

Waterbody Field Report Skagway BEACH Program Upper Taiya Inlet, Skagway, AK



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Abstract

Skagway Traditional Council (STC) and the Alaska Department of Environmental Conservation (DEC) engaged in marine pathogen monitoring at six Skagway recreational beaches between May 23rd, 2023 and September 10th, 2024, collecting 14 sets of water samples in 2023 and 18 samples in 2024 for enterococci and fecal coliform bacteria analysis. Microbial source tracking (MST) samples were collected once per recreational season at each beach location and analyzed for host species DNA markers for avian, human, and canine. Additionally, for each location and sampling event, in-situ water quality parameter measurements were taken including dissolved oxygen, pH, water and air temperature, salinity, and turbidity. No exceedances of the Alaska water quality standards (WQS) were reported for contact recreation, although two beaches (Nahku Bay and the Small Boat Harbor) exceeded the most stringent WQS for consumption of raw aquatic life. MST analysis reported quantifiable human markers at the Small Boat Harbor and Smuggler's Cove, while avian markers were present but not quantifiable at Airport Beach, Yakutania West, and Smuggler's Cove. No canine markers were detected at the five monitored beaches. Results suggest no significant sources of bacterial contamination for contact recreation, but two exceedances for consumption of raw aquatic life at two beaches may warrant a more visible and strategically placed warning sign for community and visitors using the marine area identifying port wastewater discharge location. In addition, best



Figure 1. Program Assistant Colton Belisle observing cruise ship activity while collecting in-situ parameters at Airport Beach.

management practices that may decrease bacteria sources and maintain healthy water quality include: disposal of boat-related sewage using harbor pump-out stations; proper installation of individual on-site septic systems with consistent, regular sewage pump-out and appropriate system maintenance; and public restrooms in recreational areas.

¹ Skagway Traditional Council, project #ACWA-23-12 funded by DEC from an EPA pass-through grant.

Basic Waterbody Information

Table 1. Basic Waterbody Information.

Assessment Unit ID	AK_M_1030305_004 Skagway Harbor AU		AK_M_1030305_002 Taiya Inlet AU			
EPA ID	AK568659	AK416279	AK587418	AK916382	AK622042	AK530903
Assessment Unit Name	Small Boat Harbor	Airport Beach	Yakutania West	Smuggler’s Cove	Nahku Bay	Yakutania East
Location description	Located at the head of the small boat harbor between the public boat launch and private dock.	Just south of the Skagway Airport terminal on the east bank of the Skagway River estuary.	Small pocket beach on the west flank of Yakutania Point.	Small pocket beach northwest of Yakutania Point.	Approximately 1.75 miles northwest of Skagway.	Small beach on the east side of Yakutania Point
Hydrologic unit code 10	1901030305					
Water Type	Marine Beach					
Area sampled	Point sample representing 0.11 miles of coastline	Point sample representing 0.31 miles of coastline	Point sample representing 0.04 miles of coastline	Point sample representing 0.05 miles of coastline	Point sample representing 0.12 miles of coastline	Point sample representing 0.34 miles of coastline.
Time of year sampled	May 23, 2023 – September 12, 2023; May 14, 2024 – September 10, 2024, Airport Beach in 2024 was sampled July 30, 2024 – September 10, 2024					May 14 – July 9, 2024

Water Quality Evaluation

Background

Skagway is located approximately 90 miles northwest of Alaska’s capital city Juneau, at the northern terminus of the Taiya Inlet (Figure 2). The nearly 1,000-person year-round population quadruples during the summer tourist season with transient employees providing services to 14,000 daily visitors arriving primarily by cruise ships between March and October.

Skagway Traditional Council (STC) is a Federally recognized Tribal government, responsible for the health and safety of Indigenous citizens residing in Skagway. The STC Environmental Department (ENVI) develops programs that address priority Tribal issues identified through assessments, Council oversight, and staff working sessions. Water quality in recreational waters has been a high-ranking priority for several assessment cycles, and ENVI recognized the potential for hazardous conditions considering the potential sources of bacteria adjacent to local beaches (Figure).

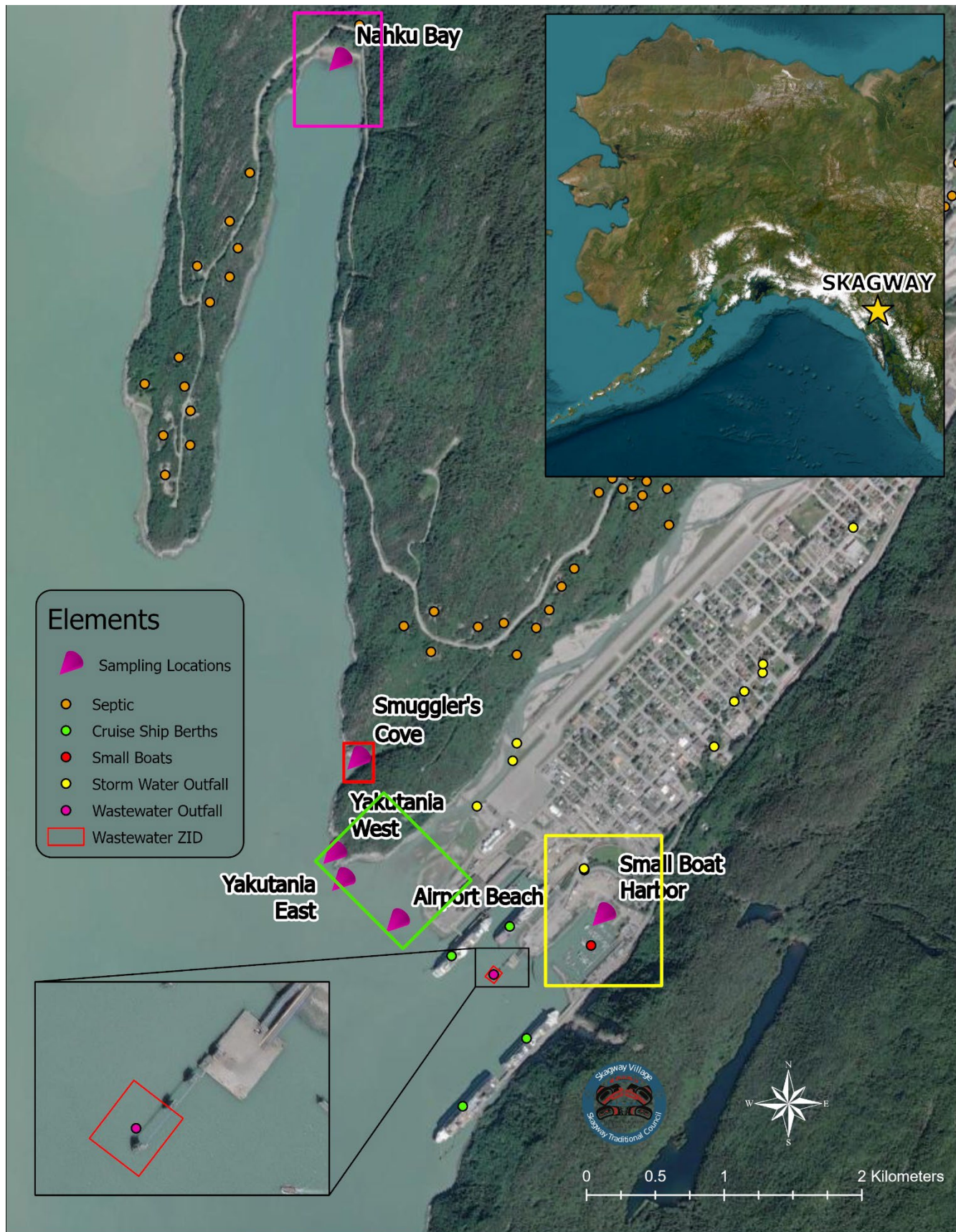


Figure 2. Overview map of BEACH sampling locations and potential sources of bacteria; colored insets are in Figure 2.



Figure 3. Detailed insets from Figure 1 with sample locations indicated by a purple cone: 2a. Nahku Bay; 2b. Smuggler's Cove; 2c. Airport Beach, Yakutania East, and Yakutania West; 2d. Small Boat Harbor.

