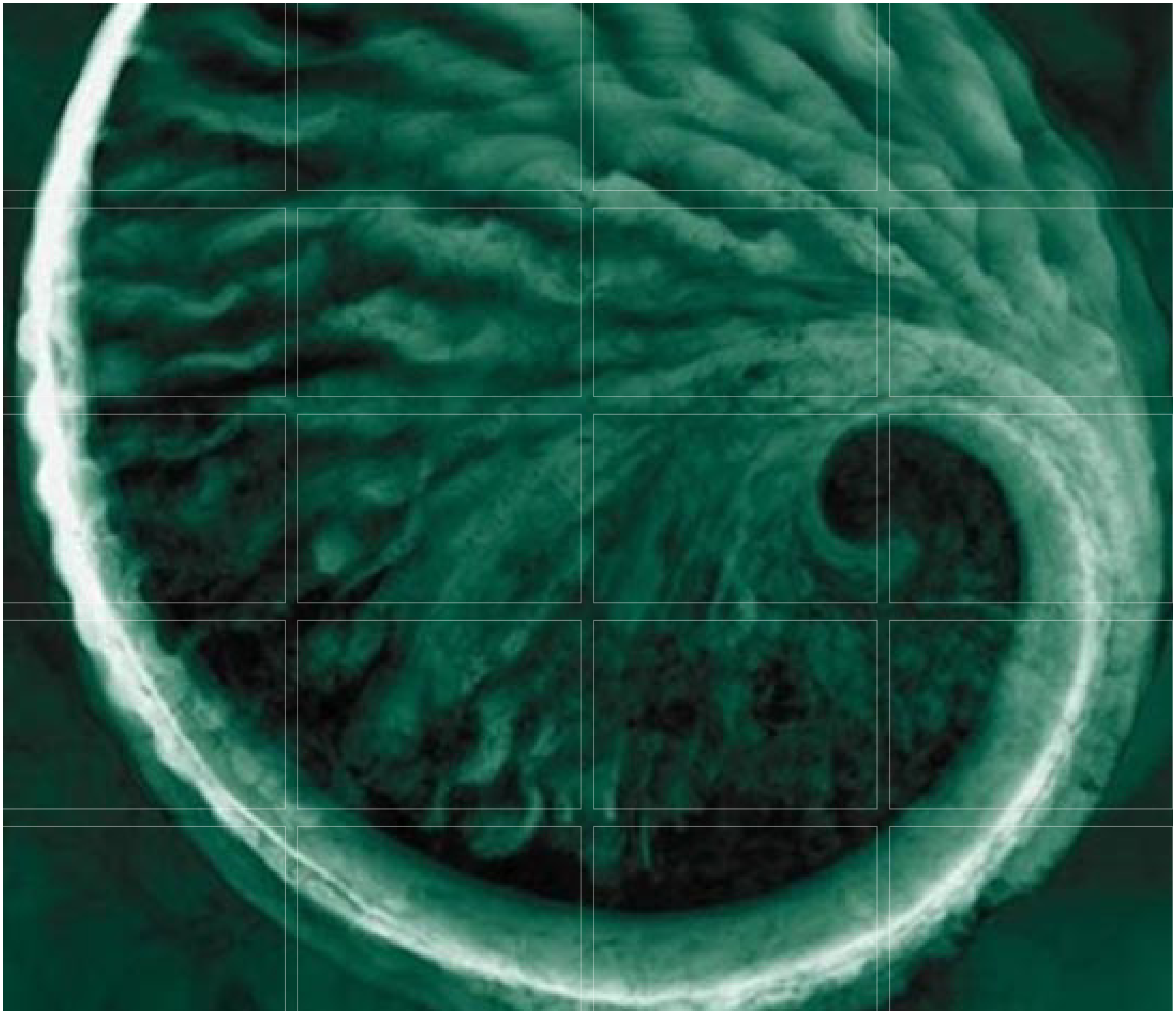

Prepared for:

Rio Tinto

DOMINION DIAMOND CORPORATION

Diavik Diamond Mine

DIAVIK DIAMOND MINE

2016 Environmental Air Quality Monitoring Report

July 2017

ERM

The business of sustainability

Diavik Diamond Mines (2012) Inc.

DIAVIK DIAMOND MINE

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July 2017

Project #0207514-0013

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EXECUTIVE SUMMARY

Diavik Diamond Mines (2012) Inc. has been collecting and reporting air quality related data since initial site construction in 2001. In June of 2013, Diavik Diamond Mines submitted an Environmental Air Quality Monitoring Plan to the Environmental Monitoring Advisory Board. The components of the Environmental Air Quality Monitoring Plan include total suspended particulate monitoring, dustfall monitoring, snow core program, National Pollutant Release Inventory reporting, and greenhouse gas reporting. This report presents an updated Environmental Air Quality Monitoring Report for the Diavik Diamond Mine for the calendar year 2016.

Total suspended particulate concentrations were measured at two stations in 2016: the Communications Building and A154 Dike stations. In February 2016, it was determined that the total suspended particulate sampler located near the A154 dike was in need of repairs and sent offsite to the vendor (CD Nova). DDMI received the repaired A154 dike sampler at the beginning of July. After a period of 2 months of sampling, it was determined there were continued operational issues with the sampler and it was returned to CD Nova for repair. The A154 dike sampler was offsite for repair for the remainder of the year. No data are presented in this report from the A154 dike sampler as little to no data are valid for the short period it was reinstalled from July to August 2016.

The 2016 annual total suspended particulate arithmetic mean measured at the Communications Building was 10.3 µg/m^3, which is below the Government of the Northwest Territories Department of Environment and Natural Resources annual arithmetic mean standard of 60 µg/m^3. In 2016 at the Communications Building Station, total suspended particulates were greater (150.5 µg/m^3) than the 24 hr mean standard (120 µg/m^3) on one occasion (January 29, 2016). There is no indication of unusual wind conditions or sampler issues on this day. These results are consistent with the prediction from the 2012 dispersion model of two 24 hour exceedances per year. There was no seasonal variability to the total suspended particulate concentrations as those observed in the winter months (10.1 µg/m^3 average from October to March) were consistent with those observed in the summer months (10.6 µg/m^3 from June to September) at the Communications Building Station. The Communications Buildings Station had hourly data completeness of 86% in 2016 due to missing data (8.9%) and data removed during post-processing (4.7%).

In 2016, dustfall was monitored at 12 dustfall gauges and 27 snow survey stations located at varying distances around the Diavik mine site. Annual dustfall estimated from each of the 12 dustfall gauges ranged from 45 to 799 mg/dm^2/y. The annualized dustfall rates estimated from the 2016 snow survey data ranged from 14 to 939 mg/dm^2/y. Overall, as expected, dustfall rates generally decreased with distance from the mine site with the lowest dustfall rate recorded at station Control 1 (4,852 m from the site), and areas that were predominantly downwind of the mine site received more dustfall than upwind areas.

Snow water chemistry was also measured at 19 of the snow survey stations and compared to Effluent Quality Criteria set out in the Wek’èezhìi Land and Water Board Water Licence W2015L2-0001 (formerly W2007L2-0003). All 2016 sample concentrations were less than their associated reference levels as specified by the “maximum concentration of any grab sample” in Water Licence W2015L2-0001.

Of the criteria air contaminants, the observed carbon monoxide, sulphur oxide, nitrogen oxide, and volatile organic compounds levels increased modestly between 2015 and 2016. These constituents are primarily derived from the combustion of diesel fuel. Diesel consumption increased 6.7% in 2016 compared to 2015 and hence there was an increase in carbon monoxide, sulphur oxide, nitrogen oxide, and volatile organic compounds. Total particulate matter and 10-micron particulate matter levels increased from 2015 to 2016, while 2.5-micron levels remained unchanged. A21 construction including crushing, increased traffic, material handling, and road dust contributed to higher fugitive dust emissions in 2016. No new substances were reported (i.e., exceeded National Pollutant Release Inventory thresholds) in 2016 compared to 2015.

Greenhouse gas emissions increased between 2015 and 2016 by 6.1%. Greenhouse gas emissions at the Diavik mine site are primarily derived from the combustion of diesel fuel. A 6.7% increase of diesel consumption in 2016 compared to 2015 is due to increased mobile equipment usage for A21 Construction. In 2016, the mine's 9.2 megawatt wind farm (consisting of four turbines) saved 3.4 million litres of diesel fuel needed for power, reducing the mine's greenhouse gas emissions by 9,030 tonnes.

DIAVIK DIAMOND MINE
2016 Environmental Air Quality Monitoring Report

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GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AEMP	Aquatic Effects Monitoring Program
BC	British Columbia
BC MOE	British Columbia Ministry of Environment
CAC	Criteria Air Contaminants
CB	Communications Building
CEPA	*Canadian Environmental Protection Act*
CH_4	Methane
CO_2e	Carbon Dioxide Equivalent
CO	Carbon Monoxide
cm	Centimetre
DDMI	Diavik Diamond Mines (2012) Inc.
dm^2	Square decimetre
Dustfall	Dust deposition
EA	Environmental Agreement
ECCC	Environment and Climate Change Canada
EAQMP	Environmental Air Quality Monitoring Plan
EMAB	Environmental Monitoring Advisory Board
EMS	Environmental Management System
ENR	Department of Environment and Natural Resources
EQC	Effluent Quality Criteria
ERM	ERM Consultants Canada Ltd.
GHG	Greenhouse Gas
GHGRP	Greenhouse Gas Emissions Reporting Program

GNWT	Government of the Northwest Territories
GWP	Global Warming Potentials
hr	Hour
L	Litre
m	Metre
Maxxam	Maxxam Analytics
mg	Milligram
NH_3	Ammonia
NO_2	Nitrogen Dioxide
NPRI	National Pollutant Release Inventory
NO_x	Oxides of Nitrogen
O_3	Ozone
$PM_{2.5}$	Particulate Matter ≤ 2.5 µg
PM_{10}	Particulate Matter ≤ 10 µg
the Project	Diavik Diamond Mine
QA/QC	Quality Assurance and Quality Control
SOP	Standard Operating Procedure
SO_x	Oxides of Sulphur
SO_2	Sulphur Dioxide
TPM	Total Particulate Matter
TSP	Total Suspended Particulate
µg	Microgram
VOCs	Volatile Organic Compounds
WLWB	Wek’èezhìi Land and Water Board

1. INTRODUCTION

Diavik Diamond Mines (2012) Inc. (DDMI) has been collecting and reporting air quality related data since initial site construction in 2001. In June of 2013, DDMI submitted an Environmental Air Quality Monitoring Plan (EAQMP) to the Environmental Monitoring Advisory Board (EMAB). The EAQMP was developed to address Article 7.2 (a) of the Environmental Agreement (EA) (Diavik 2000). The EAQMP and its results are not part of a Regulatory Instrument but are subject to review by EMAB and the Parties identified under EA Article 7.5.

The purpose of this report is to provide a summary of the 2016 air quality monitoring and emissions data in relation to the Diavik Diamond Mine's (hereafter referred to as the Project) operational activities. This *2016 Environmental Air Quality Monitoring Report* summarizes air quality observations from the following programs conducted at the Project:

- Total Suspended Particulate (TSP) Continuous Monitors;
- Dustfall Monitoring as part of the Aquatic Effects Monitoring Program (AEMP);
- Snow Core Program as part of the AEMP;
- Emission Monitoring and Reporting to the Environment and Climate Change Canada (ECCC) National Pollutant Release Inventory (NPRI); and
- Greenhouse Gas (GHG) Monitoring and Reporting to ECCC.

In 2016, the primary sources of fugitive dust were associated with unpaved roads, airstrip usage and construction activities at A21 kimberlite pipe. The A21 kimberlite pipe is located just south of Diavik's existing mining operations. A21 development required rockfill dike construction to encircle the ore body located just offshore of existing mining operations at Lac de Gras (Rio Tinto 2014). To supress fugitive dust generation, roads were watered during the summer as needed and EK35 was applied to the airport apron (tarmac) and helipad during the spring months.

Project production rate was steady throughout the year and all mining occurred underground. Fugitive dust generation is expected to be greatest during snow-free periods where and when there is site activity. It was expected that the highest fugitive dust generation and resulting dustfall occurred in areas closest to the Project footprint including A21 and the country rock pile between May and September.

The predominant wind directions at the site in 2016 were from the southeast, east, and northeast, and there were also strong winds from the northwest and south, with the least dominant wind direction from the southwest (see Figure 2.1-1 in Chapter 2). The expectation is that airborne particulate matter would be deposited primarily northwest, west, and southwest of the mine.

2. CONTINUOUS TOTAL SUSPENDED PARTICULATE MONITORING

2.1 BACKGROUND

Total suspended particulate (TSP) consists of small airborne particles such as dust, smoke, ash and pollen with aerodynamic diameters of typically less than 100 microns (µm). TSP is a concern for human health and welfare, as well as for animals and plants, due to effects on breathing and respiratory systems, damage to lung tissue, cancer and premature death. TSP that settles out of the air onto surfaces is called dust deposition or dustfall. Ambient TSP monitoring in strategic locations can provide monitoring information to assist in understanding, tracking and responding to potential dust deposition concerns.

In 2012 an updated air dispersion modelling assessment was undertaken for the entire the Project (Golder 2012). The modelling results indicated that:

- Annual TSP concentrations are predicted to be lower than the Government of the Northwest Territories (GNWT) Guidelines for Ambient Air Quality Guidelines (GNWT 2014) for receptors located in the vicinity of the Project. For two days per year, 24 hr concentrations of TSP are predicted to exceed the air quality criteria; and
- Maximum TSP deposition rates (dustfall) are predicted to be higher on the Project site (222.2 mg/dm^2/y) than offsite (4.1 mg/dm^2/y) and are generally greater than predicted in the earlier model. For example 100 mg/dm^2/y was originally predicted adjacent to A154 pit (Cirrus Consultants 1998).

Two TSP monitors were installed at the Project in April 2013. The locations of the monitors were selected based on proximity to the Project boundary, with careful consideration of the TSP results from the updated air dispersion modelling assessment and in consideration of the availability of power (Figure 2.1-1; Diavik 2013).

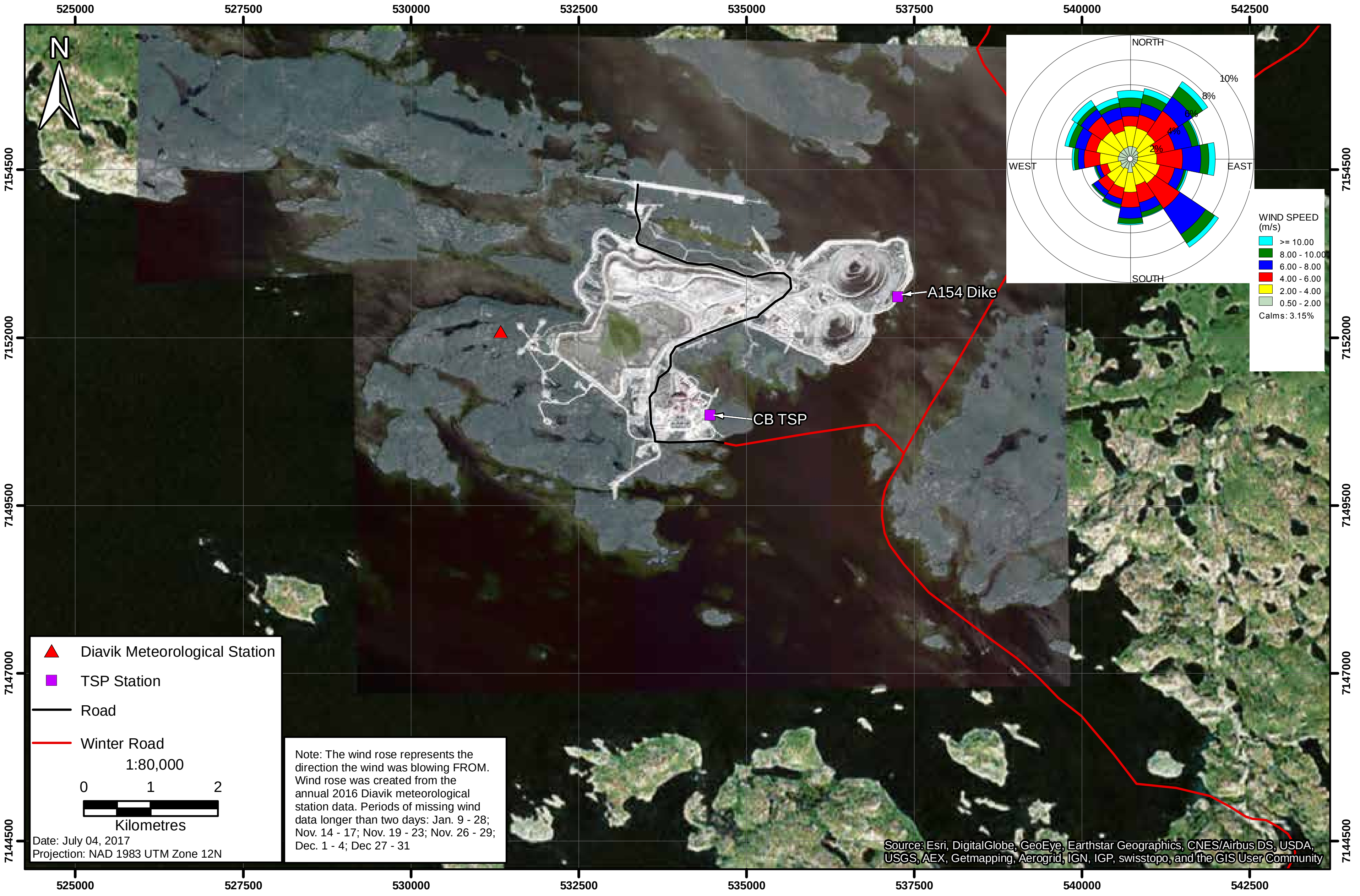
2.2 METHODS

TSP monitoring is undertaken using the Thermo SHARP 5014i monitor that uses beta attenuation monitoring technology. Ambient air is drawn through a subsonic orifice at a controlled flow rate; continuous mass measurements are conducted and hourly mass concentrations are calculated and stored in the iSeries platform data logging system. The sampling equipment is contained within a climate-controlled shelter to minimize data loss during extreme weather conditions.

The monitoring of TSP concentrations is continuous with hourly concentrations recorded over the course of 2016.

Figure 2.1-1

TSP Monitoring Locations



Date: July 04, 2017
Projection: NAD 1983 UTM Zone 12N

Note: The wind rose represents the direction the wind was blowing FROM. Wind rose was created from the annual 2016 Diavik meteorological station data. Periods of missing wind data longer than two days: Jan. 9 - 28; Nov. 14 - 17; Nov. 19 - 23; Nov. 26 - 29; Dec. 1 - 4; Dec 27 - 31

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2.2.1 Monitoring Locations

TSP monitoring is undertaken at two locations—one sampler is near the A154 Dike (along the south-east corner of the A154 pit) and the second sampler is within the Communications Building (CB) adjacent to the accommodations complex (Figure 2.1-1). The location of the A154 Dike monitor and the site near the CB was selected based on the proximity to the boundary of the Project footprint and the results of the updated air dispersion modelling assessment and power requirements. The approximate locations of the DDMI TSP stations are presented in Table 2.2-1; Figure 2.1-1 shows the location of the two TSP monitors.

Table 2.2-1. DDMI TSP Stations UTM Coordinates[1]

Station	Zone	Metres East	Metres North
CB	12W	534,460	7,150,847
A154 Dike	12W	537,258	7,152,609

[1] *World Geodetic System 1984 (WGS-84)*

2.2.2 Monitor Maintenance

In February 2016, DDMI requested that ERM initiate a site visit to the Property to perform maintenance and troubleshoot operational issues on two TSP samplers at the Mine. It was determined that the TSP sampler located near the A154 dike was in need of offsite repairs and sent off site to the vendor (CD Nova). Remote downloads and historical data analysis showed that specific alarms and data anomalies have been frequent. The vendor of the TSP samplers, CD Nova, was contracted by DDMI to facilitate troubleshooting, calibrate the instruments, and train ERM and DDMI employees on the maintenance and calibration of the samplers. A summary of the completed work can be found in the *Total Suspended Particulates Sampler Support Memorandum* (ERM 2016; Appendix A). Calibration records, and standard operating procedure for maintenance, calibration and data download are included in Appendix B and Appendix C, respectively.

DDMI received the repaired A154 dike sampler at the beginning of July. After a period of 2 months of sampling, it was determined there were continued operational issues with the sampler and it was returned to CD Nova for repair. The A154 dike sampler was offsite for repair for the remainder of the year. No data are presented in this report from the A154 dike sampler as little to no data are valid for the short period it was reinstalled from July to August 2016.

2.2.3 Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) procedures applied to TSP monitoring included the following:

- Adherence to the DDMI TSP Monitoring Standard Operating Procedure (SOP);
- Incorporation of the DDMI TSP into the DDMI Environmental Management System; and
- Review of monitoring data and retention of calibration and maintenance records as outlined in Section 2.2.4 below.

Where applicable, observations were adjusted by ERM, as required, using the methodology in the *Alberta Air Monitoring Directive Chapter 6: Ambient Data Quality* (Alberta Environment and Sustainable Resource Development 2016). Adjustments to zero in hourly data for TSP were applied when concentrations were between 0 and -3 µg/m³, which occurred approximately 11% of the time since the February 16, 2016, CD Nova site service date.

2.2.4 Analysis

Annual 24 hr TSP concentration plots were generated for each of the monitoring locations and the average annual TSP concentration were calculated from the hourly data. The 24 hr data were examined for trends and compared with predicted concentrations.

Periods of seasonal or event-driven elevated concentrations were compared with known site activities to assist with identification of dominant sources or seasonal factors. The results of this analysis are presented in this report and will be used to update and modify the dust management SOPs incorporated in the Environmental Management System (EMS) if necessary.

2.3 RESULTS

TSP results were compared to the GNWT Department of Environment and Natural Resources (ENR) Guideline for Ambient Air Quality Standards in the Northwest Territories (GNWT 2014). ENR uses two standards for TSP:

- 24 hr Average: 120 µg/m³; and
- Annual Arithmetic Mean: 60 µg/m³.

Figure 2.3-1 shows the 2016 24 hr average TSP concentrations for the CB monitoring station compared to the GNWT 2011 Standards. Table 2.3-1 summarizes the TSP results.

Table 2.3-1. 2016 TSP Results, Diavik Diamond Mine

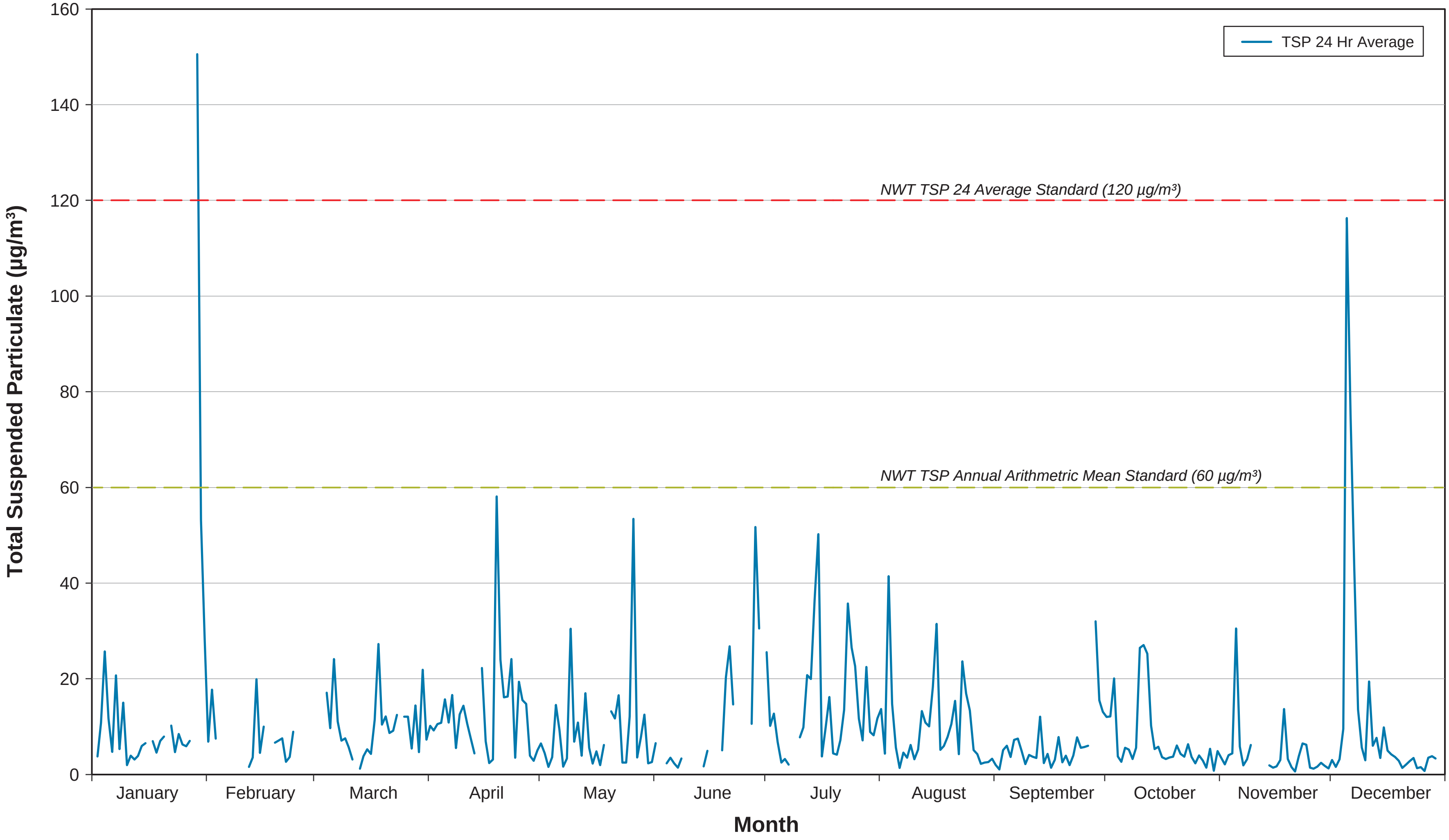
Year	Station	TSP Concentration (µg/m³) Annual Mean	Max. Daily Mean	Min. Daily Mean	No. of Daily TSP Exceedances (>120 µg/m³)	No. of Days with Data Used¹
2016	CB	10.3	150.5	0.7	1	316 (87%)
2016	A154 Dike	-	-	-	-	0 (0%)

¹ Number of days with 18 or more hours of hourly data
'-' data missing or not valid

In 2016 at the CB Station, TSP was greater (150.5µg/m³) than the 24 hr mean standard (120 µg/m³) on one occasion (January 29, 2016); however, the overall annual mean for 2016 (10.3 µg/m³) was lower than the annual mean standard (60 µg/m³).

Figure 2.3-1

2016 Daily Mean TSP Readings – Communications Building



The average wind speed for January 29, 2016, was 8.4 m/s and the wind direction ranged from the northeast to the southeast. These values were within the typical range of observations at the site. It was observed that there was a period of missing TSP data on January 28. There is no evidence, however, of a correlation between the period of missing data and higher concentrations throughout the interval analyzed in this report. Furthermore, the sampler was operating within specification with no alarms or warnings noted in the raw data. These results are consistent with the prediction from the 2012 dispersion modeling of two 24 hr exceedances per year.

TSP concentrations observed in the winter months (10.1 µg/m^3 average from October to May) were consistent with those observed in the summer months (10.6 µg/m^3 from June to September) at the CB Station. The CB Station had data completeness of 86% in 2016 based on hourly measurements. This was due to missing data 8.9% of the time and due to the removal of data during post-processing (< -3.0 µg/m^3) 4.7% of the time in 2016 (Alberta Environment and Sustainable Resource Development 2016).

As described in Section 2.2.1, the A154 dike sampler was offsite for repair for the majority of the year. No data are presented in this report from the A154 dike sampler as little to no data are valid for the short period it was onsite from July to August 2016.

In 2016, DDMI implemented a frequent audit and calibration regime which has improved data completeness and the calibration records for the CB station. It is recommended that this program be continued with the goal of further improving the data completeness for both monitors.

3. DUSTFALL MONITORING

Community interest in the possible effects of dust deposition on wildlife and aquatic environments are the basis for the focus of DDMI's EAQMP on TSP. Dustfall is the deposition of airborne particulate matter on vegetation, snow and water, and it is monitored in the dust gauges and snow cores.

In accordance with the EA and requirements associated with the Aquatic Effects Monitoring Program (AEMP), a dust monitoring program was initiated in 2001. The program was designed to achieve the following objectives:

- Determine dust deposition (dustfall) rates at various distances from the Project footprint; and
- Determine the chemical characteristics of dustfall that may be deposited onto, and subsequently into, Lac de Gras as a result of mining activities, in support of the AEMP.

In 2016, the dustfall monitoring program incorporated three monitoring components, with sampling conducted at varying distances around the mine along five transects, including three control locations, around the Project from 25 to 4,852 metres (m) away from infrastructure:

1. Dustfall gauges (10 monitoring and 2 control locations);
2. Dustfall from snow surveys (24 monitoring and 3 control locations); and
3. Snow water chemistry from snow surveys (16 monitoring and 3 control locations).

Additional information, data and figures can be found in the *2016 Diavik Dust Deposition Report* (Appendix D).

3.1 DUSTFALL GAUGES

Dustfall gauges were placed at 12 stations (including two control stations) around the Project at distances ranging from approximately 25 to 4,852 m from mining operations (Table 3.1-1 and Figure 3.1-1). Each gauge collected dustfall year-round, with samples being collected for analysis every three months. The average total sampling period for the 12 locations was 369 days.

Dustfall gauges consisted of a hollow brass cylinder (52 centimetres (cm) length, 12.5 cm inner diameter) housed in a Nipher snow gauge (Plate 3.1-1). The cylinder collected dustfall, while the Nipher snow gauge reduced air turbulence around the gauge to increase dustfall catch efficiency. At the end of each sampling period, the content of the cylinder was retrieved was processed in the DDMI environment laboratory to determine the mass of collected dustfall. This processing involved filtration, drying and weighing of samples as specified in the standard operating procedures (SOPs) ENVR-508-0112 and ENVI-403-0112. The cylinder was then exchanged with an empty, clean cylinder.

Table 3.1-1. Dustfall Gauges and Snow Survey Sampling Locations, Diavik Diamond Mine, 2016

Transect Line	Station ID	2016 Sampling Dates	Total Sample Exposure Duration (days)	UTM Coordinates[1]		Approx. Distance from Mining Operations (m)	Surface Description	Snow Water Chemistry Sampled[2]
				Easting (m)	Northing (m)			
Dustfall Gauges								
	Dust 1	Mar 31, Jul 7, Sep 25, Jan 4	369	533964	7154321	75	Land	n/a
	Dust 2A	Mar 30, Jul 8, Sep 26, Jan 4	368	535678	7151339	435	Land	n/a
	Dust 3	Mar 30, Jul 8, Sep 25, Jan 4	368	535024	7151872	30	Land	n/a
	Dust 4	Apr 1, Jul 8, Sep 28, Jan 6	371	531397	7152127	200	Land	n/a
	Dust 5	Mar 30, Jul 23 Sep 24, Jan 4	369	535696	7155138	1,195	Land	n/a
	Dust 6	Mar 31, Jul 8, Sep 25, Jan 3	369	537502	7152934	25	Land	n/a
	Dust 7	Mar 30, Jul 9, Sep 26, Jan 6	371	536819	7150510	1,155	Land	n/a
	Dust 8	Apr 1, Jul 23, Sep 24, Jan 3	367	531401	7154146	1,220	Land	n/a
	Dust 9	Mar 30, Jul 17, Sep 26, Jan 4	368	541204	7152154	3,810	Land	n/a
	Dust 10	Mar 30, Jul 7, Sep 28, Jan 6	371	532908	7148924	46	Land	n/a
	Dust C1	Apr 1, Jul 20, Sep 26, Jan 6	371	534979	7144270	4,700	Land	n/a
	Dust C2	Apr 1, Jul 23, Sep 24, Jan 4	369	528714	7153276	3,075	Land	n/a
Snow Surveys								
1	SS1-1	Apr 3	196	533911	7154288	30	Land	
	SS1-2-4[3]	Apr 3	196	533924	7154367	115	Land	
	SS1-2-5[3]	Apr 3	196	533924	7154367	115	Land	
	SS1-3	Apr 3	196	533966	7154517	275	Land	
	SS1-4	Apr 3	196	534485	7155094	920	Ice	✓
	SS1-5	Apr 3	162	535099	7156279	2,180	Ice	✓
2	SS2-1	Apr 14	162	537553	7153473	180	Ice	✓
	SS2-2	Apr 14	162	537829	7153476	445	Ice	✓
	SS2-3	Apr 14	162	538484	7153939	1,220	Ice	✓
	SS2-4	Mar 31	162	539151	7154685	2,180	Ice	✓

(continued)

Table 3.1-1. Dustfall Gauges and Snow Survey Sampling Locations, Diavik Diamond Mine, 2016 (completed)

Transect Line	Station ID	2015 Sampling Dates	Total Sample Exposure Duration (days)	UTM Coordinates[1]		Approx. Distance from Mining Operations (m)	Surface Description	Snow Water Chemistry Sampled[2]
				Easting (m)	Northing (m)			
Snow Surveys (*cont'd*)								
3	SS3-4	Apr 5	164	536585	7151002	615	Ice	✓
	SS3-5-4[3,5]	Apr 5	164	537623	7150817	1,325	Ice	✓
	SS3-5-5[3,6]	Apr 5	164	537623	7150817	1,325	Ice	✓
	SS3-6[7]	Apr 5	164	536305	7151564	60	Ice	✓
	SS3-6-EBW[4]	Apr 5	164	536305	7151564	60	Ice	✓
	SS3-7	Apr 5	164	536344	7151366	250	Ice	✓
	SS3-8	Apr 5	164	536688	7150810	830	Ice	✓
4	SS4-1-4[3]	Apr 7	200	531491	7152211	100	Land	
	SS4-1-5[3]	Apr 7	200	531491	7152211	100	Land	
	SS4-2	Apr 7	200	531356	7152261	245	Land	
	SS4-3	Apr 7	200	531331	7152434	350	Land	
	SS4-4	Apr 7	166	531141	7153167	1,065	Ice	✓
	SS4-5-	Apr 7	166	531405	7154116	1,220	Ice	✓
5	SS5-1	Apr 6	199	533150	7148925	45	Land	
	SS5-2	Apr 6	199	533150	7148875	95	Land	
	SS5-3	Apr 6	165	533150	7148700	270	Ice	✓
	SS5-4	Apr 6	165	533150	7147950	1,021	Ice	✓
	SS5-5-4[3]	Apr 6	165	533150	7146950	2,020	Ice	✓
	SS5-5-5[3]	Apr 6	165	533150	7146950	2,020	Ice	✓
	Control 1	Apr 6	192	534983	7144271	4,852	Land	✓[8]
	Control 2	Apr 7	190	528714	7153281	3,075	Land	✓[8]
	Control 3	Apr 5	187	538650	7148750	3,570	Land	✓[8]

Notes:

[1] *UTM Zone 12W, NAD83*

[2] *n/a = not applicable*

[3] *Duplicate sample taken for snow water chemistry.*

[4] *Blank sample taken for snow water chemistry.*

[5] *Moved coordinate 20 m to avoid Ice Road*

[6] *Moved coordinate 20 m to avoid Ice Road*

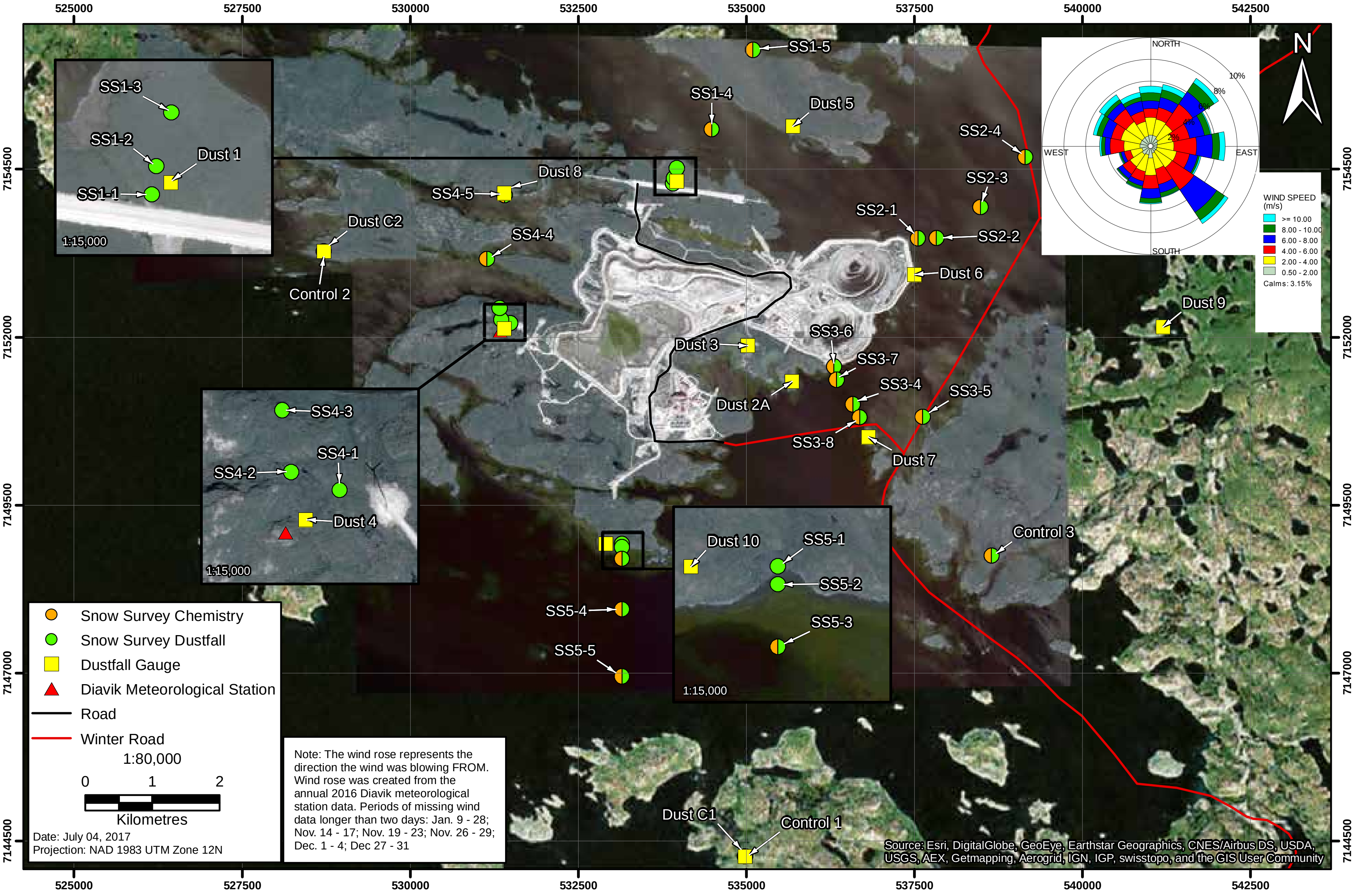
[7] *Moved coordinate 60 m to avoid Dike Road*

[8] *Snow water chemistry sampled over ice, adjacent to the on-land control station; see Section 2.3 for further details.*

Figure 3.1-1

Dustfall Gauge and Snow Survey Locations, Diavik Diamond Mine, 2016

ERM



Date: July 04, 2017
Projection: NAD 1983 UTM Zone 12N

Note: The wind rose represents the direction the wind was blowing FROM. Wind rose was created from the annual 2016 Diavik meteorological station data. Periods of missing wind data longer than two days: Jan. 9 - 28; Nov. 14 - 17; Nov. 19 - 23; Nov. 26 - 29; Dec. 1 - 4; Dec 27 - 31

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Plate 3.1-1. Dustfall gauge during sample collection. The dustfall gauge consisted of a hollow brass cylinder (centre) housed inside a Nipher snow gauge (right).

Once the mass of collected dustfall at a station was measured, the mean daily dustfall rate over the collection period was calculated as:

$$D = \frac{M}{A*T} \qquad \text{[Equation 1]}$$

where:

D = mean daily dustfall rate (mg/dm^2/d) during time period T
M = mass of dustfall collected (mg) during time period T
A = surface area of dustfall gauge collection cylinder orifice (dm^2; approximately 1.227 dm^2)
T = number of days of dustfall collection (d)

The mean daily dustfall rate (mg/dm^2/d) was then multiplied by 365 days to estimate the mean annual dustfall rate (mg/dm^2/y).

Estimated dustfall rates were compared to the former British Columbia Ministry of Environment (BC MOE) dustfall objectives for the mining, smelting and related industries (Table 3.1-2; BC MOE 2016). The dustfall objective is no longer used in BC; however, for the purposes of this report, dustfall will be compared to the former objective to be consistent with prior dust deposition reports. The dustfall objectives ranges from 1.7 to 2.9 milligram per square decimetre per day (mg/dm^2/d), averaged over 30 days. The 1.7 mg/dm^2/d objective is often considered to be applicable at sensitive locations, whereas the 2.9 mg/dm^2/d objective is applicable to areas where it can be shown that unacceptably deleterious changes will not follow. Both values are presented throughout this report. Snow water chemistry data were compared to effluent quality criteria (EQC) as indicated in the Project Water Licence (W2015L2-0001) as approved by the WLWB.

Table 3.1-2. Dustfall and Snow Water Chemistry Reference Values

Parameter	Value	Unit	Comment	Source
Dustfall Rate	1.7–2.9 (621-1,059)	mg/dm²/d (mg/dm²/y)	Former objective for the mining, smelting, and related industries	BC MOE 2016
Aluminum-Total	3,000	µg/L	Max. grab sample concentration	W2015L2-0001
Ammonia-N	12,000	µg/L	Max. grab sample concentration	W2015L2-0001
Arsenic-Total	100	µg/L	Max. grab sample concentration	W2015L2-0001
Cadmium-Total	3	µg/L	Max. grab sample concentration	W2015L2-0001
Chromium-Total	40	µg/L	Max. grab sample concentration	W2015L2-0001
Copper-Total	40	µg/L	Max. grab sample concentration	W2015L2-0001
Lead-Total	20	µg/L	Max. grab sample concentration	W2015L2-0001
Nickel-Total	100	µg/L	Max. grab sample concentration	W2015L2-0001
Nitrite-N	2,000	µg/L	Max. grab sample concentration	W2015L2-0001
Zinc-Total	20	µg/L	Max. grab sample concentration	W2015L2-0001

3.2 DUSTFALL SNOW SURVEYS

Dustfall was assessed as part of the snow surveys completed at 27 stations (including three control stations), along five transects around the Project (Table 3.1-1; Figure 3.1-1). Across stations, the distance from mining operations ranged from approximately 30 to 4,852 m. The average exposure period was 179 days in 2016. The start dates correspond to the first snowfall for land stations (September 20, 2015), and shortly after ice freeze up, once ice conditions were safe for work, for ice stations (October 24, 2015).

At each snow survey station, a snow corer was used to drill into the snow pack to retrieve a cylindrical snow core (6.1 cm inner diameter; Plate 3.2-1). Cores were extracted at each station and composited in the field to obtain a representative snow sample for the station. A minimum of three snow cores were collected at each (land and ice) snow sampling station, as outlined in the SOP ENVR-512-0213. Composited samples were bagged and brought to the DDMI environment laboratory for processing as specified in SOP ENVR-512-0213 and ENVI-403-0112. Processing of snow cores required filtration, drying and weighing. For QA/QC, duplicate samples were collected at the stations indicated in Table 3.1-1.

Mean daily dustfall rate (mg/dm²/d) was calculated for the collection period using Equation 1, with surface area (*A*) equal to the surface area of the snow corer tube orifice (0.2922 dm²) multiplied by the number of snow cores used for the composited sample at the station. The mean annual dustfall rate (mg/dm²/y) was estimated by multiplying the mean daily dustfall rate by 365 days.

Dustfall rates were compared to the BC dustfall objective for the mining, smelting and related industries (Table 3.1-2).

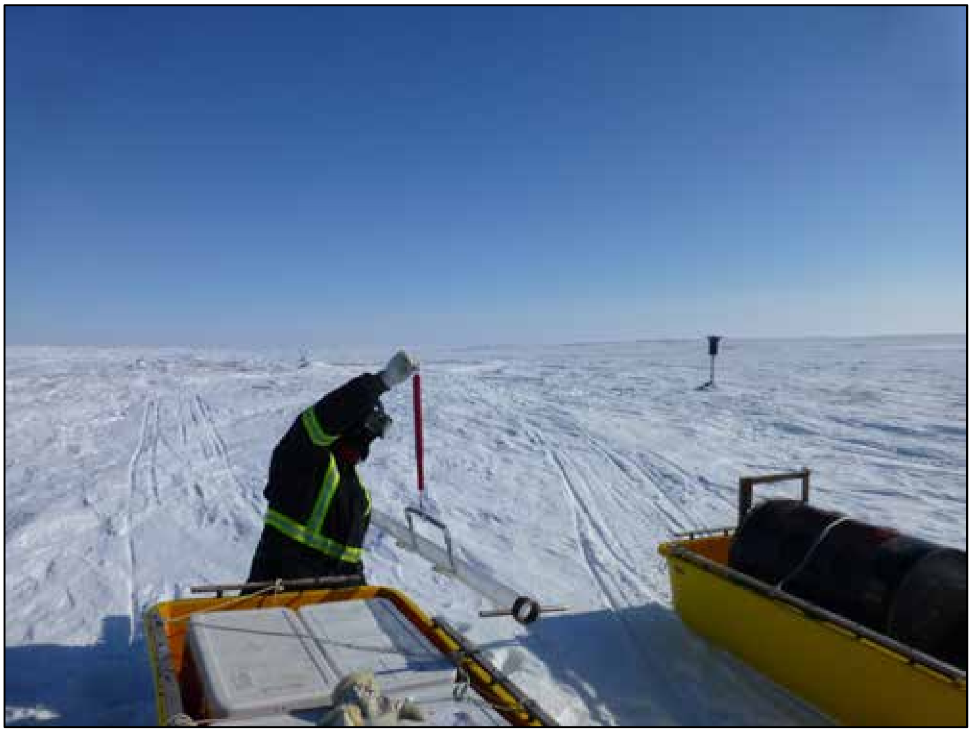


Plate 3.2-1. Snow core sample being weighed, with dustfall gauge in background.

3.3 SNOW WATER CHEMISTRY

Snow water chemistry analysis was performed on snow cores extracted from 19 of the snow survey locations (including three control locations; Table 3.1-1; Figure 3.1-1). These locations included the 16 snow survey dustfall stations that were located on ice, as well as samples taken on ice adjacent to the three control stations. Across stations, the distance from mining operations ranged from approximately 60 to 4,852 m, and the average total sampling period in 2016 was 179 days. At each station located over water, cores were collected for chemistry analysis immediately after the dustfall snow cores were extracted.

Snow water chemistry cores were extracted using a snow corer in accordance with the dustfall snow survey core extraction. A minimum of three cores at each site were extracted and composited to obtain the required 3 litres (L) of snow water for the laboratory chemical analysis. Snow cores were then processed and prepared for shipment to Maxxam Analytics (Maxxam) where the chemical analysis was performed. For QA/QC purposes, duplicate samples and blanks were collected at the stations indicated in Table 3.1-1. Snow water chemistry sampling methodology is detailed in the *2016 Diavik Dust Deposition Report* (Appendix D).

EQC, including "maximum average concentration" and "maximum concentration of any grab sample," are stipulated in DDMI's Water Licence (W2015L2-0001) for aluminium, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite and zinc (Table 3.1-2). Snow water chemistry results for these variables were compared to the "maximum concentration of any grab sample." These results are also presented as part of DDMI's Aquatics Effects Monitoring Program (AEMP) report.

3.4 RESULTS

Dustfall and snow water chemistry results were grouped into zones based on their relative distance from the Project footprint (Table 3.4-1). Although station groupings into zones were first established at the outset of the program, these groupings were re-established in 2013 using satellite imagery of the site.

Table 3.4-1. Dustfall Results, Diavik Diamond Mine, 2016

		Dustfall ($mg/dm^2/y$)	
Zone (m)	Year	Median	Mean
0 - 100	2016	462	504
101 - 250	2016	99	181
251 - 1,000	2016	237	279
1,001 - 2,500	2016	103	76
Control	2016	45	68

The primary sources of fugitive dust were associated with unpaved road and airstrip usage in 2016, with the addition of construction activities at A21. Due to construction activities at A21, the distance to mining operations decreased for dustfall stations Dust 10, SS5-1, SS5-2, SS5-3, SS5-4, SS5-5, Dust C1 and Control 1. Dust 10 station was 670 m from mining operations in previous years, but was 46 m from mining operations in 2016. Major waste rock material transfers in 2016 occurred at the A21 Stock Pile (1,449,000 tonnes), A21 Dike (1,879,000 tonnes), on haul roads (504,000 tonnes) and at the crusher (1,765,000 tonnes). Another source of fugitive dust is truck traffic along the ice road to the Project. However, the consistency in dust deposition rates near the ice road alignment between winter and summer indicated that the contributions of dust from the ice road were modest relative to other sources. There is no direct measurement of dustfall due to the use of the ice road; however, dustfall stations immediately downwind of the ice road such as Dust 7, Dust 6, and SS2-4 did not show elevated readings during winter months. To supress dust generation, roads, parking areas and laydown areas were watered during the summer as needed. Between May and September 2016, approximately 2,015 m^3 of water was applied on the Project site and 67,608 m^3 of water was applied on haul roads. The exact impact of dust suppression could not be determined from the data collected in 2016; however, it is very likely that road watering reduced the amount of dust generated at the Mine in 2016. Mine production rate was steady throughout the year, and all mining occurred underground. In general, fugitive dust generation is expected to be greatest during snow-free periods where and when there is site activity. Accordingly, it was expected that the highest fugitive dust generation and resulting dustfall would have occurred in areas closest to the mine footprint such as near A21 and the country rock pile between May and September. This expectation was borne out as Dust 10 (downwind of the Mine, southwest, and adjacent to A21 mining operations) recorded the highest dustfall during the summer months (2,032 $mg/dm^2/y$) compared to the winter months (157 $mg/dm^2/y$).

The 2016 predominant wind directions at the site were from the southeast, east, and northeast, and there are also strong winds from the northwest (Figure 3.1-1). The expectation is that airborne material would be deposited primarily northwest, west, and southwest of the mine. This is supported by the fact that Dust 10 had the highest recorded dustfall in 2016 (southwest of the Mine) and Dust 3 (which is surrounded by mining operations in nearly all cardinal directions except for the southeast) had the second highest recorded dustfall in 2016 (see Figure 3.1-1).

Results from the dustfall gauges, dustfall snow surveys and the snow water chemistry analysis are presented below.

3.4.1 Dustfall Gauges

Total dustfall collected from each dustfall gauge throughout the year is summarized by zone in Table 3.4-1. The following tables and figures are included in the *2016 Diavik Dust Deposition Report* (Appendix D):

- Total dustfall observed at each station for each sampling period;
- Annual dustfall for each station at its location relative to the Project;
- Historical records of annual dustfall for each station;
- A comparison of dustfall versus distance from the Project footprint; and
- Boxplots summarizing the dustfall magnitude distribution measured in each year.

Detailed information on the 2016 measurements and calculations for each station are included in the annual dust deposition report (Appendix D).

In general, dustfall decreased with increasing distance from the Project (Table 3.1-1; Appendix D); however, the greatest estimated dustfall rate measured using gauges occurred at Dust 10, 46 m from the Project. Dust 10 measured dustfall in 2016 was 799 mg/dm^2/y. Dust 10 is southwest of the Project footprint and adjacent to A21 mining activities and snow surveys near Dust 10 also showed higher dustfall values (SS5-1 dustfall was 457 mg/dm^2/y) in 2016. It is likely that northerly winds blew dust from the Project south during 2016. The second highest estimated dustfall rate measured using gauges occurred at Dust 3 (721 mg/dm^2/y), which recorded the highest dustfall in 2015 and is located 30 m from the Project. The lowest dustfall rate was measured at the Dust C1 (control station; 4,700 m west; 45 mg/dm^2/y) while the other control station, Dust C2 (3,075 m south), recorded the third lowest measured dustfall (185 mg/dm^2/y; Table 3.1-1; Appendix D).

Dustfall rates estimated from dustfall gauges in 2016 were generally less than historical dustfall rate estimates (Appendix D); however, average dustfall was higher in 2016 than in 2015, 2014 and 2013. Comparisons of mean and maximum dustfall values suggest that dustfall rates are increasing at the Project as mine activity increases; however, dustfall rates are well within the range recorded for the Project (Appendix D).

The annualized dustfall rates estimated from gauges at each station were less than the former BC objective for the mining industry (621 to 1,059 mg/dm^2/y). This former objective was used for comparison purposes only: there are currently no standards or objectives for the Northwest Territories. However, the BC objective was generally used as a standard for comparison at other mines in the region.

3.4.2 Dustfall Snow Surveys

Annual dustfall rates estimated from each snow survey station in 2016 are included in the annual rates presented in Table 3.4-1. Historical records of annual dustfall rates for each station, the relationships between annual dustfall rates and distance from the Project footprint, and boxplots summarizing dustfall rates measured in each year are presented in the annual dust deposition report (Appendix D). Duplicate samples were collected for QA/QC purposes and are discussed in the annual dust deposition report (Appendix D).

Annualized dustfall rates estimated from 2016 snow survey data ranged from 14 to 939 mg/dm^2/y (Appendix D). Dustfall at SS3-8 in 2016 was the highest recorded at that station. Location SS3-8 is located due south of the operating pits and is in a location that could have received increased deposition due to wind directions. In general, snow survey dustfall rates decreased with increasing distance from the Project, with the lowest dustfall rate recorded at station Control 1 (Appendix D). Mean dustfall rates estimated using both dustfall gauges and snow surveys within the 0–100, 101-250, 251–1,000, 1,001–2,500 m and Control zones were 504, 181, 279, 103 and 68 mg/dm^2/y, respectively (Appendix D). Dustfall rates at stations SS1-1, SS3-7, Dust 10, SS3-8, Dust 7, Dust 8, SS3-5, SS4-4, and Dust C2 were greater than the upper limit of the 95% confidence interval for their respective zones in 2016. These high dustfall rates, compared to the overall distribution of dustfall rates within each zone, indicated that higher dustfall rates were observed to the west, south and southeast of the Project (Table 3.1-1).

Annualized dustfall estimated from each snow survey station in 2016 were generally less than historical dustfall estimates (Appendix D). Comparisons of mean and maximum values suggest that dustfall rates were generally higher in 2016 than in 2015, 2014 and 2013 (Appendix D).

Annualized dustfall rates measured at each station during the 2016 snow survey were less than the former BC objective for the mining industry (621–1,059 mg/dm^2/y). This former objective was used for comparison purposes only: there are currently no standards or objectives for the Northwest Territories.

3.4.3 Snow Chemistry

Snow water chemistry results for 2016 are presented in Table 3.4-2. All analytical results for snow water chemistry are included in the *2016 Diavik Dust Deposition Report* (Appendix D). Results of QA/QC samples are also discussed in the annual dust deposition reports.

All 2016 samples had analyte concentrations less than reference levels as specified by the "maximum concentration of any grab sample" specified in Water Licence W2015L2-0001.

In general, average concentrations of snow water chemistry variables of interest decreased with increasing distance from the Project (Appendix D). However, high parameter concentrations were recorded at Station SS3-8, located in the 251-1,000 m zone (830 m from the project). Metal concentrations at SS3-8 were similar to concentrations at SS3-6 (60 m from the Project), which historically has had high concentrations of metals. SS3-8 is located to the southeast of the Project (Appendix D) where higher measured dustfall was observed in 2016 compared to 2015. It should be noted that the 0-100 m zone has only one sampling location; therefore, no median was reported.

Table 3.4-2. Snow Water Chemistry Results, Diavik Diamond Mine, 2016

		Maximum Snow Water Chemistry Results (µg/L)										
Zone (m)	Year	Aluminum	Ammonia	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Nitrite	Phosphorus	Zinc
0 - 100	2016	2,710	n/a	0.44	0.036	20	5.0	3.1	38	7.3	100	19
101 - 250	2016	1,390	n/a	0.17	0.037	9.3	4.3	1.6	17	3.6	64	10
251 - 1,000	2016	2,260	n/a	0.31	0.031	16	5.5	3.0	31	8.3	109	15
1,001 - 2,500	2016	1,620	n/a	0.19	0.019	11.7	2.9	0.72	20.9	4.0	49	4.9
Control	2016	413	n/a	0.086	0.0025	2.6	0.68	0.40	3.9	2.0	15	3.4

4. NATIONAL POLLUTANT RELEASE INVENTORY

4.1 PROGRAM OVERVIEW

According to ECCC, air issues such as smog and acid rain result from the presence of, and interactions between, a group of pollutants known as Criteria Air Contaminants (CAC) and some related pollutants. CAC, in particular, refer to a group of pollutants that include:

- Sulphur Oxides (SO_x);
- Nitrogen Oxides (NO_x);
- Particulate Matter (PM);
- Volatile Organic Compounds (VOC);
- Carbon Monoxide (CO); and
- Ammonia (NH_3).

In addition, ground-level ozone (O_3) and secondary particulate matter are often referred to among the CAC because both ground-level ozone and secondary particulate matter are by-products of chemical reactions between the CAC (ECCC 2013).

CAC are produced from a number of sources, including burning of fossil fuels and it is because of these shared sources that CAC are grouped together.

While there is no regulatory requirement or standard for pollutant release in the Northwest Territories, the National Pollutant Release Inventory (NPRI) is a legislated, publicly accessible inventory used to track the amount of pollutant releases (to air, water and land), disposals and transfers for recycling. The program is administered by ECCC and is a requirement of the *Canadian Environmental Protection Act* (CEPA; 1999) for owners or operators of facilities that exceed 20,000 employee hours per year and that meet the NPRI reporting requirements published in the Canada Gazette, Part I (ECCC 2016a). NPRI reports containing emissions of CACs are to be submitted prior to June 1 each year to ECCC.

NPRI substance emissions were derived using emission factor calculations provided by Environment Canada NPRI Toolkit (NPRI 2016). Operational values such as fuel usage and mobile equipment hours were recorded at the Project throughout the year and weather conditions from the Project (onsite) weather station are used to calculate NPRI values.

4.2 RESULTS

Table 4.2-1 compares 2015 NPRI results against the 2016 NPRI results for the Project. NPRI reports for previous years (2001 – 2015) are available on the NPRI website (ECCC 2016d). NPRI results for the previous year are typically released by ECCC in April, 22 months following submission on June 1 of each year (e.g., 2016 data reported by June 1 2017 is released by ECCC in April of 2018).

Table 4.2-1. NPRI Results, Diavik Diamond Mine, 2015 and 2016

CACs	Reporting Threshold (tonnes)	2015 (tonnes)	2016 (tonnes)
Carbon Monoxide (CO)	20	590	620
Sulphur Dioxide (SO_2)	20	0.8	0.9
Oxides of Nitrogen (expressed as NO_2) (NO_x)	20	2,221	2,336
Volatile Organic Compounds (VOCs)	10	57	60
Total Particulate Matter (TPM)	20	778	1048
Particulate Matter ≤ 10 µm (PM_{10})	0.5	294	328
Particulate Matter ≤ 2.5 µm ($PM_{2.5}$)	0.3	65	65

CO, SO_x, NO_x, and VOC levels increased modestly between 2015 and 2016 (Table 4.2-1). These constituents are primarily derived from the combustion of diesel fuel. Diesel consumption increased slightly (6.7%) in 2016 compared to 2015 and hence there was a minor increase in CO, SO_x, NO_x, and VOCs.

TPM, PM_{10}, and $PM_{2.5}$ levels in 2016 were greater when compared to 2015 (Table 4.2-1). The increase in dust-related variables is likely related to A21 construction activities, including crushing, material handling and road fugitive dust emissions.

5. GREENHOUSE GAS REPORTING

5.1 PROGRAM OVERVIEW

While there is no territorial regulatory requirement or standard for GHG release in the Northwest Territories, the Greenhouse Gas Emissions Reporting Program (GHGRP) is Canada's legislated, publicly accessible inventory of facility-reported GHG data and information. The program is administered by ECCC and is a requirement of the CEPA 1999 for owners or operators of facilities that emit the equivalent of 50,000 tonnes or more of GHGs in carbon dioxide equivalent units (CO_2e), per year. GHG reports are to be submitted prior to June 1 each year.

GHG emissions were derived by using emission factor calculations provided by Environment Canada for Metal Mining (ECCC 2004). Operational values such as fuel usage and mobile equipment hours were recorded at the Project throughout the year.

5.2 RESULTS

Table 5.2-1 compares 2015 and 2016 GHG emissions results for the Project. GHG reports for previous years (2001 – 2015) are available on the GHG website (ECCC 2016c). GHG emissions results for the previous year are typically released by Environment Canada in April, 22 months following submission on June 1 of each year (e.g., 2016 data reported by June 1, 2017 will be released by Environment Canada in April of 2018).

Table 5.2-1. GHG Equivalents for the Diavik Diamond Mine, 2015 and 2016

Constituent	2015 (tonnes)	2016 (tonnes)
CO_2e	186,942	198,292

Three GHGs are calculated at the Project; CO_2, methane (CH_4) and nitrous oxide (N_2O). To calculate CO_2e, Global Warming Potentials (GWP) are used to convert CH_4 and N_2O to CO_2e. The 2015 CH_4 and N_2O GWP are 25 and 298, respectively (ECCC 2016b).

The CO_2e increased between 2015 and 2016 at the Project (Table 5.2-1). GHG emissions at the Project are primarily derived from the combustion of diesel fuel. Increased diesel consumption in 2016 compared to 2015 is due to increased mobile equipment usage for A21 Construction.

In 2016, the Project's 9.2 megawatt wind farm (consisting of four turbines) saved 3.4 million litres of diesel fuel needed for power, thereby reducing the Project's CO_2e by 9,030 tonnes (4.6% of total GHG emissions; Plate 5.2-1). In 2015, the wind farm generated 14,298 gigawatt hours of energy. Since start-up in 2012, the estimated diesel fuel savings has totalled 18.2 million litres and has prevented 50,801 tonnes of CO_2e from being emitted to the atmosphere.

Plate 5.2-1. The Diavik 9.2 megawatt wind farm. The wind farm consists of four wind turbines (Diavik 2015).

6. SUMMARY

TSP was measured at two stations, the CB and A154 Dike Stations, in 2016. In February 2016 it was determined that the TSP sampler located near the A154 dike was in need of offsite repairs and sent offsite to the vendor (CD Nova). DDMI received the repaired A154 dike sampler at the beginning of July. After a period of 2 months of sampling, it was determined there were continued operational issues with the sampler and it was returned to CD Nova for repair. The A154 dike sampler was offsite for repair for the remainder of the year. No data are presented in this report from the A154 dike sampler as little to no data are valid for the short period it was reinstalled from July to August 2016.

The 2016 annual TSP arithmetic mean measured at the CB was 10.3 µg/m^3; below the GNWT's ENR annual arithmetic mean standard of 60 µg/m^3. In 2016 at the CB Station, TSP was greater (150.5 µg/m^3) than the 24 hr mean standard (120 µg/m^3) on one occasion (January 29, 2016). There is no indication of unusual wind conditions or sampler issues on this day. These results are consistent with the prediction from the 2012 dispersion model which predicted two 24 hour exceedances per year.

