Water Quality Evaluation of the Lower Little Susitna River—July 2010 through June 2011

ALASKA Department of Environmental Conservation

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Summary

Water sampling for total aromatic hydrocarbon analyses and measures of turbidity were conducted on the lower Little Susitna River in August 2010 and June 2011 to evaluate water quality relative to Alaska water quality standards (18 AAC 70). Sampling was conducted to provide additional information on the spatial and temporal variability in TAH concentrations relative to boat use at the Public Use Facility (PUF) during the coho and Chinook sport fisheries. Macroinvertebrates and rearing juvenile salmon abundance at an upstream reference location was compared to samples collected 4 km below the boat launch.

TAH concentrations exceeded water quality standards on 4 of the 6 sampling dates in August 2010 and on all 3 sampling dates in June 2011. Exceedances occurred from sampling locations 4 km above the PUF to 12 km downstream of the PUF. Consistent with previous reports, TAH concentrations were related to boat use during the sampling period. Turbidity downstream from the PUF was 5 NTU to 10 NTU higher than at the reference location.

The abundance of drifting macroinvertebrates and fish were higher at the reference site upstream of the PUF than at sampling reaches located downstream from the PUF boat launch.

Results from FY11 sampling support previous results of consistent exceedances of Alaska water quality standards for petroleum hydrocarbons and turbidity. Measures of the biotic community support the hypothesis that changes in water quality are affecting the biotic community of the Little Susitna River.

Introduction

The Little Susitna River is managed under the Susitna Area Recreational Rivers Management Plan. The river supports a highly popular salmon and trout fishery. The lower river is a popular recreational area for motorized and non-motorized boating, camping and sport fishing. Initial studies have determined that the intensive recreational use of the lower river near the Public Use Facility have resulted in increasing concentrations of water column total aromatic hydrocarbons and suspended sediment that periodically exceed state water quality standards. ACWA priority actions are to continue monitoring turbidity, water column TAH, boat use patterns, and the aquatic community. These actions are necessary to determine spatial and temporal variability in TAH and turbidity, evaluate whether initial findings are consistent, monitor changes in water quality relative to changing use patterns or management, and to assess potential impacts.

Initial evaluation of Little Susitna River hydrocarbon concentrations and other water quality parameters began in FY08 with water sample collection above and below access points near Houston and the PUF. Concentrations of hydrocarbons exceeded state water quality standards at sites above and below the PUF. Therefore, the number of sampling locations and frequency were increased to provide more information on the duration and spatial extent of hydrocarbon contamination. Weekly TAH and turbidity sampling at sites from 1 km upstream to 4 km downstream from the PUF was continued through July and September of 2008 and in May and June of 2009 (FY09). These same sampling

locations and sampling frequency were used in the fall of 2009 and spring of 2010 (FY10). Water sampling for hydrocarbon analyses was accompanied by surveys of boat use at the launch and at the entry booth. Grab samples for turbidity were augmented with hourly turbidity measures obtained from data loggers.

In recent Little Susitna River studies, TAH concentrations and turbidity exceed state water quality standards during intensive use accompanied by low flows (Table 1). Flow-corrected TAH concentrations are correlated with 2-cycle boat motor use recorded during the sampling period. Turbidity increased from 5 to 30 NTU compared to background values during intensive use. Juvenile salmon catch rates were significantly higher upstream compared to catch rates within concentrated use areas.

Review of the existing data by the state resource agencies has led to the conclusion that even though data collected to date has recorded periods when hydrocarbon concentrations exceed water quality standards, additional data collection is necessary prior to a decision about whether or not to list the waters as impaired. Further data will help determine whether exceedances are persistent over time, and how far upstream and downstream concentrations are above state standards. Additional TAH and boat use data will build upon existing information, providing consistent measures which will allow for further evaluations of relationships observed between 2-cycle motors and concentrations.

Table 1. List of dates when TAH concentrations at sampling locations near the Public Use Facility exceeded the State Water Quality Standard of 10 µg/L TAH for Petroleum, Hydrocarbons, Oils and Grease for Fresh Water Uses. Growth and Propagation, of Fish, Shellfish, Other Aquatic Life, and Wildlife (18 AAC 70.020(b)(5)(c)).

Date	Maximum TAH (µg/L)	Flow (cfs)
8/19/07	10.17	459
6/1/08	28.6	511
6/8/08	75.2	465
6/15/08	22.8	594
6/29/08	13.1	707
8/2/08	23.9	485
8/10/08	30.8	525
8/13/08	16.5	479
8/17/08	27.9	387
8/24/08	10.4	379
6/7/09	12.7	857
7/26/09	15.7	318
5/23/10	11.7	361
6/13/10	13.9	335

Frequent sampling in a 24-hour period and at increasing distances upstream and downstream during heavy use periods was used to determine the extent and duration of exceedances as hydrocarbons are transported downstream and evaporate from the water surface. Similarly, continued FY11 turbidity

sampling provided a full season of water quality and boat use data. Additional sampling was conducted in order to confirm background concentrations. Biotic measures built upon previous data collection and provides a measure of potential impacts from water quality exceedances and a tool to evaluate system recovery.

Project tasks include: (1) further quantifying the spatial and temporal distribution of total aromatic hydrocarbon concentrations near the public boat launch and to determine the relationship between 2 and 4-stroke motor use, stream flow, and hydrocarbon concentrations; (2) measuring changes in water turbidity from boat use; (3) measuring the differences in the biological community; and (4) collecting basic water chemistry data.

Methods

Sampling design, methods, equipment calibration, quality assurance, data management and data validation are described in a Quality Assurance Project Plan approved by the Department of Environmental Conservation. The procedures outlined in that plan were followed during all data sampling and analyses.

Sampling Locations

The sampling locations for TAH and basic water chemistry in the fall were located at 8.0, 4.0, and 1.0 km upstream of the PUF; at the PUF, and 4.0 km, 8.0 km, and 16 km downstream. In June, monitoring occurred at the PUF (Figures 2 and 3). Basic water chemistry was conducted at all sampling locations on all sampling dates.

Reference turbidity samples were collected near the Parks Highway upstream of the Millers Reach boat launch, which is above most boat-accessed fishing. Samples within heavy use areas were collected at TAH sampling locations. Continuous turbidity loggers were placed at the reference location near Millers Reach, and at approximately 4.0 km and 8.0 km below the PUF. Macroinvertebrate and fish sampling were collected in three sampling reaches located approximately 8 km upstream of the PUF and three sampling reaches located 4 km below the PUF.

Sampling Frequency

Water sample collection and boat surveys were conducted on Sunday August 1, Saturday August 7, Sunday August 8, Monday August 9, Sunday August 15, Saturday August 21, 2010, and Saturday June 4, Saturday June 11 and Sunday June 12, 2011. On August 4, 8, 15, 21 water samples (TAH, pH, specific conductivity, dissolved oxygen, and turbidity) were collected at sampling locations from 8 km above to 12 km downstream from the PUF. On August 7 and 8, samples (TAH and turbidity) were collected at the PUF every 3 hours from 06:00 to 21:00 and on August 9 from 06:00 to 12:00. On June 4, 11 and 12 sampling (TAH and turbidity) was conducted every 3 hours from 09:00 to 18:00.

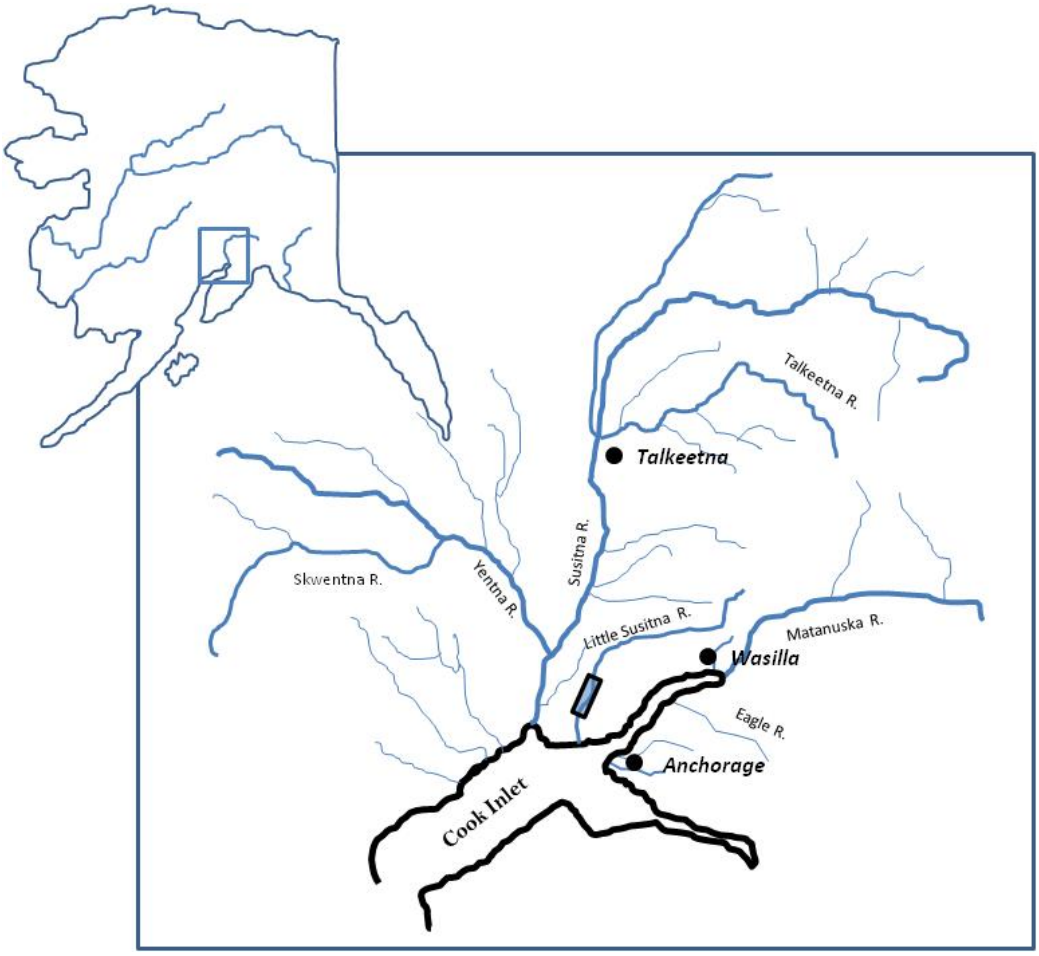

Figure 1. Drawing of Southcentral Alaska showing location of the Little Susitna River and approximate sampling reach (black rectangle).

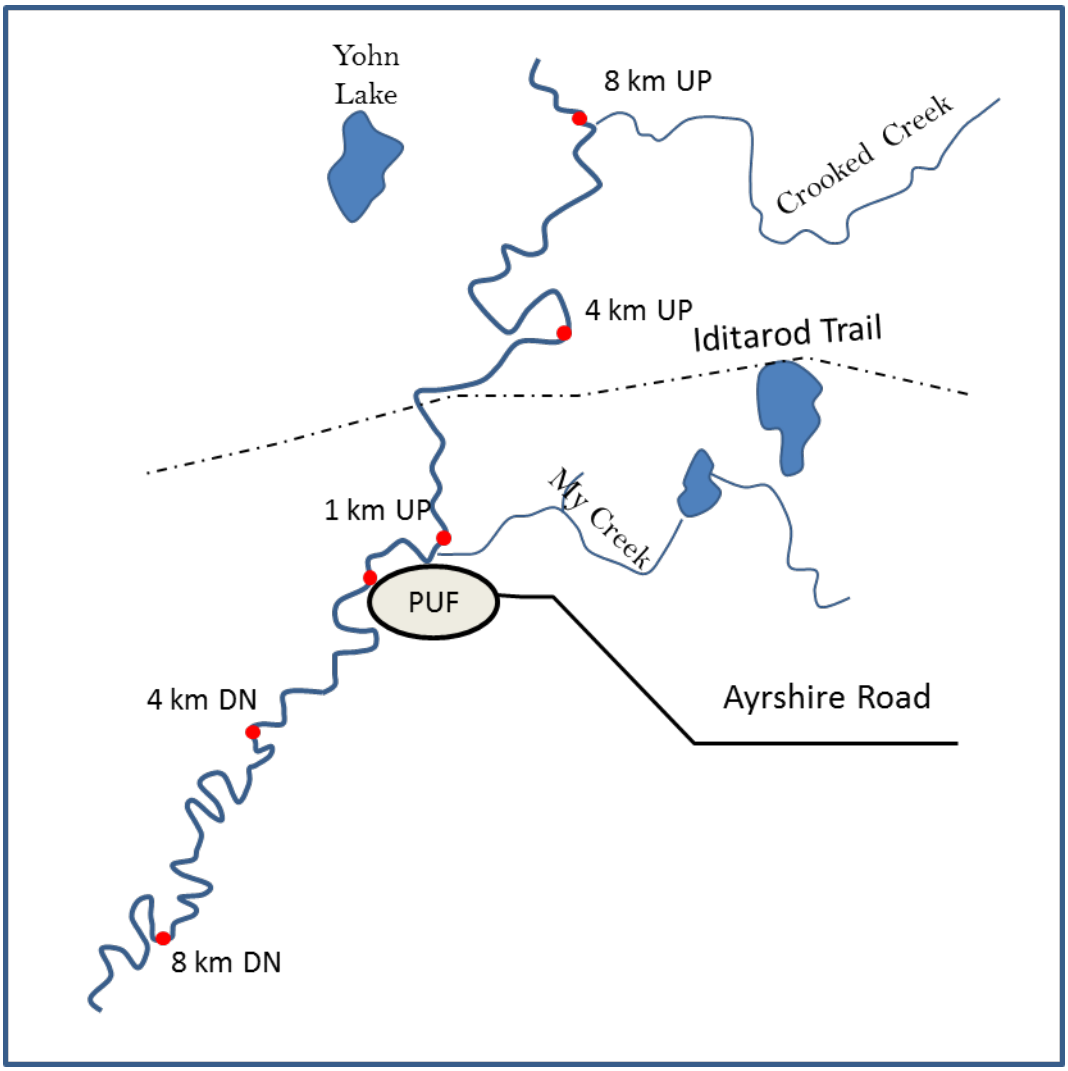

Figure 2. Sampling locations relative to the PUF boat launch and campground.

Total Aromatic Hydrocarbons (TAH)

Samples were collected in accordance with the USGS report "Field guide for collecting samples for analysis of volatile organic compounds in stream water for the national Water Quality Assessment Program (USGS Open File Report 97-401)." This report contains detailed instructions on sample collection procedures using the USGS-designed VOC sampler distributed by Wildco. Prior to sample collection, the VOC sampler was decontaminated in Alconox (or similar detergent) and rinsed thoroughly.

TAH samples were collected in 40 ml sample bottles obtained from the contract laboratory (AM Test Inc., Kirkland, WA). One sample to be analyzed for TAH was collected (2 vials) from each lowering of the sampler. Samples were collected at least 12 cm below the water surface and away from any observable sheen. Sampling locations were accessed by boat or foot. When sampling from the boat, the boat was anchored, the motor turned off for 5 minutes prior to a sample being collected upstream off of the bow. The samples were collected adjacent to the thalweg. A rope was attached to the sampler cables and the sampler lowered into the flowing water until the sampler opening was at 0.5 stream depth. The attached rope and weighted sampler was used to keep the sampler upright. Hydrochloric acid, provided by the contract laboratory, was added to each vial after sample collection for preservation and capped (~1 drop). Clean vinyl gloves were worn at all times when handling sampling bottles. The samples were checked to ensure that there were no air bubbles after capping. The sample bottles were labeled using adhesive labels, placed within a cooler on frozen gel-paks and shipped to the contract laboratory. Sample temperatures were recorded by the contract laboratory upon receipt. Trip blanks of commercial water accompanied the sample bottles during collection, shipping, and analyses. Field blanks were collected at the end of each sampling event by submerging the sampler in a stainless steel pot filled with artesian well water (potable water at the PUF boat launch). TAH concentrations were evaluated relative to state water quality standards (18 AAC 70) for fresh water.