Most of Skagway's residents live within the city grid where municipal water and sewer are provided, while a smaller percentage of residents live along the coastal Dyea Road and rely on cisterns and septic systems. A small boat harbor with slips for 104 vessels is located in the farthest east basin of the waterfront, bordered by a peninsula housing the state ferry terminal and dock. The Municipality of Skagway (MOS) wastewater treatment facility also uses this dock to discharge treated wastewater effluent into the Taiya Inlet. The MOS wastewater treatment facility has an Environmental Protection Agency (EPA) 301(h) permit waiver² requiring primary treatment before discharging with a mixing area referred to as the zone of initial dilution³. Berths for four large cruise ships are located on three docks at the waterfront, and around half the ships that visit Skagway are permitted to discharge wastewater into the harbor, although it is unknown the percentage of ships that actively discharge into the harbors. A stormwater network managed by MOS collects overland flow from the city grid and discharges into Pullen Creek and the Skagway River. Domestic dogs are common in Skagway, and a small population of resident marine mammals and seabirds is complemented twice annually by a large influx of stopover migratory waterfowl.

ENVI staff assisted DEC in completing an initial Beaches Environmental Assessment and Coast Health (BEACH) survey of Skagway recreation beaches, and five locations were identified as Tier 1⁴ priorities to be sampled during the 2023 – 24 recreational seasons (Figure 2). STC and DEC co-authored a quality assurance project plan (QAPP)⁵, communication plan, and listserv database, and ENVI established a contract with DEC-approved Admiralty Environmental laboratory in Juneau to perform bacteria analyses on collected water samples.

Objectives

The objectives for this project are to:

- Monitor selected public-use marine beaches for fecal indicator organisms (i.e., fecal coliform and enterococci bacteria) during periods of high recreational use.
- Notify the public when indicator organisms exceed recreational criteria in Alaska Water Quality Standards (WQS)⁶

² Document can be found at ["NPDES Permit Fact Sheet for Skagway Wastewater Treatment Plant – WA0020010 – July 2023" \(epa.gov\)](https://www.epa.gov/npdes/npdes-permit-fact-sheet-for-skagway-wastewater-treatment-plant-wa0020010-july-2023)

³ In some cases, a dilution allowance or mixing zone is permitted within a receiving water. A mixing zone is a limited area or volume of water where initial dilution of a discharge takes place and within which certain WQS may be exceeded. Under the 301(h) program this mixing area is referred to as the zone of initial dilution, or ZID. In accordance with 18 AAC 70.240, DEC authorizes mixing zones in Taiya Inlet for copper, dissolved oxygen, temperature, total residual chlorine, enterococcus bacteria, fecal coliform bacteria, and whole effluent toxicity contained in the discharge from the Skagway wastewater treatment facility. The mixing zones are defined as follows: The chronic mixing zone has a dilution of 28:1 and is defined as a rectangular area with a length of 6.1 meters and width of 7.4 meters centered over the diffuser with the length oriented perpendicular to the diffuser. The acute mixing zone has a dilution of 16:1 and is defined as a rectangular area with a length of 4.5 meters and width of 6.4 meters centered over the diffuser with the length oriented perpendicular to the diffuser (NPDES Permit for Skagway Wastewater Treatment Plant – WA0020010).

⁴ More information on the BEACH program are available at <https://dec.alaska.gov/water/water-quality/beach-program/>

⁵ QAPP, FAQs, Handbook, and other resources at <https://dec.alaska.gov/water/water-quality/beach-program/skagway/>

⁶ 18 AAC 70(14)(B)(i) Water Quality Standards amended as of April 26, 2024. Appendix A highlights applicable criteria.

Quality Assurance Review

ENVI Field staff adhered to protocols and standard operating procedures (SOPs) as defined by the project QAPP. In 2023 a total of 16 sampling events were scheduled, and 14 sets of samples were successfully collected and delivered to Admiralty Environmental for a completeness total of 88%. Three sets of samples were collected (6-28-23, 8-15-23, and 9-6-23) but not delivered to the lab due to inclement weather; in-situ parameters were measured for all sites on these days except for Yakutania West and Smuggler's Cove on 8-15-23, these sites were omitted for the sake of time. In 2024 a total of 18 sampling events were scheduled, and 18 sets of samples were delivered to Admiralty for a completeness total of 100%. A sampling event on July 16th was cancelled due to weather but was replaced by adding a sampling day on August 29th. All holding times and temperatures were within acceptable range and no discrepancies, errors, data qualifiers, or QC flags were reported. Calibration/verification was performed prior to and following each event on the Hach turbidimeter, and pre-sampling calibration was performed on the YSI Pro Quatro handheld unit for each event as per the manufacturer's recommendation. Calibration logs and verification records were completed for the monitoring program. One rotating duplicate sample for enterococci and fecal coliform was collected for each sampling day, and all results were below or at low magnitude values for bacteria. Relative percentage difference values for duplicate samples were all within acceptable limits per the QAPP.

Methods

Six Tier 1 beaches were monitored between May 23, 2023, and September 10, 2024 (Table 1, and Figures 2 and 3). Field staff collected a single grab sample of marine water from each beach weekly in laboratory-provided containers, plus one rotating duplicate sample, for enterococci (ASTM D6503-99) and fecal coliform (SM 9222D) analyses. A calibrated Hach turbidimeter was used to measure in-situ turbidity at each site, and a calibrated YSI Pro Quatro multiparameter unit was used to measure in-situ water temperature, salinity, dissolved oxygen, and pH. Air temperature was measured using a calibrated NIST lollipop thermometer. Modified EPA Marine Sanitary Surveys were completed at each beach for every sampling event. Grab samples were also collected on September 12, 2023, and July 30, 2024, between 6:00 am to 12:00 pm from each location and submitted to LuminUltra labs for microbial source tracking (MST) analysis for human, canine, and avian DNA markers. All samples were collected in the morning hours to meet flight and analytical methods holding times.

All beach samples were packed into a hard-sided cooler with blue ice packs to maintain a temperature range between 4.0 and 10.0 °C, and hand-delivered to Alaska Seaplanes for transport to Juneau. Samples were submitted to Admiralty Environmental by a DEC partner in Juneau within the requisite 6-hour holding time, allowing two hours for laboratory staff to prepare and perform the analyses. MST samples in 2023 were delivered to a FedEx facility in Juneau prior to the 10:30 am cutoff time for overnight freight and shipped to LuminUltra Technologies Ltd. in Maryland within the 48- hour holding time. In 2024, MST samples were collected using a field filtration kit provided by LuminUltra, generously extending the holding time and negating the issue of delivering samples to Juneau before the freight cutoff.

Results

Most results were non-detect for enterococci and fecal coliform. However, the WQS for fecal coliform of ‘harvesting for consumption of raw mollusks or other raw aquatic life’ was exceeded in both 2023 and 2024 at two beach sites, Nahku Bay and Small Boat Harbor.

2023

All enterococci results were under the threshold for contact recreation in 2023 (Figures 4 & 6, Table 2). The ‘harvesting for consumption of raw mollusks or other raw aquatic life’ for fecal coliform is exceeded if more than 10% of the samples is greater than 31 CFU/100ml⁷. The seasonal geometric mean for fecal coliform is exceeded if the geometric mean of all the recreational season samples is greater than 14 CFU/100ml. Two beach sites exceeded 14% (2 samples out of 14 samples) for the individual sample criteria (Figure 5 & 7, Table 2).

- Nahku Bay on 6-6-23 (180 CFU/100ml) and on 8-30-23 (68 CFU/100ml).
- Small Boat Harbor on 6-14-23 (54 CFU/100ml) and on 7-6-23 (58 CFU/100ml).

Table 2. Fecal coliform 2023 results summary showing percentages of WQS individual exceedances in red.

