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# City of Kenai Kenai River Beach Sampling FY 2014 Final Report



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**Kenai  
Watershed  
Forum**



The Kenai Watershed Forum is dedicated to successfully identifying and addressing the needs of the region by providing high quality EDUCATION, RESTORATION, and RESEARCH programs.



Our mission is “working together for healthy watersheds on the Kenai Peninsula”.

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## Executive Summary

The City of Kenai and the Kenai Watershed Forum (KWF) teamed up for their third year with the Alaska Department of Environmental Conservation (DEC) to monitor the presence of indicator bacteria before and during the personal use dipnet fishery at the mouth of the Kenai River in Kenai, Alaska. With funding and guidance from DEC, KWF monitored levels of fecal coliform bacteria and enterococci on a weekly basis starting July 1, 2013 and ending August 11, 2013. Many of the samples from both the North Kenai Beach and South Kenai Beach did not exceed Alaska Water Quality Standards (WQS) for enterococci and fecal coliform. In addition, samples collected after dates with reported exceedances were often found to be in compliance with WQS. At South Kenai Beach, there were several sampling events, many of them on consecutive sampling dates, that resulted in exceedances of WQS. The North and South Beach exceeded the geometric mean standard for Enterococci. The South Beach was the only beach to exceed the geometric mean standard for Fecal Coliform.

## Introduction

A large number of Alaska residents participate in the personal use dipnet fishery at the mouth of the Kenai River each year. The personal use dipnet fishery opens on July 10<sup>th</sup> and closes on July 31<sup>st</sup>, unless modified by the Alaska Board of Fish through an emergency order. As requested by the Environmental Protection Agency as part of their national beach monitoring project, the Alaska DEC monitored levels of fecal coliform bacteria (*Escherichia coli* or *E. coli*) and enterococci at the mouth of the Kenai River in July of 2010 and found exceedances at the north and south (Figure 1) beaches near the mouth of the Kenai River; however, acceptable levels of bacteria were found at the Warren Ames Bridge (5 miles upriver, RM 5). A large number of birds, primarily *Laridae* (gulls), were observed on the beaches during the dipnet fishery. The birds, which are considered a likely bacteria source, are attracted by fish waste left on the beaches during the dipnet fishery. While adequate sanitary facilities including portable toilets and fish waste disposal containers were available on both the north and south beaches for dipnetters to use, improper waste disposal remains an issue each year and can contribute to high levels of fecal coliform and enterococci.



**Figure 1:** The South Kenai Beach during the personal use dipnet fishery, 2013

Since 2010, the DEC has awarded the City of Kenai each year with a grant to monitor levels of enterococci and fecal coliform bacteria during the personal use dipnet fishery near the mouth of the Kenai River. The City of Kenai contracted KWF to monitor and test for bacteria at two North Kenai Beach locations (NKB2 and NKB4, see Figure 2) and two South Kenai Beach locations (SKB2 and SKB3, see Figure 2). The Warren Ames Bridge (BRG1, see Figure 3) was chosen as a control location to compare conditions at the river mouth, to conditions upriver from the beaches and the dipnet fishery.

Enclosed in this report are the bacteria monitoring methods employed and data collected by KWF during the 2013 Kenai River personal use dipnet fishery.





**Figure 2:** 2013 Kenai Beach sampling locations





Figure 3: 2013 control sample location, Warren Ames Bridge

## Methods

Prior to the sampling period, the DEC BEACH Water Quality Monitoring and Pathogen Detection Quality Assurance Project Plan (QAPP) was revised for sampling the Kenai River beaches.

In June of 2013, KWF employees and interns were trained in the proper sampling techniques using the methods outlined in the QAPP.

### *Sampling Design*

Twice-weekly sample collection commenced on July 1, 2013 and occurred until August 11<sup>th</sup> of 2013, once on a weekday and once on a weekend. In total, 12 monitoring events were conducted under this grant: nine events in July that included the entire personal use dipnet fishery period of July 10<sup>th</sup>-31<sup>st</sup> and three during the first half of August. As a side note, under the 2012 grant, sampling also occurred prior to the opening of the 2012 personal use dipnet fishery on June 25<sup>th</sup> and 27<sup>th</sup>, 2012 to obtain baseline conditions.