Boat Use Surveys

Boat use surveys were conducted at the PUF boat launch on each sampling date. All boats that used the launch or passed through the launch were counted. We logged the time, direction of travel, motor size (HP as printed on the cowling), and motor type as 2-cycle, 4-cycle, e-tec, or non-motorized. Boat survey data were summarized for each sampling period on each sampling date. Linear regression was used to test for significant relationships between boat use by motor type and TAH concentrations.

pH, Specific Conductance, Turbidity, and Dissolved Oxygen

Water characteristics from well mixed samples were measured on all sampling dates (pH/conductivity, (YSI), dissolved oxygen (YSI 550), and turbidity, (LaMotte TC-3000e)). Support equipment included extra batteries and sample bottles. Clean sample bottles were used. All meters were tested and calibrated prior to use and recorded in equipment log per QAPP. Dissolved oxygen, pH, specific conductance and turbidity were measured in situ at each sampling location on each sampling date in August. Turbidity was measured concurrent with TAH sampling in June at the PUF boat launch.

Continuous (hourly) measures of turbidity were collected using a Hach mini-sonde MS5. The sondes were suspended in the water column from a cable attached to overhanging vegetation. The sondes were positioned near the thalweg on the outside of a meander bend. The sondes were calibrated using turbidity standards prior to deployment. Sondes were deployed from August 1 through September 5, 2010 and from June 4 through June 29, 2011. Sondes were checked and cleared of debris every other week.

Macroinvertebrates

Macroinvertebrates were captured as they drift within the water column. Drift nets (363 μm mesh) were suspended from a floating frame. A velocity meter (General Oceanics) was placed within the

opening of the net. The drift remained in place until velocity at the inlet decreases indicating that the net mesh is filling with debris. Invertebrate samples were collected at three transects above (8 km upstream) and three transects below the PUF (4km downstream). Three samples were collected at each transect from near the right bank, middle, and left bank. The total sample was transferred to a sample container (500 ml nalgene bottle) labeled (site name, location, date, replicate) and preserved with ethanol. The sample was returned to the ARRI laboratory. All invertebrates were removed from the sample and identified to the lowest taxonomic level, generally genus. Total invertebrates, EPT taxa, Diptera, and Chironomidae per cubic meter were calculated from each sample. Mean values for each metric were calculated from the three samples at each transect. T-tests were used to test for significant differences between invertebrate metrics from upstream and downstream samples (N=3, p = 0.05).

Juvenile Salmon

Fish were collected in 10 baited minnow traps soaked for 12 to 24 hours at three sampling reaches above and three sampling reaches below the PUF. Captured fish were identified, measured to fork length, and observed for deformities, eroded fins, lesions or tumors (DELT anomalies) using the USGS NAWQA methodology (Moulton II et al. 2002). Average catch per unit trap (CPUT) for coho, Chinook, and total salmonids were tested for significant upstream to downstream differences (N=3, p = 0.05).

Results

Total Aromatic Hydrocarbons

Concentrations of TAH on sampling dates in August 2010 and June 2011 are shown in Figures 3 and 4. TAH concentrations exceed state water quality standard concentrations of 10 µg/L on August 7, 8, 9, and 15, 2010 and on June 5, 11, and 12, 2011. On August 8, concentrations were above state water quality standards at sampling sites located 4 km upstream to 8 km downstream from the PUF boat launch. TAH concentrations generally were higher downstream from the PUF (LS-0km). TAH concentrations were above detection limits on one sampling date at the site located 8 km above the PUF boat launch. Concentrations were above detection limits on all sampling dates at the PUF and all sampling sites downstream. TAH concentrations exceeded state water quality standards on one sampling date 12 km below the PUF.

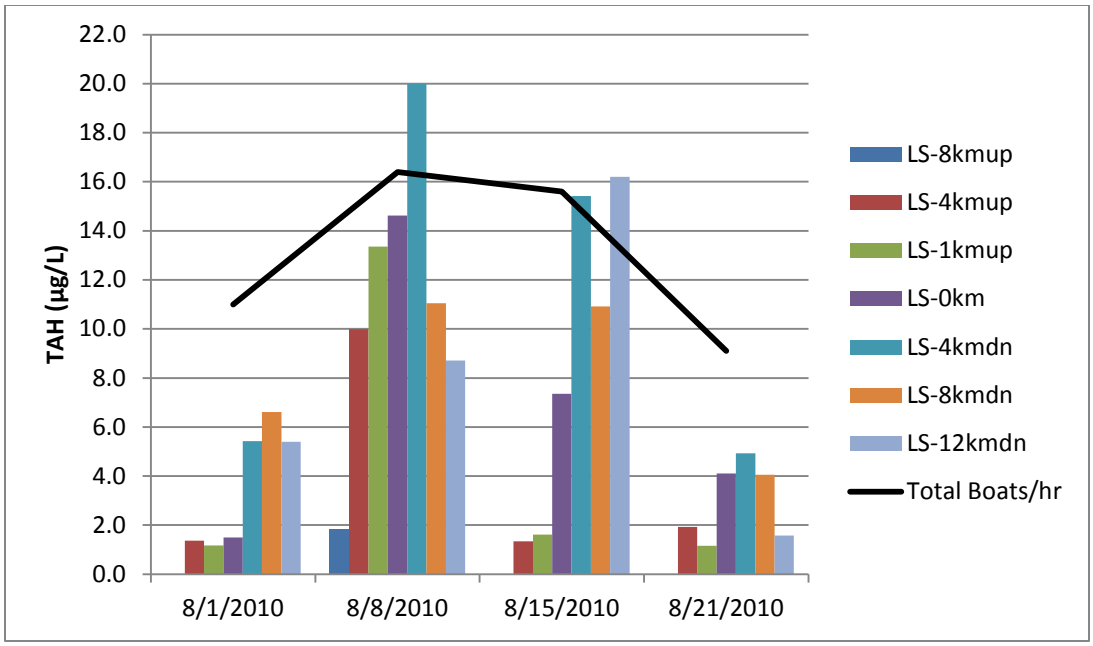

Figure 3. August 2010 TAH concentrations at sampling locations distributed from 8 km above the PUF (8kmup) to 12 km below the PUF boat launch (12 kmdn). The line indicated total boats per hour counted during sampling.

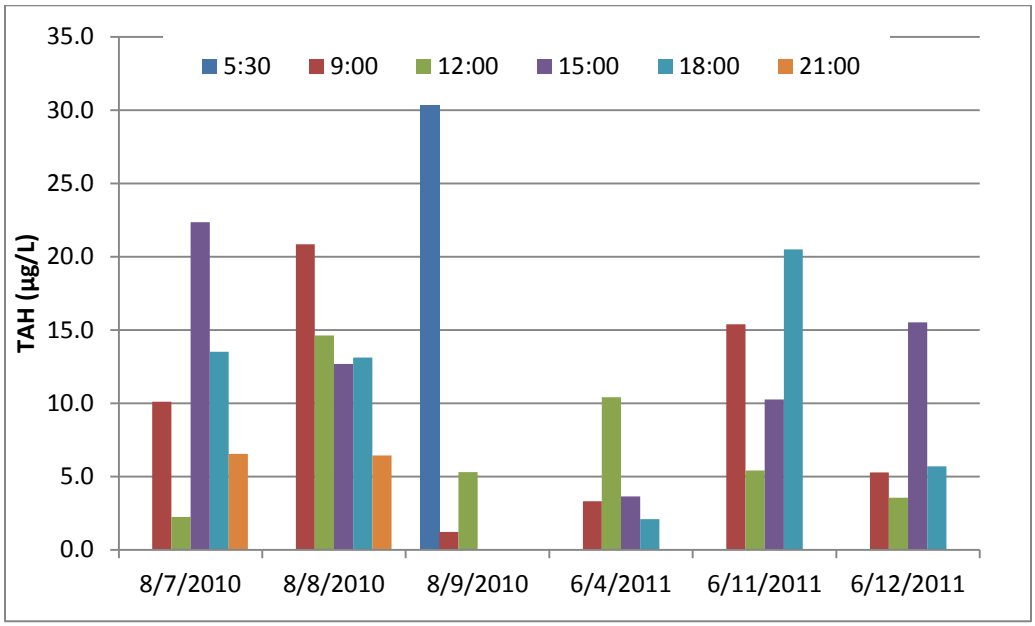

Figure 4. TAH concentrations every 3 hours in August 2010 and June 2011.

Concentration of TAH were variable throughout the day with concentrations ranging from below detection limits to over 20 µg/L (Figure 3). On August 7 and 8 TAH were absent at 05:30 prior to most boat activity and peaked at 09:00 and 15:00, respectively. However, on Monday, August 9, TAH concentrations were near 30 µg/L at 05:30. In August, 60%, 80% and 30% of the daily samples exceeded state water quality standards for the 7th, 8th, and 9th, respectively. In June, the timing of peak concentrations occurred between 12:00 and 18:00, and 25% to 75% of the daily samples in June exceeded state water quality standards.

Table 2. Results of boat surveys conducted at the PUF boat launch during TAH sampling.

Date	Survey Start Time	Survey Stop Time	Total Count	4 Cycle	2 Cycle	E-tec	Non-Motorized	Operates Upstream	Operates Downstream	Mode HP
8/1/2010	11:50	14:50	33	15	14	2	2	13	21	35
8/7/2010	5:30	8:59	58	36	20	2	0	18	42	65
8/7/2010	9:04	11:56	45	25	19	1	0	14	25	40
8/7/2010	12:00	14:19	70	26	35	3	3	27	40	35
8/7/2010	15:00	17:56	46	20	24	1	1	23	22	80
8/7/2010	18:00	20:55	30	7	20	1	1	9	17	115
8/8/2010	5:40	8:56	47	30	16	1	0	16	30	65
8/8/2010	9:00	11:58	64	38	23	3	0	21	35	65
8/8/2010	12:08	14:56	46	21	22	0	3	15	24	40
8/8/2010	15:00	20:35	72	33	32	2	5	35	34	80
8/9/2010	5:31	8:57	47	29	18	0	0	17	31	65
8/9/2010	9:08	11:53	38	26	12	0	0	10	22	40
8/15/2010	12:38	16:10	55	27	22	5	1	19	32	80
8/21/2010	15:50	18:29	24	11	13	0	0	11	11	65
6/4/2011	9:15	11:59	18	11	7	0	0	10	10	65
6/4/2011	12:12	14:52	24	17	7	0	0	14	13	65
6/4/2011	15:02	17:26	17	12	5	0	0	13	5	40
6/11/2011	9:30	11:56	33	17	14	2	0	0	0	65
6/11/2011	12:06	14:56	44	21	22	1	0	20	28	65
6/11/2011	15:02	17:45	40	19	20	0	1	27	14	65
6/12/2011	9:24	11:55	23	16	7	0	0	9	15	65
6/12/2011	12:02	14:49	34	10	23	1	0	17	19	35
6/12/2011	15:28	17:30	23	9	11	2	1	15	8	65

Boat use within the sampling reach for each sample period is shown in Table 2. Flow corrected average concentrations below the PUF in August were consistent with previous regression equations with boats by motor type (Davis et al. 2011). TAH concentrations collected every 3 hours throughout the day in August and June were related to boat use the previous 3 hours. Concentrations of TAH were significantly related to total boats/hr. ($p = 0.004$) and 2-cycle/hr, the 3 hours prior to sampling but not significant for 4-cycle use per hour.

Turbidity

Turbidity within the Little Susitna River from grab samples collected in August 2010 were consistently higher at sampling locations near the PUF relative to reference samples (Figure 5). Reference values ranged from less than 4 NTU to over 5 NTU. In comparison, turbidity at the PUF ranged from over 7 NTU to 12 NTU, and from 12 NTU to 17 NTU 12 km downstream from the launch. Regression relationships between turbidity and sampling location were significant ($p < 0.05$) on all dates except for August 21. The difference in turbidity from the reference site to sites located below the PUF was not significantly related to total boats ($N = 4$, $p < 0.05$). Turbidity varied throughout the day increasing up to 6 NTU between 06:00 and 21:00 in August during high boat use periods (Figure 6). There was no significant difference between turbidity samples collected near the streambank and the middle of the channel (Figure 7).

Turbidity data from loggers recording every hour showed large differences between the reference site and data collected 4 and 8 km below the PUF (Figure 8). At the reference site 80% of the samples were less than 14 NTU; however, at the site located 4 km below the PUF 80% of the samples were less than or equal to 35 NTU.

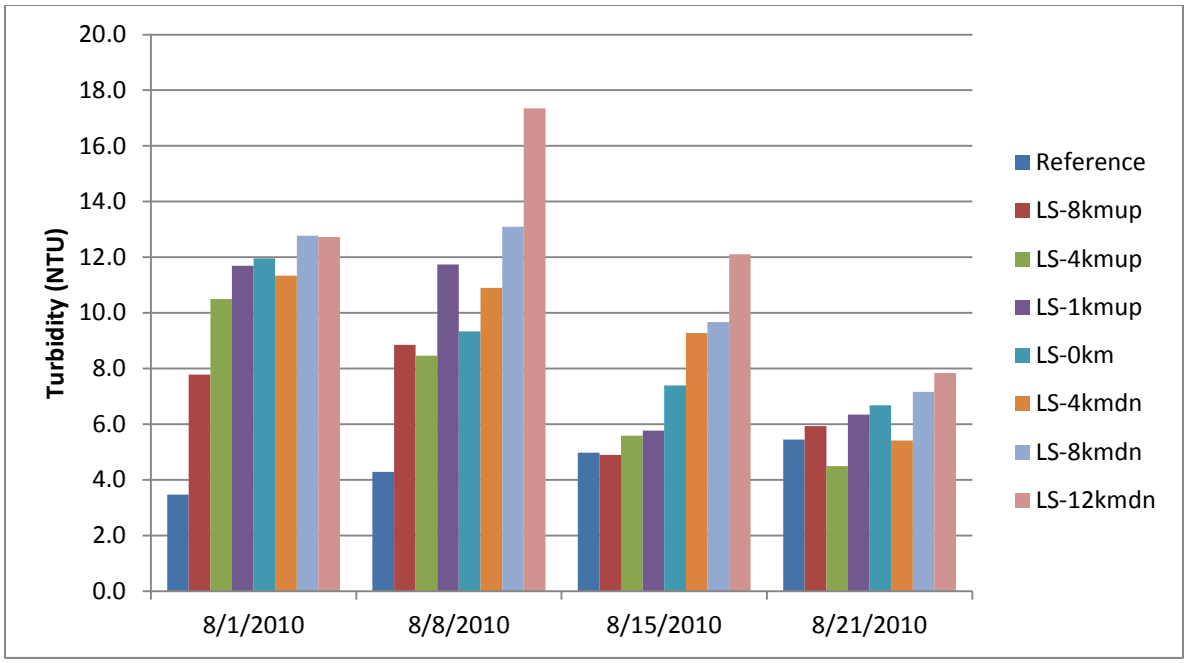

Figure 5. Turbidity from grab samples collected at the reference and sampling locations above and below the PUF in August 2010.