Analyte	Site	Individual Criteria ⁷	% of Samples Exceeding Threshold	Geometric Mean Criteria	Maximum 30-day Geomean Result
Enterococci (MPN/100 mL)	Nahku Bay	130 MPN/100ml	0%	35 MPN/100ml	ND* (5.00)
	Airport Beach		0%		7.20
	Small Boat Harbor		0%		8.71
	Smuggler’s Cove		0%		5.74
	Yakutania West		0%		ND (5.00)
Analyte	Site	Individual Criteria	% of Samples Exceeding Individual Criteria	Seasonal Geometric Mean Criteria	Seasonal Geometric Mean Result
Fecal Coliform (CFU/100 mL)	Nahku Bay	31 CFU/100ml	14%	14 CFU/100ml	4.44
	Airport Beach		0%		3.23
	Small Boat Harbor		14%		11.46
	Smuggler’s Cove		0%		2.20
	Yakutania West		0%		2.13

* ND = not detected, used ½ detection limit to calculate the geometric mean (5.00)

Field staff filled out sanitary surveys at each location weekly; however, to meet shipping and holding time requirements all sampling events took place in the early morning (0500 – 1000) which may have skewed survey results.

In-situ parameters performed as expected with typical seasonal and geographical variance (Table 3). Skagway’s location at the northern terminus of the Taiya Inlet combined with consistent southern winds in the summer and significant glacial runoff from two major rivers causes freshwater to

⁷ 18 AAC 70(14)(B)(i) Water Recreation, Contact Recreation, and 18 AAC 70(14)(D) Harvesting for Consumption of Raw Mollusks and Other Raw Aquatic Life.

accumulate on the northern shorelines – summertime salinity is often below 1 ppt. Turbidity at the three locations closest to the Skagway River estuary registered higher averages than at the Small Boat Harbor and Nahku Bay, likely a result of river sediment.

Table 3. In-situ measurement summary, 2023, all sites.

Analyte	Site	Mean	Median	Range
Air Temperature (°C)	Airport Beach	13.3	13.4	7.7 - 21.9
	Small Boat Harbor	13.4	13.7	8.0 - 19.0
	Yakutania West	13.4	13.5	9.4 - 16.6
	Nahku Bay	11.7	12.1	7.4 - 15.0
	Smuggler's Cove	12.9	12.9	8.8 - 16.0
Water Temperature (°C)	Airport Beach	9.0	8.8	5.4 - 12.0
	Small Boat Harbor	10.1	10.4	7.3 - 12.0
	Yakutania West	9.9	10.1	7.5 - 12.6
	Nahku Bay	10.9	10.5	7.3 - 15.1
	Smuggler's Cove	10.2	10.5	7.8 - 12.7
Salinity (ppt)	Airport Beach	4.7	4.2	0.0 - 15.4
	Small Boat Harbor	6.8	6.9	1.9 - 14.4
	Yakutania West	6.1	5.3	0.5 - 12.4
	Nahku Bay	6.1	5.7	0.0 - 17.8
	Smuggler's Cove	6.1	5.6	0.5 - 17.5
pH	Airport Beach	7.9	7.9	7.6 - 8.5
	Small Boat Harbor	7.7	7.7	7.3 - 8.3
	Yakutania West	8.1	8.1	7.5 - 8.5
	Nahku Bay	7.9	8.0	6.6 - 8.5
	Smuggler's Cove	8.0	8.1	7.6 - 8.4
DO (mg/L)	Airport Beach	11.2	11.0	10.1 - 12.7
	Small Boat Harbor	9.8	10.0	7.2 - 12.1
	Yakutania West	11.3	11.3	10.5 - 12.4
	Nahku Bay	11.0	11.2	9.7 - 12.3
	Smuggler's Cove	11.1	11.0	10.3 - 12.2
Turbidity (NTU)	Airport Beach	27.6	23.4	5.5 - 63.1
	Small Boat Harbor	17.8	10.9	4.0 - 53.3
	Yakutania West	26.2	23.2	6.2 - 88.0
	Nahku Bay	18.3	14.1	4.5 - 74.3
	Smuggler's Cove	27.3	19.9	5.6 - 76.7

2023 MST analysis reported human and avian markers at the Small Boat Harbor, Airport Beach, Yakutania West, and Smuggler’s Cove (Table 4). The only quantifiable markers were found at the Small Boat Harbor and Smuggler’s Cove, both human. Avian markers were present but not quantifiable at Airport Beach, Yakutania West, and Smuggler’s Cove. No canine markers were detected at all 5 beaches. Project data including in-situ measurements and sanitary survey results can be obtained from DEC Southeast staff in Juneau, AK.

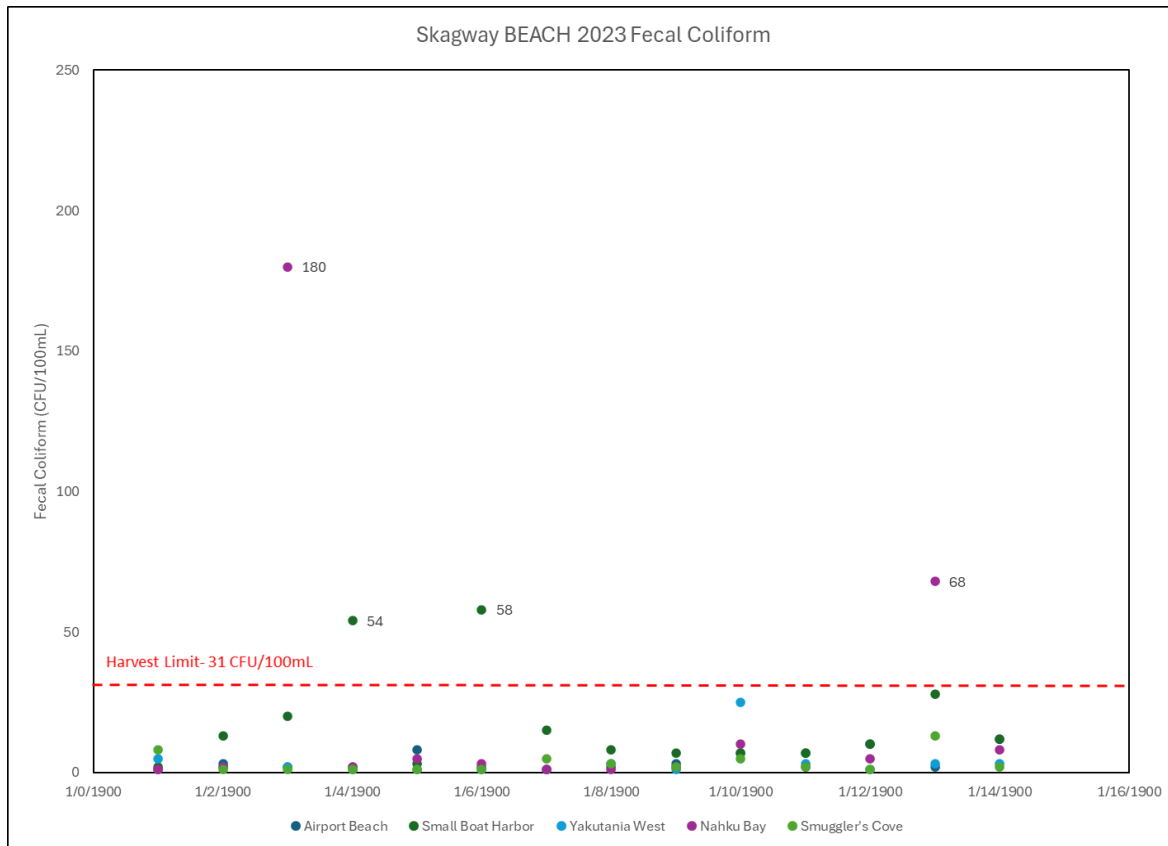


Figure 5. Fecal coliform analytical results, 2023, all sites.

