Appendix V4-1D

Hope Bay Belt Project: 2011 Meteorology Baseline Report

MAC RESOURCES

Hope Bay Mining Limited

HOPE BAY BELT PROJECT
2011 Meteorology Baseline Report

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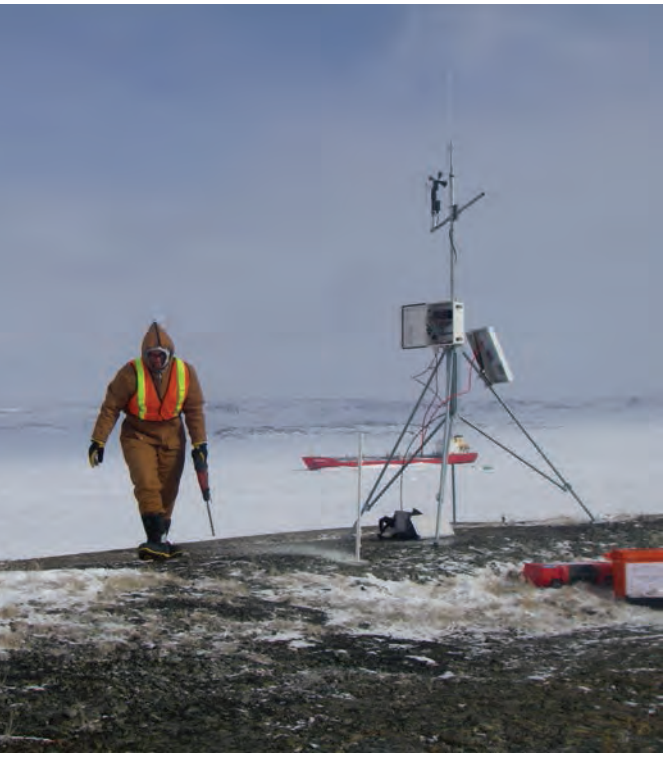

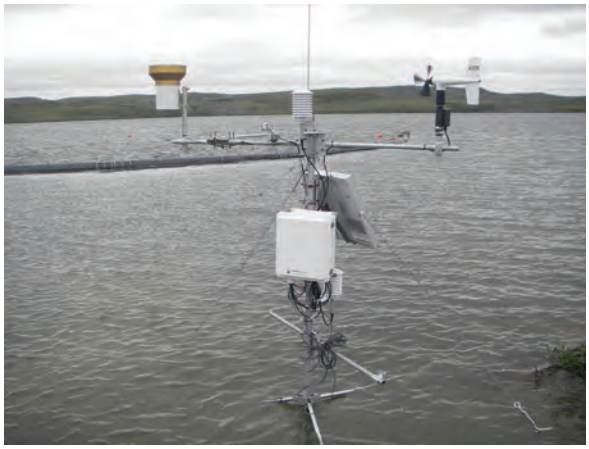

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January 2012

HOPE BAY BELT PROJECT
2011 METEOROLOGY BASELINE REPORT

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Hope Bay Mining Limited

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Executive Summary

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Executive Summary

The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound. The property consists of a greenstone belt running in a north/south direction, approximately 80 km long, with 3 main gold deposit areas. The Doris and Madrid deposits are located in the northern portion of the belt, and the Boston deposit is located in the southern end.

The objective of this meteorology baseline report is to provide preliminary estimates of annual means and the seasonal range of temperature, rainfall, evaporation, wind speed and direction and solar radiation based on data collected during 2010/11. Data collected in the Hope Bay Belt Project area during this time is also compared to historical and regional data.

Meteorological baseline studies have been conducted from 1993 to 2011 in the Hope Bay Belt Project area.

Historical meteorological data have been collected using a variety of automated and manual methods. Snow course surveys were conducted in 2004, 2005, 2006, 2007, and 2008. By 2009, two complete automated meteorological stations (Doris and Boston) and one micro-meteorology (evaporation) station were installed and commissioned. In May 2011, an automated 3 m wind tower was installed off the coast of Roberts Bay. This report summarizes data collected from September 1, 2010 to October 29, 2011 and compares it to historical and regional data. The meteorological monitoring program is scheduled to continue in 2012.

The annual mean temperature was -10.0 and -9.9ºC for both the Doris and Boston stations, respectively, for the 2010/11 hydrologic year. Comparisons to Meteorological Service of Canada (MSC) regional data from the nearest stations show that temperatures recorded in the Hope Bay Belt Project area followed regional trends and that temperatures during the measurement period were warmer than normal. This was confirmed by the Environment Canada (EC) *Climate Trends and Variations Bulletin* (EC 2011) which indicated that autumn 2010 and winter 2010/11 were the second warmest on record (based on 63 and 64 years of data, respectively) in the Arctic Tundra Region.

Total annual rainfall was 122.9 mm and 109.3 mm at the Doris and Boston stations, respectively. Climate trends and variations reported by EC (2011) indicated that autumn 2010 and winter 2010/11 were wetter than normal, but spring 2011 was dryer.

Solar radiation in the Arctic is high during the summer and very low during the winter. The annual mean number of bright sunshine hours, where mean global solar radiation is greater than 120 W/m^2, was 2,667 at Boston station and 2,365 at Doris station.

In general, wind in the Hope Bay Belt region typically blows from the northwest quadrant year round although winds are also common from the east and southeast. Mean annual wind speeds at Doris, Boston and Roberts Bay were 5.8 m/s (20.9 km/h), 5.6 m/s (20.1 km/h), and 7.0 m/s (25.2 km/h), respectively.

No new snow data was obtained during the measurement period. The mean snow water equivalent value for various terrain types based on 2004 to 2008 sampling was 71.3 mm. Results collected during 2008 which separated Boston, Doris and Madrid areas, suggest that mean snow water equivalent values should be slightly higher for the Boston area than for the Doris area.

Total evaporation values in the Hope Bay Belt Project area from July to October 2011 were estimated to be 163.5 and 156.0 mm, using the Penman Combination and Priestly-Taylor methods, respectively.

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HOPE BAY BELT PROJECT
2011 METEOROLOGY BASELINE REPORT

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Acronyms and Abbreviations

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Acronyms 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.

α	Constant value in Priestly-Taylor methodology which replaces the aerodynamic component (for subarctic regions α = 1.26)
γ	Psychometric constant in Pa ºC
ι_V	Latent heat of vaporization
ρ_w	Water density (at 10ºC = 999.7 kg m^{-3})
Δ	The slope of the temperature-saturated vapour pressure curve in Pa ºC
AES	Atmospheric Environment Services
C_P	Specific heat capacity (C_P of air = 1006 J kg^{-1} ºC)
E(PC)	Evaporation calculated using the Penman Combination methodology in mm
E(PT)	Evaporation calculated using the Priestly-Taylor methodology in mm
E_A	Aerodynamic component in mm/day
e_a	Actual vapour pressure in Pa
e_{as}	Saturated vapour pressure in Pa
EC	Environment Canada
EC-MSC	Environment Canada – Meteorological Service of Canada
E_R	Energy balance component in mm/day
G	Water heat flux
H	Sensible heat flux
J	Joules
k_a	Thermal conductivity of air (at 10ºC = 0.0241 W/m/°C)
kg	Kilograms
kPa	Kilo Pascals
k_w	Thermal conductivity of water (at 10ºC = 0.615 W/m/°C)
m	Metres
m/s	Meters per second
m^3	Cubic metres
masl	Meters above sea level
mm	Millimetres
MSC	Meteorological Service of Canada

°C	Degrees Celsius
P_A	Air pressure (Standard P_A at sea level at 20°C = $101.3*10^3$ Pa)
Pa	Pascals
PC	Penman Combination
PT	Priestly-Taylor
Rescan	Rescan Environmental Services Ltd.
RH	Relative humidity in %
R_n	Net solar radiation measured over water in W m^{-2}
SWE	Snow-water-equivalent
T	Air temperature in °C
TBRG	Tipping bucket rain gauge
T_w	Water temperature in °C
u	Wind speed in m s^{-1}
W/m^2	Watts per square meter
Wind Gust	A high wind speed that typically lasts for 3 to 5 seconds.
WMO	World Meteorological Organization
z	Height in m above the ground
z_W	Depth in m from the water surface

1. Introduction

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1. Introduction

The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound (Figure 1-1). The nearest communities are Omingmaktok (75 km to the southwest of the property), Cambridge Bay (125 km northeast of the property), and Kingaok (Bathurst Inlet; 160 km to the southwest of the property).

The property consists of a greenstone belt running in a north/south direction, approximately 80 km long, with 3 main gold deposit areas. The Doris and Madrid deposits are located in the northern portion of the belt, and the Boston deposit is located in the southern end. The northern portion of the property consists of several watershed systems that drain into Roberts Bay, and a large river (Koignuk River) that drains into Hope Bay. Watersheds in the southern portion of the belt ultimately drain into the upper Koignuk, which drains into Hope Bay.

This report presents the results from the meteorology monitoring for the Hope Bay Belt Project. The objective of this report is to provide preliminary estimates of annual means and seasonal variation of temperature, rainfall, evaporation, wind speed and direction and solar radiation based on data collected during 2010/11. Data collected in the Hope Bay Belt Project area during this time are also compared to historical and regional data. The meteorological monitoring will continue in 2012.

Figure 1-1

Hope Bay Belt Project Location

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2. Methods

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2. Methods

Meteorological monitoring has been conducted in the Hope Bay Belt Project area since 1993 and data have been collected using a variety of automated and manual methods. The bulk of the meteorology data have been collected from automated stations which allow for a more comprehensive data set in comparison with manual measurements.

Historical data from each Hope Bay Belt meteorology station up to May 2002 is included in the *1993 to 2002 Data Compilation Report for Meteorology and Hydrology* (Rescan 2002), while data from May 2002 to September 2009 is available in the *2009 Meteorology Baseline Report, Hope Bay Belt Project* (Rescan 2009a). Historical data from October 2009 to September 2010 is available in the *Doris North Gold Mine Project: 2010 Meteorology Compliance Report* (Rescan 2010).

All annual means and totals were calculated from October 2010 to September 2011 data, so that only twelve consecutive months of data were represented. Data from September 2010 and October 2011 have been included in this report to provide a continuous record of data since the 2010 meteorology compliance report. The results section summarizes monthly meteorological data for the reporting period as well as 1971 to 2000 climate normal data collected at Environment Canada – Meteorological Service of Canada (EC-MSC) Cambridge Bay, Lady Franklin, Lupin A, and Kugluktuk stations.

The 2011 meteorology monitoring program included the following components:

- Operation and maintenance of the meteorological stations at Doris Camp and Boston Camp;
- Reinstallation and operation of a micro-meteorology (evaporation) station in Doris Lake; and
- Installation of a 3 m automated wind tower on the shore of Roberts Bay.

2.1 AUTOMATED METEOROLOGY STATIONS

Two complete automated meteorological stations as well as one 3 m automated wind tower, and one micro-meteorology (evaporation) station were installed and commissioned for the Hope Bay Belt Project as part of the 2011 meteorology monitoring program. The locations of these stations are shown in Figures 2.1-1 and 2.1-2.

2.1.1 Doris

An automated meteorological station was installed on February 27, 2004 near Doris camp (Figure 2.1-1). This meteorological station records wind speed and direction, air temperature, relative humidity, rainfall, solar radiation and barometric pressure.

The two-tripod station at Doris was initially powered by a deep cycle marine battery, but was converted to include solar power when the permanent 10 m tower was installed in mid-August 2009. Temperature, relative humidity, wind speed and direction and solar radiation sensors were initially mounted on one of the 3 m tall tripod structures and a tipping bucket rain gauge (TBRG) was mounted on the other. The various sensors were remounted on the 10 m aluminum tower anchored with bed-rock anchors and guy wires on August 13, 2009 (Plate 2.1-1). The wind sensor was mounted at the top of the tower at a height of 10 m above ground. This configuration is consistent with the EC-MSC standard sensor height for data to be used for air dispersion modelling (MSC 2004). Wind speed is measured in m/s and wind direction in degrees from true north.

The temperature and relative humidity sensors are combined into one unit. Temperature is measured in degrees Celsius and relative humidity in percent. The TBRG monitors rainfall in millimetres. Global solar radiation is monitored at the station with a pyranometer which gives readings in watts per square metre. A barometric pressure sensor was added to the Doris meteorology station in late September 2010.

The sensors for the Doris station are connected to a Campbell Scientific CR10X datalogger which controls the operation of the station. The datalogger's program dictates how often the sensors will be monitored (set at every 5 seconds). It also generates and stores both hourly and daily means. The station is powered with a sealed rechargeable battery that is recharged with a 30 watt solar panel. An external deep cycle marine 105 Amp-hour battery is used to supplement the solar power during winter. The station is grounded to prevent lightning damage.

2.1.2 Boston

An automated meteorological station was installed near the Boston exploration camp (approximately 50 km south of the Doris North camp) during August 1993 and relocated in July 2006 (Plate 2.1-2; Figure 2.1-2). The former location was 2 km southeast of Boston camp near Stickleback Lake. The current location is 100 m south of Boston Camp. Like the Doris meteorology station, it has the capability to record wind speed and direction, air temperature, relative humidity, solar radiation, and rain. In addition, an ultrasonic snow depth sensor which measures snow depth in millimetres was installed on the tower on August 13, 2009. All sensors (except for the ultrasonic snow depth sensor) and operation of the meteorology station followed the methodologies listed above for the Doris 10 m meteorology station. Sensors and operation of the station were consistent before and after relocation.

Plate 2.1-1. Doris meteorology station after being upgraded to a 10 m tower on August 13, 2009.

Plate 2.1-2. Boston automated meteorology station after relocation in 2006.

PROJECT # 1009-002-02 GIS # HB-12-066a January 17 2012

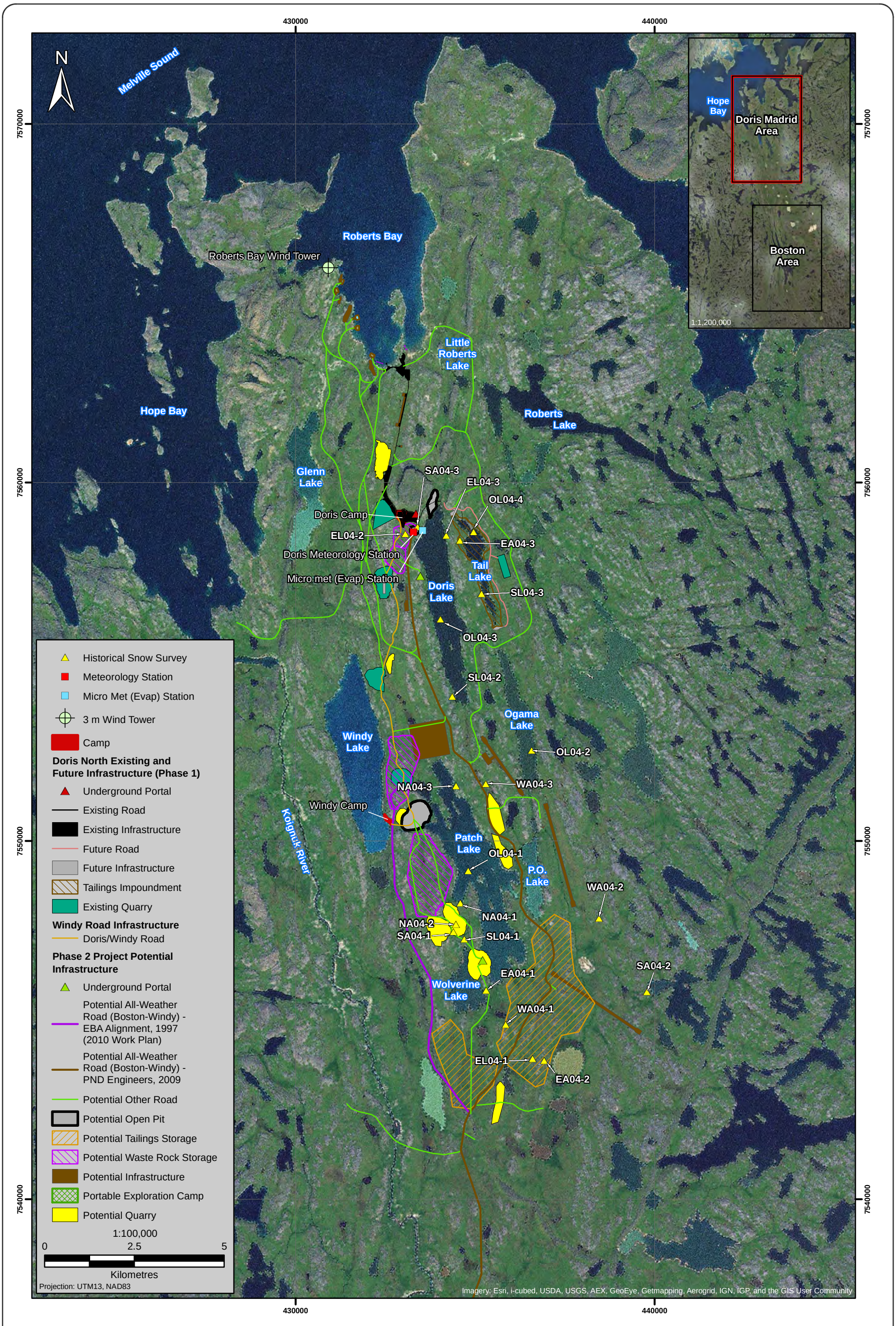

Figure 2.1-1

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Hope Bay Belt Project Meteorological Stations and Snow Surveys, Doris and Madrid Areas

Figure 2.1-1

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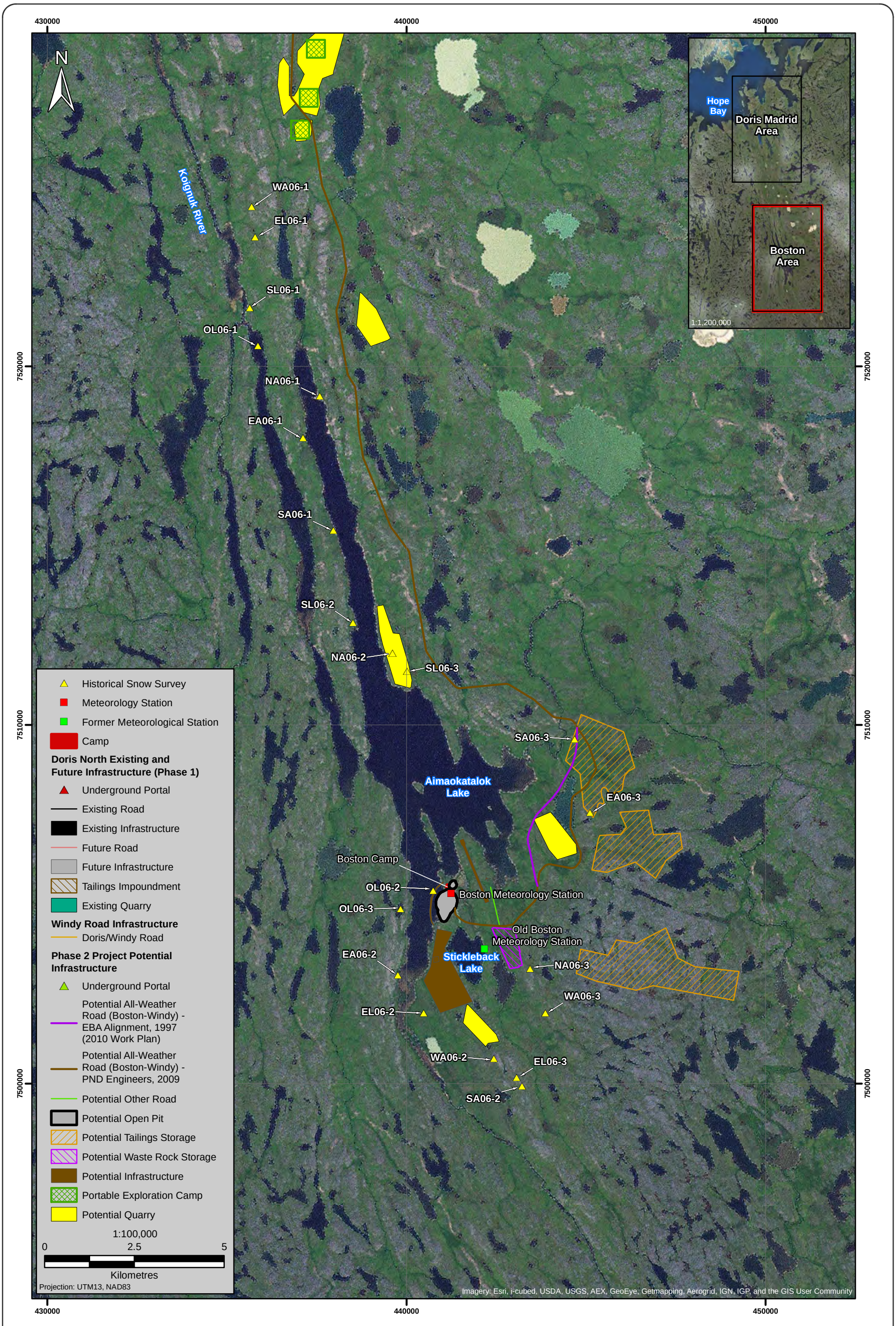

Figure 2.1-2

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Hope Bay Belt Project Meteorological Stations and Snow Surveys, Boston Area

Figure 2.1-2

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2.1.3 Doris Lake Micro-meteorology (Evaporation) Station

In 2009 the meteorological program was expanded to include measurements of open-water evaporation at Doris Lake. A micro-meteorological station was reinstalled in a shallow area of this lake on August 12, 2011 (Plate 2.1-3; Figure 2.1-1). The station is operated until the end of the open-water season. Data collected at this station was used to calculate daily evaporation rates using both the Penman Combination and Preistly-Taylor methods.