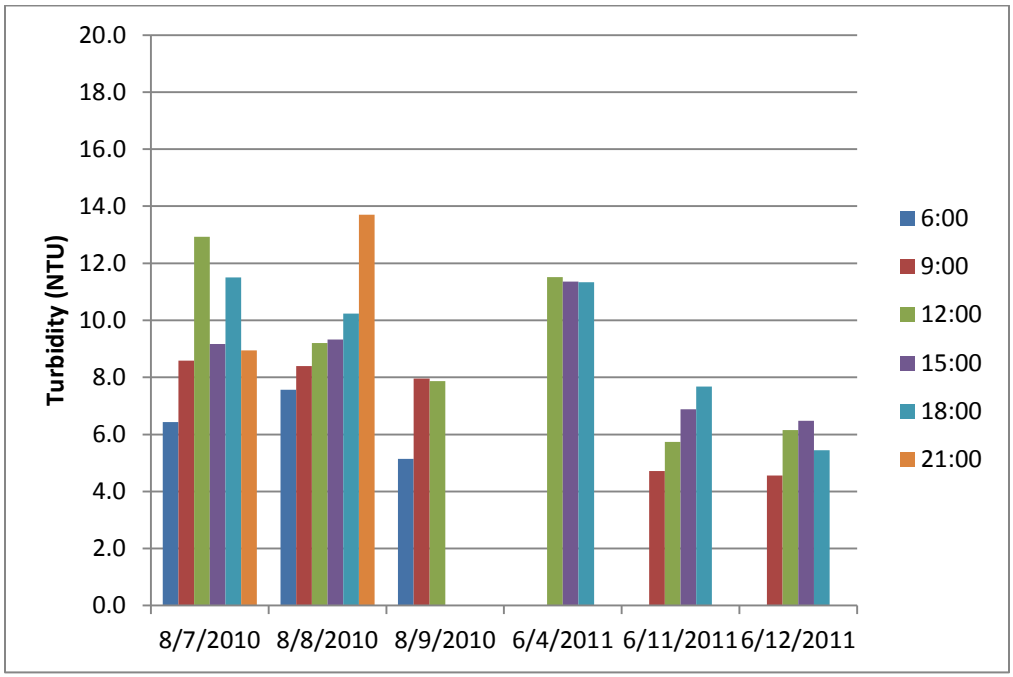

Figure 6. Turbidity from grab samples collected at the PUF throughout the day during sampling in August 2010 and June 2011.

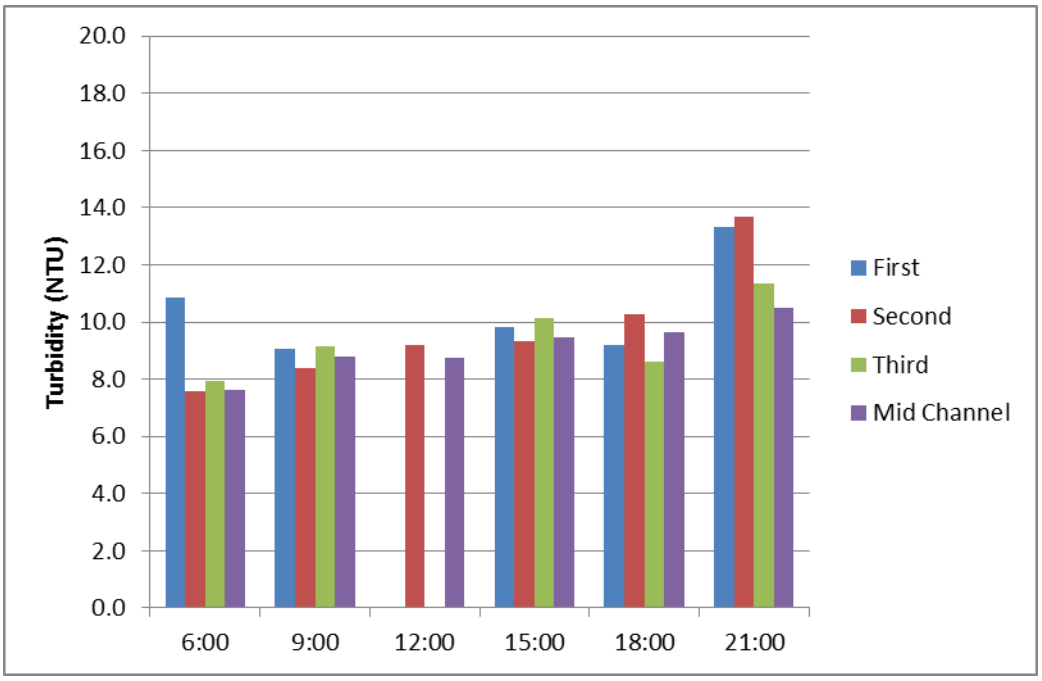

Figure 7. Stream water turbidity at locations distributed from the near the left bank (First 1/8) to the middle of the channel at the PUF boat launch on August 8, 2011.

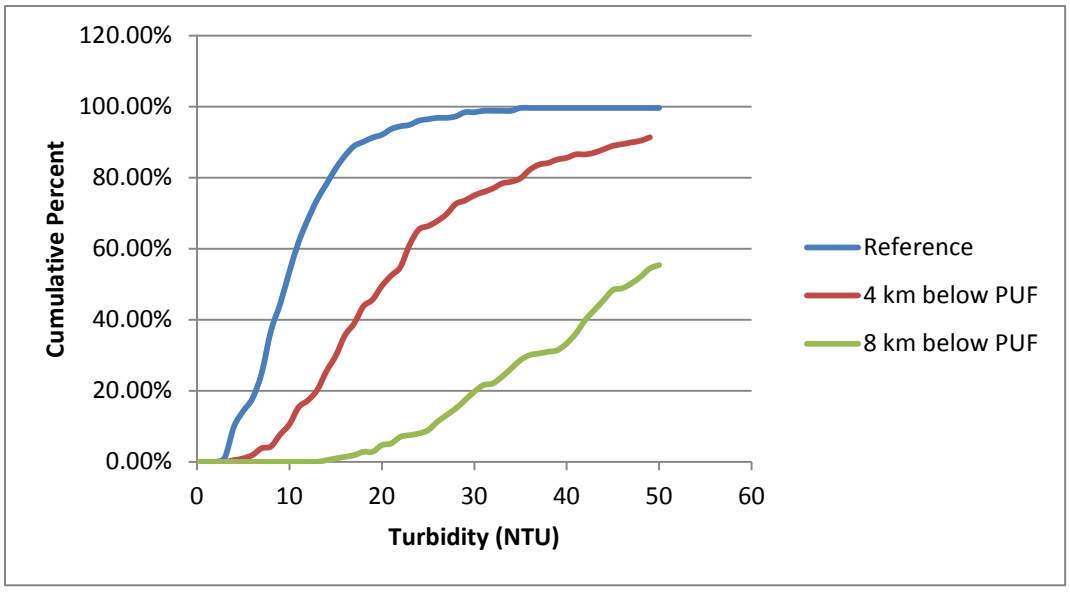

Figure 8. Cumulative frequency distribution of turbidity in the Little Susitna River at reference and sampling locations below the PUF.

Macroinvertebrates and Juvenile Salmon

There were significant differences in macroinvertebrate and rearing juvenile salmon above and below the PUF (Table 3 and Figure 9). Total macroinvertebrate drift density decreased from 3.8 to 2.5 insects per cubic meter. This is a difference of 1.3 insects per cubic meter. At a discharge of 400 cfs or 11.32 cubic meters per second, this is a difference of 14.9 insects per second, 895 insects per minute, or 53,698 insects per hour. The average density of pollution intolerant Ephemerptera, Plecoptera, and Trichoptera (EPT) also were significantly higher upstream of the PUF boat launch. Differences were even greater for Diptera which were composed primarily of Chironomidae.

Total juvenile salmon CPUT upstream of the PUF averaged 43.4 upstream of the PUF and 27.2 below the PUF. The difference in average total salmonid CPUT was statistically significant ($p < 0.05$). There was a large difference in the CPUT of Chinook salmon which was 15.9 above and 2.4 below the PUF. However, there was no significant difference in CPUT of rearing coho salmon.

Table 3. Average density of macroinvertebrates in drift at sites located above and below the PUF.

	Average		Standard Deviation		
	Upstream	Downstream	Upstream	Downstream	T-test, p
Average Density/m^3	3.77	2.45	1.46	0.87	0.017
Average EPT/m^3	0.29	0.15	0.20	0.12	0.054
Diptera/m^3	2.60	1.34	0.83	0.74	0.002
Chironomidae/m^3	2.46	1.31	0.75	0.74	0.002

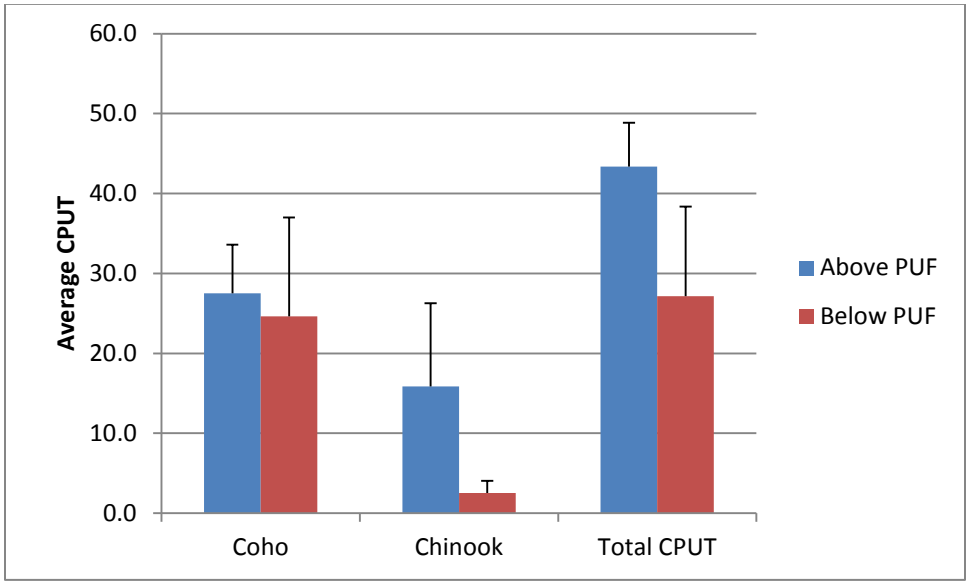

Figure 9. Average CPUT of juvenile coho and Chinook salmon in the Little Susitna River in August 2011 8 km above and 4 km below the PUF boat launch.

Discussion

The concentrations of hydrocarbons and changes in turbidity are consistent with previously reported results (Davis et al. 2011, Davis and Davis 2011). TAH concentrations continue to exceed state water quality standards from 4 km above to 16 km downstream from the PUF. TAH concentrations from samples collected on the Lower Little Susitna River are shown in Figure 10. The total number of days TAH concentrations exceeded state water quality standards and the maximum values for those dates are shown in Table 4. The increase in TAH concentrations is linked to boat use during the coho and Chinook sport fishery. The total number of boats operating during the sampling period explains most of the variability in TAH concentrations. TAH concentrations at the boat launch vary throughout the day and also are related to the number of boats operating prior to sampling.

The concentration of hydrocarbons collected every 3 hours just downstream from the boat launch during this study was related to the total number of boats and total number of boats with 2-cycle motors, but was not related to the total number of boats with 4-cycle motors. When all data from previous intensive sampling is included, TAH concentrations are significantly correlated with all motor types; however, relationships are best for boats using 2-cycle motors or all motor types and there is a strong relationship between total boat counts and 2-cycle counts. This is consistent with other studies that have shown hydrocarbon discharge to be at least 10 times greater from carbureted 2-cycle motors compared to 4-cycle motors (Jüttner et al. 1995). However, mean TAH concentrations downstream from the PUF collected during weekly sampling are best explained by total boat counts and 2-cycle motors are estimated to contribute 1.3 times the TAH as 4-cycle motors (Davis et al. 2011). In addition, TAH discharge per boat is not related to the percent of boats (28 to 64%) that use 2-cycle motors (Davis et al. 2011). This suggests that a reduction in the number of 2-cycle motors may not result in significant declines in TAH concentrations as has been reported elsewhere (Lico 2004). The differences in these relationships may be due to higher discharge from 2-cycle motors at the launch when initially starting and idling then when operating at full throttle. Hydrocarbon discharge from 2-cycle motors is much greater and fuel trapping efficiency lower at low operating speeds (Hare and Springer 1973, Butcher 1982). We have observed that 2-cycle motors generally take longer to start and spend more time idling at the launch when compared to other motor types.

Boat use of the lower river also increases turbidity relative to reference locations. The increase in turbidity has been shown to decrease primary productivity in the lower Little Susitna River (Davis et al. 2009). The density of macroinvertebrates and fish decreases concomitant with increases in hydrocarbons and turbidity. While not directly addressed, biotic effects are consistent with the direct or indirect effects of turbidity.

Hydrocarbon concentrations and turbidity should continue to be monitored on the lower Little Susitna River. TAH concentrations should be evaluated relative to the number of 2-cycle motors to determine whether reduction in the use of these motors reduce TAH concentrations below water quality standard concentrations as has been observed elsewhere (Lico 2004).

Additional work is necessary to test the hypothesis that increasing turbidities are affecting invertebrate and juvenile salmon rearing abundance. This hypothesis could be tested through combined field replicates and laboratory toxicology tests.

Table 4. Maximum TAH values for sample dates where concentrations at one or more sites exceeded water quality standard concentrations of 10 µg/L and corresponding stream flow. NM = not measured.