There was no seasonal variability in TSP concentrations as measured concentrations in the winter months (10.1 µg/m^3 average from October to May) were consistent with those observed in the summer months (10.6 µg/m^3 from June to September) at the CB Station. The CB Station had data completeness of 86% in 2016 due to missing data (8.9%) and data removed during processing (4.7%).

In 2016, dustfall was monitored at 12 dustfall gauges and 27 snow survey stations located at varying distances around the mine. Snow water chemistry was also measured at 19 of the snow survey stations and compared to EQC set out in the WLWB Water Licence W2015L2-0001 (formerly W2007L2-0003).

Annual dustfall estimated from each of the 12 dustfall gauges ranged from 45 to 799 mg/dm^2/y. The annualized dustfall rates estimated from the 2016 snow survey data ranged from 14 to 939 mg/dm^2/y. Because dustfall gauges continuously collect dust throughout the year, and the snow surveys are only representative of dustfall accumulated over the snow cover period, the reported annual dustfall results from the dustfall gauges are expected to provide a better estimate of annual dustfall compared to snow survey results for similar geographic areas. However, results obtained from both methods showed similar patterns.

Dustfall levels were generally higher in 2016 than in 2015; however, are within the range of historical data collected for the Project. Annualized dustfall estimated from each snow survey station in 2016 was less than some historical dustfall estimates. Comparisons of mean and maximum values suggest that dustfall rates were generally higher in 2016 than in 2015 and 2014. Overall, as expected, dustfall rates generally decreased with distance from the Project. The lowest dustfall rate was recorded at station Control 1 (4,852 m from the Project), and areas that were predominantly downwind of the Project received more dustfall than upwind areas. Mean dustfall rates estimated using both dustfall gauges and snow surveys within the 0–100, 101-250, 251–1,000, 1,001–2,500 m and Control zones were 504, 181, 279, 103, and 68 mg/dm^2/y, respectively. Although there are no dustfall standards for the Northwest Territories, 2016 dustfall rates were less than the 1.7 to 2.9 mg/dm^2/d (621 to

1,059 mg/dm^2/y) BC MOE former dustfall objective for the mining, smelting, and related industries (Diavik 2016). This objective, used in the 2016 Dust Deposition Report, is no longer used in BC.

Snow water chemistry analysis of interest included those variables with effluent quality criteria (EQC; i.e., aluminum, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite, and zinc) or a load limit (i.e., phosphorous) specified in the Type "A" Water Licence (W2015L2-0001, formerly W2007L2-0003). All 2016 sample concentrations were less than their associated reference levels as specified by the "maximum concentration of any grab sample" specified in Water Licence W2015L2-0001. Concentrations of aluminum, arsenic, chromium, and nickel have generally increased in recent years, while concentrations of copper, lead, phosphorus and zinc have generally decreased in recent years. Typically, concentrations decreased with distance from the Project. High concentrations of certain variables of interest (2,710 µg/L aluminum and 19.6 µg/L chromium) were recorded at Station SS3-6, located in the 0-100 m zone, due to close proximity to Mine activity. However, concentrations of these variables were less than their corresponding EQC.

Of the COCs, emissions of CO, SOx, NOx, and VOC increased modestly between 2015 and 2016. These constituents are primarily derived from the combustion of diesel fuel. Diesel consumption increased 6.7% in 2016 compared to 2015 and hence there was an increase in CO, SOx, NOx, and VOCs. TPM and PM_{10} levels in 2016 increased from 2015 and $PM_{2.5}$ levels remained unchanged. A21 Construction including crushing, increased traffic, material handling, and road dust contributed to higher fugitive dust emissions in 2016. No new substances were reported (i.e., exceeded NPRI thresholds) in 2016 compared to 2015.

CO_2e increased between 2015 and 2016 by 6.1%. GHG emissions at Diavik are primarily derived from the combustion of diesel fuel. A 6.7% increase of diesel consumption in 2016 compared to 2015 is due to increased mobile equipment usage for A21 Construction. In 2016, Diavik's 9.2 megawatt wind farm (consisting of four turbines) saved 3.4 million litres of diesel fuel needed for power, thereby reducing Diavik's CO_2e by 9,030 tonnes (4.6% of total GHG emissions). In 2016, the wind farm generated 14.298 gigawatt hours of energy. Since start-up in 2012, the estimated diesel fuel savings has totaled 18.2 million litres and has prevented 50,801 tonnes of CO_2e from being emitted to the atmosphere.

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Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

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Appendix A

Total Suspended Particulates Sampler Support Memorandum

Please note: appendices have been removed from this presentation of the memorandum. Updated versions of these materials have been attached to this 2016 Air Quality Monitoring Report in Appendices B and C.

Memorandum

Date: February 26, 2016

To: David Wells, Superintendent - Environment - HSE

From: Philip Porter, Senior Atmospheric Scientist

Cc: Jem Morrison, Atmospheric Scientist
Benjamin Beall, Project Manager
Marc Wen, Partner In Charge

Subject: DRAFT - Total Suspended Particulates Sampler Support Memorandum

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1. BACKGROUND

Diavik Diamond Mine (2012) Inc. (DDMI) installed two continuous total suspended particulate (TSP) samplers at the Diavik Diamond Mine (Mine) in accordance with their Environmental Air Quality Monitoring Plan (EAQMP; DDMI 2013) in June 2013. The locations of the monitors were selected based on proximity to the Mine boundary, with careful consideration of the TSP results from the updated air dispersion modelling assessment, and in consideration of the availability of power (DDMI 2013).

It is ERM's understanding based on discussions with DDMI that the TSP samplers have been returning inconsistent results since installation in 2013. DDMI has requested technical assistance with TSP sampler maintenance, calibration, and audits as well as data screening, analysis, and reporting.

2. INTRODUCTION

In February 2016, DDMI requested ERM initiate a trip to the Property to perform maintenance and troubleshoot operational issues on the two TSP samplers at the Mine. Remote downloads and historical data analysis showed that specific alarms and data anomalies have been frequent. The vendor of the TSP samplers, CD Nova, was contracted by DDMI to facilitate troubleshooting, calibrate the instruments, and train ERM and DDMI employees on the maintenance and calibration of the samplers.

Prior to the visit to the Mine, DDMI personnel provided ERM and CD Nova with raw particulate data with alarm codes resulting from the issues being observed by DDMI personnel. These issues included TSP concentration values below 0.0 $\mu g/m^3$ (negative values), the inability to connect remotely, and issues with screen operation of one of the TSP samplers.

Appendix A contains the field data sheets for the calibrations performed during the site visit. Appendix B is the updated DDMI TSP sampler Standard Operating Procedure (SOP) updated by ERM personnel. Appendix C provides the service report provided by the CD Nova technician.

3. METHODS

3.1. Monitoring Locations

TSP monitoring is undertaken at two locations—one sampler is near the A154 Dike (along the south-east corner of the A154 pit) and the second sampler is within the Communications Building (CB) adjacent to the accommodations complex. The location of the A154 Dike monitor was selected based on the proximity to the boundary of the Mine footprint and the results of the updated air dispersion modelling assessment and power requirements. The site near the CB was selected based on its proximity to the boundary of the Mine footprint and the results of the updated air dispersion modelling assessment and power requirements. The approximate locations of the DDMI TSP stations are:

- CB TSP station coordinates: 12W 534460 7150847 (Google Earth Pro™)
- A154 Dike TSP station coordinates: 12W 537258 7152609 (Google Earth Pro™)

3.2. Monitoring Methods

The TSP monitors are SHARP 5014i instruments that measure TSP using beta attenuation. Ambient air is drawn through a subsonic orifice at a controlled flow rate; continuous mass measurements are conducted and hourly mass concentrations are calculated and stored in the iSeries platform data logging system. The sampling equipment is contained within a climate-controlled shelter to minimize data loss during extreme weather conditions as recommended by the manufacturer.

The monitoring of TSP concentrations mass loadings as micrograms/cubic meter ($\mu g/m^3$) is continuous, and hourly concentrations average values are recorded. TSP monitoring is conducted continuously over throughout the year. After each monitoring year, the monitoring program will be re-assessed to determine the suitability of the monitoring locations and to determine if the monitoring is still required. The analysis of temporal and spatial TSP trends support comparison to measured particulate concentrations at the CB to those at the A154 Dike. The readings at the CB are expected to consistently be higher than those at the A154 Dike due the communication building's proximity to many of the diesel combustion sources (boilers and power house), the processing plant and the run of Mine (ROM) ore stockpiles. There is the possibility that unusual events in the region (e.g., a dust storm transporting airborne particulate) could result in higher measured particulate concentrations at the A154 Dike.

Meteorological data plays a key role in the interpretation of air quality data; it informs the characterization of general air quality trends and shows specific meteorological conditions at the Mine (i.e., wind direction and speed) that directly affect the direction and dispersion of TSP. Unusual TSP events, which may be the result of conditions such as dust storms or prolonged dry periods, can be analyzed in conjunction with the on-site meteorological data to identify the cause of the event. Daily documentation of local events that may contribute to unusually high or low loadings will also be examined.

4. HISTORICAL DATA REVIEW

Historical data provided to ERM was subject to post processing and quality assurance and quality control (QA/QC) to determine possible systematic trends, correlations and potential issues with the TSP samplers in anticipation for the field component of the program. TSP monitoring data from 2013 and 2014 was contained in the DDMI 2013 – 2014 Environmental Air Quality Monitoring Report (DDMI 2014) and accompanying Peer Review of the 2013-2014 Environmental Air Quality Monitoring Report by SENES Consultants (SENES 2014). 2015 TSP data was provided to ERM in separate Excel spreadsheets for the CB and A154 Dike Stations.

SHARP 5014i monitor alarms codes observed in the data were:

- CB TSP Station alarm codes:
  - cflag:
    - 0 - No alarm
    - 200 - Ambient Relative Humidity alarm
    - 202 - Ambient Relative Humidity alarm, filter tape change alarm (critical) unit will not run until cleared.
    - 802 - Barometric pressure alarm, filter tape change alarm.
  - aflag:
    - 0 - No alarm
    - 4 - Beta. Det. alarm (>5K)
    - 8000 - Flow alarm
    - 8004 - Flow alarm, Beta Det. alarm
    - c000 - Sample Relative Humidity alarm, sample Temperature alarm
    - c004 - Sample Relative Humidity alarm, sample Temperature alarm, Beta Det. Alarm.
- A154 Dike TSP Station does not have any alarm codes headings programmed into downloadable data.

Another QA/QC examination of the TSP data is that of air flow, which is supposed to be at 16.67 litres per minute (l/min) and if the flow is out the range of 16 - 17.5 l/min then the data excluded on the basis of being inaccurate and is not included in the analysis of valid data.

4.1. 2013-2014 TSP Data Review

ERM found the following during the QA/QC of the 2013-2014 data:

- Both TSP Station concentrations show instances of continuous negative readings over the monitoring period. Continuous negatives readings indicate calibration issues with the monitoring equipment. Negative values were observed in July, November and December 2013, as well as January 2014 (SENES 2014).

- Graphical representation of 2013-2014 data suggests that instrument drift was a recurring problem over the entire monitoring period, especially for the A154 Dike monitor (SENES 2014).
- Based on the data, it appears that recorded results underestimated true TSP concentrations at the Mine in 2013-2014 (SENES 2014).
- ERM found that no calibration records or notable discussion of calibration procedures were provided in the 2013-2014 Environmental Air Quality Monitoring Report. Calibration certificates and records should be provided with the Report. Without these reports no baseline adjustments could be made to the 2013-2014 data especially for the A154 Dike Station.

4.2. 2015 TSP Data Review

ERM found the following during the QA/QC of the 2015 data:

Communications Building TSP Station

- On February 5, 2015 a 24 hour mean value of 124 µg/m³ was recorded at the TSP monitor located at the Communications Building. This is above the Northwest Territories 24 hour standard for TSP. No observations were recorded on this day that would indicate a false reading; however, due to the magnitude of the value compared to the remainder of the dataset, it is believed this value is an outlier.
- There were 596 hourly data gaps in 2015 (up to December 24, 2015) at the CB Station.
- There were 1,164 negative hourly values recorded out of 7,991 valid values (missing data excluded). Any negative values greater than -5.0 µg/m³ (936 in total) were set to zero (0).
- Using the *Alberta Air Monitoring Directive Chapter 6: Ambient Data Quality* a 24 hour monitoring period must have 75% of base hourly data available for averaging.
- Missing data, TSP values below -5.0 µg/m³, and daily data with less than 75% hourly data available for averaging, represents 11% of the data recorded or a total of 40 missing days of data:
  - January 15 , 2015 (1 day);
  - June 1, 2015 (1 day);
  - October 1 to 2, and 8 to 10 2015 (4 days);
  - October 15 and 16, (2 days);
  - October 22 to November 6, 2015 (16 days);
  - November 11, 19 and 26, 2015 (3 days); and
  - December 3, 4, 10, 11, 18 to 24, 2015 (12 days).
- The CB TSP Station recorded:
  - 2 Ambient Relative Humidity alarms;
  - 16 Barometric pressure alarm or filter tape change alarms;
  - 496 Ambient Relative Humidity alarms;

  - 37 Sample Relative Humidity alarm, sample Temperature alarms;
  - 300 Flow alarms;
  - 4 Beta. Det. alarms (>5K);
  - 7 Flow or Beta Det. alarms; and
  - 1 Sample Relative Humidity alarm, sample Temperature alarm or Beta Det. alarm.

A154 Dike TSP Station

- There were 1369 hourly data gaps in 2015.
- There were 1,994 negative hourly values recorded out of 7,391 values (missing data not included). Any negative values greater than -5.0 µg/m^3 (1778 in total) were set to zero (0).
- Using the *Alberta Air Monitoring Directive Chapter 6: Ambient Data Quality* a 24 hour monitoring period must have 75% of base hourly data available for averaging.
- Missing data, TSP values below -5.0 µg/m^3, and daily data with less than 75% hourly data available for averaging, represents 34% of the data recorded or a total of 72 missing days of data:
  - January 1 to January 17, 2015 (17 days);
  - October 18 to October 21, 2015 (4 days);
  - October 25 to November 19, 2015 (26 days);
  - November 30 to December 11, 2015 (12 days); and
  - December 16 to 20 and 22 to 29, 2015 (13 days).
- The alarm codes were not programmed into the headings of the data received by ERM from DDMI.
- ERM was not provided calibration records or notable discussion of calibration procedures for 2015. Without these reports no baseline adjustments could be made to the 2015 data especially for the A154 Dike Station.

5. FIELD WORK SUMMARY

ERM conducted onsite field work on February 15 - 18, 2016. The purpose of the site visit was to inspect, calibrate and maintain/repair the DDMI TSP samplers. The following is a summary of the work completed at the site:

Monday February 15, 2016

- At the A154 Dike TSP Station, ERM:
  - brought the sampler and pump back to the environment department laboratory for inspection and performed a pump rebuild (Plate 1);
  - replaced the detector assembly and the detector amplifier assembly (Plate 2; Plate 3); and
  - relocated the pressure circuit board.

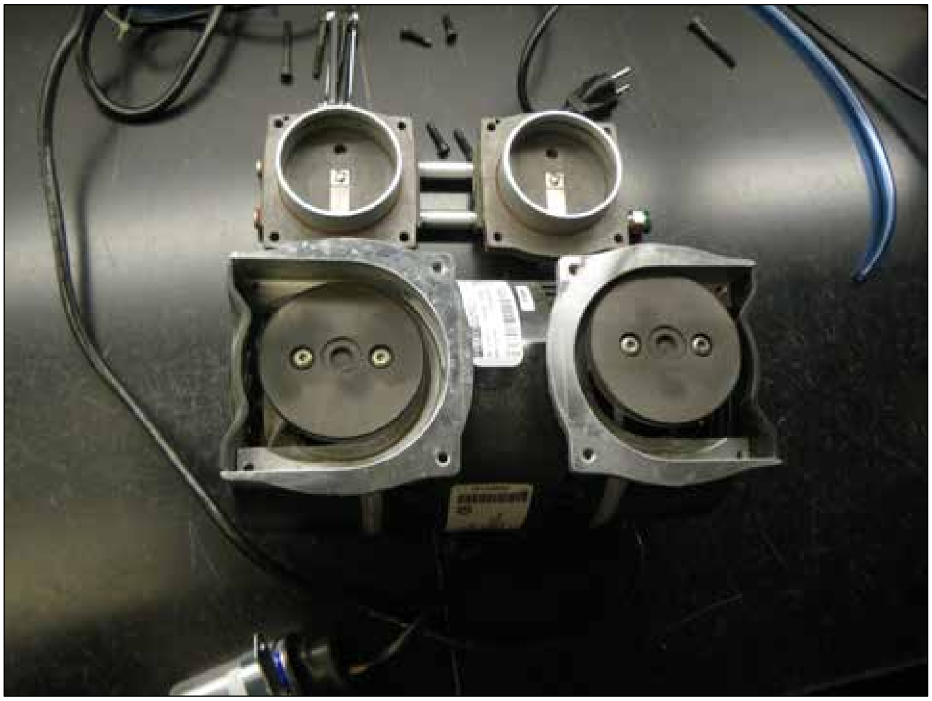

Plate 1. A154 Dike TSP station pump rebuild.

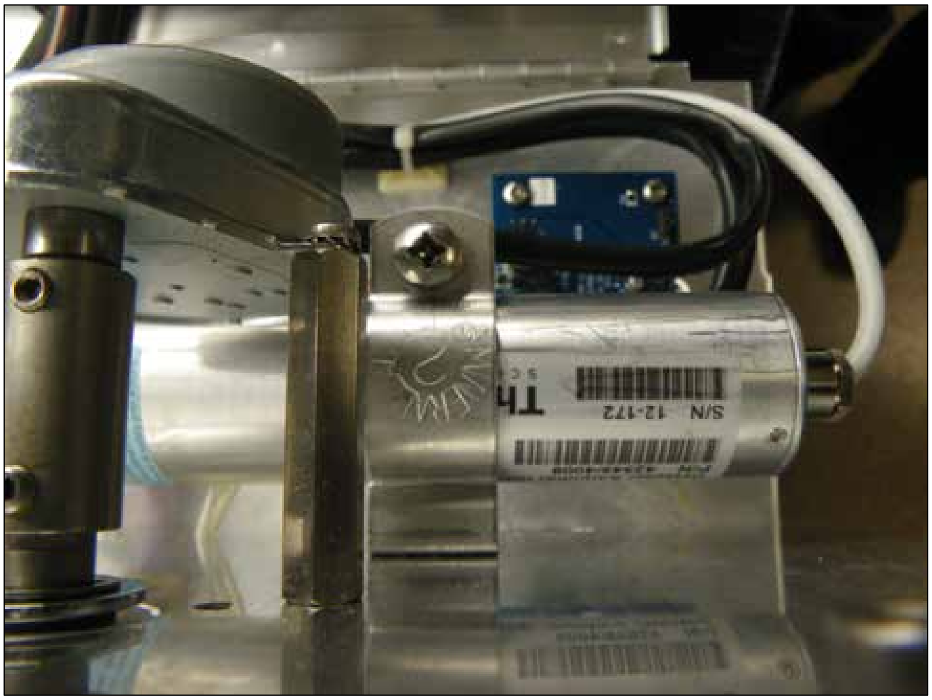

Plate 2. A154 Dike TSP Station replaced beta detector amplifier assembly.

Plate 3. A154 Dike TSP Station replaced beta detector assembly.

Tuesday February 16, 2016

- At the A154 Dike TSP Station, ERM:
  - performed a calibration audit;
  - set vacuum and pressure;
  - performed an auto beta calibration; and
  - performed a leak check which failed (Plate 4); and
  - replaced the motherboard.
- At the CB TSP Station, ERM:
  - completed a pump rebuild;
  - replaced the motherboard (Plate 5);
  - relocated the pressure circuit board;
  - completed a temperature, relative humidity and barometer calibration; and
  - calibrated the flow pressure and vacuum pressure.

Wednesday February 17, 2016

- At the CB TSP Station (Plate 6), ERM:
  - calibrated the flow temperature;
  - calibrated the air flow;
  - performed a mass calibration;
  - performed an auto detector calibration; and
  - successfully passed a leak check test.

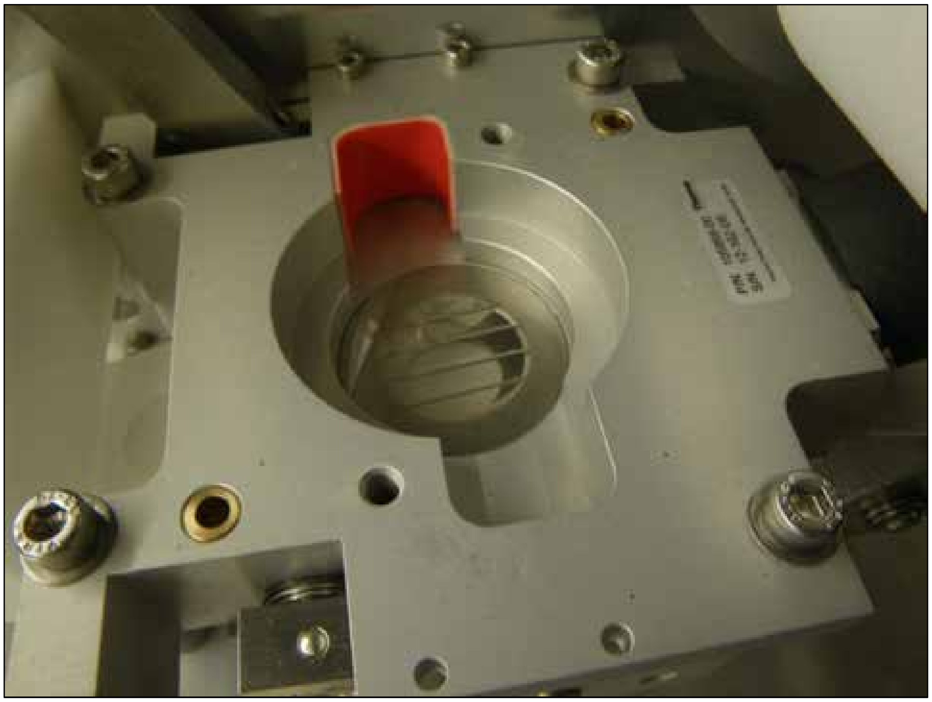

Plate 4. The damaged membrane was noted during the maintenance. No additional parts were available. The A154 Dike was taken off site for further repair at the CD Nova location in Vancouver.

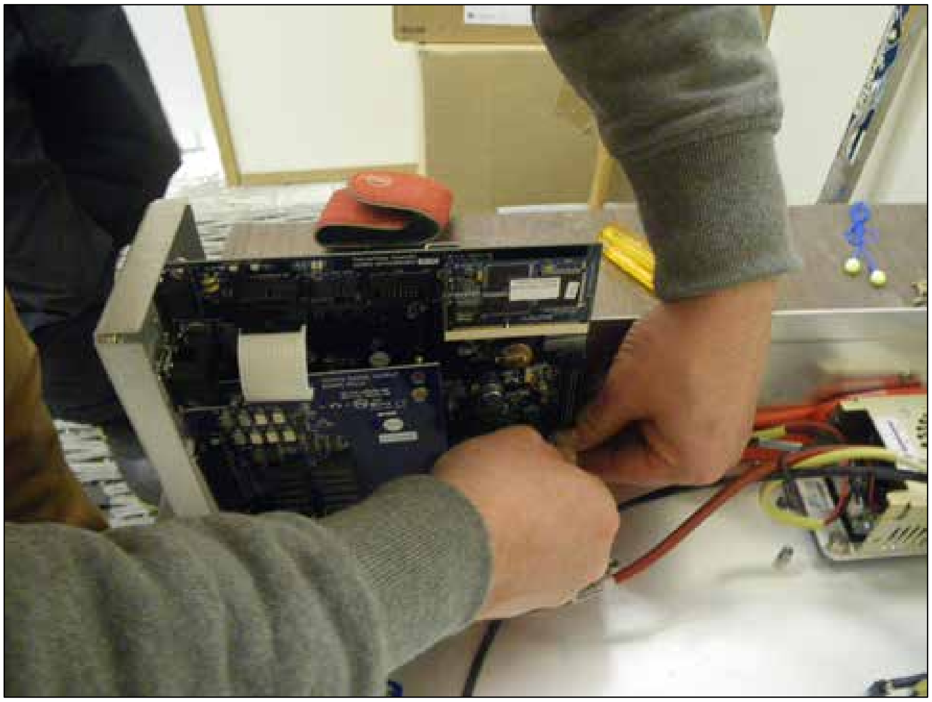

Plate 5. CB TSP Station motherboard replacement.

Plate 6. CB TSP Station calibrations and leak test.

Thursday February 18, 2016

- DDMI personnel could not connect remotely to the CB TSP Station. On arrival at the sampler, the screen had been frozen since 7:00 am. As observed by DDMI personnel this time in the day is frequently when the sampler will freeze. Potentially power surges at the communication building could be an issue. As a troubleshooting option, the power supply from the A154 Dike TSP Station was installed in the CB TSP sampler.

Based on the field work completed by ERM, ERM has updated the DDMI TSP Sampler SOP (Appendix B).

6. RECOMMENDATIONS

Based on the ERM QA/QC of DDMI TSP data and the Field Visit, ERM recommends that DDMI complete the following going forward:

- use the updated DDMI TSP Sampler SOP (Appendix B) going forward during Mine operations;
- maintain all audit, calibration and maintenance records at the Mine;
- complete calibration and maintenance log sheets;
- purchase a short inlet tube for the TSP samplers;
- purchase a Temperature/Relative Humidity meter as the one currently at site is not functioning;

- purchase a manometer for calibration;
- calibrate the Streamline Pro annually and maintain records;
- purchase an additional Temperature/Relative Humidity cord to calibrate inside in the environment department laboratory; and
- ensure alarm headings for the A154 Dike TSP sampler are available in the downloaded data.

Table 1 summarizes the audits and calibrations to perform:

Table 1. DDMI TSP Sampler Audit and Calibration Schedule

TSP Sampler Parameter/Component	Audit Frequency	Calibration / Maintenance Frequency
Replace Filter Tape	N/A	Upon 10% Remaining Alarm
Clean Air Inlet System	N/A	Annually
Rebuild Vacuum Pump	N/A	Every 12 to 18 Months
Clean Ambient Temperature/Relative Humidity Shield and Assembly	N/A	Annually
Ambient Temperature	Quarterly	Annually
Ambient Pressure	Quarterly	Annually
Flow	Quarterly	Annually
Leak Check	Quarterly	N/A
Auto Mass coefficient	N/A	Annually
Streamline Pro	N/A	Annually

Documentation of maintenance and calibration records should be kept. The calendar system used by the environment department should be updated to include the procedural items outlined in section 6.3 of the SOP.

7. CONCLUSION

ERM performed the following work, which is the basis for this memo:

- reviewed the specifications of the on-site TSP samplers;
- reviewed and conducted QA/QC of historical data to identify possible sources of sampler error;
- conducted a site visit to inspect, calibrate, and maintain/repair the TSP samplers;
- developed a TSP Sampler SOP; and
- conducted a site visit to train on site personnel in the inspection, calibration, and routine maintenance/repair of particulate samplers.

Historical data provided to ERM by DDMI showed significant data quality issues. Site visits confirmed TSP Samplers required significant maintenance and repairs. Based on the findings, ERM has updated the TSP Sampler SOP and will review and provide QA/QC for particulate sampler data on a monthly basis and provide a brief memorandum outlining any issues with data along with recommendations for resolving the issues following the data review and QA/QC each month.

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Partner in Charge

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Alberta Environment and Sustainable Resource Development. 2014. *Air Monitoring Directive Chapter 6: Ambient Data Quality*. http://aep.alberta.ca/air/legislation/air-monitoring-directive/default.aspx (accessed January 2016).

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DDMI 2014. 2013-2014 Environmental Air Quality Monitoring Report (ENVI-394-0614 R0). Diavik Diamond Mine (2012) Inc. September 2014.

ERM. 2016. Diavik Diamond Mine 2015 Dust Deposition Report. Submitted to Diavik Diamond Mine.

GNWT. 2014. Guideline for Ambient Air Quality Standards in the Northwest Territories. http://www.enr.gov.nt.ca/sites/default/files/guidelines/air_quality_standards_guideline.pdf. Accessed February 2016.

SENES. 2014. Peer Review of the 2013 – 2014 Environmental Air Quality Monitoring Report (ENVI-394-0614 R0). Diavik Diamond Mine (2012) Inc. October 2014.

Appendix B

Total Suspended Particulates Equipment Calibration Records

CD Nova Thermo 5014i Calibration Inspection

Work Order Number	N160103
Customer Name	Diavik
Instrument Part Number	5014i
Instrument Serial Number	5014i203141210 Dyke instrument
Date	15-Feb-16

Description	As found	Standard	As found variance	Allowable variance	Adjusted to	Final variance	As found offset	Adjusted offset
Ambient Air Temperature	-32.9	-34	-1.10	+/- 0.2°C	-34	0.00	-1.1	0
Ambient Relative Humidity	63.20%	67%	-5.7%	+/- 3%	67%	0.00	17.6	13.1
Flow Temperature	10.7	10.6	0.10	+/- 0.2°C	10.7	0.10		
Barometer Pressure	720.3	715.4	-4.90	+/- 5 mmHg	715.4	0.00	span 0.9762	
Vacuum Pressure Span	74.8	69.5	-7.09%	50-70 mmHg	69.5	Pass		
Flow Pressure Span	27.8	27.4	-1.44%	20-30 mmHg	27.8	Pass		
Flow calibration	16.67	17.02	2.10%	+/- 2%	17.02	0.00%		

Mass Calibration Mass calibration performed using customer supplied zero and 1201 microgram foils. Foil set calibrated 22 Jan. 2013. Reference foil set 5301 from Thermo Fisher Scientific.

Auto Detector Calibration

Initial High Voltage	1460	**Final High Voltage**	1370	
Initial Beta Count	12430	**Final Beta Count**	12266	
Final Beta	12266	**8000-13000**		Pass

Leak Test

Start Value VAC	not recorded	mmHg		
Start Value FLOW (standard)	16.66	LPM		
Leak Check Adapter VAC	not recorded	mmHg		
eak Check Adapter FLOW (standard)	13.3	LPM		
Flow Variance	3.36	LPM	+/-0.42 LPM	Fail

Standards Used	Description	S/N	Calibration Date
Flow	TetraCal	888	3-Nov-15
Temperature	TetraCal	888	3-Nov-15
Pressure	TetraCal	888	3-Nov-15
Relative Humidity	Diavik Airport		
Manometer	Omega 8205	9900631	9-Feb-16
Technical Data	Thermo Manual P/N 106428-00 dated 2 April 2014 Thermo Fisher Procedure Number 106430-00 revision A Thermo Fisher Scientific Bulletin # 5014i / 5030i Rev 5/2011		

Calibration Complete By Dan Molloy, Service Manager, Western Region

Signature: _______________________________________

Ambient temperature and ambient relative humidity calibration standard numbers provided by the Diavik Airport.

Instrument pulled from service due to failed leak test.

CD Nova Thermo 5014i Calibration Inspection

Work Order Number N160103
Customer Name Diavik
Instrument Part Number 5014i
Instrument Serial Number 5014i203191211 Communication Shack instrument
Date 16-Feb-16

Description	As found	Standard	As found variance	Allowable variance	Adjusted to	Final variance	As found offset	Adjusted offset
Ambient Air Temperature	-32.9	-29	3.90	+/- 0.2°C	-29	0.00	0	-3.9
Ambient Relative Humidity	65.80%	68%	-3.2%	+/- 3%	68%	0.00	13.7	11
Flow Temperature	16.2	16.2	0.00	+/- 0.2°C	16.2	0.00	0.8	
Barometer Pressure	701.7	711	9.30	+/- 5 mmHg	711	0.00	span 0.9889	
Vacuum Pressure Span	54.9	55.3	0.73%	50-70 mmHg	54.9	Pass		
Flow Pressure Span	25.4	25.0	-1.57%	20-30 mmHg	25.4	Pass		
Flow calibration	16.67	17.09	2.52%	+/- 2%	17.09	0.00%		
Mass Calibration	Mass calibration performed using customer supplied zero and 1201 microgram foils. Foil set calibrated 22 Jan. 2013. Reference foil set 5301 from Thermo Fisher Scientific.							

Auto Detector Calibration

Initial High Voltage	1370	**Final High Voltage**	1410
Initial Beta Count	8136	**Final Beta Count**	8573
Final Beta	8573	**8000-13000**	Pass

Leak Test

Start Value VAC	65	mmHg		
Start Value FLOW (instrument)	16.66	LPM		
Start Value FLOW (standard)	16.45	LPM		
Leak Check Adapter VAC	72	mmHg		
Leak Check Adapter FLOW (instrument)	16.64	LPM		
Leak Check Adapter FLOW (standard)	16.41	LPM		
Flow Variance standard	0.04	LPM	+/-0.42 LPM	Pass

Standards Used	Description	S/N	Calibration Date
Flow	TetraCal	888	3-Nov-15
Temperature	TetraCal	888	3-Nov-15
Pressure	TetraCal	888	3-Nov-15
Relative Humidity	Diavik Airport		
Manometer	Omega 8205	9900631	9-Feb-16
Technical Data	Thermo Manual P/N 106428-00 dated 2 April 2014 Thermo Fisher Scientific Procedure Number 106430-00 revision A Thermo Fisher Scientific Bulletin # 5014i / 5030i Rev 5/2011		

Calibration Complete By Dan Molloy, Service Manager, Western Region

Signature: ____

Ambient temperature and ambient relative humidity calibration standard numbers provided by the Diavik Airport.

Rio Tinto

AQ Unit Calibration Sheet

Area: 8000
Effective Date: 2016-October 25
Task: AQ Unit Calibration

No: ENVI-XXX-1027
Revision: 0
By: D. Dul

Page: 1 of 1

Customer Name DIAVIK
Instrument Location Communication Shack
Instrument Serial Number 5014i203191211
Date ____

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature	1.8	-3	-4.80	+/- 0.2°C	Fail	-3	0.00	NC	0.2	Adjustment made, used Airport numbers as Standard
1 Point	Ambient Relative Humidity	47.1	86	82.59%	+/- 2%	Fail	80.2	-6.74%	NC	-20	Maximum setting, Used Airport numbers for Standard
1 Point	Flow Temperature	19.9	20.1	-0.20	+/- 0.2°C	Pass	19.9	-0.20	0.8	NA	Did not adjust, Stream Line Pro needs to be calibrated first
1 Point	Barometer Pressure	721.6	768.09	46.49	+/- 10 mmHg	Fail	768.09	0.00	Span NC	Span 1.0613	Adjustment made, used Airport numbers as Standard
1 Point	Volumetric Flow Rate	16.65	15.94	4.45%	+/- 2%	Marginal	16.65	4.45%	-4.26	NA	Did not adjust, Stream Line Pro needs to be calibrated first
Calibrate	Vacuum Pressure Span			#DIV/0!	50-70 mmHg			#DIV/0!	1.0045	NA	Need Manometer for calibration
Calibrate	Flow Pressure Span			#DIV/0!	20-30 mmHg			#DIV/0!	1.0168	NA	Need Manometer for calibration
Calibrate	Auto Flow Calibration			#DIV/0!	+/- 2%	NA		#DIV/0!	-4.26	NA	Did not adjust, Stream Line Pro needs to be calibrated first

Auto Detector Calibration

Initial High Voltage		Final High Voltage	
Initial Beta Count		Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC		mmHg		Stream Line Pro needs to be calibrated first
Start Value FLOW (AQ Unit)		LPM		Stream Line Pro needs to be calibrated first
Start Value FLOW (SLR Pro)		LPM		Stream Line Pro needs to be calibrated first
Leak Check Adapter VAC		mmHg		Stream Line Pro needs to be calibrated first
Leak Check Adapter FLOW (AQ Unit)		LPM		Stream Line Pro needs to be calibrated first
Leak Check Adapter FLOW (SLR Pro)		LPM		Stream Line Pro needs to be calibrated first
Flow Variance	#DIV/0!	LPM	+/-2.5%	Stream Line Pro needs to be calibrated first

Auto Mass Coefficient Calibration Completed ____ Stream Line Pro needs to be calibrated first

Standards Used	Description	S/N	Calibration Date
Flow	Stream Line Pro	HL130101	24-Jan-13
Temperature	Stream Line Pro	T130101	24-Jan-13
Pressure	Stream Line Pro	HL130101	24-Jan-13
Temperature	Reed Thermo-Hygrometer	130403443	17-Apr-15
Relative Humidity	Reed Thermo-Hygrometer	130403443	17-Apr-15
Manometer			

Quarterly	Annually	
Yes		1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
No		Auto Detector Calibration
No		Leak Check
No		Clean Inlet Assemblies & Sample Tubels
Yes		Check Cam (grease as needed)
Yes		Calibrate AmTemp
Yes		Calibrate RH
Yes		Calibrate Flow Temp
Yes		Calibrate Baro Pressure
NA		Auto Flow Calibration
		Calibrate Vacuum Pressure Span
		Calibrate Flow Pressure Span
		Auto Mass Calibration

Technical Data
Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to: ____

Calibration Complete By Dianne L. Dul
Digitally signed by Dianne L. Dul
DN: cn=Dianne L. Dul, o=Diavik Diamond Mines Inc., ou=Environment, email=dianne.dul@riotinto.com, c=CA
Date: 2016.10.31 18:57:14 -06'00'

Signature: ____

COMMENTS

Stream Line Pro last calibrated 2013-01-24 Reed Thermo-Hygrometer last calibrated 2015-04-17.

Used the Airport numbers to adjust the Ambient Air Temperature, Ambient Relative Humidity and Barometric Pressure.
The Stream Line Pro readings: Ambient Air Temperature -1.8°C (Probe placed outside for 5 minutes) Inside Reading = 20.1°C
The Stream Line Pro readings: Ambient Barometric Pressure 728.7 Airport reading = 768.09

Reed Thermo-Hygrometer readings: Temperature -1.9°C outside 20.4°C Inside Reading
Reed Thermo-Hygrometer readings: Relative Humidity 96.4%

Used Airport Numbers to complete Quarterly Varificatons.

AQ Unit Calibration Sheet

Area: 8000
Effective Date: 2016-October 25
Task: AQ Unit Calibration

No: ENVI-622-1031
Revision: 0
By: D. Dul

Page: 1 of 1

Customer Name DIAVIK
Instrument Location Communication Shack
Instrument Serial Number 5014i203191211
Date 29-Dec-2016 JG

	Description	As Found	Standard	As Found Variance	Allowable Variance	Outcome	Adjusted to	Final Variance	Set Point as Found	Set Point Adjusted to	Comments
1 Point	Ambient Air Temperature			0.00	+/- 0.2°C			0.00			
1 Point	Ambient Relative Humidity			#DIV/0!	+/- 2%			#DIV/0!			
1 Point	Flow Temperature			0.00	+/- 0.2°C			0.00			
1 Point	Barometer Pressure			0.00	+/- 10 mmHg			0.00			
1 Point	Volumetric Flow Rate			#DIV/0!	+/- 2%			#DIV/0!			
Calibrate	Vacuum Pressure Span			#DIV/0!	50-70 mmHg			#DIV/0!			
Calibrate	Flow Pressure Span			#DIV/0!	20-30 mmHg			#DIV/0!			
Calibrate	Auto Flow Calibration	16.69	17.54	4.85%	+/- 2%	Fail	17.54	0.00%	16.67	17.54	After adjusting to 17.54 the set point stabalized to 16.67 again after a couple minutes. Stream Pro has not been calibrated. I only realized this after doing the calibration.

Auto Detector Calibration

Initial High Voltage		Final High Voltage	
Initial Beta Count		Final Beta Count	
Final Beta		8000-13000	

Leak Test

Start Value VAC		mmHg	
Start Value FLOW (AQ Unit)		LPM	
Start Value FLOW (SLR Pro)		LPM	
Leak Check Adapter VAC		mmHg	
Leak Check Adapter FLOW (AQ Unit)		LPM	
Leak Check Adapter FLOW (SLR Pro)		LPM	
Flow Variance	#DIV/0!	LPM	+/-2.5%

Auto Mass Coefficient Calibration Completed

Standards Used	Description	S/N	Calibration Date
Flow	Stream Line Pro	HL130101	24-Jan-13
Temperature	Stream Line Pro	T130101	24-Jan-13
Pressure	Stream Line Pro	HL130101	24-Jan-13
Temperature	Reed Thermo-Hygrometer	130403443	17-Apr-15
Relative Humidity	Reed Thermo-Hygrometer	130403443	17-Apr-15
Manometer			

Technical Data
Thermo Manual P/N 106428-00 dated 2 April 2014
Thermo Fisher Procedure Number 106430-00 revision A

Firmware updated to:

Calibration Complete By JG

Signature: Justin Grandjambe

Quarterly	Annually	
		1 Pt. Varification (Am Temp, RH, Flow Temp, Baro Pressure & Vol. Flow Rate)
		Auto Detector Calibration
		Leak Check
		Clean Inlet Assemblies & Sample Tubels
		Check Cam (grease as needed)
		Calibrate AmTemp
		Calibrate RH
		Calibrate Flow Temp
		Calibrate Baro Pressure
		Auto Flow Calibration
		Calibrate Vacuum Pressure Span
		Calibrate Flow Pressure Span
		Auto Mass Calibration

COMMENTS

SERVICE REPORT

Thermo Fisher Scientific
27 Forge Parkway
Franklin, MA. 02038
Phone: 866-282-0430
Fax: 508-520-2800

RA#	DATE COMPLETED
RA00065153 RG2-MA-16956	12/17/2016 5:02 AM
CUSTOMER	**CONTACT PHONE**
CD Nova Head OfficeCD Nova	(604) 430-5612
CONTACT	**CONTACT EMAIL**
Dan Molloy	dmolloy@cdnova.com
MODEL	**SERIAL NUMBER**
5014I	5014I203141210

REPORT SUBMITTED BY
Contact: Chuck Costa
Email: chuck.costa@thermofisher.com

SUBJECT: repair and calibration **REPAIR TYPE:** Time and Material **PRIORITY:** Standard

DESCRIPTION OF SERVICE REQUIRED: unit leaks and has been creating metal filings while advancing the tape. please consult with Chris Wilson on the repair and provide an estimate before proceeding with repairs and calibration

CONTAMINATED/HAZARDOUS: No
DECONTAMINATION METHOD: N/A

ACCESSORIES RECEIVED: Pump / Picnic Cooler

PHYSICAL INSPECTION (inspected for damage, missing items, pm required, cleanliness, and accuracy)

✓ Compare unit to RA detail ✓ Labeling ✓ Hardware

INSTRUMENT AS FOUND: Unit received in fair condition- ready to power up and begin NIST testing.

REPAIR NOTES: Unit received and staged. The sample path leak was confirmed due to binding of mechanism during filter changes and a faulty lower chamber O-ring. Customer complained of metal filings.

Removed and cleaned the sample chamber. Corrected leak by replacing the O-ring seal within the lower portion of the sample chamber.The chamber was binding a bit due to misalignment. This was corrected during servicing and the function of the chamber during filter changes is now smoothe and a proper seal results. Ran multiple filter changes and encountered no issues and the leak has been eliminated upon re-alignment of the chamber. Leak checks are passed with no problems. (With leak check adapter in place the flow is 16.67 LPM with vac reading of 113.6mm Hg. and with 2 adapters the flow is 16.46 LPM with vac reading of 159.1 mmHg).

Audited/calibrated the temp, pressure and RH sensors and performed flow calibration. Unit functions normally with no problems. Instrumet is runnig with no unresolved errors or status conditions.

INSTRUMENT AS LEFT: Instrument is functioning normally with no unresolved errors or status conditions

TEST EQUIPMENT AND SOURCES USED: Delta Cal Volumetric Air Flow Calibrator, Panametrics MC Series Hygrometer, Druck DP 705 Digital Pressure Indicator, Fluke 532 digital thermometer , Tektronix DMM916 True RMS Meter, Dwyer Series 473 Digital Manometer.

All measurement standards are calibrated at scheduled intervals by the National Institute of Standards and Technology (NIST), or against certified standards, which are traceable to the National Institute of Standards and Technology, formally the National Bureau of Standards (NBS). Calibration of customer equipment is performed with appropriate environmental controls, as required.

PRE-BUTTON UP INSPECTION

- ✓ Instrument interior clean and free of debris.
- ✓ All hardware is secured. (Ex. Screws, connectors, tubing, etc.)
- ✓ Cables secured and Tie wrapped where applicable
- ✓ No remaining loose hardware within the instrument closure.

FINAL QC CHECKLIST

- ✓ Instrument exterior clean.
- ✓ Serial Number/Voltage Labels intact and legible.

- ✓ All received customer accessories accounted for and clearly identified.
- ✓ Instrument turns on.
- ✓ Calibration labels/Report with instrument where applicable.
- ✓ Billing and Shipping information properly indicated on Order.
- ✓ Quantities correct and complete on Order.

Environment Site Monitoring Programs: Air Quality Checks - Last 6 Months

Sample Point	Date	Comment	Sample Collected by:	AQ - Alarms Present (Yes/No)	AQ - Board Temp. (°C)	AQ - Correct Time (Yes/No)	AQ - Is Data Downloaded (Yes/No)	AQ - Tape Counter Actual (Max 450)
A154 AQ Unit	6/9/2016 11:38	Unit not hooked up yet	DD/KJ					
A154 AQ Unit	6/17/2016 18:40	Unit not in service						
A154 AQ Unit	6/17/2016 18:41	Unit not in service	JG,SS,SME,EN	N/A	N/A	N/A	N/A	N/A
A154 AQ Unit	6/26/2016 18:20	No radio connection	JG	No	30.3	Yes	No	113
A154 AQ Unit	6/30/2016 17:40	No network connection	DD	1	46.5	Yes	No	185
A154 AQ Unit	7/7/2016 13:23	No connection download	KG	3	23	Yes	No	55
A154 AQ Unit	7/16/2016 0:12		JG	Yes	21.5	Yes	No	284
A154 AQ Unit	7/25/2016 16:20	AQ baro pres reading was from 7am weather						
A154 AQ Unit	7/25/2016 18:29	Out of tape. Data download failed.	JG	Yes	28.1	Yes	No	640
A154 AQ Unit	8/4/2016 16:39	filter Tape Counter High, filter tape change fail, Beta Count 65535, Flow Alarm Low, 0.00	DD	Yes	23.2	Yes	No	
A154 AQ Unit	8/18/2016 19:15	Unit froze up	NA	NA	NA	NA	NA	NA
A154 AQ Unit	8/25/2016 14:37	Blank blue screen when I first arrived. Restarted machine. Flow at 16.17 LPM	SS	Yes	22	Yes	Yes	8
A154 AQ Unit	9/1/2016 17:39	Changed tape counter to start machine unable to scroll in instrument alarm page	DD	Yes	17	Yes	Yes	450
A154 AQ Unit	9/9/2016 9:17	Station is down	JG					
A154 AQ Unit	9/15/2016 11:27	Just turned the unit on and changed the tape. Tape counter is still reading 29 (actual) the heat in the shack was turned off. I turned it back on.	JG	Yes	9.1	Yes	No	29
A154 AQ Unit	9/15/2016 11:31							
A154 AQ Unit	9/23/2016 18:31	Unit is down and will be sent for repairs on the 26th	DD					
A154 AQ Unit	9/29/2016 11:05	Unit off site for repairs	DD					
A154 AQ Unit	10/13/2016 13:14	Unit out for service	JG					
A154 AQ Unit	10/20/2016 16:41	Unit still out for repairs	DD KJ					
A154 AQ Unit	10/28/2016 16:36	Shipped out for repairs	SS					
A154 AQ Unit	11/3/2016 13:31	Unit broken	SS					
A154 AQ Unit	11/13/2016 14:57	Unit still out for repairs	DB	N/a	N/a	N/A	N/a	N/a
A154 AQ Unit	11/19/2016 15:13	Off site for repairs	SS					
A154 AQ Unit	11/24/2016 14:06	Sent out for repairs	SS					
Com Shack AQ Unit	6/2/2016 16:41	Reboot	DD	No	19.7	Yes	Yes	204
Com Shack AQ Unit	6/9/2016 11:40	Had to reboot	DD/KJ	No	20.5	Yes	Yes	215
Com Shack AQ Unit	6/17/2016 18:31		SME,JG,EN,SS	Yes	21.1	No	Yes	222
Com Shack AQ Unit	6/17/2016 18:35							
Com Shack AQ Unit	6/18/2016 7:47							
Com Shack AQ Unit	6/26/2016 18:46		JG	Yes	23.9	Yes	Yes	228
Com Shack AQ Unit	6/30/2016 16:43	Unit down, rebooted	DD	No	24.5	Yes	No	234
Com Shack AQ Unit	7/6/2016 10:24		SS, NG					
Com Shack AQ Unit	7/7/2016 9:41		KG	No	20.8	Yes	Yes	241
Com Shack AQ Unit	7/7/2016 13:18		KG					
Com Shack AQ Unit	7/13/2016 15:32		KG					
Com Shack AQ Unit	7/14/2016 11:47		KG					
Com Shack AQ Unit	7/15/2016 23:58		JG	No	21	Yes	Yes	249
Com Shack AQ Unit	7/20/2016 10:11		kg					
Com Shack AQ Unit	7/23/2016 10:11		kg					
Com Shack AQ Unit	7/24/2016 16:21			No	20.6	Yes	Yes	258
Com Shack AQ Unit	7/24/2016 16:22	AQ RH sensor might need to be calibrated						
Com Shack AQ Unit	7/27/2016 16:46		NG					
Com Shack AQ Unit	7/28/2016 9:30		NG					
Com Shack AQ Unit	8/3/2016 17:30		SS					
Com Shack AQ Unit	8/4/2016 13:54		DD SS					
Com Shack AQ Unit	8/4/2016 13:55		DD SS	No	21.2	Yes	Yes	270
Com Shack AQ Unit	8/10/2016 16:50		SS					
Com Shack AQ Unit	8/11/2016 16:14		SS					
Com Shack AQ Unit	8/17/2016 17:10		NG					
Com Shack AQ Unit	8/18/2016 13:23		NG					
Com Shack AQ Unit	8/18/2016 16:00			No	20.3	Yes	No	284
Com Shack AQ Unit	8/24/2016 17:30		SS NG					
Com Shack AQ Unit	8/25/2016 9:06		SS	No	20.4	Yes	Yes	291
Com Shack AQ Unit	8/25/2016 10:04		SS					

Environment Site Monitoring Programs: Air Quality Checks - Last 6 Months

Sample Point	Date	Comment	Sample Collected by:	AQ - Alarms Present (Yes/No)	AQ - Board Temp. (°C)	AQ - Correct Time (Yes/No)	AQ - Is Data Downloaded (Yes/No)	AQ - Tape Counter Actual (Max 450)
Com Shack AQ Unit	8/31/2016 18:30		DD SS					
Com Shack AQ Unit	9/1/2016 17:22		DD SS					
Com Shack AQ Unit	9/1/2016 18:42		DD SS	No	19.8	Yes	Yes	298
Com Shack AQ Unit	9/7/2016 14:44		SS					
Com Shack AQ Unit	9/9/2016 8:32		DB KJ					
Com Shack AQ Unit	9/9/2016 9:17		JG	No	19.2	Yes	Yes	309
Com Shack AQ Unit	9/15/2016 8:10		JG	No	20.6	Yes	Yes	316
Com Shack AQ Unit	9/15/2016 8:54	Nobody got around to unplug the unit	JG					
Com Shack AQ Unit	9/15/2016 8:55	Unit was not unplug and had to be restarted	JG					
Com Shack AQ Unit	9/15/2016 16:08							
Com Shack AQ Unit	9/21/2016 15:46		DD					
Com Shack AQ Unit	9/22/2016 15:39		NG					
Com Shack AQ Unit	9/23/2016 18:28		DD	No	20.3	yes	yes	324
Com Shack AQ Unit	9/28/2016 17:13		SS KJ					
Com Shack AQ Unit	9/29/2016 9:00		KJ					
Com Shack AQ Unit	9/29/2016 10:05		DD	0	19.8	Yes	Yes	330
Com Shack AQ Unit	10/3/2016 7:36	Streamline pro does not work						
Com Shack AQ Unit	10/3/2016 10:09							
Com Shack AQ Unit	10/5/2016 11:41		EN SS					
Com Shack AQ Unit	10/7/2016 10:25		EN SS					
Com Shack AQ Unit	10/7/2016 14:31		JG	No	19.7	Yes	Yes	340
Com Shack AQ Unit	10/12/2016 17:15		JG SM					
Com Shack AQ Unit	10/13/2016 13:01		JG SME					
Com Shack AQ Unit	10/13/2016 13:18		JG	No	18.6	Yes	Yes	346
Com Shack AQ Unit	10/19/2016 15:25		DD NG					
Com Shack AQ Unit	10/20/2016 16:40		DD KJ					
Com Shack AQ Unit	10/20/2016 16:41		DD KJ	No	19.4	Yes	Yes	353
Com Shack AQ Unit	10/26/2016 16:36		EN					
Com Shack AQ Unit	10/27/2016 14:20		SS					
Com Shack AQ Unit	10/28/2016 16:07	Ambient temperature, relative humidity and barometric pressure from airport similar even though alarm is high	SS	Yes	20.4	Yes	Yes	365
Com Shack AQ Unit	10/31/2016 14:44	Airport data used instead of Hygro data						
Com Shack AQ Unit	11/2/2016 11:26		EN					
Com Shack AQ Unit	11/3/2016 15:27		SME SS	No	18.6	Yes	Yes	373
Com Shack AQ Unit	11/3/2016 15:49		SS					
Com Shack AQ Unit	11/9/2016 11:30		JG SME					
Com Shack AQ Unit	11/10/2016 14:35		NG					
Com Shack AQ Unit	11/13/2016 11:11	Time changed to account for daylight savings. Monitor frozen then rebooted. There is a data gap from 11/10/2016 @8:00 till 11/13/2016 @12:00	SM DB	Yes	21.4	Yes	Yes	381
Com Shack AQ Unit	11/16/2016 11:25		SM					
Com Shack AQ Unit	11/17/2016 16:04		SM					
Com Shack AQ Unit	11/19/2016 15:13		SS	Yes	18.7	Yes	Yes	387
Com Shack AQ Unit	11/23/2016 10:45		KJ EN					
Com Shack AQ Unit	11/24/2016 10:48	Ambient RH high 100% when max is 95%	SS	Yes	19.2	Yes	Yes	392
Com Shack AQ Unit	11/24/2016 10:51		SS					
Com Shack AQ Unit	11/29/2016 11:10	High ambient RH alarm, Hygro measurements from airport as hygrometer is still out of commission						

Environment Site Monitoring Programs: Air Quality Checks - Last 6 Months

Sample Point	Date	AQ - Which Alarm	AQ Barometric Pressure Reading (mmHg)	AQ Flow Rate Calibration	AQ RH Sensor Reading (%)	AQ Temperature Reading (°C)	Completed Task	Emailed Cummulative Data to ERM	Hygrometer Barometric Pressure Reading (mmHg)	Hygrometer RH Sensor Reading (%)	Hygrometer Temperature Reading (°C)
A154 AQ Unit	6/9/2016 11:38										
A154 AQ Unit	6/17/2016 18:40		N/A		N/A	N/A			N/A	N/A	N/A
A154 AQ Unit	6/17/2016 18:41	N/A					N/A				
A154 AQ Unit	6/26/2016 18:20						Yes				
A154 AQ Unit	6/30/2016 17:40	Low Flow					Yes				
A154 AQ Unit	7/7/2016 13:23	High RH and low flow					Yes				
A154 AQ Unit	7/16/2016 0:12	Filter tape change fail, sample RH high, flow low					Yes				
A154 AQ Unit	7/25/2016 16:20		772.8		42	16.1			758.4	43	16.7
A154 AQ Unit	7/25/2016 18:29	Flow low, filter tape change fail, filter tape counter high					Yes				
A154 AQ Unit	8/4/2016 16:39	See comments					Yes				
A154 AQ Unit	8/18/2016 19:15	NA					NA				
A154 AQ Unit	8/25/2016 14:37	Low Flow alarm					Yes				
A154 AQ Unit	9/1/2016 17:39	Filter tape high, low flow alarm, filings inside tape compartment, making a funny noise when tape moves					Yes				
A154 AQ Unit	9/9/2016 9:17										
A154 AQ Unit	9/15/2016 11:27	Flow-low					Yes				
A154 AQ Unit	9/15/2016 11:31		770.9		60.7	1.1			759.4	62.7	1.9
A154 AQ Unit	9/23/2016 18:31										
A154 AQ Unit	9/29/2016 11:05										
A154 AQ Unit	10/13/2016 13:14										
A154 AQ Unit	10/20/2016 16:41										
A154 AQ Unit	10/28/2016 16:36										
A154 AQ Unit	11/3/2016 13:31										
A154 AQ Unit	11/13/2016 14:57	N/a					N/a				
A154 AQ Unit	11/19/2016 15:13										
A154 AQ Unit	11/24/2016 14:06										
Com Shack AQ Unit	6/2/2016 16:41						Yes				
Com Shack AQ Unit	6/9/2016 11:40						Yes				
Com Shack AQ Unit	6/17/2016 18:31	Flow-high					Yes				
Com Shack AQ Unit	6/17/2016 18:35		706.1		19.2	10				15.2	4.9
Com Shack AQ Unit	6/18/2016 7:47								750.57		
Com Shack AQ Unit	6/26/2016 18:46	Flow alarm - high					Yes				
Com Shack AQ Unit	6/30/2016 16:43	NA					Yes				
Com Shack AQ Unit	7/6/2016 10:24						Yes				
Com Shack AQ Unit	7/7/2016 9:41	NA					Yes				
Com Shack AQ Unit	7/7/2016 13:18						Yes				
Com Shack AQ Unit	7/13/2016 15:32						Yes				
Com Shack AQ Unit	7/14/2016 11:47						Yes				
Com Shack AQ Unit	7/15/2016 23:58	NA					Yes				
Com Shack AQ Unit	7/20/2016 10:11						yes				
Com Shack AQ Unit	7/23/2016 10:11						yes				
Com Shack AQ Unit	7/24/2016 16:21										
Com Shack AQ Unit	7/24/2016 16:22		709.4		0	18			754.6	32	13
Com Shack AQ Unit	7/27/2016 16:46						Yes				
Com Shack AQ Unit	7/28/2016 9:30						Yes				
Com Shack AQ Unit	8/3/2016 17:30						Yes				
Com Shack AQ Unit	8/4/2016 13:54						Yes				
Com Shack AQ Unit	8/4/2016 13:55	None					yes				
Com Shack AQ Unit	8/10/2016 16:50						Yes				
Com Shack AQ Unit	8/11/2016 16:14						Yes				
Com Shack AQ Unit	8/17/2016 17:10						Yes				
Com Shack AQ Unit	8/18/2016 13:23						Yes				
Com Shack AQ Unit	8/18/2016 16:00	NA									
Com Shack AQ Unit	8/24/2016 17:30						Yes				
Com Shack AQ Unit	8/25/2016 9:06	NA					SS				
Com Shack AQ Unit	8/25/2016 10:04						Yes				

Environment Site Monitoring Programs: Air Quality Checks - Last 6 Months

Sample Point	Date	AQ - Which Alarm	AQ Barometric Pressure Reading (mmHg)	AQ Flow Rate Calibration	AQ RH Sensor Reading (%)	AQ Temperature Reading (°C)	Completed Task	Emailed Cummulative Data to ERM	Hygrometer Barometric Pressure Reading (mmHg)	Hygrometer RH Sensor Reading (%)	Hygrometer Temperature Reading (°C)
Com Shack AQ Unit	8/31/2016 18:30						Yes				
Com Shack AQ Unit	9/1/2016 17:22						yes				
Com Shack AQ Unit	9/1/2016 18:42	NA					Yes				
Com Shack AQ Unit	9/7/2016 14:44						Yes				
Com Shack AQ Unit	9/9/2016 8:32						Yes				
Com Shack AQ Unit	9/9/2016 9:17	NA					JG				
Com Shack AQ Unit	9/15/2016 8:10	NA					Yes				
Com Shack AQ Unit	9/15/2016 8:54						No				
Com Shack AQ Unit	9/15/2016 8:55						No				
Com Shack AQ Unit	9/15/2016 16:08		712.3		38.5	5.9			758.1	72	1.8
Com Shack AQ Unit	9/21/2016 15:46						Yes				
Com Shack AQ Unit	9/22/2016 15:39						Yes				
Com Shack AQ Unit	9/23/2016 18:28	NA					yes				
Com Shack AQ Unit	9/28/2016 17:13						yes				
Com Shack AQ Unit	9/29/2016 9:00						Yes				
Com Shack AQ Unit	9/29/2016 10:05	NA					Yes				
Com Shack AQ Unit	10/3/2016 7:36			No							
Com Shack AQ Unit	10/3/2016 10:09		754.8		78.4	-0.3		Yes	754.1	80.4	-3.4
Com Shack AQ Unit	10/5/2016 11:41						Yes				
Com Shack AQ Unit	10/7/2016 10:25						Yes				
Com Shack AQ Unit	10/7/2016 14:31	NA					Yes				
Com Shack AQ Unit	10/12/2016 17:15						Yes				
Com Shack AQ Unit	10/13/2016 13:01						Yes				
Com Shack AQ Unit	10/13/2016 13:18	NA					Yes				
Com Shack AQ Unit	10/19/2016 15:25						Yes				
Com Shack AQ Unit	10/20/2016 16:40						Yes				
Com Shack AQ Unit	10/20/2016 16:41	NA					Yes				
Com Shack AQ Unit	10/26/2016 16:36						Yes				
Com Shack AQ Unit	10/27/2016 14:20						Yes				
Com Shack AQ Unit	10/28/2016 16:07	RH/Temperature					Yes				
Com Shack AQ Unit	10/31/2016 14:44		767.3		100	-19.7		Yes	760.9	77	-18
Com Shack AQ Unit	11/2/2016 11:26						Yes				
Com Shack AQ Unit	11/3/2016 15:27	NA					Yes				
Com Shack AQ Unit	11/3/2016 15:49						Yes				
Com Shack AQ Unit	11/9/2016 11:30						Yes				
Com Shack AQ Unit	11/10/2016 14:35						Yes				
Com Shack AQ Unit	11/13/2016 11:11	RH					Yes				
Com Shack AQ Unit	11/16/2016 11:25						Yes				
Com Shack AQ Unit	11/17/2016 16:04						Yes				
Com Shack AQ Unit	11/19/2016 15:13	RH/Temp - ambient RH is high at 100%					Yes				
Com Shack AQ Unit	11/23/2016 10:45						Yes				
Com Shack AQ Unit	11/24/2016 10:48	RH/temperature					Yes				
Com Shack AQ Unit	11/24/2016 10:51						Yes				
Com Shack AQ Unit	11/29/2016 11:10		765.8		100	-6.2		Yes	759.2	93	-8

Appendix C

TSP Monitoring Standard Operating Procedure

Environment
STANDARD OPERATING PROCEDURE

Area No.: 8000
Document #: ENVR-801-0613
Revision: 6
Task Title: TSP Monitoring

Next Review: 1 Year from Final Approval in Documentum
Effective Date: Date on approved stamp in footer.

