2017-2019 Ketchikan Beach Monitoring Comprehensive Report

January 28, 2020

Alaska Department of Environmental Conservation

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Work was completed in cooperation with EPA, Southeast Alaska Watershed Coalition, Ketchikan Indian Community, several DEC programs (Water Quality Standards, Assessment and Restoration (WQSAR), Compliance, Cruise Ship, and Wastewater Discharge Authorization), the City of Ketchikan, and the Ketchikan Gateway Borough.

Report cover photo was taken by Ketchikan Indian Community at Surprise Beach.

Executive Summary

The Alaska BEACH program was initiated along the Ketchikan coastline to monitor fecal waste contamination during the 2017, 2018 and 2019 recreation seasons. Marine water samples were collected at 13 monitoring sites to evaluate potential health risks indicated by fecal coliform and enterococci bacteria, and to notify the public when levels exceeded state standards. Monitoring sites included Knudson Cove, Beacon Hill, South Point Higgins Beach, beach at Shull Road (Shull), beach off Sunset Drive (Sunset), South Refuge Cove State Recreation Site (South Refuge Cove), Thomas Basin Harbor, Seaport Beach, Rotary Park Pool, Rotary Park Beach, Mountain Point Surprise Beach, Mountain Point Cultural Food, and Herring Cove (see Figures 1 - 7). Eight sites were sampled in 2017, 13 sites in 2018, and 12 sites in 2019.

To address additional community and tribal concerns in southern Ketchikan, the 2018 monitoring program added two alternating locations at Rotary Park Beach (Rotary Pool and Rotary Beach) and Mountain Point (Mt. Point Surprise Beach and Mt. Point Cultural Foods), and a new location at Herring Cove. For the 2019 season, Beacon Point was excluded due to access issues, and all locations were monitored every week.

Table 1 provides specific site locations and descriptions, and Table 2 provides the nearby potential pollution sources for the specific monitoring locations. Relevant state water quality criteria for recreation and shellfish harvesting in marine waters are described in Table 3.

A comprehensive monitoring report was released after the 2017 sampling season (https://dec.alaska.gov/water/water-quality/beach-program/), but in 2018, only a field report with monitoring data was released. This 2017-2019 comprehensive report includes data and results from the 2017 through 2019 monitoring seasons and provides more in-depth discussions of the 2018 and 2019 data.

The analytical tests for fecal coliform bacteria revealed that 11 of the 13 monitoring sites failed to meet the Alaska water quality standard (WQS) for the harvesting for consumption uses during 2 or more years including Knudson Cove, Beacon Hill, South Point Higgins, Shull, Sunset, South Refuge Cove, Thomas Basin Harbor, Seaport Beach, Rotary Park Pool, Mountain Point Cultural Food, and Herring Cove (Tables 4 - 7). Rotary Park Beach and Mountain Point Surprise Beach only failed to meet fecal coliform criteria during the 2019 season. In 2019, seven of 12 sites failed to mean the 10% of samples criterion for the aquaculture use for cooked products (>400 CFU/100 mL). Thomas Basin failed to meet the criterion protecting cooked products during all three years of the study. None of the 13 monitoring sites met Alaska WQS for the harvesting use during every year of this study (Tables 4 - 7).

11 of 13 monitoring sites (Knudson Cove, Beacon Hill, South Refuge Cove, Seaport, Shull, Thomas Basin, Rotary Pool, Mountain Point Cultural Food, and Herring Cove) failed to meet one or both of the enterococci criteria protecting the contact recreation use for two or more years during this study (Tables 8 - 11). Rotary Beach and Mt Point Surprise Beach only exceeded during one of the two years of monitoring. None of the 13 monitoring sites met Alaska WQS for the contact recreation use during every year of this study (Tables 8 - 11).

In addition to bacteria testing, microbial source tracking for bacteria genetic identification was conducted during each year of the study. The human host marker were detected during at least one year at all 13

monitoring locations[1] tested (Table 12). Twelve of the 13 monitoring locations also had dog host markers during at least one year with the exception of Mt. Point Surprise Beach. The gull host marker was detected in 11 of 13 locations during at least one year with the exception of Rotary Beach and Mt. Point Surprise Beach. Tables 13- 15 provides individual sample results for the 2017 through 2019 recreation seasons.

Numerous potential bacteria sources are present along the Ketchikan coast, including: private and/or public sewer treatment system outfall(s), public sewer treatment system emergency bypass discharges, sewer line breaks, individual septic tanks, wildlife, pet feces, boats in harbor and launch areas, and private watercraft, ferries, and cruise ships. The data collected to date are not sufficient to determine explicitly which bacteria sources in which beach locations are negatively affecting the marine water uses.

This document does not evaluate whether the coastal waters are impaired under Clean Water Act section 303(d), although the data summarized in this report may be used in a future impairment determination when preparing the 2020 Integrated Report. Prior to making a decision on impairment DEC will issue a public notice and comment period for the community, agencies, local and tribal governments, and other interested stakeholders.

Next Steps

DEC Beach program has been working with other DEC programs, the Ketchikan Borough, City of Ketchikan and other stakeholders to collect concurrent samples from various potential pollutant sources in the area. In addition, DEC's Alaska Clean Water Actions (ACWA) Grants Program is funding the development of a Watershed Management Plan which is designed to address the current pollution sources in Ketchikan and protect high quality waters. The plan evaluates wastewater/stormwater management options for reducing the pollutants (especially bacteria) entering Ketchikan freshwater watersheds and coastal marine waters from known diverse point and nonpoint bacteria discharges and sources. The plan will follow the EPA's 9-element watershed planning process.

This 2017-2019 Ketchikan Beach Monitoring Comprehensive Report, the 2017-2018 Ketchikan BEACH Field Report, and the 2017 Ketchikan Beach Monitoring Report are posted on the Beach website http://dec.alaska.gov/water/water-quality/beach-program/ and Water Quality Reports website at http://dec.alaska.gov/water/water-quality/reports. Data from these reports may be used to evaluate coastal waters near Ketchikan for impairment status in a future Integrated Water Quality Monitoring and Assessment Report.

In future years, bacteria concentrations may be modeled using Virtual Beach to aid in issuing beach advisories. Virtual Beach is a tool designed by the U.S. Environmental Protection Agency (EPA) Center for Exposure Assessment Modeling (CEAM) Information Sources to help develop site-specific statistical models for the prediction of pathogen indicator levels at recreational beaches.

[1] Only 11 of 13 monitoring sites were tested for genetic markers in 2018. The Pool and Cultural Food sites were the alternating monitoring locations at Rotary Park and Mountain Point, respectively, and were analyzed for microbial source tracking.

1. ABOUT ALASKA'S BEACH PROGRAM

In response to increased occurrences of water-borne illnesses U.S. Congress passed the Beaches Environmental Assessment and Coastal Health (BEACH) Act in 2002. EPA administers grant funds to states, tribes and territories under the Act to establish monitoring and public notification programs. The BEACH program has established national marine water quality monitoring and reporting standards for fecal waste contamination and notifies the public when levels exceed state standards.

Congress passed the BEACH Act because pathogens in recreational waters can be naturally occurring, or they can be introduced through contamination events with the feces of humans and other warm-blooded animals. Commonly documented health issues from swimming in contaminated recreational waters include gastrointestinal illness, respiratory illnesses, skin rashes, and ear, eye, and wound infections. People who get an illness from swimming in contaminated water do not always associate their illness with swimming because the onset of the illness is delayed. For example, viral gastrointestinal illness is often mild, short-lived, and self-limiting, and symptoms usually take up to 24 hours to appear. Outbreaks of disease are usually documented when many people seek medical assistance because of a similar illness or the severity of the illness. However, people with mild illness often do not seek medical assistance. Therefore, disease outbreaks are often inconsistently recognized and the outbreak information in the literature is likely underestimated[2].

In Alaska, the Alaska DEC's Division of Water uses EPA grant funds for the Alaska BEACH program. Alaska's BEACH program provides funds to municipalities, watershed organizations, and tribal groups to conduct water quality monitoring on high-priority public beaches. BEACH programs have been set up in 15 Alaskan communities, including Ketchikan. The Ketchikan BEACH program was developed in collaboration with the Ketchikan Indian Association (KIC), City of Ketchikan, Ketchikan Gateway Borough, and the Southeast Alaska Watershed Coalition (SAWC). In 2017, 2018, and 2019 KIC performed the monitoring activities at the nine, 13, and 12 beaches in Ketchikan, respectively.

Two groups of bacteria, fecal coliform and enterococci, are measured as indicators of fecal waste contamination in marine waters. These bacteria are found in both human and animal feces. Alaska's criteria for bacteria are discussed in Section 3 Methods.

2. KETCHIKAN BEACH MONITORING LOCATIONS

The monitoring locations are situated along the coastal recreational areas within several watersheds. The surrounding and upgradient area uses include boat harbors, residential/commercial/industrial, state recreational sites, neighborhood/local beaches, and shellfish and marine food gathering.

The 13 beaches monitored during 2017-2019 are: Knudson Cove, Beacon Hill, South Point Higgins Beach, beach at Shull Road (Shull), beach off Sunset Drive (Sunset), South Refuge Cove State Recreation Site (South Refuge Cove), Thomas Basin Harbor, Seaport Beach, Rotary Park Pool, Rotary Park Beach,

[2] EPA National Beach Guidance and Required Performance Criteria for Grants, 2014 Edition (EPA-823-B-14-001).

Mountain Point Surprise Beach, Mountain Point Cultural Food, and Herring Cove (see Figures 1 - 7). Eight sites were sampled in 2017, 13 sites in 2018, and 12 sites in 2019.

Rotary Park Beach, Rotary Park Pool, Mountain Point Surprise Beach, Mountain Point Cultural Food and Herring Cove sites were added to the monitoring program in 2018. Rotary Park 'Pool' is a shallow pool area which has a concrete enclosure at the outlet and the 'Beach' is a location where local groups recreate on the open coastal beach. The Mountain Point 'Surprise Beach' accommodates tourist groups gather for snorkeling and scuba diving, and the 'Cultural Food' location is used by tribal groups to gather marine foods for consumption. These locations were chosen based on conversations with representatives from the Ketchikan Gateway Borough and the Ketchikan Indian Community, the local tribal government. Herring Cove was also a location requested by the local tribal government group, the Our Way of Life Committee. Beacon Hill was monitored during the 2017 and 2018 seasons, but not during the 2019 season due to access issues.

Table 1 provides a site description for each monitoring location. Table 2 describes the nearby pollution sources for each site. Site photographs from 2018 and 2019 are attached as Appendix A.

Figure 1 shows the overall view of the Ketchikan beach monitoring locations. Figure 2 - 7 show detailed views of the monitoring locations. Figure 8 shows the cruise ship docking and anchor area, the ferry docking area, the airport, the Charcoal Point sewer treatment outfall and mixing zone, and the Mountain Point sewer treatment outfall and mixing zone.

Table 1. Monitoring locations and site descriptions

Site ID	Latitude	Longitude	Site description	Years Monitored
Knudson Cove	55° 28' 19.47" N 55.47208	-131° 47' 46.76" W -131.79632	Beach and small boat harbor in Knudson Cove in southern end of Clover Pass, approx. 10 miles north of downtown.	2017, 2018, 2019
Beacon Hill	55° 28' 20.21" N 55.47228	-131° 49' 22.98" W -131.82305	South of Clover Passage, approx. 9.4 miles north of downtown.	2017, 2018
South Point Higgins Beach	55° 26' 55.12" N 55.44864	-131° 49' 52.90" W -131.83136	South of South Point Higgins Beach, approx. 8.3 miles north of downtown.	2017, 2018, 2019
Beach at Shull Road	55° 26' 7.57" N 55.43544	-131° 47' 54.62" W -131.79851	South of Whipple Creek mouth, approx. 6.7 miles north of downtown.	2017, 2018, 2019
Beach at Sunset Drive	55° 24' 45.40" N 55.41261	-131° 45' 54.19" W -131.76505	On Sunset Peninsula approx. 4.7 miles north of downtown. South of Mud Bay.	2017, 2018, 2019
South Refuge Cove State Recreation Site	55° 24' 26.62" N 55.40739	-131° 45' 19.77" W -131.75549	South of state recreation site approx. 4 north miles of downtown.	2017, 2018, 2019
Thomas Basin Harbor	55° 20' 28.49" N 55.34125	-131° 38' 30.45" W -131.64179	Small boat harbor at mouth of Ketchikan Creek, approx. 2.5 miles south of downtown.	2017, 2018, 2019
Seaport Beach	55° 18' 52.63" N 55.31462	-131° 35' 35.68" W -131.5932	Local shellfish gathering beach approx. 5 miles south of downtown. Commercial area in Saxman.	2017, 2018, 2019
Rotary Park Beach (aka Bugges Beach)	55° 18' 35.34" N 55.30982	-131° 34' 49.27" W -131.58028	Highly used recreation beach approx. 6 miles south of downtown. Open coastal beach.	2018, 2019
Rotary Park Pool (aka Bugges Beach)	55° 18' 31.50" N 55.30981667	-131° 34' 39.34" W -131.58027778	Highly used recreation beach approx. 6 miles south of downtown. Concrete enclosure at outlet, marine water flows over enclosure.	2017, 2018, 2019
Mountain Point Surprise Beach	55° 17' 36.72" N 55.29353	-131° 32' 51.49"W -131.54750	Local recreation beach used for tourist group snorkeling, near Mountain Point boat launch, approx. 8 miles south of downtown.	2018, 2019
Mountain Point Cultural Food	55° 17' 34.05" N 55.29279	-131° 32' 21.08" W -131.53917	Local cultural food gathering beach, near Mountain Point boat launch, approx. 8 miles south of downtown.	2018, 2019
Herring Cove	55° 19" 34.57" N 55.32627	-131° 31' 22.13" W -131.52278	Local recreation beach used for tourist groups, northern end of Herring Cove, approx. 10.5 miles south of downtown.	2018, 2019

Table 2.
Potential point and nonpoint sources[3] present in coastal marine waters near monitoring sites

Site ID	Individual septic tanks	Private sewer treatment system outfall(s)	Wildlife Pet feces	Private watercraft	Cruise ships, Ferries	Mountain Point sewer treatment system outfall(s)	Sewer line breaks	Charcoal Point sewer treatment system emergency bypass discharge	Boats at boat launches & in harbor areas
Knudson Cove	✓	✓	✓	✓					✓
Beacon Hill	✓	✓	✓	✓					
South Point Higgins	✓	✓	✓	✓	✓				
Shull	✓	✓	✓	✓	✓				
Sunset	✓	✓	✓	✓	✓				
South Refuge Cove	✓	✓	✓	✓	✓				
Thomas Basin			✓	✓			✓	✓	✓
Seaport			✓	✓	✓		✓	✓	
Rotary Beach			✓	✓	✓		✓	✓	
Rotary Pool			✓	✓	✓		✓		
Mt Point Surprise Beach			✓	✓	✓	✓	✓		✓
Mt Point Cultural Food[4]			✓	✓	✓	✓	✓		✓
Herring Cove	✓	✓	✓	✓			✓		

[3] Sources vary in volume and bacterial level.

[4] Private sewer treatment systems in this area were connected to the Mountain Point Wastewater Treatment Plant in 2018.

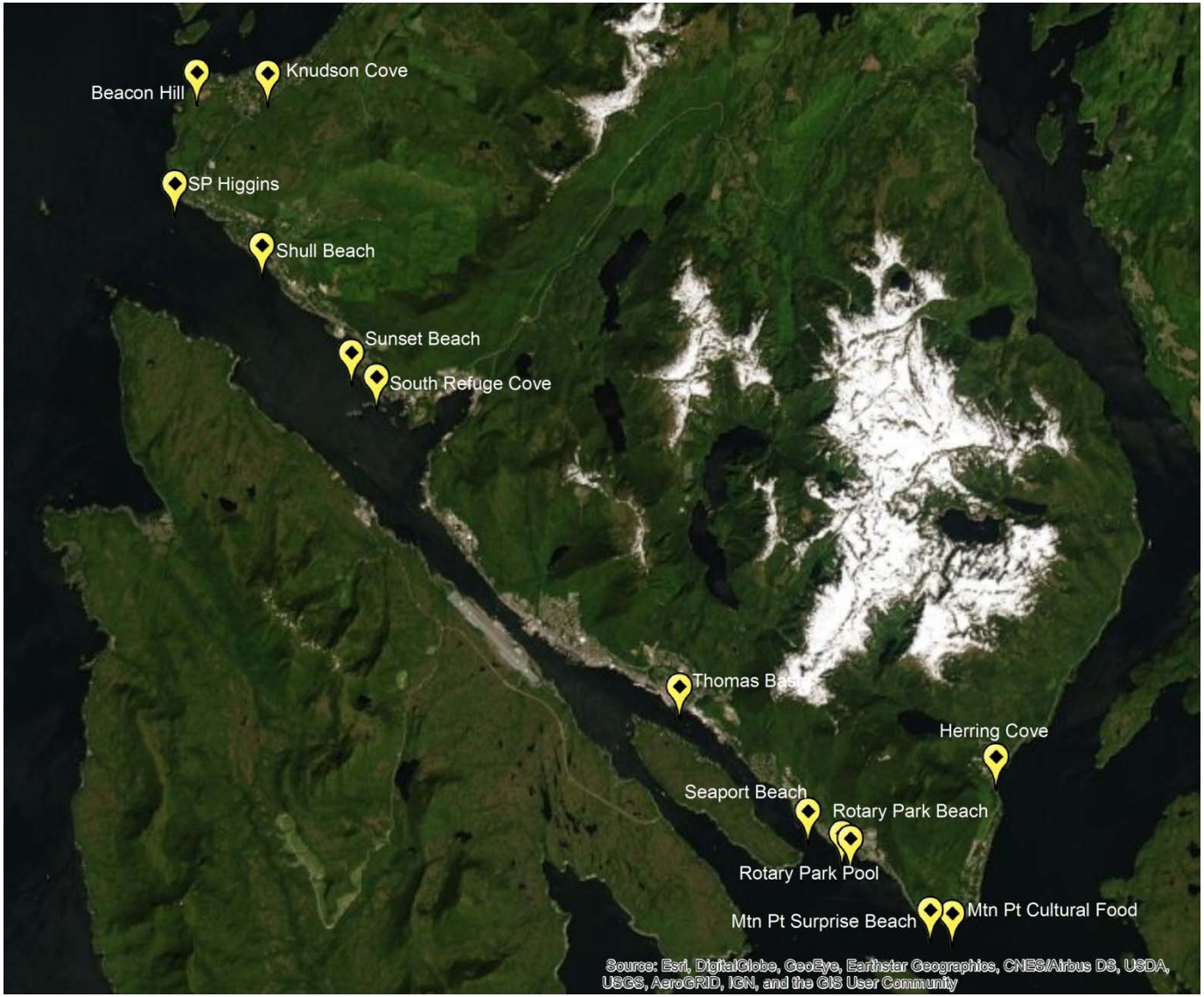


Figure 1. Ketchikan beach monitoring locations (identified with yellow markers).

Figure 2. 2019 Ketchikan beach monitoring locations – Knudson Cove, South Point Higgins, and Shull Beach
Beacon Hill was monitored 2017-2018.

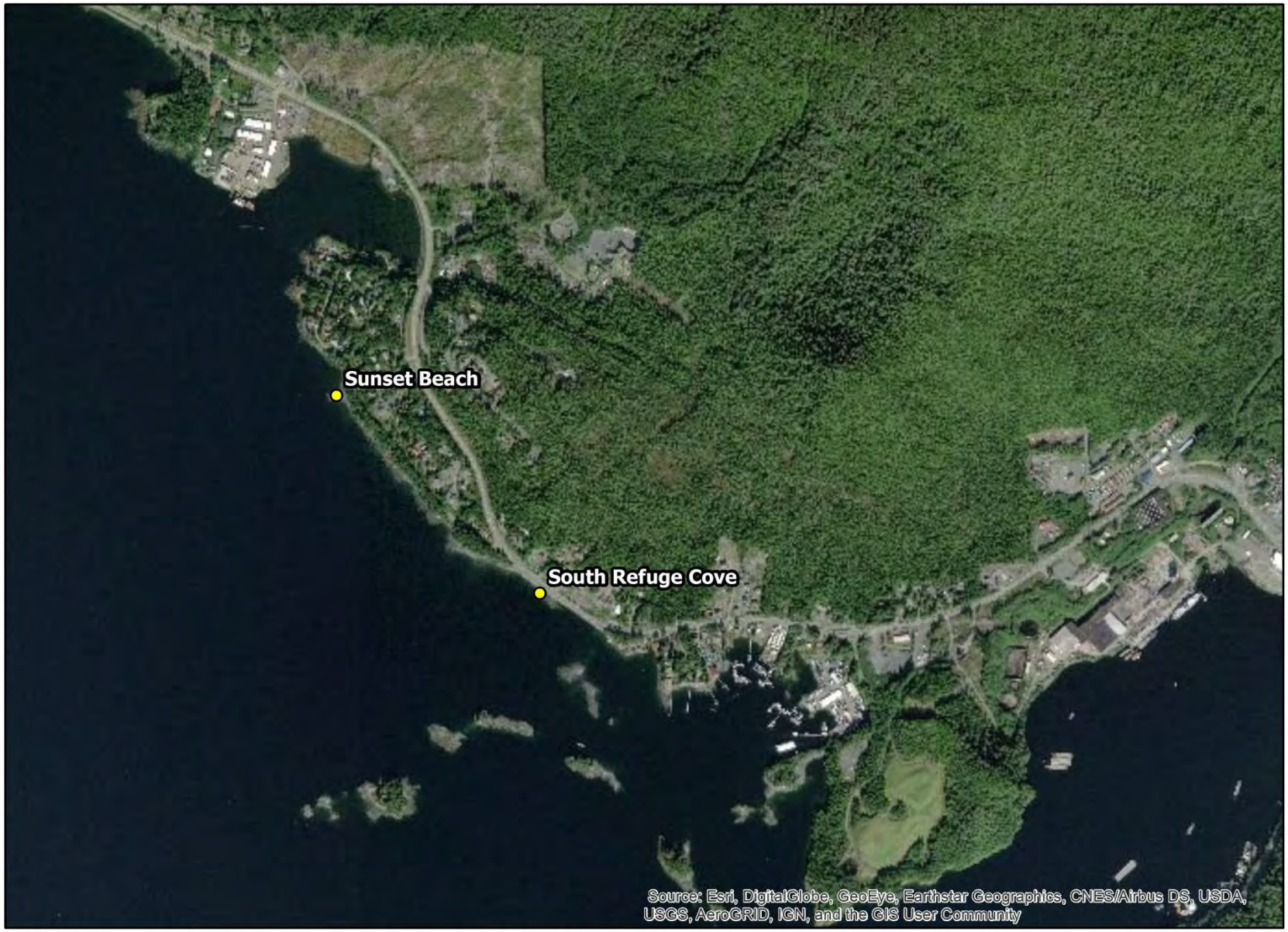


Figure 3. 2019 Ketchikan beach monitoring locations –Sunset and South Refuge Cove

Figure 4. 2019 Ketchikan beach monitoring locations – Thomas Basin

Figure 5. 2019 Ketchikan beach monitoring locations – Seaport, Rotary Beach and Rotary Pool

Figure 6. 2019 Ketchikan beach monitoring locations – Mt Point Surprise Beach and Mt Point Cultural Food

Figure 7. 2019 Ketchikan beach monitoring locations – Herring Cove.

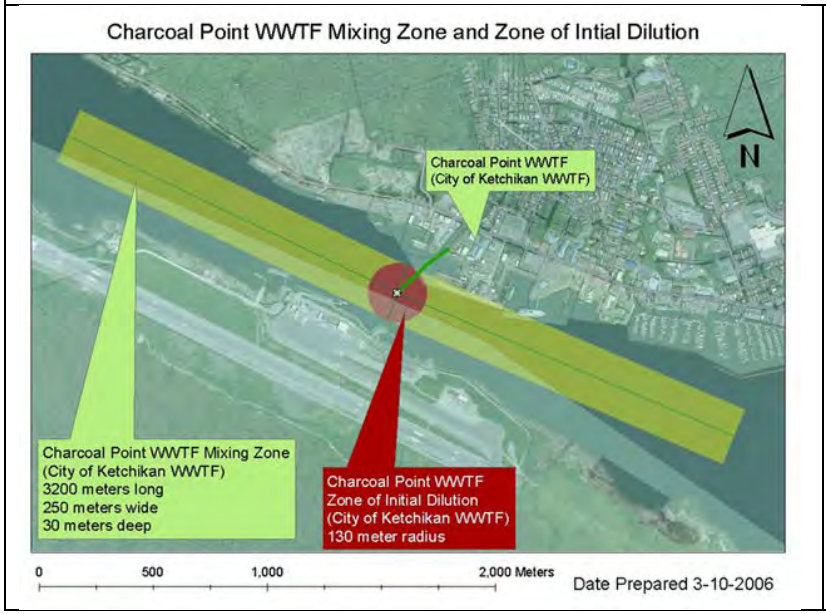


Figure 8. Ketchikan airport, ferry dock, cruise ship dock, and anchor area (top). Charcoal Point and Mountain Point mixing zones (bottom)

3. METHODS

Samples were collected for the 2017-2019 Ketchikan Beach monitoring project at 8-13 different sample locations along the coast of Ketchikan (Figures 1 - 7). Samples were collected once per week during the recreation season from approximately May 15 through September 15. Site photographs are attached as Appendix A. Sanitary surveys were also conducted, and are attached as Appendix B. The chain of custody and laboratory analytical reports for samples are attached as Appendix C.

Each sample was collected using the grab method with a 120 ml bottle preserved with sodium thiosulfate. A field replicate for each analytical parameter (fecal coliform and enterococci) was collected from one monitoring location per week on a rotating schedule so that replicates were collected from each monitoring location. Temperature blanks accompanied all coolers to document that samples remained within acceptable temperature limits.

All bacteria samples were collected by KIC staff following Standard Operating Procedures as described in the *Ketchikan BEACH Water Quality Monitoring and Pathogen Detection Quality Assurance Project Plan* (QAPP) and the *Ketchikan BEACH Monitoring Handbook* at http://dec.alaska.gov/water/water-quality/beach-program/. Trained staff collected water samples wearing chest waders and shoulder length gloves. After wading to a depth of approximately three feet, water samples were collected about one foot below the surface of the water to avoid collecting any floating material. During sampling at each location, a Marine Beach Sanitary Survey was completed. The survey records information on water recreation and beach usage activities, wildlife, weather, water and air temperature, tidal conditions, and potential sources of pollution. Site-specific survey summary tables are attached as Appendix B.

R&M Engineering-Ketchikan, Inc. (R&M), a DEC-approved water quality laboratory[5] in Ketchikan, performed analyses of bacterial colonies present in the samples. R&M provided all sampling bottles, materials, and coolers. After sample collection, the sample bottles were stored in a cooler between 1 and 10 degrees Celsius and were returned to the laboratory within 6 hours of collection. Laboratory staff checked each temperature blank upon receipt. All sample temperatures were within acceptable limits.

Samples were also collected for Microbial Source Tracking (MST)[6] analysis. For one sampling event during 2017 and 2018, and on July 30 and September 10, 2019, MST samples were collected at the same location, date, and time of the fecal coliform and enterococci samples. MST samples were collected in unpreserved laboratory-supplied 500 ml sterile polycarbonate Corning bottles.

Source Molecular, Inc., an EPA accepted MST and pathogen detection laboratory in Miami Florida, performed analyses using the quantitative polymerase chain reaction (qPCR) method to determine the host(s) genetic markers (i.e., human, domestic animals and/or wildlife) present in the samples.

[5] R&M laboratory is certified to perform microbiology analyses of drinking water.
[6] MST is a set of methods used to determine the host (different animals or human).

MST samples were packed in the cooler with gel ice and temperature blank, and were shipped via Fed Ex Priority Overnight to Source Molecular in Miami Florida immediately after the project sample collection. Source Molecular laboratory staff checked each temperature blank upon receipt. All sample temperatures were within acceptable limits. Samples were filtered and frozen upon receipt.

Data was reviewed for quality control and assurance by the DEC Quality Assurance Officer and the DEC Alaska BEACH Project Manager. The project data was subsequently uploaded to the state Ambient Water Quality Monitoring System (AQWMS) database, and transmitted to the EPA BEACH program using the Water Quality eXchange (WQX) and maintained in the EPA BEach Advisory and Closing Online Notification (BEACON)[7] system and the Water Quality Portal data warehouse[8].

4. WATER QUALITY STANDARDS FOR BACTERIA IN MARINE WATERS

Applicable Alaska WQS for fecal coliform and enterococci in marine waters address the protection of designated uses for water supply (including aquaculture, seafood processing and industrial uses), water recreation (contact and secondary), and harvesting for consumption of raw mollusks or other raw aquatic life. The most stringent criteria for fecal coliform and the recreation criteria for enterococci are shown in Table 3 and highlighted in blue.

The Alaska beach monitoring program focuses on the water recreation use using enterococci as an indicator for bacteria in the marine water. Data was compared to the contact recreation standard of "In a 30-day period, the geometric mean of samples may not exceed 35 enterococci CFU/100 ml, and not more than 10% of the samples may exceed a STV of 130 enterococci CFU/100 ml" (18 AAC 70 (14)(B)(i)). The two criteria (i.e. the "geometric mean" and the "10% of samples") in this standards must both be met. If either criterion is exceeded, then the water at that location fails the standard.

[7] The EPA created the BEach Advisory and Closing Online Notification (BEACON) system to provide pollution occurrences at coastal recreation waters to the public. The BEACON database contains state/tribe-reported beach monitoring and notification data and is available online at https://watersgeo.epa.gov/beacon2/about.html.

[8] The Water Quality Portal is maintained by the U.S. Geological Survey and the EPA.

Table 3. Alaska water quality criteria for bacteria in marine waters

Designated use	Description of criteria
(14) Bacteria, For Marine Water Uses	
(A) Water Supply	
(i) aquaculture	For products normally cooked, the geometric mean of samples taken in a 30-day period may not exceed 200 fecal coliform/100 ml, and not more than 10% of the samples may exceed 400 fecal coliform/100 ml. For products not normally cooked, the geometric mean of samples taken in a 30-day period may not exceed 20 fecal coliform/100 ml, and not more than 10% of the samples may exceed 40 fecal coliform/100 ml.
(ii) seafood processing	In a 30-day period, the geometric mean of samples may not exceed 20 fecal coliform/100 ml, and not more than 10% of the samples may exceed 40 fecal coliform/100 ml.
(iii) industrial	Where worker contact is present, the geometric mean of samples taken in a 30-day period may not exceed 200 fecal coliform/100 ml, and not more than 10% of the samples may exceed 400 fecal coliform/100 ml.
(B) Water Recreation	
(i) contact recreation	In a 30-day period, the geometric mean of samples may not exceed 35 enterococci CFU/100 ml, and not more than 10% of the samples may exceed a statistical threshold value (STV) of 130 enterococci CFU/100 ml.
(ii) secondary recreation	In a 30-day period, the geometric mean of samples may not exceed 200 fecal coliform/100ml, and not more than 10% of the samples may exceed 400 fecal coliform/100 ml.
(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife	Not applicable.
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	The geometric mean of samples may not exceed 14 fecal coliform/100 ml; and not more than 10% of the samples may exceed; - 43 MPN per 100 ml for a five-tube decimal dilution test; - 49 MPN per 100 ml for a three-tube decimal dilution test; - 28 MPN per 100 ml for a twelve-tube single dilution test; - 31 CFU per 100 ml for a membrane filtration test (see note 14).[9]

[9] Note 14. When fecal coliform are monitored in waters designated as state approved shellfish harvesting and growing waters, these waters are also subject to 18 AAC 34.010(19).

5. RESULTS – 2017, 2018, AND 2019 BEACH DATA

Tables 4 - 15 include summaries and the analytical results for the 2017, 2018, and 2019 monitoring data. Chain of custody and laboratory analytical reports from 2018 and 2019 are attached in Appendix C. Graphs showing individual monitoring location results from 2018 and 2019 are attached in Appendix D. Chain of custody forms and laboratory analytical reports from 2017 can be found in that year's monitoring report (https://dec.alaska.gov/water/water-quality/beach-program/).

5.1 Fecal Coliform

The most stringent of the criteria for fecal coliform bacteria protects harvesting for consumption of raw mollusks or other raw aquatic life (harvesting use). This harvesting use criteria states that "the geometric mean of samples may not exceed 14 fecal coliform/100 ml" (geometric mean criterion), and "not more than 10% of the samples may exceed 31 colony forming units (CFU) per 100 ml for a membrane filtration test" (10% of samples criterion) in 18 AAC 70 (14)(D). The two criteria (i.e. the "geometric mean" and the "10% of samples") in this standards must both be met. If either criterion is exceeded, then the water at that location fails the standard. Table 4 includes a summary of results from 2017-2019.

Table 4. Summary of fecal coliform bacteria results for 2017 through 2019

Monitoring Locations	# of Samples	Maximum (CFU/100 mL)[10]	Percent of Samples >31 WQS[11]			Geometric Mean CFU/100 ml[12]		
			2017	2018	2019	2017	2018	2019
Knudson Cove[13]	45	**456**	**33**[14]	**22**	**44**	**20**	13	**22**
Beacon Hill[15]	27	**66**	**11**	**17**	NA	10	12	NA
South Point Higgins	45	**236**	**22**	**39**	**50**	6	**21**	**35**
Shull	45	**>2000 CG**[16]	**22**	**28**	**44**	**15**	**20**	**30**
Sunset	45	**196**	**33**	**33**	**33**	14	**20**	**21**
South Refuge Cove	45	**184**	**11**	**33**	**22**	10	**17**	**15**
Thomas Basin	45	**>2000 CG**	**33**	**44**	**61**	**16**	**32**	**38**
Seaport	45	**>2000 CG**	**33**	**17**	**22**	**20**	7	11
Rotary Beach[17]	25	**>2000 CG**	NA[18]	0	**39**	NA	9	**28**
Rotary Pool[19]	38	**>2000 CG**	**33**	**36**	**33**	**24**	**16**	**21**
Mt Point Surprise Beach	25	**133**	NA	0	**33**	NA	7	**20**
Mt Point Cultural Food[20]	29	**526**	NA	**45**	**67**	NA	**18**	**64**
Herring Cove [21]	36	**>400**	NA	**72**	**67**	NA	**47**	**64**

[10] CFU – Colony Forming Unit is the measurement unit for fecal coliform bacteria (APHA Method 9222D).

[11] Not more than 10% of samples may exceed 31 CFU/100 ml for the designated use of harvesting for consumption of raw mollusks or other raw aquatic life.

[12] The geometric mean may not exceed 14 fecal coliform/100 ml for the harvesting use. The harvesting geometric mean is calculated for the entire recreation season.

[13] 9 samples were collected in 2017, and 18 samples were in collected 2018 and 2019 at Knudson Cove, South Point Higgins, Shull, Sunset, South Refuge Cove, Thomas Basin and Seaport.

[14] Bolded red font results exceed the Alaska Water Quality Standards (18 AAC 70.020(b)(14)(D).

[15] 9 samples were collected in 2017, and 18 samples were collected in 2018 at Beach Hill. This site was not sampled during 2019.

[16] Confluent growth

[17] 7 samples were collected in 2018, and 18 samples were collected in 2019 at Rotary Beach and Mt Point Surprise Beach. These were new monitoring location in 2018.

[18] NA – beach not sampled in a given year.

[19] 9 samples were collected in 2017, and 11 samples were collected in 2018, and 18 samples were collected in 2019 at Rotary Pool.

[20] 11 samples were collected in 2018 and 18 samples were collected in 2019 at Mt Point Cultural Food. This was a new monitoring location in 2018.

[21] 18 samples were collected in 2018 and 18 samples were collected in 2019 at Herring Cove. This was a new monitoring location in 2018.

2017 Results

Nine sites (Knutson Cove, Beacon Hill, South Point Higgins, Shull, Sunset, South Refuge Cove, Thomas Basin, Seaport and Rotary Pool) were sampled weekly from July 18 through September 13, 2017. All nine sites failed to meet fecal coliform standard for the harvesting use.

The number of fecal coliform bacteria colonies in each sample ranged from <1 CFU/100 ml (non-detect) to >2000[22] CFU/100 ml (confluent growth) at the Ketchikan beach monitoring sites. All nine of the monitoring sites failed to meet the 10% of samples criterion for fecal coliform bacteria. Confluent growth was encountered at two beaches (Seaport and Thomas Basin) on August 22, 2017 exceeding the 10% of samples criterion for the aquaculture use for cooked products.

Five of nine sites (Knudson Cove, Shull, Sunset, Thomas Basin, Seaport and Rotary Pool) also exceeded the geometric mean criterion for harvesting use. Rotary Pool also exceeded the geometric mean criterion (>20 CFU/100 ml) for aquaculture and seafood processing uses. Table 5 shows the analytical data results of fecal coliform testing for 2017 monitoring.

[22] In the 2017 report, 250 was used as a proxy value for confluent growth. Based on updated guidance, 2,001 is now being used (Julianne Ruffner, WA State Dept. of Ecology, personal communication, Nov 5, 2018).

Table 5. 2017 Fecal coliform testing results (CFU/100 ml)

Sample Date	Knudson Cove	Beacon Hill	South Pt Higgins	Shull	Sunset	South Refuge Cove	Thomas Basin	Seaport	Rotary Pool
Jul 18/19	16	5	<1	8	<1 (<1)	11	5	3 (<1)	6
Jul 24/25	5	2	8	167 (68)	16	11 (7)	9	7	68
Jul 26/27	9	6	16 (2)	12	13	8	14	3	137 (99)
Jul 31/Aug 1	167	6	<1	6	41 (8)	7	7	4 (7)	9
Aug 8/9	98	11	7 (3)	4	142	8 (15)	42	21	27
Aug 14/15	6 (9)	22	161	27	15	6	36	37	21 (11)
Aug 22/23	>200 TNTC	58	37	33	51 (29)	69 (32)	>2000 CG	>2000 CG	>200 TNTC
Aug 29	2	18	5	16	3 (2)	7	<1	41	9
Sep 13	12	8	2	9	17	4	13	21 (22)	6
Seasonal Fecal Geometric Mean	20	10	6	15	14	10	16	20	24

CFU = colony forming units

CG = confluent growth

TNTC = too numerous to count

2018 Results

13 monitoring sites (Knutson Cove, Beacon Hill, South Point Higgins, Shull, Sunset, South Refuge, Thomas Basin, Seaport, Rotary Park, Rotary Pool, Mountain Point Surprise Beach, Mountain Point Cultural Food, and Herring Cove) were sampled weekly from May 17 to September 12, 2018. Eleven of the 13 monitoring sites failed to meet the fecal coliform standard for the harvesting use. Only Rotary Park and Mountain Point Surprise Beach met fecal coliform standards.

The number of fecal coliform bacteria colonies in each sample ranged from <1 CFU/100 ml (non-detect) to > 2000 CFU/100 ml (confluent growth) at the Ketchikan beach monitoring sites. All eleven failed the 10% of samples criterion. Confluent growth was encountered in the marine water sample at Thomas Basin collected on August 9, 2018. Thomas Basin failed the 10% of samples criterion for the aquaculture use for cooked products.

Eight of the 13 monitoring sites (South Point Higgins, Shull, Sunset, South Refuge, Thomas Basin, Mountain Point Cultural Food, and Herring Cove) also failed to meet the Alaska WQS geometric mean criterion. In addition, three of the 13 sites (South Point Higgins, Thomas Basin and Herring Cove) exceeded the geometric mean criterion of 20 CFU/100 ml for the aquaculture and seafood processing uses. Table 6 shows the analytical data results of fecal coliform bacteria for 2018 monitoring.

Table 6. 2018 Fecal coliform testing results (CFU/100 ml)

Sample Date	Knudson Cove	Beacon Hill	S Pt Higgins	Shull	Sunset	S Refuge Cove	Thomas Basin	Seaport	Rotary Beach	Rotary Pool	Mt Point Surprise Beach	Mt Point Cultural Food	Herring Cove
May 17	28 (26)	3	5	3	3	5	1	<1	--	<1	--	8	2
May 22	144	26	84	132	48	64	81	51	--	39 (17)	--	46	94
May 31	26	66	56 (48)	27	51	49	12	33	--	23	--	21	9
Jun 6	15	15	31	29 (22)	11	18	139	13	--	36	--	103	123
Jun 14	11	46	65	118	31	33	19	16	--	169	--	9	32 (28)
Jun 20	6	5	8	6	4	6	9	3	13	--	15 (11)	--	67
Jun 27	17	13	22	15	12	10	19	8 (8)	26	--	23	--	13
Jul 2	9	10	11	26	21 (17)	15	41	3	8	--	9	--	18
Jul 12	18	9	136	14	28	26 (22)	37	5	8	--	3	--	33
Jul 18	2	3	2	5	5	7	19	3	4	--	2	--	32 (31)
Jul 26	32	50	236	4	67	22 (19)	23	6	13	--	9	--	45
Aug 1	6	10	33	12 (9)	8	1	24 (21)	5	5	--	5	--	18
Aug 9	8	30	168	119	93	53	>2000 CG	26	--	131	--	43	210
Aug 16	3 (2)	7	5	16	13	3	14	5	--	9	--	4	81
Aug 23	94	6	19	13	81	16	59	<1	--	24	--	<1 (<1)	246
Aug 30	3	2	3	25	8	88	49	4	--	4 (6)	--	4	56
Sep 5	42 (37)	10	3	49	23	55	72	5	--	3	NA	118	318
Sep 12	3	26	28	33	50	25	26	63	--	25	NA	98 (90)	213
Seasonal Geometric Mean	13	12	21	20	20	17	32	7	9	16	7	18	47

2019 Results

12 monitoring sites (Knutson Cove, South Point Higgins, Shull, Sunset, South Refuge, Thomas Basin, Seaport, Rotary Park, Rotary Pool, Mountain Point Surprise Beach, Mountain Point Cultural Food, and Herring Cove) were sampled weekly from May 15 to September 18, 2019. All of the 12 monitoring sites failed to meet the fecal coliform standard for the harvesting use.

The number of fecal coliform bacteria colonies in each sample ranged from <1 CFU/100 ml (non-detect) to >2000 CFU/100 ml (confluent growth) at the Ketchikan beach monitoring sites. All twelve monitoring sites failed to meet the 10% of samples criterion. Confluent growth was encountered in the marine water samples at Rotary Beach on June 11 and Shull Beach and Rotary Pool on August 21, 2019. Seven of 12 sites failed to mean the 10% of samples criterion for the aquaculture use for cooked products (>400 CFU/100 mL).

11 of 12 sites also failed the geometric mean criterion. The only beach that met the geometric mean criterion for harvesting was Seaport. In addition, 10 of the 12 sites (all but Seaport and Surprise Beach) also exceeded geometric mean criterion for the aquaculture and seafood processing uses. Table 7 shows the analytical data results of fecal coliform bacteria for 2019 monitoring.

Table 7. 2019 Fecal coliform results (CFU/100 ml)

Sample Date	Knudson Cove	S Pt Higgins	Shull	Sunset	S Refuge Cove	Thomas Basin	Seaport	Rotary Beach	Rotary Pool	Mtn Point Surprise Beach	Mtn Point Cultural Food	Herring Cove
5/15	5 (4)	52	3	17	6	55	2	10	6	21	18	30
5/22	3	7 (8)	13	15	6	11	<1	8	<1	8	9	12
5/29	20	12	3 (2)	7	48	6	3	11	9	4	61	14
6/5	2	25	15	43 (39)	7	12	3	7	6	34	11	18
6/11	58	181	276	18	163 (155)	214	79	>2000 CG	206	37	86	113
6/19	14	76	34	12	2	16 (18)	6	10	<2	24	526	36
6/25	23	16	15	12	13	12	6 (8)	9	19	8	28	15
7/2	239	68	37	165	58	74	145	46	142 (112)	13	214	171
7/10	3	6	12	7	5	9	3	16 (8)	11	4	9	8
7/17	194	66	116	87	28	431	63	272	390	133 (118)	247	386
7/23	4	10	16	14	4	42	22 (18)	24	26	10	152	36
7/29	46	160	41	14	16	38	12	37	66	82	131	104 (92)
8/7	3 (1)	7	19	5	7	11	6	8	84	30	45	33
8/13	125	43 (55)	15	16	17	37	21	51	20	58	104	215
8/21	456	176	>2000 CG	190	184	258	10	94	>2000 CG (>2000 CG)	52	86	184
9/4	66	27	53	196	12	62	3	118	22	16	209 (210)	239
9/10	44	187	95	9	8 (22)	76	163	6	3	13	20	>400
9/18	12	12	19	9	6	48	17	25	5	13	131	216 (202)
Seasonal Fecal Geometric Mean	22	35	30	21	15	38	11	28	21	20	64	64

5.2 Enterococci

The water quality criteria for enterococci bacteria protects contact recreation use. This enterococci standard states that "In a 30-day period, the geometric mean of samples may not exceed 35 enterococci CFU/100 ml" (geometric mean criterion), "and not more than 10% of the samples may exceed a statistical threshold value (STV) of 130 enterococci CFU/100 ml" (10% of samples criterion) in 18 AAC 70 (14)(B)(i). The two criteria (i.e. the "geometric mean" and the "10% of samples") in this standards must both be met within a rolling 30-day period. If either criterion is exceeded, then the water at that location fails the standard. A summary of enterococci results for 2017-2019 is shown in Table 8.

Table 8. Summary of enterococci bacteria results for 2017 through 2019

Monitoring Locations	# of Samples [23]	Maximum (MPN/100 mL)[24]	Max 30-Day Percentage of Samples >130 MPN/100 ml[25]			Max 30-Day Geometric Mean CFU/100 ml[26]		
			2017	2018	2019	2017	2018	2019
Knudson Cove	45	**2603**	**40**[27]	**20**	**25**	**87**	**54**	**44**
Beacon Hill	27	**579**	**20**	**20**	NA	**55**	21	NA
South Point Higgins	45	**1120**	**20**	**60**	0	**67**	**70**	26
Shull	45	**754**	0	**40**	**50**	**44**	**37**	**73**
Sunset	45	**301**	**20**	**20**	**75**	**42**	30	28
South Refuge Cove	45	**3448**	**20**	0	**20**	**60**	27	27
Thomas Basin	45	**2755**	**60**	**80**	**75**	**106**	**451**	**254**
Seaport	45	**250**	**60**	0	**25**	**83**	13	17
Rotary Beach	25	**269**	NA[28]	0	**40**	NA	8	**44**
Rotary Pool	38	**2851**	**80**	**20**	**25**	**437**	30	**71**
Mt Point Surprise Beach	25	**384**	NA	0	**20**	NA	8	22
Mt Point Cultural Food	29	**934**	NA	**40**	**60**	NA	**43**	**177**
Herring Cove	36	**2595**	NA	**60**	**75**	NA	**113**	**403**

[23] See Table 4 footnotes for information on the number of samples collected at each site each year.

[24] MPN – most probable number is the measurement unit for enterococci bacteria using ASTM Method D6503.

[25] In a 30-day period, not more than 10% of samples may exceed a statistical threshold value (STV) of 130 enterococci CFU/100 ml.

[26] The geometric mean may not exceed 35 enterococci CFU/100 ml.

[27] Bolded red font results exceed the Alaska Water Quality Standards in18 AAC 70.020(b)(14)(B)(i).

[28] NA – beach not sampled in a given year.

2017 Results

Nine sites (Knutson Cove, Beacon Hill, South Point Higgins, Shull, Sunset, South Refuge Cove, Thomas Basin, Seaport and Rotary Pool) were sampled weekly from July 18 through September 13, 2017. All nine sites failed to meet enterococci standard for the contact recreation use (Table 9).

The number of enterococci in each sample ranged from <1.0 MPN/100 ml (non-detect) to 2,420 MPN/100 ml at the Ketchikan beach monitoring sites (Table 9). Eight of the nine monitoring sites (all except for Shull) failed to meet the 10% of samples criterion. All nine of the monitoring sites failed to meet the geometric mean criterion.

Table 9. 2017 Enterococci testing results (MPN/100 ml)

Sample Date	Knudson Cove	Beacon Hill	S Pt Higgins	Shull	Sunset	S Refuge Cove	Thomas Basin	Seaport	Rotary Pool
Jul 18/19	5.1	1.0	1.0	6.2	4.1 (5.2)	2.0	2.0	3 (3.1)	3.0
Jul 24/25	3.0	<1	4.1	124.6 (81.3)	8.5	6.1 (5.2)	4.1	2.0	45.7
Jul 26/27	12.2	19.3	7.4 (23.8)	27.5	10.9	12.1	>2419.6	7.3	980.4 (579.4)
Jul 31/Aug 1	15.6	26.6	13.1	20.6	34.1 (46.4)	26.6	3.0	3.1 (26.6)	47.4
Aug 8/9	1986.3	579.4	1119.9 (980.4)	75.9	248.1	1299.7 (157.8)	86.2	204.6	980.4
Aug 14/15	26.9 (26.3)	16.6	82.3	50.4	22.5	21.3	156.5	21.1	313.0 (69.7)
Aug 22/23	488.4	101.7	46.2	28.1	47.4 (33.7)	81.6 (57.8)	137.4	250.0	1119.9
Aug 29	1.0	7.2	24.3	3.0	<1 (8.5)	13.0	14.5	135.4	69.3
Sep 13	14.5	9.7	9.5	8.4	9.5	13.5	70.3	12	26.2
Maximum 30-Day Geometric Mean	87	55	67	44	42	60	106	83	437

2018 Results

13 monitoring sites (Knutson Cove, Beacon Hill, South Point Higgins, Shull, Sunset, South Refuge, Thomas Basin, Seaport, Rotary Park, Rotary Pool, Mountain Point Surprise Beach, Mountain Point Cultural Food, and Herring Cove) were sampled weekly from May 17 to September 12, 2018. Nine of the 13 monitoring sites failed to meet the enterococci standard for the contact recreation use. South Refuge Cove, Seaport, Rotary Beach and Mountain Point Surprise Beach met enterococci standards for contact recreation use in 2018.

The number of enterococci in each sample ranged from non-detect (<1.0 MPN/100 ml) to 2,755 MPN/100 ml at the Ketchikan beach monitoring sites. Nine of the 13 monitoring sites (Knudson, Beacon Hill, Sunset, South Point Higgins, Shull, Thomas Basin, Rotary Pool, Mt Point Cultural Food, and Herring Cove) failed to meet the 10% of samples criterion. Six of the 13 monitoring sites failed to meet the geometric mean criterion. The beaches that exceeded the enterococci geometric mean were Knudson Cove, South Point Higgins, Shull, Thomas Basin, Mt Point Cultural Foods, and Herring Cove. Table 10 shows the analytical data results for enterococci testing in 2018.

Table 10. 2018 Enterococci testing results (MPN/100 ml)

Sample Date	Knudson Cove	Beacon Hill	S Pt Higgins	Shull	Sunset	S Refuge Cove	Thomas Basin	Seaport	Rotary Beach	Rotary Pool	Mtn Point Surprise Beach	Mtn Point Cultural Food	Herring Cove
May 17	2595 (2603)	183	31	30	20	74	10	<10	NA	20	NA	10	31
May 22	341	30	61	20	63	95	51	10	NA	30 (20)	NA	106	30
May 31	20	<10	60 (70)	<10	<10	<10	41	<10	NA	10	NA	20	<10
Jun 6	<10	<10	<10	41 (30)	<10	41	173	30	NA	30	NA	121	109
Jun 14	<10	<10	410	144	31	10	20	10	NA	145	NA	<10	10 (<10)
Jun 20	<10	<10	<10	<10	10	<10	<10	20	10	NA	<10 (<10)	NA	<10
Jun 27	<10	71	<10	20	<10	20	10	<10 (<10)	10	NA	<10	NA	<10
Jul 2	74	<10	<10	<10	<10 (<10)	<10	<10	<10	<10	NA	<10	NA	10
Jul 12	20	41	350	<10	<10	<10 (10)	30	10	<10	NA	<10	NA	41
Jul 18	20	<10	<10	20	<10	<10	52	>10	10	NA	<10	NA	20 (30)
Jul 26	20	52	134	<10	61	20 (31)	52	<10	<10	NA	<10	NA	<10
Aug 1	20	<10	30	<10 (<10)	10	20	63 (52)	<10	10	NA	51	NA	20
Aug 9	10	10	241	727	187	97	2755	52	NA	336	NA	51	201
Aug 16	<10 (10)	10	<10	181	<10	<10	74	<10	NA	10	NA	10	31
Aug 23	86	10	31	10	41	10	496	<10	NA	31	NA	<10 (<10)	156
Aug 30	<10	10	10	<10	10	<10	350	10	NA	10 (<10)	NA	40	20
Sep 5	173 (131)	<10	<10	10	10	<10	528	10	NA	<10	NA	414	457
Sep 12	<10	10	279	20	<10	41	130	<10	NA	309	NA	183 (181)	414
Maximum 30-Day Geometric Mean	54	21	70	37	30	27	451	13	8	30	8	43	113

2019 Results

12 monitoring sites (Knutson Cove, South Point Higgins, Shull, Sunset, South Refuge, Thomas Basin, Seaport, Rotary Park, Rotary Pool, Mountain Point Surprise Beach, Mountain Point Cultural Food, and Herring Cove) were sampled weekly from May 15 to September 18, 2019 with the exception of the week of August 26. 11 of the 12 monitoring sites failed to meet the enterococci standard for the contact recreation use. South Point Higgins met the enterococci standard for contact recreation use.

The number of enterococci in each sample ranged from <1.0 MPN/100 ml (non-detect) to 3,448 MPN/100 ml at the Ketchikan beach monitoring sites. 11 of the 12 monitoring sites (Knudson Cove, Shull, Sunset, Thomas Basin, Rotary Park Pool, Rotary Park Beach, Mountain Point Cultural Food, and Herring Cove) failed to meet the 10% of samples criterion. Five of the 13 monitoring sites also failed to meet the geometric mean criterion. Seven of the 12 beaches exceeded the enterococci geometric mean were (Knudson Cove, Shull, Thomas Basin, Rotary Park Beach, Mt Rotary Pool, Point Cultural Beach, and Herring Cove. Table 11 shows the analytical data results for enterococci testing in 2019.

Table 11. 2019 Enterococci testing results (MPN/100 ml)

Sample Date	Knudson Cove	S Pt Higgins	Shull	Sunset	S Refuge Cove	Thomas Basin	Seaport	Rotary Beach	Rotary Pool	Mtn Point Surprise Beach	Mtn Point Cultural Food	Herring Cove
5/15	<10 (<10)	<10	<10	10	<10	256	<10	<10	<10	<10	<10	<10
5/22	<10	<10 (<10)	20	<10	<10	<10	<10	<10	<10	<10	10	<10
5/29	<10	<10	<10 (<10)	<10	<10	<10	<10	<10	10	<10	41	<10
6/5	31	<10	<10	<10 (<10)	<10	10	<10	<10	10	10	20	<10
6/11	52	130	199	<10	2851 (3448)	487	20	84	1576	20	323	41
6/19	10	10	<10	<10	<10	20 (20)	<10	10	20	10	620	10
6/25	41	10	<10	10	<10	10	<10 (<10)	<10	52	<10	50	<10
7/2	121	97	52	301	31	41	20	197	52 (108)	51	857	213
7/10	<10	<10	<10	<10	<10	<10	<10	<10 (<10)	<10	<10	<10	<10
7/17	369	20	108	31	10	984	20	269	2851	384 (218)	934	565
7/23	<10	<10	<10	<10	<10	10	<10 (<10)	10	<10	<10	259	10
7/29	<10	10	20	10	97	<10	<10	30	41	<10	41	20 (20)
8/7	<10 (<10)	<10	10	<10	20	<10	<10	<10	<10	<10	20	<10
8/13	84	10 (10)	10	<10	<10	10	20	<10	<10	10	51	613
8/21	309	74	386 (379)	156	118	450	<10	50	372	41	84	63
9/4	20	10	<10	<10	10	1024	<10	20	52	<10	20 (20)	262
9/10	<10	10	754	<10	<10 (<10)	63	20	10	<10	<10	<10	2595
9/18	121	63	20	148	52	144	173	20	<10	10	97	185 (173)
Max 30-Day Geometric Mean	44	26	73	28	27	254	17	44	71	22	177	403

5.3 Microbial Source Tracking (MST)

MST results cannot conclusively determine presence or absence of a particular source, but repeated testing over the years suggests that human sources likely contribute to bacteria pollution at all sites. Additionally, dog and gull results point to wildlife sources at most beaches as well. MST results for individual markers are not statistically correlated with either fecal coliform or enterococci concentration, and unquantified environmental processes that break down, transport, and dilute the DNA. MST tests use these results to make inferences about the relative contributions of different sources to the bacteria contamination. A summary of MST results across the 2017-2019 monitoring years is included in Table 12.

Table 12. Summary of Microbial Source Tracking (MST) results for 2017 through 2019.

Monitoring Locations	MST Human			MST Dog			MST Gull		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
Knudson Cove	1380	DNQ	918	NA	ND	DNQ	NA	DNQ	ND
Beacon Hill	160	DNQ	NA	NA	DNQ	NA	NA	DNQ	NA
South Point Higgins	DNQ	2990	DNQ	NA	991	ND	NA	DNQ	DNQ
Shull	168	158	DNQ	NA	299	ND	NA	307	3770
Sunset	DNQ	216	DNQ	NA	1860	ND	NA	DNQ	ND
South Refuge Cove	153	771	DNQ	NA	ND	808	NA	DNQ	ND
Thomas Basin	138	287	DNQ	NA	359	DNQ	DNQ	906	3650
Seaport	1180	DNQ	ND	NA	DNQ	ND	NA	7000	1260
Rotary Beach	NA	NA	1350	NA	NA	DNQ	NA	NA	ND
Rotary Pool	DNQ	DNQ	ND	DNQ	37200	DNQ	146	2420	ND
Mt Point Surprise Beach	NA	NA	1940	NA	NA	ND	NA	NA	ND
Mt Point Cultural Food	NA	8770	ND	NA	DNQ	ND	NA	DNQ	ND
Herring Cove	NA	588	DNQ	NA	12	547	NA	11900	20200

NA – not available, not tested.
DNQ – detected, not quantified.
ND – non-detect

2017 Results

In addition to bacteria testing, source pollution investigation using microbial source tracking for bacteria genetic identification was conducted on August 8/9, 2017 samples. All nine of the monitoring locations were analyzed for human Bacteroidetes ID hosts. The human host marker was detected at all nine monitoring locations.

Based on the beach recreation activities and congregation of sea birds, two locations (Thomas Basin and Rotary Beach) were also analyzed for dog, gull and goose Bacteroidetes ID hosts. The dog and gull host markers were detected at Rotary Pool; the goose host marker was not detected. The gull host marker was also detected at Thomas Basin. Table 13 shows the host bacteria that were targeted for the 2017 monitoring project and the final results of the analyses.

Table 13. Microbial Source Tracking Results for 2017

Bacteriodetes Type	Knudson Cove	Beacon Hill	S Pt Higgins	Shull	Sunset	S Refuge Cove	Thomas Basin	Seaport	Rotary Pool
Human	1380.0	160.0	DNQ	168.0	DNQ	153.0	138.0	1180.0	DNQ
Gull	NA	NA	NA	NA	NA	NA	DNQ	NA	146
Goose	NA	NA	NA	NA	NA	NA	NA	NA	ND
Dog	NA	NA	NA	NA	NA	NA	NA	NA	DNQ

NA – not available, not tested.
DNQ – detected, not quantified.
ND – non-detect

2018 Results

On August 9, 2018, 11 of 13 monitoring sites were tested for genetic markers. (Only one of the alternating beaches at Rotary Park and at Mountain Point were analyzed for microbial source tracking; Rotary Pool and Mt Point Cultural Food sites.) The human host marker and the gull host marker were detected at all 11 monitoring locations. Nine of the 11 monitoring locations also had dog host markers detected. Knudson Cove and South Refuge Cove beaches did not have dog host markers present. Table 14 shows the host bacteria that were targeted for the 2018 monitoring project, and the final results of the analyses.

2019 Results

On July 30 and September 10, 2019 all 12 monitoring sites were tested for genetic markers. The human host marker was detected at nine locations (excluding Mt Point Cultural Foods, Rotary Pool, and Seaport). The gull host marker was detected at four locations (Seaport, Thomas Basin, Shull, Herring, and South Point Higgins), and the dog host marker was detected at six locations (Herring, South Refuge, Knudson, Rotary Park Beach, Rotary Pool, and Thomas Basin). Table 15 shows the host bacteria that were targeted for the 2019 monitoring project, and the final results of the analyses.

Table 14. Microbial Source Tracking Results for 2018

Bacteriodetes Type	Knudson Cove	Beacon Hill	S Pt Higgins	Shull	Sunset	S Refuge Cove	Thomas Basin	Seaport	Rotary Beach	Rotary Pool	Mtn Point Surprise Beach	Mtn Point Cultural Food	Herring Cove
Human	DNQ	DNQ	2990	158	216	771	287	DNQ	NA	DNQ	NA	8770	588
Dog	ND	DNQ	991	299	1860	ND	359	DNQ	NA	37200	NA	DNQ	12
Gull	DNQ	DNQ	DNQ	307	DNQ	DNQ	906	7000	NA	2420	NA	DNQ	11900

NA – not available, not tested.

DNQ – detected, not quantified.

ND – non-detect

Table 15. Microbial Source Tracking Results for 2019

Bacteriodetes Type	Knudson Cove	Beacon Hill	S Pt Higgins	Shull	Sunset	S Refuge Cove	Thomas Basin	Seaport	Rotary Beach	Rotary Pool	Mtn Point Surprise Beach	Mtn Point Cultural Food	Herring Cove
Human	918	NA	DNQ	DNQ	DNQ	DNQ	DNQ	ND	1350	ND	1940	ND	DNQ
Dog	DNQ	NA	ND	ND	ND	808	DNQ	ND	DNQ	DNQ	ND	ND	547
Gull	ND	NA	DNQ	3770	ND	ND	3650	1260	ND	ND	ND	ND	20200

NA – not available, not tested.

DNQ – detected, not quantified.

ND – non-detect

6. SANITARY SURVEYS & TIDAL MOVEMENT

Marine sanitary surveys were conducted at all 12 monitoring locations during each of the 18sampling events of 2019, and all 13 monitoring locations during each of the 18 sampling events of 2018[29]. A site-specific EPA Marine Beach Sanitary Survey was used to record water recreational and beach usage activities, wildlife, weather, water and air temperature, tidal conditions, and potential sources of pollution. Sanitary surveys summary tables with comparison to analytical results from 2018 and 2019 are attached as Appendix B. The survey observations of potential sources at each monitoring location are shown in Table 2. Site photographs from 2018 and 2019 are attached as Appendix A. Graphs showing individual monitoring location results from 2018 and 2019 are attached in Appendix D.

The following summations provide discussion of how the sanitary survey observations and analytical results may relate to one another.

- Increased precipitation, as well as extended periods of low precipitation, were associated with elevated bacteria levels in the marine water samples in 2018 and 2019. Notably, large storm events prior to the June 11, July 17, and Aug 21, 2019 sampling events were associated with high fecal coliform and enterococci concentrations, while elevated concentrations were also observed across most sites during the driest period of the summer (July 2, 2019) (Figure 9). There was no apparent linear correlation between bacteria concentration and precipitation.

- Both clear and turbid water conditions had elevated bacteria levels in the marine water samples, and turbidity conditions appeared less relevant to bacteria concentrations than precipitation (Figures 10 - 11).

- During 2018, the combination of heavy rain (1.71 inches in less than 24 hours on August 9, 2018), and turbid conditions at most locations, generally resulted in elevated bacteria levels in the marine water samples. On August 9, 2018, confluent bacteria growth was detected at Thomas Basin.

- The number of waterfowl on the beaches does not have an apparent correlation with elevated bacteria levels in the marine water samples. Some time periods have a significant number of waterfowl with low bacteria levels, and other time periods have a small amount of waterfowl with elevated bacteria levels. There are also times when both waterfowl and bacteria levels are elevated.

[29] Rotary Park and Mountain Point beaches alternate between two monitoring locations; Rotary Pool and Rotary Beach, and Mt. Point Surprise Beach and Mt. Point Cultural Food.

- Both wildlife and anthropogenic influences were detected at seven beaches during the 2019 season, and all beaches tested in the 2018 and 2017 seasons.

- Multiple environmental variables likely contribute to bacteria concentrations, and a multivariate statistical approach, such as those available in the Virtual Beach tool, may provide more insights into which combination of factors is most relevant to each site.