During a typical sampling event, two samples were collected from each beach along with one from Warren Ames Bridge. A minimum of one replicate sample was collected during each sampling event, alternating between the north and south beach.

A cursory sanitary survey was also conducted during every sampling event to document conditions and any potential sources of bacteria present while the sampling team was on the beach. Specific conductance, pH, water temperature, and turbidity were measured using a Hydrolab MS5 during each sampling event and at each sampling location. Air temperature and weather were also noted.

Samples were typically collected in the mornings, shipped via commercial air carrier to a DEC certified laboratory in Anchorage. The laboratory, Analytica Group (Analytica) provided results to KWF and DEC within 24-48 hours of receiving the samples and KWF notified the DEC immediately of any exceedances of Alaska Water Quality Standards within 24 hours of receiving results.

### *Monitoring Parameters*

The monitoring plan included the analysis of water samples for two types of bacteria typically used as indicators of potential fecal contamination: fecal coliform and enterococci. Fecal coliform bacteria colonies were measured with analytical method ID SM9222-D Fecal Coliform by Membrane Filtration. Enterococci were measured with analytical method ID ASTM-D-6503-99 Enterococci by Most Probable Number. The State of Alaska has beach water quality criteria for both fecal coliform and enterococci (Appendix A).

### *Water Quality Standards*

According to Alaska Water Quality Standards, the geometric mean of samples for fecal coliform bacteria in marine waters is not to exceed 100 FC/100mL during a 30-day period. In addition, no more than one sample, or more than 10% of all samples if there are more than 10 samples, may exceed 200 FC/100mL.

Following Federal Beach (Marine) Water Quality Standards, enterococci single sample maximum allowable density may not exceed 276 MPN/100mL. In addition, the steady state geometric mean indicator density should not exceed 35 MPN/100mL.



## **Data Analysis**

Upon return from each sampling event, field observation data was entered into an MS Excel spreadsheet (a template created by DEC), field forms were scanned, and information was sent to DEC. When lab results were received, all were checked for adherence to the approved QAPP. This data was then entered into the previous DEC template.

Due to the length of sampling, three rolling 30-day geometric means were taken for each beach and the control site; the first one from June 19<sup>th</sup> to July 16<sup>th</sup>, the second one from July 14<sup>th</sup> to August 11<sup>th</sup> and the third one from July 7<sup>th</sup> to July 31<sup>st</sup>. All three geometric means were reported. This information allows the DEC to reevaluate the Tier 1 high priority beach designation for these locations (standards for fecal coliform: 100 FC/100mL, enterococci: 35 MPN/100mL).

## **Results**

### **North Kenai Beach**

Samples for fecal coliform bacteria at the North Kenai Beach ranged from ND (not detected; which may also include 0) to 660 FC/100mL. There were no exceedances of the 30-day geometric mean (17.2 FC/100mL, 30.5 FC/100mL, 27.1 FC/100mL). For the single sample standard there were two exceedances (500 FC/100mL, 660 FC/100mL; Table 1, Appendix B).

Enterococci ranged from ND to 4400 MPN/100mL. There were two exceedances of the 30-day geometric mean (22.5 MPN/100mL, 70.5 MPN/100mL, 96.4 MPN/100mL) as well as two exceedances of the single sample standard (4400 MPN/100mL and 4100 MPN/100mL; Table 2, Appendix B).

### **South Kenai Beach**

Samples for fecal coliform bacteria ranged from 17 to 1200 FC/100mL. All three 30-day geometric means had exceedances (120.3 FC/100mL, 123.8 FC/100mL, 129.9 FC/100mL). Also, there were six exceedances of the single sample standard (470 FC/100mL, 260 FC/100mL, 330 FC/100mL, 370 FC/100mL, 320 FC/100mL, 1200 FC/100mL; Table 1, Appendix C).