Date	Maximum TAH (µg/L)	Flow (cfs)
8/19/07	10.17	459
6/1/08	28.6	511
6/8/08	75.2	465
6/15/08	22.8	594
6/29/08	13.1	707
8/2/08	23.9	485
8/10/08	30.8	525
8/13/08	16.5	479
8/17/08	27.9	387
8/24/08	10.4	379
6/7/09	12.7	857
7/26/09	15.7	318
5/23/10	11.7	361
6/13/10	13.9	335
8/7/11	22.35	466
8/8/11	20.84	NM
8/9/11	30.35	NM
8/15/11	16.2	424
6/4/11	10.41	NM
6/11/11	20.49	NM
6/12/11	15.53	NM

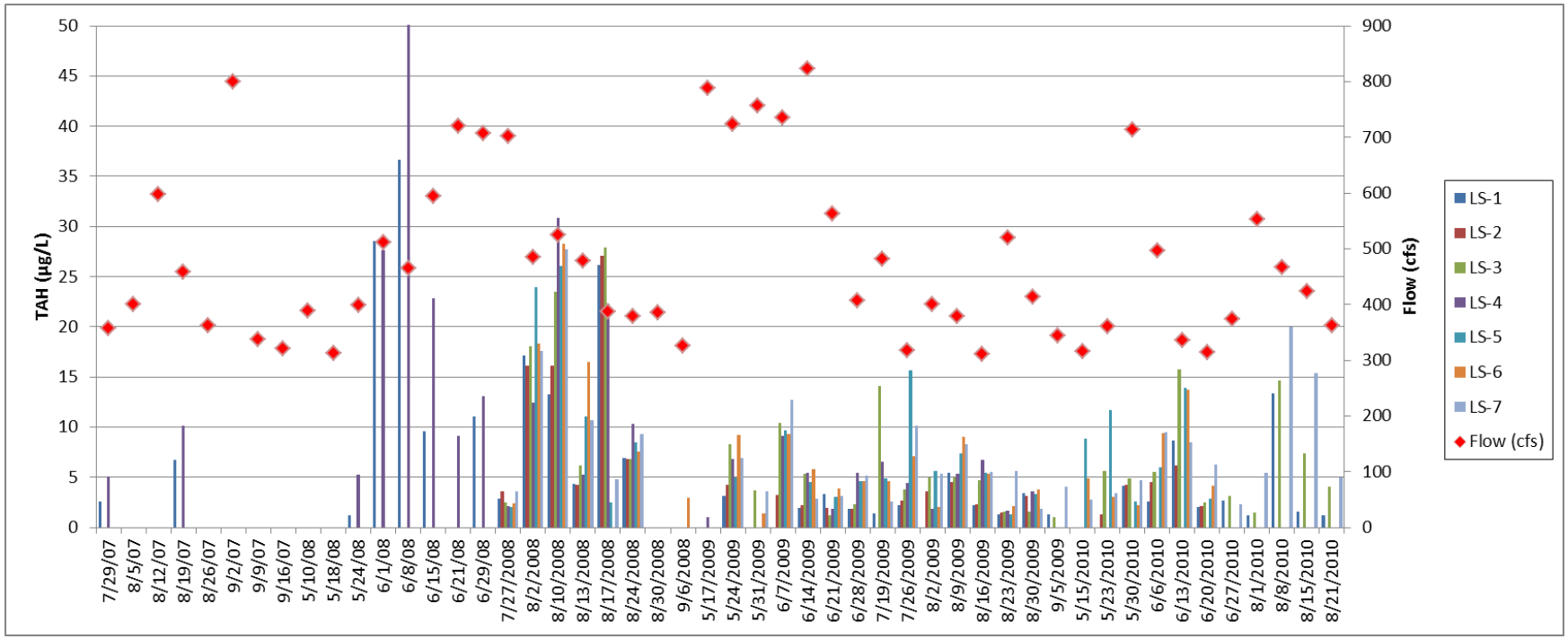

Figure 10. TAH concentrations for all sampling dates and sample sites from 1 km above (LS-1) to 4 km below (LS-7) the PUF. Red triangles are corresponding stream flows.

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Appendix A. Project Data Table

Date	Site Name	Location	Measurement	Value	Units	Notes
8/1/2010	Little Susitna	LS-8kmup	Altitude	62	feet	
8/1/2010	Little Susitna	LS-4kmup	Altitude	50	feet	
8/1/2010	Little Susitna	LS-1kmup	Altitude	35	feet	
8/1/2010	Little Susitna	LS-0km	Altitude	61	feet	
8/1/2010	Little Susitna	LS-4kmdn	Altitude	61.00	feet	
8/1/2010	Little Susitna	LS-8kmdn	Altitude	37.00	feet	
8/1/2010	Little Susitna	LS-12kmdn	Altitude	27.00	feet	
8/8/2010	Little Susitna	LS-8kmup	Altitude	53	feet	
8/8/2010	Little Susitna	LS-4kmup	Altitude	21	feet	
8/8/2010	Little Susitna	LS-1kmup	Altitude	53	feet	
8/8/2010	Little Susitna	LS-4kmdn	Altitude	25	feet	
8/8/2010	Little Susitna	LS-8kmdn	Altitude	32	feet	
8/8/2010	Little Susitna	LS-12kmdn	Altitude	35	feet	
8/15/2010	Little Susitna	LS-8kmup	Altitude	94	feet	
8/15/2010	Little Susitna	LS-4kmup	Altitude	18	feet	
8/15/2010	Little Susitna	LS-1kmup	Altitude	18	feet	
8/15/2010	Little Susitna	LS-0km	Altitude	46	feet	
8/15/2010	Little Susitna	LS-8kmdn	Altitude	33	feet	
8/15/2010	Little Susitna	LS-4kmdn	Altitude	38	feet	
8/15/2010	Little Susitna	LS-12kmdn	Altitude	37	feet	
8/21/2010	Little Susitna	LS-8kmup	Altitude	36	feet	
8/21/2010	Little Susitna	LS-4kmup	Altitude	78	feet	
8/21/2010	Little Susitna	LS-1kmup	Altitude	59	feet	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/21/2010	Little Susitna	LS-0km	Altitude	46	feet	
8/21/2010	Little Susitna	LS-4kmdn	Altitude	68	feet	
8/21/2010	Little Susitna	LS-8kmdn	Altitude	14	feet	
8/21/2010	Little Susitna	LS-12kmdn	Altitude	1	feet	
8/1/2010	Little Susitna	LS-4kmup	Apparent Color	8.3	CU	
8/1/2010	Little Susitna	LS-1kmup	Apparent Color	7.4	CU	
8/1/2010	Little Susitna	LS-0km	Apparent Color	17.4	CU	
8/1/2010	Little Susitna	LS-8kmup	Average Turbidity	7.78	NTU	
8/1/2010	Little Susitna	LS-4kmup	Average Turbidity	10.49	NTU	
8/1/2010	Little Susitna	LS-1kmup	Average Turbidity	11.69	NTU	
8/1/2010	Little Susitna	LS-0km	Average Turbidity	11.96	NTU	
8/1/2010	Little Susitna	LS-4kmdn	Average Turbidity	11.33	NTU	
8/1/2010	Little Susitna	LS-8kmdn	Average Turbidity	12.77	NTU	
8/1/2010	Little Susitna	LS-12kmdn	Average Turbidity	12.73	NTU	
8/1/2010	Little Susitna	Houston	Average Turbidity	3.47	NTU	
8/6/2010	Little Susitna	Houston	Average Turbidity	4.28	NTU	
8/7/2010	Little Susitna	LS-0km	Average Turbidity	6.43		6:30
8/7/2010	Little Susitna	LS-0km	Average Turbidity	8.59	NTU	9:00
8/7/2010	Little Susitna	LS-0km	Average Turbidity	12.93	NTU	12:00
8/7/2010	Little Susitna	LS-0km	Average Turbidity	9.17	NTU	15:00
8/7/2010	Little Susitna	LS-0km	Average Turbidity	11.5	NTU	18:00
8/7/2010	Little Susitna	LS-0km	Average Turbidity	8.95	NTU	21:00
8/8/2010	Little Susitna	LS-8kmup	Average Turbidity	8.85	NTU	
8/8/2010	Little Susitna	LS-4kmup	Average Turbidity	8.46	NTU	
8/8/2010	Little Susitna	LS-1kmup	Average Turbidity	11.74	NTU	
8/8/2010	Little Susitna	LS-4kmdn	Average Turbidity	10.9	NTU	
8/8/2010	Little Susitna	LS-8kmdn	Average Turbidity	13.1	NTU	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/8/2010	Little Susitna	LS-12kmdn	Average Turbidity	17.35	NTU	
8/8/2010	Little Susitna	LS-0km	Average Turbidity	7.56	NTU	6:00
8/8/2010	Little Susitna	LS-0km	Average Turbidity	8.39	NTU	9:00
8/8/2010	Little Susitna	LS-0km	Average Turbidity	9.2	NTU	12:00
8/8/2010	Little Susitna	LS-0km	Average Turbidity	9.33	NTU	15:00
8/8/2010	Little Susitna	LS-0km	Average Turbidity	10.23	NTU	18:00
8/8/2010	Little Susitna	LS-0km	Average Turbidity	13.7	NTU	21:00
8/9/2010	Little Susitna	LS-0km	Average Turbidity	5.14	NTU	5:30
8/9/2010	Little Susitna	LS-0km	Average Turbidity	7.96	NTU	9:00
8/9/2010	Little Susitna	LS-0km	Average Turbidity	7.87	NTU	12:00
8/15/2010	Little Susitna	Houston	Average Turbidity	4.98	NTU	
8/15/2010	Little Susitna	LS-8kmup	Average Turbidity	4.89	NTU	
8/15/2010	Little Susitna	LS-4kmup	Average Turbidity	5.59	NTU	
8/15/2010	Little Susitna	LS-1kmup	Average Turbidity	5.77	NTU	
8/15/2010	Little Susitna	LS-0km	Average Turbidity	7.39	NTU	
8/15/2010	Little Susitna	LS-8kmdn	Average Turbidity	9.67	NTU	
8/15/2010	Little Susitna	LS-4kmdn	Average Turbidity	9.28	NTU	
8/15/2010	Little Susitna	LS-12kmdn	Average Turbidity	12.1	NTU	
8/21/2010	Little Su	LS-4kmup	Average Turbidity	4.49	NTU	
8/21/2010	Little Su	LS-1kmup	Average Turbidity	6.34	NTU	
8/21/2010	Little Su	LS-0kmdn	Average Turbidity	6.68	NTU	
8/21/2010	Little Su	LS-4kmdn	Average Turbidity	5.41	NTU	
8/21/2010	Little Su	LS-8kmdn	Average Turbidity	7.16	NTU	
8/21/2010	Little Su	LS-12kmdn	Average Turbidity	7.84	NTU	
8/21/2010	Little Susitna	LS-8kmup	Average Turbidity	5.93	NTU	
8/21/2010	Little Susitna	Houston	Average Turbidity	5.45	NTU	
8/1/2010	Little Susitna	LS-8kmup	Benzene	<1	µg/L	10-A013211

Date	Site Name	Location	Measurement	Value	Units	Notes
8/1/2010	Little Susitna	LS-4kmup	Benzene	<1	µg/L	10-A013212
8/1/2010	Little Susitna	LS-1	Benzene	<1	µg/L	10-A013213
8/1/2010	Little Susitna	LS-0	Benzene	<1	µg/L	10-A013214
8/1/2010	Little Susitna	LS-4kmdn	Benzene	1.26	µg/L	10-A013215
8/1/2010	Little Susitna	LS-8kmdn	Benzene	1.68	µg/L	10-A013216
8/1/2010	Little Susitna	LS-12kmdn	Benzene	1.33	µg/L	10-A013217
8/7/2010	Little Susitna	LSINTS 0530	Benzene	<1	µg/L	10-A013220
8/7/2010	Little Susitna	LSINTS 0900	Benzene	2.18	µg/L	10-A013221
8/7/2010	Little Susitna	LSINTS 1200	Benzene	<1	µg/L	10-A013222
8/7/2010	Little Susitna	LSINTS 1500	Benzene	4.17	µg/L	10-A013223
8/7/2010	Little Susitna	LSINTS 1800	Benzene	2.63	µg/L	10-A013224
8/7/2010	Little Susitna	LSINTS 2100	Benzene	1.52	µg/L	10-A013225
8/8/2010	Little Susitna	LSINTS 0530	Benzene	<1	µg/L	10-A013228
8/8/2010	Little Susitna	LSINTS 0900	Benzene	3.9	µg/L	10-A013229
8/8/2010	Little Susitna	LSINTS 1200	Benzene	2.8	µg/L	10-A013230
8/8/2010	Little Susitna	LSINTS 1500	Benzene	2.47	µg/L	10-A013231
8/8/2010	Little Susitna	LSINTS 1800	Benzene	1.51	µg/L	10-A013232
8/8/2010	Little Susitna	LSINTS 2100	Benzene	2.46	µg/L	10-A013233
8/8/2010	Little Susitna	LS-8kmup	Benzene	<1	µg/L	10-A013240
8/8/2010	Little Susitna	LS-4kmup	Benzene	2.03	µg/L	10-A013241
8/8/2010	Little Susitna	LS-1kmup	Benzene	2.56	µg/L	10-A013242
8/8/2010	Little Susitna	LS-4kmdn	Benzene	3.93	µg/L	10-A013243
8/8/2010	Little Susitna	LS-8kmdn	Benzene	2.57	µg/L	10-A013244
8/8/2010	Little Susitna	LS-12kmdn	Benzene	2.16	µg/L	10-A013244
8/8/2010	Little Susitna	LS-12kmdnx	Benzene	2.13	µg/L	10-A013246
8/9/2010	Little Susitna	LSINTS 0530	Benzene	5.47	µg/L	10-A013236
8/9/2010	Little Susitna	LSINTS 0900	Benzene	<1	µg/L	10-A013237

Date	Site Name	Location	Measurement	Value	Units	Notes
8/9/2010	Little Susitna	LSINTS 1200	Benzene	1.28	µg/L	10-A013238
8/15/2010	Little Susitna	LS-8kmup	Benzene	<1	µg/L	10-A014344
8/15/2010	Little Susitna	LS-4kmup	Benzene	<1	µg/L	10-A-14345
8/15/2010	Little Susitna	LS-1kmup	Benzene	<1	µg/L	10-A014346
8/15/2010	Little Susitna	LS-0km	Benzene	1.85	µg/L	10-A014347
8/15/2010	Little Susitna	LS-4kmdn	Benzene	3.23	µg/L	10-A014348
8/15/2010	Little Susitna	LS-8kmdn	Benzene	2.48	µg/L	10-A014349
8/15/2010	Little Susitna	LS-12kmdn	Benzene	3.46	µg/L	10-A014349
8/15/2010	Little Susitna	LS-12kmdnx	Benzene	3.6	µg/L	10-A014349
8/21/2010	Little Susitna	LS-8kmup	Benzene	<1	µg/L	10-A014354
8/21/2010	Little Susitna	LS-4kmup	Benzene	<1	µg/L	10-A014355
8/21/2010	Little Susitna	LS-1kmup	Benzene	<1	µg/L	10-A014356
8/21/2010	Little Susitna	LS-0km	Benzene	1.27	µg/L	10-A014357
8/21/2010	Little Susitna	LS-4kmdn	Benzene	1.45	µg/L	10-A014358
8/21/2010	Little Susitna	LS-8kmdn	Benzene	1.15	µg/L	10-A014359
8/21/2010	Little Susitna	LS-12kmdn	Benzene	<1	µg/L	10-A014360
8/21/2010	Little Susitna	LS-12kmdnx	Benzene	<1	µg/L	10-A014361
6/4/2011	Little Susitna	LS-0km	Benzene	<1	ug/L	9:30
6/4/2011	Little Susitna	LS-0km	Benzene	1.25	ug/L	12:00
6/4/2011	Little Susitna	LS-0km	Benzene	<1	ug/L	15:00
6/4/2011	Little Susitna	LS-0km	Benzene	<1	ug/L	18:00
6/11/2011	Little Susitna	LS-0km	Benzene	<1	ug/L	12:00
6/11/2011	Little Susitna	LS-0km	Benzene	2	ug/L	9:45
6/11/2011	Little Susitna	LS-0km	Benzene	1.37	ug/L	15:00
6/11/2011	Little Susitna	LS-0km	Benzene	2.7	ug/L	17:45
6/12/2011	Little Susitna	LS-0km	Benzene	<1	ug/L	9:15
6/12/2011	Little Susitna	LS-0km	Benzene	<1	ug/L	12:00