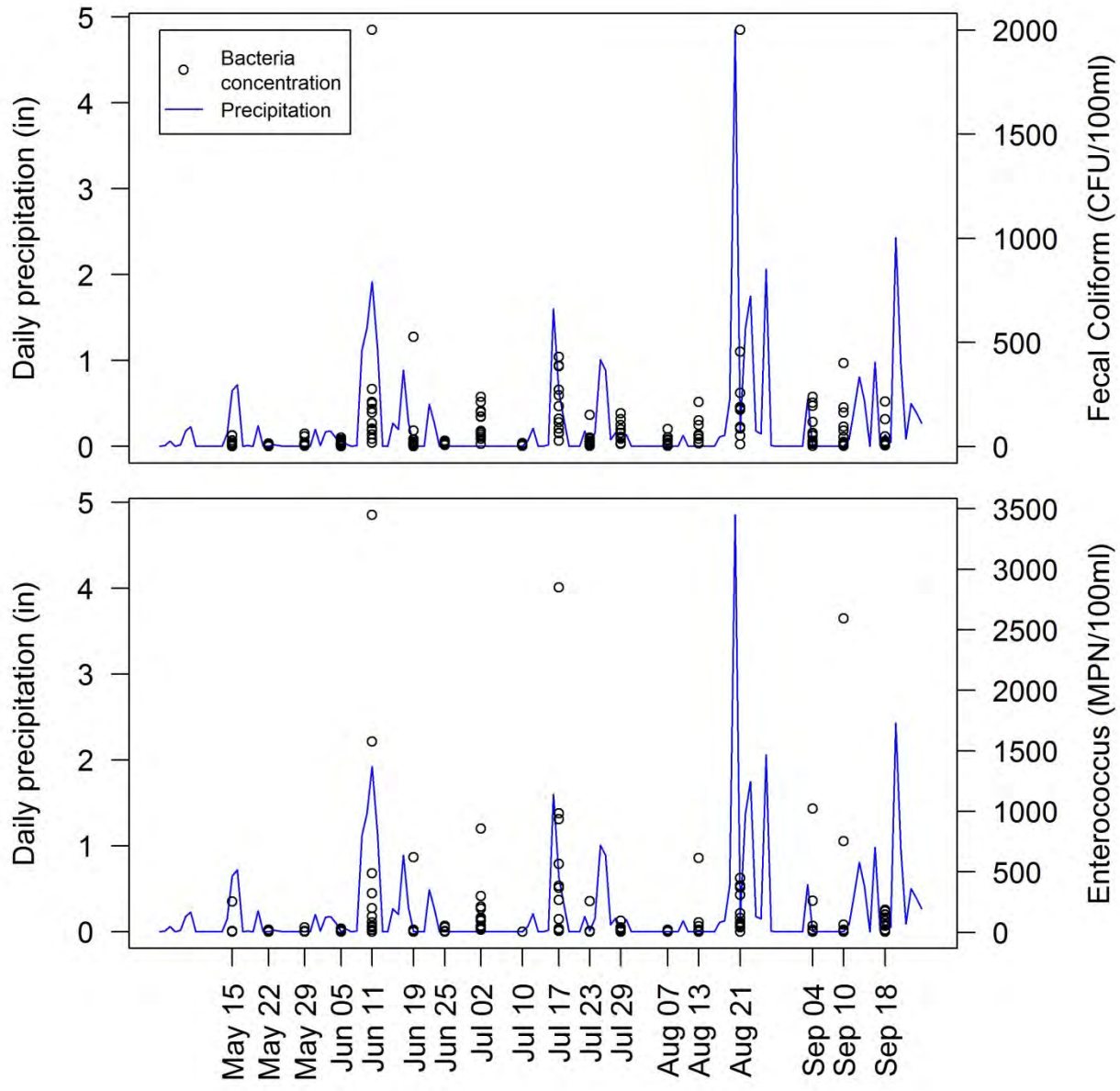


Figure 9. Bacteria concentrations in relation to precipitation across the 2019 sampling season.

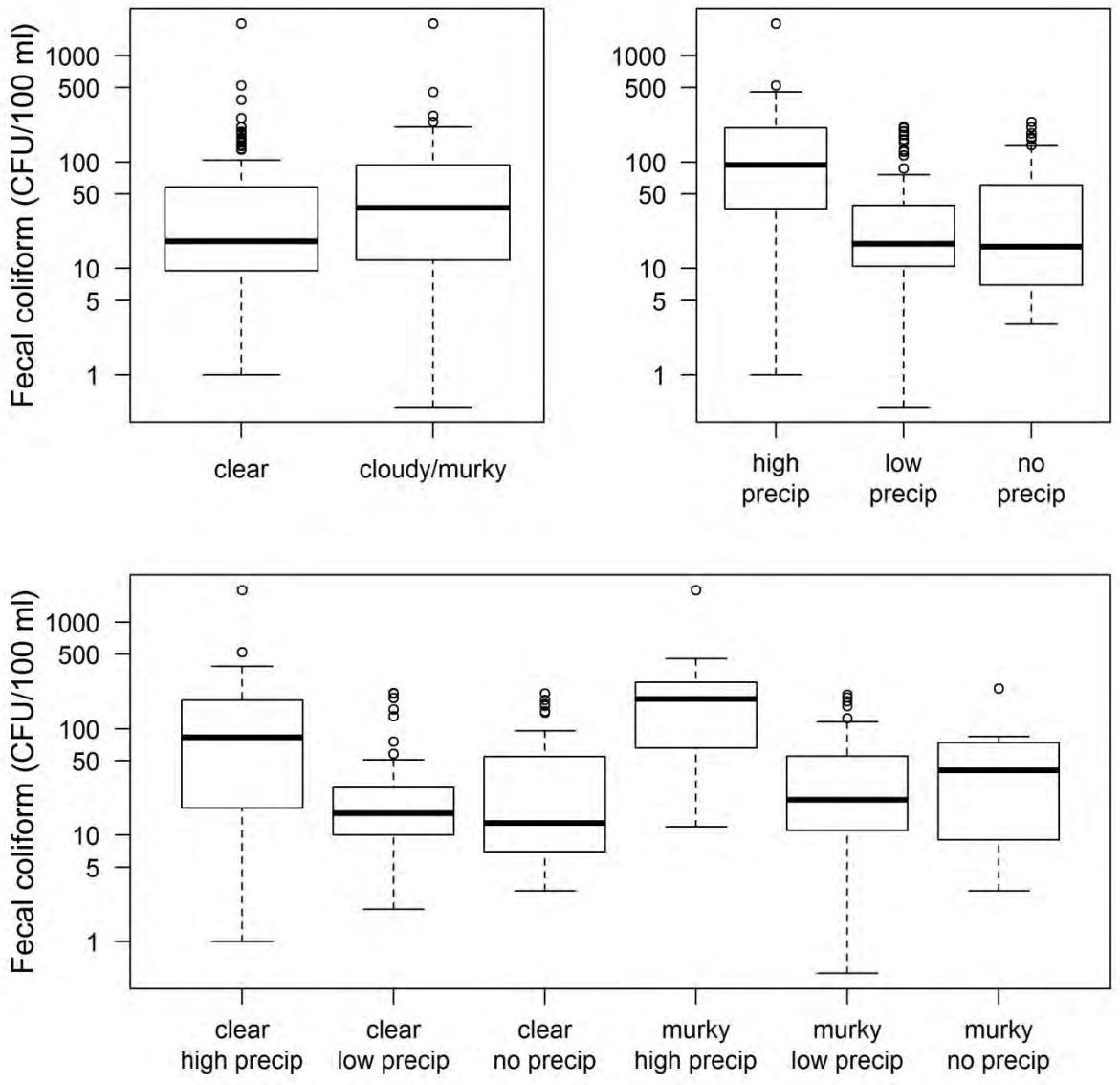


Figure 10. Fecal coliform concentrations at sampling sites across turbidity and precipitation conditions during the 2019 season.[30]

[30] For precipitation, "high" includes sampling dates with >1" in the preceding 72 hours, and "low" includes sampling dates with >0" and <1" in the preceding 72 hours.

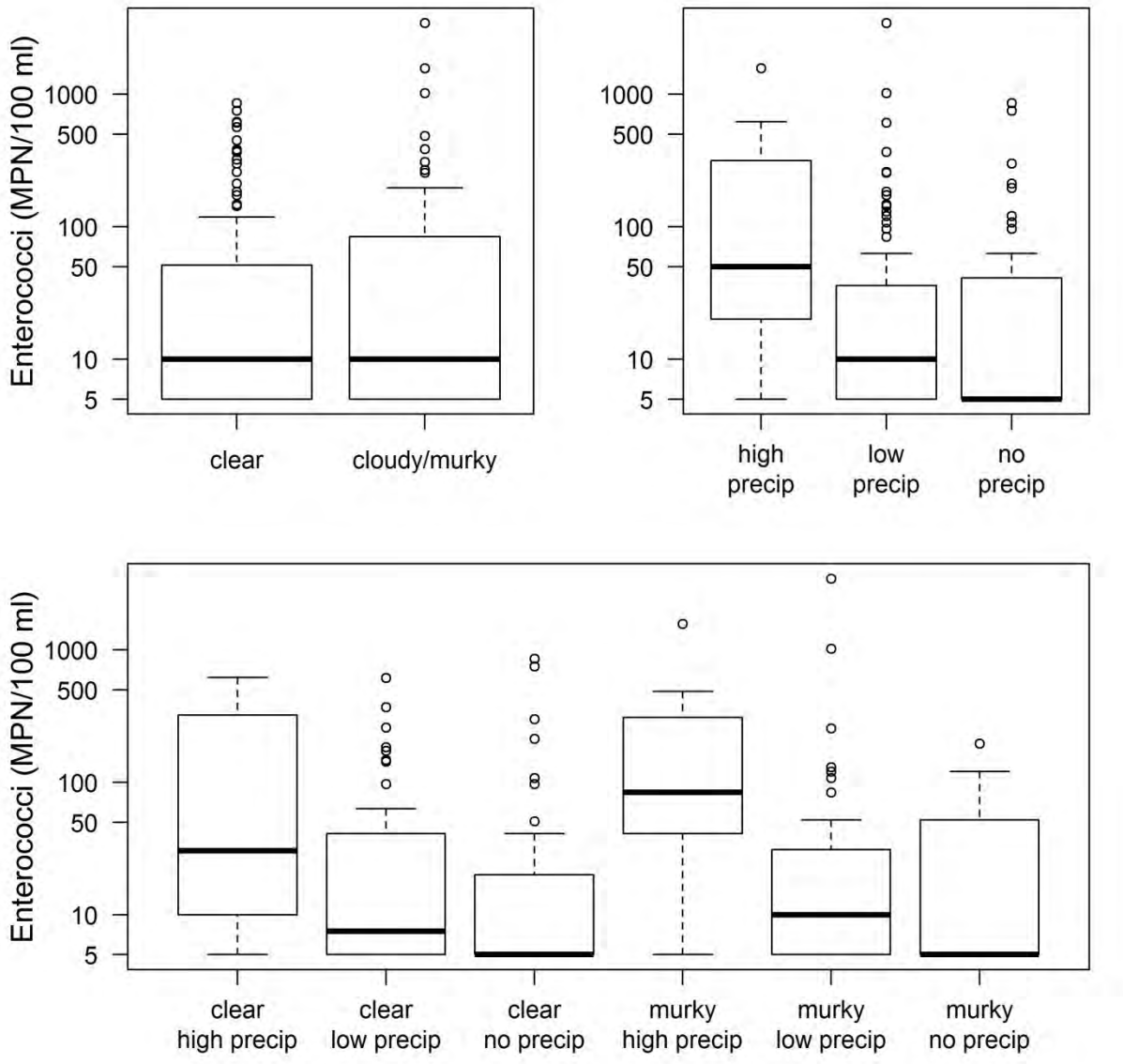


Figure 11. Enterococci concentrations at sampling sites across turbidity and precipitation conditions during the 2019 season.[33]

Tidal movement in Tongass Narrows generally follows the schematics in Figures 12 - 13[31]. NOAA staff[32] remarked that there is a flood tide convergence zone at the most narrow section. That zone does move NW/SE during flood tide (or divergence with minor upwelling at ebb) which is supported by basic fluid dynamics of the tide. It is not expected that a one-way tidal set would occur in the Narrows (with the exception of a tsunami). During the 2019 sampling season, peak predicted near-surface tidal current speeds were around 1.6 KT near the beginning of August and again during the beginning of September. Predictions can be found at https://tidesandcurrents.noaa.gov/noaacurrents/Predictions?id=SEA0711_12.

However, NOAA used a small data set (which can be found at https://tidesandcurrents.noaa.gov/cdata/StationInfo?id=SEA0711) to develop these harmonics, and the data set has limitations. It is possible that a spring or fall sampling deployment may offer a more robust data set.

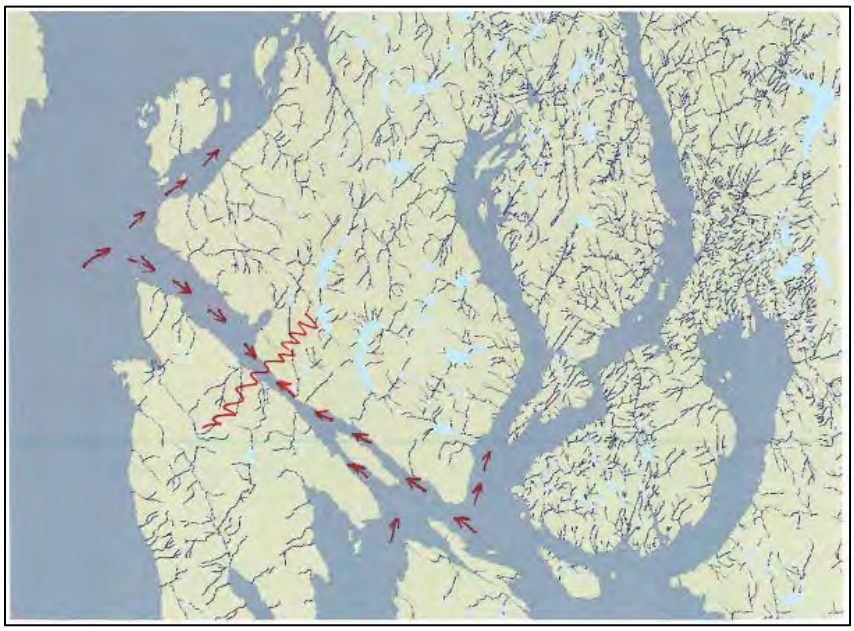


Figure 12. General direction of currents during Tongass Narrows flood tide.

[31] The schematic for the tidal movement in the Tongass Narrows was provided by Steven Corporon, Director of the Harbormaster's Office in Ketchikan, Alaska.

[32] Joel Curtis of NOAA provided measurements and predictions for the Tongass Narrows.

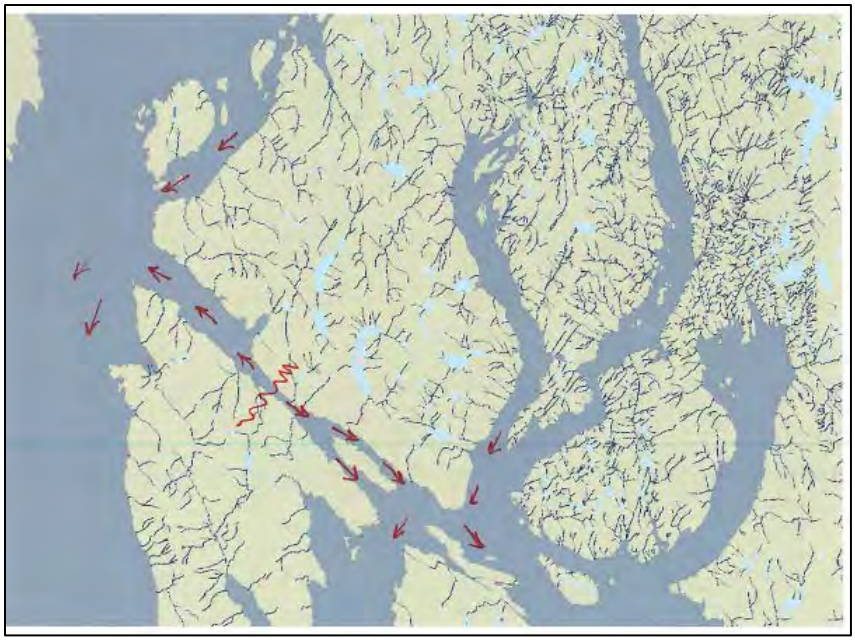


Figure 13. General direction of currents during Tongass Narrows ebb tide

7. PUBLIC OUTREACH

Four press releases were distributed between May 24 and September 18, 2018 providing detailed monitoring information and precautionary measurements to avoid exposure to bacteria impacted marine water. To further notify the public, the City of Ketchikan posted advisory signs at the beaches warning of elevated bacteria levels for 2018, and each week DEC posted information about which beaches had elevated bacteria levels on the Ketchikan Events Facebook page. Copies of these press releases can be found on the DEC's Alaska BEACH Grant Program website at http://dec.alaska.gov/water/water-quality/beach-program/. The EPA Beach webpage provides detailed beach information, and can be found at https://www.epa.gov/beaches.

During 2019, two press releases were distributed on June 13 and July 5, providing detailed monitoring information and precautionary measurements to avoid exposure to bacteria impacted marine water. Copies of these press releases can be found on the DEC's Alaska BEACH Grant Program website at http://dec.alaska.gov/water/water-quality/beach-program/. To further notify the public, the City of Ketchikan posted advisory signs at the beaches warning of elevated bacteria levels for 2019, and each week DEC posted information about which beaches had elevated bacteria levels on the Ketchikan Events Facebook page (Figure 14). The EPA Beach webpage provides detailed beach information, and can be found at https://www.epa.gov/beaches.

On April 5, 2019, DEC and SAWC staff presented on the Ketchikan environmental projects at the Friday Night Insights event at the Forest Service Southeast Discovery Center in Ketchikan Alaska. DEC's Water Quality Standards, Assessment and Restoration staff discussed the overall Ketchikan BEACH monitoring project and results through the 2018 season. SAWC provided information on the BEACH monitoring for 2019 recreational season and the Watershed Management Plan that is

being developed to address environmental issues throughout Ketchikan. (Now former) DEC Cruise Ship program manager, Ed White, gave an update on cruise ships treatment and monitoring results, as well as the air scrubber systems. Also on April 5th, staff from DEC, SAWC and KIC met with Ketchikan's Point Higgins Elementary School 4th grade students and their teachers on Ketchikan Creek to share information on stream ecosystem and health, and how the community can help improvement water quality.

On November 12, 2019, DEC, SAWC, and KIC staff will present on the results of the 2019 BEACH monitoring season at a public meeting at the Ketchikan Public Library in Ketchikan, Alaska. KIC staff will present information about the monitoring approach, and SAWC staff will present data results and discussed next steps associated with the Watershed Management Plan. DEC Cruise Ship Program staff will present a summary of the cruise ship season and answer questions, and DEC Water Quality Section will staff provide information about the summer 2019 algal bloom and the upcoming 2020 monitoring program.

The BEACH monitoring project is funded by the EPA's BEACH Act Grant, and the Watershed Management Plan project is funded by DEC's ACWA Grant Program.

Figure 14. Example Facebook post highlighting beaches with recreation advisories.

8. CONCLUSIONS

Eleven of 13 monitoring sites (Knudson Cove, Beacon Hill, South Point Higgins, Shull, Sunset, South Refuge Cove, Thomas Basin, Seaport, Rotary Pool, Mountain Point Cultural Food, and Herring Cove) failed to meet one or both of the fecal coliform criteria protecting the harvesting use for two or more years (Table 4). Eleven of 13 failed to meet the 10% of samples criterion for fecal coliform bacteria for two or more years. Nine of 13 monitoring sites failed to meet the geometric mean criterion for fecal coliform bacteria.

Eleven of 13 monitoring sites (Knudson Cove, Beacon Hill, South Point Higgins, Shull, Sunset, South Refuge Cove, Thomas Basin, Rotary Pool, Mountain Point Cultural Food, and Herring Cove)

failed to meet one or both of the enterococci criteria protecting the contact recreation use for two or more years during this study (Table 8). Eleven of 13 sites failed to meet the 10% of samples criterion for enterococci for two or more years. Seven of 13 sites failed to meet the geometric mean criterion for enterococci.

The human bacteroidetes ID was detected at all of the monitoring locations during one or more years. Dog bacteroidetes were detected at 12 of 13 sites (all except Mountain Point Surprise Beach, one test only). Gull bacteroidetes were detected at 11 of the 13 sites (all except Rotary Beach Park and Mountain Point Surprise Beach, one test only). Table 12 provides a summary of the microbial source tracking results.

Given the numerous potential bacteria sources to the coastal beaches monitored, several sources may be contributing to the elevated bacteria levels at each location, with influence from air and water temperature and precipitation. The DEC-funded Watershed Management Plan (ACWA Grant 19-04) will encompass the entire Ketchikan area, and will evaluate management options to reduce bacteria entering Ketchikan freshwater watersheds and coastal marine waters from known diverse point and nonpoint bacteria discharges and sources. This plan, being developed in collaboration with tribal, local, and state governments and the Ketchikan community, has a draft and final versions scheduled for completion in September 2020 and February 2021, respectively.

The monitoring program and management plan will help support the development of recommendations for best management practices and wastewater treatment to reduce bacteria levels along the Ketchikan coastline. All bacteria sources will need to be better controlled to improve Ketchikan's marine waters.

9. REFERENCES

Alaska Department of Environmental Conservation. 2018. 18 AAC 70, Water Quality Standards. Amended as of April 6, 2018.

U.S. Environmental Protection Agency. 2014. National Beach Guidance and Required Performance Criteria for Grants, 2014 Edition (dated July 31, 2014). EPA-823-B-14-001.

Alaska Department of Environmental Conservation. 2018. Ketchikan BEACH Water Quality Monitoring and Pathogen Detection Quality Assurance Project Plan (dated April 2018).

Alaska Department of Environmental Conservation. 2018. Ketchikan BEACH Monitoring Handbook (dated May 2018).

Alaska Department of Environmental Conservation. 2019. Ketchikan Beach Monitoring 2017-2018 Field Report (dated February 12, 2019, Updated April 19, 2019).

Alaska Department of Environmental Conservation. 2018. Ketchikan Beach Monitoring July – September 2017 report (dated January 31, 2018).

National Oceanic and Atmospheric Administration. 2019. Personal communication with Joel Curtis (dated April 12, 2019).

Appendix A. Site Photographs

2019

Knudson Cove

Knudson Cove, Aug 7, 2019. From left, Cameron Tillisch, Rebecca Bellmore, Sam Najoukas (SAWC photo)

Knudson Cove, Aug 7, 2019 (SAWC photo)

Knudson Cove, Aug 7, 2019. Sam Najoukas (SAWC photo)

South Point Higgins

South Point Higgins, Aug 7, 2019. Sam Najoukas (SAWC photo)

South Point Higgins, Aug 7, 2019. Cameron Tillisch (SAWC photo)

South Point Higgins, Aug 7, 2019 (SAWC photo)

South Point Higgins, Aug 7, 2019 (SAWC photo)

Shull

Beach at Shull Road, Aug 7, 2019. From left, Rebecca Bellmore, Cameron Tillisch, Sam Najoukas (SAWC photo)

Beach at Shull Road, Aug 7, 2019. From left, Rebecca Bellmore, Cameron Tillisch, Sam Najoukas (SAWC photo)

Beach at Shull Road, Aug 7, 2019 (SAWC photo)

Beach at Shull Road, Aug 7, 2019. Rob Cadmus (SAWC photo)

Beach at Shull Road, Aug 7, 2019. Outfall pipe (SAWC photo)

Sunset

Beach at Sunset Road, Aug 7, 2019. Sam Najoukas (SAWC photo)

Beach at Sunset Road, Aug 7, 2019. From left, Cameron Tillisch, Rebecca Bellmore, Sam Najoukas (SAWC photo)

Beach at Sunset Road, Aug 7, 2019. From left, Sam Najoukas, Cameron Tillisch, Rebecca Bellmore, (SAWC photo)

South Refuge Cove

South Refuge Cove, Aug 7, 2019. From left, Sam Najoukas, Cameron Tillisch (SAWC photo)

South Refuge Cove, Aug 7, 2019 (SAWC photo)

South Refuge Cove, Aug 7, 2019 (SAWC photo)

South Refuge Cove, Aug 7, 2019 (SAWC photo)

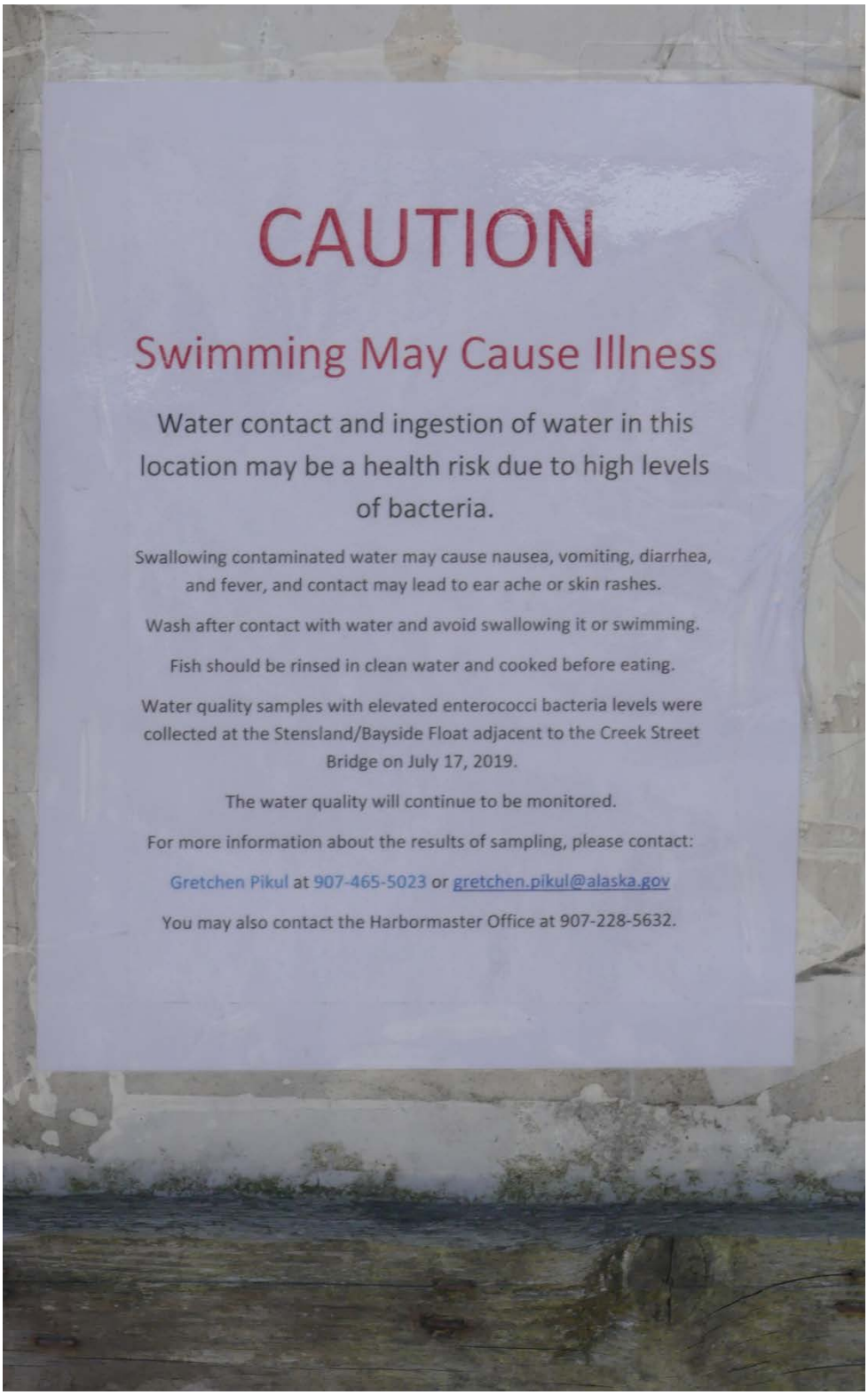
Thomas Basin

Thomas Basin, Aug 7, 2019. Sam Najoukas (SAWC photo)

Thomas Basin, Aug 7, 2019. Sam Najoukas (SAWC photo)

Thomas Basin, Aug 7, 2019. Sam Najoukas (SAWC photo)

Thomas Basin, Aug 7, 2019 (SAWC photo)



Thomas Basin, Aug 7, 2019. Water quality warning sign posted by the City of Ketchikan (SAWC photo)

Seaport Beach

Seaport Beach, Aug 7, 2019. From left, Cameron Tillisch, Sam Najoukas, Rebecca Bellmore, Rob Cadmus (SAWC photo)

Seaport Beach, Aug 7, 2019 (SAWC photo)

Seaport Beach, Aug 7, 2019. From left, Cameron Tillisch, Rebecca Bellmore, Sam Najoukas (SAWC photo)

Seaport Beach, Aug 7, 2019. Sam Najoukas (SAWC photo)

Seaport Beach, Aug 7, 2019. Sam Najoukas (SAWC photo)

Rotary Park Pool

Rotary Park Pool, Aug 7, 2019 (SAWC photo)

Rotary Park Pool, Aug 7, 2019 (SAWC photo)

Rotary Park Pool, Aug 7, 2019 (SAWC photo)

Rotary Park Pool, Aug 7, 2019. Sam Najoukas (SAWC photo)

Rotary Park Beach

Rotary Park Beach, Aug 7, 2019. Sam Najoukas (SAWC photo)

Rotary Park Beach, Aug 7, 2019. Sam Najoukas (SAWC photo)

Rotary Park Beach, Aug 7, 2019. Sam Najoukas (SAWC photo)

Rotary Park Beach, Aug 7, 2019 (SAWC photo)

Mountain Point Surprise Beach

Mountain Point Surprise Beach, Aug 7, 2019 (SAWC photo)

Mountain Point Surprise Beach, Aug 7, 2019. From left, Rob Cadmus and Sam Najoukas (SAWC photo)

Mountain Point Surprise Beach, Aug 7, 2019. Sam Najoukas (SAWC photo)

Mountain Point Surprise Beach, Aug 7, 2019 (SAWC photo)

Mountain Point Surprise Beach, Aug 7, 2019. Rob Cadmus (SAWC photo)

Mountain Point Cultural Food

Mountain Point Cultural Food, Aug 7, 2019 (SAWC photo)

Mountain Point Cultural Food, Aug 7, 2019. From left, Cameron Tillisch, Rebecca Bellmore, Sam Najoukas (SAWC photo)

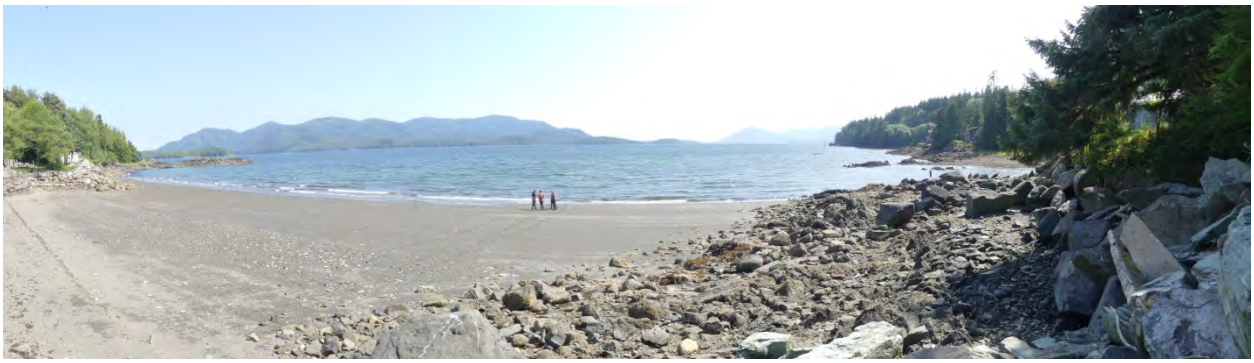
Mountain Point Cultural Food, Aug 7, 2019. From left, Cameron Tillisch and Sam Najoukas (SAWC photo)

Mountain Point Cultural Food, Aug 7, 2019. Ketchikan Gateway Borough notification of secondary treatment outfall near the beach. (SAWC photo)

Herring Cove

Herring Cove, Aug 7, 2019. From left, Cameron Tillisch, Sam Najoukas, Rebecca Bellmore (SAWC photo)

Herring Cove, Aug 7, 2019 (SAWC photo)



Herring Cove, Aug 7, 2019 (SAWC photo)

Herring Cove, Aug 7, 2019. Sam Najoukas (SAWC photo)

Herring Cove, Aug 7, 2019. Outfall in Herring Bay (SAWC photo)

Herring Cove, Aug 7, 2019. Posting notifying the public of the outfall. (SAWC photo)

2018

Knudson Cove (DEC photo taken August 16, 2018)

Beacon Hill (DEC photo taken August 16, 2018)

South Point Higgins (DEC photo taken August 16, 2018)

Shull Beach (DEC photo taken August 16, 2018)

Shull Beach (DEC photo taken August 16, 2018)

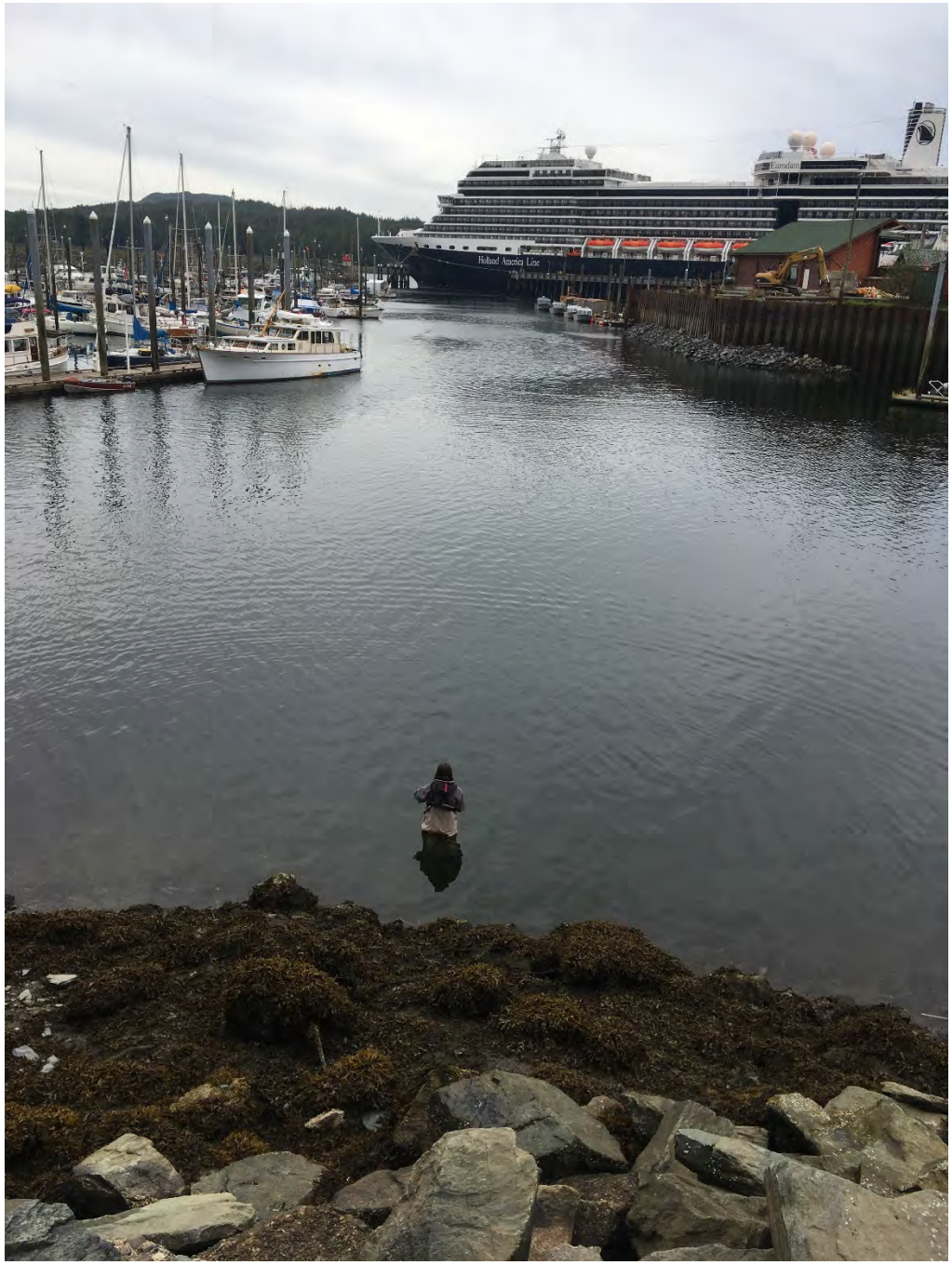
Sunset Beach (DEC photo taken August 16, 2018)

South Refuge Cove (DEC photo taken August 16, 2018)

South Refuge Cove (DEC photo taken August 16, 2018)

Thomas Basin (DEC photo taken August 16, 2018)

Thomas Basin (DEC photo taken August 16, 2018)



Thomas Basin (DEC photo taken August 16, 2018)

Seaport Beach (DEC photo taken August 16, 2018)

Rotary Park Beach (DEC photo taken April 25, 2018)

Rotary Park Beach (DEC photo taken April 25, 2018)

Rotary Park Pool (DEC photo taken August 16, 2018)

Rotary Park Pool (DEC photo taken August 16, 2018)

Mountain Point – Surprise Beach (Ketchikan Indian Community photo taken May 10, 2018)

Mountain Point – Cultural Foods Location (DEC photo taken August 16, 2018)

Mountain Point – Cultural Foods Location (DEC photo taken August 16, 2018)

Mountain Point – Cultural Foods Locations (DEC photo taken August 16, 2018)

Mountain Point – Cultural Foods Location (DEC photo taken August 16, 2018)

Herring Cove (DEC photo taken August 16, 2018)

Appendix B. Sanitary Survey Summary Tables with Comparison to Analytical Results

Contents

Notes on 2019 Summary Tables:

In the following tables, missing and erroneous rainfall data in sanitary survey forms were replaced with weather station data from the nearest weather station, downloaded from the National Climate Data Center online database (https://www.ncdc.noaa.gov/cdo-web/). Station "Ketchikan 10 N" data were applied to Knudson Cove, South Point Higgins, Shull, Sunset, and South Refuge Cove. Station "Ketchikan Airport" data were applied to Thomas Basin, Seaport Beach, Rotary Park Pool, Rotary Park Beach, Mountain Point Surprise Beach, Mountain Point Cultural Food, and Herring Cove. Daily precipitation totals from the day prior to the sampling event were considered "<24 hours", totals from two days prior were "<48 hours", and totals from three days prior were "<72 hours."

Missing and erroneous tidal phase data were replaced based on the following: "low" tide was considered +/- 2 hours from low tide time; "high" tide was considered +/- 2 hours from high tide time; flood tide was the time between low and high tide; ebb tide was the time between high and low tide.

Where appropriate, qualitative notes about visual turbidity were converted to the following categories: "clear", "cloudy/murky", "oily film", or "other." More detailed information about visual turbidity was moved to the "Notes" column.

Knudson Cove 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 4:12 AM	5 (4)	<10 (<10)		0.02	0.02	0.02	13.8	11.3	overcast	NW	5	low
5/22 4:12 AM	3	<10		0.2	0.2	0.2	13.8	11.3	overcast	NW	5	high
5/29 5:47 AM	20	<10		0	0	0	16.6	15.8	sunny and clear			low
6/5 10:50 AM	2	31		0.5	0.36	0.42	12.8	12.8	overcast/misting	NA	0	low
6/11 11:30 AM	58	52		0.5	0.7	0.7	16.4	15.8	rain			ebb
6/19 8:36 AM	14	10		0.24	0.76	0.96	14.5	15.3				low
6/25 9:55 AM	23	41		0	0.4	0.67	18	16.3	sunny and overcast	SE	3	ebb
7/2 7:11 AM	239	121		0	0	0	17.2	17.7	overcast	NA	0	low
7/10 11:00 AM	3	<10		0.02	0.02	0.02	25	15.6		NA	0	ebb
7/17 8:03 AM	194	369		0.38	0.47	0.47	15.1	17.6	light rain			low
7/23 9:14 AM	4	<10		0	0	0	14	13	slight rain with wind and lightning	NA	0	ebb
7/29 6:14 AM	46	<10	human = 9.18e+2; dog = DNQ; gull = ND	0.31	0.44	1.25	15	16.6	rain	NA	0	low
8/7 11:34 AM	3 (1)	<10 (<10)		0	0	0	17.5	19.1	sunny and clear		slight/weak	low
8/13 7:22 AM	125	84		0	0	0.2	14.3	17.8	sunny	NA	0	low
8/21 7:57 AM	456	309		3.19	3.19	3.66	16.2	15.9	rain	NA	0	ebb
9/4 7:53 AM	66	20		0.63	0.63	0.63	14.4	15.6	sunny and clear	NA	0	ebb
9/10 5:57 AM	44	<10		0	0	0	12.2	15.4	clear	NA	0	low
9/18 6:41 AM	12	121		0.31	0.79	0.79	9.7	13.4	sunny and clear	NA	0	ebb

Knudson Cove 2019

Sample Date/Time	Debris (%)		Vegetation (%)		Visual Turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 4:12 AM	0	0	15	20									2			None	no sewage odor present
5/22 4:12 AM	N	N	15	20	other	0	0	0	0	0	0		2			No	
5/29 5:47 AM					clear												
6/5 10:50 AM					clear	8				Y		Y				none	tourist boating, marina employees, fishermen, boaters, no water contact.
6/11 11:30 AM	some				clear	0	0	10			parked						Outfall
6/19 8:36 AM					clear			lots				Y					common collector pipe is visible
6/25 9:55 AM	0	0	15	10	clear	30+		25 (harbor)		Y	Y	X	5	2			outcrop divides beach end of pipe is not in sight; 13 kayaks
7/2 7:11 AM	5	0	40	10	cloudy/ murky	15+	0	Harbor	0	0	15+			0	3 eagles, 2 ravens, 10+ songbirds	none	pipe passes by sample location; end is exposed; shore was sludge like, beach grass is dominant, starfish
7/10 11:00 AM			15		cloudy/ murky			boat harbor									tourists present; sanitary water pipe ends at -2' tide
7/17 8:03 AM					clear								1			common collector outflow pipe end visible	
7/23 9:14 AM	0	0	0	0	cloudy/ murky	3	0	0					0	0	0	none	common collector pipe outfall present; bathrooms at marina; bloom-like green material on water's edge
7/29 6:14 AM			3-4	0	clear	0	0	4	0	0	0	0	3				some dog poop in parking lot;
8/7 11:34 AM	2	2	30	10	clear	0	0	many - marina					0	0	1 sea lion		
8/13 7:22 AM	0	0	15	20	cloudy/ murky	0	0	many - marina	0	0	2	0	0	0	0	none	one common collector pipe
8/21 7:57 AM	2	0	15	15	cloudy/ murky	0	0	3	0	0	0	0	0	0	0	mystery brown water?	bathrooms nearby; extremely turbid brown water, stormwater pipes or other flow present on beach
9/4 7:53 AM	10	10	15	15	other	0	0	3	0	0	0	0	0	1	0	none	bathrooms nearby; 1 sewage outfall pipe
9/10 5:57 AM	5	0	0	0	cloudy/ murky	0	0	0	0	0	0	0	3	0	0	none	bathrooms nearby, one collector pipe
9/18 6:41 AM	10	0	15	15	cloudy/ murky	0	0	0	0	0	0	0	0	0	0	slight	bathrooms nearby; 1 outflow

South Point Higgins 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 4:40 AM	52	<10		0.02	0.02	0.02	12.2	10.2	rain	NW	5	low
5/22 4:40 AM	7 (8)	<10 (<10)		0.2	0.2	0.2	12.2	10.2	rain	NW	5	high
5/29 5:33 AM	12	<10		0	0	0	16.5	15.7	sunny and clear			low
6/5 11:20 AM	25	<10		0.5	0.36	0.42	13.3	12.2	overcast			flood
6/11 11:45 AM	181	130		0.5	0.7	0.7	15.1	14.4	rain			ebb
6/19 8:23 AM	76	10		0.24	0.76	0.96	14.7	15.1				low
6/25 10:25 AM	16	10		0	0.4	0.67	14.5	14.7	sunny and clear			ebb
7/2 6:50 AM	68	97		0	0	0	15.1	15.2	overcast	S	2	low
7/10 11:25 AM	6	<10		0.02	0.02	0.02	18.2	16.3		NA	0	ebb
7/17 7:41 AM	66	20		0.38	0.47	0.47	14.7	14.7	light rain			low
7/23 9:26 AM	10	<10		0	0	0	13	11.4	slight rain with wind and lightning	E	2-3	low
7/29 5:57 AM	160	10		0.31	0.44	1.25	16.6	12.7	rain	NA	0	low
8/7 11:54 AM	7	<10		0	0	0	16	17.5	sunny and clear		light/med	low
8/13 7:05 AM	43 (55)	10 (10)		0	0	0.2	14.1	15.4	sunny	NA	0	low
8/21 8:11 AM	176	74		3.19	3.19	3.66	14.3	15.2	rain	N	2-3	ebb
9/4 8:08 AM	27	10		0.63	0.63	0.63	13	14	sunny and clear		1-2	ebb
9/10 5:40 AM	187	10	human = DNQ; dog = ND; gull = DNQ	0	0	0	13.2	13	clear	NA	0	low
9/18 6:53 AM	12	63		0.31	0.79	0.79	9.2	1.8	sunny and clear	NA	0	ebb

South Point Higgins 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 4:40 AM	0	0	15	10	cloudy/ murky												
5/22 4:40 AM	N	N	15	10	cloudy/ murky	0	0	0	0	0	0		0	0			
5/29 5:33 AM					clear												
6/5 11:20 AM					clear	2				2				1		none	large school of bait fish (see picture) in cove; discussion w/ 2 women about project
6/11 11:45 AM					cloudy/ murky	0	0	0	0	0	0						
6/19 8:23 AM					clear			5									
6/25 10:25 AM	0	0	5	5	clear	1					9			1			
7/2 6:50 AM	0	0	25	5	clear	0	0	5	0	0	0			0	eagles	0	small chop. Lots of tide pool activity. Many cucibs, many starfish, warm sustained wind.
7/10 11:25 AM					cloudy/ murky	4											noticeable turbidity near shore, weird algae clustered near shore
7/17 7:41 AM					clear			2									
7/23 9:26 AM	0	0	15	0	clear	1	0	0					0	1	0	none	dog poop on the beach; more unidentified algae bloom on shoreline; some wood debris/fire leaving
7/29 5:57 AM	clean		3	7	clear	0	0	0	0	0	0	0	0	0	0	none	state ferry in distance
8/7 11:54 AM	0	0	20	5	clear	0	0						0	0	0		boats present?
8/13 7:05 AM	11	0	10	7		0	0	0	0	0	0	0	0	0	0	none	
8/21 8:11 AM	2	0	15	15	other	0	0	0	0	0	0	0	0	0	0	none	
9/4 8:08 AM	0	0	0	10	cloudy/ murky	0	0	0	0	0	0	0	0	1	0	none	water has unusual smell. Not sewage, not ocean-y
9/10 5:40 AM	0	0	10	15	clear	0	0	0	0	0	0	0	0	0	0	none	
9/18 6:53 AM	0	0	10	10	clear	0	0	1	0	0	0	0	0	0	0	none	whales offshore

Shull 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 9:05 AM	3	<10		0.02	0.02	0.02	18.1	10.7	overcast			high
5/22 9:05 AM	13	20		0.2	0.2	0.2	18.1	10.7	overcast			low
5/29 5:21 AM	3 (2)	<10 (<10)		0	0	0	16.7	15.4	sunny and clear			low
6/5 11:48 AM	15	<10		0.5	0.36	0.42	12.8	12.4	overcast	SW		flood
6/11 12:00 PM	276	199		0.5	0.7	0.7	15.3	13.8	rain			ebb
6/19 8:11 AM	34	<10		0.24	0.76	0.96	14.4	15.2				low
6/25 10:44 AM	15	<10		0	0.4	0.67	14.5	14.4	sunny and overcast	SE	8	ebb
7/2 6:35 AM	37	52		0	0	0	15.4	14.9	overcast	S	3	low
7/10 11:35 AM	12	<10		0.02	0.02	0.02	17.8	15.9		W	5	ebb
7/17 7:24 AM	116	108		0.38	0.47	0.47	13.4	13.1	light rain			low
7/23 9:32 AM	16	<10		0	0	0	17.2	12.4	slight rain with wind and lightning	NA	0	low
7/29 5:46 AM	41	20		0.31	0.44	1.25	16.9	12.7	rain	NA	0	low
8/7 12:10 PM	19	10		0	0	0	16.3	16.9	sunny and clear		light	low
8/13 6:51 AM	15	10		0	0	0.2	13.5	15.1	sunny	NA	0	low
8/21 8:24 AM	Confluent Growth (Confluent Growth)	386 (379)		3.19	3.19	3.66	14.5	12.2	rain	NA	0	ebb
9/4 8:22 AM	53	<10		0.63	0.63	0.63	14.6	13.7	sunny and clear	NA	0	ebb
9/10 5:25 AM	95	754	human = DNQ; dog = ND; gull = 3.60e+3	0	0	0	13.2	14.4	sunny and clear	NA	0	low
9/18 7:18 AM	19	20		0.31	0.79	0.79	13	12.8	sunny and clear	NA	0	low

Shull 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 9:05 AM			5	0	clear								3				
5/22 9:05 AM			15	0	clear												
5/29 5:21 AM					clear												
6/5 11:48 AM					clear	1				1			0	0	0	none	
6/11 12:00 PM					other	0	0								1 seal		water color was orange/red
6/19 8:11 AM					clear												rusty orange water color
6/25 10:44 AM			15	10									2				
7/2 6:35 AM	1	0	10	5	cloudy/ murky	0	0	0	0	0	0		0	0		none	small chop. Warm wind coming from the south. Flow stream w/ good flow.
7/10 11:35 AM					clear			2									fresh water from nearby stream to consider
7/17 7:24 AM					cloudy/ murky												reddish brown water, cloudy; many shells are similar rust color as the water
7/23 9:32 AM	0	0	0	0	cloudy/ murky	0	0	0					0	0	0	none	lots of rusty debris on shore; shallow, turbid water; rougher waves than usual
7/29 5:46 AM	some trash		0	0	cloudy/ murky	0	0	0	0	0	0	0	3	0		none	water is rusty, orange, cloudy; much more freshwater input from Whipple Creek than normal; "2-3 birds"
8/7 12:10 PM	2	0	0	0	clear	0	0						12				
8/13 6:51 AM	10	0	0	0	cloudy/ murky	0	0	2	0	0	1	0	6	0	0	none	
8/21 8:24 AM	0	0	5	10	cloudy/ murky	0	0	10	0	0	0	0	20	0	0	none	Whipple Creek flowing a lot
9/4 8:22 AM	10	0	0	0	cloudy/ murky	0	0	1	0	0	0	0	25	0	0	none	
9/10 5:25 AM	10	0	0	0	clear	0	0	0	0	0	0	0	0	0	0	none	
9/18 7:18 AM	15	0	0	0	clear	0	0	0	0	0	0	0	20	0	0	none	

Sunset 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 8:49 AM	17	10		0.02	0.02	0.02	16.9	16.8	overcast			flood
5/22 8:49 AM	15	<10		0.2	0.2	0.2	16.9	16.8	overcast			low
5/29 5:02 AM	7	<10		0	0	0	16.8	15.4	sunny and clear			low
6/5 12:02 PM	43 (39)	<10 (<10)		0.5	0.36	0.42	12.6	15.4	overcast	SW	10	flood
6/11 12:10 PM	18	<10		0.5	0.7	0.7	15.9	14.9	rain			ebb
6/19 8:02 AM	12	<10		0.24	0.76	0.96	14.7	14.9				low
6/25 10:55 AM	12	10		0	0.4	0.67	14.6	13.8	sunny and clear	SE	12	ebb
7/2 6:21 AM	165	301		0	0	0	15.3	15	overcast	SE	4	low
7/10 11:55 AM	7	<10		0.02	0.02	0.02	16.9	16		NA	8	low
7/17 7:16 AM	87	31		0.38	0.47	0.47	14	14.4	light rain			low
7/23 9:50 AM	14	<10		0	0	0	12.2	10	slight rain with wind and lightning	NA	0	low
7/29 5:19 AM	14	10	human = DNQ; dog = ND; gull = ND	0.31	0.44	1.25	17.8	15.3	rain	NA	0	low
8/7 12:20 PM	5	<10		0	0	0	17.7	18.1	sunny and clear		light	low
8/13 6:40 AM	16	<10		0	0	0.2	13.5	15.3	sunny	NA	0	low
8/21 8:34 AM	190	156		3.19	3.19	3.66	13.2	13.5	rain	NA	0	ebb
9/4 8:37 AM	196	<10		0.63	0.63	0.63	13.1	13.4	sunny and clear	NA	0	ebb
9/10 5:15 AM	9	<10		0	0	0	12.9	13.2	clear	NA	0	low
9/18 7:18 AM	9	148		0.31	0.79	0.79	9.9	12.7	sunny and clear	NA	0	ebb

Sunset 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 8:49 AM			20	15	cloudy/ murky												lots of kelp where I sampled
5/22 8:49 AM			20	15	cloudy/ murky												lots of kelp where I sampled
5/29 5:02 AM					clear												
6/5 12:02 PM					cloudy/ murky	0	0						0	0	0	none	
6/11 12:10 PM					clear	1	0										
6/19 8:02 AM					clear								3				
6/25 10:55 AM			20	15	cloudy/ murky								3		2 ravens on beach		exposed to waves
7/2 6:21 AM	0	0	40		clear	0	0	0	0	0	0		0	0	I hear chickens clucking	none	the ground is still wet from outgoing tide. Odor of rotting seaweed. Large…of starfish at water's edge.
7/10 11:55 AM					other												more unidentified sludge on edges of water
7/17 7:16 AM					cloudy/ murky											sulfuric smell	reddish color
7/23 9:50 AM	0	0	0	0	cloudy/ murky	4	0	1			4		0	0	0	none	
7/29 5:19 AM	0	0	10	10	clear	0	0	0	0	0	0	0	0	0	0	none	
8/7 12:20 PM	0	0	1	1	clear	0	0	1					1	0	0		1 barge, dog poop on beach
8/13 6:40 AM	0	0	13	22	clear	0	0	1	0	0	0	0	0	0	0	none	1 barge
8/21 8:34 AM	0	10	0	0	cloudy/ murky	0	0	1	0	0	0	0	6	0	0	none	
9/4 8:37 AM	0	0	20	20	cloudy/ murky	0	0	0	0	0	0	0	0	0	0	none	
9/10 5:15 AM	0	0	15	15	clear	0	0	0	0	0	0	0	0	0	0	none	
9/18 7:18 AM	0	0	10	10	clear	1	0	0	0	0	0	0	0	1	0	none	

South Refuge Cove 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 8:44 AM	6	<10		0.02	0.02	0.02	18.1	10.9	overcast			flood
5/22 5:41 AM	6	<10		0.2	0.2	0.2	11.6	NA	rain	S		ebb
5/29 4:56 AM	48	<10		0	0	0	16.7	15.4	sunny and clear			low
6/5 12:15 PM	7	<10		0.5	0.36	0.42	13.5	12.6	overcast	SW	5	flood
6/11 12:20 PM	163 (155)	2851 (3448)		0.5	0.7	0.7	15.9	15.1	rain			ebb
6/19 7:56 AM	2	<10		0.24	0.76	0.96	14.3	14.7				low
6/25 11:07 AM	13	<10		0	0.4	0.67	15.2	14	sunny and clear	SE	4	low
7/2 6:15 AM	58	31		0	0	0	15.6	14.9	overcast	SE	4	low
7/10 12:00 PM	5	<10		0.02	0.02	0.02	18.7	15.8				low
7/17 7:05 AM	28	10		0.38	0.47	0.47	16.1	14.6	light rain			low
7/23 9:58 AM	4	<10		0	0	0	12.1	10	slight rain with wind and lightning	NA	0	low
7/29 5:16 AM	16	97	human = DNQ; dog = 8.08e+2; gull = ND	0.31	0.44	1.25	16.9	15.5	rain	NA	0	low
8/7 12:32 PM	7	20		0	0	0	17.4	17.1	sunny and clear	NA	0	low
8/13 6:32 AM	17	<10		0	0	0.2	17.5	15.3	sunny	NA	0	low
8/21 8:43 AM	184	118		3.19	3.19	3.66	12.3	12	rain	S	4-5	low
9/4 8:45 AM	12	10		0.63	0.63	0.63	13.6	14.3	sunny and clear	NA	0	ebb
9/10 5:10 AM	8 (22)	<10 (<10)		0	0	0	12.8	13.5	clear	NA	0	low
9/18 7:37 AM	6	52		0.31	0.79	0.79	12.4	12.7	sunny and clear	NA	0	low

South Refuge Cove 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 8:44 AM					cloudy/murky												
5/22 5:41 AM	present	present	15	10	clear												
5/29 4:56 AM					clear												
6/5 12:15 PM					cloudy/murky										2 songbirds	none	
6/11 12:20 PM					cloudy/murky												
6/19 7:56 AM					clear												
6/25 11:07 AM	0	0	15	20	clear	3				3							stormwater pipe in water
7/2 6:15 AM	5	0	10	5	cloudy/murky	0	0	2	0	0	0		0	0		none	outhouse; outcrop w/ exposed pipe; 1 barge and 1 tug
7/10 12:00 PM					clear	3											outcrop with damage to pipe near sampling location
7/17 7:05 AM					clear												
7/23 9:58 AM	0	0	0	0	clear	5	0	2			5		0	0	0	none	some boat wreck debris on shore; dog poop on beach
7/29 5:16 AM	some debris		5	0	clear	0	0	0	0	0	0	0	0	0	0	none	bathrooms nearby;
8/7 12:32 PM	0	0	2	0	clear			1					1		1 animal		
8/13 6:32 AM	0	0	0	10		0	0	0	0	0	0	0	0	0	0	none	
8/21 8:43 AM	10	50	15	10	clear	0	0	0	0	0	0	0	0	0	0	none	
9/4 8:45 AM	10	0	0	0		0	0	0	0	0	0	0	0	0	0	none	5+ fish carcasses
9/10 5:10 AM	10	0	0	15	clear	0	0	0	0	0	0	0	0	0	0	none	
9/18 7:37 AM	5	0	0	0	clear	0	0	0	0	0	0	0	0	0	0	none	one outflow nearby

Thomas Basin 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 8:10 AM	55	256		1	0.15	0.15	16.9	16.4	overcast			flood
5/22 6:13 AM	11	<10		0	0.24	0.24	9.5	9.1	rain	SE	5	ebb
5/29 4:33 AM	6	<10		0	0	0	16.2	15.5	sunny and clear		slight	low
6/5 9:48 AM	12	10		0.1	0.28	0.45	11.7	12.2	overcast	W		low
6/11 12:50 PM	214	487		1.38	2.5	2.51	15.7	14.2	rain			low
6/19 7:31 AM	16 (18)	20 (20)		0.28	1.17	1.37	15.6	14.9				low
6/25 11:35 AM	12	10		0	0.27	0.76	14.8	14.5	sunny and clear	SE	5	low
7/2 5:47 AM	74	41		0	0	0	17.4	14.8	overcast	N	0	low
7/10 12:21 PM	9	<10		0	0	0	21.9	16.5				low
7/17 6:40 AM	431	984		1.6	1.62	1.62	14.8	13.6	light rain			low
7/23 10:20 AM	42	10		0.18	0.18	0.18	14.1	12	slight rain with wind and lightning	NA	0	low
7/29 4:44 AM	38	<10		0.16	0.24	1.13	14	14.2	rain	S	3-4	low
8/7 1:00 PM	11	<10		0	0	0	17.2	18.3	sunny and clear		light	low
8/13 6:10 AM	37	10		0	0	0.13	14.5	13.2	sunny	NA	0	low
8/21 9:04 AM	258	450		4.85	5.39	5.52	14.3	13.6	rain	NA	0	low
9/4 9:09 AM	62	1024		0.55	0.55	0.55	14.7	13.8	sunny and clear	NA	0	low
9/10 4:41 AM	76	63	human = DNQ; dog = DNQ; gull = 3.38e+3	0	0	0	13.1	14.5	clear	NA	0	low
9/18 7:59 AM	48	144		0.01	0.99	0.99	10.9	12.5	sunny and clear	NA	0	low

Thomas Basin 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 8:10 AM			10	15	cloudy/murky	2		Harbor		2							biggest roach seen on rocks. 2 walkers
5/22 6:13 AM	present	present	5	2	cloudy/murky	0	0	0	0	0	0		0	0	2 seals		first flush 3 weeks
5/29 4:33 AM					cloudy/murky												
6/5 9:48 AM					clear	Y											tourist area but not for water contact
6/11 12:50 PM					cloudy/murky			marina								sulfuric	water smells like sulfur
6/19 7:31 AM					clear			several									cloudy, brownish water
6/25 11:35 AM	0	0	30	20	clear	45+		100+		25		4	X				no water coming out of stormwater pipe; 3 in boat nearby, ASUKA II in sight
7/2 5:47 AM	2	0	5	10	cloudy/murky	6	0	Harbor	0	6	harbor 20+		0	0			stormwater pipes trickle; many fish (salmon) in schools. Large freshwater stream passing by. Water is considerably colder than other sites.
7/10 12:21 PM					cloudy/murky	7		boat harbor									the sediment was easily churned
7/17 6:40 AM					cloudy/murky										several land birds		flooding lightly in street above sample site; storm drains currently flowing; water a brownish color
7/23 10:20 AM	0	0	0	0	cloudy/murky	12		many - marina					0	0	1 seal	slight sewage odor	water was slightly brown
7/29 4:44 AM	mud, trash	oil sheen	0	0	oily film	0	0	many in harbor	0	0	0	0	7	0	fish jumping	slight	storm drain;
8/7 1:00 PM			10	5	clear	6		many - marina				6			1 seal, dead salmon		
8/13 6:10 AM	25	17	0	0	oily film	0	0	many - marina	0	0	0	0	0	0	0	none	1 bathroom nearby; white sludge; trash on shore
8/21 9:04 AM	15	10	65	40	clear	3	0	1	0	0	0	0	0	0	0	none	
9/4 9:09 AM	20	25	15	0	cloudy/murky	0	0	0	0	0	0	0	0	0	0	yes	1 storm outfall
9/10 4:41 AM	20	25	0	0	cloudy/murky	0	0	0	0	0	0	0	0	0	0	strong	bathrooms nearby; 1 stormwater pipe; very strong sewage smell; many dead fish
9/18 7:59 AM	20	20	15	15	clear	0	0	0	0	0	0	0	3	0	0	awful smell	nearby bathrooms; 1 outflow; particularly bad smells

Seaport 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 7:11 AM	2	<10		1	0.15	0.15	16.1	16.4	overcast			flood
5/22 9:28 AM	<1	<10		0	0.24	0.24	10.4	9.6	rain	SE	10	ebb
5/29 4:17 AM	3	<10		0	0	0	16.5	15.3	sunny and clear		low	low
6/5 9:15 AM	3	<10		0.1	0.28	0.45	10.6	12.2	overcast	NA	0	low
6/11 1:05 PM	79	20		1.38	2.5	2.51	16.4	14.8	rain			low
6/19 7:17 AM	6	<10		0.28	1.17	1.37	16.3	14.7				low
6/25 2:36 PM	6 (8)	<10 (<10)		0	0.27	0.76	21.5	17.5	sunny and clear	SE	3	low
7/2 5:35 AM	145	20		0	0	0	15.2	15.6	overcast	NA	0	low
7/10 12:45 PM	3	<10		0	0	0	22.4	18.6				low
7/17 6:21 AM	63	20		1.6	1.62	1.62	15.3	15.1	light rain			low
7/23 10:42 AM	22 (18)	<10 (<10)		0.18	0.18	0.18	12.2	11	slight rain with wind and lightning	SE	4	low
7/29 4:29 AM	12	<10		0.16	0.24	1.13	18.2	15.4	rain	NA	0	low
8/7 1:10 PM	6	<10		0	0	0	16.2	18	sunny and clear		med/light	low
8/13 5:52 AM	21	20		0	0	0.13	15.3	14.2	sunny	NA	0	low
8/21 9:15 AM	10	<10		4.85	5.39	5.52	14.5	13.2	rain	ND	1-2	low
9/4 9:20 AM	3	<10		0.55	0.55	0.55	14.6	13.5	sunny and clear	NA	0	low
9/10 4:25 AM	163	20	human = ND; dog = ND; gull = 1.21e+3	0	0	0	12.8	14.5	clear	N	3-4	low
9/18 8:15 AM	17	173		0.01	0.99	0.99	10.9	12.5	sunny and clear	NA	0	low

Seaport 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 7:11 AM			25	15	clear			2									
5/22 9:28 AM	0	0	15	40	cloudy/ murky	0	0	0	0	0	0		8	0			
5/29 4:17 AM				lots	cloudy/ murky												
6/5 9:15 AM					clear	0	0							0			also collected beach mussels and algal/phytoplankton sample at location
6/11 1:05 PM					clear	0	0	0									
6/19 7:17 AM			lots		clear								10				
6/25 2:36 PM	3	0	25	90	clear			4			1						took some time to get authorized to use non NIST certified thermometer. This is where we restarted samples
7/2 5:35 AM			45		clear	0	0	0	0	0	0		0	0	2 young deer	none	flow stream near sample site at a trickle. There is no noticeable wind compared to other beaches. It was interesting how near they were to the water, the deer. Water is quite still. Beach is teaming with small creature movement. A lot of water is held on the beach by kelp and algae.
7/10 12:45 PM					clear												dock 100 m away
7/17 6:21 AM					cloudy/ murky								20				
7/23 10:42 AM	0	0	50	50	clear	0	0	5					0	0	0	none	lots of seaweed on sore, choppy rough seas
7/29 4:29 AM	some debris on rocks		15	75	cloudy/ murky	0	0	1	0	0	0	0	13	0	0	none	
8/7 1:10 PM	0	0	10	2	clear	0	0						21	0			
8/13 5:52 AM	15	15	10	60	cloudy/ murky	0	0	1	0	0	0	0	20	0	0	none	cruise ship
8/21 9:15 AM	0	0	25	25	clear	0	0	2	0	0	0	0	8	0	0	none	
9/4 9:20 AM	0	0	20	20	cloudy/ murky	0	0	0	0	0	0	0	0	0	0	none	
9/10 4:25 AM	15	0	20	20	too dark	0	0	1	0	0	0	0	0	0	0	none	
9/18 8:15 AM	0	0	25	30	clear	0	0	0	0	0	0	0	0	0	0	none	

