Project Note

Project: On Call Hydrology Support	**Project No: 135895**
To: Maggie Valentine, ConocoPhillips	
From: Karen Brown	**Date:** 9/26/2013
Subject: MB0401 and Z06005 Water Quality Results	

1.0 INTRODUCTION

Water quality sampling was performed at lakes MB0401 and Z06005 on September 10 and 13, 2013. In-situ measurements were performed on September 10, 2013 and included temperature, salinity. Ex-situ samples for laboratory analysis were collected on September 10, 2013 and resampling occurred on September 13, 2013. Samples were analyzed for total coliform, E-coli/LT2, pH, color, total suspended solids, turbidity, nitrate/nitrite, iron/magnesium/manganese (Fe/Mg/Mn), and hardness. Analytical services were provided by Arctic Fox Environmental, Inc. (Arctic Fox) in Prudhoe Bay.

2.0 SAMPLING METHODS

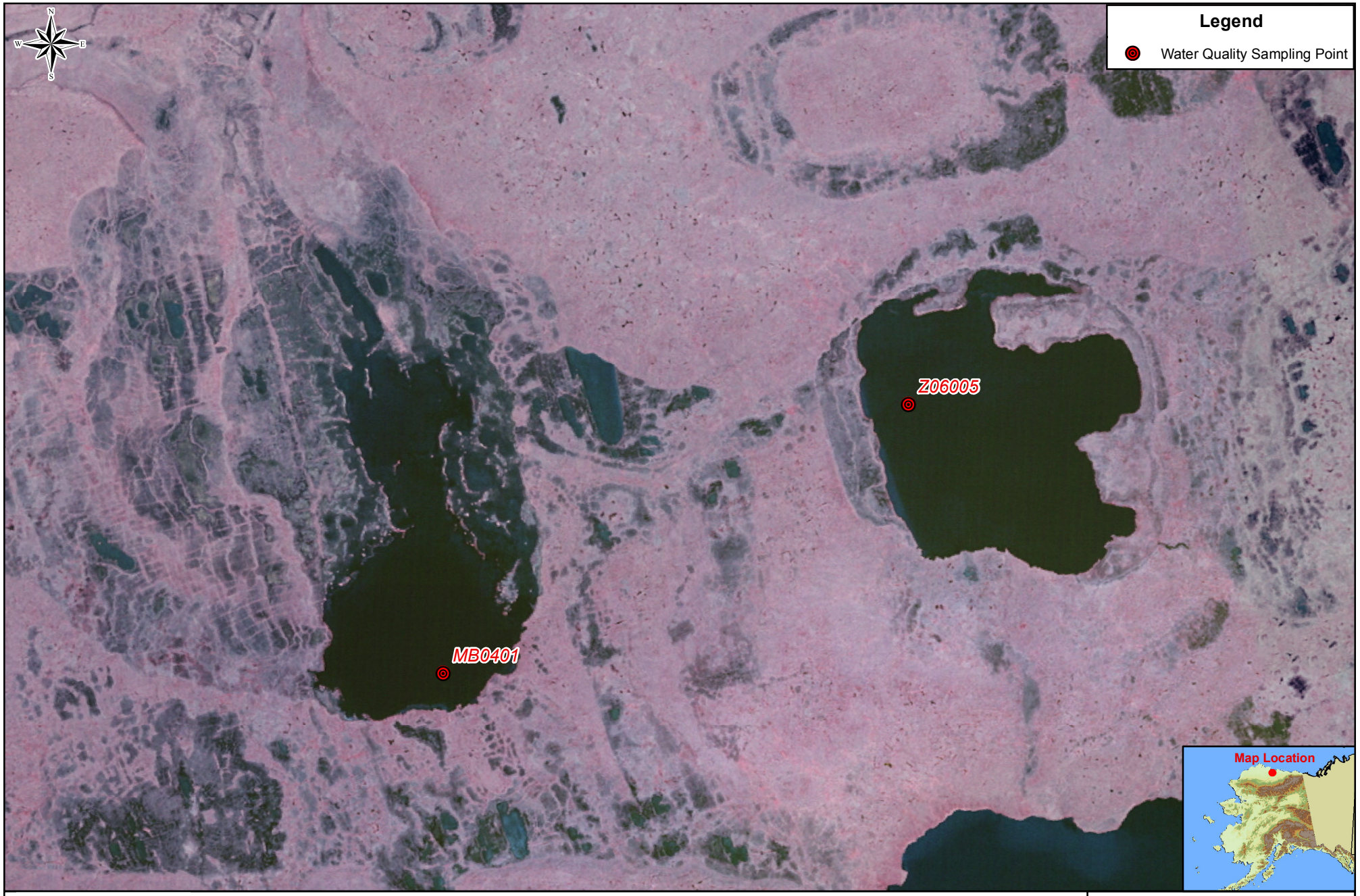
A 2-person Baker team was staged at Alpine for the sampling event. Bristow Helicopters provided access to lakes MB0401 and Z06005. In-situ water quality data measurements and laboratory sample collection were performed from two inflatable kayaks with an attached support raft for transporting the sampling equipment.

