Appendix V5-1K

Doris North Project: 2014 Hydrology Compliance Monitoring Program

TMAC RESOURCES

Memorandum

Refer to File No.: 1009-008 Hope Bay Belt

Date:	January 30, 2015
To:	John Roberts, VP Environmental Affairs Jill Turk, Environmental Coordinator
CC:	April Hayward (Ph. D), Project Manager Marc Wen (M.Sc., R.P.Bio), Partner in Charge
From:	Michael Soloducha (B.Sc., AScT)
Subject:	Doris North Project 2014 Hydrology Compliance Monitoring Program

This memorandum was prepared at the request of TMAC Resources Inc. (TMAC). The purpose of the memorandum is to present annual hydrometric data that were collected as part of the 2014 Doris North Hydrology Compliance Monitoring Program, which addresses hydrometric monitoring requirements set out in the Doris North Gold Mine Project Certificate (Nunavut Impact Review Board (NIRB) No. 003, issued September 15, 2006; NIRB (2006)) and Type A Water Licence (Nunavut Water Board (NWB) Licence No. 2AM-DOH1323 Type A, renewed August 16, 2013).

GLOSSARY AND ABBREVIATIONS

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

Datum	A reference system for computing or correlating the results of a survey.
ERM Rescan	ERM Consultants Canada Ltd.
Hydrograph	A graphical plot of water discharge versus time.
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
Root Mean Square	A statistical measure of the differences between modelled and observed values.
Runoff	The part of precipitation that appears in surface streams and is a measure of the hydrologic response of a watershed, commonly presented as a depth of water over an entire watershed in mm.
Stage	The depth of water in a water course or channel.
Stage-Discharge Curve (Rating Curve)	A curve derived from concurrently measured stage and discharge data that is used to estimate the discharge for any given observed stage at a hydrometric station (often referred to as a rating curve).

TMAC	TMAC Resources Inc.
Unit Yield	A ratio of water discharges normalized to the drainage area for a basin.
UTM	Universal Transverse Mercator
Watershed	The entire geographical area drained by a river and its tributaries; an area characterized by all runoff being conveyed to the same outlet.

1. INTRODUCTION

ERM Consultants Canada Ltd. (ERM Rescan) monitors and reports, on behalf of TMAC Resources Inc. (TMAC), the following elements of the Doris North Gold Mine Project Certificate (Nunavut Impact Review Board (NIRB) No. 003, issued September 15, 2006; NIRB (2006)), Type A Water Licence (Nunavut Water Board (NWB) Licence No. 2AM-DOH1323 Type A, renewed August 16, 2014), and Interim Water Management Plan (SRK 2012), as part of the annual Doris North Hydrology Monitoring Program (the Program): Open water season volumetric discharge from Doris Creek, Roberts Lake, and Windy Lake; water level variation at Doris Lake and the TIA. These items correspond to the following elements of the Doris North Gold Mine Project Certificate and Water Licence:

- Doris North Gold Mine Project Certificate
  - *Appendix C: Final Hearing Report Appendix B, Additional Comments, DFO, Item 2: [The Proponent] will monitor stage and discharge in Doris Outflow both upstream and downstream of the decant discharge point to provide information that can be used in assessing the accuracy of the impact predictions relating to fish habitat downstream.*
- NWB Type A Water Licence
  - *Part G. Item 31. The Licensee shall ensure that water within the Tailings Impoundment Area is maintained at an elevation of least 28.3 metres above sea level such that a minimum of four (4) metres of water cover is maintained over the tailings at all times.*
  - *Part G. Item 32. The Licensee shall ensure that the flow from the Tailings Impoundment Area into Doris Creek at monitoring station TL-4 does not exceed 10% of the background flow in Doris Creek as measured at monitoring station TL-2 at the time of discharge.*
  - *Part J. Item 2: The Licensee shall install appropriate instrumentation in Doris Creek at Monitoring Station TL-2, to monitor flow when ice conditions allow for such measurements to be taken, on a real time and continuous basis.*
  - *Part J. Item 3. The Licensee shall undertake the Water Monitoring Program detailed in the Tables of Schedule J.*

    <u>Note:</u> ERM Rescan monitors discharge at sites TL-2 and TL-3. All other requirements under this element are monitored by TMAC and presented elsewhere.