Rotary Park Pool 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 6:50 AM	6	<10		1	0.15	0.15	16.4	16.3	overcast			flood
5/22 8:42 AM	<1	<10		0	0.24	0.24	10.4	10.8	showers	SE	5	low
5/29 4:01 AM	9	10		0	0	0	16.4	16.1	sunny and clear			low
6/5 8:45 AM	6	10		0.1	0.28	0.45	10.8	12.8	overcast			low
6/11 1:20 PM	206	1576		1.38	2.5	2.51	16.6	12.2	rain			low
6/19 7:01 AM	<2	20		0.28	1.17	1.37	16.1	17.2				low
6/25 2:48 PM	19	52		0	0.27	0.76	19.4	22.4	sunny and clear	NA	0	low
7/2 5:18 AM	142 (112)	52 (108)		0	0	0	16.1	15.2	overcast	WSW	3	low
7/10 1:00 PM	11	<10		0	0	0	19.4	19.6		NA	0	low
7/17 6:07 AM	390	2851		1.6	1.62	1.62	16.3	14.3	light rain			low
7/23 10:59 AM	26	<10		0.18	0.18	0.18	11.3	16.5	slight rain with wind and lightning	NA	0	low
7/29 4:12 AM	66	41	human = ND; dog = DNQ; gull = ND	0.16	0.24	1.13	16.8	16.3	rain	NA	0	low
8/7 1:23 PM	84	<10		0	0	0	17.7	18.5	sunny and clear			low
8/13 5:39 AM	20	<10		0	0	0.13	16.8	16.3	sunny	NA	0	low
8/21 9:25 AM	Confluent Growth	372		4.85	5.39	5.52	13.9	14.2	rain	N	3-4	low
9/4 9:33 AM	22	52		0.55	0.55	0.55	14.3	14.8	sunny and clear	NA	0	low
9/10 4:14 AM	3	<10		0	0	0	14.9	17.2	clear	NA	0	low
9/18 8:28 AM	5	<10		0.01	0.99	0.99	13.5	13.4	sunny and clear	NA	0	low

Rotary Park Pool 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 6:50 AM			5	15	cloudy/murky			4		1				1			1 walker, cruise ships passing, 2 com boats, clear water (not what was marked in turbidity note…)
5/22 8:42 AM	0	0	10	40	cloudy/murky	0	0	0	0	0	0		0	0			
5/29 4:01 AM					clear											slight sewage smell	
6/5 8:45 AM					clear	5	10			Y	Y				eagles		tidepoolers, 2 offshore boats
6/11 1:20 PM					cloudy/murky	6				Y							murky brown
6/19 7:01 AM					clear												water is brownish
6/25 2:48 PM			5	25	clear	4	5							1			some turbidity; dog swimming in the pool; child recently got out of it
7/2 5:18 AM	0	0	5	20	clear	0	0	1	0	0	Y		6		birds	none	site of duplicate sample. Cooler temperature. The wind is warm.
7/10 1:00 PM					cloudy/murky	10	11		2								this is a recreational pool that holds water for a long period of time before draining. It is only cleaned by the exchange of large tides
7/17 6:07 AM					Clear			3									
7/23 10:59 AM	0	0	0	0	cloudy/murky	21	0	0					0	0	0	none	storm drains nearby, 2 restrooms nearby, people on tour groups, water was murky with oil slick, beach was fairly clean
7/29 4:12 AM	0	0	10	0	cloudy/murky	0	0	2	0	0	0	0	0	0	0	none	bathrooms nearby
8/7 1:23 PM	0	3	2	0	cloudy/murky	1	2	0	2								bathrooms closed; murky brown/tea color
8/13 5:39 AM					cloudy/murky	0	0	1	0	0	0	0	0	0	0	none	bathrooms nearby; 1 cruise ship
8/21 9:25 AM	0	0	0	0	clear	0	0	0	0	0	0	0	4	0	0	none	bathrooms nearby
9/4 9:33 AM	0	0	0	0	cloudy/murky	0	0	0	0	0	0	0	0	0	0	none	bathrooms nearby
9/10 4:14 AM	0	0	0	0	clear	0	0	0	0	0	0	0	0	0	0	none	bathrooms nearby
9/18 8:28 AM	10	0	0	0	clear	0	0	0	0	0	0	0	0	0	0	none	nearby bathrooms

Rotary Park Beach 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 6:52 AM	10	<10		1	0.15	0.15	15.1	16.7	overcast			flood
5/22 6:38 AM	8	<10		0	0.24	0.24	11	9.8	showers	SE	5	ebb
5/29 3:56 AM	11	<10		0	0	0	16.4	15.3	sunny and clear			low
6/5 8:55 AM	7	<10		0.1	0.28	0.45	10.6	12.8	overcast	NA	0	low
6/11 1:15 PM	Confluent Growth	84		1.38	2.5	2.51	16.4	15.1	rain			low
6/19 6:56 AM	10	10		0.28	1.17	1.37	16.1	16.4	sunny and clear			low
6/25 2:43 PM	9	<10		0	0.27	0.76	18.6	17.1	sunny and clear	SW	4	low
7/2 5:22 AM	46	197		0	0	0	15.6	15.5	overcast	WSW	5	low
7/10 1:05 PM	16 (8)	<10 (10)		0	0	0	18.4	17.6		SE	8	low
7/17 6:12 AM	272	269		1.6	1.62	1.62	15.3	15.1	light rain			low
7/23 10:56 AM	24	10		0.18	0.18	0.18	10.7	12	slight rain with wind and lightning	NA	0	low
7/29 4:14 AM	37	30	human = 1.35e+3; dog = DNQ; gull = ND	0.16	0.24	1.13	14.9	15.5	rain	NA	0	low
8/7 1:30 PM	8	<10		0	0	0	15.2	18	sunny and clear		light	low
8/13 5:45 AM	51	<10		0	0	0.13	16.8	16.5	sunny	NA	0	low
8/21 9:23 AM	94	50		4.85	5.39	5.52	14.6	13.7	rain	NA	0	low
9/4 9:24 AM	118	20		0.55	0.55	0.55	14.4	14	sunny and clear	NA	0	low
9/10 4:17 AM	6	10		0	0	0	14.9	14.7	clear	NA	0	low
9/18 8:25 AM	25	20		0.01	0.99	0.99	12.7	13.8	sunny and clear	NA	0	low

Rotary Park Beach 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 6:52 AM					clear	1		4			Y			1			1 walker, 2 com boats
5/22 6:38 AM	0	0	15	20	clear	0	0	0	0	0	0		0	0			
5/29 3:56 AM					clear												
6/5 8:55 AM					clear	2	4			6					eagles		most using beach since 2-3 low tide
6/11 1:15 PM					cloudy/murky											Yes	1 outflow stormwater
6/19 6:56 AM		some		lots	clear												high waves/turbulence
6/25 2:43 PM			5	10	clear	4	3			Y			1				
7/2 5:22 AM	0	0	20	25	cloudy/murky	0	0	0	0	0	0		3	0	none	none	significant waves, f/w/ stream trickle, high jelly count
7/10 1:05 PM					clear												
7/17 6:12 AM					cloudy/murky			2									organic debris, not identifiable
7/23 10:56 AM	0	60	0	0	cloudy/murky	4	0	2					0	0	0	none	some activity; most people on other part of beach; very rough, turbid because of macro organic debris, 1-2' swells, very rough, heavy seas
7/29 4:14 AM	some woody debris	0	5	0	clear	0	0	2	0	0	0	0	0	0	0	none	less choppy than last time
8/7 1:30 PM	0	0	10	0	clear	3											bathrooms closed
8/13 5:45 AM	0	10	15	15	clear	0	0	1	0	0	0	0	30	0	0	none	1 cruise ship; lots of tree needles in water
8/21 9:23 AM	0	0	25	35	cloudy/murky	0	0	2	0	0	0	0	20	0	0	none	
9/4 9:24 AM	0	0	15	30	cloudy/murky	0	0	1	0	0	0	0	15	0	0	none	
9/10 4:17 AM	0	15	10	10	clear	6	0	0	0	0	0	0	0	0	0	none	bathrooms nearby, 1 stormwater pipe
9/18 8:25 AM	0	0	10	0	clear	0	0	0	0	0	0	0	0	0	0	none	bathrooms nearby

Mountain Point Surprise Beach 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 6:40 AM	21	<10		1	0.15	0.15	16.1	16.3	overcast			low
5/22 6:57 AM	8	<10		0	0.24	0.24	12.2	10.7	showers	SE	5	ebb
5/29 3:42 AM	4	<10		0	0	0	16.2	15.4	dark			low
6/5 8:30 AM	34	10		0.1	0.28	0.45	10.6	12.8	overcast	NA	0	low
6/11 1:45 PM	37	20		1.38	2.5	2.51	16.7	17.1	rain			low
6/19 6:35 AM	24	10		0.28	1.17	1.37	16.3	16.1	sunny and clear			ebb
6/25 3:00 PM	8	<10		0	0.27	0.76	18.1	16	sunny and clear	SE	3	low
7/2 5:10 AM	13	51		0	0	0	15.2	15	overcast	W	5	ebb
7/10 1:25 PM	4	<10		0	0	0	19.1	17.5		SE	4	low
7/17 5:57 AM	133 (118)	218 (384)		1.6	1.62	1.62	14.9	16.8	light rain			low
7/23 11:09 AM	10	<10		0.18	0.18	0.18	11.1	12.5	slight rain with wind and lightning	NA	0	low
7/29 3:50 AM	82	<10	human = 1.94e+3; dog = ND; gull = ND	0.16	0.24	1.13	15.1	16	rain	S	3-4	low
8/7 1:40 PM	30	<10		0	0	0	16.8	17.7	sunny and clear		light	low
8/13 5:30 AM	58	10		0	0	0.13	16.1	16.6	sunny	NA	0	low
8/21 9:35 AM	52	41		4.85	5.39	5.52	14.1	13.9	rain	NA	0	low
9/4 9:45 AM	16	<10		0.55	0.55	0.55	14.4	14.8	sunny and clear	NA	0	ebb
9/10 3:52 AM	13	<10		0	0	0	16.2	15.4	clear	NA	0	low
9/18 8:32 AM	13	10		0.01	0.99	0.99	12.4	13.7	sunny and clear	NA	0	low

Mountain Point Surprise Beach 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 6:40 AM	0	0	5	15	clear												
5/22 6:57 AM	0	0	15	15	clear	0	0	0	0	0	0		3	0	1 seal		
5/29 3:42 AM					clear			4									
6/5 8:30 AM					cloudy/murky	0	0	0							10 eagles		wave action in large eel grass bed
6/11 1:45 PM					cloudy/murky	2						Y					3 storm drain outlets
6/19 6:35 AM		some			clear												
6/25 3:00 PM	0	0	10	0	clear												
7/2 5:10 AM	2	0	5	10	clear	0	0	0	0	0	0		2	0		none	significant chop,
7/10 1:25 PM					clear	18	7	3	8								8 divers, 100 m away; some sludge like material near shore
7/17 5:57 AM					clear			3							2 eagles		
7/23 11:09 AM	0	0	0	0	clear	0	0	0					0	0	lots of starfish, jellyfish		water was clear except at land/water margin
7/29 3:50 AM	lots of trash, animal carcass	fairly clear of debris	15	1	clear	0	0	1	0	0	0	0	0	0	0	none	lots of trash on beach
8/7 1:40 PM	0	0	15	5	clear	3	0	0	3				0	0			snorkelers
8/13 5:30 AM	10	0	0	0	clear	0	0	0	0	0	0	0	3	0	3 eagles	none	dead carcass on rocks
8/21 9:35 AM	0	0	10	10	clear	0	0	3	0	0	0	0	0	0	0	none	
9/4 9:45 AM	0	0	0	0	clear	0	0	2	0	0	0	0	0	0	0	none	
9/10 3:52 AM	0	0	100	20	too dark	0	0	0	0	0	0	0	0	0	0	none	large amounts of seaweed; lots of bioluminescence; many bird feathers in water
9/18 8:32 AM	0	0	40	10	clear	0	0	0	0	0	2	0	0	0	0	none	

Mountain Point Cultural Food 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 6:27 AM	18	<10		1	0.15	0.15	16.3	16.3	overcast			low
5/22 7:04 AM	9	10		0	0.24	0.24	11.5	10.8	showers	SE	5	ebb
5/29 3:35 AM	61	41		0	0	0	16.2	15.6	dark			low
6/5 8:15 AM	11	20		0.1	0.28	0.45	11.7	12.8	overcast	NA	0	low
6/11 1:35 PM	86	323		1.38	2.5	2.51	16.1	15.8	rain			low
6/19 6:27 AM	526	620		0.28	1.17	1.37	16.2	16.4	sunny and clear			ebb
6/25 3:05 PM	28	50		0	0.27	0.76	18	16	sunny and clear	SE	5	low
7/2 5:00 AM	214	857		0	0	0	15.4	16.1	overcast	W	4	ebb
7/10 1:30 PM	9	<10		0	0	0	19.8	17.5				low
7/17 5:50 AM	247	934		1.6	1.62	1.62	13.4	13.8	light rain			ebb
7/23 11:19 AM	152	259		0.18	0.18	0.18	12	13.7	slight rain with wind and lightning	NA	0	low
7/29 3:44 AM	131	41	human = ND; dog = ND; gull = ND	0.16	0.24	1.13	16.3	16.2	rain	NA	0	low
8/7 1:51 PM	45	20		0	0	0	17.8	17.8	sunny and clear	NA	0	low
8/13 5:19 AM	104	51		0	0	0.13	16.4	17.1	sunny	NA	0	low
8/21 9:42 AM	86	84		4.85	5.39	5.52	14.4	14.1	rain	NA	0	low
9/4 9:52 AM	209 (210)	20 (20)		0.55	0.55	0.55	14.2	14.6	sunny and clear	NA	0	low
9/10 3:45 AM	20	<10		0	0	0	15.4	16.2	clear	NA	0	low
9/18 8:48 AM	131	97		0.01	0.99	0.99	13.3	12.7	sunny and clear	NA	0	low

Mountain Point Cultural Food 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 6:27 AM			5	20	clear			4			4					odor from beach grass	3 com boats, 1 skiff
5/22 7:04 AM	N	N	15	10	cloudy/murky	0	0	0	0	0	0		8	0			
5/29 3:35 AM					clear												
6/5 8:15 AM					cloudy/murky	1						Y					waves and stream inflow increasing turbidity; boats just offshore/commercial and sport; lots of sea urchins red/purple
6/11 1:35 PM					clear			3			Y					sulfur smell	sharp sulfur and sewage smell
6/19 6:27 AM					clear											slight sulfuric smell	
6/25 3:05 PM	0	0	15	20	clear			8							2 eagles		sulfuric odor from grass/bog; water is unusually clear, lacking sediment
7/2 5:00 AM	0	0	15	0	clear	2	0	2	0	0	0		3	0			2 fishing boats
7/10 1:30 PM					clear			3							3 ravens, 3 eagles		an outcrop/treatment plant is not far from this location
7/17 5:50 AM					clear										3 eagles	sulfuric	
7/23 11:19 AM	0	0	0	0	clear	0	0	0					0	0	0	slight sulfur	one restroom 200 yards away
7/29 3:44 AM		some debris	35	5	too dark	0	0	0	0	0	0	0	0	0	0	strong, present far away from site	there was a strong sewage smell even as we drove up to the site; bathrooms nearby
8/7 1:51 PM	0	0	15	0	clear	0	0	2					0	0	0		
8/13 5:19 AM	0	0	20	5	cloudy/murky	0	0	1	0	0	0	0	0	0	0	sewage smell in parking lot	1 cruise ship; sulfuric smell; unidentified brown algae in water; lots of sediment
8/21 9:42 AM	0	5	60	25	clear	0	0	0	0	0	0	0	0	0	0	none	
9/4 9:52 AM	0	0	90	10	cloudy/murky	0	0	0	0	0	0	0	0	0	0	none	
9/10 3:45 AM	0	0	100	20	too dark	0	0	0	0	0	0	0	0	0	0	yes, strongly	nearby bathrooms, sewage discharge nearby; unusually heavy amount of beach seaweed; lots of bioluminescence
9/18 8:48 AM	0	0	40	20	clear	0	0	0	0	0	2	0	0	0	0	none	bathrooms nearby

Herring Cove 2019

Sample Date/Time	Fecal Coliform (cfu/100 ml)	Entero-cocci (MPN/100 ml)	MST results	Rainfall (inches)			Temperature (°C)		Weather	Direction	Speed (mph)	Tidal phase
				<24 hr	<48 hr	<72 hr	Air	Marine Water				
5/15 6:15 AM	30	<10		1	0.15	0.15	14	14.7	overcast	NA	0	low
5/22 7:15 AM	12	<10		0	0.24	0.24	10.7	9.6	showers	SE	lo	ebb
5/29 3:11 AM	14	<10		0	0	0	16.4	15.7	dark		medium	low
6/5 7:48 AM	18	<10		0.1	0.28	0.45	10	12.8	overcast	NA	0	low
6/11 2:00 PM	113	41		1.38	2.5	2.51	15.1	16.2	rain			low
6/19 6:15 AM	36	10		0.28	1.17	1.37	15.3	16.5	cloudy			ebb
6/25 3:15 PM	15	<10		0	0.27	0.76	20.4	17	sunny and clear			flood
7/2 4:45 AM	171	213		0	0	0	15.1	14.3	overcast	SE	2	ebb
7/10 1:45 PM	8	<10		0	0	0						low
7/17 5:35 AM	386	565		1.6	1.62	1.62	17.7	13.4	light rain			ebb
7/23 11:32 AM	36	10		0.18	0.18	0.18	12.6	10.1	slight rain with wind and lightning	NA	0	low
7/29 3:28 AM	104 (92)	20 (20)		0.16	0.24	1.13	18.6	13.2	rain	NA	0	low
8/7 2:05 PM	33	<10		0	0	0	16.3	17.8	sunny and clear		med/ strong	low
8/13 5:02 AM	215	613		0	0	0.13	14.4	13.8	cloudy	NA	0	low
8/21 9:56 AM	184	63		4.85	5.39	5.52	14.1	13.7	rain	NA	0	low
9/4 10:02 AM	239	262		0.55	0.55	0.55	12.6	14.3	sunny and clear	NA	0	low
9/10 3:26 AM	>400	2595	human = DNQ; dog = 5.47e+2; gull = 1.99e+4	0	0	0	16.2	15.5	clear	NA	0	low
9/18 9:04 AM	216 (202)	185 (173)		0.01	0.99	0.99	11.8	13.8	sunny and clear	NA	0	low

Herring Cove 2019

Sample Date/Time	Debris (%)		Vegetation (%)		visual turbidity	# adults	# children	# boats	# swimming	# walking	# boating	# fishing	# water fowl	# dogs	other	Sewage odor/ presence	Notes
	On shore	In water	On shore	In water													
5/15 6:15 AM	0	0	10	5	clear	1											one person fishing
5/22 7:15 AM	some	0	5	5	cloudy/ murky	0	0	0	0	0	0		12	0			waves
5/29 3:11 AM					clear			2									
6/5 7:48 AM					clear			lots of trawlers near shore			Y				2 eagles		lots of crabs in eel grass,
6/11 2:00 PM					cloudy/ murky	10		5								yes, sulfuric	water was reddish orange and murky; sewage smell
6/19 6:15 AM					clear	3		2					6				people fishing in water; 2 boats fishing near shore
6/25 3:15 PM			5		clear	3		6				3			4 eagles		construction up creek. Unusual! Commercial vessel very close.
7/2 4:45 AM	0	0	5	0	clear	7	0	4	0	0	Y	Y	Y	0	bear, eagles	none	1 bear, multiple (10+) eagles, 5 fishing on beach
7/10 1:45 PM					clear												
7/17 5:35 AM					clear	3									1 bear, 4 eagles		
7/23 11:32 AM	0	0	0	0	clear	2	0	3				2	0	0	6 eagles and 2 seals	none	
7/29 3:28 AM	0	0	0	0	clear	0	0								2-3 seals, 3-4 eagles	none	lots of bioluminescence on sand and in water
8/7 2:05 PM	0	0	0	0	clear	3						3	0		1 seal, dead salmon		dog poop observed on beach
8/13 5:02 AM	0	0	0	0	clear	0	0	1	0	0	1	1	20	0	0	none	
8/21 9:56 AM	0	0	0	0	clear	1	0	0	0	0	0	0	3	0	0	none	
9/4 10:02 AM	10	0	0	0	cloudy/ murky	3	0	0	0	0	0	0	0	0	0	none	
9/10 3:26 AM	0	0	0	0	too dark	0	0	0	0	0	0	0	0	0	1 bear	none	
9/18 9:04 AM	10	0	0	0	clear	2	0	0	0	0	1	0	0	0	1 seal	none	

Knudson Cove 2018

Knudson Cove Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		g	Walking	Fishing	Boating	Waterfowl	Dogs	cfu/100 ml	MPN/100 ml	
													onshore	in water	onshore	in water													
17-May	7:39 AM	0.00	0.00	0.00	0.00	51	10.0	sunny, clear	NNW	5	low -3.6, high 15.5	ebbing	random construction	none	30	20	cloudy, murky	40	0	75	n/a	✓	n/a	✓	0	0	28 (26)	2595 (2603)	
22-May	2:50 PM	0.82	4.28	5.22	5.22	48	8.8	cloudy, overcast, rain	ESE	8	low 0.6, high 13.7	flooding	none	none	30	30	cloudy, murky	0	0	75	n/a	n/a	n/a	✓	10	0	144	341	
31-May	6:15 AM	0.00	0.00	0.15	0.44	43	6.0	sunny, clear	none	0	low -1.5, high 14.0	ebbing	random construction cebris (tire, foam)	none	10	60	clear	0	0	75	n/a	n/a	n/a	✓	5	0	26	20	
6-Jun	3:00 PM	1.21	1.30	1.80	2.13	50	5.8	cloudy, overcast, rain	SE	15	low 2.4, high 12.2	flooding	none	none	50	30	clear	0	0	75	n/a	n/a	n/a	✓	0	0	15	<10	
14-Jun	6:00 AM	0.02	0.18	0.27	0.28	51	7.5	cloudy, overcast, fog	SE	5	low -4.1, high 15.6	ebbing	rusted screw driver, various construction debris	none	40	30	clear	0	0	75	n/a	n/a	n/a	✓	5	0	11	<10	
20-Jun	2:00 PM	0.00	0.00	0.00	0.00	80	19.9	partly cloudy	W	4	low 0.6, high 14.3	flooding	wood planks, rubber	none	10	5	clear	3	0	75	n/a	n/a	n/a	✓	0	0	6	<10	
27-Jun	5:30 AM	0.00	0.00	0.01	0.67	50	9.0	cloudy, overcast	SE	3	low -1.3, high 13.6	ebbing	none	none	5	10	clear	4	0	75	n/a	n/a	n/a	✓	7	0	17	<10	
2-Jul	12:00 PM	0.00	0.00	0.12	0.66	62	7.9	sunny, clear	NNW	11	low -0.4, high 13.3	flooding	none	none	30	30	clear	50	20	75	n/a	n/a	n/a	✓	0	0	9	74	
12-Jul	5:10 AM	0.19	0.20	0.23	0.23	55	10.5	cloudy, overcast	WSW	0	low -3.5, high 15.0	ebbing	various construction debris	none	30	40	clear	0	0	75	n/a	n/a	n/a	✓	2	0	18	20	
18-Jul	1:10 PM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	2	20	
26-Jul	4:35 AM	0.00	0.00	0.00	0.00	61	62	sunny, clear	NW	5	low -0.5, high 13.3	ebbing	rubber, metal	none	20	20	d/m	0	0	0	n/a	n/a	n/a	✓	1	0	32	20	
1-Aug	12:24 PM	0.00	0.00	0.00	0.00	57	64.2	sunny, clear	SE	9	low 2.7, high 14	flooding	rope, metal scrap, lumber	none	1	0	clear	1	0	5	n/a	n/a	n/a	✓	0	0	6	20	
9-Aug	4:25 AM	1.71	1.74	1.74	1.74	60	61.5	cloudy	n/a	0	low -2.2, high 14.1	ebbing	none	none	20	20	clear	0	0	d/m	n/a	n/a	n/a	✓	0	0	8	10	Human, Gull
16-Aug	12:07 PM	0.00	0.00	0.39	0.39	60	61.5	overcast	NNW	6	low 0.4, high 15.4	flooding	metal scraps	none	10	10	clear	3	0	3	n/a	n/a	n/a	✓	0	0	3 (2)	<10 (10)	
23-Aug	4:50 AM	0.00	0.21	0.42	0.42	59	60.4	cloudy, overcast	n/a	0	low 0.5, high 12.8	ebbing	none	none	0	0	clear	1	0	d/m	n/a	n/a	✓	✓	0	heard barking dog	94	86	
30-Aug	10:46 AM	0.05	0.07	0.56	0.56	60	61.1	overcast	n/a	0	low 2.6, high 15.07	flooding	none	none	0	0	clear	10	0	100	n/a	✓	✓	✓	10	0	3	<10	
5-Sep	12:45 PM	0.42	0.48	0.48	0.56	57	9.9	cloudy, overcast, rain	n/a	0	low 4.6, high 12.0	ebbing	none	none	50	30	clear	15	0	100	n/a	✓	n/a	✓	0	0	42 (37)	173 (131)	
12-Sep	10:20 AM	0.00	0.00	0.00	0.02	53	8.5	sunny, clear, cloudy, overcast	N	7	low -1.6, high 17.3	flooding	none	none	30	10	clear	0	0	75	n/a	n/a	n/a	✓	6	0	3	<10	

n/a - not applicable

d/m - data missing

Potential sources = private sewer treatment system outfall(s), individual septic tanks, wildlife, pet feces, boats in harbor areas.

kayakers, zodiak tours, tourists, guides

tourists on boats/kayak tours

Beacon Hill 2018

Beacon Hill Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		Swimming	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
17-May	8:12 AM	0.00	0.00	0.00	0.00	54	10.3	sunny, clear	NNW	5	low -3.6, high 15.5	ebbing	none	none	50	30	clear	2	0	n/a	n/a	n/a	n/a	n/a	0	0	3	183	
22-May	2:41 PM	0.82	4.28	5.22	5.22	48	9.0	cloudy, overcast, rain	ESE	8	low 0.6, high 13.7	flooding	none	none	80	80	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	26	30	
31-May	6:32 AM	0.00	0.00	0.15	0.44	43	6.0	sunny, clear	n/a	0	low -1.5, high 14.0	ebbing	plastic bag	none	80	90	clear	0	0	1	n/a	n/a	n/a	✓	0	0	0	<10	
6-Jun	2:40 PM	1.21	1.30	1.80	2.13	50	5.6	cloudy, overcast, rain	SE	15	low 2.4, high 12.2	flooding	none	none	70	70	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	1	0	15	<10	
14-Jun	6:18 AM	0.02	0.18	0.27	0.28	51	7.2	cloudy, overcast	N	3	low -4.1, high 15.6	ebbing	none	none	100	60	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	46	<10	Human, Dog, Gull
20-Jun	2:30 PM	0.00	0.00	0.00	0.00	80	16.8	sunny, clear	W	5	low 0.6, high 14.3	flooding	none	none	15	50	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	5	<10	
27-Jun	5:50 AM	0.00	0.00	0.01	0.67	50	8.6	cloudy, overcast	SE	3	low -1.3, high13.63	ebbing	none	none	80	60	clear	0	0	1	n/a	n/a	n/a	✓	0	0	13	71	
2-Jul	11:45 AM	0.00	0.00	0.12	0.66	62	9.0	sunny, clear	NNW	11	low -0.4, high 13.3	flooding	none	styrofoam	70	60	clear	0	0	8	n/a	n/a	n/a	✓	0	0	10	<10	
12-Jul	5:30 AM	0.19	0.20	0.23	0.23	55	9.9	cloudy, overcast	WSW	0	low -3.5, high 15.0	ebbing	none	none	60	20	clear	0	0	2	n/a	n/a	n/a	✓	2	0	9	41	
18-Jul	1:20 PM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	3	<10	
26-Jul	4:50 AM	0.00	0.00	0.00	0.00	61	62.7	sunny, clear	d/m	5	low -0.7, high 13.3	ebbing	none	none	60	80	d/m	0	0	0	n/a	n/a	n/a	n/a	0	0	50	52	
1-Aug	12:06 PM	0.00	0.00	0.00	0.00	61	60.8	sunny, clear	SE	9	low 2.7, high 14	flooding	none	none	50	50	clear	0	0	15	n/a	n/a	n/a	✓	0	0	10	<10	
9-Aug	4:46 AM	1.71	1.74	1.74	1.74	60	61.3	rain	n/a	0	low -2.2, high 14.1	d/m	none	none	20	20	cloudy, murky	0	0	1	n/a	n/a	n/a	✓	0	0	30	10	
16-Aug	11:54 AM	0.00	0.00	0.39	0.39	59.3	60.9	cloudy	N	10	low 0.4, high 15.4	flooding	none	none	60	60	clear	0	0	5	n/a	n/a	n/a	✓	9	0	7	10	
23-Aug	4:37 AM	0.00	0.21	0.42	0.42	59.7	60.4	cloudy, overcast	n/a	0	low 0.5, high 12.8	ebbing	none	none	0	0	very clear	0	0	0	n/a	n/a	n/a	n/a	0	0	6	10	
30-Aug	11:05 AM	0.05	0.07	0.56	0.56	58	60.4	cloudy, overcast	SE	d/m	low 2.6, high 15.07	flooding	none	none	80	95	clear	0	0	8	n/a	n/a	n/a	✓	0	0	2	10	
5-Sep	1:00 PM	0.42	0.48	0.48	0.56	57	9.5	cloudy, overcast, rain	n/a	0	low 4.6, hgih 12.0	ebbing	none	none	40	60	clear	0	0	25	n/a	n/a	✓	n/a	5	0	10	<10	
12-Sep	10:00 AM	0.00	0.00	0.00	0.02	51	7.5	cloudy, overcast	N	7	low -1.6, high 17.3	flooding	none	none	40	40	clear	0	0	18	n/a	n/a	n/a	✓	4	0	26	10	

n/a - not applicable

d/m - data missing

Potential sources = private sewer treatment system outfall(s), individual septic tanks, wildlife.

decay smell (unknown source)

fast moving

1 eagle

1 eagle, 8 geese, v formation heading south

South Point Higgins 2018

South Point Higgins Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		Swimming	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
17-May	8:40 AM	0.00	0.00	0.00	0.00	54	9.8	sunny, clear	n/a	0	low -3.6, high 15.5	ebbing	none	none	30	10	clear	15	5	d/m	n/a	✓	n/a	✓	6	0	5	31.0	
22-May	2:25 PM	0.82	4.28	5.22	5.22	48	8.2	cloudy, overcast	ESE	8	low 0.6, high13.7	flooding	none	none	20	5	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	84	61	
31-May	12:45 PM	0.00	0.00	0.15	0.44	44	4.5	sunny, clear	n/a	0	low -1.5, high 14.0	ebbing	none	none	10	10	clear	0	0	0	n/a	n/a	n/a	n/a	15	0	48 (56)	60 (70)	
6-Jun	2:25 PM	1.21	1.30	1.80	2.13	50	5.8	d/m	SE	15	low 2.4, high 12.2	flooding	none	none	20	20	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	31	<10	
14-Jun	6:40 AM	0.02	0.18	0.27	0.28	51	6.4	cloudy, overcast	N	3	low -4.1, high 15.6	ebbing	none	none	30	0	clear	0	0	1	n/a	n/a	n/a	✓	5	0	65	410	
20-Jun	2:55 PM	0.00	0.00	0.00	0.00	80	15.0	sunny, clear	W	5	low 0.6, high 14.3	flooding	none	none	20	10	cloudy, murky	4	7	0	n/a	✓	n/a	n/a	0	1	8	<10	
27-Jun	6:10 AM	0.00	0.00	0.01	0.67	51	7.0	cloudy, overcast	SE	3	low -1.3, high 13.6	ebbing	none	none	5	10	clear	0	0	3	n/a	n/a	n/a	✓	0	0	22	<10	
2-Jul	11:30 AM	0.00	0.00	0.12	0.66	59	8.2	sunny, clear	NNW	9	low -0.4, high 13.3	flooding	none	none	40	10	clear	3	11	0	✓	✓	n/a	n/a	0	0	11	<10	
12-Jul	5:50 AM	0.19	0.20	0.23	0.23	54	8.8	cloudy, overcast	SW	0	low -3.5, high 15.0	ebbing	batteries	none	20	0	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	4	0	136	350	
18-Jul	12:50 PM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	2	<10	
26-Jul	5:10 AM	0.00	0.00	0.00	0.00	61	59.9	sunny, clear	d/m	7	low -0.7, high 13.3	ebbing	none	none	50	10	clear	0	0	1	n/a	n/a	n/a	✓	0	0	236	134	
1-Aug	11:53 AM	0.00	0.00	0.00	0.00	57	60.9	sunny, clear	ESE	9	low 2.7, high 14	flooding	none	none	0	0	clear	2	5	1	n/a	✓	n/a	n/a	0	0	33	30	
9-Aug	4:18 AM	1.71	1.74	1.74	1.74	60	61.5	cloudy	d/m	4	low -2.2, high 14.1	ebbing	none	none	20	20	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	168	241	Human, Dog, Gull
16-Aug	11:38 AM	0.00	0.00	0.39	0.39	58.2	57.3	overcast	N	10	low 0.4, high 15.4	flooding	none	none	30	30	clear	3	1	0	n/a	✓	n/a	n/a	0	0	5	<10	
23-Aug	4:20 AM	0.00	0.21	0.42	0.42	59.3	59.3	cloudy, overcast	n/a	0	low 0.5, high 12.8	ebbing	none	none	0	0	d/m	0	0	0	n/a	n/a	n/a	n/a	0	0	19	31	
30-Aug	11:28 AM	0.05	0.07	0.56	0.56	58	57.9	cloudy, overcast	n/a	0	low 0.26, high 15.07	flooding	none	none	0	0	clear	0	0	0	n/a	✓	n/a	n/a	2	0	3	10	
5-Sep	1:20 PM	0.42	0.48	0.48	0.56	57	8.1	cloudy, overcast, rain	NNW	5	low 4.6, high 12.0	ebbing	beer cans, pallets	d/m	20	10	clear	0	0	3	n/a	n/a	n/a	✓	3	0	3	<10	
12-Sep	9:40 AM	0.00	0.00	0.00	0.02	51	7.5	sunny, clear, cloudy, overcast	NNW	5	low -1.6, high 17.3	flooding	none	none	30	5	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	28	279	

n/a - not applicable

d/m - data missing

Potential sources = private/public sewer treatment system outfall(s), public treatment system emergency bypasses, individual septic tanks, wildlife, pet feces.

lots of water movement

people foraging at low tide

saw bunch humpbacks

Shull 2018

Shull Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		Swimming	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
17-May	9:15 AM	0.00	0.00	0.00	0.00	56	10.3	sunny, clear	NNW	10	low -3.6, high 15.5	flooding	none	none	30	0	clear	0	0	0	n/a	n/a	n/a	n/a	60	0	3	30	
22-May	2:15 PM	0.82	4.28	5.22	5.22	48	8.9	cloudy, overcast, rain	ESE	8	low 0.6, high 13.7	flooding	none	none	40	20	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	132	20	
31-May	7:45 AM	0.00	0.00	0.15	0.44	46	4.3	sunny, clear	NNW	6	low -1.5, high 14.0	ebbing	none	none	50	50	clear	2	0	1	n/a	✓	n/a	✓	30	0	27	<10	
6-Jun	2:05 PM	1.21	1.30	1.80	2.13	50	5.8	cloudy, overcast, rain	SE	15	low 2.4, high 12.2	flooding	none	none	60	60	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	22 (29)	41 (30)	
14-Jun	6:55 AM	0.02	0.18	0.27	0.28	51	6.5	cloudy, overcast, rain	N	3	low -4.1, high 15.6	ebbing	scrap metal	none	50	100	clear	0	0	2	n/a	n/a	n/a	✓	5	0	118	144	
20-Jun	3:10 PM	0.00	0.00	0.00	0.00	75	16.2	sunny, clear	W	4	low 0.6, high 14.3	flooding	none	none	15	15	cloudy, murky	1	1	0	n/a	✓	n/a	n/a	0	0	6	<10	
27-Jun	6:30 AM	0.00	0.00	0.01	0.67	51	7.1	cloudy, overcast	SSE	0	low -1.3, high 13.6	ebbing	various cable & pipe debris	none	70	20	clear	0	0	0	n/a	n/a	n/a	n/a	5	0	15	20	
2-Jul	11:10 AM	0.00	0.00	0.12	0.66	59	9.2	sunny, clear	NNW	9	low -0.4, high 13.3	flooding	none	none	60	30	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	26	<10	
12-Jul	6:10 AM	0.19	0.20	0.23	0.23	54	9.0	cloudy, overcast	SSW	3	low -3.5, high 15.0	ebbing	none	none	70	10	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	1	0	14	<10	
18-Jul	12:30 PM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	5	20	
26-Jul	5:24 AM	0.00	0.00	0.00	0.00	61	60.9	sunny, clear	d/m	7	low -0.7, high 13.3	ebbing	none	none	>10	>10	clear	0	0	0	n/a	n/a	n/a	n/a	7	0	4	<10	
1-Aug	11:43 AM	0.00	0.00	0.00	0.00	57	61.5	sunny, clear	ESE	9	low 2.7, high 14	flooding	none	none	>1	>1	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	20	0	12 (9)	<10 (<10)	
9-Aug	4:00 AM	1.71	1.74	1.74	1.74	60	60.7	cloudy	d/m	0	low -2.2, high 14.1	ebbing	none	none	20	20	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	119	727	Human, Dog, Gull
16-Aug	11:22 AM	0.00	0.00	0.39	0.39	58.1	d/m	overcast	N	10	low 0.4, high 15.4		none	some metal scraps	50	50	clear	0	0	0	n/a	n/a	n/a	n/a	50	0	16	181	
23-Aug	4:06 AM	0.00	0.21	0.42	0.42	57.2	60.0	cloudy, overcast	n/a	0	low 0.5, high 12.8	ebbing	none	none	0	0	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	13	10	
30-Aug	11:46 AM	0.05	0.07	0.56	0.56	57	58.6	cloudy, overcast, rain	SE	10	low 0.26, high 15.07	flooding	none	none	0	0	d/m	6	0	0	n/a	✓	n/a	n/a	120	0	25	<10	
5-Sep	1:40 PM	0.42	0.48	0.48	0.56	57	8.3	cloudy, overcast, rain	NNW	5	low 4.6, high 12.0	ebbing	filleted fish carcasses	paper	70	30	clear	0	0	0	n/a	n/a	n/a	n/a	15	0	49	10.0	
12-Sep	9:15 AM	0.00	0.00	0.00	0.02	51	6.5	cloudy, overcast	NNW	5	low -1.6, high 17.3	flooding	none	none	40	10	clear	0	0	0	n/a	n/a	n/a	n/a	40	0	33	20	

n/a - not applicable

d/m - data missing

Potential sources = private/public sewer treatment system outfall(s), public treatment system emergency bypasses, individual septic tanks, wildlife, pet feces.

Strange smell (like Fritos) away from water; tons of crabs

Sunset 2018

Sunset Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		Swimming	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
17-May	9:35 AM	0.00	0.00	0.00	0.00	56	10.4	d/m	NNW	5	low -3.6, high 15.5	flooding	none	none	20	10	clear	2	0	0	n/a	✓	n/a	n/a	0	2	3	20	
22-May	2:00 PM	0.82	4.28	5.22	5.22	49	9.1	cloudy, overcast, rain	ESE	8	low 0.6, high 13.7	flooding	none	none	30	60	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	48	63	
31-May	8:10 AM	0.00	0.00	0.15	0.44	48	4.9	sunny, clear	NW	6	low -1.5, high 14.0	ebbing	random parts on beach	none	30	10	clear	0	0	0	n/a	n/a	n/a	n/a	10	0	51	<10	
6-Jun	1:50 PM	1.21	1.30	1.80	2.13	50	6.0	cloudy, overcast, rain	SE	5	low 2.4, high 12.2	ebbing	none	none	0	0	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	10	0	11	<10	
14-Jun	7:20 AM	0.02	0.18	0.27	0.28	51	6.2	cloudy, overcast, rain	NNW	8	low -4.1, high 15.6	ebbing	weird plastic rings	weird plastic rings	50	80	clear	0	0	0	n/a	n/a	n/a	n/a	1	0	31	31	
20-Jun	3:30 PM	0.00	0.00	0.00	0.00	72	16.2	sunny, clear	W	9-12	low 0.6, high 14.3	flooding	none	none	5	5	clear	2	0	0	n/a	✓	n/a	n/a	0	0	4	10	
27-Jun	6:50 AM	0.00	0.00	0.01	0.67	51	8.2	cloudy, overcast	SSE	0	low -1.3, high 13.6	ebbing	food trash (bags, cups/lids)	none	40	5	clear	0	0	1	n/a	n/a	n/a	✓	1	0	12	<10	
2-Jul	10:55 AM	0.00	0.00	0.12	0.66	60	9.2	sunny, clear	N	9	low -0.4, high 13.3	flooding	none	none	60	60	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	21(17)	<10 (<10)	
12-Jul	6:40 AM	0.19	0.20	0.23	0.23	54	8.9				low -3.5, high 15.0	ebbing															28	<10	
18-Jul	12:15 PM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	5	<10	
26-Jul	5:36 AM	0.00	0.00	0.00	0.00	61	61.5	sunny, clear	d/m	7	low -0.7, high 13.3	ebbing	none	none	20	10	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	67	61	
1-Aug	11:31 AM	0.00	0.00	0.00	0.00	59	59.7	sunny, clear	ESE	9	low 2.7, high 14	flooding	none	none	1	1	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	8	10	
9-Aug	5:05 AM	1.71	1.74	1.74	1.74	60	61.5	rain	SE	2	low -2.2, high 14.1	ebbing	none	none	10	10	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	93	187	Human, Dog, Gull
16-Aug	12:24 PM	0.00	0.00	0.39	0.39	59.3	57.3	cloudy	NNW	8	low 0.4, high 15.4	flooding	some litter	none	40	40	clear	1	0	1	n/a	n/a	n/a	✓	0	0	13	<10	
23-Aug	5:09 AM	0.00	0.21	0.42	0.42	59.0	59.9	cloudy, overcast	n/a	0	low 0.5, high 12.8	ebbing	too dark to determine	too dark to determine	too dark to determine	too dark to determine	too dark to determine	0	0	0	n/a	n/a	n/a	n/a	0	0	81	41	
30-Aug	11:58 AM	0.05	0.07	0.56	0.56	56.8	57	rain	S	n/a	low 0.26, high 15.07	d/m	lots of ?? Loose	none	0	0	clear	1	0	0	n/a	n/a	n/a	n/a	3	0	8	10	
5-Sep	2:00 PM	0.42	0.48	0.48	0.56	57	8.2	cloudy, overcast	WNW	6	low 4.6, high 12.0	ebbing	none	none	40	40	clear	0	0	2	n/a	n/a	n/a	✓	0	0	23	10	
12-Sep	9:00 AM	0.00	0.00	0.00	0.02	51	7.5	cloudy, overcast, foggy	NNW	5	low -1.6, high 17.3	d/m	none	none	60	10	cloudy, murky, oily film	0	0	0	n/a	n/a	n/a	n/a	0	0	50	<10	

n/a - not applicable

d/m - data missing

very rough waters

10 seals watching

Potential sources = private/public sewer treatment system outfall(s), individual septic tanks, wildlife, pet feces.

Refuge Cove 2018

Refuge Cove Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		Swimming	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
17-May	9:50 AM	0.00	0.00	0.00	0.00	56	10.2	sunny, clear	NNW	10	low -3.6, high 15.5	flooding	none	none	50	50	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	5	74.0	
22-May	1:45 PM	0.82	4.28	5.22	5.22	49	8.4	cloudy, overcast	ESE	8	low 0.6, high 13.7	flooding	plastic bags, food trash	none	50	50	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	64	95	
31-May	8:36 AM	0.00	0.00	0.15	0.44	50	5.1	sunny, clear	NW	6	low -1.5, high 14.0	ebbing	plastic bag	none	80	100	clear	0	0	0	n/a	n/a	n/a	n/a	6	0	49	<10	
6-Jun	1:15 PM	1.21	1.30	1.80	2.13	50	5.5	cloudy, overcast	SE	18	low 2.4, high 12.2	flooding	none	none	80	90	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	5	0	18	41	
14-Jun	7:36 AM	0.02	0.18	0.27	0.28	51	6.0	cloudy, overcast	NNW	8	low -4.1, high 15.6	ebbing	plastic bags, paper plates	none	90	60	clear	1	1	0	n/a	✓	n/a	n/a	10	0	33	10	
20-Jun	12:40 PM	0.00	0.00	0.00	0.00	65	13.7	cloudy, overcast	W	4 to 12	low 0.6, high 14.3	ebbing	none	none	20	30	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	6	<10	
27-Jun	7:00 AM	0.00	0.00	0.01	0.67	51	8.4	cloudy, overcast	SE	6	low -1.3, high 13.6	ebbing	food garbage (pizza box, bags, cigarettes)	none	80	80	clear	0	0	1	n/a	n/a	n/a	✓	0	0	10	20	
2-Jul	10:30 AM	0.00	0.00	0.12	0.66	60	8.5	sunny, clear	N	9	low -0.4, high 13.3	flooding	food trash (pizza box, plastic bags)	none	70	60	cloudy, murky	5	2	0	n/a	✓	n/a	n/a	0	0	15	<10	
12-Jul	6:50 AM	0.19	0.20	0.23	0.23	54	8.9	cloudy, overcast	SW	3	low -3.5, high 15.0	ebbing	none	none	80	80	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	22 (26)	<10 (10)	
18-Jul	12:00 PM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	7	<10	
26-Jul	5:47 AM	0.00	0.00	0.00	0.00	61	60.8	sunny, clear	d/m	7	low -0.7, high 13.3	ebbing	none	none	60	d/m	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	22 (19)	20 (31)	
1-Aug	11:25 AM	0.00	0.00	0.00	0.00	57	59.9	sunny, clear	d/m	7	low 2.7, high 14	flooding	none	none	10	10	d/m	0	0	0	n/a	n/a	n/a	n/a	0	0	1	20	
9-Aug	5:12 AM	1.71	1.74	1.74	1.74	58	61	cloudy	SE	2	low -2.2, high 14.1	ebbing	none	none	20	20	d/m	0	0	0	n/a	n/a	n/a	n/a	0	0	53	97	Human, Gull
16-Aug	11:47 AM	0.00	0.00	0.39	0.39	59.1	57.0	overcast	N	10	low 0.4, high 15.4	flooding	none	none	20	20	d/m	0	0	0	n/a	n/a	n/a	n/a	20	0	3	<10	
23-Aug	5:20 AM	0.00	0.21	0.42	0.42	59	59.7	cloudy, overcast	n/a	0	low 0.5, high 12.8	ebbing	none	none	0	0	clear	0	0	0	n/a	n/a	n/a	✓	20	0	16	10	
30-Aug	12:12 PM	0.05	0.07	0.56	0.56	57	56.3	cloudy, overcast	ESE	10	low 0.26, high 15.07	flooding	none	none	0	0	clear	1	0	0	n/a	✓	n/a	n/a	0	1	88	<10	
5-Sep	2:10 PM	0.42	0.48	0.48	0.56	57	8.2	partly cloudy, rain	WNW	6	low 4.6, high 12.0	ebbing	none	none	80	60	clear	0	0	0	n/a	n/a	n/a	n/a	3	0	55	<10	
12-Sep	8:50 AM	0.00	0.00	0.00	0.02	51	6.5	cloudy, overcast	NNW	5	low -1.6, high 17.3	ebbing	none	none	40	30	clear	0	0	0	n/a	n/a	n/a	n/a	8	0	25	41	

n/a - not applicable

d/m - data missing

temperature decrease with rainfall

2 cruise ships coming into port

mink came close to samplers and watched

Potential sources = private/public sewer treatment system outfall(s), public treatment system emergency bypasses, individual septic tanks, wildlife, pet feces.

Thomas Basin 2018

Thomas Basin Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		Swimming	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
17-May	12:10 PM	0.00	0.00	0.00	0.00	60	10.3	sunny, clear	NNW	8	low -3.6, high 15.5	flooding	none	none	20	40	slightly turbid	0	0	50	n/a	n/a	n/a	✓	0	0	1.0	10.0	
22-May	1:10 PM	0.82	4.28	5.22	5.22	49	8.5	cloudy, overcast	ESE	8	low 0.6, high 13.7	ebbing	none	none	50	50	cloudy, murky, oily film	0	0	50	n/a	n/a	n/a	✓	5	0	81.0	51.0	
31-May	9:20 AM	0.00	0.00	0.15	0.44	52	4.6	sunny, clear	NNW	7	low -1.5, high 14.0	flooding	cigarettes, chip bags, etc.	none	30	20	clear, oily film	0	0	50	n/a	n/a	n/a	✓	4	0	12.0	41.0	
6-Jun	12:45 PM	1.21	1.30	1.80	2.13	49	4.3	cloudy, overcast, rain	SE	14	low 2.4, high 12.2	ebbing	none	none	30	80	cloudy, murky	0	0	50	n/a	n/a	n/a	✓	0	0	139.0	173.0	
14-Jun	8:15 AM	0.02	0.18	0.27	0.28	53	4.9	cloudy, overcast	N	10	low -4.1, high 15.6	flooding	cigarettes	none	10	10	cloudy, very murky	0	0	50	n/a	n/a	n/a	✓	0	0	19.0	20.0	
20-Jun	11:45 AM	0.00	0.00	0.00	0.00	65	14.5	sunny, clear	W	4	low 0.6, high 14.3	ebbing	none	none	80	10	d/m	d/m	d/m	50	n/a	✓	✓	✓	0	d/m	9.0	<10	
27-Jun	7:35 AM	0.00	0.00	0.01	0.67	51	7.6	cloudy, overcast	SE	6	low -1.3, high 13.6	flooding	none	none	60	5	clear	3	0	50	n/a	✓	✓	✓	0	0	19.0	10.0	
2-Jul	10:00 AM	0.00	0.00	0.12	0.66	59	8.2	sunny, clear	N	9	low -0.4, high 13.3	ebbing	none	none	80	20	clear	30	0	50	n/a	✓	n/a	✓	0	0	41.0	<10	
12-Jul	7:30 AM	0.19	0.20	0.23	0.23	55	8.2	cloudy, overcast	WSW	0	low -3.5, high 15.0	flooding	food debris	none	0	20	cloudy, murky	0	0	50	n/a	n/a	n/a	✓	0	0	37.0	30.0	
18-Jul	11:30 AM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	19.0	52.0	
26-Jul	6:12 AM	0.00	0.00	0.00	0.00	61	59.9	sunny, clear	d/m	6	low -0.7, high 13.3	ebbing	none	none	70	0	clear	0	0	50	n/a	n/a	n/a	✓	0	0	23.0	52.0	
1-Aug	10:45 AM	0.00	0.00	0.00	0.00	59	63	cloudy, overcast	ESE	8	low 2.7, high 14	flooding	none	none	25	0	clear	2	0	50	n/a	✓	n/a	✓	0	0	21 (24)	63 (52)	
9-Aug	5:40 AM	1.71	1.74	1.74	1.74	58	61.0	rain	SE	4	low -2.2, high 14.1	flooding	none	none	10	10	cloudy, murky	0	0	50	n/a	n/a	n/a	✓	0	0	CONF (250)	2755.0	Human, Dog, Gull
16-Aug	10:21 AM	0.00	0.00	0.39	0.39	61.3	58.1	overcast	NNW	10	low 0.4, high 15.4	ebbing	none	none	30	30	cloudy, murky	>50	0	50	n/a	✓	✓	✓	0	0	14.0	74.0	
23-Aug	5:43 AM	0.00	0.21	0.42	0.42	59	59.3	cloudy, overcast	NW	2	low 0.5, high 12.8	ebbing	none	salmon carcasses	0	0	clear	0	0	50	n/a	n/a	n/a	✓	0	0	59	496	
30-Aug	9:59 AM	0.05	0.07	0.56	0.56	58	58.4	cloudy, overcast	SE	3	low 0.26, high 15.07	flooding	none	none	30	2	clear	100	10	50	n/a	✓	✓	✓	12	0	49	350	
5-Sep	2:50 PM	0.42	0.48	0.48	0.56	59	9.7	partly cloudy	WNW	6	low 4.6, high 12.0	ebbing	none	none	60	60	clear	5	0	50	n/a	✓	n/a	✓	2	0	72	528	
12-Sep	8:15 AM	0.00	0.00	0.00	0.02	51	7.8	cloudy, overcast	N	5	low -1.6, high 17.3	ebbing	liquor bottles	none	60	10	clear, oily film	3	0	50	n/a	n/a	n/a	✓	8	0	26	130	

n/a - not applicable

d/m - data missing

road construction so less foot traffic

24 salmon

5 harbor seals

Potential sources = private/public sewer treatment system outfall(s), public treatment system emergency bypasses, sewer line breaks, individual septic tanks, wildlife, pet feces, boats in harbor areas.

Seaport 2018

Seaport Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		g	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
17-May	10:40 AM	0.00	0.00	0.00	0.00	60	12.1	sunny, clear	NNW	3	low -3.6, high 15.5	flooding	none	none	10	90	cloudy, murky	5	0	3	n/a	✓	n/a	✓	50	0	<1	<10	
22-May	12:54 PM	0.82	4.28	5.22	5.22	49	8.7	cloudy, overcast	ESE	8	low 0.6, high 13.7	ebbing	none	none	60	80	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	10	0	51.0	10.0	
31-May	9:50 AM	0.00	0.00	0.15	0.44	52	5.2	sunny, clear	NNW	7	low -1.5, high 14.0	flooding	none	none	60	60	clear	0	0	0	n/a	n/a	n/a	n/a	50	0	33.0	<10	
6-Jun	12:25 PM	1.21	1.30	1.80	2.13	50	5.7	cloudy, overcast, rain	SE	14	low 2.4, high 12.2	ebbing	none	none	60	90	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	30	0	13.0	30.0	
14-Jun	8:40 AM	0.02	0.18	0.27	0.28	53	6.5	cloudy, overcast	N	10	low -4.1, high 15.6	flooding	none	none	d/m	d/m	cloudy, murky	0	0	2	n/a	n/a	n/a	✓	2	0	16.0	10.0	
20-Jun	12:08 PM	0.00	0.00	0.00	0.00	65	15.9	cloudy	W	4	low 0.6, high 14.3	ebbing	small rusted metal debris	none	30	85	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	3.0	20.0	
27-Jun	7:55 AM	0.00	0.00	0.01	0.67	54	8.5	cloudy, overcast	SE	6	low -1.3, high 13.6	flooding	none	none	80	20	clear	0	0	3	n/a	n/a	n/a	✓	0	0	8 (8)	<10 (<10)	
2-Jul	9:40 AM	0.00	0.00	0.12	0.66	59	8.4	sunny, clear	N	9	low -0.4, high 13.3	ebbing	none	none	95	50	clear	0	0	0	n/a	n/a	n/a	n/a	15	0	3.0	<10	
12-Jul	7:55 AM	0.19	0.20	0.23	0.23	54	9.7	cloudy, overcast	WSW	0	low -3.5, high 15.0	flooding	none	none	60	60	cloudy, murky	0	0	5	n/a	n/a	n/a	✓	0	0	5.0	10.0	
18-Jul	11:05 AM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	3.0	>10	
26-Jul	7:31 AM	0.00	0.00	0.00	0.00	61	60.0	sunny, clear	d/m	d/m	low -0.7, high 13.3	d/m	none	none	5	5	clear	0	0	0	n/a	n/a	n/a	n/a	20	0	6.0	<10	
1-Aug	10:26 AM	0.00	0.00	0.00	0.00	61	62.4	sunny, clear	ESE	8	low 2.7, high 14	ebbing	none	none	5	0	clear	0	0	1	n/a	n/a	n/a	✓	40	0	5.0	<10	
9-Aug	6:50 AM	1.71	1.74	1.74	1.74	60	61.3	cloudy, rain	n/a	0	low -2.2, high 14.1	flooding	none	none	30	30	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	>30	0	26.0	52.0	Human, Dog, Gull
16-Aug	10:02 AM	0.00	0.00	0.39	0.39	59.1	59.9	overcast	NNW	6	low 0.4, high 15.4	ebbing	none	none	30	30	clear	3	1	1	n/a	✓	n/a	✓	20	0	5.0	<10	
23-Aug	6:01 AM	0.00	0.21	0.42	0.42	59	57.3	cloudy, overcast	NW	2	low 0.5, high 12.8	flooding	none	none	0	0	clear	0	0	0	n/a	n/a	n/a	n/a	30	0	<1	<10	
30-Aug	9:36 AM	0.05	0.07	0.56	0.56	58	57.7	cloudy, overcast	SE	3	low 0.26, high 15.07	flooding	some metal debris	seastars, juvenile dungies	60	20	clear	2	0	0	n/a	n/a	n/a	n/a	25	0	4.0	10.0	
5-Sep	3:00 PM	0.42	0.48	0.48	0.56	59	9.7	partly cloudy	WNW	6	low 4.6, high 12.0	ebbing	none	none	10	80	clear	0	0	2	n/a	n/a	n/a	✓	40	0	<1	10.0	
12-Sep	8:00 AM	0.00	0.00	0.00	0.02	51	8.0	cloudy, overcast	N	5	low -1.6, high 17.3	ebbing	tubing	none	60	20	clear	0	0	3	n/a	n/a	n/a	✓	30	0	63.0	<10	

2 eagles

n/a - not applicable

d/m - data missing

Potential sources = private/public sewer treatment system outfall(s), public treatment system emergency bypasses, sewer line breaks, individual septic tanks, wildlife, pet feces, boat launch area.

Rotary Park Pool 2018

Rotary Pool Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		Swimming	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
17-May	11:03 AM	0.00	0.00	0.00	0.00	60	11.0	sunny, clear	NNW	5	low -3.6, high 15.5	flooding	none	none	none	none	clear	25	50	0	✓	✓	n/a	n/a	5	0	<1	20.0	
22-May	12:45 PM	0.82	4.28	5.22	5.22	50	8.9	cloudy, overcast, rain	ESE	4	low 0.6, high 13.7	ebbing	none	none	10	0	clear	4	10	d/m	n/a	✓	n/a	✓	0	0	39 (17)	30 (20)	
31-May	10:05 AM	0.00	0.00	0.15	0.44	52	6.8	sunny, clear	NNW	7	low -1.5, high 14.0	flooding	none	none	10	0	clear	15	0	0	n/a	✓	n/a	n/a	0	0	23.0	10.0	
6-Jun	12:10 PM	1.21	1.30	1.80	2.13	50	7.0	cloudy, overcast, rain	SE	14	low 2.4, high 12.2	ebbing	none	none	10	10	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	3	0	36.0	30.0	
14-Jun	9:00 AM	0.02	0.18	0.27	0.28	53	6.1	cloudy, overcast	NNW	10	low -4.1, high 15.6	flooding	none	none	0	0	cloudy, murky	19	2	0	n/a	✓	n/a	n/a	0	0	169.0	145.0	
9-Aug	6:00 AM	1.71	1.74	1.74	1.74	60	61.4	rain	SE	2	low -2.2, high 14.1	flooding	none	none	0	0	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	131.0	336.0	Human, Dog, Gull
16-Aug	9:51 AM	0.00	0.00	0.39	0.39	59.3	57.5	overcast	NNW	6	low 0.4, high 15.4	ebbing	none	none	10	10	clear	2	0	0	n/a	✓	n/a	n/a	0	0	9.0	10.0	
23-Aug	6:52 AM	0.00	0.21	0.42	0.42	59	61.1	cloudy, overcast	n/a	0	low 0.5, high 12.8	flooding	none	none	0	0	d/m	0	0	0	n/a	n/a	n/a	n/a	0	0	24.0	31.0	
30-Aug	9:29 AM	0.05	0.07	0.56	0.56	58	57.3	cloudy, overcast	d/m	1	low 0.26, high 15.07	ebbing	none	none	1	3	clear	2	0	0	n/a	✓	n/a	n/a	0	0	4 (6)	10 (<10)	
5-Sep	3:15 PM	0.42	0.48	0.48	0.56	59	11.5	partly cloudy	WNW	6	low 4.6, high 12.0	ebbing	none	none	20	5	clear	0	0	0	n/a	n/a	n/a	n/a	3	0	3.0	<10	
12-Sep	7:55 AM	0.00	0.00	0.00	0.02	51	6.0	cloudy, overcast	NW	3	low -1.6, high 17.3	ebbing	none	none	10	0	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	25.0	309.0	

school students visiting beach

n/a - not applicable

d/m - data missing

Potential sources = private/public sewer treatment system outfall(s), public treatment system emergency bypasses, sewer line breaks, individual septic tanks, wildlife, pet feces.

Rotary Park Beach 2018

		Rotary Beach Sanitary Survey Summary Table																											
2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Animals		g	Walking	Fishing	Boating	l	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
20-Jun	11:20 AM	0.00	0.00	0.00	0.00	d/m	15.7	sunny, clear	SSE	12	low 0.6, high 14.3	ebbing	none	none	30	20	clear	2	2	0	✓	✓	n/a	n/a	0	2	13.0	10.0	
27-Jun	8:10 AM	0.00	0.00	0.01	0.67	53	8.7	cloudy, overcast	ESE	6	low -1.3, high 13.6	flooding	candy wrappers	none	70	0	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	26.0	10.0	
2-Jul	9:20 AM	0.00	0.00	0.12	0.66	59	8.5	sunny, clear	N	9	low -0.4, high 13.3	ebbing	none	none	40	0	clear	12	0	0	n/a	✓	n/a	n/a	4	0	8.0	<10	
12-Jul	8:10 AM	0.19	0.20	0.23	0.23	54	10.0	cloudy, overcast	W	0	low -3.5, high 15.0	flooding	none	none	20	0	cloudy, murky	4	2	5	n/a	✓	n/a	✓	6	1	8.0	<10	
18-Jul	10:50 AM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	4.0	10.0	
26-Jul	6:30 AM	0.00	0.00	0.00	0.00	61	60.0	sunny, clear	d/m	6	low -0.7, high 13.3	d/m	none	none	5	5	clear	0	0	0	n/a	n/a	n/a	n/a	20	0	13.0	<10	
1-Aug	10:08 AM	0.00	0.00	0.00	0.00	57	61.8	cloudy, overcast	SSE	7	low 2.7, high 14	ebbing	none	none	10	0	clear	2	3	0	n/a	✓	n/a	n/a	25	0	5.0	10.0	
n/a - not applicable																													
d/m - data missing																													
Potential sources = private/public sewer treatment system outfall(s), public treatment system emergency bypasses, sewer line breaks, individual septic tanks, wildlife, pet feces.																													

Mountain Point Surprise Beach 2018

Mountain Point Surprise Beach Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		Swimming	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
20-Jun	11:05 AM	0.00	0.00	0.00	0.00	d/m	15	n/a	SSE	12	low 0.6, high 14.3	ebbing	d/m	d/m	d/m	d/m	clear	0	0	15	n/a	n/a	n/a	✓	0	0	15 (11)	<10 (<10)	
27-Jun	8:40 AM	0.00	0.00	0.01	0.67	55	d/m	cloudy, overcast	ESE	6	low -1.3, high 13.6	flooding	lots of trash (clothes, food packaging)	none	80	5	clear	0	0	3	n/a	n/a	n/a	✓	4	0	23.0	<10	
2-Jul	8:50 AM	0.00	0.00	0.12	0.66	60	8.4	sunny, clear	NNW	10	low -0.4, high 13.3	ebbing	lots of trash (clothes, food items)	none	60	20	clear	20	0	8	✓	n/a	n/a	✓	5	0	9.0	<10	
12-Jul	8:40 AM	0.19	0.20	0.23	0.23	56	8.9	cloudy, overcast	SW	0	low -3.5, high 15.0	flooding	lots of trash	none	70	70	clear	0	0	8	n/a	n/a	n/a	✓	8	0	3.0	<10	
18-Jul	10:30 AM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	2.0	<10	
26-Jul	6:53 AM	0.00	0.00	0.00	0.00	61	60.9	sunny, clear	d/m	6	low -0.7, high 13.3	d/m	none	none	80	95	clear	0	0	0	n/a	n/a	n/a	n/a	0	0	9.0	<10	
1-Aug	9:55 AM	0.00	0.00	0.00	0.00	59	61.3	cloudy, overcast	ESE	8	low 2.7, high 14	ebbing	trash pile leading up to beach	none	50	50	cloudy, murky	15	0	3	✓	n/a	✓	✓	0	0	5.0	51.0	

n/a - not applicable

d/m - data missing

8 snorkelers in

Potential sources = private/public sewer treatment system outfall(s), public treatment system emergency bypasses, sewer line breaks, individual septic tanks, wildlife, pet feces.

Mountain Point Cultural Food 2018

Mountain Point Cultural Food Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		Swimming	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
17-May	11:15 AM	0.00	0.00	0.00	0.00	60	11.5	sunny, clear	NNW	2	low 0.6, high 14.3	flooding	none	none	50	80	clear	10	0	10	n/a	✓	✓	✓	4	0	8.0	10.0	
22-May	12:26 PM	0.82	4.28	5.22	5.22	50	9.0	cloudy, overcast, rain	SE	3	low 0.6, high 13.7	ebbing	various types of trash (beer, chip bags)	none	60	20	clear	0	0	3	n/a	n/a	n/a	✓	0	0	46.0	106.0	
31-May	10:20 AM	0.00	0.00	0.15	0.44	52	5.8	sunny, clear	NNW	7	low -1.5, high 14.0	flooding	beer cans	none	40	20	clear	0	0	15	n/a	n/a	n/a	✓	0	0	21.0	20.0	
6-Jun	11:52 AM	1.21	1.30	1.80	2.13	51	5.5	cloudy, overcast, rain	SE	8	low 2.4, high 12.2	ebbing	none	none	60	50	cloudy, murky	0	0	15	n/a	n/a	n/a	✓	3	0	103.0	121.0	
14-Jun	9:15 AM	0.02	0.18	0.27	0.28	55	7.0	partly cloudy	NNW	9	low -4.1, high 15.6	flooding	none	none	80	80	clear	0	0	10	n/a	n/a	n/a	✓	20	0	9.0	<10	
9-Aug	6:15 AM	1.71	1.74	1.74	1.74	60	61.5	rain	SE	3	low -2.2, high 14.1	flooding	none	none	50	50	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	0	0	43.0	51.0	Human, Dog, Gull
16-Aug	9:38 AM	0.00	0.00	0.39	0.39	57.3	60.2	overcast	NNW	6	low 0.4, high 15.4	ebbing	none	none	70	70	clear	0	0	4	n/a	n/a	n/a	✓	0	0	4.0	10.0	
23-Aug	6:16 AM	0.00	0.21	0.42	0.42	59	59.2	cloudy, overcast	Wind	2	low 0.5, high 12.8	flooding	none	none	0	0	clear	3	0	2	n/a	✓	✓	✓	2 to 5	1	<1 (<1)	<10 (<10)	
30-Aug	9:14 AM	0.05	0.07	0.56	0.56	57.0	58.6	cloudy, overcast	n/a	0	low 0.26, high 15.07	ebbing	none	none	70	80	clear	8	0	1	n/a	✓	n/a	✓	0	0	4.0	40.0	
5-Sep	3:20 PM	0.42	0.48	0.48	0.56	59	8.9	partly cloudy	WNW	6	low 4.6, high 12.0	ebbing	none	none	90	90	clear	0	0	4	n/a	n/a	n/a	✓	3	0	118.0	414.0	
12-Sep	7:30 AM	0.00	0.00	0.00	0.02	51	8.0	cloudy, overcast	NW	3	low -1.6, high 17.3	ebbing	none	none	100	30	clear	0	0	1	n/a	n/a	n/a	✓	5	0	98 (90)	183 (181)	

eagles

n/a - not applicable
d/m - data missing

Potential sources = private/public sewer treatment system outfall(s), public treatment system emergency bypasses, sewer line breaks, individual septic tanks, wildlife, pet feces.