Enterococci ranged from 10 to 620 MPN/100mL. All three 30-day geometric means had exceedances (85.2 MPN/100mL, 115.8 MPN/100mL, 115.6 MPN/100mL) and there were three exceedances of the single sample standard (340 MPN/100mL, 320 MPN/100mL, 620 MPN/100mL; Table 2, Appendix C).

### **Warren Ames Bridge**

Samples for fecal coliform bacteria ranged from ND to 63 FC/100mL. There were no exceedances of the 30-day geometric means (17.2 FC/100mL, 20.9 FC/100mL, 20.5 FC/100mL) and there were no exceedances of the single sample standard at BRG1 (Table 1, Appendix D).

Enterococci ranged from ND to 50 MPN/100mL. There were no exceedances of the 30-day geometric means (10 MPN/100mL, 17.3 MPN/100mL, 13.3 MPN/100mL) and there were no exceedances of the single sample standard at BRG1 (Table 2, Appendix D).

**Table 1.** Standards and total exceedances of fecal coliform bacteria and enterococci for all samples taken during the 2013 personal use dipnet fishery on the Kenai River of Alaska.

Site	Fecal Coliform Bacteria					
	Single Sample Standard: 200 FC/100mL		30 Day Geometric Mean Standard: 100 FC/100mL			
	# of Single Sample Exceedance s	Value/s of Exceedances	Geometric Mean Value (6/19/2013- 7/16/2013)	Geometric Mean Value (7/14/2013- 8/11/2013)	Geometric Mean Value (7/7/2013- 7/31/2013)	Exceedance ? Y/N
<b>North Kenai Beach</b>	2	500, 660	17.2	30.5	27.1	N
<b>South Kenai Beach</b>	6	260, 320, 330, 370, 470, 1200	120.3	123.8	129.9	Y
<b>Warren Ames Bridge</b>	0	NA	17.2	20.9	20.5	N

**Table 2.** Standards and total exceedances of enterococci for all samples taken during the 2013 personal use dipnet fishery on the Kenai River of Alaska

Site	Enterococci					
	Single Sample Standard: 276 MPN/100mL		30 Day Geometric Mean Standard: 35 MPN/100mL			
	# of Single Sample Exceedance s	Value/s of Exceedance s	Geometric Mean Value (6/19/2013- 7/16/2013)	Geometric Mean Value (7/14/2013- 8/11/2013)	Geometric Mean Value (7/7/2013- 7/31/2013)	Exceedance ? Y/N
<b>North Kenai Beach</b>	2	4100, 4400	22.5	96.4	70.5	Y
<b>South Kenai Beach</b>	3	320, 340, 620	85.2	115.8	115.6	Y
<b>Warren Ames Bridge</b>	0	NA	10	17.3	13.3	N

### **Samples Prior to Personal Use Fishery**

Samples for fecal coliform bacteria taken prior to the opening of the Personal Use Fishery, including all locations ranged from ND to 670 FC/100mL. Four of the samples exceeded the single sample standard, 3 from South Kenai Beach (360 FC/100mL, 670 FC/100mL, 240 FC/100mL) and 1 from North Kenai Beach (330 FC/100mL).

Enterococci ranged from ND to 97 MPN/100mL and none of the samples exceeded the single sample standard.

### *Samples After Personal Use Fishery*

Samples for fecal coliform bacteria taken after the closing of the Personal Use Fishery, including all locations ranged from 2.9 to 320 FC/100mL. One of the samples exceeded the single sample standard at South Kenai Beach (320 FC/100mL).

Enterococci ranged from ND to 350 MPN/100mL and two of the samples exceeded the single sample standard. Both exceedances occurred at South Kenai Beach (330 MPN/100mL, 350 MPN/100mL).

## Discussion

After monitoring the mouth of the Kenai River for a span of 54 days, which included the entire personal use dipnet fishery, many of the samples were reported to be below exceedance levels.

North Kenai Beach had three exceedances for the fecal coliform single sample standard, two of which were recorded on the same sampling date at each North Kenai Beach location. Three days later, samples were collected from the previously exceeding locations and no exceedances were reported. The third exceedance occurred at one location on North Kenai Beach. However, a sample taken from the second North Kenai Beach location on the same sampling date was reported below exceedance levels.