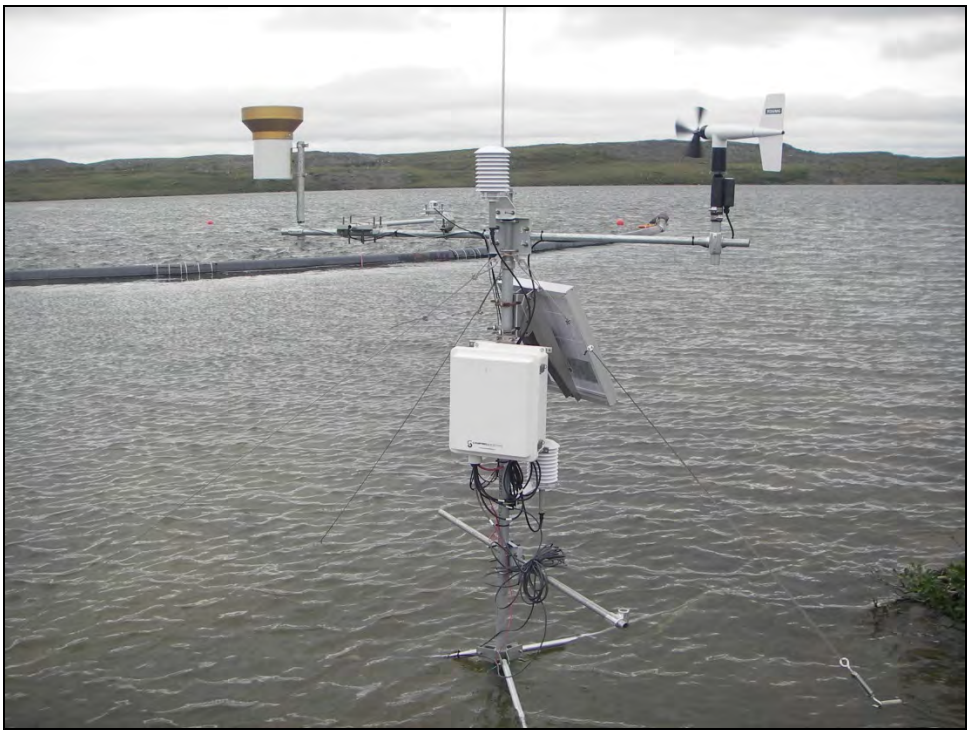

Plate 2.1-3. The Doris Lake micro-meteorology (evaporation) station in August 2011.

The station is powered with a sealed rechargeable 8.5 Amp-hour battery that is recharged with a 50 watt solar panel. Operation of the station is controlled by a CR1000-55 datalogger whose program dictates how often the sensors will be monitored (every 5 seconds) and generates and stores hourly and daily means. Sensors for this station are mounted on a tripod which is partially submerged in the lake. Sensors (units of measure are shown in brackets) include:

- A silicon pyranometer (solar radiation; W/m^2);
- A net radiometer (net radiation; W/m^2);
- Two air temperature (ºC) and relative humidity (%) probes;
- A wind speed (m/s) and direction (degrees from true north) sensor;
- Two water temperature thermistors (ºC); and
- A tipping bucket rain gauge (rain precipitation; mm).

Normally, two wind speed sensors are used; however, one of the sensors was damaged during installation and was not used for the 2011 monitoring period. Since the equations for calculating evaporation rates only require wind speed from one height, the missing sensor had minimal impact on the results.

Lake evaporation rates are calculated from mean daily weather data using the Penman Combination (PC) Method from Chow, Maidment, and Mays (1988). The Penman model is a combined energy-balance/aerodynamic mathematical model defined by the general equation:

$$E(PC) = \frac{\Delta}{\Delta + \gamma} E_R + + \frac{\gamma}{\Delta + \gamma} E_A \text{ with } \Delta = \frac{4098 e_{as}}{(237.3 + T)^2} \text{ and } \gamma = \frac{C_P P_A}{0.622 l_v}$$

where Δ is the slope of the temperature-saturated vapour pressure curve in Pa ºC; γ is the psychometric constant in Pa ºC; e_{as} is the saturated vapour pressure at air temperature T in ºC; C_P = 1006 J kg^{-1} ºC is the specified heat of air; P_A = 101.3 * 10^3 Pa is air pressure at 20ºC; and l_v = 2.501 x 10^6 – 2370T J kg^{-1} is the latent heat of vaporization.

The energy-balance component E_R in mm/day is determined by the equation:

$$E_R = \frac{R_n - H - G}{l_v \rho_w} * 8.64 * 10^7 \text{, with } H = -k_a \left(\frac{T_2 - T_1}{z_2} \right) \text{ and } G = -k_w \left(\frac{T_{w2} - T_{w1}}{z_w} \right)$$

where R_n is the net solar radiation measured over water in W m^{-2}; H and G are the sensible heat flux and water heat flux; ρ_w = 999.7 kg m^{-3} is the water density at 10ºC; T_2 - T_1 and T_{w2} - T_{w1} are the change in mean daily air and water temperatures from the previous day, as measured at height z_2 and depth z_w in metres from the water surface. Yarwood & Castle (1970) give the thermal conductivities of air k_a and water k_w at 10ºC as 0.0241 and 0.615 W/m/ºC, respectively. The energy-balance equation can be simplified to a constant if it is assumed that the sensible heat flux H and water heat flux G are negligible, such that Chow et al. (1988) calculate the energy-balance component by E_R = 0.0353 * R_n.

Two modifications to the above equation are used in order to calculate the instantaneous evaporation rate. Rather than using the difference in mean daily air and water temperatures from the previous day, the instantaneous heat flux from above and below the water's surface is determined by the equations:

$$H = -k_a \left(\frac{T_2 - T_1}{z_2 - z_1} \right) \text{ and } G = -k_w \left(\frac{T_{w2} - T_{w1}}{z_{w2} - z_{w1}} \right)$$

where T_2 - T_1 is the change in air temperature over height z_2 - z_1 and T_{w2} - T_{w1} is the change in water temperature over depth z_{w2} - z_{w1}.

The aerodynamic component E_A in mm/day is calculated as:

$$E_A = \frac{0.1062 u_2}{[\ln(z_2 / z_0)]^2} * (e_{as} - e_a) \text{ with } e_a = -RH * e_{as} \text{ and } e_{as} = 611 \exp\left(\frac{17.27 * T}{237.3 + T} \right)$$

where u_2 is wind speed in m s^{-1} measured at a height of z_2 in cm; Brutsaert (1982) gives the surface water roughness height z_0 as 0.01 cm; the term e_{as} - e_a is the difference between saturated vapour pressure e_{as} and actual vapour pressure e_a in Pa; and relative humidity (RH) is given as a proportion ($0 \le RH \le 1$).

The Priestly-Taylor (PT) method is similar to the Penman Combination method and defined by the general equation:

$$E(PT) = \alpha \frac{\Delta}{\Delta + \gamma} E_R$$

where the weighted aerodynamic component E_A is replaced by a constant α, and where the sensible heat flux term H is omitted from the energy flux term, E_R, after Shuttleworth (1993). Stewart and Rouse (1977) substantiate the constant α = 1.26 for subarctic regions.

This report uses both of the described methods for calculating evaporation.

2.1.4 Roberts Bay

In May 2011 an automated 3 m wind tower was placed along the coastline of Roberts Bay in order to measure wind speed and direction (Plate 2.1-4, Figure 2.1-1). This station was installed to support the Doris North Water License Amendment 4, by providing wind speed and direction data for use in ocean circulation calculations.

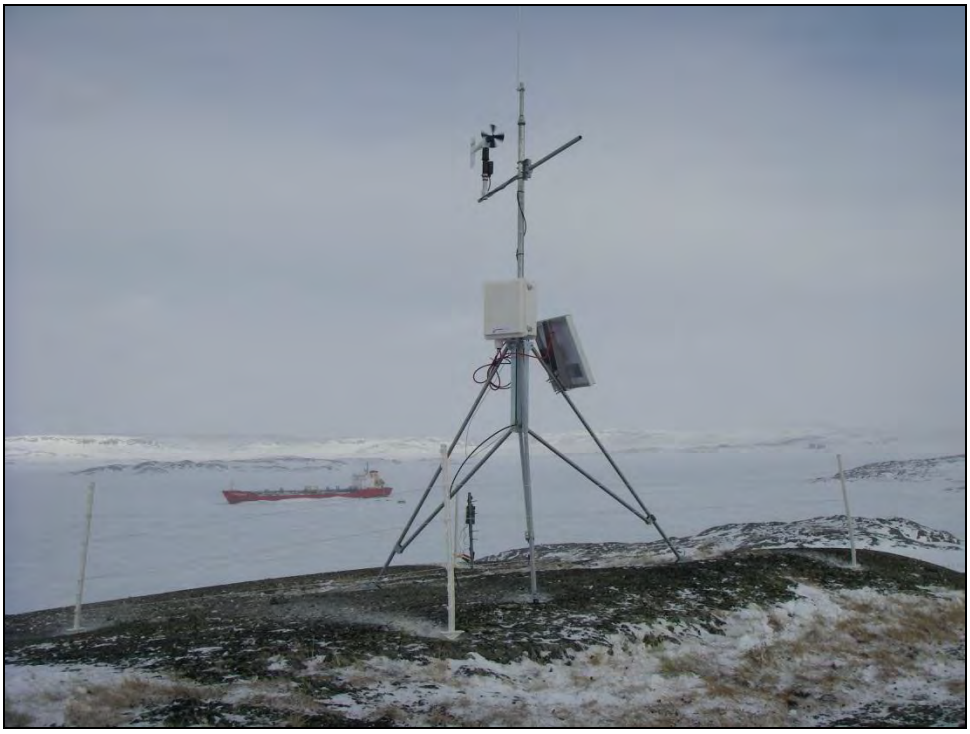

Plate 2.1-4. The Roberts Bay 3 m wind tower in May 2011.

The station is powered by an 8.5 Amp-hour battery that is recharged with a 20 watt solar panel. Operation of the station is controlled by a CR800-XT whose program dictates how often the sensor is monitored (every 5 seconds) and generates and stores hourly and daily data. All of the equipment is mounted on a tripod which is anchored to bed-rock. The station is grounded to prevent lightning damage, and is surrounded by an electric fence to keep animals out.

Table 2.1-1 summarizes the parameters measured at the four automated meteorological stations. Meteorological stations and their sensors are installed in areas that are free of obstructions that could bias the data being collected. Placement of stations and sensors follow standards established by MSC (2004). Site visits to these meteorological stations have taken place every one to three months during the measurement period, to collect data and conduct routine maintenance.

Table 2.1-2 lists the regional meteorological stations operated by EC-MSC. Figure 2.1-3 shows the location of the regional meteorological stations with respect to the Hope Bay Belt Project. Regional stations allow for comparison of data collected at the Project and provide a historical context. Data provided by EC-MSC for the Lupin CS station during the reporting period were not comprehensive and included some estimated values; therefore they were excluded from this report.

Table 2.1-1. List of Hope Bay Belt Meteorological Stations and Parameters

Date Established	Doris Station[a] March 2004	Boston Station August 1993[b]	Doris Lake (micro met) July 2009	Roberts Bay Station May 2011
Temperature and Relative Humidity	✓	✓	✓	n/a
Wind Speed and Direction	✓	✓	✓	✓
Snow Depth via Ultrasonic Gauge	n/a	✓	n/a	n/a
Rainfall via Tipping Bucket Rain Gauge	✓	✓	✓	n/a
Solar Radiation	✓	✓	✓	n/a
Barometric Pressure	✓	n/a	n/a	n/a
Water Temperature via Thermistors	n/a	n/a	✓	n/a
Net Radiation	n/a	n/a	✓	n/a

Notes:
n/a = This type of sensor was not installed at this particular meteorological station.
[a] The Doris meteorology station consisted of two tripods from February 27, 2004 to August 13, 2009 when its sensors were reinstalled on a MSC recommended 10 m tower.
[b] The Boston meteorology station was relocated in July 2006 but remained near the Boston exploration camp (Figure 2.1-2).

Table 2.1-2. Summary of Regional Meteorological Stations in the Hope Bay Belt (HBB) Region

Station	Environment Canada Climate ID	Station Location (with respect to HBB) (km)	Elevation (m)	Data Record Start	Data Record End
Cambridge Bay	2400600	125	31.1	1953	Current
Lady Franklin	2302680	275	15.9	1973	2000
Lupin Airport	23026HN	335	490.1	1986	2006
Lupin CS	230N002	335	488.0	1997	Current
Kugluktuk	2300902	360	22.6	1978	Current

2.2 MANUAL SNOW SURVEYS

Snow course surveys were undertaken on May 5 and 6, 2004, May 9 and 12, 2005, April 30, 2006, April 28 and May 4, 2007, and May 16 to 21, 2008. The snow survey locations throughout the belt were selected on the basis of terrain type and are shown in Figures 2.1-1 and 2.1-2. These included:

- Open Lake (flat areas on lakes);
- Exposed Lowland (flat areas at the top of slopes);
- Sheltered Lowland (flat areas at the toe of slopes); and
- North, East, South and West Aspects (slopes facing these directions).

The purpose of sampling multiple locations was to determine if significant differences existed between terrain types.

At each survey station, 30 depth measurements were made at randomly selected locations in a large circle with approximately 10 m between measurements. These depth measurements were taken by inserting a metal metre stick into the snowpack and reading the snow depth.

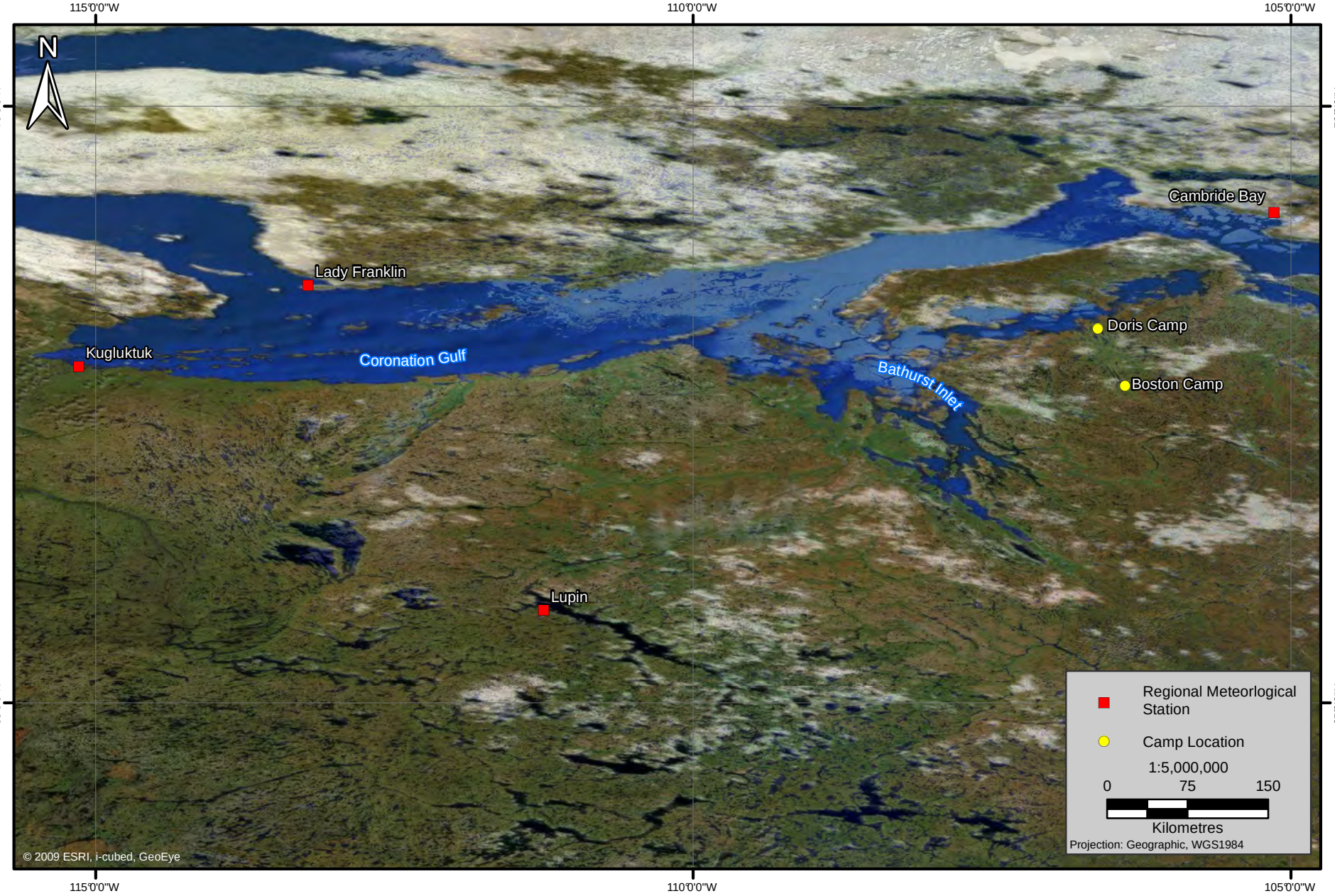

Figure 2.1-3

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Regional Meteorology Stations in Hope Bay Belt Project Region

Figure 2.1-3

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Three density measurements were recorded at each survey station, using an Atmospheric Environment Services (AES) snow density sampler. The AES sampler was inserted carefully into the snowpack to avoid compaction. When the corer reached the soil surface the snow depth was read on the tube. The corer was then twisted/inserted more deeply into the ground to ensure that a plug of soil was extracted with the sampler to prevent granular snow from falling out. After extracting the sampler and carefully removing the soil plug, the sampler weight was measured with and without the snow core, to measure the weight of the snow and allow a snow water equivalent to be calculated.

Snow-water-equivalent (SWE) is defined as the depth of water (in mm) in the snowpack on a horizontal surface area if that snowpack is completely melted. SWE is related to snow depth and snow density by:

$$SWE\ (mm) = depth\ (m) \times density\ (kg/m^3)$$

The conversion of SWE (mm) from a mass of snow per unit area to depth of water is based on the fact that 1 mm of water spread over an area of 1 m^2 weights 1 kg. The most commonly used approach for determining SWE is the gravimetric method, which involves taking a vertical core through the snowpack and weighing or melting the core to obtain SWE (National Resources Council 2005).

Snow surveys were not conducted during the 2009 to 2011 field seasons and therefore, snow data are not discussed in detail in this report. Previous snow survey data can be located in the *2009 Meteorology Baseline Report, Hope Bay Belt Project* (Rescan 2009a).

3. Results

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3. Results

3.1 AIR TEMPERATURE

Figures 3.1-1 to 3.1-3 summarize the mean, mean daily maximum and mean daily minimum monthly air temperatures at the Hope Bay Belt and regional EC-MSC meteorological stations for September 2010 to October 2011, respectively. Tables 3.1-1 and 3.1-2 provide a summary of the available meteorological data at each onsite station. Appendix 3.1-1 provides daily temperature values between September 2010 and October 2011 for Boston and Doris stations. The mean monthly air temperatures for Boston station (82 masl) ranged from -29.9ºC in January 2011 to 13.9ºC in July 2011. The mean monthly air temperatures for Doris station (30 masl) ranged from -29.8ºC in January 2011 to 13.0ºC in July 2011. The annual mean air temperatures for Boston and Doris were -9.9 and -10.0ºC, respectively.

The mean minimum daily air temperatures for Boston and Doris ranged from lows of -33.7ºC (January 2011) and -33.6ºC (January 2011), respectively, to highs of 9.2ºC (July 2011) and 8.6ºC (July 2011), respectively. The mean maximum daily air temperatures for Boston and Doris stations ranged from lows of -26.0ºC (January 2011) and -25.9ºC (January 2011), respectively, to highs of 18.2ºC (July 2011) and 17.2ºC (July 2011), respectively.

At the Boston station the extreme minimum temperature was -44.0ºC, recorded on January 25, 2011 at 11:32 p.m., and the extreme maximum temperature was 25.5ºC, recorded on July 25, 2011 at 4:09 p.m. The extreme minimum temperature at Doris station was -42.3ºC on January 26, 2011 at 5:10 a.m., and the extreme maximum temperature was 23.7ºC on July 22, 2011 at 6:34 p.m. The all-time extreme minimum temperature at EC-MSC operated Cambridge Bay station was -52.8ºC and occurred on January 3, 1935. The all-time extreme maximum temperature was 28.9ºC and occurred on July 1, 1930.

Comparisons to EC-MSC regional data from the nearest stations show that temperatures recorded in the Hope Bay Project area followed regional climate normal trends (Figures 3.1-1 to 3.1-3 and Tables 3.1-3 to 3.1-6). Data from the EC-MSC Kugluktuk and Cambridge Bay stations show that April and June 2011 were slightly cooler than normal (by about 1.3ºC less), while all other months were warmer (by about 2.8ºC more). The 1971 to 2000 climate normal mean annual air temperatures for the regional stations ranged from -14.4ºC to -10.6ºC at the Cambridge Bay and Kugluktuk stations, respectively, indicating that mean annual temperatures measured onsite were warmer than normal.

Environment Canada's (2011) Climate Trends and Variations website confirmed that air temperatures in the Arctic Tundra were warmer than normal for the entire measurement period (Table 3.1-7). Air temperatures recorded during autumn 2010 and winter 2010/11 ranked as the second warmest on record (duration of record was 63 and 64 years of data, respectively). Spring 2011 temperature ranked just above the mean value, and summer 2011 ranking was not available at the time of reporting.

3.2 RAINFALL

Rainfall data were collected from September 2010 to October 2011 at the Doris and Boston stations. The precipitation gauge at the Boston station had a wiring issue which was identified and resolved on September 16, 2010 therefore no rainfall data is available up to this date. Total annual rainfall during the period (October 2010 to September 2011) was 122.9 mm and 109.3 mm at the Doris and Boston stations, respectively. Monthly rainfall values are summarized in Tables 3.1-1 and 3.1-2 for the Boston and Doris stations, respectively. Appendix 3.1-1 provides daily rainfall values between September 2010 and October 2011 for these two stations. Snowfall adapters were not utilized at either station and therefore on-site snow water equivalent (SWE) data are unavailable. Total rainfall measured at Boston and Doris stations were higher than the Cambridge Bay climate normal (1971 to 2000) annual rainfall of 70 mm, as well as higher than onsite data recorded in previous years.