Herring Cove 2018

Herring Sanitary Survey Summary Table

2018 Sampling Date	Sample Collection Time	Rainfall " in <24 hr	Rainfall " in <48 hr	Rainfall " in <72 hr	>72 hr Since Last Rain Event	Air Temp F	Marine Water Temp C / F	Weather	Wind		Tide		Beach Conditions				Visual Turbidity	#People at Beach		#Boats	Beach Activity				Wildlife, Domestic Animal Presence		Fecal Coliform Result	Enterococcus Result	MST Results
									Direction	Speed	Elevation	Phase	Debris		% Vegetation			#Adults	#Children		Swimming	Walking	Fishing	Boating	Waterfowl	Dogs			
													onshore	in water	onshore	in water											cfu/100 ml	MPN/100 ml	
17-May	11:35 AM	0.00	0.00	0.00	0.00	60	12.5	sunny, clear	NNW	2	low -3.6, high 15.5	flooding	none	none	0	0	clear	5	0	0	n/a	✓	n/a	n/a	20	0	2.0	31.0	
22-May	11:58 AM	0.82	4.28	5.22	5.22	50	9.2	cloudy, overcast, rain	SE	3	low 0.6, high 13.7	ebbing	none	none	0	10	cloudy, murky	1	0	0	n/a	✓	n/a	✓	4	1	94.0	30.0	
31-May	10:50 AM	0.00	0.00	0.15	0.44	55	5.9	sunny, clear	NNW	6	low -1.5, high 14.0	flooding	none	none	0	0	clear	0	0	0	n/a	n/a	n/a	n/a	15	0	9.0	<10	
6-Jun	11:17 AM	1.21	1.30	1.80	2.13	51	3.5	cloudy, overcast	SE	5	low 2.4, high 12.2	ebbing	none	none	0	0	cloudy, murky	0	0	0	n/a	n/a	n/a	n/a	10	0	123.0	109.0	
14-Jun	9:30 AM	0.02	0.18	0.27	0.28	55	6.5	partly cloudy	NNW	9	low -4.1, high 15.6	flooding	none	none	0	20	clear	16	2	9	n/a	✓	✓	✓	9	0	32 (28)	10 (<10)	
20-Jun	10:40 AM	0.00	0.00	0.00	0.00	d/m	16.7	sunny, clear	SSE	12	low 0.6, high 14.3	ebbing	d/m	d/m	d/m	d/m	clear	10	0	7	n/a	n/a	✓	✓	4	0	67.0	<10	
27-Jun	8:57 AM	0.00	0.00	0.01	0.67	55	8.7	cloudy, overcast	E	5	low -1.3, high 13.6	flooding	none	none	0	0	clear	25	4	10	n/a	✓	✓	✓	25	0	13.0	<10	
2-Jul	8:30 AM	0.00	0.00	0.12	0.66	59	8.5	sunny, clear	NNW	10	low -0.4, high 13.3	ebbing	none	none	0	0	clear	12	2	9	n/a	✓	✓	✓	25	0	18.0	10.0	
12-Jul	9:00 AM	0.19	0.20	0.23	0.23	56	8.7	cloudy, overcast	SSW	0	low -3.5, high 15.0	flooding	none	none	0	5	clear	18	0	0	n/a	n/a	✓	n/a	25	0	33.0	41.0	
18-Jul	10:10 AM	0.00	0.48	0.69	0.69	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	d/m	32 (31)	20 (30)	
26-Jul	7:10 AM	0.00	0.00	0.00	0.00	61	61.3	sunny, clear	d/m	6	low -0.7, high 13.3	d/m	metal pipes	none	0	0	clear	0	0	0	n/a	n/a	n/a	n/a	2	0	45.0	<10	
1-Aug	9:28 AM	0.00	0.00	0.00	0.00	57	60.2	cloudy, overcast	ESE	7	low 2.7, high 14	ebbing	eroded small scrap metal	none	2	0	clear	0	0	0	n/a	n/a	n/a	n/a	9	0	18.0	20.0	
9-Aug	6:30 AM	1.71	1.74	1.74	1.74	60	51.4	cloudy, rain	SE	2	low -2.2, high 14.1	flooding	small metal	none	0	0	clear	0	0	0	n/a	n/a	n/a	n/a	20	0	210.0	201.0	Human, Dog, Gull
16-Aug	9:19 AM	0.00	0.00	0.39	0.39	57.2	59.7	overcast	NNW	6	low 0.4, high 15.4	ebbing	none	none	2	2	clear	2	3	0	n/a	✓	✓	n/a	50	0	81.0	31.0	
23-Aug	6:30 AM	0.00	0.21	0.42	0.42	59	58.6	cloudy, overcast	n/a	0	low 0.5, high 12.8	flooding	none	none	0	0	clear	2	0	0	n/a	✓	✓	n/a	40	0	246.0	156.0	
30-Aug	8:59 AM	0.05	0.07	0.56	0.56	60.9	58.9	cloudy, overcast	SE	8	low 0.26, high 15.07	ebbing	metal	none	2	1	clear	5	0	0	n/a	n/a	✓	n/a	25	0	56.0	20.0	
5-Sep	3:40 PM	0.42	0.48	0.48	0.56	59	9.0	partly cloudy	WNW	6	low 4.6, high 12.0	flooding	fish carcasses	none	0	0	clear	1	0	0	n/a	n/a	✓	n/a	50	0	318.0	457.0	
12-Sep	7:17 AM	0.00	0.00	0.00	0.02	50	7.0	cloudy, overcast	NW	3	low -1.6, high 17.3	ebbing	fish carcasses	none	0	0	clear	4	0	1	n/a	n/a	✓	n/a	100	0	213.0	414.0	
n/a - not applicable																									4 seals	2 seals			
d/m - data missing																													
Potential sources = private/public sewer treatment system outfall(s), public treatment system emergency bypasses, sewer line breaks, individual septic tanks, wildlife, pet feces.																													

Appendix C. Chain of Custody Forms and Laboratory Reports

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5079
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVENUE	Sampler Name (Print): SAMUA NAUJOCAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS. USE PROVIDED REMOVABLE BLUE TAPE LABELS. THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-KNUDSON	MARINE	5/15	4 12 am	GRAB	FC SM9222D
KB-SP HIGGINS		5/15	4 40		ENTERO DG503.99
KB-SHUTT		5/15	5:02		
KB-SUNSET		5/15	5 18		
KB-SREFUGE		5/15	5 41		
KB-THOMAS BASIN		5/15	6 13		
KB-SEAPORT		5/15	6 28		
KB-ROTARY POOL		5/15	6 42		
KB-ROTARY BCH.		5/15	6 58		
KB-MTN. SURPRISE		5/15	6 03		
KB-MTN. LUIT.		5/15	7 04		
KB-HERRING		5/15	7 15		

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
SAM NAUJOCAS	5-15	8:16		5/15/19	0816

R&M

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 907-383-5079
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 Willoughby Ave.	Sampler Name (Print): SAMUEL NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature: [signature]

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Herring	MARINE	5/22	8 43	GRAB	FC SM9222D
KB-MTN CUIT.			9 07		ENTERO D6503.99
KB-MTN. Surprise			9 13		
KB-ROTARY BEA.			9 26		
KB-ROTARY POOL			9 28		
KB-SEAPORT			9 39		
KB-THOMAS			9 58		
KB-S REFUGE			10:45		
KB-SUNSET			10:50		
KB-SHULL			11:08		
KB-SP Higgins			11:16		
KB-KNUDSON			11:45		
KB S Pt Hen Dup			11 16		

1st drop-off

2nd drop-off

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
SAM NAUJOKAS	5/22	12:03	[signature]	5/22/19	@ 1024
			Robert Bar[illegible]	5/22/15	12:03

5.5°C

[signature] 1320 temp 7.0°C

R&M

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5074
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVENUE	Sampler Name (Print): SAMUEL NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - KENNISON	MARINE	5/24	3:45	GRAB	FC SM 9221D
KB - SP HIGGINS			4:00		ENTERO D6503.99
KB - SHUII (DUP)			4:27		
KB - SUNSET			4:45		
KB - SREFUGE			4:48		
KB - THOMAS BASIN			5:05		
KB - SEAPORT			5:20		
KB - ROTARY POOL			5:25		
KB - ROTARY BEA.			5:26		
KB - MTN. SURFISE			5:55		
KB - MTN. LUIT.			6:00		
KB - HERRING			6:15		

FIELD/LAB NOTES: - ROTARY POOL VERY DARK + MURKY

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
SAM NAUJOKAS	5/24	7:45	Joel Teune	5/29/19	7:45 am
				5/29/19	0900 @ 6.0°C

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN DIKUL	Phone Number: 707-383-5079
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVE.	Sampler Name (Print): ~~SAMUEL NAUSOKAS~~ Tony Gallegos
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-HERRING	MARINE	6/5	7:48	GRAB	FC SM9222D
KB-MTN CUT.			8:15		ENTERO D6503.04
KB-MTN. SURPRISE			8:30		
KB-ROTARY BEA.			8:55		
KB-ROTARY POOL			8:45		
KB-SEAPORT			9:15		
KB-THOMAS			9:48		
KB-S REFUGE					
KB-SUNSET			12:02		
KB-SHULL			11:48		
KB-SP HIGGINS			11:20		
KB-KANOSOL			10:50		

1st drop off

DUP.

#2

FIELD/LAB NOTES: drop-off 1: temp = 4.5°C
drop-off 2: temp =

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	6/5/19	10:20 am		6/5/19	1020
	6/5/19	12:30 pm		6/5/19	1305

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5074
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVENUE	Sampler Name (Print): SAMUEL NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - KNUDSON	MARINE	6/11	11:30 AM	GRAB	FC SM 9222D
KB - SP HIGGINS			11:45AM		ENTERO DG503.99
KB - SHULL			12:00AM		
KB - SUNSET			12:10AM		
(DUP) KB - SREFUGE			12:20AM		
KB - THOMAS BASIN			12:50AM		
KB - SEAPORT			1:05PM		
KB - ROTARY POOL			1:20 PM		
KB - ROTARY BCH.			1:15PM		
KB - MTN. SURPRISE			1:45PM		
KB - MTN. CUIT.			1:35PM		
KB - HERRING			2:00PM		

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
				6/11/19	1430

temp = 5.0°C

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5074
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVENUE	Sampler Name (Print): SAMUEL NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - KNUDSON	MARINE	6/6/19	9:35 AM	GRAB	FC SM 9222D
KB - SP HIGGINS	"	"	9:17 AM	"	ENTERO DG503.99
KB - SHUII (DUP)	"	"	9:05 AM	"	"
KB - SUNSET	"	"	8:49 AM	"	"
KB - SREFUGE	"	"	8:44 AM	"	"
KB - THOMAS BASIN	"	"	9:10 AM	"	"
KB - SEAPORT	"	"	7:11 AM	"	"
KB - ROTARY POOL	"	"	6:52 AM	"	"
KB - ROTARY BCH.	"	"	6:50 AM	"	"
KB - MTN. SURFISE	"	"	6:40 AM	"	"
KB - MTN. CUIT.	"	"	6:27 AM	"	"
KB - HERRING	"	"	6:15 AM	"	"

~~FIELD~~/~~LAB~~ NOTES: bottles show Thomas Basin as the site with a duplicate sample; this appears to be a photocopy (w/ new date/time)

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
				6/19/19	1015
					temp: 60° C

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5079
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVENUE	Sampler Name (Print): SAMUA NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - KNUDSON	MARINE	6/25	9:55am	GRAB	FC SM 9222D
KB - SP HIGGINS			10:25am		ENTERO DG503.99
KB - SHULL			10:44am		
KB - SUNSET			10:55am		
KB - SREFUGE			11:07		
KB - THOMAS BASIN			11:35		
KB - SEAPORT					
KB - ROTARY POOL					
KB - ROTARY BCH.					
KB - MTN. SURPISE					
KB - MTN. LUIT.					
KB - HERRING					
KB - SEAPORT DUP					

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	6-25	12:45		6/25/19	1245

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5079
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVE.	Sampler Name (Print): SAMUEL NAUSOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - HERRING	MARINE	7-2	4:45 PM	GRAB	FC SM9222D
KB - MTN CUT.	"	"	5:00	"	ENTERO D6503.04
KB - MTN. SURPRISE	"	"	5:10	"	"
KB - ROTARY BEA.	"	"	5:22	"	"
KB - ROTARY POOL	"	"	5:28	"	"
KB - SEAPORT	"	"	5:35	"	"
KB - THOMAS	"	"	5:47	"	"
KB - S REFUGE	"	"	6:15	"	"
KB - SUNSET	"	"	6:21	"	"
KB - SHELL	"	"	6:35	"	"
KB - SP HIGGINS	"	"	6:50	"	"
KB - KANOSOL	"	"	7:11	"	"
KB - [illegible]	"	"	5:18	"	"

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
				7/2/19	0730
			LAB - JE	7/2/19	0845

temp = 4.5°C

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5079
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVENUE	Sampler Name (Print): SAMUEL NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - KNUDSON	MARINE	7-10	11:00	GRAB	FC SM 9222D
KB - SP HIGGINS			11:25		ENTERO DG503.99
KB - SHULL			11:35		
KB - SUNSET			11:55		
KB - SREFUGE			12:00		
KB - THOMAS BASIN			12:21		
KB - SEAPORT			12:45		
KB - ROTARY POOL			1:00		
KB - ROTARY BCH.			1:05		
KB - MTN. SURFISE			1:25		
KB - MTN. CUIT.			1:30		
KB - HERRING			1:45		
KB - Rotary B. Duplicate			1:05		

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	7-10-19	2:30		7/10/19	1430
					7°C

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN DICUL	Phone Number: 707-583-5079
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVE.	Sampler Name (Print): SAMUEL NAUSOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-HERRING	MARINE		5:35	GRAB	FC SM92220
KB-MTN CUT.	"		5:50	"	ENTRO D6503.04
KB-MTN. SURPRISE	"		5:57	"	"
KB-ROTARY BCH.	"		6:12	"	"
KB-ROTARY POOL	"		6:07	"	"
KB-SEAPORT	"		6:21	"	"
KB-THOMAS	"		6:40	"	"
KB-S REFUGE	"		7:05	"	"
KB-SUNSET	"		7:11	"	"
KB-SHELL	"		7:21	"	"
KB-SP HIGGINS	"		7:41	"	"
KB-KANOSOL	"		8:03	"	"

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
SAM	7/17	8:23		7/17	0822

R&M

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5074
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVENUE	Sampler Name (Print): SAMUEL NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS. USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - KNUDSON	MARINE	7/23	8:56	GRAB	FC SM 9222D
KB - SP HIGGINS			9:14		ENTERO D6503.99
KB - SHULL			9:32		
KB - SUNSET			9:50		
KB - SREFUGE			9:58		
KB - THOMAS BASIN			10:26		
KB - SEAPORT			10:42		
KB - ROTARY POOL			10:54		
KB - ROTARY BCH.			10:56		
KB - MTN. SURPRISE			11:08		
KB - MTN. CUIT.			11:19		
KB - HERRING			11:32		

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	7/23	12:19		7/23/19	1230
				7/23/19	1310

temp = 5.5°C

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN DIKU	Phone Number: 707-383-5079
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 Willoughby Ave.	Sampler Name (Print): SAMUEL NAUDOFAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS. USE PROVIDED REMOVABLE BLUE TAPE LABELS. THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-HERRING	MARINE	7/23	3:28	GRAB	FC SM92220
KB-MTN CUT.	"	"	3:44	"	ENTERO D6503.04
KB-MTN. SURPRISE	"	"	3:50	"	"
KB-ROTARY BCH.	"	"	4:12	"	"
KB-ROTARY POOL	"	"	4:12	"	"
KB-SEAPORT	"	"	4:29	"	"
KB-THOMAS	"	"	4:44	"	"
KB-S REFUGE	"	"	5:16	"	"
KB-SUNSET	"	"	5:19	"	"
KB-SHELL	"	"	5:46	"	"
KB-SP HIGGINS	"	"	5:57	"	"
KB-KNUDSON	"	"	6:14	"	"
HERRING DUP	"	"	3:28	"	"

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	7/24	6:58		7/24/19	0700

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
907-225-7917 x 110 or jlarna@rmketchikan.com

Chain of Custody

Facility Name:	Phone Number:
Analysis Results To: KIC	Email:
Address:	Sampler Name (Print): SAM NAUSOFAS
City, State, Zip:	Sampler Signature:

SAMPLING INSTRUCTIONS:

- Fill appropriate bottle (requirements below) with sample, leaving a 1" air space. **Please do not fill to full**
- Complete form & label bottles accordingly, labels should clearly distinguish samples from another facilities.
- Samples are accepted Mon-Thurs 8:00-3:00 and expire 6 hours after collection.
- If transit to lab exceeds 2 hours, samples must be stored on ice and be accompanied by a temperature

SAMPLE BOTTLE REQUIREMENTS: *Please us bottles provided by R&M*

- Effluent BOD/TSS = 1000 ml HDPE plastic, screw top bottle
- Influent BOD/TSS = 500 ml HDPE plastic, scew top bottle
- Fecal Coliform/Enterococcus = 120 ml sterile plastic bottle

Sample Information

PLEASE DO NOT WRITE ON RE-USABLE BOD BOTTLES/LIDS, USE PROVIDED BLUE LABELS

Sample Location	Sample Matrix	Date	Time	Grab/Comp	Analysis Requested
SURPRISE		8/7	1:40	GRAB	↓
C/I T. FOODS		"	1:51	"	
HERRING		"	2:05	"	

DUE TO PROCEDURE AND REGULATION, FAILURE TO COMPLY WITH SAMPLING INSTRUCTIONS & REQUIREMENTS, OR EXCEEDANCE OF TIME/TEMPERATURE LIMITS, MAY RESULT IN SAMPLE REJECTION AND ASSOCIATED RE-SAMPLING FEES.

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	8/7	3:00 PM		8/7/19	1500

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
907-225-7917 x 110 or jlarna@rmketchikan.com

Chain of Custody

Facility Name: KI	Phone Number:
Analysis Results To: KIC	Email:
Address:	Sampler Name (Print): SAM NAUTOKAS
City, State, Zip:	Sampler Signature: S

SAMPLING INSTRUCTIONS:

- Fill appropriate bottle (requirements below) with sample, leaving a 1" air space. **Please do not fill to full**
- Complete form & label bottles accordingly, labels should clearly distinguish samples from another facilities.
- Samples are accepted Mon-Thurs 8:00-3:00 and expire 6 hours after collection.
- If transit to lab exceeds 2 hours, samples must be stored on ice and be accompanied by a temperature

SAMPLE BOTTLE REQUIREMENTS: *Please us bottles provided by R&M*

- Effluent BOD/TSS = 1000 ml HDPE plastic, screw top bottle
- Influent BOD/TSS = 500 ml HDPE plastic, scew top bottle
- Fecal Coliform/Enterococcus = 120 ml sterile plastic bottle

Sample Information

PLEASE DO NOT WRITE ON RE-USABLE BOD BOTTLES/LIDS, USE PROVIDED BLUE LABELS

Sample Location	Sample Matrix	Date	Time	Grab/Comp	Analysis Requested
KNUDSON	GRAB	8/7	11:34	GRAB	FC/ENTERO
SP. HIGGINS	"	"	11:54	"	"
SHULL	"	"	12:10	"	"
SUNSPT	"	"	12:20	"	"
S:RRP	"	"	12:32	"	"
THOMAS	"	"	1:00	"	"
SEAPORT	"	"	1:10	"	"
ROT. POOL	"	"	1:23	"	"
ROTI BEACH	"	"	1:30	"	"

DUE TO PROCEDURE AND REGULATION, FAILURE TO COMPLY WITH SAMPLING INSTRUCTIONS & REQUIREMENTS, OR EXCEEDANCE OF TIME/TEMPERATURE LIMITS, MAY RESULT IN SAMPLE REJECTION AND ASSOCIATED RE-SAMPLING FEES.

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
S	8/7	3:00 PM	[signature]	8/7/19	1500

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-383-5079
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVE.	Sampler Name (Print): SAMUEL NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-HERRING	MARINE	8/13	5:02	GRAB	FC SM92220
KB-MINCUT.			5:19		ENTERO D6503.04
KB-MTN. SURPRISE			5:30		
KB-ROTARY BEA.			5:49		
KB-ROTARY POOL			5:39		
KB-SEAPORT			5:52		
KB-THOMAS			6:10		
KB-S REFUGE			6:32		
KB-SUNSPT			6:40		
KB-SHELL			6:51		
KB-SP HIGGINS			7:05		
KB-KANOSOL			7:22		
KB-SPITFIRE			7:04		
↑FIELD REP					

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	8-13	7:52		8/13/19	7:50

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5074
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVENUE	Sampler Name (Print): SAMUA NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-KNUDSON	MARINE	8/21	7:57	GRAB	FC SM9222D
KB-SPIGGINS			8:13		ENTERO DG503.99
KB-SHULL			8:24		
KB-SUNSET			8:34		
KB-SREFUGE			8:43		
KB-THOMAS BASIN			9:04		
KB-SEAPORT			9:15		
KB-ROTARY POOL			9:25		
KB-ROTARY BCH.			9:23		
KB-MTN. SURFACE			9:35		
KB-MTN. LUIT.			9:42		
KB-HERRING			9:56		
KB-SHULL F.R.			8:25		

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	8/21	10:35		8/21/19 @7.5°C	1035

R&M ENGINEERING-KETCHIKAN, INC.
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Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5074
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVENUE	Sampler Name (Print): SAMUEL NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - KNUDSON	MARINE	9/4	7:53	GRAB	FC SM 9222D
KB - SP HIGGINS	"	"	8:08	"	ENTERO DG503.99
KB - SHULL	"	"	8:22	"	"
KB - SUNSET	"	"	8:37	"	"
KB - SREFUGE	"	"	8:45	"	"
KB - THOMAS BASIN	"	"	9:09	"	"
KB - SEAPORT	"	"	9:20	"	"
KB - ROTARY POOL	"	"	9:33	"	"
KB - ROTARY BCH.	"	"	9:29	"	"
KB - MTN. SURFACE	"	"	9:45	"	"
KB - MTN. CUT.	"	"	9:52	"	"
KB - HERRING	"	"	10:02	"	"
CULT DUP	"	"	9:52	"	"

FIELD/LAB NOTES: temp 6.0°C je

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	9-4-19	11:00 AM		9/4/19	1100

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-383-5079
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVE.	Sampler Name (Print): SAMUEL NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-HERRING	MARINE	9/18/14	3:26	GRAB	FC SM92220
KB-MINCUT.			3:45		ENTERO D6503.04
KB-MTN. SURPRISE			3:52		
KB-ROTARY BEA.			4:14		
KB-ROTARY POOL			4:17		
KB-SEAPORT			4:25		
KB-THOMAS			4:41		
KB-S REFUGE			5:10		
KB-SUNSET			5:15		
KB-SHELL			5:25		
KB-SP HIGGINS			5:40		
KB-KNUDSON			5:57		
SIREF REP			5:10		

FIELD/LAB NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	9/10	6:44 AM		9/10/14	6 55 AM

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: GRETCHEN PIKUL	Phone Number: 707-583-5074
Company Name: DEC DIV OF WATER	Fax Number:
Address: 410 WILLOUGHBY AVENUE	Sampler Name (Print): SAMUEL NAUJOKAS
City, State, Zip JUNEAU, AK 99811	Sampler Signature:

PLEASE REVIEW SAMPLING INSTRUCTIONS ON REVERSE PRIOR TO SAMPLING

Sample Information

DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS, THESE BOTTLES ARE NOT SINGLE USE

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - KNUDSON	MARINE	9/18	6:41	GRAB	FC SM 9221D
KB - SP HIGGINS	"	"	6:53	"	ENTERO DG503.99
KB - SHULL	"	"	7:18	"	"
KB - SUNSET	"	"	7:26	"	"
KB - SREFUGE	"	"	7:39	"	"
KB - THOMAS BASIN	"	"	7:59	"	"
KB - SEAPORT	"	"	8:15	"	"
KB - ROTARY POOL	"	"	8:28	"	"
KB - ROTARY BCH.	"	"	8:35	"	"
KB - MTN. SURFACE	"	"	8:37	"	"
KB - MTN. CUIT.	"	"	8:48	"	"
KB - HERRING	"	"	9:04	"	"
HERRING FR	"	"	9:04	"	"

FIELD/LAB NOTES: 9.0°C

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
SAM	9/18	09:45		9/18/19	0945

Chain Of Custody Record

Revision 1.2
Effective Date 8/20/2018

Source Molecular Corporation
15280 NW 79th CT Suite 107 Miami Lakes, FL 33016
Tel: (1) 786-220-0379 Fax: (1) 786-513-2733
Email: info@sourcemolecular.com

Company Name	KC/ADEC
Contact Name(s)	GRETCHEN PIKUL / SAM NAUTOKAS
Send Results To	(email)
Phone	707-383-5071
Address	
City/State/Zip	
Billing Info	PO#: ☐ Will call with credit card

Sample ID	Analysis Requested (see pg. 2) Mark boxes with "X"	Comments (i.e. special requests, # of containers)	Collection Date	Collection Time
KB - Herring Cove			7-29	2:57 am
KB - MTN P cult Foods				3:14 am
KB - MTN P Supr.				3:50 am
KB - Rotary Pool				4:35 am
KB - Rotary Beach				4:40 am
KB - Jensen Seafood				4:49 am
KB - Thomas Point				4:54 am
KB - S. Refuge				5:16 am
KB - Sunset				5:19 am
KB - Shull				5:46 am
KB - SP Higgins				5:57 am
KB - Knudson Cove				6:14 am

Completed by Client:
Relinquished By SAM NAUTOKAS
Signature
Date/Time 7/24 7:13 AM

To protect confidentiality, confirmation and results will only be sent to email address provided or authorized by contact provided. Signed form indicates agreement with the test limitations on the back of this form and the company's terms of use found here: sourcemolecular.com/about-sourcemolecular/privacy_statement/.

Completed by Source Molecular:
Temperature 10.6C
Thermometer 001
Cooler Number BM025
Received/Filtered Douglas Gramajo
Signature
Date/Time 7/31/19 10:50

Chain Of Custody Record

Revision 1.2
Effective Date 8/20/2018

Source Molecular

Source Molecular Corporation
15280 NW 79th CT Suite 107 Miami Lakes, FL 33016
Tel: (1) 786-220-0379 Fax: (1) 786-513-2733
Email: info@sourcemolecular.com

Company Name	KETCHIKAN INDIAN COMM./AK DEPT. OF ENV. CON
Contact Name(s)	SAM NAUJOKAS, GRETCHEN PIKUL, REBECCA BELLMO
Send Results To	(email) REBECCA@SAWCAK.ORG; GRETCHEN.PIKUL@ALASKA.GOV; SNAVJOKAS@KICTRIBE.ORG
Phone	907-228-9447
Address	429 DEERMOUNT STREET
City/State/Zip	KETCHIKAN, AK 99901
Billing Info	PO#: ☐ Will call with credit card

Analysis Requested (see pg. 2) Mark boxes with "X"

Sample ID	MICROBIAL SOURCE TRACKING	Comments (i.e. special requests, # of containers)	Collection Date	Collection Time
HERRING COVE	X		9-10-19	3:26 AM
MTN. PT. CULTURAL FOODS	X			3:45
MTN. PT. SURPRISE	X			3:52
ROTARY POOL	X			4:14
ROTARY BEACH	X			4:27
SEAPORT	X			4:25
THOMAS	X			4:41
SOUTH REFUGE	X			5:10
SUNSET	X			5:15
SITULI	X			5:25
SOUTH POINT HIGGINS	X			5:40
KNUDSON COVE	X			5:57

Completed by Client:

Relinquished By SAM NAUJOKAS
Signature
Date/Time 9-9-2019 6:15 AM

To protect confidentiality, confirmation and results will only be sent to email address provided or authorized by contact provided. Signed form indicates agreement with the test limitations on the back of this form and the company's terms of use found here: sourcemolecular.com/about-sourcemolecular/privacy_statement/.

Completed by Source Molecular:

Temperature 12.3C
Thermometer 007
Cooler Number Blue 15
Received/Filtered Douglas Greenwood
Signature
Date/Time 9:30am 9/11/2019

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

Southeast Alaska Watershed Coaltion
Attn: Rebecca Bellmore
1107 W. 8th St., Ste. #4
Juneau, AK 99801

Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 5/15/2019
Time: 0412-0715
Matrix: marine
Type: grab

LAB RECEIVING
Date: 5/15/2019
Time: 0816

LAB REPORTING
Date: 5/17/2019
Time: 1500

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27019	**KB - Knudson**	**FC**	5/15/2019	1120	**5**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503
27020	**KB - SP Higgins**	**FC**	5/15/2019	1120	**52**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503
27021	**KB - Shull**	**FC**	5/15/2019	1120	**3**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503
27022	**KB - Sunset**	**FC**	5/15/2019	1120	**17**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**10**	**MPN / 100 ml**	10	D6503
27023	**KB - S Refuge**	**FC**	5/15/2019	1120	**6**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503
27024	**KB - Thomas Basin**	**FC**	5/15/2019	1120	**55**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**256**	**MPN / 100 ml**	10	D6503
27025	**KB - Seaport**	**FC**	5/15/2019	1120	**2**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503
27026	**KB - Rotary Pool**	**FC**	5/15/2019	1120	**6**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503
27027	**KB - Rotary Beach**	**FC**	5/15/2019	1120	**10**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503
27028	**KB - Mtn. Surprise**	**FC**	5/15/2019	1120	**21**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503
27029	**KB - Mtn. Cult**	**FC**	5/15/2019	1120	**18**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503
27030	**KB - Herring**	**FC**	5/15/2019	1120	**30**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503
27031	**KB - Knudson (field rep)**	**FC**	5/15/2019	1120	**4**	**cfu / 100 ml**	1	9222D
		entero	5/15/2019	1000	**<10**	**MPN / 100 ml**	10	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

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Southeast Alaska Watershed Coaltion
Attn: Rebecca Bellmore
1107 W. 8th St., Ste. #4
Juneau, AK 99801

Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 5/22/2019
Time: 0843-1145
Matrix: marine
Type: grab

LAB RECEIVING
Date: 5/22/2019
Time: 1203

LAB REPORTING
Date: 5/24/2019
Time: 1120

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27052	**KB - Herring**	**FC**	5/22/2019	1540	**12**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503
27053	**KB - Mt Cult**	**FC**	5/22/2019	1540	**9**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**10**	**MPN / 100 ml**	10	D6503
27054	**KB - Mt Surp**	**FC**	5/22/2019	1540	**8**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503
27055	**KB - Rotary Beach**	**FC**	5/22/2019	1540	**8**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503
27056	**KB - Rotary Pool**	**FC**	5/22/2019	1540	**<1**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503
27057	**KB - Seaport**	**FC**	5/22/2019	1540	**<1**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503
27058	**KB - Thomas Basin**	**FC**	5/22/2019	1540	**11**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503
27059	**KB - Refuge**	**FC**	5/22/2019	1540	**6**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503
27060	**KB - Sunset**	**FC**	5/22/2019	1540	**15**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503
27061	**KB - Shull**	**FC**	5/22/2019	1540	**13**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**20**	**MPN / 100 ml**	10	D6503
27062	**KB - S Point Higgins**	**FC**	5/22/2019	1540	**7**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503
27063	**KB - Knudson**	**FC**	5/22/2019	1540	**3**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503
27064	**KB - S Point Duplicate**	**FC**	5/22/2019	1540	**8**	**cfu / 100 ml**	1	9222D
		entero	5/22/2019	1400	**<10**	**MPN / 100 ml**	10	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

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7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

Southeast Alaska Watershed Coaltion
Attn: Rebecca Bellmore
1107 W. 8th St., Ste. #4
Juneau, AK 99801

Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 5/29/2019
Time: 0345-0615
Matrix: marine
Type: grab

LAB RECEIVING
Date: 5/29/2019
Time: 0745

LAB REPORTING
Date: 5/30/2019
Time: 1415

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27080	**KB - Knudson**	**FC**	5/29/2019	1120	**20**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503
27081	**KB - S Pt Higgins**	**FC**	5/29/2019	1120	**12**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503
27082	**KB - Shull**	**FC**	5/29/2019	1120	**3**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503
27083	**KB - Shull (dup)**	**FC**	5/29/2019	1120	**2**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503
27084	**KB - Sunset**	**FC**	5/29/2019	1120	**7**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503
27085	**KB - Refuge**	**FC**	5/29/2019	1120	**48**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503
27086	**KB - Thomas Basin**	**FC**	5/29/2019	1120	**6**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503
27087	**KB - Seaport**	**FC**	5/29/2019	1120	**3**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503
27088	**KB - Rotary Pool**	**FC**	5/29/2019	1120	**9**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**10**	**MPN / 100 ml**	10	D6503
27089	**KB - Rotary Beach**	**FC**	5/29/2019	1120	**11**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503
27090	**KB - Mtn Surprise**	**FC**	5/29/2019	1120	**4**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503
27091	**KB - Mtn Cultural**	**FC**	5/29/2019	1120	**61**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**41**	**MPN / 100 ml**	10	D6503
27092	**KB - Herring**	**FC**	5/29/2019	1120	**14**	**cfu / 100 ml**	1	9222D
		entero	5/29/2019	0945	**<10**	**MPN / 100 ml**	10	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

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ENGINEERS GEOLOGISTS SURVEYORS

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PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

Southeast Alaska Watershed Coaltion
Attn: Rebecca Bellmore
1107 W. 8th St., Ste. #4
Juneau, AK 99801

Ketchikan BEACH

Sampler: Tony Gallegos
Date: 6/5/2019
Time: 0748-1202
Matrix: marine
Type: grab

LAB RECEIVING
Date: 6/5/2019
Time: 1020 & 1305

LAB REPORTING
Date: 6/7/2019
Time: 1100

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27125	**KB - Herring**	**FC**	6/5/2019	1430	**18**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1120	**<10**	**MPN / 100 ml**	10	D6503
27126	**KB - Mtn Cult**	**FC**	6/5/2019	1430	**11**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1120	**20**	**MPN / 100 ml**	10	D6503
27127	**KB - Mtn Surprise**	**FC**	6/5/2019	1430	**34**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1120	**10**	**MPN / 100 ml**	10	D6503
27128	**KB - Rotary Bea**	**FC**	6/5/2019	1430	**7**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1120	**<10**	**MPN / 100 ml**	10	D6503
27129	**KB - Rotary Pool**	**FC**	6/5/2019	1430	**6**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1120	**10**	**MPN / 100 ml**	10	D6503
27130	**KB - Seaport**	**FC**	6/5/2019	1430	**3**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1120	**<10**	**MPN / 100 ml**	10	D6503
27131	**KB - Thomas**	**FC**	6/5/2019	1430	**12**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1120	**10**	**MPN / 100 ml**	10	D6503
27132	**KB - S Refuge**	**FC**	6/5/2019	1430	**7**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1515	**<10**	**MPN / 100 ml**	10	D6503
27133	**KB - Sunset**	**FC**	6/5/2019	1430	**43**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1515	**<10**	**MPN / 100 ml**	10	D6503
27134	**KB - Sunset (dup)**	**FC**	6/5/2019	1430	**39**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1515	**<10**	**MPN / 100 ml**	10	D6503
27135	**KB - Shull**	**FC**	6/5/2019	1430	**15**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1515	**<10**	**MPN / 100 ml**	10	D6503
27136	**KB - SP Higgins**	**FC**	6/5/2019	1430	**25**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1515	**<10**	**MPN / 100 ml**	10	D6503
27137	**KB - Knudson**	**FC**	6/5/2019	1430	**2**	**cfu / 100 ml**	1	9222D
		entero	6/5/2019	1515	**31**	**MPN / 100 ml**	10	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

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Southeast Alaska Watershed Coalition
Attn: Rebecca Bellmore
1107 W. 8th St., Ste. #4
Juneau, AK 99801

Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 6/11/2019
Time: 1130-1400
Matrix: marine
Type: grab

LAB RECEIVING
Date: 6/11/2019
Time: 1430

LAB REPORTING
Date: 6/14/2019
Time: 1145

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27156	**KB - Knudson**	**FC**	6/11/2019	1600	**58**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**52**	**MPN / 100 ml**	10	D6503
27157	**KB - S P Higgins**	**FC**	6/11/2019	1600	**181**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**130**	**MPN / 100 ml**	10	D6503
27158	**KB - Shull**	**FC**	6/11/2019	1600	**276**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**199**	**MPN / 100 ml**	10	D6503
27159	**KB - Sunset**	**FC**	6/11/2019	1600	**18**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**<10**	**MPN / 100 ml**	10	D6503
27160	**KB - Refuge**	**FC**	6/11/2019	1600	**163**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**2851**	**MPN / 100 ml**	10	D6503
27161	**KB - Refuge (DUP)**	**FC**	6/11/2019	1600	**155**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**3448**	**MPN / 100 ml**	10	D6503
27162	**KB - Thomas**	**FC**	6/11/2019	1600	**214**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**487**	**MPN / 100 ml**	10	D6503
27163	**KB - Seaport**	**FC**	6/11/2019	1600	**79**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**20**	**MPN / 100 ml**	10	D6503
27164	**KB - Rotary Pool**	**FC**	6/11/2019	1600	**206**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**1576**	**MPN / 100 ml**	10	D6503
27165	**KB - Rotary Beach**	**FC**	6/11/2019	1600	**confluent growth**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**84**	**MPN / 100 ml**	10	D6503
27166	**KB - Mtn Surprise**	**FC**	6/11/2019	1600	**37**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**20**	**MPN / 100 ml**	10	D6503
27167	**KB - Mtn Cultural**	**FC**	6/11/2019	1600	**86 (spreaders)**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**323**	**MPN / 100 ml**	10	D6503
27168	**KB - Herring**	**FC**	6/11/2019	1600	**113**	**cfu / 100 ml**	1	9222D
		entero	6/11/2019	1710	**41**	**MPN / 100 ml**	10	D6503

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Ketchikan BEACH

Sampler: Shane Bennett
Date: 6/19/2019
Time: 0615-0938
Matrix: marine
Type: grab

LAB RECEIVING
Date: 6/19/2019
Time: 1015

LAB REPORTING
Date: 6/20/2019
Time: 1600

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27194	**KB - Knudson**	**FC**	6/19/2019	1120	**14**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**10**	**MPN / 100 ml**	10	D6503
27195	**KB - S P Higgins**	**FC**	6/19/2019	1120	**76**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**10**	**MPN / 100 ml**	10	D6503
27196	**KB - Shull**	**FC**	6/19/2019	1120	**34**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**<10**	**MPN / 100 ml**	10	D6503
27197	**KB - Sunset**	**FC**	6/19/2019	1120	**12**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**<10**	**MPN / 100 ml**	10	D6503
27198	**KB - Refuge**	**FC**	6/19/2019	1120	**2**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**<10**	**MPN / 100 ml**	10	D6503
27199	**KB Thomas**	**FC**	6/19/2019	1120	**16**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**20**	**MPN / 100 ml**	10	D6503
27200	**KB - Thomas (dup)**	**FC**	6/19/2019	1120	**18**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**20**	**MPN / 100 ml**	10	D6503
27201	**KB - Seaport**	**FC**	6/19/2019	1120	**6**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**<10**	**MPN / 100 ml**	10	D6503
27202	**KB - Rotary Pool**	**FC**	6/19/2019	1120	**<2**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**20**	**MPN / 100 ml**	10	D6503
27203	**KB - Rotary Beach**	**FC**	6/19/2019	1120	**10**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**10**	**MPN / 100 ml**	10	D6503
27204	**KB - Mtn Surprise**	**FC**	6/19/2019	1120	**24**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**10**	**MPN / 100 ml**	10	D6503
27205	**KB - Mtn Cultural**	**FC**	6/19/2019	1120	**526**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**620**	**MPN / 100 ml**	10	D6503
27206	**KB - Herring**	**FC**	6/19/2019	1120	**36**	**cfu / 100 ml**	2	9222D
		entero	6/19/2019	1140	**10**	**MPN / 100 ml**	10	D6503

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Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 6/25/2019
Time: 0955-1515
Matrix: marine
Type: grab

LAB RECEIVING
Date: 6/25/2019
Time: 1245 & 1610

LAB REPORTING
Date: 6/28/2019
Time: 730

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27243	**KB - Knudson**	**FC**	6/25/2019	1410	**23**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1435	**41**	**MPN / 100 ml**	10	D6503
27244	**KB - S P Higgins**	**FC**	6/25/2019	1410	**16**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1435	**10**	**MPN / 100 ml**	10	D6503
27245	**KB - Shull**	**FC**	6/25/2019	1410	**15**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1435	**<10**	**MPN / 100 ml**	10	D6503
27246	**KB - Sunset**	**FC**	6/25/2019	1410	**12**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1435	**10**	**MPN / 100 ml**	10	D6503
27247	**KB - Refuge**	**FC**	6/25/2019	1410	**13**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1435	**<10**	**MPN / 100 ml**	10	D6503
27248	**KB Thomas**	**FC**	6/25/2019	1410	**12**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1435	**10**	**MPN / 100 ml**	10	D6503
27249	**KB - Seaport**	**FC**	6/25/2019	1645	**6**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1720	**<10**	**MPN / 100 ml**	10	D6503
27255	**KB - Seaport (dup)**	**FC**	6/25/2019	1645	**8**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1720	**<10**	**MPN / 100 ml**	10	D6503
27250	**KB - Rotary Pool**	**FC**	6/25/2019	1645	**19**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1720	**52**	**MPN / 100 ml**	10	D6503
27254	**KB - Rotary Beach**	**FC**	6/25/2019	1645	**9**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1720	**<10**	**MPN / 100 ml**	10	D6503
27251	**KB - Mtn Surprise**	**FC**	6/25/2019	1645	**8**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1720	**<10**	**MPN / 100 ml**	10	D6503
27252	**KB - Mtn Cultural**	**FC**	6/25/2019	1645	**28**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1720	**50**	**MPN / 100 ml**	10	D6503
27253	**KB - Herring**	**FC**	6/25/2019	1645	**15**	**cfu / 100 ml**	1	9222D
		entero	6/25/2019	1720	**<10**	**MPN / 100 ml**	10	D6503

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Juneau, AK 99801

Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 7/2/2019
Time: 0445-0711
Matrix: marine
Type: grab

LAB RECEIVING
Date: 7/2/2019
Time: 0730

LAB REPORTING
Date: 7/3/2019
Time: 1620

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27296	**KB - Herring**	**FC**	7/2/2019	1145	**171**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**213**	**MPN / 100 ml**	10	D6503
27297	**KB - Mtn Cult.**	**FC**	7/2/2019	1145	**214**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**857**	**MPN / 100 ml**	10	D6503
27298	**KB - Mtn Surp.**	**FC**	7/2/2019	1145	**13**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**51**	**MPN / 100 ml**	10	D6503
27299	**KB - Rotary Bea.**	**FC**	7/2/2019	1145	**46**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**197**	**MPN / 100 ml**	10	D6503
27300	**KB - Rotary Pool**	**FC**	7/2/2019	1145	**142**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**52**	**MPN / 100 ml**	10	D6503
27301	**KB - Seaport**	**FC**	7/2/2019	1145	**145**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**20**	**MPN / 100 ml**	10	D6503
27302	**KB - Thomas**	**FC**	7/2/2019	1145	**74**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**41**	**MPN / 100 ml**	10	D6503
27303	**KB - S Refuge**	**FC**	7/2/2019	1145	**58**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**31**	**MPN / 100 ml**	10	D6503
27304	**KB - Sunset**	**FC**	7/2/2019	1145	**165**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**301**	**MPN / 100 ml**	10	D6503
27305	**KB - Shull**	**FC**	7/2/2019	1145	**37**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**52**	**MPN / 100 ml**	10	D6503
27306	**KB - SP Higgins**	**FC**	7/2/2019	1145	**68**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**97**	**MPN / 100 ml**	10	D6503
27307	**KB - Knudson**	**FC**	7/2/2019	1145	**239**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**121**	**MPN / 100 ml**	10	D6503
27308	**KB - Rotary Pool (dup)**	**FC**	7/2/2019	1145	**112**	**cfu / 100 ml**	1	9222D
		entero	7/2/2019	1030	**108**	**MPN / 100 ml**	10	D6503

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Juneau, AK 99801

Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 7/10/2019
Time: 1100-1345
Matrix: marine
Type: grab

LAB RECEIVING
Date: 7/10/2019
Time: 1430

LAB REPORTING
Date: 7/12/2019
Time: 1030

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27365	**KB - Knudson**	**FC**	7/10/2019	1530	**3**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27366	**KB - S P Higgins**	**FC**	7/10/2019	1530	**6**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27367	**KB - Shull**	**FC**	7/10/2019	1530	**12**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27368	**KB - Sunset**	**FC**	7/10/2019	1530	**7**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27369	**KB - S Refuge**	**FC**	7/10/2019	1530	**5**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27370	**KB - Thomas Basin**	**FC**	7/10/2019	1530	**9**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27371	**KB - Seaport**	**FC**	7/10/2019	1530	**3**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27372	**KB - Rotary Pool**	**FC**	7/10/2019	1530	**11**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27373	**KB - Rotary Beach**	**FC**	7/10/2019	1530	**16**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27374	**KB - Mt Surprise**	**FC**	7/10/2019	1530	**4**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27375	**KB - Mt Cultural**	**FC**	7/10/2019	1530	**9**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27376	**KB - Herring**	**FC**	7/10/2019	1530	**8**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**<10**	**MPN / 100 ml**	10	D6503
27377	**KB - Rotary Beach (dup)**	**FC**	7/10/2019	1530	**8**	**cfu / 100 ml**	1	9222D
		entero	7/10/2019	1625	**10**	**MPN / 100 ml**	10	D6503

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Juneau, AK 99801

Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 7/17/2019
Time: 0535-0803
Matrix: marine
Type: grab

LAB RECEIVING
Date: 7/17/2019
Time: 0822

LAB REPORTING
Date: 7/19/2019
Time: 1055

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27399	**KB - Herring**	**FC**	7/17/2019	1105	**386**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**565**	**MPN / 100 ml**	10	D6503
27400	**KB - Mtn Cult.**	**FC**	7/17/2019	1105	**247**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**934**	**MPN / 100 ml**	10	D6503
27401	**KB - Mtn Surp.**	**FC**	7/17/2019	1105	**133**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**218**	**MPN / 100 ml**	10	D6503
27402	**KB - Rotary Bea.**	**FC**	7/17/2019	1105	**272**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**269**	**MPN / 100 ml**	10	D6503
27403	**KB - Rotary Pool**	**FC**	7/17/2019	1105	**390**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**2,851**	**MPN / 100 ml**	10	D6503
27404	**KB - Seaport**	**FC**	7/17/2019	1105	**63**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**20**	**MPN / 100 ml**	10	D6503
27405	**KB - Thomas**	**FC**	7/17/2019	1105	**431**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**984**	**MPN / 100 ml**	10	D6503
27406	**KB - S Refuge**	**FC**	7/17/2019	1105	**28**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**10**	**MPN / 100 ml**	10	D6503
27407	**KB - Sunset**	**FC**	7/17/2019	1105	**87**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**31**	**MPN / 100 ml**	10	D6503
27408	**KB - Shull**	**FC**	7/17/2019	1105	**116**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**108**	**MPN / 100 ml**	10	D6503
27409	**KB - SP Higgins**	**FC**	7/17/2019	1105	**66**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**20**	**MPN / 100 ml**	10	D6503
27410	**KB - Knudson**	**FC**	7/17/2019	1105	**194**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**369**	**MPN / 100 ml**	10	D6503
27411	**KB - Mtn Surp. (dup)**	**FC**	7/17/2019	1105	**118**	**cfu / 100 ml**	1	9222D
		entero	7/17/2019	1150	**384**	**MPN / 100 ml**	10	D6503

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Southeast Alaska Watershed Coaltion
Attn: Rebecca Bellmore
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Juneau, AK 99801

Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 7/23/2019
Time: 0856-1132
Matrix: marine
Type: grab

LAB RECEIVING
Date: 7/23/2019
Time: 1230

LAB REPORTING
Date: 7/25/2019
Time: 1445

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27443	**KB - Knudson**	**FC**	7/23/2019	1540	**4**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**<10**	**MPN / 100 ml**	10	D6503
27444	**KB - S P Higgins**	**FC**	7/23/2019	1540	**10**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**<10**	**MPN / 100 ml**	10	D6503
27445	**KB - Shull**	**FC**	7/23/2019	1540	**16**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**<10**	**MPN / 100 ml**	10	D6503
27446	**KB - Sunset**	**FC**	7/23/2019	1540	**14**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**<10**	**MPN / 100 ml**	10	D6503
27447	**KB - S Refuge**	**FC**	7/23/2019	1540	**4**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**<10**	**MPN / 100 ml**	10	D6503
27448	**KB - Thomas Basin**	**FC**	7/23/2019	1540	**42**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**10**	**MPN / 100 ml**	10	D6503
27449	**KB - Seaport**	**FC**	7/23/2019	1540	**22**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**<10**	**MPN / 100 ml**	10	D6503
27450	**KB - Rotary Pool**	**FC**	7/23/2019	1540	**26**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**<10**	**MPN / 100 ml**	10	D6503
27451	**KB - Rotary Beach**	**FC**	7/23/2019	1540	**24**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**10**	**MPN / 100 ml**	10	D6503
27452	**KB - Mt Surprise**	**FC**	7/23/2019	1540	**10**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**<10**	**MPN / 100 ml**	10	D6503
27453	**KB - Mt Cultural**	**FC**	7/23/2019	1540	**152**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**259**	**MPN / 100 ml**	10	D6503
27454	**KB - Herring**	**FC**	7/23/2019	1540	**36**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**10**	**MPN / 100 ml**	10	D6503
27455	**KB - Seaport (dup)**	**FC**	7/23/2019	1540	**18**	**cfu / 100 ml**	2	9222D
		entero	7/23/2019	1440	**<10**	**MPN / 100 ml**	10	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

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Juneau, AK 99801

Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 7/29/2019
Time: 0328-0614
Matrix: marine
Type: grab

LAB RECEIVING
Date: 7/29/2019
Time: 0705

LAB REPORTING
Date: 7/30/2019
Time: 1115

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27399	**KB - Herring**	**FC**	7/29/2019	1040	**104**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**20**	**MPN / 100 ml**	10	D6503
27400	**KB - Mtn Cult.**	**FC**	7/29/2019	1040	**131**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**41**	**MPN / 100 ml**	10	D6503
27401	**KB - Mtn Surp.**	**FC**	7/29/2019	1040	**82**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**<10**	**MPN / 100 ml**	10	D6503
27402	**KB - Rotary Bea.**	**FC**	7/29/2019	1040	**37**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**30**	**MPN / 100 ml**	10	D6503
27403	**KB - Rotary Pool**	**FC**	7/29/2019	1040	**66**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**41**	**MPN / 100 ml**	10	D6503
27404	**KB - Seaport**	**FC**	7/29/2019	1040	**12**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**<10**	**MPN / 100 ml**	10	D6503
27405	**KB - Thomas**	**FC**	7/29/2019	1040	**38**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**<10**	**MPN / 100 ml**	10	D6503
27406	**KB - S Refuge**	**FC**	7/29/2019	1040	**16**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**97**	**MPN / 100 ml**	10	D6503
27407	**KB - Sunset**	**FC**	7/29/2019	1040	**14**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**10**	**MPN / 100 ml**	10	D6503
27408	**KB - Shull**	**FC**	7/29/2019	1040	**41**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**20**	**MPN / 100 ml**	10	D6503
27409	**KB - SP Higgins**	**FC**	7/29/2019	1040	**160**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**10**	**MPN / 100 ml**	10	D6503
27410	**KB - Knudson**	**FC**	7/29/2019	1040	**46**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**<10**	**MPN / 100 ml**	10	D6503
27411	**KB - Herring (dup)**	**FC**	7/29/2019	1040	**92**	**cfu / 100 ml**	1	9222D
		entero	7/29/2019	0910	**20**	**MPN / 100 ml**	10	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

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Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 8/7/2019
Time: 1134-1405
Matrix: marine
Type: grab

LAB RECEIVING
Date: 8/7/2019
Time: 1500

LAB REPORTING
Date: 8/9/2019
Time: 1420

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27535	**KB - Knudson**	**FC**	8/7/2019	1700	**3**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**<10**	**MPN / 100 ml**	10	D6503
27536	**KB - S P Higgins**	**FC**	8/7/2019	1700	**7**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**<10**	**MPN / 100 ml**	10	D6503
27537	**KB - Shull**	**FC**	8/7/2019	1700	**19**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**10**	**MPN / 100 ml**	10	D6503
27538	**KB - Sunset**	**FC**	8/7/2019	1700	**5**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**<10**	**MPN / 100 ml**	10	D6503
27539	**KB - S Refuge**	**FC**	8/7/2019	1700	**7**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**20**	**MPN / 100 ml**	10	D6503
27540	**KB - Thomas Basin**	**FC**	8/7/2019	1700	**11**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**<10**	**MPN / 100 ml**	10	D6503
27541	**KB - Seaport**	**FC**	8/7/2019	1700	**6**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**<10**	**MPN / 100 ml**	10	D6503
27542	**KB - Rotary Pool**	**FC**	8/7/2019	1700	**84**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**<10**	**MPN / 100 ml**	10	D6503
27543	**KB - Rotary Beach**	**FC**	8/7/2019	1700	**8**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**<10**	**MPN / 100 ml**	10	D6503
27544	**KB - Mt Surprise**	**FC**	8/7/2019	1700	**30**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**<10**	**MPN / 100 ml**	10	D6503
27545	**KB - Mt Cultural**	**FC**	8/7/2019	1700	**45**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**20**	**MPN / 100 ml**	10	D6503
27546	**KB - Herring**	**FC**	8/7/2019	1700	**33**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**<10**	**MPN / 100 ml**	10	D6503
27547	**KB - Knudson (dup)**	**FC**	8/7/2019	1700	**1**	**cfu / 100 ml**	2	9222D
		entero	8/7/2019	1530	**<10**	**MPN / 100 ml**	10	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

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Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 8/13/2019
Time: 0505-0722
Matrix: marine
Type: grab

LAB RECEIVING
Date: 8/13/2019
Time: 0750

LAB REPORTING
Date: 8/15/2019
Time: 1130

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27575	**KB - Herring**	**FC**	8/13/2019	1005	**215**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**613**	**MPN / 100 ml**	10	D6503
27576	**KB - Mtn Cult.**	**FC**	8/13/2019	1005	**104**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**51**	**MPN / 100 ml**	10	D6503
27577	**KB - Mtn Surp.**	**FC**	8/13/2019	1005	**58**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**10**	**MPN / 100 ml**	10	D6503
27578	**KB - Rotary Bea.**	**FC**	8/13/2019	1005	**51**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**<10**	**MPN / 100 ml**	10	D6503
27579	**KB - Rotary Pool**	**FC**	8/13/2019	1005	**20**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**<10**	**MPN / 100 ml**	10	D6503
27580	**KB - Seaport**	**FC**	8/13/2019	1005	**21**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**20**	**MPN / 100 ml**	10	D6503
27581	**KB - Thomas**	**FC**	8/13/2019	1005	**37**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**10**	**MPN / 100 ml**	10	D6503
27582	**KB - S Refuge**	**FC**	8/13/2019	1005	**17**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**<10**	**MPN / 100 ml**	10	D6503
27583	**KB - Sunset**	**FC**	8/13/2019	1005	**16**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**<10**	**MPN / 100 ml**	10	D6503
27584	**KB - Shull**	**FC**	8/13/2019	1005	**15**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**10**	**MPN / 100 ml**	10	D6503
27585	**KB - SP Higgins**	**FC**	8/13/2019	1005	**43**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**10**	**MPN / 100 ml**	10	D6503
27586	**KB - Knudson**	**FC**	8/13/2019	1005	**125**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**84**	**MPN / 100 ml**	10	D6503
27587	**KB - SP Higgins (dup)**	**FC**	8/13/2019	1005	**55**	**cfu / 100 ml**	1	9222D
		entero	8/13/2019	1040	**10**	**MPN / 100 ml**	10	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

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Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 8/21/2019
Time: 0757-0956
Matrix: marine
Type: grab

LAB RECEIVING
Date: 8/21/2019
Time: 1035

LAB REPORTING
Date: 8/23/2019
Time: 1015

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	RL	Method
27632	**KB - Knudson**	**FC**	8/21/2019	1145	**456**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**309**	**MPN / 100 ml**	10	D6503
27633	**KB - S P Higgins**	**FC**	8/21/2019	1145	**176**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**74**	**MPN / 100 ml**	10	D6503
27634	**KB - Shull**	**FC**	8/21/2019	1145	**CG**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**386**	**MPN / 100 ml**	10	D6503
27635	**KB - Sunset**	**FC**	8/21/2019	1145	**190**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**156**	**MPN / 100 ml**	10	D6503
27636	**KB - S Refuge**	**FC**	8/21/2019	1145	**184**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**118**	**MPN / 100 ml**	10	D6503
27637	**KB - Thomas Basin**	**FC**	8/21/2019	1145	**258**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**450**	**MPN / 100 ml**	10	D6503
27638	**KB - Seaport**	**FC**	8/21/2019	1145	**10**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**<10**	**MPN / 100 ml**	10	D6503
27639	**KB - Rotary Pool**	**FC**	8/21/2019	1145	**CG**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**372**	**MPN / 100 ml**	10	D6503
27640	**KB - Rotary Beach**	**FC**	8/21/2019	1145	**94**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**50**	**MPN / 100 ml**	10	D6503
27641	**KB - Mt Surprise**	**FC**	8/21/2019	1145	**52**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**41**	**MPN / 100 ml**	10	D6503
27642	**KB - Mt Cultural**	**FC**	8/21/2019	1145	**86**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**84**	**MPN / 100 ml**	10	D6503
27643	**KB - Herring**	**FC**	8/21/2019	1145	**184**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**63**	**MPN / 100 ml**	10	D6503
27644	**KB - Shull (dup)**	**FC**	8/21/2019	1145	**CG**	**cfu / 100 ml**	2	9222D
		entero	8/21/2019	1230	**379**	**MPN / 100 ml**	10	D6503

CG = confluent growth / colonies indistinguishable from one another

samples for fecal analysis were diluted to account for sedimentation; samples for enterococci analysis were diluted to eliminate the potential

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Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 9/4/2019
Time: 0753-1002
Matrix: marine
Type: grab

LAB RECEIVING
Date: 9/4/2019
Time: 1100

LAB REPORTING
Date: 9/6/2019
Time: 1430

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	RL	Method
27690	**KB - Knudson**	**FC**	9/4/2019	1500	**66**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**20**	**MPN / 100 ml**	10	D6503
27691	**KB - S P Higgins**	**FC**	9/4/2019	1500	**27**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**10**	**MPN / 100 ml**	10	D6503
27692	**KB - Shull**	**FC**	9/4/2019	1500	**53**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**<10**	**MPN / 100 ml**	10	D6503
27693	**KB - Sunset**	**FC**	9/4/2019	1500	**196**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**<10**	**MPN / 100 ml**	10	D6503
27694	**KB - S Refuge**	**FC**	9/4/2019	1500	**12**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**10**	**MPN / 100 ml**	10	D6503
27695	**KB - Thomas Basin**	**FC**	9/4/2019	1500	**62**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**1024**	**MPN / 100 ml**	10	D6503
27696	**KB - Seaport**	**FC**	9/4/2019	1500	**3**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**<10**	**MPN / 100 ml**	10	D6503
27697	**KB - Rotary Pool**	**FC**	9/4/2019	1500	**22**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**52**	**MPN / 100 ml**	10	D6503
27698	**KB - Rotary Beach**	**FC**	9/4/2019	1500	**118**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**20**	**MPN / 100 ml**	10	D6503
27699	**KB - Mt Surprise**	**FC**	9/4/2019	1500	**16**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**<10**	**MPN / 100 ml**	10	D6503
27700	**KB - Mt Cultural**	**FC**	9/4/2019	1500	**209**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**20**	**MPN / 100 ml**	10	D6503
27701	**KB - Herring**	**FC**	9/4/2019	1500	**239**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**262**	**MPN / 100 ml**	10	D6503
27702	**KB - Mt Cultural (dup)**	**FC**	9/4/2019	1500	**210**	**cfu / 100 ml**	2	9222D
		entero	9/4/2019	1345	**20**	**MPN / 100 ml**	10	D6503

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Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 9/10/2019
Time: 0326-0557
Matrix: marine
Type: grab

LAB RECEIVING
Date: 9/10/2019
Time: 0845

LAB REPORTING
Date: 9/12/2019
Time: 1715

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27732	**KB - Herring**	**FC**	9/10/2019	1120	**>400**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**2595**	**MPN / 100 ml**	10	D6503
27733	**KB - Mtn Cult.**	**FC**	9/10/2019	1120	**20**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**<10**	**MPN / 100 ml**	10	D6503
27734	**KB - Mtn Surp.**	**FC**	9/10/2019	1120	**13**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**<10**	**MPN / 100 ml**	10	D6503
27735	**KB - Rotary Bea.**	**FC**	9/10/2019	1120	**6**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**10**	**MPN / 100 ml**	10	D6503
27736	**KB - Rotary Pool**	**FC**	9/10/2019	1120	**3**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**<10**	**MPN / 100 ml**	10	D6503
27737	**KB - Seaport**	**FC**	9/10/2019	1120	**163**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**20**	**MPN / 100 ml**	10	D6503
27738	**KB - Thomas**	**FC**	9/10/2019	1120	**76**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**63**	**MPN / 100 ml**	10	D6503
27739	**KB - S Refuge**	**FC**	9/10/2019	1120	**8**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**<10**	**MPN / 100 ml**	10	D6503
27740	**KB - Sunset**	**FC**	9/10/2019	1120	**9**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**<10**	**MPN / 100 ml**	10	D6503
27741	**KB - Shull**	**FC**	9/10/2019	1120	**95**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**754**	**MPN / 100 ml**	10	D6503
27742	**KB - SP Higgins**	**FC**	9/10/2019	1120	**187**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**10**	**MPN / 100 ml**	10	D6503
27743	**KB - Knudson**	**FC**	9/10/2019	1120	**44**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**<10**	**MPN / 100 ml**	10	D6503
27744	**KB - S Refuge (dup)**	**FC**	9/10/2019	1120	**22**	**cfu / 100 ml**	1	9222D
		entero	9/10/2019	1010	**<10**	**MPN / 100 ml**	10	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
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Southeast Alaska Watershed Coaltion
Attn: Rebecca Bellmore
1107 W. 8th St., Ste. #4
Juneau, AK 99801

Ketchikan BEACH

Sampler: Samuel Naujokas
Date: 9/18/2019
Time: 0641-0904
Matrix: marine
Type: grab

LAB RECEIVING
Date: 9/18/2019
Time: 0945

LAB REPORTING
Date: 9/20/2019
Time: 1040

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
27791	**KB - Knudson**	**FC**	9/18/2019	1320	**12**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**121**	**MPN / 100 ml**	10	D6503
27792	**KB - S P Higgins**	**FC**	9/18/2019	1320	**12**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**63**	**MPN / 100 ml**	10	D6503
27793	**KB - Shull**	**FC**	9/18/2019	1320	**19**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**20**	**MPN / 100 ml**	10	D6503
27794	**KB - Sunset**	**FC**	9/18/2019	1320	**9**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**148**	**MPN / 100 ml**	10	D6503
27795	**KB - S Refuge**	**FC**	9/18/2019	1320	**6**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**52**	**MPN / 100 ml**	10	D6503
27796	**KB - Thomas Basin**	**FC**	9/18/2019	1320	**48**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**144**	**MPN / 100 ml**	10	D6503
27797	**KB - Seaport**	**FC**	9/18/2019	1320	**17**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**173**	**MPN / 100 ml**	10	D6503
27798	**KB - Rotary Pool**	**FC**	9/18/2019	1320	**5**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**<10**	**MPN / 100 ml**	10	D6503
27799	**KB - Rotary Beach**	**FC**	9/18/2019	1320	**25**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**20**	**MPN / 100 ml**	10	D6503
27800	**KB - Mt Surprise**	**FC**	9/18/2019	1320	**13**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**10**	**MPN / 100 ml**	10	D6503
27801	**KB - Mt Cultural**	**FC**	9/18/2019	1320	**131**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**97**	**MPN / 100 ml**	10	D6503
27802	**KB - Herring**	**FC**	9/18/2019	1320	**216**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**185**	**MPN / 100 ml**	10	D6503
27803	**KB - Herring (dup)**	**FC**	9/18/2019	1320	**202**	**cfu / 100 ml**	1	9222D
		entero	9/18/2019	1145	**173**	**MPN / 100 ml**	10	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

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ACCREDITED Certificate 4126.01
ISO 17025 Accredited Testing Laboratory

Human Fecal Quantification ID

Detection and quantification of the fecal associated Human gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: July 31, 2019
Report Generated: September 27, 2019

ND: Not Detected
DNQ: Detected Not Quantified

SM #	Sample ID	Analysis Requested	Marker Quantified (copies/100 ml)	DNA Analytical Results
SM-9I16001	KB- MTN P Cult Foods	Human Bacteroidetes ID: Dorei	ND	Not Detected
SM-9I16002	KB- MTN P Suprise	Human Bacteroidetes ID: Dorei	1.94E+03	**Detected**
SM-9I16003	KB- Rotary Pool	Human Bacteroidetes ID: Dorei	ND	Not Detected
SM-9I16004	KB- Rotary Beach	Human Bacteroidetes ID: Dorei	1.35E+03	**Detected**
SM-9I16005	KB- S. Refuge	Human Bacteroidetes ID: Dorei	DNQ	**Detected**
SM-9I16006	KB- Sunset	Human Bacteroidetes ID: Dorei	DNQ	**Detected**
SM-9I16007	KB- Knudson Cove	Human Bacteroidetes ID: Dorei	9.18E+02	**Detected**

Revision 1.3
Effective Date 9/25/18

Laboratory Comments

Submitter: Ketchikan Indian Community

Report Generated: September 27, 2019

Non-Detect Results
In sample(s) classified as non-detect, the host-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis.