- Interim Water Management Plan (IWMP)
  - *Section 4.2: Continuous monitoring of Doris Lake water levels and outflows will continue under the hydrologic baseline characterization. These data will be used to calibrate the existing water balance and quality model.*

    Note: This item was formerly part of the NWB Type A Water Licence (No. 2AM-DOH0713, issued September 19th, 2007): Part F, Item 1a. [the Water Management Plan should include a] requirement to continuously monitor Doris Lake levels and outflow during the two (2) years of mining and beyond to confirm water balance model predictions.

ERM Rescan also monitors and reports, on behalf of TMAC, hydrometric data collected to support habitat compensation projects and monitoring requirements for Fisheries Authorization NU-02-0117.3 ERM Rescan has conducted baseline hydrometric monitoring in the Project area since 2009. The current Compliance Program has been in place since 2011.

All other aspects of water and waste water monitoring (e.g., water use and recycling, pumping volumes, etc.) are monitored by TMAC under the Surveillance Network Program and reported monthly and annually to the NWB in accordance with the relevant clauses of Water Licence 2AM-DOH1323.

2. METHODOLOGY

ERM Rescan re-established the existing network of hydrometric stations for the Program at the beginning of the open water season in 2014 (Figure 1; Table 1). Four streamflow and two lake level monitoring stations were established in the same locations as the 2013 monitoring network. Details regarding the standard methodologies used for installation of hydrometric stations, development of stage-discharge rating equations, and daily flow hydrographs for the Program were provided in the Doris North Project 2013 Hydrology Compliance Monitoring Report (ERM Rescan 2014).

3. RESULTS AND DISCUSSION

Results from the 2014 Program are presented as follows: 1) manual stage-discharge measurements; 2) rating equations; 3) daily discharge hydrographs; 4) hydrologic indices; 5) lake water levels; 6) Quality Assurance. Results of the 2014 Program were compared to results from the 2009 to 2013 monitoring programs, which are available in previously published hydrology baseline and compliance reports (Rescan 2009, 2011a, 2011b, 2012a, 2012b, ERM Rescan 2014).

3.1 Manual Stage-Discharge Measurements

In 2014, a minimum of eight stage-discharge measurements were completed at each hydrometric station over a variety of flow conditions to create new stage-discharge relationships or validate existing rating curves (Table 2).

3.2 Stage-Discharge Rating Equations

Stage-discharge rating curves were developed for all hydrometric stations in the network. Rating equations are summarized in Table 3.

