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

***Kuparuk Deadarm 2 survey, photo by D. Reichardt***

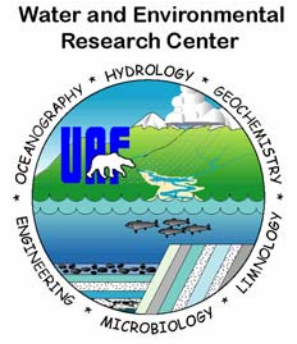
by

Kristie Holland, Dan Reichardt, Greta Myerchin, Amanda Blackburn, Matthew Whitman, and Michael Lilly

March 2008

North Slope Lakes Hydrologic Project

Report No. INE/WERC 08.09

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By:

Kristie Holland[1], Dan Reichardt[1], 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.
- Bureau of Land Management
- Geo-Watersheds Scientific

March 2008

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[3]Bureau of Land Management, Fairbanks, Alaska

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Fairbanks, Alaska
March 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.

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# 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

This project was funded by cooperative agreement number DE-FC26_01NT41248, from the U.S. Department of Energy's (DOE) Arctic Energy Office to the University of Alaska Fairbanks Arctic Energy Technology Development Laboratory (AETDL). Field coordination and logistics support were provided by BP Exploration (Alaska) Inc. and ConocoPhillips Alaska. Additional support was provided by other project cooperators, North Slope Borough, Bureau of Land Management (BLM), National Weather Service, and Geo-Watersheds Scientific (GWS), in the form of financial and in-kind match.

# Lake Chemistry and Physical Data For Selected North Slope, Alaska, Lakes: February 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 February 2008, 2) summarize accomplished field trip objectives.

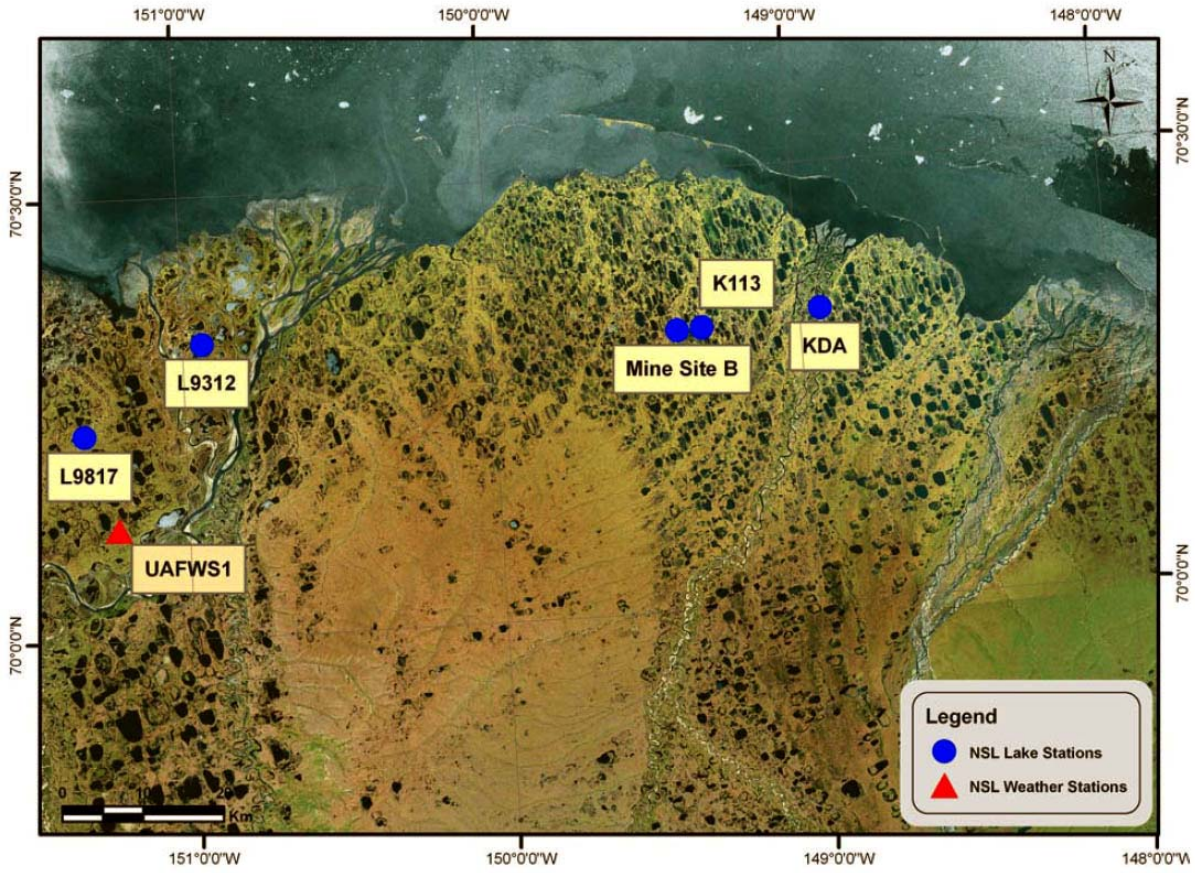


**Figure 1. Location of study lakes in the NPR-A, Alpine, Kuparuk, and Prudhoe Bay field operating areas, North Slope, Alaska.**

## 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 February 2008, we focused on the following locations/tasks:

1. L9312, Alpine Facility
    - Measure field water-quality parameters at standard locations.
    - Survey water levels to local elevation control.
    - Conduct snow surveys at standard locations.
    - Automated data collection and station maintenance.
2. L9817, NPR-A
    - Measure field water-quality parameters at standard locations.
    - Survey water levels to local elevation control.
    - Automated data collection and station maintenance.
3. Kuparuk Deadarm Lakes, (Cells 1-3)
    - Measure field water-quality parameters in cells 1, 2, and 3.
    - Survey water levels of KDA 1-3 to local elevation control.
    - Conduct snow surveys at standard locations.
    - Automated data collection station maintenance.
4. Mine Site B, Milne-Point Operating Area
    - Measure field water-quality parameters on North cell, South cell, and at Milne Creek upstream of South cell.
    - Survey water levels to local elevation control.
    - Conduct snow surveys at standard locations
5. Betty Pingo, Prudhoe Bay Operating Area
    - 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% |

**Figure 2.** **Snow Water Equivalent measurement at Mine Site B by D. Reichardt**

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.

## SELECTED RESULTS

Sampling occurred at the Kuparuk Deadarm Reservoirs, Mine Site B, and L9312 during the February field campaign. 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. KDA2, KDA3, MSBN, and MSBS all experienced increases in elevation while KDA1 and L9312 had drops in elevation.

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

| Sampling Site | Ice Thickness [ft; (m)] | Median DO Concentration [mg/L] | Median Actual Conductivity [μS/cm] | Water level change since mid January [ft; (m)] |
|---|---|---|---|---|
| **KDA1-CT** | 5.10; (1.55) | 16.15 | 118.40 | -0.06; (-0.018) |
| **KDA2-CT** | 4.85; (1.48) | 15.75 | 128.35 | +0.64; (+0.195) |
| **KDA3-CT** | 4.75; (1.45) | 15.03 | 116.5 | +0.65; (+0.198) |
| **MSBS-CT** | 4.55; (1.38) | 11.28 | 168.85 | +1.00;(+0.305) |
| **MSBN-CT** | 4.80; (1.46) | 14.37 | 161.6 | +0.70;(+0.213) |
| **L9312-B** | 3.65; (1.11) | 12.38 | 79.25 | -4.42; (-1.35) |

## SUMMARY

Continuous monitoring of 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 during the

winter, it is important to identify the changing water chemistry as well as the potential spring recharge. This information is necessary 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


Reichardt, D., Holland, K., 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: February 2008. Water and Environmental Research Center, University of Alaska Fairbanks. 15 pages.

Holland, K.M., Blackburn, A.J., and Lilly, M.R., 2008. Lake Chemistry and Physical Data For Selected North Slope, Alaska, Lakes: January 2008. University of Alaska Fairbanks, Water and Environmental Research Center, Report INE/WERC 08.08, Fairbanks, Alaska, 6 pp.

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: L9312 Raft B

Sample Purpose: **Lake Water Quality** Date: 2/15/08 Time: 12:49

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 10.9 Ice Thickness (ft): 3.65

Freeboard (ft): 0.2 Snow Depth (ft): 0.60

Elev. (BPMSL +/- .02): 11.72 Survey By: MRL/MW Date: 2/15/08 Time: 13:35

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: | 10:20 | 10:23 | 10:26 | 10:30 | 10:32 | 10:35 | 10:38 | 10:41 | | |
| Depth BWS (ft): | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 10.5 | | |
| Temp (°C): | 0.34 | 0.47 | 0.77 | 1.15 | 1.62 | 1.90 | 2.12 | 2.27 | | |
| pH: | 7.70 | 7.81 | 7.81 | 7.72 | 7.68 | 7.62 | 7.49 | 7.20 | | |
| *Barometric (mmHg):* | 747.1 | 747.0 | 747.0 | 747.0 | 747.1 | 747.1 | 747.2 | 747.3 | | |
| *Pressure (kPa):* | 10.137 | 13.331 | 16.151 | 19.089 | 22.479 | 25.191 | 28.532 | 29.652 | | |
| Conductivity (µS/cm): | 80.02 | 79.96 | 78.79 | 79.02 | 79.48 | 79.58 | 83.85 | 90.69 | | |
| RDO (ppm): (mg/L) | 10.73 | 11.25 | 11.90 | 12.25 | 12.50 | 12.51 | 11.68 | 9.89 | | |
| Turbidity (NTU): | 0.5 | 0.5 | 0.7 | 0.8 | 1.0 | 41.0 | 1.5 | 5.2 | | |
| ORP | 295 | 281 | 280 | 281 | 281 | 282 | 285 | 297 | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**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: Start log time not recorded. End log time 11:01. Water samples collected by M. Whitman for zooplankton