Detected Results
In sample(s) classified as detected, the host-associated fecal gene biomarker(s) was detected in both test replicates suggesting that the host's fecal contamination is present in the sample(s). Copy number measurements reported are relative, not absolute, quantification.

Detected Not Quantified (DNQ) Results
In sample(s) classified as Detected Not Quantified (DNQ), the host-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with the respective host was present in the sample(s) but in low concentrations.

Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the host-associated biomarker with the regional population. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "non-detect", "low concentration", "moderate concentration", or "high concentration" based on the concentration of the genetic markers found in the sample(s).

The presence of the biomarker does not signify the presence or absence of that form of fecal pollution conclusively. Only repeated sampling will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Water Samples: Each submitted water sample is filtered through 0.45 micron membrane filter(s). Each filter is placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample is homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol. Devitations to these procedures may occur at the client's request.

Non-Water Samples: Each non-water sample submitted by the client is processed as per internal laboratory extraction procedures. An extracted DNA sample is proceed directly to PCR analysis. Details available upon request.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul sample extract, forward primer, reverse primer, probe and an optimized buffer. All assays are run in duplicate. Quantification is achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control and a negative control, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.

Human Bacteroidetes ID™ Species*: B. dorei*

The **Human Bacteroidetes ID™ Species*: B. dorei*** service targets the species *Bacteroides dorei*. *B. dorei* is an anaerobe that is frequently shed from the gastrointestinal tract and isolated from human feces worldwide. It is a newly discovered species that is widely distributed in the USA.[1,2] The human-associated marker DNA sequence is located on the 16S rRNA gene of *B. dorei*.[3] The marker is the microbial source tracking (MST) marker of choice for detecting human fecal pollution due to its exceptional sensitivity and specificity. Internal validations have been conducted on hundreds of sewage, septage, human and animal host fecal samples collected from throughout the U.S and archived in the Source Molecular fecal bank. The marker has also been evaluated in both inland and coastal waters. A recent, comprehensive, multi-laboratory MST method evaluation study, exploring the performance of current MST methods, concluded the *B. dorei* qPCR assay to be the top performing human-associated assay amongst those tested. The success and consistency of this marker in numerous studies around the world[1,3,4] makes the **Human Bacteroidetes ID™ Species*: B. dorei*** service the primary service for identifying human fecal pollution at Source Molecular.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.[5] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*.

The Human Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.[3,5,6,7,8] Furthermore, certain strains of *Bacteroidetes* have been found to be associated with humans.[3,6] As such, these bacterial strains can be used as indicators of human fecal contamination.

Accuracy of the results is possible because the method amplifies DNA into a large number of small copies of the gene biomarker of interest. This is accomplished with small pieces of DNA called primers that are complementary and specific to the unique *B. dorei* DNA sequence. Through a heating process called thermal cycling, the double stranded DNA is denatured, hybridized to the complementary primers and amplified to create many copies of the DNA fragment desired. If the primers are successful in finding a site on the DNA fragment that is specific to the *B. dorei* DNA sequence, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve by the qPCR software. The absence of an amplification curve indicates that the *B. dorei* gene biomarker is not detected in the water sample because it is either not present or present at concentrations below the analytical detection limit.

To strengthen the validity of the results, additional tests targeting other high-ranking, human-associated *Bacteroidetes* species should be performed, such as
Human Bacteroidetes ID™ Species*: B. stercoris*,
Human Bacteroidetes ID™ Species*: B. fragilis,* and
Human Bacteroidetes ID™ Species*: B. thetaiotaomicron*.

[1]Boehm, A., Fuhrman, J., Mrse, R., Grant, S. **Tiered approach for identification of a human fecal pollution source at a recreational beach: case study at Avalon Bay, Catalina Island, California**. Environ Sci Technol. 2003 37**:** 673–680.
[2]Bakir, M., Sakamoto, M., Kitahara, M., Matsumoto, M., Benno, Y. **Bacteroides dorei sp. nov., isolated from human faeces**. Int. J. Syst. Evol. Microbiol. 2006 56: 1639–1641.
[3] Bernhard, A., Field, K. **A PCR assay to discriminate human and ruminant feces on the basis of host differences in Bacteroides-Prevotella genes encoding 16S rRNA.** Appl. Environ. Microbiol. 2000b 66: 4571-4574.
[4]Ahmed, w., Masters, N., Toze, S. **Consistency in the host specificity and host sensitivity of the Bacteroides HF183 marker for sewage pollution tracking. Lett. Appl. Microbiol. 2012 55: 283-289.**
[5] Scott, T., Rose, J., Jenkins, T., Farrah, S., Lukasik, J. **Microbial Source Tracking: Current Methodology and Future Directions.** Appl. Environ. Microbiol. 2002 68: 5796-5803.
[6] Bernhard, A., Field, K. **Identification of nonpoint sources of fecal pollution in coastal waters by using host-specific 16S ribosomal DNA genetic markers from fecal anaerobes.** Appl. Environ. Microbiol. 2000a 66: 1587-1594.
[7] Fogarty, L., Voytek, M. **A Comparison of Bacteroides-Prevotella 16S rRNA Genetic Markers for Fecal Samples from Different Animal Species.** Appl. Environ. Microbiol. 2005 71: 5999-6007.
[8] Dick, L., Bernhard, A., Brodeur, T., Santo Domingo, J., *et al*. **Host Distributions of Uncultivated Fecal Bacteroidales Bacteria Reveal Genetic Markers for Fecal Source Identification.** Appl. Environ. Microbiol. 2005 71: 3184-3191.

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ISO 17025 Accredited Testing Laboratory

Human Fecal Quantification ID

Detection and quantification of the fecal associated Human gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: September 11, 2019
Report Generated: September 27, 2019

ND: Not Detected
DNQ: Detected Not Quantified

SM #	Sample ID	Analysis Requested	Marker Quantified (copies/100 ml)	DNA Analytical Results
SM-9I16022	Herring Cove	Human Bacteroidetes ID: Dorei	DNQ	**Detected**
SM-9I16023	Seaport	Human Bacteroidetes ID: Dorei	ND	Not Detected
SM-9I16024	Thomas	Human Bacteroidetes ID: Dorei	DNQ	**Detected**
SM-9I16025	Shull	Human Bacteroidetes ID: Dorei	DNQ	**Detected**
SM-9I16026	South Point Higgins	Human Bacteroidetes ID: Dorei	DNQ	**Detected**

Revision 1.3
Effective Date 9/25/18

Laboratory Comments

Submitter: Ketchikan Indian Community

Report Generated: September 27, 2019

Non-Detect Results
In sample(s) classified as non-detect, the host-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis.

Detected Results
In sample(s) classified as detected, the host-associated fecal gene biomarker(s) was detected in both test replicates suggesting that the host's fecal contamination is present in the sample(s). Copy number measurements reported are relative, not absolute, quantification.

Detected Not Quantified (DNQ) Results
In sample(s) classified as Detected Not Quantified (DNQ), the host-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with the respective host was present in the sample(s) but in low concentrations.

Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the host-associated biomarker with the regional population. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "non-detect", "low concentration", "moderate concentration", or "high concentration" based on the concentration of the genetic markers found in the sample(s).

The presence of the biomarker does not signify the presence or absence of that form of fecal pollution conclusively. Only repeated sampling will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Water Samples: Each submitted water sample is filtered through 0.45 micron membrane filter(s). Each filter is placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample is homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol. Devitations to these procedures may occur at the client's request.

Non-Water Samples: Each non-water sample submitted by the client is processed as per internal laboratory extraction procedures. An extracted DNA sample is proceed directly to PCR analysis. Details available upon request.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul sample extract, forward primer, reverse primer, probe and an optimized buffer. All assays are run in duplicate. Quantification is achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control and a negative control, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.

Human Bacteroidetes ID™ Species*: B. dorei*

The **Human Bacteroidetes ID™ Species*: B. dorei*** service targets the species *Bacteroides dorei*. *B. dorei* is an anaerobe that is frequently shed from the gastrointestinal tract and isolated from human feces worldwide. It is a newly discovered species that is widely distributed in the USA.[1,2] The human-associated marker DNA sequence is located on the 16S rRNA gene of *B. dorei*.[3] The marker is the microbial source tracking (MST) marker of choice for detecting human fecal pollution due to its exceptional sensitivity and specificity. Internal validations have been conducted on hundreds of sewage, septage, human and animal host fecal samples collected from throughout the U.S and archived in the Source Molecular fecal bank. The marker has also been evaluated in both inland and coastal waters. A recent, comprehensive, multi-laboratory MST method evaluation study, exploring the performance of current MST methods, concluded the *B. dorei* qPCR assay to be the top performing human-associated assay amongst those tested. The success and consistency of this marker in numerous studies around the world[1,3,4] makes the **Human Bacteroidetes ID™ Species*: B. dorei*** service the primary service for identifying human fecal pollution at Source Molecular.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.[5] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*.

The Human Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.[3,5,6,7,8] Furthermore, certain strains of *Bacteroidetes* have been found to be associated with humans.[3,6] As such, these bacterial strains can be used as indicators of human fecal contamination.

Accuracy of the results is possible because the method amplifies DNA into a large number of small copies of the gene biomarker of interest. This is accomplished with small pieces of DNA called primers that are complementary and specific to the unique *B. dorei* DNA sequence. Through a heating process called thermal cycling, the double stranded DNA is denatured, hybridized to the complementary primers and amplified to create many copies of the DNA fragment desired. If the primers are successful in finding a site on the DNA fragment that is specific to the *B. dorei* DNA sequence, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve by the qPCR software. The absence of an amplification curve indicates that the *B. dorei* gene biomarker is not detected in the water sample because it is either not present or present at concentrations below the analytical detection limit.

To strengthen the validity of the results, additional tests targeting other high-ranking, human-associated *Bacteroidetes* species should be performed, such as
Human Bacteroidetes ID™ Species*: B. stercoris*,
Human Bacteroidetes ID™ Species*: B. fragilis,* and
Human Bacteroidetes ID™ Species*: B. thetaiotaomicron*.

[1]Boehm, A., Fuhrman, J., Mrse, R., Grant, S. **Tiered approach for identification of a human fecal pollution source at a recreational beach: case study at Avalon Bay, Catalina Island, California**. Environ Sci Technol. 2003 37**:** 673–680.
[2]Bakir, M., Sakamoto, M., Kitahara, M., Matsumoto, M., Benno, Y. **Bacteroides dorei sp. nov., isolated from human faeces**. Int. J. Syst. Evol. Microbiol. 2006 56: 1639–1641.
[3] Bernhard, A., Field, K. **A PCR assay to discriminate human and ruminant feces on the basis of host differences in Bacteroides-Prevotella genes encoding 16S rRNA.** Appl. Environ. Microbiol. 2000b 66: 4571-4574.
[4]Ahmed, w., Masters, N., Toze, S. **Consistency in the host specificity and host sensitivity of the Bacteroides HF183 marker for sewage pollution tracking. Lett. Appl. Microbiol. 2012 55: 283-289.**
[5] Scott, T., Rose, J., Jenkins, T., Farrah, S., Lukasik, J. **Microbial Source Tracking: Current Methodology and Future Directions.** Appl. Environ. Microbiol. 2002 68: 5796-5803.
[6] Bernhard, A., Field, K. **Identification of nonpoint sources of fecal pollution in coastal waters by using host-specific 16S ribosomal DNA genetic markers from fecal anaerobes.** Appl. Environ. Microbiol. 2000a 66: 1587-1594.
[7] Fogarty, L., Voytek, M. **A Comparison of Bacteroides-Prevotella 16S rRNA Genetic Markers for Fecal Samples from Different Animal Species.** Appl. Environ. Microbiol. 2005 71: 5999-6007.
[8] Dick, L., Bernhard, A., Brodeur, T., Santo Domingo, J., *et al*. **Host Distributions of Uncultivated Fecal Bacteroidales Bacteria Reveal Genetic Markers for Fecal Source Identification.** Appl. Environ. Microbiol. 2005 71: 3184-3191.

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Dog Fecal Quantification ID

Detection and quantification of the fecal associated Dog gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: July 31, 2019
Report Generated: September 27, 2019

ND: Not Detected
DNQ: Detected Not Quantified

SM #	Sample ID	Analysis Requested	Marker Quantified (copies/100 ml)	DNA Analytical Results
SM-9I16015	KB- MTN P Cult Foods	Dog Bacteroidetes ID: Target 1	ND	Not Detected
SM-9I16016	KB- MTN P Suprise	Dog Bacteroidetes ID: Target 1	ND	Not Detected
SM-9I16017	KB- Rotary Pool	Dog Bacteroidetes ID: Target 1	DNQ	**Detected**
SM-9I16018	KB- Rotary Beach	Dog Bacteroidetes ID: Target 1	DNQ	**Detected**
SM-9I16019	KB- S. Refuge	Dog Bacteroidetes ID: Target 1	8.08E+02	**Detected**
SM-9I16020	KB- Sunset	Dog Bacteroidetes ID: Target 1	ND	Not Detected
SM-9I16021	KB- Knudson Cove	Dog Bacteroidetes ID: Target 1	DNQ	**Detected**

Revision 1.3
Effective Date 9/25/18

Laboratory Comments

Submitter: Ketchikan Indian Community

Report Generated: September 27, 2019

Non-Detect Results
In sample(s) classified as non-detect, the host-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis.

Detected Results
In sample(s) classified as detected, the host-associated fecal gene biomarker(s) was detected in both test replicates suggesting that the host's fecal contamination is present in the sample(s). Copy number measurements reported are relative, not absolute, quantification.

Detected Not Quantified (DNQ) Results
In sample(s) classified as Detected Not Quantified (DNQ), the host-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with the respective host was present in the sample(s) but in low concentrations.

Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the host-associated biomarker with the regional population. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "non-detect", "low concentration", "moderate concentration", or "high concentration" based on the concentration of the genetic markers found in the sample(s).

The presence of the biomarker does not signify the presence or absence of that form of fecal pollution conclusively. Only repeated sampling will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Water Samples: Each submitted water sample is filtered through 0.45 micron membrane filter(s). Each filter is placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample is homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol. Devitations to these procedures may occur at the client's request.

Non-Water Samples: Each non-water sample submitted by the client is processed as per internal laboratory extraction procedures. An extracted DNA sample is proceed directly to PCR analysis. Details available upon request.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul sample extract, forward primer, reverse primer, probe and an optimized buffer. All assays are run in duplicate. Quantification is achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control and a negative control, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.

Theory Explanation of Dog Bacteroidetes "Quantification" ID™

The phylum *Bacteroidetes* is composed of three large groups of bacteria with the best-known category being *Bacteroidaceae*. This family of gram-negative bacteria is found primarily in the intestinal tracts and mucous membranes of warm-blooded animals and is sometimes considered pathogenic.

Comprising *Bacteroidaceae* are the genus *Bacteroides* and *Prevotella*. The latter genus was originally classified within the former (i.e. *Bacteroides*), but since the 1990's it has been classified in a separate genus because of new chemical and biochemical findings. *Bacteroides* and *Prevotella* are gram-negative, anaerobic, rod-shaped bacteria that inhabitant of the oral, respiratory, intestinal, and urogenital cavities of humans, animals, and insects. They are sometimes pathogenic.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.[1] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*. Furthermore, these latter two organisms are facultative anaerobes and as such they can be problematic for monitoring purposes since it has been shown that they are able to proliferate in soil, sand and sediments.

The Dog Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.[2,3,4,5,6] Furthermore, certain categories of *Bacteroidetes* have been shown to be predominately detected in dog. Within these *Bacteroidetes*, certain strains of the *Bacteroides* and *Prevotella* genus have been found in dog.[2,3,5,6] As such, these bacterial strains can be used as indicators of dog fecal contamination.

One of the advantages of the Dog Bacteroidetes ID™ service is that the entire water is sampled and filtered for fecal *Bacteroidetes*. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates off a petri dish. This is a particular advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method uses PCR DNA technology. PCR allows quantities of DNA to be amplified into large number of small copies of DNA sequences. This is accomplished with small pieces of DNA called primers that are complementary and specific to the genomes to be detected.

Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers to create exact copies of the DNA fragment desired. This process is repeated rapidly many times ensuring an exponential progression in the number of copied DNA. If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve. The absence of an amplification curve would indicate that the dog *Bacteroidetes* gene biomarker is not present.

References

[1] Scott, Troy M., Rose, Joan B., Jenkins, Tracie M., Farrah, Samuel R., Lukasik, Jerzy **Microbial Source Tracking: Current Methodology and Future Directions.** Appl. Environ. Microbiol. (2002) 68: 5796-5803.

[2] Bernhard, A.E., and K.G. Field (2000a). **Identification of nonpoint sources of fecal pollution in coastal waters by using host-specific 16S ribosomal DNA genetic markers from fecal anaerobes.** Applied and Environmental Microbiology, 66: 1,587-1,594.

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[4] Kreader, C.A. (1995). **Design and evaluation of Bacteroides DNA probes for the specific detection of human fecal pollution.** Applied and Environmental Microbiology, 61: 1,171-1,179.

[5] Fogarty, Lisa R., Voytek, Mary **A.Comparison of Bacteroides-Prevotella 16S rRNA Genetic Markers for Fecal Samples from Different Animal Species** Appl. Environ. Microbiol. 2005 71: 5999-6007.

[6] Dick, Linda K., Bernhard, Anne E., Brodeur, Timothy J., Santo Domingo, Jorge W., Simpson, Joyce M., Walters, Sarah P., Field, Katharine G. **Host Distributions of Uncultivated Fecal Bacteroidales Bacteria Reveal Genetic Markers for Fecal Source Identification** Appl. Environ. Microbiol. 2005 71: 3184-3191.

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Dog Fecal Quantification ID

Detection and quantification of the fecal associated Dog gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: September 11, 2019
Report Generated: September 27, 2019

ND: Not Detected
DNQ: Detected Not Quantified

SM #	Sample ID	Analysis Requested	Marker Quantified (copies/100 ml)	DNA Analytical Results
SM-9I16027	Herring Cove	Dog Bacteroidetes ID: Target 1	5.47E+02	**Detected**
SM-9I16028	Seaport	Dog Bacteroidetes ID: Target 1	ND	Not Detected
SM-9I16029	Thomas	Dog Bacteroidetes ID: Target 1	DNQ	**Detected**
SM-9I16030	Shull	Dog Bacteroidetes ID: Target 1	ND	Not Detected
SM-9I16031	South Point Higgins	Dog Bacteroidetes ID: Target 1	ND	Not Detected

Revision 1.3
Effective Date 9/25/18

Laboratory Comments

Submitter: Ketchikan Indian Community

Report Generated: September 27, 2019

Non-Detect Results
In sample(s) classified as non-detect, the host-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis.

Detected Results
In sample(s) classified as detected, the host-associated fecal gene biomarker(s) was detected in both test replicates suggesting that the host's fecal contamination is present in the sample(s). Copy number measurements reported are relative, not absolute, quantification.

Detected Not Quantified (DNQ) Results
In sample(s) classified as Detected Not Quantified (DNQ), the host-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with the respective host was present in the sample(s) but in low concentrations.

Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the host-associated biomarker with the regional population. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "non-detect", "low concentration", "moderate concentration", or "high concentration" based on the concentration of the genetic markers found in the sample(s).

The presence of the biomarker does not signify the presence or absence of that form of fecal pollution conclusively. Only repeated sampling will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Water Samples: Each submitted water sample is filtered through 0.45 micron membrane filter(s). Each filter is placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample is homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol. Devitations to these procedures may occur at the client's request.

Non-Water Samples: Each non-water sample submitted by the client is processed as per internal laboratory extraction procedures. An extracted DNA sample is proceed directly to PCR analysis. Details available upon request.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul sample extract, forward primer, reverse primer, probe and an optimized buffer. All assays are run in duplicate. Quantification is achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control and a negative control, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.

Theory Explanation of Dog Bacteroidetes "Quantification" ID™

The phylum *Bacteroidetes* is composed of three large groups of bacteria with the best-known category being *Bacteroidaceae*. This family of gram-negative bacteria is found primarily in the intestinal tracts and mucous membranes of warm-blooded animals and is sometimes considered pathogenic.

Comprising *Bacteroidaceae* are the genus *Bacteroides* and *Prevotella*. The latter genus was originally classified within the former (i.e. *Bacteroides*), but since the 1990's it has been classified in a separate genus because of new chemical and biochemical findings. *Bacteroides* and *Prevotella* are gram-negative, anaerobic, rod-shaped bacteria that inhabitant of the oral, respiratory, intestinal, and urogenital cavities of humans, animals, and insects. They are sometimes pathogenic.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.[1] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*. Furthermore, these latter two organisms are facultative anaerobes and as such they can be problematic for monitoring purposes since it has been shown that they are able to proliferate in soil, sand and sediments.

The Dog Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.[2,3,4,5,6] Furthermore, certain categories of *Bacteroidetes* have been shown to be predominately detected in dog. Within these *Bacteroidetes*, certain strains of the *Bacteroides* and *Prevotella* genus have been found in dog.[2,3,5,6] As such, these bacterial strains can be used as indicators of dog fecal contamination.

One of the advantages of the Dog Bacteroidetes ID™ service is that the entire water is sampled and filtered for fecal *Bacteroidetes*. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates off a petri dish. This is a particular advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method uses PCR DNA technology. PCR allows quantities of DNA to be amplified into large number of small copies of DNA sequences. This is accomplished with small pieces of DNA called primers that are complementary and specific to the genomes to be detected.

Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers to create exact copies of the DNA fragment desired. This process is repeated rapidly many times ensuring an exponential progression in the number of copied DNA. If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve. The absence of an amplification curve would indicate that the dog *Bacteroidetes* gene biomarker is not present.

References

[1] Scott, Troy M., Rose, Joan B., Jenkins, Tracie M., Farrah, Samuel R., Lukasik, Jerzy **Microbial Source Tracking: Current Methodology and Future Directions.** Appl. Environ. Microbiol. (2002) 68: 5796-5803.

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[6] Dick, Linda K., Bernhard, Anne E., Brodeur, Timothy J., Santo Domingo, Jorge W., Simpson, Joyce M., Walters, Sarah P., Field, Katharine G. **Host Distributions of Uncultivated Fecal Bacteroidales Bacteria Reveal Genetic Markers for Fecal Source Identification** Appl. Environ. Microbiol. 2005 71: 3184-3191.

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ISO 17025 Accredited Testing Laboratory

Gull Fecal Quantification ID

Detection and quantification of the fecal associated Gull gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: July 31, 2019
Report Generated: September 27, 2019

ND: Not Detected

SM #	Sample ID	Analysis Requested	Marker Quantified (copies/100 ml)	DNA Analytical Results
SM-9I16008	KB- MTN P Cult Foods	Gull Fecal ID	ND	Not Detected
SM-9I16009	KB- MTN P Suprise	Gull Fecal ID	ND	Not Detected
SM-9I16010	KB- Rotary Pool	Gull Fecal ID	ND	Not Detected
SM-9I16011	KB- Rotary Beach	Gull Fecal ID	ND	Not Detected
SM-9I16012	KB- S. Refuge	Gull Fecal ID	ND	Not Detected
SM-9I16013	KB- Sunset	Gull Fecal ID	ND	Not Detected
SM-9I16014	KB- Knudson Cove	Gull Fecal ID	ND	Not Detected

Revision 1.3
Effective Date 9/25/18

Laboratory Comments

Submitter: Ketchikan Indian Community

Report Generated: September 27, 2019

Non-Detect Results
In sample(s) classified as non-detect, the host-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis.

Detected Results
In sample(s) classified as detected, the host-associated fecal gene biomarker(s) was detected in both test replicates suggesting that the host's fecal contamination is present in the sample(s). Copy number measurements reported are relative, not absolute, quantification.

Detected Not Quantified (DNQ) Results
In sample(s) classified as Detected Not Quantified (DNQ), the host-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with the respective host was present in the sample(s) but in low concentrations.

Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the host-associated biomarker with the regional population. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "non-detect", "low concentration", "moderate concentration", or "high concentration" based on the concentration of the genetic markers found in the sample(s).

The presence of the biomarker does not signify the presence or absence of that form of fecal pollution conclusively. Only repeated sampling will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Water Samples: Each submitted water sample is filtered through 0.45 micron membrane filter(s). Each filter is placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample is homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol. Devitations to these procedures may occur at the client's request.

Non-Water Samples: Each non-water sample submitted by the client is processed as per internal laboratory extraction procedures. An extracted DNA sample is proceed directly to PCR analysis. Details available upon request.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul sample extract, forward primer, reverse primer, probe and an optimized buffer. All assays are run in duplicate. Quantification is achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control and a negative control, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.

C. marimammalium Gull Fecal "Quantification" ID™

C. marimammalium are shown to be ubiquitous in the gull gastrointestinal tract for multiple species of the gull genus Larus found throughout North America.[1]

Classified as a novel genus and species in 2006, *C. marimammalium* is a Gram-positive, catalase-negative, facultatively anaerobic, coccus-shaped bacterium, related to, although distinct from, other catalase-negative genera which include *Enterococcus*, *Melissococcus*, *Tetragenococcus* and *Vagococcus*[2].

As a novel bacterium species, the pathogenesis of *C. marimammalium* is relatively unknown. However, there are increasing public health concerns regarding avian fecal contamination in the environment due to the potential spread of microbial avian pathogens to humans, domesticated animals, and human food sources[1]. Studies have shown also that waterfowl carry human pathogens such as *Campylobacter spp*[3], *Salmonella spp*[4], and *E. coli*[5], as well as being reservoirs of influenza viruses[6].

The Gull Fecal ID™ service is designed around the principle that *C. marimammalium* is highly specific and sensitive to numerous gulls of the genus Larus[1]. This *C. marimammalium* baterium can be used as an indicator of gull fecal contamination. Use of real-time (quantitative) Polymerase Chain Reaction (qPCR) allows for the rapid amplification of the gene biomarker to demonstrate the presence of gull feces and allow for the real-time visualization of the target.

Accuracy of the results is possible because the method uses real-time (quantitative) PCR DNA technology. Real-time (quantitative) PCR allows small DNA sequences to be amplified exponentially and detected in real-time via fluorescent probes.
DNA amplification is accomplished with small pieces of DNA called primers that are specific to the genomes of interest. Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers. The DNA is replicated to create exact copies of the desired DNA fragment (i.e. the gene biomarker). This process is repeated rapidly many times ensuring an exponential growth in the number of copied DNA.

If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available for detection. With real-time (quantitative) PCR, the desired DNA fragments are also bound by fluorescent reporter probes. Consequently, the more copies of the desired DNA fragments that are made, the stronger the fluorescent signal, thus allowing for a straightforward detection and quantification of the targeted gene in real-time via the real-time PCR associated software. Nonetheless, as with all analytical tests, in order to strengthen the validity of the results, the Gull Fecal ID™ service should be combined with other DNA analytical services such as the E. coli ID™ service.

References

[1]**Phylogenic Diversity and Molecular Detection of Bacteria in Gull Feces** Lu, Jungrang, Santo Domingo, Jorge W., Lamendella, Regina, Edge, Thomas, Hill, Stephen; *Appl. Environ. Microbiol*, **2008**, 74: 3969-3976.

[2]***Catellicoccus marimammalium* gen. nov., sp. nov., a novel gram-positive, catalase-negative, coccus-shaped bacterium from porpoise and grey seal** Lawson, P.A., Collins, M.D., Falsen, E., Foster, G.; *Int J Syst Evol Microbiol.* **2006**, 56: 429-432.

[3]**Prevalence of *Campylobacter jejuni*, *Campylobacter lari*, and *Campylobacter coli* in Different Ecological Guilds and Taxa of Migrating Birds** Waldenström, J., Broman, T., Carlsson, I., Hasselquist, D., Achterberg, R.P, Wagenaar, J.A., Olsen, B.; *Appl. Environ. Microbiol*, **2002**, 68: 5911-5917.

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[6]**Influenza in Migratory Birds and Evidence of Limited Intercontinental Virus Exchange** Krauss, S., Obert, C.A., Franks, J., Walker, D., Jones, K., Seiler, P., Niles, L., Pryor, S.P., Obenauer, J.C., Naeve, C.W., Widjaja, L., Webby, R.J., Webster, R.G.; *PLos Pathog*.; **2007**, 3: 167.

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Gull Fecal Quantification ID

Detection and quantification of the fecal associated Gull gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: September 11, 2019
Report Generated: September 27, 2019

DNQ: Detected Not Quantified

SM #	Sample ID	Analysis Requested	Marker Quantified (copies/100 ml)	DNA Analytical Results
SM-9I16032	Herring Cove	Gull Fecal ID	1.99E+04	Detected
SM-9I16033	Seaport	Gull Fecal ID	1.21E+03	Detected
SM-9I16034	Thomas	Gull Fecal ID	3.38E+03	Detected
SM-9I16035	Shull	Gull Fecal ID	3.60E+03	Detected
SM-9I16036	South Point Higgins	Gull Fecal ID	DNQ	Detected

Revision 1.3
Effective Date 9/25/18

Laboratory Comments

Submitter: Ketchikan Indian Community

Report Generated: September 27, 2019

Non-Detect Results
In sample(s) classified as non-detect, the host-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis.

Detected Results
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References

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Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9445
Company Name: DEC Division of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON RE-USABLE BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB- Knudson	marine	5/17/18	~~7:22~~ 7:39 AF	grab	FC 9222D
KB- Knudson			~~7:22~~		Entero D6503991
KB- Knudson-dup			~~7:22~~		FC
KB- Knudson-dup			~~7:22~~		Entero
KB- Beacon Hill			8:12		FC
KB- Beacon Hill			8:12		Entero
KB- S Pt Higgins			8:40		FC
KB- S Pt Higgins			8:40		Entero

SAMPLING INSTRUCTIONS: Wastewater samples are accepted Mon-Thurs 8:00-3:00 and must be received within 6 hours of collection. If more than 2 hours elapses between collection and receipt, the samples must be stored under 10°C. When sampling, please leave a 1-inch air space for laboratory homogenization; ***please DO NOT fill to capacity***. This form MUST be completed by the sampler and the bottles labeled with the sample location AND facility name. We need to be able to identify your samples from others based on these labels.

FAILURE TO COMPLY WITH SAMPLING INSTRUCTIONS & REQUIREMENTS MAY RESULT IN SAMPLE REJECTION

PLEASE CONTACT THE LAB IF YOU HAVE ANY QUESTIONS

SAMPLING REQUIREMENTS: Effluent BOD/TSS requires a 1000-ml poly container. Influent BOD/TSS requires a 500-ml poly container. Effluenent fecal coliform requires a separate 120-ml sterile container filled to 100-ml, if needed, enterococcus can be analyzed from this same container. However, if you are sampling any mixing zone site and need both fecal coliform and enterococcus analyzed, you will need to sample TWO seperate 120-ml sterile containers.

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	5/17/18	12:45		5/17/18	1245

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9445
Company Name: DEC Division of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON RE-USABLE BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Shull	marine	5/17/18	9:15	grab	FC
KB-Shull	"	"	9:15	"	Entero
KB-Sunset	"	"	9:35	"	FC
KB-Sunset	"	"	9:35	"	Entero
KB-Refuge	"	"	9:50	"	FC
KB-Refuge	"	"	9:50	"	Entero
KB-Thomas Basin	"	"	12:10	"	FC
KB-Thomas Basin	"	"	12:10	"	Entero

SAMPLING INSTRUCTIONS: Wastewater samples are accepted Mon-Thurs 8:00-3:00 and must be received within 6 hours of collection. If more than 2 hours elapses between collection and receipt, the samples must be stored under 10°C. When sampling, please leave a 1-inch air space for laboratory homogenization; ***please DO NOT fill to capacity***. This form MUST be completed by the sampler and the bottles labeled with the sample location AND facility name. We need to be able to identify your samples from others based on these labels.

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FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	5/17/18	1345	[signature]	5/17/18	1345

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9445
Company Name: DEC Divison of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON RE-USABLE BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Seaport	marine	5/17/18	10:40	grab	FC
KB-Seaport			10:40		Entero
KB-Rotary			11:03		FC
KB-Rotary			11:03		Entero
KB-MtnPoint			11:15		FC
KB-Mtn Point			11:15		Entero
KB-Herring			11:35		FC
KB-Herring			11:35		Entero

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FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	5/17/18	1245		5/17/18	1245

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Nicole Forbes
Date: 5/17/2018
Time: 0739-1210
Matrix: marine
Type: grab

LAB RECEIVING
Date: 5/17/2018
Time: 1300
Temp: 8.0° C

LAB REPORTING
Date: 5/21/2018
Time: 1000

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25214	**KB-Knudson**	**FC**	5/17/2018	1445	**28**	**cfu / 100 ml**	1.0	9222D
25215	**KB-Knudson**	**entero**	5/17/2018	1420	**2595**	**MPN / 100 ml**	10.0	D6503
25216	***Knudson dup***	**FC**	5/17/2018	1445	**26**	**cfu / 100 ml**	1.0	9222D
25217	***Knudson dup***	**entero**	5/17/2018	1420	**2603**	**MPN / 100 ml**	10.0	D6503
25218	**KB-Beacon Hill**	**FC**	5/17/2018	1445	**3**	**cfu / 100 ml**	1.0	9222D
25219	**KB-Beacon Hill**	**entero**	5/17/2018	1420	**183**	**MPN / 100 ml**	10.0	D6503
25220	**KB-S Pt Higgins**	**FC**	5/17/2018	1445	**5**	**cfu / 100 ml**	1.0	9222D
25221	**KB-S Pt Higgins**	**entero**	5/17/2018	1420	**31**	**MPN / 100 ml**	10.0	D6503
25222	**KB-Seaport**	**FC**	5/17/2018	1545	**<1**	**cfu / 100 ml**	1.0	9222D
25223	**KB-Seaport**	**entero**	5/17/2018	1530	**<1**	**MPN / 100 ml**	10.0	D6503
25224	**KB-Rotary**	**FC**	5/17/2018	1645	**<1**	**cfu / 100 ml**	1.0	9222D
25225	**KB-Rotary**	**entero**	5/17/2018	1620	**20**	**MPN / 100 ml**	10.0	D6503
25226	**KB-Mt Point**	**FC**	5/17/2018	1645	**8**	**cfu / 100 ml**	1.0	9222D
25227	**KB-Mt Point**	**entero**	5/17/2018	1620	**10**	**MPN / 100 ml**	10.0	D6503
25228	**KB-Herring**	**FC**	5/17/2018	1645	**2**	**cfu / 100 ml**	1.0	9222D
25229	**KB-Herring**	**entero**	5/17/2018	1620	**31**	**MPN / 100 ml**	10.0	D6503
25230	**KB-Shull**	**FC**	5/17/2018	1545	**3**	**cfu / 100 ml**	1.0	9222D
25231	**KB-Shull**	**entero**	5/17/2018	1530	**30**	**MPN / 100 ml**	10.0	D6503
25232	**KB-Sunset**	**FC**	5/17/2018	1545	**3**	**cfu / 100 ml**	1.0	9222D
25233	**KB-Sunset**	**entero**	5/17/2018	1530	**20**	**MPN / 100 ml**	10.0	D6503
25234	**KB-Refuge**	**FC**	5/17/2018	1545	**5**	**cfu / 100 ml**	1.0	9222D
25235	**KB-Refuge**	**entero**	5/17/2018	1530	**74**	**MPN / 100 ml**	10.0	D6503
25236	**KB-T. Basin**	**FC**	5/17/2018	1645	**1**	**cfu / 100 ml**	1.0	9222D
25237	**KB-T. Basin**	**entero**	5/17/2018	1620	**10**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9312
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave Suite 301	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON RE-USABLE BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB- Herring	marine	5/22/18	11:58	grab	FC SM9222D
KB- Herring			11:58		Entero D16503-99
KB - Mtn Point			12:26		FC
KB- Mtn Point			12:26		Entero
KB- Rotary			12:45		FC
KB- Rotary			12:45		Entero
KB - Seaport			12:54		FC
KB - Seaport			12:54		Entero

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PLEASE CONTACT THE LAB IF YOU HAVE ANY QUESTIONS

SAMPLING REQUIREMENTS: Effluent BOD/TSS requires a 1000-ml poly container. Influent BOD/TSS requires a 500-ml poly container. Effluenent fecal coliform requires a separate 120-ml sterile container filled to 100-ml, if needed, enterococcus can be analyzed from this same container. However, if you are sampling any mixing zone site and need both fecal coliform and enterococcus analyzed, you will need to sample TWO seperate 120-ml sterile containers.

FIELD NOTES:

LAB NOTE: DROP OFF | ENTERO EXPIRES 7/18

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	5/22/18			5/22/18	1340
			Temp @ 8.5°C		

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Phone Number:
Company Name: See	Fax Number: Page
Address:	Sampler Name (Print):
City, State, Zip	Sampler Signature: 1

first drop off

Sample Information

PLEASE DO NOT WRITE ON RE-USABLE BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Thomas Basin	marine	5/22/18	13:10	grab	FC SM9222D
KB-Thomas Basin			13:10		Entero D6503-99
KB-Refuge			13:45		FC
KB-Refuge			13:45		Entero
KB-Sunset			14:00		FC
KB-Sunset			14:00		Entero
KB-Shull			14:15		FC
KB-Shull			14:15		Entero

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second drop off

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Jorves	5/22/18	13:40		5/22/18	1340
Nicole Jorves	5/22/18	15:00		5/22/18	1500

1500 - temp 0.5°C jr

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Phone Number:
Company Name: See	Fax Number: page
Address:	Sampler Name (Print): 1
City, State, Zip	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON RE-USABLE BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - S Pt Higgins	marine	5/22/18	14:25	grab	FC SM 9222 D
KB - S Pt Higgins			14:25		Entero ~~SM~~ D6503-99
KB - Beacon Hill			14:41		FC
KB - Beacon Hill			14:41		Entero
KB - Knudson			14:50		FC
KB - Knudson			14:50		Entero
KB - Herring - dup			12:45		FC
KB - Herring - dup			12:45		Entero

second drop off

first drop off

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FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Torres	5/22/18	13:40	C. Johnson	5/22/18	1340
Nicole Torres	5/22/18	15:00	cday	5/22/18	1508

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Nicole Forbes
Date: 5/22/2018
Time: 1158-1450
Matrix: marine
Type: grab

LAB RECEIVING
Date: 5/22/2018
Time: 1340 & 1500
Temp: 8.0° C & 8.5° C

LAB REPORTING
Date: 5/24/2018
Time: 930

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25267	**KB-Herring**	**FC**	5/22/2018	1520	**94**	**cfu / 100 ml**	1.0	9222D
25268	**KB-Herring**	**entero**	5/22/2018	1440	**30**	**MPN / 100 ml**	10.0	D6503
25269	***KB-Mt Point***	**FC**	5/22/2018	1520	**46**	**cfu / 100 ml**	1.0	9222D
25270	***KB-Mt Point***	**entero**	5/22/2018	1440	**106**	**MPN / 100 ml**	10.0	D6503
25271	**KB-Rotary**	**FC**	5/22/2018	1520	**39**	**cfu / 100 ml**	1.0	9222D
25272	**KB-Rotary**	**entero**	5/22/2018	1440	**30**	**MPN / 100 ml**	10.0	D6503
25277	**KB-Rotary-dup**	**FC**	5/22/2018	1520	**17**	**cfu / 100 ml**	1.0	9222D
25278	**KB-Rotary-dup**	**entero**	5/22/2018	1440	**20**	**MPN / 100 ml**	10.0	D6503
25273	**KB-Seaport**	**FC**	5/22/2018	1520	**51**	**cfu / 100 ml**	1.0	9222D
25274	**KB-Seaport**	**entero**	5/22/2018	1440	**10**	**MPN / 100 ml**	10.0	D6503
25275	**KB-Th. Basin**	**FC**	5/22/2018	1520	**81**	**cfu / 100 ml**	1.0	9222D
25276	**KB-Th. Basin**	**entero**	5/22/2018	1440	**51**	**MPN / 100 ml**	10.0	D6503
25279	**KB-Refuge**	**FC**	5/22/2018	1740	**64**	**cfu / 100 ml**	1.0	9222D
25280	**KB-Refuge**	**entero**	5/22/2018	1630	**95**	**MPN / 100 ml**	10.0	D6503
25281	**KB-Sunset**	**FC**	5/22/2018	1740	**48**	**cfu / 100 ml**	1.0	9222D
25282	**KB-Sunset**	**entero**	5/22/2018	1630	**63**	**MPN / 100 ml**	10.0	D6503
25283	**KB-Shull**	**FC**	5/22/2018	1740	**132**	**cfu / 100 ml**	1.0	9222D
25284	**KB-Shull**	**entero**	5/22/2018	1630	**20**	**MPN / 100 ml**	10.0	D6503
25285	**KB-S Pt Higgins**	**FC**	5/22/2018	1740	**84**	**cfu / 100 ml**	1.0	9222D
25286	**KB-S Pt Higgins**	**entero**	5/22/2018	1630	**61**	**MPN / 100 ml**	10.0	D6503
25287	**KB-Beacon Hill**	**FC**	5/22/2018	1740	**26**	**cfu / 100 ml**	1.0	9222D
25288	**KB-Beacon Hill**	**entero**	5/22/2018	1630	**30**	**MPN / 100 ml**	10.0	D6503
25289	**KB-Knudson**	**FC**	5/22/2018	1740	**144**	**cfu / 100 ml**	1.0	9222D
25290	**KB-Knudson**	**entero**	5/22/2018	1630	**341**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9445
Company Name: DEC Divison of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Knudson	marine	5/31/18	6:15	grab	FC SM9222D
KB-Knudson	"	"	6:15	"	Entero D6503-99
KB-Beacon Hill	"	"	6:32	"	FC
KB-Beacon Hill	"	"	6:32	"	Entero
KB-S Pt Higgins	"	"	6:57	"	FC
KB-S Pt Higgins	"	"	6:57	"	Entero
KB-SPtHiggins-dup	"	"	6:57	"	FC
KB-SPt Higgins-dup	"	"	6:57	"	Entero

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PLEASE CONTACT THE LAB AT 907-225-7917 x 110 IF YOU HAVE ANY QUESTIONS

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~~FIELD~~ LAB NOTES: ROUND 1 ENTC IN 1125, TEMP 41.5
ROUND 1 FC IN 1140, TEMP 44.6
ROUND 1 = KCOVE, BHILL, SPTHIG, SUNSET, SHULL REFUGE

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	5/31/18	9:00am		5.31.18	9:00am
				5-31-18	0915

temp = 6.5°C

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Phone Number:
Company Name: see	Fax Number: page
Address:	Sampler Name (Print):
City, State, Zip	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Shull	marine	5/31/18	7:45	grab	FC
KB-Shull			7:45		Entero
KB-Sunset			8:10		FC
KB-Sunset			8:10		Entero
KB-Refuge			8:36		FC
KB-Refuge			8:36		Entero
KB-Thomas Basin			9:20		FC
KB-Thomas Basin			9:20		Entero

drop 1

drop 2

SAMPLING INSTRUCTIONS: Wastewater samples are accepted Mon-Thurs 8:00-3:00 and must be received within 6 hours of collection. If more than 2 hours elapses between collection and receipt, the samples must be stored under 10°C. When sampling, please leave a 1-inch air space for laboratory homogenization; ***please DO NOT fill to capacity***. This form MUST be completed by the sampler and the bottles labeled with the sample location AND facility name. We need to be able to identify your samples from others based on these labels.

FAILURE TO COMPLY WITH SAMPLING INSTRUCTIONS & REQUIREMENTS MAY RESULT IN SAMPLE REJECTION

PLEASE CONTACT THE LAB AT 907-225-7917 x 110 IF YOU HAVE ANY QUESTIONS

SAMPLING REQUIREMENTS: Effluent BOD/TSS requires a 1000-ml poly container. Influent BOD/TSS requires a 500-ml poly container. Effluent fecal coliform requires a separate 120-ml sterile container filled to 100-ml, if needed, enterococcus can be analyzed from this same container. However, if you are sampling any mixing zone or creek/ditch site and need both fecal coliform and enterococcus analyzed, you will need to sample TWO seperate 120-ml sterile containers. E.coli requires a seperate 120-ml sample bottle filled to the 100-ml line.

FIELD NOTES:

Tracking Information

	Relinquished By:	Date	Time	Received By:	Date	Time
drop 1	Nicole Toles	5/31/18	9:00am		5.31.18	9:00am
drop 2	Nicole Toles	5/31/18	12:00am		5.31.18	12:00am

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Phone Number:
Company Name: SER	Fax Number: page
Address:	Sampler Name (Print):
City, State, Zip	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Seaport	marine	05/31/18	9:50	grab	FC
KB-Seaport	"	"	9:50	"	Entero
KB-Rotary	"	"	10:05	"	FC
KB-Rotary	"	"	10:05	"	Entero
KB-Mtn Point	"	"	10:20	"	FC
KB-Mtn Point	"	"	10:20	"	Entero
KB-Herring	"	"	10:50	"	FC
KB-Herring	"	"	10:50	"	Entero

SAMPLING INSTRUCTIONS: Wastewater samples are accepted Mon-Thurs 8:00-3:00 and must be received within 6 hours of collection. If more than 2 hours elapses between collection and receipt, the samples must be stored under 10°C. When sampling, please leave a 1-inch air space for laboratory homogenization; ***please DO NOT fill to capacity***. This form MUST be completed by the sampler and the bottles labeled with the sample location AND facility name. We need to be able to identify your samples from others based on these labels.

FAILURE TO COMPLY WITH SAMPLING INSTRUCTIONS & REQUIREMENTS MAY RESULT IN SAMPLE REJECTION

PLEASE CONTACT THE LAB AT 907-225-7917 x 110 IF YOU HAVE ANY QUESTIONS

SAMPLING REQUIREMENTS: Effluent BOD/TSS requires a 1000-ml poly container. Influent BOD/TSS requires a 500-ml poly container. Effluent fecal coliform requires a separate 120-ml sterile container filled to 100-ml, if needed, enterococcus can be analyzed from this same container. However, if you are sampling any mixing zone or creek/ditch site and need both fecal coliform and enterococcus analyzed, you will need to sample TWO seperate 120-ml sterile containers. E.coli requires a seperate 120-ml sample bottle filled to the 100-ml line.

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Bowles	5/31/18	12:00		5.31.18	12:00pm

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Nicole Forbes
Date: 5/31/2018
Time: 0615-1050
Matrix: marine
Type: grab

LAB RECEIVING
Date: 5/31/2018
Time: 0900 & 1200
Temp: 6.5° C & 6.0° C

LAB REPORTING
Date: 6/4/2018
Time: 945

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25346	**KB-Knudson**	**FC**	5/31/2018	1140	**26**	**cfu / 100 ml**	1.0	9222D
	KB-Knudson	**entero**	5/31/2018	1125	**20**	**MPN / 100 ml**	10.0	D6503
25347	**KB-Beacon Hill**	**FC**	5/31/2018	1140	**66**	**cfu / 100 ml**	1.0	9222D
	KB-Beacon Hill	**entero**	5/31/2018	1125	**<10**	**MPN / 100 ml**	10.0	D6503
25348	**KB-S Pt Higgins**	**FC**	5/31/2018	1140	**48**	**cfu / 100 ml**	1.0	9222D
	KB-S Pt Higgins	**entero**	5/31/2018	1125	**60**	**MPN / 100 ml**	10.0	D6503
25349	**KB-S.Pt Hig-dup**	**FC**	5/31/2018	1140	**56**	**cfu / 100 ml**	1.0	9222D
	KB-S.Pt Hig-dup	**entero**	5/31/2018	1125	**70**	**MPN / 100 ml**	10.0	D6503
25350	**KB-Shull**	**FC**	5/31/2018	1140	**27**	**cfu / 100 ml**	1.0	9222D
	KB-Shull	**entero**	5/31/2018	1125	**<10**	**MPN / 100 ml**	10.0	D6503
25351	**KB-Sunset**	**FC**	5/31/2018	1140	**51**	**cfu / 100 ml**	1.0	9222D
	KB-Sunset	**entero**	5/31/2018	1125	**<10**	**MPN / 100 ml**	10.0	D6503
25352	**KB-Refuge**	**FC**	5/31/2018	1140	**49**	**cfu / 100 ml**	1.0	9222D
	KB-Refuge	**entero**	5/31/2018	1125	**<10**	**MPN / 100 ml**	10.0	D6503
25353	**KB-Th. Basin**	**FC**	5/31/2018	1440	**12**	**cfu / 100 ml**	1.0	9222D
	KB-Th. Basin	**entero**	5/31/2018	1510	**41**	**MPN / 100 ml**	10.0	D6503
25354	**KB-Seaport**	**FC**	5/31/2018	1440	**33**	**cfu / 100 ml**	1.0	9222D
	KB-Seaport	**entero**	5/31/2018	1510	**<10**	**MPN / 100 ml**	10.0	D6503
25355	**KB-Rotary**	**FC**	5/31/2018	1440	**23**	**cfu / 100 ml**	1.0	9222D
	KB-Rotary	**entero**	5/31/2018	1510	**10**	**MPN / 100 ml**	10.0	D6503
25356	**KB-Mt Point**	**FC**	5/31/2018	1440	**21**	**cfu / 100 ml**	1.0	9222D
	KB-Mt Point	**entero**	5/31/2018	1510	**20**	**MPN / 100 ml**	10.0	D6503
25357	**KB-Herring**	**FC**	5/31/2018	1440	**9**	**cfu / 100 ml**	1.0	9222D
	KB-Herring	**entero**	5/31/2018	1510	**<10**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9312
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave Suite 301	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Herring	marine	06/15/18	11:17	grab	FC
KB-Herring			11:17		Entero
KB-Mtn Point			11:52		FC
KB-Mtn Point			11:52		Entero
KB-Rotary			12:10		FC
KB-Rotary			12:10		Entero
KB-Seaport			12:25		FC
KB-Seaport			12:25		Entero
KB-Thomas Basin			12:45		FC
KB-Thomas Basin			12:45		Entero
KB-Refuge			13:15		FC
KB-Refuge			13:15		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	6/15/18	13:30	[illegible]	6/15/18	1330
			Temp = 9.0°C		

SAMPLING INSTRUCTIONS ON REVERSE

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Phone Number:
Company Name:	Fax Number:
Address: see page 1 of 2	Sampler Name (Print):
City, State, Zip	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Sunset	marine	6/5/18	13:50	grab	FC
KB-Sunset			13:50		Entero
KB-Shull			14:05		FC
KB-Shull			14:05		Entero
KB-Spt Higgins			14:25		FC
KB-Spt Higgins			14:25		Entero
KB-Beacon Hill			14:40		FC
KB-Beacon Hill			14:40		Entero
KB-Knudson			15:00		FC
KB-Knudson			15:00		Entero
KB-Shull-dup			14:05		FC
KB-Shull-dup			14:05		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Poller	6/5/18	15:20	[signature]	6/5/18	1520
			temp = 8.5°C		

SAMPLING INSTRUCTIONS ON REVERSE

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Nicole Forbes
Date: 6/6/2018
Time: 1117-1500
Matrix: marine
Type: grab

LAB RECEIVING
Date: 6/6/2018
Time: 1330 & 1520
Temp: 9.0° C & 8.5° C

LAB REPORTING
Date: 6/8/2018
Time: 1220

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25397	**KB-Herring**	**FC**	6/6/2018	1630	**123**	**cfu / 100 ml**	1.0	9222D
	KB-Herring	**entero**	6/6/2018	1510	**109**	**MPN / 100 ml**	10.0	D6503
25398	**KB-Mt Point**	**FC**	6/6/2018	1630	**103**	**cfu / 100 ml**	1.0	9222D
	KB-Mt Point	**entero**	6/6/2018	1510	**121**	**MPN / 100 ml**	10.0	D6503
25399	**KB-Rotary**	**FC**	6/6/2018	1630	**36**	**cfu / 100 ml**	1.0	9222D
	KB-Rotary	**entero**	6/6/2018	1510	**30**	**MPN / 100 ml**	10.0	D6503
25400	**KB-Seaport**	**FC**	6/6/2018	1630	**13**	**cfu / 100 ml**	1.0	9222D
	KB-Seaport	**entero**	6/6/2018	1510	**30**	**MPN / 100 ml**	10.0	D6503
25401	**KB-Th. Basin**	**FC**	6/6/2018	1630	**139**	**cfu / 100 ml**	1.0	9222D
	KB-Th. Basin	**entero**	6/6/2018	1510	**173**	**MPN / 100 ml**	10.0	D6503
25402	**KB-Refuge**	**FC**	6/6/2018	1630	**18**	**cfu / 100 ml**	1.0	9222D
	KB-Refuge	**entero**	6/6/2018	1510	**41**	**MPN / 100 ml**	10.0	D6503
25403	**KB-Sunset**	**FC**	6/6/2018	1745	**11**	**cfu / 100 ml**	1.0	9222D
	KB-Sunset	**entero**	6/6/2018	1720	**<10**	**MPN / 100 ml**	10.0	D6503
25404	**KB-Shull**	**FC**	6/6/2018	1745	**22**	**cfu / 100 ml**	1.0	9222D
	KB-Shull	**entero**	6/6/2018	1720	**41**	**MPN / 100 ml**	10.0	D6503
25405	**KB-S.Pt.Higgins**	**FC**	6/6/2018	1745	**31**	**cfu / 100 ml**	1.0	9222D
	KB-S.Pt.Higgins	**entero**	6/6/2018	1720	**<10**	**MPN / 100 ml**	10.0	D6503
25406	**KB-Beacon Hill**	**FC**	6/6/2018	1745	**15**	**cfu / 100 ml**	1.0	9222D
	KB-Beacon Hill	**entero**	6/6/2018	1720	**<10**	**MPN / 100 ml**	10.0	D6503
25407	**KB-Knudson**	**FC**	6/6/2018	1745	**15**	**cfu / 100 ml**	1.0	9222D
	KB-Knudson	**entero**	6/6/2018	1720	**<10**	**MPN / 100 ml**	10.0	D6503
25408	**KB-Shull-dup**	**FC**	6/6/2018	1745	**29**	**cfu / 100 ml**	1.0	9222D
	KB-Shull-dup	**entero**	6/6/2018	1720	**30**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9445
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Knudson	marine	06/14/18	6:00	grab	FC SM9222D
KB-Knudson	"	"	6:00	"	Entero D6503-99
KB-Beacon Hill	"	"	6:18	"	FC
KB-Beacon Hill	"	"	6:18	"	Entero
KB-S Pt Higgins	"	"	6:40	"	FC
KB-S Pt Higgins	"	"	6:40	"	Entero
KB-Shull	"	"	6:55	"	FC
KB-Shull	"	"	6:55	"	Entero
KB-Sunset	"	"	7:20	"	FC
KB-Sunset	"	"	7:20	"	Entero
KB-Refuge	"	"	7:36	"	FC
KB-Refuge	"	"	7:36	"	Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	06/14/18	10:20		6/14/18	1050

SAMPLING INSTRUCTIONS ON REVERSE

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	see	Phone Number:	page
Company Name:		Fax Number:	
Address:		Sampler Name (Print):	
City, State, Zip		Sampler Signature:	

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - Thomas Basin	marine	06/14/18	8:15	grab	FC
KB - Thomas Basin			8:15		Entero
KB - Seaport			8:40		FC
KB - Seaport			8:40		Entero
KB - Rotary			9:00		FC
KB - Rotary			9:00		Entero
KB - Mtn Point			9:15		FC
KB - Mtn Point			9:15		Entero
KB - Herring			9:30		FC
KB - Herring			9:30		Entero
KB - Herring-dup			9:30		FC
KB - Herring-dup			9:30		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	06/14/18	10:20		6/14/18	1020

SAMPLING INSTRUCTIONS ON REVERSE

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Nicole Forbes
Date: 6/14/2018
Time: 0600-0930
Matrix: marine
Type: grab

LAB RECEIVING
Date: 6/14/2018
Time: 1020
Temp: 8.0° C & 8.5° C

LAB REPORTING
Date: 6/18/2018
Time: 1145

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25457	**KB-Knudson**	**FC**	6/14/2018	1515	**11**	**cfu / 100 ml**	1.0	9222D
	KB-Knudson	**entero**	6/14/2018	1200	**<10**	**MPN / 100 ml**	10.0	D6503
25458	**KB-Beacon Hill**	**FC**	6/14/2018	1515	**46**	**cfu / 100 ml**	1.0	9222D
	KB-Beacon Hill	**entero**	6/14/2018	1200	**<10**	**MPN / 100 ml**	10.0	D6503
25459	**KB-S.Pt.Higgins**	**FC**	6/14/2018	1515	**65**	**cfu / 100 ml**	1.0	9222D
	KB-S.Pt.Higgins	**entero**	6/14/2018	1200	**410**	**MPN / 100 ml**	10.0	D6503
25460	**KB-Shull**	**FC**	6/14/2018	1515	**118**	**cfu / 100 ml**	1.0	9222D
	KB-Shull	**entero**	6/14/2018	1200	**144**	**MPN / 100 ml**	10.0	D6503
25461	**KB-Sunset**	**FC**	6/14/2018	1515	**31**	**cfu / 100 ml**	1.0	9222D
	KB-Sunset	**entero**	6/14/2018	1200	**31**	**MPN / 100 ml**	10.0	D6503
25462	**KB-Refuge**	**FC**	6/14/2018	1515	**33**	**cfu / 100 ml**	1.0	9222D
	KB-Refuge	**entero**	6/14/2018	1200	**10**	**MPN / 100 ml**	10.0	D6503
25463	**KB-Th. Basin**	**FC**	6/14/2018	1515	**19**	**cfu / 100 ml**	1.0	9222D
	KB-Th. Basin	**entero**	6/14/2018	1200	**20**	**MPN / 100 ml**	10.0	D6503
25464	**KB-Seaport**	**FC**	6/14/2018	1515	**16**	**cfu / 100 ml**	1.0	9222D
	KB-Seaport	**entero**	6/14/2018	1200	**10**	**MPN / 100 ml**	10.0	D6503
25465	**KB-Rotary**	**FC**	6/14/2018	1515	**169**	**cfu / 100 ml**	1.0	9222D
	KB-Rotary	**entero**	6/14/2018	1200	**145**	**MPN / 100 ml**	10.0	D6503
25466	**KB-Mt Point**	**FC**	6/14/2018	1515	**9**	**cfu / 100 ml**	1.0	9222D
	KB-Mt Point	**entero**	6/14/2018	1200	**<10**	**MPN / 100 ml**	10.0	D6503
25467	**KB-Herring**	**FC**	6/14/2018	1515	**32**	**cfu / 100 ml**	1.0	9222D
	KB-Herring	**entero**	6/14/2018	1200	**10**	**MPN / 100 ml**	10.0	D6503
25468	**KB-Herring dup**	**FC**	6/14/2018	1515	**28**	**cfu / 100 ml**	1.0	9222D
	KB-Herring dup	**entero**	6/14/2018	1200	**<10**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Tony Gallegos
Date: 6/20/2018
Time: 1040-1530
Matrix: marine
Type: grab

LAB RECEIVING
Date: 6/20/2018
Time: 1300 & 1545
Temp: N/T & 8.5° C

LAB REPORTING
Date: 6/25/2018
Time: 1100

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25494	**KB-Rotary**	**FC**	6/20/2018	1735	**13**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**10**	**MPN / 100 ml**	10.0	D6503
25495	**KB-Seaport**	**FC**	6/20/2018	1735	**3**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**20**	**MPN / 100 ml**	10.0	D6503
25496	**KB-Thomas Basin**	**FC**	6/20/2018	1735	**9**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**<10**	**MPN / 100 ml**	10.0	D6503
25497	**KB-Mt. Point**	**FC**	6/20/2018	1735	**15**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**<10**	**MPN / 100 ml**	10.0	D6503
25498	**KB-Mt Point duplicate**	**FC**	6/20/2018	1735	**11**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**<10**	**MPN / 100 ml**	10.0	D6503
25499	**KB-Refuge**	**FC**	6/20/2018	1735	**6**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**<10**	**MPN / 100 ml**	10.0	D6503
25500	**KB- Herring Cove**	**FC**	6/20/2018	1735	**67**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**<10**	**MPN / 100 ml**	10.0	D6503
25501	**KB-Sunset**	**FC**	6/20/2018	1735	**4**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**10**	**MPN / 100 ml**	10.0	D6503
25502	**KB-Shull**	**FC**	6/20/2018	1735	**6**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**<10**	**MPN / 100 ml**	10.0	D6503
25503	**KB-S. Pt. Higgins**	**FC**	6/20/2018	1735	**8**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**<10**	**MPN / 100 ml**	10.0	D6503
25504	**KB- Beacon Hill**	**FC**	6/20/2018	1735	**5**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**<10**	**MPN / 100 ml**	10.0	D6503
25505	**KB-Knudson Cove**	**FC**	6/20/2018	1735	**6**	**cfu / 100 ml**	1.0	9222D
		entero	6/20/2018	1630	**<10**	**MPN / 100 ml**	10.0	D6503

R&M

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9445
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB- Knudson	marine	06127/18	5:30	grab	FC SM9222D
KB - Knudson			5:30		Entero D6503-99
KB- Beacon Hill			5:50		FC
KB - Beacon Hill			5:50		Entero
KB - S Pt Higgins			6:10		FC
KB - S Pt Higgins			6:10		Entero
KB- Shull			6:30		FC
KB- Shull			6:30		Entero
KB - Sunset			6:50		FC
KB - Sunset			6:50		Entero
KB - Refuge			7:00		FC
KB- Refuge			7:00		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	06127/18	0945		6/27/18	0945

SAMPLING INSTRUCTIONS ON REVERSE

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Phone Number: Page
Company Name: See	Fax Number:
Address:	Sampler Name (Print): 1
City, State, Zip	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Thomas Basin	marine	06127/18	7:35	grab	FC
KB-Thomas Basin			7:35		Entero
KB-Seaport			7:55		FC
KB-Seaport			7:55		Entero
KB-Seaport-dup			7:55		FC
KB-Seaport-dup			7:55		Entero
KB-Rotary			8:10		FC
KB-Rotary			8:10		Entero
KB-Mtn Point			8:40		FC
KB-Mtn Point			8:40		Entero
KB-Herring			8:57		FC
KB-Herring			8:57		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Bibes	06127118	0945		6/27/18	0945

SAMPLING INSTRUCTIONS ON REVERSE

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Tony Gallegos
Date: 6/27/2018
Time: 0530-0857
Matrix: marine
Type: grab

LAB RECEIVING
Date: 6/27/2018
Time: 945

LAB REPORTING
Date: 6/29/2018
Time: 1500

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25543	**KB-Knudson Cove**	**FC**	6/27/2018	1540	**17**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**<10**	**MPN / 100 ml**	10.0	D6503
25544	**KB- Beacon Hill**	**FC**	6/27/2018	1540	**13**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**71**	**MPN / 100 ml**	10.0	D6503
25545	**KB-S. Pt. Higgins**	**FC**	6/27/2018	1540	**22**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**<10**	**MPN / 100 ml**	10.0	D6503
25546	**KB-Shull**	**FC**	6/27/2018	1540	**15**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**20**	**MPN / 100 ml**	10.0	D6503
25547	**KB-Sunset**	**FC**	6/27/2018	1540	**12**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**<10**	**MPN / 100 ml**	10.0	D6503
25548	**KB-Refuge**	**FC**	6/27/2018	1540	**10**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**20**	**MPN / 100 ml**	10.0	D6503
25549	**KB-Thomas Basin**	**FC**	6/27/2018	1540	**19**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**10**	**MPN / 100 ml**	10.0	D6503
25550	**KB-Seaport**	**FC**	6/27/2018	1540	**8**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**<10**	**MPN / 100 ml**	10.0	D6503
25551	**KB-Seaport duplicate**	**FC**	6/27/2018	1540	**8**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**<10**	**MPN / 100 ml**	10.0	D6503
25552	**KB-Rotary**	**FC**	6/27/2018	1540	**26**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**10**	**MPN / 100 ml**	10.0	D6503
25553	**KB-Mt Point**	**FC**	6/27/2018	1540	**23**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**<10**	**MPN / 100 ml**	10.0	D6503
25554	**KB- Herring Cove**	**FC**	6/27/2018	1540	**13**	**cfu / 100 ml**	1.0	9222D
		entero	6/27/2018	1145	**<10**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Gretchen Pikul	Phone Number:	907-228-9445
Company Name:	DEC Div of Water	Fax Number:	
Address:	410 Willoughby Ave	Sampler Name (Print):	Nicole Fortes
City, State, Zip	Juneau, AK 99811	Sampler Signature:	Nicole Fortes

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Herring	marine	07/02/18	8:30	grab	FC SM9222D
KB-Herring			8:30		Entero D6503-99
KB-Mtn Point			8:50		FC
KB-Mtn Point			8:50		Entero
KB-Rotary			9:20		FC
KB-Rotary			9:20		Entero
KB-Seaport			9:40		FC
KB-Seaport			9:40		Entero
KB-Thomas Basin			10:00		FC
KB-Thomas Basin			10:00		Entero
KB-Refuge			10:30		FC
KB-Refuge			10:30		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Fortes	07/02/18	10:45		7/2/18	1045