Date	Site Name	Location	Measurement	Value	Units	Notes
6/12/2011	Little Susitna	LS-0km	Benzene	1.9	ug/L	15:00
6/12/2011	Little Susitna	LS-0km	Benzene	<1	ug/L	17:30
8/1/2010	Little Susitna	LS-8kmup	Color	16.3	CU	apparent color
8/1/2010	Little Susitna	LS-4kmdn	Color	20.00	CU	
8/1/2010	Little Susitna	LS-8kmdn	Color	25.20	CU	
8/1/2010	Little Susitna	LS-12kmdn	Color	15.40	CU	
8/8/2010	Little Susitna	LS-8kmup	D.O.	94.2	percent saturation	
8/1/2010	Little Susitna	LS-8kmup	D.O. %	98	percent saturation	
8/1/2010	Little Susitna	LS-4kmup	D.O. %	92.8	percent saturation	
8/1/2010	Little Susitna	LS-1kmup	D.O. %	91.4	percent saturation	
8/1/2010	Little Susitna	LS-0km	D.O. %	91.5	percent saturation	
8/1/2010	Little Susitna	LS-8kmdn	D.O. %	89.60	percent saturation	
8/1/2010	Little Susitna	LS-12kmdn	D.O. %	87.90	percent saturation	
8/8/2010	Little Susitna	LS-4kmup	D.O. %	92.2	percent saturation	
8/8/2010	Little Susitna	LS-1kmup	D.O. %	99.7	percent saturation	
8/8/2010	Little Susitna	LS-4kmdn	D.O. %	98.5	percent saturation	
8/8/2010	Little Susitna	LS-8kmdn	D.O. %	98	percent saturation	
8/8/2010	Little Susitna	LS-12kmdn	D.O. %	96.2	percent saturation	
8/15/2010	Little Susitna	LS-8kmup	D.O. %	97.2	percent saturation	
8/15/2010	Little Susitna	LS-4kmup	D.O. %	94.1	percent saturation	
8/15/2010	Little Susitna	LS-1kmup	D.O. %	93.5	percent saturation	
8/15/2010	Little Susitna	LS-0km	D.O. %	88.9	percent saturation	
8/15/2010	Little Susitna	LS-8kmdn	D.O. %	92.4	percent saturation	
8/15/2010	Little Susitna	LS-4kmdn	D.O. %	92.7	percent saturation	
8/15/2010	Little Susitna	LS-12kmdn	D.O. %	91.4	percent saturation	
8/21/2010	Little Susitna	LS-8kmup	D.O. %	103.8	percent saturation	
8/21/2010	Little Susitna	LS-4kmup	D.O. %	100	percent saturation	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/21/2010	Little Susitna	LS-1kmup	D.O. %	100.4	percent saturation	
8/21/2010	Little Susitna	LS-0km	D.O. %	99.5	percent saturation	
8/21/2010	Little Susitna	LS-4kmdn	D.O. %	98.8	percent saturation	
8/21/2010	Little Susitna	LS-8kmdn	D.O. %	98.8	percent saturation	
8/21/2010	Little Susitna	LS-12kmdn	D.O. %	95.9	percent saturation	
8/1/2010	Little Susitna	LS-8kmup	D.O. mg/L	10.09	mg/L	
8/1/2010	Little Susitna	LS-4kmup	D.O. mg/L	9.55	mg/L	
8/1/2010	Little Susitna	LS-1kmup	D.O. mg/L	9.37	mg/L	
8/1/2010	Little Susitna	LS-0km	D.O. mg/L	9.32	mg/L	
8/1/2010	Little Susitna	LS-4kmdn	D.O. mg/L	9.17	mg/L	
8/1/2010	Little Susitna	LS-8kmdn	D.O. mg/L	9.08	mg/L	
8/1/2010	Little Susitna	LS-12kmdn	D.O. mg/L	8.92	mg/L	
8/8/2010	Little Susitna	LS-8kmup	D.O. mg/L	10.06	mg/L	
8/8/2010	Little Susitna	LS-4kmup	D.O. mg/L	9.76	mg/L	
8/8/2010	Little Susitna	LS-1kmup	D.O. mg/L	10.51	mg/L	
8/8/2010	Little Susitna	LS-4kmdn	D.O. mg/L	10.24	mg/L	
8/8/2010	Little Susitna	LS-8kmdn	D.O. mg/L	10.2	mg/L	
8/8/2010	Little Susitna	LS-12kmdn	D.O. mg/L	10.01	mg/L	
8/15/2010	Little Susitna	LS-8kmup	D.O. mg/L	10.3	mg/L	
8/15/2010	Little Susitna	LS-4kmup	D.O. mg/L	9.95	mg/L	
8/15/2010	Little Susitna	LS-1kmup	D.O. mg/L	9.87	mg/L	
8/15/2010	Little Susitna	LS-0km	D.O. mg/L	9.13	mg/L	
8/15/2010	Little Susitna	LS-8kmdn	D.O. mg/L	9.73	mg/L	
8/15/2010	Little Susitna	LS-4kmdn	D.O. mg/L	9.75	mg/L	
8/15/2010	Little Susitna	LS-12kmdn	D.O. mg/L	9.61	mg/L	
8/21/2010	Little Susitna	LS-8kmup	D.O. mg/L	10.46	mg/L	
8/21/2010	Little Susitna	LS-4kmup	D.O. mg/L	10.11	mg/L	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/21/2010	Little Susitna	LS-1kmup	D.O. mg/L			
8/21/2010	Little Susitna	LS-0km	D.O. mg/L	10.01	mg/L	
8/21/2010	Little Susitna	LS-4kmdn	D.O. mg/L	9.84	mg/L	
8/21/2010	Little Susitna	LS-8kmdn	D.O. mg/L	9.73	mg/L	
8/21/2010	Little Susitna	LS-12kmdn	D.O. mg/L	9.48	mg/L	
8/1/2010	Little Susitna	LS-4kmdn	D.O .%	90.50	percent saturation	
8/1/2010	Little Susitna	LS-0km	Discharge	552.40	cfs	
8/15/2010	Little Susitna	LS-1kmup	Discharge	423.75	cfs	Section 86
8/21/2010	Little Susitna	LS-0km	Discharge	362.06	cfs	at launch
8/7/2011	Little Susitna	LS-1kmup	Discharge	466.14	cfs	
8/1/2010	Little Susitna	LS-8kmup	Ethyl Benzene	<1	µg/L	10-A013211
8/1/2010	Little Susitna	LS-4kmup	Ethyl Benzene	<1	µg/L	10-A013212
8/1/2010	Little Susitna	LS-1	Ethyl Benzene	<1	µg/L	10-A013213
8/1/2010	Little Susitna	LS-0	Ethyl Benzene	<1	µg/L	10-A013214
8/1/2010	Little Susitna	LS-4kmdn	Ethyl Benzene	<1	µg/L	10-A013215
8/1/2010	Little Susitna	LS-8kmdn	Ethyl Benzene	<1	µg/L	10-A013216
8/1/2010	Little Susitna	LS-12kmdn	Ethyl Benzene	<1	µg/L	10-A013217
8/7/2010	Little Susitna	LSINTS 0530	Ethyl Benzene	<1	µg/L	10-A013220
8/7/2010	Little Susitna	LSINTS 0900	Ethyl Benzene	<1	µg/L	10-A013221
8/7/2010	Little Susitna	LSINTS 1200	Ethyl Benzene	<1	µg/L	10-A013222
8/7/2010	Little Susitna	LSINTS 1500	Ethyl Benzene	2.08	µg/L	10-A013223
8/7/2010	Little Susitna	LSINTS 1800	Ethyl Benzene	1.23	µg/L	10-A013224
8/7/2010	Little Susitna	LSINTS 2100	Ethyl Benzene	<1	µg/L	10-A013225
8/8/2010	Little Susitna	LSINTS 0530	Ethyl Benzene	<1	µg/L	10-A013228
8/8/2010	Little Susitna	LSINTS 0900	Ethyl Benzene	1.67	µg/L	10-A013229
8/8/2010	Little Susitna	LSINTS 1200	Ethyl Benzene	1.16	µg/L	10-A013230
8/8/2010	Little Susitna	LSINTS 1500	Ethyl Benzene	1.05	µg/L	10-A013231

Date	Site Name	Location	Measurement	Value	Units	Notes
8/8/2010	Little Susitna	LSINTS 1800	Ethyl Benzene	<1	µg/L	10-A013232
8/8/2010	Little Susitna	LSINTS 2100	Ethyl Benzene	1.19	µg/L	10-A013233
8/8/2010	Little Susitna	LS-8kmup	Ethyl Benzene	<1	µg/L	10-A013240
8/8/2010	Little Susitna	LS-4kmup	Ethyl Benzene	<1	µg/L	10-A013241
8/8/2010	Little Susitna	LS-1kmup	Ethyl Benzene	1.11	µg/L	10-A013242
8/8/2010	Little Susitna	LS-4kmdn	Ethyl Benzene	1.73	µg/L	10-A013243
8/8/2010	Little Susitna	LS-8kmdn	Ethyl Benzene	<1	µg/L	10-A013244
8/8/2010	Little Susitna	LS-12kmdn	Ethyl Benzene	<1	µg/L	10-A013244
8/8/2010	Little Susitna	LS-12kmdnx	Ethyl Benzene	<1	µg/L	10-A013246
8/9/2010	Little Susitna	LSINTS 0530	Ethyl Benzene	2.71	µg/L	10-A013236
8/9/2010	Little Susitna	LSINTS 0900	Ethyl Benzene	<1	µg/L	10-A013237
8/9/2010	Little Susitna	LSINTS 1200	Ethyl Benzene	<1	µg/L	10-A013238
8/15/2010	Little Susitna	LS-8kmup	Ethyl Benzene	<1	µg/L	10-A014344
8/15/2010	Little Susitna	LS-4kmup	Ethyl Benzene	<1	µg/L	10-A-14345
8/15/2010	Little Susitna	LS-1kmup	Ethyl Benzene	<1	µg/L	10-A014346
8/15/2010	Little Susitna	LS-0km	Ethyl Benzene	<1	µg/L	10-A014347
8/15/2010	Little Susitna	LS-4kmdn	Ethyl Benzene	1.1	µg/L	10-A014348
8/15/2010	Little Susitna	LS-8kmdn	Ethyl Benzene	<1	µg/L	10-A014349
8/15/2010	Little Susitna	LS-12kmdn	Ethyl Benzene	1.25	µg/L	10-A014349
8/15/2010	Little Susitna	LS-12kmdnx	Ethyl Benzene	1.2	µg/L	10-A014349
8/21/2010	Little Susitna	LS-8kmup	Ethyl Benzene	<1	µg/L	10-A014354
8/21/2010	Little Susitna	LS-4kmup	Ethyl Benzene	<1	µg/L	10-A014355
8/21/2010	Little Susitna	LS-1kmup	Ethyl Benzene	<1	µg/L	10-A014356
8/21/2010	Little Susitna	LS-0km	Ethyl Benzene	<1	µg/L	10-A014357
8/21/2010	Little Susitna	LS-4kmdn	Ethyl Benzene	<1	µg/L	10-A014358
8/21/2010	Little Susitna	LS-8kmdn	Ethyl Benzene	<1	µg/L	10-A014359
8/21/2010	Little Susitna	LS-12kmdn	Ethyl Benzene	<1	µg/L	10-A014360

Date	Site Name	Location	Measurement	Value	Units	Notes
8/21/2010	Little Susitna	LS-12kmdnx	Ethyl Benzene	<1	µg/L	10-A014361
6/4/2011	Little Susitna	LS-0km	Ethyl Benzene	<1	ug/L	9:30
6/4/2011	Little Susitna	LS-0km	Ethyl Benzene	<1	ug/L	12:00
6/4/2011	Little Susitna	LS-0km	Ethyl Benzene	<1	ug/L	15:00
6/4/2011	Little Susitna	LS-0km	Ethyl Benzene	<1	ug/L	18:00
6/11/2011	Little Susitna	LS-0km	Ethyl Benzene	<1	ug/L	12:00
6/11/2011	Little Susitna	LS-0km	Ethyl Benzene	1.1	ug/L	9:45
6/11/2011	Little Susitna	LS-0km	Ethyl Benzene	<1	ug/L	15:00
6/11/2011	Little Susitna	LS-0km	Ethyl Benzene	1.51	ug/L	17:45
6/12/2011	Little Susitna	LS-0km	Ethyl Benzene	<1	ug/L	9:15
6/12/2011	Little Susitna	LS-0km	Ethyl Benzene	<1	ug/L	12:00
6/12/2011	Little Susitna	LS-0km	Ethyl Benzene	1.1	ug/L	15:00
6/12/2011	Little Susitna	LS-0km	Ethyl Benzene	<1	ug/L	17:30
8/1/2010	Little Susitna	LS-8kmup	Latitude	61.47112	NAD 83	
8/1/2010	Little Susitna	LS-4kmup	Latitude	61.45642	NAD 83	
8/1/2010	Little Susitna	LS-1kmup	Latitude	61.44205	NAD 83	
8/1/2010	Little Susitna	LS-0km	Latitude	61.43730	NAD 83	
8/1/2010	Little Susitna	LS-4kmdn	Latitude	61.43328	NAD 83	
8/1/2010	Little Susitna	LS-8kmdn	Latitude	61.41130	NAD 83	
8/1/2010	Little Susitna	LS-12kmdn	Latitude	61.39652	NAD 83	
8/8/2010	Little Susitna	LS-8kmup	Latitude	61.47116	NAD 83	
8/8/2010	Little Susitna	LS-4kmup	Latitude	61.45636	NAD 83	
8/8/2010	Little Susitna	LS-1kmup	Latitude	61.44201	NAD 83	
8/8/2010	Little Susitna	LS-4kmdn	Latitude	61.42415	NAD 83	
8/8/2010	Little Susitna	LS-8kmdn	Latitude	61.41127	NAD 83	
8/8/2010	Little Susitna	LS-12kmdn	Latitude	61.39650	NAD 83	
8/15/2010	Little Susitna	LS-8kmup	Latitude	61.47116	NAD 83	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/15/2010	Little Susitna	LS-4kmup	Latitude	61.45644	NAD 83	
8/15/2010	Little Susitna	LS-1kmup	Latitude	61.44205	NAD 83	
8/15/2010	Little Susitna	LS-0km	Latitude	61.43750	NAD 83	
8/15/2010	Little Susitna	LS-8kmdn	Latitude	61.41133	NAD 83	
8/15/2010	Little Susitna	LS-4kmdn	Latitude	61.42443	NAD 83	
8/15/2010	Little Susitna	LS-12kmdn	Latitude	61.39647	NAD 83	
8/21/2010	Little Susitna	LS-8kmup	Latitude	61.47115	NAD 83	
8/21/2010	Little Susitna	LS-4kmup	Latitude	61.45638	NAD 83	
8/21/2010	Little Susitna	LS-1kmup	Latitude	61.44208	NAD 83	
8/21/2010	Little Susitna	LS-0km	Latitude	61.43719	NAD 83	
8/21/2010	Little Susitna	LS-4kmdn	Latitude	61.42444	NAD 83	
8/21/2010	Little Susitna	LS-8kmdn	Latitude	61.41125	NAD 83	
8/21/2010	Little Susitna	LS-12kmdn	Latitude	61.39638	NAD 83	
8/1/2010	Little Susitna	LS-8kmup	Longitude	150.14136	NAD 83	
8/1/2010	Little Susitna	LS-4kmup	Longitude	150.14433	NAD 83	
8/1/2010	Little Susitna	LS-1kmup	Longitude	150.16169	NAD 83	
8/1/2010	Little Susitna	LS-0km	Longitude	150.17625	NAD 83	
8/1/2010	Little Susitna	LS-4kmdn	Longitude	150.19385	NAD 83	
8/1/2010	Little Susitna	LS-8kmdn	Longitude	150.20579	NAD 83	
8/1/2010	Little Susitna	LS-12kmdn	Longitude	150.22297	NAD 83	
8/8/2010	Little Susitna	LS-8kmup	Longitude	150.14126	NAD 83	
8/8/2010	Little Susitna	LS-4kmup	Longitude	150.14415	NAD 83	
8/8/2010	Little Susitna	LS-1kmup	Longitude	150.16170	NAD 83	
8/8/2010	Little Susitna	LS-4kmdn	Longitude	150.19598	NAD 83	
8/8/2010	Little Susitna	LS-8kmdn	Longitude	150.20571	NAD 83	
8/8/2010	Little Susitna	LS-12kmdn	Longitude	150.22285	NAD 83	
8/15/2010	Little Susitna	LS-8kmup	Longitude	150.14310	NAD 83	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/15/2010	Little Susitna	LS-4kmup	Longitude	150.14410	NAD 83	
8/15/2010	Little Susitna	LS-1kmup	Longitude	150.16168	NAD 83	
8/15/2010	Little Susitna	LS-0km	Longitude	150.19476	NAD 83	
8/15/2010	Little Susitna	LS-8kmdn	Longitude	150.20581	NAD 83	
8/15/2010	Little Susitna	LS-4kmdn	Longitude	150.19753	NAD 83	
8/15/2010	Little Susitna	LS-12kmdn	Longitude	150.22272	NAD 83	
8/21/2010	Little Susitna	LS-8kmup	Longitude	150.14125	NAD 83	
8/21/2010	Little Susitna	LS-4kmup	Longitude	150.14431	NAD 83	
8/21/2010	Little Susitna	LS-1kmup	Longitude	150.16183	NAD 83	
8/21/2010	Little Susitna	LS-0km	Longitude	150.17702	NAD 83	
8/21/2010	Little Susitna	LS-4kmdn	Longitude	150.19760	NAD 83	
8/21/2010	Little Susitna	LS-8kmdn	Longitude	150.20590	NAD 83	
8/21/2010	Little Susitna	LS-12kmdn	Longitude	150.22220	NAD 83	
8/1/2010	Little Susitna	LS-8kmup	pH	7.70		
8/1/2010	Little Susitna	LS-4kmup	pH	7.68		
8/1/2010	Little Susitna	LS-1kmup	pH	7.60		
8/1/2010	Little Susitna	LS-0km	pH	7.67		
8/1/2010	Little Susitna	LS-4kmdn	pH	7.63		
8/1/2010	Little Susitna	LS-8kmdn	pH	7.63		
8/1/2010	Little Susitna	LS-12kmdn	pH	7.50		
8/8/2010	Little Susitna	LS-8kmup	pH	7.61		
8/8/2010	Little Susitna	LS-4kmup	pH	7.67		
8/8/2010	Little Susitna	LS-1kmup	pH	7.62		
8/8/2010	Little Susitna	LS-4kmdn	pH	7.57		
8/8/2010	Little Susitna	LS-8kmdn	pH	7.44		
8/8/2010	Little Susitna	LS-12kmdn	pH	7.44		
8/15/2010	Little Susitna	LS-8kmup	pH	7.53		