1 REFERENCES/RELATED DOCUMENTS

1.1 Thermo Scientific Model 5014*i* Beta Instruction Manual

1.2 Thermo Scientific Technical Bulletin 5030 5014 leak test procedure

1.3 Thermo Scientific *i*Port Instruction Manual

1.4 Diavik Diamond Mine Environmental Air Quality Monitoring Plan. Document #: ENVI-302-0613 R0

1.5 MP5 Monitoring Schedules “AQ Weekly Inspection/Download”, “AQ Monthly Audit” and “AQ Quarterly Flow Rate Calibration”

1.6 ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment

1.7 ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment

1.8 ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment

Revision History

Revision	Revision Description	Date of Revision	Author
0	Initial Release	01-Jun-13	D. Wells
1	Update SOP template	28-Apr-14	K. Moore
2	Updates to procedures	20-Apr-15	D. Bourassa
3	General updates	27-Apr-15	S. Sinclair
4	Updates to iPort set-up & Troubleshooting	12-Dec-15	K. Raymond
5	Updates to procedures	18-Feb-16	J. Morrison
6	New Template	04-Nov-16	S. Martin-Elson

Authorized Electronically in Documentum By:

Area Superintendent:	D.Wells
Area Manager:	S.Bourn

CRITICAL RISKS ARE HIGHLIGHTED IN GREY

Please click on the CRM Risks that are applicable for this SOP			
			
			
			
			

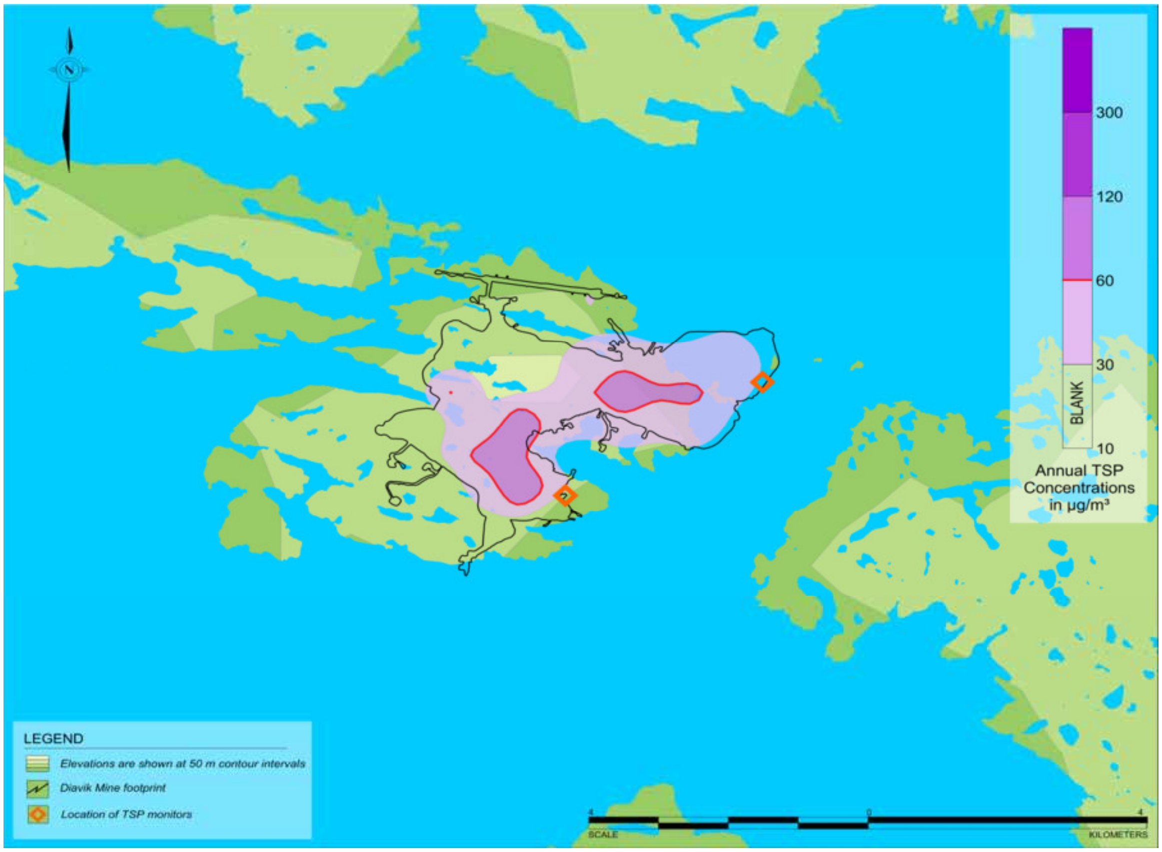


Figure 1. TSP Monitoring Map

Plate 1. Communication Building (Monitor Located on Northeast Corner)

Plate 2. A154 Dike Road Location

Plate 3. **TSP Monitor at the A154 Dike Road**

Description

This SOP covers the maintenance, calibration and data download for two TSP monitors (Thermo Scientific 4015*i* Beta continuous ambient particulate monitors) located at Diavik site.

2 PURPOSE

The purpose of this standard operating procedure (SOP) is to outline the responsibilities and processes required for performing maintenance, calibration and data download of the total suspended particulate (TSP) monitoring equipment.

3 SCOPE

3.1 Scope of Procedure

This SOP describes the responsibilities and processes for maintaining, calibrating, and downloading data from the two Thermo Scientific 4015*i* Beta continuous ambient particulate monitors for the measurement of TSP at the Diavik mine site. This procedure applies to those authorized to download data from the TSP monitors. It should be noted that during all procedures listed in this SOP, the 5014i operating manual should be referenced and understanding the procedures in the operating manual is recommended.

3.2 Scope of Activities

This SOP is designed to satisfy expectations of our organization, including industry best practices, Rio Tinto Health, Safety and Environment (HS & E) standards and the Health, Safety, Environment and Quality (HSEQ) Management System

4 DEFINITIONS

Definitions							
PPE	✓	**GPS**	✗	**DO**	✗	**NTU**	✗
MSDS	✗	**SOP**	✓	**DI Water**	✗	**ELT**	✗
Problem Bear	✗	**JHA**	✓	**AEMP**	✗	**WLWB**	✗
QA	✗	**Groundwater**	✗	**COC**	✗	**PAL**	✗
QC	✗	**Seepage**	✗	**WHMIS**	✗	**ACTS**	✗
Remote Work	✗	**SNP**	✗	**TSS**	✗	**PROVE**	✗
TSP	✓		✗		✗		✗

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Slip, Trip, Fall	✓	**Chemical Contact**	✗	**Rotating Parts**	✗	**Uneven Terrain / Ground**	✗
Sprain / Strain	✓	**Fall into Water**	✗	**Firearms / Deterrents**	✓	**Perception**	✗
Working Remotely	✗	**Overhead Objects**	✓	**Dehydration**	✗	**Risk to Wildlife**	✗
Aircraft	✗	**Visibility**	✗	**Ergonomics**	✗	**Unfamiliar Area**	✗
Watercraft Operation	✗	**Fire**	✗	**Glass**	✗	**Falling**	✗
Snowmobile Operation	✗	**Line of Fire**	✓	**Fumes / Gases**	✗	**Confined Space**	✗
Light Vehicle	✓	**Cuts /Scrapes**	✓	**Entanglement**	✗	**Heavy Equipment**	✗
Lifting	✗	**Pinch Points**	✓	**Stored Energy**	✓	**Extreme Weather**	✗
Manual Labour	✗	**Noise**	✗	**Burns**	✗	**Electrical**	✓
Wildlife	✓	**Spills**	✗	**Equipment Loss or Damage**	✓	**Sample Loss or Damage**	✓

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	**Critical Control**
Wildlife	Scans
Vehicle collision or rollover	Seatbelts, segregation, Defensive Driving
Vehicle impact on person	Seatbelts, Segregation, Defensive Driving/Walking
Uncontrolled release of energy	Stay out of line of fire

Contact with electricity	Stay out of line of fire

6.3 Tools Required

Supplies, Tools and Equipment			
Tool / Equipment	**Quantity**	**Supplies**	**Quantity**
Streamline Pro Multi Cal System : contains barometer and temperature probe (Plate 4)	**1**	**Relative humidity (hygrometer) standard readable to the nearest 0.5%**	**1**
Flow Audit Adapter	**1**	**Airport Meteorological Station (Can be used for audit temp, pressure and RH)**	**1**
Leak Check Adapter	**1**	**Hygrometer (RH/Temperature Probe; airport can be used)**	**1**
Mass Foil Calibrations Kits x 2 (1 kit is left at each TSP sampler; Plate 5)	**2**	**Short inlet adapter**	**1**
Manometer (annual calibration only)	**1**	**Lint free cloth and cleaning solution**	**1**

Plate 4. Streamline Pro and flow/leak check adapter on the left.

Plate 5. Mass foil calibration kit.

6.4 Procedural Steps

6.4..1 Bi-Weekly

The following can be completed remotely bi-weekly:

1. Perform data downloads and import to MP5.
2. Ensure ambient temperature, relative humidity and barometric pressure is similar to airport conditions.
3. Check that the time is reading correctly on the unit.
4. Check for alarms.

6.4..2 Monthly

1. Inspections of the units to ensure all parts are in good working condition (no physical damage).
2. Fan filter inspection.
3. Housekeeping (everything is stored properly, no items are restricting access).
4. Check the temperature in the AQ Unit (Start fan in summer months).
5. Check that the time is reading correct on the unit.
6. Check for alarms.
7. Download Data and import to MP5 (completed back at office).

6.4..3 Quarterly

1. One-point temperature, relative humidity, barometric pressure and flow rate verification: see manual **chapter 2, pages 2-7 through 2-8** for procedures and percent tolerance ranges.
2. Auto Detector Calibration: see manual **chapter 4, page 4-12**.
3. Perform a leak check: see Thermo "**Technical Document: Leak Test Procedure**" document.
4. Clean inlet assemblies and sample tubes.
5. Check Cam for proper greasing.

6.4..4 Annually

1. Ambient Temperature, Relative humidity, flow temperature calibration (**manual chapter 4, page 4-3 through 4-4**).
2. Pressure vacuum calibration (**manual chapter 4, page 4-4 through 4-7**)
3. Flow calibration (**manual chapter 4, page 4-7**).
4. Mass Calibration (**manual chapter 4, page 4-7 through 4-12**)
5. Leak check (Thermo “**Technical Document: Leak Test Procedure**” document).

6.5 General Preventative Equipment Maintenance

Preventative equipment maintenance as indicated in Chapter 5 “Preventative Maintenance” of the manual for the Thermo Scientific 5014i continuous beta attenuation monitor must be ongoing. Since usage and environmental conditions vary greatly, inspect the components frequently and clean or replace components as indicated in the sections below or as required based on site conditions. Figures 2 and 3 provide a general schematic of the TSP samplers.

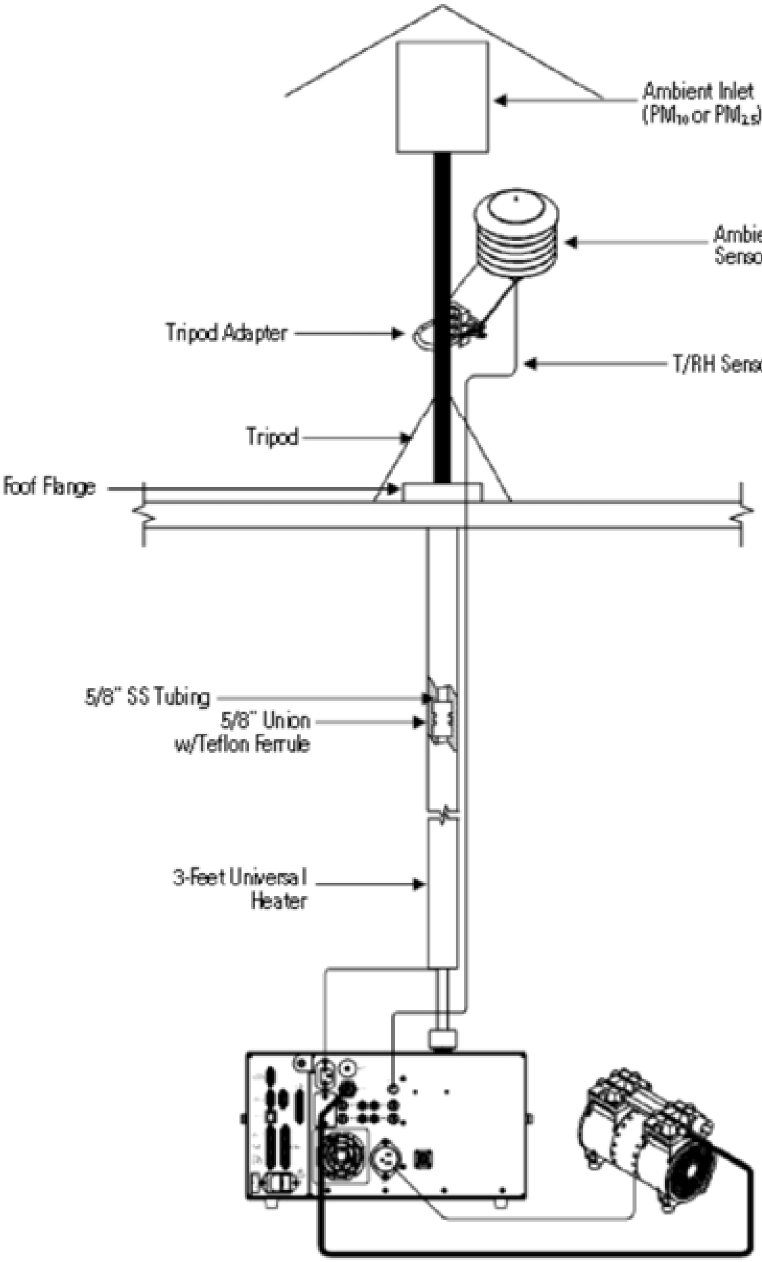


Figure 2. Model 5024i Vertical View

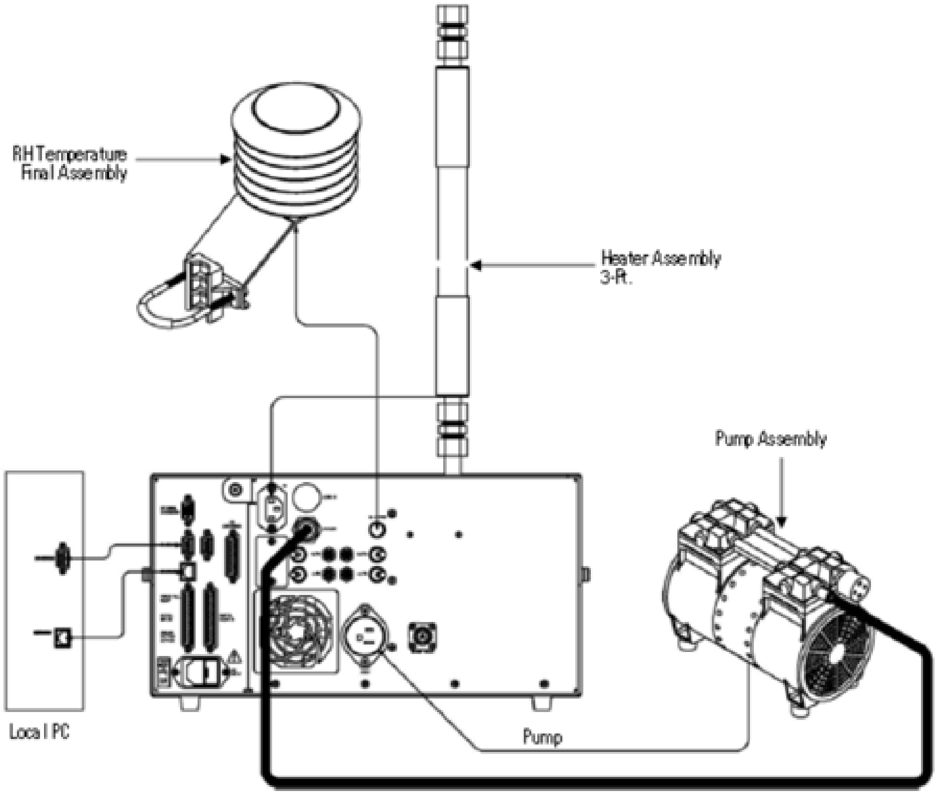


Figure 3. Rear Panel Plumbing Assembly

6.5..1 Replacement Parts

If a part requires replacing, refer to the Chapter 7 "Servicing" of the Model 5014i Instruction Manual.

6.5..2 Cleaning the Inlets

Inlet assemblies should be cleaned on a quarterly interval with mild soap solution, a thorough rinsing, and dried with a lint-free cloth. A general inspection of O-rings should be completed and the rings replaced if necessary.

6.5..3 Heater and Sample Tubes

On at least an annual basis (more frequently in heavily polluted environments) the sample tube that attaches to the inlet and to the Model 5014i Beta should be removed and cleaned. The use of a bottle brush and string will allow you to remove any deposits within the sample tube. This same procedure also applies to the heater tube.

6.5..4 Weather Proofing

The weather-proof installation should be checked at all interfaces exposed to ambient conditions, ensure that the condition of the roof flange and silicone caulking will prevent any precipitation from entering the shelter and possibly damaging the instrument’s electronics.

6.5..5 Fan Filter Inspection and Cleaning

Fan filter inspection and cleaning should occur quarterly. To inspect and clean the fan filter, first disconnect the power by unplugging the unit, remove the fan guard from the fan and remove the filter. Flush the filter with water and let dry or blow the filter clean with compressed air. Re-install the filter and fan. The illustration below located on page 5-4 of the manual provides a schematic of the fan filter assembly (Figure 4).

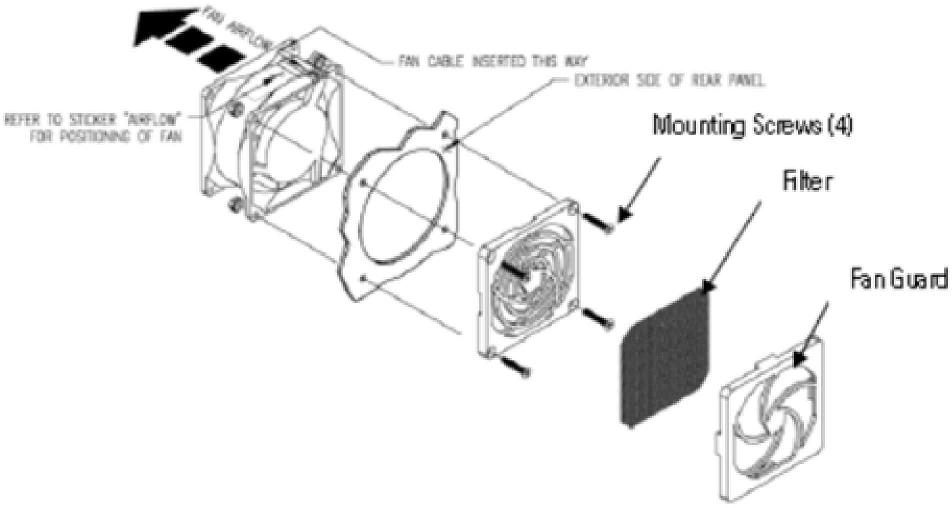


Figure 4. Fan Filter Assembly

6.5..6 Pump Rebuilding

The sample pump should be rebuilt once every 12-18 months. The pump repair kit contains detailed instructions for rebuilding the pump. In Chapter 7 “Servicing” of the Model 5014i Instruction Manual the list of replacement is included in Table 7-1 on page 7-5.

6.5..7 Filter Tape Replacement

If the filter tape breaks or the tape runs out, refer to Chapter 5 “Preventative Maintenance” on **page 5-8 and Figure 5-6 on page 5-9 of the manual** as illustrated in the figure below.

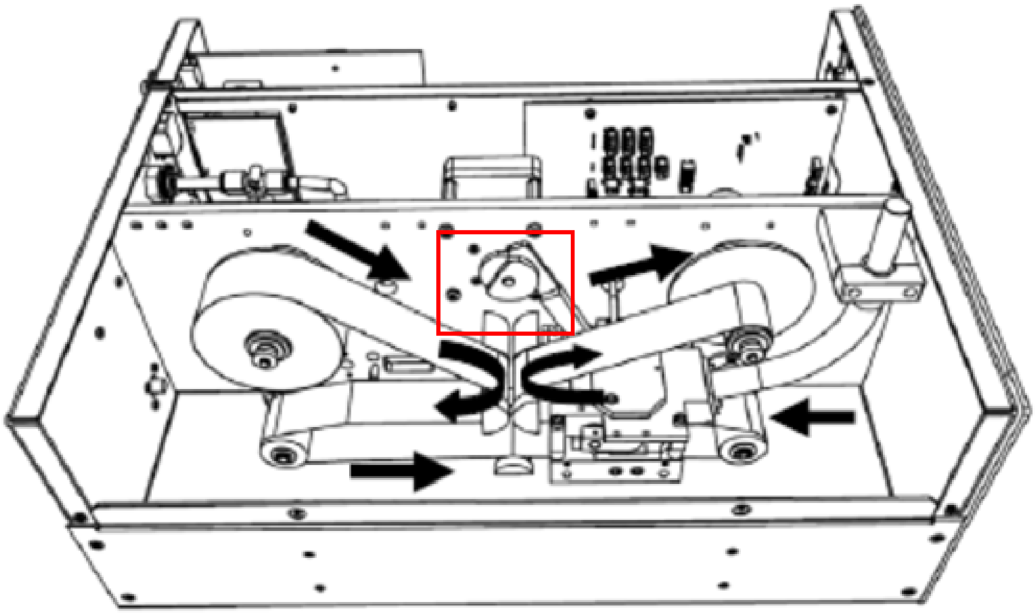


Figure 5. Filter Tape Assembly. The Cam is located in the center of the filter tape assembly.

The following procedure is used to replace the filter tape:

1) Remove left side cover;
2) From the main menu choose Instrument Controls > Filter Tape Control > Manual > **Bench(s)**. Press enter;
3) Loosen the reel nuts on the tape spindles. Remove the used filter tape and the empty tape spool from the tape spindles;
4) Insert the new filter tape on the left tape spindle (with the loose end of the tape pointing to the center when on top) and tighten the reel nut;
5) Insert the new blank pick up spool on the right tape spindle;
6) Route the tape from top of left spindle down to the left-center guide, then around the lower left roller, along the bottom to the lower right roller, up to the right-center guide, and up to the right spindle;
7) Attach the end of the tape to the blank tape spool on the right tape spindle with 2 inches of tape;
8) Turn the blank tape spool until there are two complete wrappings of tape and hand tighten the right reel nut;
9) From Filter Tape Control > Manual choose **Tape** and press enter to MOVE tape;
10) From the main menu choose Alarms > **Instrument Alarms** to verify there are no filter tape alarms; and
11) Replace left side cover.

6.5..8 Greasing the Cam

The cam should be checked every 3 months and greased if needed. To grease the cam, metal assembly paste should be applied to the perimeter of the cam. Dow Corning Molykote G-N metal assembly paste should be used. The cam is shown in centre of the Filter Tape Assembly in the above section and in Figure 5-6 on page 5-9.

6.5..9 Leak Test

The leak test should be conducted annually. This leak test procedure uses a volumetric flow meter and a custom leak check adapter. Use the following procedure to verify no leaks. Please refer to the **Technical Bulletin, 5014 and 5030 Leak Test Procedure** for more detailed information on leak test procedures.

1. Place a reference volumetric flow meter (e.g., Streamline Pro) onto the inlet adapter and calibrate the 5014i so that the reference flow meter and the 5014i monitor read the same flow rate.
2. Install the custom leak check adapter onto the inlet adapter and then place the reference flow meter onto the leak check adapter.

3. Record the reference volumetric flow meter reading and the instant flow reading. If the difference between both readings is less than 0.42 L/min (±2.5%), the leak check passes.

6.6 Calibration

To perform the calibration steps the analyzer will need to be put into “service mode”. See the manual **chapter 3, page 3-72 through 3-88**, for additional information on the service menu. To enter the service menu from the main menu:

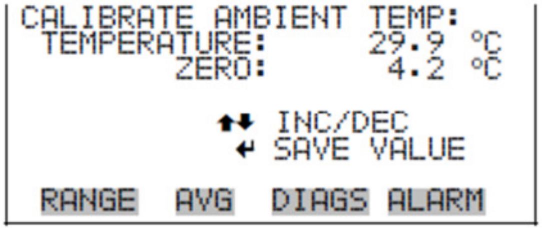
- choose Instrument controls < **Service Mode.**
- Go back to the main menu choose **service.**

It is recommended that Thermo Scientific monitors be calibrated annually as noted in **Chapter 4 “Calibration”** of the manual. The instruction manual details the procedures for **temperature and relative humidity (page 4-3), pressure (page 4-4), flow rate (page 4-7), mass coefficient (page 4-7) and detector calibration (page 4-12).** All screens referred to in this section are referenced in Chapter 3 of the operating manual.

Calibration is also recommended after any physical relocation, or following an interruption of more than a few days or any indication of monitor malfunction. A visual inspection of the monitor, where possible, and an assessment of the operating parameters of the monitor is recommended during each downloading session. A final leak check should be performed on the equipment after calibrations are performed.

6.6..1 Ambient Temperature

Using a NIST-traceable thermometer (Streamline Pro) as a reference collocated next to the ambient RH/temperature sensor assembly, measure and compare three individual readings between both the reference and the 5014i response. Taking an average of both sets of readings, calculate the average difference between the two readings and record that as your offset. This offset (ZERO) should now be entered in the screen below (Figure 6):



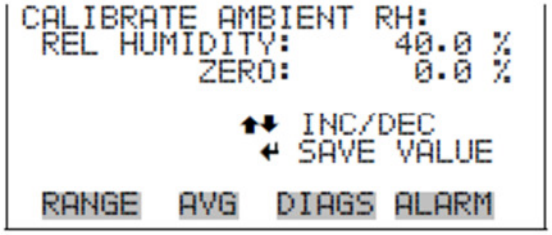
```
CALIBRATE AMBIENT TEMP:
 TEMPERATURE:     29.9 °C
       ZERO:       4.2 °C
```

Figure 6. Ambient Temperature Calibration Screen

Be sure to save the entry and compare the values once more. If it appears that the temperature has shifted into the wrong direction, change the sign of your offset value.

6.6..2 Ambient Relative Humidity

Using a NIST-traceable hygrometer as a reference collocated next to the ambient RH/temperature sensor assembly, measure and compare three individual readings between both the reference and the 5014i response. Taking an average of both sets of readings, calculate the average difference between the two readings and record that as your offset. This offset (ZERO) should now be entered in the screen below (Figure 7):



```
CALIBRATE AMBIENT RH:
 REL HUMIDITY:      40.0 %
         ZERO:       0.0 %

            ↑↓ INC/DEC
             ↵ SAVE VALUE

 RANGE   AVG   DIAGS ALARM
```

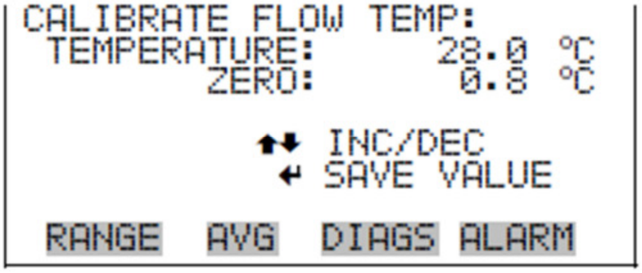
Figure 7. Ambient Relative Humidity Calibration Screen

Be sure to save the entry and compare the values once more. If it appears that the temperature has shifted into the wrong direction, change the sign of your offset value.

6.6..3 Flow Temperature

Assuming the instrument cover has been removed, the heater has been turned off and removed from the instrument and the instrument has been sampling room temperature air for 1 hour, this calibration can now proceed.

Using a NIST-traceable thermometer as a reference collocated next to the small sample tube inlet on top of the instrument, measure and compare three individual readings between both the reference and the 5014i response. Taking an average of both sets of readings, calculate the average difference between the two readings and record that as your offset. This offset (ZERO) should now be entered in the screen below (Figure 8):



```
CALIBRATE FLOW TEMP:
 TEMPERATURE:      28.0 °C
        ZERO:       0.8 °C

           ↑↓ INC/DEC
            ↵ SAVE VALUE

 RANGE   AVG   DIAGS ALARM
```

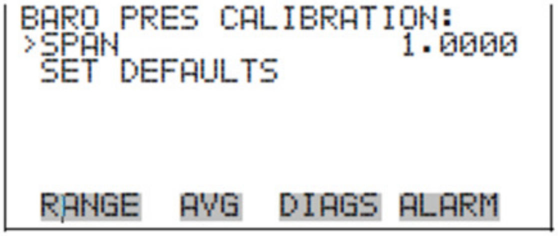
Figure 8. Flow Temperature Calibration screen

Be sure to save the entry and compare the values once more. If it appears that the temperature has shifted into the wrong direction, change the sign of your offset value.

6.6..4 Pressure/Vacuum Calibration

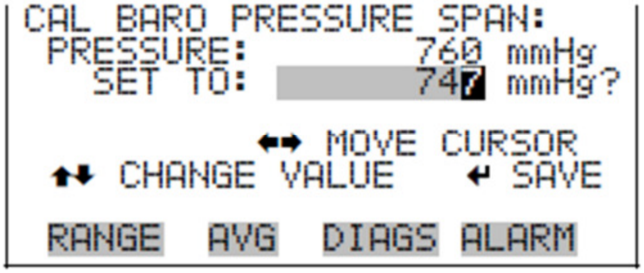
There are three pressure sensors that can be calibrated, however, the primary sensor to be calibrated is the barometric pressure sensor. Both the vacuum sensor and pressure flow sensors are re-zeroed automatically with every filter tape change.

Using a NIST-traceable barometer (Streamline Pro), measure the barometric pressure (and convert as necessary) in units of millimetres of mercury (mmHg). Use the SPAN feature from the barometric calibration submenu (Figure 9 and Figure 10).



```
BARO PRES CALIBRATION:
>SPAN                 1.0000
 SET DEFAULTS



 RANGE   AVG   DIAGS ALARM
```

Figure 9. Barometric SPAN menu



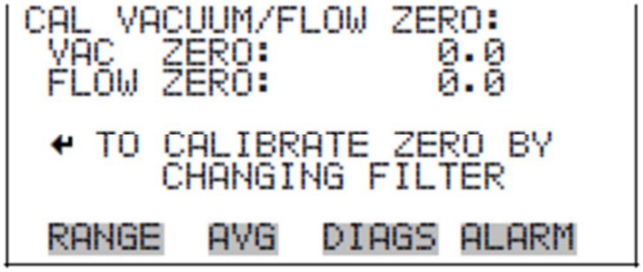
```
CAL BARO PRESSURE SPAN:
 PRESSURE:         760 mmHg
    SET TO:        747 mmHg?

           ←→ MOVE CURSOR
 ↑↓ CHANGE VALUE   ↵ SAVE

 RANGE   AVG   DIAGS ALARM
```

Figure 10. Barometric Pressure SPAN

Be sure to save the entry and compare the values once more. Repeat the calibration as necessary so that the pressure is within 2 mmHg.

6.6..5 Calibrate Vacuum/Flow Zero

The Calibrate Vacuum/Flow Zero screen calibrates the vacuum/flow sensor at zero value. This is done automatically with every filter tape change. However, if for any reason this needs to be done, proceed to the following screen below to execute a zeroing filter tape change (Figure 11).



```
CAL VACUUM/FLOW ZERO:
 VAC  ZERO:         0.0
 FLOW ZERO:         0.0

 ↵ TO CALIBRATE ZERO BY
      CHANGING FILTER

 RANGE   AVG   DIAGS ALARM
```

Figure 11. Barometric Pressure SPAN

The Calibrate Vacuum Pressure Span screen allows the user to view and set the vacuum sensor calibration span point. To calibrate the vacuum sensor, zero a digital manometer (capable of measuring up to 100 mmHg) to the +ΔP port on the rear panel. Then push the toggle switch on the right inward to open (see Figure 12. The manometer reading can now be used to calibrate the vacuum sensor.

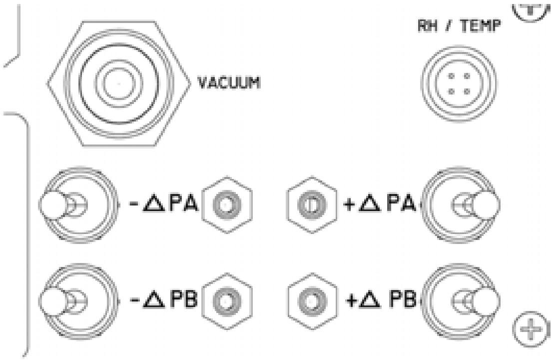
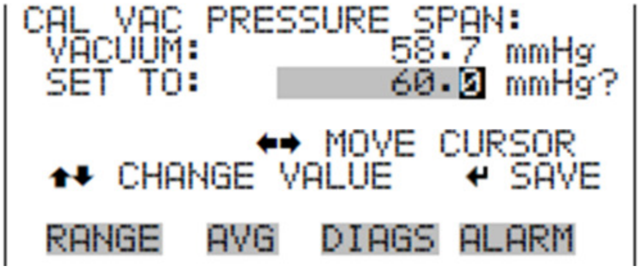


Figure 12. Differential Pressure and Vacuum Calibration Ports

- In the Main Menu, choose **Service** > **Pres/Vacuum Calibration** > **Vac/Flow** > **Vac Pres Span** (Figure 13).

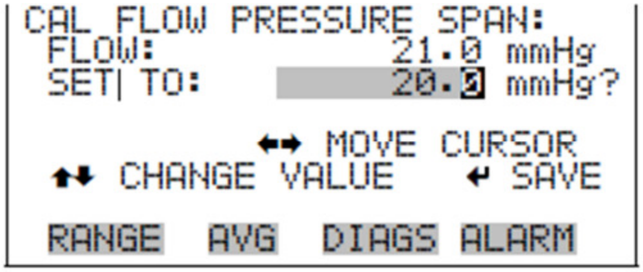


```
CAL VAC PRESSURE SPAN:
 VACUUM:            58.7 mmHg
 SET TO:            60.0 mmHg?

              ←→ MOVE CURSOR
 ↑↓ CHANGE VALUE      ↵ SAVE
```

Figure 13. Calibrate Vacuum Pressure

6.6..6 Calibrate Flow Pressure Span

The Flow Pressure Span screen allows the user to view and set the flow sensor calibration span point. To calibrate the flow pressure sensor span point, the instrument must by pulling an active flow through the filter tape. Connect the respective +/- ports of NIST-traceable manometer to the respective rear panel +/- ports. (Please be certain to zero any digital manometers prior to connecting!) Open the ports by pressing the toggle switches inward. Calculate an average reading from the reference manometer in units of mmHg. Enter this span value into the screen below (Figure 14):



```
CAL FLOW PRESSURE SPAN:
 FLOW:              21.0 mmHg
 SET| TO:           20.0 mmHg?

              ↔ MOVE CURSOR
 ↕ CHANGE VALUE     ↵ SAVE

 RANGE   AVG   DIAGS ALARM
```

Figure 14. Flow Pressure SPAN

- In the Main Menu, choose **Service** > **Pres/Vacuum Calibration** > **Vac/Flow** > **Flow Pres Span**.

Be sure to save the entry and compare the values once more. Repeat the calibration as necessary so that the pressure is within 2 mmHg.

6.6..7 Flow Calibration, Mass Calibration and Detector Calibration

Please follow the instructions in the operating manual, **pages 4-7 to 4-12.**

6.7 Data Download

6.7..1 Installing iPort

If iPort is not already set-up, install the program from the following filepath:

P:\DDMI Environment\10.0 Operational Control\10.5 Equipment\AQ TSP Units\iPort v1.4.1.39 setup

1) Open up File Explorer and browse to C:\Program Files (x86)\
2) Right-click on the “**Thermo**” folder and choose ‘Properties’
3) Click the ‘**Security**’ tab
4) Click ‘**Edit**’
5) If prompted, enter your username/password
6) Click ‘**Add**’
7) Click on ‘**Locations**’
8) Choose your computer name from the top of the list
9) Type “**Everyone**” in the box
10) Press ‘**OK**’
11) Choose “**Everyone**” from the list
12) Click the check box for ‘Full Control’ in the ‘Allow’ column
13) Press ‘**OK**’. Press ‘**OK**’
14) Transfer data from iPort

The above steps are required to be able to properly load data from the iPort program without Windows 7 blocking it.

6.7..2 Set-up iPort

1) Click **File** > **Preferences**.

2) On the right hand side of the box under 'Ethernet', it says 'Direct TCP/IP'. Check the 'Enable' box.
3) To the left of this section, 'Instruments', see 'Size' and select 'Full' (otherwise your remote connection will appear too tiny to read)
4) Press 'OK'
5) Click **Instrument** > **TCP Connect** > **IP Addresses**
6) Type in "10.164.72.53 10.164.72.52". There is a space between the two IP addresses; the left represents TSP-1 (Comm Shack AQ monitor) and the right represents TSP-2 (A154 Dyke AQ Monitor)

6.7..3 Data Download

Data is to be downloaded weekly after calibration for the first two months, then biweekly thereafter, using the iPort communication software. iPort is a program which allows complete remote access and control of the SHARP 5014i Beta TSP monitor. To download records:

- Select the pull down menu Instrument;
- Select Load Records starting at the date of the previous download; and
- Save the records by selecting Save to File and specify a file name.

The file will be stored in the iPort folder under the Program Files of the download computer (C:\Program Files (x86)\Thermo\iPort). Transfer the file to the appropriate data management location (on the P: drive in 13.7) and send to a qualified professional for QA and analysis purposes.

6.8 Encountered Issues

1. The screen is no longer functioning and unable to connect to the equipment.
   - Replace the motherboard, see **manual chapter 7, page 7-26.**
   - Power supply replaced.
2. Low beta count alarms and negative TSP concentrations.
   - Replace the detector amplifier assembly and the detector assembly and the, see **manual chapter 7, pages page 7-12 to 7-13 and 7-31 to 7-33** respectively.

6.8..1 Troubleshooting

The Instruction Manual for Model 5014*i* Beta should be referenced for alarm troubleshooting and other errors. However common issues are outlined in steps below:

6.8..2 Filter Tape Counter Alarm:

A filter tape alarm may be fixed by manually telling the filter tape to change using the following steps (see manual chapter 3, page 3-17 and 3-18):

1. Go to the main menu on the machine.
2. Choose ‘Instrument Controls’
3. Choose ‘Filter Tape Control’
4. Choose ‘Tape’

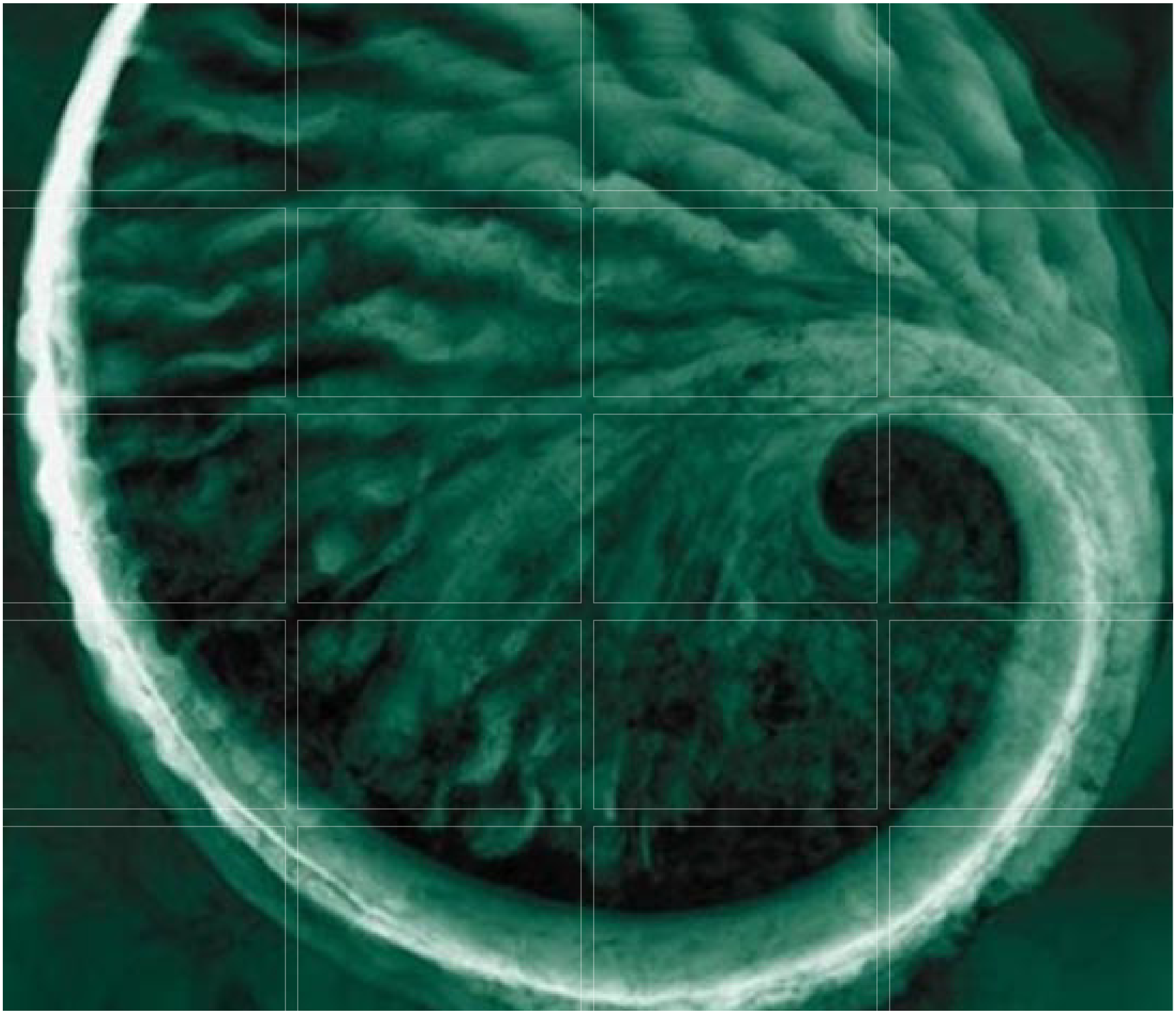
7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

Appendix D

2016 Diavik Dust Deposition Report



Prepared for:

DOMINION DIAMOND CORPORATION

Rio Tinto

Diavik Diamond Mine

DIAVIK DIAMOND MINE
2016 Dust Deposition Report

June 2017

The business of sustainability

ERM

Diavik Diamond Mines (2012) Inc.

DIAVIK DIAMOND MINE
2016 Dust Deposition Report

June 2017

Project #0207514-0013

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EXECUTIVE SUMMARY

Potential air and water quality concerns associated with airborne fugitive dust, which may result from Diavik Diamond Mine (the "Project") mining activities, were identified in the Diavik Diamond Mine Environmental Assessment (DDMI 1998). In accordance with the Environmental Assessment and requirements associated with the Aquatic Effects Monitoring Program (AEMP), a dust monitoring program was initiated in 2001. The program was designed to achieve the following objectives:

- determine dust deposition (dustfall) rates at various distances from the mine project footprint; and
- determine the chemical characteristics of dustfall that may be deposited onto, and subsequently into, Lac de Gras as a result of mining activities, in support of the AEMP.

In 2016, dustfall monitoring included three components, with sampling conducted at varying distances around the mine from 25 to 4,852 metres (m) away from infrastructure:

1. Dustfall gauges (10 monitoring and 2 control locations).
2. Dustfall from snow surveys (24 monitoring and 3 control locations).
3. Snow water chemistry from snow surveys (16 monitoring and 3 control locations).

A general reduction trend in dust levels was observed prior to 2016 for several years; however, dustfall rates were generally higher in 2016 than in 2015. Overall, as expected, dustfall rates decreased with distance from the Project, and areas that were predominantly downwind of the Project received more dustfall than upwind areas. As expected, Dust 10 had the highest recorded dustfall in 2016 (south of the Mine) and Dust 3 had the second highest recorded dustfall in 2016. Fugitive dust generation also was the greatest during snow-free periods where and when there is site activity. Dust 10 (downwind of the Mine) recorded the highest dustfall during the summer months (2,032 $mg/dm^2/y$) compared to the winter months (157 $mg/dm^2/y$).

Median dustfall estimated in 2016 was also higher than results in 2015 and 2014 and also decreased with distance from the Project. Annual dustfall estimated from each of the 12 dustfall gauges ranged from 45 to 799 $mg/dm^2/y$. The annualized dustfall rates estimated from the 2016 snow survey data ranged from 14 to 939 $mg/dm^2/y$. Although there are no dustfall standards for the Northwest Territories, 2016 dustfall rates were less than the 1.7 to 2.9 $mg/dm^2/d$ (621 to 1,059 $mg/dm^2/y$) documented in British Columbia (BC) Ministry of Environment former dustfall objective for the mining, smelting, and related industries (Diavik 2016). This objective used in the 2015 Dust Deposition Report is no longer used in BC.

Snow water chemistry analytes of interest included those variables with effluent quality criteria (EQC; i.e., aluminum, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite, and zinc) or a load limit (i.e., phosphorous) specified in the Type "A" Water Licence (W2015L2-0001, formerly W2007L2-0003). All 2016 sample concentrations were less than their associated reference levels as

specified by the “maximum concentration of any grab sample” specified in Water Licence W2015L2-0001. Concentrations of aluminum, arsenic, chromium, and nickel have generally increased in recent years, while concentrations of copper, lead, phosphorus and zinc have generally decreased in recent years. Typically, concentrations decreased with distance from the Project. High concentrations of certain variables of interest were recorded at Station SS3-6, located in the 0-100 m zone. However, concentrations of these variables were less than their corresponding EQC.

ACKNOWLEDGEMENTS

This report was prepared for Diavik Diamond Mines (2012) Inc. (DDMI) by ERM Consultants Canada Ltd. (ERM). Fieldwork and on site sample analyses were completed by DDMI, and other sample analyses were completed by Maxxam Analytics. Data analyses and reporting were completed by Philip Porter (P.Eng.) and reviewed by Daniel Casanova (B.Sc.). The report was also reviewed by Benjamin Beall (Ph.D.). The project was managed by Benjamin Beall and Marc Wen (M.Sc.) was the partner in charge.

DIAVIK DIAMOND MINE

2016 Dust Deposition Report

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GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AEMP	Aquatic effects monitoring program
BC	British Columbia
BC MOE	British Columbia Ministry of Environment
cm	Centimetre
d	Day
DDMI	Diavik Diamond Mines (2012) Inc.
DL	Detection limits
dm^2	Square decimetre
Dustfall	Dust deposition
EQC	Effluent quality criteria
ERM	ERM Consultants Canada Ltd.
L	Litre
m	Metre
mg	Milligram
QA/QC	Quality assurance and quality control
RPD	Relative percent difference
SOP	Standard operating procedure
the Project	Diavik Diamond Mine
WLWB	Wek’èezhìi Land and Water Board
y	Year
µg	Microgram

1. INTRODUCTION

Potential air and water quality concerns associated with airborne fugitive dust, which may result from Diavik Diamond Mine (the “Project”) mining activities, were identified in the Diavik Diamond Mine Environmental Assessment (DDMI 1998). In accordance with the Environmental Assessment and requirements associated with the Aquatic Effects Monitoring Program (AEMP), a dust monitoring program was initiated in 2001. The program was designed to achieve the following objectives:

- determine dust deposition (dustfall) rates at various distances from the mine project footprint; and
- determine the chemical characteristics of dustfall that may be deposited onto, and subsequently into, Lac de Gras as a result of mining activities, in support of the AEMP.

Since 2001, the dustfall monitoring program has gone through various changes, including an increase in the number of sampling locations, the relocation of some sampling stations, and improvements to the dustfall sampling methodology. A description of annual changes is provided in Appendix A. This report includes a comparison between the 2016 observations of dustfall to all site-specific data collected between 2002 and 2014. Appendix A of the Dust Deposition Report summarizes the amendments and additions to the dust fall monitoring program since 2001. Historical dustfall monitoring results have been presented each year in the *Diavik Diamond Mine Dust Deposition* reports from 2001 to 2015 (DDMI 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, and 2016). The historical data presented is not considered baseline because construction of the mine began in 2001.

2. METHODOLOGY

The 2016 dustfall monitoring program incorporated three monitoring components, with sampling completed at varying distances around the mine along five transects, including three control locations (Table 2-1, Figure 2-1):

1. Dustfall gauges (10 monitoring and 2 control locations).
2. Dustfall from snow surveys (24 monitoring and 3 control locations).
3. Snow water chemistry from snow surveys (16 monitoring and 3 control locations).

2.1 DUSTFALL GAUGES

Dustfall gauges were placed at 12 stations (including two control stations) around the Project at distances ranging from approximately 25 to 4,852 metres (m) from mining operations (Table 2-1). Each gauge collected dustfall year-round, with samples were collected every three months. The average total sampling period for the 12 locations was 369 days.

Dustfall gauges consisted of a hollow brass cylinder (52 centimetres (cm) length, 12.5 cm inner diameter) housed in a Nipher snow gauge (Plate 2.1-1). The cylinder collected dustfall, while the Nipher snow gauge reduced air turbulence around the gauge to increase dustfall catch efficiency. The cylinder was exchanged with an empty, clean cylinder at the end of each sampling period, and the content of the cylinder that was retrieved was processed in the Diavik Diamond Mines (2012) Inc. (DDMI) environment lab to determine the mass of collected dustfall. This processing involved filtration, drying in a high heat oven, and weighing of samples as specified in the Dust Gauge Collection Standard Operating Procedure (SOP; ENVR-508-0112; Appendix E) and the Quality Assurance/Quality Control SOP (ENVR-303-0112; Appendix G).

Once the mass of collected dustfall at a station was measured, the mean daily dustfall rate over the collection period was calculated as:

$$D = \frac{M}{A * T} \qquad \text{[Equation 1]}$$

where:

D = mean daily dustfall rate (mg/dm^2/d) during time period T
M = mass of dustfall collected (mg) during time period T
A = surface area of dustfall gauge collection cylinder orifice (dm^2; approximately 1.227 dm^2)
T = number of days of dustfall collection (d)

The mean daily dustfall rate (mg/dm^2/d) was then multiplied by 365 days to estimate the mean annual dustfall rate (mg/dm^2/y).

Table 2-1. Dustfall and Snow Water Chemistry Sampling Locations, Diavik Diamond Mine, 2016

Transect Line	Station ID	2016 Sampling Dates	Total Sample Exposure Duration (days)	UTM Coordinates[1]		Approx. Distance from Mining Operations (m)	Surface Description	Snow Water Chemistry Sampled[2]
				Easting (m)	Northing (m)			
Dustfall Gauges								
	Dust 1	Mar 31, Jul 7, Sep 25, Jan 4	369	533964	7154321	75	Land	n/a
	Dust 2A	Mar 30, Jul 8, Sep 26, Jan 4	368	535678	7151339	435	Land	n/a
	Dust 3	Mar 30, Jul 8, Sep 25, Jan 4	368	535024	7151872	30	Land	n/a
	Dust 4	Apr 1, Jul 8, Sep 28, Jan 6	371	531397	7152127	200	Land	n/a
	Dust 5	Mar 30, Jul 23 Sep 24, Jan 4	369	535696	7155138	1,195	Land	n/a
	Dust 6	Mar 31, Jul 8, Sep 25, Jan 3	369	537502	7152934	25	Land	n/a
	Dust 7	Mar 30, Jul 9, Sep 26, Jan 6	371	536819	7150510	1,155	Land	n/a
	Dust 8	Apr 1, Jul 23, Sep 24, Jan 3	367	531401	7154146	1,220	Land	n/a
	Dust 9	Mar 30, Jul 17, Sep 26, Jan 4	368	541204	7152154	3,810	Land	n/a
	Dust 10	Mar 30, Jul 7, Sep 28, Jan 6	371	532908	7148924	46	Land	n/a
	Dust C1	Apr 1, Jul 20, Sep 26, Jan 6	371	534979	7144270	4,700	Land	n/a
	Dust C2	Apr 1, Jul 23, Sep 24, Jan 4	369	528714	7153276	3,075	Land	n/a
Snow Surveys								
1	SS1-1	Apr 3	196	533911	7154288	30	Land	
	SS1-2-4[3]	Apr 3	196	533924	7154367	115	Land	
	SS1-2-5[3]	Apr 3	196	533924	7154367	115	Land	
	SS1-3	Apr 3	196	533966	7154517	275	Land	
	SS1-4	Apr 3	196	534485	7155094	920	Ice	✓
	SS1-5	Apr 3	162	535099	7156279	2,180	Ice	✓
2	SS2-1	Apr 14	162	537553	7153473	180	Ice	✓
	SS2-2	Apr 14	162	537829	7153476	445	Ice	✓
	SS2-3	Apr 14	162	538484	7153939	1,220	Ice	✓
	SS2-4	Mar 31	162	539151	7154685	2,180	Ice	✓

(continued)

Table 2-1. Dustfall and Snow Water Chemistry Sampling Locations, Diavik Diamond Mine, 2015 (completed)

Transect Line	Station ID	2015 Sampling Dates	Total Sample Exposure Duration (days)	UTM Coordinates[1]		Approx. Distance from Mining Operations (m)	Surface Description	Snow Water Chemistry Sampled[2]
				Easting (m)	Northing (m)			
Snow Surveys *(cont'd)*								
3	SS3-4	Apr 5	164	536585	7151002	615	Ice	✓
	SS3-5-4[3,5]	Apr 5	164	537623	7150817	1,325	Ice	✓
	SS3-5-5[3,6]	Apr 5	164	537623	7150817	1,325	Ice	✓
	SS3-6[7]	Apr 5	164	536305	7151564	60	Ice	✓
	SS3-6-EBW[4]	Apr 5	164	536305	7151564	60	Ice	✓
	SS3-7	Apr 5	164	536344	7151366	250	Ice	✓
	SS3-8	Apr 5	164	536688	7150810	830	Ice	✓
4	SS4-1-4[3]	Apr 7	200	531491	7152211	100	Land	
	SS4-1-5[3]	Apr 7	200	531491	7152211	100	Land	
	SS4-2	Apr 7	200	531356	7152261	245	Land	
	SS4-3	Apr 7	200	531331	7152434	350	Land	
	SS4-4	Apr 7	166	531141	7153167	1,065	Ice	✓
	SS4-5-	Apr 7	166	531405	7154116	1,220	Ice	✓
5	SS5-1	Apr 6	199	533150	7148925	45	Land	
	SS5-2	Apr 6	199	533150	7148875	95	Land	
	SS5-3	Apr 6	165	533150	7148700	270	Ice	✓
	SS5-4	Apr 6	165	533150	7147950	1,021	Ice	✓
	SS5-5-4[3]	Apr 6	165	533150	7146950	2,020	Ice	✓
	SS5-5-5[3]	Apr 6	165	533150	7146950	2,020	Ice	✓
	Control 1	Apr 6	192	534983	7144271	4,852	Land	✓[8]
	Control 2	Apr 7	190	528714	7153281	3,075	Land	✓[8]
	Control 3	Apr 5	187	538650	7148750	3,570	Land	✓[8]

[1] *UTM Zone 12W, NAD83*

[2] *n/a = not applicable*

[3] *Duplicate sample taken for snow water chemistry.*

[4] *Blank sample taken for snow water chemistry.*

[5] *Moved coordinate 20 m to avoid Ice Road*

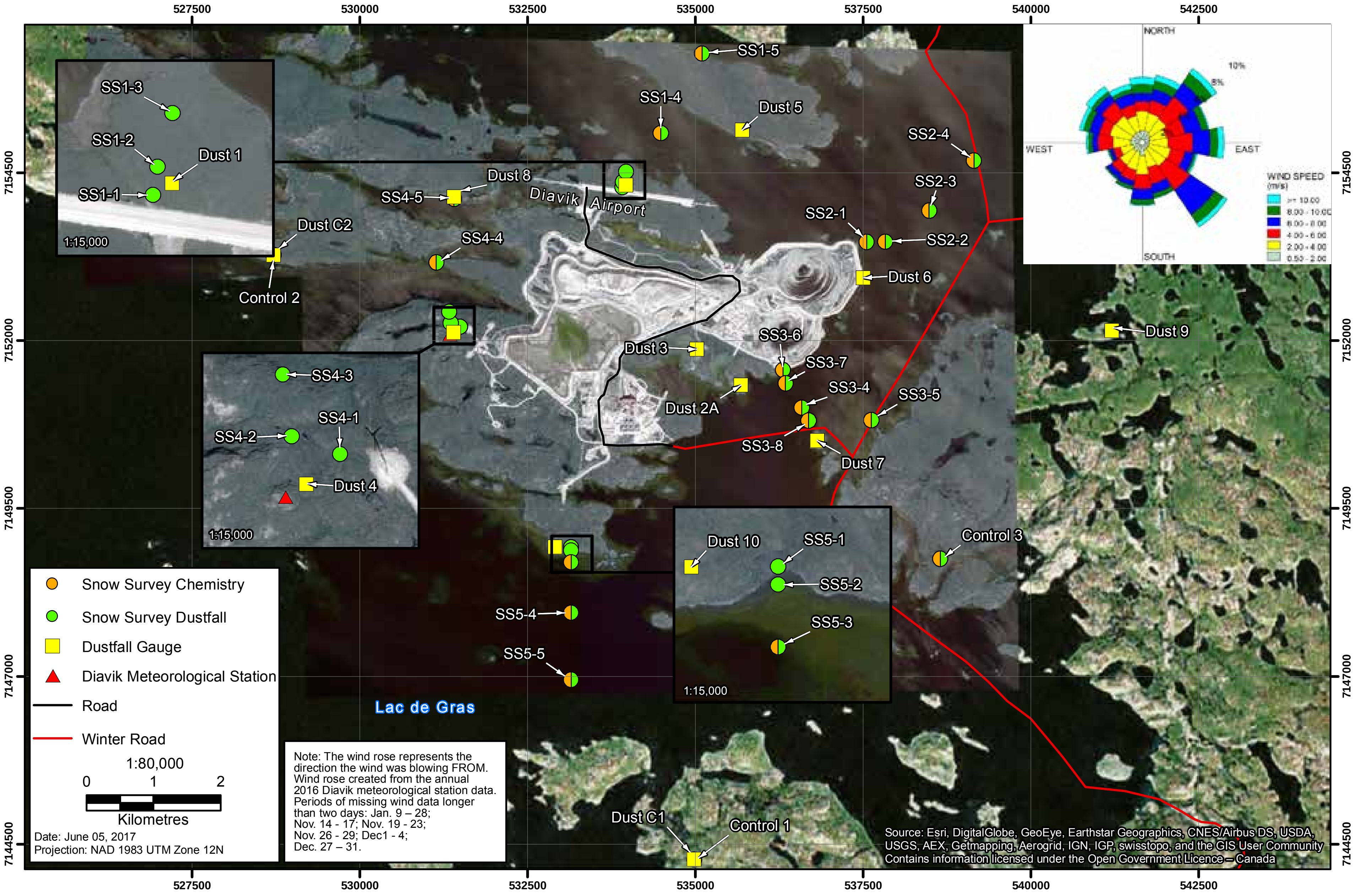
[6] *Moved coordinate 20 m to avoid Ice Road*

[7] *Moved coordinate 60 m to avoid Dike Road*

[8] *Snow water chemistry sampled over ice, adjacent to the on-land control station; see Section 2.3 for further details.*

Figure 2-1

Dustfall Gauge and Snow Survey Locations, Diavik Diamond Mine, 2016



Date: June 05, 2017
Projection: NAD 1983 UTM Zone 12N

Note: The wind rose represents the direction the wind was blowing FROM. Wind rose created from the annual 2016 Diavik meteorological station data. Periods of missing wind data longer than two days: Jan. 9 – 28; Nov. 14 - 17; Nov. 19 - 23; Nov. 26 - 29; Dec1 - 4; Dec. 27 – 31.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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DIAVIK DIAMOND MINES (2012) INC.

Proj # 0207514-0013 | GIS # DIA-12-009

Plate 2.1-1. Dustfall gauge during sample collection. The dustfall gauge consisted of a hollow brass cylinder (centre) housed inside a Nipher snow gauge (right).

Estimated dustfall rates were compared to the former British Columbia Ministry of Environment (BC MOE) dustfall objectives for the mining, smelting and related industries (Table 2.1-1; Diavik 2016). The dustfall objective is no longer used in BC; however, for the purposes of this report, dustfall will be compared to the former objective to be consistent with prior dust deposition reports. The dustfall objectives ranged from 1.7 to 2.9 milligram per square decimetre per day ($mg/dm^2/d$), averaged over 30 days. The 1.7 $mg/dm^2/d$ objective was often considered to be applicable at sensitive locations whereas the 2.9 $mg/dm^2/d$ objective was applicable to areas where it can be shown that unacceptably deleterious changes will not follow. Both values are presented throughout this report. Snow water chemistry data were compared to effluent quality criteria (EQC) set out in Wek'èezhìi Land and Water Board (WLWB) Water Licence W2015L2-0001 (formerly W2007L2-0003).

Table 2.1-1. Dustfall and Snow Water Chemistry Reference Values

Parameter	Value	Unit	Comment	Source
Dustfall Rate	1.7–2.9 (621–1,059)	$mg/dm^2/d$ ($mg/dm^2/y$)	Former objective for the mining, smelting, and related industries	Diavik 2016
Aluminum-Total	3,000	µg/L	Max. grab sample concentration	W2015L2-0001
Ammonia-N	12,000	µg/L	Max. grab sample concentration	W2015L2-0001
Arsenic-Total	100	µg/L	Max. grab sample concentration	W2015L2-0001
Cadmium-Total	3	µg/L	Max. grab sample concentration	W2015L2-0001
Chromium-Total	40	µg/L	Max. grab sample concentration	W2015L2-0001
Copper-Total	40	µg/L	Max. grab sample concentration	W2015L2-0001
Lead-Total	20	µg/L	Max. grab sample concentration	W2015L2-0001
Nickel-Total	100	µg/L	Max. grab sample concentration	W2015L2-0001
Nitrite-N	2,000	µg/L	Max. grab sample concentration	W2015L2-0001
Zinc-Total	20	µg/L	Max. grab sample concentration	W2015L2-0001

2.2 DUSTFALL SNOW SURVEYS

Dustfall snow surveys were performed at 27 stations (including three control stations), along five transects around the Project (Table 2-1 and Figure 2-1). Across stations, the distance from mining operations ranged from approximately 30 to 4,852 m and the average total sampling period in 2016 was 179 days. The start dates correspond to the first snowfall for land stations (September 20, 2015), and shortly after ice freeze up for ice stations (October 24, 2015).

At each snow survey station, a snow corer was used to drill into the snow pack to retrieve a cylindrical snow core (6.1 cm inner diameter; Plate 2.2-1). Cores were extracted at each station and composited in the field to ensure a representative snow sample was obtained for the station. A minimum of three snow cores were collected at each (land and ice) of the snow sampling stations, as outlined in the Snow Core Survey SOP (ENVR-512-0213; Appendix F). Composited samples were bagged and brought to the DDMI environment lab for processing as specified in the Snow Core Survey SOP (ENVR-512-0213; Appendix F) and the Quality Assurance/Quality Control SOP (ENVR-303-0112; Appendix G). Processing of snow cores involved filtration, drying in a high heat oven and weighing. For quality assurance and control, duplicate samples were collected at stations SS1-2 and SS4-1.