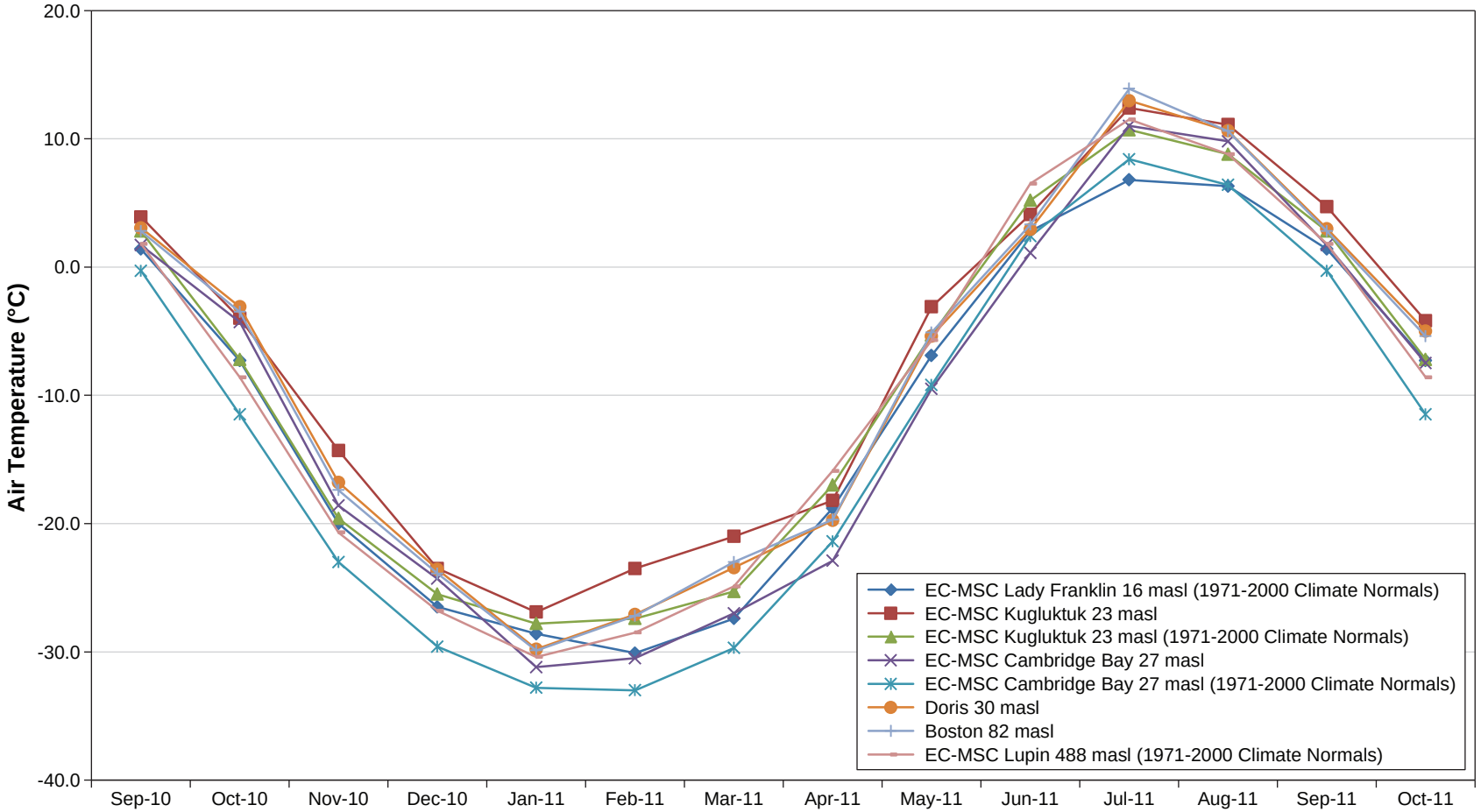

Figure 3.1-1

NEWMONT NORTH AMERICA

Hope Bay Belt Project and Regional Mean Air Temperatures (°C), September 2010 to October 2011

Figure 3.1-1

Rescan™ Engineers & Scientists

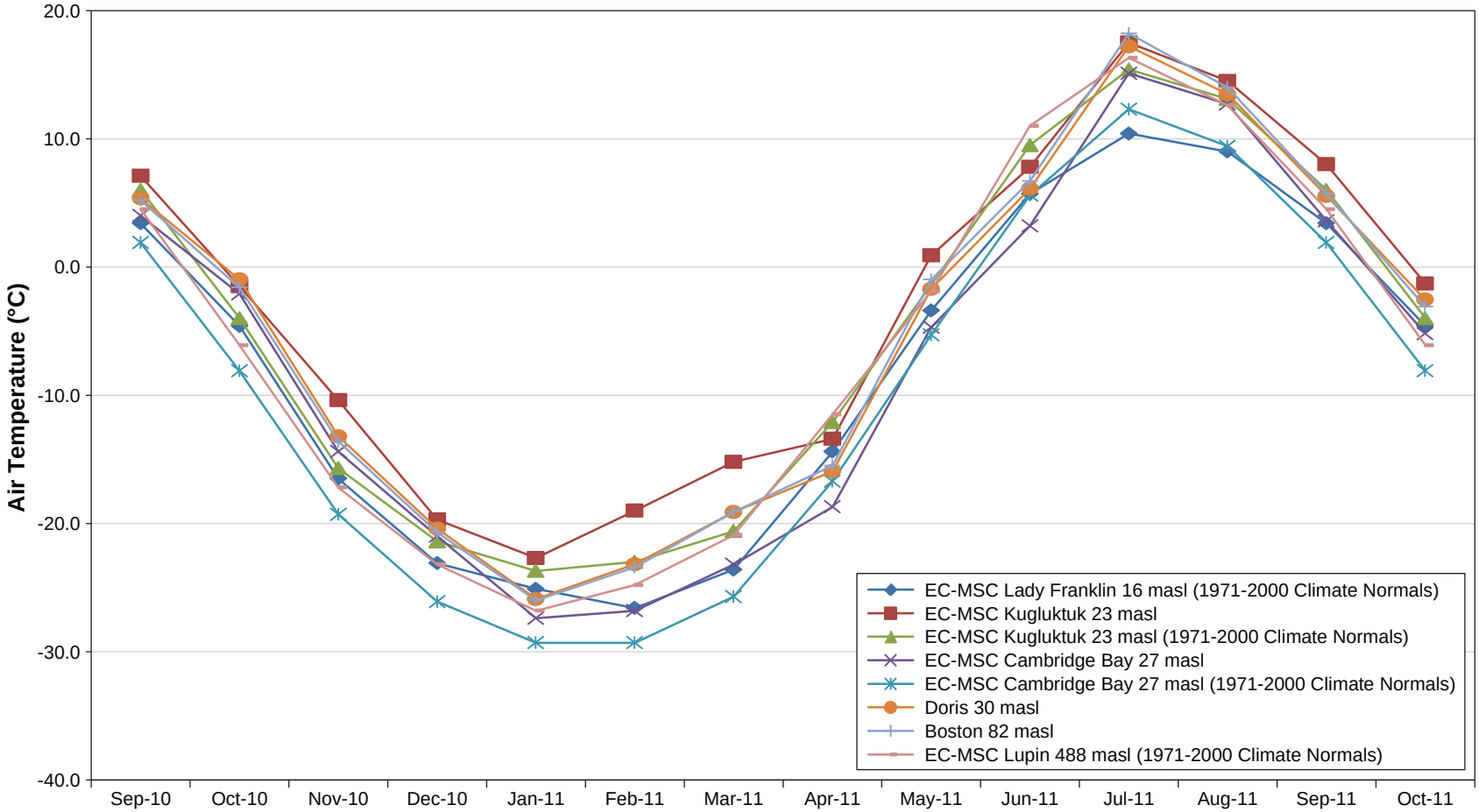

Figure 3.1-2

NEWMONT NORTH AMERICA

Hope Bay Belt Project and Regional Mean Daily Maximum Air Temperatures (°C), September 2010 to October 2011

Figure 3.1-2

Rescan™ Engineers & Scientists

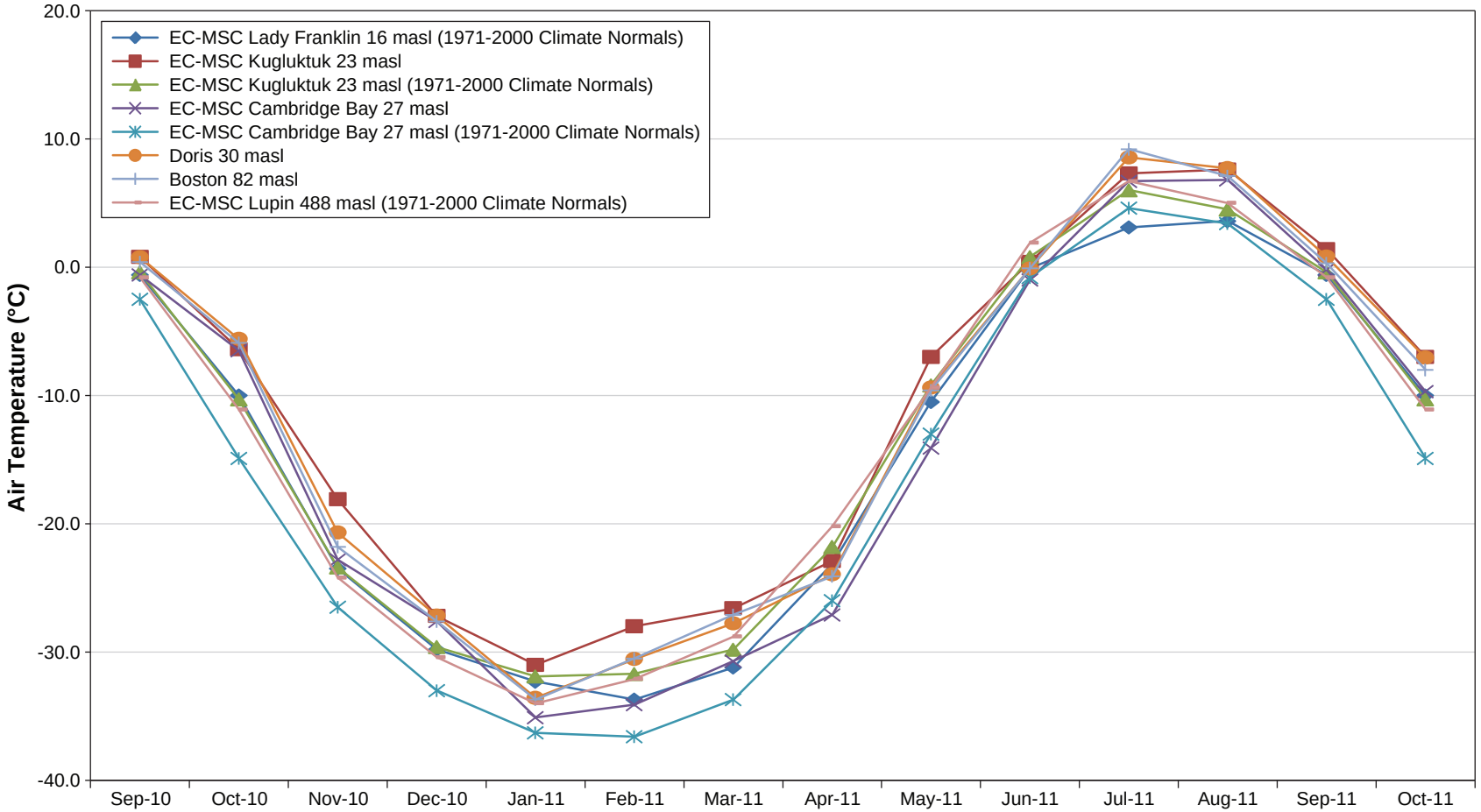

Figure 3.1-3

NEWMONT NORTH AMERICA

Hope Bay Belt Project and Regional Mean Daily Minimum Air Temperatures (°C), September 2010 to October 2011

Figure 3.1-3

Rescan™ Engineers & Scientists

Table 3.1-1. Monthly Meteorological Data from Boston Meteorological Station, September 2010 to October 2011

Month	Mean Air Temperature ˚C	Mean Daily Minimum Air Temperature ˚C	Mean Daily Maximum Air Temperature ˚C	Mean Relative Humidity %	Mean Hourly Wind Speed m/s	Mean Hourly Wind Speed km/h	Maximum Wind Gust Speed m/s	Maximum Wind Gust Speed km/h	Mean Solar Radiation W/m^2	Total Bright Sunshine Hours (>120 W/m^2)	Total Rain mm
Sep-10	2.8	0.4	5.2	84.0	4.9	17.5	18.2	65.3	92.9	209	1.3[a]
Oct-10	-3.5	-5.9	-1.6	93.4	5.7	20.6	20.0	71.9	30.1	62	8.9
Nov-10	-17.4	-21.8	-13.6	86.0	6.0	21.6	22.2	79.8	6.6	0	0.0
Dec-10	-23.9	-27.6	-20.7	79.7	5.2	18.5	18.6	67.0	0.7	0	0.0
Jan-11	-29.9	-33.7	-26.0	74.7	5.0	18.1	24.5	88.2	3.8	0	0.0
Feb-11	-27.2	-30.5	-23.4	76.2	6.8	24.4	25.3	91.2	31.9	70	0.0
Mar-11	-23.0	-27.1	-19.1	75.9	5.4	19.4	19.0	68.4	115.6	264	0.0
Apr-11	-19.7	-24.1	-15.5	79.6	6.3	22.7	18.9	67.9	240.3	358	0.0
May-11	-5.1	-9.6	-1.0	84.8	4.9	17.6	16.6	59.8	337.8	468	4.8
Jun-11	3.3	-0.1	6.7	81.8	5.8	21.0	16.7	60.2	271.2	438	20.1
Jul-11	13.9	9.2	18.2	66.2	4.5	16.0	18.1	65.1	313.3	469	33.8
Aug-11	10.6	7.1	14.0	79.6	5.2	18.8	19.0	68.4	183.7	341	20.1
Sep-11	2.8	0.3	5.7	85.8	6.1	21.8	20.5	73.9	87.3	207	21.6
Oct-11[b]	-5.4	-8.0	-3.1	88.0	5.7	20.5	16.8	60.6	32.4	59	5.3
Mean[c]	-9.9	-13.7	-6.4	80.3	5.6	20.0	20.0	71.8	135.2	-	-
Sum[c]	-	-	-	-	-	-	-	-	-	2,677	109.3

Notes:

[a] *The rain gauge malfunctioned until it was fixed on September 16th.*

[b] *October 2011 is missing data from the last two days of the month.*

[c] *This calculation was only performed on data from October 2010 to September 2011.*

Table 3.1-2. Monthly Meteorological Data from Doris Meteorological Station, September 2010 to October 2011

Month	Mean Air Temperature ˚C	Mean Daily Minimum Air Temperature ˚C	Mean Daily Maximum Air Temperature ˚C	Mean Relative Humidity %	Mean Hourly Wind Speed m/s	Mean Hourly Wind Speed km/h	Maximum Wind Gust Speed m/s	Maximum Wind Gust Speed km/h	Mean Solar Radiation W/m^2	Total Bright Sunshine Hours (>120 W/m^2)	Total Rain mm	Mean Barometric Pressure kPa
Sep-10	3.0	0.8	5.3	82.6	5.1	18.5	19.7	70.9	63.0	161	23.9	n/a[a]
Oct-10	-3.1	-5.6	-1.0	91.8	5.4	19.6	22.5	81.1	20.8	7	16.0	100.85
Nov-10	-16.8	-20.7	-13.2	84.8	5.7	20.6	21.8	78.3	4.1	0	0.0	101.05
Dec-10	-23.6	-27.2	-20.4	79.3	5.7	20.4	21.2	76.3	0.4	0	0.0	102.43
Jan-11	-29.8	-33.6	-25.9	74.2	5.6	20.1	26.1	93.8	2.3	0	0.0	100.41
Feb-11	-27.1	-30.6	-23.2	75.9	7.1	25.6	24.0	86.4	22.2	35	0.0	100.88
Mar-11	-23.4	-27.8	-19.1	75.5	5.7	20.4	17.2	62.1	87.7	227	0.0	101.63
Apr-11	-19.8	-24.0	-15.9	79.4	6.9	24.7	21.2	76.3	181.0	345	0.0	101.13
May-11	-5.4	-9.4	-1.7	85.9	5.1	18.3	16.8	60.7	249.5	439	9.1	102.32
Jun-11	2.9	-0.1	6.1	83.9	6.0	21.7	17.7	63.8	206.3	400	32.0	100.93
Jul-11	13.0	8.6	17.2	68.5	4.9	17.7	16.3	58.7	240.9	441	21.1	100.98
Aug-11	10.6	7.7	13.5	80.3	5.5	19.7	20.9	75.4	137.0	312	12.7	100.96
Sep-11	3.0	0.8	5.5	85.2	5.9	21.1	19.3	69.4	62.3	159	32.0	100.64
Oct-11[b]	-5.0	-7.1	-2.5	87.4	5.8	21.0	17.9	64.4	23.2	25	0.3	100.94
Mean[c]	-10.0	-13.5	-6.5	80.4	5.8	20.8	20.4	73.5	101.2	-	-	101.18
Sum[c]	-	-	-	-	-	-	-	-	-	2,365	122.9	

Notes:

n/a = not available

[a] *The barometric pressure sensor was installed in the end of September 2010.*

[b] *October 2011 is missing data from the last two days of the month.*

[c] *This calculation was only performed on data from October 2010 to September 2011.*

Table 3.1-3. Monthly Meteorological (September 2010 to October 2011) and Climate Normal (1971 to 2000, in brackets) Data from Cambridge Bay EC-MSC Meteorological Station

Month	Mean Air Temperature °C		Mean Daily Minimum Air Temperature °C		Mean Daily Maximum Air Temperature °C		Mean Hourly Wind Speed m/s		Mean Hourly Wind Speed km/h		Maximum Wind Gust Speed m/s		Maximum Wind Gust Speed km/h		Total Rain mm		Total Snow cm		Total Precipitation mm		Mean Snow Depth cm	
Sep-10	1.7	(-0.3)	-0.6	(-2.5)	4.0	(1.9)	4.9	(6.2)	17.7	(22.4)	18.6	(32.2)	67	(116)	19.2	(11.4)	2.2	(8.9)	21.4	(19.3)	0.1	(1)
Oct-10	-4.3	(-11.5)	-6.5	(-14.9)	-2.1	(-8.1)	6.3	(6.4)	22.7	(-23.0)	18.1	(33.6)	65	(121)	2.6	(0.4)	20.8	(16.2)	23.4	(14.6)	9.9	(7)
Nov-10	-18.6	(-23.0)	-22.8	(-26.5)	-14.4	(-19.3)	6.1	(5.8)	22.1	(20.9)	25.8	(28.3)	93	(102)	0.0	(0.0)	13.8	(9.3)	13.8	(7.2)	24.1	(14)
Dec-10	-24.3	(-29.6)	-27.6	(-33.0)	-21.0	(-26.1)	6.0	(5.9)	21.6	(21.4)	0.0	(33.9)	65	(122)	0.0	(0.0)	13.0	(6.3)	13.0	(5.3)	32.5	(18)
Jan-11	-31.2	(-32.8)	-35.1	(-36.3)	-27.4	(-29.3)	5.0	(6.2)	18.1	(22.4)	18.1	(30.0)	65	(108)	0.0	(0.0)	5.4	(5.6)	5.4	(4.6)	37.7	(21)
Feb-11	-30.5	(-33.0)	-34.1	(-36.6)	-26.8	(-29.3)	5.7	(6.0)	20.7	(21.6)	22.2	(30.3)	80	(109)	0.0	(0.0)	7.4	(6.4)	7.4	(5.1)	41.0	(24)
Mar-11	-27.0	(-29.7)	-30.7	(-33.7)	-23.2	(-25.7)	4.4	(5.9)	15.7	(21.2)	0.0	(26.9)	54	(97)	0.0	(0.0)	4.4	(7.4)	4.2	(6.0)	42.5	(28)
Apr-11	-22.9	(-21.4)	-27.1	(-26.0)	-18.7	(-16.7)	5.6	(5.7)	20.0	(20.4)	0.0	(28.3)	59	(102)	0.0	(0.1)	5.2	(7.5)	5.2	(6.5)	44.1	(31)
May-11	-9.5	(-9.2)	-14.1	(-13.0)	-4.7	(-5.3)	4.5	(5.8)	16.1	(20.7)	15.8	(28.3)	57	(102)	2.8	(1.6)	2.8	(9.3)	5.6	(9.4)	45.6	(30)
Jun-11	1.1	(2.4)	-1.0	(-0.8)	3.2	(5.6)	6.2	(5.4)	22.5	(19.6)	17.5	(33.3)	63	(120)	30.9	(9.8)	12.6	(2.8)	43.1	(12.5)	21.4	(7)
Jul-11	11.0	(8.4)	6.7	(4.6)	15.1	(12.3)	4.6	(5.5)	16.5	(19.7)	16.4	(25.8)	59	(93)	19.8	(21.7)	0.0	(0.0)	19.8	(21.7)	0.0	(0)
Aug-11	9.8	(6.4)	6.8	(3.4)	12.7	(9.4)	5.3	(6.0)	19.1	(21.5)	16.9	(30.3)	61	(109)	18.2	(24.5)	0.0	(2.2)	18.2	(26.7)	0.0	(0)
Sep-11	1.7	(-0.3)	-0.2	(-2.5)	3.6	(1.9)	5.6	(6.2)	20.0	(22.4)	20.6	(32.2)	74	(116)	34.6	(11.4)	1.8	(8.9)	36.4	(19.3)	1.4	(1)
Oct-11	-7.5	(-11.5)	-9.7	(-14.9)	-5.2	(-8.1)	6.2	(6.4)	22.2	(-23.0)	19.4	(33.6)	70	(121)	3.2	(0.4)	9.4	(16.2)	11.6	(14.6)	1.4	(7)
Mean [a]	-12.1	(-14.4)	-15.5	(-18.0)	-8.6	(-10.9)	5.4	(5.9)	19.6	(21.2)	14.3	(30.1)	66.3	(108.4)	-	-	-	-	-	-	25.0	(15)
Sum [a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	108.9	(69.6)	87.2	(82.1)	195.5	(138.8)	-	-

Notes:

[a] This calculation was only performed on data from October 2010 to September 2011.