Field-Form Filled Out By: GMM Date: 2/16/08

QAQC Check By: CMC Date: 2/1/08

***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: 2/15/08 Time: 10:58

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 11.2 Ice Thickness (ft): 3.80

Freeboard (ft): 0.25 Snow Depth (ft): 0.50

Elev. (BPMSL +/- .02): 11.72 Survey By: MRL/Whitman Date: 2/15/08 Time: 13:35

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-pH fail |

| **Parameters** | **Field Measurements** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time: | 11:03 | 11:06 | 11:09 | 11:11 | 11:14 | 11:17 | 11:19 | | | |
| Depth BWS (ft): | 4 | 5 | 6 | 7 | 9 | 10 | 11.0 | | | |
| Temp (°C): | 0.19 | 0.27 | 0.65 | 1.06 | 1.78 | 2.12 | 2.42 | | | |
| pH: | 6.98 | 6.96 | 6.86 | 6.83 | 6.75 | 6.64 | 6.60 | | | |
| *Barometeric (mmHg):* | 747.4 | 747.4 | 747.5 | 747.6 | 747.6 | 747.7 | 747.7 | | | |
| *Pressure (kPa):* | 10.164 | 12.240 | 16.103 | 19.203 | 25.277 | 28.297 | 31.176 | | | |
| Conductivity (µS/cm): | 82.16 | 81.69 | 80.46 | 79.08 | 78.21 | 78.90 | 87.64 | | | |
| RDO (ppm): (mg/L) | 11.60 | 11.77 | 11.92 | 11.99 | 11.78 | 10.35 | 8.66 | | | |
| Turbidity (NTU): | 0.2 | 0.3 | 1.2 | 0.3 | 0.3 | 1.3 | 7.4 | | | |
| ORP | 354 | 355 | 358 | 358 | 361 | 365 | 361 | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**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: Log start 11:08; Log stop 11:20. Samples collected by M. Whitman for zooplankton.

Field-Form Filled Out By: GMM Date: 2/1608

QAQC Check By: CMC Date: 3/17/08

***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: 2/15/08 Time: 11:38

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 9.3 Ice Thickness (ft): 3.75

Freeboard (ft): 0.3 Snow Depth (ft): 0.65

Elev. (BPMSL +/- .02): 11.72 Survey By: MRL/Whitman Date: 2/15/08 Time: 13:35

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-pH fail |

| **Parameters** | **Field Measurements** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time: | 11:45 | 11:49 | 11:52 | 11:56 | 11:59 | 12:03 | | | | |
| Depth BWS (ft): | 4 | 5 | 6 | 7 | 8 | 9 | | | | |
| Temp (°C): | 0.16 | 0.31 | 0.66 | 1.06 | 1.38 | 1.65 | | | | |
| pH: | 7.11 | 7.08 | 7.02 | 6.88 | 6.83 | 6.73 | | | | |
| *Barometeric (mmHg):* | 747.7 | 747.7 | 747.8 | 747.8 | 747.9 | 748.0 | | | | |
| *Pressure (kPa):* | 10.487 | 13.296 | 16.507 | 19.376 | 22.462 | 25.231 | | | | |
| Conductivity (µS/cm): | 80.49 | 80.70 | 81.70 | 81.56 | 81.31 | 80.99 | | | | |
| RDO (ppm): (mg/L) | 10.76 | 10.66 | 9.91 | 9.44 | 9.08 | 8.48 | | | | |
| Turbidity (NTU): | 0.6 | 0.1 | 1.4 | 1.4 | 2.1 | 2.8 | | | | |
| ORP | 350 | 351 | 352 | 358 | 359 | 361 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**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: Log start 11:45; log stop 12:04. Actual ice thickness 4.0ft, Additional 0.25ft from ice road construction an surface flow.

Field-Form Filled Out By: GMM Date: 2/16/08

QAQC Check By: CMC Date: 2/17/08

***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: 2/15/08 Time: 12:27

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 7.55 Ice Thickness (ft): 3.75

Freeboard (ft): 0.1 Snow Depth (ft): 0.80

Elev. (BPMSL +/- .02): 11.72 Survey By: MRL/Whitman Date: 2/15/08 Time: 13:35

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-pH fail |

| **Parameters** | **Field Measurements** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time: | 12:34 | 12:36 | 12:38 | 12:42 | 12:45 | | | | | |
| Depth BWS (ft): | 4 | 5 | 6 | 7 | 7.5 | | | | | |
| Temp (°C): | 0.15 | 0.26 | 0.66 | 1.02 | 1.14 | | | | | |
| pH: | 7.13 | 7.10 | 7.03 | 6.95 | 6.92 | | | | | |
| *Barometeric (mmHg):* | 748.0 | 748.0 | 748.1 | 748.1 | 748.1 | | | | | |
| *Pressure (kPa):* | 10.252 | 13.202 | 16.302 | 19.160 | 20.670 | | | | | |
| Conductivity (µS/cm): | 82.35 | 81.23 | 81.92 | 82.36 | 82.35 | | | | | |
| RDO (ppm): (mg/L) | 10.87 | 10.86 | 10.07 | 8.37 | 7.49 | | | | | |
| Turbidity (NTU): | 0.7 | 0.9 | 1.4 | 1.9 | 2.4 | | | | | |
| ORP | 363 | 363 | 365 | 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: reject ORP data due to unbelievable results (~400mV).

Field-Form Filled Out By: GMM Date: 2/16/08

QAQC Check By: CMC Date: 2/17/08

***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: L9817-1

Sample Purpose: **Lake Water Quality** Date: 2/16/08 Time 10:05

**FIELD MEASUREMENTS**

GPS Coord. Northing: N70°14.070' Easting: W151°20.121' Datum: NAD83

Measurements By: GMM Time: n/a

Water Depth (ft): 7.35 Ice Thickness (ft): 4.15

Freeboard (ft): 0.15 Snow Depth (ft): 0.35

Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00

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: | 10:13 | 10:16 | 10:20 | 10:25 | | | | | | |
| Depth BWS (ft): | 4 | 5 | 6 | 7 | | | | | | |
| Temp (°C): | 0.17 | 0.16 | 0.21 | 0.74 | | | | | | |
| pH: | 7.02 | 7.03 | 7.01 | 6.95 | | | | | | |
| *Barometeric (mmHg):* | 758.2 | 758.4 | 758.4 | 758.4 | | | | | | |
| *Pressure (kPa):* | 10.214 | 13.293 | 16.375 | 19.318 | | | | | | |
| Conductivity (µS/cm): | 700.4 | 696.2 | 690.2 | 699.7 | | | | | | |
| RDO (ppm): (mg/L) | 2.23 | 2.31 | 2.23 | 1.99 | | | | | | |
| Turbidity (NTU): | 4.5 | 4.2 | 4.6 | 6.3 | | | | | | |
| ORP | 221 | 220 | 221 | 217 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| **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: Log start 10:13. Log end 10:25

Field-Form Filled Out By: GMM Date: 2/15/08

QAQC Check By: DAR Date: 2/17/08

***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: L9817 - 2

Sample Purpose: **Lake Water Quality** Date: 2/16/08 Time 10:32

**FIELD MEASUREMENTS**

GPS Coord. Northing: N70°14.046' Easting: W151°20.079' Datum: NAD83

Measurements By: GMM Time: n/a

Water Depth (ft): 5.85 Ice Thickness (ft): 4.45

Freeboard (ft): 0.30 Snow Depth (ft): 0.25

Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00

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: | 10:39 | 10:44 | 10:50 | 10:56 | | | | | | |
| Depth BWS (ft): | 4 | 4.5 | 5 | 5.5 | | | | | | |
| Temp (°C): | 0.07 | 0.05 | 0.04 | 0.03 | | | | | | |
| pH: | 6.89 | 6.88 | 6.85 | 6.79 | | | | | | |
| *Barometeric (mmHg):* | 758.4 | 758.4 | 758.4 | 758.4 | | | | | | |
| *Pressure (kPa):* | 10.431 | 12.189 | 13.253 | 15.103 | | | | | | |
| Conductivity (µS/cm): | 696.6 | 696.6 | 696.8 | 697.9 | | | | | | |
| RDO (ppm): (mg/L) | 2.59 | 2.39 | 2.36 | 2.41 | | | | | | |
| Turbidity (NTU): | 6.2 | 6.0 | 5.7 | 5.8 | | | | | | |
| ORP | 310 | 306 | 304 | 304 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**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: Log start 10:38. Log stop 10:32

Field-Form Filled Out By: GMM Date: 2/16/08

QAQC Check By: DAR Date: 2/17/08

***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: L9817 - 3

Sample Purpose: **Lake Water Quality** Date: 2/16/08 Time 11:05

**FIELD MEASUREMENTS**

GPS Coord. Northing: N70°14.022' Easting: W151°20.037' Datum: NAD83

Measurements By: GMM Time: n/a

Water Depth (ft): 7.10 Ice Thickness (ft): 4.05

Freeboard (ft): 0.25 Snow Depth (ft): 0.45

Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00

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: | 11:13 | 11:17 | 11:21 | 11:24 | | | | | | |
| Depth BWS (ft): | 4 | 5 | 6 | 7 | | | | | | |
| Temp (°C): | 0.07 | 0.09 | 0.22 | 0.48 | | | | | | |
| pH: | 6.74 | 6.72 | 6.68 | 6.54 | | | | | | |
| *Barometeric (mmHg):* | 758.5 | 758.5 | 758.4 | 758.4 | | | | | | |
| *Pressure (kPa):* | 10.367 | 13.263 | 16.323 | 19.286 | | | | | | |
| Conductivity (µS/cm): | 695.3 | 691.7 | 694.2 | 711.6 | | | | | | |
| RDO (ppm): (mg/L) | 2.30 | 2.29 | 2.20 | 2.04 | | | | | | |
| Turbidity (NTU): | 7.8 | 8.5 | 7.7 | 10.0 | | | | | | |
| ORP | 316 | 315 | 316 | 319 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**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: Log start 11:16. Log end 11:25