SAMPLING INSTRUCTIONS ON REVERSE

R&M

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Phone Number:
Company Name: see	Fax Number: page
Address:	Sampler Name (Print): 1
City, State, Zip	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Sunset	marine	07/02/18	10:55	grab	FC
KB-Sunset			10:55		Entero
KB-Sunset-dup			10:55		FC
KB-Sunset-dup			10:56		Entero
KB-Snuil			11:10		FC
KB-Snuil			11:10		Entero
KB-SPt Higgins			11:30		FC
KB-SPt Higgins			11:30		Entero
KB-Beacon Hill			11:45		FC
KB-Beacon Hill			11:45		Entero
KB-Knudson			12:00		FC
KB-Knudson			12:00		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Bolz	07/02/18	12:40	[signature]	7/2/18	12:40

SAMPLING INSTRUCTIONS ON REVERSE

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Nicole Forbes
Date: 7/2/2018
Time: 0830-1200
Matrix: marine
Type: grab

LAB RECEIVING
Date: 7/2/2018
Time: 1045

LAB REPORTING
Date: 7/5/2018
Time: 1545

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25589	**KB - Herring Cove**	**FC**	7/2/2018	1400	**18**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**10**	**MPN / 100 ml**	10.0	D6503
25590	**KB - Mt Point**	**FC**	7/2/2018	1400	**9**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**<10**	**MPN / 100 ml**	10.0	D6503
25591	**KB - Rotary**	**FC**	7/2/2018	1400	**8**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**<10**	**MPN / 100 ml**	10.0	D6503
25592	**KB - Seaport**	**FC**	7/2/2018	1400	**3**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**<10**	**MPN / 100 ml**	10.0	D6503
25593	**KB - Thomas Basin**	**FC**	7/2/2018	1400	**41**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**<10**	**MPN / 100 ml**	10.0	D6503
25594	**KB - Refuge**	**FC**	7/2/2018	1400	**15**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**<10**	**MPN / 100 ml**	10.0	D6503
25595	**KB - Sunset**	**FC**	7/2/2018	1400	**21**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**<10**	**MPN / 100 ml**	10.0	D6503
25596	**KB - Sunset (duplicate)**	**FC**	7/2/2018	1400	**17**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**<10**	**MPN / 100 ml**	10.0	D6503
25597	**KB - Shull**	**FC**	7/2/2018	1400	**26**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**<10**	**MPN / 100 ml**	10.0	D6503
25598	**KB - S. Pt. Higgins**	**FC**	7/2/2018	1400	**11**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**<10**	**MPN / 100 ml**	10.0	D6503
25599	**KB - Beacon Hill**	**FC**	7/2/2018	1400	**10**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**<10**	**MPN / 100 ml**	10.0	D6503
25600	**KB - Knudson Cove**	**FC**	7/2/2018	1400	**9**	**cfu / 100 ml**	1.0	9222D
		entero	7/2/2018	1340	**74**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: (907) 228-9445
Company Name: DEC Drot Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - Knudson	marine	07/12/18	5:10	grab	FC SM9222D
KB - Knudson			5:10		Entero D6503-99
KB - Beacon Hill			5:30		FC
KB - Beacon Hill			5:30		Entero
KB - S Pt Higgins			5:50		FC
KB - S Pt Higgins			5:50		Entero
KB - Shull			6:10		FC
KB - Shull			6:10		Entero
KB - Sunset			6:40		FC
KB - Sunset			6:40		Entero
KB - Refuge			6:50		FC
KB - Refuge			6:50		Entero
KB - ~~Beacon Hill~~ Sunset - dup			6:40		
KB - ~~Beacon Hill~~ Sunset - dup			6:40		

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	07/12/18	10:00		7/12/18	1000

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Phone Number: page
Company Name: see	Fax Number:
Address:	Sampler Name (Print):
City, State, Zip	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - Thomas Basin	marine	07/12/18	7:30	grab	FC
KB - Thomas Basin	"	"	7:30	"	Entero
KB - Seaport	"	"	7:55	"	FC
KB - Seaport	"	"	7:55	"	Entero
KB - Rotary	"	"	8:10	"	FC
KB - Rotary	"	"	8:10	"	Entero
KB - Mtn Point	"	"	8:40	"	FC
KB - Mtn Point	"	"	8:40	"	Entero
KB - Herring	"	"	9:00	"	FC
KB - Herring	"	"	9:00	"	Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Bowles	07/12/18	10:00		7/12/18	1000

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Nicole Forbes
Date: 7/12/2018
Time: 0510-0900
Matrix: marine
Type: grab

LAB RECEIVING
Date: 7/12/2018
Time: 1000

LAB REPORTING
Date: 7/16/2018
Time: 1645

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25638	**KB-Knudson Cove**	**FC**	7/12/2018	1240	**18**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**20**	**MPN / 100 ml**	10.0	D6503
25639	**KB-Beacon Hill**	**FC**	7/12/2018	1240	**9**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**41**	**MPN / 100 ml**	10.0	D6503
25640	**KB-S.Pt. Higgins**	**FC**	7/12/2018	1240	**136**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**350**	**MPN / 100 ml**	10.0	D6503
25641	**KB-Shull**	**FC**	7/12/2018	1240	**14**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**<10**	**MPN / 100 ml**	10.0	D6503
25642	**KB-Sunset**	**FC**	7/12/2018	1240	**28**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**<10**	**MPN / 100 ml**	10.0	D6503
25643	**KB-Refuge**	**FC**	7/12/2018	1240	**22**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**<10**	**MPN / 100 ml**	10.0	D6503
25644	**KB-Sunset (dup)**	**FC**	7/12/2018	1240	**26**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**10**	**MPN / 100 ml**	10.0	D6503
25645	**KB-Thomas Basin**	**FC**	7/12/2018	1240	**37**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**30**	**MPN / 100 ml**	10.0	D6503
25646	**KB-Seaport**	**FC**	7/12/2018	1240	**5**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**10**	**MPN / 100 ml**	10.0	D6503
25647	**KB-Rotary**	**FC**	7/12/2018	1240	**8**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**<10**	**MPN / 100 ml**	10.0	D6503
25648	**KB-Mt. Point**	**FC**	7/12/2018	1240	**3**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**<10**	**MPN / 100 ml**	10.0	D6503
25649	**KB-Herring**	**FC**	7/12/2018	1240	**33**	**cfu / 100 ml**	1.0	9222D
		entero	7/12/2018	1300	**41**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: (907) 228-9445
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - Herring	marine	07/18/18	10:10	grab	FC SM9222D
KB - Herring			10:10		Entero D6503-99
KB - Mtn Point			10:30		FC
KB - Mtn Point			10:30		Entero
KB - Rotary			10:50		FC
KB - Rotary			10:50		Entero
KB - Seaport			11:05		FC
KB - Seaport			11:05		Entero
KB - Thomas Basin			11:30		FC
KB - Thomas Basin			11:30		Entero
KB - Herring-dup			10:10		FC
KB - Herring-dup			10:10		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	7/18/18	12:00		7/18/18	1200

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Phone Number:
Company Name: see	Fax Number: page
Address:	Sampler Name (Print):
City, State, Zip	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - Refuge	marine	07/18/18	12:00	grab	FC
KB - Refuge	"	"	12:00	"	Entero
KB - Sunset	"	"	12:15	"	FC
KB - Sunset	"	"	12:15	"	Entero
KB - Shull	"	"	12:30	"	FC
KB - Shull	"	"	12:30	"	Entero
KB - SPt Higgins	"	"	12:50	"	FC
KB - SPt Higgins	"	"	12:50	"	Entero
KB - Beacon Hill	"	"	13:20	"	FC
KB - Beacon Hill	"	"	13:20	"	Entero
KB - Knudson	"	"	13:10	"	FC
KB - Knudson	"	"	13:10	"	Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Rodvz	07/18/18	14:00		7/18/18	1400

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Nicole Forbes
Date: 7/18/2018
Time: 1010-1310
Matrix: marine
Type: grab

LAB RECEIVING
Date: 7/18/2018
Time: 1200 & 1400

LAB REPORTING
Date: 7/20/2018
Time: 1330

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25675	**KB-Herring Cove**	**FC**	7/18/2018	1630	**32**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**20**	**MPN / 100 ml**	10.0	D6503
25676	**KB-Mt Point**	**FC**	7/18/2018	1630	**2**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**<10**	**MPN / 100 ml**	10.0	D6503
25677	**KB-Rotary**	**FC**	7/18/2018	1630	**4**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**10**	**MPN / 100 ml**	10.0	D6503
25678	**KB-Seaport**	**FC**	7/18/2018	1630	**3**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**<10**	**MPN / 100 ml**	10.0	D6503
25679	**KB-Thomas Basin**	**FC**	7/18/2018	1630	**19**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**52**	**MPN / 100 ml**	10.0	D6503
25680	**KB-Herring Cove (duplicate)**	**FC**	7/18/2018	1630	**31**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**30**	**MPN / 100 ml**	10.0	D6503
25681	**KB-Refuge**	**FC**	7/18/2018	1630	**7**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**<10**	**MPN / 100 ml**	10.0	D6503
25682	**KB-Sunset**	**FC**	7/18/2018	1630	**5**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**<10**	**MPN / 100 ml**	10.0	D6503
25683	**KB-Shull**	**FC**	7/18/2018	1630	**5**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**20**	**MPN / 100 ml**	10.0	D6503
25684	**KB-S. Pt. Higgins**	**FC**	7/18/2018	1630	**2**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**<10**	**MPN / 100 ml**	10.0	D6503
25685	**KB-Beacon Hill**	**FC**	7/18/2018	1630	**3**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**<10**	**MPN / 100 ml**	10.0	D6503
25686	**KB-Knudson**	**FC**	7/18/2018	1630	**2**	**cfu / 100 ml**	1.0	9222D
		entero	7/18/2018	1540	**10**	**MPN / 100 ml**	10.0	D6503

20 in A

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907 228 4445
Company Name: DEC Divot Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Gerhard Jansen
City, State, Zip Juneau AK 99811	Sampler Signature:

Sample Information

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CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Thomas Basin	marine	7/26/18	6:12	grab	FC
KB-Thomas Basin			6:12		Entero
KB-Seaport			7:31		FC
KB-Seaport			7:31		Entero
KB-Rotary			6:30		FC
KB-Rotary			6:30		Entero
KB-Mtn Point			6:53		FC
KB-Mtn Point			6:53		Entero
KB-Herring			7:10		FC
KB-Herring			7:10		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	7/26/18	8:10		7/26/18	0810

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7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Gerhard Jansen
Date: 7/26/2018
Time: 0435-0710
Matrix: marine
Type: grab

LAB RECEIVING
Date: 7/26/2018
Time: 810

LAB REPORTING
Date: 7/30/2018
Time: 1030

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25724	**KB-Knudson**	**FC**	7/26/2018	1120	**32**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**20**	**MPN / 100 ml**	10.0	D6503
25725	**KB-Beacon Hill**	**FC**	7/26/2018	1120	**50**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**52**	**MPN / 100 ml**	10.0	D6503
25726	**KB-S. Pt. Higgins**	**FC**	7/26/2018	1120	**236**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**134**	**MPN / 100 ml**	10.0	D6503
25727	**KB-Shull**	**FC**	7/26/2018	1120	**4**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**<10**	**MPN / 100 ml**	10.0	D6503
25728	**KB-Sunset**	**FC**	7/26/2018	1120	**67**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**61**	**MPN / 100 ml**	10.0	D6503
25729	**KB-Refuge**	**FC**	7/26/2018	1120	**22**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**20**	**MPN / 100 ml**	10.0	D6503
25730	**KB-Refuge (duplicate)**	**FC**	7/26/2018	1120	**19**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**31**	**MPN / 100 ml**	10.0	D6503
25731	**KB-Thomas Basin**	**FC**	7/26/2018	1120	**23**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**52**	**MPN / 100 ml**	10.0	D6503
25732	**KB-Seaport**	**FC**	7/26/2018	1120	**6**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**<10**	**MPN / 100 ml**	10.0	D6503
25733	**KB-Rotary**	**FC**	7/26/2018	1120	**13**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**<10**	**MPN / 100 ml**	10.0	D6503
25734	**KB-Mt. Point**	**FC**	7/26/2018	1120	**9**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**<10**	**MPN / 100 ml**	10.0	D6503
25735	**KB-Herring**	**FC**	7/26/2018	1120	**45**	**cfu / 100 ml**	1.0	9222D
		entero	7/26/2018	1030	**<10**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

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phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907 228 9445
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Gerhard Jansen
City, State, Zip Juneau AK 99811	Sampler Signature: Gerhard Jansen

Sample Information

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Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - Herring Cove	marine	8/1/18	9:28	grab	
KB - Mtn Point			9:55		
KB - Rotary			10:08		
KB - Seaport			10:26		
KB - Thomas Basin			10:45		
KB - Refuge			11:25		
KB - Sunset			11:31		
KB - Shull			11:43		
KB - So. Pt. Higgins			11:53		
KB - Beacon Hill			12:06		
KB - Knudson			12:24		
KB - Thomas Basin dup			10:45		
KB - Shull - dup			11:43		

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Gerhard Jansen	8/1/18	4:		8/1/18	1120
				8/1/18	1300

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ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Gerhard Jansen
Date: 8/1/2018
Time: 0928-1224
Matrix: marine
Type: grab

LAB RECEIVING
Date: 8/1/2018
Time: 1120 & 1300

LAB REPORTING
Date: 8/7/2018
Time: 1020

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25775	**KB - Refuge**	**FC**	8/1/2018	1430	**1**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**20**	**MPN / 100 ml**	10.0	D6503
25776	**KB - Sunset**	**FC**	8/1/2018	1430	**8**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503
25777	**KB - Shull**	**FC**	8/1/2018	1430	**12**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
25778	**KB - S. Pt. Higgins**	**FC**	8/1/2018	1430	**33**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**30**	**MPN / 100 ml**	10.0	D6503
25779	**KB - Beacon**	**FC**	8/1/2018	1430	**10**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
25780	**KB - Knudson**	**FC**	8/1/2018	1430	**6**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**20**	**MPN / 100 ml**	10.0	D6503
25781	**KB - Shull (duplicate)**	**FC**	8/1/2018	1430	**9**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
25782	**KB - Herring Cove**	**FC**	8/1/2018	1430	**18**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**20**	**MPN / 100 ml**	10.0	D6503
25783	**KB - Mt. Point**	**FC**	8/1/2018	1430	**5**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**51**	**MPN / 100 ml**	10.0	D6503
25784	**KB - Rotary**	**FC**	8/1/2018	1430	**5**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503
25785	**KB - Seaport**	**FC**	8/1/2018	1430	**5**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
25786	**KB - Thomas**	**FC**	8/1/2018	1430	**21**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**63**	**MPN / 100 ml**	10.0	D6503
25787	**KB - Thomas (duplicate)**	**FC**	8/1/2018	1430	**24**	**cfu / 100 ml**	1.0	9222D
		entero	8/1/2018	1500	**52**	**MPN / 100 ml**	10.0	D6503

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phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907 228 9445
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Gerhard Jansen
City, State, Zip Juneau AK 99811	Sampler Signature:

Sample Information

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Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - Thomas Basin	marine	8/9/18	5:40	grab	FC SM9222D
KB - Thomas Basin			5:40		Entero D6503-99
KB - Seaport			6:50		FC
KB - Seaport			6:50		Entero
KB - Rotary			6:00		FC
KB - Rotary			6:00		Entero
KB - Mtn Point			6:15		FC
KB - Mtn Point			6:15		Entero
KB - Herring			6:30		FC
KB - Herring			6:30		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	8/9/18	9:10		8/9/18	0910

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phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9445
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Gerhard Jansen
City, State, Zip Juneau AK 99811	Sampler Signature: Gerhard Jansen

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
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Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - Knudson	marine	8/9/18	4:25	grab	FC SM9222D
KB - Knudson			4:25		Entero D6503-99
KB - Beacon Hill			4:46		FC
KB - Beacon Hill			4:46		Entero
KB - S Pt Higgins			4:18		FC
KB - S Pt Higgins			4:14		Entero
KB - Shull			4:00		FC
KB - Shull			4:00		Entero
KB - Sunset			5:05		FC
KB - Sunset			5:05		Entero
KB - Refuge			5:12		FC
KB - Refuge			5:12		Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Gerhard Jansen	8/9/18	9:10	[signature]	8/9/18	0910

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ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Gerhard Jansen
Date: 8/9/2018
Time: 0400-0630
Matrix: marine
Type: grab

LAB RECEIVING
Date: 8/9/2018
Time: 910

LAB REPORTING
Date: 8/13/2018
Time: 1400

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25848	**KB - Knudson Cove**	**FC**	8/9/2018	1200	**8**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**10**	**MPN / 100 ml**	10.0	D6503
25849	**KB - Beacon Hill**	**FC**	8/9/2018	1200	**30**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**10**	**MPN / 100 ml**	10.0	D6503
25850	**KB - S. Pt. Higgins**	**FC**	8/9/2018	1200	**168**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**241**	**MPN / 100 ml**	10.0	D6503
25851	**KB - Shull**	**FC**	8/9/2018	1200	**119**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**727**	**MPN / 100 ml**	10.0	D6503
25852	**KB - Sunset**	**FC**	8/9/2018	1200	**93**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**187**	**MPN / 100 ml**	10.0	D6503
25853	**KB - Refuge**	**FC**	8/9/2018	1200	**53**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**97**	**MPN / 100 ml**	10.0	D6503
25854	**KB - Thomas Basin**	**FC**	8/9/2018	1200	**CONFLUENT**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**2,755**	**MPN / 100 ml**	10.0	D6503
25855	**KB - Seaport**	**FC**	8/9/2018	1200	**26**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**52**	**MPN / 100 ml**	10.0	D6503
25856	**KB - Rotary**	**FC**	8/9/2018	1200	**131**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**336**	**MPN / 100 ml**	10.0	D6503
25857	**KB - Mt. Point**	**FC**	8/9/2018	1200	**43**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**51**	**MPN / 100 ml**	10.0	D6503
25858	**KB - Herring**	**FC**	8/9/2018	1200	**210**	**cfu / 100 ml**	1.0	9222D
		entero	8/9/2018	1100	**201**	**MPN / 100 ml**	10.0	D6503

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Dog Fecal Quantification ID

Detection and quantification of the fecal associated Dog gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: August 10, 2018
Report Generated: August 30, 2018

ND: Not Detected
DNQ: Detected Not Quantified

SM #	Sample ID	Analysis Requested	Marker Quantified (copies/100 ml)	DNA Analytical Results
SM-8H20047	Rotary	Dog Bacteroidetes ID: Target 1	3.72E+04	**Detected**
SM-8H20048	Seaport	Dog Bacteroidetes ID: Target 1	DNQ	**Detected**
SM-8H20049	Beacon Hill	Dog Bacteroidetes ID: Target 1	DNQ	**Detected**
SM-8H20050	Mtn point	Dog Bacteroidetes ID: Target 1	DNQ	**Detected**
SM-8H20051	Sunset	Dog Bacteroidetes ID: Target 1	1.86E+03	**Detected**
SM-8H20052	Herring	Dog Bacteroidetes ID: Target 1	1.21E+01	**Detected**
SM-8H20053	Knudson	Dog Bacteroidetes ID: Target 1	ND	Not Detected
SM-8H20054	Refuge	Dog Bacteroidetes ID: Target 1	ND	Not Detected
SM-8H20055	Thomas Basin	Dog Bacteroidetes ID: Target 1	3.59E+02	**Detected**
SM-8H20056	S. point Higgins	Dog Bacteroidetes ID: Target 1	9.91E+02	**Detected**
SM-8H20057	Shull	Dog Bacteroidetes ID: Target 1	2.99E+02	**Detected**

Revision 1.2
Effective Date 11/2/17

Source Molecular
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Preliminary Interpretation of Dog Fecal "Quantification" ID Results

Detection and quantification of the fecal associated Dog gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: August 10, 2018
Report Generated: August 30, 2018

Sample ID	INTERPRETATION	
	Concentration of Dog Fecal Pollution in Sample	Comment
Rotary	**Moderate Concentration**	Moderate levels of Dog fecal biomarker(s)
Seaport	**Low Concentration**	Low levels of Dog fecal biomarker(s)
Beacon Hill	**Low Concentration**	Low levels of Dog fecal biomarker(s)
Mtn point	**Low Concentration**	Low levels of Dog fecal biomarker(s)
Sunset	**Low Concentration**	Low levels of Dog fecal biomarker(s)
Herring	**Low Concentration**	Low levels of Dog fecal biomarker(s)
Knudson	Not Detected	Dog fecal biomarker not detected
Refuge	Not Detected	Dog fecal biomarker not detected
Thomas Basin	**Low Concentration**	Low levels of Dog fecal biomarker(s)
S. point Higgins	**Low Concentration**	Low levels of Dog fecal biomarker(s)
Shull	**Low Concentration**	Low levels of Dog fecal biomarker(s)

The opinions/interpretations identified/expressed in this report are outside the scope of this organization's A2LA Accreditation.

Laboratory Comments

Submitter: Ketchikan Indian Community

Report Generated: August 30, 2018

Non-Detect Results
In sample(s) classified as non-detect, the host-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis.

Detected Results
In sample(s) classified as detected, the host-associated fecal gene biomarker(s) was detected in both test replicates suggesting that the host's fecal contamination is present in the sample(s). Copy number measurements reported are relative, not absolute, quantification.

Detected Not Quantified (DNQ) Results
In sample(s) classified as Detected Not Quantified (DNQ), the host-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with the respective host was present in the sample(s) but in low concentrations.

Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the host-associated biomarker with the regional population. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "non-detect", "low concentration", "moderate concentration", or "high concentration" based on the concentration of the genetic markers found in the sample(s).

The presence of the biomarker does not signify the presence or absence of that form of fecal pollution conclusively. Only repeated sampling will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Water Samples: Each submitted water sample is filtered through 0.45 micron membrane filter(s). Each filter is placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample is homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol. Devitations to these procedures may occur at the client's request.

Non-Water Samples: Each non-water sample submitted by the client is processed as per internal laboratory extraction procedures. An extracted DNA sample is proceed directly to PCR analysis. Details available upon request.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul sample extract, forward primer, reverse primer, probe and an optimized buffer. All assays are run in duplicate. Quantification is achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control and a negative control, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.

Theory Explanation of Dog Bacteroidetes "Quantification" ID™

The phylum *Bacteroidetes* is composed of three large groups of bacteria with the best-known category being *Bacteroidaceae*. This family of gram-negative bacteria is found primarily in the intestinal tracts and mucous membranes of warm-blooded animals and is sometimes considered pathogenic.

Comprising *Bacteroidaceae* are the genus *Bacteroides* and *Prevotella*. The latter genus was originally classified within the former (i.e. *Bacteroides*), but since the 1990's it has been classified in a separate genus because of new chemical and biochemical findings. *Bacteroides* and *Prevotella* are gram-negative, anaerobic, rod-shaped bacteria that inhabitant of the oral, respiratory, intestinal, and urogenital cavities of humans, animals, and insects. They are sometimes pathogenic.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.[1] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*. Furthermore, these latter two organisms are facultative anaerobes and as such they can be problematic for monitoring purposes since it has been shown that they are able to proliferate in soil, sand and sediments.

The Dog Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.[2,3,4,5,6] Furthermore, certain categories of *Bacteroidetes* have been shown to be predominately detected in dog. Within these *Bacteroidetes*, certain strains of the *Bacteroides* and *Prevotella* genus have been found in dog.[2,3,5,6] As such, these bacterial strains can be used as indicators of dog fecal contamination.

One of the advantages of the Dog Bacteroidetes ID™ service is that the entire water is sampled and filtered for fecal *Bacteroidetes*. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates off a petri dish. This is a particular advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method uses PCR DNA technology. PCR allows quantities of DNA to be amplified into large number of small copies of DNA sequences. This is accomplished with small pieces of DNA called primers that are complementary and specific to the genomes to be detected.

Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers to create exact copies of the DNA fragment desired. This process is repeated rapidly many times ensuring an exponential progression in the number of copied DNA. If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve. The absence of an amplification curve would indicate that the dog *Bacteroidetes* gene biomarker is not present.

References

[1] Scott, Troy M., Rose, Joan B., Jenkins, Tracie M., Farrah, Samuel R., Lukasik, Jerzy **Microbial Source Tracking: Current Methodology and Future Directions.** Appl. Environ. Microbiol. (2002) 68: 5796-5803.

[2] Bernhard, A.E., and K.G. Field (2000a). **Identification of nonpoint sources of fecal pollution in coastal waters by using host-specific 16S ribosomal DNA genetic markers from fecal anaerobes.** Applied and Environmental Microbiology, 66: 1,587-1,594.

[3] Bernhard, A.E., and K.G. Field (2000b). **A PCR assay to discriminate human and ruminant feces on the basis of host differences in Bacteroides-Prevotella genes encoding 16S rRNA.** Applied and Environmental Microbiology, 66: 4,571-4,574.

[4] Kreader, C.A. (1995). **Design and evaluation of Bacteroides DNA probes for the specific detection of human fecal pollution.** Applied and Environmental Microbiology, 61: 1,171-1,179.

[5] Fogarty, Lisa R., Voytek, Mary **A.Comparison of Bacteroides-Prevotella 16S rRNA Genetic Markers for Fecal Samples from Different Animal Species** Appl. Environ. Microbiol. 2005 71: 5999-6007.

[6] Dick, Linda K., Bernhard, Anne E., Brodeur, Timothy J., Santo Domingo, Jorge W., Simpson, Joyce M., Walters, Sarah P., Field, Katharine G. **Host Distributions of Uncultivated Fecal Bacteroidales Bacteria Reveal Genetic Markers for Fecal Source Identification** Appl. Environ. Microbiol. 2005 71: 3184-3191.

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Certificate 4126.01

Gull Fecal Quantification ID

Detection and quantification of the fecal associated Gull gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: August 10, 2018
Report Generated: August 30, 2018

DNQ: Detected Not Quantified

SM #	Sample ID	Analysis Requested	Marker Quantified (copies/100 ml)	DNA Analytical Results
SM-8H20058	Rotary	Gull Fecal ID	2.42E+03	Detected
SM-8H20059	Seaport	Gull Fecal ID	7.00E+03	Detected
SM-8H20060	Beacon Hill	Gull Fecal ID	DNQ	Detected
SM-8H20061	Mtn point	Gull Fecal ID	DNQ	Detected
SM-8H20062	Sunset	Gull Fecal ID	DNQ	Detected
SM-8H20063	Herring	Gull Fecal ID	1.19E+04	Detected
SM-8H20064	Knudson	Gull Fecal ID	DNQ	Detected
SM-8H20065	Refuge	Gull Fecal ID	DNQ	Detected
SM-8H20066	Thomas Basin	Gull Fecal ID	9.06E+02	Detected
SM-8H20067	S. point Higgins	Gull Fecal ID	DNQ	Detected
SM-8H20068	Shull	Gull Fecal ID	3.07E+02	Detected

Revision 1.2
Effective Date 11/2/17

Source Molecular
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ilac-MRA A2LA ACCREDITED Certificate 4126.01
ISO 17025 Accredited Testing Laboratory

Preliminary Interpretation of Gull Fecal "Quantification" ID Results

Detection and quantification of the fecal associated Gull gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: August 10, 2018
Report Generated: August 30, 2018

Sample ID	INTERPRETATION	
	Concentration of Gull Fecal Pollution in Sample	Comment
Rotary	**Low Concentration**	Low levels of Gull fecal biomarker(s)
Seaport	**Low Concentration**	Low levels of Gull fecal biomarker(s)
Beacon Hill	**Low Concentration**	Low levels of Gull fecal biomarker(s)
Mtn point	**Low Concentration**	Low levels of Gull fecal biomarker(s)
Sunset	**Low Concentration**	Low levels of Gull fecal biomarker(s)
Herring	**Moderate Concentration**	Moderate levels of Gull fecal biomarker(s)
Knudson	**Low Concentration**	Low levels of Gull fecal biomarker(s)
Refuge	**Low Concentration**	Low levels of Gull fecal biomarker(s)
Thomas Basin	**Low Concentration**	Low levels of Gull fecal biomarker(s)
S. point Higgins	**Low Concentration**	Low levels of Gull fecal biomarker(s)
Shull	**Low Concentration**	Low levels of Gull fecal biomarker(s)

The opinions/interpretations identified/expressed in this report are outside the scope of this organization's A2LA Accreditation.

Laboratory Comments

Submitter: Ketchikan Indian Community

Report Generated: August 30, 2018

Non-Detect Results
In sample(s) classified as non-detect, the host-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis.

Detected Results
In sample(s) classified as detected, the host-associated fecal gene biomarker(s) was detected in both test replicates suggesting that the host's fecal contamination is present in the sample(s). Copy number measurements reported are relative, not absolute, quantification.

Detected Not Quantified (DNQ) Results
In sample(s) classified as Detected Not Quantified (DNQ), the host-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with the respective host was present in the sample(s) but in low concentrations.

Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the host-associated biomarker with the regional population. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "non-detect", "low concentration", "moderate concentration", or "high concentration" based on the concentration of the genetic markers found in the sample(s).

The presence of the biomarker does not signify the presence or absence of that form of fecal pollution conclusively. Only repeated sampling will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Water Samples: Each submitted water sample is filtered through 0.45 micron membrane filter(s). Each filter is placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample is homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol. Devitations to these procedures may occur at the client's request.

Non-Water Samples: Each non-water sample submitted by the client is processed as per internal laboratory extraction procedures. An extracted DNA sample is proceed directly to PCR analysis. Details available upon request.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul sample extract, forward primer, reverse primer, probe and an optimized buffer. All assays are run in duplicate. Quantification is achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control and a negative control, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.

C. marimammalium Gull Fecal "Quantification" ID™

C. marimammalium are shown to be ubiquitous in the gull gastrointestinal tract for multiple species of the gull genus Larus found throughout North America.[1]

Classified as a novel genus and species in 2006, *C. marimammalium* is a Gram-positive, catalase-negative, facultatively anaerobic, coccus-shaped bacterium, related to, although distinct from, other catalase-negative genera which include *Enterococcus*, *Melissococcus*, *Tetragenococcus* and *Vagococcus*[2].

As a novel bacterium species, the pathogenesis of *C. marimammalium* is relatively unknown. However, there are increasing public health concerns regarding avian fecal contamination in the environment due to the potential spread of microbial avian pathogens to humans, domesticated animals, and human food sources[1]. Studies have shown also that waterfowl carry human pathogens such as *Campylobacter spp*[3], *Salmonella spp*[4], and *E. coli*[5], as well as being reservoirs of influenza viruses[6].

The Gull Fecal ID™ service is designed around the principle that *C. marimammalium* is highly specific and sensitive to numerous gulls of the genus Larus[1]. This *C. marimammalium* baterium can be used as an indicator of gull fecal contamination. Use of real-time (quantitative) Polymerase Chain Reaction (qPCR) allows for the rapid amplification of the gene biomarker to demonstrate the presence of gull feces and allow for the real-time visualization of the target.

Accuracy of the results is possible because the method uses real-time (quantitative) PCR DNA technology. Real-time (quantitative) PCR allows small DNA sequences to be amplified exponentially and detected in real-time via fluorescent probes.
DNA amplification is accomplished with small pieces of DNA called primers that are specific to the genomes of interest. Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers. The DNA is replicated to create exact copies of the desired DNA fragment (i.e. the gene biomarker). This process is repeated rapidly many times ensuring an exponential growth in the number of copied DNA.

If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available for detection. With real-time (quantitative) PCR, the desired DNA fragments are also bound by fluorescent reporter probes. Consequently, the more copies of the desired DNA fragments that are made, the stronger the fluorescent signal, thus allowing for a straightforward detection and quantification of the targeted gene in real-time via the real-time PCR associated software. Nonetheless, as with all analytical tests, in order to strengthen the validity of the results, the Gull Fecal ID™ service should be combined with other DNA analytical services such as the E. coli ID™ service.

References

[1] **Phylogenic Diversity and Molecular Detection of Bacteria in Gull Feces** Lu, Jungrang, Santo Domingo, Jorge W., Lamendella, Regina, Edge, Thomas, Hill, Stephen; *Appl. Environ. Microbiol*, **2008**, 74: 3969-3976.

[2] ***Catellicoccus marimammalium* gen. nov., sp. nov., a novel gram-positive, catalase-negative, coccus-shaped bacterium from porpoise and grey seal** Lawson, P.A., Collins, M.D., Falsen, E., Foster, G.; *Int J Syst Evol Microbiol.* **2006**, 56: 429-432.

[3] **Prevalence of *Campylobacter jejuni*, *Campylobacter lari*, and *Campylobacter coli* in Different Ecological Guilds and Taxa of Migrating Birds** Waldenström, J., Broman, T., Carlsson, I., Hasselquist, D., Achterberg, R.P, Wagenaar, J.A., Olsen, B.; *Appl. Environ. Microbiol*, **2002**, 68: 5911-5917.

[4] **Diversity of *Salmonella* Strains Isolated from the Aquatic Environment as Determined by Serotyping and Amplification of the Ribosomal DNA Spacer Regions** Julia Baudart, Karine Lemarchand, Anne Brisabois, and Philippe Lebaron.; *Appl. Environ. Microbiol.;* **2002**, 66: 1544-1552.

[5] **Detection and Characterization of Shinga-toxin Producing E. coli from Seagulls** Makino, S., Korbi, H., Asakura, H., Watarai, M., Shirahata, T., Ikeda, T., Takeshi, K., Tsukamoto, T.; *Epidemiol. Infect*, **2000**, 125: 55-61.

[6] **Influenza in Migratory Birds and Evidence of Limited Intercontinental Virus Exchange** Krauss, S., Obert, C.A., Franks, J., Walker, D., Jones, K., Seiler, P., Niles, L., Pryor, S.P., Obenauer, J.C., Naeve, C.W., Widjaja, L., Webby, R.J., Webster, R.G.; *PLos Pathog*.; **2007**, 3: 167.

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Human Fecal Quantification ID

Detection and quantification of the fecal associated Human gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: August 10, 2018
Report Generated: August 30, 2018

DNQ: Detected Not Quantified

SM #	Sample ID	Analysis Requested	Marker Quantified (copies/100 ml)	DNA Analytical Results
SM-8H20036	Rotary	Human Bacteroidetes ID: Dorei	DNQ	Detected
SM-8H20037	Seaport	Human Bacteroidetes ID: Dorei	DNQ	Detected
SM-8H20038	Beacon Hill	Human Bacteroidetes ID: Dorei	DNQ	Detected
SM-8H20039	Mtn point	Human Bacteroidetes ID: Dorei	8.77E+03	Detected
SM-8H20040	Sunset	Human Bacteroidetes ID: Dorei	2.16E+02	Detected
SM-8H20041	Herring	Human Bacteroidetes ID: Dorei	5.88E+02	Detected
SM-8H20042	Knudson	Human Bacteroidetes ID: Dorei	DNQ	Detected
SM-8H20043	Refuge	Human Bacteroidetes ID: Dorei	7.71E+02	Detected
SM-8H20044	Thomas Basin	Human Bacteroidetes ID: Dorei	2.87E+02	Detected
SM-8H20045	S. point Higgins	Human Bacteroidetes ID: Dorei	2.99E+03	Detected
SM-8H20046	Shull	Human Bacteroidetes ID: Dorei	1.58E+02	Detected

Revision 1.2
Effective Date 11/2/17

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Preliminary Interpretation of Human Fecal "Quantification" ID Results

Detection and quantification of the fecal associated Human gene biomarker by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Ketchikan Indian Community
Date Received: August 10, 2018
Report Generated: August 30, 2018

Sample ID	INTERPRETATION	
	Concentration of Human Fecal Pollution in Sample	Comment
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Seaport	**Low Concentration**	Low levels of Human fecal biomarker(s)
Beacon Hill	**Low Concentration**	Low levels of Human fecal biomarker(s)
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Sunset	**Low Concentration**	Low levels of Human fecal biomarker(s)
Herring	**Low Concentration**	Low levels of Human fecal biomarker(s)
Knudson	**Low Concentration**	Low levels of Human fecal biomarker(s)
Refuge	**Low Concentration**	Low levels of Human fecal biomarker(s)
Thomas Basin	**Low Concentration**	Low levels of Human fecal biomarker(s)
S. point Higgins	**Low Concentration**	Low levels of Human fecal biomarker(s)
Shull	**Low Concentration**	Low levels of Human fecal biomarker(s)

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Laboratory Comments

Submitter: Ketchikan Indian Community

Report Generated: August 30, 2018

Non-Detect Results
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For quality control purposes, a positive control and a negative control, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.

Human Bacteroidetes ID™ Species*: B. dorei*

The **Human Bacteroidetes ID™ Species*: B. dorei*** service targets the species *Bacteroides dorei*. *B. dorei* is an anaerobe that is frequently shed from the gastrointestinal tract and isolated from human feces worldwide. It is a newly discovered species that is widely distributed in the USA.[1,2] The human-associated marker DNA sequence is located on the 16S rRNA gene of *B. dorei*.[3] The marker is the microbial source tracking (MST) marker of choice for detecting human fecal pollution due to its exceptional sensitivity and specificity. Internal validations have been conducted on hundreds of sewage, septage, human and animal host fecal samples collected from throughout the U.S and archived in the Source Molecular fecal bank. The marker has also been evaluated in both inland and coastal waters. A recent, comprehensive, multi-laboratory MST method evaluation study, exploring the performance of current MST methods, concluded the *B. dorei* qPCR assay to be the top performing human-associated assay amongst those tested. The success and consistency of this marker in numerous studies around the world[1,3,4] makes the **Human Bacteroidetes ID™ Species*: B. dorei*** service the primary service for identifying human fecal pollution at Source Molecular.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.[5] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*.

The Human Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.[3,5,6,7,8] Furthermore, certain strains of *Bacteroidetes* have been found to be associated with humans.[3,6] As such, these bacterial strains can be used as indicators of human fecal contamination.

Accuracy of the results is possible because the method amplifies DNA into a large number of small copies of the gene biomarker of interest. This is accomplished with small pieces of DNA called primers that are complementary and specific to the unique *B. dorei* DNA sequence. Through a heating process called thermal cycling, the double stranded DNA is denatured, hybridized to the complementary primers and amplified to create many copies of the DNA fragment desired. If the primers are successful in finding a site on the DNA fragment that is specific to the *B. dorei* DNA sequence, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve by the qPCR software. The absence of an amplification curve indicates that the *B. dorei* gene biomarker is not detected in the water sample because it is either not present or present at concentrations below the analytical detection limit.

To strengthen the validity of the results, additional tests targeting other high-ranking, human-associated *Bacteroidetes* species should be performed, such as
Human Bacteroidetes ID™ Species*: B. stercoris*,
Human Bacteroidetes ID™ Species*: B. fragilis,* and
Human Bacteroidetes ID™ Species*: B. thetaiotaomicron*.

[1]Boehm, A., Fuhrman, J., Mrse, R., Grant, S. **Tiered approach for identification of a human fecal pollution source at a recreational beach: case study at Avalon Bay, Catalina Island, California**. Environ Sci Technol. 2003 37**:** 673–680.
[2]Bakir, M., Sakamoto, M., Kitahara, M., Matsumoto, M., Benno, Y. **Bacteroides dorei sp. nov., isolated from human faeces**. Int. J. Syst. Evol. Microbiol. 2006 56: 1639–1641.
[3] Bernhard, A., Field, K. **A PCR assay to discriminate human and ruminant feces on the basis of host differences in Bacteroides-Prevotella genes encoding 16S rRNA.** Appl. Environ. Microbiol. 2000b 66: 4571-4574.
[4]Ahmed, w., Masters, N., Toze, S. **Consistency in the host specificity and host sensitivity of the Bacteroides HF183 marker for sewage pollution tracking. Lett. Appl. Microbiol. 2012 55: 283-289.**
[5] Scott, T., Rose, J., Jenkins, T., Farrah, S., Lukasik, J. **Microbial Source Tracking: Current Methodology and Future Directions.** Appl. Environ. Microbiol. 2002 68: 5796-5803.
[6] Bernhard, A., Field, K. **Identification of nonpoint sources of fecal pollution in coastal waters by using host-specific 16S ribosomal DNA genetic markers from fecal anaerobes.** Appl. Environ. Microbiol. 2000a 66: 1587-1594.
[7] Fogarty, L., Voytek, M. **A Comparison of Bacteroides-Prevotella 16S rRNA Genetic Markers for Fecal Samples from Different Animal Species.** Appl. Environ. Microbiol. 2005 71: 5999-6007.
[8] Dick, L., Bernhard, A., Brodeur, T., Santo Domingo, J., *et al*. **Host Distributions of Uncultivated Fecal Bacteroidales Bacteria Reveal Genetic Markers for Fecal Source Identification.** Appl. Environ. Microbiol. 2005 71: 3184-3191.

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9445
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Gerhard Jansen
City, State, Zip Juneau AK 99811	Sampler Signature: Gerhard Jansen

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Herring	marine	~~8/14/18~~	9:19	grab	FC SM9 222D and Entero D6503-99
KB - Mtn Point		8/14/18	9:38		FC + Entero
KB - Rotary		"	9:51		FC + Entero (1)
KB - Seaport			10:02		FC + Entero
KB - Thomas Basin			10:21		FC + Entero
KB - Refuse			11:47		FC + Entero
KB - Sunset			12:24		FC + Entero
KB - Shull			11:22		FC + Entero (2)
KB - S Pt. Hissing			11:38		FC + Entero
KB - Beacon Hill			11:54		FC + Entero
KB - Knudson			12:07		FC + Entero
KB - Knudson dup			12:07		FC + Entero

FIELD NOTES:

receiving (2) - temp blank = 7.5°C
Entero @ 1500
fecal @ 1600

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
(2)	8/16/18	12:34		8/16/18	
left in lab				8/16/18	1350 (2)

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ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Gerhard Jansen
Date: 8/16/2018
Time: 0914-1224
Matrix: marine
Type: grab

LAB RECEIVING
Date: 8/16/2018
Time: 1350

LAB REPORTING
Date: 8/17/2018
Time: 1620

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25920	**KB - Herring**	**FC**	8/16/2018	1600	**81**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**31**	**MPN / 100 ml**	10.0	D6503
25921	**KB - Mt Point**	**FC**	8/16/2018	1600	**4**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503
25922	**KB - Rotary**	**FC**	8/16/2018	1600	**9**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503
25923	**KB - Seaport**	**FC**	8/16/2018	1600	**5**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
25924	**KB - Thomas Basin**	**FC**	8/16/2018	1600	**14**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**74**	**MPN / 100 ml**	10.0	D6503
25925	**KB - Refuge**	**FC**	8/16/2018	1600	**3**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
25926	**KB - Sunset**	**FC**	8/16/2018	1600	**13**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
25927	**KB - Shull**	**FC**	8/16/2018	1600	**16**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**181**	**MPN / 100 ml**	10.0	D6503
25928	**KB - S. Pt. Higgins**	**FC**	8/16/2018	1600	**5**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
25929	**KB - Beacon Hill**	**FC**	8/16/2018	1600	**7**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503
25930	**KB - Knudson**	**FC**	8/16/2018	1600	**3**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
25931	**KB - Knudson (duplicate)**	**FC**	8/16/2018	1600	**2**	**cfu / 100 ml**	1.0	9222D
		entero	8/16/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

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Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907 228 9445
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Address: 410 Willoughby Ave	Sampler Name (Print): Gerhard Jansen
City, State, Zip Juneau AK 99811	Sampler Signature:

Sample Information

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CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time am	Grab/Comp	Analysis Requested
KB - Knudson	marine	8/23/18	4:50	grab	FL + Entero
KB - Beacon Hill	"	"	4:37	"	"
KB - S Pt. Higgins	"	"	4:20	"	"
KB - Shull	"	"	4:06	"	"
KB - Sunset	"	"	5:09	"	"
KB - Refuge	"	"	5:20	"	"
KB - Thomas Basin	"	"	5:43	"	"
KB - Seaport	"	"	6:01	"	"
KB - Rotary	"	"	6:52	"	"
KB - Mtn Point	"	"	6:16	"	"
KB - Herring	"	"	6:30	"	"

LAB ~~FIELD~~ NOTES: 8/23/18
FC SET: 0940 jl
ENTC SET: 1010 jl

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	8/23	8:40	8.5°C	8/23/18	0840

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

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Ketchikan BEACH

Sampler: Gerhard Jansen
Date: 8/23/2018
Time: 0406-0652
Matrix: marine
Type: grab

LAB RECEIVING
Date: 8/23/2018
Time: 0840

LAB REPORTING
Date: 8/24/2018
Time: 1645

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
25982	**KB-Knudson**	**FC**	8/23/2018	0940	**94**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**86**	**MPN / 100 ml**	10.0	D6503
25983	**KB - Beacon Hill**	**FC**	8/23/2018	0940	**6**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**10**	**MPN / 100 ml**	10.0	D6503
25984	**KB - S. Pt. Higgins**	**FC**	8/23/2018	0940	**19**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**31**	**MPN / 100 ml**	10.0	D6503
25985	**KB - Shull**	**FC**	8/23/2018	0940	**13**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**10**	**MPN / 100 ml**	10.0	D6503
25986	**KB - Sunset**	**FC**	8/23/2018	0940	**81**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**41**	**MPN / 100 ml**	10.0	D6503
25987	**KB - Refuge**	**FC**	8/23/2018	0940	**16**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**10**	**MPN / 100 ml**	10.0	D6503
25988	**KB - Thomas Basin**	**FC**	8/23/2018	0940	**59**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**496**	**MPN / 100 ml**	10.0	D6503
25989	**KB - Seaport**	**FC**	8/23/2018	0940	**<1**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**<10**	**MPN / 100 ml**	10.0	D6503
25990	**KB - Rotary**	**FC**	8/23/2018	0940	**24**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**31**	**MPN / 100 ml**	10.0	D6503
25991	**KB - Mt Point**	**FC**	8/23/2018	0940	**<1**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**<10**	**MPN / 100 ml**	10.0	D6503
25992	**KB - Herring**	**FC**	8/23/2018	0940	**246**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**156**	**MPN / 100 ml**	10.0	D6503
25993	**KB - Mt Point (duplicate)**	**FC**	8/23/2018	0940	**<1**	**cfu / 100 ml**	1.0	9222D
		entero	8/23/2018	1010	**<10**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M

1 of 2

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9495 KIC
Company Name: ADEC Div. Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Tony Gallegos KIC
City, State, Zip Juneau AK 99811	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Herring Cove	Marine	8/30/18	0859	Grab	FC SM9222D
KB-Herring Cove			0859		Entero D6503-99
KB Mt. Point			0914		FC
KB Mt. Point			0914		Entero
KB Rotary			0929		FC
KB Rotary			0929		Entero
KB Seaport			0936		FC
KB Seaport			0936		Entero
KB Thomas Basin			0959		FC
KB Thomas Basin			0959		Entero
KB-Dupl			0929		
KB-Dupl			0927		
		8/31/18			

FIELD NOTES: Mt. Point — Control
* Rotary Beach — Pool

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	~~8/30/18~~			8/30/18	1025
	8/30/18	10:25			

R&M

2 of 2

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9445 (KLCTRG)
Company Name: ADEC Div. Water Quality	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Tony Gallegos (KK)
City, State, Zip Juneau, AK 99811	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Knudsen	Marine	8/30/18	10:46	Grab	FC SM9222D
" "		8/30/18			Entero D6503-99
KB-Beacon Hill			11:05		FC
" "					Entero
KB-S. Pt. Higgins			11:25		FC
" "					Entero
KB-Shell			11:46		FC
" "					Entero
KB-Sunset			11:58		FC
" "					Entero
KB-Refuge			12:12		FC
" "					Entero

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
	8/30/18			8/30/18	1225
	8/30/18				

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Tony Gallegos
Date: 8/30/2018
Time: 0859-1212
Matrix: marine
Type: grab

LAB RECEIVING
Date: 8/30/2018
Time: 1025 & 1225

LAB REPORTING
Date: 8/31/2018
Time: 1640

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
26028	**KB - Herring Cove**	**FC**	8/30/2018	1620	**56**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**20**	**MPN / 100 ml**	10.0	D6503
26029	**KB - Mt. Point**	**FC**	8/30/2018	1620	**4**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**40**	**MPN / 100 ml**	10.0	D6503
26030	**KB - Rotary**	**FC**	8/30/2018	1620	**4**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503
26031	**KB - Seaport**	**FC**	8/30/2018	1620	**4**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503
26032	**KB - Thomas Basin**	**FC**	8/30/2018	1620	**49**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**350**	**MPN / 100 ml**	10.0	D6503
26033	**KB - Dup 1**	**FC**	8/30/2018	1620	**6**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
26034	**KB - Knudson**	**FC**	8/30/2018	1620	**3**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
26035	**KB - Beacon Hill**	**FC**	8/30/2018	1620	**2**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503
26036	**KB - S. Pt. Higgins**	**FC**	8/30/2018	1620	**3**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503
26037	**KB - Shull**	**FC**	8/30/2018	1620	**25**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503
26038	**KB - Sunset**	**FC**	8/30/2018	1620	**8**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**10**	**MPN / 100 ml**	10.0	D6503
26039	**KB - Refuge**	**FC**	8/30/2018	1620	**88**	**cfu / 100 ml**	1.0	9222D
		entero	8/30/2018	1500	**<10**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9445
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave.	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB - Knudson	marine	09/05/18	12:45	grab	FC SM9222D/Entero
KB-Knudson-dup	"	"	12:45	"	Entero D6503-99/FC
KB - Bearon Hill	"	"	13:00	"	FC/Entero
KB - S Pt Higgins	"	"	13:20	"	Entero/FC
KB - Shull	"	"	13:40	"	FC/Entero
KB - Sunset	"	"	14:00	"	FC/Entero
KB - Refuge	"	"	14:10	"	

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	09/05/18	14:20		9/5/18	1420

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention:	Phone Number:
Company Name: See	Fax Number: Page
Address:	Sampler Name (Print):
City, State, Zip	Sampler Signature:

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Thomas Basin	marine	09/05/18	14:50	grab	FC/Entero
KB-Seaport	"	"	15:00	"	"
KB-Rotary	"	"	15:15	"	"
KB-Mtn Point	"	"	15:20	"	"
KB-Herring	"	"	15:46	"	"

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Zolles	09/05/18	16:30		9/5/18	1630
				temp	= 8.5°C

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Nicole Forbes
Date: 9/5/2018
Time: 1245-1546
Matrix: marine
Type: grab

LAB RECEIVING
Date: 9/5/2018
Time: 1420 & 1630

LAB REPORTING
Date: 9/10/2018
Time: 1030

ANALYST: JML

Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
26061	**KB - Knudson**	**FC**	9/5/2018	1450	**42**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1515	**173**	**MPN / 100 ml**	10.0	D6503
26062	**KB - Knudson (duplicate)**	**FC**	9/5/2018	1450	**37**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1515	**131**	**MPN / 100 ml**	10.0	D6503
26063	**KB - Beacon Hill**	**FC**	9/5/2018	1450	**10**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1515	**<10**	**MPN / 100 ml**	10.0	D6503
26064	**KB - S. Pt. Higgins**	**FC**	9/5/2018	1450	**3**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1515	**<10**	**MPN / 100 ml**	10.0	D6503
26065	**KB - Shull**	**FC**	9/5/2018	1450	**49**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1515	**10**	**MPN / 100 ml**	10.0	D6503
26066	**KB - Sunset**	**FC**	9/5/2018	1450	**23**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1515	**10**	**MPN / 100 ml**	10.0	D6503
26067	**KB - Refuge**	**FC**	9/5/2018	1450	**55**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1515	**<10**	**MPN / 100 ml**	10.0	D6503
26068	**KB - Thomas Basin**	**FC**	9/5/2018	1710	**72**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1745	**528**	**MPN / 100 ml**	10.0	D6503
26069	**KB - Seaport**	**FC**	9/5/2018	1710	**5**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1745	**10**	**MPN / 100 ml**	10.0	D6503
26070	**KB - Rotary**	**FC**	9/5/2018	1710	**3**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1745	**<10**	**MPN / 100 ml**	10.0	D6503
26071	**KB - Mt. Point**	**FC**	9/5/2018	1710	**118**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1745	**414**	**MPN / 100 ml**	10.0	D6503
26072	**KB - Herring Cove**	**FC**	9/5/2018	1710	**318**	**cfu / 100 ml**	1.0	9222D
		entero	9/5/2018	1745	**457**	**MPN / 100 ml**	10.0	D6503

samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

R&M ENGINEERING-KETCHIKAN, INC.
7180 Revilla Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Gretchen Pikul	Phone Number: 907-228-9312
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Ave	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

PLEASE DO NOT WRITE ON BOD BOTTLES/LIDS, USE PROVIDED REMOVABLE BLUE TAPE LABELS
CLEAR MICRO BOTTLES MAY BE WRITTEN DIRECTLY ON

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB- Herring	marine	09/12/18	7:17	grab	FC / entero
KB - Mtn Point			7:30		
KB - Rotary			7:55		
KB - Seaport			8:00		
KB - Thomas Basin			8:15		
KB - Refuge			8:50		
KB - Sunset			9:00		
KB - Shull			9:15		
KB - S Pt Higgins			9:40		
KB - Beacon Hill			10:00		
KB - Knudson			10:20		
KB - Mtn Point - dup			7:50		

FIELD NOTES:

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	09/12/18	10:50	Joanna	9/12/18	1050

R&M ENGINEERING-KETCHIKAN, INC.
ENGINEERS GEOLOGISTS SURVEYORS

7180 REVILLA ROAD, SUITE 300, KETCHIKAN, ALASKA 99901
PHONE: 907-225-7917 FAX: 907-225-3441 www.rmketchikan.com

ADEC Division of Water
Attn: Gretchen Pikul
410 Willoughby Ave
Jumeau, AK 99811

Ketchikan BEACH

Sampler: Nicole Forbes
Date: 9/12/2018
Time: 0717-1020
Matrix: marine
Type: grab

LAB RECEIVING
Date: 9/12/2018
Time: 1050

LAB REPORTING
Date: 9/14/2018
Time: 1540

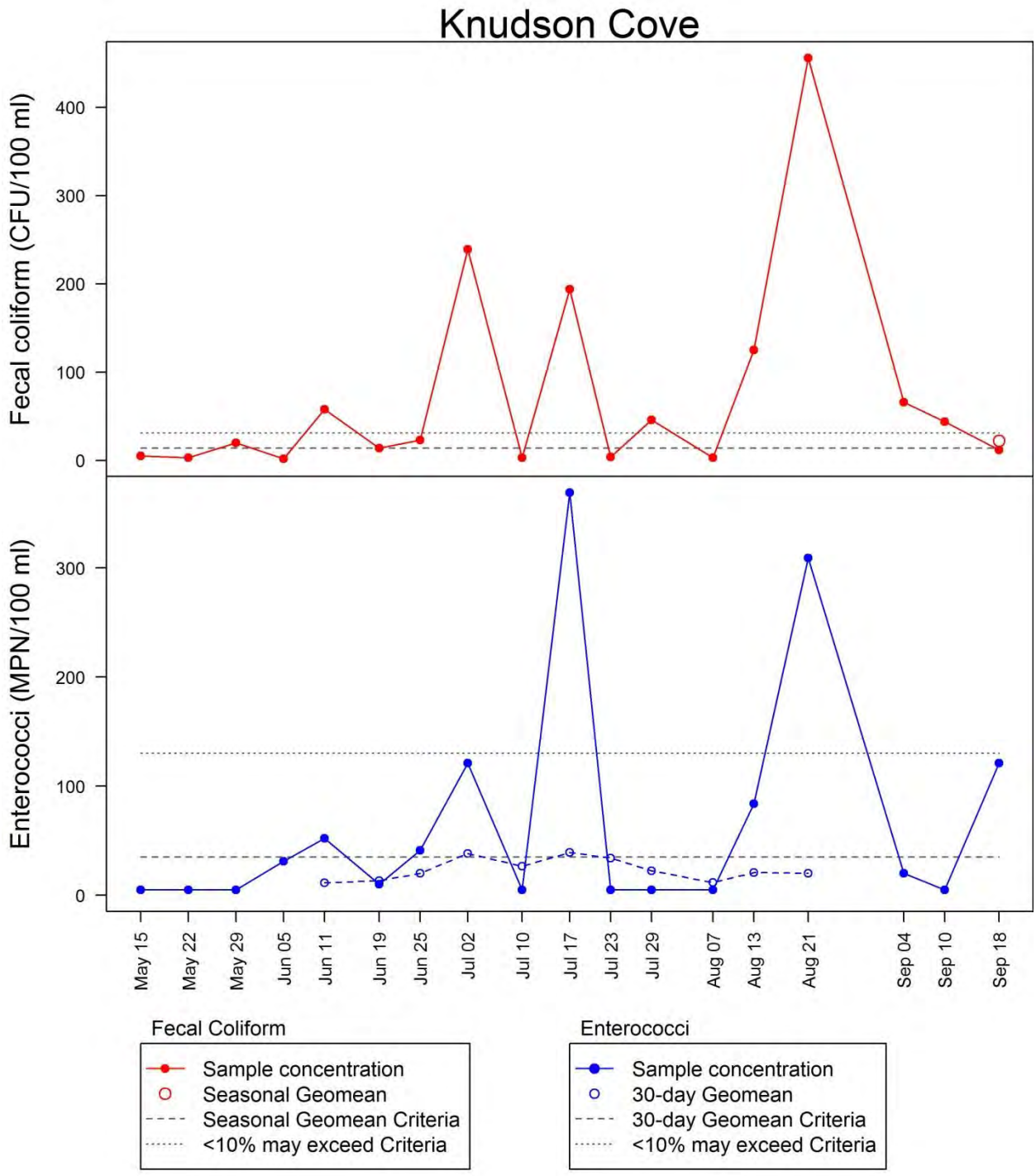
ANALYST: JML

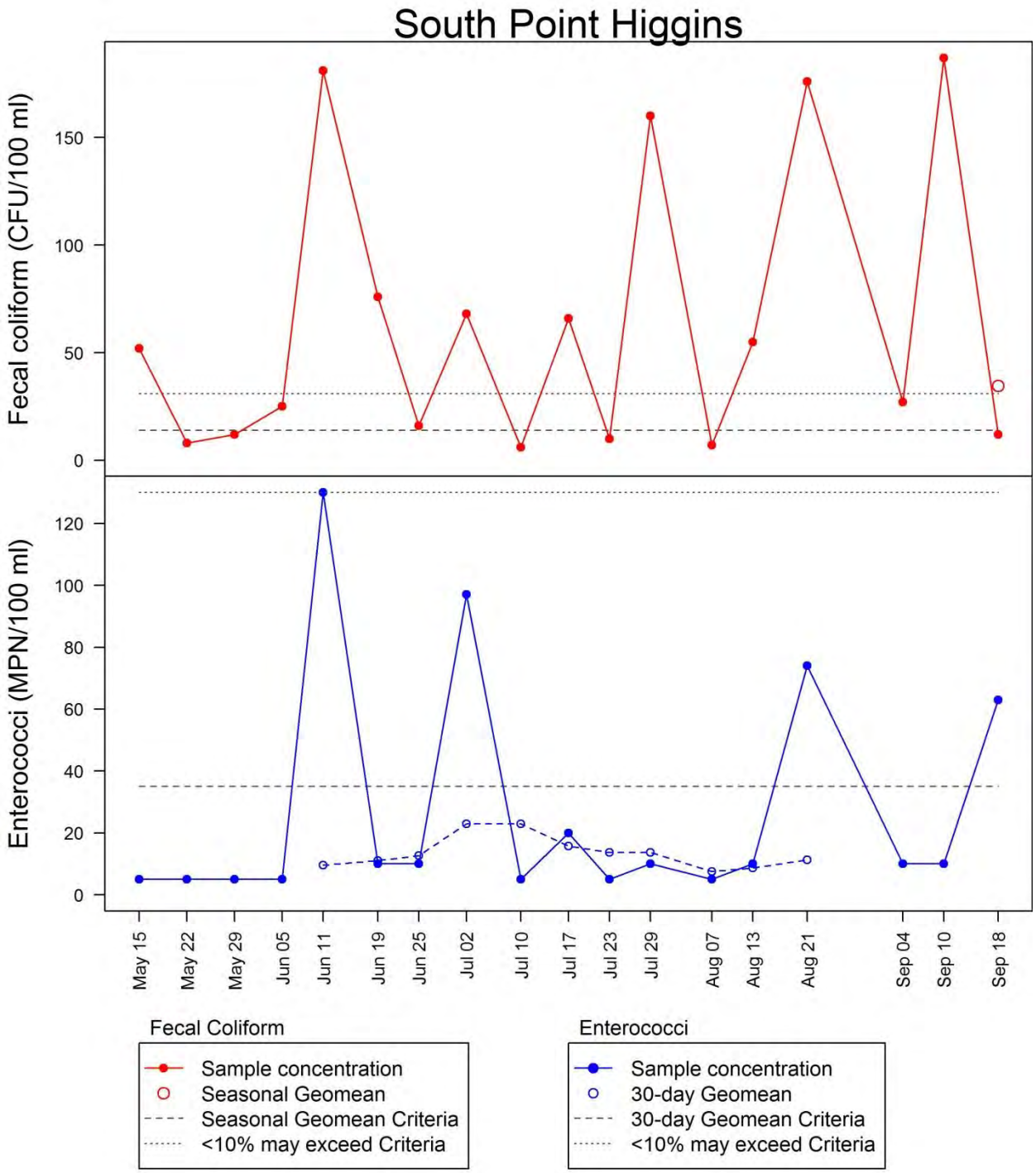
Lab #	Sample Name	Analysis	Date Tested	Time Tested	Results	Units	MRL	Method
26129	**KB - Herring Cove**	**FC**	9/12/2018	1515	**213**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**414**	**MPN / 100 ml**	10.0	D6503
26130	**KB - Mt. Point**	**FC**	9/12/2018	1515	**98**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**183**	**MPN / 100 ml**	10.0	D6503
26131	**KB - Rotary**	**FC**	9/12/2018	1515	**25**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**309**	**MPN / 100 ml**	10.0	D6503
26132	**KB - Seaport**	**FC**	9/12/2018	1515	**63**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**<10**	**MPN / 100 ml**	10.0	D6503
26133	**KB - Thomas Basin**	**FC**	9/12/2018	1515	**26**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**130**	**MPN / 100 ml**	10.0	D6503
26134	**KB - Refuge**	**FC**	9/12/2018	1515	**25**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**41**	**MPN / 100 ml**	10.0	D6503
26135	**KB - Sunset**	**FC**	9/12/2018	1515	**50**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**<10**	**MPN / 100 ml**	10.0	D6503
26136	**KB - Shull**	**FC**	9/12/2018	1515	**33**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**20**	**MPN / 100 ml**	10.0	D6503
26137	**KB - S. Pt. Higgins**	**FC**	9/12/2018	1515	**28**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**279**	**MPN / 100 ml**	10.0	D6503
26138	**KB - Beacon Hill**	**FC**	9/12/2018	1515	**26**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**10**	**MPN / 100 ml**	10.0	D6503
26139	**KB - Knudson**	**FC**	9/12/2018	1515	**3**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**<10**	**MPN / 100 ml**	10.0	D6503
26140	**KB - Mt Point (duplicate)**	**FC**	9/12/2018	1515	**90**	**cfu / 100 ml**	1.0	9222D
		entero	9/12/2018	1400	**181**	**MPN / 100 ml**	10.0	D6503

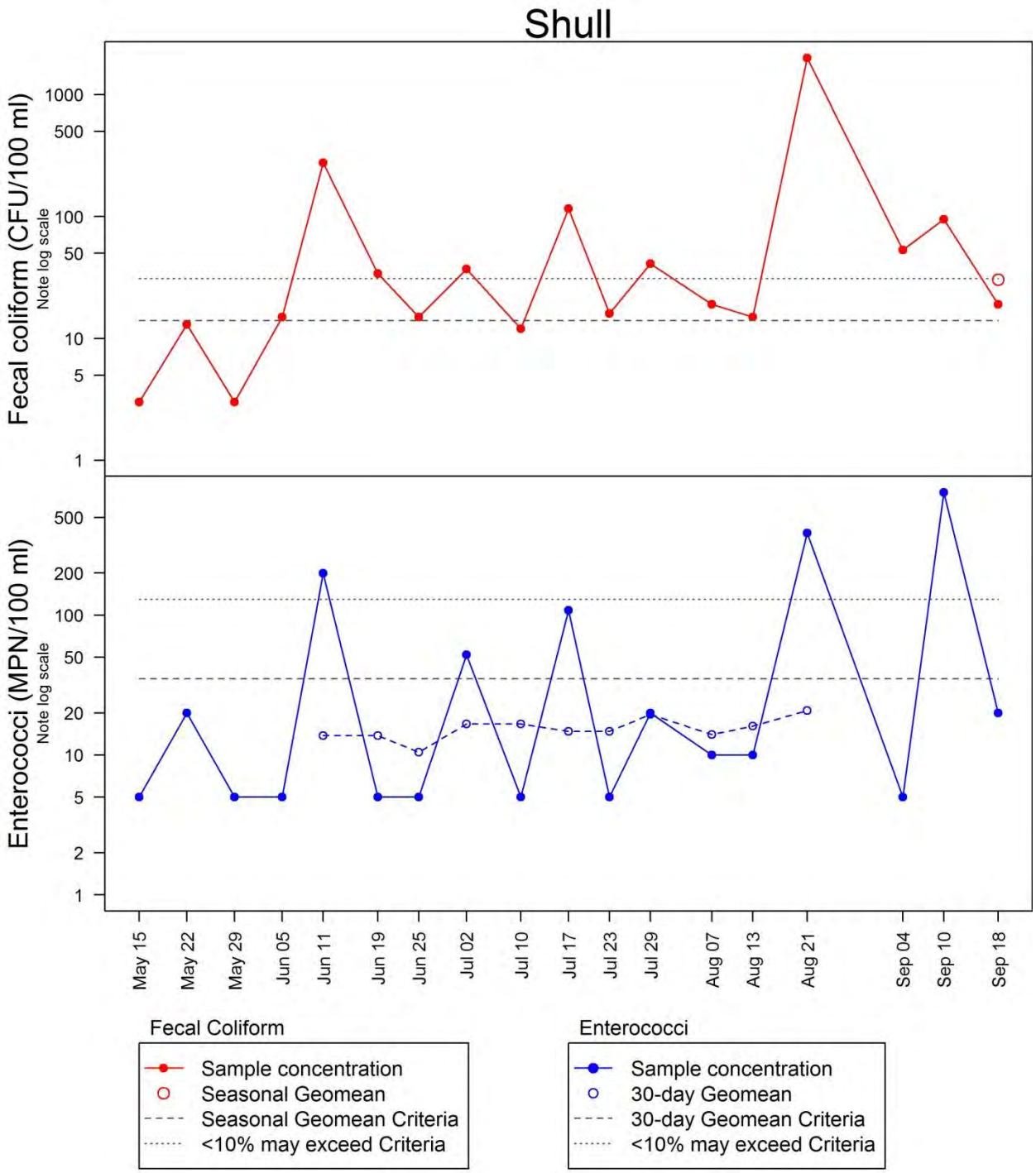
samples for enterococci analysis were diluted 1:10 to eliminate the potential interference of Bacillus