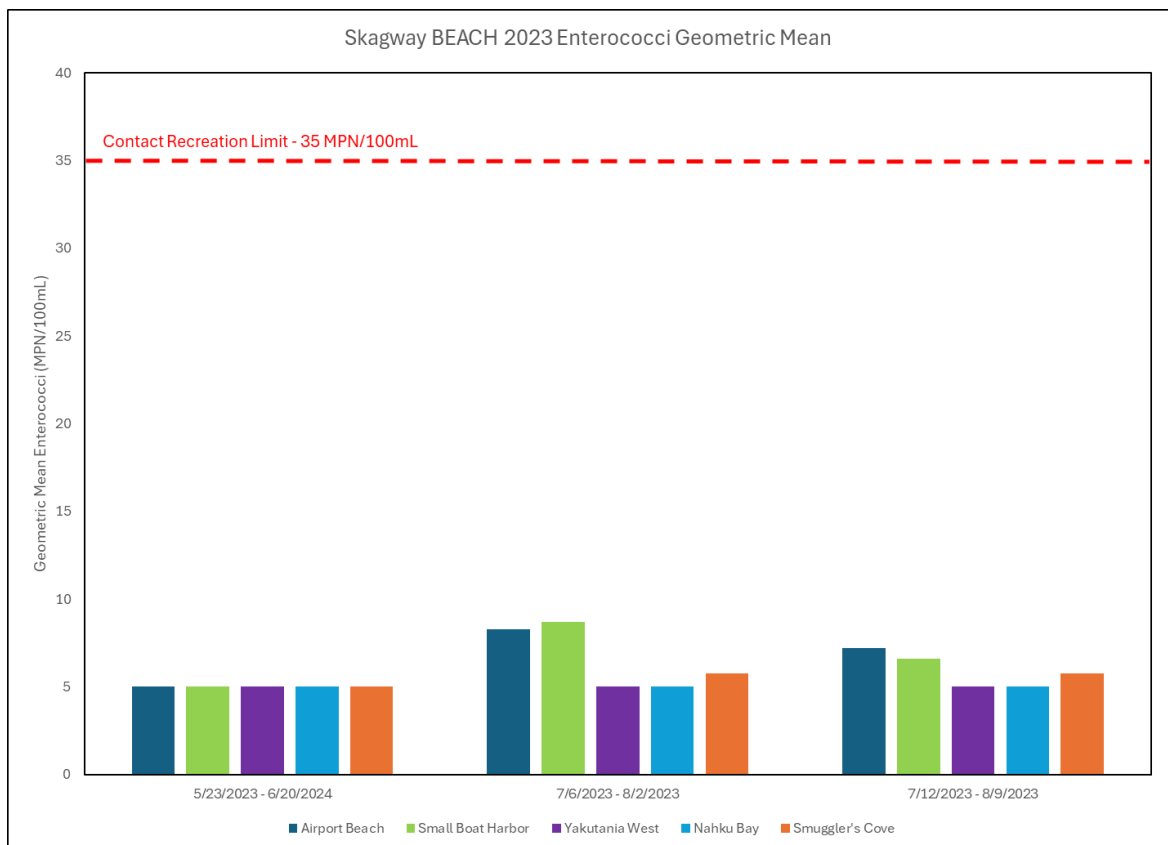


Figure 6. Enterococci rolling geometric mean, all sites.

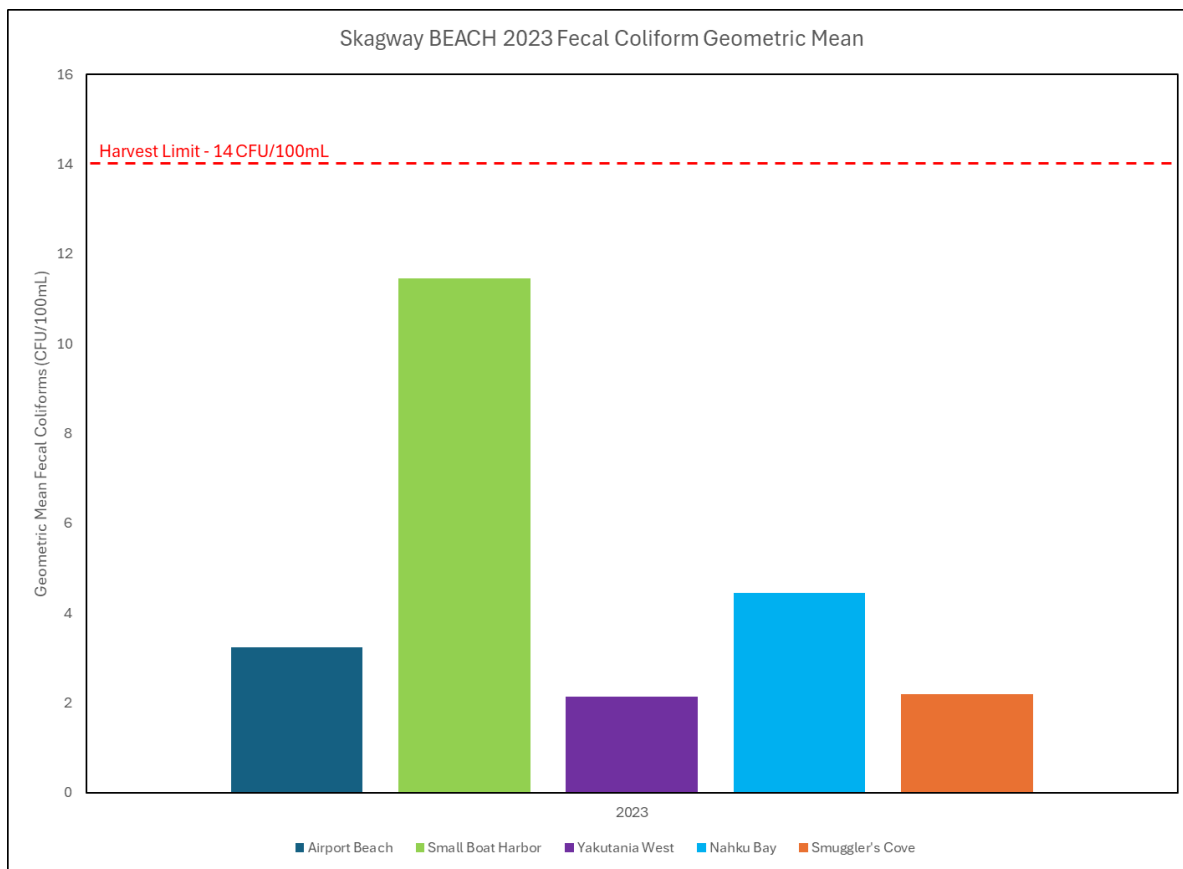


Figure 7. Fecal coliform seasonal geometric mean, 2023, all sites.

2024

Sampler concern about safe access to the Airport Beach site prompted the establishment of a new sampling location on the east side of Yakutania Point, named Yakutania East (Table 1). This site was sampled from May 14 – July 9, 2024, but was dropped from the program after the Skagway River shifted its mainstem into the site and introduced new access hazards. Staff resumed sampling at Airport Beach after this channel migration. All Enterococci results were under the threshold for contact recreation in 2024, although one sample (5%) was in excess at Nahku Bay on 5-14-2024 (160 MPN/100mL; Figures 8 & 10, Table 5). Since 18 samples were collected, this did not exceed 10% of total samples. For fecal coliforms, two beach sites exceeded 11% (2 samples out of 18 samples) for the individual sample criteria (Figure 9 & Table 5).

- Small Boat Harbor on 6-25-2024 (33 CFU/100mL) and 8-6-2024 (110 CFU/100mL).
- Nahku Bay on 7-9-2024 (210 CFU/100mL) and 8-27-2024 (100 CFU/100mL).

Table 5. Table 1. Fecal coliform 2024 results summary showing percentages of WQS individual exceedances in red.

Analyte	Site	Individual Criteria ⁹	% of Samples Exceeding Threshold	Geometric Mean Criteria	Maximum 30-day Geomean Result
Enterococci (MPN/100 mL)	Nahku Bay	130 MPN/100ml	5%	35 MPN/100ml	10.00
	Airport Beach		0%		7.07
	Small Boat Harbor		0%		14.77
	Smuggler’s Cove		0%		7.20
	Yakutania West		0%		7.62
Analyte	Site	Individual Criteria	% of Samples Exceeding Individual Criteria	Seasonal Geometric Mean Criteria	Seasonal Geometric Mean Result
Fecal Coliform (CFU/100 mL)	Nahku Bay	31 CFU/100ml	11%	14 CFU/100ml	3.56
	Airport Beach		0%		5.54
	Small Boat Harbor		11%		4.75
	Smuggler’s Cove		0%		1.94
	Yakutania West		0%		1.92

In-situ parameters performed as expected in 2024 (Table 7). Salinity values began higher than in 2023, likely due to an earlier initiation of sampling prior to the influx of freshwater from river runoff. Water temperatures on average were lower in 2024. pH values were within an acceptable range both years. Turbidity was slightly lower in 2024 but followed the seasonal pattern of elevated levels during the midsummer glacial melting period flanked by lower turbidity values in the beginning and end of the season.