Figure 1

Hydrometric Monitoring Stations, Doris North Project, 2014

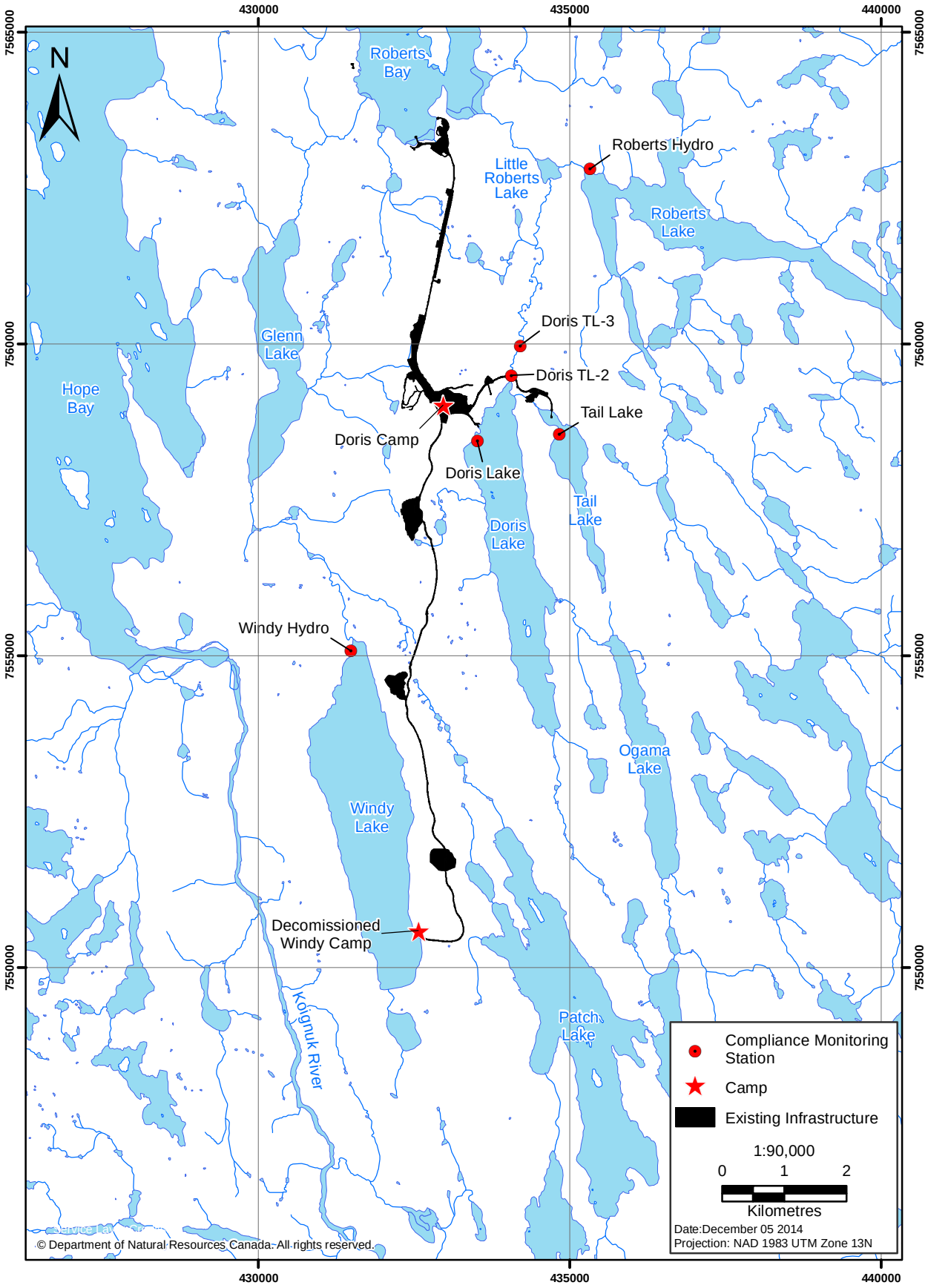


Table 1. 2014 Hydrometric Compliance Monitoring Stations, Doris North Project, 2014

Hydrometric Station	Location	UTM Coordinates (Zone 13W, NAD83)		Drainage Area (km²)	Lake Coverage (%)	Monitoring Period	Period of Operation in 2014	Purpose
		Easting	Northing					
Streamflow Monitoring Stations								
Doris TL-2	Doris Lake outflow	434,059	7,559,504	94.6	20	1996-1998, 2000, 2003-2014	June 15 - September 22	Monitoring required for Project Certificate and Type A Water Licence
Doris TL-3	Doris Creek, downstream of waterfall	434,204	7,559,985	95.3	20	2011-2014	June 1 - September 22	Monitoring required for Project Certificate and Type A Water Licence
Roberts Hydro	Roberts Lake outflow	435,325	7,562,815	97.9	17	2003-2014	June 18 - September 21	Supports requirements for Fisheries Authorization and No Net Loss Plan
Windy Hydro[a]	Northwest shore of Windy Lake	431,481	7,555,089	14.1	39	2006-2014	June 18 -September 21	Supports requirements for Fisheries Authorization and No Net Loss Plan
Lake Monitoring Stations								
Doris Lake	Northwest shore of Doris Lake	433,512	7,558,452	n/a	n/a	2004-2014	January 1 -September 21	Monitoring required for Type A Water Licence
Tailings Impoundment Area	Northwest shore of Tail Lake	434,832	7,558,560	n/a	n/a	2004-2014	March 16 -September 18	Monitoring required for Type A Water Licence

