Lake Chemistry and Physical Data For Selected North Slope, Alaska, Lakes: January 2008

Lathes at Mine Site B, photo by D. Reichardt

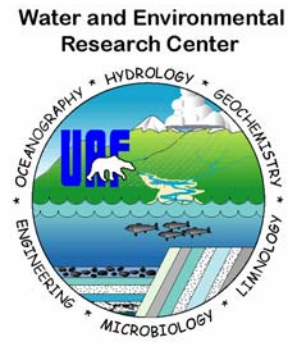
by

Kristie Holland, Horacio Toniolo, Jeff Derry, Chad Cormack, Greta Myerchin, Amanda Blackburn, Matthew Whitman, and Michael Lilly

February 2008

North Slope Lakes Hydrologic Project

Report No. INE/WERC 08.08



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By:

Kristie Holland[1], Horacio Toniolo[2], Jeff Derry[1], Chad Cormack[2], Greta Myerchin[2], Amanda Blackburn[1], Matthew Whitman[3], and Michael Lilly[1]

A report on research sponsored by:

- U.S. Department of Energy
- National Energy Technology Laboratory
- BP Exploration (Alaska), Inc.
- ConocoPhillips Alaska, Inc.
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February 2008

North Slope Lakes Hydrologic Project

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Fairbanks, Alaska
February 2008

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DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the accuracy of the data presented herein. This research was funded by the U.S. Department of Energy (DOE) and the National Energy Technology Laboratory (NETL). Funding and support was also provided by the Bureau of Land Management (BLM), BP Exploration (Alaska) Inc. (BPX), ConocoPhillips Alaska, Inc. (CPA), and Geo-Watersheds Scientific (GWS). The contents of the report do not necessarily reflect the views or policies of the DOE, NETL, BLM, BPX, CPA, GWS, or any local sponsor. This work does not constitute a standard, specification, or regulation.

The use of trade and firm names in this document is for the purpose of identification only and does not imply endorsement by the University of Alaska Fairbanks (UAF), DOE, NETL, BLM, BPX, CPA, GWS, or other project sponsors.

CONVERSION FACTORS, UNITS, WATER QUALITY UNITS, VERTICAL AND HORIZONTAL DATUM, ABBREVIATIONS AND SYMBOLS

Conversion Factors

Multiply	By	To obtain
	Length	
inch (in.)	25.4	millimeter (mm)
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
Acre	43559.999	square feet (ft^2)
Acre	0.405	hectare (ha)
Square foot (ft^2)	3.587e-8	square mile (mi^2)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallon (gal)	3.785	liter (L)
gallon (gal)	3785.412	milliliter (mL)
Cubic foot (ft^3)	28.317	liter (L)
Acre-ft	1233	Cubic meter (m^3)
	Velocity and Discharge	
foot per day (ft/d)	0.3048	meter per day (m/d)
Square foot per day (ft^2/d)	.0929	square meter per day (m^2/d)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/sec)
	Hydraulic Conductivity	
foot per day (ft/d)	0.3048	meter per day (m/d)
foot per day (ft/d)	0.00035	centimeter per second (cm/sec)
meter per day (m/d)	0.00115	centimeter per second (cm/sec)
	Hydraulic Gradient	
foot per foot (ft/ft)	5280	foot per mile (ft/mi)
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)
	Pressure	
pound per square inch (lb/in^2)	6.895	kilopascal (kPa)

Units

For the purposes of this report, both English and Metric (SI) units were employed. The choice of "primary" units employed depended on common reporting standards for a particular property or parameter measured. Whenever possible, the approximate value in the "secondary" units was also provided in parentheses. Thus, for instance, stream flow was reported in cubic feet per second (cfs) followed by the equivalent value in cubic meters per second (m^3/s) in parentheses.

Physical and Chemical Water-Quality Units:

Temperature:

Water and air temperature are given in degrees Celsius (°C) and in degrees Fahrenheit (°F). Degrees Celsius can be converted to degrees Fahrenheit by use of the following equation:

$$°F = 1.8(°C) + 32$$

Specific electrical conductance (conductivity):

Conductivity of water is expressed in microsiemens per centimeter at 25°C (µS/cm). This unit is equivalent to microhms per centimeter at 25°C.

Milligrams per liter (mg/L) or micrograms per liter (µg/L):

Milligrams per liter is a unit of measurement indicating the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter. For concentrations less than 7,000 mg/L, the numerical value is the same as for concentrations in parts per million.

Millivolt (mV):

A unit of electromotive force equal to one thousandth of a volt.

Vertical Datum:

In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929), a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called *Sea Level Datum of 1929*.

Horizontal Datum:

The horizontal datum for all locations in this report is the North American Datum of 1983 or North American Datum of 1927.

Abbreviations, Acronyms, and Symbols

AC	Actual conductivity
ADOT&PF	Alaska Department of Transportation and Public Facilities
ASTM	American Society for Testing and Materials
atm	atmospheres
C	Celsius
DO	Dissolved oxygen
DVM	digital voltage multi-meter
e-tape	electric tape
F	Fahrenheit (^{o}F).
ft	feet
GWS	Geo-Watersheds Scientific
GWSI	USGS Ground-Water Site Inventory
km^2	square kilometers
kPa	kilopascal
lb/in^2	pounds per square inch
m	meters
mg/L	milligrams per liter, equivalent to ppm
µg/L	micrograms per liter
mi^2	square miles
mm	millimeters
µS/cm	microsiemens per centimeter
mV	Millivolt
NGVD	National Geodetic Vertical Datum
NTU	Nephelometric Turbidity Units
NWIS	National Water Information System
ORP	oxygen-reduction potential
ppm	parts per million, equivalent to mg/L
SC25	specific conductance at 25^{o}C
SWE	Snow Water Equivalent
QA	quality assurance
QC	quality control
UAF	University of Alaska Fairbanks
USACE	U.S. Army Corps of Engineers, Alaska District
USGS	U.S. Geological Survey
WERC	Water and Environmental Research Center
WWW	World Wide Web
YSI	Yellow Springs Instruments

Lake Nomenclature

KDA	Kuparuk Dead Arm (Prudhoe Bay field, serves Prudhoe Bay field operations)
MSB	Mine Site B (Prudhoe Bay field, serves Milne Point and Kuparuk field operations)
L9312	Lake L9312 (Alpine field, serves Alpine field operations)
L9817	Lake L9817 (Alpine field, serves Alpine field operations)
K113	Lake K113 (Prudhoe Bay field, not currently used for field operations)

PROJECT COOPERATORS

The North Slope Lakes project covers a large area of the North Slope and benefits from a number of positive partnerships, all contributing to the overall project objectives.

- BP Exploration (Alaska) Inc.
- ConocoPhillips Alaska, Inc. (CPA)
- Bureau of Land Management
- Alaska Department of Natural Resources
- The Nature Conservancy
- Northern Alaska Environmental Center

ACKNOWLEDGEMENTS

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Lake Chemistry and Physical Data For Selected North Slope, Alaska, Lakes: January 2008

INTRODUCTION

The University of Alaska Fairbanks (UAF) Water and Environmental Research Center (WERC) and Geo-Watersheds Scientific (GWS), together with project cooperators, initiated a study in the Fall of 2002 (Phase One) to obtain baseline information about the physical and chemical characteristics of North Slope tundra lakes. The project was extended in 2005 (Phase Two). The location of the study lakes changed and was expanded to include other reservoirs so as to further develop the understanding and simulation tools necessary for water-source management. K113 is an un-pumped lake in the Kuparuk oilfield and is sampled on selected field trips during the year. L9312 is a natural lake studied in the Alpine operations area. L9817 is a natural lake in eastern NPRA, west of Nuiqsut. L9817 had been used in past years for ice-road construction, but was not pumped during the 2005-06 or 2006-07 winters, however, it was heavily pumped throughout the 2007-08 winter. Two reservoir systems (mine sites) were added to the study in 2005. Mine Site B, also known as Six-mile Lake, is located near the Milne Point facility at the intersection of the Spine Road with the Milne Point access road and has two cells connected to Milne Creek. The Kuparuk Reservoir System (Kuparuk Deadarm Lakes) has nine reservoirs. The three southernmost reservoir cells (1-3) are included in the study to observe ground-water and surface-water interactions between each cells and the adjacent Kuparuk River. Study location can be seen in Figure 1.

Water-quality and hydrologic data is collected in the field during monthly visits to the lakes and water samples are collected from priority locations for further analysis at the UAF-WERC chemistry laboratories. The purposes of this publication are to 1) report data collected for the month of January 2008, 2) summarize accomplished field trip objectives.