Field-Form Filled Out By: GMM Date: 2/16/08

QAQC Check By: DAR Date: 2/17/08

***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: L9817 - 4

Sample Purpose: **Lake Water Quality** Date: 2/16/08 Time 11:35

**FIELD MEASUREMENTS**

GPS Coord. Northing: N70°13.998' Easting: W151°19.997' Datum: NAD83

Measurements By: GMM Time: n/a

Water Depth (ft): 4.80 Ice Thickness (ft): 4.60

Freeboard (ft): 0.50 Snow Depth (ft): 0.60

Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00

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: | 11:41 | 11:45 | | | | | | | | |
| Depth BWS (ft): | 4.5 | BOT | | | | | | | | |
| Temp (°C): | 0.06 | 0.08 | | | | | | | | |
| pH: | 6.70 | 6.68 | | | | | | | | |
| *Barometeric (mmHg):* | 758.4 | 758.5 | | | | | | | | |
| *Pressure (kPa):* | 11.695 | 13.644 | | | | | | | | |
| Conductivity (µS/cm): | 715.1 | 717.5 | | | | | | | | |
| RDO (ppm): (mg/L) | 1.43 | 1.17 | | | | | | | | |
| Turbidity (NTU): | 9.7 | 25.8 | | | | | | | | |
| ORP | 346 | 343 | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| **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: Log start 11:39. Log stop 11:45

Field-Form Filled Out By: GMM Date: 2/16/08

QAQC Check By: DAR Date: 2/17/08

***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: L9817 - 20

Sample Purpose: **Lake Water Quality** Date: 2/16/08 Time 13:32

**FIELD MEASUREMENTS**

GPS Coord. Northing: N70°14.079' Easting: W151°19.969' Datum: NAD83

Measurements By: GMM Time: n/a

Water Depth (ft): 8.40 Ice Thickness (ft): 4.55

Freeboard (ft): 0.50 Snow Depth (ft): 0.45

Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00

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: | 13:45 | 13:51 | 13:55 | 14:00 | 14:04 | | | | | |
| Depth BWS (ft): | 5 | 6 | 7 | 8 | 8.5 | | | | | |
| Temp (°C): | 0.47 | 0.46 | 0.69 | 1.09 | 1.30 | | | | | |
| pH: | 6.75 | 6.73 | 6.70 | 6.67 | 6.76 | | | | | |
| *Barometeric (mmHg):* | 758.4 | 758.4 | 758.4 | 758.4 | 758.4 | | | | | |
| *Pressure (kPa):* | 13.558 | 16.277 | 19.286 | 22.241 | 23.699 | | | | | |
| Conductivity (µS/cm): | 658.7 | 683.0 | 694.1 | 710.7 | 740.5 | | | | | |
| RDO (ppm): (mg/L) | 0.76 | 1.67 | 1.59 | 0.90 | 0.54 | | | | | |
| Turbidity (NTU): | 20.2 | 12.6 | 11.8 | 15.4 | 19.4 | | | | | |
| ORP | 338 | 338 | 335 | 312 | 283 | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**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: Log start 13:37. Log end 14:04

Field-Form Filled Out By: GMM Date: 2/16/08

QAQC Check By: DAR Date: 2/17/08

***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: L9817 - 22

Sample Purpose: **Lake Water Quality** Date: 2/16/08 Time 13:00

**FIELD MEASUREMENTS**

GPS Coord. Northing: N70°14.074' Easting: W151°20.017 Datum: NAD83

Measurements By: GMM Time: n/a

Water Depth (ft): 8.35 Ice Thickness (ft): 4.25

Freeboard (ft): 0.15 Snow Depth (ft): 0.40

Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00

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

2

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**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: | 13:10 | 13:15 | 13:18 | 13:23 | | | | | | |
| Depth BWS (ft): | 5 | 6 | 7 | 8 | | | | | | |
| Temp (°C): | 0.12 | 0.16 | 0.25 | 0.77 | | | | | | |
| pH: | 6.77 | 6.74 | 6.71 | 6.65 | | | | | | |
| *Barometeric (mmHg):* | 758.7 | 758.8 | 758.7 | 758.8 | | | | | | |
| *Pressure (kPa):* | 13.142 | 16.488 | 19.360 | 22.458 | | | | | | |
| Conductivity (µS/cm): | 685.6 | 691.4 | 709.6 | 731.2 | | | | | | |
| RDO (ppm): (mg/L) | 2.60 | 2.47 | 2.44 | 1.92 | | | | | | |
| Turbidity (NTU): | 8.0 | 6.0 | 4.2 | 8.9 | | | | | | |
| ORP | 346 | 347 | 347 | 342 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| **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: Log start 13:13. Log end 13:24.

Field-Form Filled Out By: GMM Date: 2/16/08

QAQC Check By: DAR Date: 2/17/08

***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: L9817 - 23

Sample Purpose: **Lake Water Quality** Date: 2/16/08 Time 11:52

**FIELD MEASUREMENTS**

GPS Coord. Northing: N70°14.071' Easting: W151°20.067 Datum: NAD83

Measurements By: GMM Time: n/a

Water Depth (ft): 7.60 Ice Thickness (ft): 3.60

Freeboard (ft): 0.35 Snow Depth (ft): 0.55

Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00

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

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**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: | 12:04 | 12:09 | 12:23 | 12:16 | 12:20 | | | | | |
| Depth BWS (ft): | 4 | 5 | 6 | 7 | BOT | | | | | |
| Temp (°C): | 0.08 | 0.12 | 0.30 | 0.71 | 1.03 | | | | | |
| pH: | 6.76 | 6.73 | 6.70 | 6.67 | 6.64 | | | | | |
| *Barometeric (mmHg):* | 758.4 | 758.3 | 758.4 | 758.4 | 758.4 | | | | | |
| *Pressure (kPa):* | 10.300 | 13.256 | 16.258 | 19.133 | 22.023 | | | | | |
| Conductivity (µS/cm): | 684.7 | 679.9 | 681.1 | 686.6 | 705.5 | | | | | |
| RDO (ppm): (mg/L) | 2.58 | 2.40 | 2.39 | 2.19 | 1.78 | | | | | |
| Turbidity (NTU): | 4.9 | 4.8 | 4.9 | 6.3 | 47.1 | | | | | |
| ORP | 361 | 358 | 357 | 357 | 344 | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**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: Log start 12:01. Log stop 12:21

Field-Form Filled Out By: GMM Date: 2/16/08

QAQC Check By: DAR Date: 2/17/08

***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: L9817 - 25

Sample Purpose: **Lake Water Quality** Date: 2/16/08 Time 14:15

**FIELD MEASUREMENTS**

GPS Coord. Northing: N70°14.100' Easting: W151°20.066' Datum: NAD83

Measurements By: GMM Time: 14:15

Water Depth (ft): 6.50 Ice Thickness (ft): 4.90

Freeboard (ft): 0.30 Snow Depth (ft): 0.00

Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00

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: | 14:27 | 14:30 | 14:35 | 14:40 | | | | | | |
| Depth BWS (ft): | 5 | 5.5 | 6 | BOT | | | | | | |
| Temp (°C): | 0.10 | 0.09 | 0.11 | 0.44 | | | | | | |
| pH: | 6.80 | 6.79 | 6.78 | 6.75 | | | | | | |
| *Barometeric (mmHg):* | 758.3 | 758.3 | 758.3 | 758.2 | | | | | | |
| *Pressure (kPa):* | 13.224 | 14.967 | 16.278 | 18.146 | | | | | | |
| Conductivity (µS/cm): | 699.8 | 694.8 | 693.2 | 697.2 | | | | | | |
| RDO (ppm): (mg/L) | 2.28 | 2.26 | 2.23 | 1.86 | | | | | | |
| Turbidity (NTU): | 6.6 | 6.7 | 6.5 | 11.3 | | | | | | |
| ORP | 337 | 337 | 336 | 334 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**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: Log start 14:21. Log stop 14:41.

Field-Form Filled Out By: GMM Date: 2/16/08

QAQC Check By: DAR Date: 2/17/08

***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

Sample Purpose: **Lake Water Quality** Date: 2/18/08 Time: 14:45

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 20.2 Ice Thickness (ft): 5.10

Freeboard (ft): 0.45 Snow Depth (ft): 0.10

Elev. (BPMSL +/- .02): 8.02 Survey By: DAR/ MW Date: 2/18/08 Time: nr

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

2

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**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: | 15:03 | 15:07 | 15:11 | 15:17 | 15:21 | 15:26 | 15:30 | 15:36 | 15:44 | 15:47 | 15:51 |
| Depth BWS (ft): | 6 | 7 | 8 | 9 | 11 | 13 | 15 | 17 | 18 | 19 | 20 |
| Temp (°C): | 0.32 | 0.63 | 0.86 | 1.05 | 1.20 | 1.35 | 1.49 | 1.62 | 1.77 | 1.80 | 1.86 |
| pH: | 7.74 | 7.70 | 7.67 | 7.63 | 7.58 | 7.50 | 7.42 | 7.32 | 7.15 | 7.07 | 7.00 |
| *Barometeric (mmHg):* | 752.4 | 752.5 | 752.7 | 752.8 | 752.8 | 752.9 | 752.9 | 752.9 | 753.0 | 753.0 | 753.00 |
| *Pressure (mmHg):* | 16.426 | 19.383 | 22.474 | 25.51 | 31.372 | 37.424 | 43.359 | 49.332 | 52.2 | 55.192 | 58.15 |
| Conductivity (µS/cm): | 118.8 | 117.9 | 118.1 | 118.3 | 118.3 | 118.4 | 118.4 | 118.50 | 119.70 | 122.80 | 130.10 |
| RDO (ppm): (mg/L) | 15.33 | 15.48 | 15.59 | 15.68 | 15.91 | 16.15 | 16.39 | 16.60 | 12.11 | 10.52 | 7.00 |
| Turbidity (NTU): | 0.7 | 0.9 | 1.1 | 1.0 | 0.9 | 0.7 | 0.5 | 0.2 | 0.1 | 0.4 | 1.1 |
| ORP | 278 | 278 | 278 | 278 | 280 | 282 | 286 | 289 | 293 | 295 | 282 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**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: Log start 1457. Log stop 1552.