MST results in 2024 did not identify markers for any target species: avian, canine, or human (Table 6). These results may have been affected by a decrease in observed wildlife at the mouth of the Skagway River during the eulachon (*Thaleichthys pacificus*) migration.

Table 6. MST analytical results, 2024, all sites.

Site	Bacteroidetes	Result ¹⁰
Nahku Bay	Human	ND
	Canine	ND
	Avian	ND
Small Boat Harbor	Human	ND
	Canine	ND
	Avian	ND
Airport Beach	Human	ND
	Canine	ND
	Avian	ND
Yakutania West	Human	ND
	Canine	ND
	Avian	ND
Smuggler’s Cove	Human	ND
	Canine	ND
	Avian	ND

⁹ 18 AAC 70(14)(B)(i) Water Recreation, Contact Recreation, and 18 AAC 70(14)(D) Harvesting for Consumption of Raw Mollusks and Other Raw Aquatic Life.

¹⁰ ND – Not Detected; DNQ – Not Quantifiable; Unit are copies/100mL

Table 7. In-situ measurement summary, 2024, all sites.

Analyte	Site	Mean	Median	Range
Air Temperature (°C)	Airport Beach	13.5	13.2	10.4 - 18.7
	Yakutania East	12.0	12.2	5.1 - 8.9
	Small Boat Harbor	12.6	13.0	9.4 - 14.6
	Yakutania West	12.6	12.8	7.5 - 16.7
	Nahku Bay	12.1	12.1	8.1 - 14.5
	Smuggler's Cove	12.3	12.8	7.3 - 16.3
Water Temperature (°C)	Airport Beach	9.9	10.0	7.8 - 11.9
	Yakutania East	7.3	7.2	4.7 - 11.0
	Small Boat Harbor	10.1	10.3	7.3 - 11.4
	Yakutania West	9.6	9.7	7.2 - 11.1
	Nahku Bay	10.1	10.1	7.0 - 12.3
	Smuggler's Cove	10.0	10.1	7.3 - 11.6
Salinity (ppt)	Airport Beach	4.4	4.5	1.3 - 6.6
	Yakutania East	7.2	1.8	0.0 - 24.8
	Small Boat Harbor	9.6	7.1	2.5 - 23.4
	Yakutania West	7.1	4.6	0.7 - 23.5
	Nahku Bay	7.7	5.4	1.2 - 23.3
	Smuggler's Cove	7.7	5.8	1.0 - 12.2
pH	Airport Beach	7.8	7.8	7.7 - 8.2
	Yakutania East	8.0	7.9	7.6 - 8.4
	Small Boat Harbor	7.7	7.6	7.1 - 8.4
	Yakutania West	8.1	8.1	6.7 - 8.8
	Nahku Bay	7.8	7.7	7.4 - 8.5
	Smuggler's Cove	8.1	8.1	7.5 - 8.7
DO (mg/L)	Airport Beach	11.2	11.1	9.5 - 12.4
	Yakutania East	12.5	11.9	11.2 - 13.8
	Small Boat Harbor	9.8	10.1	6.9 - 11.8
	Yakutania West	12.3	12.3	10.8 - 14.3
	Nahku Bay	11.1	11.2	9.0 - 14.6
	Smuggler's Cove	11.8	11.6	10.7 - 14.8
Turbidity (NTU)	Airport Beach	22.3	20.4	9.1 - 39.7
	Yakutania East	14.6	12.5	2.2 - 38.4
	Small Boat Harbor	8.0	5.7	0.6 - 30.7
	Yakutania West	17.4	9.8	2.1 - 50.5
	Nahku Bay	14.7	9.8	1.6 - 56.8
	Smuggler's Cove	16.7	12.8	1.5 - 65.9

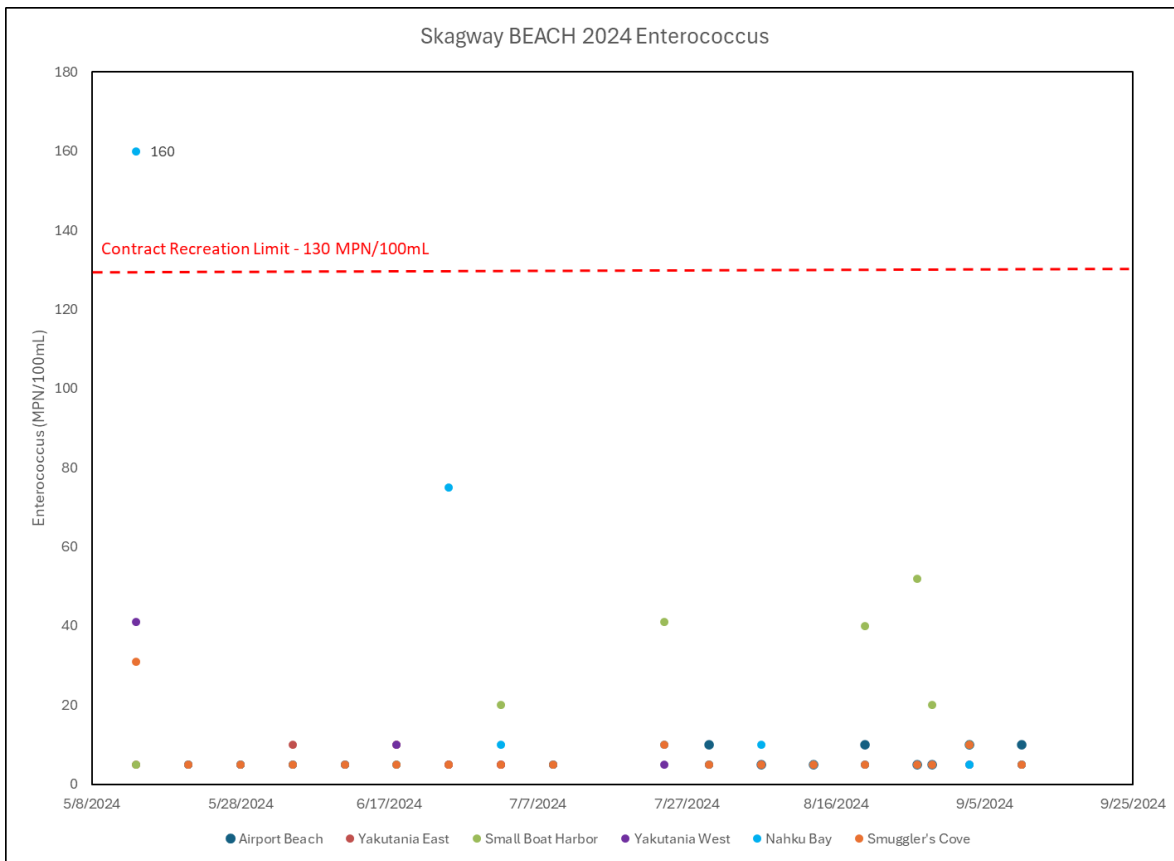


Figure 8. Enterococci analytical results, 2024, all sites.