EC-MSC Cambridge Bay Station (Climate ID 2400600, WMO ID 71925) is located at 69°06'29.000" N, 105°08'18.000" W at 31.1 m above sea level.

Table 3.1-4. Monthly Meteorological (September 2010 to October 2011) and Climate Normal (1971 to 2000, in brackets) Data from Kugluktuk EC-MSC Meteorological Station

Month	Mean Air Temperature °C		Mean Daily Minimum Air Temperature °C		Mean Daily Maximum Air Temperature °C		Mean Hourly Wind Speed m/s		Mean Hourly Wind Speed km/h		Maximum Wind Gust Speed m/s		Maximum Wind Gust Speed km/h		Total Rain mm		Total Snow cm		Total Precipitation mm		Mean Snow Depth cm	
Sep-10	3.9	(2.8)	0.8	(-0.4)	7.1	(6.0)	2.7	(4.7)	9.9	(16.8)	14.4	(23.6)	52	(85)	22.7	(32.1)	10.3	(8.1)	30.8	(39.0)	0.0	(0)
Oct-10	-4.0	(-7.2)	-6.4	(-10.3)	-1.5	(-4.0)	3.5	(4.8)	12.6	(17.4)	19.4	(24.7)	70	(89)	9.3	(5.1)	56.1	(34.1)	34.6	(29.5)	8.5	(9)
Nov-10	-14.3	(-19.6)	-18.1	(-23.4)	-10.4	(-15.7)	5.5	(4.7)	19.7	(16.8)	22.8	(27.8)	82	(100)	0.0	(0.0)	50.9	(19.7)	22.8	(12.6)	24.5	(20)
Dec-10	-23.5	(-25.5)	-27.2	(-29.6)	-19.7	(-21.4)	3.5	(5.1)	12.5	(18.2)	0.0	(28.9)	59	(104)	0.0	(0.0)	29.2	(18.6)	12.0	(11.5)	29.2	(28)
Jan-11	-26.9	(-27.8)	-31.0	(-31.9)	-22.7	(-23.7)	4.7	(5.3)	16.9	(19.0)	19.2	(29.4)	69	(106)	0.0	(0.0)	22.4	(15.4)	10.6	(11.0)	34.2	(35)
Feb-11	-23.5	(-27.4)	-28.0	(-31.7)	-19.0	(-23.0)	6.2	(5.1)	22.4	(18.5)	23.1	(29.4)	83	(106)	0.0	(0.0)	46.8	(16.5)	10.3	(9.9)	34.1	(43)
Mar-11	-21.0	(-25.3)	-26.6	(-29.8)	-15.2	(-20.6)	4.4	(4.3)	15.9	(15.6)	0.0	(29.4)	56	(106)	0.0	(0.0)	17.6	(16.0)	6.4	(10.6)	39.7	(47)
Apr-11	-18.2	(-17.0)	-22.9	(-21.8)	-13.4	(-12.1)	4.9	(3.7)	17.5	(13.4)	0.0	(23.1)	56	(83)	0.0	(0.6)	23.6	(17.8)	6.0	(13.3)	40.7	(48)
May-11	-3.1	(-5.3)	-7.0	(-9.2)	0.9	(-1.4)	3.6	(3.9)	13.0	(13.9)	15.8	(24.7)	57	(89)	0.4	(5.8)	16.6	(16.6)	5.0	(19.5)	20.0	(28)
Jun-11	4.1	(5.2)	0.4	(0.8)	7.8	(9.5)	3.7	(3.9)	13.5	(14.0)	15.0	(20.6)	54	(74)	8.6	(12.8)	0.6	(2.7)	9.0	(15.1)	0.0	(3)
Jul-11	12.4	(10.7)	7.3	(6.0)	17.5	(15.4)	3.1	(4.0)	11.1	(14.4)	13.3	(22.5)	48	(81)	20.0	(36.3)	0.0	(0.0)	20.0	(36.3)	0.0	(0)
Aug-11	11.1	(8.8)	7.6	(4.5)	14.5	(13.1)	3.9	(4.3)	14.2	(15.5)	16.4	(23.1)	59	(83)	97.9	(40.8)	0.0	(0.3)	97.9	(41.1)	0.0	(0)
Sep-11	4.7	(2.8)	1.4	(-0.4)	8.0	(6.0)	4.4	(4.7)	15.8	(16.8)	17.5	(23.6)	63	(85)	63.9	(32.1)	4.6	(8.1)	69.0	(39.0)	1.8	(0)
Oct-11	-4.2	(-7.2)	-7.0	(-10.3)	-1.3	(-4.0)	3.8	(4.8)	13.6	(17.4)	16.4	(24.7)	59	(89)	6.8	(5.1)	26.9	(34.1)	17.0	(29.5)	3.7	(9)
Mean [a]	-8.5	(-10.6)	-12.5	(-14.7)	-4.4	(-6.5)	4.3	(4.5)	15.4	(16.1)	13.5	(25.6)	63	(92.2)	-	-	-	-	-	-	19.4	(22)
Sum [a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200.1	(133.4)	268.4	(165.7)	303.6	(249.3)	-	-

Notes:

[a] This calculation was only performed on data from October 2010 to September 2011.

EC-MSC Kugluktuk Station (Climate ID 2300902, WMO ID 71938) is located at 67°49'00.000" N, 115°08'38.000" W at 22.6 m above sea level.

Table 3.1-5. Climate Normal (1971 to 2000) Data from Lupin Airport EC-MSC Meteorological Station

Month	Mean Air Temperature °C	Mean Daily Minimum Air Temperature °C	Mean Daily Maximum Air Temperature °C	Mean Hourly Wind Speed m/s	Mean Hourly Wind Speed km/h	Maximum Hourly Wind Speed m/s	Maximum Hourly Wind Speed km/h	Total Rain mm	Total Snow cm	Total Precipitation mm
Sep	1.8	-0.8	4.5	n/a	n/a	20.6	74	27.7	18.0	45.7
Oct	-8.6	-11.1	-6.1	n/a	n/a	19.4	70	1.9	28.2	30.1
Nov	-20.7	-24.2	-17.2	n/a	n/a	25.8	93	0.0	15.2	15.2
Dec	-26.8	-30.4	-23.2	n/a	n/a	19.4	70	0.0	14.4	14.4
Jan	-30.4	-34.0	-26.8	n/a	n/a	22.2	80	0.0	9.4	9.4
Feb	-28.5	-32.1	-24.8	n/a	n/a	30.3	109	0.0	8.4	8.4
Mar	-24.9	-28.8	-20.9	n/a	n/a	23.1	83	0.0	11.3	11.3
Apr	-15.9	-20.2	-11.5	n/a	n/a	18.6	67	0.1	13.7	13.8
May	-5.7	-9.4	-1.9	n/a	n/a	20.6	74	6.2	12.3	18.5
Jun	6.5	1.9	11.0	n/a	n/a	15.6	56	25.6	3.6	29.2
Jul	11.5	6.7	16.3	n/a	n/a	20.6	74	42.7	0.5	43.1
Aug	8.8	5.0	12.6	n/a	n/a	16.9	61	56.9	3.3	60.1
Sep	1.8	-0.8	4.5	n/a	n/a	20.6	74	27.7	18.0	45.7
Oct	-8.6	-11.1	-6.1	n/a	n/a	19.4	70	1.9	28.2	30.1
Mean [a]	-11.1	-14.8	-7.3	n/a	n/a	21.1	75.9	-	-	-
Sum [a]	-	-	-	-	-	-	-	161.1	138.3	299.2

Notes:

n/a = not available

[a] *This calculation was only performed on 12 months of data.*

EC-MSC Lupin Airport Station (Climate ID 23026HN) is located at 65°45'33.000" N, 111°15'00.000" W at 490.1 m above sea level.

Table 3.1-6. Climate Normal (1971 to 2000) Data from Lady Franklin EC-MSC Meteorological Station

Month	Mean Air Temperature °C	Mean Daily Minimum Air Temperature °C	Mean Daily Maximum Air Temperature °C	Mean Hourly Wind Speed m/s	Mean Hourly Wind Speed km/h	Maximum Hourly Wind Speed m/s	Maximum Hourly Wind Speed km/h	Total Rain mm	Total Snow cm	Total Precipitation mm
Sep	1.4	-0.6	3.4	5.9	21.4	20.0	72	14.8	4.7	19.5
Oct	-7.3	-10.0	-4.6	6.2	22.3	23.6	85	0.9	15.3	16.1
Nov	-20.0	-23.5	-16.5	5.5	19.9	21.1	76	0.0	6.4	6.4
Dec	-26.5	-29.8	-23.1	5.4	19.3	23.1	83	0.0	4.2	4.2
Jan	-28.6	-32.3	-25.1	5.4	19.5	22.2	80	0.0	4.7	4.7
Feb	-30.1	-33.7	-26.6	5.7	20.5	23.3	84	0.0	4.8	4.8
Mar	-27.4	-31.2	-23.6	5.4	19.6	20.6	74	0.0	4.2	4.2
Apr	-18.8	-23.1	-14.4	5.6	20.0	22.8	82	0.0	4.4	4.4
May	-6.9	-10.5	-3.4	5.7	20.4	21.4	77	1.5	3.5	5.0
Jun	2.8	-0.1	5.7	5.6	20.0	20.0	72	9.4	1.4	10.8
Jul	6.8	3.1	10.4	5.2	18.7	18.1	65	20.6	0.0	20.6
Aug	6.3	3.6	9.0	5.4	19.4	17.5	63	19.9	0.8	20.6
Sep	1.4	-0.6	3.4	5.9	21.4	20.0	72	14.8	4.7	19.5
Oct	-7.3	-10.0	-4.6	6.2	22.3	23.6	85	0.9	15.3	16.1
Mean [a]	-12.4	-15.7	-9.1	5.6	20.1	21.1	76.1	-	-	-
Sum [a]	-	-	-	-	-	-	-	67.1	54.4	121.3

Notes:

n/a = not available

[a] *This calculation was only performed on 12 months of data.*

EC-MSC Lady Frankline Station (Climate ID 2302680, WMO ID 71937) is located at 68°30'00.000" N, 113°13'00.000" W at 15.9 m above sea level.

Table 3.1-7. Temperature Trends and Variations in the Arctic Tundra Region, Autumn 2010 to Spring 2011

	Autumn 2010	Winter 2010/11	Spring 2011
Departure	+4.5ºC	+4.6ºC	+0.3ºC
Ranking[1]	2nd	2nd	37th

[1] Rankings are from warmest to coldest. Autumn 2010 is based on a 63 year period of record, while the winter 2010/11 and spring 2011 are based on 64 years.
Source: Environment Canada (EC 2011).

Figure 3.2-1 shows the Hope Bay Belt and regional monthly rainfall. Monthly and total annual rainfall data were available at all of the regional stations for September 2010 to October 2011. Since precipitation can vary greatly over a spatial domain, it is best to discuss rainfall estimates with respect to data from the closest EC-MSC regional station which is Cambridge Bay. Monthly rainfall accumulation between Doris, Boston and Cambridge Bay stations were relatively consistent with each other, compared to Kugluktuk station which is located much further west. The annual accumulative precipitation from Cambridge Bay station, between October 2010 and September 2011, was 195.5 mm comprised of 108.9 mm of rainfall and 87.2 mm of snow water equivalent (SWE). The 1971 to 2000 climate normal annual precipitation is 139 mm comprised of 70 mm of rainfall and 69 mm of SWE (50% snowfall and 50% rainfall). Snowfall can occur year round in the Cambridge Bay area but is typically highest during October when a mean value of 16.2 cm is measured. Typically, little to no snow falls during July. The rainiest month is usually August when a mean rainfall of 24.5 mm is measured.

In comparison to locations further south in Canada, the low Arctic regions are significantly drier. The record for highest daily rainfall at Cambridge Bay is 35.8 mm and occurred on July 24, 1988. The record for extreme daily snowfall was recorded on October 8, 1962 and is 20.8 cm. On average there are 77 days of the year when snowfall is greater than 0.2 cm and 36 days when rainfall is greater than 0.2 mm but only 2 days when snowfall is greater than 5 cm and 3 days when rainfall is greater than 5 mm.

Environment Canada's (2011) Climate Trends and Variations website indicated that during the 2010/11 hydrologic year (October to September) the Arctic Tundra (Table 3.2-1) was wetter than normal during autumn 2010 and winter 2010/2011, but dryer in spring 2011. At the time of reporting, the summer 2011 ranking was not yet available.

Table 3.2-1. Precipitation Trends and Variations in the Arctic Tundra Region, Autumn 2010 to Spring 2011

	Autumn 2010	Winter 2010/11	Spring 2011
Departure	+11.5%	+13.6%	-35%
Ranking[1]	25th	26th	60th

[1] Rankings are from wettest to driest. All rankings are based on a 63 year period of record.
Source: Environment Canada (EC 2011).

3.3 SOLAR RADIATION

Solar radiation is electromagnetic energy from the sun. Solar energy accounts for 99% of the Earth's energy budget. The solar radiation incident on top of the terrestrial atmosphere is called extraterrestrial solar radiation. Ninety seven percent of this radiation is confined to the spectral range of 0.29 to 3.0 microns and is referred to as short-wave radiation. A portion of the extraterrestrial solar radiation penetrates through the atmosphere to the earth's surface, while part of it is scattered and/or absorbed in the atmosphere by gases, aerosol particles, cloud droplets and cloud crystals. Global solar radiation is monitored at the Hope Bay Belt meteorological stations using a silicone pyranometer. Global solar radiation is the total incoming direct and diffuse short-wave solar radiation received from the whole dome of the sky on a horizontal surface.

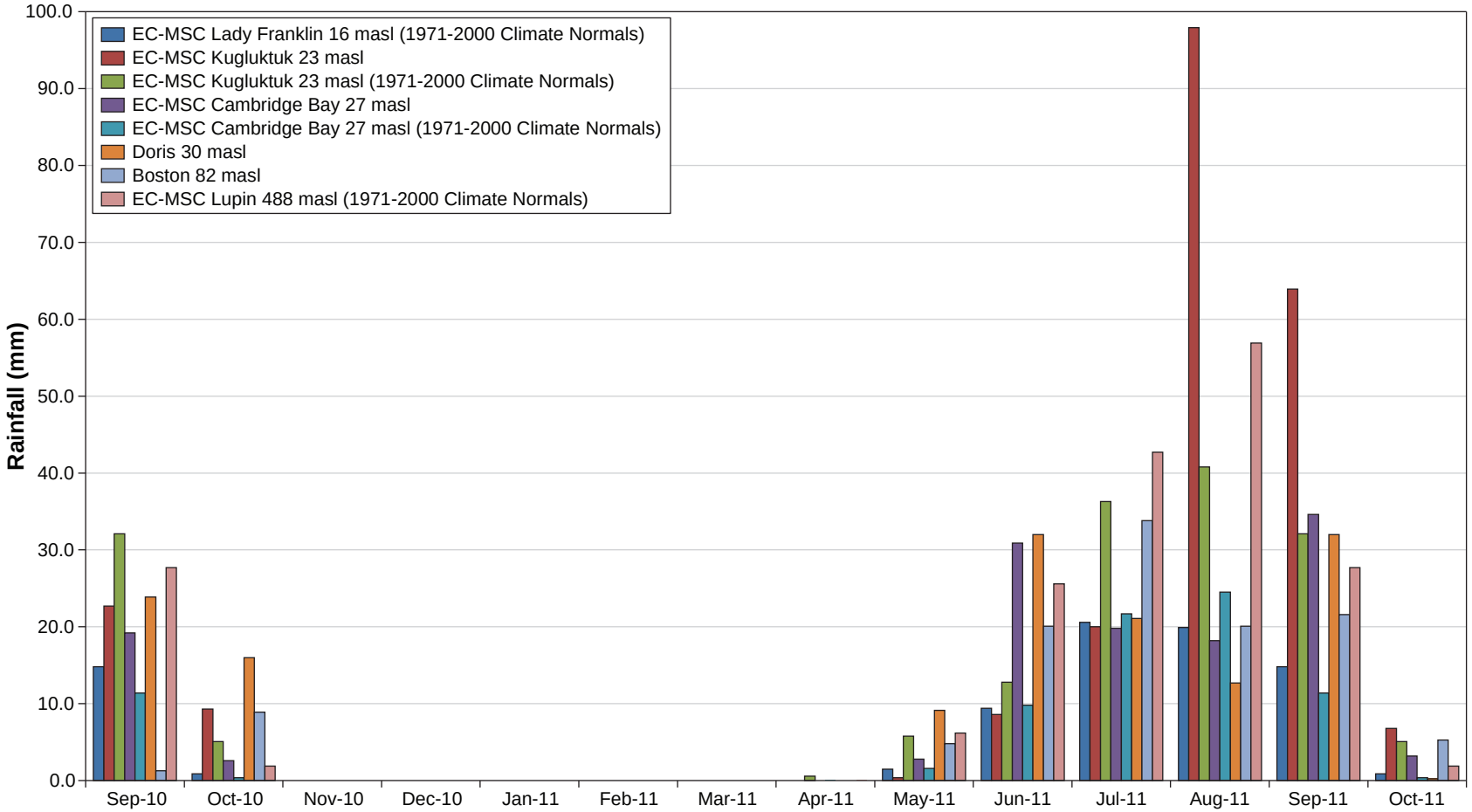

Figure 3.2-1

NEWMONT NORTH AMERICA

Hope Bay Belt Project and Regional Rainfall, September 2010 to October 2011

Figure 3.2-1

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Tables 3.1-1 and 3.1-2 provide monthly total bright sunshine hours and mean daily global solar radiation in watts per square metre at Boston and Doris stations, respectively. Figure 3.3-1 shows monthly mean global solar radiation at Boston and Doris. Appendix 3.1-1 provides daily mean global solar radiation values between September 2010 and October 2011 for these two stations. The highest daily mean solar radiations were 427 W/m^2 (June 17, 2011) and 336 W/m^2 (June 17, 2011) at Boston and Doris stations, respectively. The maximum hourly mean solar radiation value at the Boston station occurred on June 16, 2011 and was 966 W/m^2 at 1:00 p.m. The highest hourly mean solar radiation at Doris station was 736 W/m^2 on June 3, 2011 at 3:00 p.m. The Hope Bay Project area experiences almost 24 hours of sunlight per day from mid-May to the end of July.

The lowest solar radiation values are recorded during winter months when the sun is at its lowest angle and there is a higher frequency for low cloud cover that reflects and absorbs the solar radiation. The minimum mean daily solar radiation, 0.32 W/m^2, was recorded at the Boston station on December 25, 2010. The hourly mean solar radiation values recorded on that day were all below 3 W/m^2. The minimum mean daily solar radiation of 0.16 W/m^2 was recorded at the Doris station December 25, 2010. The hourly mean solar radiation values recorded on that day were all below 1.5 W/m^2. All of the hourly mean solar radiation values recorded during the night time were 0 W/m^2. The Hope Bay Project area experiences almost 24 hours of darkness per day during late November to early January.

A bright sunshine hour is defined by the World Meteorological Organization (WMO) as an hour when the mean global solar radiation is greater than 120 W/m^2. There were 2,677 hours and 2,365 hours of bright sunshine during the annual October 2010 to September 2011 measurement period at the Boston and Doris stations, respectively. Summer months have a significantly higher occurrence of bright sunshine hours than winter months. These values provide a guide for sizing potential solar panel systems at this site.

3.4 SNOW

An ultrasonic snow depth sensor was installed at Boston station on August 13, 2009 but due to the exposed nature of the meteorological station and high, consistent winds, snow was redistributed from the area. It is difficult to get an accurate single point measurement of snow depth in Arctic areas for this reason. Data recorded by the ultrasonic snow sensor is not representative of the Project area and was therefore excluded from this report. Some general statements about snow in Arctic areas as well as a summary of snow survey data previously collected from the Project area are provided below.

Arctic snow cover is often hard packed and denser than the snow of the subarctic (Williams 1957). The snow stratigraphy generally follows Benson et al. (1982) description derived from observations in Greenland, Antarctica and northern Alaska. Four major varieties of snow are recognized, including:

1. Fresh snow at the surface with variable crystal forms and a density between 150 and 200 kg m^{-3};
2. Hard and fine-grained windslab with a density between 305 and 450 kg m^{-3};
3. Medium-grained snow at a density between 230 and 350 kg m^{-3}; and
4. Depth hoar consisting of coarse, loosely-bonded crystals yielding a mean density between 200 and 300 kg m^{-3}.