Samples taken from South Kenai Beach exceeded the fecal coliform single sample standard ten times. The majority of exceedances occurred on dates where exceedances were reported for both South Kenai Beach locations. Many of the exceedances occurred during periods of consecutive dates, or dates close in the same timeframe, each of which resulted in at least one exceedance at South Kenai Beach..

In regards to enterococci, North Kenai Beach had two exceedances for the single sample standard. For each exceedance, a sample taken from a second North Kenai Beach Location was collected at North Kenai Beach on the same day. Each of these secondary samples were reported below exceedance. In addition, North Kenai Beach was sampled three days after each date during which an exceedance occurred, and enterococci levels were reported below the enterococci single sample standard.

Four samples collected from South Kenai Beach exceeded the enterococci single sample standard. On three of the four dates where an exceedance was reported for one South Kenai Beach location, a a sample was collected from the second South Kenai Beach location on the same day. The secondary samples were not reported to be in exceedance. Samples collected two days later from the exceeding sample locations showed no exceedances. However, samples were not collected after the final exceedance, which occurred on the last day of the predetermined sampling period.

The variability among samples results displays the importance of taking additional samples at each location to gain a representative sample of water quality with each sampling event.



Exceedances were reported before, during and after the dip net fisheries season. Results were not correlated to specific types of days (weekday/weekend). There are several possible causes for these exceedances. However, determining the exact cause of the exceedances that occurred during this sampling period is outside the scope of this report.

## Conclusion

Sample results for fecal coliform and enterococci testing from 2013 revealed an overall increase in the number of single sample exceedances compared to samples collected in 2012. In 2012 there were 4 single sample exceedances of either fecal coliform or enterococci out of a total of 63 samples, while in 2013 there were 20 single sample exceedances out of a total of 64 samples. This reveals an approximate 500% increase in the number of single sample exceedances from 2012 to 2013.

Due to the high level of human activity at the mouth of the Kenai River during the personal use fishery, it is important to continue monitoring efforts, which allow the DEC to keep the public informed on water quality and their recreational safety. Collaboration with DEC and KWF will help the City of Kenai provide a fun and safe recreational opportunity to the many residents and visitors who use the Kenai River each year (Figure 4)



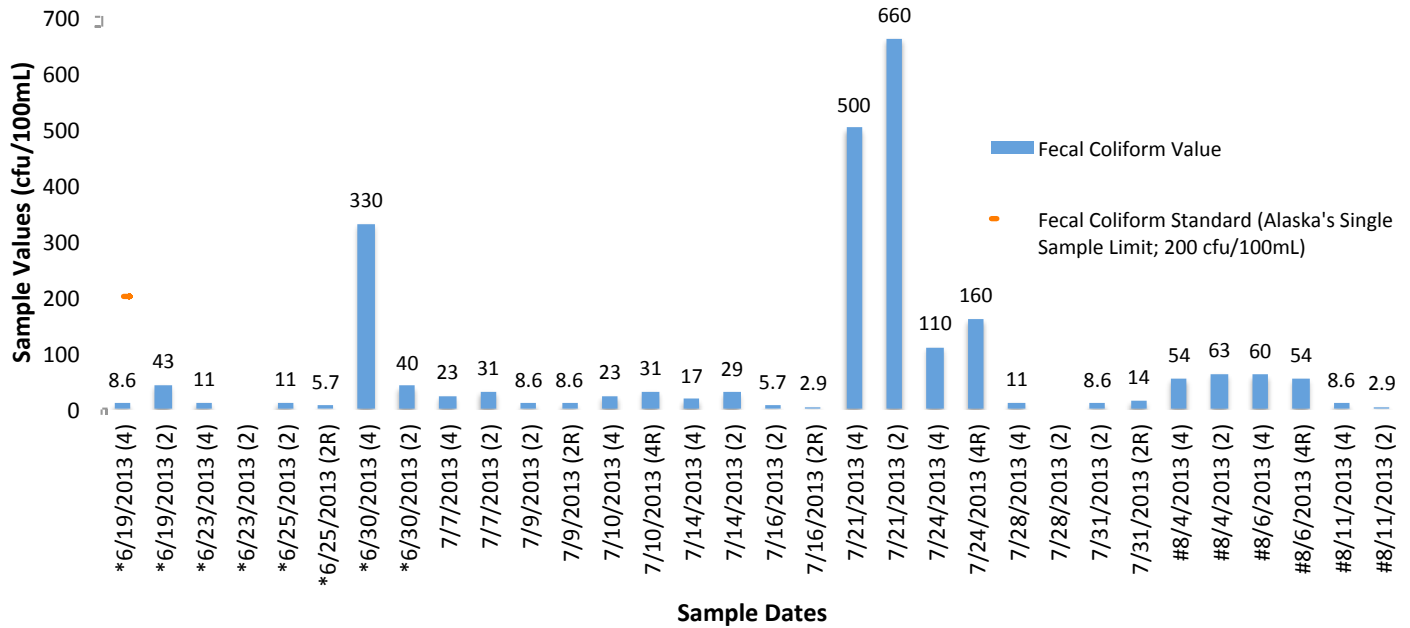
**Figure 4: Dipnet fisherman on North Kenai Beach, 2013**