Photo 2.1: Shallow wetlands extending from Lake MB0401, looking northwest; September 10, 2013

2.1 Sample Location Selection

Previous in-situ monitoring of North Slope lakes indicates hydraulically isolated lakes are well-mixed during open water conditions. The likelihood of homogeneous conditions, which was verified with the in-situ measurements, supports the use of single point sampling. For this project, it is assumed that data collected at specific stations are representative of conditions throughout the well mixed water body and thus, water samples collected at a single location are representative of the lake.

The sample location selections for both Lake MB0401 and Lake Z06005 were based on maximum lake depth. Aerial reconnaissance was used to identify what appeared to be the deepest parts of the water bodies, and a single representative sampling location was selected. Sample locations were recorded using a handheld global positioning system Garmin Rino 520HCx referenced to the North American [horizontal] Datum of 1983. The sample locations for lakes MB0401 and Z06005 are shown in Figure 1.



ConocoPhillips Alaska

Feet
0 500 1,000 2,000

Date:	09/24/2013	Project:	135895
Drawn:	AJZ	File:	Figure 1
Checked:	KB	Scale:	1 in = 1,000 feet

Baker

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On Call Hydrology Support

MB0401/Z06005

FIGURE: 1

(SHEET 1 of 1)

2.2 In-Situ Water Quality Parameters

In-situ water quality on Lake MB0401 was measured at 2-foot intervals throughout the water column. To obtain more data points, the shallower Lake Z06005 was measured at 1-foot intervals throughout the water column. A list of parameters collected is presented in Table 2.1.

Table 2.1: In-Situ Water Quality Parameters

Parameter	Units	Notes
Temperature	°C	degrees Celsius
Salinity	ppt	parts per thousand
Conductivity	µS/cm	microsiemens per centimeter
Specific Conductance	µS/cm	microsiemens per centimeter

2.2.1 Instrument Calibration

A YSI Professional Plus handheld unit with YSI Pro 30 sensor was used for in-situ water quality measurements. The YSI Professional Plus meter was calibrated for conductivity by Baker personnel the morning of sampling. Prior to sampling, the meter was thoroughly rinsed with lake water.

2.3 Laboratory Sample Collection and Analysis

In-situ sampling was performed to confirm well-mixed water quality constituents within the water column prior to laboratory sample collection. No thermocline (notable change in temperature values with depth), nor halocline (change in salinity with depth) was apparent (see Table 3.1). Therefore, a representative single point sample at mid-depth was collected. Samples were collected using 1.6” x 36” and 1.6” x 12” disposable polyethylene bailers. Nitrile gloves were worn during sample collection.

Sample bottles provided by Arctic Fox were stored in the provided cooler before, during, and after sample collection to maintain adequate storage temperatures and ensure chain of custody procedures were followed. Field samples were transported to Arctic Fox within 7 hours of initial sample collection. The procedures for transport and transfer are described in the Arctic Fox analysis report in Appendix A.

3.0 RESULTS

3.1 Field Conditions September 10 and 13, 2013

During the first field sampling event on September 10, 2013, the temperature was 34°F. The weather was overcast with 5-8 mph winds. Lake surface waves were 2-6 inches in height on both lakes. During the second field sampling event on September 13, 2013, the temperate was 34°F. The weather was partly cloudy with 10 mph winds. Lake surface waves were 6-9 inches in height on both lakes.