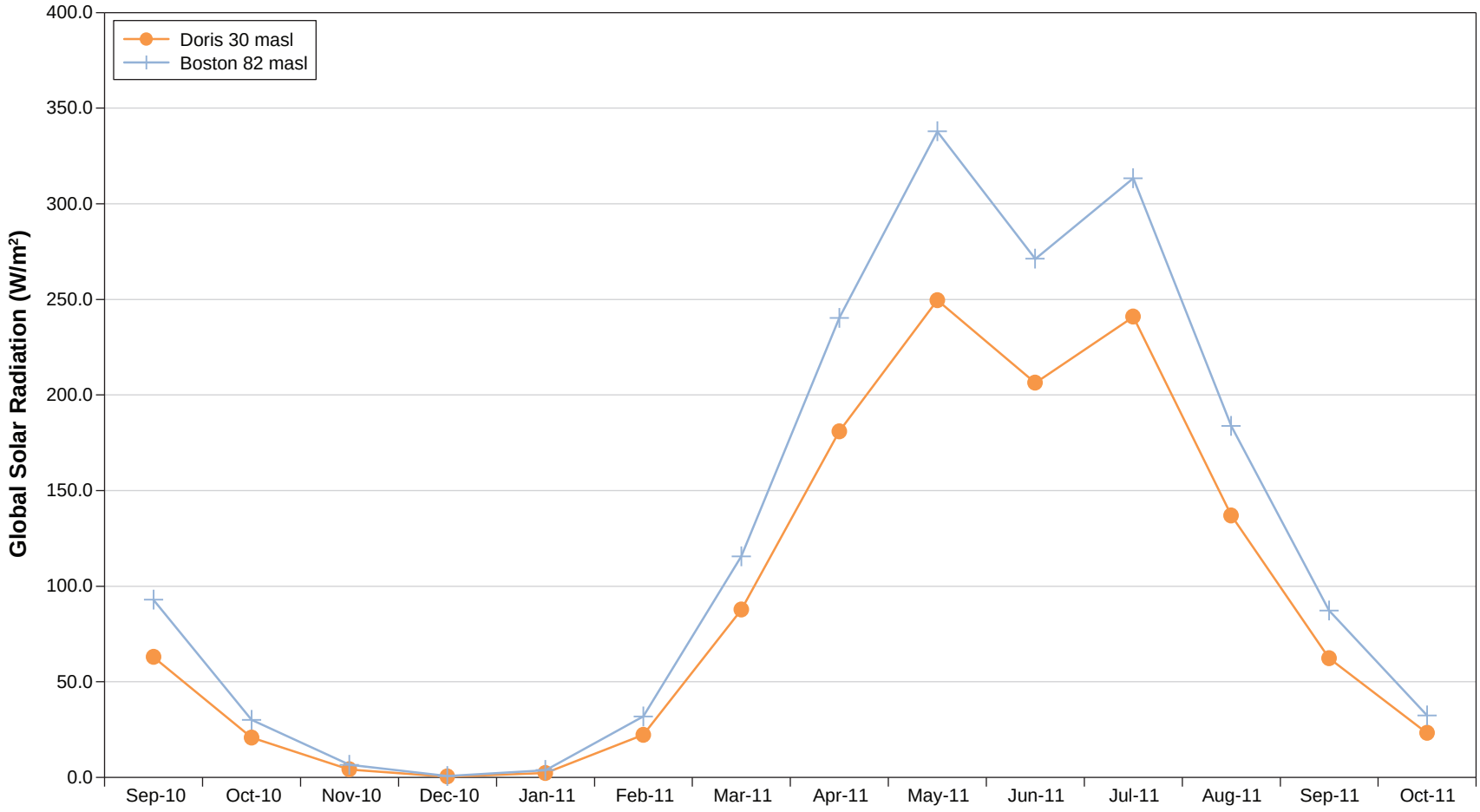

Figure 3.3-1

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Hope Bay Belt Project Mean Global Solar Radiation (W/m²), September 2010 to October 2011

Figure 3.3-1

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Wind redistributes snowfall over the course of a winter, and in general, exposed terrain, such as open lakes, collects less snow than sheltered lowland areas (Benson et al. 1982). Similarly, prevailing winds redistribute snow unequally across slopes of differing aspect. These effects may result in substantial differences between terrain types in some cases. However, this study involved a limited number of sampling sites in an area with little vegetation, and broad ranges of measured values were observed within each terrain type. As such, detailed calculation of the mean snow water equivalent, based on the relative proportion of each terrain type, is not recommended. An un-weighted mean of the SWE values for various terrain types based on 2004 to 2008 sampling, equal to 71.3 mm, may be used for site-specific water balance calculations. Results collected during 2008 which separated Boston and Doris and Madrid Project areas suggest that un-weighted mean SWE values should be slightly higher for the Boston area than for Doris area. Overall, SWE were higher in 2008 than previous years suggesting that snowpacks were larger during that year.

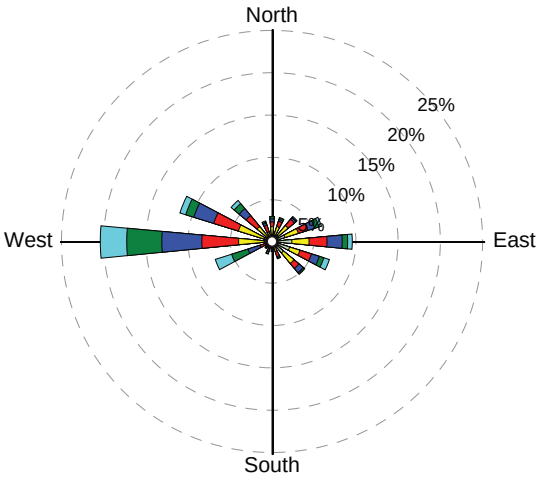
The extreme snow depth measured at Cambridge Bay EC-MSC station was 59 cm and was recorded on May 9, 1993. The highest monthly mean snow depth for the reporting period was 45.6 cm, for May 2011. The highest monthly mean climate normal (1971 to 2000) snow depth at that station is 31 cm for April. Annually, on average, there are 263 days at Cambridge Bay station when there is greater than 1 cm of snow on the ground and 132 days where snow is 20 cm or deeper.

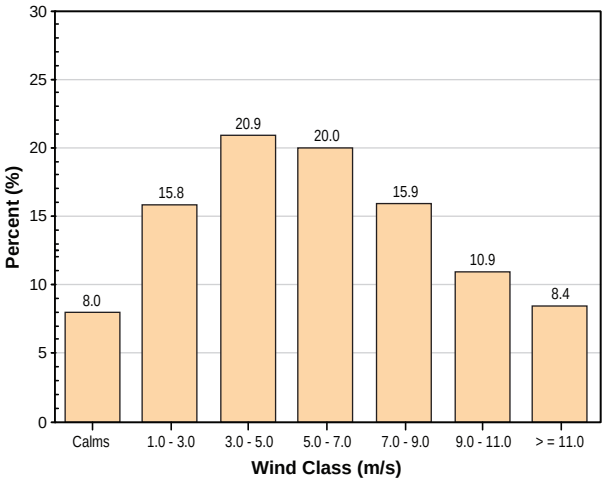
3.5 WIND SPEED AND DIRECTION

Figure 3.5-1 shows annual (October 2010 to September 2011), winter (October 2010 to May 2011), and summer (June 2011 to September 2011) wind direction and speed distributions, as well as wind speed class distributions at the Doris station. The predominant wind directions at the Doris meteorological station were from the west, west-northwest and east. Based on annual data, these wind directions were recorded 41.2% of the time. The mean wind speed was 5.8 m/s (20.9 km/h) and the most frequent wind speeds at this station were 3 to 5 m/s (10.8 to 18 km/h), occurring 20.9% of the time. Strong winds over 11 m/s (39.6 km/h) occurred 8.4% of the time, and calm conditions (i.e., hourly mean wind speeds less than 1 m/s (3.6 km/h)) were experienced 8.0% of the time. During the winter, winds were primarily from the west, west-northwest and west-southwest, occurring 46.1% of the time. Wind speed was generally higher during the winter, with 5 to 7 m/s (18 to 25.2 km/h) winds occurring 18.0% of the time, and calm and strong winds occurring 10.6% and 10.5% of the time, respectively. During the summer, the most frequent winds came from both the west and east, almost equally, at 13.6% and 13.5% of the time, respectively. Wind speeds were lower compared to the winter, with 3 to 5 m/s (10.8 to 18 km/h) winds occurring 27.6% of the time, and calm and strong winds occurring 2.9% and 4.3% of the time, respectively.

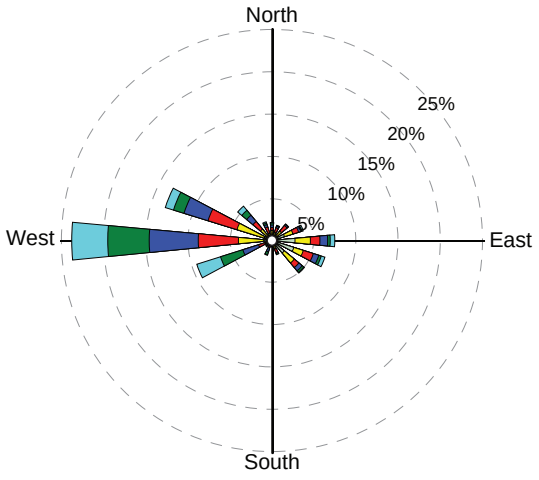
Figure 3.5-2 shows annual (October 2010 to September 2011), winter (October 2010 to May 2011), and summer (June 2011 to September 2011) wind direction and speed distributions, as well as wind speed class distributions at the Boston station. During the annual measurement period, the predominant wind directions were from the west-northwest, west and northwest 34.9% occurring of the time. The mean wind speed was 5.6 m/s (20.2 km/h) and the most frequent wind speeds at this station were 3 to 5 m/s (10.8 to 18 km/h), occurring 21.1% of the time. Strong winds over 11 m/s (39.6 km/h) occurred 6.9% of the time, and calm conditions (i.e., hourly mean wind speeds less than 1 m/s (3.6 km/h)) were experienced 5.8% of the time. During the winter, winds were primarily from the west-northwest, west and northwest occurring 41.4% of the time. The mean wind speed was generally higher during the winter, compared to summer, with 1 to 3 m/s (3.6 to 10.8 km/h) winds occurring 21.0% of the time, and calm and strong winds occurring 7.3% and 8.2% of the time, respectively. During the summer, the most frequent winds came from the east, north-northwest and west-north west, almost equally, occurring 29.5% of the time. Wind speeds were lower compared to the winter, with 3 to 5 m/s (10.8 to 18 km/h) winds occurring 26.8% of the time, and calm and strong winds occurring 2.8% and 4.2% of the time, respectively.

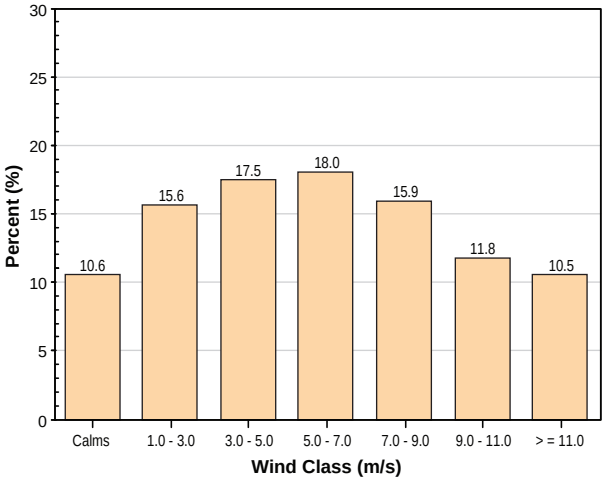
All Seasons



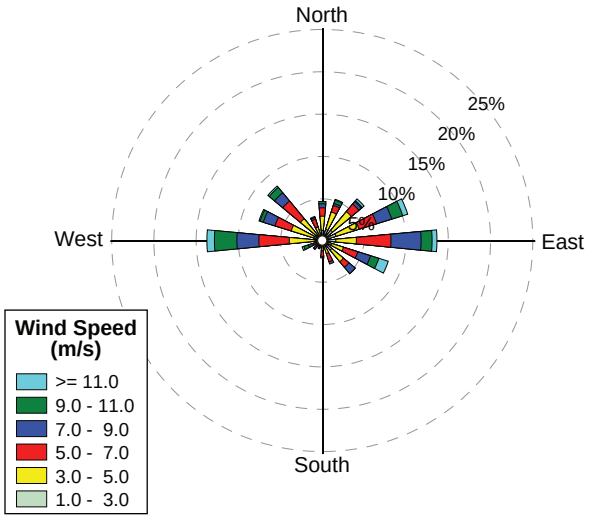


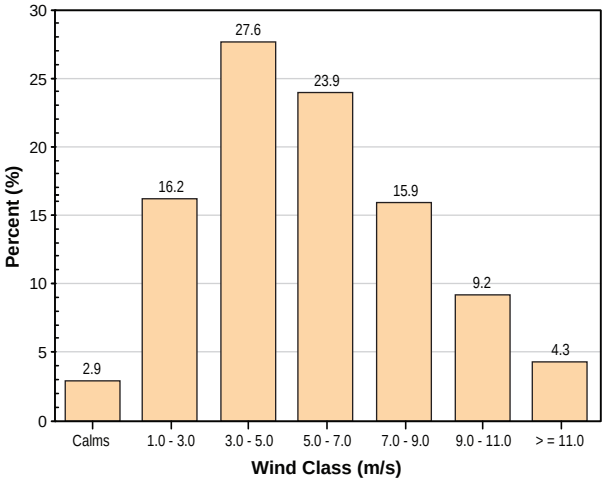
October to May





June to September





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Doris Station Windroses and Frequency Distributions, October 2010 to September 2011

Figure 3.5-1

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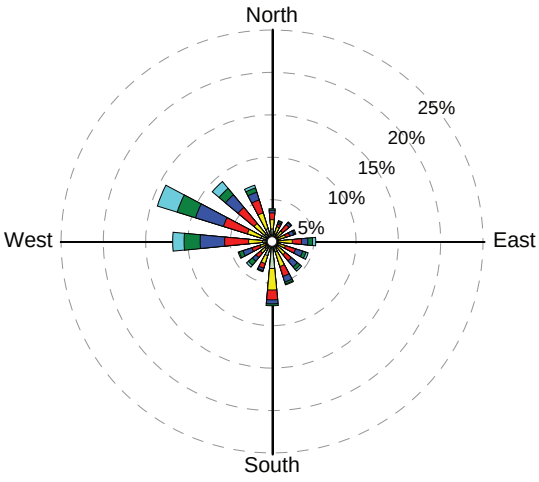
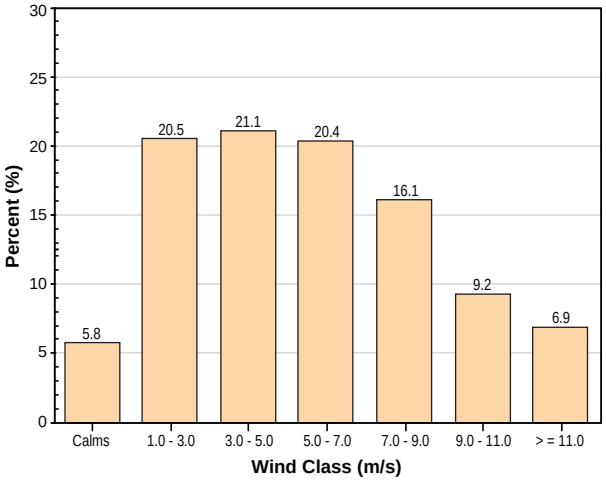
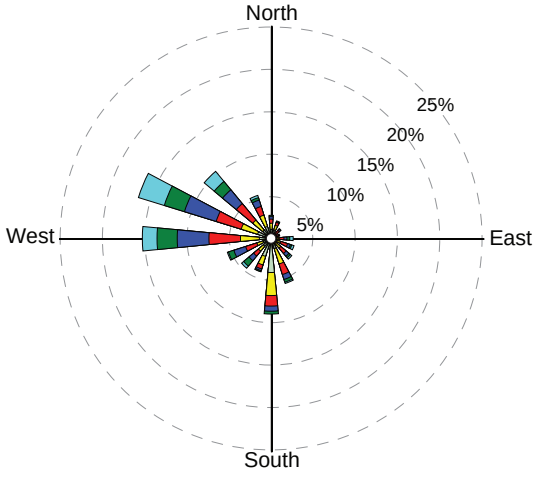
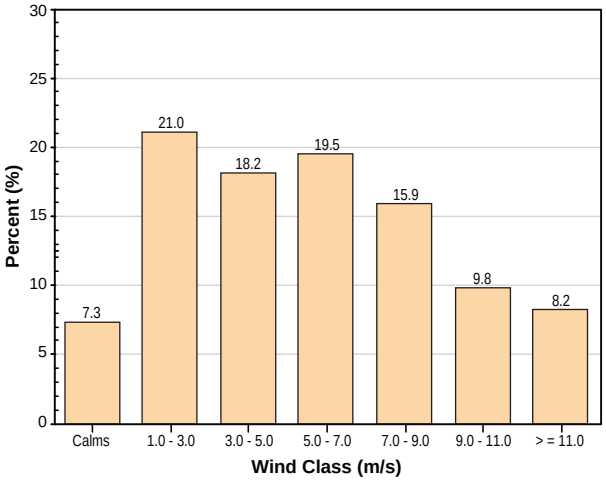
All Seasons



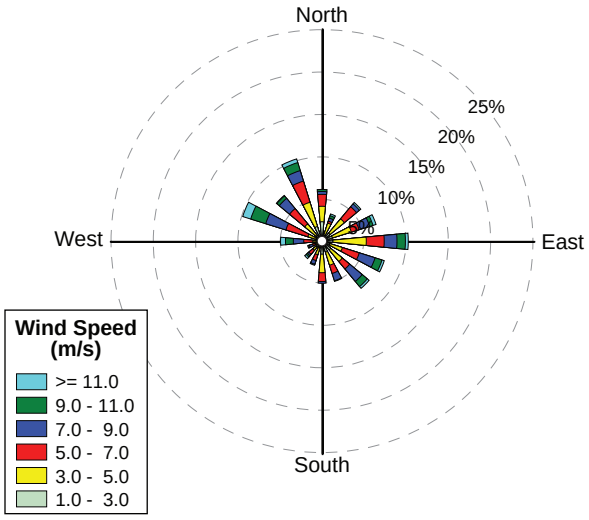


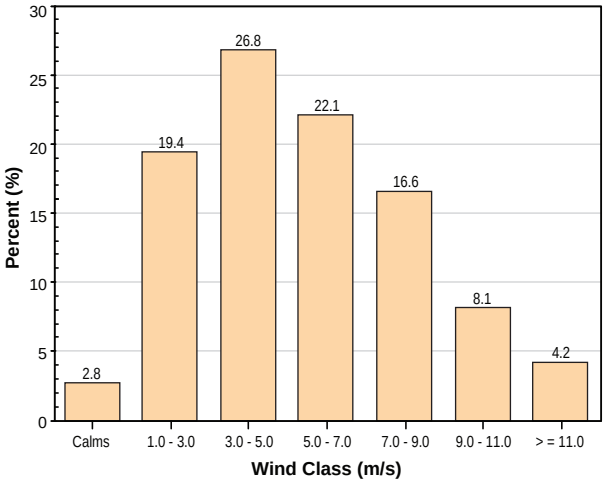
October to May





June to September





NEWMONT NORTH AMERICA

Boston Station Windroses and Frequency Distributions, October 2010 to September 2011

Figure 3.5-2

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The Roberts Bay wind monitoring station was installed in early May 2011 and therefore does not cover the entire annual and winter timespan. Table 3.5-1 shows the monthly mean wind speeds and maximum gust speeds. Figure 3.5-3 shows wind direction and speed distributions, as well as wind speed class distributions for the total May to October 2011 wind dataset. It is expected that the full annual and winter wind dataset would have a higher mean wind speed and western component to the wind direction. During the total measurement period, the predominant wind directions were from the east-southeast, east, and west occurring 35.4% of the time. The mean wind speed was 7.0 m/s (25.2 km/h) and most frequent wind speeds at this station were 5 to 7 m/s (18 to 25.2 km/h), occurring 22.6% of the time. Strong winds over 11 m/s (39.6 km/h) occurred 13.8% of the time, and calm conditions (i.e., hourly mean wind speeds less than 1 m/s (3.6 km/h)) were experienced 1.1% of the time.

Table 3.5-1. Monthly Wind Speed Data for Roberts Bay Station

Month	Mean Hourly Wind Speed m/s	Mean Hourly Wind Speed km/h	Maximum Wind Gust Speed m/s	Maximum Wind Gust Speed km/h
May-11[a]	6.1	21.9	20.2	72.8
Jun-11	7.5	27.0	22.8	82.0
July-11	6.2	22.4	20.8	74.9
Aug-11	6.6	23.9	25.9	93.3
Sep-11	7.6	27.4	30.5	109.7
Oct-11[b]	7.8	28.2	23.4	84.3
Mean	7.0	25.1	23.9	86.2

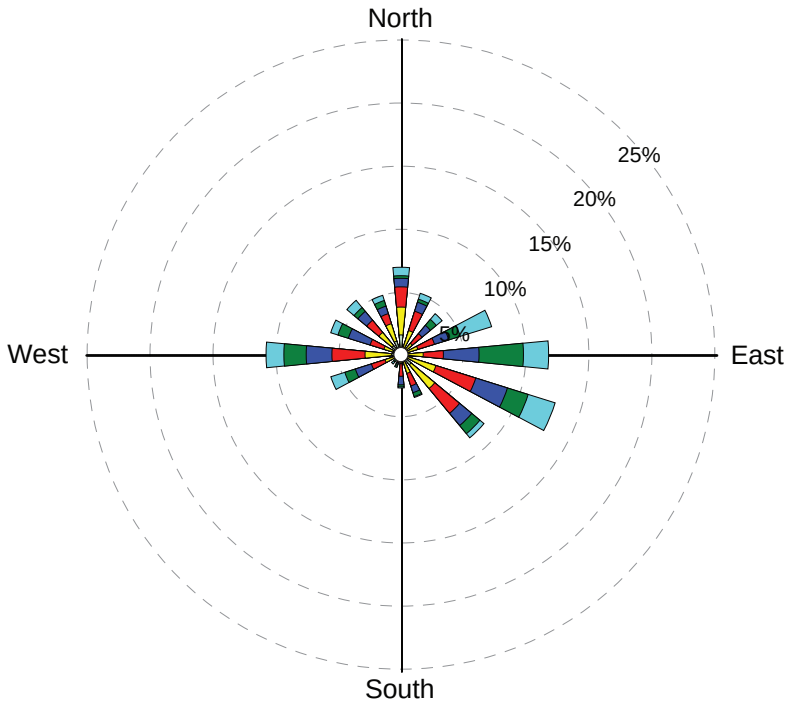
[a] *May is missing the first two days of data.*
[b] *October is missing the last two days of data.*

In general, wind speeds at Doris and Boston stations were less calm, had fewer occurrences of strong winds, and wind directions were more distributed in the summer compared to the winter. Because Roberts Bay station is located next to the ocean, it is expected that winds will be stronger at this station compared to Doris and Boston which are further inland.

The climate normal (1971 to 2000) mean annual wind speed for Cambridge Bay station is 5.4 m/s (19.4 km/h) which is slightly stronger than wind speeds measured at Doris or Boston, but weaker than Roberts Bay. Similar to Doris and Boston meteorology stations, the most common wind direction is from the northwest, although winds from both onsite stations also frequently blew from the southeast. The maximum gust speeds measured during this reporting period at Doris, Boston and Roberts Bay were 26.1 m/s (93.8 km/h) on January 15, 25.3 m/s (91.2 km/h) on February 7, and 30.5 m/s (109.7 km/h) on September 8, respectively. The maximum gust speed ever recorded at Cambridge Bay station was 33.9 m/s (122 km/h) on December 23, 1976. On average, 14 days with wind speeds greater than 17.5 m/s (63 km/h) and 44 days with wind speeds greater than 14.4 m/s (52 km/h) occur annually, at this station. Most of these high wind days occur during the winter months.