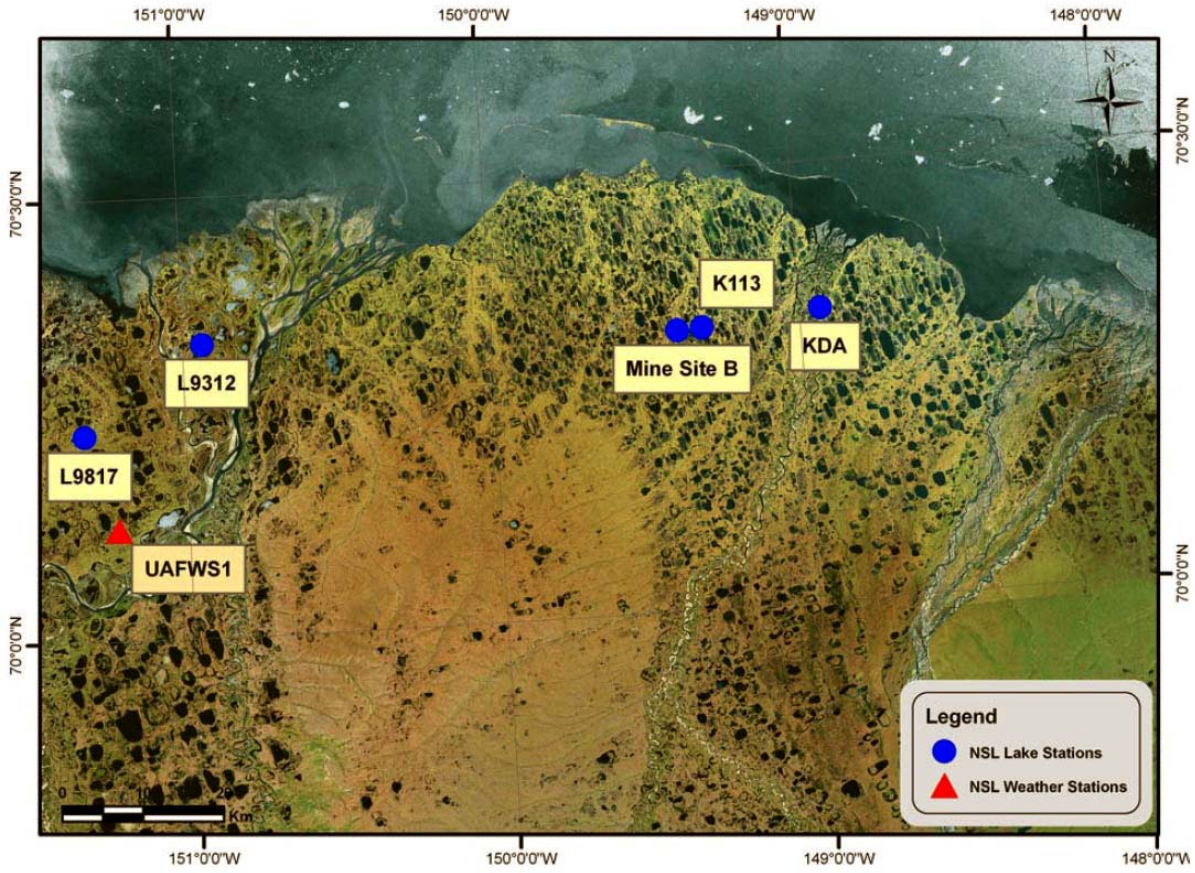

Figure 1. Location of study lakes in the NPR-A, Alpine, Kuparuk, and Prudhoe Bay field operating areas, North Slope, Alaska.

TRIP OBJECTIVES

The goal of each sampling trip is to collect physical and chemical data from each study lake. For each lake, a series of holes are drilled at designated sampling locations or a raft is taken onto the water when conditions are ice-free. Logistical, personnel, and weather constraints, can limit the amount of time available in the field for sampling. A project workplan was distributed before the trip outlining the sampling schedule (Lilly and others, 2008). In January 2008, we focused on the following locations/tasks:

1. Kuparuk Deadarm Lakes, (Cells 1-3)
    - Measure field water-quality parameters in cells 1, 2, and 3. This includes vertical profile measurements at each location for temperature, dissolved oxygen (DO), conductivity, pH, turbidity, and barometric pressure.
    - Survey water levels of KDA 1-3 to local elevation control.
    - Conduct snow surveys at standard locations.
    - Automated data collection station maintenance.
2. Mine Site B, Milne-Point Facility
    - Measure field water-quality parameters on North and South cells. This includes vertical profile measurements at each location for temperature, dissolved oxygen (DO), conductivity, pH, turbidity, and barometric pressure.
    - Survey water levels to local elevation control.
    - Conduct snow surveys at standard locations
3. L9312, Alpine Facility
    - Measure field water-quality parameters at standard locations. This includes vertical profile measurements for temperature, dissolved oxygen (DO), conductivity, pH, turbidity, oxygen reduction potential (ORP) and barometric pressure.
    - Survey water levels to local elevation control.
    - Conduct snow surveys at standard locations.
    - Automated data collection and station maintenance.
4. Prudhoe Bay Operating Area, Primary Objectives
    - Betty Pingo: Automated data collection station maintenance.
    - Conduct snow survey at standard location.

PROCEDURES

Water Chemistry Sampling

All field work follows the specified health, safety, and environmental guidelines outlined by BPX and CPA (White and Lilly, 2008 *a*, *b*, *c*). Physical measurements of water depth were

taken at each sampling location. Water quality parameters such as temperature, pH, turbidity, oxygen reduction potential (ORP), conductivity, and dissolved oxygen (DO) were obtained by using an In-Situ Troll 9000 (submersible meter), at multiple depths throughout the water column. The precision with which physical measurements were reported takes into account field conditions. The calibration of each parameter was checked before and after each day of sampling using the criteria in Table 1.

Table 1. In-Situ Troll 9000 calibration quality control criteria.

Parameter	Standards used	Acceptable deviation from calibration standard value
Turbidity	Factory calibrated	± 2 (NTU)
pH	4.01, 7.0, 10.0	± 0.2
Conductivity	447 (µs/cm)	within 10%
100% DO	100 % saturated	within 10%
0% DO	0 % saturated solution	within 0.3 mg/L
ORP	In-Situ Quick Cal 224 mV	within 10%

Snow Surveys

Small-scale snow depth measurements were conducted in "L" shaped patterns on lake surface and/or tundra surface at predetermined locations (Figure 2). Snow depth measurements were taken every meter for twenty-five meters, then turning 90 degrees, and continuing for another twenty-five meters. Snow samples were also collected for density measurements with an Adirondack snow sampler. Five densities were collected from points on tundra and lake and averaged to establish a representative density.

Figure 2. Snow Water Equivalence Measurement by D. Reichardt at Mine Site B

SELECTED RESULTS

Sampling occurred at Kuparuk Deadarm Lakes, Mine Site B, and L9312 during January field activities, K113 was not visited. Table 2 summarizes conditions at "Priority Sampling Sites". These locations have more historical data than other locations on the lakes, and have been chosen as representative of the deeper portion of the respective lakes. As Table 2 demonstrates, water levels at KDA 2, 3, MSB, and L9312 appear to be increasing each month. The dissolved oxygen levels at the Kuparuk Deadarm Reservoir increased by approximately 1 mg/L from last month with differences of 0.97 mg/L at KDA-1 and 1.45 mg/L at KDA-2. L9312 had a drop in dissolved oxygen during this same time period with a decrease of 1.94 mg/L. The DO levels at MSB remained similar between months and all of the sites exhibited similar conductivity levels when compared to last months results.

Table 2. Ice thickness, Median DO Concentration, Median Actual Conductance and Monthly Water Change for North Slope lakes in mid-January.

Sampling Site	Ice Thickness [ft; (m)]	Median DO Concentration [mg/L]	Median Actual Conductivity [µS/cm]	Water level Change since mid December [ft; (m)]
KDA1-CT	3.35; (1.02)	15.82	105.6	-0.04; (0.122)
KDA2-CT	3.20; (0.975)	16.05	110.9	+0.24; (0.073)
KDA3-CT	3.30; (1.00)	14.94	106.4	+0.23; (+0.070)
MSBS-CT	3.58; (1.09)	12.28	154.0	+0.28; (+0.085)
MSBN-CT	3.48; (1.06)	12.76	149.3	+0.28; (+0.085)
L9312 Raft B	3.30; (1.00)	13.07	62.09	+0.02; (+0.006)

SUMMARY

Continuous monitoring of the water-quality parameters and spatial distribution of snow cover at North Slope lakes throughout the winter will help in the understanding and development of simulation tools necessary for water resource management. As water levels drop due to freezing and pumping activities in the winter, it is important to identify the changing water chemistry as well as the potential spring recharge. This information is important for permitting agencies as well as the industry professionals who depend on this resource for facility use and ice road/pad construction. Through monthly hydrologic assessments, water chemistry testing, and water sample analysis, we will continue to answer some of the questions brought forth on the effects of mid-winter pumping of North Slope tundra lakes.

REFERENCES

Holland, K., Derry, J., Lilly, M.R. 2008. A Workplan for Meteorological Station Maintenance, Lake Chemistry Sampling, and Surveying at Study Lakes in Alpine, Kuparuk River, and Prudhoe Bay Areas: January 2008. Water and Environmental Research Center, University of Alaska Fairbanks. 17 pages.

White, D.M., and Lilly, M.R. 2008 *a*. BPX: Health, Safety, and Environmental Interface Document. Water and Environmental Research Center, University of Alaska Fairbanks. 4 p.

White, D.M., and Lilly, M.R. 2008 *b*. BPX: Health, Safety, and Environmental Plan. Water and Environmental Research Center, University of Alaska Fairbanks. 6 p.

White, D.M., and Lilly, M.R. 2008 *c*. ConocoPhillips Alaska, Inc.: Health, Safety, and Environmental Plan. Water and Environmental Research Center, University of Alaska Fairbanks. 5 p.

APPENDIX A. WATER QUALITY FIELD SAMPLING FORMS

The following forms report the data collected with the water quality meters during field sampling.