Date	Site Name	Location	Measurement	Value	Units	Notes
8/15/2010	Little Susitna	LS-4kmup	pH	7.64		
8/15/2010	Little Susitna	LS-1kmup	pH	7.71		
8/15/2010	Little Susitna	LS-0km	pH	7.80		
8/15/2010	Little Susitna	LS-8kmdn	pH	7.58		
8/15/2010	Little Susitna	LS-4kmdn	pH	7.61		
8/15/2010	Little Susitna	LS-12kmdn	pH	7.59		
8/21/2010	Little Susitna	LS-8kmup	pH	7.84		
8/21/2010	Little Susitna	LS-4kmup	pH	7.91		
8/21/2010	Little Susitna	LS-1kmup	pH	7.95		
8/21/2010	Little Susitna	LS-0km	pH	7.94		
8/21/2010	Little Susitna	LS-4kmdn	pH	7.84		
8/21/2010	Little Susitna	LS-8kmdn	pH	7.80		
8/21/2010	Little Susitna	LS-12kmdn	pH	7.69		
8/1/2010	Little Susitna	LS-8kmup	Specific Conductivity	87.5	microS/cm	
8/1/2010	Little Susitna	LS-4kmup	Specific Conductivity	88.4	microS/cm	
8/1/2010	Little Susitna	LS-1kmup	Specific Conductivity	87.9	microS/cm	
8/1/2010	Little Susitna	LS-0km	Specific Conductivity	89.9	microS/cm	
8/1/2010	Little Susitna	LS-4kmdn	Specific Conductivity	89.6	microS/cm	
8/1/2010	Little Susitna	LS-8kmdn	Specific Conductivity	89.5	microS/cm	
8/1/2010	Little Susitna	LS-12kmdn	Specific Conductivity	89.7	microS/cm	
8/8/2010	Little Susitna	LS-8kmup	Specific Conductivity	90.1	microS/cm	
8/8/2010	Little Susitna	LS-4kmup	Specific Conductivity	91.2	microS/cm	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/8/2010	Little Susitna	LS-1kmup	Specific Conductivity	91.2	microS/cm	
8/8/2010	Little Susitna	LS-4kmdn	Specific Conductivity	92.8	microS/cm	
8/8/2010	Little Susitna	LS-8kmdn	Specific Conductivity	93.1	microS/cm	
8/8/2010	Little Susitna	LS-12kmdn	Specific Conductivity	93.2	microS/cm	
8/15/2010	Little Susitna	LS-8kmup	Specific Conductivity	93.1	microS/cm	
8/15/2010	Little Susitna	LS-4kmup	Specific Conductivity	94.6	microS/cm	
8/15/2010	Little Susitna	LS-1kmup	Specific Conductivity	94.6	microS/cm	
8/15/2010	Little Susitna	LS-0km	Specific Conductivity	97.4	microS/cm	
8/15/2010	Little Susitna	LS-8kmdn	Specific Conductivity	95.9	microS/cm	
8/15/2010	Little Susitna	LS-4kmdn	Specific Conductivity	95.9	microS/cm	
8/15/2010	Little Susitna	LS-12kmdn	Specific Conductivity	96.2	microS/cm	
8/21/2010	Little Susitna	LS-8kmup	Specific Conductivity	97.5	microS/cm	
8/21/2010	Little Susitna	LS-4kmup	Specific Conductivity	97.9	microS/cm	
8/21/2010	Little Susitna	LS-1kmup	Specific Conductivity	98.1	microS/cm	
8/21/2010	Little Susitna	LS-0km	Specific Conductivity	99.6	microS/cm	
8/21/2010	Little Susitna	LS-4kmdn	Specific Conductivity	99.1	microS/cm	
8/21/2010	Little Susitna	LS-8kmdn	Specific Conductivity	99.2	microS/cm	
8/21/2010	Little Susitna	LS-12kmdn	Specific	99.5	microS/cm	

Date	Site Name	Location	Measurement	Value	Units	Notes
			Conductivity			
8/1/2010	Little Susitna	LS-8kmup	TAH	<1	µg/L	
8/1/2010	Little Susitna	LS-4kmup	TAH	1.36	µg/L	
8/1/2010	Little Susitna	LS-1	TAH	1.17	µg/L	
8/1/2010	Little Susitna	LS-0	TAH	1.5	µg/L	
8/1/2010	Little Susitna	LS-4kmdn	TAH	5.42	µg/L	
8/1/2010	Little Susitna	LS-8kmdn	TAH	6.61	µg/L	
8/1/2010	Little Susitna	LS-12kmdn	TAH	5.4	µg/L	
8/7/2010	Little Susitna	LSINTS 0530	TAH	<1	µg/L	
8/7/2010	Little Susitna	LSINTS 0900	TAH	10.11	µg/L	
8/7/2010	Little Susitna	LSINTS 1200	TAH	2.24	µg/L	
8/7/2010	Little Susitna	LSINTS 1500	TAH	22.35	µg/L	
8/7/2010	Little Susitna	LSINTS 1800	TAH	13.52	µg/L	
8/7/2010	Little Susitna	LSINTS 2100	TAH	6.54	µg/L	
8/8/2010	Little Susitna	LSINTS 0530	TAH	<1	µg/L	
8/8/2010	Little Susitna	LSINTS 0900	TAH	20.84	µg/L	
8/8/2010	Little Susitna	LSINTS 1200	TAH	14.62	µg/L	
8/8/2010	Little Susitna	LSINTS 1500	TAH	12.69	µg/L	
8/8/2010	Little Susitna	LSINTS 1800	TAH	6.44	µg/L	
8/8/2010	Little Susitna	LSINTS 2100	TAH	13.12	µg/L	
8/8/2010	Little Susitna	LS-8kmup	TAH	1.82	µg/L	
8/8/2010	Little Susitna	LS-4kmup	TAH	9.99	µg/L	
8/8/2010	Little Susitna	LS-1kmup	TAH	13.36	µg/L	
8/8/2010	Little Susitna	LS-4kmdn	TAH	19.98	µg/L	
8/8/2010	Little Susitna	LS-8kmdn	TAH	11.05	µg/L	
8/8/2010	Little Susitna	LS-12kmdn	TAH	8.71	µg/L	
8/8/2010	Little Susitna	LS-12kmdnx	TAH	9.35	µg/L	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/9/2010	Little Susitna	LSINTS 0530	TAH	30.35	µg/L	
8/9/2010	Little Susitna	LSINTS 0900	TAH	1.21	µg/L	
8/9/2010	Little Susitna	LSINTS 1200	TAH	5.31	µg/L	
8/15/2010	Little Susitna	LS-8kmup	TAH	<1	µg/L	
8/15/2010	Little Susitna	LS-4kmup	TAH	1.34	µg/L	
8/15/2010	Little Susitna	LS-1kmup	TAH	1.61	µg/L	
8/15/2010	Little Susitna	LS-0km	TAH	7.35	µg/L	
8/15/2010	Little Susitna	LS-4kmdn	TAH	15.42	µg/L	
8/15/2010	Little Susitna	LS-8kmdn	TAH	10.92	µg/L	
8/15/2010	Little Susitna	LS-12kmdn	TAH	16.2	µg/L	
8/15/2010	Little Susitna	LS-12kmdnx	TAH	16.3	µg/L	
8/21/2010	Little Susitna	LS-8kmup	TAH	<1	µg/L	
8/21/2010	Little Susitna	LS-4kmup	TAH	1.93	µg/L	
8/21/2010	Little Susitna	LS-1kmup	TAH	1.16	µg/L	
8/21/2010	Little Susitna	LS-0km	TAH	4.1	µg/L	
8/21/2010	Little Susitna	LS-4kmdn	TAH	4.93	µg/L	
8/21/2010	Little Susitna	LS-8kmdn	TAH	4.06	µg/L	
8/21/2010	Little Susitna	LS-12kmdn	TAH	1.58	µg/L	
8/21/2010	Little Susitna	LS-12kmdnx	TAH	1.48	µg/L	
6/4/2011	Little Susitna	LS-0km	TAH	3.31	ug/L	9:30
6/4/2011	Little Susitna	LS-0km	TAH	10.41	ug/L	12:00
6/4/2011	Little Susitna	LS-0km	TAH	3.65	ug/L	15:00
6/4/2011	Little Susitna	LS-0km	TAH	2.08	ug/L	18:00
6/11/2011	Little Susitna	LS-0km	TAH	5.41	ug/L	12:00
6/11/2011	Little Susitna	LS-0km	TAH	15.38	ug/L	9:45
6/11/2011	Little Susitna	LS-0km	TAH	10.25	ug/L	15:00
6/11/2011	Little Susitna	LS-0km	TAH	20.49	ug/L	17:45

Date	Site Name	Location	Measurement	Value	Units	Notes
6/12/2011	Little Susitna	LS-0km	TAH	5.27	ug/L	9:15
6/12/2011	Little Susitna	LS-0km	TAH	3.55	ug/L	12:00
6/12/2011	Little Susitna	LS-0km	TAH	15.53	ug/L	15:00
6/12/2011	Little Susitna	LS-0km	TAH	5.69	ug/L	17:30
8/1/2010	Little Susitna	LS-8kmup	Temperature	13.9	Celsius	
8/1/2010	Little Susitna	LS-8kmup	Temperature	13.5	Celsius	
8/1/2010	Little Susitna	LS-4kmup	Temperature	14.1	Celsius	
8/1/2010	Little Susitna	LS-4kmup	Temperature	13.6	Celsius	
8/1/2010	Little Susitna	LS-1kmup	Temperature	14.3	Celsius	
8/1/2010	Little Susitna	LS-1kmup	Temperature	13.8	Celsius	
8/1/2010	Little Susitna	LS-0km	Temperature	14.1	Celsius	
8/1/2010	Little Susitna	LS-0km	Temperature	14.6	Celsius	
8/1/2010	Little Susitna	LS-4kmdn	Temperature	14.70	Celsius	
8/1/2010	Little Susitna	LS-4kmdn	Temperature	14.30	Celsius	
8/1/2010	Little Susitna	LS-8kmdn	Temperature	14.80	Celsius	
8/1/2010	Little Susitna	LS-8kmdn	Temperature	14.40	Celsius	
8/1/2010	Little Susitna	LS-12kmdn	Temperature	14.70	Celsius	
8/1/2010	Little Susitna	LS-12kmdn	Temperature	14.30	Celsius	
8/8/2010	Little Susitna	LS-8kmup	Temperature	12	Celsius	
8/8/2010	Little Susitna	LS-8kmup	Temperature	12.4	Celsius	
8/8/2010	Little Susitna	LS-4kmup	Temperature	12.4	Celsius	
8/8/2010	Little Susitna	LS-4kmup	Temperature	12.8	Celsius	
8/8/2010	Little Susitna	LS-1kmup	Temperature	12.7	Celsius	
8/8/2010	Little Susitna	LS-1kmup	Temperature	13	Celsius	
8/8/2010	Little Susitna	LS-4kmdn	Temperature	13.2	Celsius	
8/8/2010	Little Susitna	LS-4kmdn	Temperature	13.6	Celsius	
8/8/2010	Little Susitna	LS-8kmdn	Temperature	13.1	Celsius	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/8/2010	Little Susitna	LS-8kmdn	Temperature	13.5	Celsius	
8/8/2010	Little Susitna	LS-12kmdn	Temperature	13.1	Celsius	
8/8/2010	Little Susitna	LS-12kmdn	Temperature	13.6	Celsius	
8/15/2010	Little Susitna	LS-8kmup	Temperature	12.5	Celsius	
8/15/2010	Little Susitna	LS-8kmup	Temperature	12.7	Celsius	
8/15/2010	Little Susitna	LS-4kmup	Temperature	12.5	Celsius	
8/15/2010	Little Susitna	LS-4kmup	Temperature	12.9	Celsius	
8/15/2010	Little Susitna	LS-1kmup	Temperature	12.6	Celsius	
8/15/2010	Little Susitna	LS-1kmup	Temperature	12.9	Celsius	
8/15/2010	Little Susitna	LS-0km	Temperature	13.1	Celsius	
8/15/2010	Little Susitna	LS-0km	Temperature	13.2	Celsius	
8/15/2010	Little Susitna	LS-8kmdn	Temperature	12.7	Celsius	
8/15/2010	Little Susitna	LS-8kmdn	Temperature	13.1	Celsius	
8/15/2010	Little Susitna	LS-4kmdn	Temperature	12.7	Celsius	
8/15/2010	Little Susitna	LS-4kmdn	Temperature	13.1	Celsius	
8/15/2010	Little Susitna	LS-12kmdn	Temperature	12.8	Celsius	
8/15/2010	Little Susitna	LS-12kmdn	Temperature	13.1	Celsius	
8/21/2010	Little Susitna	LS-8kmup	Temperature	14.7	Celsius	
8/21/2010	Little Susitna	LS-8kmup	Temperature	15.1	Celsius	
8/21/2010	Little Susitna	LS-4kmup	Temperature	14.5	Celsius	
8/21/2010	Little Susitna	LS-4kmup	Temperature	14.9	Celsius	
8/21/2010	Little Susitna	LS-1kmup	Temperature	14.6	Celsius	
8/21/2010	Little Susitna	LS-1kmup	Temperature	15	Celsius	
8/21/2010	Little Susitna	LS-0km	Temperature	14.8	Celsius	
8/21/2010	Little Susitna	LS-0km	Temperature	15.2	Celsius	
8/21/2010	Little Susitna	LS-4kmdn	Temperature	15.2	Celsius	
8/21/2010	Little Susitna	LS-4kmdn	Temperature	15.5	Celsius	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/21/2010	Little Susitna	LS-8kmdn	Temperature	15.7	Celsius	
8/21/2010	Little Susitna	LS-8kmdn	Temperature	16.1	Celsius	
8/21/2010	Little Susitna	LS-12kmdn	Temperature	15.6	Celsius	
8/21/2010	Little Susitna	LS-12kmdn	Temperature	16	Celsius	
8/1/2010	Little Susitna	LS-8kmup	Time	12:10	Hours	
8/1/2010	Little Susitna	LS-4kmup	Time	12:35	Hours	
8/1/2010	Little Susitna	LS-1kmup	Time	12:52	Hours	
8/1/2010	Little Susitna	LS-0km	Time	13:25	Hours	
8/1/2010	Little Susitna	LS-4kmdn	Time	13:45	Hours	
8/1/2010	Little Susitna	LS-8kmdn	Time	14:00	Hours	
8/1/2010	Little Susitna	LS-12kmdn	Time	14:16	Hours	
8/8/2010	Little Susitna	LS-8kmup	Time	11:30	AM	
8/8/2010	Little Susitna	LS-1kmup	Time	12:23	PM	
8/8/2010	Little Susitna	LS-4kmdn	Time	13:20		
8/8/2010	Little Susitna	LS-8kmdn	Time	13:45		
8/8/2010	Little Susitna	LS-12kmdn	Time	14:15		
8/15/2010	Little Susitna	LS-8kmup	Time	13:00		
8/15/2010	Little Susitna	LS-4kmup	Time	13:20		
8/15/2010	Little Susitna	LS-1kmup	Time	13:40		
8/15/2010	Little Susitna	LS-0km	Time	14:30		
8/15/2010	Little Susitna	LS-8kmdn	Time	15:10		
8/15/2010	Little Susitna	LS-4kmdn	Time	14:50	hours	
8/15/2010	Little Susitna	LS-12kmdn	Time	15:30		
8/21/2010	Little Susitna	LS-8kmup	Time	16:10		
8/21/2010	Little Susitna	LS-4kmup	Time	16:30		
8/21/2010	Little Susitna	LS-1kmup	Time	16:45		
8/21/2010	Little Susitna	LS-0km	Time	17:00		