3.6 EVAPORATION

Lake evaporation values were calculated using data from the Doris Lake micro-meteorology (evaporation) station (reinstalled on August 12, 2011) by two methods, the Penman Combination and the Priestly-Taylor. In total, 64 days of data were collected (August 12, 2011 to October 14, 2011). On average, the Doris North Project area experiences an open-water season that starts in early to mid-July; however, there are variations in the length of the open water season year to year. The Doris Lake evaporation station will be installed again in 2012, as soon as possible after ice-off.



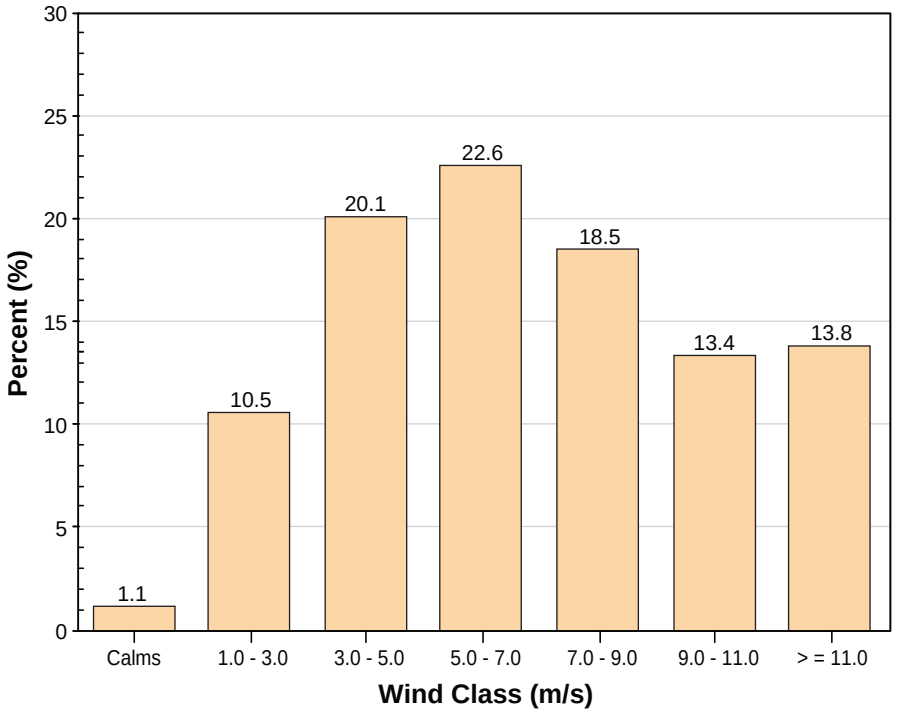


Figure 3.5-3

NEWMONT NORTH AMERICA

Roberts Bay Station Windrose and Frequency Distribution, May to October 2011

Figure 3.5-3

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From August 22 to October 14, 2011 the thermistor designated to measure water temperature at a depth of 75 cm below the lake malfunctioned. The best method available to fill this data gap was to assume that the water temperature difference between 10 cm and 75 cm was equal to the mean temperature difference of last year's data. This was reasonable because last year's data had a very consistent temperature difference between the two water depths, and because air and water heat fluxes in the Arctic have small influences on the evaporation rate.

Total evaporation values in the Doris North Project area from July 1 to mid-October 2011 were estimated to be 163.5 and 156.0 mm based on total monthly evaporation values calculated using the Penman Combination and Priestly-Taylor methods, respectively (Table 3.6-1). The micro-meteorology station was not installed until August 12; therefore, meteorological measurements from the Doris station were used to calculate the evaporation from July 1 to August 11, 2011. Correction factors were applied to these measurements to account for the difference in station location and sensor heights, compared to Doris Lake station. These corrections were based on the relationship between measurements taken from Doris station and Doris Lake station between August 12 and October 14, 2011.

Table 3.6-1. Hope Bay Belt Project – 2011 Monthly Evaporation

	Mean Daily Evaporation Rate (mm/day)		Total Monthly Evaporation (mm)	
Month	Penman Method	Priestly-Taylor Method	Penman Method	Priestly-Taylor Method
July[a]	3.31	3.34	99.2	100.2
August[a,b]	1.59	1.46	49.3	45.2
September	0.44	0.33	13.3	9.9
October[c]	0.06	0.02	1.8	0.7
2011 Mean	*1.35*	*1.29*	-	-
2011 Sum	-	-	*163.5*	*156.0*

Note:
[a] The July 1 to August 11, 2011 evaporation values were calculated from Doris station meteorological data. Correction factors were applied to these measurements to account for the difference in station location and sensor heights, compared to Doris Lake station. These corrections were based on the relationship between measurements taken from Doris and Doris Lake stations between August 12 and October 14, 2011.
[b] The micro-meteorology station was installed on August 12, 2011.
[c] The micro-meteorology station was uninstalled on October 14, 2011.
From August 22 to October 14, 2011 the thermistor designated to measure water temperature at a depth of 75 cm below the lake malfunctioned. The best method available to fill this data gap was to assume that water temperature difference between 10 cm and 75 cm was the mean temperature difference of last year's data. This is reasonable because last year's data had a fairly consistent temperature difference between the two water depths, and because the air and water heat fluxes in the Arctic only have a small influence on the evaporation rate.

Evaporation measured from this station between July and August shows how evaporation in August is roughly half of the evaporation in July. This is due to the fact that solar radiation has the largest influence on evaporation rate, and the water surface receives significantly more solar radiation in July than August, after which it decreases significantly (see Figure 3.3-1). The total evaporation measured between July and September 2009 and 2010 amounts to roughly 166 mm (Rescan 2009a, 2010).

Evaporation measured at Polar Lake for the EKATI Diamond Mine Project in 2008 was approximately 277 mm using the Penman method and based on 122 days of measurement (June 1 to September 31, 2008; Rescan 2009b). The EKATI Diamond Mine Project is located about 420 km south of the Hope Bay Belt Project, meaning that it is located at lower latitude and is more continental than the Hope Bay

Belt Project (see Figure 1-1). These characteristics mean that it experiences a longer open-water season and more heating days than Hope Bay which result in higher evaporation.

Lake evaporation has also been measured at the Lupin mine site that is approximately 470 km southwest of the Hope Bay Belt Project. The Preistly-Taylor evaporation calculated for a 54 day period in summer 1992 was 171 mm and for a 46 day period in 1993 it was 103 mm (Gibson, Prowse, and Edwards 1996).

4. Summary

4. Summary

Meteorological data were collected from September 2010 to October 2011 for the Hope Bay Belt Project using two automated meteorology stations (Doris and Boston), a micro-meteorology (evaporation) station (Doris Lake), and a 3 m wind tower (Roberts Bay). Each year, starting in 2009, the micro-meteorology station was installed in Doris Lake to collect evaporation data during the open-water season. The 3 m wind tower was installed near the coast of Roberts Bay in May 2011.

The annual mean temperature was -10.0ºC and -9.9ºC for both the Doris and Boston stations, respectively, for the 2010/11 hydrologic year. Comparisons to MSC regional data from the nearest stations show that temperatures recorded in the Hope Bay Belt Project area followed regional trends and that temperatures during the measurement period were warmer than normal. This was confirmed by the *Climate Trends and Variations Bulletin* (EC 2011) which indicated that autumn 2010 and winter 2010/11 were the second warmest on record (based on 63 and 64 years of data, respectively) in the Arctic Tundra Region. The 1971 to 2000 climate normal mean annual air temperatures for the EC-MSC regional stations ranged from -14.4ºC to -10.6ºC at the Cambridge Bay and Kugluktuk Airport stations, respectively.

Total annual rainfall during the period (October 2010 to September 2011) was 122.9 mm and 109.3 mm at the Doris and Boston stations, respectively. The 1971 to 2000 climate normal annual precipitation at the Cambridge Bay regional station is 139 mm, comprised of 70 mm of rainfall and 69 mm of snow water equivalent (SWE).

Solar radiation in the Arctic is high during the summer and very low during the winter. The annual mean number of bright sunshine hours, where mean global solar radiation is greater than 120 W/m^2, was 2,667 at Boston station and 2,365 at Doris station.

In general, wind in the Hope Bay Belt region typically blows from the northwest quadrant year round although winds are also common from the east and southeast. Mean annual wind speeds at Doris, Boston and Roberts Bay were 5.8 m/s (20.9 km/h), 5.6 m/s (20.1 km/h), and 7.0 m/s (25.2 km/h), respectively.

No new snowcourse data was obtained during the measurement period. A mean of the snow water equivalent values for various terrain types based on 2004 to 2008 sampling, is equal to 71.3 mm, and may be used for site-specific water balance calculations. Results collected during 2008 which separated Boston, Doris and Madrid areas, suggest that mean snow water equivalent values should be slightly higher for the Boston area than for the Doris Project area. Overall, snow water equivalents were higher in 2008 than previous years suggesting that snowpacks were larger during that year.

Total evaporation values in the Hope Bay Belt Project area from July to October 2011 were estimated to be 163.5 and 156.0 mm, using the Penman Combination and Priestly-Taylor methods, respectively.

References

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References

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

Benson, C. S. 1982. *Reassessment of winter precipitation on Alaska's Arctic slope and measurement on the flux of wind blown snow*. Geophysical Institute, University of Alaska: Fairbanks, Alaska.

Brutsaert, W. 1982. *Evaporation into the Atmosphere: Theory, History, and Applications*. Dordrecht, The Netherlands: D. Reidel Publishing.

Chow, V. T., D. R. Maidment, and L. W. Mays. 1988. *Applied Hydrology*. New York, NY: McGraw-Hill Book Co.

EC. 2011. *Climate Trends and Variations Bulletins*. http://www.ec.gc.ca/adsc-cmda/default.asp?lang=En&n=4A21B114-1 (accessed January 2012).

Gibson, J. J., T. D. Prowse, and T. W. D. Edwards. 1996. Evaporation from a small lake in the continental arctic using multiple methods. *Nordic Hydrology*, 27: 1-24.

MSC. 2004. *MSC Guidelines for Co-operative Climatological Autostations, Version 3.0*. Environment Canada, MSC, Surface Weather, Climate and Marine Division, Atmospheric Monitoring Water Survey Branch: n.p.

National Resources Council. 2005. *The Atlas of Canada – Snow Cover*. http://atlas.gc.ca/site/english/maps/environment/climate/snowcover/1 (accessed January 2012).

Rescan. 2002. *1993 to 2002 Data Compilation Report for Meteorology and Hydrology*. Prepared for Miramar Hope Bay Ltd. By Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2009a. *2009 Meteorology Baseline Report, Hope Bay Belt Project*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2009b. *EKATI Diamond Mine: 2008 Aquatic Effects Monitoring Program – Appendix B: Data Report*. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd.: Yellowknife, NT.

Rescan. 2010. *Doris North Gold Mine Project: 2010 Meteorology Compliance Report*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.: Vancouver, BC.

Shuttleworth, W. J. 1993. Evaporation. In *Handbook of Hydrology*. Ed. D. R. Maidment. New York, NY: McGraw-Hill Book Co.

Stewart, R. B. and W. R. Rouse. 1977. Substantiation of the Priestly and Taylor parameter $\alpha = 1.26$ for potential evaporation in high latitudes. *Journal of Applied Meteorology*, 16(6): 649-650.

Williams, G. P. 1957. *An analysis of snow cover characteristics at Aklavik and Resolute, Northwest Territories*. Research Paper No. 40. National Research Council of Canada, Division of Building Research: Ottawa, ON.

Yarwood, T. M. and F. Castle. 1970. *Physical and Mathematical Tables*. 3rd ed. Basingstoke and London, UK: Macmillan and Co. Ltd.

Appendix 3.1-1

Daily Temperatures, Solar Radiation and Rainfall for Boston and Doris Stations, Sept. 1, 2010 to Oct. 29, 2011

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Appendix 3.1-1. Daily Temperature, Solar Radiation and Rainfall for Boston and Doris Stations, Sept. 1, 2010 to Oct. 29, 2011

	Boston					Doris				
Date	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (˚C)	Daily Maximum Air Temperature (˚C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (˚C)	Daily Maximum Air Temperature (˚C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)
9/1/2010	3.9	6.9	8.9	98.4	n/a	5.2	7.5	9.7	73.4	0.0
9/2/2010	2.9	9.7	15.5	226.2	n/a	4.0	9.3	16.2	165.5	0.0
9/3/2010	7.5	12.5	18.4	218.2	n/a	5.1	12.2	18.9	158.2	0.0
9/4/2010	8.1	9.9	11.2	29.3	n/a	9.3	11.0	13.9	69.5	0.0
9/5/2010	7.5	9.7	11.3	31.7	n/a	7.9	9.7	11.0	23.7	13.5
9/6/2010	4.5	7.2	9.0	153.0	n/a	3.5	7.0	8.8	95.7	0.0
9/7/2010	1.6	2.9	4.5	81.6	n/a	1.9	3.0	4.2	52.5	0.0
9/8/2010	-0.7	1.5	4.5	163.2	n/a	0.6	2.3	4.8	110.4	0.0
9/9/2010	2.4	6.1	11.6	186.3	n/a	2.0	5.7	10.4	98.3	0.0
9/10/2010	1.5	5.5	11.2	127.7	n/a	3.1	4.5	6.4	57.9	0.0
9/11/2010	2.2	4.6	7.4	95.0	n/a	1.9	4.2	6.7	70.7	0.0
9/12/2010	2.5	4.6	6.5	89.5	n/a	2.0	4.4	6.4	71.0	0.3
9/13/2010	3.4	6.5	9.1	60.5	n/a	5.3	6.9	8.4	30.8	2.3
9/14/2010	4.0	7.4	9.4	64.5	n/a	2.9	6.8	8.9	38.6	6.4
9/15/2010	-0.9	0.4	4.1	68.9	n/a	-0.6	0.6	2.9	44.3	0.0
9/16/2010	-0.5	2.0	5.8	133.6	n/a	-0.5	2.5	5.6	74.0	0.8
9/17/2010	-1.2	0.5	2.4	117.4	0.0	-0.6	0.8	2.5	65.8	0.0
9/18/2010	-0.8	1.0	3.7	74.0	0.3	-0.4	1.7	3.7	52.8	0.3
9/19/2010	-2.1	-1.1	0.4	97.1	0.0	-1.9	-1.3	0.0	55.4	0.0
9/20/2010	-2.0	-0.5	2.0	78.8	0.0	-2.0	-0.3	2.6	57.7	0.0
9/21/2010	-1.5	0.1	0.8	60.5	0.0	-0.5	0.6	1.9	48.3	0.0
9/22/2010	-2.5	-1.1	0.9	76.5	0.0	-2.0	-0.8	1.1	55.6	0.0
9/23/2010	-1.8	-0.8	0.2	41.9	0.0	-1.6	-0.3	0.5	28.8	0.0
9/24/2010	-1.5	-0.4	0.4	56.9	0.0	-0.8	0.0	1.0	40.3	0.0
9/25/2010	-3.8	-2.3	-1.3	45.6	0.0	-3.4	-1.3	-0.1	40.3	0.0
9/26/2010	-4.5	-3.1	-2.0	46.3	0.0	-3.5	-2.4	-0.7	30.9	0.0
9/27/2010	-4.8	-3.3	-2.3	60.7	0.0	-3.7	-2.3	-1.5	32.5	0.0
9/28/2010	-3.0	-1.2	0.6	65.3	0.5	-2.7	-0.5	1.4	48.4	0.0
9/29/2010	-3.8	-0.3	1.1	69.4	0.3	-2.9	0.0	1.9	52.1	0.3
9/30/2010	-4.9	-0.5	2.1	67.8	0.3	-4.3	0.2	3.0	46.0	0.3
10/1/2010	-0.3	0.5	2.2	35.6	3.0	-0.4	0.7	2.8	27.6	0.8
10/2/2010	-0.3	0.6	1.6	28.9	0.0	-0.7	0.3	1.2	20.9	0.0
10/3/2010	-6.1	-2.0	0.7	36.9	1.8	-5.7	-1.9	1.1	23.1	0.8
10/4/2010	-6.6	-4.8	-3.7	45.7	0.0	-6.5	-4.9	-3.1	37.0	0.0
10/5/2010	-3.7	-0.8	1.1	66.2	1.8	-5.0	-1.1	1.4	32.8	0.5
10/6/2010	-1.9	0.3	1.2	27.3	0.5	-2.0	0.8	2.1	20.6	2.8
10/7/2010	-3.3	-2.3	-0.5	41.7	0.0	-4.5	-2.7	-0.7	27.6	0.0
10/8/2010	-3.2	-0.9	2.2	53.7	0.0	-4.1	-1.1	3.0	45.0	1.3
10/9/2010	-5.1	-2.6	-0.8	61.6	0.0	-3.8	-1.7	0.0	39.5	0.0
10/10/2010	-4.4	-1.4	0.8	15.4	0.3	-3.9	-1.3	0.2	13.7	0.0
10/11/2010	0.4	2.1	3.8	29.4	1.3	-0.1	1.8	3.8	16.1	8.9
10/12/2010	-1.1	0.4	1.6	13.0	0.0	-0.8	1.2	2.4	11.8	1.0
10/13/2010	-3.5	-2.4	-0.9	22.6	0.0	-3.9	-2.8	-0.8	8.9	0.0
10/14/2010	-6.2	-4.5	-3.3	22.7	0.0	-5.5	-4.9	-3.8	19.6	0.0
10/15/2010	-6.9	-5.7	-4.5	13.0	0.0	-6.4	-5.4	-4.8	13.9	0.0
10/16/2010	-6.7	-5.9	-5.0	18.2	0.0	-5.9	-5.2	-4.7	22.7	0.0
10/17/2010	-7.3	-6.1	-5.2	18.5	0.0	-7.2	-6.2	-4.8	20.0	0.0
10/18/2010	-8.0	-6.0	-3.4	30.2	0.0	-7.4	-4.4	-2.3	25.6	0.0
10/19/2010	-5.1	-3.5	-2.6	35.9	0.0	-3.4	-2.3	-1.8	30.2	0.0
10/20/2010	-3.9	-3.4	-2.9	25.9	0.0	-3.0	-2.5	-1.4	15.8	0.0
10/21/2010	-3.1	-1.7	-1.0	24.6	0.0	-1.4	-0.8	-0.1	13.1	0.0
10/22/2010	-4.1	-2.1	-1.0	23.3	0.0	-3.0	-1.6	-0.7	17.7	0.0
10/23/2010	-4.5	-3.2	-1.6	30.5	0.0	-3.7	-2.2	-0.8	12.3	0.0
10/24/2010	-4.7	-3.7	-2.8	23.8	0.0	-4.2	-2.4	-0.2	16.8	0.0
10/25/2010	-8.6	-5.2	-3.6	36.3	0.0	-6.1	-3.3	-1.8	17.4	0.0

Note: n/a = not available

Appendix 3.1-1. Daily Temperature, Solar Radiation and Rainfall for Boston and Doris Stations, Sept. 1, 2010 to Oct. 29, 2011