## Appendix A: State and Federal Water Quality Standards

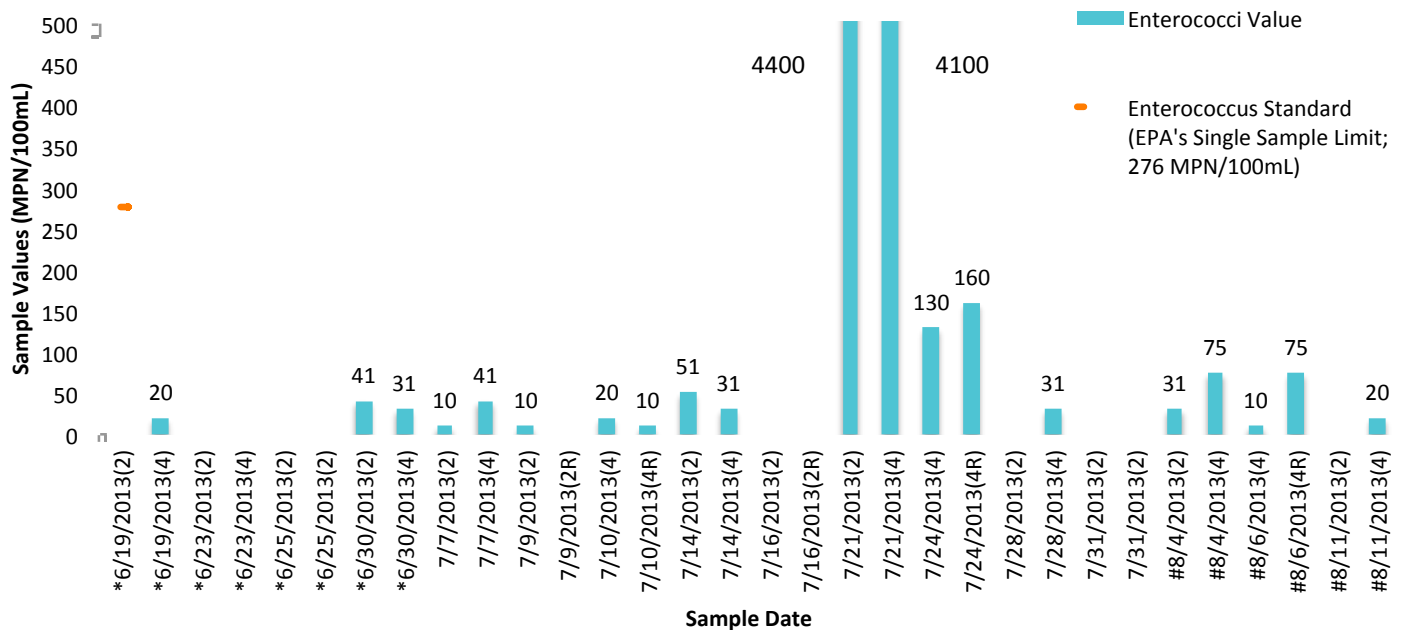
<b>State Water Quality Standards; Fecal Coliform Bacteria for Marine Waters</b>	
Water Recreation, Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 100 FC/100 mL, and not more than one sample, or more than 10% of the samples if there are more than 10 samples, may exceed 200 FC/100 mL
<b>Federal Beach (Marine) Water Quality Standards; Enterococci</b>	
Single sample maximum allowable density	No single sample may exceed 276 MPN/100 mL
Steady state geometric mean indicator density	35 MPN/100 mL