Date	Site Name	Location	Measurement	Value	Units	Notes
8/21/2010	Little Susitna	LS-4kmdn	Time	17:20		
8/21/2010	Little Susitna	LS-8kmdn	Time	17:36		
8/21/2010	Little Susitna	LS-12kmdn	Time	18:00		
8/1/2010	Little Susitna	LS-8kmup	Toluene	<1	µg/L	10-A013211
8/1/2010	Little Susitna	LS-4kmup	Toluene	1.36	µg/L	10-A013212
8/1/2010	Little Susitna	LS-1	Toluene	1.17	µg/L	10-A013213
8/1/2010	Little Susitna	LS-0	Toluene	1.5	µg/L	10-A013214
8/1/2010	Little Susitna	LS-4kmdn	Toluene	3.15	µg/L	10-A013215
8/1/2010	Little Susitna	LS-8kmdn	Toluene	3.8	µg/L	10-A013216
8/1/2010	Little Susitna	LS-12kmdn	Toluene	3.07	µg/L	10-A013217
8/7/2010	Little Susitna	LSINTS 0530	Toluene	<1	µg/L	10-A013220
8/7/2010	Little Susitna	LSINTS 0900	Toluene	5.15	µg/L	10-A013221
8/7/2010	Little Susitna	LSINTS 1200	Toluene	2.24	µg/L	10-A013222
8/7/2010	Little Susitna	LSINTS 1500	Toluene	10	µg/L	10-A013223
8/7/2010	Little Susitna	LSINTS 1800	Toluene	6.06	µg/L	10-A013224
8/7/2010	Little Susitna	LSINTS 2100	Toluene	3.82	µg/L	10-A013225
8/8/2010	Little Susitna	LSINTS 0530	Toluene	<1	µg/L	10-A013228
8/8/2010	Little Susitna	LSINTS 0900	Toluene	10.2	µg/L	10-A013229
8/8/2010	Little Susitna	LSINTS 1200	Toluene	6.83	µg/L	10-A013230
8/8/2010	Little Susitna	LSINTS 1500	Toluene	5.96	µg/L	10-A013231
8/8/2010	Little Susitna	LSINTS 1800	Toluene	3.78	µg/L	10-A013232
8/8/2010	Little Susitna	LSINTS 2100	Toluene	6.1	µg/L	10-A013233
8/8/2010	Little Susitna	LS-8kmup	Toluene	1.82	µg/L	10-A013240
8/8/2010	Little Susitna	LS-4kmup	Toluene	5.11	µg/L	10-A013241
8/8/2010	Little Susitna	LS-1kmup	Toluene	6.24	µg/L	10-A013242
8/8/2010	Little Susitna	LS-4kmdn	Toluene	8.98	µg/L	10-A013243
8/8/2010	Little Susitna	LS-8kmdn	Toluene	5.54	µg/L	10-A013244

Date	Site Name	Location	Measurement	Value	Units	Notes
8/8/2010	Little Susitna	LS-12kmdn	Toluene	5.13	µg/L	10-A013244
8/8/2010	Little Susitna	LS-12kmdnx	Toluene	4.77	µg/L	10-A013246
8/9/2010	Little Susitna	LSINTS 0530	Toluene	14.1	µg/L	10-A013236
8/9/2010	Little Susitna	LSINTS 0900	Toluene	1.21	µg/L	10-A013237
8/9/2010	Little Susitna	LSINTS 1200	Toluene	2.99	µg/L	10-A013238
8/15/2010	Little Susitna	LS-8kmup	Toluene	<1	µg/L	10-A014344
8/15/2010	Little Susitna	LS-4kmup	Toluene	1.34	µg/L	10-A-14345
8/15/2010	Little Susitna	LS-1kmup	Toluene	1.61	µg/L	10-A014346
8/15/2010	Little Susitna	LS-0km	Toluene	4.41	µg/L	10-A014347
8/15/2010	Little Susitna	LS-4kmdn	Toluene	7.59	µg/L	10-A014348
8/15/2010	Little Susitna	LS-8kmdn	Toluene	5.69	µg/L	10-A014349
8/15/2010	Little Susitna	LS-12kmdn	Toluene	7.82	µg/L	10-A014349
8/15/2010	Little Susitna	LS-12kmdnx	Toluene	7.81	µg/L	10-A014349
8/21/2010	Little Susitna	LS-8kmup	Toluene	<1	µg/L	10-A014354
8/21/2010	Little Susitna	LS-4kmup	Toluene	1.93	µg/L	10-A014355
8/21/2010	Little Susitna	LS-1kmup	Toluene	1.16	µg/L	10-A014356
8/21/2010	Little Susitna	LS-0km	Toluene	2.83	µg/L	10-A014357
8/21/2010	Little Susitna	LS-4kmdn	Toluene	3.48	µg/L	10-A014358
8/21/2010	Little Susitna	LS-8kmdn	Toluene	2.91	µg/L	10-A014359
8/21/2010	Little Susitna	LS-12kmdn	Toluene	1.58	µg/L	10-A014360
8/21/2010	Little Susitna	LS-12kmdnx	Toluene	1.48	µg/L	10-A014361
6/4/2011	Little Susitna	LS-0km	Toluene	3.31	ug/L	9:30
6/4/2011	Little Susitna	LS-0km	Toluene	6.52	ug/L	12:00
6/4/2011	Little Susitna	LS-0km	Toluene	3.65	ug/L	15:00
6/4/2011	Little Susitna	LS-0km	Toluene	2.08	ug/L	18:00
6/11/2011	Little Susitna	LS-0km	Toluene	4.39	ug/L	12:00
6/11/2011	Little Susitna	LS-0km	Toluene	9.1	ug/L	9:45

Date	Site Name	Location	Measurement	Value	Units	Notes
6/11/2011	Little Susitna	LS-0km	Toluene	6.28	ug/L	15:00
6/11/2011	Little Susitna	LS-0km	Toluene	11.4	ug/L	17:45
6/12/2011	Little Susitna	LS-0km	Toluene	5.27	ug/L	9:15
6/12/2011	Little Susitna	LS-0km	Toluene	3.55	ug/L	12:00
6/12/2011	Little Susitna	LS-0km	Toluene	8.9	ug/L	15:00
6/12/2011	Little Susitna	LS-0km	Toluene	4.61	ug/L	17:30
8/1/2010	Little Susitna	LS-8kmup	Total Xylene	<1	µg/L	10-A013211
8/1/2010	Little Susitna	LS-4kmup	Total Xylene	<1	µg/L	10-A013212
8/1/2010	Little Susitna	LS-1	Total Xylene	<1	µg/L	10-A013213
8/1/2010	Little Susitna	LS-0	Total Xylene	<1	µg/L	10-A013214
8/1/2010	Little Susitna	LS-4kmdn	Total Xylene	1.01	µg/L	10-A013215
8/1/2010	Little Susitna	LS-8kmdn	Total Xylene	1.13	µg/L	10-A013216
8/1/2010	Little Susitna	LS-12kmdn	Total Xylene	1	µg/L	10-A013217
8/7/2010	Little Susitna	LSINTS 0530	Total Xylene	<1	µg/L	10-A013220
8/7/2010	Little Susitna	LSINTS 0900	Total Xylene	2.78	µg/L	10-A013221
8/7/2010	Little Susitna	LSINTS 1200	Total Xylene	<1	µg/L	10-A013222
8/7/2010	Little Susitna	LSINTS 1500	Total Xylene	6.1	µg/L	10-A013223
8/7/2010	Little Susitna	LSINTS 1800	Total Xylene	3.6	µg/L	10-A013224
8/7/2010	Little Susitna	LSINTS 2100	Total Xylene	1.2	µg/L	10-A013225
8/8/2010	Little Susitna	LSINTS 0530	Total Xylene	<1	µg/L	10-A013228
8/8/2010	Little Susitna	LSINTS 0900	Total Xylene	5.07	µg/L	10-A013229
8/8/2010	Little Susitna	LSINTS 1200	Total Xylene	3.83	µg/L	10-A013230
8/8/2010	Little Susitna	LSINTS 1500	Total Xylene	3.21	µg/L	10-A013231
8/8/2010	Little Susitna	LSINTS 1800	Total Xylene	1.15	µg/L	10-A013232
8/8/2010	Little Susitna	LSINTS 2100	Total Xylene	3.37	µg/L	10-A013233
8/8/2010	Little Susitna	LS-8kmup	Total Xylene	<1	µg/L	10-A013240
8/8/2010	Little Susitna	LS-4kmup	Total Xylene	2.85	µg/L	10-A013241

Date	Site Name	Location	Measurement	Value	Units	Notes
8/8/2010	Little Susitna	LS-1kmup	Total Xylene	3.45	µg/L	10-A013242
8/8/2010	Little Susitna	LS-4kmdn	Total Xylene	5.34	µg/L	10-A013243
8/8/2010	Little Susitna	LS-8kmdn	Total Xylene	2.94	µg/L	10-A013244
8/8/2010	Little Susitna	LS-12kmdn	Total Xylene	1.42	µg/L	10-A013244
8/8/2010	Little Susitna	LS-12kmdnx	Total Xylene	2.45	µg/L	10-A013246
8/9/2010	Little Susitna	LSINTS 0530	Total Xylene	8.07	µg/L	10-A013236
8/9/2010	Little Susitna	LSINTS 0900	Total Xylene	<1	µg/L	10-A013237
8/9/2010	Little Susitna	LSINTS 1200	Total Xylene	1.04	µg/L	10-A013238
8/15/2010	Little Susitna	LS-8kmup	Total Xylene	<1	µg/L	10-A014344
8/15/2010	Little Susitna	LS-4kmup	Total Xylene	<1	µg/L	10-A-14345
8/15/2010	Little Susitna	LS-1kmup	Total Xylene	<1	µg/L	10-A014346
8/15/2010	Little Susitna	LS-0km	Total Xylene	1.09	µg/L	10-A014347
8/15/2010	Little Susitna	LS-4kmdn	Total Xylene	3.5	µg/L	10-A014348
8/15/2010	Little Susitna	LS-8kmdn	Total Xylene	2.75	µg/L	10-A014349
8/15/2010	Little Susitna	LS-12kmdn	Total Xylene	3.67	µg/L	10-A014349
8/15/2010	Little Susitna	LS-12kmdnx	Total Xylene	3.69	µg/L	10-A014349
8/21/2010	Little Susitna	LS-8kmup	Total Xylene	<1	µg/L	10-A014354
8/21/2010	Little Susitna	LS-4kmup	Total Xylene	<1	µg/L	10-A014355
8/21/2010	Little Susitna	LS-1kmup	Total Xylene	<1	µg/L	10-A014356
8/21/2010	Little Susitna	LS-0km	Total Xylene	<1	µg/L	10-A014357
8/21/2010	Little Susitna	LS-4kmdn	Total Xylene	<1	µg/L	10-A014358
8/21/2010	Little Susitna	LS-8kmdn	Total Xylene	<1	µg/L	10-A014359
8/21/2010	Little Susitna	LS-12kmdn	Total Xylene	<1	µg/L	10-A014360
8/21/2010	Little Susitna	LS-12kmdnx	Total Xylene	<1	µg/L	10-A014361
6/4/2011	Little Susitna	LS-0km	Total Xylene	<1	ug/L	9:30
6/4/2011	Little Susitna	LS-0km	Total Xylene	2.64	ug/L	12:00
6/4/2011	Little Susitna	LS-0km	Total Xylene	<1	ug/L	15:00