	Boston					Doris				
Date	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)
10/26/2010	-10.7	-6.6	-4.3	20.2	0.0	-11.6	-4.4	-1.7	18.0	0.0
10/27/2010	-13.5	-10.5	-6.6	16.3	0.0	-12.4	-10.0	-6.1	11.1	0.0
10/28/2010	-18.1	-10.7	-6.2	48.7	0.0	-16.0	-9.6	-4.5	30.2	0.0
10/29/2010	-18.7	-12.1	-7.3	22.9	0.0	-19.6	-12.6	-6.3	13.2	0.0
10/30/2010	-7.3	-3.4	0.4	29.2	0.0	-8.1	-3.3	0.9	14.6	0.0
10/31/2010	-6.3	-1.3	1.2	13.8	0.3	-7.3	-2.7	1.3	8.6	0.0
11/1/2010	-8.4	-4.7	-1.7	16.6	0.0	-9.9	-4.5	-1.3	12.1	0.0
11/2/2010	-11.8	-7.8	-4.6	18.0	0.0	-10.3	-7.4	-4.0	10.7	0.0
11/3/2010	-13.1	-11.4	-8.0	12.4	0.0	-14.9	-12.0	-9.1	9.9	0.0
11/4/2010	-21.8	-18.0	-13.1	16.4	0.0	-17.9	-16.7	-14.3	11.2	0.0
11/5/2010	-17.3	-12.3	-8.3	8.4	0.0	-16.4	-12.9	-7.7	4.8	0.0
11/6/2010	-9.9	-7.7	-6.1	7.0	0.0	-9.3	-7.2	-5.8	4.6	0.0
11/7/2010	-17.5	-12.8	-9.7	9.9	0.0	-14.0	-11.8	-9.1	7.6	0.0
11/8/2010	-24.0	-15.8	-12.8	7.9	0.0	-18.3	-14.6	-12.3	5.7	0.0
11/9/2010	-24.1	-18.3	-10.4	8.4	0.0	-22.4	-18.4	-12.0	4.1	0.0
11/10/2010	-10.4	-6.9	-5.3	6.7	0.0	-12.2	-6.9	-5.6	4.6	0.0
11/11/2010	-12.3	-8.1	-6.3	13.7	0.0	-8.6	-7.0	-5.5	4.1	0.0
11/12/2010	-12.7	-9.5	-6.5	6.7	0.0	-13.2	-9.3	-6.9	4.3	0.0
11/13/2010	-16.6	-12.8	-8.9	10.9	0.0	-16.2	-12.2	-10.1	7.7	0.0
11/14/2010	-18.4	-16.8	-14.9	4.8	0.0	-17.5	-15.7	-13.8	2.6	0.0
11/15/2010	-23.6	-16.5	-13.1	8.2	0.0	-22.4	-15.2	-11.7	3.7	0.0
11/16/2010	-25.5	-20.8	-14.8	4.5	0.0	-26.0	-20.2	-14.9	3.3	0.0
11/17/2010	-29.9	-25.1	-17.2	6.7	0.0	-27.2	-24.0	-15.9	4.3	0.0
11/18/2010	-18.5	-14.7	-13.2	3.6	0.0	-15.8	-13.1	-11.6	2.4	0.0
11/19/2010	-28.3	-18.5	-10.1	3.6	0.0	-27.1	-19.2	-10.5	2.1	0.0
11/20/2010	-30.3	-28.7	-27.2	4.4	0.0	-28.8	-27.6	-25.7	2.7	0.0
11/21/2010	-28.7	-21.7	-16.3	2.5	0.0	-27.7	-20.7	-15.5	1.4	0.0
11/22/2010	-17.4	-16.5	-15.3	1.8	0.0	-16.8	-15.7	-14.2	0.8	0.0
11/23/2010	-26.9	-22.2	-16.4	3.4	0.0	-25.7	-21.1	-15.1	2.0	0.0
11/24/2010	-31.4	-24.2	-19.5	2.6	0.0	-28.9	-20.0	-15.5	1.5	0.0
11/25/2010	-38.8	-36.1	-31.3	2.6	0.0	-36.9	-33.3	-28.6	1.4	0.0
11/26/2010	-39.6	-32.5	-28.2	2.6	0.0	-37.7	-34.2	-29.8	1.4	0.0
11/27/2010	-28.7	-22.7	-20.2	1.3	0.0	-29.9	-24.6	-19.3	0.7	0.0
11/28/2010	-23.3	-21.1	-16.5	1.1	0.0	-22.6	-20.4	-17.5	0.9	0.0
11/29/2010	-21.4	-17.8	-16.8	0.8	0.0	-21.9	-18.2	-16.9	0.6	0.0
11/30/2010	-23.5	-18.8	-16.2	0.8	0.0	-24.1	-19.6	-16.0	0.5	0.0
12/1/2010	-19.8	-16.6	-15.1	1.3	0.0	-20.1	-16.9	-16.2	0.6	0.0
12/2/2010	-25.4	-22.8	-19.8	1.0	0.0	-24.0	-22.1	-20.0	0.7	0.0
12/3/2010	-28.9	-26.9	-22.8	1.5	0.0	-27.8	-25.9	-21.2	0.9	0.0
12/4/2010	-32.6	-29.5	-27.1	1.3	0.0	-32.6	-28.6	-25.8	0.7	0.0
12/5/2010	-31.8	-25.9	-22.1	0.6	0.0	-32.3	-26.4	-22.2	0.4	0.0
12/6/2010	-30.6	-29.3	-26.6	1.0	0.0	-31.9	-28.8	-25.8	0.5	0.0
12/7/2010	-34.8	-33.0	-29.9	0.8	0.0	-33.4	-32.0	-31.2	0.4	0.0
12/8/2010	-35.1	-34.1	-32.4	0.8	0.0	-33.0	-32.3	-31.6	0.4	0.0
12/9/2010	-33.6	-30.7	-25.8	0.7	0.0	-32.2	-28.8	-23.0	0.4	0.0
12/10/2010	-25.8	-23.6	-22.8	0.5	0.0	-23.9	-23.0	-22.0	0.2	0.0
12/11/2010	-27.3	-25.3	-23.1	0.9	0.0	-26.6	-24.6	-21.9	0.5	0.0
12/12/2010	-26.5	-23.9	-20.9	0.6	0.0	-25.7	-23.2	-20.5	0.3	0.0
12/13/2010	-29.8	-24.4	-20.4	0.4	0.0	-29.8	-24.2	-20.4	0.2	0.0
12/14/2010	-31.0	-29.2	-28.0	0.6	0.0	-30.9	-29.2	-28.0	0.3	0.0
12/15/2010	-32.5	-31.4	-29.5	0.7	0.0	-32.9	-31.8	-30.9	0.4	0.0
12/16/2010	-32.1	-22.9	-19.9	0.6	0.0	-31.3	-23.3	-19.2	0.3	0.0
12/17/2010	-28.6	-25.0	-21.0	0.5	0.0	-26.5	-23.8	-20.2	0.3	0.0
12/18/2010	-21.8	-17.4	-12.3	0.5	0.0	-21.2	-16.2	-10.7	0.2	0.0
12/19/2010	-12.3	-5.9	-3.5	0.7	0.0	-10.7	-5.0	-3.1	0.3	0.0

Note: n/a = not available

Appendix 3.1-1. Daily Temperature, Solar Radiation and Rainfall for Boston and Doris Stations, Sept. 1, 2010 to Oct. 29, 2011

	Boston					Doris				
Date	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)
12/20/2010	-15.5	-9.2	-3.5	1.2	0.0	-14.5	-8.0	-2.6	0.8	0.0
12/21/2010	-18.9	-15.3	-11.8	0.6	0.0	-20.2	-15.5	-11.4	0.4	0.0
12/22/2010	-21.6	-18.0	-15.6	0.7	0.0	-22.6	-19.3	-15.6	0.4	0.0
12/23/2010	-28.1	-23.0	-19.5	0.7	0.0	-26.6	-24.1	-19.9	0.4	0.0
12/24/2010	-26.8	-20.8	-17.5	0.7	0.0	-26.1	-22.5	-16.6	0.4	0.0
12/25/2010	-18.6	-11.9	-8.6	0.3	0.0	-19.9	-12.7	-8.4	0.2	0.0
12/26/2010	-25.7	-18.9	-13.1	0.7	0.0	-25.2	-18.6	-13.4	0.3	0.0
12/27/2010	-26.8	-25.0	-23.5	0.4	0.0	-25.8	-24.7	-24.0	0.2	0.0
12/28/2010	-31.8	-29.4	-25.5	0.4	0.0	-31.9	-29.3	-25.8	0.2	0.0
12/29/2010	-30.4	-28.9	-27.8	0.7	0.0	-31.2	-29.5	-28.3	0.3	0.0
12/30/2010	-35.0	-32.6	-28.2	0.7	0.0	-36.0	-32.1	-28.4	0.4	0.0
12/31/2010	-35.9	-29.7	-24.6	0.6	0.0	-36.1	-28.4	-24.5	0.3	0.0
1/1/2011	-35.5	-31.6	-27.9	0.8	0.0	-35.3	-31.3	-26.1	0.4	0.0
1/2/2011	-37.7	-36.0	-33.4	0.9	0.0	-35.5	-34.5	-32.9	0.4	0.0
1/3/2011	-38.2	-36.0	-34.4	0.8	0.0	-37.2	-35.0	-32.4	0.4	0.0
1/4/2011	-38.4	-33.5	-28.6	0.7	0.0	-37.2	-31.8	-27.4	0.4	0.0
1/5/2011	-28.7	-26.7	-23.1	0.5	0.0	-27.8	-26.0	-23.5	0.3	0.0
1/6/2011	-31.7	-29.4	-26.1	0.7	0.0	-33.1	-30.8	-26.5	0.4	0.0
1/7/2011	-31.0	-28.4	-25.5	1.1	0.0	-31.8	-30.0	-28.3	0.5	0.0
1/8/2011	-32.0	-25.5	-19.9	0.6	0.0	-31.9	-24.1	-18.7	0.3	0.0
1/9/2011	-24.9	-21.4	-19.0	0.5	0.0	-26.2	-21.6	-18.2	0.4	0.0
1/10/2011	-26.6	-22.7	-19.6	0.6	0.0	-24.6	-21.7	-19.4	0.5	0.0
1/11/2011	-29.8	-22.3	-18.5	0.9	0.0	-28.1	-22.9	-19.2	0.3	0.0
1/12/2011	-31.3	-30.4	-28.7	1.0	0.0	-33.5	-29.8	-27.6	0.3	0.0
1/13/2011	-35.7	-33.5	-30.6	1.7	0.0	-37.4	-34.8	-30.2	0.5	0.0
1/14/2011	-34.4	-27.6	-20.8	2.8	0.0	-31.0	-26.7	-21.0	1.3	0.0
1/15/2011	-25.3	-20.3	-18.4	1.4	0.0	-25.1	-20.3	-17.6	0.9	0.0
1/16/2011	-29.4	-27.4	-25.0	2.7	0.0	-28.8	-26.8	-24.2	1.4	0.0
1/17/2011	-29.5	-23.4	-18.5	1.6	0.0	-29.3	-22.6	-18.3	0.8	0.0
1/18/2011	-29.7	-23.0	-19.3	2.3	0.0	-30.0	-22.8	-19.6	1.1	0.0
1/19/2011	-34.9	-31.3	-29.2	3.1	0.0	-36.3	-31.1	-28.3	1.9	0.0
1/20/2011	-39.2	-37.3	-34.7	4.4	0.0	-40.1	-37.0	-35.1	2.4	0.0
1/21/2011	-38.2	-36.5	-35.1	3.9	0.0	-39.3	-37.2	-36.0	1.6	0.0
1/22/2011	-38.4	-35.7	-32.4	6.2	0.0	-39.3	-36.3	-32.8	3.0	0.0
1/23/2011	-39.3	-34.8	-27.8	3.4	0.0	-39.3	-36.4	-32.7	2.0	0.0
1/24/2011	-37.2	-35.5	-33.0	7.6	0.0	-36.3	-35.0	-32.2	4.7	0.0
1/25/2011	-44.0	-38.6	-34.8	9.5	0.0	-42.2	-38.7	-35.4	5.2	0.0
1/26/2011	-43.8	-36.7	-22.6	8.8	0.0	-42.6	-36.8	-22.8	5.7	0.0
1/27/2011	-37.2	-29.6	-20.6	8.9	0.0	-37.3	-29.9	-19.8	6.8	0.0
1/28/2011	-37.0	-34.3	-31.4	8.3	0.0	-36.7	-33.9	-30.6	5.5	0.0
1/29/2011	-35.1	-31.3	-26.6	8.8	0.0	-34.9	-30.8	-27.0	7.2	0.0
1/30/2011	-27.5	-26.4	-23.8	14.9	0.0	-27.8	-26.5	-22.8	9.7	0.0
1/31/2011	-23.9	-20.0	-16.8	8.1	0.0	-25.1	-20.4	-16.3	5.8	0.0
2/1/2011	-27.4	-24.6	-20.9	15.7	0.0	-27.5	-25.8	-22.9	9.9	0.0
2/2/2011	-27.2	-23.5	-17.8	11.9	0.0	-28.4	-24.6	-18.7	9.6	0.0
2/3/2011	-19.8	-18.0	-16.5	19.4	0.0	-23.6	-19.3	-16.4	12.0	0.0
2/4/2011	-23.8	-20.3	-17.6	9.0	0.0	-25.6	-21.0	-17.1	6.1	0.0
2/5/2011	-27.0	-22.9	-17.5	14.3	0.0	-27.4	-23.7	-18.2	9.2	0.0
2/6/2011	-29.0	-24.2	-15.9	23.5	0.0	-28.7	-23.5	-13.8	13.4	0.0
2/7/2011	-26.7	-22.4	-16.5	15.3	0.0	-25.7	-21.6	-16.1	11.9	0.0
2/8/2011	-34.6	-31.5	-26.6	20.1	0.0	-34.1	-31.1	-25.7	18.1	0.0
2/9/2011	-34.7	-33.6	-31.0	28.3	0.0	-35.3	-33.2	-29.4	20.3	0.0
2/10/2011	-32.0	-28.9	-26.6	19.6	0.0	-31.5	-28.2	-25.6	14.8	0.0
2/11/2011	-30.9	-29.4	-28.2	28.6	0.0	-30.8	-28.4	-25.7	24.6	0.0
2/12/2011	-32.9	-31.5	-30.2	32.7	0.0	-32.7	-31.3	-29.9	20.5	0.0

Note: n/a = not available

Appendix 3.1-1. Daily Temperature, Solar Radiation and Rainfall for Boston and Doris Stations, Sept. 1, 2010 to Oct. 29, 2011

	Boston					Doris				
Date	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)
2/13/2011	-33.2	-31.6	-29.1	26.5	0.0	-33.0	-31.4	-28.8	17.4	0.0
2/14/2011	-31.6	-28.6	-27.0	21.3	0.0	-30.9	-28.3	-26.4	14.8	0.0
2/15/2011	-33.0	-31.4	-29.4	35.5	0.0	-31.9	-29.9	-27.9	28.7	0.0
2/16/2011	-33.2	-29.1	-25.5	32.9	0.0	-31.0	-26.9	-24.7	20.9	0.0
2/17/2011	-34.9	-32.8	-28.4	36.8	0.0	-34.5	-31.8	-29.7	25.4	0.0
2/18/2011	-33.2	-26.6	-21.9	29.8	0.0	-32.5	-25.1	-19.6	19.5	0.0
2/19/2011	-22.7	-20.1	-16.6	38.8	0.0	-23.5	-19.0	-16.5	20.4	0.0
2/20/2011	-28.9	-24.9	-17.8	46.5	0.0	-29.1	-25.1	-17.7	35.3	0.0
2/21/2011	-30.3	-27.6	-25.6	37.1	0.0	-30.4	-28.7	-25.4	28.1	0.0
2/22/2011	-33.5	-31.6	-27.2	51.7	0.0	-33.2	-31.3	-28.2	38.5	0.0
2/23/2011	-33.6	-31.9	-29.1	51.6	0.0	-34.0	-31.5	-29.1	34.0	0.0
2/24/2011	-34.4	-29.5	-24.0	51.8	0.0	-32.8	-29.6	-26.2	32.4	0.0
2/25/2011	-28.6	-19.8	-14.3	37.1	0.0	-31.4	-23.7	-15.3	16.4	0.0
2/26/2011	-30.9	-25.3	-17.0	44.6	0.0	-30.2	-25.7	-19.9	36.9	0.0
2/27/2011	-32.2	-30.6	-29.2	59.5	0.0	-32.3	-29.5	-27.6	43.6	0.0
2/28/2011	-35.0	-30.2	-27.8	52.3	0.0	-33.5	-29.4	-26.4	40.1	0.0
3/1/2011	-30.9	-29.5	-28.4	58.6	0.0	-31.2	-28.8	-26.7	38.7	0.0
3/2/2011	-35.7	-30.7	-28.5	58.5	0.0	-35.6	-30.2	-28.0	39.9	0.0
3/3/2011	-37.5	-35.6	-33.1	86.0	0.0	-36.4	-34.6	-32.5	64.0	0.0
3/4/2011	-36.0	-33.3	-30.9	68.3	0.0	-34.5	-32.4	-30.9	48.0	0.0
3/5/2011	-37.9	-33.2	-23.8	87.8	0.0	-37.4	-31.9	-22.3	63.7	0.0
3/6/2011	-24.4	-22.4	-19.5	66.8	0.0	-23.0	-21.6	-19.7	56.9	0.0
3/7/2011	-29.7	-25.9	-23.0	60.1	0.0	-28.9	-25.2	-22.6	73.7	0.0
3/8/2011	-35.9	-26.6	-22.8	61.5	0.0	-35.6	-26.0	-21.6	52.5	0.0
3/9/2011	-38.6	-36.1	-32.8	71.8	0.0	-38.6	-36.4	-33.5	72.5	0.0
3/10/2011	-35.1	-32.6	-31.1	87.7	0.0	-34.7	-31.9	-29.7	66.6	0.0
3/11/2011	-35.0	-33.1	-31.3	112.3	0.0	-33.7	-32.0	-30.1	87.5	0.0
3/12/2011	-33.8	-30.8	-27.6	118.9	0.0	-35.1	-31.5	-28.1	92.0	0.0
3/13/2011	-35.6	-30.2	-25.1	121.1	0.0	-36.3	-31.8	-24.7	92.3	0.0
3/14/2011	-33.3	-29.3	-27.6	111.4	0.0	-34.2	-30.0	-25.8	74.2	0.0
3/15/2011	-36.3	-33.9	-32.0	127.7	0.0	-36.2	-33.4	-31.1	99.6	0.0
3/16/2011	-34.5	-28.1	-21.7	126.3	0.0	-34.9	-28.0	-21.3	96.7	0.0
3/17/2011	-27.5	-23.1	-18.8	103.3	0.0	-27.8	-23.0	-17.7	76.0	0.0
3/18/2011	-30.4	-26.9	-24.1	133.3	0.0	-29.5	-26.3	-22.2	101.8	0.0
3/19/2011	-28.6	-25.4	-22.3	133.1	0.0	-29.9	-25.3	-23.4	107.7	0.0
3/20/2011	-31.3	-25.8	-19.6	144.8	0.0	-31.7	-26.6	-19.4	114.7	0.0
3/21/2011	-21.0	-16.4	-12.8	123.5	0.0	-19.5	-15.4	-10.7	76.2	0.0
3/22/2011	-18.8	-15.3	-11.1	154.1	0.0	-22.9	-17.5	-12.3	122.2	0.0
3/23/2011	-18.3	-11.8	-6.2	142.8	0.0	-19.5	-13.1	-7.3	112.3	0.0
3/24/2011	-12.3	-8.2	-6.1	152.1	0.0	-15.3	-8.2	-2.4	119.9	0.0
3/25/2011	-14.2	-9.5	-3.2	130.4	0.0	-15.8	-11.8	-7.0	75.5	0.0
3/26/2011	-12.1	-7.8	-3.9	163.2	0.0	-15.7	-9.3	-1.7	124.1	0.0
3/27/2011	-14.7	-9.6	-3.2	152.5	0.0	-16.4	-12.3	-6.3	116.9	0.0
3/28/2011	-15.6	-11.0	-4.4	165.6	0.0	-19.9	-15.3	-8.9	131.2	0.0
3/29/2011	-10.0	-7.3	-3.1	108.9	0.0	-16.6	-12.1	-10.1	73.2	0.0
3/30/2011	-15.9	-9.0	-3.0	185.4	0.0	-15.2	-9.7	-6.4	129.6	0.0
3/31/2011	-18.0	-14.6	-10.2	167.2	0.0	-18.9	-14.9	-8.0	119.3	0.0
4/1/2011	-22.2	-16.9	-13.0	155.2	0.0	-18.2	-15.4	-12.2	104.0	0.0
4/2/2011	-19.4	-15.9	-13.6	162.4	0.0	-20.7	-15.9	-13.7	114.1	0.0
4/3/2011	-24.0	-19.8	-15.3	208.5	0.0	-24.6	-20.7	-15.1	159.2	0.0
4/4/2011	-22.2	-17.8	-12.3	216.5	0.0	-22.7	-17.7	-12.5	155.9	0.0
4/5/2011	-26.5	-22.7	-18.1	199.2	0.0	-26.5	-23.6	-21.1	135.7	0.0
4/6/2011	-23.1	-17.9	-12.1	208.1	0.0	-24.1	-18.6	-10.7	154.2	0.0
4/7/2011	-24.0	-20.5	-15.4	197.6	0.0	-24.2	-21.5	-18.6	142.8	0.0
4/8/2011	-24.9	-16.8	-9.6	205.1	0.0	-22.6	-18.1	-15.7	142.6	0.0

Note: n/a = not available

Appendix 3.1-1. Daily Temperature, Solar Radiation and Rainfall for Boston and Doris Stations, Sept. 1, 2010 to Oct. 29, 2011