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA1-CT

Sample Purpose: **Lake Water Quality** Date: 1/8/08 Time: 12:21

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.894' Easting: W148°56.743' Datum: NAD83

Measurements By: GMM/ DMS Time: 12:21

Water Depth (ft): 20.45 Ice Thickness (ft): 3.35

Freeboard (ft): 0.25 Snow Depth (ft): 0.04

Elev. (BPMSL +/- .02): 7.96 Survey By: Chad/Horacio Date: 1/8/08 Time: 12:30

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	Insitu/ Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	12:28	12:32	12:33	12:35	12:38	12:42	12:45	12:47	12:49	
Depth BWS (ft):	4	5	6	7	9	11	13	15	17	
Temp (°C):	0.21	0.44	0.67	0.80	1.08	1.36	1.53	1.61	1.79	
pH:	7.74	7.74	7.74	7.74	7.72	7.72	7.73	7.75	7.71	
Barometeric (mmHg):	769.6	769.6	769.6	769.7	769.8	769.8	769.9	770.0	770.0	
Pressure (kPa):	10.282	13.277	16.346	19.284	25.153	31.206	37.123	43.125	49.116	
Conductivity (µS/cm):	107.4	106.6	106.4	106.2	106.0	105.6	105.3	105.40	105.40	
RDO (ppm): (mg/L)	15.86	15.78	15.85	15.83	15.80	15.82	15.72	15.74	15.52	
Turbidity (NTU):	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	-0.2	
ORP	393	392	390	389	389	387	385	383	385	

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks: Sheet 1 of 2

Field-Form Filled Out By: G. Myerchin Date: 1/10/08

QAQC Check By: JED Date: 1/11/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA1-CT

Sample Purpose: **Lake Water Quality** Date: 1/8/08 Time: 12:21

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.894' Easting: W148°56.743' Datum: NAD83

Measurements By: GMM/ DMS Time: 12:21

Water Depth (ft): 20.45 Ice Thickness (ft): 3.35

Freeboard (ft): 0.25 Snow Depth (ft): 0.04

Elev. (BPMSL +/- .02): 7.96 Survey By: Chad/Horacio Date: 1/8/08 Time: 12:30

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	Insitu/ Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	12:56	13:00	13:05							
Depth BWS (ft):	18	19	BOT*							
Temp (°C):	2.00	2.07	2.11							
pH:	7.43	7.36	7.34							
Barometeric (mmHg):	770.0	770.1	770.1							
Pressure (kPa):	52.134	55.021	57.365							
Conductivity (µS/cm):	108.0	112.0	120.7							
RDO (ppm): (mg/L)	11.52	8.07	5.03							
Turbidity (NTU):	0.0	0.0	0.3							
ORP	392	393	393							

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks: *BOT = ~ 6" above bottom @ 19.8 ft

Sheet 2 of 2

Field-Form Filled Out By: G. Myerchin Date: 1/10/08

QAQC Check By: JED Date: 1/11/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA1A

Sample Purpose: **Lake Water Quality** Date: 1/8/08 Time: nr

FIELD MEASUREMENTS

GPS Coord. Northing: N70° 19.868' Easting: W148° 56.768' Datum: NAD83

Measurements By: White Time: 12:21

Water Depth (ft): 14.3 Ice Thickness (ft): 3.55

Freeboard (ft): 0.26 Snow Depth (ft): 0.04

Elev. (BPMSL +/- .02): 7.96 Survey By: Chad/Horacio Date: 1/8/08 Time: 12:30

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, Temp	BLM	Hach LDO	3625	PASS	PASS

Parameters	**Field Measurements**									
Time:										
Depth BWS (ft):	4	5	6	8	10	11	12	13	14	BOT
Temp (°C):	0.50	0.80	1.00	1.20	1.30	1.40	1.40	1.50	1.50	1.50
pH:										
Barometeric (mmHg):										
Pressure (mmHg):	776.00	776.00	770.00	770.00	770.00	770.00	770.00	770.00	769.00	769.00
Conductivity (µS/cm):										
RDO (ppm): (mg/L)	15.60	15.60	15.60	15.50	15.40	15.20	14.90	14.70	14.20	13.90
Turbidity (NTU):										
ORP										

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA2-CT

Sample Purpose: **Lake Water Quality** Date: 1/8/08 Time: 11:09

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.966' Easting: W148°56.429' Datum: NAD83

Measurements By: GMM/ DMS Time: 11:09

Water Depth (ft): 18.95 Ice Thickness (ft): 3.20

Freeboard (ft): 0.25 Snow Depth (ft): 0.00

Elev. (BPMSL +/- .02): 6.7 Survey By: Chad/Horacio Date: 1/8/08 Time: 12:30

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

WATER QUALITY METER INFORMATION 3

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	Insitu/ Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	11:13	11:15	11:18	11:21	11:28	11:32	11:35	11:37	11:40	
Depth BWS (ft):	4	5	6	7	9	11	13	15	16	
Temp (°C):	0.83	0.34	0.55	0.74	1.05	1.21	1.39	1.61	1.78	
pH:	7.85	7.86	7.85	7.82	7.65	7.62	7.64	7.63	7.51	
Barometeric (mmHg):	769.9	769.8	769.7	769.7	769.8	769.9	770.0	770.1	770.2	
Pressure (kPa):	10.326	13.176	16.197	19.237	25.247	31.216	37.110	43.122	46.052	
Conductivity (µS/cm):	110.2	111.6	111.1	111.0	111.0	110.9	111.0	111.30	112.70	
RDO (ppm): (mg/L)	13.88	14.48	15.05	15.43	15.90	16.05	16.29	16.10	15.34	
Turbidity (NTU):	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	
ORP	380	377	375	374	378	378	376	375	378	

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks: Sheet 1 of 2

Field-Form Filled Out By: G. Myerchin Date: 1/10/08

QAQC Check By: JED Date: 1/11/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA2-CT

Sample Purpose: **Lake Water Quality** Date: 1/8/08 Time: 11:09

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.966' Easting: W148°56.429' Datum: NAD83

Measurements By: GMM/ DMS Time: 11:09

Water Depth (ft): 18.95 Ice Thickness (ft): 3.20

Freeboard (ft): 0.25 Snow Depth (ft): 0.00

Elev. (BPMSL +/- .02): 6.7 Survey By: Chad/Horacio Date: 1/8/08 Time: 12:30

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	Insitu/ Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	11:44	11:52								
Depth BWS (ft):	17	18								
Temp (°C):	2.03	2.16								
pH:	7.20	7.12								
Barometeric (mmHg):	770.2	770.1								
Pressure (kPa):	49.150	52.166								
Conductivity (µS/cm):	118.8	127.7								
RDO (ppm): (mg/L)	8.57	4.48								
Turbidity (NTU):	1.6	6.0								
ORP	384	384								

FIELD TESTING OF WATER SAMPLES (if small probe is used) Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks: Sheet 2 of 2

Field-Form Filled Out By: G. Myerchin Date: 1/10/08

QAQC Check By: JED Date: 1/11/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA2MT

Sample Purpose: **Lake Water Quality** Date: 1/8/08 Time: nr

FIELD MEASUREMENTS

GPS Coord. Northing: N70° 19.948' Easting: W148° 56.368' Datum: NAD83

Measurements By: White Time: 12:21

Water Depth (ft): 12.95 Ice Thickness (ft): 3.62

Freeboard (ft): 0.12 Snow Depth (ft): 0.12

Elev. (BPMSL +/- .02): 6.7 Survey By: Chad/Horacio Date: 1/8/08 Time: 12:30

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, Temp	BLM	Hach LDO	3625	PASS	PASS

Parameters	**Field Measurements**									
Time:										
Depth BWS (ft):	3	4	5	6	8	10	11	12	BOT	
Temp (°C):	0.00	0.00	0.20	0.40	0.60	0.80	0.90	1.00	1.10	
pH:										
Barometeric (mmHg):										
Pressure (mmHg):	770.00	770.00	770.00	770.00	770.00	770.00	771.00	771.00	771.00	
Conductivity (µS/cm):										
RDO (ppm): (mg/L)	14.00	14.70	14.90	14.90	15.10	15.10	15.00	14.80	14.60	
Turbidity (NTU):										
ORP										

FIELD TESTING OF WATER SAMPLES (if small probe is used)					
Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA2NT

Sample Purpose: **Lake Water Quality** Date: 1/8/08 Time: nr

FIELD MEASUREMENTS

GPS Coord. Northing: N70° 19.960' Easting: W148° 56.317' Datum: NAD83

Measurements By: White Time: 12:21

Water Depth (ft): 16.6 Ice Thickness (ft): 3.52

Freeboard (ft): 0.05 Snow Depth (ft): 0.33

Elev. (BPMSL +/- .02): 6.7 Survey By: Chad/Horacio Date: 1/8/08 Time: 12:30

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, Temp	BLM	Hach LDO	3625	PASS	PASS

Parameters	**Field Measurements**									
Time:										
Depth BWS (ft):	4	5	6	8	10	12	14	15	16	BOT
Temp (°C):	0.00	0.00	0.00	0.00	0.60	1.10	1.20	1.30	1.30	1.60
pH:										
Barometeric (mmHg):										
Pressure (mmHg):	772.00	772.00	772.00	772.00	772.00	772.00	772.00	772.00	770.00	770.00
Conductivity (µS/cm):										
RDO (ppm): (mg/L)	15.10	15.00	15.10	15.20	14.40	15.10	14.90	14.70	10.40	8.10
Turbidity (NTU):										
ORP										

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA2NS

Sample Purpose: **Lake Water Quality** Date: 1/8/08 Time: nr

FIELD MEASUREMENTS

GPS Coord. Northing: N70° 20.020' Easting: W148° 56.372' Datum: NAD83

Measurements By: White Time: 12:21

Water Depth (ft): 12.85 Ice Thickness (ft): 3.47

Freeboard (ft): 0.2 Snow Depth (ft): 0.28

Elev. (BPMSL +/- .02): 6.7 Survey By: Chad/Horacio Date: 1/8/08 Time: 12:30

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, Temp	BLM	Hach LDO	3625	PASS	PASS

Parameters	**Field Measurements**									
Time:										
Depth BWS (ft):	4	5	6	8	10	11	12	BOT		
Temp (°C):	0.10	0.10	0.20	0.40	0.50	0.80	0.80	0.90		
pH:										
Barometeric (mmHg):										
Pressure (mmHg):	770.00	770.00	770.00	770.00	770.00	770.00	770.00	771.00		
Conductivity (µS/cm):										
RDO (ppm): (mg/L)	15.60	15.50	15.50	15.40	15.10	15.00	14.80	14.70		
Turbidity (NTU):										
ORP										