## Appendix B: North Kenai Beach sites 2 and 4 (NKB2/4) – Results

### North Kenai Beach Fecal Coliform 2013 Results



### North Kenai Beach Enterococci 2013 Results



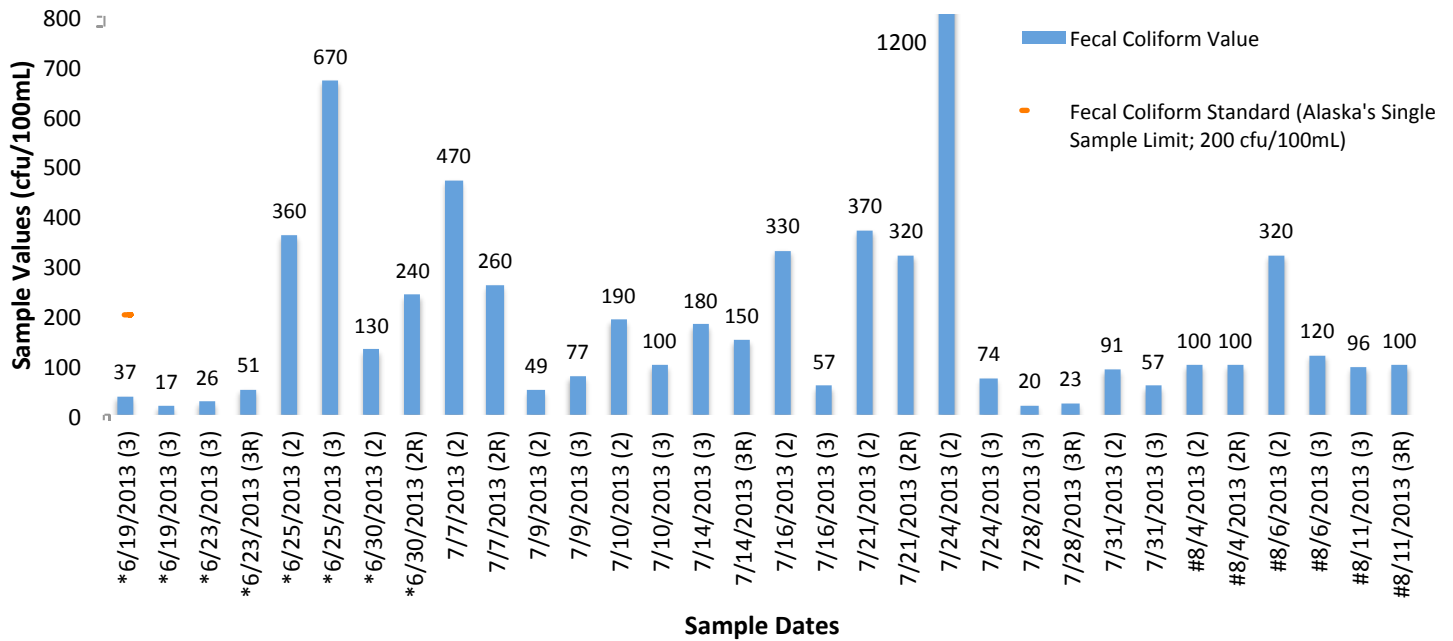
\* Samples taken prior to the opening of the personal use dipnet fishery.