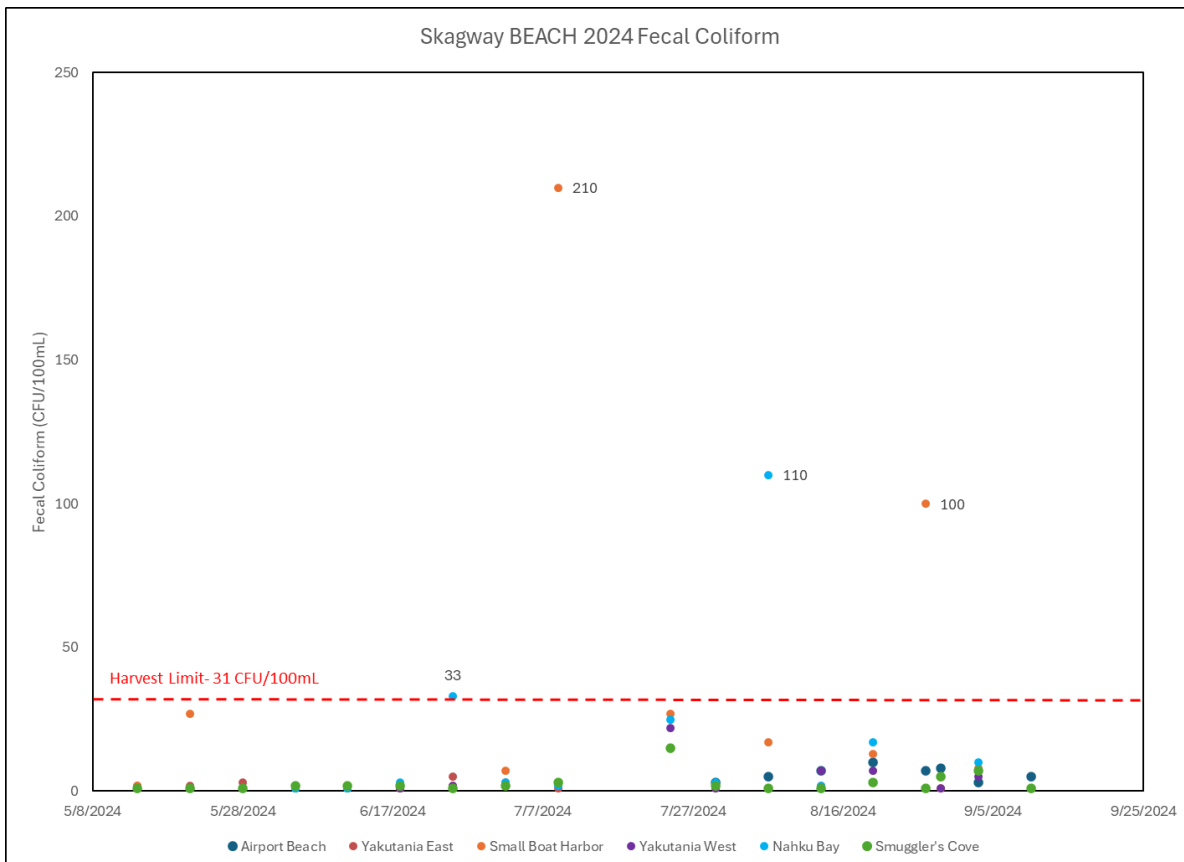


Figure 9. Fecal coliforms analytical results, 2024, all sites.

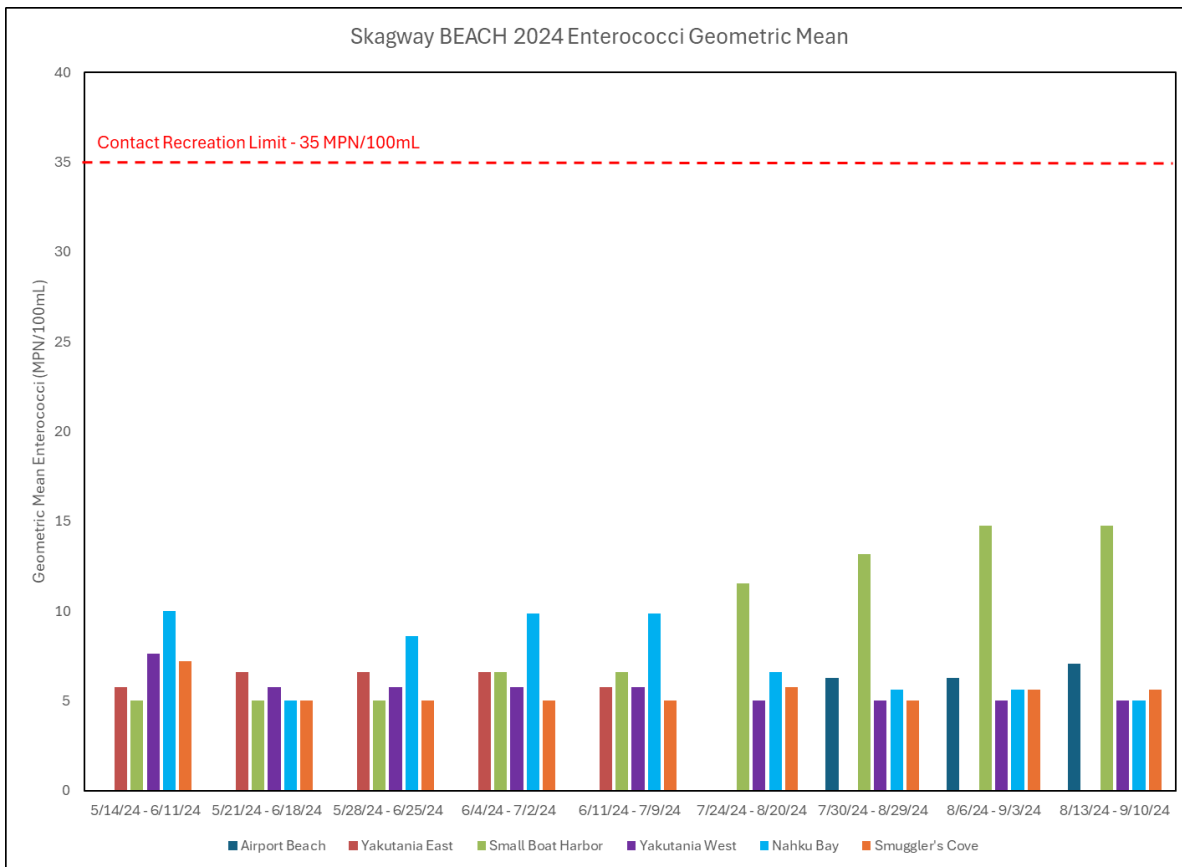


Figure 10. Enterococci rolling geometric mean, 2024, all sites.

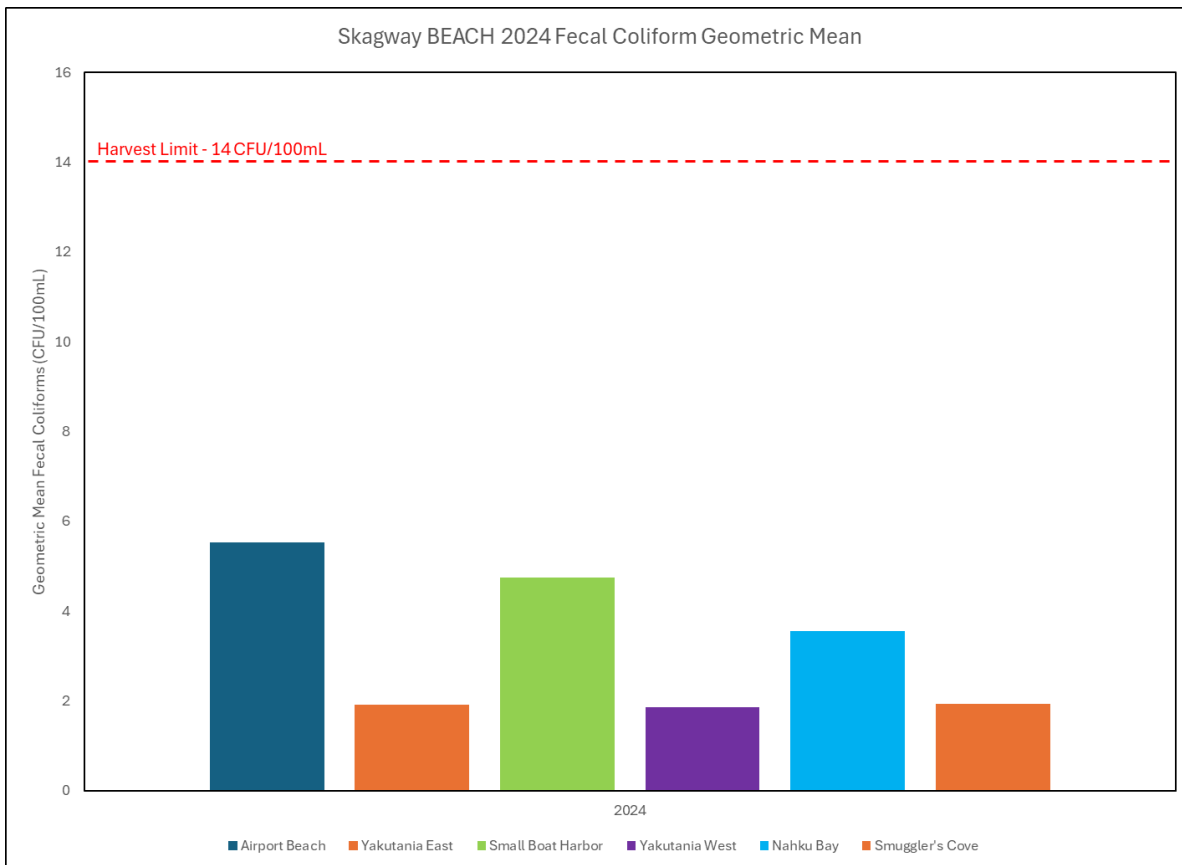


Figure 11. Fecal coliforms rolling geometric mean, 2024, all sites.