FIELD TESTING OF WATER SAMPLES (if small probe is used)					
Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA3-CT

Sample Purpose: **Lake Water Quality** Date: 1/8/08 Time: 14:15

FIELD MEASUREMENTS

GPS Coord. Northing: N70°20.025' Easting: W148°56.204' Datum: NAD83

Measurements By: GMM/ DMS Time: 14:15

Water Depth (ft): 22.7 Ice Thickness (ft): 3.30

Freeboard (ft): 0.3 Snow Depth (ft): 0.00

Elev. (BPMSL +/- .02): 6.71 Survey By: Chad/Horacio Date: 1/8/08 Time: 12:30

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	Insitu/ Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	14:18	14:20	14:22	14:25	14:28	14:33	14:37	14:40	14:44	
Depth BWS (ft):	4	5	6	7	9	11	13	15	17	
Temp (°C):	0.21	0.60	0.70	1.07	1.34	1.56	1.63	1.78	1.87	
pH:	7.85	7.84	7.85	7.84	7.84	7.83	7.80	7.79	7.76	
Barometeric (mmHg):	769.7	769.8	769.8	769.8	769.8	769.8	769.9	770.0	770.1	
Pressure (kPa):	10.346	13.282	16.227	19.289	25.123	31.213	37.109	43.088	49.075	
Conductivity (µS/cm):	107.6	106.9	106.7	106.6	106.6	106.5	106.4	106.1	106.1	
RDO (ppm): (mg/L)	15.24	15.38	15.37	15.32	15.31	15.10	14.94	14.54	14.29	
Turbidity (NTU):	0.2	0.2	0.2	0.1	0.0	-0.1	-0.1	-0.1	-0.1	
ORP	357	355	355	354	354	353	354	354	354	

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks: Sheet 1 of 2

Field-Form Filled Out By: G. Myerchin Date: 1/10/08

QAQC Check By: JED Date: 1/11/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA3-CT

Sample Purpose: **Lake Water Quality** Date: 1/8/08 Time: 14:15

FIELD MEASUREMENTS

GPS Coord. Northing: N70°20.025' Easting: W148°56.204' Datum: NAD83

Measurements By: GMM/ DMS Time: 14:15

Water Depth (ft): 22.7 Ice Thickness (ft): 3.30

Freeboard (ft): 0.3 Snow Depth (ft): 0.00

Elev. (BPMSL +/- .02): 6.71 Survey By: Chad/Horacio Date: 1/8/08 Time: 12:30

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	Insitu/ Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	14:50	14:55	15:00	15:04						
Depth BWS (ft):	19	20	21	22						
Temp (°C):	2.13	2.22	2.28	2.32						
pH:	7.64	7.53	7.31	7.28						
Barometeric (mmHg):	770.1	770.1	770.1	770.1						
Pressure (kPa):	55.089	58.059	61.096	64.051						
Conductivity (µS/cm):	106.0	106.4	109.2	112.7						
RDO (ppm): (mg/L)	12.74	11.55	6.56	5.56						
Turbidity (NTU):	0.0	0.2	0.7	1.1						
ORP	357	361	367	368						

FIELD TESTING OF WATER SAMPLES (if small probe is used) Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks: Sheet 2 of 2

Field-Form Filled Out By: G. Myerchin Date: 1/10/08

QAQC Check By: JED Date: 1/11/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: MSBN-CT

Sample Purpose: **Lake Water Quality** Date: 1/9/08 Time: 12:05

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.280' Easting: W149°24.009' Datum: NAD83

Measurements By: GMM/ DMS Time: 12:05

Water Depth (ft): 34.33 Ice Thickness (ft): 3.48

Freeboard (ft): 0.25 Snow Depth (ft): 0.08

Elev. (BPMSL +/- .02): 94.6 Survey By: Chad/Horacio Date: 1/9/08 Time: 13:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	INSITU/ Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	12:10	12:14	12:16	12:19	12:22	12:26	12:28	12:30	12:33	12:37
Depth BWS (ft):	4	5	6	7	9	11	13	15	17	19
Temp (°C):	0.33	0.09	0.09	0.08	0.43	0.91	1.32	1.50	1.63	1.7
pH:	7.89	7.85	7.84	7.82	7.72	7.73	7.73	7.74	7.72	7.69
Barometeric (mmHg):	765.0	764.9	764.9	764.9	764.9	764.9	765.1	765.2	765.1	765.2
Pressure (kPa):	10.447	13.322	16.180	19.194	25.245	31.129	37.060	42.994	49.098	54.973
Conductivity (µS/cm):	155.0	152.2	152.0	151.9	149.8	149.4	149.7	149.8	149.5	149.3
RDO (ppm): (mg/L)	12.65	13.06	13.18	13.32	13.32	13.24	13.01	12.87	12.69	12.76
Turbidity (NTU):	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0
ORP	314	314	314	314	317	316	314	313	313	313

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks: Sheet 1 of 2

Field-Form Filled Out By: G. Myerchin Date: 1/10/08

QAQC Check By: JED Date: 1/11/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: MSBN-CT

Sample Purpose: **Lake Water Quality** Date: 1/9/08 Time: 12:05

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.280' Easting: W149°24.009' Datum: NAD83

Measurements By: GMM/ DMS Time: 12:05

Water Depth (ft): 34.33 Ice Thickness (ft): 3.48

Freeboard (ft): 0.25 Snow Depth (ft): 0.08

Elev. (BPMSL +/- .02): 94.6 Survey By: Chad/Horacio Date: 1/9/08 Time: 13:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	INSITU/ Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	12:41	12:42	12:45	12:47	12:51	12:56	13:02	13:05	13:06	
Depth BWS (ft):	21	23	25	27	29	31	32	33	34	
Temp (°C):	1.79	1.86	1.95	2.03	2.15	2.30	2.40	2.44	2.41	
pH:	7.68	7.69	7.66	7.60	7.32	7.14	7.15	7.21	7.56	
Barometeric (mmHg):	765.2	765.3	765.4	765.4	765.4	765.4	765.5	765.5	765.6	
Pressure (kPa):	60.913	66.976	72.792	78.840	85.041	90.939	93.742	96.767	99.608	
Conductivity (µS/cm):	149.2	149.1	149.1	149.3	155.1	171.9	191.1	210.2	260.9	
RDO (ppm): (mg/L)	12.61	12.48	12.21	11.46	8.52	4.41	1.71	0.87	0.48	
Turbidity (NTU):	0.0	0.0	0.0	0.0	0.5	1.6	1.9	2.0	1.5	
ORP	313	312	313	314	322	329	325	311	274	

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks: Sheet 2 of 2

Field-Form Filled Out By: G. Myerchin Date: 1/10/08

QAQC Check By: JED Date: 1/11/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: MSBS-CT

Sample Purpose: **Lake Water Quality** Date: 1/9/08 Time: 13:27

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.214' Easting: W149°24.020' Datum: NAD83

Measurements By: GMM/ DMS Time: 13:27

Water Depth (ft): 26.08 Ice Thickness (ft): 3.58

Freeboard (ft): 0.17 Snow Depth (ft): 0.08

Elev. (BPMSL +/- .02): 94.6 Survey By: Chad/Horacio Date: 1/9/08 Time: 13:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	INSITU/ Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	13:31	13:33	13:36	13:38	13:42	13:44	13:46	13:48	13:52	13:55
Depth BWS (ft):	4	5	6	7	9	11	13	15	17	19
Temp (°C):	0.12	0.21	0.39	0.68	1.13	1.41	1.56	1.63	1.76	1.92
pH:	7.74	7.74	7.73	7.72	7.69	7.68	7.68	7.67	7.62	7.6
Barometeric (mmHg):	764.7	764.8	764.7	764.7	764.6	764.7	764.7	764.8	764.8	764.9
Pressure (kPa):	10.281	13.251	16.239	19.240	25.506	31.140	37.277	43.094	49.202	55.042
Conductivity (µS/cm):	160.0	157.1	155.5	154.8	154.8	154.4	154.1	154.0	153.9	153.9
RDO (ppm): (mg/L)	13.26	13.20	13.11	13.00	12.96	12.72	12.46	12.28	11.95	11.82
Turbidity (NTU):	0.4	0.4	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.1
ORP	323	321	321	320	320	319	318	317	318	318

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks: Sheet 1 of 2

Field-Form Filled Out By: G. Myerchin Date: 1/10/08

QAQC Check By: JED Date: 1/11/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID:	**North Slope Lakes**		Site Location/Lake ID:	MSBS-CT	
Sample Purpose:	**Lake Water Quality**		Date: 1/9/08	Time:	13:27

FIELD MEASUREMENTS

GPS Coord. Northing:	N70°19.214'	Easting:	W149°24.020'	Datum:	NAD83	
Measurements By:	GMM/ DMS	Time:	13:27			
Water Depth (ft):	26.08	Ice Thickness (ft):	3.58			
Freeboard (ft):	0.17	Snow Depth (ft):	0.08			
Elev. (BPMSL +/- .02):	94.6	Survey By:	Chad/Horacio	Date: 1/9/08	Time:	13:00
Water Sampling By:	n/a	Sample Depths BWS (ft): 1	n/a	Date: n/a	Time:	n/a
		2				
		3				

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	INSITU/ Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	13:59	14:02	14:07	14:10	14:12					
Depth BWS (ft):	21	23	24	25	26					
Temp (°C):	2.11	2.27	2.39	2.43	2.52					
pH:	7.55	7.33	7.15	7.11	7.11					
Barometeric (mmHg):	765.0	765.1	765.2	765.2	765.2					
Pressure (kPa):	61.052	66.973	70.052	73.091	75.776					
Conductivity (µS/cm):	154.1	154.2	157.7	159.9	167.3					
RDO (ppm): (mg/L)	11.41	9.68	4.94	2.81	1.35					
Turbidity (NTU):	0.1	0.2	1.3	2.6	6.7					
ORP	319	324	330	331	331					