# Samples taken after the personal use dipnet fishery.

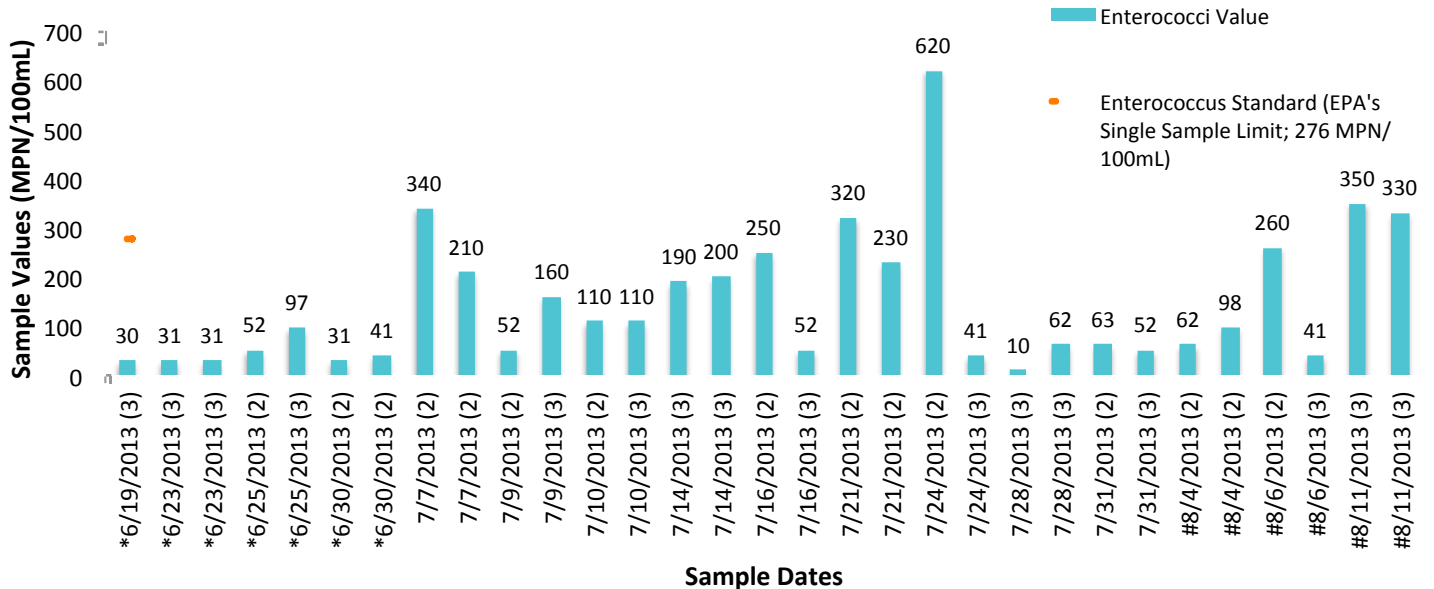


## Appendix C: South Kenai Beach sites 2 and 3 (SKB2/3) – Results

### South Kenai Beach Fecal Coliform 2013 Results



### South Kenai Beach Enterococci Results 2013

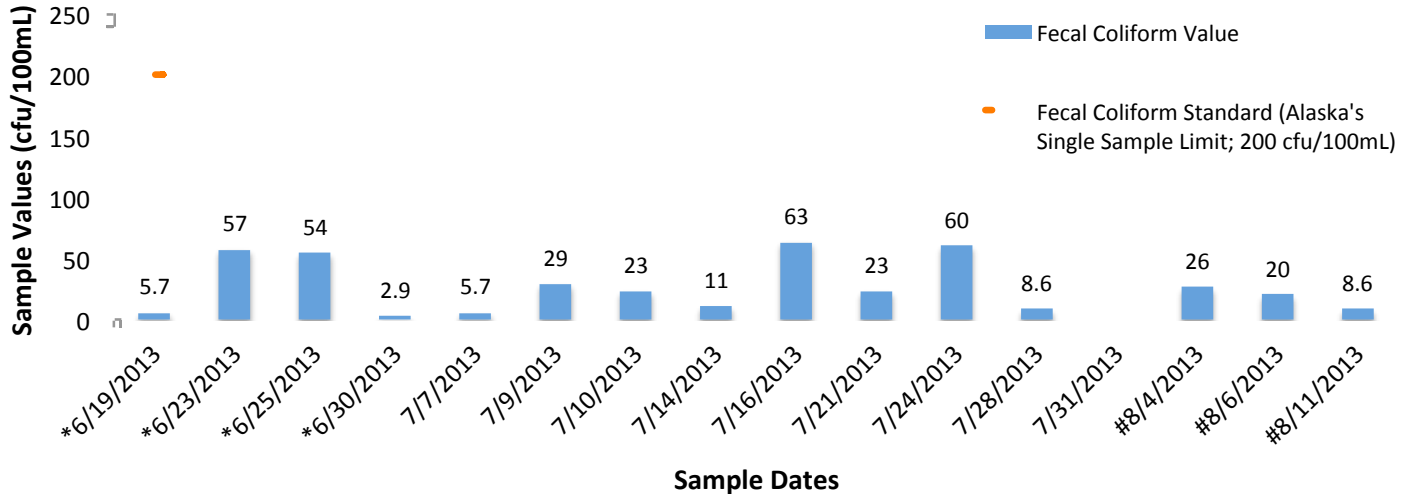


\* Samples taken prior to the opening of the personal use dipnet fishery.