Field-Form Filled Out By: GMM Date: 2/20/08

QAQC Check By: AJB Date: 3/10/08

***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

Sample Purpose: **Lake Water Quality** Date: 2/18/08 Time: 13:20

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 18.05 Ice Thickness (ft): 4.85

Freeboard (ft): 0.5 Snow Depth (ft): 0.10

Elev. (BPMSL +/- .02): 6.06 Survey By: DAR/ MW Date: 2/18/08 Time: nr

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

2

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**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: | 13:28 | 13:32 | 13:38 | 13:44 | 13:53 | 14:01 | 14:05 | 14:09 | 14:14 | 14:20 | | |
| Depth BWS (ft): | 5 | 6 | 7 | 9 | 11 | 13 | 15 | 16 | 17 | 17.8 | | |
| Temp (°C): | 0.18 | 0.28 | 0.69 | 1.00 | 1.20 | 1.40 | 1.60 | 1.75 | 1.91 | 2.01 | | |
| pH: | 7.79 | 7.79 | 7.76 | 7.70 | 7.63 | 7.52 | 7.44 | 7.25 | 7.02 | 6.93 | | |
| *Barometeric (mmHg):* | 752.2 | 752.1 | 752.1 | 752.2 | 752.3 | 752.5 | 752.5 | 752.4 | 752.5 | 752.7 | | |
| *Pressure (mmHg):* | 13.573 | 16.326 | 19.37 | 25.599 | 31.415 | 37.464 | 43.314 | 46.259 | 49.277 | 51.744 | | |
| Conductivity (µS/cm): | 129.0 | 127.8 | 128.1 | 128.5 | 128.5 | 128.2 | 128.8 | 128.9 | 130.5 | 138.90 | | |
| RDO (ppm): (mg/L) | 14.71 | 14.77 | 15.05 | 15.29 | 15.63 | 15.87 | 15.93 | 14.23 | 9.53 | 5.39 | | |
| Turbidity (NTU): | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.8 | 2.2 | | |
| ORP | 212 | 213 | 215 | 214 | 219 | 223 | 226 | 232 | 239 | 243 | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

**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: Log start 13:26. Log stop 14:21.

Field-Form Filled Out By: GMM Date: 2/20/08

QAQC Check By: AJB Date: 3/10/08

***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

Sample Purpose: **Lake Water Quality** Date: 2/18/08 Time: 16:12

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 21.7 Ice Thickness (ft): 4.75

Freeboard (ft): 0.5 Snow Depth (ft): 0.25

Elev. (BPMSL +/- .02): 6.06 Survey By: DAR/ MW Date: 2/18/08 Time: nr

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: | 16:19 | 16:23 | 16:28 | 16:33 | 16:38 | 16:43 | 16:46 | 16:49 | 16:53 | 16:56 | 17:01 | 17:06 |
| Depth BWS (ft): | 5 | 6 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 20 | 21 | 21.5 |
| Temp (°C): | 0.18 | 0.40 | 0.85 | 1.27 | 1.50 | 1.62 | 1.71 | 1.82 | 1.94 | 2.06 | 2.13 | 2.10 |
| pH: | 7.77 | 7.74 | 7.70 | 7.65 | 7.58 | 7.50 | 7.46 | 7.36 | 7.27 | 7.09 | 6.88 | 6.88 |
| *Barometeric (mmHg):* | 752.7 | 752.7 | 752.8 | 752.9 | 753.0 | 753.2 | 753.2 | 753.3 | 753.3 | 753.4 | 753.4 | 753.40 |
| *Pressure (mmHg):* | 31.521 | 16.316 | 19.425 | 25.56 | 31.542 | 37.411 | 43.451 | 49.469 | 55.03 | 58.239 | 61.331 | 62.766 |
| Conductivity (µS/cm): | 117.8 | 116.7 | 116.0 | 116.4 | 116.6 | 116.6 | 116.5 | 116.5 | 116.60 | 116.40 | 117.40 | 121.70 |
| RDO (ppm): (mg/L) | 14.59 | 14.71 | 14.72 | 14.83 | 14.93 | 15.03 | 15.03 | 15.01 | 14.57 | 12.03 | 7.95 | 7.85 |
| Turbidity (NTU): | 0.0 | 0.1 | 0.2 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.7 | 1.0 |
| ORP | 284 | 284 | 284 | 285 | 287 | 289 | 291 | 295 | 299 | 305 | 309 | 309 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

**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: Log start 1615. Log stop 1706.

Field-Form Filled Out By: GMM Date: 2/20/08

QAQC Check By: AJB Date: 3/10/08

***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: 2/19/08 Time: 14:25

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 33.65 Ice Thickness (ft): 4.80

Freeboard (ft): 0.5 Snow Depth (ft): 0.35

Elev. (BPMSL +/- .02): 93.9 Survey By: DAR/MW Date: 2/19/08 Time: 17:00

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 - pH ORP Fail |

| **Parameters** | **Field Measurements** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time: | 14:36 | 14:39 | 14:42 | 14:45 | 14:50 | 14:54 | 14:57 | 15:01 | 15:03 | 15:06 | 15:10 | 15:13 |
| Depth BWS (ft): | 5 | 6 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 |
| Temp (°C): | 0.26 | 0.19 | 0.20 | 0.35 | 0.72 | 1.07 | 1.27 | 1.42 | 1.53 | 1.61 | 1.67 | 1.75 |
| pH: | | | | | | | | | | | | |
| *Barometeric (mmHg):* | 752.7 | 752.7 | 752.6 | 752.6 | 752.6 | 752.7 | 752.7 | 752.8 | 752.9 | 752.9 | 753.0 | 753.0 |
| *Pressure (kPa):* | 13.361 | 16.279 | 19.228 | 25.001 | 31.028 | 37.005 | 42.933 | 49.212 | 55.399 | 60.818 | 66.753 | 72.639 |
| Conductivity (µS/cm): | 163.7 | 162.4 | 161.9 | 161.0 | 160.5 | 161.2 | 161.3 | 161.5 | 161.6 | 161.6 | 161.7 | 161.9 |
| RDO (ppm): (mg/L) | 12.84 | 13.28 | 13.70 | 13.97 | 14.45 | 14.33 | 14.36 | 14.64 | 14.53 | 14.21 | 14.73 | 14.75 |
| Turbidity (NTU): | 0.2 | 0.5 | 0.6 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 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: Sheet 1 of 2. No log taken. pH/ ORP probe sensor covered therefore reading inaccurate and thrown out.

Field-Form Filled Out By: GMM Date: 2/20/08

QAQC Check By: AJB Date: 3/10/08

***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: 2/19/08 Time: 14:25

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 33.65 Ice Thickness (ft): 4.80

Freeboard (ft): 0.5 Snow Depth (ft): 0.35

Elev. (BPMSL +/- .02): 93.9 Survey By: DAR/MW Date: 2/19/08 Time: 17:00

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 - pH ORP FAIL |

| **Parameters** | **Field Measurements** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time: | 15:17 | 15:24 | 15:28 | 15:30 | 15:33 | 15:35 | | | | | | |
| Depth BWS (ft): | 27 | 29 | 31 | 32 | 33 | 33.4 | | | | | | |
| Temp (°C): | 1.88 | 2.09 | 2.18 | 2.17 | 2.13 | 2.11 | | | | | | |
| pH: | | | | | | | | | | | | |
| *Barometeric (mmHg):* | 753.0 | 753.0 | 753.0 | 753.1 | 753.1 | 753.2 | | | | | | |
| *Pressure (kPa):* | 78.535 | 84.723 | 90.403 | 93.811 | 96.710 | 98.139 | | | | | | |
| Conductivity (µS/cm): | 162.1 | 171.6 | 194.1 | 243.6 | 280.0 | 329.3 | | | | | | |
| RDO (ppm): (mg/L) | 13.94 | 7.29 | 6.15 | 4.18 | 3.85 | 3.37 | | | | | | |
| Turbidity (NTU): | 0.0 | 2.4 | 2.9 | 1.2 | 1.5 | 1.4 | | | | | | |
| 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: Sheet 2 of 2. No log taken. pH/ ORP probe sensor covered therefore reading inaccurate and thrown out.