FIELD TESTING OF WATER SAMPLES (if small probe is used)					
Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks: Sheet 2 of 2

Field-Form Filled Out By:	G. Myerchin	Date:	1/10/08
QAQC Check By:	JED	Date:	1/11/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: L9312 Raft B

Sample Purpose: **Lake Water Quality** Date: 1/13/08 Time: 9:52

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.995' Easting: W150°56.918' Datum: NAD83

Measurements By: GMM Time: 9:52

Water Depth (ft): 10.9 Ice Thickness (ft): 3.30

Freeboard (ft): 0.2 Snow Depth (ft): 0.33

Elev. (BPMSL +/- .02): 7.3 Survey By: Chad/Horacio Date: 1/13/08 Time: 12:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	IN-SITU Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	10:00	10:02	10:05	10:07	10:10	10:13	10:16	10:21		
Depth BWS (ft):	4	5	6	7	8	9	10	BOT		
Temp (°C):	0.34	0.81	1.19	1.49	1.74	2.11	2.38	2.57		
pH:	7.19	7.18	7.17	7.16	7.13	7.04	6.90	6.83		
Barometeric (mmHg):	765.8	765.7	765.7	765.7	765.8	765.8	765.8	765.9		
Pressure (kPa):	10.338	13.445	16.229	19.289	22.224	25.158	28.268	30.125		
Conductivity (µS/cm):	67.93	62.13	62.10	62.14	62.05	61.12	61.98	73.14		
RDO (ppm): (mg/L)	13.64	13.76	13.79	13.63	13.54	12.60	10.63	7.37		
Turbidity (NTU):	0.6	0.7	0.8	0.8	0.8	0.9	1.6	5.1		
ORP	468	466	465	464	464	466	469	472		

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: L9312 Screen

Sample Purpose: **Lake Water Quality** Date: 1/13/08 Time: 10:36

FIELD MEASUREMENTS

GPS Coord. Northing: N70°20.003' Easting: W150°57.005' Datum: NAD83

Measurements By: GMM Time: 10:36

Water Depth (ft): 10.95 Ice Thickness (ft): 3.00

Freeboard (ft): 0.15 Snow Depth (ft): 0.50

Elev. (BPMSL +/- .02): 7.3 Survey By: Chad/Horacio Date: 1/13/08 Time: 12:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	IN-SITU Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	10:42	10:45	10:48	10:51	10:54	10:57	11:02	11:07		
Depth BWS (ft):	3	4	5	7	8	9	10	BOT		
Temp (°C):	0.15	0.30	0.64	1.31	1.69	1.93	2.39	2.58		
pH:	7.04	7.02	7.02	6.97	6.93	6.85	6.64	6.62		
Barometeric (mmHg):	765.6	765.6	765.6	765.8	765.8	765.8	765.8	765.9		
Pressure (kPa):	7.769	10.383	13.329	19.313	22.265	25.269	28.364	30.511		
Conductivity (µS/cm):	70.31	69.52	64.75	64.04	63.36	62.51	62.11	70.12		
RDO (ppm): (mg/L)	13.67	13.67	13.75	13.79	13.44	12.40	7.62	5.13		
Turbidity (NTU):	0.6	0.7	0.7	0.7	0.7	0.8	3.3	6.6		
ORP	474	474	473	474	474	475	481	481		

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: L9312 SH

Sample Purpose: **Lake Water Quality** Date: 1/13/08 Time: 11:20

FIELD MEASUREMENTS

GPS Coord. Northing: N70°20.017' Easting: W150°57.076' Datum: NAD83

Measurements By: GMM Time: 11:20

Water Depth (ft): 9.2 Ice Thickness (ft): 3.10

Freeboard (ft): 0.15 Snow Depth (ft): 0.50

Elev. (BPMSL +/- .02): 7.3 Survey By: Chad/Horacio Date: 1/13/08 Time: 12:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	IN-SITU Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	11:30	11:34	11:39	11:45	11:50	11:56				
Depth BWS (ft):	4	5	6	7	8	9				
Temp (°C):	0.26	0.59	1.14	1.47	1.68	1.93				
pH:	6.86	6.83	6.72	6.63	6.59	6.54				
Barometeric (mmHg):	765.6	765.7	765.7	765.8	765.8	765.9				
Pressure (kPa):	10.464	13.160	16.386	19.522	22.205	25.302				
Conductivity (µS/cm):	69.94	64.90	65.13	69.76	69.70	64.87				
RDO (ppm): (mg/L)	12.04	11.52	10.84	8.61	7.86	7.19				
Turbidity (NTU):	1.1	1.2	1.6	2.2	2.7	3.6				
ORP	468	469	473	475	476	477				

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: L9312 SH_SHORE_MID

Sample Purpose: **Lake Water Quality** Date: 1/13/08 Time: 12:50

FIELD MEASUREMENTS

GPS Coord. Northing: N70°20.017' Easting: W150°57.101' Datum: NAD83

Measurements By: GMM Time: 12:50

Water Depth (ft): 8.4 Ice Thickness (ft): 3.10

Freeboard (ft): 0.1 Snow Depth (ft): nr

Elev. (BPMSL +/- .02): 7.3 Survey By: Chad/Horacio Date: 1/13/08 Time: 12:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	IN-SITU Troll 9000	33033	PASS	PASS

Parameters	**Field Measurements**									
Time:	12:55	12:58	1:01	1:07	1:12					
Depth BWS (ft):	4	5	6	7	8					
Temp (°C):	0.08	0.49	0.88	1.20	1.48					
pH:	6.84	6.78	6.68	6.61	6.58					
Barometeric (mmHg):	765.7	765.6	765.6	765.7	765.6					
Pressure (kPa):	10.400	13.574	16.199	19.593	22.281					
Conductivity (µS/cm):	91.43	71.01	74.19	74.37	75.20					
RDO (ppm): (mg/L)	2.00	3.30	1.30	1.90	2.20					
Turbidity (NTU):	479.0	481.0	481.0	483.0	483.0					
ORP										

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: L9312 #1

Sample Purpose: **Lake Water Quality** Date: 1/13/08 Time: nr

FIELD MEASUREMENTS

GPS Coord. Northing: N70 19.872 Easting: W150 56.803 Datum: NAD83

Measurements By: JED Time: nr

Water Depth (ft): 12.9 Ice Thickness (ft): 3.30

Freeboard (ft): 0.3 Snow Depth (ft): 0.50

Elev. (BPMSL +/- .02): 7.3 Survey By: Chad/Horacio Date: 1/13/08 Time: 12:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, Temp	BLD	Hach LDO	3625	PASS	PASS

Parameters	**Field Measurements**									
Time:										
Depth BWS (ft):	4.0	5.0	7.0	9.0	11.0	12.0	12.5	BOT		
Temp (°C):	0.30	1.10	1.50	2.10	3.30	3.20	3.20	3.30		
pH:										
Barometeric (mmHg):										
Pressure (kPa):	764.00	764.00	764.00	764.00	764.00	764.00	764.00	764.00		
Conductivity (µS/cm):										
RDO (ppm): (mg/L)	14.60	13.90	13.80	12.20	1.72	0.24	0.21	0.19		
Turbidity (NTU):										
ORP										

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: L9312 #2

Sample Purpose: **Lake Water Quality** Date: 1/13/08 Time: nr

FIELD MEASUREMENTS

GPS Coord. Northing: N70 19.837 Easting: W150 57.055 Datum: NAD83

Measurements By: JED Time: nr

Water Depth (ft): 10.8 Ice Thickness (ft): 2.70

Freeboard (ft): 0.3 Snow Depth (ft): 0.50

Elev. (BPMSL +/- .02): 7.3 Survey By: Chad/Horacio Date: 1/13/08 Time: 12:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, Temp	BLD	Hach LDO	3625	PASS	PASS

Parameters	**Field Measurements**									
Time:										
Depth BWS (ft):	4.0	5.0	7.0	9.0	10.0	10.5	BOT			
Temp (°C):	0.20	0.80	1.50	2.80	3.00	2.90	3.00			
pH:										
Barometeric (mmHg):										
Pressure (kPa):										
Conductivity (µS/cm):										
RDO (ppm): (mg/L)	15.40	15.30	14.80	10.60	4.69	2.18	1.44			
Turbidity (NTU):										
ORP										

FIELD TESTING OF WATER SAMPLES (if small probe is used)					
Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: L9312 #3

Sample Purpose: **Lake Water Quality** Date: 1/13/08 Time: nr

FIELD MEASUREMENTS

GPS Coord. Northing: N70 19.930 Easting: W150 56.845 Datum: NAD83

Measurements By: JED Time: nr

Water Depth (ft): 12.8 Ice Thickness (ft): 2.75

Freeboard (ft): 0.3 Snow Depth (ft): 0.50

Elev. (BPMSL +/- .02): 7.3 Survey By: Chad/Horacio Date: 1/13/08 Time: 12:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, Temp	BLD	Hach LDO	3625	PASS	PASS

Parameters	**Field Measurements**									
Time:										
Depth BWS (ft):	3.0	4.0	5.0	7.0	9.0	10.0	11.0	12.0	12.5	BOT
Temp (°C):		0.80	1.20	1.90	2.70	2.90	3.00	3.10	3.20	3.2
pH:										
Barometeric (mmHg):										
Pressure (kPa):										
Conductivity (µS/cm):										
RDO (ppm): (mg/L)	15.60	14.40	14.00	13.50	8.69	3.09	0.64	0.25	0.22	0.21
Turbidity (NTU):										
ORP										

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: **North Slope Lakes** Site Location/Lake ID: L9312 #4

Sample Purpose: **Lake Water Quality** Date: 1/13/08 Time: nr

FIELD MEASUREMENTS

GPS Coord. Northing: N70 19.790 Easting: W150 57.347 Datum: NAD83

Measurements By: JED Time: nr

Water Depth (ft): 8.5 Ice Thickness (ft): 2.60

Freeboard (ft): 0.3 Snow Depth (ft): 0.50

Elev. (BPMSL +/- .02): 7.3 Survey By: Chad/Horacio Date: 1/13/08 Time: 12:00

Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a

2

3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, Temp	BLD	Hach LDO	3625	PASS	PASS

Parameters	**Field Measurements**									
Time:										
Depth BWS (ft):	4.0	5.0	6.0	7.0	8.0	BOT				
Temp (°C):	0.20	0.90	1.20	1.60	2.20	2.30				
pH:										
Barometeric (mmHg):										
Pressure (kPa):										
Conductivity (µS/cm):										
RDO (ppm): (mg/L)	15.30	15.10	15.10	14.50	2.45	1.50				
Turbidity (NTU):										
ORP										

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	**Depth BWS (ft):**			**Depth BWS (ft):**			**Depth BWS (ft):**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)										Digital titrator 10-4000 mg/L as CaCO3
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****										0.01-0.50 mg/L NH3-N
Ammonia/ Iron dilution										

Remarks:

Field-Form Filled Out By: Cormack Date: 1/15/08

QAQC Check By: JED Date: 1/15/08

APPENDIX B. WATER QUALITY METER CALIBRATION FORMS

The following forms report the pre- and post-calibration checks for the water quality meters used during field sampling.