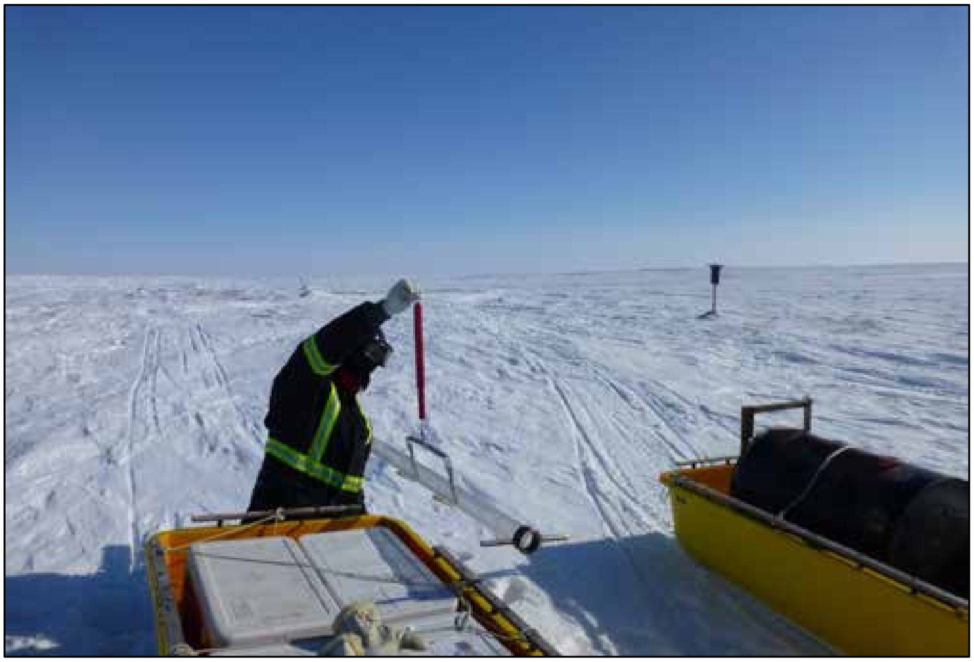


Plate 2.2-1. Snow core sample being weighed, with dustfall gauge in background.

Mean daily dustfall rate (mg/dm^2/d) was then calculated over the collection period using Equation 1, with surface area (A) equal to the surface area of the snow corer tube orifice (0.2922 dm^2) multiplied by the number of snow cores used for the composited sample at the station. The mean annual dustfall rate (mg/dm^2/y) was estimated by multiplying the mean daily dustfall rate by 365 days.

Dustfall rates were compared to the former BC dustfall objective for the mining, smelting and related industries (Table 2.1-1), for comparison purposes only.

2.3 SNOW WATER CHEMISTRY

Snow water chemistry analysis was performed on snow cores extracted from 19 locations (including three control locations; Table 2-1 and Figure 2-1). These locations included the 16 dustfall snow survey stations that were located on ice, as well as samples taken on ice adjacent to the three control stations. Across stations, the distance from mining operations ranged from approximately 60 m to 4,852 m and the average total sampling period in 2016 was 179 days. At each station located over water, cores were collected for chemistry analysis immediately after the dustfall snow cores were extracted.

Snow water chemistry cores were extracted using a snow corer in accordance with the dustfall snow survey core extraction. A minimum of three cores at each site were extracted and composited to obtain the necessary 3 litres (L) of snow water required for the laboratory chemical analysis as required (see Appendix F). Snow cores were then processed and prepared for shipment to Maxxam where the chemical analysis was performed. For quality assurance and control purposes, duplicate samples were collected at stations SS3-5and SS5-5, and an equipment blank sample was collected at station SS3-6. Snow water chemistry sampling methodology is detailed in SOP ENVR-512-0213 (see Appendix F).

EQC, including “maximum average concentration” and “maximum concentration of any grab sample,” are stipulated in DDMI’s Water Licence (W2015L2-0001) for aluminium, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite, and zinc (Table 2.1-1). Snow water chemistry results for these variables were compared to the “maximum concentration of any grab sample.” These results are also presented as part of DDMI’s Aquatic Effects Monitoring Program (AEMP) report.

3. RESULTS

Dustfall and snow water chemistry results were grouped into zones based on their relative distance from the mine footprint (see Table 3.1-1). Although station groupings into zones were first established at the outset of the program, these groupings were re-established in 2013 using satellite imagery of the site.

In 2016, the primary sources of fugitive dust were associated with unpaved road and airstrip usage and construction activities at A21. Due to construction activities at A21, the distance to mining operations decreased for dustfall stations Dust 10, SS5-1, SS5-2, SS5-3, SS5-4, SS5-5, Dust C1 and Control 1. The revised distances to mining operations are shown in Table 2-1. Dust 10 station was 670 m from mining operations in previous years, butwas 46 m from mining operations in 2016. Major waste rock material transfers in 2016 occurred at the A21 Stock Pile (1,449,000 tonnes), A21 Dike (1,879,000 tonnes), on haul roads (504,000 tonnes) and at the crusher (1,765,000 tonnes). Another source of fugitive dust is truck traffic along the ice road to the Project. However, the consistency in dust deposition rates near the ice road alignment between winter and summer indicated that the contributions of dust from the ice road were modest relative to other sources. There is no direct measurement of dustfall due to the use of the ice road; however, dustfall stations immediately downwind of the ice road such as Dust 7, Dust 6, and SS2-4 did not show elevated readings during winter months. To supress dust generation, roads, parking areas and laydown areas were watered during the summer as needed. Between May and September 2016, approximately 2,015 m^3 of water was applied on the Project site and 67,608 m^3 of water was applied on haul roads. The exact impact of dust suppression could not be determined from the data collected in 2016; however, it is very likely that road watering reduced the amount of dust generated at the Mine in 2016. Mine production rate was steady throughout the year, and all mining occurred underground. Fugitive dust generation is expected to be greatest during snow-free periods where and when there is site activity. It was expected that the highest fugitive dust generation and resulting dustfall occurred in areas closest to the mine footprint such as near A21 and the country rock pile between May and September. Dust 10 (downwind of the Mine, southwest, and adjacent to A21 mining operations) recorded the highest dustfall during the summer months (2,032 $mg/dm^2/y$) compared to the winter months (157 $mg/dm^2/y$).

The 2016 predominant wind directions at the site were from the southeast, east, and northeast, and there are also strong winds from the northwest. The expectation is that airborne material will be deposited primarily northwest, west, and southwest of the mine. This is supported by the fact that Dust 10 had the highest recorded dustfall in 2016 (south of the Mine) and Dust 3 had the second highest recorded dustfall in 2016 which is surrounded by mining operations on nearly all cardinal directions except for the southeast (see Figure 3.1-1).

Results from the dustfall gauges, dustfall snow surveys, and the snow water chemistry analysis are presented below.

3.1 DUSTFALL GAUGES

Total dustfall collected from each dustfall gauge throughout the year is summarized in Table 3.1-1; annual 2016 dustfall for each station at its location relative to the Project is presented in Figure 3.1-1; the historical records of annual dustfall for each station are presented in Figures 3.1-2 and 3.1-3. A comparison of 2016 dustfall versus distance from the mine footprint is presented in Figure 3.1-4. Boxplots summarizing the dustfall magnitude distribution measured in each year are presented in Figure 3.1-5. Detailed information on 2016 measurements and calculations for each station are included in Appendix B.

In general, dustfall decreased with increasing distance from the Project (Table 3.1-1 and Figure 3.1-1 to 3.1-4); however, the greatest estimated dustfall rate measured using gauges occurred at Dust 10, 46 m from the Project. Dust 10 measured dustfall in 2016 was 799 mg/dm^2/y. Dust 10 is southwest of the Project footprint and adjacent to A21 mining activities and snow surveys near Dust 10 also showed higher dustfall values (SS5-1 dustfall was 457 mg/dm^2/y in 2016). It is likely that northerly winds blew dust from the Project south during 2016. The second highest estimated dustfall rate measured using gauges occurred at Dust 3 (721 mg/dm^2/y) which recorded the highest dustfall in 2015 and is located 30 m from the Project. The lowest dustfall rate was measured at the Dust C1 (control station; 4,700 m west; 45 mg/dm^2/y) while the other control station, Dust C2 (3,075 m south), recorded the third lowest measured dustfall (185 mg/dm^2/y; Table 3.1-1; Figures 3.1-3 and 3.1-4).

Dustfall rates estimated from dustfall gauges in 2016 were generally less than historical dustfall rate estimates (Figures 3.1-2 to 3.1-4); however, average dustfall was higher in 2016 than in 2015, 2014 and 2013. Comparisons of mean and maximum dustfall values suggest that dustfall rates are increasing at the Project as mine activity increases; however, are well within the range of dustfall rates recorded for the Project (Figures 3.1-4 and 3.1-5).

The annualized dustfall rates estimated from gauges at each station were less than the former BC objective for the mining industry (621 to 1,059 mg/dm^2/y; Figures 3.1-2 to 3.1-4). This former objective was used for comparison purposes only: there are currently no standards or objectives for the Northwest Territories. However, the BC objective was generally used as a standard for comparison at other mines in the region.

3.2 DUSTFALL SNOW SURVEYS

Annual dustfall rates estimated from each snow survey station in 2016 are summarized in Table 3.1-1. Historical records of annual snow survey dustfall rates for each station are presented in Figures 3.1-2 and 3.1-3. The relationships between annual snow survey dustfall rates and distance from the mine footprint are shown in Figures 3.1-1 and 3.1-4. Boxplots summarizing dustfall rates measured in each year are presented in Figure 3.1-5. 2016 snow survey field datasheets and laboratory results are included in Appendix B. Duplicate samples were collected at stations SS1-2 and SS4-1 for QA/QC purposes and are discussed in Section 3.4.

Table 3.1-1. Dustfall and Snow Water Chemistry Results, Diavik Diamond Mine, 2016

				Snow Water Chemistry (μg/L)										
Zone	Station	Approx. Distance from 2016 Project Footprint (m)	Dustfall (mg/dm^2/y) (621 – 1,059)	Aluminum (3,000)	Ammonia (12,000)	Arsenic (100)	Cadmium (3)	Chromium (40)	Copper (40)	Lead (20)	Nickel (100)	Nitrite (2,000)	Phosphorous (n/a)	Zinc (20)
0-100 m	Dust 1	75	462	-	-	-	-	-	-	-	-	-	-	-
	Dust 3	30	721	-	-	-	-	-	-	-	-	-	-	-
	Dust 6	25	486	-	-	-	-	-	-	-	-	-	-	-
	Dust 10	46	799	-	-	-	-	-	-	-	-	-	-	-
	SS1-1	30	939	-	-	-	-	-	-	-	-	-	-	-
	SS3-6	60	323	2,710	n/a	0.44	0.036	20	5.0	3.1	38	7.3	100	19
	SS4-1	100	195	-	-	-	-	-	-	-	-	-	-	-
	SS5-1	45	457	-	-	-	-	-	-	-	-	-	-	-
	SS5-2	95	158	-	-	-	-	-	-	-	-	-	-	-
	Mean (SD)		**504 (268)**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
	95% Confidence Interval on Mean (Lower – Upper Limit)		**206 (298 – 711)**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
	Median		**462**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
101-250 m	Dust 4	200	134	-	-	-	-	-	-	-	-	-	-	-
	SS1-2	115	243	-	-	-	-	-	-	-	-	-	-	-
	SS2-1	180	61	192	n/a	0.08	*0.0025*	1.3	0.31	0.30	2.2	*2.0*	12	2.2
	SS3-7	250	315	1,390	n/a	0.17	0.037	9.3	4.3	1.6	17	3.6	64	10
	SS4-2	245	153	-	-	-	-	-	-	-	-	-	-	-
	Mean (SD)		**181 (99)**	**791 (847)**	**n/a**	**0.12 (0.059)**	**0.02 (0.02)**	**5.3 (5.7)**	**2.3 (2.8)**	**0.96 (0.93)**	**9.4 (10.3)**	**2.8 (1.1)**	**37.7 (36.7)**	**6.1 (5.5)**
	95% Confidence Interval on Mean (Lower – Upper Limit)		**123 (58 – 304)**	**7,611 (0.0 – 8402)**	**n/a**	**0.53 (0.0 – 0.65)**	**0.22 (0.0 – 0.24)**	**51 (0.0 - 56.3)**	**25.1 (0.0 – 27.4)**	**8.4 (0.0 – 9.4)**	**92.2 (0.0 – 101.6)**	**10.2 (0.0 – 13.0)**	**329.7 (0.0 – 367.4)**	**49.4 (0.0 – 55.5)**
	Median		**99**	**791**	**n/a**	**0.12**	**0.02**	**5.3**	**2.3**	**0.96**	**9.4**	**2.8**	**37.7**	**6.1**
251-1,000 m	Dust 2A	435	350	-	-	-	-	-	-	-	-	-	-	-
	SS1-3	275	259	-	-	-	-	-	-	-	-	-	-	-
	SS1-4	920	59	200	n/a	0.072	*0.0025*	1.0	0.29	0.24	1.5	*2.0*	9.4	2.0
	SS2-2	445	86	173	n/a	0.047	*0.0025*	1.2	0.33	0.21	1.4	2.1	8.2	2.1
	SS3-4	615	291	1,590	n/a	0.22	0.018	10	2.6	1.6	18	6.7	57	10
	SS3-8	830	840	2,260	n/a	0.31	0.031	16	5.5	3.0	31	8.3	109	15
	SS4-3	350	216	-	-	-	-	-	-	-	-	-	-	-
	SS5-3	270	131	818	n/a	0.18	0.006	4.3	1.7	0.82	6.4	2.8	30.6	5.1
	Mean (SD)		**279 (248)**	**1,008 (907)**	**n/a**	**0.2 (0.1)**	**0.012 (0.012)**	**6.6 (6.6)**	**2.1 (2.2)**	**1.2 (1.1)**	**11.6 (12.7)**	**4.4 (2.9)**	**42.8 (41.9)**	**6.9 (5.8)**
	95% Confidence Interval on Mean (Lower – Upper Limit)		**208 (71 – 487)**	**1,127 (0.0 – 2,135)**	**n/a**	**0.1 (0.0 – 0.3)**	**0.015 (0.0 – 0.027)**	**8.2 (0.0 – 14.8)**	**2.7 (0.0 – 4.8)**	**1.4 (0.0 – 2.6)**	**15.8 (0.0 – 27.4)**	**3.6 (0.8 – 8.0)**	**52.1 (0.0 – 94.8)**	**7.2 (0.0 – 14.1)**
	Median		**237**	**818**	**n/a**	**0.2**	**0.006**	**4.3**	**1.7**	**0.8**	**6.4**	**2.8**	**30.6**	**5.1**

(continued)

Table 3.1-1. Dustfall and Snow Water Chemistry Results, Diavik Diamond Mine, 2016 (completed)

				Snow Water Chemistry (µg/L)										
Zone	Station	Approx. Distance from 2016 Project Footprint (m)	Dustfall (mg/dm^2/y) (621 – 1,059)	Aluminum (3,000)	Ammonia (12,000)	Arsenic (100)	Cadmium (3)	Chromium (40)	Copper (40)	Lead (20)	Nickel (100)	Nitrite (2,000)	Phosphorous (n/a)	Zinc (20)
1,001-2,500 m	Dust 5	1,195	81	-	-	-	-	-	-	-	-	-	-	-
	Dust 7	1,155	213	-	-	-	-	-	-	-	-	-	-	-
	Dust 8	1,220	199	-	-	-	-	-	-	-	-	-	-	-
	Dust 9	3,810	63	-	-	-	-	-	-	-	-	-	-	-
	SS1-5	2,180	70	387	n/a	0.47	*0.0025*	1.8	0.42	0.39	2.2	2.9	13	3.1
	SS2-3	1,220	45	123	n/a	0.067	*0.0025*	0.76	0.24	0.20	1.0	*2.0*	7.4	1.9
	SS2-4	2,180	25	118	n/a	0.05	*0.0025*	0.79	0.32	0.14	0.92	*2.0*	7.4	2.0
	SS3-5	1,325	170	1,620	n/a	0.19	0.019	11.7	2.9	1.7	20.9	4.0	49	12
	SS4-4	1,065	168	623	n/a	0.13	0.0050	3.8	1.3	0.72	6.4	2.8	28	4.7
	SS4-5	1,220	141	650	n/a	0.13	0.006	3.0	1.4	0.68	4.0	*2.0*	31	4.9
	SS5-4	1,021	38	256	n/a	0.14	*0.0025*	1.8	0.36	0.26	2.4	2.0	5.5	2.2
	SS5-5	2,020	18	31	n/a	0.010	*0.0025*	0.79	0.09	0.08	0.61	*2.0*	11	1.3
	Mean (SD)		**103 (71)**	**476 (517)**	**n/a**	**0.15 (0.14)**	**0.0053 (0.0057)**	**3.0 (3.7)**	**0.88 (0.95)**	**0.52 (0.52)**	**4.8 (6.8)**	**2.5 (0.73)**	**19.0 (15.6)**	**4.0 (3.4)**
	95% Confidence Interval on Mean (Lower – Upper Limit)		**45 (58 – 148)**	**432 (44 – 908)**	**n/a**	**0.12 (0.03 – 0.27)**	**0.0048 (0.0005 – 0.010)**	**3.1 (0.0 – 6.1)**	**0.79 (0.089 – 1.7)**	**0.43 (0.083 – 0.95)**	**5.7 (0.0 – 10.5)**	**0.61 (1.9 – 3.1)**	**13.1 (5.9 – 32.0)**	**2.9 (1.1 – 6.9)**
	Median		**76**	**322**	**n/a**	**0.13**	**0.0025**	**1.8**	**0.39**	**0.33**	**2.3**	**2.0**	**11.6**	**2.7**
Control	Dust C1	4,700	45	-	-	-	-	-	-	-	-	-	-	-
	Dust C2	3,075	185	-	-	-	-	-	-	-	-	-	-	-
	CONTROL 1	4,852	14	85	n/a	0.023	*0.0025*	0.46	0.083	0.11	0.72	*2.0*	7.6	1.4
	CONTROL 2	3,075	60	413	n/a	0.086	*0.0025*	2.6	0.68	0.40	3.9	*2.0*	15	3.4
	CONTROL 3	3,570	38	245	n/a	0.048	*0.0025*	1.6	0.46	0.31	2.4	*2.0*	9.6	2.3
	Mean (SD)		**68 (67)**	**248 (164)**	**n/a**	**0.052 (0.048)**	**n/a**	**1.5 (1.1)**	**0.41 (0.30)**	**0.27 (0.15)**	**2.4 (1.6)**	**2.0 (0.0)**	**10.8 (4.0)**	**2.4 (1.0)**
	95% Confidence Interval on Mean (Lower – Upper Limit)		**84 (0.0 – 152)**	**407 (0 – 655)**	**n/a**	**0.032 (0.0 – 0.13)**	**n/a**	**2.7 (0.0 – 4.2)**	**0.75 (0.0 – 1.2)**	**0.38 (0.0 – 0.65)**	**4.0 (0.0 – 6.4)**	**n/a**	**9.9 (0.9 – 20.8)**	**2.5 (0.0 – 4.9)**
	Median		**45**	**245**	**n/a**	**0.048**	**n/a**	**1.6**	**0.46**	**0.31**	**2.4**	**2.0**	**9.6**	**2.3**
Reference Levels[a]			**621 – 1,059**	**3,000**	**12,000**	**100**	**3.0**	**40**	**40.0**	**20.0**	**100**	**2,000.0**	**n/a**	**20.0**

Notes:

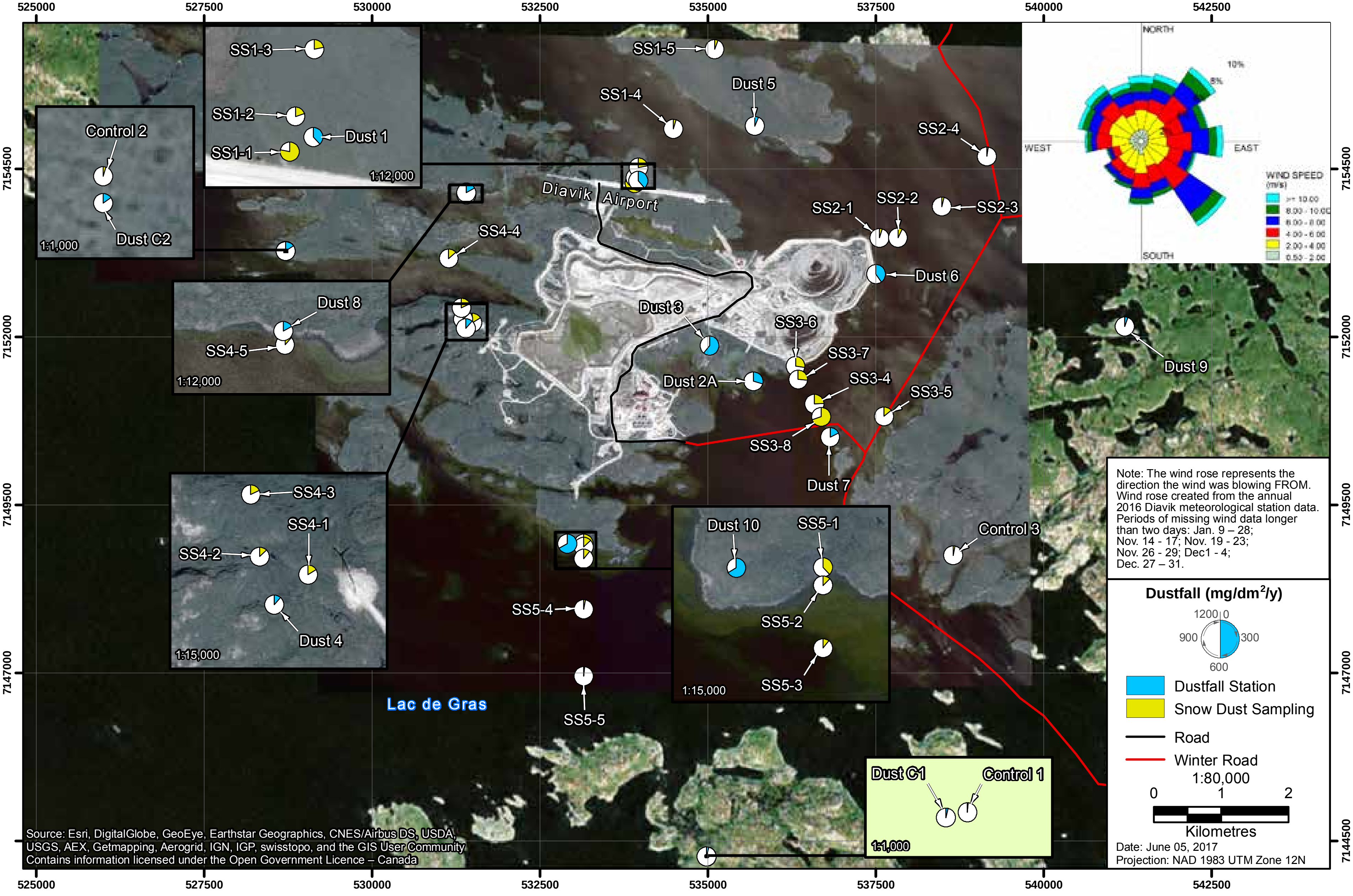
Dash (-) = not available (snow water chemistry not sampled)

n/a = not applicable

For measurements that were less than the detection limit, half of the detection limit was used for calculations and are shown as italicized in the table.

[a] *BC MOE (2016) for dustfall and Water Licence W2015L2-0001 for snow water chemistry. See Table 2.1-1 for reference level descriptions.*

Figure 3.1-1
Dustfall Results, Diavik Diamond Mine, 2016



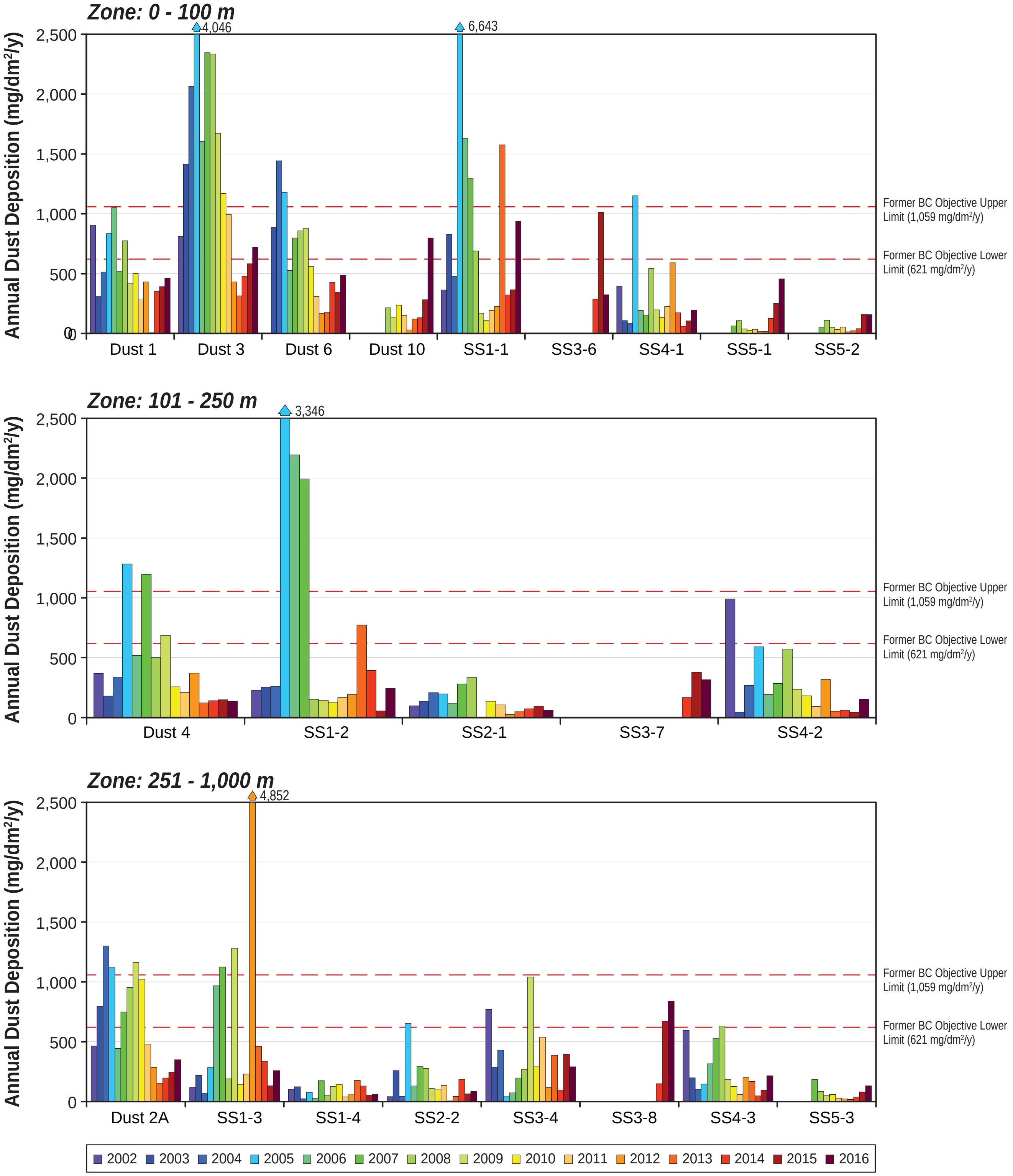
Note: The wind rose represents the direction the wind was blowing FROM. Wind rose created from the annual 2016 Diavik meteorological station data. Periods of missing wind data longer than two days: Jan. 9 – 28; Nov. 14 - 17; Nov. 19 - 23; Nov. 26 - 29; Dec1 - 4; Dec. 27 – 31.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Contains information licensed under the Open Government Licence – Canada

Date: June 05, 2017
Projection: NAD 1983 UTM Zone 12N

Figure 3.1-2

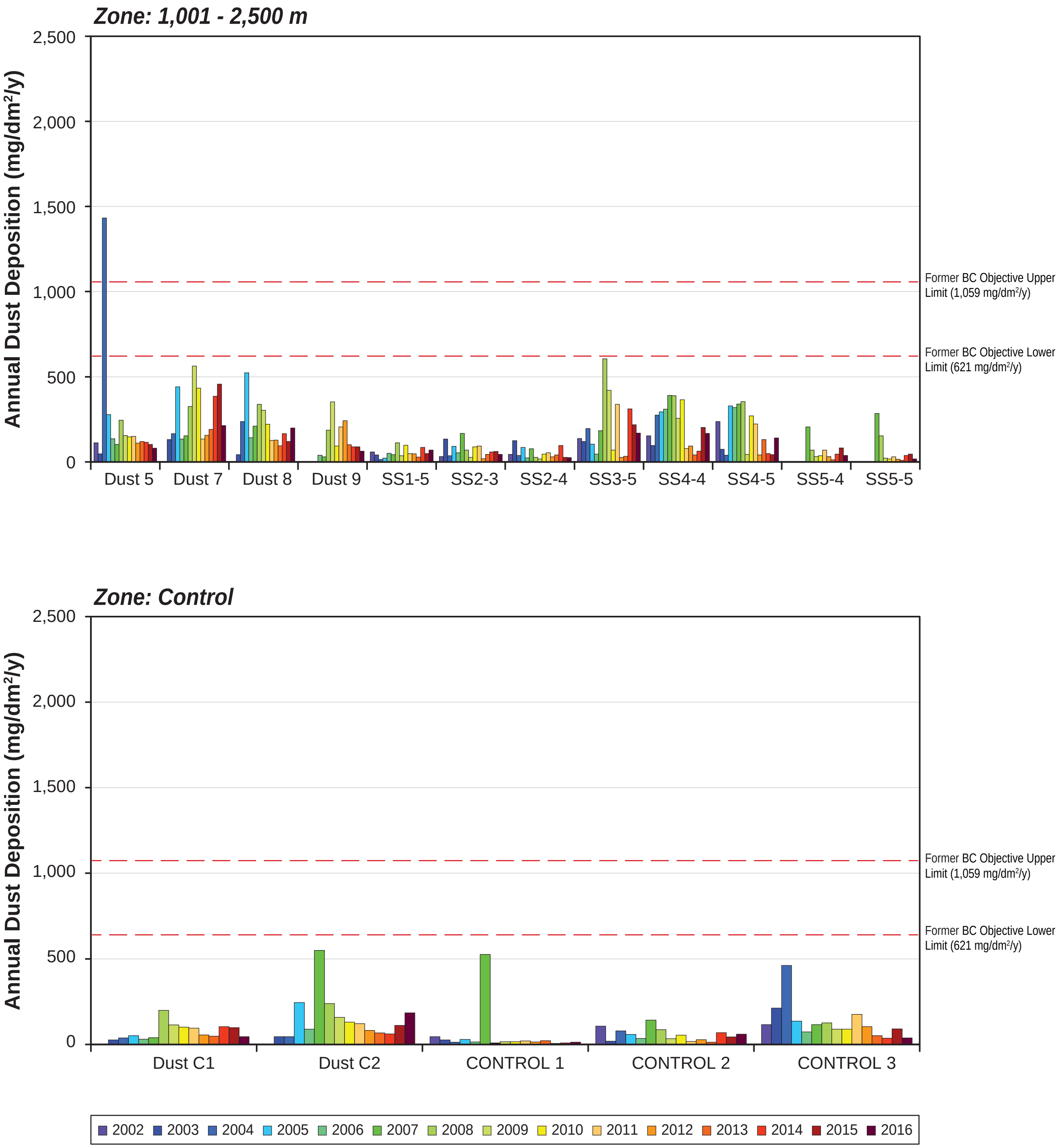
Calculated Annual Dust Deposition Rates at Dustfall Gauges and Snow Survey Locations up to 1,000 m from the Project Footprint, Diavik Diamond Mine, 2002 to 2016



Notes: *Former BC Objective (Diavik 2016).*
Annual deposition was calculated using the methodology described in Section 2.
See Table 2-1 for actual 2016 sample exposure times.
Station locations have been grouped into zones based on their distance from the 2016 Project footprint. Some stations have historically been grouped in different zones based on their distance from the Project footprint when they were first established (see Section 3 for further details).

Figure 3.1-3

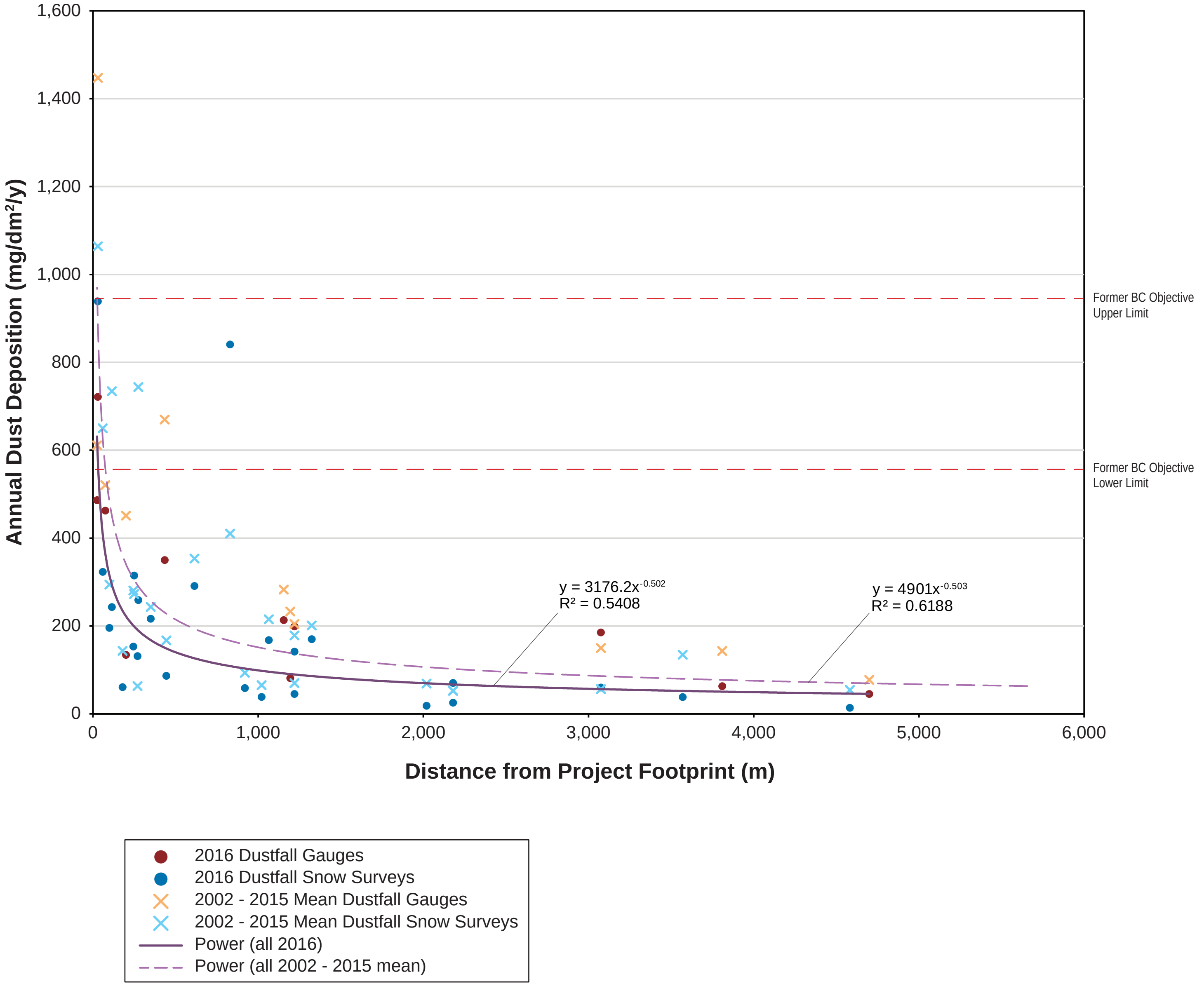
Calculated Annual Dust Deposition Rates at Dustfall Gauges and Snow Survey Locations greater than 1,000 m from the Project Footprint, Diavik Diamond Mine, 2002 to 2016



Notes: *Former BC Objective (Diavik 2016).*
Annual deposition was calculated using the methodology described in Section 2.
See Table 2-1 for actual 2016 sample exposure times.
Station locations have been grouped into zones based on their distance from the 2016 Project footprint. Some stations have historically been grouped in different zones based on their distance from the Project footprint when they were first established (see Section 3 for further details).

Figure 3.1-4

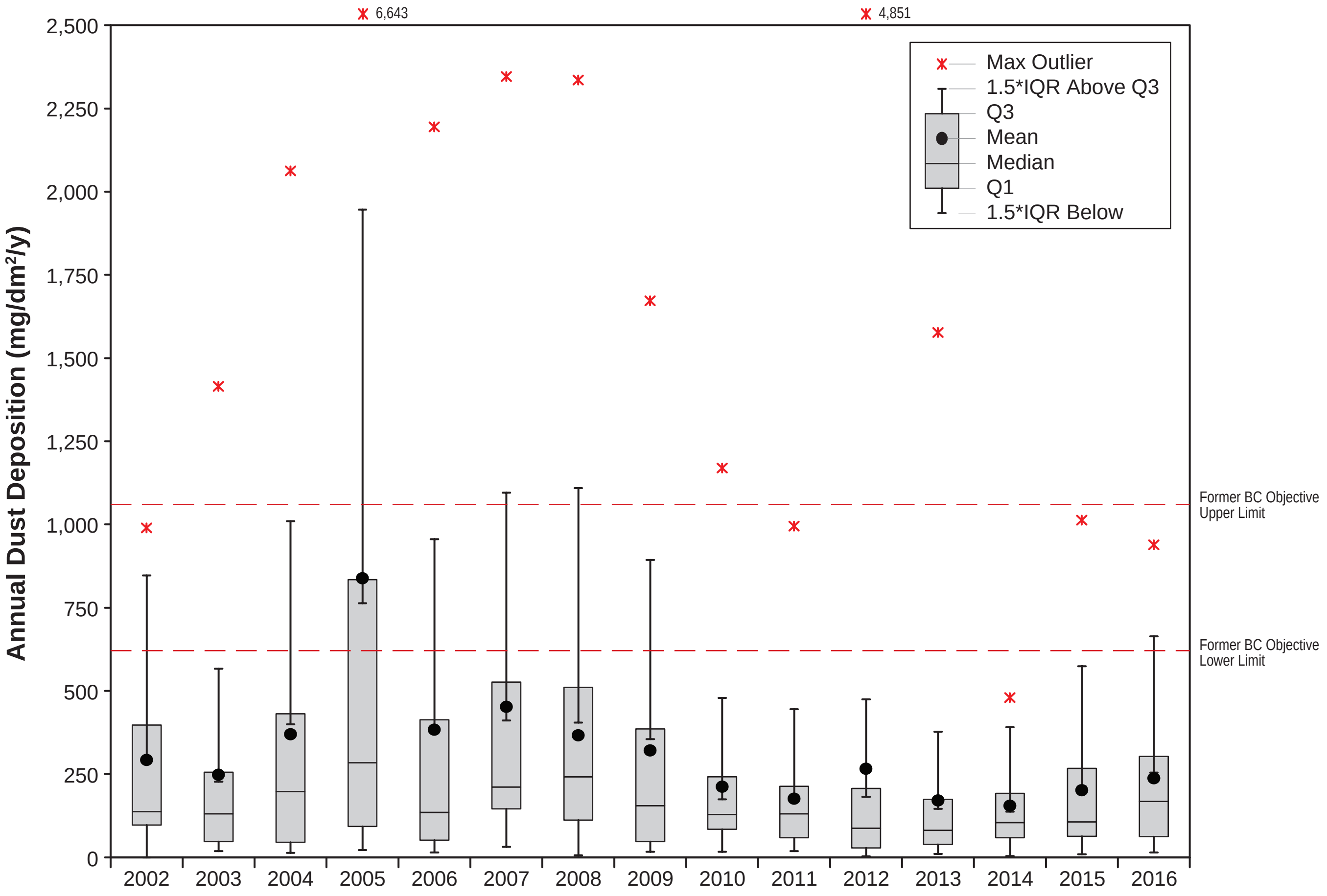
Dust Deposition Versus Distance from Project Footprint, Diavik Diamond Mine, 2016



Notes: Former BC Objective (Diavik 2016).
Annual deposition is calculated using the methodology described in Section 2.
See Table 2-1 for actual 2016 sample exposure times.

Figure 3.1-5

**Dust Deposition Box Plot,
Diavik Diamond Mine, 2002 to 2016**



Notes: Former BC Objective (Diavik 2016).
Annual deposition is calculated using the methodology described in Section 2.
See Table 2-1 for actual 2016 sample exposure times.

Annualized dustfall rates estimated from 2016 snow survey data ranged from 14 to 939 mg/dm^2/y (Table 3.1-1; Figures 3.1-2 and 3.1-3). Dustfall at SS3-8 was the highest recorded at that station (monitoring since 2014; Figure 3.1-3). Location SS308 is located due south of the operating pits and is in a location that could have received increased deposition due to wind directions. In general, snow survey dustfall rates decreased with increasing distance from the Project, with the lowest dustfall rate recorded at station Control 1 (Table 3.1-1; Figure 3.1-4). Mean dustfall rates estimated using both dustfall gauges and snow surveys within the 0–100, 101-250, 251–1,000, 1,001–2,500 and Control zones were 504, 181, 279, 103 and 68 mg/dm^2/y, respectively (Table 3.1-1). Dustfall rates at stations SS1-1, SS3-7, Dust 10, SS3-8, Dust 7, Dust 8, SS3-5, SS4-4, and Dust C2 were greater than the upper limit of the 95% confidence interval for their respective zones in 2016. These high dustfall rates, compared to the overall distribution of dustfall rates within each zone, indicated that higher dustfall rates were observed to the west, south and southeast of the Project (Table 3.1-1).

Annualized dustfall estimated from each snow survey station in 2016 were generally less than historical dustfall estimates (Figures 3.1-2 and 3.1-3). Comparisons of mean and maximum values suggest that dustfall rates were generally higher in 2016 than in 2015, 2014 and 2013 (Figures 3.1-4 and 3.1-5).

Annualized dustfall rates measured at each station during the 2016 snow survey were less than the former BC objective for the mining industry (621–1,059 mg/dm^2/y). This former objective was used for comparison purposes only: there are currently no standards or objectives for the Northwest Territories.

3.3 SNOW WATER CHEMISTRY

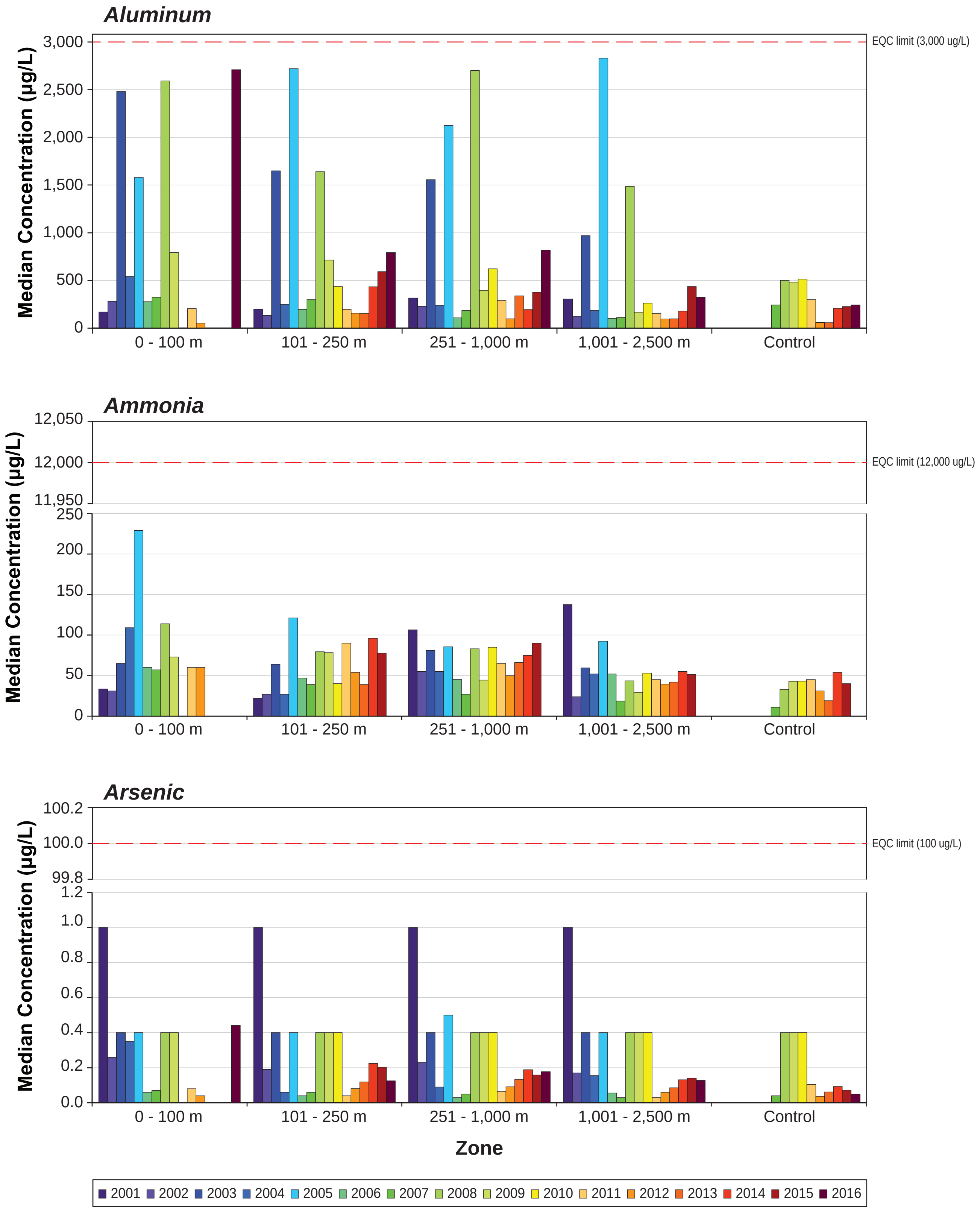
A summary of the snow water chemistry results for each variable of interest (i.e., variables with EQC and phosphorous) is provided below. The full suite of analytical results for snow water chemistry is included in Appendix D. For QA/QC purposes, duplicate samples were collected at stations SS3-5 and SS5-5, and an equipment blank sample was collected at station SS3-6. Results of QA/QC samples are discussed in Section 3.4.

All 2016 sample concentrations were less than their associated reference levels as specified by the "maximum concentration of any grab sample" specified in Water Licence W2015L2-0001.

In general, average concentrations of snow water chemistry variables of interest decreased with increasing distance from the Project (Figures 3.3-1 to 3.3-4). However, high parameter concentrations were recorded at Station SS3-8, located in the 251-1000 zone (830 m from the project). Metal concentrations at SS3-8 were similar to concentrations at SS3-6 (60 m from the Project), which historically has high metals. SS3-8 is located to the southeast of the Project (Figure 2-1) where higher measured dustfall was observed in 2016 compared to 2015. It should be noted that the 0-100 zone has only one (1) sampling location; therefore, no median was reported or included in Figures 3.3-1 to 3.3-4.

Figure 3.3-1

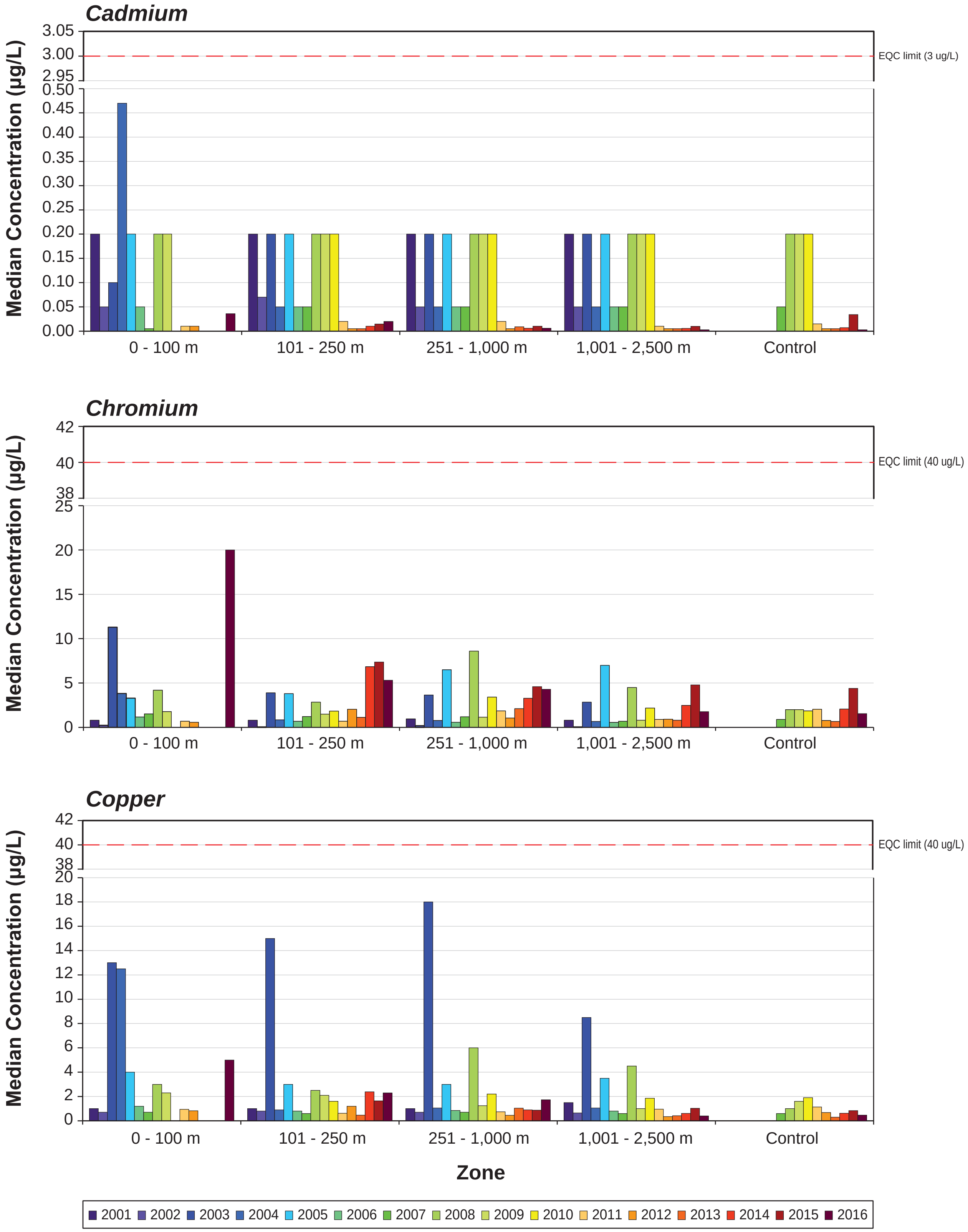
Snow Water Chemistry Results: Aluminum, Ammonia and Arsenic, 2001 to 2016



Notes: Applicable EQC shown on each figure.
The value used for the 0-100 m zone in 2016 represents one sample rather than the median.

Figure 3.3-2

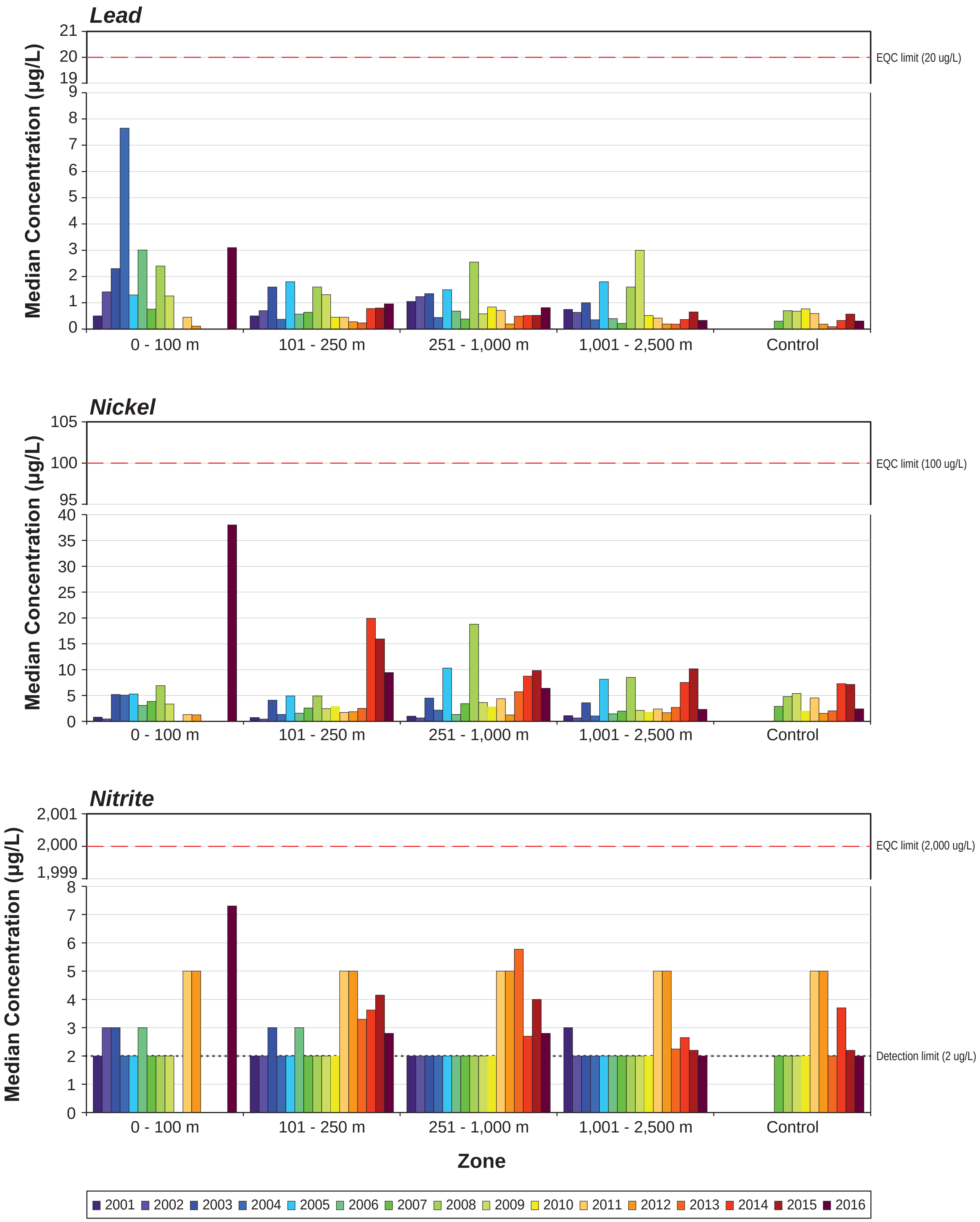
Snow Water Chemistry Results: Cadmium, Chromium and Copper, 2001 to 2016



Notes: Applicable EQC shown on each figure.
The value used for the 0-100 m zone in 2016 represents one sample rather than the median.

Figure 3.3-3

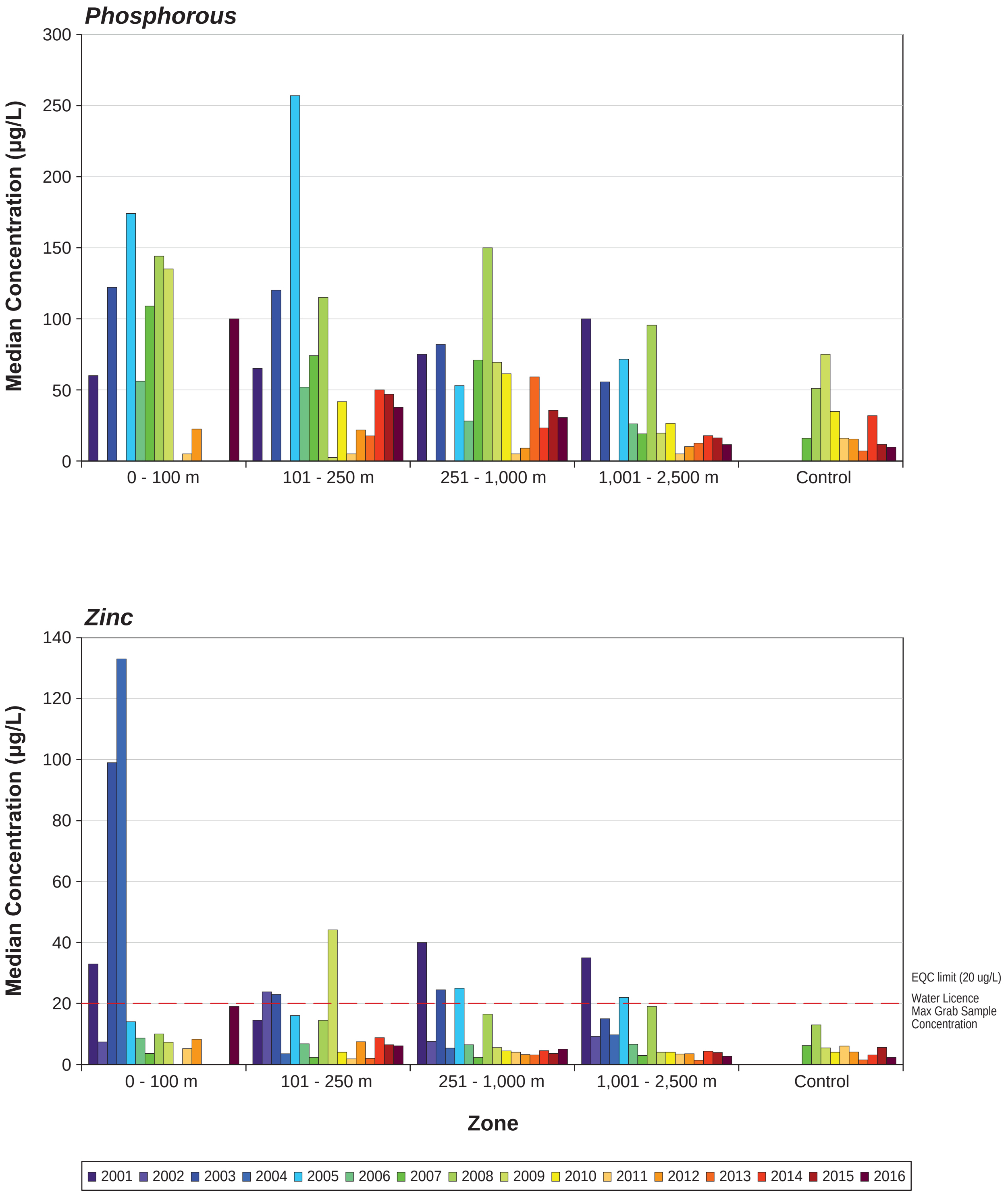
Snow Water Chemistry Results: Lead, Nickel and Nitrite, 2001 to 2016



Notes: Applicable EQC shown on each figure.
The value used for the 0-100 m zone in 2016 represents one sample rather than the median.

Figure 3.3-4

Snow Water Chemistry Results: Phosphorus and Zinc, 2001 to 2016



Notes: Applicable EQC shown on each figure.
The value used for the 0-100 m zone in 2016 represents one sample rather than the median.

3.3.1 Aluminum

Aluminum concentrations measured in 2016 ranged from 31.4 µg/L at station SS5-5 in the 1,001-2,500 m zone to 2,710 µg/L at station SS3-6 in the 0-100 m zone (Table 3.1-1). Median 2016 aluminum concentrations were greatest in the 251-1,000 m zone (slightly higher than in the 101-250 m zone; Figure 3.3-1). Compared to previous years, the 2016 median concentration in each zone was relatively high; however, there were no concentrations greater than the reference value the 3,000 µg/L EQC specified in the Water Licence at SS3-6 (Table 3.1-1; Figure 3.3-1). There were generally high concentrations of aluminum observed in snow water chemistry samples in 2016 compared to 2015 and 2014; however, were within the range of historical concentrations.

3.3.2 Ammonia

Ammonia concentrations were not analyzed for by the laboratory due to an oversight in regards to the parameter list for the laboratory analyses. This oversight was has been corrected for the 2017 program. Historical ammonia concentrations have been well below the value of 12,000 µg/L specified in the Water Licence for grab sample concentrations.

3.3.3 Arsenic

Arsenic concentrations measured in 2016 ranged from 0.01 µg/L at station SS2-3 in the 1,001-2,500 m zone to 0.5 µg/L at station SS1-5 in the 1,001-2,500 m zone (Table 3.1-1). Median 2015 arsenic concentrations were greatest in the 251-1,000 m zone and were similar for all distance ranges (Figure 3.3-1). The 2016 median concentration in each zone was similar to 2015 median concentrations (Figure 3.3-1). All measurements were well less than the value of 100 µg/L specified in the Water Licence for grab sample concentrations.

3.3.4 Cadmium

Cadmium concentrations measured in 2016 ranged from less than the analytical detection limit (0.0025 µg/L) at multiple stations in all zones to 0.04 µg/L at station SS3-7 in the 101-250 m zone (Table 3.1-1). Median 2016 cadmium concentrations were near or below analytical detection limits and were similar for all distance ranges (Figure 3.3-2). Cadmium concentrations in 2016 were well below 2015 and 2014 concentrations. The 2015 median concentration in each zone was similar to 2014 median concentrations (Figure 3.3-2). All measurements were less than the value of 3 µg/L specified in the Water Licence for grab sample concentrations.

3.3.5 Chromium

Chromium concentrations measured in 2016 ranged from less than the analytical detection limit (0.5 µg/L) at Control 1 station (4,852 m from Project) to 19.6 µg/L at station SS3-6 in the 0–100 m zone (Table 3.1-1). Median 2016 chromium concentrations were greatest in the 101-250 m zone (Figure 3.3-2) and decreased with increasing distance from the Project. The 2016 median concentration in each zone were less than 2015 and 2014 median concentrations (Figure 3.3-2). All measurements were well less than the value of 40 µg/L specified in the Water Licence for grab sample concentrations.

3.3.6 Copper

Copper concentrations measured in 2016 ranged from 0.1 µg/L at Control 1 station (4,852 m from Project) to 5.5 µg/L at station SS3-8 in the 251–1,000 m zone (Table 3.1-1). Median 2016 copper concentrations were greatest in the 101-250 m zone (Figure 3.3-2) and decreased with increasing distance from the Project. Modest inter-annual variations in copper concentrations were observed from 2014 to 2016 (Figure 3.3-2). All measurements were less than the value of 40 µg/L specified in the Water Licence for grab sample concentrations.

3.3.7 Lead

Lead concentrations measured in 2016 ranged from 0.1 µg/L at Control 1 station (4,852 m from Project) to 3.1 µg/L at station SS3-6 in the 0–100 m zone (Table 3.1-1). Median 2016 lead concentrations were greatest in the 101-250 m zone (Figure 3.3-3) and decreased with increasing distance from the Project. The 2016 median concentration in each zone was similar to 2015 and 2014 median concentrations (Figure 3.3-3). All measurements were less than the value of 20 µg/L specified in the Water Licence for grab sample concentrations.

3.3.8 Nickel

Nickel concentrations measured in 2016 ranged from 0.6 µg/L at station SS5-5 in the 1,001-2,500 m zone to 37.5 µg/L at station SS3-6 in the 0–100 m zone (Table 3.1-1). Median 2016 nickel concentrations were greatest in the 101-250 m zone (Figure 3.3-3) and decreased with increasing distance from the Project. The 2016 median concentrations in each zone were less than those measured in 2015 and 2014 (Figure 3.3-3). All measurements were less than the value of 100 µg/L specified in the Water Licence for grab sample concentrations.

3.3.9 Nitrite

Nitrite concentrations measured in 2016 ranged from less than the analytical detection limit (2.0 µg/L) at multiple stations in each zone to 8.3 µg/L at station SS3-8 in the 251-1,000 m zone (Table 3.1-1). Median 2016 nitrite concentrations were greatest (2.8 µg/L) in the 101-250 m and 251-1,000 m and was less than the analytical detection limit (2.0 µg/L) in the other zones (Figure 3.3-3). The 2016 median concentrations in each zone were less than those measured in 2015 and 2014 (Figure 3.3-3). All measurements were less than the value of 2,000 µg/L specified in the Water Licence for grab sample concentrations.