Field-Form Filled Out By: GMM Date: 2/20/08

QAQC Check By: AJB Date: 3/10/08

***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: 2/19/08 Time: 15:53

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 26.5 Ice Thickness (ft): 4.55

Freeboard (ft): 0.4 Snow Depth (ft): 0.45

Elev. (BPMSL +/- .02): 93.9 Survey By: DAR/MW Date: 2/19/08 Time: 17:00

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 - pH ORP Fail |

| **Parameters** | **Field Measurements** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time: | 15:58 | 16:02 | 16:07 | 16:10 | 16:12 | 16:15 | 16:18 | 16:21 | 16:25 | 16:28 | 16:30 | 16:33 |
| Depth BWS (ft): | 5 | 6 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 24 |
| Temp (°C): | 0.34 | 0.23 | 0.56 | 0.87 | 1.09 | 1.31 | 1.44 | 1.58 | 1.71 | 1.79 | 1.90 | 2.01 |
| pH: | | | | | | | | | | | | |
| *Barometeric (mmHg):* | 752.1 | 752.1 | 752.1 | 752.1 | 752.1 | 752.2 | 752.2 | 752.3 | 752.4 | 752.5 | 752.5 | 752.5 |
| *Pressure (kPa):* | 13.684 | 16.128 | 19.082 | 25.175 | 31.209 | 37.261 | 42.921 | 49.020 | 55.009 | 60.943 | 66.714 | 69.82 |
| Conductivity (µS/cm): | 169.7 | 169.0 | 168.5 | 168.7 | 169.2 | 169.4 | 169.1 | 168.6 | 168.5 | 169.1 | 169.4 | 169.7 |
| RDO (ppm): (mg/L) | 11.65 | 11.74 | 11.75 | 11.70 | 11.63 | 11.53 | 11.37 | 11.20 | 10.98 | 10.72 | 10.90 | 9.98 |
| Turbidity (NTU): | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.6 | 0.9 |
| 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: Sheet 1 of 2. Log start 15:57. Log stop 16:38.. pH/ ORP probe sensor covered therefore reading inaccurate and thrown out.

Field-Form Filled Out By: GMM Date: 2/20/08

QAQC Check By: AJB Date: 3/10/08

***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: 2/19/08 Time: 15:53

**FIELD MEASUREMENTS**

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

Measurements By: GMM Time: nr

Water Depth (ft): 26.5 Ice Thickness (ft): 4.55

Freeboard (ft): 0.4 Snow Depth (ft): 0.45

Elev. (BPMSL +/- .02): 93.9 Survey By: DAR/MW Date: 2/19/08 Time: 17:00

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 - pH ORP Fail |

| **Parameters** | **Field Measurements** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time: | 16:35 | 16:38 | | | | | | | | | | |
| Depth BWS (ft): | 25 | 26 | | | | | | | | | | |
| Temp (°C): | 2.10 | 2.17 | | | | | | | | | | |
| pH: | | | | | | | | | | | | |
| *Barometeric (mmHg):* | 752.5 | 752.1 | | | | | | | | | | |
| *Pressure (kPa):* | 72.709 | 75.765 | | | | | | | | | | |
| Conductivity (µS/cm): | 173.1 | 179.1 | | | | | | | | | | |
| RDO (ppm): (mg/L) | 7.43 | 5.10 | | | | | | | | | | |
| Turbidity (NTU): | 3.7 | 4.7 | | | | | | | | | | |
| 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: Sheet 2 of 2. Log start 15:57. Log stop 16:38.. pH/ ORP probe sensor covered therefore reading inaccurate and thrown out.

Field-Form Filled Out By: GMM Date: 2/20/08

QAQC Check By: AJB Date: 3/10/08

***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-CNT

Sample Purpose: **Lake Water Quality** Date: 2/19/08 Time: 16:48

**FIELD MEASUREMENTS**

GPS Coord. Northing: nr Easting: nr Datum: nr

Measurements By: GMM Time: nr

Water Depth (ft): 19.4 Ice Thickness (ft): 4.05

Freeboard (ft): 0.5 Snow Depth (ft): 0.20

Elev. (BPMSL +/- .02): n/a Survey By: n/a Date: n/a Time: n/a

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 - pH ORP Fail |

| **Parameters** | **Field Measurements** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time: | 16:54 | 16:57 | 16:59 | 17:02 | 15:05 | 15:08 | 15:10 | 15:12 | 15:14 | 17:16 | | |
| Depth BWS (ft): | 5 | 6 | 7 | 9 | 11 | 13 | 15 | 17 | 18 | 19 | | |
| Temp (°C): | 0.22 | 0.20 | 0.36 | 0.83 | 1.09 | 1.19 | 1.35 | 1.40 | 1.49 | 1.52 | | |
| pH: | | | | | | | | | | | | |
| *Barometeric (mmHg):* | 751.8 | 751.8 | 751.8 | 751.8 | 751.8 | 751.8 | 751.8 | 751.9 | 751.9 | 751.9 | | |
| *Pressure (kPa):* | 13.349 | 16.119 | 19.226 | 25.081 | 31.154 | 37.039 | 43.079 | 48.909 | 52.194 | 55.100 | | |
| Conductivity (µS/cm): | 177.7 | 177.0 | 175.0 | 173.3 | 173.0 | 173.1 | 172.9 | 172.8 | 172.8 | 173.3 | | |
| RDO (ppm): (mg/L) | 13.00 | 13.06 | 13.05 | 12.77 | 12.67 | 12.59 | 12.31 | 12.29 | 11.76 | 11.35 | | |
| Turbidity (NTU): | 0.3 | 0.5 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.4 | 0.8 | 1.2 | | |
| 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: Log start 16:54. Log stop 17:16. pH/ ORP probe sensor covered therefore reading inaccurate and thrown out.

Field-Form Filled Out By: GMM Date: 2/20/08

QAQC Check By: AJB Date: 3/10/08

# 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: Alpine-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 | 2/14/08 | 21:50 | Oakton 4.01 | 2709256 | Aug-09 | 4.08 @ 18.93 | Pass |
| ph 7.00 | 2/14/08 | 21:52 | Oakton 7.00 | 2709203 | Aug-09 | 7.04 @ 18.42 | Pass |
| ph 10.00 | 2/14/08 | 21:48 | Oakton 10.00 | 2707084 | Jan-09 | 10.02 @ 18.12 | Pass |
| Conductivity 447 µS/cm | 2/14/08 | 21:26 | Oakton 447 | 2707012 | Jul-08 | 376 @ 17.18 | Pass |
| Conductivity 84 µS/cm | 2/14/08 | 21:24 | Oakton 84 | 2706156 | Jun-08 | 80.81 @ 18.33 | Pass |
| ORP | 2/14/08 | 21:11 | Zobell's | 2709340 | Jun-08 | 242 @ 18.52 | Pass |
| Saturated $O_2$ | 2/14/08 | 21:58 | Bubbled Nanopure | -- | -- | 94.7 @ 18.30 | Pass |
| Zero $O_2$ | 2/14/08 | 22:00 | Oakton | 2706384 | Jun-08 | 0.01 @ 14.34 | Pass |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Post-Sampling QA**

| Parameter | Date | Time | Standard | Lot No. | Exp. | Meter Reading | Pass/Fail |
|---|---|---|---|---|---|---|---|
| pH 4.01 | 2/15/08 | 16:54 | Oakton 4.01 | 2709256 | Aug-09 | 4.0 @ 19.39 | Pass |
| ph 7.00 | 2/15/08 | 16:51 | Oakton 7.00 | 2709203 | Aug-09 | 7.06 @ 19.26 | Pass |
| ph 10.00 | 2/15/08 | 16:48 | Oakton 10.00 | 2707084 | Jan-09 | 10.04 @19.45 | Pass |
| Conductivity 447 µS/cm | 2/15/08 | 16:25 | Oakton 447 | 270712 | Jul-08 | 385.1 @ 18.20 | Pass |
| Conductivity 84 µS/cm | 2/15/08 | 16:22 | Oakton 84 | 2706156 | Jun-08 | 75.31 @ 18.16 | Pass |
| ORP | 2/15/08 | 17:09 | Zobell's | 2709340 | Jun-08 | 248 @ 19.30 | Pass |
| Saturated $O_2$ | 2/15/08 | 17:03 | Bubbled Nanopure | -- | -- | 100.9 @ 19.13 | Pass |
| Zero $O_2$ | 2/15/08 | 17:06 | Oakton | 2706384 | Jun-08 | 0.03 @ 16.18 | Pass |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Remarks: pH Failed 4.01 calibration. Re-calibrated.

ph/ORP probe SN:PP10242 (GWS)

Field-Form Filled Out By: GMM Date: 2/20/2008

QAQC Check By: AJB Date: 3/10/2008

*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: Alpine-L9817

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 | 2/15/08 | 16:54 | Oakton 4.01 | 2709256 | Aug-09 | 4.0 @ 19.39 | Pass |
| ph 7.00 | 2/15/08 | 16:51 | Oakton 7.00 | 2709203 | Aug-09 | 7.06 @ 19.26 | Pass |
| ph 10.00 | 2/15/08 | 16:48 | Oakton 10.00 | 2707084 | Jan-09 | 10.04 @19.45 | Pass |
| Conductivity 447 µS/cm | 2/15/08 | 16:25 | Oakton 447 | 270712 | Jul-08 | 385.1 @ 18.20 | Pass |
| Conductivity 84 µS/cm | 2/15/08 | 16:22 | Oakton 84 | 2706156 | Jun-08 | 75.31 @ 18.16 | Pass |
| ORP | 2/15/08 | 17:09 | Zobell's | 2709340 | Jun-08 | 248 @ 19.30 | Pass |
| Saturated $O_2$ | 2/15/08 | 17:03 | Bubbled Nanopure | -- | -- | 100.9 @ 19.13 | Pass |
| Zero $O_2$ | 2/15/08 | 17:06 | Oakton | 2706384 | Jun-08 | 0.03 @ 16.18 | Pass |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Post-Sampling QA**

| Parameter | Date | Time | Standard | Lot No. | Exp. | Meter Reading | Pass/Fail |
|---|---|---|---|---|---|---|---|
| pH 4.01 | 2/16/08 | 18:13 | Oakton 4.01 | 2709256 | Aug-09 | 4.11 @ 18.71 | Pass |
| ph 7.00 | 2/16/08 | 18:15 | Oakton 7.00 | 2709203 | Aug-09 | 7.01 @ 18.09 | Pass |
| ph 10.00 | 2/16/08 | 18:21 | Oakton 10.00 | 2707084 | Jan-09 | 10.04 @ 19.7 | Pass |
| Conductivity 447 µS/cm | 2/16/08 | 18:05 | Oakton 447 | 270712 | Jul-08 | 397 @ 19.04 | Pass |
| Conductivity 84 µS/cm | 2/16/08 | 18:00 | Oakton 84 | 2706156 | Jun-08 | 76.31 @ 19.08 | Pass |
| ORP | 2/16/08 | 18:27 | Zobell's | 2709340 | Jun-08 | 220 @ 19.3 | Pass |
| Saturated $O_2$ | 2/16/08 | 17:52 | Bubbled Nanopure | -- | -- | 97.6 @ 18.22 | Pass |
| Zero $O_2$ | 2/16/08 | 18:38 | Oakton | 2706384 | Jun-08 | 0.03 @ 16.1 | Pass |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Remarks:

ph/ORP probe SN:PP10242 (GWS)