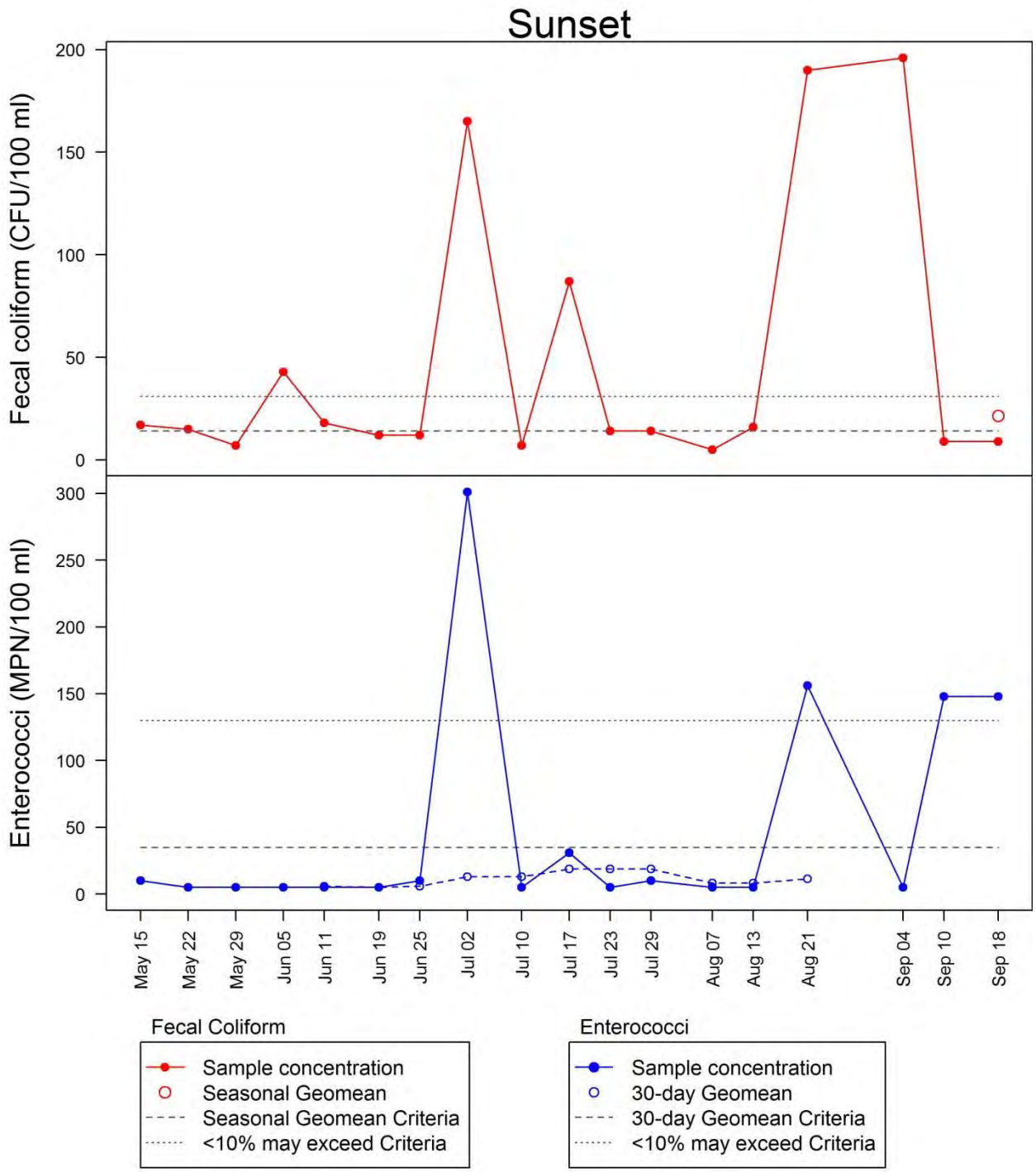
Appendix D. Bacteria Data in Graphical Form

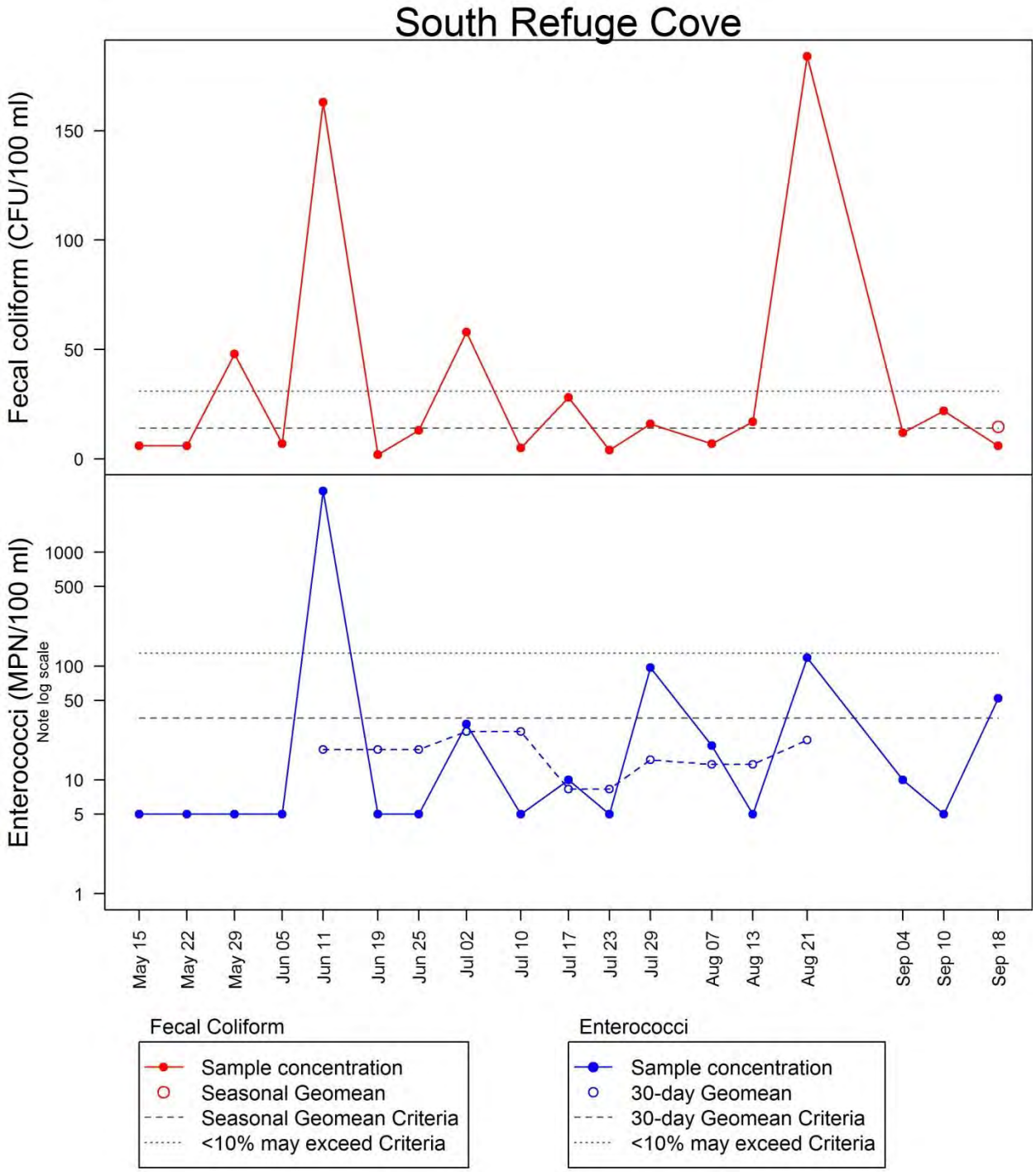
2019

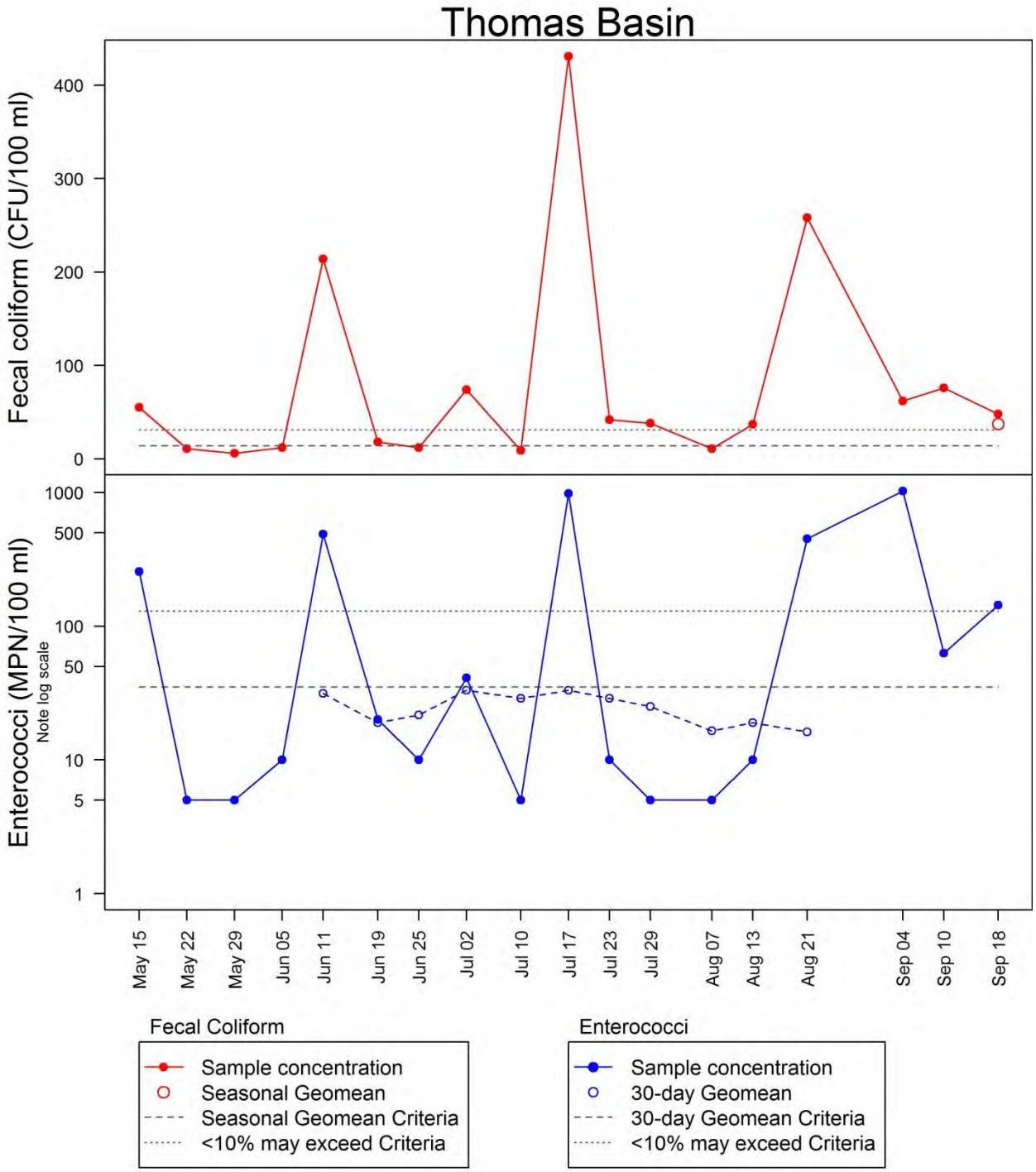


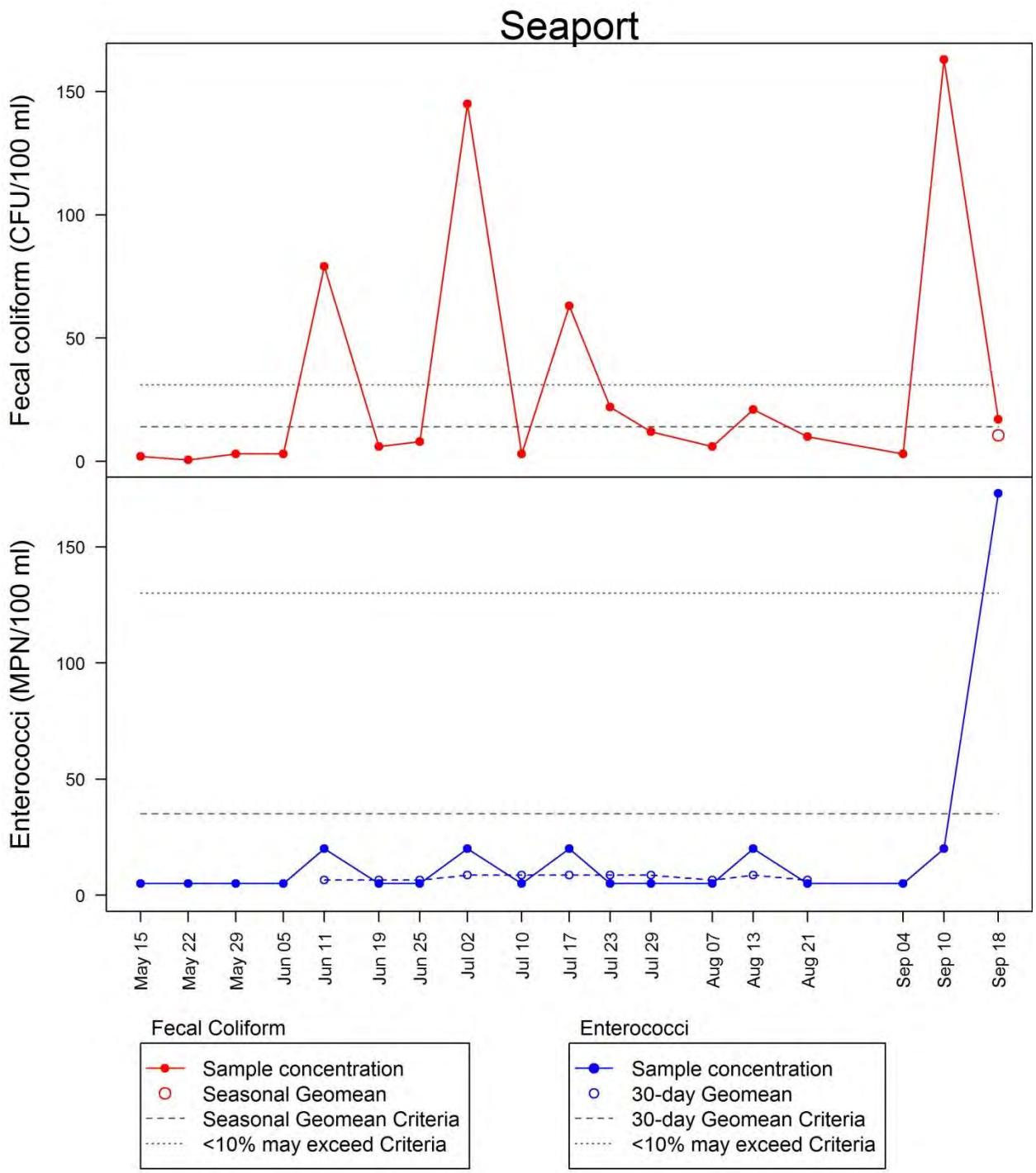

South Point Higgins
Fecal coliform (CFU/100 ml)
0
50
100
150
Enterococci (MPN/100 ml)
0
20
40
60
80
100
120
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria

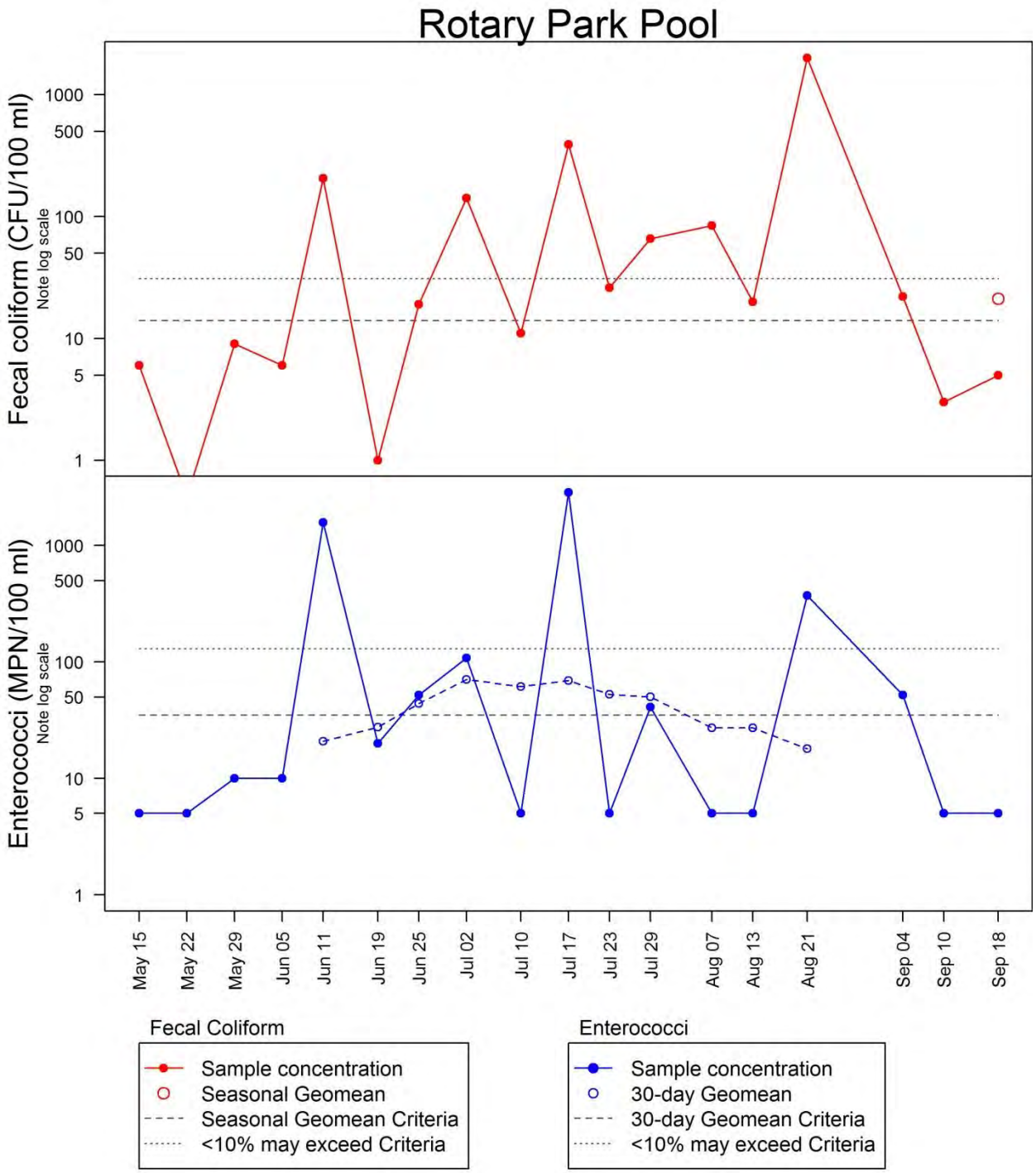

Shull
Fecal coliform (CFU/100 ml)
Note log scale
1000
500
100
50
10
5
1
Enterococci (MPN/100 ml)
Note log scale
500
200
100
50
20
10
5
2
1
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria

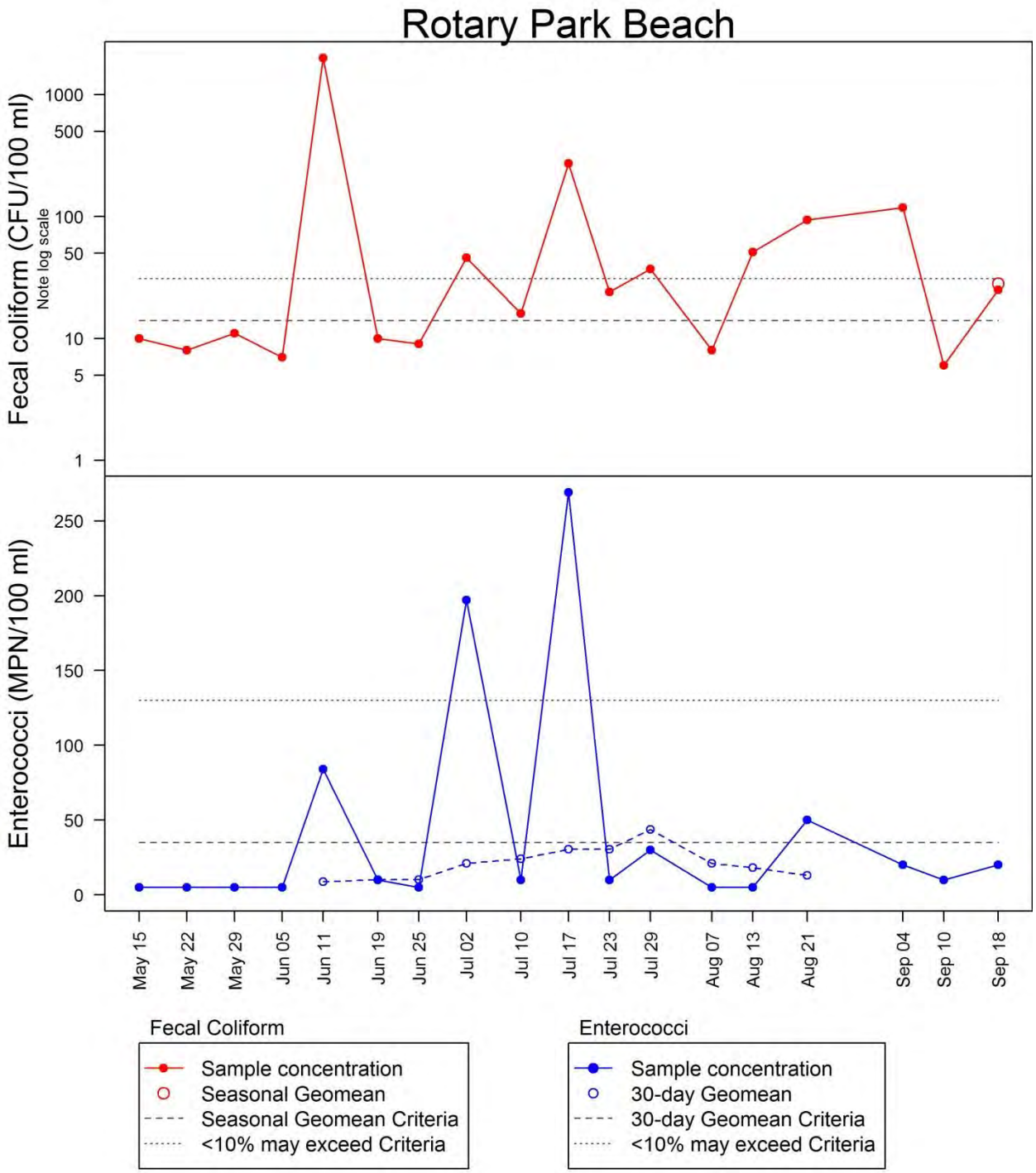

Sunset
Fecal coliform (CFU/100 ml)
200
150
100
50
0
Enterococci (MPN/100 ml)
300
250
200
150
100
50
0
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria

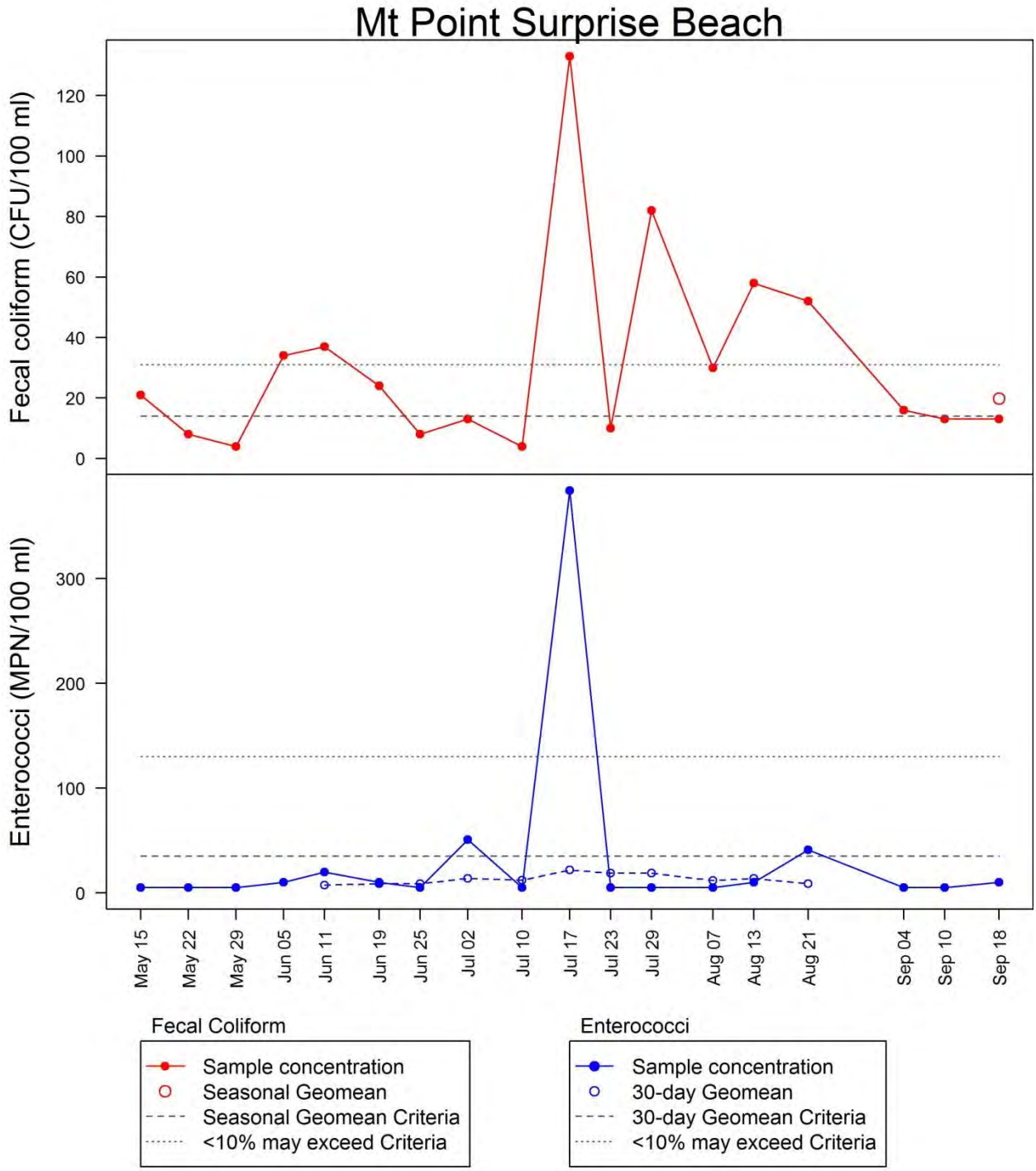

South Refuge Cove
Fecal coliform (CFU/100 ml)
150
100
50
0
Enterococci (MPN/100 ml)
Note log scale
1000
500
100
50
10
5
1
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria

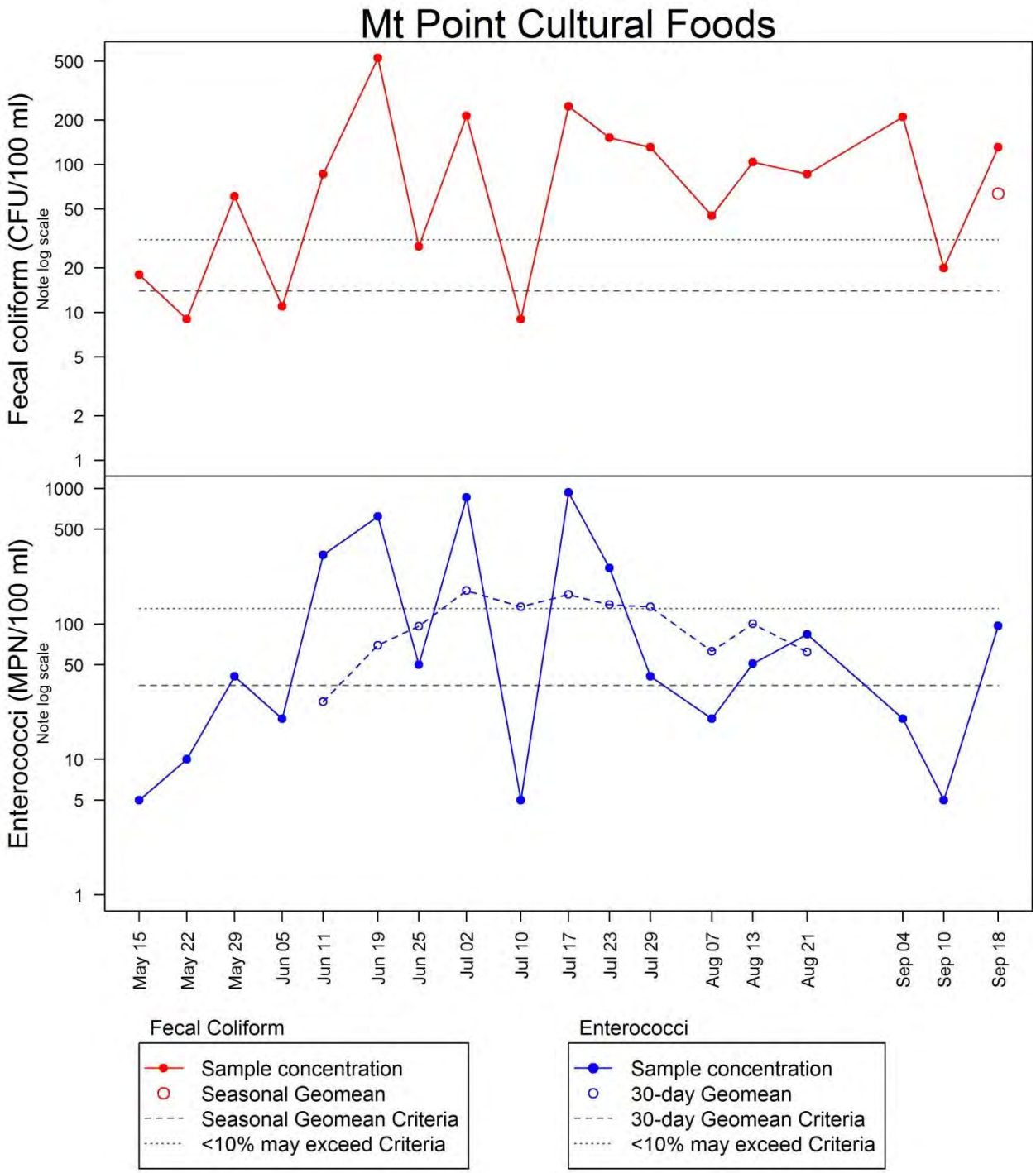

Thomas Basin
Fecal coliform (CFU/100 ml)
400
300
200
100
0
Enterococci (MPN/100 ml)
Note log scale
1000
500
100
50
10
5
1
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria

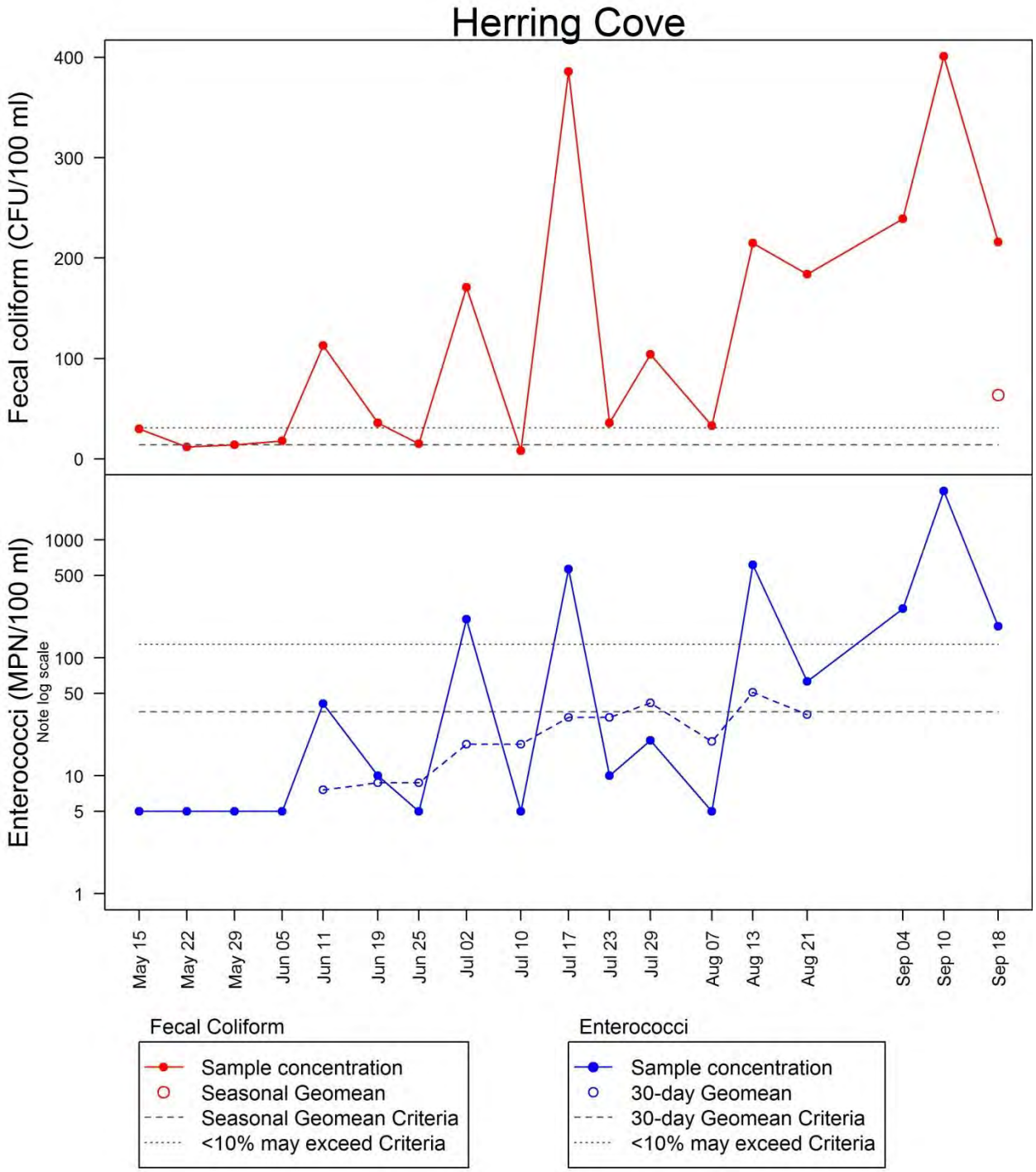

Seaport
Fecal coliform (CFU/100 ml)
150
100
50
0
Enterococci (MPN/100 ml)
150
100
50
0
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria


Rotary Park Pool
Fecal coliform (CFU/100 ml)
Note log scale
1000
500
100
50
10
5
1
Enterococci (MPN/100 ml)
Note log scale
1000
500
100
50
10
5
1
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria


Rotary Park Beach
Fecal coliform (CFU/100 ml)
Note log scale
1000
500
100
50
10
5
1
Enterococci (MPN/100 ml)
250
200
150
100
50
0
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria


Mt Point Surprise Beach
Fecal coliform (CFU/100 ml)
0
20
40
60
80
100
120
Enterococci (MPN/100 ml)
0
100
200
300
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria


Mt Point Cultural Foods
Fecal coliform (CFU/100 ml)
Note log scale
500
200
100
50
20
10
5
2
1
Enterococci (MPN/100 ml)
Note log scale
1000
500
100
50
10
5
1
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria


Herring Cove
Fecal coliform (CFU/100 ml)
400
300
200
100
0
Enterococci (MPN/100 ml)
Note log scale
1000
500
100
50
10
5
1
May 15
May 22
May 29
Jun 05
Jun 11
Jun 19
Jun 25
Jul 02
Jul 10
Jul 17
Jul 23
Jul 29
Aug 07
Aug 13
Aug 21
Sep 04
Sep 10
Sep 18
Fecal Coliform
Sample concentration
Seasonal Geomean
Seasonal Geomean Criteria
<10% may exceed Criteria
Enterococci
Sample concentration
30-day Geomean
30-day Geomean Criteria
<10% may exceed Criteria

2018

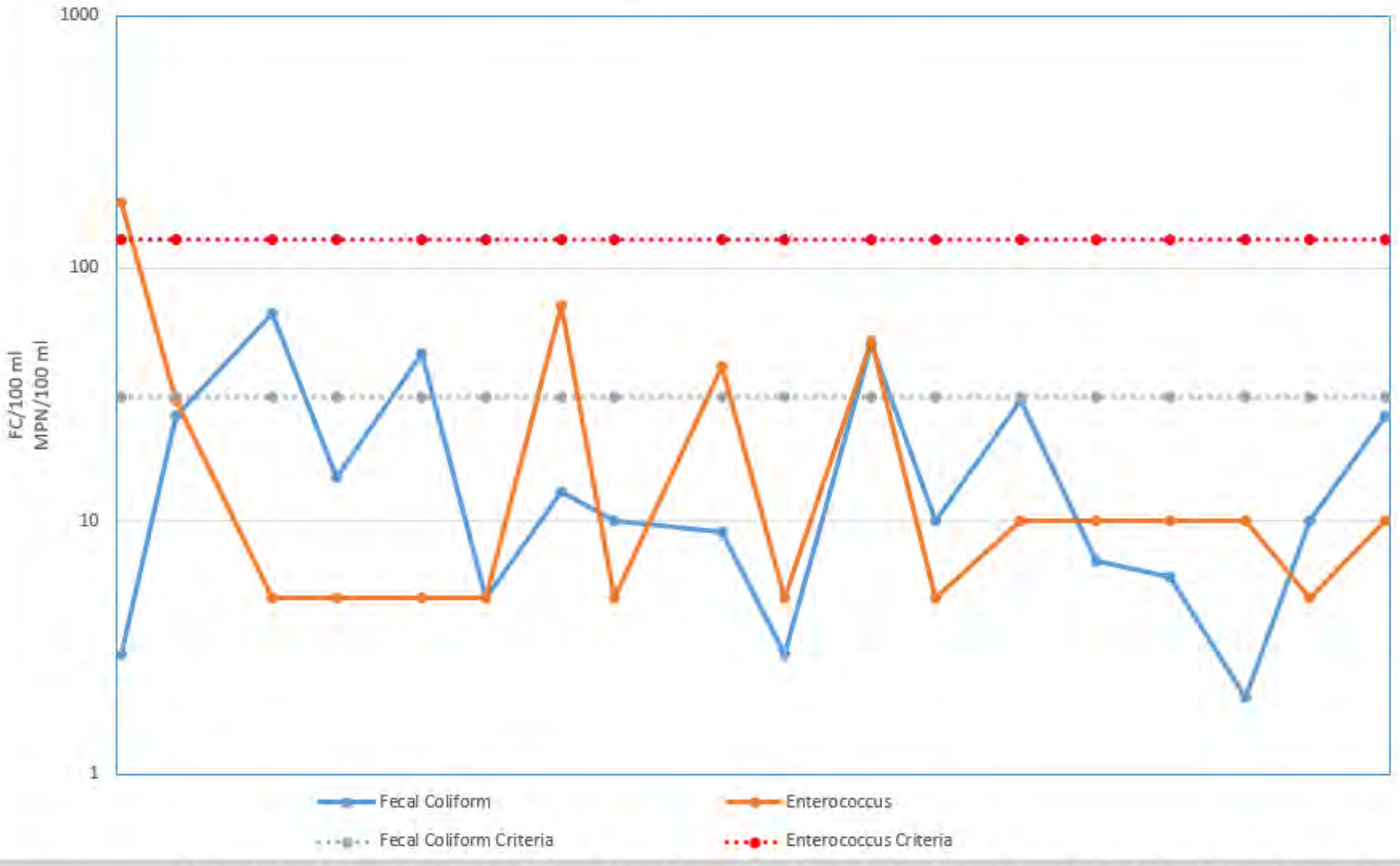
2018 Bacteria Monitoring Results
Knudson Cove
logarithmic scale

	5/17	5/22	5/31	6/6	6/14	6/20	6/27	7/2	7/12	7/18	7/26	8/1	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	28	144	26	15	11	6	17	9	18	2	32	6	8	3	94	3	42	3
Enterococcus	2603	341	20	5	5	5	5	74	20	20	20	20	10	10	86	5	173	5

2018 Geomean Bacteria Monitoring Results
Knudson Cove

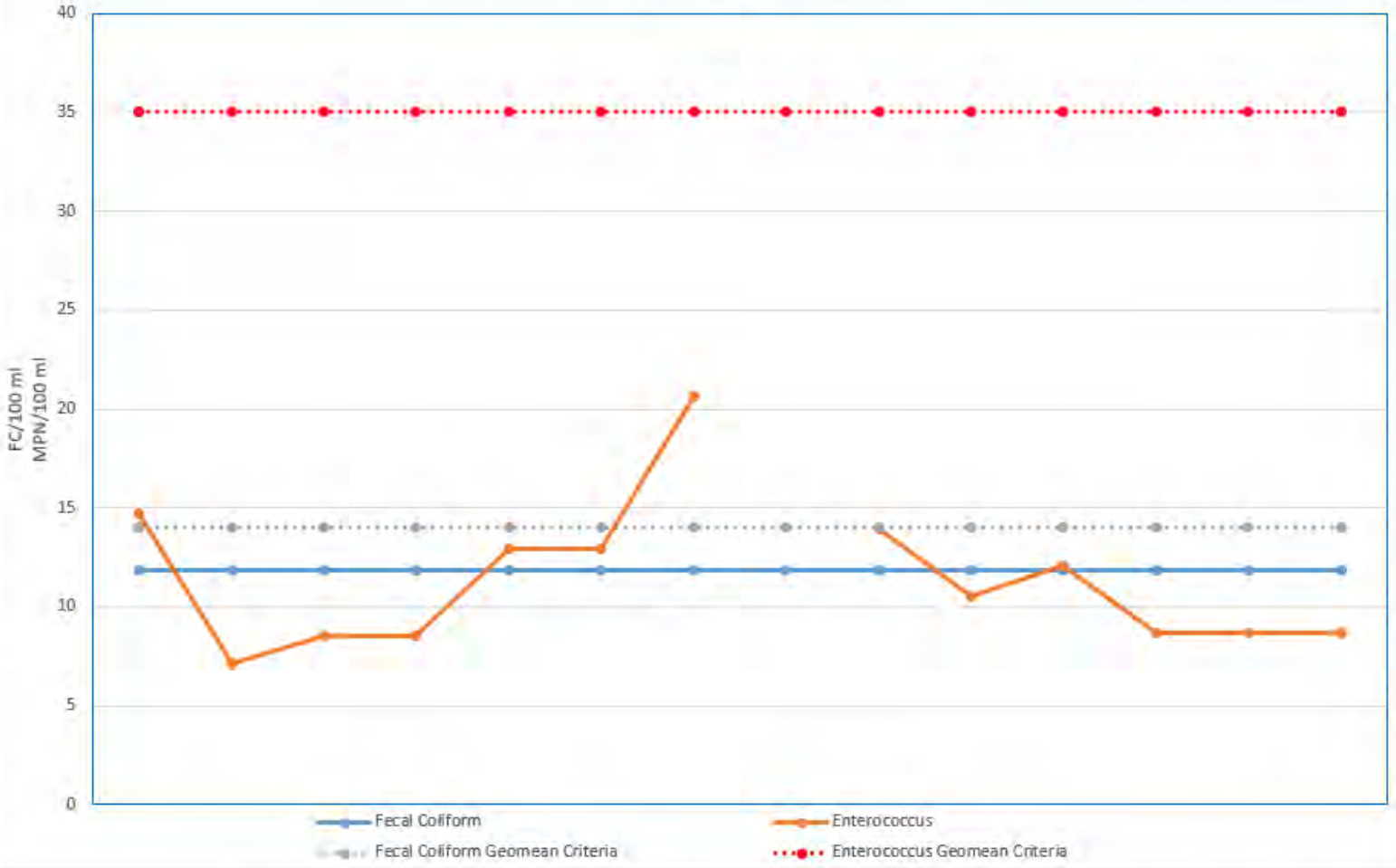
	5/17 - 6/15	5/22 - 6/20	5/31 - 6/29	6/6 - 7/5	6/14 - 7/13	6/20 - 7/19	6/27 - 7/26	7/2 - 7/31	7/12 - 8/10	7/18 - 8/16	7/26 - 8/24	8/1 - 8/30	8/9 - 9/7	8/16 - 9/14
Fecal Coliform	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Enterococcus	54	15	7	9	11	15	20		17	15	20	15	24	21

2018 Bacteria Monitoring Results
Beacon Hill
logarithmic



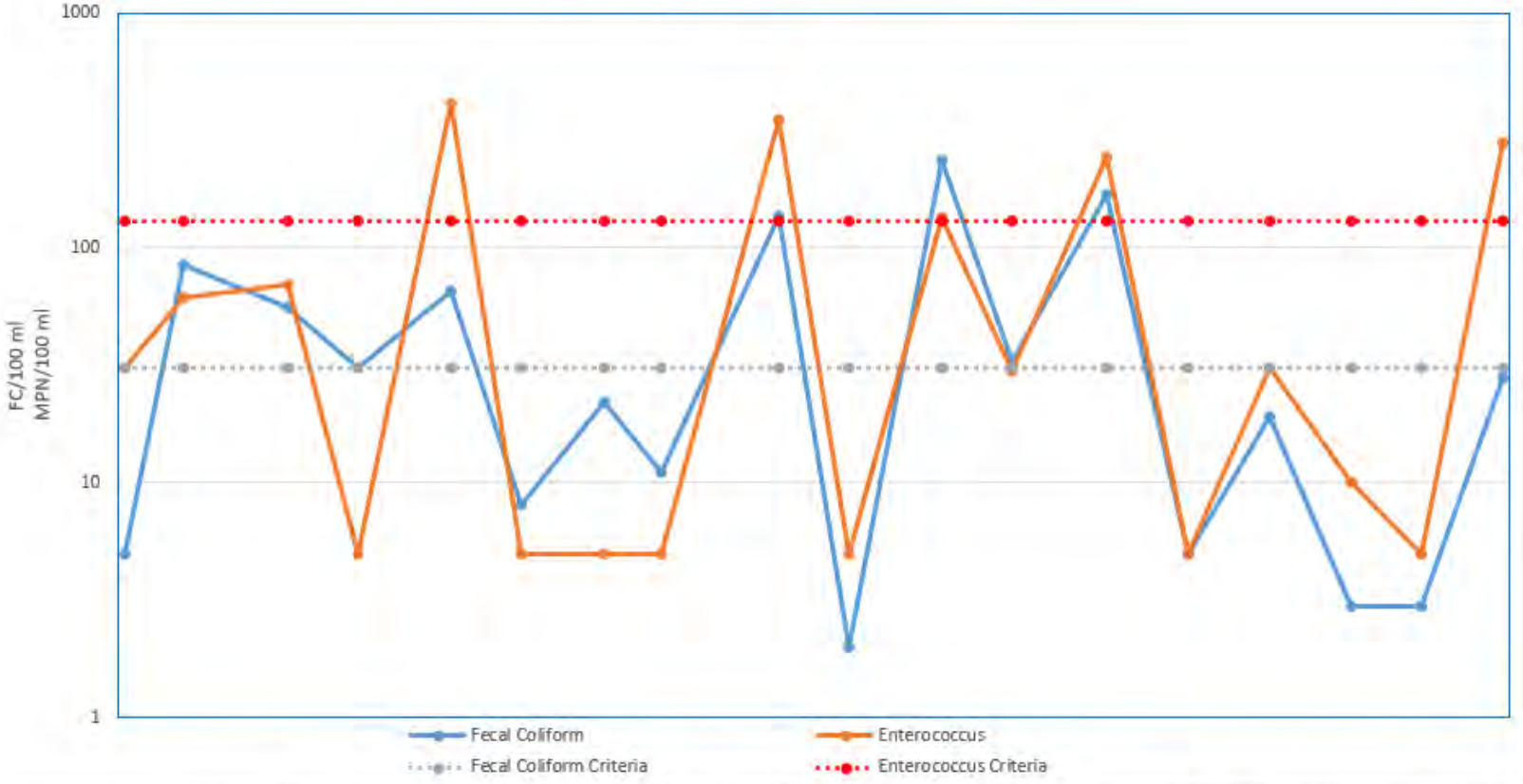
	5/17	5/22	5/31	6/6	6/14	6/20	6/27	7/2	7/12	7/18	7/26	8/1	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	3	26	66	15	46	5	13	10	9	3	50	10	30	7	6	2	10	26
Enterococcus	183	30	5	5	5	5	71	5	41	5	52	5	10	10	10	10	5	10

2018 Geomean Bacteria Monitoring Results
Beacon Hill



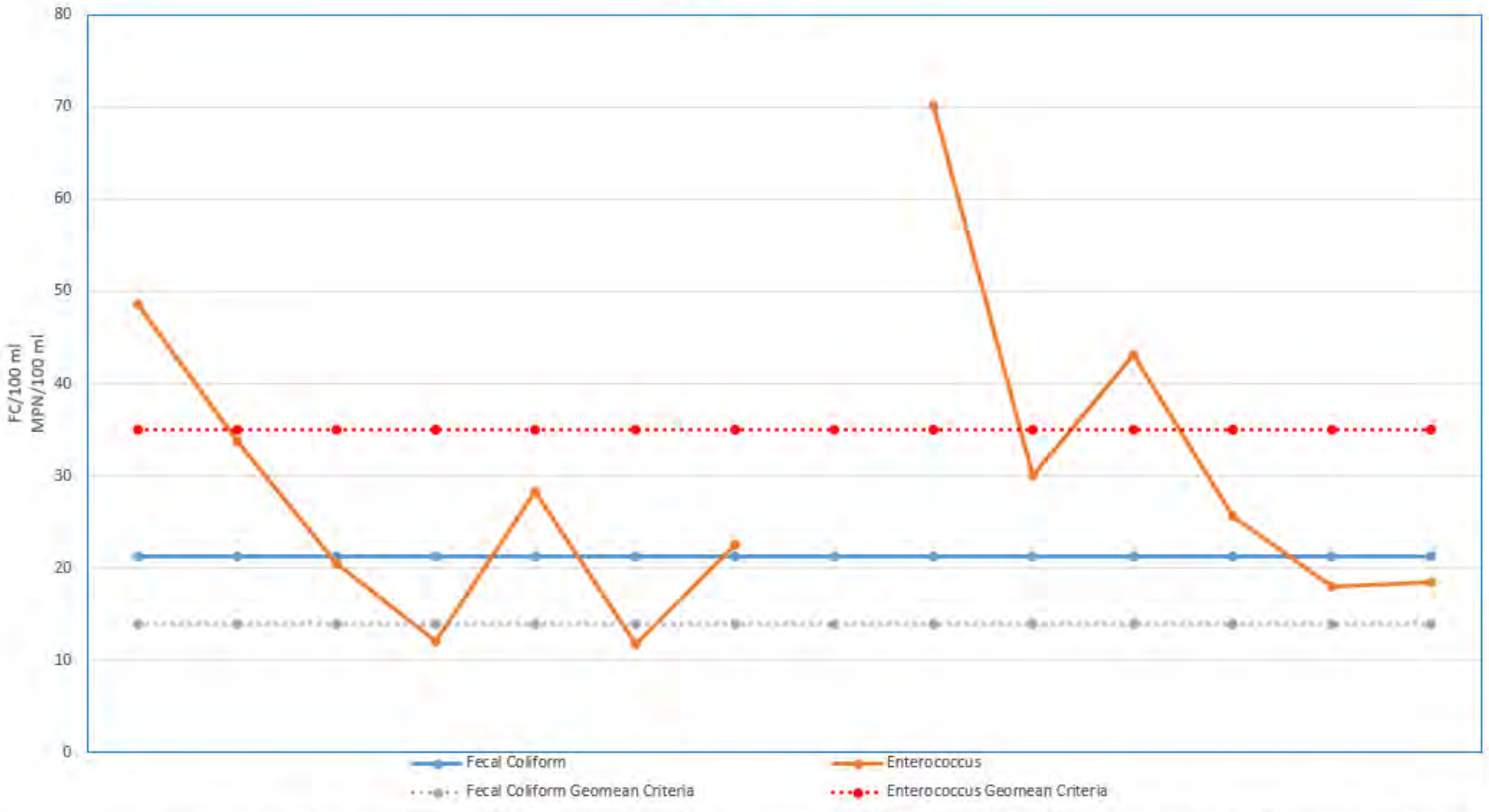
	5/17-6/15	5/22-6/20	5/31-6/29	6/6-7/5	6/14-7/13	6/20-7/19	6/27-7/26	7/2-7/31	7/12-8/10	7/18-8/16	7/26-8/24	8/1-8/30	8/9-9/7	8/16-9/14
Fecal Coliform	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Enterococcus	15	7	9	9	13	13	21		14	11	12	9	9	9

2018 Bacteria Monitoring Results
SP Higgins
logarithmic



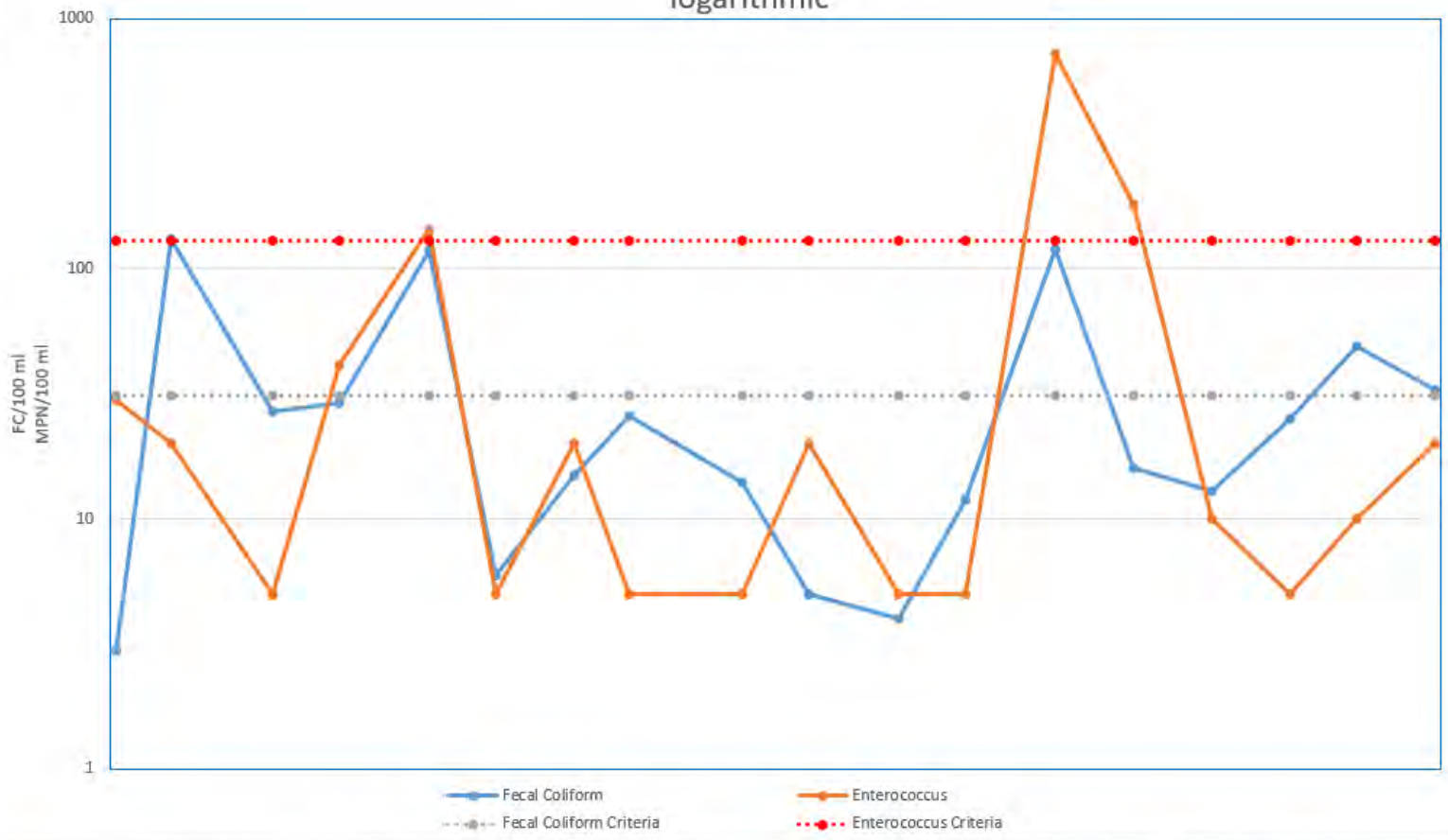
	5/17	5/22	5/31	6/6	6/14	6/20	6/27	7/2	7/12	7/18	7/26	8/1	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	5	84	56	31	65	8	22	11	136	2	236	33	168	5	19	3	3	28
Enterococcus	31	61	70	5	410	5	5	5	350	5	134	30	241	5	31	10	5	279

2018 Geomean Bacteria Monitoring Results
SP Higgins



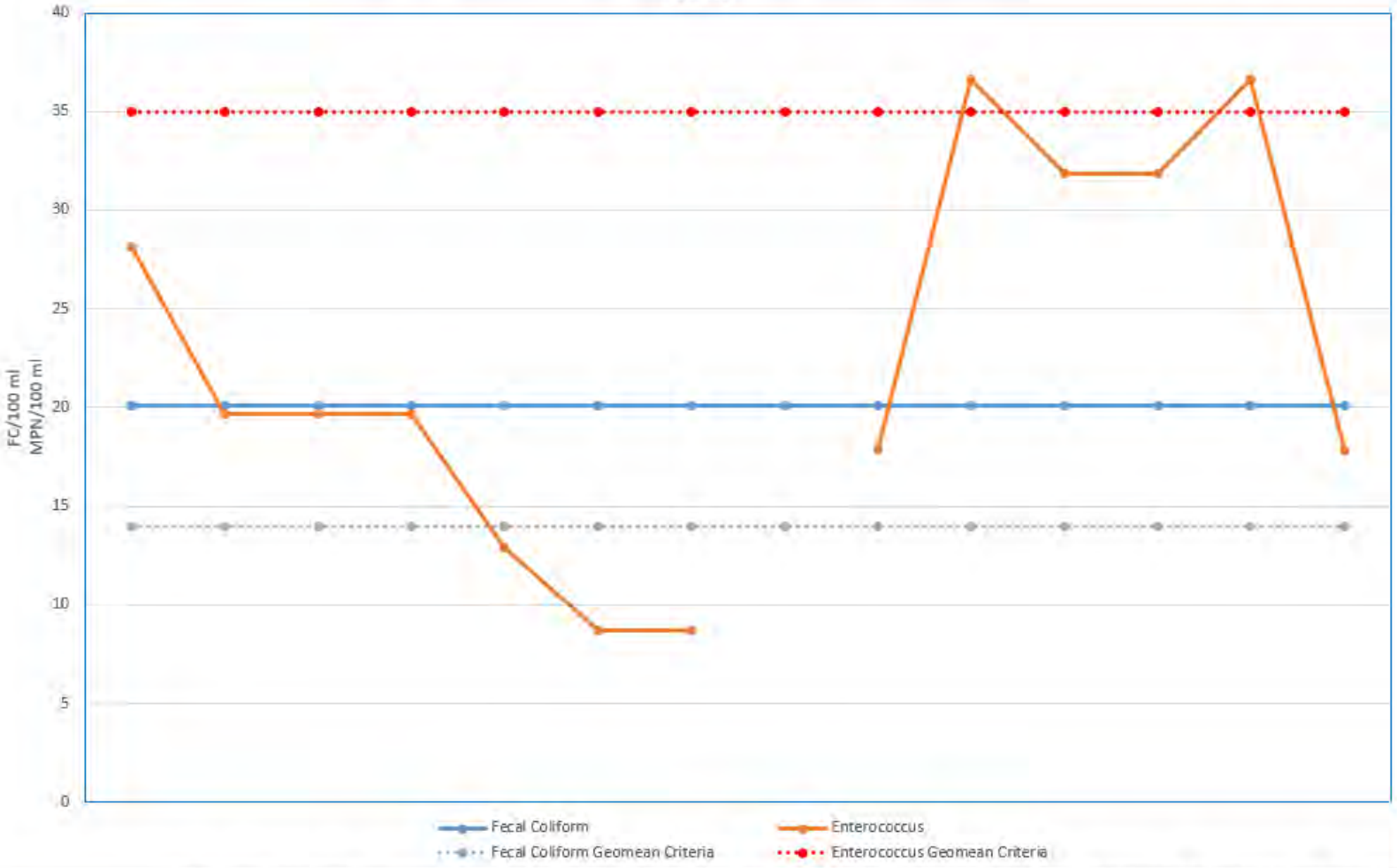
	5/17-6/15	5/22-6/20	5/31-6/29	6/6-7/5	6/14-7/13	6/20-7/19	6/27-7/26	7/2-7/31	7/12-8/10	7/18-8/16	7/26-8/24	8/1-8/30	8/9-9/7	8/16-9/14
Fecal Coliform	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Enterococcus	49	34	20	12	28	12	23		70	30	43	26	18	18

2018 Bacteria Monitoring Results
Shull
logarithmic



	5/17	5/22	5/31	6/6	6/14	6/20	6/27	7/2	7/12	7/18	7/26	8/1	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	3	132	27	29	118	6	15	26	14	5	4	12	119	16	13	25	49	33
Enterococcus	30	20	5	41	144	5	20	5	5	20	5	5	727	181	10	5	10	20

2018 Geomean Bacteria Monitoring Results
Shull

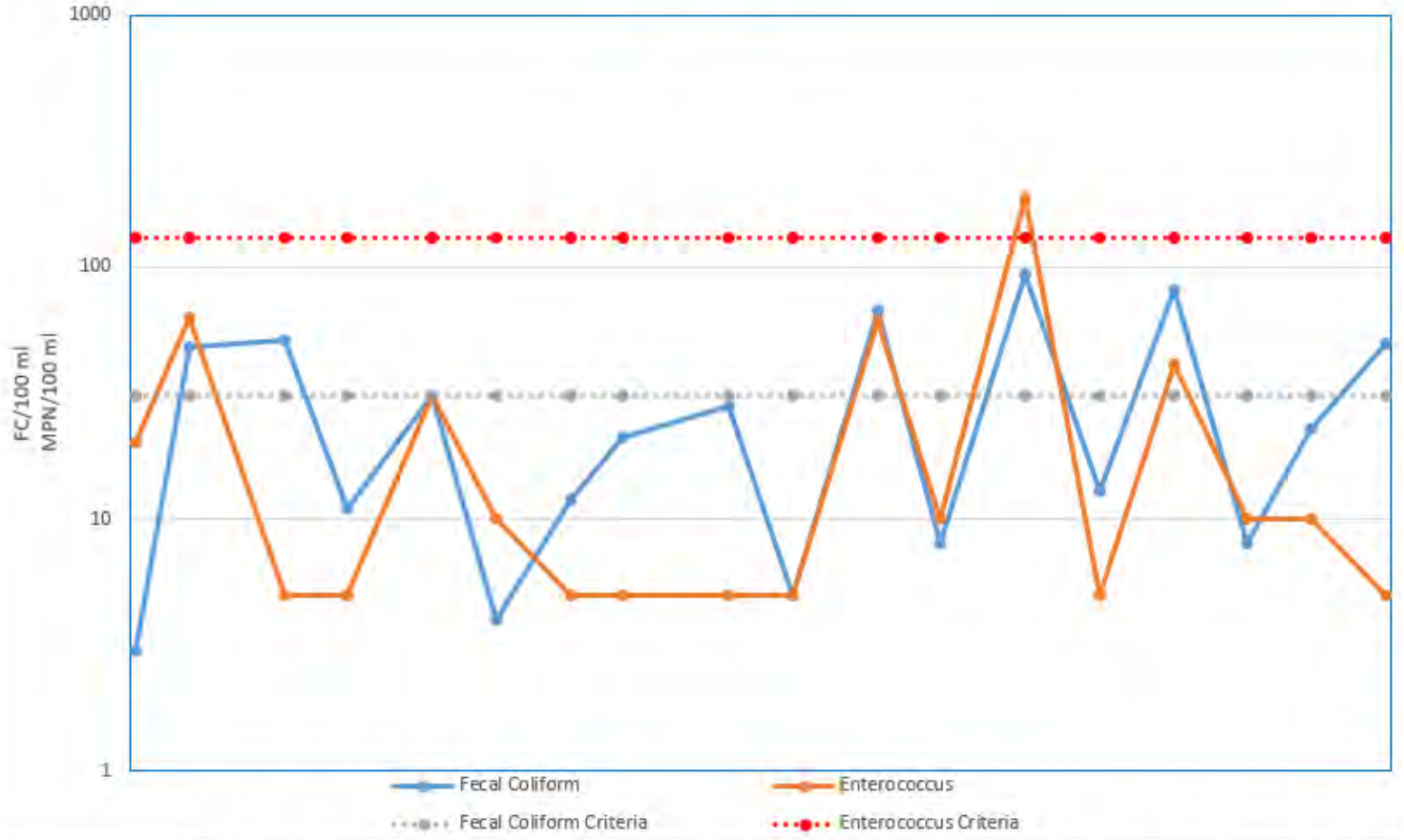


	5/17-6/15	5/22-6/20	5/31-6/29	6/6-7/5	6/14-7/13	6/20-7/19	6/27-7/26	7/2-7/31	7/12-8/10	7/18-8/16	7/26-8/24	8/1-8/30	8/9-9/7	8/16-9/14
Fecal Coliform	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Enterococcus	28	20	20	20	13	9	9		18	37	32	32	37	18