3.3.10 Phosphorous

Phosphorous concentrations measured in 2016 ranged from 5.5 µg/L at station SS5-4 in the 1,001-2,500 m zone to 109 µg/L at station SS3-8 in the 251–1,000 m zone (Table 3.1-1). Median 2016 phosphorus concentrations were greatest (37.7 µg/L) in the 101-250 m zone and decreased with increasing distance from the Project (Figure 3.3-4). The 2016 median concentrations in each zone were less than those measured in 2015 and 2014 (Figure 3.3-4). Although the Water Licence has a load limit for phosphorous, there is no EQC specified in the licence.

3.3.11 Zinc

Zinc concentrations measured in 2016 ranged from 1.3 µg/L at station SS5-5 in the 1,001-2,500 m zone to 18.7 µg/L at station SS3-6 in the 0–100 m zone (Table 3.1-1). Median 2016 zinc concentrations were greatest (6.1 µg/L) in the 101-250 m zone and decreased with increasing distance from the Project (Figure 3.3-4). The 2016 median concentrations in each zone were less than those measured in 2015 and 2014 (Figure 3.3-4). All measurements were less than the value of 20 µg/L specified in the Water Licence for grab sample concentrations.

3.4 QUALITY ASSURANCE AND CONTROL

Dustfall gauge, dustfall snow survey and snow water chemistry sampling and analysis were conducted by experienced technicians following SOPs ENVR-508-0112 R3, ENVR-512-0213 R3, and ENVI-303-0112 R2 to ensure proper field sampling and laboratory analysis. As part of SOP ENVR-512-0213, duplicate and blank samples were taken for some snow survey and snow water chemistry sample sites (Table 2-1). The results from these samples are summarized in Tables 3.4-1 and 3.4-2.

Table 3.4-1. QA/QC Sample Duplicates

	Duplicate Analytical Results (DUPW1/DUPW2; mg/dm^2/y; µg/L)				Relative Percent Difference [a] (%)				Detection Limit (µg/L)
Parameter	SS1-2	SS4-1	SS3-5	SS5-5	SS1-2	SS4-1	SS3-5	SS5-5	
Dustfall	267/219	180/211	n/a	n/a	20%	18%	n/a	n/a	0.1
Aluminum	n/a	n/a	1,640/ 1,490	31.4/126	n/a	n/a	8%	120%	0.2
Ammonia	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Arsenic	n/a	n/a	0.19/0.25	0.01/0.03	n/a	n/a	24%	100%	0.02
Cadmium	n/a	n/a	0.0019/ 0.0018	*0.0025/ 0.0025*	n/a	n/a	5%	0%	0.005
Chromium	n/a	n/a	11.7/12.5	0.79/0.87	n/a	n/a	7%	10%	0.05
Copper	n/a	n/a	2.9/3.0	0.091/0.43	n/a	n/a	4%	129%	0.05
Lead	n/a	n/a	1.6/1.4	0.082/0.20	n/a	n/a	21%	84%	0.005
Nickel	n/a	n/a	20.9/22.9	0.61/1.5	n/a	n/a	9%	86%	0.02
Nitrite	n/a	n/a	4.0/2.4	*2.0/2.0*	n/a	n/a	50%	0%	2.0
Phosphorous	n/a	n/a	49.4/48.9	10.6/8.1	n/a	n/a	1%	27%	2.0
Zinc	n/a	n/a	11.9/11.0	1.3/1.6	n/a	n/a	8%	16%	0.1

Notes:
n/a = not applicable
For measurements that were less than the detection limit, the detection limit was used for calculations and are italicized.
[a] *Relative difference between duplicates, with respect to their mean: RPD = 100 × |rep1 – rep2| / [(rep1 + rep2)/2].*

Table 3.4-2. Analytical Blanks for QA/QC Program

Parameter	SS Bag Average (µg/L)	SS3-6 Results (µg/L)	SS3-6 Blank Sample (µg/L)	Percent below Non-blank SS3-6 Sample[a] (%)	Detection Limit (µg/L)
Dustfall	n/a	n/a	n/a	n/a	n/a
Aluminum	0.53	2.7	5.1	-88%[b]	0.2
Ammonia	*2.5*	n/a	n/a	n/a	5.0
Arsenic	*0.01*	0.44	*0.01*	n/a	0.02
Cadmium	*0.0025*	0.036	*0.0025*	n/a	0.005
Chromium	*0.025*	19.6	0.06	100%	0.05
Copper	*0.025*	5.0	0.073	99%	0.05
Lead	*0.0025*	3.1	0.063	98%	0.005
Nickel	*0.01*	37.5	0.095	100%	0.02
Nitrite	*2.0*	7.3	*2.0*	73%	2.0
Phosphorous	*2.0*	100	2.4	98%	2.0
Zinc	0.73	18.7	0.48	97%	0.1

Notes:
n/a = not applicable
For measurements that were less than the detection limit, half the detection limit was used for calculations and are italicized.
[a] *The non-blank sample is the result from the sample collected from SS3-6 (column SS3-6 results).*
[b] *The value for aluminum was higher in the blank than the SS3-6 results.*

The relative percent difference (RPD) of duplicate samples from a site represents the amount of variation between duplicates. According to the Project AEMP, the data quality objective for duplicate water quality samples is a RPD of 20% when concentrations are ≥ 5 times the detection limit (DL; AEMP 2014). It is important to note that all RPD values were calculated regardless of if the concentrations were ≥ 5 times the DL. Of the calculated RPD values, almost all exceed 20%.

The results of the QA/QC duplicates indicate that snow chemistry is spatially variable on the scale of metres within which the duplicates are collected. The data quality objective from the AEMP (i.e., RPD less than 20%) is designed for surface *liquid* water samples. Surface water in a stream or lake will mix more readily than snow, particularly once snow has settled and has been compacted by wind. Site-specific differences between snow core sampling replicates may not be visible to the sampling team, but may result in differences in the chemical composition of the snow. In contrast, the SS3-5 has smaller RPD—only three parameters were greater 20%. Furthermore, the differences between the SS3-5 and SS5-5 demonstrate the sensitivity of the RPD analysis to the scale of the analytical measurements. The absolute differences between observations were similar in magnitude for both duplicates from both locations, but the substantially lower concentrations observed at SS5-5 resulted in an emphasis of this variation in the RPD analysis. The similarly in the magnitude of the variability is consistent with small-scale spatial variation, rather than data quality issues. The results of the sampling network of 19 sites has been demonstrated to detect and quantify Project effects on snow water chemistry (Section 3.3), and these results are concluded to be reliable even with consideration of the small-scale variation identified in the QA/QC program.

Dustfall RPD at SS1-2 was 20% and SS4-1 was 18%, which shows that small scale variation for dustfall measures was relatively small, and the precision of the dustfall measurements was acceptable. The concentrations of all parameters in the blank processed at station SS3-6 were much less than those from the non-blank sample (except for aluminum), suggesting the data were of good quality. Additionally, a blank demineralized water sample to analyze for leachate from the snow sample bag showed that the majority of the contaminants of concern were below detection limits. The majority of the parameters analyzed in the blank sample were below analytical DL, which would be expected for an uncontaminated blank.

4. SUMMARY

In 2016, dustfall was monitored at 12 dustfall gauges and 27 snow survey stations located at varying distances around the mine. Snow water chemistry was also measured at 19 of the snow survey stations and compared to EQC set out in the WLWB Water Licence W2015L2-0001 (formerly W2007L2-0003).

Median dustfall estimated in 2016 was higher than results in 2015 and 2014 and also decreased with distance from the Project. Annual dustfall estimated from each of the 12 dustfall gauges ranged from 45 to 799 mg/dm^2/y. The annualized dustfall rates estimated from the 2016 snow survey data ranged from 14 to 939 mg/dm^2/y. Because dustfall gauges continuously collect dust throughout the year, and the snow surveys are only representative of dustfall accumulated over the snow cover period, the reported annual dustfall results from the dustfall gauges are expected to provide a better estimate of annual dustfall compared to snow survey results for similar geographic areas. However, results obtained from both methods showed similar patterns.

Dustfall levels were generally higher in 2016 than in 2015; however, are within the range of historical data collected for the Project. Annualized dustfall estimated from each snow survey station in 2016 was less than some historical dustfall estimates. Comparisons of mean and maximum values suggest that dustfall rates were generally higher in 2016 than in 2015 and 2014. Overall, as expected, dustfall rates generally decreased with distance from the Project with the lowest dustfall rate recorded at station Control 1 (4,852 m from the Project), and areas that were predominantly downwind of the Project received more dustfall than upwind areas. Mean dustfall rates estimated using both dustfall gauges and snow surveys within the 0–100, 101-250, 251–1,000, 1,001–2,500 and Control zones were 504, 181, 279, 103, and 68 mg/dm^2/y, respectively. Although there are no dustfall standards for the Northwest Territories, 2016 dustfall rates were less than the 1.7 to 2.9 mg/dm^2/d (621 to 1,059 mg/dm^2/y) BC MOE former dustfall objective for the mining, smelting, and related industries (Diavik 2016). This objective, used in the 2015 Dust Deposition Report, is no longer used in BC.

Snow water chemistry analytes of interest included those variables with effluent quality criteria (EQC; i.e., aluminum, ammonia, arsenic, cadmium, chromium, copper, lead, nickel, nitrite, and zinc) or a load limit (i.e., phosphorous) specified in the Type "A" Water Licence (W2015L2-0001, formerly W2007L2-0003). All 2016 sample concentrations were less than their associated reference levels as specified by the "maximum concentration of any grab sample" specified in Water Licence W2015L2-0001. Concentrations of aluminum, arsenic, chromium, and nickel have generally increased in recent years, while concentrations of copper, lead, phosphorus and zinc have generally decreased in recent years. Typically, concentrations decreased with distance from the Project. High concentrations of certain variables of interest (2,710 µg/L aluminum and 19.6 µg/L chromium) were recorded at Station SS3-6, located in the 0-100 m zone, due to close proximity to Mine activity. However, concentrations of these variables were less than their corresponding EQC.

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Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

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Appendix A

Annual Changes to Dustfall Program

APPENDIX A. ANNUAL CHANGES TO DUSTFALL PROGRAM

2001

The 2001 dust monitoring program was based entirely upon snow survey samples collected along four radial transects emanating from the project footprint outward to a distance of approximately 1,000 meters. All sample locations were analyzed for dust deposition, while only those locations on Lac de Gras were analyzed for snow water chemistry.

2002

DDMI amended the dust monitoring program, in response to recommendations made by the Mackenzie Valley Land and Water Board, to include two snow survey control locations. In addition, five dust gauges (passive dust collectors) were deployed, one along each of the snow survey transects and one at a control location, in efforts to enhance the monitoring program.

2003

In response to further recommendations, the dust monitoring program was modified. All four snow survey transects were extended in length to a distance of approximately 2,000 meters from the project footprint. An additional five dust gauges, including a second control, were deployed.

2004

Increased construction activity necessitated further changes to the dust monitoring program. One dust gauge (Dust 02) was removed from its location to accommodate project footprint expansion, and subsequently relocated and redeployed (Dust 2A).

2005

Dust deposition monitoring was carried out with no modifications to either the snow survey or the dust gauge portion of the program.

2006

An additional dust gauge was deployed bringing the total to eleven (including two controls). Testing of Mini-Vol portable air samplers were conducted to determine feasibility of incorporation into the dust monitoring program. Preliminary findings proved the inclusion of the Mini-Vol samplers would be impractical.

2007

The snow survey portion of the program was amended with an additional snow survey transect being incorporated bringing the total number of transects to five. As well, snow water chemistry samples were collected adjacent to the pre-existing control locations as background references.

Two additional dust gauges (temporary) were deployed adjacent to two pre-existing dust gauges. The intent of the temporary gauges was to compare results from the same location when sample collection frequency is altered.

DDMI initiated contact with Environment Canada and Golder Associates with regards to remodeling dust deposition with the intent of revising predictions made in the 1998 environmental effects report.

In light of dust deposition monitoring results from previous years, several control measures were adopted to reduce dust generation on site, including the utilization of EK-35 (suppressant) on the airport apron, taxiway and helipad, and fitting a second 830E haul truck with tank for haul road watering.

2008

All of the dust gauges were modified to accommodate the replacement of the polyacrylic dust gauge inserts with brass Nipher gauge inserts, to minimize loss associated with damage during the collection and handling of the dust gauges.

An additional dust gauge was added to the program bringing the total to twelve permanently deployed (including two control), and two temporary (reference) dust gauges.

Three snow survey sample points were not sampled as they had become overtaken by construction activity and expansion of the project footprint.

Additional preparations for dust deposition modelling were completed including data collection, identification of point source inputs, selection of a modelling program and inputs (with regulator input) and discussion of cumulative effects.

2009

The two temporary dust gauges deployed in 2007 were decommissioned. All twelve permanent gauges were collected quarterly. An error in collection/deployment resulted in "No Data" being collected for Dust 03 between July 11 and September.

Snow survey sampling was conducted in April. An error in collection/analysis resulted in the Dust Deposition sample for SS2-1 being compromised; as such "No Dust Deposition Data" was available for this location.

2010

All twelve permanent dust gauges were collected quarterly during 2010. Overall, there was a reduction of observed dustfall deposition from 2009 to 2010, with the exception of Dust 1 and Dust 10.

Snow survey sampling was conducted throughout the month of April. An error in collection/ processing resulted in two missing stations for the water quality analysis. SS2-1 field results were collected; however, the sample was compromised during processing in the lab. An error also resulted with the collection of SS5-2; data collection for water quality analysis was missed in the field. No data for these two stations resulted in Zone 1 having no data for the various water chemistry results and SS5-2 was not represented in Zone 3 data for 2010.

2011

All twelve permanent dust gauges were collected quarterly during 2011. During collection and repair to Station Dust 5 in September, the sample was compromised and therefore not processed, which resulted in data loss.

Snow survey sampling was conducted throughout the month of April. Due to an internal error shipping samples, water quality samples for stations SS1-4, SS1-5, SS2-1, SS2-2, SS2-3, SS2-4, and SSC-3 arrived at the Maxxam laboratory past the recommended holding time.

2012

All twelve permanent dust gauges were collected quarterly during 2012. During collection in June repairs were conducted on Station Dust 9 as it was found on its side, the sample was compromised, which resulted in data loss. Overall in 2012, 8 of the 12 dust gauges reported lower deposition rates compared to 2011.

Snow survey sampling was conducted on April 30 and on May 4 and 5.

2013

All twelve permanent dust gauges were collected quarterly during 2013. Station Dust 5 was dismantled upon arrival in September and the sample was compromised, which resulted in data loss for that quarter.

Snow survey sampling was conducted at 24 locations from April 26 to 28.

2014

All twelve permanent dust gauges were collected quarterly during 2014.

Snow survey sampling was conducted at 24 locations from April 7 to May 12. Three additional sites, SS3-6, SS3-7, SS3-8, were installed.

2015

No changes were made to the dustfall program in 2015.

All twelve permanent dust gauges were collected quarterly during 2015.

Snow survey sampling was conducted at 24 locations from March 31 to April 10.

2016

Additional dustfall monitoring stations (MDS2, 4 in total) were added to monitor dust suppression activities along the Misery Haul Road.

Additional dustfall monitoring stations (LYNX, 5 in total) were added to monitor dust from the Lynx Haul Road.

Due to construction activities at A21, the distance to mining operations decreased for dustfall stations Dust 10, SS5-1, SS5-2, SS5-3, SS5-4, SS5-5, Dust C1, and Control 1. The new distances to mining operations are shown in Table 2-1. Dust 10 station was 670 m from mining operations and now is 46 m from mining operations.

All twelve permanent dust gauges were collected quarterly during 2016.

Snow survey sampling was conducted at 24 locations from March 3 to April 7.

Appendix B

Dustfall Gauge Analytical Results

Appendix B. Dustfall Gauge Analytical Results

Sample Date	Dust Gauge ID	Filter #	Weight of Filter (mg)	Filter + Residue (mg)	Weight of Residue (mg)	Cumulative (filters, mg)	Dust Deposition (mg/dm^2)	Days Deployed	Dust Deposition ($mg/dm^2/d$)	Dust Deposition ($mg/dm^2/y$)
1-Jan-16	Initial deployment date									
31-Mar-16	Dust 1	1	120.9	206.1	85.2	85.2	69.46	90.00	0.77	281.7
7-Jul-16	Dust 1	1	119.4	442.4	323	323	0.00	98.00	2.69	980.8
25-Sep-16	Dust 1[1]	1	116.6	203	86.4				n/a	n/a
25-Sep-16	Dust 1	2	128.1	128.3	0.2	86.6	70.60	80.00	0.88	322.1
4-Jan-17	Dust 1	1	117.5	196	78.5	78.5	64.00	101.00	0.63	231.3
					TOTALS	**573.3**	**467.40**	**369.00**	**1.27**	**462.3**
2-Jan-16	Initial deployment date									
30-Mar-16	Dust 2A	1	117.7	314.8	197.1	197.1	160.69	88.00	1.83	666.5
8-Jul-16	Dust 2A	1	122.6	281.3	158.7	158.7	129.39	100.00	1.29	472.3
26-Sep-16	Dust 2A	1	115.3	153.5	38.2	38.2	31.14	80.00	0.39	142.1
4-Jan-17	Dust 2A	1	127.9	166.6	38.7	38.7	31.55	100.00	0.32	115.2
					TOTALS	**432.7**	**352.77**	**368.00**	**0.96**	**349.9**
2-Jan-16	Initial deployment date									
30-Mar-16	Dust 3	1	125.7	592.4	466.7	466.7	380.49	88.00	4.32	1578.2
8-Jul-16	Dust 3	1	119.1	298.1	179	179	145.94	100.00	1.29	472.3
25-Sep-16	Dust 3	1	128.4	278.8	150.4	150.4	122.62	79.00	0.39	142.1
4-Jan-17	Dust 3	1	117.6	213.4	95.8	95.8	78.10	101.00	0.32	115.2
					TOTALS	**891.9**	**727.15**	**368.00**	**1.98**	**721.2**
1-Jan-16	Initial deployment date									
1-Apr-16	Dust 4	1	113.8	175.1	61.3	61.3	49.98	91.00	0.55	200.5
8-Jul-16	Dust 4[2]	1	119.5	121.5	2				n/a	n/a
8-Jul-16	Dust 4	2	125	193.7	68.7	70.7	57.64	98.00	0.59	214.7
28-Sep-16	Dust 4	1	128.2	144.3	16.1	16.1	13.13	82.00	0.16	58.4
6-Jan-17	Dust 4	1	129.2	148.4	19.2	19.2	15.65	100.00	0.16	57.1
					TOTALS	**167.3**	**136.40**	**371.00**	**0.37**	**134.2**

Appendix B. Dustfall Gauge Analytical Results

Sample Date	Dust Gauge ID	Filter #	Weight of Filter (mg)	Filter + Residue (mg)	Weight of Residue (mg)	Cumulative (filters, mg)	Dust Deposition (mg/dm^2)	Days Deployed	Dust Deposition ($mg/dm^2/d$)	Dust Deposition ($mg/dm^2/y$)
1-Jan-16	Initial deployment date									
30-Mar-16	Dust 5	1	125.4	146.7	21.3	21.3	17.37	89.00	0.20	71.2
23-Jul-16	Dust 5	1	120.3	157.4	37.1	37.1	30.25	115.00	0.26	96.0
24-Sep-16	Dust 5	1	116	130.4	14.4	14.4	11.74	63.00	0.19	68.0
4-Jan-17	Dust 5	1	117	144.8	27.8	27.8	22.66	102.00	0.22	81.1
					TOTALS	**100.6**	**82.02**	**369.00**	**0.22**	**81.1**
31-Dec-15	Initial deployment date									
31-Mar-16	Dust 6	1	125.3	296.5	171.2	171.2	139.58	91.00	1.53	559.8
8-Jul-16	Dust 6	1	119.7	482.8	363.1	363.1	296.03	99.00	2.99	1091.4
25-Sep-16	Dust 6[2]	1	128.2	133.1	4.9				n/a	n/a
25-Sep-16	Dust 6[2]	2	116.9	135.1	18.2				n/a	n/a
25-Sep-16	Dust 6[2]	3	129.1	131.2	2.1				n/a	n/a
25-Sep-16	Dust 6[2]	4	128.8	131.6	2.8				n/a	n/a
25-Sep-16	Dust 6[2]	5	128.9	130.9	2				n/a	n/a
25-Sep-16	Dust 6	6	128.2	131.1	2.9	32.9	26.82	79.00	0.34	123.9
3-Jan-17	Dust 6	1	117.4	153.2	35.8	35.8	29.19	100.00	0.29	106.5
					TOTALS	**603**	**491.62**	**369.00**	**1.33**	**486.3**
1-Jan-16	Initial deployment date									
30-Mar-16	Dust 7	1	121.8	210.8	89	89	72.56	89.00	0.82	297.6
9-Jul-16	Dust 7[2]	1	118.6	219.4	100.8				n/a	n/a
9-Jul-16	Dust 7	2	124.9	127.6	2.7	103.5	84.38	101.00	0.84	304.9
26-Sep-16	Dust 7	1	128.1	158.3	30.2	30.2	24.62	79.00	0.31	113.8
6-Jan-17	Dust 7	1	127.3	170.6	43.3	43.3	35.30	102.00	0.35	126.3
					TOTALS	**266**	**216.87**	**371.00**	**0.58**	**213.4**

Appendix B. Dustfall Gauge Analytical Results

Sample Date	Dust Gauge ID	Filter #	Weight of Filter (mg)	Filter + Residue (mg)	Weight of Residue (mg)	Cumulative (filters, mg)	Dust Deposition (mg/dm^2)	Days Deployed	Dust Deposition (mg/dm^2/d)	Dust Deposition (mg/dm^2/y)
2-Jan-16	Initial deployment date									
1-Apr-16	Dust 8	1	119.1	136.5	17.4	17.4	14.19	90.00	0.16	57.5
23-Jul-16	Dust 8	1	119.9	314.4	194.5	194.5	158.57	113.00	1.40	512.2
24-Sep-16	Dust 8[3]	1	129.2	129.4	0.2				n/a	n/a
24-Sep-16	Dust 8[3]	2	116.2	116.4	0.2				n/a	n/a
24-Sep-16	Dust 8[3]	3	116.4	116.5	0.1				n/a	n/a
24-Sep-16	Dust 8[3]	4	115.5	115.8	0.3				n/a	n/a
24-Sep-16	Dust 8[3]	5	128.7	128.8	0.1				n/a	n/a
24-Sep-16	Dust 8[3]	6	116.9	116.9	0				n/a	n/a
24-Sep-16	Dust 8[3]	7	116.6	123.3	6.7				n/a	n/a
24-Sep-16	Dust 8[3]	8	115.6	116	0.4				n/a	n/a
24-Sep-16	Dust 8[3]	9	117	121	4				n/a	n/a
24-Sep-16	Dust 8[3]	10	128.4	134.4	6				n/a	n/a
24-Sep-16	Dust 8	11	128.6	130	1.4	19.4	15.82	63.00	0.25	91.6
3-Jan-17	Dust 8	1	116	130.2	14.2	14.2	11.58	101.00	0.11	41.8
					TOTALS	**245.5**	**200.15**	**367.00**	**0.55**	**199.1**
2-Jan-16	Initial deployment date									
30-Mar-16	Dust 9	1	117.9	126.7	8.8	8.8	7.17	88.00	0.08	29.8
17-Jul-16	Dust 9	1	119.4	125.9	6.5	6.5	5.30	109.00	0.05	17.7
26-Sep-16	Dust 9	1	116.2	169.3	53.1	53.1	43.29	71.00	0.61	222.6
4-Jan-17	Dust 9	1	117.1	126.6	9.5	9.5	7.75	100.00	0.08	28.3
					TOTALS	**77.9**	**63.51**	**368.00**	**0.17**	**63.0**

Appendix B. Dustfall Gauge Analytical Results

Sample Date	Dust Gauge ID	Filter #	Weight of Filter (mg)	Filter + Residue (mg)	Weight of Residue (mg)	Cumulative (filters, mg)	Dust Deposition (mg/dm²)	Days Deployed	Dust Deposition (mg/dm²/d)	Dust Deposition (mg/dm²/y)
1-Jan-16	Initial deployment date									
30-Mar-16	Dust 10	1	124.5	253.6	129.1	129.1	105.25	89.00	1.18	431.7
7-Jul-16	Dust 10	1	125.3	801.3	676	676	551.13	99.00	5.57	2032.0
28-Sep-16	Dust 10	1	117.7	255.9	138.2	138.2	112.67	83.00	1.36	495.5
6-Jan-17	Dust 10	1	116.4	169.1	52.7	52.7	42.97	100.00	0.43	156.8
					TOTALS	**996**	**812.03**	**371.00**	**2.19**	**798.9**
1-Jan-16	Initial deployment date									
1-Apr-16	Dust C1	1	121.1	129.4	8.3	8.3	6.77	91.00	0.07	27.1
20-Jul-16	Dust C1	1	120.8	152.8	32	32	26.09	110.00	0.24	86.6
26-Sep-16	Dust C1	1	129.1	138.5	9.4	9.4	7.66	68.00	0.11	41.1
6-Jan-17	Dust C1	1	117.4	124.2	6.8	6.8	5.54	102.00	0.05	19.8
					TOTALS	**56.5**	**46.06**	**371.00**	**0.12**	**45.3**
1-Jan-16	Initial deployment date									
1-Apr-16	Dust C2	1	112.8	121.2	8.4	8.4	6.85	91.00	0.08	27.5
23-Jul-16	Dust C2	1	121.3	320.3	199	199	162.24	113.00	1.44	524.1
24-Sep-16	Dust C2	1	116.8	126.5	9.7	9.7	7.91	63.00	0.13	45.8
4-Jan-17	Dust C2	1	128	140.6	12.6	12.6	10.27	102.00	0.10	36.8
					TOTALS	**229.7**	**187.27**	**369.00**	**0.51**	**185.2**

Notes:

[1] *Sample not used as water and bugs present in sample.*

[2] *Sample not used as water would not go through the filter.*

[3] *Filtering difficult, viscous water, lots of small bug, filter "stained", no visible particles on filter.*

Appendix C

Dustfall Snow Survey Field Sheets and Analytical Results

Dust Gauge Collection Field Sheet

No: ENVI-178-0312
Area: 8000
Revision: R0
Effective Date: 26-Mar-2012
By: Dianne Dul
Task: Dust Gauge Collection Field Sheet
Page: 1 of 2

GENERAL

LOCATION NAME: DUST 1

DATE (dd-mmm-yyyy): 2016-03-31

TIME (24:00): 11:26

SAMPLED BY: JG

TYPE OF SAMPLE: [✓ Dust]

Other

GPS COORDINATES (UTM): 533964 **E** 7154321 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C

Wind Direction: NW

Wind Speed (knots): 10

Precipitation: rain / mist / snow / [✓ N/A]

Cloud Cover: 0%, [✓ 10%], 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%]

Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2015-12-31

Total Volume of Water After Melting : 225 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	120.9	206.1	85.2	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 2A **DATE (dd-mmm-yyyy):** 2016-03-30 **TIME (24:00):** 12:12

SAMPLED BY: JG/KG **TYPE OF SAMPLE:** [✓ **Dust**] **Other**

GPS COORDINATES (UTM): 535678 **E** 7151339 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -11 °C **Wind Direction:** NE **Wind Speed (knots):** 17-22

Precipitation: rain / mist / [✓ snow] / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-01-02

Total Volume of Water After Melting : 340 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.7	314.8	197.1	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 3 **DATE (dd-mmm-yyyy):** 2016-03-30 **TIME (24:00):** 12:04

SAMPLED BY: JG/KG **TYPE OF SAMPLE:** [✓ **Dust**] **Other**

GPS COORDINATES (UTM): 535024 **E** 7151872 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -11 °C **Wind Direction:** NE **Wind Speed (knots):** 17-22

Precipitation: rain / mist / [✓ snow] / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-01-02

Total Volume of Water After Melting : 365 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	125.7	592.4	466.7	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
		Page:	1 of 2

GENERAL

LOCATION NAME: DUST 4 **DATE (dd-mmm-yyyy):** 2016-04-01 **TIME (24:00):** 16:35

SAMPLED BY: JG/SS **TYPE OF SAMPLE:** [✓ Dust] **Other** ____

GPS COORDINATES (UTM): 531397 **E** 7152127 **N (Zone)** 12

DESCRIPTION: ____

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** NW **Wind Speed (knots):** 9

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, [✓ 10%], 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-01-01

Total Volume of Water After Melting : 400 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	113.8	175.1	61.3	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

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Area:	8000	**Revision:**	R0
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GENERAL

LOCATION NAME: DUST 5 **DATE (dd-mmm-yyyy):** 2016-03-30 **TIME (24:00):** 10:53

SAMPLED BY: JL/KG **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 535696 **E** 7155138 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -11 °C **Wind Direction:** NE **Wind Speed (knots):** 17-22

Precipitation: rain / mist / [✓ snow] / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-01-01

Total Volume of Water After Melting : 300 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	125.4	146.7	21.3	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST 6
DATE (dd-mmm-yyyy): 2016-03-31
TIME (24:00): 10:53
SAMPLED BY: JK
TYPE OF SAMPLE: [✓ Dust]
Other
GPS COORDINATES (UTM): 537502 **E** 7152934 **N (Zone)** 12
DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C
Wind Direction: NW
Wind Speed (knots): 10
Precipitation: rain / mist / snow / [✓ N/A]
Cloud Cover: 0%, [✓ 10%], 25%, 50%, 75%, 100
Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%]
Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2015-12-31

Total Volume of Water After Melting: 240 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	125.3	296.5	171.2	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST 7

DATE (dd-mmm-yyyy): 2016-03-30

TIME (24:00): 11:33

SAMPLED BY: JF/KL

TYPE OF SAMPLE: [✓ Dust]

Other

GPS COORDINATES (UTM): 536819 E 7150510 N (Zone) 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -11 °C

Wind Direction: NE

Wind Speed (knots): 17-22

Precipitation: rain / mist / [✓ snow] / N/A

Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%]

Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-01-01

Total Volume of Water After Melting: 330 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	121.8	210.8	89.0	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST 8 **DATE (dd-mmm-yyyy):** 2016-04-01 **TIME (24:00):** 16:15

SAMPLED BY: JG/SS **TYPE OF SAMPLE:** [✓ Dust] **Other**____

GPS COORDINATES (UTM): 531401 **E** 7154146 **N (Zone)** 12

DESCRIPTION: ____

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** NW **Wind Speed (knots):** 9

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, [✓ 10%], 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-01-02

Total Volume of Water After Melting : 340 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	119.1	136.5	17.4	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST 9

DATE (dd-mmm-yyyy): 2016-03-30

TIME (24:00): 11:16

SAMPLED BY: JR/KG

TYPE OF SAMPLE: [✓ Dust]

Other

GPS COORDINATES (UTM): 541204 E 7152154 N (Zone) 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -11 °C

Wind Direction: NE

Wind Speed (knots): 17-22

Precipitation: rain / mist / [✓ snow] / N/A

Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%]

Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-01-02

Total Volume of Water After Melting: 200 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	119.9	126.7	8.8	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST 10 **DATE (dd-mmm-yyyy):** 2016-03-30 **TIME (24:00):** 11:48

SAMPLED BY: CC/KG **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 532908 E 7148924 N (Zone) 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -11 °C **Wind Direction:** NE **Wind Speed (knots):** 17-22

Precipitation: rain / mist / [✓ snow] / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** [✓ Visible], Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-01-01

Total Volume of Water After Melting : 365 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	124.5	253.6	129.1	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST C1 **DATE (dd-mmm-yyyy):** 2016-04-01 **TIME (24:00):** 15:30

SAMPLED BY: JG/CS **TYPE OF SAMPLE:** Dust **Other**

GPS COORDINATES (UTM): 534980 **E** 7144770 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** NW **Wind Speed (knots):** 9

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, [✓ 10%], 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-01-01

Total Volume of Water After Melting : 275 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	121.1	129.4	8.3	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST C2 **DATE (dd-mmm-yyyy):** 2016-04-01 **TIME (24:00):** 16:00

SAMPLED BY: JG/SS **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 528714 **E** 528714 **N (Zone)** 12

DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** NW **Wind Speed (knots):** 9

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, [✓ 10%], 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-01-01

Total Volume of Water After Melting : 350 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	112.8	121.2	8.4	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 1 **DATE (dd-mmm-yyyy):** 07-Jul-2016 **TIME (24:00):** 15:43

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 533964 **E** 7154321 **N (Zone)** 12

DESCRIPTION: North of Airstrip

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 11.64 °C **Wind Direction:** 131.9 **Wind Speed (knots):** 13.6

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** [✓ Visible], Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 31-Mar-2016

- No water in vestibule
- visable dust in bottom of beaker

few mosquitos
few flies

Total Volume of Water After Melting : 50 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	119.4	442.4	323	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 2A **DATE (dd-mmm-yyyy):** 2016-07-08 **TIME (24:00):** 17:30

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 535678 **E** 7151339 **N (Zone)** 12

DESCRIPTION: East Shallow Bay

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 17.63 °C **Wind Direction:** 142 **Wind Speed (knots):** 9.1

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-03-30

- Straightened up stand
- flies (few)
- misquitoes (few)
- visible dust in bottom of sample

Total Volume of Water After Melting : 100 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	122.6	281.3	158.7	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 3 **DATE (dd-mmm-yyyy):** 2016-07-08 **TIME (24:00):** 17:58

SAMPLED BY: DDISS **TYPE OF SAMPLE:** [✓ Dust] **Other**________

GPS COORDINATES (UTM): 535024 **E** 7151872 **N (Zone)** 12

DESCRIPTION: West Shallow Bay

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 17.63 °C **Wind Direction:** 142 **Wind Speed (knots):** 9.1

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-03-30

- No water in vestibale
- Straightened up stand

flies (few)
masquitos (few)
bird droppings

Total Volume of Water After Melting : 0 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	119.1	298.1	179.0	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 4 **DATE (dd-mmm-yyyy):** 2016-07-08 **TIME (24:00):** 18:46

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 531397 **E** 7152127 **N (Zone)** 12

DESCRIPTION: By Weather Station

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 17.81 °C **Wind Direction:** 147.8 **Wind Speed (knots):** 8.9

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** [✓ Visible], Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-04-01

- Straightened up stand
- visable dust in bottom of beaker
- very few flies

Total Volume of Water After Melting : 275 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	119.5	121.5	2.0	very hard to suck water through filter
2	125.0	193.7	68.7	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST5 **DATE (dd-mmm-yyyy):** 23-Jul-2016 **TIME (24:00):** 1700

SAMPLED BY: SS **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 535696 **E** 7155138 **N (Zone)** 12

DESCRIPTION: NE of Runway

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 9.84 °C **Wind Direction:** 321.2 **Wind Speed (knots):** 15.2

Precipitation: rain / mist / snow [✓ N/A] **Cloud Cover:** 0%, 10%, [✓ 25%] 50%, 75%, 100

Snow Cover: [✓ 0%,] 10%, 25%, 50%, 75%, 100% **Dust in area:** [✓ Visible] Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-Mar-30

some bugs + debris, adjusted pole

Total Volume of Water After Melting : 2mL (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	120.3	157.4	37.1	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 6 **DATE (dd-mmm-yyyy):** 2016-07-08 **TIME (24:00):** 16:57

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** Dust **Other** ______

GPS COORDINATES (UTM): 537502 **E** 7152934 **N (Zone)** ______

DESCRIPTION: ______

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 17.35 °C **Wind Direction:** 138.1 **Wind Speed (knots):** 10.3

Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-03-31

- Straightened up stand
- Bird droppings
- misquitoes (lots)
- few flies
- good amount organic matter

Total Volume of Water After Melting : 50 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	119.7	482.8	363.1	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 7 **DATE (dd-mmm-yyyy):** 2016-07-09 **TIME (24:00):** 14:23
SAMPLED BY: DB/SS **TYPE OF SAMPLE:** [✓ Dust] **Other**
GPS COORDINATES (UTM): 536819 **E** ~~7154446~~ 7150510 **N (Zone)** 12
DESCRIPTION: Island to SE of A418 Pit

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 18.81 °C **Wind Direction:** 155.4 **Wind Speed (knots):** 8.4
Precipitation: rain / mist / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100
Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible / [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-03-30

- misquitoes (very few)
- flies (very few)

Total Volume of Water After Melting : 0 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	118.6	219.4	100.8	
2	124.9	127.6	2.7	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST8
DATE (dd-mmm-yyyy): 23-Jul-2016 **TIME (24:00):** 1558
SAMPLED BY: SS
TYPE OF SAMPLE: [✓ Dust] **Other**
GPS COORDINATES (UTM): 531401 **E** 7154146 **N (Zone)** 12
DESCRIPTION: West of Runway on island, on shoreline

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 8.67 °C **Wind Direction:** 311.7 **Wind Speed (knots):** 16.3
Precipitation: rain / mist / snow / [✓ N/A]
Cloud Cover: 0%, 10%, [✓ 25%], 50%, 75%, 100
Snow Cover: [✓ 0%], 10%, 25%, 50%, 75%, 100%
Dust in area: [✓ Visible], Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed ~~Unknown~~ 2016/04/01
some flies, cloudy water, live spider, adjusted pole

Total Volume of Water After Melting: 350 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	119.9	314.4	194.5	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST 9
DATE (dd-mmm-yyyy): 17-Jul-2016
TIME (24:00): 1711
SAMPLED BY: DD
TYPE OF SAMPLE: [✓ Dust]
Other
GPS COORDINATES (UTM): 541204 **E** 7152154 **N (Zone)** 12
DESCRIPTION: TK Camp

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 15.22 °C
Wind Direction: 340.5
Wind Speed (knots): 7.6
Precipitation: rain / mist / snow / N/A
Cloud Cover: 0%, 10%, 25%, 50%, 75%, 100
Snow Cover: 0%, 10%, 25%, 50%, 75%, 100%
Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016/03/30

lots of bird droppings, tiny bit of water

Total Volume of Water After Melting: 75 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	119.4	125.9	6.5	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 10 **DATE (dd-mmm-yyyy):** 2016-07-07 **TIME (24:00):** 15:42

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 532908 **E** 7148924 **N (Zone)** 12

DESCRIPTION: South of A21 stockpile

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 11.64 °C **Wind Direction:** 131.9 **Wind Speed (knots):** 13.6

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, 100

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** [✓ Visible], Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-03-30

- few flies
- few misquitoes
- visable dust in beaker

Total Volume of Water After Melting : 400 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	125.3	801.3	676	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Rio Tinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
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GENERAL

LOCATION NAME: DUST C1 **DATE (dd-mmm-yyyy):** 20-Jul-2016 **TIME (24:00):** 16:48

SAMPLED BY: SS **TYPE OF SAMPLE: Dust** **Other**

GPS COORDINATES (UTM): 534979 **E** 7144270 **N (Zone)** 12

DESCRIPTION: S of Diavik

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 11.9 °C **Wind Direction:** 204.5 **Wind Speed (knots):** 2.5

Precipitation: rain / [✓ mist] / snow / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016/04/01

Cloudy water, a few bugs present, adjusted pole

Total Volume of Water After Melting : 150 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	120.8	152.8	32.0	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUSTC2 **DATE (dd-mmm-yyyy):** 23-Jul-2016 **TIME (24:00):** 1315

SAMPLED BY: SS **TYPE OF SAMPLE:** [✓ **Dust**] **Other**

GPS COORDINATES (UTM): 528714 **E** 7153276 **N (Zone)** 12

DESCRIPTION: SW of Runway on Island

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 7.57 °C **Wind Direction:** 300.9 **Wind Speed (knots):** 18.0

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, 10%, [✓ 25%], 50%, 75%, 100

Snow Cover: [✓ 0%] 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed Unknown 2016/04/01

small bugs, lots of particles

Total Volume of Water After Melting : 50 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	121.3	320.3	199	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals				

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 1
DATE (dd-mmm-yyyy): ~~2~~ 25-09-2016
TIME (24:00): 1650
SAMPLED BY: NG DD
TYPE OF SAMPLE: Dust
Other________
GPS COORDINATES (UTM): ________ E ________ N (Zone) ________
DESCRIPTION: N of runway

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 7 °C
Wind Direction: ________
Wind Speed (knots): ________
Precipitation: rain / mist / snow [✓ N/A]
Cloud Cover: [✓ 0%], 10%, 25%, 50%, 75%, 100
Snow Cover: [✓ 0%], 10%, 25%, 50%, 75%, 100%
Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed________

2016-07-07 1819

Water, bugs
had to prop brass tube w/ rocks, doesn't fit ring

Total Volume of Water After Melting: 350 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.6	203.0		← 86.4
2	128.1	128.3		← 0.2
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	244.7	331.3		← 86.6

RioTinto

Dust Gauge Collection Field Sheet

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Revision History

Revision	Revision Description	Date of Revision	Author
0	Initial Release	16-Mar-2012	D. Dul

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 2A DATE (dd-mmm-yyyy): 26-09-2016 TIME (24:00): 1522

SAMPLED BY: NG SM TYPE OF SAMPLE: [✓ Dust] Other

GPS COORDINATES (UTM): E N (Zone)

DESCRIPTION: DRy shallow bays

CLIMATE CONDITIONS (if sampling outside)

Air Temp: R °C Wind Direction: Wind Speed (knots):

Precipitation: rain / mist / snow / [✓ N/A] Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: [✓ 0%] 10%, 25%, 50%, 75%, 100% Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed

2016-07-08 1730

water, bugs

Total Volume of Water After Melting: 375 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.3	153.5	38.2	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	115.3	153.5	38.2	

RioTinto

Dust Gauge Collection Field Sheet

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Revision History

Revision	Revision Description	Date of Revision	Author
0	Initial Release	16-Mar-2012	D. Dul

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 3
DATE (dd-mmm-yyyy): 25-09-2016
TIME (24:00): 1534
SAMPLED BY: DONG
TYPE OF SAMPLE: Dust
Other
GPS COORDINATES (UTM): E N (Zone)
DESCRIPTION: West Shallow Bay

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 7 °C
Wind Direction:
Wind Speed (knots):
Precipitation: rain / mist / snow / [✓ N/A]
Cloud Cover: 0%, [✓ 10%], 25%, 50%, 75%, 100
Snow Cover: [✓ 0%], ~~10%~~, 25%, 50%, 75%, 100%
Dust in area: Visible [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016/07/08

Water, 1 moth

Total Volume of Water After Melting : 500 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	128.4	278.8	←	150·4
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	128·4	278·8	←	150·4

RioTinto

Dust Gauge Collection Field Sheet

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Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUST 4 **DATE (dd-mmm-yyyy):** 28-Sep-2016 **TIME (24:00):** 09:10
SAMPLED BY: DD FL **TYPE OF SAMPLE:** Dust **Other**________
GPS COORDINATES (UTM): ________ **E** ________ **N (Zone)** ________
DESCRIPTION: Wind Farm Area.

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ______ °C **Wind Direction:** ______ **Wind Speed (knots):** ______
Precipitation: rain / mist / [✓ snow] / N/A **Cloud Cover:** 0%, 10%, 25%, 50%, [✓ 75%], 100
Snow Cover: [✓ 0%], 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016/07/08 @ 8:45
- water + bugs present
- Flies.

Total Volume of Water After Melting : 450 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	128.2	144.3	16.1	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	128.2	144.3	16.1	

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 5 **DATE (dd-mmm-yyyy):** 2016-09-24 **TIME (24:00):** 18:30
SAMPLED BY: DD/SM **TYPE OF SAMPLE:** [✓ Dust] **Other**________
GPS COORDINATES (UTM): ________ **E** ________ **N (Zone)** ________
DESCRIPTION: ________

CLIMATE CONDITIONS (if sampling outside)

Air Temp: _____ °C **Wind Direction:** _____ **Wind Speed (knots):** _____
Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** [✓ 0%], 10%, 25%, 50%, 75%, 100
Snow Cover: [✓ 0%], 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-07-23

Bugs & Water.
- visable dust on filter
- Couple of bugs.

Total Volume of Water After Melting: 240 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.0	130.4	14.4	~~14.4~~
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.0	130.4	14.4	~~14.4~~

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust6 DATE (dd-mmm-yyyy): 2016-09-25 TIME (24:00): 1642

SAMPLED BY: DD/NC TYPE OF SAMPLE: [✓ Dust] Other____

GPS COORDINATES (UTM): ____ E ____ N (Zone) ____

DESCRIPTION: ____

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ____ °C Wind Direction: ____ Wind Speed (knots): ____

Precipitation: rain / mist / snow [✓ / N/A] Cloud Cover: 0%, [✓ 10%], 25%, 50%, 75%, 100

Snow Cover: [✓ 0%], 10%, 25%, 50%, 75%, 100% Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-07-08

Lots Bugs & water is amber colored

Water very hard to filter, looks thick

Total Volume of Water After Melting : 340 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	128.2	133.1	4.9	
2	116.9	135.1	18.2	
3	129.1	131.2	2.1	
4	128.8	131.6	2.8	
5	128.9	130.9	2.0	
6	128.2	131.1	2.9	
7				
8				
9				
10				
11				
Totals	760.1	793.0	32.9	

RioTinto

Dust Gauge Collection Field Sheet

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Revision History

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0	Initial Release	16-Mar-2012	D. Dul

RioTinto

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 7 DATE (dd-mmm-yyyy): 26-09-2016 TIME (24:00): 1540

SAMPLED BY: NG SM TYPE OF SAMPLE: [✓ Dust] Other________

GPS COORDINATES (UTM): ________ E ________ N (Zone) ________

DESCRIPTION: Island SE of shallow bays

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 8 °C Wind Direction: ________ Wind Speed (knots): ________

Precipitation: rain / mist / snow / [✓ N/A] Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: [✓ 0%], 10%, 25%, 50%, 75%, 100% Dust in area: Visible [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed________ 2016-07-09 1628

Water, bugs

Total Volume of Water After Melting: 375 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	128.1	158.3	30.2	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	128.1	158.3	30.2	

RioTinto

Dust Gauge Collection Field Sheet

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Revision History

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Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 8 **DATE (dd-mmm-yyyy):** 2016-09-24 **TIME (24:00):** 1740

SAMPLED BY: DD/SM **TYPE OF SAMPLE:** [✓ Dust] **Other**________

GPS COORDINATES (UTM): ________**E** ________**N (Zone)** ________

DESCRIPTION: ________

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ______°C **Wind Direction:** ______ **Wind Speed (knots):**______

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: [✓ 0%], 10%, 25%, 50%, 75%, 100% **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-07-23

Lots of flys & some Water.

Filtering difficult, viscous water, lots of bugs

Total Volume of Water After Melting : 400 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	129.2	129.4	0.2	filter "stained", no particles ontop o filter
2	116.2	116.4	0.2	" "
3	116.4	116.5	0.1	" "
4	115.5	115.8	0.3	" "
5	128.7	128.8	0.1	" "
6	116.9	116.9	0.0	" "
7	116.6	123.3	6.7	particles ontop of filter
8	115.6	116.0	0.4	filter "stained", no particles ontop of filter
9	117.0	121.0	~~3.0~~ 4.0	particles on top of filter
10	128.4	134.4	6.0	" "
11	128.6	~~129.9~~ 130.0	1.4	" "
Totals	1329.1	~~1355.7~~ 1348.5	19.4	

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust 9 DATE (dd-mmm-yyyy): 26-09-2016 TIME (24:00): 169

SAMPLED BY: NB/SM TYPE OF SAMPLE: [✓ Dust] Other

GPS COORDINATES (UTM): E N (Zone)

DESCRIPTION: By CRM camp

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 8 °C Wind Direction: Wind Speed (knots):

Precipitation: rain / mist / snow / [✓ N/A] Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: [✓ 0%] 10%, 25%, 50%, 75%, 100% Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed

2016-07-17 1711

water, bugs

Total Volume of Water After Melting: 190 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.2	169.3	53.1	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.2	169.3	53.1	

Dust Gauge Collection Field Sheet

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Revision History

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GENERAL

LOCATION NAME: Dust 10
DATE (dd-mmm-yyyy): 28-Sep-2016 TIME (24:00): 09:51
SAMPLED BY: DD FL
TYPE OF SAMPLE: [✓ Dust] Other
GPS COORDINATES (UTM): E N (Zone)
DESCRIPTION:

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 0 °C Wind Direction: Wind Speed (knots):
Precipitation: rain / mist / [✓ snow] / N/A
Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100]
Snow Cover: [✓ 0%], 10%, 25%, 50%, 75%, 100%
Dust in area: Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016/07/07 @ 16:45

- water + bugs present
- mostly flies

Total Volume of Water After Melting: 750 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.7	255.~~8~~9	138.2	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	117.7	255.9	138.2	

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust C1 DATE (dd-mmm-yyyy): 2016-09-26 TIME (24:00): 1430

SAMPLED BY: NG.SM TYPE OF SAMPLE: [✓ Dust] Other

GPS COORDINATES (UTM): E N (Zone)

DESCRIPTION: South OF AD1

CLIMATE CONDITIONS (if sampling outside)

Air Temp: 8 °C Wind Direction: Wind Speed (knots):

Precipitation: rain / mist / snow [✓ N/A] Cloud Cover: 0%, 10%, 25%, 50%, [✓ 75%], 100

Snow Cover: [✓ 0%], 10%, 25%, 50%, 75%, 100% Dust in area: Visible [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed

2016-07-20 1648

Water, Flies

Total Volume of Water After Melting : 350 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	129.1	~~138.3~~ 1385	9.4	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	129.1	138.5	9.4	

Dust Gauge Collection Field Sheet

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Revision History

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Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: Dust C2
DATE (dd-mmm-yyyy): 2016-09-24
TIME (24:00): 1703
SAMPLED BY: DD/SM
TYPE OF SAMPLE: [✓ Dust]
Other
GPS COORDINATES (UTM): E N (Zone)
DESCRIPTION: SW of Diavik

CLIMATE CONDITIONS (if sampling outside)

Air Temp: °C
Wind Direction:
Wind Speed (knots):
Precipitation: rain / mist / snow / [✓ N/A]
Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100]
Snow Cover: [✓ 0%], 10%, 25%, 50%, 75%, ~~100%~~
Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-07-23

Bugs & Water

-Visable dust on filter

-minor organics on filter

Total Volume of Water After Melting: 140 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.8	126.5	9.7	
2	~~126.5~~			
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.8	126.5	9.7	

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: DUSt1 **DATE (dd-mmm-yyyy):** 04-Jan-2017 **TIME (24:00):** 14:10

SAMPLED BY: KG JG **TYPE OF SAMPLE: Dust** **Other**

GPS COORDINATES (UTM): 533964 **E** 7154321 **N (Zone)** 12

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -12 °C **Wind Direction:** N/W **Wind Speed (knots):** 7

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100%]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-~~Jul~~ 09 -25

Water little cloudy some midsize particles

Total Volume of Water After Melting : ~~8~~66510 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.5	196.0	78.5	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	117.5	196.0	78.5	

Dust Gauge Collection Field Sheet

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GENERAL

LOCATION NAME: 2A **DATE (dd-mmm-yyyy):** 04-Jan-2017 **TIME (24:00):** 15:10

SAMPLED BY: KGJG **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 535678 **E** 7151339 **N (Zone)** 12

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -12 °C **Wind Direction:** NW **Wind Speed (knots):** 7

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-~~July~~ 09 -27

little cloudy fine particles

Total Volume of Water After Melting : 500 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	127.9	166.6	38.7	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	127.9	166.6	38.7	

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
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Task:	Dust Gauge Collection Field Sheet		
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GENERAL

LOCATION NAME: Dust 3 **DATE (dd-mmm-yyyy):** 04-Jan-2017 **TIME (24:00):** 15:34

SAMPLED BY: KG JG **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 535024 **E** 7151872 **N (Zone)** 10

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -12 °C **Wind Direction:** NW **Wind Speed (knots):** 7

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-Jul-25 09

Water little cloudy

Total Volume of Water After Melting: 585 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.6	213.4	95.8	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	117.6	213.4	95.8	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
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GENERAL

LOCATION NAME: DUST4 DATE (dd-mmm-yyyy): 06-Jan-2017 TIME (24:00): 13:00

SAMPLED BY: JG SS TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): 531397 E 7152127 N (Zone) # 12

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -16 °C **Wind Direction:** NW **Wind Speed (knots):** 9

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-09-29

- Water cloudy. No debris

Total Volume of Water After Melting: 590 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	129.2	148.4	19.2	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	129.2	148.4	19.2	

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
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GENERAL

LOCATION NAME: Dust 5 DATE (dd-mmm-yyyy): 04-Jan-2017 TIME (24:00): 14:19

SAMPLED BY: KG JG TYPE OF SAMPLE: [✓ Dust] Other

GPS COORDINATES (UTM): 535696 E 7155138 N (Zone) 12

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -12 °C Wind Direction: NW Wind Speed (knots): 7

Precipitation: rain / mist / snow / [✓ N/A] Cloud Cover: 0%, 10%, 25%, 50%, 75% [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] Dust in area: Visible [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-09-24

little cloudy

Total Volume of Water After Melting : 415 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	~~117.0~~	~~145.7~~	~~28.7~~	
2	117.0	144.8	27.8	
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	117.0	144.8	27.8	

Dust Gauge Collection Field Sheet

Area:	8000	**No:**	ENVI-178-0312
Effective Date:	26-Mar-2012	**Revision:**	R0
Task:	Dust Gauge Collection Field Sheet	**By:**	Dianne Dul
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GENERAL

LOCATION NAME: DUST6 **DATE (dd-mmm-yyyy):** 03-Jan-2017 **TIME (24:00):** 16:30

SAMPLED BY: JG KG **TYPE OF SAMPLE: Dust** **Other**

GPS COORDINATES (UTM): 537502 **E** 7152934 **N (Zone)** 12

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -12 °C **Wind Direction:** NW **Wind Speed (knots):** 13

Precipitation: rain / mist / snow / [✓ N/A] **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** [✓ Visible], Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-04-25

Total Volume of Water After Melting : 330 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.4	153.2	35.8	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	117.4	153.2	35.8	

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
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GENERAL

LOCATION NAME: DUST 7 DATE (dd-mmm-yyyy): 06-Jun-2017 TIME (24:00): 1200

SAMPLED BY: JG SS TYPE OF SAMPLE: [✓ Dust] Other

GPS COORDINATES (UTM): 5368189 E 7150510 N (Zone) 18

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -16 °C Wind Direction: NW Wind Speed (knots): 9

Precipitation: rain / mist / snow / [✓ N/A]

Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%]

Dust in area: Visible [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-09-27

-Water cloudy, No debris

Total Volume of Water After Melting: 575 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	127.3	170.6	43.3	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	127.3	170.6	43.3	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
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GENERAL

LOCATION NAME: DUST 8 DATE (dd-mmm-yyyy): 18-Jan-2017 TIME (24:00): 14:30

SAMPLED BY: JG KG TYPE OF SAMPLE: Dust Other

GPS COORDINATES (UTM): ~~534~~531400 E 7154146 N (Zone) 12

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -12 °C Wind Direction: NW Wind Speed (knots): 13

Precipitation: rain / mist / snow / [✓ N/A] Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] Dust in area: [✓ Visible], Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-09-25

Total Volume of Water After Melting : 750 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.0	130.2	14.2	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.0	130.2	14.2	

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
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GENERAL

LOCATION NAME: Dust 9 DATE (dd-mmm-yyyy): 04-Jan-2017 TIME (24:00): 14:42

SAMPLED BY: KG JG TYPE OF SAMPLE: [✓ Dust] Other

GPS COORDINATES (UTM): 541204 E 7152154 N (Zone) 12

DESCRIPTION: Quarterly dust guage collution

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -12 °C Wind Direction: NW Wind Speed (knots): 7

Precipitation: rain / mist / snow / [✓ N/A] Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-09-26

Total Volume of Water After Melting: 250 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.1	126.6	9.5	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	117.1	126.6	9.5	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
Task:	Dust Gauge Collection Field Sheet		
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GENERAL

LOCATION NAME: DUST 10 **DATE (dd-mmm-yyyy):** 06-Jan-2017 **TIME (24:00):** 12:50

SAMPLED BY: JG SS **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 532908 **E** 7148924 **N (Zone)** 12

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -16 °C **Wind Direction:** NW **Wind Speed (knots):** 9

Precipitation: rain / mist / snow [✓ N/A] **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, Not Visible

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed ~~380~~ 2016-02-29

- Very cloudy - No debris

Total Volume of Water After Melting : 380 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.4	169.1	52.7	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	116.4	169.1	52.7	

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
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GENERAL

LOCATION NAME: DUST C1 DATE (dd-mmm-yyyy): 06-01-2017 TIME (24:00): 12:23

SAMPLED BY: JG SS TYPE OF SAMPLE: [✓ Dust] Other

GPS COORDINATES (UTM): 534979 E 7144270 N (Zone) 12

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -16 °C Wind Direction: NW Wind Speed (knots): 9

Precipitation: rain / mist / snow / [✓ N/A] Cloud Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] Dust in area: Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-09-26

- No debris

Total Volume of Water After Melting: 600 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.4	124.2	6.8	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	117.4	124.2	6.8	

RioTinto

Dust Gauge Collection Field Sheet

		No:	ENVI-178-0312
Area:	8000	**Revision:**	R0
Effective Date:	26-Mar-2012	**By:**	Dianne Dul
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GENERAL

LOCATION NAME: Dust C2 **DATE (dd-mmm-yyyy):** 04-Jan-2019 **TIME (24:00):** 13:40

SAMPLED BY: EG JG **TYPE OF SAMPLE:** [✓ Dust] **Other**

GPS COORDINATES (UTM): 528714 **E** 7153276 **N (Zone)** 12

DESCRIPTION: Quarterly dust gauge collection

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -12 °C **Wind Direction:** NW **Wind Speed (knots):** 7

Precipitation: rain / mist / snow [✓ N/A] **Cloud Cover:** 0%, 10%, 25%, 50%, 75%, [✓ 100]

Snow Cover: 0%, 10%, 25%, 50%, 75%, [✓ 100%] **Dust in area:** Visible, [✓ Not Visible]

COLLECTION COMMENTS: (i.e. damage to station, bugs - twigs in sample, hole in vestibule, etc.)

Date Sample Collected was Deployed 2016-09-24

~~Watter is~~ Water is clear, little dust

Total Volume of Water After Melting: 500 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	128.0	140.6	12.6	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
Totals	128.0	140.6	12.6	

RioTinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	**Revision:**	R6
Effective Date:	26-MAR-2012	**By:**	D. Dul
Task:	Snow Sampling Field Sheet		
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GENERAL

LOCATION NAME: SSL-1 **DATE (yyyy-mm-dd):** 2016-04-03 **TIME (24:00):** 18:55

SAMPLED BY: Jr/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 0533909 **E** 7154287 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik On site km & Direction ____ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** S **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%

Dust in area: Visible ☑ Not Visible ☐ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	70	65	56.5	39	17.5	Y [✓ N]	
	2	69	65	56.5	39	17.5	Y [✓ N]	
	3	70	66	57	39	18	Y [✓ N]	
	4					53	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet

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Area:	8000	**Revision:**	R6
Effective Date:	26-MAR-2012	**By:**	D. Dul
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Dust Sample Filters

Total Volume of Melted Snow : 1615 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.9	557.8	441.9	Sample is cloudy can Visably see some
2				dust Lots of dust on
3				filter
4				Water was merky - [illegible] had a whiteish tinsh to it
Totals	115.9	557.8	441.9	was hard to filter

Water Quality Bottles

Total Volume of Melted Snow : __________ (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

Snow Sampling Field Sheet

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GENERAL

LOCATION NAME: SSI-2-4 **DATE (yyyy-mm-dd):** 2016-04-03 **TIME (24:00):** 18:35
SAMPLED BY: JG/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:** ______
GPS COORDINATES (UTM): 0533914 **E** 7K4367 **N (Zone)** 12 **NAD 83**
DESCRIPTION: Distance to Diavik On site km & Direction ______ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** S **Wind Speed (knots):** 5
Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%
Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	45	36	49	39	10	Y [✓ N]	
	2	47	40	50	39	11	Y [✓ N]	
	3	47	40	50.5	39	11.5	Y [✓ N]	
	4					32.5	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ ***

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	**Revision:**	R6
Effective Date:	26-MAR-2012	**By:**	D. Dul
Task:	Snow Sampling Field Sheet		
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Dust Sample Filters

Total Volume of Melted Snow : 1010 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.0	240.7	125.7	visable see dust small amount of organic
2				matter - small twig/grass - triple rinsed twig & grass
3				can visably see dust on
4				filter ~~most~~ med. amount
Totals	115.0	240.7	125.7	

Water Quality Bottles

Total Volume of Melted Snow : ~~1010~~ DD (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Rio Tinto

Snow Sampling Field Sheet

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Effective Date:	26-MAR-2012	**By:**	D. Dul
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GENERAL

LOCATION NAME: SSl-2-5 **DATE (yyyy-mm-dd):** 2016-04-03 **TIME (24:00):** 18:35

SAMPLED BY: JC/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 0537914 **E** 7154767 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik On Site km & Direction ____ On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26°C **Wind Direction:** S **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	44	41	50.5	39	11.5	Y [✓ N]	Removed sticks
	2	45	40	51	39	12	Y [✓ N]	Removed sticks/grass
	3	45	41	51.5	39	12.5	Y [✓ N]	
	4					36	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

Rio Tinto

Snow Sampling Field Sheet

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Dust Sample Filters

Total Volume of Melted Snow : 1090 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	123.8	226.8	103.0	few blades of grass (rinsed) a little cloudy
2				med dust on filter
3				few organics .
4				
Totals	123.8	226.8	103.0	

Water Quality Bottles

Total Volume of Melted Snow :__________(mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Snow Sampling Field Sheet

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GENERAL

LOCATION NAME: SSI-3 **DATE (yyyy-mm-dd):** 2016-04-03 **TIME (24:00):** 18:15

SAMPLED BY: JG/GG **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 0533971 **E** 7154520 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik On site km & Direction On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** S **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	33	28	47	39	8	Y [✓ N]	
	2	36	29	47	39	8	Y [✓ N]	
	3	33	29	47.5	39	8.5	Y [✓ N]	
	4	33.5	29	47.5	39	8.5	Y [✓ N]	
	Dust (Min. of 3 cores – Total Water Content SWE =/> 25)					33		
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
	Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)							

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

RioTinto

Snow Sampling Field Sheet

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Dust Sample Filters

Total Volume of Melted Snow : 1015 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	124.7	287.1	162.4	visible dust - organic matter some blades of grass
2				(triple rinsed
3				med amount of dust
4				-hard to filter - water cloudy
Totals	124.7	287.1	162.4	

Water Quality Bottles

Total Volume of Melted Snow :____________(mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

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GENERAL

LOCATION NAME: SSI-4 **DATE (yyyy-mm-dd):** 2016-04-03 **TIME (24:00):** 17:45
SAMPLED BY: JG/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**
GPS COORDINATES (UTM): 0534485 **E** 7155094 **N (Zone)** 12 **NAD 83**
DESCRIPTION: Distance to Diavik 4.31 km & Direction N On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** S **Wind Speed (knots):** 5
Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%
Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present	
							Yes / No	Comments
Dust Cores	1	63	56	55	39	16	Y [✓ N]	
	2	63	57	56	39	17	Y [✓ N]	
	3	63	50	53.5	39	14.5	Y [✓ N]	
	4					47.5	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	65	60.5	56.5	39	17.5	Y [✓ N]	
	2	65	61	57	39	18	Y [✓ N]	
	3	66	61	57	39	18	Y [✓ N]	
	4	67	62	56.5	39	17.5	Y [✓ N]	
	5	67	61	57	39	18	Y [✓ N]	
	6	66	59	56.5	39	17.5	Y [✓ N]	
	7					106.5	Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

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Dust Sample Filters

Total Volume of Melted Snow : 1518 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.1	138.9	22.8	fairly clear no visable dust Minor dust on filter.
2				
3				
4				
Totals	116.1	138.9	22.8	

Water Quality Bottles

1650
1635

Total Volume of Melted Snow : 3285 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
					GW				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL - HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL - H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate bottle.