Field-Form Filled Out By: GMM Date: 2/20/2008

QAQC Check By: AJB Date: 3/10/2008

***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 | 2/16/08 | 18:13 | Oakton 4.01 | 2709256 | Aug-09 | 4.11 @ 18.71 | Pass |
| ph 7.00 | 2/16/08 | 18:15 | Oakton 7.00 | 2709203 | Aug-09 | 7.01 @ 18.09 | Pass |
| ph 10.00 | 2/16/08 | 18:21 | Oakton 10.00 | 2707084 | Jan-09 | 10.04 @ 19.7 | Pass |
| Conductivity 447 µS/cm | 2/16/08 | 18:05 | Oakton 447 | 270712 | Jul-08 | 397 @ 19.04 | Pass |
| Conductivity 84 µS/cm | 2/16/08 | 18:00 | Oakton 84 | 2706156 | Jun-08 | 76.31 @ 19.08 | Pass |
| ORP | 2/16/08 | 18:27 | Zobell's | 2709340 | Jun-08 | 220 @ 19.3 | Pass |
| Saturated $O_2$ | 2/16/08 | 17:52 | Bubbled Nanopure | -- | -- | 97.6 @ 18.22 | Pass |
| Zero $O_2$ | 2/16/08 | 18:38 | Oakton | 2706384 | Jun-08 | 0.03 @ 16.1 | Pass |
| | | | | | | | |
| | | | | | | | |

**Post-Sampling QA**

| Parameter | Date | Time | Standard | Lot No. | Exp. | Meter Reading | Pass/Fail |
|---|---|---|---|---|---|---|---|
| pH 4.01 | 2/18/08 | 19:29 | Oakton 4.01 | 2709256 | Aug-09 | 4.01 @ 22.59 | Pass |
| ph 7.00 | 2/18/08 | 19:31 | Oakton 7.00 | 2612531 | Dec-08 | 6.98 @ 21.68 | Pass |
| ph 10.00 | 2/18/08 | 19:33 | Oakton 10.00 | 2612532 | Jun-08 | 9.94 @ 22.59 | Pass |
| Conductivity 447 µS/cm | 2/18/08 | 19:28 | Oakton 447 | 2707012 | Jul-08 | 428.8 @ 22.48 | Pass |
| Conductivity 84 µS/cm | 2/18/08 | 19:24 | Oakton 84 | 2706156 | Jun-08 | 80.62 @ 21.43 | Pass |
| ORP | 2/18/08 | 19:35 | Zobell's | 2709340 | Aug-07 | 217 @ 22.20 | Pass |
| Saturated $O_2$ | 2/18/08 | 19:38 | Bubbled Nanopure | -- | -- | 115 @ 21.62 | Pass |
| Zero $O_2$ | 2/18/08 | 19:40 | Oakton | 270638 | Jun-08 | 0.04 @ 19.62 | Pass |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

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

Field-Form Filled Out By: GMM Date: 2/20/2008

QAQC Check By: AJB Date: 3/10/2008

***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: 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 | 2/18/08 | 19:29 | Oakton 4.01 | 2709256 | Aug-09 | 4.01 @ 22.59 | Pass |
| ph 7.00 | 2/18/08 | 19:31 | Oakton 7.00 | 2612531 | Dec-08 | 6.98 @ 21.68 | Pass |
| ph 10.00 | 2/18/08 | 19:33 | Oakton 10.00 | 2612532 | Jun-08 | 9.94 @ 22.59 | Pass |
| Conductivity 447 µS/cm | 2/18/08 | 19:28 | Oakton 447 | 2707012 | Jul-08 | 428.8 @ 22.48 | Pass |
| Conductivity 84 µS/cm | 2/18/08 | 19:24 | Oakton 84 | 2706156 | Jun-08 | 80.62 @ 21.43 | Pass |
| ORP | 2/18/08 | 19:35 | Zobell's | 2709340 | Aug-07 | 217 @ 22.20 | Pass |
| Saturated $O_2$ | 2/18/08 | 19:38 | Bubbled Nanopure | -- | -- | 115 @ 21.62 | Pass |
| Zero $O_2$ | 2/18/08 | 19:40 | Oakton | 270638 | Jun-08 | 0.04 @ 19.62 | Pass |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Post-Sampling QA**

| Parameter | Date | Time | Standard | Lot No. | Exp. | Meter Reading | Pass/Fail |
|---|---|---|---|---|---|---|---|
| pH 4.01 | 2/19/08 | - | Oakton 4.01 | 2709256 | Aug-09 | - | - |
| ph 7.00 | 2/19/08 | - | Oakton 7.00 | 2612531 | Dec-08 | - | - |
| ph 10.00 | 2/19/08 | - | Oakton 10.00 | 2612532 | Jun-08 | - | - |
| Conductivity 447 µS/cm | 2/19/08 | 19:22 | Oakton 447 | 2707012 | Jul-08 | 420.8 @ 21.69 | Pass |
| Conductivity 84 µS/cm | 2/19/08 | 19:20 | Oakton 84 | 2706156 | Jun-08 | 84.43 @ 21.41 | Pass |
| ORP | 2/19/08 | - | Zobell's | 2709340 | Aug-07 | - | - |
| Saturated $O_2$ | 2/19/08 | 19:18 | Bubbled Nanopure | | | 104.9 @ 20.81 | Pass |
| Zero $O_2$ | 2/19/08 | 19:28 | Oakton | 270638 | Jun-08 | 0.03 @ 17.97 | Pass |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

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

pH/ORP not cal-checked due to field error of values. pH/ ORP sensor covered up during field reading.

Field-Form Filled Out By: GMM Date: 2/20/2008

QAQC Check By: AJB Date: 3/10/2008

# 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: L9312

Survey Purpose: **Water-Level Elevations** Date: 2/15/2008 Time: 13:35

| Location: | Lake L9312, located southeast of Alpine pad, survey by pump house benchmarks | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Survey objective: | Determine FWS Elevation. | | | | | Weather Observations: | | |
| Instrument Type: | LCMF Zeiss Ni2 | | Instrument ID: | #147298 | | | | |
| Rod Type: | Fiberglass | | Rod ID: | Sokkia Fiber Glass | | -15°F, 10-15 mph winds, Clear | | |
| Bench Mark Information: | | | | | | Survey Team Names | | |
| Name | Agency Responsible | Elevation (ft) | Latitude (dd-mm.mmm) | Longitude (ddd-mm.mmm) | | Michael Lilly, Matthew Whitman | | |
| L9312"P" | CP | 11.72 | na | na | | | | |
| **Station** | **BS (ft)** | **HI (ft)** | **FS (ft)** | **Elevation (fasl)** | **Distance (ft)** | **Horizontal Angle** | **Vertical Angle** | **Remarks** |
| TBM "P" | 0.590 | 12.31 | | 11.72 | | | | Top of inlet pipe support |
| TBM "O" | | 12.31 | 0.85 | 11.46 | | | | Top of inlet pipe support. BM Elev=11.46' |
| 99-32-59 | | 12.31 | 2.24 | 14.55 | | | | Top of Pumphouse SE VSM. BM Elev = 14.57 |
| L9312 WL | | 12.31 | 5.10 | **7.21** | | | | **Water Surface Level** |
| Turn on L9312 WL | | | | | | | | |
| L9312 WL | 5.20 | 12.41 | | 7.21 | | | | |
| 99-32-59 | | 12.41 | 2.14 | 14.55 | | | | Inverted shot |
| TBM"O" | | 12.41 | 0.95 | 11.46 | | | | |
| TBM"P" | | 12.41 | 0.69 | 11.72 | | | | close survey to 0.00 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Note:

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: L9817

Survey Purpose: **Water-Level Elevations** Date: 2/17/2008 Time: 16:00

| Location: | Near rebar on west side of lake. Water surface elevation taken near sample point #4 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Survey objective: | Lake water elevation survey | | | | | Weather Observations: | | -15 F, partly cloudy, 10-15 mph winds |
| Instrument Type: | Leica NA 720 | | Instrument ID: | 5482372 (GWS owned) | | | | |
| Rod Type: | Craine fiberglass 20' | | Rod ID: | | | | | |
| Bench Mark Information: | | | | | | Survey Team Names | | |
| Name | Agency Responsible | Elevation (ft) | Latitude (dd-mm.mmm) | Longitude (ddd-mm.mmm) | | Michael Lilly, Matthew Whitman | | |
| B | nr | 54.98 | na | na | | | | |
| **Station** | **BS (ft)** | **HI (ft)** | **FS (ft)** | **Elevation (fasl)** | **Distance (ft)** | **Horizontal Angle** | **Vertical Angle** | **Remarks** |
| B | 4.98 | 59.96 | | 54.98 | | | | rebar survey control |
| C | | 59.96 | 4.03 | 55.93 | | | | rebar survey control |
| E | | 59.96 | 3.62 | 56.34 | | | | rebar survey control |
| Top of Lake Ice | | 59.96 | 7.10 | 52.86 | | | | Near TBM E |
| Top of 2x2 | | 59.96 | 6.54 | 53.42 | | | | Near TBM E |
| Top of Rebar #1 | | 59.96 | 6.40 | 53.56 | | | | Near TBM E |
| Outlet Channel | | 59.96 | 7.72 | 52.24 | | | | Adjacent to Marking Lath |
| Top of Lake Ice, Outlet Channel | | 59.96 | 7.18 | 52.78 | | | | Top of Ice, 0,5 ft from outlet bank |
| Water surface | | 59.96 | 7.85 | 52.11 | | | | All measuements to water level |
| | | | | | | | | Turn point, moved instrument. |
| Water surface | 8.04 | 60.15 | | 52.11 | | | | L9817 Water Level |
| Top of Lake Ice, Outlet Channel | | 60.15 | 7.37 | 52.78 | | | | Top of Ice, 0,5 ft from outlet bank |
| Outlet Channel | | 60.15 | 7.92 | 52.23 | | | | Adjacent to Marking Lath |
| Top of Rebar #1 | | 60.15 | 6.60 | 53.55 | | | | Near TBM E |
| Top of 2x2 | | 60.15 | 6.74 | 53.41 | | | | Near TBM E |
| Top of Lake Ice | | 60.15 | 7.30 | 52.85 | | | | Near TBM E |
| E | | 60.15 | 3.81 | 56.34 | | | | rebar survey control |
| C | | 60.15 | 4.22 | 55.93 | | | | rebar survey control |
| B | | 60.15 | 5.17 | 54.98 | | | | Survey closes within 0.00' |
| | | | | | | | | |

Note: Survey control rebar points A, D were not found, Lath missing

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

Survey Purpose: **Water-Level Elevations** Date: 2/18/2008 Time: nr

| Location: | KDA1,2,3 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Survey objective: | Lake water elevation survey | | | | | Weather Observations: | | 0F, 60% cloudy, 4 mph winds SW |
| Instrument Type: | Leica NA 720 | Instrument ID: | 5482372 (GWS owned) | | | | | |
| Rod Type: | Craine fiberglass 20' | Rod ID: | | | | | | |
| Bench Mark Information: | | | | | | Survey Team Names | | |
| Name | Agency Responsible | Elevation (ft) | Latitude (dd-mm.mmm) | Longitude (ddd-mm.mmm) | | DAR, Matt Whitman | | |
| BM1 | nr | 19.32 | N70 20.048 | W148 56.367 (NAD83) | | | | |
| **Station** | **BS (ft)** | **HI (ft)** | **FS (ft)** | **Elevation (fasl)** | **Distance (ft)** | **Horizontal Angle** | **Vertical Angle** | **Remarks** |
| BM1 | 1.18 | 20.50 | | 19.32 | | | | |
| KDA3-SH | | 20.50 | 14.44 | 6.06 | | | | |
| KDA2-SHA | | 20.50 | 14.44 | 6.06 | | | | |
| KDA2-ICE | | 20.50 | 13.71 | **6.79** | | | | |
| Move instrument ^2 , turn on KDA2-ICE | | | | | | | | |
| KDA2-ICE | 13.59 | 20.37 | | | | | | |
| KDA2-SHA | | 20.37 | 14.31 | | | | | |
| KDA3-SH | | 20.37 | 14.31 | | | | | |
| BM1 | | 20.37 | 1.05 | | | | | |
| Move instrument ^3 (island) , turn on KDA2-SH | | | | | | | | |
| KDA2-SHB | 8.42 | 14.48 | | 6.06 | | | | |
| KDA1-SH | | 14.48 | 6.46 | 8.02 | | | | |
| KDA1-ICE | | 14.48 | 5.60 | 8.88 | | | | |
| Move to ^4, turn on KDA1-ICE | | | | | | | | |
| KDA1-ICE | 5.42 | 14.30 | | **8.88** | | | | |
| KDA1-SH | | 14.30 | 6.28 | 8.02 | | | | |
| KDA2-SHB | | 14.30 | 8.23 | 6.07 | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Note:

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: MSB

Survey Purpose: **Water-Level Elevations** Date: 2/19/2008 Time: 17:00

| Location: | Mine Site B | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Survey objective: | Lake water elevation survey | | | | | Weather Observations: | | Clear, 8F, 3mph winds from the East |
| Instrument Type: | Leica NA 720 | | Instrument ID: | 5482332 | | | | |
| Rod Type: | Craine fiberglass 20' | | Rod ID: | | | | | |
| Bench Mark Information: | | | | | | Survey Team Names | | |
| Name | Agency Responsible | Elevation (ft) | Latitude (dd-mm.mmm) | Longitude (ddd-mm.mmm) | | DAR, Matt Whitman | | |
| TBM1 | nr | 100 | N70 20.048 | W148 56.367 (NAD83) | | | | |
| **Station** | **BS (ft)** | **HI (ft)** | **FS (ft)** | **Elevation (fasl)** | **Distance (ft)** | **Horizontal Angle** | **Vertical Angle** | **Remarks** |
| TBM 1 | 5.72 | 105.72 | | 100.00 | | | | |
| MSBN-SHA | | 105.72 | 11.82 | 93.90 | | | | |
| VSMS | | 105.72 | 1.91 | 103.81 | | | | 11/17/06 103.882 |
| VSMN | | 105.72 | 2.27 | 103.45 | | | | |
| VSM CUT | | 105.72 | 4.42 | 101.303 | | | | |
| Turn on VSM_Cut move ^2 | | | | | | | | |
| VSM CUT | 0.16 | 105.46 | | 101.30 | | | | |
| VSM-N | | 105.46 | 2.01 | 103.45 | | | | |
| VSM-S | | 105.46 | 1.64 | 103.82 | | | | |
| MSBN-SHA | | 105.46 | 11.558 | 93.9 | | | | |
| TBM1 | | 105.46 | 5.46 | 100.00 | | | | close survey to 0.002 |
| Move to island ^3, turn on MSBS -WS | | | | | | | | |
| MSBN-SHB | 7.64 | 101.54 | | 93.90 | | | | Elevation from MSBN-SHA |
| MSBS-SH | | 101.54 | 7.32 | 94.23 | | | | |
| MSBS-ICE | | 101.54 | 6.69 | 94.584 | | | | |
| Turn on Ice move to ^4 | | | | | | | | |
| MSBN-ICE | 6.42 | 101.27 | | 94.85 | | | | |
| MSBS-SH | | 101.27 | 7.04 | 94.23 | | | | |
| MSBN-SHB | | 101.27 | 7.36 | 93.91 | | | | close elevation to + 0.007 |
| | | | | | | | | |
| | | | | | | | | |

Note:

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: | **L9312_Raft_B** |
| Survey Purpose: | **Determine snow water equivalent** | Date: 2/15/2008 | Time: 12:00 |

| | | | | | |
|---|---|---|---|---|---|
| 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: | -10°F, 10 mph winds, partly cloudy |
| 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 | | | Michael Lilly, Matthew Whitman, DAR | |

Snow Course Depths, in cm.

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 20.0 | 5.5 | 11.5 | 11.0 | 9.0 |
| 2 | 19.0 | 3.5 | 12.0 | 13.5 | 10.0 |
| 3 | 12.5 | 5.0 | 10.0 | 12.0 | 14.0 |
| 4 | 10.0 | 9.5 | 9.0 | 9.0 | 25.0 |
| 5 | 11.0 | 10.5 | 7.0 | 10.0 | 11.0 |
| 6 | 10.5 | 8.5 | 7.0 | 8.5 | 14.0 |
| 7 | 12.0 | 10.5 | 6.5 | 10.0 | 8.5 |
| 8 | 13.0 | 10.0 | 9.0 | 11.0 | 9.0 |
| 9 | 13.0 | 7.5 | 10.0 | 13.0 | 16.0 |
| 10 | 9.0 | 9.0 | 10.0 | 14.0 | 13.5 |

| | (cm) |
|---|---|
| Average snow depth = | **10.9** |
| Maximum snow depth = | 25.0 |
| Minimum snow depth = | 3.5 |
| Standard variation = | 3.7 |

Snow Sample Depths and Weights

| Bag # | Depth (cm) | Weight (gr) | Volume (cm^3) | Density (gr/cm^3) |
|---|---|---|---|---|
| L1 | 10 | 80.3 | 357.0 | 0.22 |
| L2 | 12 | 122.8 | 428.4 | 0.29 |
| L3 | 11 | 151.3 | 392.7 | 0.39 |
| L4 | 14 | 161.9 | 499.8 | 0.32 |
| L5 | 12 | 123.3 | 428.4 | 0.29 |

| | | |
|---|---|---|
| Average Density = | **0.30** | |
| Average Snow Water Equivalent (SWE) = | **3.3** | cm H2O |
| Average Snow Water Equivalent = | **1.29** | inches H2O |
| Average Snow Water Equivalent = | **0.11** | 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: **KDA**

Survey Purpose: **Determine snow water equivalent** Date: 2/18/2008 Time: 15:30

| | | | | | |
|---|---|---|---|---|---|
| Location Description: | 50m South x 50m East | | | | |
| Survey objective: | Determine Snow Water Equivalent | | | Weather Observations: | 0°F, 4 mph winds out of SW, 60% cloudy |
| Latitude: | 70 20.048 | Longitude: | 148 56.048 | Datum: | NAD 83 |
| Elevation: | 7 ft | Elevation Datum: | BPMSL | Reference Markers: | nr |
| Drainage Basin: | nr | 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 | | | Matthew Whitman, DAR | |

Snow Course Depths, in cm.