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004e: Water Quality Meter Calibration Form

Project ID: **North Slope Lakes** Site Location/Lake ID: Mine Site B

Sample Purpose: **Lake Water Quality**

WATER QUALITY METER INFORMATION

Meter Make: InSitu Make: Troll 9000

Owner: GW Scientific S/N: 33033

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	1/8/08	7:49	Oakton 4.01	2709256	Aug-09	3.92	pass
ph 7.00	1/8/08	7:51	Oakton 7.00	2612531	Dec-08	7.06	pass
ph 10.00	1/8/08	7:56	Oakton 10.00	2612532	Jun-08	9.99	pass
Conductivity 447 µS/cm	1/8/08	7:59	Oakton 447	2707012	Jul-08	421.0	pass
Conductivity 84 µS/cm	1/8/08	8:02	Oakton	2706156	Jun-08	83.2	pass
ORP	1/8/08	8:06	Zobell's	2709340	Aug-07	228	pass
Saturated O_2	1/8/08	8:14	Bubbled Nanopure	--	--	101.3% satur.	pass
Zero O_2	1/8/08	8:25	Oakton	270638	Jun-08	0.02	pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	11/17/07	17:00	Oakton 4.01	2709256	Aug-09	4.10	Pass
ph 7.00	11/17/07	17:06	Oakton 7.00	2612531	Dec-08	7.15	Pass
ph 10.00	11/17/07	17:08	Oakton 10.00	2612532	Jun-08	10.06	Pass
Conductivity 447 µS/cm	11/17/07	16:50	Oakton 447	2707012	Jul-08	412.8	Pass
Conductivity 84 µS/cm	11/17/07	16:53	Oakton	2706156	Jun-08	81.110	Pass
ORP	11/17/07	17:13	Zobell's	2709340	Aug-07	233.0	Pass
Saturated O_2	11/17/07	17:19	Bubbled Nanopure	--	--	108.90	Pass
Zero O_2	11/17/07	17:22	Oakton	270638	Jun-08	0.040	Pass

Remarks: ph/ORP probe SN:PP10242 (GWS)

Field-Form Filled Out By: JED Date: 1/11/2008

QAQC Check By: CMC Date: 1/12/2008

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004e: Water Quality Meter Calibration Form

Project ID: **North Slope Lakes** Site Location/Lake ID: Kuparuk Deadarm Lakes

Sample Purpose: **Lake Water Quality**

WATER QUALITY METER INFORMATION

Meter Make: InSitu Make: Troll 9000

Owner: GW Scientific S/N: 33033

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	1/7/08	5:00	Oakton 4.01	2612530	Dec-08	3.88	pass
ph 7.00	1/7/08	5:04	Oakton 7.00	2612531	Dec-08	7.05	pass
ph 10.00	1/7/08	5:08	Oakton 10.00	2612532	Jun-08	10.14	pass
Conductivity 447 µS/cm	1/7/08	5:15	Oakton 447	2707012	Jul-08	353.6	pass
Conductivity 84 µS/cm	1/7/08	5:22	Oakton	2706156	Jun-08	67.1	pass
ORP	1/7/08	5:39	Zobell's	2709340	Aug-07	241	pass
Saturated O_2	1/7/08	7:45	Bubbled Nanopure	--	--	93.0% satur.	pass
Zero O_2	1/7/08	18:07	Oakton	270638	Jun-08	0.10	pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	1/8/08	7:49	Oakton 4.01	2709256	Aug-09	3.92	pass
ph 7.00	1/8/08	7:51	Oakton 7.00	2612531	Dec-08	7.06	pass
ph 10.00	1/8/08	7:56	Oakton 10.00	2612532	Jun-08	9.99	pass
Conductivity 447 µS/cm	1/8/08	7:59	Oakton 447	2707012	Jul-08	421.0	pass
Conductivity 84 µS/cm	1/8/08	8:02	Oakton	2706156	Jun-08	83.2	pass
ORP	1/8/08	8:06	Zobell's	2709340	Aug-07	228	pass
Saturated O_2	1/8/08	8:14	Bubbled Nanopure	--	--	101.3% satur.	pass
Zero O_2	1/8/08	8:25	Oakton	270638	Jun-08	0.02	pass

Remarks: ph/ORP probe SN:PP10242 (GWS)

Field-Form Filled Out By: JED Date: 1/11/2008

QAQC Check By: CMC Date: 1/12/2008

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004e: Water Quality Meter Calibration Form

Project ID: **North Slope Lakes** Site Location/Lake ID: L9312

Sample Purpose: **Lake Water Quality**

WATER QUALITY METER INFORMATION

Meter Make: InSitu Make: Troll 9000

Owner: GW Scientific S/N: 33033

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	1/11/08	19:30	Oakton 4.01	2709256	Aug-09	3.97	Pass
ph 7.00	1/11/08	19:35	Oakton 7.00	2709203	Aug-09	7.00	Pass
ph 10.00	1/11/08	19:37	Oakton 10.00	2707084	Jan-09	10.20	Pass
Conductivity 447 µS/cm	1/11/08	19:43	Oakton 447	270712	Jul-08	357.4	Pass
Conductivity 84 µS/cm	1/11/08	19:55	Oakton	2706156	Jun-08	68.890	Pass
ORP	1/11/08	20:09	Zobell's	2709340	Jun-08	246.0	Pass
Saturated O_2	1/11/08	20:15	Bubbled Nanopure	--	--	93.3 % satur.	Pass
Zero O_2	1/11/08	nr	Oakton	2706384	Jun-08	0.00	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	1/13/08	16:04	Oakton 4.01	2709256	Aug-09	4.15	Pass
ph 7.00	1/13/08	16:08	Oakton 7.00	2709203	Aug-09	7.18	Pass
ph 10.00	1/13/08	16:09	Oakton 10.00	2707084	Jan-09	10.05	Pass
Conductivity 447 µS/cm	1/13/08	16:01	Oakton 447	270712	Jul-08	387.1	Pass
Conductivity 84 µS/cm	1/13/08	15:58	Oakton	2706156	Jun-08	75.640	Pass
ORP	1/13/08	16:13	Zobell's	2709340	Jun-08	238.0	Pass
Saturated O_2	1/13/08	16:16	Bubbled Nanopure	--	--	105.8	Pass
Zero O_2	1/13/08	nr	Oakton	2706384	Jun-08	0.04	Pass

Remarks:

ph/ORP probe SN:PP10242 (GWS)

Field-Form Filled Out By: GMM Date: 1/13/2008

QAQC Check By: JED Date: 1/15/2008

APPENDIX C. ELEVATION SURVEY FORMS

The following form reports the elevation survey information obtained during field sampling.

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-011: Elevation Survey Form

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA 1,2,3

Survey Purpose: **Water-Level Elevations** Date: 1/8/2008 Time: 12:30

Location: Kuparuk Deadarm Lakes, east of the Spine Road Kuparuk bridge.

Survey objective: Determine FWS Elevation of cell 1, cell 2 and cell 3.

