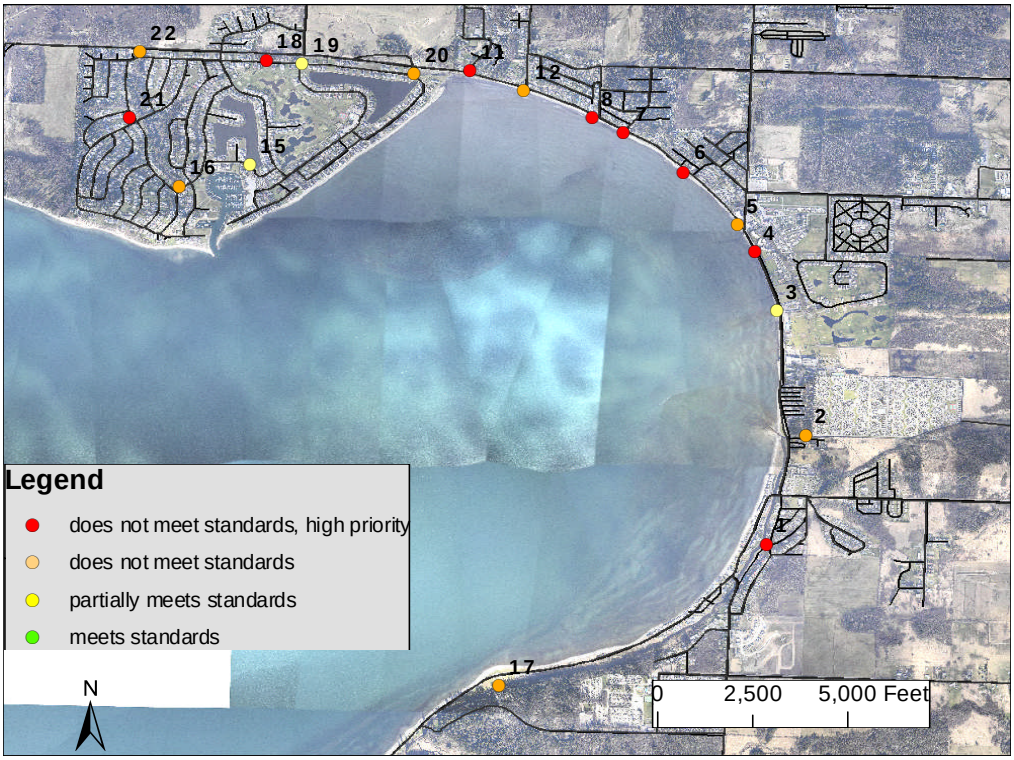
Note: Sites DH2 and DH3 locations do not show up well on this map. DH2 is approximately 20 feet east of DH3. These sites are outfalls located at the intersection of Harborview Road and Drayton Harbor Road.

Washington State Freshwater Fecal Coliform Standards for Drayton Harbor Watershed:

- Geometric mean <100 colonies/100mL
- No more than 10% of the samples > 200 colonies/100mL

Birch Bay Water Quality Monitoring Summary

Water Quality Status 6/22/06-5/21/08



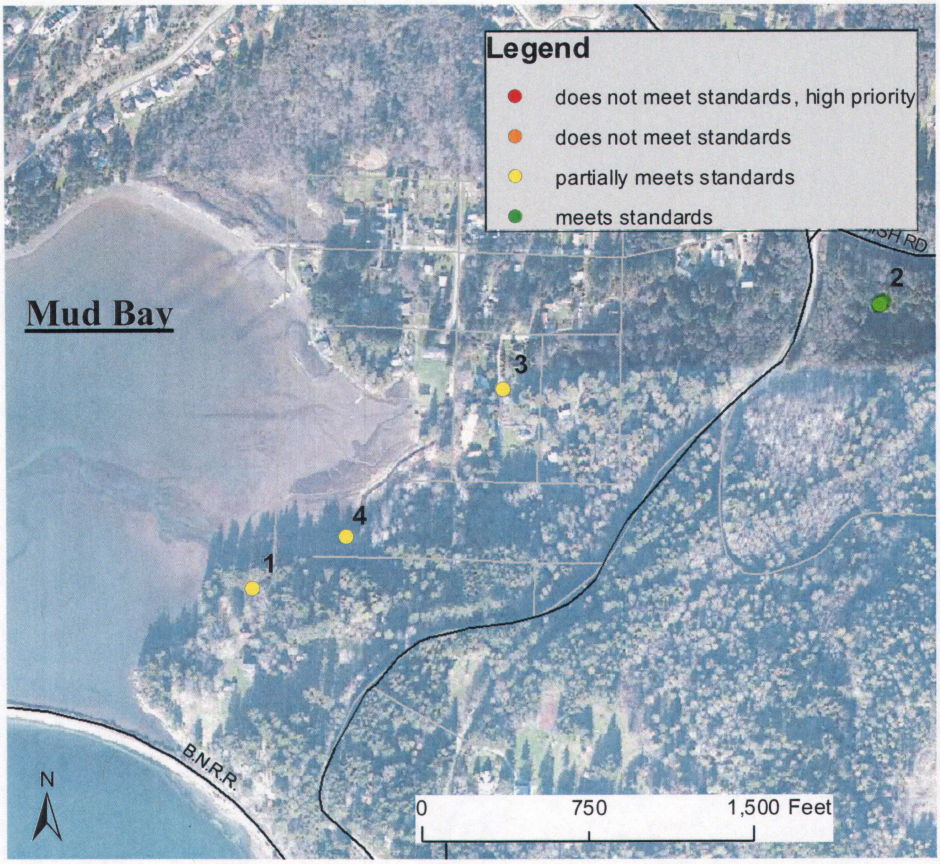
Site	Number of samples	GeoMean	Minimum	Maximum	% > 100	Status
BB17	25	76	1	6500	44	
BB1	14	209	30	2500	64	
BB2	25	96	1	2500	56	
BB3	14	34	1	1000	36	
BB4	22	127	7	5300	50	
BB5	22	73	1	5000	41	
BB6	23	169	9	30200	39	
BB7	17	237	6	11600	65	
BB8	17	781	1	12000	94	
BB11	10	85	5	680	40	
BB12	6	54	1	660	50	
BB15	15	23	1	4600	20	
BB16	17	59	2	710	35	
BB18	13	193	8	5400	62	
BB19	10	18	1	2550	20	
BB20	15	57	1	28300	40	
BB21	13	107	11	4600	46	
BB22	12	83	15	590	33	

Washington State Freshwater Fecal Coliform Standards for for Birch Bay Waters:

- Geometric mean **<50** colonies/100mL
- No more than 10% of the samples > 100 colonies/100mL

Chuckanut Bay/Mud Bay Water Quality Monitoring Summary

Water Quality Status 8/22/06-5/21/08



Site	Number of samples	GeoMean	Minimum	Maximum	% > 200	Status
CB1	20	65	1	15400	30	○
CB2	22	31	1	1470	9	●
CB3	22	55	1	1800	27	○
CB4	19	52	3	277	16	○

Washington State Freshwater Fecal Coliform Standards for Chuckanut Bay Waters:

- Geometric mean <100 colonies/100mL
- No more than 10% of the samples > 200 colonies/100mL