Lake MB0401 and Lake Z06005 are approximately 0.6 miles apart and situated in a large lake basin that encompasses other smaller lakes. Lake MB0401 is characterized by a mixture of low grassy eroded banks and emergent marshy vegetation with an extensive shallow marshy area that extends from the north and east of the main basin (Photo 2.1). Lake Z06005 is characterized by low eroded banks that are a

mixture of low shrubs and grasses and an irregular-shaped basin (Photo 2). At the time of sampling, no inflow or out flow was evident at either lake. The surrounding topography did not suggest any recent hydraulic connections, and it is assumed the primary recharge mechanism for both lakes is local melt.

There were no visual signs of contamination or potential sources of contamination (e.g. drums, derelict equipment or natural seeps) in either lake or within the lake basin.

Photo 3.1: Lake Z06005 showing mixed, grassy, and shrubby shoreline; September 13, 2013

3.2 In-Situ Results

The in-situ water quality results from the September 10, 2013 sampling event are tabulated in Table 3.1.

Table 3.1: In-Situ Water Quality Results

On Call Hydrology Support - MB0401 and Z06005
In-Situ Water Quality

Sample Date: September 10, 2013

Lake Location Time	Total Depth (ft)	Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)
MB0401 N70°11'34.9" W151°36'33.3" 9/10/2013 10:40	9.0	2.0	3.70	61	104	0.05
		4.0	3.70	61	104	0.05
		6.0	3.70	60	104	0.05
		8.0	3.70	61	104	0.05
Z06005 N70°11'56.2" W151°34'50.9" 9/10/2013 09:05	6.0	1.0	3.70	113	193	0.09
		2.0	3.70	113	193	0.09
		3.0	3.70	113	193	0.09
		4.0	3.70	113	193	0.09
		5.0	3.80	113	192	0.09

Notes:

(1) Sample depth is measured from the water surface.

(2) Temperature, conductivity, and salinity were measured using a YSI Professional Plus meter.

(3) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.

3.3 Laboratory Results

Analytical results are shown in Table 3.2. The laboratory report is presented in Appendix A.

Table 3.2: Laboratory Analytical Results

Parameter	Lake MB0401 Results	Lake Z06005 Results	Units
Total Coliform	2.0	12.1	MPN/100mL
E.Coli/LT2	1.0	1.0	MPN/100mL
pH	7.62	7.67	pH units
Color	13	13	Color Units
Total Suspended Solids	ND	ND	mg/L
Turbidity	0.64	1.1	NTU
Nitrate/Nitrite	ND	ND	mg/L
Iron	0.13	0.16	mg/L
Magnesium	2.6	4.3	mg/L
Manganese	ND	ND	mg/L
Hardness	37	68	mg/L
Calcium Hardness as $CaCO_3$	26	50	mg/L
Magnesium Hardness as $CaCO_3$	11	18	mg/L
Calcium	11	20	mg/L

MPN/100mL – Most probable number of coliform per 100 milliliters
mg/L – Milligram per liter
NTU - Nephelometric turbidity units
ND – Not detected at the reporting limit

Source: Arctic Fox Environmental, Inc. Laboratory Analysis Reports AF48622 MB0401 and AF48623 Z06005

Appendix A LABORATORY ANALYTICAL REPORT

Arctic Fox Environmental, Inc.
Pouch 340043 / Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146
arcticfox@astacalaska.com / www.arcticfoxenv.com

Analytical Services Order and Chain of Custody Form

84453

Unit. 0913-0979

Client Name and Address:	Account Number:		HNO_3	NONE	NONE	NONE	HNO_3			Preservative
MICHAEL BAKER JR, INC. 1400 W. BENSON BLVD SUITE 200 ANCHORAGE AK 99503 Contact Person: KAREN BROWN	P.O. or Contract Number:	Number of Containers	TOTAL Fe, Mn, MS HARDNESS	PH - COLOR - TSS - TURBIDITY	E COLI BY LTZ	TOTAL ECOLI	NO_3 / NO_2			
	Authorization Number:									
Phone Number: 907.273.1600 Fax Number: 907.273.1699	Sampled By: SARAH CASE									
E-mail: KAREN.BROWN@MBAKERCORP.COM	PWS Number: N/A									
Project Name: ON-CALL HYDROLOGY MB0401/Z06005										
Data Deliverables: Level I ☐ Level II ☐ Level III ☐ EDD/Format:	Send Results to ADEC: ☐ YES ☒ No									
Requested Turnaround Time and Special Instructions:										