Rio Tinto

Snow Sampling Field Sheet

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GENERAL

LOCATION NAME: SS1-5 **DATE (yyyy-mm-dd):** 2016-04-03 **TIME (24:00):** 17:10

SAMPLED BY: JT/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:** [illegible]

GPS COORDINATES (UTM): 0535098 **E** 7156280 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 5.56 km & Direction N On: Land ☒ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** S **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / 25% / [✓ 50%] / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Dust Present Comments
Dust Cores	1	63	60	55.5	39	16.5	Y [✓ N]	
	2	63	60	55.5	39	16.5	Y [✓ N]	
	3	63	59	55.	39	16	Y [✓ N]	
	4					49	Y [✓ N]	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	64	62.5	56	39	17	Y [✓ N]	
	2	64	55	54	39	15	Y [✓ N]	
	3	64	63	56	39	17	Y [✓ N]	
	4	65	62	56	39	17	Y [✓ N]	
	5	65	63.5	56	39	17	Y [✓ N]	
	6	65	63.5	56	39	17	Y [✓ N]	
	7					100	Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

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Dust Sample Filters

Total Volume of Melted Snow : 1520 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	114.0	141.3	27.3	a little visable dust in sample Small amount dust on filter
2				
3				
4				
Totals	114.0	141.3	27.3	

Water Quality Bottles

1495
1580

Total Volume of Melted Snow : 3075 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
					GW				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL - HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL - H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	Dropped Cap
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments
plus perchlorate

Rio Tinto

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GENERAL

LOCATION NAME: SS2-1 **DATE (yyyy-mm-dd):** 2016-04-03 **TIME (24:00):** 16:15

SAMPLED BY: JG/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 0537547 **E** 7153464 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 4,36 km & Direction NE On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** S **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / 25% / 50% / [✓ 75%] / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	58	57	57	39	18	Y [✓ N]	
	2	58	56.5	56	39	17	Y [✓ N]	
	3	57	56	56	39	17	Y [✓ N]	
	4					52	Y [✓ N]	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	58	56.5	56	39	17	Y [✓ N]	
	2	57.5	51.5	54.5	39	15.5	Y [✓ N]	
	3	58	56	56	39	17	Y [✓ N]	
	4	58	57	56	39	17	Y [✓ N]	
	5	57	56	56	39	17	Y [✓ N]	
	6	57.5	56.5	56	39	17	Y [✓ N]	
	7					100.5	Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

RioTinto

Snow Sampling Field Sheet

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Dust Sample Filters

Total Volume of Melted Snow : 1690 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	125.1	148.7	23.6	fairly clean minor dust on filter
2				
3				
4				
Totals	125.1	148.7	23.6	

Water Quality Bottles

1020
2015

Total Volume of Melted Snow : 3035 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

RioTinto

Snow Sampling Field Sheet

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LOCATION NAME: SS2-2 **DATE (yyyy-mm-dd):** 2016-04-03 **TIME (24:00):** 15:40

SAMPLED BY: DG/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 537832 **E** 7153479 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 4.19 km & Direction NE On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** S **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / 25% / 50% / [✓ 75%] / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present	
							Yes / No	Comments
Dust Cores	1	48	41.5	51	39	12	Y [✓ N]	
	2	46	38.5	49.5	39	10.5	Y [✓ N]	
	3	49	52.5	51	39	12	Y [✓ N]	
	4					34.5	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	53	44.5	53	39	14	Y [✓ N]	
	2	53	48	53	39	14	Y [✓ N]	
	3	53	52	54	39	15	Y [✓ N]	
	4	52	50.2	54.5	39	15.5	Y [✓ N]	
	5	53	50	53.5	39	14.5	Y [✓ N]	
	6	53	45	52.5	39	13.5	Y [✓ N]	
	7	51	50	54.5	39	15.5	Y [✓ N]	
	8					102	Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

Rio Tinto

Snow Sampling Field Sheet

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Dust Sample Filters

Total Volume of Melted Snow : 1055 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.9	149.5	33.6	relatively clean sample minor amount of dust on
2				filter
3				
4				
Totals	115.9	149.5	33.6	

Water Quality Bottles

1315
1805

Total Volume of Melted Snow : 3120 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
					GW				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL - HCL]	Lost Teflon insert
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL - H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate Bottle forgot to fill - used TSS & Routine bottles to fill

Note: Bag 2 had a leak.

Rio Tinto

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GENERAL

LOCATION NAME: SS2-3 **DATE (yyyy-mm-dd):** 2016-04-03 **TIME (24:00):** 14:55

SAMPLED BY: JG/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 0538482 **E** 7153934 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 5.38 km & Direction NE On: Land ☒ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** S **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / 25% / 50% / [✓ 75%] / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	49	42	52	39	13	Y [✓ N]	
	2	49	42.5	51.5	39	12.5	Y [✓ N]	
	3	48	42	52	39	13	Y [✓ N]	
	4				39	38.5	Y [✓ N]	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	47	43.5	53.5	39	14.5	Y [✓ N]	
	2	48	45	54	39	15	Y [✓ N]	
	3	48	47.5	55	39	16	Y [✓ N]	
	4	47	44.5	54	39	15	Y [✓ N]	
	5	46	44	53.5	39	14.5	Y [✓ N]	
	6	47.5	44.5	53	39	14	Y [✓ N]	
	7	47.5	43.5	53	39	14	Y [✓ N]	
	8					103	Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

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Dust Sample Filters

Total Volume of Melted Snow : 1165 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	122.4	140.0	17.6	Sample looks fairly clean minor dust on filter
2				
3				
4				
Totals	122.4	140.0	17.6	

Water Quality Bottles

1270
1765

Total Volume of Melted Snow : 3035 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
					Gw				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL - HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL - H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments
plus perchlorate bottle

Rio Tinto

Snow Sampling Field Sheet

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GENERAL

LOCATION NAME: SS2-4 **DATE (yyyy-mm-dd):** 2016-04-03 **TIME (24:00):** 14:14

SAMPLED BY: JF/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 0539159 **E** 7154682 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 6.37 km & Direction NE On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -26 °C **Wind Direction:** S **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☐ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	47.5	46.5	52	39	13	Y [✓ N]	
	2	48	47	52.5	39	13.5	Y [✓ N]	
	3	48	46.5	52.5	39	13.5	Y [✓ N]	
	4					40	Y [✓ N]	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	47.5	46.5	52.5	39	13.5	Y [✓ N]	
	2	48	47	53	39	14	Y [✓ N]	
	3	50	45	51.5	39	12.5	Y [✓ N]	
	4	47	41	51	39	12	Y [✓ N]	
	5	47	46.5	51.5	39	12.5	Y [✓ N]	
	6	47.5	47	52	39	13	Y [✓ N]	
	7	47	40	50	39	11	Y [✓ N]	
	8	47.5	45.5	52	39	13	Y [✓ N]	
	9					101.5	Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

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Dust Sample Filters

Total Volume of Melted Snow : 1200 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	124.4	134.3	9.9	Visible dust on filter
2				
3				
4				
Totals	124.4	134.3	9.9	

Water Quality Bottles

1145
1925

Total Volume of Melted Snow : 3070 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Bag 2 had small leak

plus Perchlorate bottle

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GENERAL

LOCATION NAME: SS3-4 **DATE (yyyy-mm-dd):** 2016-04-05 **TIME (24:00):** 16:37

SAMPLED BY: KG DD **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:** ____

GPS COORDINATES (UTM): 536550 **E** 7151043 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 1.21 km & Direction N On: Land ☐ &/or Lake ☒

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ____ °C **Wind Direction:** ____ **Wind Speed (knots):** ____

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** [✓ 0%] / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☒ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	53	51	52	39	13	Y [✓ N]	
	2	53	53	56	39	17	Y [✓ N]	
	3	~~50~~ 46	50	54	39	15	Y [✓ N]	
	4					45	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	53	52	56	39 RW	17	Y [✓ N]	
	2	53	52	55	39	16	Y [✓ N]	
	3	54	53	56	39	17	Y [✓ N]	
	4	53	42	51	39	12	Y [✓ N]	
	5	52	51	51	39 RW	12	Y [✓ N]	
	6	54	53	56	39	17	Y [✓ N]	
	7	53	51	55	39	16	Y [✓ N]	
	8					107	Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

RioTinto

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Dust Sample Filters

Total Volume of Melted Snow : 1430 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	122.9	237.5	114.6	little merky looking no visable dust
2				
3				
4				
Totals	122.9	237.5	114.6	

Water Quality Bottles

1885
1470

Total Volume of Melted Snow : 3355 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

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GENERAL

LOCATION NAME: SS3-5-4 **DATE (yyyy-mm-dd):** 2016-04-05 **TIME (24:00):** 1506

SAMPLED BY: KB DD **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:** Dup Water only ?)

GPS COORDINATES (UTM): 537633 E 7150857 N (Zone) 12W NAD 83

DESCRIPTION: Distance to Diavik 1.59 km & Direction NW On: Land ☐ &/or Lake ☒

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ______ °C **Wind Direction:** ________ **Wind Speed (knots):** ______

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** [✓ 0%] / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☐ **Snow Condition:** Crystallized ☒ Packed ☐ Wet ☐ Dry ☐

SS3-5

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	50	49	58	39	19	Y [✓ N]	
	2	50	50	52	39	13	Y [✓ N]	
	3	49	48	51	39	12	Y [✓ N]	
	4					44	Y [✓ N]	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	52	40	49	39 RW	10	Y [✓ N]	
	2	53	52	53	39	14	Y [✓ N]	
	3	54	53	51	39	11	Y [✓ N]	
	4	54	52	53	39	14	Y [✓ N]	
	5	53	51	49	39 RW	10	Y [✓ N]	
	6	53	52	58	39	19	Y [✓ N]	
	7	55	53	53	39	14	Y [✓ N]	
	8	48	40	51	39	12	Y [✓ N]	
	9					104	Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

SS3-5-4 Dup #1

2
2
22
92
24

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

* Moved coordinate off of iceroad ~ 20m

RioTinto

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Dust Sample Filters

Total Volume of Melted Snow : 1405 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	123.6	190.5	66.9	fairly clear, no visable dust ~~mel~~ dust on filter
2				
3				
4				
Totals	123.6	190.5	66.9	

Water Quality Bottles

1620
1630

Total Volume of Melted Snow : 3250 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * DUPW1	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

RioTinto

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GENERAL

LOCATION NAME: SS3-5-S **DATE (yyyy-mm-dd):** 2016-04-05 **TIME (24:00):** ~~3/3~~ 1535

SAMPLED BY: DD/KG **TYPE OF SAMPLE:** Dust ☐ Water Quality ☐ **QAQC:** Dup2on Ice only (water Quality)

GPS COORDINATES (UTM): 537633 **E** 7150857 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 1.59 km & Direction NW On: Land ☐ &/or Lake ☒ !!

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ____ °C **Wind Direction:** ____ **Wind Speed (knots):** ____

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☐ **Snow Condition:** Crystallized ☐ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	54	54 ~~54/52~~	52	39	13	Y [✓ N]	
	2	54	54	52	39	13	Y [✓ N]	
	3	53	53	52	39	13	Y [✓ N]	
	4	55	55	52	39 ~~[illegible]~~	13	Y [✓ N]	
	5	54	53	52	39	13	Y [✓ N]	
	6	54	54	56	39 RW	17	Y [✓ N]	
	7	55	53	54	39	15	Y N	
	8	53	52	54	39	15	Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

32

Water Quality only

Dup #2 Dup

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

~~#~~ moved coordinate off ice road ~20m

Rio Tinto

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Dust Sample Filters

Total Volume of Melted Snow : ______ (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1				
2				
3				
4				
Totals				

Water Quality Bottles

1845
2005

Total Volume of Melted Snow : 3850 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
					DUPW 2				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

Rio Tinto

Snow Sampling Field Sheet

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GENERAL

LOCATION NAME: SSS-10 **DATE (yyyy-mm-dd):** 2016-04-05 **TIME (24:00):** 1744

SAMPLED BY: KG DP **TYPE OF SAMPLE:** Dust ☐ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 536395 **E** 7151587 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 825 km & Direction NE On: Land ☐ &/or Lake ☒

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ______ °C **Wind Direction:** ______ **Wind Speed (knots):** ______

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** [✓ 0%] / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	45	41	48	39	9	Y [✓ N]	
	2	47	47	49	39	10	Y [✓ N]	
	3	47	46	49	39	10	Y [✓ N]	
	4					29	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	47	45	49	39 RW	10	Y [✓ N]	
	2	46	45	51	39	12	Y [✓ N]	
	3	46	40	45	39	06	Y [✓ N]	
	4	47	46	52	39	13	Y [✓ N]	
	5	47	46	52	39	13	Y [✓ N]	
	6	47	45	50	39	11	Y [✓ N]	
	7	47	46	51	39	12	Y [✓ N]	
	8	48	46	46	39	7	Y [✓ N]	
	9	47	45	49	39	10	Y [✓ N]	
	10	46	45	47	39	8	Y [✓ N]	
	11					102	Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

77
18
95

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

* need to change coordinate ~ 80m away

RioTinto

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Dust Sample Filters

Total Volume of Melted Snow : 1060 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	122.4	249.6	127.2	little cloudy, some dust in bag -filter has dust ~~[illegible]~~ (Med)
2				
3				
4				
Totals	122.4	249.6	127.2	

Water Quality Bottles

1870
1920

Total Volume of Melted Snow : 3790 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
					GW				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL HCl]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

Bag 1 a little cloudy looking so is bag 2

Rio Tinto

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GENERAL

LOCATION NAME: SS3-6-1 **DATE (yyyy-mm-dd):** 2016-04-06 **TIME (24:00):** 09:00

SAMPLED BY: DD/KG **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:** EBW

GPS COORDINATES (UTM): NA **E** NA **N (Zone)** NA **NAD 83**

DESCRIPTION: Distance to Diavik NA km & Direction NA On: Land ☐ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: _______ °C **Wind Direction:** _________ **Wind Speed (knots):** _______

Precipitation: Rain / Mist / Snow / Ice / None **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☐ **Snow Condition:** Crystallized ☐ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1						Y N	EBW
	2						Y N	
	3						Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	EBW
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** $\text{Water Content}_{SWE} = \text{Wt. of Tube \& Core}_{SWE} - \text{Wt. of Empty Tube}_{SWE}$ ***

Rio Tinto

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Dust Sample Filters

Total Volume of Melted Snow : ~~NA~~ 200 mL DI Wat (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	120.1	120.1	< 2	DI 031716-0317
2				
3				
4				
Totals				

Water Quality Bottles

Total Volume of Melted Snow : 3000 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
					EBW				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑ EBW	☐	☐	[✓ NA]	DI 031716-0317
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑ EBW	☐	☐	[✓ 1 mL - HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑ EBW	☐	☐	[✓ 1mL - H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑ EBW	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☒ EBW	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

Triple rinsed snow corer then fill bag by running DI through corer. Let water sit in bag overnight in the fridge before filling bottles

Rio Tinto

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GENERAL

LOCATION NAME: SS3-7 **DATE (yyyy-mm-dd):** 2016-04-05 **TIME (24:00):** 17:08

SAMPLED BY: KG DD **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:** ______

GPS COORDINATES (UTM): 536335 **E** 7151369 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 988m km & Direction NE On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ______ °C **Wind Direction:** ______ **Wind Speed (knots):** ______

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** [✓ 0%] / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☒ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	55	55	55	39	16	Y [✓ N]	
	2	~~58~~ 57	56	55	39	16	Y [✓ N]	
	3	57	54	59	39	20	Y [✓ N]	
	4					52	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	58	53	54	~~3~~39	15	Y [✓ N]	
	2	57	57	57	39	18	Y [✓ N]	
	3	58	56	54	39	15	Y [✓ N]	
	4	~~58~~ 59	58	59	39 RW	20	Y [✓ N]	
	5	58	57	60	X39	21	Y [✓ N]	
	6	58	58	58	39	19	Y [✓ N]	
	7					108	Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

RioTinto

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Dust Sample Filters

Total Volume of Melted Snow : 1645 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	123.7	247.7	124.0	some fine dust in bag filter has (med) dust
2				
3				
4				
Totals	123.7	247.7	124.0	

Water Quality Bottles

1100 2160
~~[illegible]~~

Total Volume of Melted Snow : 3260 ~~[illegible]~~ (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

This is not a controlled document when printed

RioTinto

Snow Sampling Field Sheet

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GENERAL

LOCATION NAME: SS3-8 **DATE (yyyy-mm-dd):** 2016-04-05 **TIME (24:00):** 16:05

SAMPLED BY: KG DD **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:** ____

GPS COORDINATES (UTM): 536609 **E** 7150815 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 1.42 km & Direction N On: Land ☐ &/or Lake ☒

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ____ °C **Wind Direction:** ____ **Wind Speed (knots):** ____

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** [✓ 0%] / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☒ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	52	50	~~54~~ 54	39	15	Y [✓ N]	
	2	53	51	51	39	12	Y [✓ N]	
	3	53	52	53	39	14	Y [✓ N]	
	4					41	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	53	53	55	39 RW	16	Y [✓ N]	
	2	53	50	53	39	14	Y [✓ N]	
	3	53	51	55	39	16	Y [✓ N]	
	4	53	51	55	39 RW	16	Y [✓ N]	
	5	54	53	55	39	16	Y [✓ N]	
	6	54	51	50	39	11	Y [✓ N]	
	7	53	52	52	39	^{89}13	Y [✓ N]	
	8					102	Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

Rio Tinto

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Dust Sample Filters

Total Volume of Melted Snow : 1360 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	108.5	234.1	125.6	cloudy, visible dust on bottom of bag med dust on filter
2	123.5	329.0	205.5	med dust on filter
3				
4				
Totals	232.0	563.1	331.1	

Water Quality Bottles

1336
1810

Total Volume of Melted Snow : 3140 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL - HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL - H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

water looks very light grey - like there are dust particles in it. (grey enough that it isn't transparent)

RioTinto

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GENERAL

LOCATION NAME: SS 4-1-4 **DATE (yyyy-mm-dd):** 2016-04-07 **TIME (24:00):** 1625

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:** Dup1

GPS COORDINATES (UTM): 0531493 **E** 7152213 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 2.95 km & Direction SE On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** W **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☑

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present	
							Yes / No	Comments
Dust Cores	1	44	35	50	39	11	Y [✓ N]	
	2	52	45	51.5		12.5	Y [✓ N]	
	3	52	45	52		13	Y [✓ N]	
	4					36.5	Y N	

Dust (Min. of 3 cores – Total Water Content SWE =/> 25)

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present	
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	

Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

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Dust Sample Filters

Total Volume of Melted Snow : 1085 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	125.7	212.2	86.5	Small amount of visable dust minor amount of
2				dust on filter
3				
4				
Totals	125.7	212.2	86.5	

Water Quality Bottles

Total Volume of Melted Snow :____________(mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type**: GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

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GENERAL

LOCATION NAME: SS4-1-5 **DATE (yyyy-mm-dd):** 2016-04-07 **TIME (24:00):** 1635

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☒ **QAQC:** Dup 2

GPS COORDINATES (UTM): 0531493 **E** 7152213 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 2.95 km & Direction SE On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** W **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☑

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	53	50	53	39	14	Y [✓ N]	
	2	54	46	52.5		13	Y [✓ N]	
	3	60	54	54		15	Y [✓ N]	
	4					42	Y [✓ N]	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

Snow Sampling Field Sheet

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Dust Sample Filters

Total Volume of Melted Snow : 1270 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	124.8	226.1	101.3	Some visable dust & organic matter
2				
3				
4				
Totals	124.8	226.1	101.3	

Water Quality Bottles

Total Volume of Melted Snow :__________(mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

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GENERAL

LOCATION NAME: SS4-2 **DATE (yyyy-mm-dd):** 2016-04-07 **TIME (24:00):** 1610

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 0531560 **E** 7152251 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 3.09 km & Direction SE On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -20 °C **Wind Direction:** W **Wind Speed (knots):** 5

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / [✓ 10%] / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☑

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present	
							Yes / No	Comments
Dust Cores	1	49	41	50	39	11	Y [✓ N]	Organic Matter.
	2	48	43	50.5		11.5	Y [✓ N]	Organic Matter
	3	45	41	49.5		10.5	Y [✓ N]	
	4					33	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Snow Sampling Field Sheet

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Dust Sample Filters

Total Volume of Melted Snow : 1015 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	115.9	189.4	73.5	several blades of Grass visibly dust - small amount
2				Organic matter pick out grass & triple rinse
3				it into the sample bag before
4				filtering. med amount ~~of~~ dust on filter
Totals	115.9	189.4	73.5	

Water Quality Bottles

Total Volume of Melted Snow : ____________ (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in-field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type**: GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

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GENERAL

LOCATION NAME: 554-3 **DATE (yyyy-mm-dd):** 2016-04-07 **TIME (24:00):** 1550

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** Dust ☐ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 0531321 **E** 7152475 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 3.23 km & Direction SE On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -21 °C **Wind Direction:** W **Wind Speed (knots):** 8

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / [✓ 10%] / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☑

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present	
							Yes / No	Comments
Dust Cores	1	45	42	49.5	39	10.5	Y [✓ N]	twigs - 10.5
	2	44	39.5	49		10	Y [✓ N]	organic matter
	3	47	~~4~~39	50		11	Y [✓ N]	
	4					31.5	Y [✓ N]	

Dust (Min. of 3 cores – Total Water Content SWE =/> 25)

Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	

Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

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Dust Sample Filters

Total Volume of Melted Snow : 965 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	124.2	228.1	103.9	very light Brown - little dust some organics . med dust on filter
2				
3				
4				
Totals	124.2	2281	103.9	

Water Quality Bottles

Total Volume of Melted Snow : __________(mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type**: GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

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GENERAL

LOCATION NAME: SS 4-4 **DATE (yyyy-mm-dd):** 2016-04-07 **TIME (24:00):** 15 20

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** Dust ☐ Water Quality ☐ **QAQC:** NA

GPS COORDINATES (UTM): 0531129 **E** 7153156 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 3.78 km & Direction SE On: Land ☐ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -21 °C **Wind Direction:** W **Wind Speed (knots):** 8

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / [✓ 10%] / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☑

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Dust Present Comments
Dust Cores	1	68	66	58.5	39	19.5	Y [✓ N]	
	2	69	67	58		19	Y [✓ N]	
	3	69	67	58		19	Y [✓ N]	
	4					57.5	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	69	46	58	39	19	Y [✓ N]	
	2	68	64	57		18	Y [✓ N]	
	3	68	66.5	58		19	Y [✓ N]	
	4	69	67	58.5		19.5	Y [✓ N]	
	5	69	66	58		19	Y [✓ N]	
	6	68	65	58		19	Y [✓ N]	
	7					113.5	Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

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Dust Sample Filters

Total Volume of Melted Snow : 1735 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	123.4	190.3	66.9	fairly clean no visable dust med dust on filter
2				
3				
4				
Totals	123.4	190.3	66.9	

Water Quality Bottles

1725
1705

Total Volume of Melted Snow : 3429 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
					GW				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	1 mL - HCL	Dropped bottle - rinsed X3 then filled
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate bottle

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GENERAL

LOCATION NAME: SS 4-5 **DATE (yyyy-mm-dd):** 2016-04-07 **TIME (24:00):** 1445

SAMPLED BY: DD / SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 0531406 **E** 7154116 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 4.26 km & Direction SE On: Land ☒ &/or Lake ☑

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -21 °C **Wind Direction:** W **Wind Speed (knots):** 8

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / [✓ 10%] / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☑

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	54	53	53.5	39	14.5	Y [✓ N]	
	2	54	53	54		15	Y [✓ N]	
	3	53	53	53		14	Y [✓ N]	
	4					43.5	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	55	54	54	39	15	Y N	
	2	54	53	53.5		14.5	Y N	29.5
	3	55	53	54		15	Y N	
	4	54	53	54		15	Y N	59.5
	5	54	52	53.5	39	14.5	Y N	74.0
	6	54	53	54		15	Y N	89
	7	55	52	53.5		14.5	Y N	
	8					103.5	Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

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Dust Sample Filters

Total Volume of Melted Snow : 1320 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	116.1	172.5	56.4	Few dust particals/few pieces of organic matter
2				
3				
4				
Totals	116.1	172.5	56.4	

Water Quality Bottles

1345
1800

Total Volume of Melted Snow : 3145 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * GW	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☒	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL - HCL]	Dropped Teflon Cap out
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL - H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

RioTinto

Snow Sampling Field Sheet

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GENERAL

LOCATION NAME: SS5-1 **DATE (yyyy-mm-dd):** 2016-04-06 **TIME (24:00):** 16:30

SAMPLED BY: KG DD **TYPE OF SAMPLE:** Dust ☒ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 533148 **E** 7148929 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 4.94 km & Direction NE On: Land ☒ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ____ °C **Wind Direction:** ____ **Wind Speed (knots):** ____

Precipitation: Rain / Mist / Snow / Ice / ~~None~~ ice crystals **Cloud Cover:** 0% / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☑ Not Visible ☐ **Snow Condition:** Crystallized ☑ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	slight dust cover ✓ Comments
Dust Cores	1	65	61	52	39 RW	13	[✓ Y] N	
	2	65	61	56	39	17	[✓ Y] N	
	3	70	64	51	39	12	[✓ Y] N	
	4					42	Y N	

Dust (Min. of 3 cores – Total Water Content SWE =/> 25)

Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	

Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

*A21 construction Actively dumping crush

RioTinto

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Dust Sample Filters

Total Volume of Melted Snow : 1515 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	108.6	326.9	218.3	cloudy looking Some dust in bottom of bag fair amount of dust on filter
2				
3				
4				
Totals	108.6	326.9	218.3	

Water Quality Bottles

Total Volume of Melted Snow : ____________ (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

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GENERAL * Still on ice

LOCATION NAME: SSS-2 **DATE (yyyy-mm-dd):** 2016-04-06 **TIME (24:00):** 16:19

SAMPLED BY: KO DD **TYPE OF SAMPLE:** Dust ☒ Water Quality ☐ **QAQC:**

GPS COORDINATES (UTM): 533148 **E** 7148875 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 4.97 km & Direction NE On: Land ☒ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: _______ °C **Wind Direction:** _________ **Wind Speed (knots):** _______

Precipitation: Rain / Mist / Snow / Ice / None some ice crystals **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%

Dust in area: Visible ☒ slightly Not Visible ☐ **Snow Condition:** Crystallized ☒ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	44	42	48	39	9	[✓ Y] N	slight dust on snow cover
	2	44	43	51	39	12	[✓ Y] N	
	3	44	43	46	39	7	[✓ Y] N	
	4					28	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1						Y N	
	2						Y N	
	3						Y N	
	4						Y N	
	5						Y N	
	6						Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

* A21 construction - actively dumping crush

RioTinto

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Dust Sample Filters

Total Volume of Melted Snow : 1020 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	122.6	197.9	75.3	a little cloud a little bit of Visable dust
2				
3				
4				
Totals	122.6	197.9	75.3	

Water Quality Bottles

Total Volume of Melted Snow : ____________ (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	Y	N	☐	☐	☐	NA	
2	Total Mercury	40 mL clear glass	Y	Y	☐	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	Y	Y	☐	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	Y	N	☐	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	Y	N	☐	☐	☐	N/A	

***Sample Type**: GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

RioTinto

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GENERAL

LOCATION NAME: SSS-3 **DATE (yyyy-mm-dd):** 2016-04-06 **TIME (24:00):** 15:50

SAMPLED BY: KG DD **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:** —

GPS COORDINATES (UTM): 533141 **E** 7148696 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 5.10 km & Direction NE On: Land ☐ &/or Lake ☒

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ____ °C **Wind Direction:** ____ **Wind Speed (knots):** ____

Precipitation: Rain / Mist / Snow / Ice / [✓ None] some ice crystals **Cloud Cover:** 0% / [✓ 10%] / 25% / 50% / 75% / 100%

Dust in area: Visible ☒ Not Visible ☐ **Snow Condition:** Crystallized ☒ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	63	61	54	39	16	[✓ Y] N	minor dust on snow cover in general
	2	63	62	53	39	14	[✓ Y] N	
	3	63	61	55	39	16	[✓ Y] N	
	4					45	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	63	62	56	39 RW	16	[✓ Y] N	
	2	65	54	54	39	15	[✓ Y] N	
	3	63	63	54	39	15	[✓ Y] N	
	4	65	~~64~~ 63	51	39	12	[✓ Y] N	
	5	65	64	56	39	16	[✓ Y] N	
	6	65	65	54	39	15	[✓ Y] N	
	7	65	64	54	39	15	[✓ Y] N	
	8					104	Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*nal construction ~500 metres + dumping crush

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

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Dust Sample Filters

Total Volume of Melted Snow : 1645 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	122.6	174.7	52.1	fairly clean - fine dust in bottom of bag
2				
3				
4				
Totals	122.6	174.7	52.1	

Water Quality Bottles

1540
2225

Total Volume of Melted Snow : 3765 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL - HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL - H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type**: GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

RioTinto

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GENERAL

LOCATION NAME: SS5-4 **DATE (yyyy-mm-dd):** 2016-04-06 **TIME (24:00):** 15:20

SAMPLED BY: KG DD **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:**

GPS COORDINATES (UTM): 533136 **E** 7147140 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 5.65 km & Direction NE On: Land ☐ &/or Lake ☒

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ____ °C **Wind Direction:** ____ **Wind Speed (knots):** ____

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☑ **Snow Condition:** Crystallized ☑ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	~~70~~65	50	51	39	12	Y [✓ N]	
	2	65	64	54	39	15	Y [✓ N]	
	3	65	64	55	39	16	Y [✓ N]	
	4					43	Y [✓ N]	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	65	64	57	39 RW	18	Y [✓ N]	
	2	65	64	58	39	19	Y [✓ N]	
	3	64	63	55	39	16	Y [✓ N]	
	4	64	64	59	39	20	Y [✓ N]	
	5	63	63	53	39	14	Y [✓ N]	
	6	64	64	54	39	15	Y [✓ N]	
	7					102	Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

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Revision History

Revision	Revision Description	Date of Revision	Author
0	Initial Release	16-Mar-2012	D. Dul
1	First Revision	13-May-2012	D. Dul
2	Revised Table 1	27-April-2013	D. Dul
3	Revised Table 3 (Total Mercury & TSS/Turb/pH & Filling Order column	08-April-2014	D. Dul
4	Clarified Water Content Calculation	13-May-2014	D. Dul
5	Minor clarifications and fixes	30-Apr-2015	S. Sinclair
6	Updated table and added comments section	21-Mar-2016	D. Dul

Dust Sample Filters

Total Volume of Melted Snow: ________ (mL)

Total volume melted snow
1570 mL

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	125.2	140.4	15.2	Fairly Clean - no visible dust in bag
2				minor dust on filter
3				
4				
Totals	125.2	140.4	15.2	

Water Quality Bottles

1690
1665

Total Volume of Melted Snow: 3355 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ mL HCl]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ mL H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type**: GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

RioTinto

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GENERAL

LOCATION NAME: SSS-5-4 **DATE (yyyy-mm-dd):** 2016-04-06 **TIME (24:00):** 14:41
SAMPLED BY: KG DD **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:** DUP WQ Water Quality only
GPS COORDINATES (UTM): 533156 E 7146950 N (Zone) 12W NAD 83
DESCRIPTION: Distance to Diavik_____km & Direction_____ On: Land ☐ &/or Lake ☒

CLIMATE CONDITIONS (if sampling outside)

Air Temp: _____°C **Wind Direction:** _____ **Wind Speed (knots):** _____
Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%
Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☒ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Dust Present Comments
Dust Cores	1	50	48	52	39	13	Y [✓ N]	
	2	51	50	53	39	14	Y [✓ N]	
	3	50	49	53	39	14	Y [✓ N]	
	4					41	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	51	51	55	39 RW	16	Y [✓ N]	
	2	53	52	52	39	13	Y [✓ N]	
	3	51	58	52	39	13	Y [✓ N]	
	4	52	52	53	39	13	Y [✓ N]	
	5	54	53	54	39	15	Y [✓ N]	
	6	54	53	52	39	13	Y [✓ N]	
	7	54	54	52	39	13 13	Y [✓ N]	
	8	53	38	48	39	9	Y [✓ N]	
	9					105	Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

SSS-5-4

*** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ ***

RioTinto

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Dust Sample Filters

Total Volume of Melted Snow : 1305 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	109.3	116.5	7.2	fairly clean no visable dust filter fairly clean
2				
3				
4				
Totals	109.3	116.5	7.2	

Water Quality Bottles

1695
1790

Total Volume of Melted Snow : 3485 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type * DupW1	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC**, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type**: GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

RioTinto

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GENERAL

LOCATION NAME: SSS-5-5 **DATE (yyyy-mm-dd):** 2016-04-06 **TIME (24:00):** 14:56
SAMPLED BY: KG DD **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:** ~~14:58~~ Dup 2 Water Quality only
GPS COORDINATES (UTM): 533156 **E** 7146950 **N (Zone)** 12W **NAD 83**
DESCRIPTION: Distance to Diavik 6.42 km & Direction NE On: Land ☐ &/or Lake ☒

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ______ °C **Wind Direction:** ________ **Wind Speed (knots):** ______
Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%
Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☒ Packed ☐ Wet ☐ Dry ☐

NA

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	~~55~~	~~40~~	~~47~~	~~39~~	8	Y [✓ N]	
	2	~~53~~	~~51~~	~~55~~	~~39~~		Y [✓ N]	
	3	~~53~~	~~51~~	~~52~~	~~39~~		Y N	
	4						Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	55	40	47	39	08	Y [✓ N]	
	2	53	51	55	39	16	Y [✓ N]	
	3	53	51	52	39	13	Y [✓ N]	
	4	53	51	52	39	13	Y [✓ N]	
	5	5~~3~~4	45	51	39	12	Y [✓ N]	
	6	54	53	53	39	13	Y [✓ N]	
	7	54	51	50	39 Rw	11	Y [✓ N]	
	8	54	45	48	39	9	Y [✓ N]	
	9	53	50	48	39	7	Y [✓ N]	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

1
86
9
55

SSS-5-5

*** **Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$** ***

Rio Tinto

Snow Sampling Field Sheet

No: ENVI-177-0312
Area: 8000
Revision: R6
Effective Date: 26 MAR 2012
By: D. Dul
Task: Snow Sampling Field Sheet
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Revision History

Revision	Revision Description	Date of Revision	Author
0	Initial Release	16-Mar-2012	D. Dul
1	First Revision	13-May-2012	D. Dul
2	Revised Table 1	27-April-2013	D. Dul
3	Revised Table 3 (Total Mercury & TSS/Turb/pH & Filling Order column	08-April-2014	D. Dul
4	Clarified Water Content Calculation	13-May-2014	D. Dul
5	Minor clarifications and fixes	30-Apr-2015	S. Sinclair
6	Updated table and added comments section	21-Mar-2016	D. Dul

Dust Sample Filters

Total Volume of Melted Snow ____ (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1				
2				
3				
4				
Totals				

Water Quality Bottles

1625
1935

Total Volume of Melted Snow 3560 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
					DUPW2				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL - H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

Snow Sampling Field Sheet

Area: 8000
Effective Date: 26-MAR-2012
Task: Snow Sampling Field Sheet
No: ENVI-177-0312
Revision: R6
By: D. Dul
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GENERAL

LOCATION NAME: SSC-1 **DATE (yyyy-mm-dd):** 2016-04-06 **TIME (24:00):** 1406

SAMPLED BY: DD KG **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:** NA

GPS COORDINATES (UTM): 534930 **E** 7144113 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 8.32 km & Direction N On: Land ☒ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ____ °C **Wind Direction:** ____ **Wind Speed (knots):** ____

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / 10% / [✓ 25%] / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☒ Packed ☐ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	88	79	62	39	23	Y [✓ N]	
	2	90	82	63	39	23	Y [✓ N]	
	3	97	86	65	39	24	Y [✓ N]	
	4					70	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	~~103~~ 90	78	61	39	22	Y [✓ N]	debris removed from bottom
	2	85	53	59	39	20	Y [✓ N]	small stick in sample
	3	85	72	56	39	17	Y [✓ N]	debris removed
	4	86	~~77~~ 75	57	39	18	Y [✓ N]	
	5	88	80	62	39	23	Y [✓ N]	
	6					100	Y N	
	7						Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

*** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ ***

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	**Revision:**	R6
Effective Date:	26-MAR-2012	**By:**	D. Dul
Task:	Snow Sampling Field Sheet		
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Dust Sample Filters

Total Volume of Melted Snow : 2200 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	117.2	123.8	6.6	fairly clear - small amount organics Minor dust on filter
2				Some organics
3				
4				
Totals	117.2	123.8	6.6	

Water Quality Bottles

1765
1285

Total Volume of Melted Snow : 3050 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
					GW				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	NA	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	1 mL - HCL	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	

***Sample Type**: GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

Bag 1 - 1 small leaf - small amount of organic matter

RioTinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	**Revision:**	R6
Effective Date:	26-MAR-2012	**By:**	D. Dul
Task:	Snow Sampling Field Sheet		
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GENERAL

LOCATION NAME: SSC-2 **DATE (yyyy-mm-dd):** 2016-04-07 **TIME (24:00):** 1400

SAMPLED BY: DD/SS **TYPE OF SAMPLE:** Dust ☑ Water Quality ☑ **QAQC:**

GPS COORDINATES (UTM): 0528725 **E** 7153322 **N (Zone)** 12 **NAD 83**

DESCRIPTION: Distance to Diavik 5.92 km & Direction SE On: Land ☑ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: -21 °C **Wind Direction:** W **Wind Speed (knots):** 8

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** 0% / [✓ 10%] / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☑ Packed ☑ Wet ☐ Dry ☑

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	62	50	53.5	39	14.5	Y [✓ N]	
	2	64	45	52		13.0	Y [✓ N]	
	3	64	55	55		16	Y [✓ N]	
	4					43.5	Y N	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	69	63	56.5	39	17.5	Y [✓ N]	
	2	~~67~~ 59	53	52.5		13.5	Y [✓ N]	
	3	60	48	53.		14	Y [✓ N]	
	4	63	59	56.5		17.5	Y [✓ N]	62.5
	5	68	56	55.5	39	16.5	Y [✓ N]	16.5 32.0
	6	65	53	55		16	Y [✓ N]	16 32 .15. 0 95.5
	7	54	47	52		13	Y [✓ N]	
	8						Y N	
	9					108	Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

RioTinto

Snow Sampling Field Sheet

No: ENVI-177-0312
Area: 8000
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By: D. Dul
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Dust Sample Filters

Total Volume of Melted Snow : 1295 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	127.3	156.0	28.7	minor dust visable Small amount of organic
2				matter - few small twigs (triple rinsed)
3				
4				
Totals	127.3	156.0	28.7	

Water Quality Bottles

1385
1855

Total Volume of Melted Snow : 3240 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments **DI Batch # for QAQC,** Location preserved if not in field, label changes
					GW				
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL - HCL]	Dropped cap
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	1mL - H_2SO_4	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	N/A	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

bag 1 had 2 small twigs in it
bag 2 had a leak - had some grass & orgaic matter

RioTinto

Snow Sampling Field Sheet

		No:	ENVI-177-0312
Area:	8000	**Revision:**	R6
Effective Date:	26-MAR-2012	**By:**	D. Dul
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GENERAL

LOCATION NAME: SSB-3 **DATE (yyyy-mm-dd):** 2016-04-05 **TIME (24:00):** 1418

SAMPLED BY: KG DO **TYPE OF SAMPLE:** Dust ☒ Water Quality ☒ **QAQC:**______

GPS COORDINATES (UTM): 538638 **E** 7148760 **N (Zone)** 12W **NAD 83**

DESCRIPTION: Distance to Diavik 3.91 km & Direction NW On: Land ☒ &/or Lake ☐

CLIMATE CONDITIONS (if sampling outside)

Air Temp: ______ °C **Wind Direction:** ______ **Wind Speed (knots):**______

Precipitation: Rain / Mist / Snow / Ice / [✓ None] **Cloud Cover:** [✓ 0%] / 10% / 25% / 50% / 75% / 100%

Dust in area: Visible ☐ Not Visible ☒ **Snow Condition:** Crystallized ☒ Packed ☒ Wet ☐ Dry ☐

	Core Number	Depth of Snow (cm)	Length of Snow Core (cm)	Weight of Tube & Core (SWE)	Weight of Empty Tube (SWE)	Water Content (SWE) ***	Dust Present Yes / No	Comments
Dust Cores	1	69	68	48	39	9	Y [✓ N]	
	2	71	58	56	39	17	Y [✓ N]	
	3	70	58	55	39	16	Y [✓ N]	
	4					45	Y [✓ N]	
Dust (Min. of 3 cores – Total Water Content SWE =/> 25)								
Water Quality Cores	1	~~7~~ 69	66	58	39	19	Y [✓ N]	
	2	70	58	52	39	13	Y [✓ N]	
	3	70	67	57	39	18	Y [✓ N]	
	4	~~70~~ 69	67	57	39	18	Y [✓ N]	
	5	70	68	52	39 RW	13	Y N	
	6	71	67	58	39	19	Y N	
	7					100	Y N	
	8						Y N	
	9						Y N	
	10						Y N	
	11						Y N	
	12						Y N	
Water Quality (Min. of 3 cores – Total Water Content SWE =/> 100)								

1
24
16
43
60
03

18
16

***** Water Content $_{SWE}$ = Wt. of Tube & Core $_{SWE}$ – Wt. of Empty Tube $_{SWE}$ *****

Snow Sampling Field Sheet

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Dust Sample Filters

Total Volume of Melted Snow : 1480 (mL)

Filter #	Weight of Filter	Filter + Residue	Residue Weight	Comments
1	124.5	142.6	18.1	fairly clear no dust / small amount organic matter minor amount of dust on filter
2				
3				
4				
Totals	124.5	142.6	18.1	

Water Quality Bottles

1540
1685

Total Volume of Melted Snow : 3225 (mL)

Filling Order	Analysis	Bottle Type	Triple Rinse	Preserve	Sample Type *	Sample Type *	Sample Type *	Preserved (circle when added)	Sample Comments DI Batch # for QAQC, Location preserved if not in field, label changes
1	Metals Total	60 mL Falcon Tube	[✓ Y]	[✓ N]	☑	☐	☐	[✓ NA]	
2	Total Mercury	40 mL clear glass	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1 mL HCL]	
3	Nutrients	120 mL plastic	[✓ Y]	[✓ Y]	☑	☐	☐	[✓ 1mL H_2SO_4]	
4	Routine	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	
5	TSS/Turb/pH	1000 mL plastic	[✓ Y]	[✓ N]	☑	☐	☐	[✓ N/A]	

***Sample Type:** GW, DUPW1/DUPW2, FBW, TBW, EBW, REP1/ REP2, Filter Blank

Additional Comments

plus perchlorate

~~Bag~~ Bag 2 few grass blades & minor organic matter

Appendix D

Snow Water Chemistry Analytical Results

DIAVIK DIAMOND MINE

2016 Dust Deposition Report

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Acidity (pH 4.5)	mg/L	CONTROL 1	4/6/2016	<0.50	0.25	0.50	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	<0.50	0.25	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	<0.50	0.25	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	
	mg/L	SS1-4	4/3/2016	<0.50	0.25	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	<0.50	0.25	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	<0.50	0.25	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.50	0.25	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	<0.50	0.25	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.50	0.25	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	<0.50	0.25	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4368	DUPW1	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4369	DUPW2	
	mg/L	SS3-6	4/5/2016	<0.50	0.25	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.50	0.25	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	<0.50	0.25	0.50	OL4371	GS	
	mg/L	SS3-8	4/5/2016	<0.50	0.25	0.50	OL4401	GS	
	mg/L	SS4-4	4/7/2016	<0.50	0.25	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	<0.50	0.25	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	<0.50	0.25	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.50	0.25	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4363	DUPW2	
Acidity (pH 8.3)	mg/L	CONTROL 1	4/6/2016	0.98000	0.98	0.50	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	0.67000	0.67	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	0.73000	0.73	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7801	EBW	
	mg/L	SS1-4	4/3/2016	<0.50	0.25	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	0.67000	0.67	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.95000	0.95	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	0.76000	0.76	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	1.23000	1.23	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.50	0.25	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	1.01000	1.01	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	1.49000	1.49	0.50	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	1.55000	1.55	0.50	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	2.03000	2.03	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.50	0.25	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	<0.50	0.25	0.50	OL4371	GS	
	mg/L	SS3-8	4/5/2016	<0.50	0.25	0.50	OL4401	GS	
	mg/L	SS4-4	4/7/2016	0.78000	0.78	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	<0.50	0.25	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	1.19000	1.19	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	1.60000	1.6	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.87000	0.87	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	0.54000	0.54	0.50	OL4363	DUPW2	
Alkalinity (PP as $CaCO_3$)	mg/L	CONTROL 1	4/6/2016	<0.50	0.25	0.50	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	<0.50	0.25	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	<0.50	0.25	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	
	mg/L	SS1-4	4/3/2016	<0.50	0.25	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	<0.50	0.25	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	<0.50	0.25	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.50	0.25	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	<0.50	0.25	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.50	0.25	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	<0.50	0.25	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4368	DUPW1	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4369	DUPW2	
	mg/L	SS3-6	4/5/2016	<0.50	0.25	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.50	0.25	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	<0.50	0.25	0.50	OL4371	GS	
	mg/L	SS3-8	4/5/2016	<0.50	0.25	0.50	OL4401	GS	
	mg/L	SS4-4	4/7/2016	<0.50	0.25	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	<0.50	0.25	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	<0.50	0.25	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.50	0.25	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4363	DUPW2	
Alkalinity (Total as $CaCO_3$) - Total	mg/L	CONTROL 1	4/6/2016	1.33000	1.33	0.50	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	0.76000	0.76	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	0.85000	0.85	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	0.52000	0.52	0.50	OG7801	EBW	
	mg/L	SS1-4	4/3/2016	0.98000	0.98	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	<0.50	0.25	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.84000	0.84	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.50	0.25	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	<0.50	0.25	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.50	0.25	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	1.31000	1.31	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	1.87000	1.87	0.50	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	1.82000	1.82	0.50	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	2.82000	2.82	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	0.57000	0.57	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	2.18000	2.18	0.50	OL4371	GS	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Alkalinity (Total as $CaCO_3$) - Total *(cont'd)*	mg/L	SS3-8	4/5/2016	4.27000	4.27	0.50	OL4401	GS	
	mg/L	SS4-4	4/7/2016	1.16000	1.16	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	0.89000	0.89	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	0.54000	0.54	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.50	0.25	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.53000	0.53	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	0.72000	0.72	0.50	OL4363	DUPW2	
Aluminum (Al) - Total	ug/L	CONTROL 1	4/6/2016	85.10000	85.1	0.20	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	413.00000	413	0.20	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	245.00000	245	0.20	OL4359	GS	
	ug/L	SS BAG	3/10/2016	0.74000	0.74	0.20	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	0.57000	0.57	0.20	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	0.27000	0.27	0.20	OG7803	EBW	
	ug/L	SS1-4	4/3/2016	200.00000	200	0.20	OL4360	GS	
	ug/L	SS1-5	4/3/2016	387.00000	387	0.20	OL4361	GS	
	ug/L	SS2-1	4/3/2016	192.00000	192	0.20	OL4362	GS	
	ug/L	SS2-2	4/3/2016	173.00000	173	0.20	OL4364	GS	
	ug/L	SS2-3	4/3/2016	123.00000	123	0.20	OL4365	GS	
	ug/L	SS2-4	4/3/2016	118.00000	118	0.20	OL4366	GS	
	ug/L	SS3-4	4/5/2016	1590.00000	1590	0.20	OL4367	GS	
	ug/L	SS3-5	4/5/2016	1490.00000	1490	0.20	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	1620.00000	1620	0.20	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	2710.00000	2710	0.20	OL4370	GS	
	ug/L	SS3-6	4/6/2016	5.13000	5.13	0.20	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	1390.00000	1390	0.20	OL4371	GS	
	ug/L	SS3-8	4/5/2016	2260.00000	2260	0.20	OL4401	GS	
	ug/L	SS4-4	4/7/2016	623.00000	623	0.20	OL4402	GS	
	ug/L	SS4-5	4/7/2016	650.00000	650	0.20	OL4403	GS	
	ug/L	SS5-3	4/6/2016	818.00000	818	0.20	OL4404	GS	
	ug/L	SS5-4	4/6/2016	256.00000	256	0.20	OL4405	GS	
	ug/L	SS5-5	4/6/2016	31.40000	31.4	0.20	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	126.00000	126	0.20	OL4363	DUPW2	
Ammonia (N)	mg/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7802	EBW	
Antimony (Sb) - Total	ug/L	CONTROL 1	4/6/2016	<0.020	0.01	0.02	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	<0.020	0.01	0.02	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	<0.020	0.01	0.02	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.020	0.01	0.02	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.020	0.01	0.02	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.020	0.01	0.02	OG7802	EBW	
	ug/L	SS1-4	4/3/2016	<0.020	0.01	0.02	OL4360	GS	
	ug/L	SS1-5	4/3/2016	<0.020	0.01	0.02	OL4361	GS	
	ug/L	SS2-1	4/3/2016	<0.020	0.01	0.02	OL4362	GS	
	ug/L	SS2-2	4/3/2016	<0.020	0.01	0.02	OL4364	GS	
	ug/L	SS2-3	4/3/2016	<0.020	0.01	0.02	OL4365	GS	
	ug/L	SS2-4	4/3/2016	<0.020	0.01	0.02	OL4366	GS	
	ug/L	SS3-4	4/5/2016	<0.020	0.01	0.02	OL4367	GS	
	ug/L	SS3-5	4/5/2016	0.03500	0.035	0.02	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	0.02100	0.021	0.02	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	0.02600	0.026	0.02	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.020	0.01	0.02	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	<0.020	0.01	0.02	OL4371	GS	
	ug/L	SS3-8	4/5/2016	0.02100	0.021	0.02	OL4401	GS	
	ug/L	SS4-4	4/7/2016	<0.020	0.01	0.02	OL4402	GS	
	ug/L	SS4-5	4/7/2016	<0.020	0.01	0.02	OL4403	GS	
	ug/L	SS5-3	4/6/2016	<0.020	0.01	0.02	OL4404	GS	
	ug/L	SS5-4	4/6/2016	<0.020	0.01	0.02	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.020	0.01	0.02	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<0.020	0.01	0.02	OL4363	DUPW2	
Arsenic (As) - Total	ug/L	CONTROL 1	4/6/2016	0.02300	0.023	0.02	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	0.08600	0.086	0.02	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.04800	0.048	0.02	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.020	0.01	0.02	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.020	0.01	0.02	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.020	0.01	0.02	OG7802	EBW	
	ug/L	SS1-4	4/3/2016	0.07200	0.072	0.02	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.47100	0.471	0.02	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.08300	0.083	0.02	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.04700	0.047	0.02	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.06700	0.067	0.02	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.04500	0.045	0.02	OL4366	GS	
	ug/L	SS3-4	4/5/2016	0.22400	0.224	0.02	OL4367	GS	
	ug/L	SS3-5	4/5/2016	0.24600	0.246	0.02	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	0.19400	0.194	0.02	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	0.43900	0.439	0.02	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.020	0.01	0.02	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	0.16600	0.166	0.02	OL4371	GS	
	ug/L	SS3-8	4/5/2016	0.30800	0.308	0.02	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.12800	0.128	0.02	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.12500	0.125	0.02	OL4403	GS	
	ug/L	SS5-3	4/6/2016	0.17700	0.177	0.02	OL4404	GS	
	ug/L	SS5-4	4/6/2016	0.14400	0.144	0.02	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.020	0.01	0.02	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	0.03000	0.03	0.02	OL4363	DUPW2	
Barium (Ba) - Total	ug/L	CONTROL 1	4/6/2016	1.39000	1.39	0.02	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	5.71000	5.71	0.02	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	3.46000	3.46	0.02	OL4359	GS	
	ug/L	SS BAG	3/10/2016	0.12100	0.121	0.02	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	0.18800	0.188	0.02	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	0.44200	0.442	0.02	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	2.66000	2.66	0.02	OL4360	GS	
	ug/L	SS1-5	4/3/2016	4.77000	4.77	0.02	OL4361	GS	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Barium (Ba) - Total *(cont'd)*	ug/L	SS2-1	4/3/2016	3.52000	3.52	0.02	OL4362	GS	
	ug/L	SS2-2	4/3/2016	2.31000	2.31	0.02	OL4364	GS	
	ug/L	SS2-3	4/3/2016	2.01000	2.01	0.02	OL4365	GS	
	ug/L	SS2-4	4/3/2016	1.98000	1.98	0.02	OL4366	GS	
	ug/L	SS3-4	4/5/2016	20.90000	20.9	0.02	OL4367	GS	
	ug/L	SS3-5	4/5/2016	26.60000	26.6	0.02	OL4368	DUPW1	
	ug/L	SS3-5	4/5/2016	27.20000	27.2	0.02	OL4369	DUPW2	
	ug/L	SS3-6	4/5/2016	42.80000	42.8	0.02	OL4370	GS	
	ug/L	SS3-6	4/6/2016	0.06000	0.06	0.02	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	20.80000	20.8	0.02	OL4371	GS	
	ug/L	SS3-8	4/5/2016	41.50000	41.5	0.02	OL4401	GS	
	ug/L	SS4-4	4/7/2016	9.48000	9.48	0.02	OL4402	GS	
	ug/L	SS4-5	4/7/2016	6.97000	6.97	0.02	OL4403	GS	
	ug/L	SS5-3	4/6/2016	8.87000	8.87	0.02	OL4404	GS	
	ug/L	SS5-4	4/6/2016	3.72000	3.72	0.02	OL4405	GS	
	ug/L	SS5-5	4/6/2016	1.08000	1.08	0.02	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	1.90000	1.9	0.02	OL4363	DUPW2	
Beryllium (Be) - Total	ug/L	CONTROL 1	4/6/2016	<0.010	0.005	0.01	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	0.01000	0.01	0.01	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	<0.010	0.005	0.01	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.010	0.005	0.01	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.010	0.005	0.01	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.010	0.005	0.01	OG7803	EBW	
	ug/L	SS1-4	4/3/2016	<0.010	0.005	0.01	OL4360	GS	
	ug/L	SS1-5	4/3/2016	<0.010	0.005	0.01	OL4361	GS	
	ug/L	SS2-1	4/3/2016	<0.010	0.005	0.01	OL4362	GS	
	ug/L	SS2-2	4/3/2016	<0.010	0.005	0.01	OL4364	GS	
	ug/L	SS2-3	4/3/2016	<0.010	0.005	0.01	OL4365	GS	
	ug/L	SS2-4	4/3/2016	<0.010	0.005	0.01	OL4366	GS	
	ug/L	SS3-4	4/5/2016	0.03600	0.036	0.01	OL4367	GS	
	ug/L	SS3-5	4/5/2016	0.03400	0.034	0.01	OL4368	DUPW1	
	ug/L	SS3-5	4/5/2016	0.03100	0.031	0.01	OL4369	DUPW2	
	ug/L	SS3-6	4/5/2016	0.06400	0.064	0.01	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.010	0.005	0.01	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	0.03500	0.035	0.01	OL4371	GS	
	ug/L	SS3-8	4/5/2016	0.06500	0.065	0.01	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.01300	0.013	0.01	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.01300	0.013	0.01	OL4403	GS	
	ug/L	SS5-3	4/6/2016	0.01600	0.016	0.01	OL4404	GS	
	ug/L	SS5-4	4/6/2016	<0.010	0.005	0.01	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.010	0.005	0.01	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<0.010	0.005	0.01	OL4363	DUPW2	
Bicarbonate (HCO_3)	mg/L	CONTROL 1	4/6/2016	1.62000	1.62	0.50	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	0.93000	0.93	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	1.04000	1.04	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	0.63000	0.63	0.50	OG7801	EBW	
	mg/L	SS1-4	4/3/2016	1.20000	1.2	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	<0.50	0.25	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	1.02000	1.02	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.50	0.25	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	<0.50	0.25	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.50	0.25	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	1.60000	1.6	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	2.28000	2.28	0.50	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	2.22000	2.22	0.50	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	3.44000	3.44	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	0.69000	0.69	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	2.66000	2.66	0.50	OL4371	GS	
	mg/L	SS3-8	4/5/2016	5.21000	5.21	0.50	OL4401	GS	
	mg/L	SS4-4	4/7/2016	1.42000	1.42	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	1.09000	1.09	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	0.66000	0.66	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.50	0.25	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.65000	0.65	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	0.88000	0.88	0.50	OL4363	DUPW2	
Bismuth (Bi) - Total	ug/L	CONTROL 1	4/6/2016	0.00800	0.008	0.005	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	0.04500	0.045	0.005	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.03300	0.033	0.005	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	0.33500	0.335	0.005	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.03400	0.034	0.005	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.05000	0.05	0.005	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.02700	0.027	0.005	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.02600	0.026	0.005	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.01100	0.011	0.005	OL4366	GS	
	ug/L	SS3-4	4/5/2016	0.33200	0.332	0.005	OL4367	GS	
	ug/L	SS3-5	4/5/2016	0.16600	0.166	0.005	OL4368	DUPW1	
	ug/L	SS3-5	4/5/2016	0.22500	0.225	0.005	OL4369	DUPW2	
	ug/L	SS3-6	4/5/2016	0.47800	0.478	0.005	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.0050	0.0025	0.005	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	0.32200	0.322	0.005	OL4371	GS	
	ug/L	SS3-8	4/5/2016	0.60700	0.607	0.005	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.10100	0.101	0.005	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.13500	0.135	0.005	OL4403	GS	
	ug/L	SS5-3	4/6/2016	0.17200	0.172	0.005	OL4404	GS	
	ug/L	SS5-4	4/6/2016	0.03000	0.03	0.005	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.0050	0.0025	0.005	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	0.02300	0.023	0.005	OL4363	DUPW2	

Data source: Maxxam

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Boron (B)	ug/L	CONTROL 1	4/6/2016	<5.0	2.5	5.00	OL4357	GS	
- Total	ug/L	CONTROL 2	4/7/2016	<5.0	2.5	5.00	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	<5.0	2.5	5.00	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<5.0	2.5	5.00	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<5.0	2.5	5.00	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<5.0	2.5	5.00	OG7803	EBW	
	ug/L	SS1-4	4/3/2016	<5.0	2.5	5.00	OL4360	GS	
	ug/L	SS1-5	4/3/2016	<5.0	2.5	5.00	OL4361	GS	
	ug/L	SS2-1	4/3/2016	<5.0	2.5	5.00	OL4362	GS	
	ug/L	SS2-2	4/3/2016	<5.0	2.5	5.00	OL4364	GS	
	ug/L	SS2-3	4/3/2016	<5.0	2.5	5.00	OL4365	GS	
	ug/L	SS2-4	4/3/2016	<5.0	2.5	5.00	OL4366	GS	
	ug/L	SS3-4	4/5/2016	<5.0	2.5	5.00	OL4367	GS	
	ug/L	SS3-5	4/5/2016	<5.0	2.5	5.00	OL4368	DUPW1	
	ug/L	SS3-5	4/5/2016	<5.0	2.5	5.00	OL4369	DUPW2	
	ug/L	SS3-6	4/5/2016	<5.0	2.5	5.00	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<5.0	2.5	5.00	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	<5.0	2.5	5.00	OL4371	GS	
	ug/L	SS3-8	4/5/2016	<5.0	2.5	5.00	OL4401	GS	
	ug/L	SS4-4	4/7/2016	<5.0	2.5	5.00	OL4402	GS	
	ug/L	SS4-5	4/7/2016	<5.0	2.5	5.00	OL4403	GS	
	ug/L	SS5-3	4/6/2016	<5.0	2.5	5.00	OL4404	GS	
	ug/L	SS5-4	4/6/2016	<5.0	2.5	5.00	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<5.0	2.5	5.00	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<5.0	2.5	5.00	OL4363	DUPW2	
Cadmium (Cd)	ug/L	CONTROL 1	4/6/2016	<0.0050	0.0025	0.005	OL4357	GS	
- Total	ug/L	CONTROL 2	4/7/2016	<0.0050	0.0025	0.005	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	<0.0050	0.0025	0.005	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	<0.0050	0.0025	0.005	OL4360	GS	
	ug/L	SS1-5	4/3/2016	<0.0050	0.0025	0.005	OL4361	GS	
	ug/L	SS2-1	4/3/2016	<0.0050	0.0025	0.005	OL4362	GS	
	ug/L	SS2-2	4/3/2016	<0.0050	0.0025	0.005	OL4364	GS	
	ug/L	SS2-3	4/3/2016	<0.0050	0.0025	0.005	OL4365	GS	
	ug/L	SS2-4	4/3/2016	<0.0050	0.0025	0.005	OL4366	GS	
	ug/L	SS3-4	4/5/2016	0.01800	0.018	0.005	OL4367	GS	
	ug/L	SS3-5	4/5/2016	0.01900	0.019	0.005	OL4368	DUPW1	
	ug/L	SS3-5	4/5/2016	0.01800	0.018	0.005	OL4369	DUPW2	
	ug/L	SS3-6	4/5/2016	0.03600	0.036	0.005	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.0050	0.0025	0.005	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	0.03700	0.037	0.005	OL4371	GS	
	ug/L	SS3-8	4/5/2016	0.03100	0.031	0.005	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.00500	0.005	0.005	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.00600	0.006	0.005	OL4403	GS	
	ug/L	SS5-3	4/6/2016	0.00600	0.006	0.005	OL4404	GS	
	ug/L	SS5-4	4/6/2016	<0.0050	0.0025	0.005	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.0050	0.0025	0.005	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<0.0050	0.0025	0.005	OL4363	DUPW2	
Calcium (Ca)	mg/L	CONTROL 1	4/6/2016	0.09500	0.095	0.05	OL4357	GS	
- Total	mg/L	CONTROL 2	4/7/2016	0.27100	0.271	0.05	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	0.27500	0.275	0.05	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7803	EBW	
	mg/L	SS1-4	4/3/2016	0.16200	0.162	0.05	OL4360	GS	
	mg/L	SS1-5	4/3/2016	0.25300	0.253	0.05	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.19500	0.195	0.05	OL4362	GS	
	mg/L	SS2-2	4/3/2016	0.15600	0.156	0.05	OL4364	GS	
	mg/L	SS2-3	4/3/2016	0.17800	0.178	0.05	OL4365	GS	
	mg/L	SS2-4	4/3/2016	0.11100	0.111	0.05	OL4366	GS	
	mg/L	SS3-4	4/5/2016	1.23000	1.23	0.05	OL4367	GS	
	mg/L	SS3-5	4/5/2016	1.08000	1.08	0.05	OL4368	DUPW1	
	mg/L	SS3-5	4/5/2016	1.11000	1.11	0.05	OL4369	DUPW2	
	mg/L	SS3-6	4/5/2016	2.18000	2.18	0.05	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.050	0.025	0.05	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	1.49000	1.49	0.05	OL4371	GS	
	mg/L	SS3-8	4/5/2016	2.42000	2.42	0.05	OL4401	GS	
	mg/L	SS4-4	4/7/2016	0.48400	0.484	0.05	OL4402	GS	
	mg/L	SS4-5	4/7/2016	0.44100	0.441	0.05	OL4403	GS	
	mg/L	SS5-3	4/6/2016	0.48500	0.485	0.05	OL4404	GS	
	mg/L	SS5-4	4/6/2016	0.19600	0.196	0.05	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.11100	0.111	0.05	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	0.12800	0.128	0.05	OL4363	DUPW2	
Carbonate (CO_3)	mg/L	CONTROL 1	4/6/2016	<0.50	0.25	0.50	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	<0.50	0.25	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	<0.50	0.25	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	
	mg/L	SS1-4	4/3/2016	<0.50	0.25	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	<0.50	0.25	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	<0.50	0.25	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.50	0.25	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	<0.50	0.25	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.50	0.25	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	<0.50	0.25	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	<0.50	0.25	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.50	0.25	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	<0.50	0.25	0.50	OL4371	GS	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Carbonate (CO_3)	mg/L	SS3-8	4/5/2016	<0.50	0.25	0.50	OL4401	GS	
(cont'd)	mg/L	SS4-4	4/7/2016	<0.50	0.25	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	<0.50	0.25	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	<0.50	0.25	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.50	0.25	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4363	DUPW2	
Chloride (Cl)	mg/L	CONTROL 1	4/6/2016	<0.50	0.5	0.50	OL4357	GS	
- Dissolved	mg/L	CONTROL 2	4/7/2016	<0.50	0.5	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	<0.50	0.5	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.5	0.50	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.5	0.50	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.5	0.50	OG7801	EBW	
	mg/L	SS1-4	4/3/2016	0.61000	0.61	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	<0.50	0.5	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.62000	0.62	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.50	0.5	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	<0.50	0.5	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.50	0.5	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	0.52000	0.52	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	0.59000	0.59	0.50	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	0.53000	0.53	0.50	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	<0.50	0.5	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	0.54000	0.54	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	<0.50	0.5	0.50	OL4371	GS	
	mg/L	SS3-8	4/5/2016	0.63000	0.63	0.50	OL4401	GS	
	mg/L	SS4-4	4/7/2016	0.58000	0.58	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	<0.50	0.5	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	<0.50	0.5	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.50	0.5	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	<0.50	0.5	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	<0.50	0.5	0.50	OL4363	DUPW2	
Chromium (Cr)	ug/L	CONTROL 1	4/6/2016	0.45600	0.456	0.05	OL4357	GS	
- Total	ug/L	CONTROL 2	4/7/2016	2.60000	2.6	0.05	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	1.55000	1.55	0.05	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	1.03000	1.03	0.05	OL4360	GS	
	ug/L	SS1-5	4/3/2016	1.80000	1.8	0.05	OL4361	GS	
	ug/L	SS2-1	4/3/2016	1.31000	1.31	0.05	OL4362	GS	
	ug/L	SS2-2	4/3/2016	1.17000	1.17	0.05	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.76100	0.761	0.05	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.78500	0.785	0.05	OL4366	GS	
	ug/L	SS3-4	4/5/2016	10.40000	10.4	0.05	OL4367	GS	
	ug/L	SS3-5	4/5/2016	12.50000	12.5	0.05	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	11.70000	11.7	0.05	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	19.60000	19.6	0.05	OL4370	GS	
	ug/L	SS3-6	4/6/2016	0.06000	0.06	0.05	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	9.33000	9.33	0.05	OL4371	GS	
	ug/L	SS3-8	4/5/2016	16.20000	16.2	0.05	OL4401	GS	
	ug/L	SS4-4	4/7/2016	3.75000	3.75	0.05	OL4402	GS	
	ug/L	SS4-5	4/7/2016	3.00000	3	0.05	OL4403	GS	
	ug/L	SS5-3	4/6/2016	4.30000	4.3	0.05	OL4404	GS	
	ug/L	SS5-4	4/6/2016	1.76000	1.76	0.05	OL4405	GS	
	ug/L	SS5-5	4/6/2016	0.78600	0.786	0.05	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	0.86600	0.866	0.05	OL4363	DUPW2	
Cobalt (Co)	ug/L	CONTROL 1	4/6/2016	0.09000	0.09	0.005	OL4357	GS	
- Total	ug/L	CONTROL 2	4/7/2016	0.39900	0.399	0.005	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.24100	0.241	0.005	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7802	EBW	
	ug/L	SS1-4	4/3/2016	0.18600	0.186	0.005	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.32800	0.328	0.005	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.20200	0.202	0.005	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.14800	0.148	0.005	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.10700	0.107	0.005	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.10800	0.108	0.005	OL4366	GS	
	ug/L	SS3-4	4/5/2016	1.77000	1.77	0.005	OL4367	GS	
	ug/L	SS3-5	4/5/2016	2.00000	2	0.005	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	1.98000	1.98	0.005	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	3.52000	3.52	0.005	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.0050	0.0025	0.005	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	1.59000	1.59	0.005	OL4371	GS	
	ug/L	SS3-8	4/5/2016	3.01000	3.01	0.005	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.66500	0.665	0.005	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.58300	0.583	0.005	OL4403	GS	
	ug/L	SS5-3	4/6/2016	0.78800	0.788	0.005	OL4404	GS	
	ug/L	SS5-4	4/6/2016	0.24900	0.249	0.005	OL4405	GS	
	ug/L	SS5-5	4/6/2016	0.05000	0.05	0.005	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	0.13000	0.13	0.005	OL4363	DUPW2	
Conductivity	us/cm	CONTROL 1	4/6/2016	3.40000	3.4	1.0	OL4357	GS	
	us/cm	CONTROL 2	4/7/2016	3.10000	3.1	1.0	OL4358	GS	
	us/cm	CONTROL 3	4/5/2016	2.70000	2.7	1.0	OL4359	GS	
	us/cm	SS BAG	3/10/2016	1.20000	1.2	1.0	OG7803	EBW	
	us/cm	SS BAG	3/10/2016	1.20000	1.2	1.0	OG7802	EBW	
	us/cm	SS BAG	3/10/2016	1.40000	1.4	1.0	OG7801	EBW	
	us/cm	SS1-4	4/3/2016	2.30000	2.3	1.0	OL4360	GS	
	us/cm	SS1-5	4/3/2016	2.60000	2.6	1.0	OL4361	GS	
	us/cm	SS2-1	4/3/2016	3.10000	3.1	1.0	OL4362	GS	
	us/cm	SS2-2	4/3/2016	2.20000	2.2	1.0	OL4364	GS	
	us/cm	SS2-3	4/3/2016	2.80000	2.8	1.0	OL4365	GS	