Date	Site Name	Location	Measurement	Value	Units	Notes
6/4/2011	Little Susitna	LS-0km	Total Xylene	<1	ug/L	18:00
6/11/2011	Little Susitna	LS-0km	Total Xylene	1.02	ug/L	12:00
6/11/2011	Little Susitna	LS-0km	Total Xylene	3.18	ug/L	9:45
6/11/2011	Little Susitna	LS-0km	Total Xylene	2.61	ug/L	15:00
6/11/2011	Little Susitna	LS-0km	Total Xylene	4.88	ug/L	17:45
6/12/2011	Little Susitna	LS-0km	Total Xylene	<1	ug/L	9:15
6/12/2011	Little Susitna	LS-0km	Total Xylene	<1	ug/L	12:00
6/12/2011	Little Susitna	LS-0km	Total Xylene	3.63	ug/L	15:00
6/12/2011	Little Susitna	LS-0km	Total Xylene	1.08	ug/L	17:30
8/1/2010	Little Susitna	LS-8kmup	Turbidity	8.77	NTU	
8/1/2010	Little Susitna	LS-8kmup	Turbidity	7.07	NTU	
8/1/2010	Little Susitna	LS-8kmup	Turbidity	7.5	NTU	
8/1/2010	Little Susitna	LS-4kmup	Turbidity	10.77	NTU	
8/1/2010	Little Susitna	LS-4kmup	Turbidity	11.6	NTU	
8/1/2010	Little Susitna	LS-4kmup	Turbidity	9.11	NTU	
8/1/2010	Little Susitna	LS-1kmup	Turbidity	12	NTU	
8/1/2010	Little Susitna	LS-1kmup	Turbidity	12.2	NTU	
8/1/2010	Little Susitna	LS-1kmup	Turbidity	10.86	NTU	
8/1/2010	Little Susitna	LS-0km	Turbidity	14	NTU	
8/1/2010	Little Susitna	LS-0km	Turbidity	11.6	NTU	
8/1/2010	Little Susitna	LS-0km	Turbidity	10.27	NTU	
8/1/2010	Little Susitna	LS-4kmdn	Turbidity	11.70	NTU	
8/1/2010	Little Susitna	LS-4kmdn	Turbidity	12.20	NTU	
8/1/2010	Little Susitna	LS-4kmdn	Turbidity	10.10	NTU	
8/1/2010	Little Susitna	LS-8kmdn	Turbidity	11.40	NTU	
8/1/2010	Little Susitna	LS-8kmdn	Turbidity	11.90	NTU	
8/1/2010	Little Susitna	LS-8kmdn	Turbidity	15.00	NTU	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/1/2010	Little Susitna	LS-12kmdn	Turbidity	12.30	NTU	
8/1/2010	Little Susitna	LS-12kmdn	Turbidity	13.90	NTU	
8/1/2010	Little Susitna	LS-12kmdn	Turbidity	12.00	NTU	
8/1/2010	Little Susitna	Houston	Turbidity	3.52	NTU	
8/1/2010	Little Susitna	Houston	Turbidity	3.29	NTU	
8/1/2010	Little Susitna	Houston	Turbidity	3.59	NTU	
8/6/2010	Little Susitna	Houston	Turbidity	4.24	NTU	
8/6/2010	Little Susitna	Houston	Turbidity	5.05	NTU	
8/6/2010	Little Susitna	Houston	Turbidity	3.54	NTU	
8/7/2010	Little Susitna	LS-0km	Turbidity	6.34	NTU	6:30
8/7/2010	Little Susitna	LS-0km	Turbidity	6.26	NTU	6:30
8/7/2010	Little Susitna	LS-0km	Turbidity	6.68		6:30
8/7/2010	Little Susitna	LS-0km	Turbidity	7.22	NTU	9:00
8/7/2010	Little Susitna	LS-0km	Turbidity	8.29	NTU	9:00
8/7/2010	Little Susitna	LS-0km	Turbidity	10.25	NTU	9:00
8/7/2010	Little Susitna	LS-0km	Turbidity	11.1	NTU	12:00
8/7/2010	Little Susitna	LS-0km	Turbidity	10.87	NTU	12:00
8/7/2010	Little Susitna	LS-0km	Turbidity	14.5	NTU	12:00
8/7/2010	Little Susitna	LS-0km	Turbidity	13	NTU	12:00
8/7/2010	Little Susitna	LS-0km	Turbidity	15.2	NTU	12:00
8/7/2010	Little Susitna	LS-0km	Turbidity	8.01	NTU	15:00
8/7/2010	Little Susitna	LS-0km	Turbidity	9.14	NTU	15:00
8/7/2010	Little Susitna	LS-0km	Turbidity	10.35	NTU	15:00
8/7/2010	Little Susitna	LS-0km	Turbidity	11.7	NTU	18:00
8/7/2010	Little Susitna	LS-0km	Turbidity	11.4	NTU	18:00
8/7/2010	Little Susitna	LS-0km	Turbidity	11.4	NTU	18:00
8/7/2010	Little Susitna	LS-0km	Turbidity	8.02	NTU	21:00

Date	Site Name	Location	Measurement	Value	Units	Notes
8/7/2010	Little Susitna	LS-0km	Turbidity	9.04	NTU	21:00
8/7/2010	Little Susitna	LS-0km	Turbidity	9.79	NTU	21:00
8/8/2010	Little Susitna	LS-8kmup	Turbidity	6.76	NTU	
8/8/2010	Little Susitna	LS-8kmup	Turbidity	9.01	NTU	
8/8/2010	Little Susitna	LS-8kmup	Turbidity	9.59	NTU	
8/8/2010	Little Susitna	LS-8kmup	Turbidity	10.05	NTU	
8/8/2010	Little Susitna	LS-4kmup	Turbidity	8.97	NTU	
8/8/2010	Little Susitna	LS-4kmup	Turbidity	5.59	NTU	
8/8/2010	Little Susitna	LS-4kmup	Turbidity	9.17	NTU	
8/8/2010	Little Susitna	LS-4kmup	Turbidity	10.09	NTU	
8/8/2010	Little Susitna	LS-1kmup	Turbidity	11.1	NTU	
8/8/2010	Little Susitna	LS-1kmup	Turbidity	11.9	NTU	
8/8/2010	Little Susitna	LS-1kmup	Turbidity	13.4	NTU	
8/8/2010	Little Susitna	LS-1kmup	Turbidity	10.57	NTU	
8/8/2010	Little Susitna	LS-4kmdn	Turbidity	9.07	NTU	
8/8/2010	Little Susitna	LS-4kmdn	Turbidity	12.3	NTU	
8/8/2010	Little Susitna	LS-4kmdn	Turbidity	11.4	NTU	
8/8/2010	Little Susitna	LS-8kmdn	Turbidity	11.8	NTU	
8/8/2010	Little Susitna	LS-8kmdn	Turbidity	14	NTU	
8/8/2010	Little Susitna	LS-8kmdn	Turbidity	13.6	NTU	
8/8/2010	Little Susitna	LS-12kmdn	Turbidity	15	NTU	
8/8/2010	Little Susitna	LS-12kmdn	Turbidity	18.6	NTU	
8/8/2010	Little Susitna	LS-12kmdn	Turbidity	17.6	NTU	
8/8/2010	Little Susitna	LS-12kmdn	Turbidity	18.2	NTU	
8/8/2010	Little Susitna	LS-0km	Turbidity	7.71	NTU	6:00
8/8/2010	Little Susitna	LS-0km	Turbidity	7.86	NTU	6:00
8/8/2010	Little Susitna	LS-0km	Turbidity	7.12	NTU	6:00

Date	Site Name	Location	Measurement	Value	Units	Notes
8/8/2010	Little Susitna	LS-0km	Turbidity	9.28	NTU	9:00
8/8/2010	Little Susitna	LS-0km	Turbidity	7.69	NTU	9:00
8/8/2010	Little Susitna	LS-0km	Turbidity	8.21	NTU	9:00
8/8/2010	Little Susitna	LS-0km	Turbidity	8.13	NTU	12:00
8/8/2010	Little Susitna	LS-0km	Turbidity	9.74	NTU	12:00
8/8/2010	Little Susitna	LS-0km	Turbidity	9.73	NTU	12:00
8/8/2010	Little Susitna	LS-0km	Turbidity	9.93	NTU	15:00
8/8/2010	Little Susitna	LS-0km	Turbidity	8.83	NTU	15:00
8/8/2010	Little Susitna	LS-0km	Turbidity	9.22	NTU	15:00
8/8/2010	Little Susitna	LS-0km	Turbidity	9.97	NTU	18:00
8/8/2010	Little Susitna	LS-0km	Turbidity	10.87	NTU	18:00
8/8/2010	Little Susitna	LS-0km	Turbidity	9.96	NTU	18:00
8/8/2010	Little Susitna	LS-0km	Turbidity	15.1	NTU	21:00
8/8/2010	Little Susitna	LS-0km	Turbidity	13.4	NTU	21:00
8/8/2010	Little Susitna	LS-0km	Turbidity	12.6	NTU	21:00
8/9/2010	Little Susitna	LS-0km	Turbidity	5.38	NTU	5:30
8/9/2010	Little Susitna	LS-0km	Turbidity	4.3	NTU	5:30
8/9/2010	Little Susitna	LS-0km	Turbidity	5.74	NTU	5:30
8/9/2010	Little Susitna	LS-0km	Turbidity	8.12	NTU	9:00
8/9/2010	Little Susitna	LS-0km	Turbidity	8.3	NTU	9:00
8/9/2010	Little Susitna	LS-0km	Turbidity	7.45	NTU	9:00
8/9/2010	Little Susitna	LS-0km	Turbidity	8.61	NTU	12:00
8/9/2010	Little Susitna	LS-0km	Turbidity	7.11	NTU	12:00
8/9/2010	Little Susitna	LS-0km	Turbidity	7.88	NTU	12:00
8/15/2010	Little Susitna	Houston	Turbidity	5.08	NTU	
8/15/2010	Little Susitna	Houston	Turbidity	5.77	NTU	
8/15/2010	Little Susitna	Houston	Turbidity	4.1	NTU	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/15/2010	Little Susitna	LS-8kmup	Turbidity	5.42	NTU	
8/15/2010	Little Susitna	LS-8kmup	Turbidity	5.02	NTU	
8/15/2010	Little Susitna	LS-8kmup	Turbidity	4.23	NTU	
8/15/2010	Little Susitna	LS-4kmup	Turbidity	5.12	NTU	
8/15/2010	Little Susitna	LS-4kmup	Turbidity	6.6	NTU	
8/15/2010	Little Susitna	LS-4kmup	Turbidity	5.05	NTU	
8/15/2010	Little Susitna	LS-1kmup	Turbidity	5.64	NTU	
8/15/2010	Little Susitna	LS-1kmup	Turbidity	6	NTU	
8/15/2010	Little Susitna	LS-1kmup	Turbidity	5.68	NTU	
8/15/2010	Little Susitna	LS-0km	Turbidity	6.23	NTU	
8/15/2010	Little Susitna	LS-0km	Turbidity	6.47	NTU	
8/15/2010	Little Susitna	LS-0km	Turbidity	9.48	NTU	
8/15/2010	Little Susitna	LS-8kmdn	Turbidity	9.02	NTU	
8/15/2010	Little Susitna	LS-8kmdn	Turbidity	9.99	NTU	
8/15/2010	Little Susitna	LS-8kmdn	Turbidity	9.99	NTU	
8/15/2010	Little Susitna	LS-4kmdn	Turbidity	9.14	NTU	
8/15/2010	Little Susitna	LS-4kmdn	Turbidity	8.65	NTU	
8/15/2010	Little Susitna	LS-4kmdn	Turbidity	10.06	NTU	
8/15/2010	Little Susitna	LS-12kmdn	Turbidity	12.2	NTU	
8/15/2010	Little Susitna	LS-12kmdn	Turbidity	11.5	NTU	
8/15/2010	Little Susitna	LS-12kmdn	Turbidity	12.6	NTU	
8/21/2010	Little Su	LS-4kmup	Turbidity	4.49	NTU	
8/21/2010	Little Su	LS-4kmup	Turbidity	4.91	NTU	
8/21/2010	Little Su	LS-1kmup	Turbidity	5.88	NTU	
8/21/2010	Little Su	LS-1kmup	Turbidity	6.41	NTU	
8/21/2010	Little Su	LS-1kmup	Turbidity	6.73	NTU	
8/21/2010	Little Su	LS-0kmdn	Turbidity	6.23	NTU	

Date	Site Name	Location	Measurement	Value	Units	Notes
8/21/2010	Little Su	LS-0kmdn	Turbidity	7.05	NTU	
8/21/2010	Little Su	LS-0kmdn	Turbidity	6.77	NTU	
8/21/2010	Little Su	LS-4kmdn	Turbidity	4.87	NTU	
8/21/2010	Little Su	LS-4kmdn	Turbidity	5.39	NTU	
8/21/2010	Little Su	LS-4kmdn	Turbidity	5.98	NTU	
8/21/2010	Little Su	LS-8kmdn	Turbidity	5.66	NTU	
8/21/2010	Little Su	LS-8kmdn	Turbidity	7.16	NTU	
8/21/2010	Little Su	LS-8kmdn	Turbidity	7.82	NTU	
8/21/2010	Little Su	LS-8kmdn	Turbidity	7.99	NTU	
8/21/2010	Little Su	LS-12kmdn	Turbidity	6.57	NTU	
8/21/2010	Little Su	LS-12kmdn	Turbidity	7.47	NTU	
8/21/2010	Little Su	LS-12kmdn	Turbidity	8.71	NTU	
8/21/2010	Little Su	LS-12kmdn	Turbidity	8.62	NTU	
8/21/2010	Little Su	Houston	Turbidity	5.17	NTU	
8/21/2010	Little Su	Houston	Turbidity	5.6	NTU	
8/21/2010	Little Su	Houston	Turbidity	7.12	NTU	
8/21/2010	Little Su	Houston	Turbidity	4.8	NTU	
8/21/2010	Little Su	Houston	Turbidity	4.58	NTU	
8/21/2010	Little Susitna	LS-8kmup	Turbidity	5.46	NTU	
8/21/2010	Little Susitna	LS-8kmup	Turbidity	5.2	NTU	
8/21/2010	Little Susitna	LS-8kmup	Turbidity	7.11	NTU	
8/21/2010	Little Susitna	LS-8kmup	Turbidity	5.95	NTU	
8/21/2010	Little Susitna	LS-4kmup	Turbidity	4.07	NTU	

Appendix B. Site Photographs

Photograph 1. Sampling site 8 km upstream from the PUF looking downstream (8/1/10).

Photograph 2. Sampling site 8 km upstream from the PUF looking upstream (8/1/10).

Photograph 3. Site 4 km above the PUF looking downstream (8/1/10).

Photograph 4. Site 1 km above the PUF looking upstream (8/1/10).

Photograph 5. Site 4 km below the PUF looking upstream (8/1/10).

Photograph 6. PUF from upstream (8/8/10).

Photograph 7. Defoliated alders at 5 km below the PUF (8/8/10).

Photograph 8. Site 12 km below the PUF (8/8/10).

Photograph 9. Turbid water (6.7 NTU) at the PUF looking downstream (8/21/10).

Photograph 10. Sampling location 4 km below PUF looking upstream (8/21/10).

Photograph 11. Site 8 km below the PUF looking upstream (8/21/10).

Photograph 12. Millers Reach boat launch below Houston (9/24/10).

Photograph 13. Boat repairs at the PUF (8/9/10).

Photograph 14. PUF 2-cycle motors (8/9/10).

Photograph 15. Cold start at the PUF (8/9/10).

Photograph 16. Sampling location 8 km below the PUF (6/11/11).

Photograph 17. Sampling location 4 km below the PUF 6/11/11).

Photograph 18. Location of Houston turbidity logger looking upstream (6/12/11).

Photograph 19. Personal water craft used during the Chinook sport fishery (6/11/11).

Photograph 20. Non-motorized boats at the PUF (6/12/11).

Photograph 21. Non-motorized boat use at Houston (6/12/11).