2018 Bacteria Monitoring Results

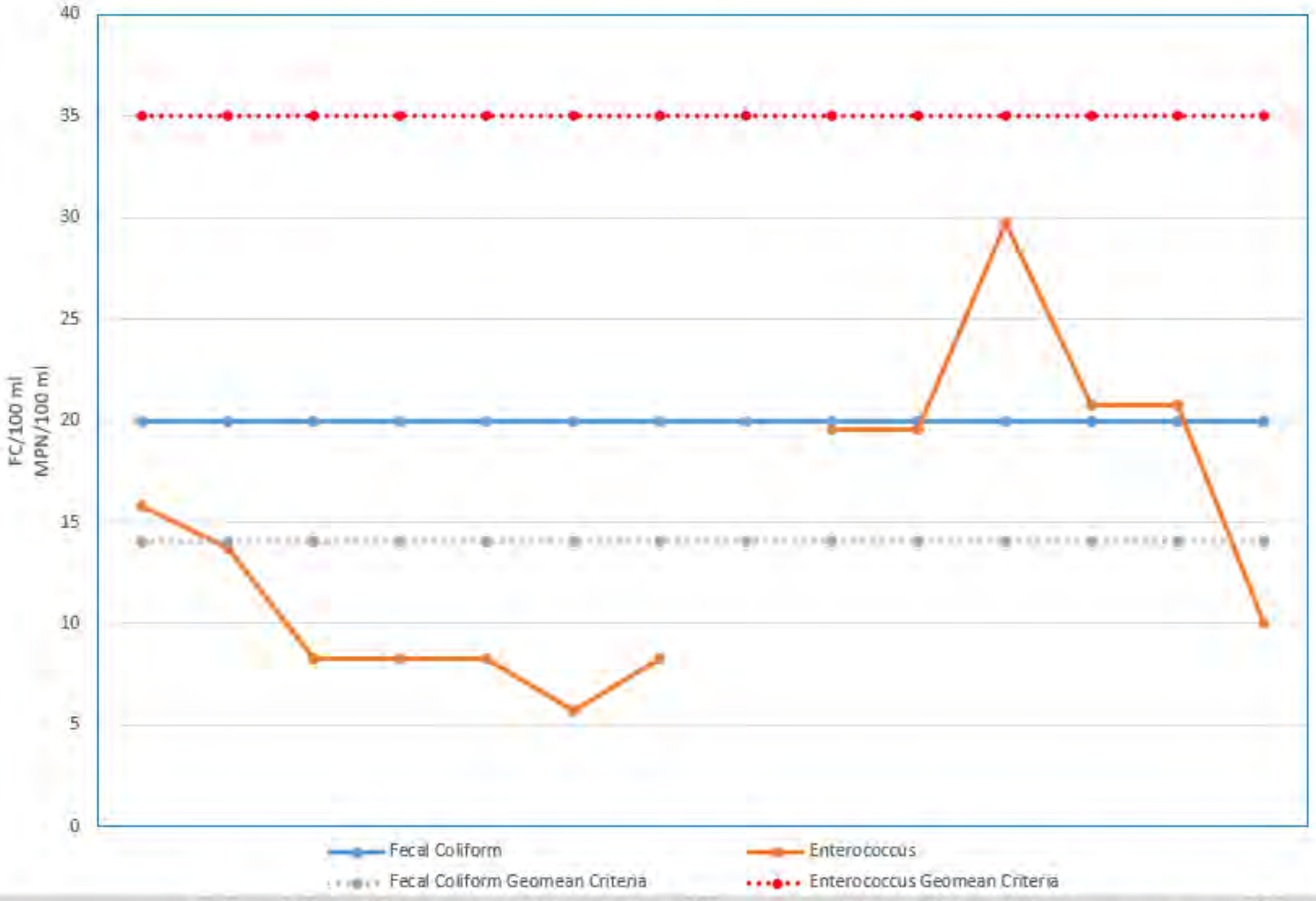
Sunset

logarithmic



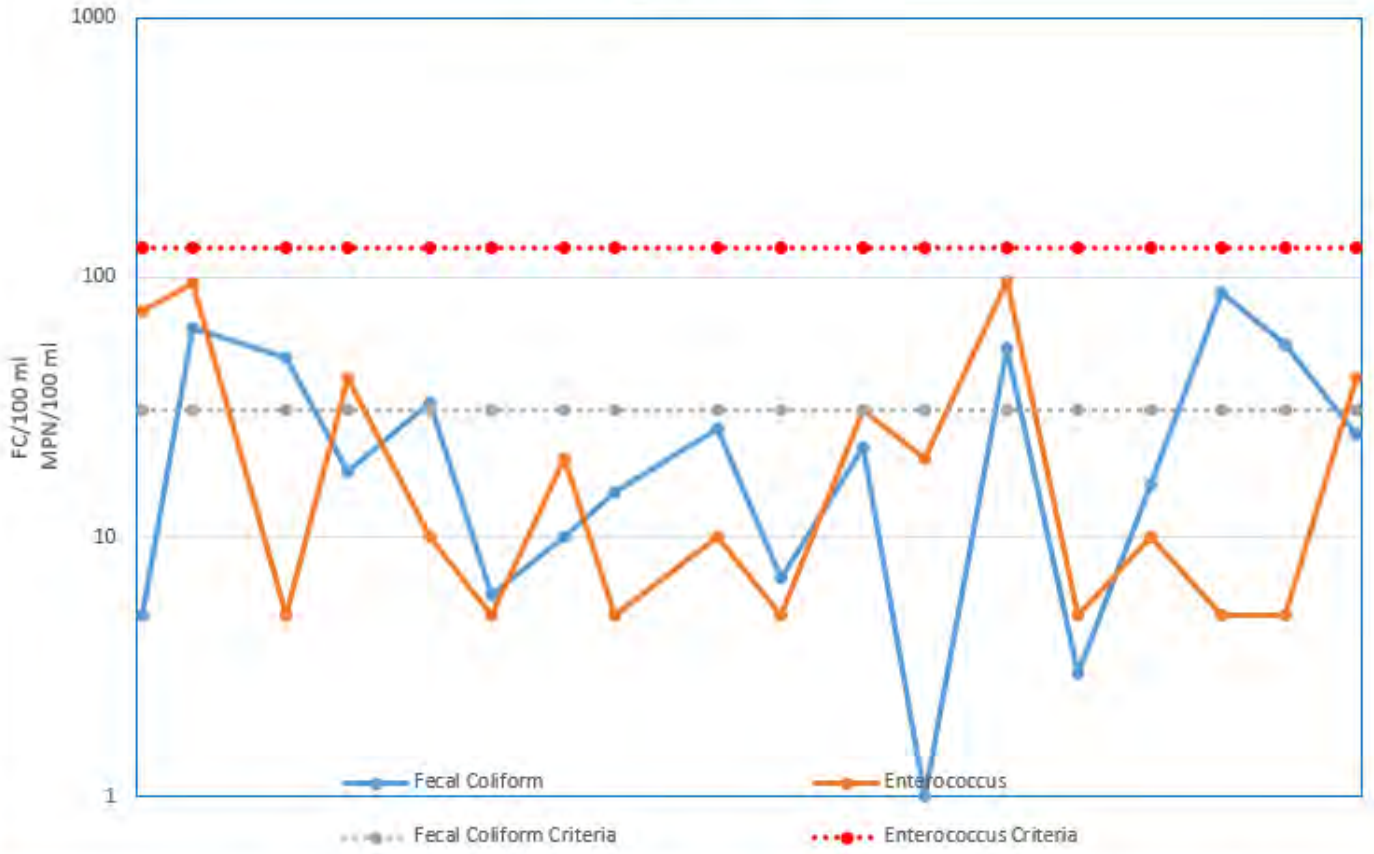
	5/17	5/22	5/31	6/6	6/14	6/20	6/27	7/2	7/12	7/18	7/26	8/1	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	3	48	51	11	31	4	12	21	28	5	67	8	93	13	81	8	23	50
Enterococcus	20	63	5	5	31	10	5	5	5	5	61	10	187	5	41	10	10	5

2018 Geomean Bacteria Monitoring Results
Sunset



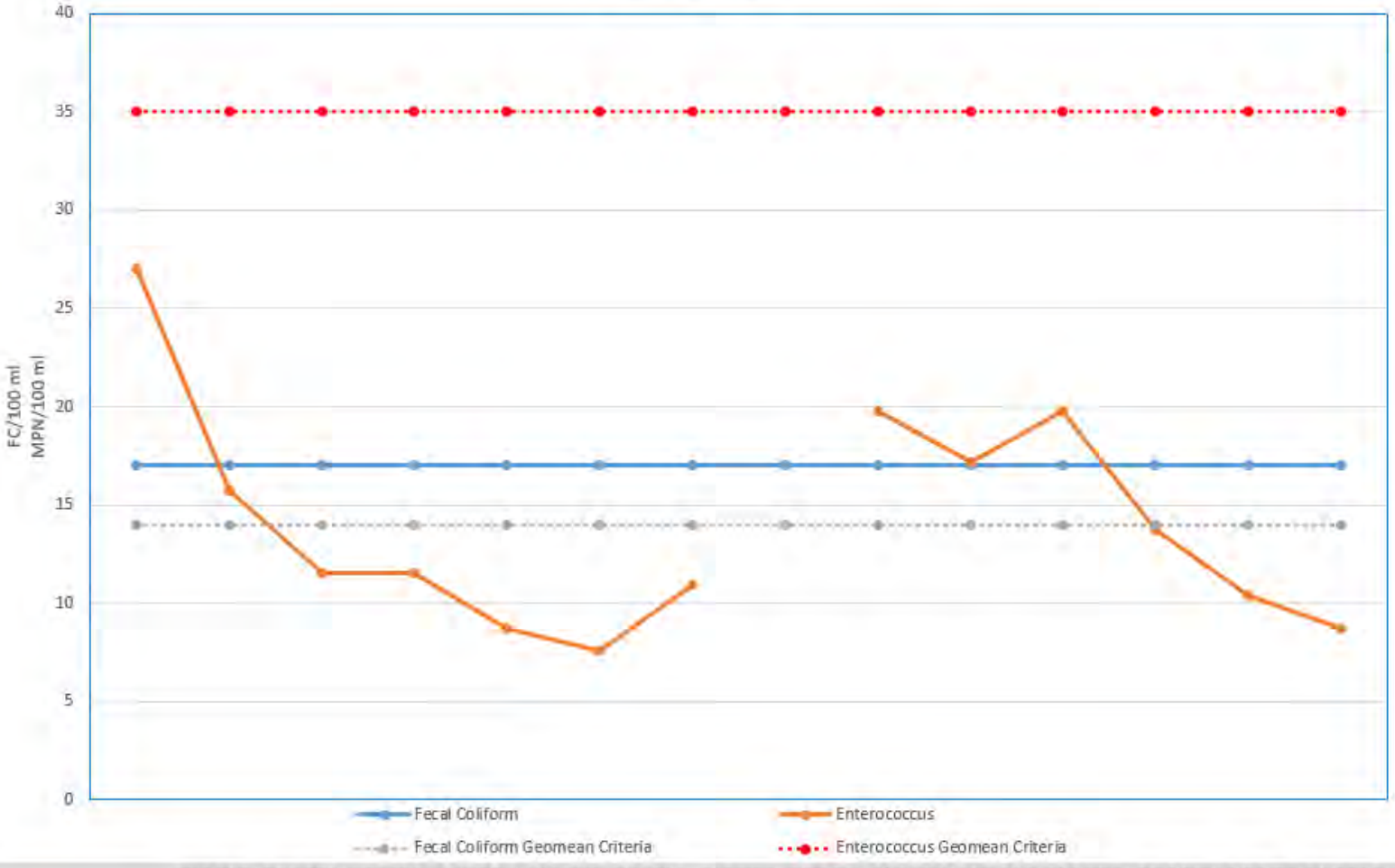
	5/17-6/15	5/22-6/20	5/31-6/29	6/6-7/5	6/14-7/13	6/20-7/19	6/27-7/26	7/2-7/31	7/12-8/10	7/18-8/16	7/26-8/24	8/1-8/30	8/9-9/7	8/16-9/14
Fecal Coliform	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Enterococcus	16	14	8	8	8	6	8		20	20	30	21	21	10

2018 Bacteria Monitoring Results
S Refuge Cove
logarithmic



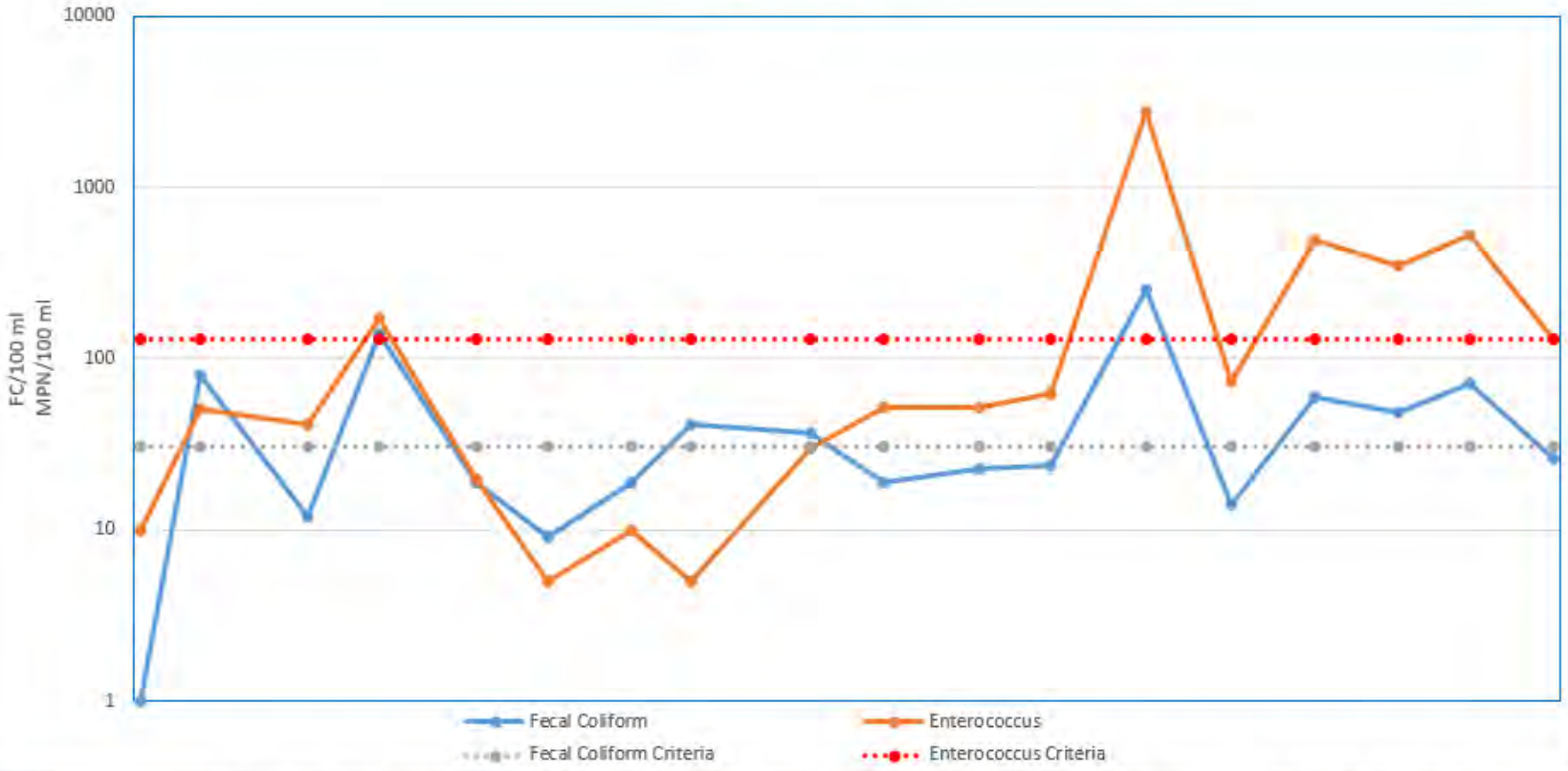
	5/17	5/22	5/31	6/6	6/14	6/20	6/27	7/2	7/12	7/18	7/26	8/1	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	5	64	49	18	33	6	10	15	26	7	22	1	53	3	16	88	55	25
Enterococcus	74	95	5	41	10	5	20	5	10	5	31	20	97	5	10	5	5	41

2018 Geomean Bacteria Monitoring Results
S Refuge Cove



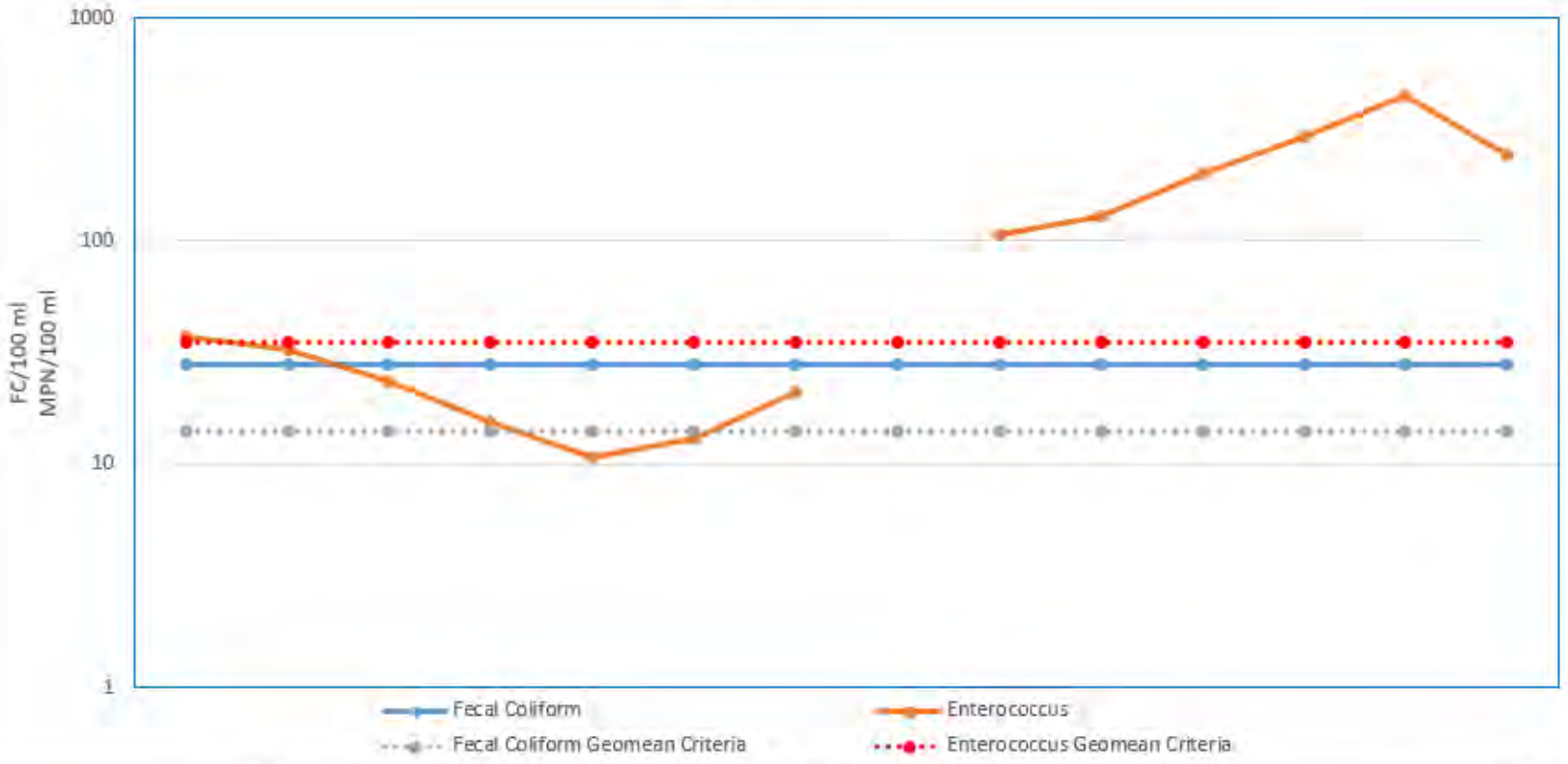
	5/17-6/15	5/22-6/20	5/31-6/29	6/6-7/5	6/14-7/13	6/20-7/19	6/26-7/26	7/2-7/31	7/12-8/10	7/18-8/16	7/26-8/24	8/1-8/30	8/9-9/7	8/16-9/14
Fecal Coliform	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Enterococcus	27	16	12	12	9	8	11		20	17	20	14	10	9

2018 Bacteria Monitoring Results
Thomas Basin
logarithmic

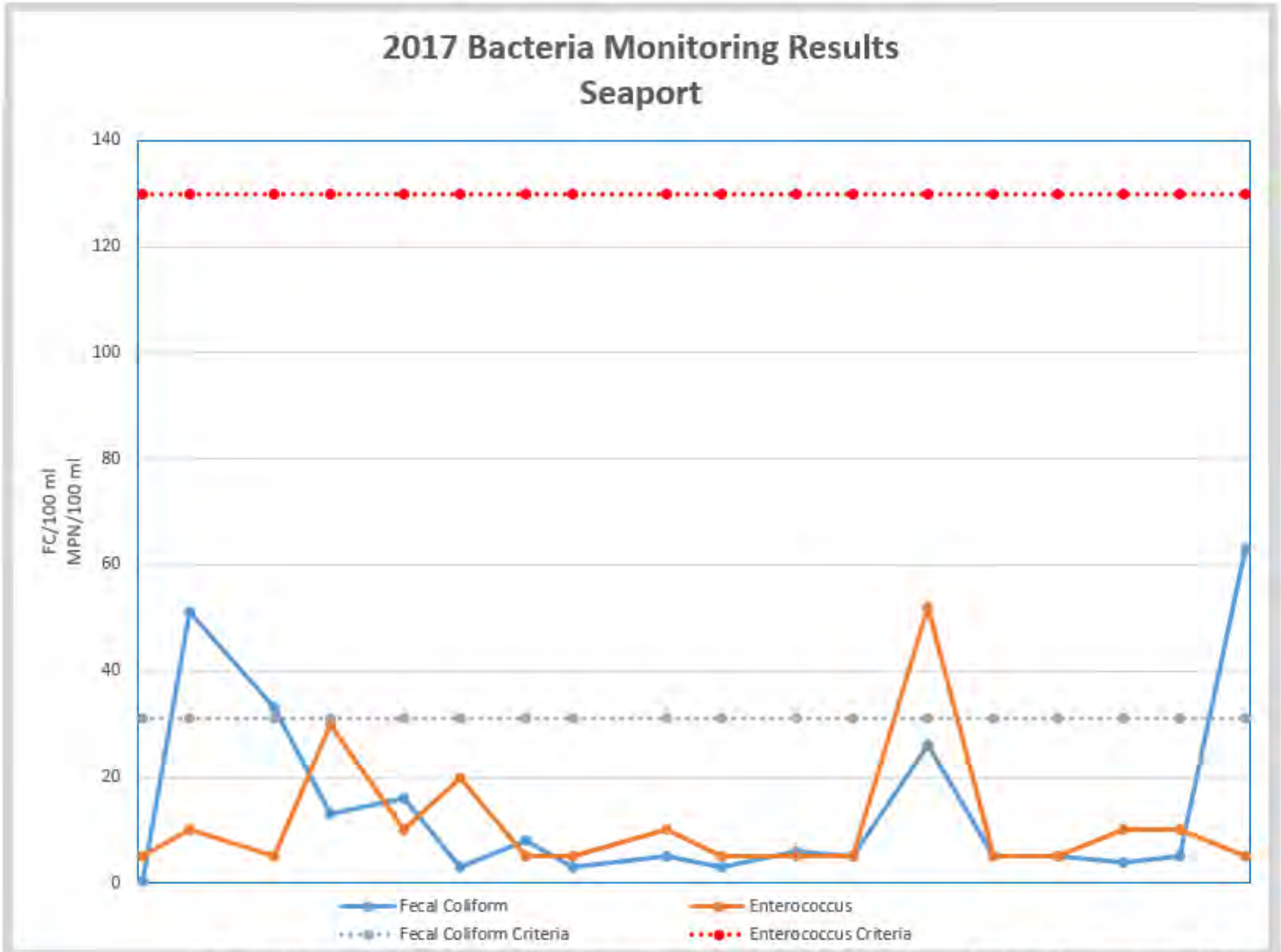


	5/17	5/22	5/31	6/6	6/14	6/20	6/27	7/2	7/12	7/18	7/26	8/1	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	1	81	12	139	19	9	19	41	37	19	23	24	250	14	59	49	72	26
Enterococcus	10	51	41	173	20	5	10	5	30	52	52	63	2755	74	496	350	528	130

2018 Geomean Bacteria Monitoring Results
Thomas Basin
logarithmic



	5/17-6/15	5/22-6/20	5/31-6/29	6/6-7/5	6/14-7/13	6/20-7/19	6/27-7/26	7/2-7/31	7/12-8/10	7/18-8/16	7/26-8/24	8/1-8/30	8/9-9/7	8/16-9/14
Fecal Coliform	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Enterococcus	37	32	23	15	11	13	21		107	128	201	295	451	245

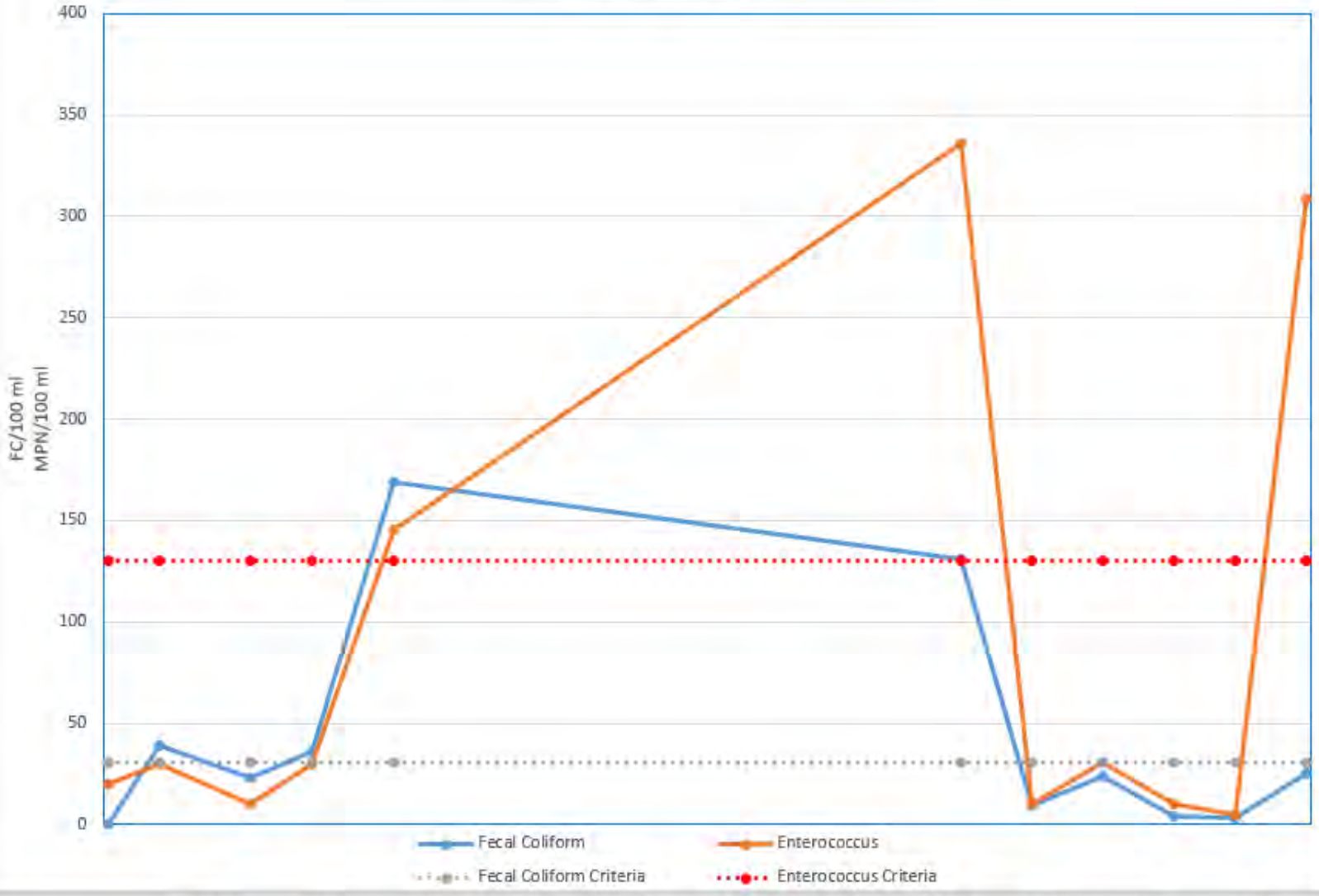


	5/17	5/22	5/31	6/6	6/14	6/20	6/27	7/2	7/12	7/18	7/26	8/1	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	0.5	51	33	13	16	3	8	3	5	3	6	5	26	5	5	4	5	63
Enterococcus	5	10	5	30	10	20	5	5	10	5	5	5	52	5	5	10	10	5

2017 Geomean Bacteria Monitoring Results
Seaport

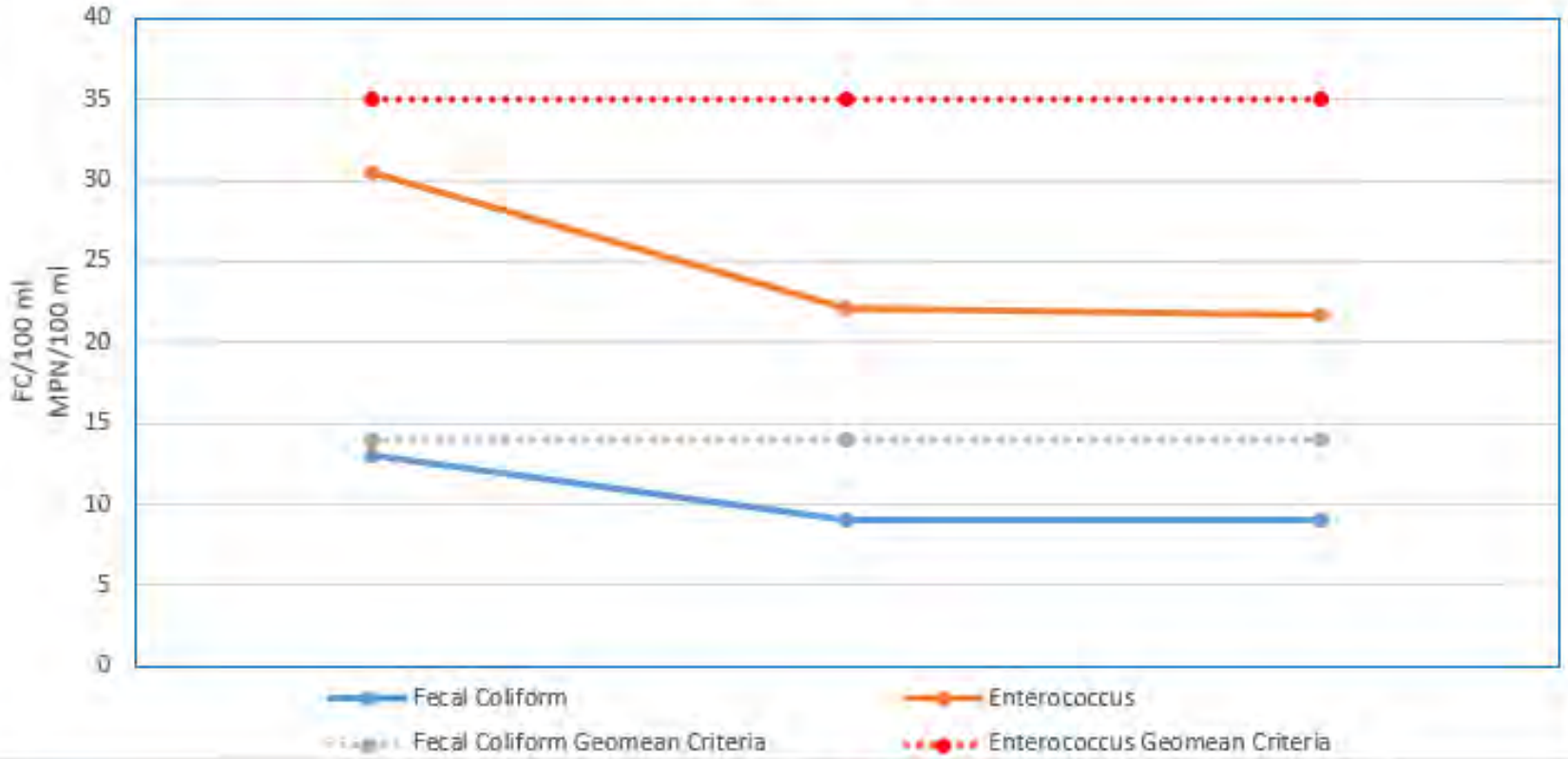
	5/17-6/15	5/22-6/20	5/31-6/29	6/6-7/5	6/14-7/13	6/20-7/19	6/27-7/26	7/2-7/31	7/12-8/10	7/18-8/16	7/26-8/24	8/1-8/30	8/9-9/7	8/16-9/14
Fecal Coliform	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Enterococcus	9	12	11	11	9	8	6		9	8	8	9	11	7

2018 Bacteria Monitoring Results
Rotary Pool



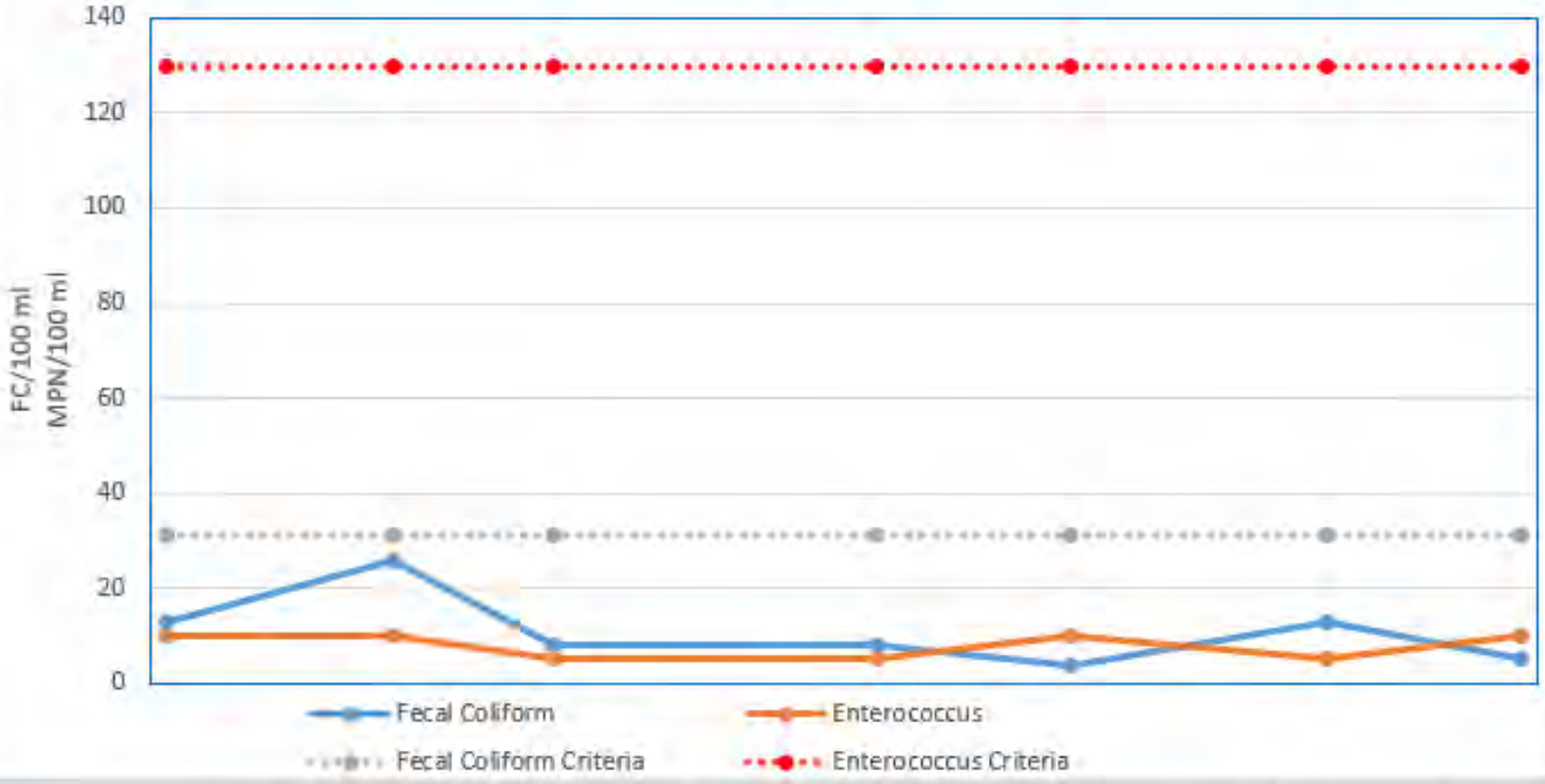
	5/17	5/22	5/31	6/6	6/14	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	0.5	39	23	36	169	131	9	24	4	3	25
Enterococcus	20	30	10	30	145	336	10	31	10	5	309

2018 Geomean Bacteria Monitoring Results
Rotary Pool



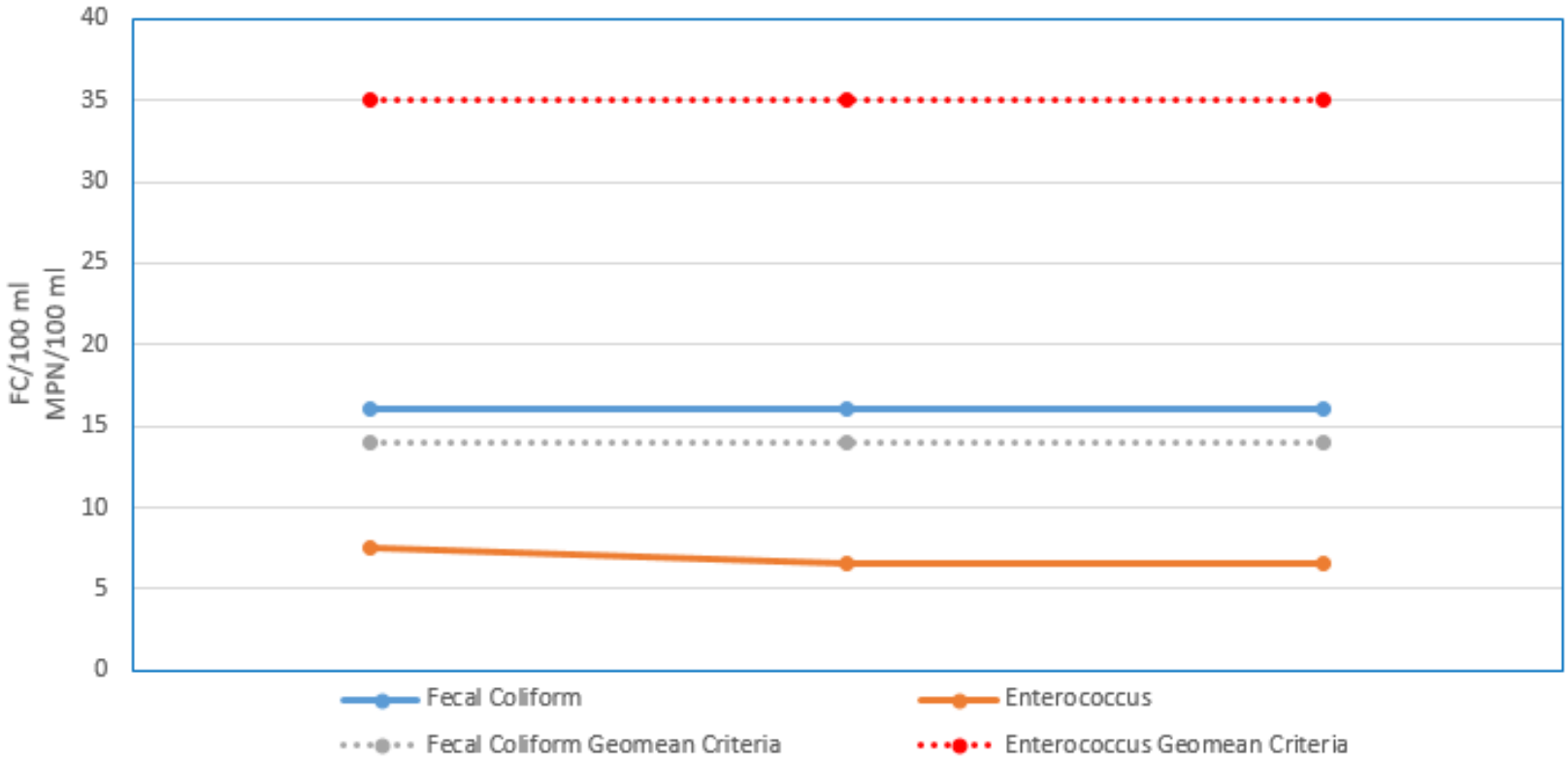
	5/17-6/15	8/9-9/7	8/16-9/14
Fecal Coliform	13	9	9
Enterococcus	30	22	22

2018 Bacteria Monitoring Results
Rotary Beach



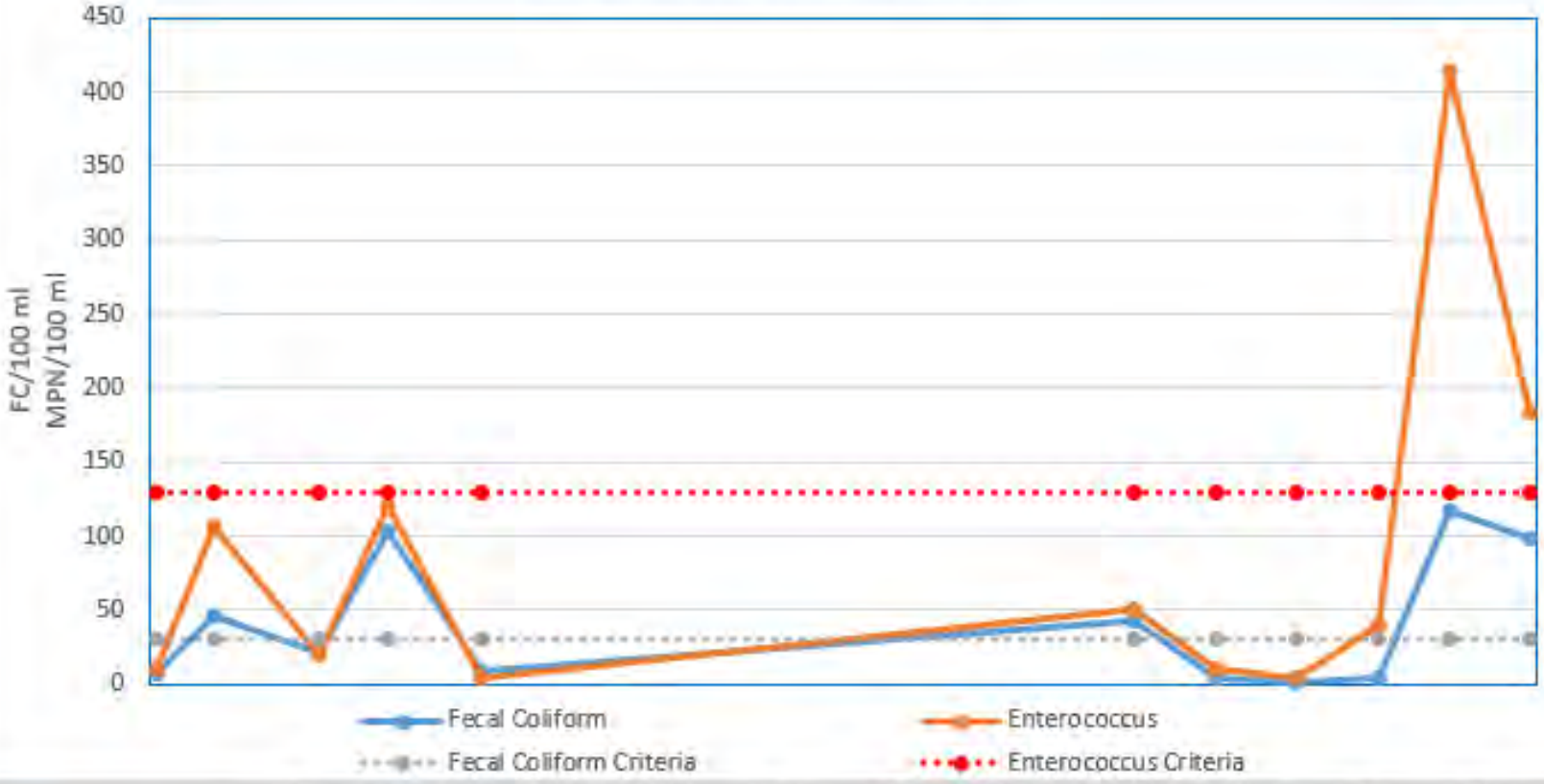
	6/20	6/27	7/2	7/12	7/18	7/26	8/1
Fecal Coliform	13	26	8	8	4	13	5
Enterococcus	10	10	5	5	10	5	10

2018 Geomean Bacteria Monitoring Results
Rotary Beach



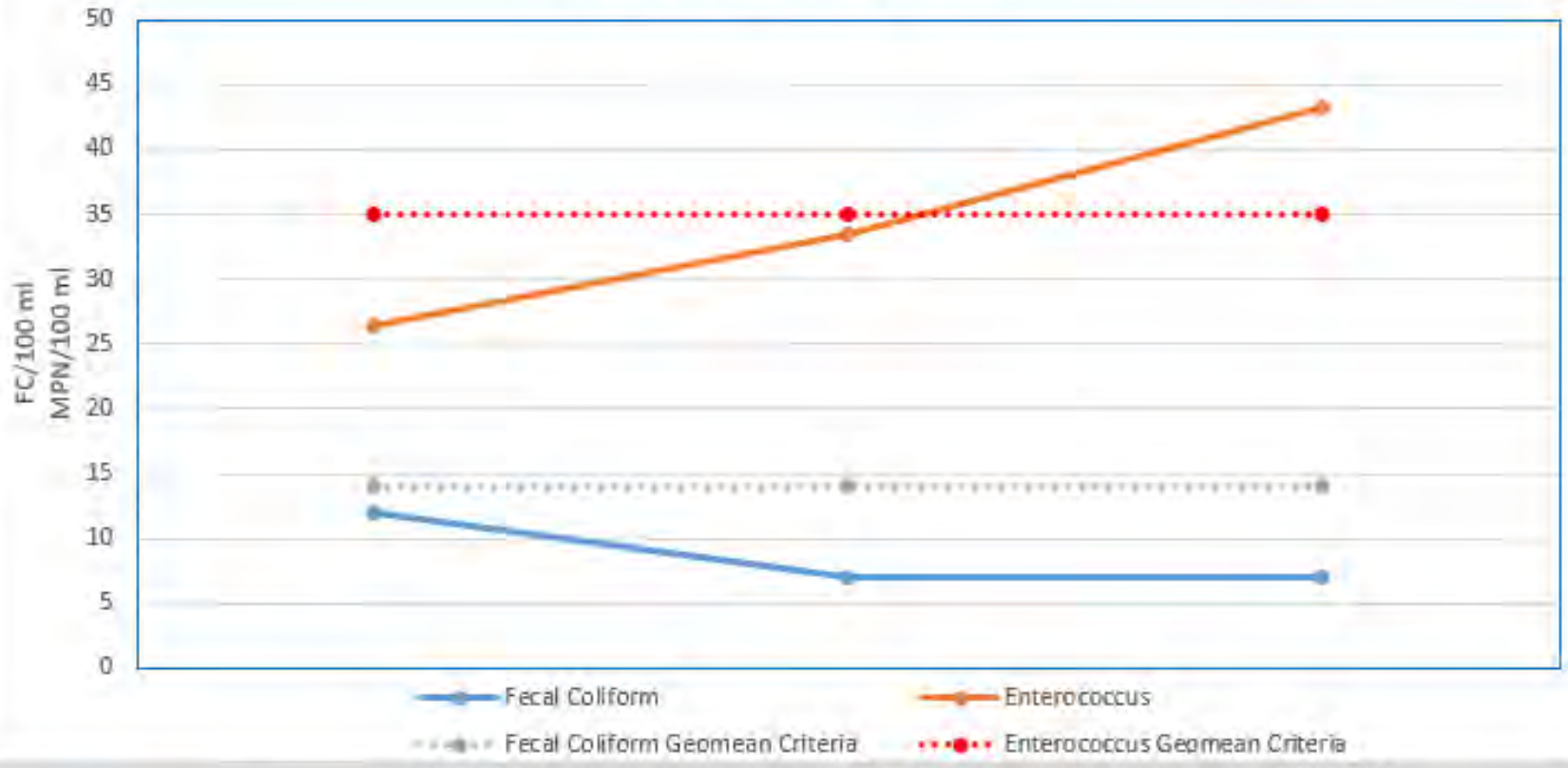
	5/17-6/15	8/9-9/7	8/16-9/14
Fecal Coliform	13	9	9
Enterococcus	30	22	22

2018 Bacteria Monitoring Results
Mt Pt Cultural Food



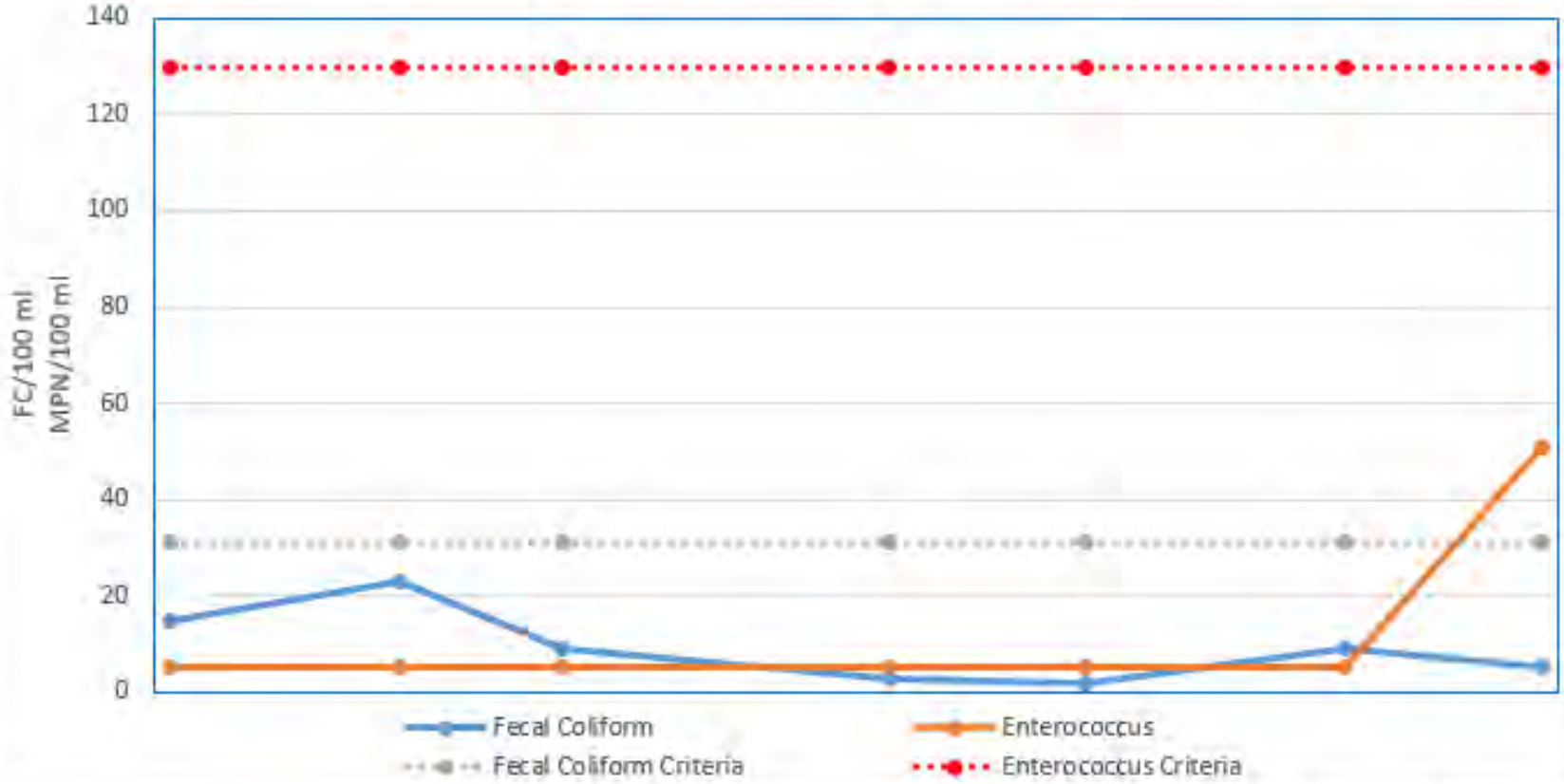
	5/17	5/22	5/31	6/6	6/14	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	8	46	21	103	9	43	4	1	4	118	98
Enterococcus	10	106	20	121	5	51	10	5	40	414	183

2018 Geomean Bacteria Monitoring Results
Mt Pt Cultural Food



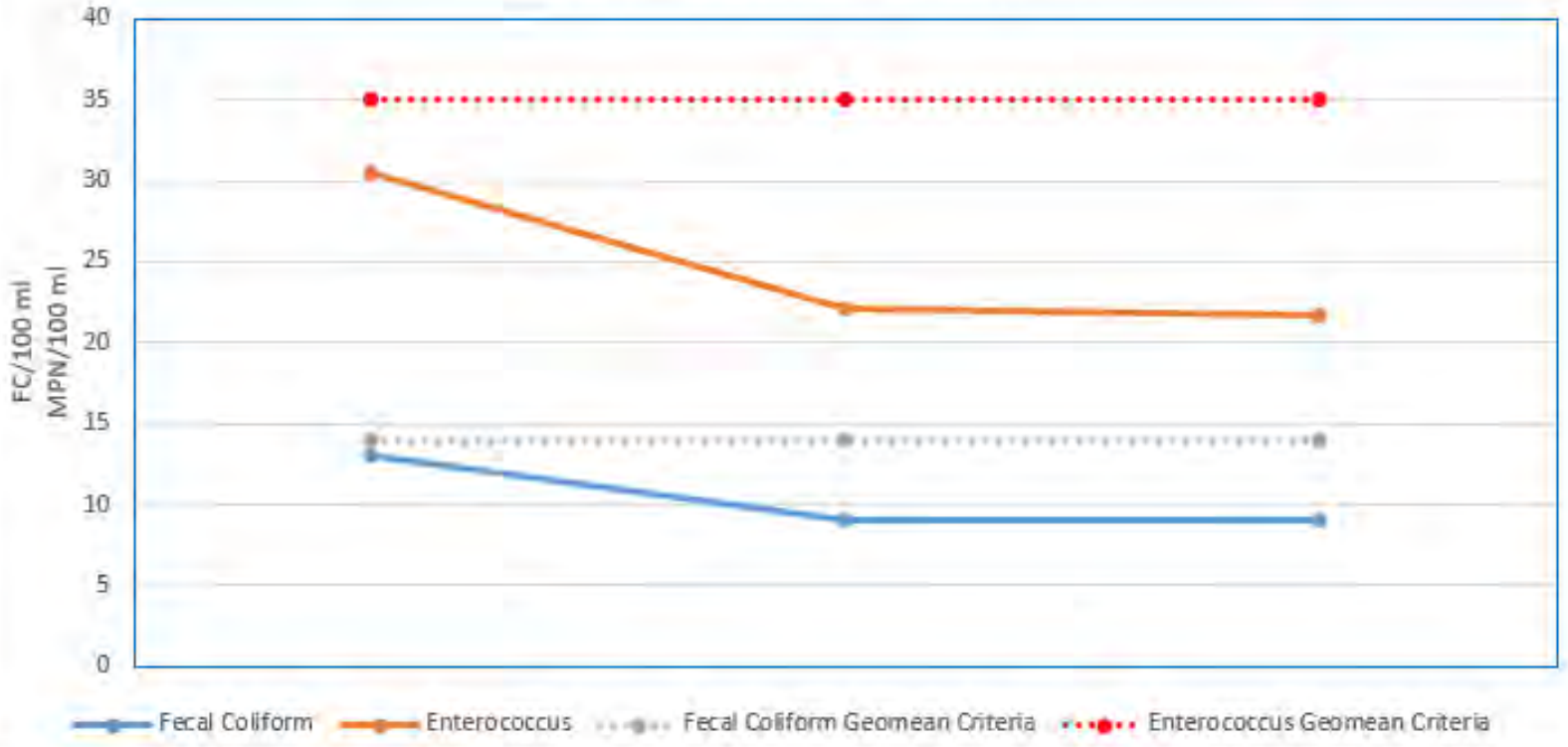
	5/17-6/15	8/9-9/7	8/16-9/14
Fecal Coliform	12	7	7
Enterococcus	26	34	43

2018 Bacteria Monitoring Results
Mt Pt Surprise Beach



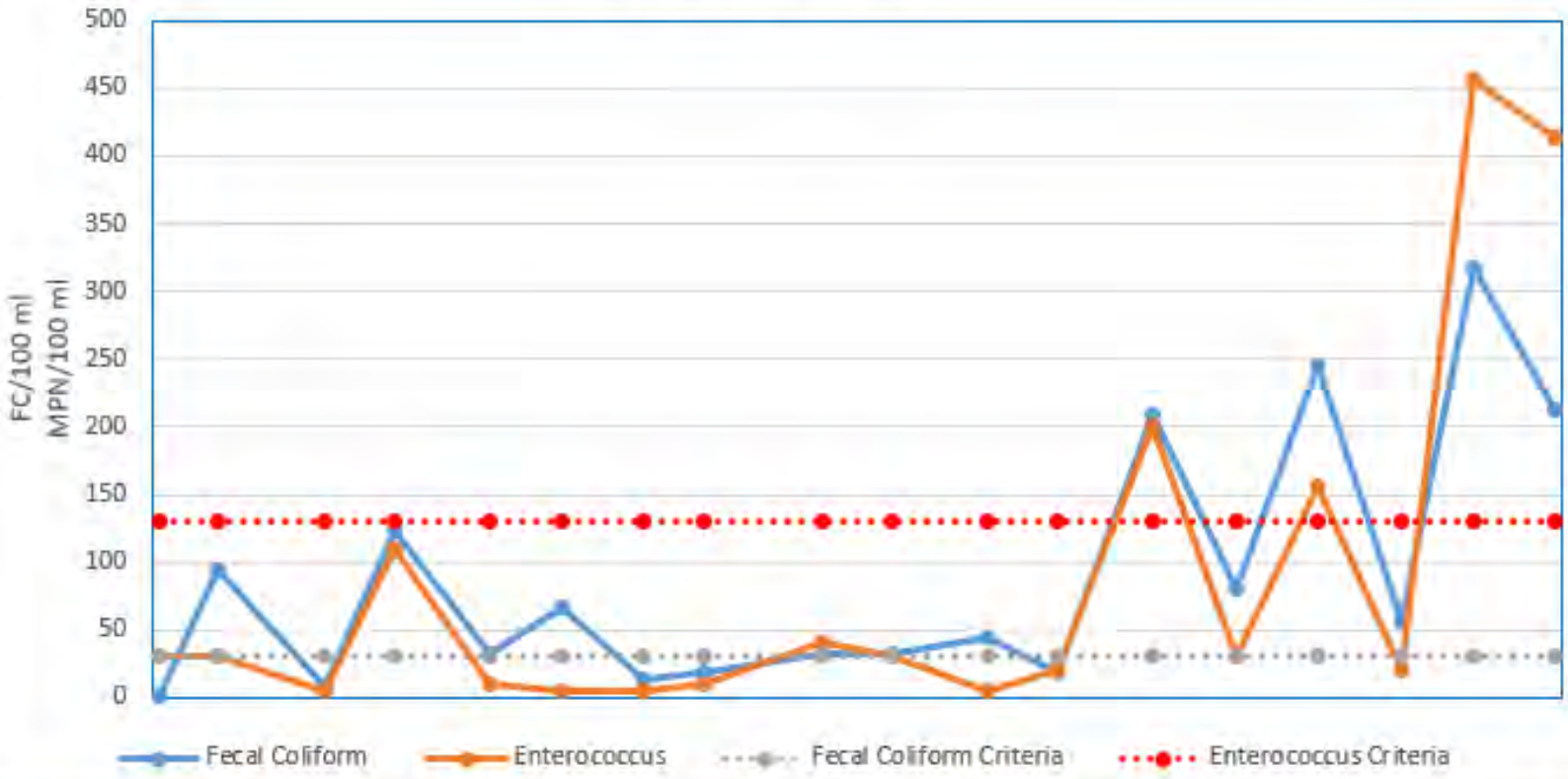
	6/20	6/27	7/2	7/12	7/18	7/26	8/1
Fecal Coliform	15	23	9	3	2	9	5
Enterococcus	5	5	5	5	5	5	51

2018 Geomean Bacteria Monitoring Results
Mt Pt Surprise Beach



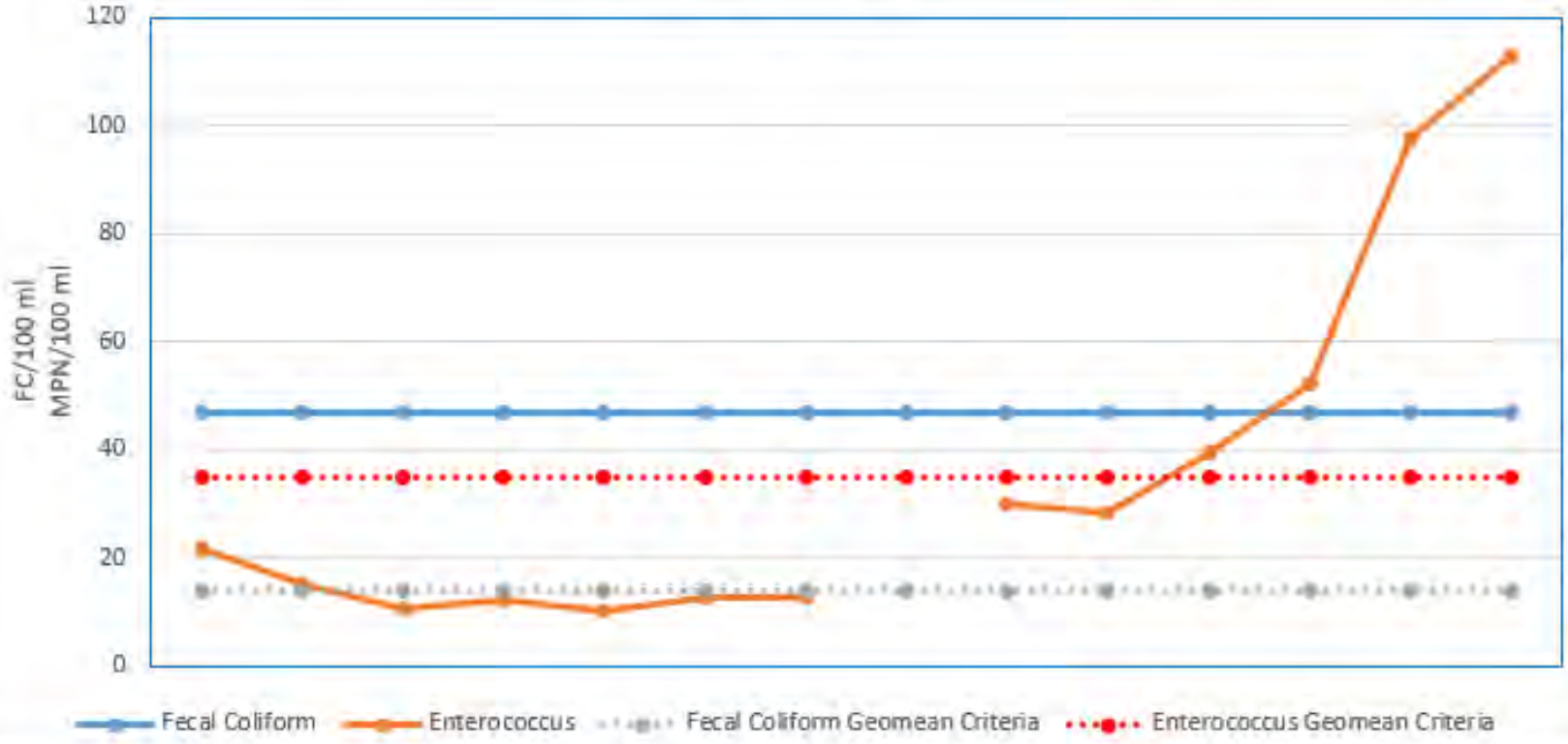
	5/17-6/15	8/9-9/7	8/16-9/14
Fecal Coliform	13	9	9
Enterococcus	30	22	22

2018 Bacteria Monitoring Results
Herring Cove



	5/17	5/22	5/31	6/6	6/14	6/20	6/27	7/2	7/12	7/18	7/26	8/1	8/9	8/16	8/23	8/30	9/5	9/12
Fecal Coliform	2	94	9	123	32	67	13	18	33	32	45	18	210	81	246	56	318	213
Enterococcus	31	30	5	109	10	5	5	10	41	30	5	20	201	31	156	20	457	414

2018 Geomean Bacteria Monitoring Results
Herring Cove



	5/17-6/15	8/9-9/7	8/16-9/14
Fecal Coliform	13	9	9
Enterococcus	30	22	22