Outreach

STC and DEC developed a communication plan and released a general press release at the beginning of the monitoring season. The Alaska Beach Program website has a specific Skagway webpage highlighting an interactive map and data table with the most current beach sampling results, FAQs, and supporting project documents. During the water sampling season, DEC shared beach sampling results through a stakeholder email listserv and updated DEC website results table and interactive map as soon as analytical data was received. Facebook posts and advisory beach signage were prepared for when the contact recreational criteria exceedances occurred, however, no advisories or beach advisory sign postings were necessary during either the 2023 or 2024 recreational season. STC shared Beach Program information via social media and flyers posted around town prior to each monitoring season and held outreach events prior to the recreational season to share the general Beach Program and planned water monitoring activities and following the recreational season to share the monitoring program results summary, potential bacteria sources, and next steps.

Conclusion

STC successfully implemented two years of marine pathogen monitoring at Skagway recreational beaches, and results indicated that contact recreational activities were not negatively affected by high bacteria loads; however, limits for the harvesting of raw aquatic life for consumption were reached at two beaches (Nahku Bay and Small Boat Harbor), and human and avian DNA markers were present at four beaches. Quantifiable human markers were found at the Small Boat Harbor and Smuggler's Cove, while avian markers were present but not quantifiable at Airport Beach, Yakutania West, and Smuggler's Cove. No canine markers were detected at the five monitored beaches. Potential bacteria sources within all these areas include birds, gulls and wildlife. Additional potential bacteria sources within the Small Boat Harbor are the wastewater treatment plant discharge and mixing zone, boats in the harbor, stormwater outfalls, and wildlife, while Nahku Bay and Smuggler's Cove potential bacteria sources include on-site individual septic systems, small boats, and wildlife.

Recommended Next Steps

Best management practices that may decrease bacteria sources and maintain healthy water quality include: disposal of boat-related sewage using harbor pump-out stations: proper installation of individual on-site septic systems with consistent, regular pump-outs and appropriate maintenance; and public restrooms in recreational areas. Smuggler's Cove does not have an on-site restroom, and users are required to transit the Yakutania Point trail system to access facilities. Establishing a pit toilet at this location is suggested.

STC is concerned about the visibility of posted notices regarding the municipal wastewater treatment facility mixing zone. The permit requires that signs be posted notifying the public about the mixing zone and its risks, however, the facility mixing zone signage is poorly located and often covered by vegetation or blocked by vehicles (Figure 12). In an informal assessment of outreach participants, less than half of residents present were aware of the mixing zone and what activities should be avoided there. STC recommends improving the visibility of signage and engaging in community outreach to provide information about safety at recreational beaches within this zone.



Figure 12. Location of the wastewater treatment facility mixing zone warning sign, indicated by a red arrow; inset shows vegetation blocking visibility.

Appendix A – 18 AAC 70(14) Water Quality Standards amended as of November 13, 2022

Designated Use Class	Use Subclass	Criteria
(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 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/100 mL, and not more than 10% of the samples may exceed 400 fecal coliform/100 mL.
(D) Harvesting for consumption of raw mollusks or other raw aquatic life		The geometric mean of samples may not exceed 14 fecal coliform CFU/100 mL; and not more than 10% of the samples may exceed 31 fecal coliform CFU/100 mL ¹¹

¹¹ When fecal coliform is monitored in waters designated as state approved shellfish harvesting and growing waters, these waters are also subject to 18 AAC 34.010(19).

Appendix B – 2023 Skagway Beaches Bacteria Data Results

Table B1. 2023 Fecal coliform analytical results, all sites.

Sample Date	Airport Beach ¹²	Small Boat Harbor	Yakutania West	Nahku Bay	Smuggler's Cove
5/23/2023	ND	2.0	5.0	ND	8.0
5/31/2023	3.0	13	2.0	2.0	ND
6/6/2023	2.0	20	2.0	180	ND
6/14/2023	2.0	54	ND	2.0	ND
6/20/2023	8.0	3.0	ND	5.0	ND
7/6/2023	2.0	58	ND	3.0	ND
7/12/2023	ND	15	ND	ND	5.0
7/18/2023	2.0	8.0	3.0	ND	3.0
7/26/2023	3.0	7.0	ND	2.0	2.0
8/2/2023	7.0	7.0	25	10	5.0
8/9/2023	7.0	7.0	3.0	2.0	2.0
8/23/2023	10	10	ND	5.0	ND
8/30/2023	2.0	28	3.0	68	13
9/12/2023	12	12	3.0	8.0	2.0

Table B2. 2023 Enterococci analytical results, all sites.

Sample Date	Airport Beach ¹³	Small Boat Harbor	Yakutania West	Nahku Bay	Smuggler's Cove
5/23/2023	ND	ND	ND	ND	ND
5/31/2023	ND	ND	ND	ND	ND
6/6/2023	ND	ND	ND	ND	ND
6/14/2023	ND	ND	ND	ND	ND
6/20/2023	ND	ND	ND	ND	ND
7/6/2023	10	20	ND	ND	ND
7/12/2023	ND	10	ND	ND	ND
7/18/2023	ND	ND	ND	ND	10
7/26/2023	31	10	ND	ND	ND
8/2/2023	ND	ND	ND	ND	ND
8/9/2023	ND	ND	ND	ND	ND
8/23/2023	ND	ND	ND	ND	ND
8/30/2023	ND	ND	20	52	ND
9/12/2023	10	10	ND	10	ND

¹² Non-detect (ND) is reported by the analytical laboratory as <2.0 FCU/100ml.

¹³ Non-detect (ND) is reported by the analytical laboratory as <10 MPN/100ml.

Table B3. 2023 Fecal coliform seasonal geometric mean, all sites.

Site	5/23/2023 to 9/12/2023
Nahku Bay	4.4 ¹⁴
Airport Beach	3.2
Small Boat Harbor	11.5
Smuggler's Cove	2.2
Yakutania West	2.1

Table B4. 2023 Enterococci 30-day rolling geometric mean, all sites.

Site	5/23/2023 - 6/20/2023	7/6/2023 - 8/2/2023	7/12/2023 - 8/9/2023
Airport Beach	5.00 ¹⁵	8.27	7.20
Small Boat Harbor	5.00	8.71	6.60
Yakutania West	5.00	5.00	5.00
Nahku Bay	5.00	5.00	5.00
Smuggler's Cove	5.00	5.74	5.74

¹⁴ When a sample result was non-detect, ½ the Practical Quantitation Limit of fecal coliform (2.0 FC/100ml) was used to calculate the seasonal geometric mean.

¹⁵ When a sample result was non-detect, ½ the Practical Quantitation Limit of fecal coliform (10 MPN/100ml) was used to calculate the rolling geometric mean.

Appendix C – 2024 Skagway Beaches Bacteria Data Results

Table C1. 2024 Fecal coliform analytical results, all sites.