Client Sample ID	Date Sampled	Time Sampled	Matrix	AF Sample ID									Remarks
MB0401	9/13	11:10	WTR	AF48622	5	1	1	1	1	1			
Z06005	9/13	09:15	WTR	AF48623	5	1	1	1	1	1			

Relinquished By (1):	Date:	Time:	Received By:
SARAH CASE	9/13	12:15	SHARED SERVICES.
Relinquished By (2):	Date: 9/13/13	Time: 1530	Received By:
Relinquished By (3):	Date:	Time:	Received for lab by:

TO BE COMPLETED BY LABORATORY

Location Received/ Temp on Arrival: ANC ☐ 5.3°C 8178°C FBK ☐ _____°C PB ☐ _____°C

Chain of Custody Seal ☐ INTACT ☐ BROKEN ☐ ABSENT

Shipping Bill Number: _____

Arctic Fox Environmental, Inc.
Pouch 340043 - Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146 / arcticfox@astacalaska.com

Michael Baker Jr
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Suite 200
Anchorage, AK 99503

Attn: Karen Brown
Phone: (907) 273-1600
Fax: (907) 273-1699
email karen.brown@mbakercorp.com

Report Date:	9/25/2013
Date Arrived:	9/13/2013
Time Arrived:	3:50 PM
Date Sampled:	9/13/2013
Time Sampled:	1110
Collected By:	SC

AF Lab #:	AF48622
Client Sample ID:	MB0401
Location/Project:	On-Call Hydrology MB0401/Z06005
COC#:	84453
Sample Matrix:	Water

Flag Definitions:
MRL = Method Reporting Limit
B = Below Regulatory Minimum
H = Above Regulatory Maximum
M = Matrix Interference
J = Best Available Estimate
U = Less Than Detection Limit
D = Lost to Dilution

Comment: Attached are results for analysis of your sample.
A portion of this sample was analyzed by Test America in Beaverton, OR.
Tracking information is as follows:

Michael Baker Jr Sample ID: MB0401
Analysis requested: pH, Color, TSS, Turbidity, Fe, Mg, Mn, Hardness and NO3/NO2
Arctic Fox ID: AF48622
Test America ID: 250-14157-1

Comments: Sample run for total coliform and E.coli started 9/13/2013 @1630.
Comments: Sample run for total coliform and E.coli by LT2 started 9/13/2013 @1630.

Parameter	Result	Units	Flag	MRL	Analysis Method	Analysis Date
SM9223B by LT2 Colilert Quanti-Tray						
Total Coliform	2.0	MPN/100ml			SM9223B	9/13/2013
E.Coli	1.0	MPN/100ml			SM9223B	9/13/2013
SM9223B						
Total Coliform	Detected				SM9223B	9/13/2013
E.coli	Detected				SM9223B	9/13/2013

Reported By: Ralph E. Allphin / Michael Hawley / Maxwell Greene
Arctic Fox Environmental, Inc.

Arctic Fox Environmental, Inc.
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Suite 200
Anchorage, AK 99503

Attn: Karen Brown
Phone: (907) 273-1600
Fax: (907) 273-1699
email karen.brown@mbakercorp.com

Report Date:	9/25/2013
Date Arrived:	9/13/2013
Time Arrived:	3:50 PM
Date Sampled:	9/13/2013
Time Sampled:	0915
Collected By:	SC

Flag Definitions:
MRL = Method Reporting Limit
B = Below Regulatory Minimum
H = Above Regulatory Maximum
M = Matrix Interference
J = Best Available Estimate
U = Less Than Detection Limit
D = Lost to Dilution

AF Lab #:	AF48623
Client Sample ID:	Z06005
Location/Project:	On-Call Hydrology MB0401/Z06005
COC#:	84453
Sample Matrix:	Water

Comment: Attached are results for analysis of your sample.
A portion of this sample was analyzed by Test America in Beaverton, OR.
Tracking information is as follows:

Michael Baker Jr Sample ID: Z06005
Analysis requested: pH, Color, TSS, Turbidity, Fe, Mg, Mn, Hardness and NO3/NO2
Arctic Fox ID: AF48623
Test America ID: 250-14157-2

Comments: Sample run for total coliform and E.coli started 9/13/2013 @1630.
Comments: Sample run for total coliform and E.coli by LT2 started 9/13/2013 @1630.