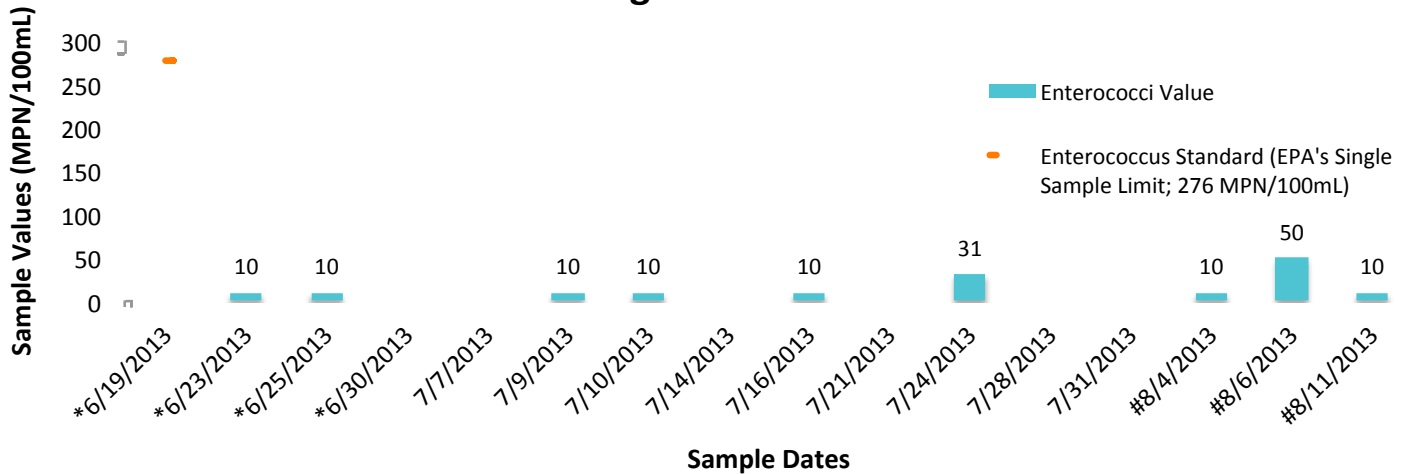
# Samples taken after the personal use dipnet fishery.

## Appendix D: Warren Ames Bridge (BRG1) – Results

### Warren Ames Bridge Fecal Coliform 2013 Results



### Warren Ames Bridge Enterococci 2013 Results



\* Samples taken prior to the opening of the personal use dipnet fishery.

# Samples taken after the personal use dipnet fishery.