Sample Date	Airport Beach ¹⁶	Yakutania East	Small Boat Harbor	Yakutania West	Nahku Bay	Smuggler's Cove
5/14/2024		2	2	1.0	ND	ND
5/21/2024		2	27	1.0	ND	ND
5/28/2024		3	ND	ND	ND	ND
6/4/2024		2	ND	ND	ND	2
6/11/2024		ND	ND	ND	ND	2
6/18/2024		ND	ND	ND	3	2
6/25/2024		5.0	2.0	2.0	33	ND
7/2/2024		3.0	7.0	2.0	3.0	2.0
7/9/2024		ND	210	3.0	2.0	3.0
7/24/2024			27	22	25	15
7/30/2024	3.0		ND	ND	3.0	2.0
8/6/2024	5		17	ND	110	ND
8/13/2024	7.0		2.0	7.0	2.0	ND
8/20/2024	10		13	7.0	17	3.0
8/27/2024	7.0		100	ND	ND	ND
8/29/2024	8.0		ND	ND	5.0	5.0
9/3/2024	3.0		8.0	5.0	10	7.0
9/10/2024	5.0		ND	ND	ND	ND

Table C2. 2024 Enterococci analytical results, all sites.

Sample Date	Airport Beach ¹⁷	Yakutania East	Small Boat Harbor	Yakutania West	Nahku Bay	Smuggler's Cove
5/14/2024		ND	ND	41	160	31
5/21/2024		ND	ND	ND	ND	ND
5/28/2024		ND	ND	ND	ND	ND
6/4/2024		10	ND	ND	ND	ND
6/11/2024		ND	ND	ND	ND	ND
6/18/2024		10	ND	10	ND	ND
6/25/2024		ND	ND	ND	75	ND
7/2/2024		ND	20	ND	10	ND
7/9/2024		ND	ND	ND	ND	ND
7/24/2024			41	ND	10	10
7/30/2024	10		ND	ND	ND	ND
8/6/2024	ND		ND	ND	10	ND
8/13/2024	ND		ND	ND	ND	ND
8/20/2024	10		40	ND	ND	ND
8/27/2024	ND		52	ND	ND	ND
8/29/2024	ND		20	ND	ND	ND
9/3/2024	10		10	ND	ND	10
9/10/2024	10		ND	ND	ND	ND

¹⁶ Non-detect (ND) is reported by the analytical laboratory as <2.0 FCU/100ml.

¹⁷ Non-detect (ND) is reported by the analytical laboratory as <10 MPN/100ml.

Table C3. 2024 Fecal coliform seasonal geometric mean, all sites.

Site	5/14/2024 to 9/10/2024
Nahku Bay	3.6 ¹⁸
Airport Beach	5.5
Small Boat Harbor	4.8
Smuggler's Cove	1.9
Yakutania West	1.9

Table C4. 2024 Enterococci 30-day rolling geometric mean, all sites.

Site	5/14/24 - 6/11/24	5/21/24 - 6/18/24	5/28/24 - 6/25/24	6/4/24 - 7/2/24	6/11/24 - 7/9/24	7/24/24 - 8/20/24
Airport Beach						
Yakutania East	5.74 ¹⁹	6.60	6.60	6.60	5.74	
Small Boat Harbor	5.00	5.00	5.00	6.60	6.60	11.54
Yakutania West	7.62	5.74	5.74	5.74	5.74	5.00
Nahku Bay	10.00	5.00	8.59	9.87	9.87	6.60
Smuggler's Cove	7.20	5.00	5.00	5.00	5.00	5.74
Site	7/30/24 - 8/29/24	8/6/24 - 9/3/24	8/13/24 - 9/10/24			
Airport Beach	6.30	6.30	7.07			
Yakutania East						
Small Boat Harbor	13.16	14.77	14.77			
Yakutania West	5.00	5.00	5.00			
Nahku Bay	5.61	5.61	5.00			
Smuggler's Cove	5.00	5.61	5.61			

¹⁸ When a sample result was non-detect, ½ the Practical Quantitation Limit of fecal coliform (2.0 FC/100ml) was used to calculate the seasonal geometric mean.

¹⁹ When a sample result was non-detect, ½ the Practical Quantitation Limit of fecal coliform (10 MPN/100ml) was used to calculate the rolling geometric mean.

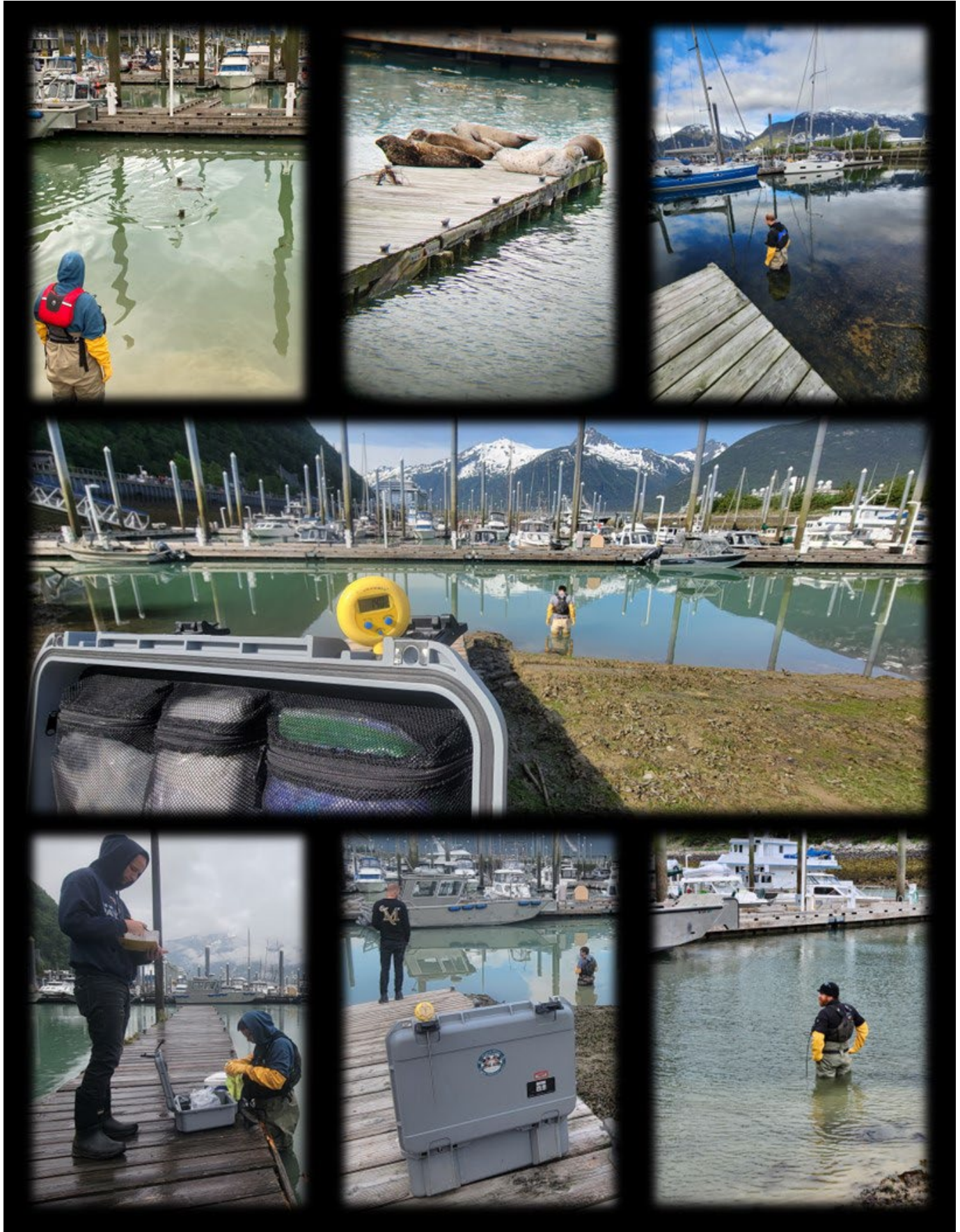
Appendix D - Field Photos Airport Beach



Appendix E - Field Photos Yakutania East



Appendix F - Field Photos Small Boat Harbor



Appendix G - Field Photos Yakutania West



Appendix H - Field Photos Nahku Bay



Appendix I - Field Photos Smuggler's Cove