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 0.0 | 0.0 | 1.5 | 2.0 | 1.5 |
| 3 | 1.0 | 2.5 | 0.0 | 1.0 | 0.5 |
| 4 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 2.0 | 1.0 | 1.5 | 0.5 | 0.0 |
| 6 | 3.0 | 4.5 | 0.5 | 0.0 | 0.0 |
| 7 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 |
| 8 | 2.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |

| | (cm) |
|---|---|
| Average snow depth = | **0.6** |
| Maximum snow depth = | 4.5 |
| 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) |
|---|---|---|---|---|
| no densities taken | | | | |

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: | **MSBN-CT** |
| Survey Purpose: | **Determine snow water equivalent** | Date: 2/19/2008 | Time: 15:30 |

| | | | | | |
|---|---|---|---|---|---|
| Location Description: | Starting at center, West 25m, South 25m | | | | |
| Survey objective: | Determine Snow Water Equivalent | | | Weather Observations: | -8°F, calm, mostly sunny |
| Latitude: | N70°19.280' | Longitude: | W149°24.009' | Datum: | NAD83 |
| Elevation: | 7 ft | Elevation Datum: | BPMSL | Reference Markers: | nr |
| Drainage Basin: | generally drains SE | Slope Direction: | Flat | Vegetation Type: | tussocks tundra |
| Slope Angle: | Flat | Access Notes: | nr | Other: | |
| Snow Depth Probe Type: | | T-handle probe | | Snow-Survey Team Names | |
| Snow Tube Type: | Arinodack snow tube | | | Matthew Whitman, DAR | |

Snow Course Depths, in cm.

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 3.0 | 1.5 | 13.0 | 4.0 | 0.0 |
| 2 | 0.0 | 2.0 | 9.0 | 1.0 | 0.0 |
| 3 | 0.0 | 4.0 | 9.0 | 1.0 | 0.0 |
| 4 | 1.0 | 2.5 | 11.0 | 1.0 | 0.0 |
| 5 | 1.0 | 5.5 | 12.0 | 1.0 | 1.0 |
| 6 | 0.0 | 5.0 | 11.0 | 2.0 | 1.0 |
| 7 | 1.0 | 3.0 | 10.0 | 2.0 | 0.0 |
| 8 | 0.0 | 5.5 | 11.0 | 2.0 | 0.0 |
| 9 | 2.0 | 11.0 | 12.0 | 0.0 | 0.0 |
| 10 | 1.5 | 15.0 | 11.0 | 0.0 | 1.0 |

| | (cm) |
|---|---|
| Average snow depth = | **3.8** |
| Maximum snow depth = | 15.0 |
| Minimum snow depth = | 0.0 |
| Standard variation = | 4.5 |

Snow Sample Depths and Weights

| Bag # | Depth (cm) | Weight (gr) | Volume (cm^3) | Density (gr/cm^3) |
|---|---|---|---|---|
| AW1 | 10 | 133.5 | 357.0 | 0.37 |
| A2 | 11.5 | 171.9 | 410.6 | 0.42 |
| A3 | 6 | 40.0 | 214.2 | 0.19 |
| A4 | 9 | 71.3 | 321.3 | 0.22 |
| A5 | 15.5 | 229.5 | 553.4 | 0.41 |

| | | |
|---|---|---|
| Average Density = | **0.32** | |
| Average Snow Water Equivalent (SWE) = | **1.2** | cm H2O |
| Average Snow Water Equivalent = | **0.48** | inches H2O |
| Average Snow Water Equivalent = | **0.04** | 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: **MSBN-Tun**
Survey Purpose: **Determine snow water equivalent** Date: 2/19/2008 Time: 16:00

| | | | | | |
|---|---|---|---|---|---|
| Location Description: | Located at MSBN-TUN stake West 25m x South 25m | | | | |
| Survey objective: | Determine Snow Water Equivalent | | | Weather Observations: | -8°F, calm, mostly sunny |
| Latitude: | nr | Longitude: | nr | Datum: | nr |
| Elevation: | 7 ft | Elevation Datum: | BPMSL | Reference Markers: | nr |
| Drainage Basin: | generally drains SE | Slope Direction: | Flat | Vegetation Type: | tussocks tundra |
| Slope Angle: | Flat | Access Notes: | nr | Other: | |
| Snow Depth Probe Type: | | T-handle probe | | Snow-Survey Team Names | |
| Snow Tube Type: | Arinodack snow tube | | | Matthew Whitman, DAR | |

Snow Course Depths, in cm.

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 39.0 | 34.5 | 22.0 | 9.5 | 37.0 |
| 2 | 42.0 | 33.5 | 24.5 | 18.5 | 37.0 |
| 3 | 33.5 | 35.0 | 14.0 | 28.0 | 34.5 |
| 4 | 31.5 | 41.0 | 13.0 | 23.0 | 35.0 |
| 5 | 31.0 | 42.0 | 14.0 | 19.0 | 23.0 |
| 6 | 30.5 | 37.5 | 14.0 | 25.0 | 8.0 |
| 7 | 35.0 | 27.0 | 17.0 | 14.5 | 6.5 |
| 8 | 47.0 | 20.5 | 12.0 | 16.0 | 12.5 |
| 9 | 46.0 | 24.5 | 14.0 | 14.0 | 20.0 |
| 10 | 38.0 | 21.0 | 14.5 | 32.0 | 38.5 |

| | (cm) |
|---|---|
| Average snow depth = | **26.0** |
| Maximum snow depth = | 47.0 |
| Minimum snow depth = | 6.5 |
| Standard variation = | 11.0 |

Snow Sample Depths and Weights

| Bag # | Depth (cm) | Weight (gr) | Volume (cm^3) | Density (gr/cm^3) |
|---|---|---|---|---|
| V1 | 35.5 | 467.3 | 1267.4 | 0.37 |
| V2 | 27.5 | 319.5 | 981.8 | 0.33 |
| V3 | 19.5 | 115.9 | 696.2 | 0.17 |
| V4 | 19.5 | 179.9 | 696.2 | 0.26 |
| V5 | 30 | 259.6 | 1071.0 | 0.24 |

| | | |
|---|---|---|
| Average Density = | **0.27** | |
| Average Snow Water Equivalent (SWE) = | **7.1** | cm H2O |
| Average Snow Water Equivalent = | **2.79** | inches H2O |
| Average Snow Water Equivalent = | **0.23** | 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: 2/20/2008 | Time: nr |

| | | | | | |
|---|---|---|---|---|---|
| Location Description: | Started East, turn North 25m x 25m. | | | | |
| Survey objective: | Determine Snow Water Equivalent | | | Weather Observations: | nr |
| Latitude: | N 70° 16.832 | Longitude: | W 148° 53.856 | Datum: | NAD83 Alaska |
| Elevation: | nr | Elevation Datum: | BPMSL | Reference Markers: | Wyoming precipitation gauge |
| Drainage Basin: | | Slope Direction: | Flat | Vegetation Type: | Tussock |
| Slope Angle: | Flat | Access Notes: | truck | Other: | 1 meter increments |
| Snow Depth Probe Type: | | T-handle probe | | Snow-Survey Team Names | |
| Snow Tube Type: | Arinodack snow tube | | | Matthew Whitman, DAR | |

Snow Course Depths, in cm.

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 46.0 | 11.0 | 26.5 | 17.0 | 31.0 |
| 2 | 42.5 | 21.0 | 30.0 | 11.0 | 27.5 |
| 3 | 18.0 | 17.0 | 30.5 | 19.0 | 33.0 |
| 4 | 16.0 | 20.5 | 34.0 | 25.0 | 22.0 |
| 5 | 13.0 | 18.0 | 26.0 | 21.5 | 36.0 |
| 6 | 14.5 | 18.0 | 15.0 | 19.0 | 33.0 |
| 7 | 15.0 | 16.0 | 18.0 | 37.5 | 23.0 |
| 8 | 25.0 | 23.0 | 14.0 | 17.0 | 19.0 |
| 9 | 24.0 | 23.5 | 10.0 | 24.0 | 13.0 |
| 10 | 17.0 | 29.0 | 8.0 | 29.0 | 12.0 |

| | (cm) |
|---|---|
| Average snow depth = | **22.2** |
| Maximum snow depth = | 46.0 |
| Minimum snow depth = | 8.0 |
| Standard variation = | 8.5 |

Snow Sample Depths and Weights

| Bag # | Depth (cm) | Weight (gr) | Volume (cm^3) | Density (gr/cm^3) |
|---|---|---|---|---|
| F1 | 36 | 374.3 | 1285.2 | 0.29 |
| F2 | 18 | 160.2 | 642.6 | 0.25 |
| F3 | 18 | 136.6 | 642.6 | 0.21 |
| F4 | 22 | 239.2 | 785.4 | 0.30 |
| F5 | 27 | 288.0 | 963.9 | 0.30 |

| | | |
|---|---|---|
| Average Density = | **0.27** | |
| Average Snow Water Equivalent (SWE) = | **6.0** | cm H2O |
| Average Snow Water Equivalent = | **2.37** | inches H2O |
| Average Snow Water Equivalent = | **0.20** | feet H2O |

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