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Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Conductivity	us/cm	SS2-4	4/3/2016	2.30000	2.3	1.0	OL4366	GS	
(cont'd)	us/cm	SS3-4	4/5/2016	5.90000	5.9	1.0	OL4367	GS	
	us/cm	SS3-5	4/5/2016	6.10000	6.1	1.0	OL4368	DUPW1	
	us/cm	SS3-5	4/5/2016	7.40000	7.4	1.0	OL4369	DUPW2	
	us/cm	SS3-6	4/5/2016	8.30000	8.3	1.0	OL4370	GS	
	us/cm	SS3-6	4/6/2016	1.60000	1.6	1.0	OK6544	EBW	
	us/cm	SS3-7	4/5/2016	6.70000	6.7	1.0	OL4371	GS	
	us/cm	SS3-8	4/5/2016	12.20000	12.2	1.0	OL4401	GS	
	us/cm	SS4-4	4/7/2016	3.60000	3.6	1.0	OL4402	GS	
	us/cm	SS4-5	4/7/2016	3.20000	3.2	1.0	OL4403	GS	
	us/cm	SS5-3	4/6/2016	2.50000	2.5	1.0	OL4404	GS	
	us/cm	SS5-4	4/6/2016	2.70000	2.7	1.0	OL4405	GS	
	us/cm	SS5-5	4/6/2016	3.10000	3.1	1.0	OL4406	DUPW1	
	us/cm	SS5-5	4/6/2016	3.50000	3.5	1.0	OL4363	DUPW2	
Copper (Cu)	ug/L	CONTROL 1	4/6/2016	0.08300	0.083	0.05	OL4357	GS	
- Total	ug/L	CONTROL 2	4/7/2016	0.68000	0.68	0.05	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.46000	0.46	0.05	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7803	EBW	
	ug/L	SS1-4	4/3/2016	0.29300	0.293	0.05	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.42400	0.424	0.05	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.31300	0.313	0.05	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.32500	0.325	0.05	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.24400	0.244	0.05	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.31700	0.317	0.05	OL4366	GS	
	ug/L	SS3-4	4/5/2016	2.58000	2.58	0.05	OL4367	GS	
	ug/L	SS3-5	4/5/2016	2.99000	2.99	0.05	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	2.88000	2.88	0.05	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	5.00000	5	0.05	OL4370	GS	
	ug/L	SS3-6	4/6/2016	0.07300	0.073	0.05	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	4.26000	4.26	0.05	OL4371	GS	
	ug/L	SS3-8	4/5/2016	5.53000	5.53	0.05	OL4401	GS	
	ug/L	SS4-4	4/7/2016	1.33000	1.33	0.05	OL4402	GS	
	ug/L	SS4-5	4/7/2016	1.40000	1.4	0.05	OL4403	GS	
	ug/L	SS5-3	4/6/2016	1.72000	1.72	0.05	OL4404	GS	
	ug/L	SS5-4	4/6/2016	0.36400	0.364	0.05	OL4405	GS	
	ug/L	SS5-5	4/6/2016	0.09100	0.091	0.05	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	0.42500	0.425	0.05	OL4363	DUPW2	
Fluoride (F)	mg/L	CONTROL 1	4/6/2016	<0.010	0.005	0.01	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	<0.010	0.005	0.01	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	<0.010	0.005	0.01	OL4359	GS	
	mg/L	SS BAG	3/10/2016	0.00000	0	0.01	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.010	0.005	0.01	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.010	0.005	0.01	OG7802	EBW	
	mg/L	SS1-4	4/3/2016	<0.010	0.005	0.01	OL4360	GS	
	mg/L	SS1-5	4/3/2016	0.01000	0.01	0.01	OL4361	GS	
	mg/L	SS2-1	4/3/2016	<0.010	0.005	0.01	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.010	0.005	0.01	OL4364	GS	
	mg/L	SS2-3	4/3/2016	<0.010	0.005	0.01	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.010	0.005	0.01	OL4366	GS	
	mg/L	SS3-4	4/5/2016	<0.010	0.005	0.01	OL4367	GS	
	mg/L	SS3-5	4/5/2016	<0.010	0.005	0.01	OL4368	DUPW1	
	mg/L	SS3-5	4/5/2016	<0.010	0.005	0.01	OL4369	DUPW2	
	mg/L	SS3-6	4/5/2016	<0.010	0.005	0.01	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.010	0.005	0.01	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	<0.010	0.005	0.01	OL4371	GS	
	mg/L	SS3-8	4/5/2016	0.01200	0.012	0.01	OL4401	GS	
	mg/L	SS4-4	4/7/2016	0.01000	0.01	0.01	OL4402	GS	
	mg/L	SS4-5	4/7/2016	<0.010	0.005	0.01	OL4403	GS	
	mg/L	SS5-3	4/6/2016	<0.010	0.005	0.01	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.010	0.005	0.01	OL4405	GS	
	mg/L	SS5-5	4/6/2016	<0.010	0.005	0.01	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	<0.010	0.005	0.01	OL4363	DUPW2	
Hardness (as	mg/L	CONTROL 1	4/6/2016	0.84000	0.84	0.50	OL4357	GS	
$CACO_3$) - Total	mg/L	CONTROL 2	4/7/2016	4.01000	4.01	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	2.69000	2.69	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	
	mg/L	SS1-4	4/3/2016	1.60000	1.6	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	2.43000	2.43	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	2.17000	2.17	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	1.52000	1.52	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	1.22000	1.22	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	0.94000	0.94	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	16.00000	16	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	17.50000	17.5	0.50	OL4368	DUPW1	
	mg/L	SS3-5	4/5/2016	18.20000	18.2	0.50	OL4369	DUPW2	
	mg/L	SS3-6	4/5/2016	29.00000	29	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.50	0.25	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	15.00000	15	0.50	OL4371	GS	
	mg/L	SS3-8	4/5/2016	26.90000	26.9	0.50	OL4401	GS	
	mg/L	SS4-4	4/7/2016	5.96000	5.96	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	4.13000	4.13	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	5.93000	5.93	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	2.52000	2.52	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.58000	0.58	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	1.56000	1.56	0.50	OL4363	DUPW2	
Hydroxide (OH)	mg/L	CONTROL 1	4/6/2016	<0.50	0.25	0.50	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	<0.50	0.25	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	<0.50	0.25	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Hydroxide (OH) *(cont'd)*	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	mg/L	SS1-4	4/3/2016	<0.50	0.25	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	<0.50	0.25	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	<0.50	0.25	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.50	0.25	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	<0.50	0.25	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.50	0.25	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	<0.50	0.25	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	<0.50	0.25	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.50	0.25	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	<0.50	0.25	0.50	OL4371	GS	
	mg/L	SS3-8	4/5/2016	<0.50	0.25	0.50	OL4401	GS	
	mg/L	SS4-4	4/7/2016	<0.50	0.25	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	<0.50	0.25	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	<0.50	0.25	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.50	0.25	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4363	DUPW2	
Iron (Fe) - Total	ug/L	SS5-5	4/6/2016	45.50000	45.5	1.00	OL4406	DUPW1	Matrix spike outside acceptance criteria (10% of analytes failure allowed)
	ug/L	CONTROL 1	4/6/2016	131.00000	131	1.00	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	659.00000	659	1.00	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	424.00000	424	1.00	OL4359	GS	
	ug/L	SS BAG	3/10/2016	3.20000	3.2	1.00	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	1.10000	1.1	1.00	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	2.20000	2.2	1.00	OG7802	EBW	
	ug/L	SS1-4	4/3/2016	327.00000	327	1.00	OL4360	GS	
	ug/L	SS1-5	4/3/2016	568.00000	568	1.00	OL4361	GS	
	ug/L	SS2-1	4/3/2016	336.00000	336	1.00	OL4362	GS	
	ug/L	SS2-2	4/3/2016	285.00000	285	1.00	OL4364	GS	
	ug/L	SS2-3	4/3/2016	212.00000	212	1.00	OL4365	GS	
	ug/L	SS2-4	4/3/2016	200.00000	200	1.00	OL4366	GS	
	ug/L	SS3-4	4/5/2016	2620.00000	2620	1.00	OL4367	GS	
	ug/L	SS3-5	4/5/2016	2690.00000	2690	1.00	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	2850.00000	2850	1.00	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	5150.00000	5150	1.00	OL4370	GS	
	ug/L	SS3-6	4/6/2016	6.70000	6.7	1.00	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	2420.00000	2420	1.00	OL4371	GS	
	ug/L	SS3-8	4/5/2016	3900.00000	3900	1.00	OL4401	GS	
	ug/L	SS4-4	4/7/2016	1030.00000	1030	1.00	OL4402	GS	
	ug/L	SS4-5	4/7/2016	1060.00000	1060	1.00	OL4403	GS	
	ug/L	SS5-3	4/6/2016	1340.00000	1340	1.00	OL4404	GS	
	ug/L	SS5-4	4/6/2016	427.00000	427	1.00	OL4405	GS	
	ug/L	SS5-5	4/6/2016	218.00000	218	1.00	OL4363	DUPW2	
Lead (Pb) - Total	ug/L	CONTROL 1	4/6/2016	0.10600	0.106	0.005	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	0.40400	0.404	0.005	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.30500	0.305	0.005	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	0.24100	0.241	0.005	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.39400	0.394	0.005	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.29900	0.299	0.005	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.20500	0.205	0.005	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.19600	0.196	0.005	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.13900	0.139	0.005	OL4366	GS	
	ug/L	SS3-4	4/5/2016	1.57000	1.57	0.005	OL4367	GS	
	ug/L	SS3-5	4/5/2016	1.66000	1.66	0.005	OL4368	DUPW1	
	ug/L	SS3-5	4/5/2016	1.35000	1.35	0.005	OL4369	DUPW2	
	ug/L	SS3-6	4/5/2016	3.13000	3.13	0.005	OL4370	GS	
	ug/L	SS3-6	4/6/2016	0.06300	0.063	0.005	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	1.62000	1.62	0.005	OL4371	GS	
	ug/L	SS3-8	4/5/2016	2.96000	2.96	0.005	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.72400	0.724	0.005	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.68100	0.681	0.005	OL4403	GS	
	ug/L	SS5-3	4/6/2016	0.81600	0.816	0.005	OL4404	GS	
	ug/L	SS5-4	4/6/2016	0.26400	0.264	0.005	OL4405	GS	
	ug/L	SS5-5	4/6/2016	0.08200	0.082	0.005	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	0.20100	0.201	0.005	OL4363	DUPW2	
Lithium (Li) - Total	ug/L	CONTROL 1	4/6/2016	<0.50	0.25	0.50	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	1.39000	1.39	0.50	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.63000	0.63	0.50	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	ug/L	SS1-4	4/3/2016	0.84000	0.84	0.50	OL4360	GS	
	ug/L	SS1-5	4/3/2016	1.25000	1.25	0.50	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.69000	0.69	0.50	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.77000	0.77	0.50	OL4364	GS	
	ug/L	SS2-3	4/3/2016	<0.50	0.25	0.50	OL4365	GS	
	ug/L	SS2-4	4/3/2016	<0.50	0.25	0.50	OL4366	GS	
	ug/L	SS3-4	4/5/2016	5.71000	5.71	0.50	OL4367	GS	
	ug/L	SS3-5	4/5/2016	4.17000	4.17	0.50	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	5.03000	5.03	0.50	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	9.51000	9.51	0.50	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.50	0.25	0.50	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	4.53000	4.53	0.50	OL4371	GS	
	ug/L	SS3-8	4/5/2016	7.05000	7.05	0.50	OL4401	GS	
	ug/L	SS4-4	4/7/2016	1.69000	1.69	0.50	OL4402	GS	
	ug/L	SS4-5	4/7/2016	1.88000	1.88	0.50	OL4403	GS	
	ug/L	SS5-3	4/6/2016	2.90000	2.9	0.50	OL4404	GS	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Lithium (Li) - Total *(cont'd)*	ug/L	SS5-4	4/6/2016	0.74000	0.74	0.50	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4363	DUPW2	
Magnesium (Mg) - Total	mg/L	CONTROL 1	4/6/2016	0.14600	0.146	0.05	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	0.81100	0.811	0.05	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	0.48500	0.485	0.05	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7801	EBW	
	mg/L	SS1-4	4/3/2016	0.29100	0.291	0.05	OL4360	GS	
	mg/L	SS1-5	4/3/2016	0.43700	0.437	0.05	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.41000	0.41	0.05	OL4362	GS	
	mg/L	SS2-2	4/3/2016	0.27400	0.274	0.05	OL4364	GS	
	mg/L	SS2-3	4/3/2016	0.18700	0.187	0.05	OL4365	GS	
	mg/L	SS2-4	4/3/2016	0.16200	0.162	0.05	OL4366	GS	
	mg/L	SS3-4	4/5/2016	3.13000	3.13	0.05	OL4367	GS	
	mg/L	SS3-5	4/5/2016	3.59000	3.59	0.05	OL4368	DUPW1	
	mg/L	SS3-5	4/5/2016	3.75000	3.75	0.05	OL4369	DUPW2	
	mg/L	SS3-6	4/5/2016	5.72000	5.72	0.05	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.050	0.025	0.05	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	2.73000	2.73	0.05	OL4371	GS	
	mg/L	SS3-8	4/5/2016	5.05000	5.05	0.05	OL4401	GS	
	mg/L	SS4-4	4/7/2016	1.15000	1.15	0.05	OL4402	GS	
	mg/L	SS4-5	4/7/2016	0.73700	0.737	0.05	OL4403	GS	
	mg/L	SS5-3	4/6/2016	1.15000	1.15	0.05	OL4404	GS	
	mg/L	SS5-4	4/6/2016	0.49200	0.492	0.05	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.07400	0.074	0.05	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	0.30200	0.302	0.05	OL4363	DUPW2	
Manganese (Mn) - Total	ug/L	CONTROL 1	4/6/2016	2.67000	2.67	0.05	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	9.72000	9.72	0.05	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	5.84000	5.84	0.05	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7802	EBW	
	ug/L	SS1-4	4/3/2016	5.02000	5.02	0.05	OL4360	GS	
	ug/L	SS1-5	4/3/2016	8.13000	8.13	0.05	OL4361	GS	
	ug/L	SS2-1	4/3/2016	4.97000	4.97	0.05	OL4362	GS	
	ug/L	SS2-2	4/3/2016	4.18000	4.18	0.05	OL4364	GS	
	ug/L	SS2-3	4/3/2016	3.39000	3.39	0.05	OL4365	GS	
	ug/L	SS2-4	4/3/2016	3.21000	3.21	0.05	OL4366	GS	
	ug/L	SS3-4	4/5/2016	38.70000	38.7	0.05	OL4367	GS	
	ug/L	SS3-5	4/5/2016	38.30000	38.3	0.05	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	40.50000	40.5	0.05	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	75.70000	75.7	0.05	OL4370	GS	
	ug/L	SS3-6	4/6/2016	0.08700	0.087	0.05	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	36.70000	36.7	0.05	OL4371	GS	
	ug/L	SS3-8	4/5/2016	58.40000	58.4	0.05	OL4401	GS	
	ug/L	SS4-4	4/7/2016	16.00000	16	0.05	OL4402	GS	
	ug/L	SS4-5	4/7/2016	15.60000	15.6	0.05	OL4403	GS	
	ug/L	SS5-3	4/6/2016	20.30000	20.3	0.05	OL4404	GS	
	ug/L	SS5-4	4/6/2016	5.90000	5.9	0.05	OL4405	GS	
	ug/L	SS5-5	4/6/2016	1.20000	1.2	0.05	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	3.23000	3.23	0.05	OL4363	DUPW2	
Mercury (Hg) - Total	ug/L	CONTROL 1	4/6/2016	<0.0020	0.001	0.002	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	<0.0020	0.001	0.002	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	<0.0020	0.001	0.002	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	<0.0020	0.001	0.002	OL4360	GS	
	ug/L	SS1-5	4/3/2016	<0.0020	0.001	0.002	OL4361	GS	
	ug/L	SS2-1	4/3/2016	<0.0020	0.001	0.002	OL4362	GS	
	ug/L	SS2-2	4/3/2016	<0.0020	0.001	0.002	OL4364	GS	
	ug/L	SS2-3	4/3/2016	<0.0020	0.001	0.002	OL4365	GS	
	ug/L	SS2-4	4/3/2016	<0.0020	0.001	0.002	OL4366	GS	
	ug/L	SS3-4	4/5/2016	<0.0020	0.001	0.002	OL4367	GS	
	ug/L	SS3-5	4/5/2016	<0.0020	0.001	0.002	OL4368	DUPW1	
	ug/L	SS3-5	4/5/2016	<0.0020	0.001	0.002	OL4369	DUPW2	
	ug/L	SS3-6	4/5/2016	<0.0020	0.001	0.002	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.0020	0.001	0.002	OK5282	EBW	
	ug/L	SS3-7	4/5/2016	<0.0020	0.001	0.002	OL4371	GS	
	ug/L	SS3-8	4/5/2016	<0.0020	0.001	0.002	OL4401	GS	
	ug/L	SS4-4	4/7/2016	<0.0020	0.001	0.002	OL4402	GS	
	ug/L	SS4-5	4/7/2016	<0.0020	0.001	0.002	OL4403	GS	
	ug/L	SS5-3	4/6/2016	<0.0020	0.001	0.002	OL4404	GS	
	ug/L	SS5-4	4/6/2016	<0.0020	0.001	0.002	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.0020	0.001	0.002	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<0.0020	0.001	0.002	OL4363	DUPW2	
Molybdenum (Mo) - Total	ug/L	CONTROL 1	4/6/2016	<0.050	0.025	0.05	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	0.07000	0.07	0.05	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	<0.050	0.025	0.05	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7802	EBW	
	ug/L	SS1-4	4/3/2016	<0.050	0.025	0.05	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.05200	0.052	0.05	OL4361	GS	
	ug/L	SS2-1	4/3/2016	<0.050	0.025	0.05	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.05500	0.055	0.05	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.06100	0.061	0.05	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.06100	0.061	0.05	OL4366	GS	
	ug/L	SS3-4	4/5/2016	0.12500	0.125	0.05	OL4367	GS	
	ug/L	SS3-5	4/5/2016	0.18700	0.187	0.05	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	0.15900	0.159	0.05	OL4368	DUPW1	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Molybdenum (Mo) - Total *(cont'd)*	ug/L	SS3-6	4/5/2016	0.20900	0.209	0.05	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.050	0.025	0.05	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	0.12400	0.124	0.05	OL4371	GS	
	ug/L	SS3-8	4/5/2016	0.21600	0.216	0.05	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.13100	0.131	0.05	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.07400	0.074	0.05	OL4403	GS	
	ug/L	SS5-3	4/6/2016	0.07000	0.07	0.05	OL4404	GS	
	ug/L	SS5-4	4/6/2016	<0.050	0.025	0.05	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.050	0.025	0.05	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<0.050	0.025	0.05	OL4363	DUPW2	
Nickel (Ni) - Total	ug/L	CONTROL 1	4/6/2016	0.72300	0.723	0.02	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	3.94000	3.94	0.02	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	2.42000	2.42	0.02	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.020	0.01	0.02	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.020	0.01	0.02	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.020	0.01	0.02	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	1.47000	1.47	0.02	OL4360	GS	
	ug/L	SS1-5	4/3/2016	2.19000	2.19	0.02	OL4361	GS	
	ug/L	SS2-1	4/3/2016	2.19000	2.19	0.02	OL4362	GS	
	ug/L	SS2-2	4/3/2016	1.43000	1.43	0.02	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.96800	0.968	0.02	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.92000	0.92	0.02	OL4366	GS	
	ug/L	SS3-4	4/5/2016	18.10000	18.1	0.02	OL4367	GS	
	ug/L	SS3-5	4/5/2016	22.90000	22.9	0.02	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	20.90000	20.9	0.02	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	37.50000	37.5	0.02	OL4370	GS	
	ug/L	SS3-6	4/6/2016	0.09500	0.095	0.02	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	16.70000	16.7	0.02	OL4371	GS	
	ug/L	SS3-8	4/5/2016	30.80000	30.8	0.02	OL4401	GS	
	ug/L	SS4-4	4/7/2016	6.43000	6.43	0.02	OL4402	GS	
	ug/L	SS4-5	4/7/2016	3.97000	3.97	0.02	OL4403	GS	
	ug/L	SS5-3	4/6/2016	6.40000	6.4	0.02	OL4404	GS	
	ug/L	SS5-4	4/6/2016	2.43000	2.43	0.02	OL4405	GS	
	ug/L	SS5-5	4/6/2016	0.60700	0.607	0.02	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	1.52000	1.52	0.02	OL4363	DUPW2	
Nitrate (N)	mg/L	CONTROL 1	4/6/2016	0.07480	0.0748	0.002	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	0.08650	0.0865	0.002	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	0.08900	0.089	0.002	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7801	EBW	
	mg/L	SS1-4	4/3/2016	0.06210	0.0621	0.002	OL4360	GS	
	mg/L	SS1-5	4/3/2016	0.06610	0.0661	0.002	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.09430	0.0943	0.002	OL4362	GS	
	mg/L	SS2-2	4/3/2016	0.05450	0.0545	0.002	OL4364	GS	
	mg/L	SS2-3	4/3/2016	0.07100	0.071	0.002	OL4365	GS	
	mg/L	SS2-4	4/3/2016	0.06320	0.0632	0.002	OL4366	GS	
	mg/L	SS3-4	4/5/2016	0.12400	0.124	0.002	OL4367	GS	
	mg/L	SS3-5	4/5/2016	0.14600	0.146	0.002	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	0.14300	0.143	0.002	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	0.12800	0.128	0.002	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.0020	0.001	0.002	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	0.11000	0.11	0.002	OL4371	GS	
	mg/L	SS3-8	4/5/2016	0.18200	0.182	0.002	OL4401	GS	
	mg/L	SS4-4	4/7/2016	0.10700	0.107	0.002	OL4402	GS	
	mg/L	SS4-5	4/7/2016	0.09790	0.0979	0.002	OL4403	GS	
	mg/L	SS5-3	4/6/2016	0.06660	0.0666	0.002	OL4404	GS	
	mg/L	SS5-4	4/6/2016	0.07930	0.0793	0.002	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.07940	0.0794	0.002	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	0.08090	0.0809	0.002	OL4363	DUPW2	
Nitrate plus Nitrite (N)	mg/L	SS3-6	4/6/2016	<0.0020	0.001	0.002	OK6544	EBW	Sample analysed past recommended hold time.
	mg/L	CONTROL 1	4/6/2016	0.07480	0.0748	0.002	OL4357	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 2	4/7/2016	0.08650	0.0865	0.002	OL4358	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 3	4/5/2016	0.08900	0.089	0.002	OL4359	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-4	4/3/2016	0.06210	0.0621	0.002	OL4360	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-5	4/3/2016	0.06900	0.069	0.002	OL4361	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-1	4/3/2016	0.09430	0.0943	0.002	OL4362	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-2	4/3/2016	0.05660	0.0566	0.002	OL4364	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-3	4/3/2016	0.07100	0.071	0.002	OL4365	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-4	4/3/2016	0.06320	0.0632	0.002	OL4366	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-4	4/5/2016	0.13100	0.131	0.002	OL4367	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	0.14800	0.148	0.002	OL4369	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	0.14700	0.147	0.002	OL4368	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-6	4/5/2016	0.13600	0.136	0.002	OL4370	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-7	4/5/2016	0.11400	0.114	0.002	OL4371	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-8	4/5/2016	0.19000	0.19	0.002	OL4401	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-4	4/7/2016	0.11000	0.11	0.002	OL4402	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-5	4/7/2016	0.09790	0.0979	0.002	OL4403	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-3	4/6/2016	0.06940	0.0694	0.002	OL4404	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-4	4/6/2016	0.07930	0.0793	0.002	OL4405	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	0.07940	0.0794	0.002	OL4406	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	0.08090	0.0809	0.002	OL4363	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7803	EBW	
Nitrite (N) - Total	mg/L	SS3-6	4/6/2016	<0.0020	0.001	0.002	OK6544	EBW	Sample analysed past recommended hold time.
	mg/L	CONTROL 1	4/6/2016	<0.0020	0.001	0.002	OL4357	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 2	4/7/2016	<0.0020	0.001	0.002	OL4358	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 3	4/5/2016	<0.0020	0.001	0.002	OL4359	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-4	4/3/2016	<0.0020	0.001	0.002	OL4360	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-5	4/3/2016	0.00290	0.0029	0.002	OL4361	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-1	4/3/2016	<0.0020	0.001	0.002	OL4362	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-2	4/3/2016	0.00210	0.0021	0.002	OL4364	GS	Sample arrived to laboratory past recommended hold time.

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Nitrite (N) - Total *(cont'd)*	mg/L	SS2-3	4/3/2016	<0.0020	0.001	0.002	OL4365	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-4	4/3/2016	<0.0020	0.001	0.002	OL4366	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-4	4/5/2016	0.00670	0.0067	0.002	OL4367	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	0.00400	0.004	0.002	OL4368	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	0.00240	0.0024	0.002	OL4369	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-6	4/5/2016	0.00730	0.0073	0.002	OL4370	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-7	4/5/2016	0.00360	0.0036	0.002	OL4371	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-8	4/5/2016	0.00830	0.0083	0.002	OL4401	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-4	4/7/2016	0.00280	0.0028	0.002	OL4402	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-5	4/7/2016	<0.0020	0.001	0.002	OL4403	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-3	4/6/2016	0.00280	0.0028	0.002	OL4404	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-4	4/6/2016	<0.0020	0.001	0.002	OL4405	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	<0.0020	0.001	0.002	OL4406	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	<0.0020	0.001	0.002	OL4363	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7801	EBW	
Nitrogen (N) - Total	mg/L	CONTROL 1	4/6/2016	0.11500	0.115	0.02	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	0.14900	0.149	0.02	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	0.13100	0.131	0.02	OL4359	GS	
	mg/L	SS BAG	3/10/2016	0.05300	0.053	0.02	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	0.04000	0.04	0.02	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	0.02500	0.025	0.02	OG7802	EBW	
	mg/L	SS1-4	4/3/2016	0.08400	0.084	0.02	OL4360	GS	
	mg/L	SS1-5	4/3/2016	0.10700	0.107	0.02	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.15200	0.152	0.02	OL4362	GS	
	mg/L	SS2-2	4/3/2016	0.09200	0.092	0.02	OL4364	GS	
	mg/L	SS2-3	4/3/2016	0.10300	0.103	0.02	OL4365	GS	
	mg/L	SS2-4	4/3/2016	0.07500	0.075	0.02	OL4366	GS	
	mg/L	SS3-4	4/5/2016	0.19500	0.195	0.02	OL4367	GS	
	mg/L	SS3-5	4/5/2016	0.24800	0.248	0.02	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	0.25100	0.251	0.02	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	0.23100	0.231	0.02	OL4370	GS	
	mg/L	SS3-6	4/6/2016	0.04300	0.043	0.02	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	0.17500	0.175	0.02	OL4371	GS	
	mg/L	SS3-8	4/5/2016	0.27700	0.277	0.02	OL4401	GS	
	mg/L	SS4-4	4/7/2016	0.13100	0.131	0.02	OL4402	GS	
	mg/L	SS4-5	4/7/2016	0.14200	0.142	0.02	OL4403	GS	
	mg/L	SS5-3	4/6/2016	0.11000	0.11	0.02	OL4404	GS	
	mg/L	SS5-4	4/6/2016	0.11300	0.113	0.02	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.11400	0.114	0.02	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	0.11000	0.11	0.02	OL4363	DUPW2	
Orthophosphate (PO$_4$-P)	mg/L	CONTROL 1	4/6/2016	0.00570	0.0057	0.001	OL4357	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 2	4/7/2016	0.00230	0.0023	0.001	OL4358	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 3	4/5/2016	0.00440	0.0044	0.001	OL4359	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-4	4/3/2016	0.00330	0.0033	0.001	OL4360	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-5	4/3/2016	0.00160	0.0016	0.001	OL4361	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-1	4/3/2016	0.00540	0.0054	0.001	OL4362	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-2	4/3/2016	<0.0010	0.0005	0.001	OL4364	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-3	4/3/2016	0.00270	0.0027	0.001	OL4365	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-4	4/3/2016	0.00470	0.0047	0.001	OL4366	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-4	4/5/2016	0.02300	0.023	0.001	OL4367	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	0.01100	0.011	0.001	OL4368	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	0.00970	0.0097	0.001	OL4369	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-6	4/5/2016	0.02000	0.02	0.001	OL4370	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-7	4/5/2016	0.01200	0.012	0.001	OL4371	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-8	4/5/2016	0.02600	0.026	0.001	OL4401	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-4	4/7/2016	0.01100	0.011	0.001	OL4402	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-5	4/7/2016	0.00690	0.0069	0.001	OL4403	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-3	4/6/2016	0.00530	0.0053	0.001	OL4404	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-4	4/6/2016	0.00360	0.0036	0.001	OL4405	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	0.00220	0.0022	0.001	OL4406	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	0.00240	0.0024	0.001	OL4363	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS BAG	3/10/2016	<0.0010	0.0005	0.001	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	0.00100	0.001	0.001	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.0010	0.0005	0.001	OG7803	EBW	
	mg/L	SS3-6	4/6/2016	0.00110	0.0011	0.001	OK6544	EBW	
pH	pH	CONTROL 1	4/6/2016	5.92000	5.92		OL4357	GS	
	pH	CONTROL 2	4/7/2016	5.56000	5.56		OL4358	GS	
	pH	CONTROL 3	4/5/2016	5.50000	5.5		OL4359	GS	
	pH	SS BAG	3/10/2016	5.33000	5.33		OG7803	EBW	
	pH	SS BAG	3/10/2016	5.34000	5.34		OG7802	EBW	
	pH	SS BAG	3/10/2016	5.65000	5.65		OG7801	EBW	
	pH	SS1-4	4/3/2016	5.39000	5.39		OL4360	GS	
	pH	SS1-5	4/3/2016	5.27000	5.27		OL4361	GS	
	pH	SS2-1	4/3/2016	5.42000	5.42		OL4362	GS	
	pH	SS2-2	4/3/2016	5.25000	5.25		OL4364	GS	
	pH	SS2-3	4/3/2016	5.27000	5.27		OL4365	GS	
	pH	SS2-4	4/3/2016	5.26000	5.26		OL4366	GS	
	pH	SS3-4	4/5/2016	6.22000	6.22		OL4367	GS	
	pH	SS3-5	4/5/2016	6.49000	6.49		OL4369	DUPW2	
	pH	SS3-5	4/5/2016	6.28000	6.28		OL4368	DUPW1	
	pH	SS3-6	4/5/2016	6.55000	6.55		OL4370	GS	
	pH	SS3-6	4/6/2016	5.89000	5.89		OK6544	EBW	
	pH	SS3-7	4/5/2016	6.50000	6.5		OL4371	GS	
	pH	SS3-8	4/5/2016	6.79000	6.79		OL4401	GS	
	pH	SS4-4	4/7/2016	5.72000	5.72		OL4402	GS	
	pH	SS4-5	4/7/2016	5.52000	5.52		OL4403	GS	
	pH	SS5-3	4/6/2016	5.46000	5.46		OL4404	GS	
	pH	SS5-4	4/6/2016	5.37000	5.37		OL4405	GS	
	pH	SS5-5	4/6/2016	5.12000	5.12		OL4406	DUPW1	
	pH	SS5-5	4/6/2016	5.19000	5.19		OL4363	DUPW2	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Phosphorus (P) - Dissolved (TDP)	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7803	EBW	Sample analysed past recommended hold time.
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7801	EBW	Sample analysed past recommended hold time.
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7802	EBW	Sample analysed past recommended hold time.
	mg/L	CONTROL 1	4/6/2016	0.00700	0.007	0.002	OL4357	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 2	4/7/2016	0.00350	0.0035	0.002	OL4358	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 3	4/5/2016	0.00640	0.0064	0.002	OL4359	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-4	4/3/2016	0.00680	0.0068	0.002	OL4360	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-5	4/3/2016	0.00450	0.0045	0.002	OL4361	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-1	4/3/2016	0.00660	0.0066	0.002	OL4362	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-2	4/3/2016	0.00620	0.0062	0.002	OL4364	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-3	4/3/2016	0.00490	0.0049	0.002	OL4365	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-4	4/3/2016	0.01300	0.013	0.002	OL4366	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-4	4/5/2016	0.12800	0.128	0.002	OL4367	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	0.02810	0.0281	0.002	OL4368	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	0.03140	0.0314	0.002	OL4369	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-6	4/5/2016	0.06180	0.0618	0.002	OL4370	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-7	4/5/2016	0.02820	0.0282	0.002	OL4371	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-8	4/5/2016	0.04520	0.0452	0.002	OL4401	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-4	4/7/2016	0.02780	0.0278	0.002	OL4402	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-5	4/7/2016	0.01730	0.0173	0.002	OL4403	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-3	4/6/2016	0.01030	0.0103	0.002	OL4404	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-4	4/6/2016	0.00420	0.0042	0.002	OL4405	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	0.00370	0.0037	0.002	OL4406	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	0.00410	0.0041	0.002	OL4363	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-6	4/6/2016	<0.0020	0.001	0.002	OK6544	EBW	Sample preserved to extend hold time.
	mg/L	CONTROL 1	4/6/2016	0.00760	0.0076	0.002	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	0.01530	0.0153	0.002	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	0.00960	0.0096	0.002	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7803	EBW	
	mg/L	SS1-4	4/3/2016	0.00940	0.0094	0.002	OL4360	GS	
	mg/L	SS1-5	4/3/2016	0.01250	0.0125	0.002	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.01170	0.0117	0.002	OL4362	GS	
	mg/L	SS2-2	4/3/2016	0.00820	0.0082	0.002	OL4364	GS	
	mg/L	SS2-3	4/3/2016	0.00740	0.0074	0.002	OL4365	GS	
	mg/L	SS2-4	4/3/2016	0.00740	0.0074	0.002	OL4366	GS	
	mg/L	SS3-4	4/5/2016	0.05660	0.0566	0.002	OL4367	GS	
	mg/L	SS3-5	4/5/2016	0.04940	0.0494	0.002	OL4368	DUPW1	
	mg/L	SS3-5	4/5/2016	0.04890	0.0489	0.002	OL4369	DUPW2	
	mg/L	SS3-6	4/5/2016	0.10000	0.1	0.002	OL4370	GS	
	mg/L	SS3-6	4/6/2016	0.00240	0.0024	0.002	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	0.06360	0.0636	0.002	OL4371	GS	
	mg/L	SS3-8	4/5/2016	0.10900	0.109	0.002	OL4401	GS	
	mg/L	SS4-4	4/7/2016	0.02790	0.0279	0.002	OL4402	GS	
	mg/L	SS4-5	4/7/2016	0.03090	0.0309	0.002	OL4403	GS	
	mg/L	SS5-3	4/6/2016	0.03060	0.0306	0.002	OL4404	GS	
	mg/L	SS5-4	4/6/2016	0.00550	0.0055	0.002	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.01060	0.0106	0.002	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	0.00810	0.0081	0.002	OL4363	DUPW2	
Potassium (K) - Total	mg/L	CONTROL 1	4/6/2016	0.06400	0.064	0.05	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	0.20000	0.2	0.05	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	0.12300	0.123	0.05	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7801	EBW	
	mg/L	SS1-4	4/3/2016	0.08700	0.087	0.05	OL4360	GS	
	mg/L	SS1-5	4/3/2016	0.15100	0.151	0.05	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.10700	0.107	0.05	OL4362	GS	
	mg/L	SS2-2	4/3/2016	0.07700	0.077	0.05	OL4364	GS	
	mg/L	SS2-3	4/3/2016	0.07500	0.075	0.05	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.050	0.025	0.05	OL4366	GS	
	mg/L	SS3-4	4/5/2016	0.63200	0.632	0.05	OL4367	GS	
	mg/L	SS3-5	4/5/2016	0.60400	0.604	0.05	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	0.64600	0.646	0.05	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	1.12000	1.12	0.05	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.050	0.025	0.05	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	0.54200	0.542	0.05	OL4371	GS	
	mg/L	SS3-8	4/5/2016	1.01000	1.01	0.05	OL4401	GS	
	mg/L	SS4-4	4/7/2016	0.29000	0.29	0.05	OL4402	GS	
	mg/L	SS4-5	4/7/2016	0.32200	0.322	0.05	OL4403	GS	
	mg/L	SS5-3	4/6/2016	0.34600	0.346	0.05	OL4404	GS	
	mg/L	SS5-4	4/6/2016	0.10700	0.107	0.05	OL4405	GS	
	mg/L	SS5-5	4/6/2016	<0.050	0.025	0.05	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	0.05300	0.053	0.05	OL4363	DUPW2	
Selenium (Se) - Total	ug/L	CONTROL 1	4/6/2016	<0.040	0.02	0.04	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	<0.040	0.02	0.04	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	<0.040	0.02	0.04	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.040	0.02	0.04	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.040	0.02	0.04	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.040	0.02	0.04	OG7802	EBW	
	ug/L	SS1-4	4/3/2016	<0.040	0.02	0.04	OL4360	GS	
	ug/L	SS1-5	4/3/2016	<0.040	0.02	0.04	OL4361	GS	
	ug/L	SS2-1	4/3/2016	<0.040	0.02	0.04	OL4362	GS	
	ug/L	SS2-2	4/3/2016	<0.040	0.02	0.04	OL4364	GS	
	ug/L	SS2-3	4/3/2016	<0.040	0.02	0.04	OL4365	GS	
	ug/L	SS2-4	4/3/2016	<0.040	0.02	0.04	OL4366	GS	
	ug/L	SS3-4	4/5/2016	<0.040	0.02	0.04	OL4367	GS	
	ug/L	SS3-5	4/5/2016	<0.040	0.02	0.04	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	<0.040	0.02	0.04	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	<0.040	0.02	0.04	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.040	0.02	0.04	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	<0.040	0.02	0.04	OL4371	GS	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Selenium (Se)	ug/L	SS3-8	4/5/2016	<0.040	0.02	0.04	OL4401	GS	
- Total *(cont'd)*	ug/L	SS4-4	4/7/2016	<0.040	0.02	0.04	OL4402	GS	
	ug/L	SS4-5	4/7/2016	<0.040	0.02	0.04	OL4403	GS	
	ug/L	SS5-3	4/6/2016	<0.040	0.02	0.04	OL4404	GS	
	ug/L	SS5-4	4/6/2016	<0.040	0.02	0.04	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.040	0.02	0.04	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<0.040	0.02	0.04	OL4363	DUPW2	
Silicon (Si)	ug/L	CONTROL 1	4/6/2016	178.00000	178	50.00	OL4357	GS	
- Total	ug/L	CONTROL 2	4/7/2016	873.00000	873	50.00	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	506.00000	506	50.00	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<50	25	50.00	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<50	25	50.00	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<50	25	50.00	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	390.00000	390	50.00	OL4360	GS	
	ug/L	SS1-5	4/3/2016	707.00000	707	50.00	OL4361	GS	
	ug/L	SS2-1	4/3/2016	442.00000	442	50.00	OL4362	GS	
	ug/L	SS2-2	4/3/2016	352.00000	352	50.00	OL4364	GS	
	ug/L	SS2-3	4/3/2016	249.00000	249	50.00	OL4365	GS	
	ug/L	SS2-4	4/3/2016	230.00000	230	50.00	OL4366	GS	
	ug/L	SS3-4	4/5/2016	3330.00000	3330	50.00	OL4367	GS	
	ug/L	SS3-5	4/5/2016	3470.00000	3470	50.00	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	3500.00000	3500	50.00	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	5550.00000	5550	50.00	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<50	25	50.00	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	2980.00000	2980	50.00	OL4371	GS	
	ug/L	SS3-8	4/5/2016	5110.00000	5110	50.00	OL4401	GS	
	ug/L	SS4-4	4/7/2016	1300.00000	1300	50.00	OL4402	GS	
	ug/L	SS4-5	4/7/2016	1220.00000	1220	50.00	OL4403	GS	
	ug/L	SS5-3	4/6/2016	1530.00000	1530	50.00	OL4404	GS	
	ug/L	SS5-4	4/6/2016	544.00000	544	50.00	OL4405	GS	
	ug/L	SS5-5	4/6/2016	70.00000	70	50.00	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	279.00000	279	50.00	OL4363	DUPW2	
Silver (Ag)	ug/L	CONTROL 1	4/6/2016	<0.0050	0.0025	0.005	OL4357	GS	
- Total	ug/L	CONTROL 2	4/7/2016	<0.0050	0.0025	0.005	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	<0.0050	0.0025	0.005	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.0050	0.0025	0.005	OG7802	EBW	
	ug/L	SS1-4	4/3/2016	<0.0050	0.0025	0.005	OL4360	GS	
	ug/L	SS1-5	4/3/2016	<0.0050	0.0025	0.005	OL4361	GS	
	ug/L	SS2-1	4/3/2016	<0.0050	0.0025	0.005	OL4362	GS	
	ug/L	SS2-2	4/3/2016	<0.0050	0.0025	0.005	OL4364	GS	
	ug/L	SS2-3	4/3/2016	<0.0050	0.0025	0.005	OL4365	GS	
	ug/L	SS2-4	4/3/2016	<0.0050	0.0025	0.005	OL4366	GS	
	ug/L	SS3-4	4/5/2016	0.00700	0.007	0.005	OL4367	GS	
	ug/L	SS3-5	4/5/2016	0.00800	0.008	0.005	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	0.00600	0.006	0.005	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	0.01300	0.013	0.005	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.0050	0.0025	0.005	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	0.00600	0.006	0.005	OL4371	GS	
	ug/L	SS3-8	4/5/2016	0.01300	0.013	0.005	OL4401	GS	
	ug/L	SS4-4	4/7/2016	<0.0050	0.0025	0.005	OL4402	GS	
	ug/L	SS4-5	4/7/2016	<0.0050	0.0025	0.005	OL4403	GS	
	ug/L	SS5-3	4/6/2016	<0.0050	0.0025	0.005	OL4404	GS	
	ug/L	SS5-4	4/6/2016	<0.0050	0.0025	0.005	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.0050	0.0025	0.005	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<0.0050	0.0025	0.005	OL4363	DUPW2	
Sodium (Na)	mg/L	CONTROL 1	4/6/2016	<0.050	0.025	0.05	OL4357	GS	
- Total	mg/L	CONTROL 2	4/7/2016	0.06800	0.068	0.05	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	<0.050	0.025	0.05	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7801	EBW	
	mg/L	SS1-4	4/3/2016	<0.050	0.025	0.05	OL4360	GS	
	mg/L	SS1-5	4/3/2016	0.06300	0.063	0.05	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.05200	0.052	0.05	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.050	0.025	0.05	OL4364	GS	
	mg/L	SS2-3	4/3/2016	0.09500	0.095	0.05	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.050	0.025	0.05	OL4366	GS	
	mg/L	SS3-4	4/5/2016	0.14200	0.142	0.05	OL4367	GS	
	mg/L	SS3-5	4/5/2016	0.19700	0.197	0.05	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	0.19300	0.193	0.05	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	0.17500	0.175	0.05	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.050	0.025	0.05	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	0.09900	0.099	0.05	OL4371	GS	
	mg/L	SS3-8	4/5/2016	0.21600	0.216	0.05	OL4401	GS	
	mg/L	SS4-4	4/7/2016	0.09100	0.091	0.05	OL4402	GS	
	mg/L	SS4-5	4/7/2016	0.08400	0.084	0.05	OL4403	GS	
	mg/L	SS5-3	4/6/2016	0.05500	0.055	0.05	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.050	0.025	0.05	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.05600	0.056	0.05	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	<0.050	0.025	0.05	OL4363	DUPW2	
Strontium (Sr)	ug/L	CONTROL 1	4/6/2016	0.49200	0.492	0.05	OL4357	GS	
- Total	ug/L	CONTROL 2	4/7/2016	1.61000	1.61	0.05	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	1.19000	1.19	0.05	OL4359	GS	
	ug/L	SS BAG	3/10/2016	0.52400	0.524	0.05	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	0.08900	0.089	0.05	OG7802	EBW	
	ug/L	SS1-4	4/3/2016	0.92500	0.925	0.05	OL4360	GS	
	ug/L	SS1-5	4/3/2016	1.48000	1.48	0.05	OL4361	GS	
	ug/L	SS2-1	4/3/2016	1.10000	1.1	0.05	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.86300	0.863	0.05	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.92300	0.923	0.05	OL4365	GS	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Strontium (Sr)	ug/L	SS2-4	4/3/2016	0.56100	0.561	0.05	OL4366	GS	
- Total *(cont'd)*	ug/L	SS3-4	4/5/2016	6.12000	6.12	0.05	OL4367	GS	
	ug/L	SS3-5	4/5/2016	7.84000	7.84	0.05	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	6.59000	6.59	0.05	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	11.50000	11.5	0.05	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.050	0.025	0.05	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	6.43000	6.43	0.05	OL4371	GS	
	ug/L	SS3-8	4/5/2016	15.90000	15.9	0.05	OL4401	GS	
	ug/L	SS4-4	4/7/2016	2.89000	2.89	0.05	OL4402	GS	
	ug/L	SS4-5	4/7/2016	2.21000	2.21	0.05	OL4403	GS	
	ug/L	SS5-3	4/6/2016	2.17000	2.17	0.05	OL4404	GS	
	ug/L	SS5-4	4/6/2016	1.21000	1.21	0.05	OL4405	GS	
	ug/L	SS5-5	4/6/2016	0.62700	0.627	0.05	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	0.64500	0.645	0.05	OL4363	DUPW2	
Sulphate (SO_4)	mg/L	CONTROL 1	4/6/2016	<0.50	0.25	0.50	OL4357	GS	
- Dissolved	mg/L	CONTROL 2	4/7/2016	<0.50	0.25	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	<0.50	0.25	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	mg/L	SS1-4	4/3/2016	<0.50	0.25	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	<0.50	0.25	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.72000	0.72	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.50	0.25	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	0.64000	0.64	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.50	0.25	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	<0.50	0.25	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4368	DUPW1	
	mg/L	SS3-5	4/5/2016	1.16000	1.16	0.50	OL4369	DUPW2	
	mg/L	SS3-6	4/5/2016	<0.50	0.25	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.50	0.25	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	<0.50	0.25	0.50	OL4371	GS	
	mg/L	SS3-8	4/5/2016	0.66000	0.66	0.50	OL4401	GS	
	mg/L	SS4-4	4/7/2016	<0.50	0.25	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	<0.50	0.25	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	<0.50	0.25	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.50	0.25	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4363	DUPW2	
Sulphur (S)	mg/L	CONTROL 1	4/6/2016	<0.50	0.25	0.50	OL4357	GS	
- Total	mg/L	CONTROL 2	4/7/2016	<0.50	0.25	0.50	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	<0.50	0.25	0.50	OL4359	GS	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	<0.50	0.25	0.50	OG7801	EBW	
	mg/L	SS1-4	4/3/2016	<0.50	0.25	0.50	OL4360	GS	
	mg/L	SS1-5	4/3/2016	<0.50	0.25	0.50	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.57000	0.57	0.50	OL4362	GS	
	mg/L	SS2-2	4/3/2016	<0.50	0.25	0.50	OL4364	GS	
	mg/L	SS2-3	4/3/2016	<0.50	0.25	0.50	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.50	0.25	0.50	OL4366	GS	
	mg/L	SS3-4	4/5/2016	<0.50	0.25	0.50	OL4367	GS	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4369	DUPW2	
	mg/L	SS3-5	4/5/2016	<0.50	0.25	0.50	OL4368	DUPW1	
	mg/L	SS3-6	4/5/2016	<0.50	0.25	0.50	OL4370	GS	
	mg/L	SS3-6	4/6/2016	<0.50	0.25	0.50	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	<0.50	0.25	0.50	OL4371	GS	
	mg/L	SS3-8	4/5/2016	<0.50	0.25	0.50	OL4401	GS	
	mg/L	SS4-4	4/7/2016	<0.50	0.25	0.50	OL4402	GS	
	mg/L	SS4-5	4/7/2016	<0.50	0.25	0.50	OL4403	GS	
	mg/L	SS5-3	4/6/2016	<0.50	0.25	0.50	OL4404	GS	
	mg/L	SS5-4	4/6/2016	<0.50	0.25	0.50	OL4405	GS	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	<0.50	0.25	0.50	OL4363	DUPW2	
Thallium (Tl)	ug/L	CONTROL 1	4/6/2016	<0.0020	0.001	0.002	OL4357	GS	
- Total	ug/L	CONTROL 2	4/7/2016	0.00600	0.006	0.002	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.00400	0.004	0.002	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	0.00400	0.004	0.002	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.00600	0.006	0.002	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.00400	0.004	0.002	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.00300	0.003	0.002	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.00300	0.003	0.002	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.00200	0.002	0.002	OL4366	GS	
	ug/L	SS3-4	4/5/2016	0.02700	0.027	0.002	OL4367	GS	
	ug/L	SS3-5	4/5/2016	0.02800	0.028	0.002	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	0.02700	0.027	0.002	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	0.05500	0.055	0.002	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.0020	0.001	0.002	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	0.03000	0.03	0.002	OL4371	GS	
	ug/L	SS3-8	4/5/2016	0.04500	0.045	0.002	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.01000	0.01	0.002	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.01300	0.013	0.002	OL4403	GS	
	ug/L	SS5-3	4/6/2016	0.01600	0.016	0.002	OL4404	GS	
	ug/L	SS5-4	4/6/2016	0.00600	0.006	0.002	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.0020	0.001	0.002	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	0.00200	0.002	0.002	OL4363	DUPW2	
Tin (Sn) - Total	ug/L	CONTROL 1	4/6/2016	<0.010	0.005	0.01	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	0.02100	0.021	0.01	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.11800	0.118	0.01	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.010	0.005	0.01	OG7801	EBW	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Tin (Sn) - Total *(cont'd)*	ug/L	SS BAG	3/10/2016	<0.010	0.005	0.01	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.010	0.005	0.01	OG7803	EBW	
	ug/L	SS1-4	4/3/2016	0.01200	0.012	0.01	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.01800	0.018	0.01	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.01100	0.011	0.01	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.02600	0.026	0.01	OL4364	GS	
	ug/L	SS2-3	4/3/2016	<0.010	0.005	0.01	OL4365	GS	
	ug/L	SS2-4	4/3/2016	<0.010	0.005	0.01	OL4366	GS	
	ug/L	SS3-4	4/5/2016	0.06100	0.061	0.01	OL4367	GS	
	ug/L	SS3-5	4/5/2016	0.05500	0.055	0.01	OL4368	DUPW1	
	ug/L	SS3-5	4/5/2016	0.06600	0.066	0.01	OL4369	DUPW2	
	ug/L	SS3-6	4/5/2016	0.07400	0.074	0.01	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.010	0.005	0.01	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	0.06000	0.06	0.01	OL4371	GS	
	ug/L	SS3-8	4/5/2016	0.09300	0.093	0.01	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.03500	0.035	0.01	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.03300	0.033	0.01	OL4403	GS	
	ug/L	SS5-3	4/6/2016	0.04200	0.042	0.01	OL4404	GS	
	ug/L	SS5-4	4/6/2016	0.02000	0.02	0.01	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.010	0.005	0.01	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<0.010	0.005	0.01	OL4363	DUPW2	
Titanium (Ti) - Total	ug/L	CONTROL 1	4/6/2016	7.16000	7.16	0.50	OL4357	GS	
Total Dissolved Solids (TDS)	mg/L	CONTROL 1	4/6/2016	2.00000	2	1.00	OL4357	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 2	4/7/2016	2.80000	2.8	1.00	OL4358	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 3	4/5/2016	2.80000	2.8	1.00	OL4359	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-4	4/3/2016	1.60000	1.6	1.00	OL4360	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-5	4/3/2016	1.60000	1.6	1.00	OL4361	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-1	4/3/2016	2.40000	2.4	1.00	OL4362	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-2	4/3/2016	1.20000	1.2	1.00	OL4364	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-3	4/3/2016	1.60000	1.6	1.00	OL4365	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-4	4/3/2016	2.00000	2	1.00	OL4366	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-4	4/5/2016	5.20000	5.2	1.00	OL4367	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	4.40000	4.4	1.00	OL4368	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	3.20000	3.2	1.00	OL4369	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-6	4/5/2016	7.20000	7.2	1.00	OL4370	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-7	4/5/2016	6.00000	6	1.00	OL4371	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-8	4/5/2016	9.00000	9	1.00	OL4401	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-4	4/7/2016	3.60000	3.6	1.00	OL4402	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-5	4/7/2016	2.80000	2.8	1.00	OL4403	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-3	4/6/2016	2.40000	2.4	1.00	OL4404	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-4	4/6/2016	2.40000	2.4	1.00	OL4405	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	2.80000	2.8	1.00	OL4406	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	2.40000	2.4	1.00	OL4363	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS BAG	3/10/2016	2.00000	2	1.00	OG7803	EBW	
	mg/L	SS BAG	3/10/2016	1.60000	1.6	1.00	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	4.00000	4	1.00	OG7802	EBW	
	mg/L	SS3-6	4/6/2016	<1.0	0.5	1.00	OK6544	EBW	
Total Kjeldahl Nitrogen (TKN) - (Calc)	mg/L	CONTROL 1	4/6/2016	0.04000	0.04	0.02	OL4357	GS	
	mg/L	CONTROL 2	4/7/2016	0.06200	0.062	0.02	OL4358	GS	
	mg/L	CONTROL 3	4/5/2016	0.04200	0.042	0.02	OL4359	GS	
	mg/L	SS BAG	3/10/2016	0.02500	0.025	0.02	OG7802	EBW	
	mg/L	SS BAG	3/10/2016	0.05300	0.053	0.02	OG7801	EBW	
	mg/L	SS BAG	3/10/2016	0.04000	0.04	0.02	OG7803	EBW	
	mg/L	SS1-4	4/3/2016	0.02200	0.022	0.02	OL4360	GS	
	mg/L	SS1-5	4/3/2016	0.03800	0.038	0.02	OL4361	GS	
	mg/L	SS2-1	4/3/2016	0.05700	0.057	0.02	OL4362	GS	
	mg/L	SS2-2	4/3/2016	0.03500	0.035	0.02	OL4364	GS	
	mg/L	SS2-3	4/3/2016	0.03200	0.032	0.02	OL4365	GS	
	mg/L	SS2-4	4/3/2016	<0.020	0.01	0.02	OL4366	GS	
	mg/L	SS3-4	4/5/2016	0.06400	0.064	0.02	OL4367	GS	
	mg/L	SS3-5	4/5/2016	0.10400	0.104	0.02	OL4368	DUPW1	
	mg/L	SS3-5	4/5/2016	0.10000	0.1	0.02	OL4369	DUPW2	
	mg/L	SS3-6	4/5/2016	0.09500	0.095	0.02	OL4370	GS	
	mg/L	SS3-6	4/6/2016	0.12800	0.128	0.02	OK6544	EBW	
	mg/L	SS3-7	4/5/2016	0.06100	0.061	0.02	OL4371	GS	
	mg/L	SS3-8	4/5/2016	0.08700	0.087	0.02	OL4401	GS	
	mg/L	SS4-4	4/7/2016	0.02100	0.021	0.02	OL4402	GS	
	mg/L	SS4-5	4/7/2016	0.04400	0.044	0.02	OL4403	GS	
	mg/L	SS5-3	4/6/2016	0.04100	0.041	0.02	OL4404	GS	
	mg/L	SS5-4	4/6/2016	0.03400	0.034	0.02	OL4405	GS	
	mg/L	SS5-5	4/6/2016	0.03500	0.035	0.02	OL4406	DUPW1	
	mg/L	SS5-5	4/6/2016	0.03000	0.03	0.02	OL4363	DUPW2	
Total Suspended Solids (TSS)	mg/L	CONTROL 1	4/6/2016	3.00000	3	1.00	OL4357	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 2	4/7/2016	8.00000	8	1.00	OL4358	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	CONTROL 3	4/5/2016	6.30000	6.3	1.00	OL4359	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-4	4/3/2016	7.10000	7.1	1.00	OL4360	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS1-5	4/3/2016	13.40000	13.4	1.00	OL4361	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-1	4/3/2016	9.60000	9.6	1.00	OL4362	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-2	4/3/2016	6.40000	6.4	1.00	OL4364	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-3	4/3/2016	6.30000	6.3	1.00	OL4365	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS2-4	4/3/2016	5.00000	5	1.00	OL4366	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-4	4/5/2016	19.70000	19.7	1.00	OL4367	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	19.90000	19.9	1.00	OL4369	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-5	4/5/2016	18.80000	18.8	1.00	OL4368	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-6	4/5/2016	42.90000	42.9	1.00	OL4370	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-7	4/5/2016	43.90000	43.9	1.00	OL4371	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-8	4/5/2016	24.60000	24.6	1.00	OL4401	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-4	4/7/2016	25.30000	25.3	1.00	OL4402	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS4-5	4/7/2016	11.50000	11.5	1.00	OL4403	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-3	4/6/2016	10.80000	10.8	1.00	OL4404	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-4	4/6/2016	9.80000	9.8	1.00	OL4405	GS	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	3.30000	3.3	1.00	OL4406	DUPW1	Sample arrived to laboratory past recommended hold time.
	mg/L	SS5-5	4/6/2016	4.90000	4.9	1.00	OL4363	DUPW2	Sample arrived to laboratory past recommended hold time.
	mg/L	SS3-6	4/6/2016	<1.0	0.5	1.00	OK6544	EBW	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Turbidity	NTU	CONTROL 1	4/6/2016	1.36000	1.36	0.10	OL4357	GS	Sample arrived to laboratory past recommended hold time.
	NTU	CONTROL 2	4/7/2016	3.74000	3.74	0.10	OL4358	GS	Sample arrived to laboratory past recommended hold time.
	NTU	CONTROL 3	4/5/2016	1.74000	1.74	0.10	OL4359	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS1-4	4/3/2016	2.33000	2.33	0.10	OL4360	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS1-5	4/3/2016	3.53000	3.53	0.10	OL4361	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS2-1	4/3/2016	3.12000	3.12	0.10	OL4362	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS2-2	4/3/2016	2.78000	2.78	0.10	OL4364	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS2-3	4/3/2016	2.21000	2.21	0.10	OL4365	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS2-4	4/3/2016	1.31000	1.31	0.10	OL4366	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS3-4	4/5/2016	3.52000	3.52	0.10	OL4367	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS3-5	4/5/2016	7.01000	7.01	0.10	OL4368	DUPW1	Sample arrived to laboratory past recommended hold time.
	NTU	SS3-5	4/5/2016	4.53000	4.53	0.10	OL4369	DUPW2	Sample arrived to laboratory past recommended hold time.
	NTU	SS3-6	4/5/2016	19.30000	19.3	0.10	OL4370	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS3-7	4/5/2016	8.78000	8.78	0.10	OL4371	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS3-8	4/5/2016	13.50000	13.5	0.10	OL4401	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS4-4	4/7/2016	1.95000	1.95	0.10	OL4402	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS4-5	4/7/2016	3.03000	3.03	0.10	OL4403	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS5-3	4/6/2016	2.38000	2.38	0.10	OL4404	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS5-4	4/6/2016	1.14000	1.14	0.10	OL4405	GS	Sample arrived to laboratory past recommended hold time.
	NTU	SS5-5	4/6/2016	1.66000	1.66	0.10	OL4406	DUPW1	Sample arrived to laboratory past recommended hold time.
	NTU	SS5-5	4/6/2016	1.23000	1.23	0.10	OL4363	DUPW2	Sample arrived to laboratory past recommended hold time.
	NTU	SS3-6	4/6/2016	<0.10	0.05	0.10	OK6544	EBW	
Uranium (U) - Total	ug/L	CONTROL 1	4/6/2016	0.05300	0.053	0.002	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	0.41500	0.415	0.002	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.27400	0.274	0.002	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.0020	0.001	0.002	OG7803	EBW	
	ug/L	SS1-4	4/3/2016	0.23400	0.234	0.002	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.26100	0.261	0.002	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.27700	0.277	0.002	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.23900	0.239	0.002	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.22100	0.221	0.002	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.09100	0.091	0.002	OL4366	GS	
	ug/L	SS3-4	4/5/2016	2.76000	2.76	0.002	OL4367	GS	
	ug/L	SS3-5	4/5/2016	1.77000	1.77	0.002	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	1.70000	1.7	0.002	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	5.13000	5.13	0.002	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.0020	0.001	0.002	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	2.88000	2.88	0.002	OL4371	GS	
	ug/L	SS3-8	4/5/2016	4.64000	4.64	0.002	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.98000	0.98	0.002	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.90100	0.901	0.002	OL4403	GS	
	ug/L	SS5-3	4/6/2016	1.39000	1.39	0.002	OL4404	GS	
	ug/L	SS5-4	4/6/2016	0.27900	0.279	0.002	OL4405	GS	
	ug/L	SS5-5	4/6/2016	0.07000	0.07	0.002	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	0.15300	0.153	0.002	OL4363	DUPW2	
Vanadium (V) - Total	ug/L	CONTROL 1	4/6/2016	0.22000	0.22	0.10	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	0.97000	0.97	0.10	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.59000	0.59	0.10	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.10	0.05	0.10	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.10	0.05	0.10	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.10	0.05	0.10	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	0.49000	0.49	0.10	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.92000	0.92	0.10	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.50000	0.5	0.10	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.45000	0.45	0.10	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.26000	0.26	0.10	OL4365	GS	
	ug/L	SS2-4	4/3/2016	0.25000	0.25	0.10	OL4366	GS	
	ug/L	SS3-4	4/5/2016	3.42000	3.42	0.10	OL4367	GS	
	ug/L	SS3-5	4/5/2016	3.96000	3.96	0.10	OL4368	DUPW1	
	ug/L	SS3-5	4/5/2016	3.83000	3.83	0.10	OL4369	DUPW2	
	ug/L	SS3-6	4/5/2016	6.66000	6.66	0.10	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.10	0.05	0.10	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	3.02000	3.02	0.10	OL4371	GS	
	ug/L	SS3-8	4/5/2016	5.39000	5.39	0.10	OL4401	GS	
	ug/L	SS4-4	4/7/2016	1.36000	1.36	0.10	OL4402	GS	
	ug/L	SS4-5	4/7/2016	1.45000	1.45	0.10	OL4403	GS	
	ug/L	SS5-3	4/6/2016	1.78000	1.78	0.10	OL4404	GS	
	ug/L	SS5-4	4/6/2016	0.56000	0.56	0.10	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.10	0.05	0.10	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	0.36000	0.36	0.10	OL4363	DUPW2	
Zinc (Zn) - Total	ug/L	CONTROL 1	4/6/2016	1.44000	1.44	0.10	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	3.42000	3.42	0.10	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	2.30000	2.3	0.10	OL4359	GS	
	ug/L	SS BAG	3/10/2016	0.67000	0.67	0.10	OG7801	EBW	
	ug/L	SS BAG	3/10/2016	0.79000	0.79	0.10	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	0.72000	0.72	0.10	OG7803	EBW	
	ug/L	SS1-4	4/3/2016	2.00000	2	0.10	OL4360	GS	
	ug/L	SS1-5	4/3/2016	3.11000	3.11	0.10	OL4361	GS	
	ug/L	SS2-1	4/3/2016	2.22000	2.22	0.10	OL4362	GS	
	ug/L	SS2-2	4/3/2016	2.08000	2.08	0.10	OL4364	GS	
	ug/L	SS2-3	4/3/2016	1.94000	1.94	0.10	OL4365	GS	
	ug/L	SS2-4	4/3/2016	2.02000	2.02	0.10	OL4366	GS	
	ug/L	SS3-4	4/5/2016	10.10000	10.1	0.10	OL4367	GS	
	ug/L	SS3-5	4/5/2016	11.00000	11	0.10	OL4369	DUPW2	
	ug/L	SS3-5	4/5/2016	11.90000	11.9	0.10	OL4368	DUPW1	
	ug/L	SS3-6	4/5/2016	18.70000	18.7	0.10	OL4370	GS	
	ug/L	SS3-6	4/6/2016	0.48000	0.48	0.10	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	10.00000	10	0.10	OL4371	GS	
	ug/L	SS3-8	4/5/2016	15.40000	15.4	0.10	OL4401	GS	
	ug/L	SS4-4	4/7/2016	4.70000	4.7	0.10	OL4402	GS	
	ug/L	SS4-5	4/7/2016	4.87000	4.87	0.10	OL4403	GS	