Weather Observations: -35°F, 5 mph wind, clear

Instrument Type: Leica NA720 Instrument ID: 5482727 (GWS owned)

Rod Type: Fiberglass Rod ID: Sokkia Fiber Glass

Bench Mark Information:

Name	Agency Responsible	Elevation (ft)	Latitude (dd-mm.mmm)	Longitude (ddd-mm.mmm)
BM1	BP	19.32	nr	nr

Survey Team Names: Horacio Toniolo, Chad Cormack

Station	BS (ft)	HI (ft)	FS (ft)	Elevation (fasl)	Distance (ft)	Horizontal Angle	Vertical Angle	Remarks
BM1	0.240	19.560		19.320				
KDA3-SH		19.560	12.860	6.700				
KDA2-SH		19.560	12.860	6.700				
Turn on KDA2-Ice. Move to Inst.2								
KDA2-SH	13.140	19.840		6.700				**KDA2 WL=6.70'**
KDA3-SH		19.840	13.130	6.710				**KDA3 WL=6.71'**
BM1		19.840	0.510	19.330				close survey to 0.01
Move to Inst.3								
KDA2-SH'	9.090	15.790		6.700				
KDA1-SH		15.790	7.830	**7.960**				**KDA1 WL=7.96**
Turn on KDA3-ICE. Move to Inst.4								
KDA1-SH	7.610	15.570		7.960				
KDA2-SH'		15.570	8.860	6.710				close survey to 0.01

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasml; foresight, FS; height of instrument, HI; minutes, mm; seconds, ss; BP Mean Sea Level, BPMSL

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-011: Elevation Survey Form

Project ID: **North Slope Lakes** Site Location/Lake ID: KDA 4,5

Survey Purpose: **Water-Level Elevations** Date: 1/8/2008 Time: 3:00

Location:	Kuparuk Deadarm Lakes, east of the Spine Road Kuparuk bridge.							
Survey objective:	Determine FWS Elevation of cells 4 and 5.					Weather Observations:		
Instrument Type:	T-Handle Probe		Instrument ID:			-35°F, 5 mph wind, clear		
Rod Type:			Rod ID:					
Bench Mark Information:						Survey Team Names		
Name	Agency Responsible	Elevation (ft)	Latitude (dd-mm.mmm)	Longitude (ddd-mm.mmm)		Horacio Toniolo, Chad Cormack		
TBM3		18.90	nr	nr				
Station	**BS (ft)**	**HI (ft)**	**FS (ft)**	**Elevation (fasl)**	**Distance (ft)**	**Horizontal Angle**	**Vertical Angle**	**Remarks**
Distance from West Culvert between KDA 4 and KDA5 to Water Level was measured. Elev. of TOC4-H from Nov'07 Survey								
TBM3	2.360	21.260		18.900				
TP1		21.260	14.100	7.160				
Turned on TP1 to close loop and find elevation.								
TP1	13.940	21.100		7.160				
TBM3		21.100	2.220	18.880				Closed within 0.02
Used TP1 to get elevations of KDA-4 and KDA-5								
TP1	4.890	12.050		7.160				
KDA-5		12.050	7.300	4.750				
KDA-4		12.050	7.300	4.750				
Turned on KDA4 and moved instrument								
KDA-4	7.340	12.090		4.750				**KDA4 WL = 4.75'**
KDA-5		12.090	7.340	4.750				**KDA5 WL = 4.75'**
TP1		12.090	4.930	7.160				Closed within 0.02

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasml; foresight, FS; height of instrument, HI; minutes, mm; seconds, ss; BP Mean Sea Level, BPMSL

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-011: Elevation Survey Form

Project ID: **North Slope Lakes** Site Location/Lake ID: Mine Site B

Survey Purpose: **Water-Level Elevations** Date: 1/9/2008 Time: 13:00

Location:	Mine Site B aka 6 mile Lake							
Survey objective:	Determine lake water elevation in North and South Cells					Weather Observations:		
Instrument Type:	Leica NA720		Instrument ID:	5482372 (GWS owned)		-35°F, 5 mph wind, clear		
Rod Type:	Craine fiberglass 20'		Rod ID:	GWS owned				
Bench Mark Information:						Survey Team Names		
Name	Agency Responsible	Elevation (ft)	Latitude (dd-mm.mmm)	Longitude (ddd-mm.mmm)		Toniolo, Cormack		
TBM_1	nr	100.00 Arbitrary	N70°19.308'	W149°23.882'				
Station	**BS (ft)**	**HI (ft)**	**FS (ft)**	**Elevation (fasl)**	**Distance (ft)**	**Horizontal Angle**	**Vertical Angle**	**Remarks**
TBM_1	5.630	105.630		100.000				
MSBN-SH		105.630	11.030	**94.600**				**WL MSBN=94.60'**
TBM 2		105.630	1.820	103.810				
TBM 3		105.630	2.190	103.440				
TBM 4		105.630	4.270	101.360				
Move instrument to ^2, turn on TBM 4								
TBM 4	4.000	105.360		101.360				
TBM 3		105.360	1.910	103.450				
TBM 2		105.360	1.540	103.820				
MSBN-SH		105.360	10.760	94.600				
TBM_1		105.360	5.350	100.010				Survey leg closes within ±0.01
Move instrument to ^3 on island, turn on MSBN Water Level								
MSBN-SH'	8.170	102.770		94.600				
MSBS-SH		102.770	8.170	**94.600**				**WL MSBS=94.60'**
Move instrument to ^4, turn on MSBS-SH. Water Surface has frozen in hole.								
MSBS-SH	8.250	102.850		94.600				
MSBN-SH'		102.850	8.250	94.600				Survey leg closes within ±0.00

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasml; foresight, FS; height of instrument, HI; minutes, mm; seconds, ss; BP Mean Sea Level, BPMSL

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-011: Elevation Survey Form

Project ID: **North Slope Lakes** Site Location/Lake ID: L9312

Survey Purpose: **Water-Level Elevations** Date: 1/13/2008 Time: 12:00

Location:	Lake L9312, located southeast of Alpine pad, survey by pump house benchmarks							
Survey objective:	Determine FWS Elevation.					Weather Observations:		
Instrument Type:	Leica NA720		Instrument ID:	5482372 (GWS owned)				
Rod Type:	Fiberglass		Rod ID:	Sokkia Fiber Glass		-50°F, Light Wind. Clear with light haze		
Bench Mark Information:						Survey Team Names		
Name	Agency Responsible	Elevation (ft)	Latitude (dd-mm.mmm)	Longitude (ddd-mm.mmm)		Toniolo, Cormack		
L9312"P"	CP	11.73	N70°20.053'	W150°56.600'				
Station	**BS (ft)**	**HI (ft)**	**FS (ft)**	**Elevation (fasl)**	**Distance (ft)**	**Horizontal Angle**	**Vertical Angle**	**Remarks**
TBM "P"	2.290	14.020		11.730				Top of inlet pipe support
TBM "O"		14.020	2.520	11.500				Top of inlet pipe support. BM Elev=11.46'
99-32-59		14.020	0.570	14.590				Top of Pumphouse SE VSM. BM Elev = 14.57
L9312 WL		14.020	6.720	**7.300**				**Water Surface Level**
Turn on L9312 WL								
L9312 WL	6.830	14.130		7.300				
99-32-59		14.130	0.460	14.590				
TBM"O"		14.130	2.640	11.490				
TBM"P"		14.130	2.400	11.730				close survey to 0.00

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasml; foresight, FS; height of instrument, HI; minutes, mm; seconds, ss; BP Mean Sea Level, BPMSL

APPENDIX D. SNOW SURVEY FORMS

The following forms report the snow survey information obtained during field sampling.

University of Alaska Fairbanks, Water and Environmental Research Center
Form F-012: Snow Depth and Water Content Survey Form

Project ID: **North Slope Lakes** Site Location/Lake ID: **KDA2-CT**
Survey Purpose: **Determine snow water equivalent** Date: 1/8/2008 Time: 15:30

Location Description:	At KDA2-CT snow course bears North 25 meters, then West 25 meters.				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	-35°F, 5 mph wind, clear
Latitude:	N70°19.966'	Longitude:	W14°856.429'	Datum:	NAD83
Elevation:	Approximately 10 ft	Elevation Datum:	BPMSL	Reference Markers:	KDA-CT Lathe
Drainage Basin:	Kuparuk River	Slope Direction:	flat	Vegetation Type:	Ice
Slope Angle:	flat	Access Notes:	Highway vehicle	Other:	
Snow Depth Probe Type:		T-handle probe		Snow-Survey Team Names	
Snow Tube Type:	n/a			Chad Cormack, Horacio Toniolo	

Snow Course Depths, in cm.

	1	2	3	4	5
1	1.0	0.0	0.0	1.0	0.0
2	0.0	0.0	0.0	1.0	1.0
3	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	2.0	0.0	0.0
5	1.0	2.0	2.0	0.0	0.0
6	1.0	2.0	2.0	1.0	0.0
7	0.0	1.0	0.0	1.0	0.0
8	1.0	0.0	2.0	1.0	0.0
9	1.0	0.0	3.0	0.0	0.0
10	1.0	1.0	2.0	1.0	0.0

(cm)
Average snow depth = **0.6**
Maximum snow depth = 3.0
Minimum snow depth = 0.0
Standard variation = 0.8

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm^3)	Density (gr/cm^3)
* Insufficient snow depth for densities				

Average Density =
Average Snow Water Equivalent (SWE) = _____ cm H2O
Average Snow Water Equivalent = _____ inches H2O
Average Snow Water Equivalent = _____ feet H2O

SWE = avg. snow depth*(density snow/density water)

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-012: Snow Depth and Water Content Survey Form

Project ID: **North Slope Lakes** Site Location/Lake ID: **MSB-CT**

Survey Purpose: **Determine snow water equivalent** Date: 1/9/2008 Time: 13:00

Location Description:	At MSBN-CT snow course bears West 25 meters, then South 25 meters.				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	-35°F, 5 mph E wind, mostly clear. Dark.
Latitude:	N70°19.280'	Longitude:	W149°24.009'	Datum:	NAD83
Elevation:	Approximately 50 ft BPMSL.	Elevation Datum:	BPMSL	Reference Markers:	Lathe is at MSBN-CT
Drainage Basin:	Milne Creek	Slope Direction:	Flat	Vegetation Type:	Ice
Slope Angle:	flat	Access Notes:	Highway Vehicle	Other:	glaze lake ice. No or little snow on surface.
Snow Depth Probe Type:		T-handle probe		Snow-Survey Team Names	
Snow Tube Type:	Arinodack snow tube			Dan White, Matt Whitman	

Snow Course Depths, in cm.