Parameter	Result	Units	Flag	MRL	Analysis Method	Analysis Date
SM9223B by LT2 Colilert Quanti-Tray						
Total Coliform	12.1	MPN/100ml			SM9223B	9/13/2013
E.Coli	1.0	MPN/100ml			SM9223B	9/13/2013
SM9223B						
Total Coliform	Detected				SM9223B	9/13/2013
E.coli	Not Detected				SM9223B	9/13/2013

Reported By: Ralph E. Allphin / Michael Hawley / Maxwell Greene
Arctic Fox Environmental, Inc.

Case Narrative

Client: Arctic Fox Environmental, Inc
Project/Site: 0913-0979/Hydrology

TestAmerica Job ID: 250-14157-1

Job ID: 250-14157-1

Laboratory: TestAmerica Portland

Narrative

Job Narrative
250-14157-1

Comments
No additional comments.

Receipt
The samples were received on 9/16/2013 8:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.9º C.

Except:

The following sample(s) was received outside of holding time: AF48622 MB0401 (250-14157-1), AF48623 Z06005 (250-14157-2) for pH, turbidity, and color.

Metals
No analytical or quality issues were noted.

General Chemistry
No other analytical or quality issues were noted.

Client Sample ID: AF48622 MB0401

Lab Sample ID: 250-14157-1

Date Collected: 09/13/13 11:10

Matrix: Water

Date Received: 09/16/13 08:45

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Magnesium	2.6		0.10		mg/L		09/18/13 08:43	09/18/13 16:06	1
Iron	0.13		0.10		mg/L		09/18/13 08:43	09/18/13 16:06	1
Manganese	ND		0.10		mg/L		09/18/13 08:43	09/18/13 16:06	1
Calcium	11		0.10		mg/L		09/18/13 08:43	09/18/13 16:06	1

Method: SM 2340B - Hardness, Calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness	37		0.20		mg/L			09/18/13 17:24	1
Calcium hardness as calcium carbonate	26		0.20		mg/L			09/18/13 17:24	1
Magnesium hardness as calcium carbonate	11		0.20		mg/L			09/18/13 17:24	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.62	H	0.100		SU			09/16/13 10:04	1
Nitrate Nitrite as N	ND		0.10		mg/L			09/24/13 22:13	1
Color	13	H	1.0		Color Units			09/17/13 20:32	1
pH at time of analysis	7.6	H	0.10		SU			09/17/13 20:32	1
Turbidity	0.64	H	0.10		NTU			09/17/13 20:30	1
Total Suspended Solids	ND		10		mg/L			09/18/13 19:06	1

Client Sample ID: AF48623 Z06005

Lab Sample ID: 250-14157-2

Date Collected: 09/13/13 09:15

Matrix: Water

Date Received: 09/16/13 08:45

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Magnesium	4.3		0.10		mg/L		09/18/13 08:43	09/18/13 16:18	1
Iron	0.16		0.10		mg/L		09/18/13 08:43	09/18/13 16:18	1
Manganese	ND		0.10		mg/L		09/18/13 08:43	09/18/13 16:18	1
Calcium	20		0.10		mg/L		09/18/13 08:43	09/18/13 16:18	1

Method: SM 2340B - Hardness, Calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness	68		0.20		mg/L			09/18/13 17:24	1
Calcium hardness as calcium carbonate	50		0.20		mg/L			09/18/13 17:24	1
Magnesium hardness as calcium carbonate	18		0.20		mg/L			09/18/13 17:24	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.67	H	0.100		SU			09/16/13 10:04	1
Nitrate Nitrite as N	ND		0.10		mg/L			09/24/13 22:15	1
Color	13	H	1.0		Color Units			09/17/13 20:32	1
pH at time of analysis	7.6	H	0.10		SU			09/17/13 20:32	1
Turbidity	1.1	H	0.10		NTU			09/17/13 20:30	1
Total Suspended Solids	ND		10		mg/L			09/18/13 19:06	1

Qualifiers

General Chemistry

Qualifier	Qualifier Description
H	Sample was prepped or analyzed beyond the specified holding time

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)