Data source: Maxxam

Appendix D. Snow Water Chemistry Analytical Results

Parameter	Unit	Site	Date	Data Point	Graphable Value	RDL	Lab Ref	Sample Type	Comment
Zinc (Zn) - Total	ug/L	SS5-3	4/6/2016	5.06000	5.06	0.10	OL4404	GS	
(cont'd)	ug/L	SS5-4	4/6/2016	2.20000	2.2	0.10	OL4405	GS	
	ug/L	SS5-5	4/6/2016	1.34000	1.34	0.10	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	1.57000	1.57	0.10	OL4363	DUPW2	
Zirconium (Zr) - Total	ug/L	CONTROL 1	4/6/2016	<0.050	0.025	0.05	OL4357	GS	
	ug/L	CONTROL 2	4/7/2016	0.09500	0.095	0.05	OL4358	GS	
	ug/L	CONTROL 3	4/5/2016	0.14500	0.145	0.05	OL4359	GS	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7803	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7802	EBW	
	ug/L	SS BAG	3/10/2016	<0.050	0.025	0.05	OG7801	EBW	
	ug/L	SS1-4	4/3/2016	0.16600	0.166	0.05	OL4360	GS	
	ug/L	SS1-5	4/3/2016	0.12100	0.121	0.05	OL4361	GS	
	ug/L	SS2-1	4/3/2016	0.05500	0.055	0.05	OL4362	GS	
	ug/L	SS2-2	4/3/2016	0.06000	0.06	0.05	OL4364	GS	
	ug/L	SS2-3	4/3/2016	0.06200	0.062	0.05	OL4365	GS	
	ug/L	SS2-4	4/3/2016	<0.050	0.025	0.05	OL4366	GS	
	ug/L	SS3-4	4/5/2016	0.41100	0.411	0.05	OL4367	GS	
	ug/L	SS3-5	4/5/2016	0.36700	0.367	0.05	OL4368	DUPW1	
	ug/L	SS3-5	4/5/2016	0.36000	0.36	0.05	OL4369	DUPW2	
	ug/L	SS3-6	4/5/2016	0.55300	0.553	0.05	OL4370	GS	
	ug/L	SS3-6	4/6/2016	<0.050	0.025	0.05	OK6544	EBW	
	ug/L	SS3-7	4/5/2016	0.31300	0.313	0.05	OL4371	GS	
	ug/L	SS3-8	4/5/2016	0.51700	0.517	0.05	OL4401	GS	
	ug/L	SS4-4	4/7/2016	0.48900	0.489	0.05	OL4402	GS	
	ug/L	SS4-5	4/7/2016	0.17500	0.175	0.05	OL4403	GS	
	ug/L	SS5-3	4/6/2016	0.18600	0.186	0.05	OL4404	GS	
	ug/L	SS5-4	4/6/2016	0.08100	0.081	0.05	OL4405	GS	
	ug/L	SS5-5	4/6/2016	<0.050	0.025	0.05	OL4406	DUPW1	
	ug/L	SS5-5	4/6/2016	<0.050	0.025	0.05	OL4363	DUPW2	

Data source: Maxxam

Appendix E

Dust Gauge Collection Standard Operating Procedure (ENVR-508-0112)

ENVIRONMENT
STANDARD OPERATING PROCEDURE

Area No.:	**8000**	**Document #:**	**ENVR-508-0112**
		Revision:	**3**
Task Title:	**SOP – Dust Gauge Collection**		
	Supersedes ENV SOP 508		

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Effective Date: **See Area Manager Authorized Signature Date below**

1 REFERENCES/RELATED DOCUMENTS

1.1 **ENVI-403-0112 - SOP Total Suspended Solids** - Located in: Diavik Intranet - SOPs – Environment Folder

1.2 **ENVR-301-0112 – SOP General Laboratory Safety** - Located in: Diavik Intranet – SOPs – Environment Folder

1.3 **ENVR-605-0112 - SOP Snowmobiles** – Located in: Diavik Intranet – SOPs – Environment Folder

1.4 **ENVR-602-0112 - SOP Watercraft** – Located in: Diavik Intranet – SOPs – Environment Folder

1.5 **ENVR-504-0112 - SOP Remote Field Safety** – Located in: Diavik Intranet – SOPs – Environment Folder

1.6 **ENVR-101-0813 - SOP Electrical Storm Safety –** Located in: Diavik Intranet – SOPs – Environment Folder

1.7 **ENVR-601-0112 – SOP Helicopter -** Located in: Diavik Intranet – SOPs – Environment Folder

1.8 **ENVI-135-0112 - Remote Field Safety Permit Form** – Located in: Diavik Intranet – SOPs – Environment

1.9 **ENVI-178-0312 - Dust Gauge Collection Field Sheet** – Located in: Diavik Intranet – SOPs – Environment

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Initial Release	11-Jan-12	D. Meredith
1	New SOP format, Clarify procedures, adds photos.	23-Nov-14	D. Dul/ D. Bourassa
2	Format update	19-Jul-15	D. Birch
3	Annual Update	10-Feb-2016	S. Sinclair

Authorized By:		
Area Superintendent:	D. Wells	**Date:**
Area Manager:	S. Bourn	**Date:**

(Document owners will be prompted annually to update content; however, changes may or may not result.)

Dust Gauge Site 5 in the Summer

Dust Gauge Site 7 in the Winter

Dust Gauge Tubes in the Field Lab

Description

This Standard Operating Procedure (SOP) provides guidelines on procedures to follow when carrying out Dust Gauge Collections.

2 PURPOSE

The purpose of this Standard Operating Procedure is to outline the methodology for collecting dust gauges. This program is aimed at understanding dust deposition rates associated with project activities. Results collected from this program are complied and placed in the Appendix of the annual AEMP report.

3 SCOPE

3.1 Scope of Procedure

This standard operating procedure (SOP) describes the responsibilities and processes for the deployment, collection and analysis of Dust Gauge Samples. These procedures apply to all Diavik Mine personnel and contractor personnel authorized for sample collection activities.

3.2 Scope of Activities

Twelve-dust gauges (10 sample sites, plus 2 control sites) are established on and around East Island for monitoring airborne dust particles. The-dust gauges are collected quarterly throughout the year.

4 DEFINITIONS

Definitions							
PPE	✓	GPS	✓	DO	✗	NTU	✗
MSDS	✗	SOP	✓	DI Water	✓	ELT	✗
Problem Bear	✓	JHA	✓	AEMP	✓	WLWB	✗
QA	✗	Groundwater	✗	COC	✓	PAL	✗
QC	✗	Seepage	✗	WHMIS	✗	ACTS	✗
Remote Work	✓	SNP	✗	TSS	✓	PROVE	✗
TSP							

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Slip, Trip, Fall	✓	**Chemical Contact**	✗	**Rotating Parts**	✓	**Uneven Terrain / Ground**	✓
Sprain / Strain	✓	**Fall into Water**	✓	**Firearms / Deterrents**	✓	**Perception**	✓
Working Remotely	✓	**Overhead Objects**	✗	**Dehydration**	✓	**Risk to Wildlife**	✓
Aircraft	✓	**Visibility**	✓	**Ergonomics**	✗	**Unfamiliar Area**	✗
Watercraft Operation	✓	**Fire**	✗	**Glass**	✓	**Falling**	✗
Snowmobile Operation	✓	**Line of Fire**	✓	**Fumes / Gases**	✗	**Confined Space**	✗
Light Vehicle	✓	**Cuts Scrapes**	✓	**Entanglement**	✗	**Heavy Equipment**	✓
Lifting	✓	**Pinch Points**	✓	**Stored Energy**	✓	**Extreme Weather**	✓
Manual Labour	✓	**Noise**	✓	**Burns**	✓	**Electrical**	✗
Wildlife	✓	**Spills**	✓	**Equipment Loss or Damage**	✓	**Sample Loss or Damage**	✓

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 Tools Required

Supplies, Tools and Equipment			
Tool / Equipment	**Quantity**	**Supplies**	**Quantity**
Snowmobile(2), Boat or Helicopter	**1**	**Winter/Summer/Boat Survival Gear (Set)**	**1**
GPS/ Loaded Coordinates	**2**	**Spare Batteries**	**4**
Satellite Phone	**1**	**Personal Gear (per person)**	**1**
Spot (per snowmobile)	**1**	**Wildlife Deterrents (air horn/banger kit)**	**1**
Camera (per person)	**1**	**Field Permit and Map**	**1**
Radio with spare battery (per person)	**1**	**Adjustable Wrench's**	**1**
Forceps, Pliers, Leatherman or Tweezers	**1**	**Field Sheets**	**14**
Clean Replacement Sample Tubes	**6**	**Pencils, Pens or Markers**	**2**
Glass Beakers (1000 mL)	**6**	**Large/Clear/Heavy-duty Plastic Bags or Gloves**	**6**
High Temp Oven	**1**	**TSS Filters**	**12 - 36**
Fire Proof Gloves/Tongs	**1**	**Duct Tape**	**12 - 36**
Vice Grips	**1**		

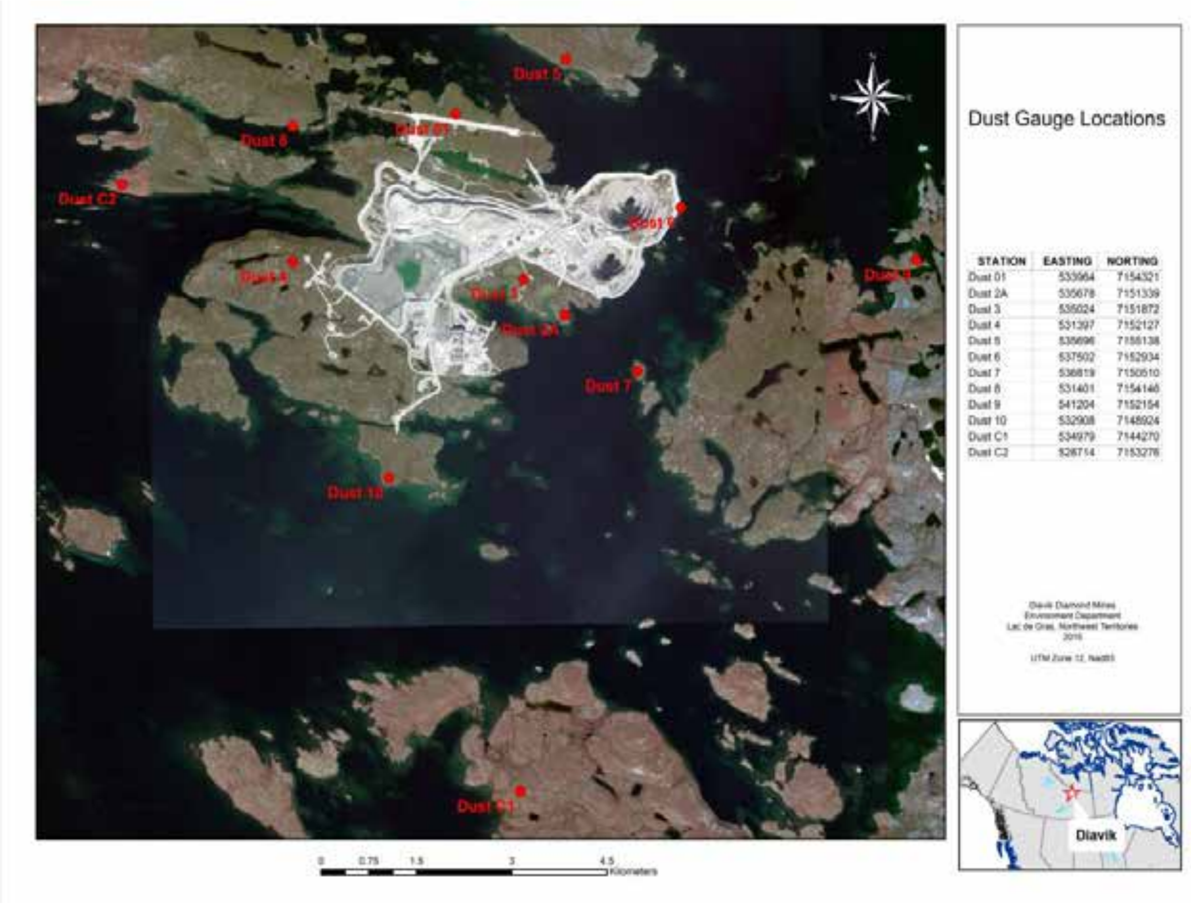
6.3 Procedural Steps

6.3.1 Pre-Deployment

- Spare tubes are stored in the Environment field lab Shelf B3. **Tubes needs to be cleaned and checked for leaks**. To clean and check for leaks fill spare tubes with water and leave overnight on counter in Environment Lab. If leaks are discovered tag out and make arrangements with truck shop to have them fixed.

6.3.2 Sample Collection and Deployment

- Depending on location and season samples are collected using various methods of transportation; you can walk, drive, boat, snowmobile or use a helicopter to access the various sites. When using a Helicopter, a Hot Loading Variance is permitted (a JHA must be completed and signed off by OHSE Manager). The map in Figure 1 provides the Dust Gauges locations, and Table 1 provides the coordinates.



STATION	EASTING	NORTING
Dust 01	533964	7154321
Dust 2A	535678	7151339
Dust 3	535024	7151872
Dust 4	531397	7152127
Dust 5	535696	7155138
Dust 6	537502	7152934
Dust 7	536819	7150510
Dust 8	531401	7154146
Dust 9	541204	7152154
Dust 10	532908	7148924
Dust C1	534979	7144270
Dust C2	528714	7153276

Figure 1: Map: Identifying Dust Gauge Sites

Table 1.0 below provides the coordinates for each Dust Gauge Site

STATION	EASTING	NORTING		STATION	EASTING	NORTING
Dust 01	533964	7154321		**Dust 7**	536819	7150510
Dust 2A	535678	7151339		**Dust 8**	531401	7154146
Dust 3	535024	7151872		**Dust 9**	541204	7152154
Dust 4	531397	7152127		**Dust 10**	532908	7148924
Dust 5	535696	7155138		**Dust C1**	534979	7144270
Dust 6	537502	7152934		**Dust C2**	528714	7153276

- When you arrive at the sample location, first inspect the station for damage (fiberglass tube on ground, station on angle etc.) and document anything noted on the Dust Gauge Collection Field Sheet - ENVI-178-0312.

- Carefully remove the copper tube out from the center of the fiberglass shield, keeping it upright. If the tube is stuck or frozen, try wiggling it, or tapping it near the bottom. If the tube is still stuck you may need extra leverage to free the tube and may if absolutely necessary use vice grips to grab the top and wiggle while pulling up. If it will not come free, you may have to remove the shield and pop the tube out. Be sure to replace the shield and insert a new tube afterwards. See photo 1 & 2 below.

Photo 1: Tube Retrieval

Photo 2: Fiberglass Shield Removed

- Once retrieved, keep the tube upright, place an extra-large latex glove over top of tube and seal with clean plastic bag and duct tape. Ensure tube is labelled with the station number, date and time collected. Keep the tube upright and secure at all times during transport. See photo 3 below.

- Place a clean, leak tested tube into the fiberglass shield (the tube should be labelled with the Dust Gauge Site, deployment date and time).

Photo 3: Sealing the Tube

6.3.3 Sample Analysis

- Once back in the Environment Lab, carefully transfer sample into a triple rinsed 1000ml glass beaker. Extract all debris including bugs and twigs and be sure to triple rinse them into the beaker to capture all the dust particles. Rinse the copper tube with DI water until all dust particles are removed. Record the total volume of water on the Dust Gauge Collection Field Sheet- ENVI-178-0312. If snow is present stand up the sample tube in a clean plastic bag (prevents sample loss if there is a leak) and allow samples to melt before conducting the above procedure.

- Cover the 1000ml beaker with parafilm and store the sample in the fridge until samples can be analysed for Total Suspended Solids (ENVI-403-0112). This should be conducted as soon as possible because some solids may dissolve in water, especially after snow melt. Note that it may take multiple filters to complete one sample.

- The resulting filter(s) with the dust particles are put into ceramic crucibles; ensure that you record the sample id on the crucibles **in pencil** before putting them into the oven. (1 filter per crucible) See photo 4 below.

Photo 4: Ceramic Crucibles with filter

- The high temperature oven is set up in the fume hood with the fan running. Heavy-duty fire-proof gloves and long tongs are used when placing or removing the crucibles from the oven. Filters are processed in the oven at 650 degrees Celsius for one hour. See photo 5 & photo 6 below.

Photo 5: High Heat Oven

Photo 6: Fire Proof Glove and Long Tongs

- When samples are removed from the oven, place the crucibles into their original labeled tin tray. Let the sample cool for at least 10 minutes before carefully removing the filters from their ceramic crucible using tweezers. Add any dust that has fallen off into the crucible to the top of the filter. Place the tin tray into the desiccator and allow the sample to cool further for a minimum of one hour.

- Remove the tin tray from the desiccator and weigh the filter according to the procedure outlined in the Total Suspended Solids SOP ENVI-403-0112.

- Record the results on the Dust Gauge Data Form (ENVI-178-0312) and in 13.14 Annual Dust Gauge Collection excel file in the P-Drive in for the given year.

- The dust fall deposition rate is determined using the equation below:

Daily Dust fall Deposition (mg/dm$_2$/d) = (TP (mg) / SA (dm$_2$)) / TDD (d)

Where:

TP (mg) = Total Particulate

SA (dm$_2$) = Surface Area of Dust Gauge Collection Tube = (3.14*(6.25*6.25))*(100)

TDD = Total Days Gauge was Deployed

Calculations are setup in the excel file. If you have any questions about entering this data contact your supervisor.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Produce quality, accurate and repeatable results.

Appendix F

Snow Core Survey Standard Operating Procedure (ENVR-512-0213)

Environment

STANDARD OPERATING PROCEDURE

Area No.:	**8000**	**Document #:**	**ENVR-512-0213 R3**
		Revision:	**3**
Task Title:	**Snow Core Survey**		

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1 REFERENCES/RELATED DOCUMENTS

1.1 **ENVR-501-0112 – SOP Remote Field Safety -** Located in: Diavik Intranet – SOPs – Environment Folder

1.2 **ENVR-602-0112 – SOP Snowmobile Operation -** Located in: Diavik Intranet – SOPs – Environment Folder

1.3 **ENVR-301-0112 – SOP General Laboratory Safety -** Located in: Diavik Intranet – SOPs – Environment Folder

1.4 **ENVR-303-0112 – SOP Quality assurance and Quality Control -** Located in: Diavik Intranet – SOPs – Environment Folder

1.5 **ENVR-206-0112 – SOP Chain of Custody and Sample Shipment -** Located in: Diavik Intranet – SOPs – Environment Folder

1.6 **ENVR-403-0112 – SOP Total Suspended Solids Analysis -** Located in: Diavik Intranet – SOPs – Environment Folder

1.7 **ENVI-099-1011 – Snowmobile Inspection Checklist -** Located in: Diavik Intranet – SOPs – Environment Folder

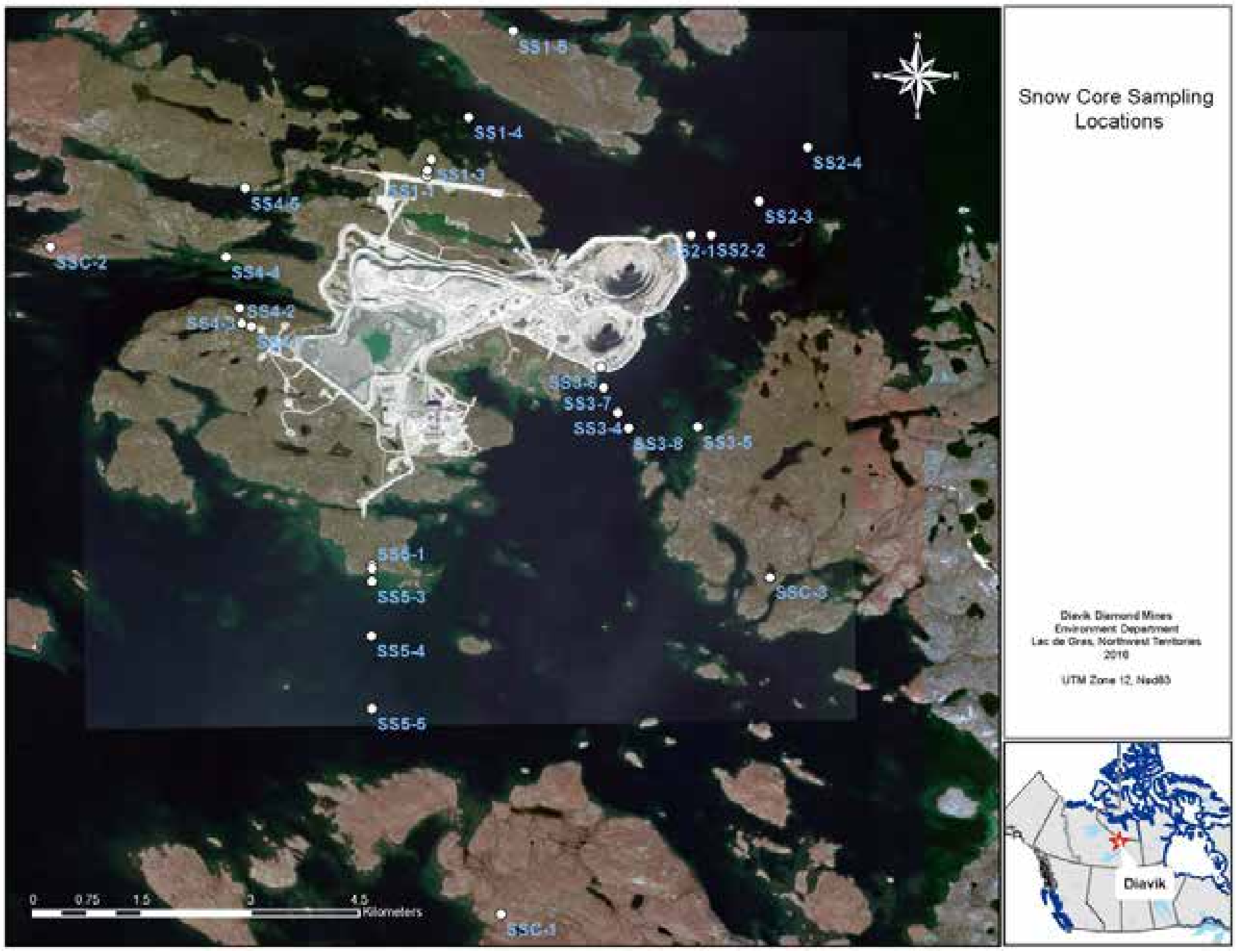
1.8 **ENVI-135-0112 R0 – Remote Field Safety Permit -** Located in: Diavik Intranet – SOPs – Environment Folder

1.9 **ENVI-177-0312 R0 – Snow Sampling Field Sheet -** Located in: Diavik Intranet – SOPs – Environment Folder

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	08-FEB-2012	D. Grabke
1	Updated Map for 2014, added SS3-6, SS3-7, SS3-8 sample points, updated to new environment SOP format	8-Apr-2014	D. Grabke
2	Format update	19-Jul-15	D. Birch
3	Format update	06-Dec-15	G.Reid

Authorized By:		
Area Supervisor:	D. Wells	**Date:**
Area Manager:	S. Bourn	**Date:**

(Document owners will be prompted annually to update content; however, changes may or may not result.)



Snow Survey Sample Program Map

Description

Snow sampling at the Diavik Diamond Mine consists of snow core sampling to monitor dust deposition rates relative to predictions outlined in the DDMI Environmental Effects Report (1998), and snow water quality sampling in support of the DDMI Aquatic Effects Monitoring Program (AEMP).

2 PURPOSE

The purpose of this guide is to promote efficient and accurate snow surveying and to establish uniform sampling procedures.

3 SCOPE

3.1 Scope of Procedure

This standard operating procedure (SOP) describes the responsibilities and processes for collecting, documenting, and processing snow samples from at the Diavik mine site a surrounding Lac de Gras area (during ice cover). This procedure applies to all Diavik Diamond Mines personnel and contractor personnel authorized to collect samples under the current years Aurora Research Institute – Aquatic Effects Monitoring Program (AEMP) Research Permit.

3.2 Scope of Activities

This procedure has been developed to be consistent with the requirements of the AEMP design document and Environmental Effects Monitoring.

4 DEFINITIONS

Definitions							
PPE	✓	**GPS**	✓	**DO**	✗	**NTU**	✓
MSDS	✓	**SOP**	✓	**DI Water**	✓	**ELT**	✗
Problem Bear	✗	**JHA**	✓	**AEMP**	✗	**WLWB**	✗
QA	✗	**Groundwater**	✗	**COC**	✓	**PAL**	✗
QC	✓	**Seepage**	✗	**WHMIS**	✓	**ACTS**	✗
Remote Work	✓	**SNP**	✗	**TSS**	✓	**PROVE**	✗
TSP	✗						

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: **ENVI-444-0415 - Environment Roles and Responsibilities** - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Slip, Trip, Fall	✓	**Chemical Contact**	✓	**Rotating Parts**	✓	**Uneven Terrain / Ground**	✓
Sprain / Strain	✓	**Fall into Water**	✓	**Firearms / Deterrents**	✗	**Perception**	✓
Working Remotely	✓	**Overhead Objects**	✗	**Dehydration**	✓	**Risk to Wildlife**	✓
Aircraft	✗	**Visibility**	✓	**Ergonomics**	✓	**Unfamiliar Area**	✓
Watercraft Operation	✗	**Fire**	✓	**Glass**	✗	**Falling**	✓
Snowmobile Operation	✓	**Line of Fire**	✓	**Fumes / Gases**	✓	**Confined Space**	✓
Light Vehicle	✓	**Cuts Scrapes**	✓	**Entanglement**	✓	**Heavy Equipment**	✗
Lifting	✗	**Pinch Points**	✓	**Stored Energy**	✓	**Extreme Weather**	✓
Manual Labour	✓	**Noise**	✗	**Burns**	✓	**Electrical**	✗
Wildlife	✓	**Spills**	✓	**Equipment Loss or Damage**	✓	**Sample Loss or Damage**	✓

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 Planning

6.2.1 Program Management

The sampling snow survey will be completed annually in April. The survey design consists of 27 sample stations, including 3 control areas established along 5 transect lines originating from East Island and extending onto Lac de Gras.

Table 1 - Snowcore Sampling Locations

Transect Line	Station	UTM E (NAD 83)	UTM W (NAD 83)	Description
1	SS1-1	533911	7154288	Land
	SS1-2	533924	7154367	Land
	SS1-3	533966	7154517	Land
	SS1-4	534485	7155094	Ice
	SS1-5	535099	7156279	Ice
2	SS2-1	537553	7153473	Ice
	SS2-2	537829	7153476	Ice
	SS2-3	538484	7153939	Ice
	SS2-4	539151	7154685	Ice
3	SS3-4	536585	7151002	Ice
	SS3-5	537623	7150817	Ice
	SS3-6	536305	7151564	Ice
	SS3-7	536344	7151366	Ice
	SS3-8	536688	7150810	Ice
4	SS4-1	531491	7152211	Land
	SS4-2	531356	7152261	Land
	SS4-3	531331	7152434	Land
	SS4-4	531141	7153167	Ice
	SS4-5	531405	7154116	Ice
5	SS5-1	533150	7148925	Land
	SS5-2	533150	7148875	Land
	SS5-3	533150	7148700	Ice
	SS5-4	533150	7147950	Ice
	SS5-5	533150	7146950	Ice
	Control 1	534983	7144271	Land
	Control 2	528714	7153281	Land
	Control 3	538650	7148750	Land

6.2.2 Sampling Requirements – Dust Deposition

Dust deposition will be measured in-house using standard DDMI Total Suspended Solids laboratory procedures ENVR-403-0112. To facilitate this analysis, a composite sample comprised of a minimum of 3 snow cores will be collected at **ALL** (land and Ice) of the snow sampling stations. Water content must add up to a minimum 25 SWE for there to be sufficient water for analysis.

6.2.3 Sampling Requirements – Snow Water Quality

Snow water quality samples are required for all sample stations on Lac de Gras identified as **on-ice** locations, as well as at the **three control** areas
. Snow chemistry analysis will be conducted by Maxxam Analytics. To facilitate the required analysis Table 2- Snow Water Quality Sample Requirements, a composite sample comprised of a minimum of 3 snow cores with a water Content (SWE) of at least 100 will be collected at all of the snow water quality stations.

Table 2- Snow Water Quality Sample Requirements

Bottle Filling Sequence	Maxxam Bottle	Analysis	Minimum Volume of Sample Required (ml)	Preservative
1	Metals	Total ICP Metals (Ultra Low)	60mL Falcon Tube	1ml Nitric Acid – HNO_3
2	Mercury	Total	40mL Glass Vial	1 ml Hydrochloric Acid - HCL
3	Nutrients	Ammonia	120mL HDPE	1 ml Sulfuric Acid
4	Routine	Sulfates, Nitrates, and Nitrites	1000mL HDPE	None Required
5	TSS, Turbidity & pH (Routine, 2nd Bottle)	TSS, Turbidity & pH	1000mL HDPE	None Required
Total Sample Volume Required			2220ml + 30% Triple Rinse	**3000ml = 100SWE**

Determining anticipated sample volume from Snow Water Equivalent (SWE)
Sample Water (ml) = SWE (cm) x 30(cm^2)
3000ml /30cm^2 = SWE = 100cm SWE

Therefore the aggregate Water Content SWE collected at a sample site must add up to at least 100 to ensure sufficient volume for water quality analysis.

6.3 Quality Assurance and Quality Control

Quality Control will be achieved through the use of duplicate and blank samples.

- Duplicate samples will be collected for a minimum 10% of the total samples (both Dust and Water Quality).
- At least **two** duplicate samples for the **dust** deposition samples
- At least **two** duplicate samples for the **water quality** samples
- One **equipment blank** will be collected and processed by Maxxam for water quality chemical analysis and internally for TSS. Maxxam DI water batch number will be

recorded on the field sheet. Equipment blanks will be completed from a single batch of DI water. Ensure that information from the DI water is recorded on the field sheet. Batch ID and Expiry date.

Quality assurance will be achieved via the following processes;

- Field data sheets will be utilized to document any and all observations, or occurrences that may impact the integrity of the samples, as well as corrective actions implemented to deal with those occurrences.
- If a sample becomes compromised, it will be recorded on the field data sheet, the sample will be discarded and a new sample collected.
- Individuals collecting the samples will take precautions to eliminate sample contamination during handling. Avoid touching insides of sample bags, avoid contacting the snow samples with anything other than the sampling corer.

Steps will be taken prior to, during, and after sampling to ensure all samples are correctly labeled with the sample date, sample ID, and sample type.

6.4 Equipment Inspection & Preparation

Prior to commencing the sampling program, inspect all sampling equipment for fouling, contamination, or damage. All of the polyacrylic tubes that will be utilized will be rinsed with a 10% Nitric Acid solution to ensure they are clean prior to the initiation of the program.

Snow Corer – Inspect the core tube to ensure measurement etchings are legible. Check the cutting edge to ensure blade is not deformed or damaged. Inspect the handles and threads to ensure they will assemble and disassemble without binding. Ensure the corer has been de-contaminated (acid rinsed) prior to commencing the program.

Weighing Scale and Cradle – Inspect the scale and cradle for deformity or damage

Snowmobiles – Inspection and use of snowmobiles will be in accordance with ENVR-603-0112

Communication – Inspect all communication equipment (Radios/Sat Phones, Spot Personal Locator) to ensure they are operational and functional. Ensure batteries (including spares) are fully charged. Ensure check-in times and procedures are clearly identified on the Field Work Permit.

Navigation – Inspect GPS and spare batteries to ensure equipment is functioning correctly. Verify that all sample locations are present and correct, and that the GPS Essentials file is loaded. Ensure an appropriate map is present to allow navigation back to site should the GPS fail.

Personnel Gear – In addition to winter survival equipment, each individual participating in off-site activities is expected to carry appropriate personal gear and equipment as is deemed necessary for the individual well being in an emergency situation.

Survival Kit – Inspect survival kit and Ice Rescue kits to ensure that they are complete and all items are functional and ready for use.

Misc – Individual core samples will be compiled into plastic bags (soil sampling bags) and sealed with zip-ties until they are ready for processing. Prior to the program commencing bags must be inspected to ensure they are new and clean.

6.5 Tools Required

Supplies, Tools and Equipment			
Tool / Equipment	**Quantity**	**Supplies**	**Quantity**
Snow Corer & Handles	1	Snow Survey Map	2
Transport Case	1	GPS & Waypoints	2
Weighing Scale & Cradle	1	Satellite Phone	1
Sample Collection Bags & Zip Ties	20	Spot Personal Locator	2
Black Permanent Marker	2	Survival Kit	1
Field Data Sheets (Pens/Pencils) & Clipboard	10	Ice Rescue Kit	2
Snowmobile	1	Radio and Spare Battery	2
Toboggan	1	Coolers	5
Camera	1		

Table 3 - Tools and Gear Required

6.6 Procedural Steps

6.6.1 Sample Collection

Navigate to the sampling locations – If the sample point falls on or immediately adjacent to the winter road adjusts your location to the nearest area with natural snow coverage (i.e. not impacted by the road or snow clearing).

Assemble the corer by threading the handles onto the tube, and re-inspect the snow corer for fouling and/or damage that may have occurred during transportation.

Fill in station location and weather information on the field data sheet. Identify snow conditions and dust observations in the comments section.

Prior to collecting a sample re-inspect the tube to check for cleanliness.

- **Take the weight of the empty snowcorer at each station prior to collecting any samples.**
- **For all station requiring snow water chemistry, collect the dust sample first – this will effectively rinse the corer with ambient snow minimizing cross contamination from locations.**

Hold the corer vertically (cutter end down) and drive it through the snow to the ground/ice surface below. Be sure the cutter contacts the ground/ice as compacted snow/ice may feel like the ground and result in an incomplete core.

Before raising the corer, read the depth of the snow (nearest cm) and record on the field datasheet.

Turn the corer at least one full turn to cut the core loose from the ground/ice surface. Carefully raise the corer and record the length of the core extracted. [Note: this could potentially be different from the depth of snow, see next]

Inspect the cutter end of the tube for dirt or litter, with gloves on carefully remove soil and litter from the core. If need be correct the length of the core extracted by subtracting the depth of the soil or litter (plug). Record adjusted core length and litter/soil observations on the field data sheet.

Carefully balance the corer containing the core on the weighing cradle.

- **Suspend the corer (like a pendulum) do not hold the corer tube or handles**

To ensure and accurate reading, gently tap the scale to be sure it is not sticking or binding.

Read the weight of the tube and core from the graduations on the scale. The scale is marked in cm of water.

Record the weight of the corer and the core to the nearest one-half cm.

To collect the core, lift the tube from the cradle and turn cutter und up. Gently tap the corer and the extracted core will slide out the top end. Be sure to use a clean/new sample bag to catch the core sample.

- **Ensure all sample bags are clearly labelled with the station ID, sample type, date, and number of cores included in the composite**
- **Ensure all bags are sealed using a clean zip-tie**

Weigh the empty sampling tube following the first and at least every fourth sample as the weight will change as small particle of water or snow accumulate/cling to the inside and outside of the tube and checking will make the data more accurate. Record the weight of the empty corer on the field data sheet.

Subtract the weight of the empty tube from the weight of the tube and core to obtain the water content of the sample.

Density calculations can be completed back in the lab following the completion of the program.

Density (g/cm^3) = Total SWE Collected (g/cm^{2*}) / Total Snow Core Length Collected (cm)
***assumes pure water density 1g/cm^3**

Prior to moving to the next sampling location ensure the field datasheet is complete.

6.6.2 Sample Processing

Prior to processing, all samples must be kept in a frozen state to minimize sample degradation.

When preparing the samples for decanting and analysis, remove the sample bags from the freezer. Check to ensure that the top of the bag is well twisted and the zip-tie is tight. Place the sample bag into a new (clean) sample bag and affix a zip-tie to seal the second bag. This double bagging will help to ensure no sample is lost during the melting process. To process samples, they will require anywhere from 12-36 hours to thaw at room temperature.

Place the sealed sample bags upright in clean coolers in the lab to thaw overnight.

Once a sample is completely melted it is ready for processing.

Sample volume can be determined using a scale accurate to 1g, set up scale, tare the sampling basin with two bags and 2 zip-ties. Place sample bags in the basin and record the weight of each of the bags on the field sheet.

Dust deposition samples will be processed in the DDMI Lab for TSS.

- **The entire volume of sample must be processed – this may require the use of multiple filters.**
- **For samples with large quantities of organics (twigs/leaves etc.) it may be necessary to sieve the sample through a course filter prior to processing.**
- **Given the possibility of the samples containing organic matter, sample filters will be dried in the high temperature oven (650°F) for 1hr to burn off any organics on the filter.**
- **Allow Samples to cool in the desiccator prior to weighing the filters.**

Snow Water Quality samples will be decanted to fill the appropriate (pre-labelled) Maxxam sample bottles as per standard water sampling procedures. Any excess sample water can be discarded.

6.6.3 Sample Chain of Custody

Samples will be shipped to Maxxam Analytics as per ENVR-206-0112 – CHAIN OF CUSTODY & SAMPLE SHIPPING – and accompanied by COC documentation.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

Appendix G

Quality Assurance/Quality Control Standard Operating Procedure (ENVR-303-0112)

ENVIRONMENT
STANDARD OPERATING PROCEDURE

Area No.:	**8000**	**Document #:**	**ENVR-303-0112**
		Revision:	**2**
Task Title:	**Quality Assurance/Quality Control**		
	Supersedes: ENV SOP 303		

FOR DOCUMENT CONTROL USE ONLY:
Next Review: **1 year from Area Manager Authorized Signature Date below**
Effective Date: **See Area Manager Authorized Signature Date below**

1 REFERENCES/RELATED DOCUMENTS

1.1 XXX-XXXX DDMI Environment Lab – Training – Located in : P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\5.2 Training

1.2 ENVR-301-0112 – SOP- General Laboratory Safety - Located in: Diavik Intranet – SOPs – Environment Folder

1.3 ENVR-206-0112 – SOP- Chain of Custody & Sample Shipping - Located in: Diavik Intranet – SOPs – Environment Folder

1.4 ENVI-133-0112 – Aquatic Effects Field Sheet - Located in: P:\DDMIEnvironment\10.0 Operational Control\10.2 Forms\2012 Active Forms

1.5 ENVI-111-1111 – Maxxam SNP Monitoring Field - Located in: P:\DDMIEnvironment\10.0 Operational Control\10.2 Forms

1.6 ENVI-134-0112 – 1645-19 SNP Monitoring Field Sheet – Located in : P:\DDMIEnvironment\10.0 Operational Control\10.2 Forms\2012 Active Forms

1.7 XXX-XXXX DDMI Environment Lab - Equipment - Located in : P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\5.5 Equipment

1.8 XXX-XXXX DDMI Environment Lab – Measurement Traceability - Located in : P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\5.6 Measurement Traceability

1.9 XXX-XXXX DDMI Environment Lab – Record Control - Located in : P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\4.13 Record Control

1.10 XXX-XXXX DDMI Environment Lab – Document Control - Located in : P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\4.3 Document Control

1.11 ENVR-403-0112 – SOP Total Suspended Solids Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.12 ENVR-404-0112 – SOP pH Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.13 ENVR-405-0112 – SOP Turbidity Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.14 ENVR-604-0112 – SOP Field Meter - Located in: Diavik Intranet – SOPs – Environment Folder

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Initial Release	01-JAN-12	D. Grabke
1	Formatting	08-Dec-15	D. Birch
2	Revision of QC schedule and measures	29-May-16	N. Goodman
	CALA Updates	15-Dec-16	N. Goodman

Authorized By:		
Area Superintendent:	D. Wells	**Date:**
Area Manager:	S. Bourn	**Date:**

(Document owners will be prompted annually to update content; however, changes may or may not result.)

Internal QA/QC
LABBW
LDUPW1/ LDUPW2
DUPRDGS
EBINT

External QA/QC KEY		
-1	=	EBW
-2	=	FBW
-3	=	TBW
-4	=	DUPW1
-5	=	DUPW2
-6	=	DLS

Description

This SOP reviews the quality assurance and quality control measures we use to ensure best practices are being utilized while collecting and analysing samples.

2 PURPOSE

The Objective of this Standard Operating Procedure is to establish consistent and uniform criteria and procedures to be implemented for laboratory activities undertaken during water quality analysis to ensure environmental data generated and processed is scientifically valid.

This SOP is intended to define Environmental Quality Assurance (QA) and Quality Control (QC) measures in place to ensure all data generated in the DDMI Environment Laboratory shall be of known precision and accuracy, be complete, representative, and comparable.

3 SCOPE

3.1 Scope of Procedure

This procedure applies to all Diavik Diamond Mines personnel and contract personnel authorized by the Environment Superintendent to collect, analyse and ship samples. All persons conducting analyses in the DDMI laboratory are required to read, understand, and fully comply with the methods outlined in the SOP for each analytical test conducted, respectively.

This procedure has been developed to be consistent with the requirements of the Rio Tinto HS & E standards.

4 DEFINITIONS

Definitions							
PPE	✓	**GPS**	✓	**DO**	✗	**NTU**	✗
MSDS	✗	**SOP**	✓	**DI Water**	✗	**ELT**	✓
Problem Bear	✗	**JHA**	✓	**AEMP**	✗	**WLWB**	✗
QA	✗	**Groundwater**	✗	**COC**	✗	**PAL**	✗
QC	✗	**Seepage**	✗	**WHMIS**	✗	**ACTS**	✗
Remote Work	✓	**SNP**	✗	**TSS**	✗	**PROVE**	✗
TSP	✗						

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key Safety Aspects

Task Hazards							
Slip, Trip, Fall	✓	Chemical Contact	✗	Rotating Parts	✓	Uneven Terrain / Ground	✓
Sprain / Strain	✓	Fall into Water	✗	Firearms / Deterrents	✓	Perception	✗
Working Remotely	✓	Overhead Objects	✗	Dehydration	✗	Risk to Wildlife	✓
Aircraft	✓	Visibility	✗	Ergonomics	✗	Unfamiliar Area	✗
Watercraft Operation	✗	Fire	✗	Glass	✗	Falling	✗
Snowmobile Operation	✗	Line of Fire	✓	Fumes / Gases	✓	Confined Space	✗
Light Vehicle	✗	Cuts Scrapes	✗	Entanglement	✗	Heavy Equipment	✗
Lifting	✗	Pinch Points	✓	Stored Energy	✗	Extreme Weather	✓
Manual Labour	✗	Noise	✓	Burns	✗	Electrical	✗
Wildlife	✓	Spills	✓	Equipment Loss or Damage	✗	Sample Loss or Damage	✗

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 Procedural Steps

6.2.1 Quality Assurance (QA)

Quality assurance for the environmental laboratory encompasses all quality-related activities that ensure the validity of aquatics testing and analysis and all relevant technical support. All DDMI environment personnel, from management to field laboratory technicians, are required to conscientiously follow applicable quality control measures and standard operating procedures (SOPs). Adherence to these documents, combined with staff vigilance, can help ensure that the analytical data and other test results collected will be acceptable as the bases for making significant decisions.

The DDMI laboratory ("the lab") encompasses a broad range of activities including preparation of samples for internal analytical processing, calibration and maintenance of equipment, data management, and sample handling for external analysis.

Our approach to quality assurance places an emphasis on four aspects:

- Infrastructure (instruments, testing capabilities, calibrations, SOP's)
- Control Measures (internal/external)
- Personnel (competence, ethics, and integrity)
- Data Management/Control of Non-Conforming Work

The quality of the outputs is at risk if any of these four aspects are deficient in any way.

6.2.2 Infrastructure…

6.2.3 Equipment

All equipment is to be maintained and operated in accordance with manufacturer instructions and SOPs. Modifications to equipment/equipment settings/any issues are to be recorded in the spreadsheet in the relevant Equipment folder, which is accessible to all staff and should be regularly consulted during troubleshooting, as per XXX-XXXX DDMI Environment Lab – Equipment.

6.2.4 Testing Capabilities

Continued testing capability is verified through a regular (semi-annual) program of Proficiency Testing (PT). Environmental conditions within the lab (such as sample storage areas, as well as within test-specific equipment such as ovens and desiccators) shall be maintained such that the exact requirements of specific methods are met and testing capability is not impaired. Furthermore, lab management has a responsibility to review new editions of external method reference documents (such as the Standard Methods) whenever a new edition is released to ensure continued consistency with internationally approved best practice.

6.2.5 Calibrations

Calibrations are performed regularly on all pieces of lab equipment with the potential to impact test results, following a predefined schedule and bearing traceability to SI units wherever possible. When performed internally, calibrations are always done in accordance with method SOPs. All observations and maintenance actions must be reported in the QA/QC Lab Performance logbook.

The logbook must also keep record of the instrument calibration history. Calibration records for fixed and portable laboratory measuring equipment, and individual monitoring devices, shall be maintained and include dates, personnel, and specifics of calibration standards and reference solutions. Instrument calibration procedures and schedules are clearly outlined in individual SOP's.

More details on calibrations and calibration records are available in XXX-XXXX DDMI Environment Lab – Measurement Traceability, XXX-XXXX DDMI Environment Lab – Record Control, and XXX-XXXX DDMI Environment Lab – Document Control

6.2.6 Purchasing and Verifying Supplies and Services

Services and supplies that affect the quality of tests and/or calibrations shall be purchased only from suppliers that have been investigated and approved. Suppliers shall only be approved when they have been verified as complying with standard specifications or requirements defined in the methods for the tests and/or calibrations concerned. All received supplies will be compared against their accompanying purchase documents, and their reception and specifications must be recorded. Supplies must be verified prior to use according to XXX-XXXX DDMI Environment Lab – Purchasing Supplies and Services

6.2.7 Internal Quality Control (QC) Measures

Laboratory quality control consists of both internal and external checks on precision and accuracy of analytical results. Employees are trained in quality control and good lab practices through the lab analyst certification process (ENVI-560-0616, ENVI-561-0616, ENVI-562-0616). An annual performance evaluation ensures that the integrity of analytical procedures remains intact.

Best practices in water quality monitoring dictate that QC samples will comprise at least 10% of all samples analyzed, and more as required to maintain assurance of quality across homogenous sampling matrices and conditions. Due to high sample volumes, the DDMI Environment department performs more than 10% internal QC in order to ensure that any errors or sources of contamination in procedures or equipment are caught immediately. No batch of samples is ever analyzed without some form of internal QC (at least a Lab Blank, below).

Internal Quality Control sample types (descriptions below) consist of: Lab Blanks (LBW), Lab Duplicates (LDUPW1/LDUPW2), Duplicate Readings (DUPRDGS), Laboratory Splits (DLS), and Internal Equipment Blanks (EBINT). Results of Internal Quality Control samples are recorded as per XXX-XXXX DDMI Environment Lab – Record Control, and reviewed by Environment Supervisors to detect trends.

Lab Blanks (LABBW)

A laboratory blank is a sample comprised of deionised (DI) water, prepared in the lab, which remains in the lab for analysis. This blank is exposed to any and all reagents that are used in the analytical process and is carried through the entire analytical processes including any filtration required. Lab blanks may identify unsuspected contaminates associated with DI water purity, improper cleaning procedures, filters or air contaminants in the lab. LABBWs are the most frequent form of QC at DDMI and occur every day that samples are analyzed.

Lab Duplicates (LDUPW1/LDUPW2)

A laboratory duplicate consists of a single sample to be analyzed twice internally (using the same techniques) as though it is two separate samples. The entire lab procedure is repeated twice, using two separate aliquots of water poured from the same sample bottle. Lab duplicates evaluate analytical precision and sample homogeneity, as well as consistency of lab and operator procedures. LDUPW1/LDUPW2 are the most frequent form of QC at DDMI and occur every day that samples are analyzed.

*in Monitor Pro 5 (MP5), under regular sample data entry, the sample that is to be the LDUP is assigned a sample type of “LDUPW1.” Then, in the data entry section for that day’s LDUPW1/LDUPW2, the corresponding sample site is to be assigned a sample type of “LDUPW2.”

Duplicate Readings (DUPRDG)

Duplicate readings are intentionally obtained during the analysis of samples, with a single sample being read twice. The only aspect of the lab procedure to be repeated is the actual measurement, with sample preparation occurring only once on a single sample. Variability between duplicate readings can be attributed to instrumentation or operator error, rather than variation in the sample. Note that field meters are included in DUPRDGS.

Allowable Discrepancy Limits between LDUPWs and DUPRDGs

If the relative percent difference (RPD) exceeds 20% when analyte concentrations are ≥ 5 times the detection limit (DL), the environment supervisor must be informed so that the data can be flagged and sampling/analytical methods and instrumentation performance can be reviewed. Relevant DLs for DDMI laboratory analysis are:

TSS – 0.3mg/L

Turbidity – 0.15 NTU

Conductivity – 0.9uS/cm

pH has no applicable detection limit.

Laboratory Splits (DLS)

A laboratory split consists of a single sample divided into two aliquots, one to be analyzed internally, and the other to be sent to an external lab using the same techniques to analyze their aliquot so that the two results would be compared. Variability of results must be considered carefully in light of analyte hold times. RPD between duplicate samples will be assessed by environment supervisor.

Equipment Blanks, Internal (EBINT)

An aliquot of DI water is subjugated, in the DDMI Environmental Laboratory, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the equipment blank is to determine if the sampling devices and apparatus for sample collection have been adequately cleaned before they are utilized at the field sampling location

6.2.8 Internal QC Scheduling

DDMI Environment internal QC falls under two schedules: Station-Dependent Internal QC and Station-Independent Internal QC. Station-Dependent Internal QC is tied to different sample matrices and is included in regular sampling schedules in MP5 (ex. samplers will be required to complete one EBINT with every set of monthly pond sampling.)

Station-Dependent Internal QC		QC Frequency per sampling event		
Sample Matrix	**Sampling Frequency***	**EBINT**	**DLS**	**DUPRDGS**
Ponds	Monthly	Every event	none	none
Diffuser	Monthly	Every event	none	none
PKC	Monthly	n/a	1 in 4	1 in 4
UG /clarifiers	Biweekly	n/a	none	none
NIWTP Influent/Effluent	6 days	n/a	none	none

*Note that sampling frequency refers to the frequency with which the entire set of samples is taken, and not the number of sites sampled (ex. the monthly pond sampling includes **10** sample sites but compromises **1** sampling event.)

Station-Independent Internal QC is not tied to any particular sample matrix and QC sample types are scheduled as stand-alone events in MP5.

Station-Independent Internal QC	Frequency
LABBW	Daily when samples collected
LDUPW	Daily when samples collected

6.2.9 External Quality Control (QC) Measures

External QC samples comprise ~ 10% of all samples analyzed and are spaced across sampling matrices and sample events to capture as much process homogeneity as possible. With the exception of Trip Blanks (below), external quality control samples are prepared by DDMI Environment staff, who subjugate them to the relevant procedures. All external QC samples are then shipped off-site to a qualified external laboratory, where all analysis is conducted.

External QC sample types consist of Trip Blanks (TBW), Equipment Blanks (EBW), Field Blanks (FBW), and Duplicates (DUPW1/DUPW2). Results of External Quality Control samples are recorded as per XXX-XXXX DDMI Environment Lab – Record Control, and reviewed by Environment Supervisors to detect trends.

Trip Blanks (TBW)

A Trip Blank is an aliquot of laboratory grade distilled water, which is received from an external lab, in the same type of container that is required for the analytical test. The trip blank is sealed and labelled in the external lab from which it originates. Upon our receipt of the trip blanks they are to be stored, sealed, at ~ 4°C until such a time as they are to be utilized (no longer than 1 month). When utilized, trip blanks travel with the sampling cooler from the laboratory to the sampling site and back to the laboratory without being opened. The trip blank is then packaged and shipped to the originating laboratory to be analyzed. The purpose of the trip blank is to verify that no sample contamination occurred during transportation or sampling operations.

Equipment Blanks (EBW)

An aliquot of DI water is subjugated, in the Environment laboratory, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the equipment blank is to determine if the sampling devices and apparatus for sample collection have been adequately cleaned before they are utilized at the field sampling location.

Field Blanks (FBW)

An aliquot of DI water is subjugated, in the field, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the field blank is to demonstrate that sample contamination has not occurred during field sample collection and processing.

Duplicates (DUPW1/DUPW2)

Co-located samples are independent samples collected as close as possible to the same point in space and time and are intended to assess precision of the entire program (field and laboratory components). The use of replicates for this purpose assumes that the variability between DUPW1 and DUPW2 is affected by the sampling method or technician. In most cases natural variability between samples collected in close succession will be low. When performing duplicate samples, the second sample will consist of each bottle that is regularly collected for that station, including the DDMI internal routine bottle.

*in MP5, under regular sample data entry, the sample that is to be the DUPW is assigned a sample type of “DUPW1.” Then, in the data entry section for that day’s DUPW1/DUPW2, the corresponding sample site is to be assigned a sample type of “DUPW2.”

6.2.10 External QC Scheduling

DDMI Environment external QC is entirely station-dependent, and QC types have different frequencies for each sample matrix that are programmed into MP5.

External QC		**QC Frequency per sampling event**				**Total % External QC (all types)**
Sample Matrix*	**Sampling Frequency**	**DUPW**	**FB**	**TB**	**EB**	
Ponds	Monthly	1 in 2	1 in 6	1 in 6	1 in 3	**11.7**
Diffuser	Monthly	1 in 1	1 in 6	1 in 6	1 in 3	**11.1**
PKC	Monthly	1 in 2	1 in 8	None	n/a	**12.5**
UG /clarifiers	Biweekly	1 in 6	1 in 6	1 in 12	n/a	**10.4**
NIWTP Influent/Effluent	6 days	1 in 6	1 in 12	1 in 12	n/a	**11.1**
Total QC type per month**		**3.16**	**1.21**	**0.91**	**0.66**	**5.94 QC/month** **11.2 % Ext. QC**

*See ENVR-477-0815 – SOP A21 DCMP for A21 QC instructions/schedule

Again, note that sampling frequency refers to the frequency with which the entire set of samples is taken, and not the number of sites sampled (ex. the monthly pond sampling includes **10 sample sites but compromises **1** sampling event.)

6.3 Data Management

6.3.1 External Sample Tracking – Chain of Custody

All samples collected, packaged and shipped to external laboratories are tracked via Chain of Custody documentation. The CoC record is used to document change in possession from sampling to delivery to receipt by the external analytical laboratory. CoC procedures are clearly outlined in ENVR-206-0112 - SOP- Chain of Custody.

6.3.2 Internal Sample Tracking

All samples collected are documented in Monitor Pro 5 on the Environment iPads as per the regular sampling schedule.

6.3.3 Data Recording/Record Keeping

The lab has a procedure in place (XXX-XXXX DDMI Environment Lab – Record Control) to ensure accurate and appropriate record keeping and review of records.

6.3.4 Data Reporting

Immediately following laboratory analyses, all records are transferred from the applicable field sheets, to their respective electronic databases.

Laboratory supervisors will regularly review the electronic databases to ensure that laboratory recordkeeping meets the aforementioned elements. Results can then be queried and exported as required from MP5 for reporting purposes.

Reporting considerations for individual methods can be found both in individual Method Validations and summarized in method SOPs.

6.4 Control of Nonconforming Testing and/or Calibration Work

The lab has procedures in place to define responses to nonconforming test or calibration work or results (XXX-XXXX DDMI Environment Lab – Control of Nonconforming Testing and/or Calibration Work). This procedure covers responsibility and authority pertaining to management of nonconforming work, evaluation of non-conformance significance, and guidelines for corrective action. Environment Supervisors are to ensure that all employees are trained in this procedure.

6.4.1 Corrective and Preventive Action

The laboratory has procedures (XXX-XXXX DDMI Environment Lab – Control of Nonconforming Testing and/or Calibration Work) in place to provide guidelines for both corrective action (as per 6.4, above, and also pertaining to departures from policies and procedures in the management system or technical operations). Procedures also provide guidance on identifying and incorporating preventive action (addressing needed improvements and potential sources of management or technical nonconformities).

6.4.2 Continual Improvement

The laboratory shall continually improve the effectiveness of its QAQC system and produced data through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

6.5 Personnel

6.5.1 Competency – Certification of Analyst Proficiency

Certification of Analyst Proficiency is the process for assessing and recognizing the technical competence and the effective quality processes of the DDMI Environment Laboratory and staff.

Staff proficiency means that an individual is capable of performing specified test methods and procedures correctly, and familiar with all related policies and procedures pertaining to lab quality as referenced in the Quality Manual. Staff will be trained and tested so as to document their competence for the range of activities they will be expected to perform in the lab, in accordance with all method SOPs.. A performance evaluation will be conducted annually at a minimum, to ensure that staff are fully trained and competent.

Details on staff training are available in XXX-XXXX DDMI Environment Lab – Training.

6.5.2 Ethics

Ethics is a set of moral principles, code for right and wrong, or behaviour which conforms to acceptable professional practices.

All employees at all times shall conduct themselves in an honest and ethical manner.

Examples of unethical behaviour include but are not limited to the following:

- Improper manipulation of data or software
- Improper handling of data errors, non-compliant data, or QC outliers
- Lack of reporting unethical behaviour of others
- Artificially fabricating results
- Misrepresenting data such as peak integration, calibration, tuning, or system suitability
- Improper clock setting to meet holding times
- Intentional deletion of non-compliant data

An employee must report any suspected unethical behaviour or fraudulent activities to the Environment Supervisor.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.