	1	2	3	4	5
1	0.0	0.0	0.0	0.0	1.0
2	0.0	1.0	0.0	0.0	2.0
3	0.0	1.0	2.0	0.0	1.0
4	0.0	0.0	4.0	1.0	0.0
5	2.5	0.0	3.0	0.0	0.0
6	2.0	1.0	1.0	0.0	3.5
7	2.0	0.0	0.0	0.0	0.0
8	1.0	0.0	0.0	1.0	0.0
9	1.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0

	(cm)
Average snow depth =	**0.6**
Maximum snow depth =	4.0
Minimum snow depth =	0.0
Standard variation =	1.0

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm^3)	Density (gr/cm^3)
Insufficient snow depth for densities				

Average Density =

Average Snow Water Equivalent (SWE) = _____ cm H2O

Average Snow Water Equivalent = _____ inches H2O

Average Snow Water Equivalent = _____ feet H2O

SWE = avg. snow depth*(density snow/density water)

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-012: Snow Depth and Water Content Survey Form

Project ID: **North Slope Lakes** Site Location/Lake ID: **MSB-SNOTUN**

Survey Purpose: **Determine snow water equivalent** Date: 1/9/2008 Time: 14:00

Location Description:	At MSBN-SNOTUN snow course bears West 25 meters, then South 25 meters.				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	-35°F, 5 mph E wind, mostly clear. Dark.
Latitude:	N70°19.256'	Longitude:	W149°24.242'	Datum:	NAD83
Elevation:	Approximately 50 ft BPMSL.	Elevation Datum:	BPMSL	Reference Markers:	Lathe is at MSBN-SNOTUN in tundra west of Lake
Drainage Basin:	Milne Creek	Slope Direction:	Flat	Vegetation Type:	Tussock Tundra
Slope Angle:	flat	Access Notes:	Highway Vehicle	Other:	Very thin crust, snow in depressions.
Snow Depth Probe Type:		T-handle probe		Snow-Survey Team Names	
Snow Tube Type:	Arinodack snow tube			Dan White, Matt Whitman	

Snow Course Depths, in cm.

	1	2	3	4	5
1	13.0	14.0	10.5	10.5	12.0
2	15.0	14.0	20.0	12.0	33.0
3	14.5	17.0	11.0	20.5	30.0
4	9.0	14.5	11.5	16.0	13.0
5	11.0	13.5	12.0	12.0	12.0
6	11.5	11.5	11.0	17.5	13.0
7	31.0	13.0	8.5	14.5	15.0
8	13.5	14.5	20.0	9.0	33.5
9	19.5	11.0	12.0	14.5	26.0
10	20.0	11.0	12.5	25.0	27.5

	(cm)
Average snow depth =	**15.8**
Maximum snow depth =	33.5
Minimum snow depth =	8.5
Standard variation =	6.4

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm^3)	Density (gr/cm^3)
T1	27	235.7	963.9	0.24
T2	12	73.9	428.4	0.17
T3	20	142.8	714.0	0.20
T4	16	94.0	571.2	0.16
T5	8	32.7	285.6	0.11

Average Density =	**0.18**	
Average Snow Water Equivalent (SWE) =	**2.8**	cm H2O
Average Snow Water Equivalent =	**1.11**	inches H2O
Average Snow Water Equivalent =	**0.09**	feet H2O

SWE = avg. snow depth*(density snow/density water)

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Form F-012: Snow Depth and Water Content Survey Form

Project ID:	**North Slope Lakes**	Site Location/Lake ID:	**L9312_Raft_B**
Survey Purpose:	**Determine snow water equivalent**	Date: 1/13/2008	Time: 2:00

Location Description:	Started 5 meters north of "Raft B" on L9312. Travelled 25 meters northerly towards Raft A. Turned left 90° and travelled 25 meters west to end point.				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	-50°F, Light Wind. Mostly clear with light haze.
Latitude:	N 70° 19.995'	Longitude:	W 150° 56.918'	Datum:	NAD 83
Elevation:	7 ft	Elevation Datum:	BPMSL	Reference Markers:	Raft B is marked with lathe
Drainage Basin:	Lake L9312	Slope Direction:	Flat	Vegetation Type:	Ice
Slope Angle:	Flat	Access Notes:	Snowmobile	Other:	
Snow Depth Probe Type:		T-handle probe		Snow-Survey Team Names	
Snow Tube Type:	Arinodack snow tube			Chad Cormack, Horacio Toniolo	

Snow Course Depths, in cm.

	1	2	3	4	5
1	13.0	7.0	13.0	12.0	11.0
2	11.0	8.0	10.0	10.0	11.0
3	14.0	6.0	8.0	9.0	9.0
4	8.0	6.0	7.0	15.0	9.0
5	10.0	9.0	6.0	17.0	9.0
6	11.0	11.0	7.0	20.0	9.0
7	11.0	14.0	6.0	18.0	11.0
8	12.0	15.0	10.0	15.0	6.0
9	7.0	15.0	13.0	9.0	4.0
10	7.0	15.0	13.0	10.0	8.0

	(cm)
Average snow depth =	**10.5**
Maximum snow depth =	20.0
Minimum snow depth =	4.0
Standard variation =	3.5

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm^3)	Density (gr/cm^3)
DW4-1	10.16	124.8	362.7	0.34
DW4-2	6.35	54.9	226.7	0.24
DW4-3	12.7	146.2	453.4	0.32
DW4-4	6.35	48.2	226.7	0.21
DW4-5	5.08	51.1	181.4	0.28

Average Density =	**0.28**	
Average Snow Water Equivalent (SWE) =	**2.9**	cm H2O
Average Snow Water Equivalent =	**1.16**	inches H2O
Average Snow Water Equivalent =	**0.10**	feet H2O

SWE = avg. snow depth*(density snow/density water)

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Form F-012: Snow Depth and Water Content Survey Form

Project ID:	**North Slope Lakes**	Site Location/Lake ID:	**L9312-WxStation**
Survey Purpose:	**Determine snow water equivalent**	Date: 1/13/2008	Time: 11:00

Location Description:	North of weather station at L9312. Start at east snow pole, transect goes 25 m west x 25 m North. See L9312 WxSta Snow 070922.JPG for layout.				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	-50°F, Light Wind. Mostly clear with light haze.
Latitude:	N70°20.019'	Longitude:	W150°57.134'	Datum:	NAD83
Elevation:	Approximately 10 ft	Elevation Datum:	BPMSL	Reference Markers:	Orange snow poles
Drainage Basin:	Lake L9312	Slope Direction:	East	Vegetation Type:	Tussuck tundra
Slope Angle:	2°	Access Notes:		Other:	
Snow Depth Probe Type:		T-handle probe		Snow-Survey Team Names	
Snow Tube Type:	Arinodack snow tube			Derry, Cormack, Toniolo	

Snow Course Depths, in cm.

	1	2	3	4	5
1	19.0	20.0	22.0	50.0	30.0
2	15.0	18.0	25.0	36.0	36.0
3	17.0	15.0	24.0	18.0	48.0
4	16.0	21.0	22.0	15.0	64.0
5	22.0	44.0	13.0	23.0	62.0
6	21.0	38.0	14.0	44.0	59.0
7	20.0	25.0	18.0	42.0	44.0
8	20.0	12.0	23.0	41.0	39.0
9	22.0	20.0	51.0	32.0	18.0
10	19.0	17.0	64.0	14.0	23.0

	(cm)
Average snow depth =	**28.7**
Maximum snow depth =	64.0
Minimum snow depth =	12.0
Standard variation =	14.7

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm^3)	Density (gr/cm^3)
DW4-1	16	113.5	571.2	0.20
DW4-2	26	189.2	928.2	0.20
DW4-3	10	76.1	357.0	0.21
DW4-4	12	60.3	428.4	0.14
DW4-5	12	120.6	428.4	0.28

Average Density =	**0.21**	
Average Snow Water Equivalent (SWE) =	**6.0**	cm H2O
Average Snow Water Equivalent =	**2.35**	inches H2O
Average Snow Water Equivalent =	**0.20**	feet H2O

SWE = avg. snow depth*(density snow/density water)

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-012: Snow Depth and Water Content Survey Form

Project ID: **North Slope Lakes** Site Location/Lake ID: **Betty Pingo**

Survey Purpose: **Determine snow water equivalent** Date: 1/16/2008 Time: 16:00

Location Description:	Near Wyoming gage. At staked snow site. Started east and then went north. Point of beginning is flagged rebar.				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	-30 F, 10 mph Wind
Latitude:	N70°16.772'	Longitude:	W148°53.741'	Datum:	NAD83
Elevation:	Approximately 10 ft	Elevation Datum:	BPMSL	Reference Markers:	Re-bar and lathe
Drainage Basin:	Kuparuk River	Slope Direction:	flat	Vegetation Type:	Tussock Tundra
Slope Angle:	flat	Access Notes:	Highway vehicle	Other:	
Snow Depth Probe Type:		T-handle probe		Snow-Survey Team Names	
Snow Tube Type:	Arinodack snow tube			Cormack, Derry	

Snow Course Depths, in cm.

	1	2	3	4	5
1	45.0	25.0	31.0	9.0	30.0
2	23.0	10.0	14.0	14.0	32.0
3	16.0	15.0	15.0	17.0	35.0
4	15.0	23.0	8.0	16.0	19.0
5	14.0	30.0	17.0	31.0	16.0
6	13.0	30.0	10.0	38.0	11.0
7	14.0	30.0	11.0	20.0	10.0
8	16.0	23.0	11.0	21.0	14.0
9	23.0	25.0	9.0	26.0	14.0
10	15.0	25.0	10.0	27.0	32.0

	(cm)
Average snow depth =	**20.0**
Maximum snow depth =	45.0
Minimum snow depth =	8.0
Standard variation =	8.8

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm^3)	Density (gr/cm^3)
T1	35.56	420.8	1269.5	0.33
H2	11.43	52.0	408.1	0.13
H1	15.24	97.7	544.1	0.18
H4	25.4	181.5	906.8	0.20
K2	15.24	190.3	544.1	0.35

Average Density = **0.24**

Average Snow Water Equivalent (SWE) = **4.7** cm H2O

Average Snow Water Equivalent = **1.87** inches H2O

Average Snow Water Equivalent = **0.16** feet H2O

SWE = avg. snow depth*(density snow/density water)