	Boston					Doris				
Date	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)
4/9/2011	-27.4	-25.0	-22.4	218.6	0.0	-26.3	-23.6	-20.7	179.6	0.0
4/10/2011	-32.5	-26.3	-22.5	232.5	0.0	-31.4	-26.0	-23.0	172.2	0.0
4/11/2011	-34.4	-29.7	-26.4	240.2	0.0	-34.4	-29.3	-25.4	175.8	0.0
4/12/2011	-27.1	-24.1	-21.5	244.2	0.0	-27.1	-23.8	-20.0	180.4	0.0
4/13/2011	-26.5	-23.0	-20.5	250.6	0.0	-26.8	-22.8	-20.1	188.4	0.0
4/14/2011	-23.4	-20.9	-18.7	224.9	0.0	-23.4	-20.6	-18.2	157.9	0.0
4/15/2011	-19.5	-16.7	-12.9	251.0	0.0	-18.6	-15.8	-12.0	192.2	0.0
4/16/2011	-16.8	-13.5	-9.1	224.2	0.0	-17.2	-13.5	-9.8	191.8	0.0
4/17/2011	-22.2	-18.8	-15.5	243.2	0.0	-22.6	-19.4	-16.1	194.3	0.0
4/18/2011	-24.4	-21.9	-19.5	268.6	0.0	-25.6	-22.5	-20.0	199.0	0.0
4/19/2011	-24.7	-17.4	-9.9	223.9	0.0	-25.2	-18.0	-12.7	172.6	0.0
4/20/2011	-26.1	-18.1	-10.1	251.5	0.0	-26.8	-19.7	-11.8	202.8	0.0
4/21/2011	-28.4	-25.3	-21.6	285.1	0.0	-29.6	-25.0	-20.7	208.4	0.0
4/22/2011	-28.1	-23.1	-18.9	273.8	0.0	-25.7	-21.8	-19.1	204.2	0.0
4/23/2011	-28.1	-24.6	-21.6	294.0	0.0	-27.4	-24.7	-22.0	229.2	0.0
4/24/2011	-30.2	-24.2	-19.9	276.3	0.0	-29.7	-23.6	-18.4	216.3	0.0
4/25/2011	-22.6	-16.8	-10.9	283.0	0.0	-21.0	-15.5	-11.0	224.2	0.0
4/26/2011	-16.9	-13.0	-9.6	272.4	0.0	-15.5	-12.7	-10.3	177.3	0.0
4/27/2011	-15.6	-11.4	-8.8	260.9	0.0	-15.8	-12.0	-9.5	194.3	0.0
4/28/2011	-20.4	-17.8	-12.0	297.8	0.0	-23.4	-19.2	-15.4	241.3	0.0
4/29/2011	-23.1	-16.9	-13.6	286.6	0.0	-24.0	-17.9	-10.4	229.7	0.0
4/30/2011	-18.1	-13.2	-10.9	252.7	0.0	-18.0	-13.8	-11.7	188.9	0.0
5/1/2011	-22.5	-19.6	-17.1	300.8	0.0	-21.6	-18.7	-15.7	226.5	0.0
5/2/2011	-21.6	-14.7	-10.8	300.2	0.0	-19.5	-14.6	-10.9	232.9	0.0
5/3/2011	-16.9	-12.3	-7.1	335.0	0.0	-17.2	-13.6	-10.1	266.2	0.0
5/4/2011	-20.0	-13.0	-6.0	321.2	0.0	-20.6	-14.0	-8.5	246.2	0.0
5/5/2011	-15.2	-9.0	-1.1	330.7	0.3	-16.4	-10.9	-5.6	258.4	0.0
5/6/2011	-17.2	-7.3	-0.2	300.2	0.0	-15.7	-8.7	-4.3	215.3	0.0
5/7/2011	-9.7	-4.1	1.6	302.1	0.0	-6.0	-4.4	-1.9	178.3	0.0
5/8/2011	-9.9	-6.4	-4.6	245.6	0.0	-8.0	-6.8	-5.1	171.0	0.0
5/9/2011	-7.7	-1.8	3.4	328.2	0.0	-9.4	-3.1	2.4	254.6	0.3
5/10/2011	-6.7	-2.7	0.0	345.7	0.0	-6.2	-2.4	0.2	274.0	0.0
5/11/2011	-2.3	1.3	3.9	198.5	1.8	-1.6	1.1	3.0	98.9	8.9
5/12/2011	-7.4	-3.8	0.7	213.6	2.3	-8.2	-4.7	0.0	128.2	0.0
5/13/2011	-12.0	-9.2	-7.2	374.3	0.0	-10.9	-8.6	-6.1	295.3	0.0
5/14/2011	-12.2	-4.0	2.0	293.3	0.5	-12.4	-4.6	0.6	209.8	0.0
5/15/2011	-4.0	-2.8	-1.3	314.1	0.0	-5.1	-3.1	-1.2	248.4	0.0
5/16/2011	-8.2	-5.9	-3.8	332.8	0.0	-9.1	-6.6	-3.5	191.2	0.0
5/17/2011	-11.8	-8.1	-4.8	399.8	0.0	-12.6	-8.0	-4.4	309.7	0.0
5/18/2011	-9.9	-5.7	-2.7	382.1	0.0	-9.9	-5.3	-2.1	266.1	0.0
5/19/2011	-11.5	-6.5	-2.0	397.6	0.0	-9.6	-5.0	-1.3	310.6	0.0
5/20/2011	-9.7	-3.4	2.0	403.5	0.0	-8.9	-3.0	2.1	315.3	0.0
5/21/2011	-12.2	-8.2	-3.8	351.3	0.0	-10.6	-6.5	-3.5	265.2	0.0
5/22/2011	-8.4	-4.3	-0.4	382.9	0.0	-10.2	-4.9	-0.4	291.7	0.0
5/23/2011	-6.6	-3.2	0.3	393.8	0.0	-6.6	-2.7	1.7	308.5	0.0
5/24/2011	-5.9	-1.7	2.0	405.0	0.0	-6.4	-2.3	1.7	319.9	0.0
5/25/2011	-5.7	-0.9	2.8	416.2	0.0	-6.8	-2.0	2.6	311.1	0.0
5/26/2011	-5.8	-3.5	-0.9	298.4	0.0	-5.4	-3.5	-1.3	174.5	0.0
5/27/2011	-5.8	-2.4	1.1	375.3	0.0	-5.7	-3.7	-1.5	248.7	0.0
5/28/2011	-6.8	-1.7	3.2	407.9	0.0	-5.1	-1.6	2.6	303.3	0.0
5/29/2011	-5.0	-0.1	5.1	390.7	0.0	-4.0	-0.1	3.8	292.8	0.0
5/30/2011	0.3	5.5	11.0	372.3	0.0	-1.2	3.7	9.7	302.9	0.0
5/31/2011	-0.3	1.1	3.3	260.3	0.0	-0.5	1.4	3.5	220.0	0.0
6/1/2011	-4.9	1.5	8.4	222.7	1.5	-5.3	0.7	9.5	177.4	3.6
6/2/2011	-5.9	-4.2	-2.3	297.8	0.0	-7.1	-3.9	-1.2	252.1	0.0

Note: n/a = not available

Appendix 3.1-1. Daily Temperature, Solar Radiation and Rainfall for Boston and Doris Stations, Sept. 1, 2010 to Oct. 29, 2011

	Boston					Doris				
Date	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)
6/3/2011	-4.4	-2.5	-0.4	349.2	0.0	-4.6	-2.7	-0.9	257.8	0.0
6/4/2011	-3.5	-1.0	0.6	205.9	0.3	-2.4	-0.5	1.1	147.5	0.0
6/5/2011	-2.2	-1.2	-0.4	237.6	0.0	-1.9	-1.0	-0.1	145.9	0.0
6/6/2011	-2.7	-1.9	-1.0	138.6	0.0	-3.0	-1.8	-0.9	106.5	0.0
6/7/2011	-2.5	-0.7	1.1	247.6	0.0	-1.8	-0.4	0.9	185.6	0.0
6/8/2011	-1.9	-0.5	1.2	281.9	0.0	-1.6	-0.3	1.5	202.3	0.0
6/9/2011	-2.2	0.0	1.4	239.9	0.0	-1.0	0.3	2.2	118.8	0.0
6/10/2011	-2.0	0.0	1.8	394.8	0.0	-1.6	0.0	1.5	204.7	0.0
6/11/2011	-1.6	2.4	6.1	253.3	0.0	-1.3	2.8	6.5	201.2	0.0
6/12/2011	1.8	6.8	12.5	288.2	0.0	1.2	7.0	12.5	293.8	0.0
6/13/2011	2.3	6.6	9.5	358.0	0.3	3.0	5.8	8.4	277.7	1.3
6/14/2011	0.3	1.3	2.5	175.7	2.8	0.5	1.8	3.3	127.1	4.6
6/15/2011	0.1	1.8	3.5	141.0	0.3	0.5	1.7	3.5	120.1	0.3
6/16/2011	0.9	5.3	9.7	394.6	0.0	0.5	3.9	8.7	326.6	0.0
6/17/2011	1.9	6.2	10.0	426.9	0.0	0.4	4.5	6.8	336.4	0.0
6/18/2011	-0.7	5.2	11.8	373.8	0.0	-0.9	3.5	7.9	329.1	0.0
6/19/2011	4.3	11.8	18.2	304.4	0.0	1.7	8.4	14.0	233.5	0.3
6/20/2011	3.0	10.7	16.7	267.6	0.3	3.3	8.0	12.7	207.0	0.3
6/21/2011	1.4	3.1	5.3	177.7	0.0	1.6	3.4	5.5	138.5	0.0
6/22/2011	1.0	3.8	6.8	198.5	0.0	1.4	3.7	6.2	202.9	0.0
6/23/2011	0.2	8.3	15.2	424.1	0.0	0.5	7.3	13.0	329.9	0.0
6/24/2011	3.3	9.9	17.9	328.3	0.0	3.3	9.7	17.5	223.6	0.0
6/25/2011	0.4	1.8	3.7	206.2	1.8	1.0	2.3	4.8	188.6	2.0
6/26/2011	0.8	2.7	4.3	125.4	1.5	1.7	3.5	5.7	98.3	1.0
6/27/2011	1.7	3.7	5.6	259.9	0.3	1.5	3.0	4.3	115.1	3.0
6/28/2011	1.7	3.8	5.9	258.8	1.5	1.8	3.3	5.6	232.7	0.8
6/29/2011	2.7	9.8	15.6	360.3	0.0	1.8	8.3	14.4	262.2	0.0
6/30/2011	2.8	6.0	9.6	199.8	9.7	3.6	5.6	8.4	146.2	15.0
7/1/2011	3.5	4.7	7.3	105.0	20.8	3.3	4.9	8.0	105.3	16.8
7/2/2011	3.9	6.6	9.8	147.4	0.8	3.3	5.5	9.5	122.5	0.5
7/3/2011	7.5	14.1	22.5	313.5	3.3	6.4	12.0	19.6	246.1	0.0
7/4/2011	12.2	17.7	22.1	398.2	0.0	9.1	14.5	20.3	305.4	0.0
7/5/2011	11.0	16.9	21.9	382.1	0.0	7.4	13.7	19.4	316.9	0.0
7/6/2011	10.6	16.0	20.6	414.8	0.0	7.8	15.1	20.2	316.9	0.0
7/7/2011	8.6	12.7	15.9	391.0	0.0	9.5	13.0	16.0	288.2	0.0
7/8/2011	10.6	15.3	19.9	276.0	0.5	9.0	13.7	19.4	198.3	1.0
7/9/2011	12.3	16.9	20.8	400.0	0.0	10.0	15.0	19.7	310.9	0.0
7/10/2011	10.7	17.0	21.9	399.0	0.0	9.9	16.2	20.9	301.7	0.0
7/11/2011	12.7	16.3	19.9	307.0	0.0	9.9	13.4	17.6	197.3	0.0
7/12/2011	6.5	10.4	12.9	389.6	0.0	5.6	8.4	11.1	291.9	0.0
7/13/2011	5.2	9.8	14.7	345.9	0.0	4.7	9.6	13.6	270.0	0.0
7/14/2011	7.9	11.6	14.5	308.6	0.0	8.0	10.8	14.0	238.7	0.0
7/15/2011	6.5	11.3	14.9	293.4	0.0	7.2	11.7	14.8	286.9	0.0
7/16/2011	8.0	11.2	14.2	343.0	0.0	7.8	11.3	14.3	247.9	0.0
7/17/2011	9.3	14.1	17.7	399.2	0.0	8.9	13.8	17.4	292.8	0.0
7/18/2011	8.9	14.5	19.5	388.2	0.0	9.4	13.2	16.7	301.9	0.0
7/19/2011	9.9	15.6	20.4	387.7	0.0	9.5	14.6	19.3	297.8	0.0
7/20/2011	10.3	16.9	21.5	369.5	0.0	10.4	16.1	21.1	281.1	0.0
7/21/2011	10.5	18.2	23.1	338.1	0.0	10.8	18.1	23.4	248.5	0.0
7/22/2011	12.9	19.3	24.0	281.6	0.0	12.0	17.6	23.7	249.3	0.0
7/23/2011	11.0	15.0	20.5	196.9	1.3	9.6	12.4	15.6	126.8	0.5
7/24/2011	10.6	14.0	18.5	260.2	1.5	10.0	13.0	16.9	214.5	0.0
7/25/2011	11.1	17.4	25.5	268.9	4.3	10.8	16.4	23.2	210.7	0.0
7/26/2011	8.3	10.5	14.5	139.3	0.0	8.1	10.3	12.4	113.1	0.0
7/27/2011	9.3	13.4	17.0	329.3	0.0	9.3	13.5	17.5	250.0	0.0

Note: n/a = not available

Appendix 3.1-1. Daily Temperature, Solar Radiation and Rainfall for Boston and Doris Stations, Sept. 1, 2010 to Oct. 29, 2011

	Boston					Doris				
Date	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (°C)	Daily Maximum Air Temperature (°C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)
7/28/2011	9.2	14.4	18.8	252.7	0.0	9.5	13.4	17.1	165.7	0.0
7/29/2011	10.5	12.7	15.1	205.2	1.3	11.0	12.6	14.8	133.5	2.3
7/30/2011	6.2	12.9	17.9	330.5	0.0	8.3	14.2	18.4	272.0	0.0
7/31/2011	8.4	13.8	17.9	348.4	0.0	8.7	14.1	17.9	264.1	0.0
8/1/2011	8.2	13.4	18.7	323.0	0.0	9.1	12.8	16.7	244.9	0.0
8/2/2011	7.9	12.0	15.5	324.9	0.0	8.4	12.5	15.7	240.8	0.0
8/3/2011	7.4	11.4	13.8	206.2	0.0	9.7	11.8	13.5	152.6	0.0
8/4/2011	7.5	13.8	20.0	321.2	0.0	7.2	14.1	19.8	236.3	0.0
8/5/2011	11.5	15.7	19.7	142.1	0.0	13.1	16.1	20.2	117.7	0.0
8/6/2011	11.8	18.1	23.4	316.3	0.0	12.7	17.9	22.4	238.0	0.0
8/7/2011	10.1	16.3	21.1	320.7	0.0	10.5	15.7	20.1	246.0	0.0
8/8/2011	7.3	13.2	17.4	318.4	0.0	8.9	13.6	17.5	243.9	0.0
8/9/2011	7.8	11.3	15.5	156.5	0.0	8.7	11.6	14.7	95.5	0.0
8/10/2011	9.7	11.3	13.6	119.2	0.0	9.7	11.6	14.4	98.5	0.0
8/11/2011	9.5	11.4	14.5	168.1	0.0	10.0	11.4	13.4	102.5	0.5
8/12/2011	8.0	11.3	15.5	132.0	0.0	8.5	12.3	16.8	123.9	0.3
8/13/2011	9.8	13.4	17.6	223.7	0.0	8.4	12.9	16.6	186.3	0.0
8/14/2011	7.1	12.4	17.1	238.2	0.0	8.4	10.8	12.8	80.2	0.0
8/15/2011	5.6	9.3	15.2	205.2	0.0	6.4	8.9	11.7	122.8	0.0
8/16/2011	3.9	6.6	9.5	130.3	0.0	5.0	7.1	9.4	129.4	0.0
8/17/2011	6.8	8.6	9.9	76.2	10.2	7.5	8.7	10.0	51.1	1.5
8/18/2011	7.5	9.2	10.3	69.9	5.6	7.9	9.6	10.7	53.6	0.8
8/19/2011	5.4	8.3	11.4	165.7	0.3	6.7	8.3	10.2	115.0	1.3
8/20/2011	5.3	8.5	10.6	130.1	0.0	6.1	8.2	11.1	144.5	0.0
8/21/2011	2.6	9.0	14.3	186.8	0.0	4.8	9.9	14.0	150.5	0.0
8/22/2011	7.3	10.0	11.5	64.6	1.8	8.3	10.6	12.5	68.7	0.0
8/23/2011	10.2	11.8	14.9	181.3	1.5	10.1	11.2	12.9	80.1	3.0
8/24/2011	7.6	11.3	14.9	165.6	0.0	8.2	11.1	14.0	126.7	1.0
8/25/2011	8.2	10.3	12.4	114.8	0.0	7.5	9.4	12.0	91.6	0.0
8/26/2011	7.2	8.3	9.6	64.3	0.5	7.1	8.0	9.6	59.7	1.3
8/27/2011	6.3	7.7	9.3	120.9	0.0	6.7	7.8	9.6	126.3	0.3
8/28/2011	6.1	7.5	9.3	123.5	0.3	6.4	7.3	9.3	91.8	2.3
8/29/2011	3.1	6.3	8.8	131.7	0.0	3.2	5.9	6.9	73.7	0.5
8/30/2011	2.0	5.5	10.0	224.6	0.0	2.8	6.7	10.3	179.7	0.0
8/31/2011	1.1	4.4	8.3	227.8	0.0	1.0	5.4	9.3	173.4	0.0
9/1/2011	0.0	2.0	4.6	150.8	0.0	0.6	2.9	5.3	113.1	0.0
9/2/2011	-0.9	2.1	6.6	191.9	0.0	-0.2	2.6	6.3	133.0	0.0
9/3/2011	0.2	5.9	11.1	119.0	0.0	1.6	5.6	9.3	68.9	3.3
9/4/2011	1.4	5.8	10.0	125.0	0.0	3.8	6.4	10.9	101.3	0.3
9/5/2011	1.1	3.7	6.2	60.6	0.0	3.2	5.2	7.6	83.2	0.0
9/6/2011	3.3	5.5	8.9	138.2	0.0	4.0	6.3	9.2	108.7	0.0
9/7/2011	4.5	9.3	15.3	97.6	13.5	3.9	7.5	10.1	16.1	17.5
9/8/2011	2.4	3.8	5.1	60.0	0.8	2.7	4.0	5.2	50.0	0.0
9/9/2011	4.3	7.7	12.2	136.9	0.0	4.4	7.2	11.8	93.8	0.0
9/10/2011	3.6	5.8	8.9	64.9	0.0	2.9	5.3	6.9	41.9	1.0
9/11/2011	-0.4	1.7	3.9	101.0	0.0	0.2	1.8	4.2	77.8	0.3
9/12/2011	-0.9	1.0	3.0	113.0	0.0	-0.3	1.4	3.3	72.1	0.3
9/13/2011	0.7	4.1	7.8	87.7	0.0	1.6	4.3	6.4	47.8	0.3
9/14/2011	0.8	6.1	11.2	120.3	0.0	2.8	6.7	11.2	123.4	0.0
9/15/2011	-0.6	2.6	6.6	62.0	0.3	0.2	2.6	5.7	60.9	0.0
9/16/2011	-0.8	0.6	2.6	45.1	0.5	-0.4	1.0	2.8	39.8	0.0
9/17/2011	-1.1	-0.4	0.6	49.9	2.0	-0.3	0.5	1.5	41.7	0.3
9/18/2011	-2.4	-1.6	-0.4	75.8	0.3	-1.7	-1.0	-0.1	43.1	0.0
9/19/2011	-2.7	0.2	2.8	84.4	0.0	-1.5	0.5	2.6	52.9	0.0
9/20/2011	1.8	5.7	10.0	82.7	0.0	2.5	5.9	10.8	71.9	0.0

Note: n/a = not available

Appendix 3.1-1. Daily Temperature, Solar Radiation and Rainfall for Boston and Doris Stations, Sept. 1, 2010 to Oct. 29, 2011

	Boston					Doris				
Date	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (˚C)	Daily Maximum Air Temperature (˚C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)	Daily Minimum Air Temperature (°C)	Mean Daily Air Temperature (˚C)	Daily Maximum Air Temperature (˚C)	Mean Solar Radiation (W/m^2)	Daily Rainfall (mm)
9/21/2011	7.3	10.0	14.5	72.1	0.0	6.1	9.5	13.3	35.5	0.0
9/22/2011	4.6	8.9	13.5	60.0	2.5	4.2	7.3	12.0	20.2	0.5
9/23/2011	3.1	4.1	5.0	56.5	0.8	3.1	3.9	5.2	36.0	6.6
9/24/2011	1.4	2.8	3.7	94.7	0.0	1.7	2.9	4.3	55.8	1.5
9/25/2011	-0.1	1.9	3.1	78.3	0.0	-0.1	1.8	3.2	42.9	0.3
9/26/2011	-2.0	-1.0	0.0	22.1	0.0	-1.3	-0.3	0.5	16.9	0.0
9/27/2011	-3.7	-2.2	-1.0	68.6	0.0	-3.3	-2.0	-0.8	50.8	0.0
9/28/2011	-5.4	-4.4	-3.1	62.9	0.0	-5.1	-4.2	-2.7	47.2	0.0
9/29/2011	-5.7	-4.1	-2.1	74.9	1.0	-6.0	-3.8	1.5	71.7	0.0
9/30/2011	-4.7	-2.4	-0.3	60.9	0.0	-5.2	-2.5	-0.9	51.1	0.0
10/1/2011	-5.3	-3.6	-2.0	41.3	0.0	-5.6	-3.1	-0.6	27.4	0.0
10/2/2011	-5.1	-1.1	2.3	56.1	0.5	-5.4	-0.6	2.4	34.7	0.0
10/3/2011	-2.9	0.9	3.2	38.6	0.0	-1.9	0.2	2.5	42.5	0.0
10/4/2011	-4.1	-0.2	2.9	97.1	1.3	-4.1	0.3	3.5	70.5	0.3
10/5/2011	1.1	2.5	4.0	43.7	1.8	1.6	2.5	4.0	23.9	0.0
10/6/2011	0.3	1.5	2.3	54.4	0.0	1.1	1.6	1.9	24.7	0.0
10/7/2011	0.2	2.7	5.3	49.9	0.0	0.8	2.7	5.5	35.4	0.0
10/8/2011	-2.2	1.2	2.7	19.5	0.0	-2.6	1.3	3.0	13.8	0.0
10/9/2011	-6.9	-4.9	-2.2	31.9	0.0	-6.1	-4.7	-2.5	22.6	0.0
10/10/2011	-8.3	-6.3	-4.5	27.8	0.0	-7.2	-5.4	-3.5	18.4	0.0
10/11/2011	-7.9	-5.8	-2.6	25.0	0.0	-7.0	-5.2	-2.9	19.3	0.0
10/12/2011	-2.6	0.3	1.9	24.1	1.8	-2.9	0.3	2.0	24.2	0.0
10/13/2011	0.1	1.2	2.7	30.5	0.0	1.5	2.2	3.5	17.3	0.0
10/14/2011	-2.5	-0.3	1.0	32.1	0.0	-2.1	0.0	2.2	19.4	0.0
10/15/2011	-5.5	-3.5	-2.2	21.5	0.0	-5.2	-4.0	-2.1	17.9	0.0
10/16/2011	-9.9	-6.5	-5.3	23.7	0.0	-10.8	-6.6	-4.1	21.4	0.0
10/17/2011	-12.1	-10.8	-9.3	43.3	0.0	-11.3	-10.4	-9.4	29.8	0.0
10/18/2011	-9.3	-8.3	-7.4	44.4	0.0	-10.2	-8.5	-7.0	25.5	0.0
10/19/2011	-12.4	-9.6	-8.0	39.7	0.0	-9.7	-7.7	-6.3	38.4	0.0
10/20/2011	-12.5	-10.4	-9.0	21.4	0.0	-11.2	-9.0	-7.0	12.8	0.0
10/21/2011	-9.6	-9.0	-8.2	21.7	0.0	-10.2	-9.1	-7.8	13.4	0.0
10/22/2011	-12.4	-10.4	-9.2	20.7	0.0	-10.6	-9.6	-8.9	15.2	0.0
10/23/2011	-12.5	-7.4	-4.9	19.0	0.0	-11.5	-6.8	-4.1	13.4	0.0
10/24/2011	-8.8	-6.3	-4.5	24.2	0.0	-8.6	-6.0	-4.1	18.0	0.0
10/25/2011	-14.7	-11.0	-8.0	21.4	0.0	-12.1	-10.3	-5.5	13.6	0.0
10/26/2011	-11.0	-4.3	-1.3	15.0	0.0	-10.9	-6.8	-3.4	10.7	0.0
10/27/2011	-17.4	-12.5	-2.8	22.6	0.0	-15.9	-12.9	-7.1	14.5	0.0
10/28/2011	-20.3	-17.6	-15.8	17.8	0.0	-19.8	-17.4	-15.7	12.6	0.0
10/29/2011	-17.1	-14.5	-9.9	19.4	0.0	n/a	n/a	n/a	n/a	n/a

Note: n/a = not available