[a] *The station is also used for monitoring water level variation in Windy Lake.*

Table 2. Summary of Manual Stage-Discharge Measurements, Doris North Project, 2014

Hydrometric Station and Drainage Area	Date	Stage (m)[a]	Discharge (m^3/s)	Discharge Measurement Uncertainty (%)[b]	Equipment Used
Doris TL-2 (94.6 km^2)	June 14	96.503	1.26	5.9	Flo-Mate 2000
	June 16	96.537	1.63	6.2	Flo-Mate 2000
	June 19	96.649	2.30	5.4	Swoffer 2100
	July 22	96.445	1.13	5.7	Flo-Mate 2000
	July 24	96.449	1.33	5.5	Flo-Mate 2000
	July 26	96.440	1.18	5.9	Flo-Mate 2000
	July 27	96.435	1.22	5.3	Flo-Mate 2000
	July 28	96.428	1.21	5.7	Flo-Mate 2000
	August 20	96.311	0.73	5.7	Flo-Mate 2000
	August 21	96.310	0.71	6.0	Flo-Mate 2000
	September 16	96.283	0.63	5.7	Flo-Mate 2000
	September 19	96.276	0.60	6.0	Flo-Mate 2000
	September 20	96.273	0.63	5.9	Flo-Mate 2000
	September 22	96.271	0.59	5.7	Flo-Mate 2000
Doris TL-3 (95.3 km^2)	June 19	97.789	2.89	4.9	Swoffer 2100
	July 24	97.477	1.23	6.3	Flo-Mate 2000
	July 25	97.466	1.23	5.5	Flo-Mate 2000
	July 27	97.452	1.02	6.4	Flo-Mate 2000
	July 28	97.467	1.09	6.5	Flo-Mate 2000
	August 19	97.325	0.68	6.7	Flo-Mate 2000
	September 18	97.291	0.64	6.8	Flo-Mate 2000
	September 22	97.279	0.54	6.8	Flo-Mate 2000
Roberts Hydro (97.9 km^2)	June 18	99.578	5.72	5.1	Swoffer 2100
	July 25	99.332	1.44	6.1	Flo-Mate 2000
	July 27	99.316	1.29	6.2	Flo-Mate 2000
	July 28	99.316	1.29	6.2	Flo-Mate 2000
	August 16	99.233	0.78	7.0	Flo-Mate 2000
	August 21	99.194	0.62	6.8	Flo-Mate 2000
	September 19	99.184	0.56	6.1	Flo-Mate 2000
	September 21	99.155	0.49	6.4	Flo-Mate 2000
Windy Hydro (14.1 km^2)	June 18	95.070	0.23	7.2	Swoffer 2100
	July 24	95.095	0.20	5.9	Flo-Mate 2000
	July 25	95.100	0.20	5.7	Flo-Mate 2000
	July 28	95.086	0.14	6.4	Flo-Mate 2000
	August 18	95.061	0.11	6.6	Flo-Mate 2000
	September 19	95.026	0.08	6.9	Flo-Mate 2000
	September 20	95.012	0.08	6.7	Flo-Mate 2000
	September 21	95.021	0.07	6.6	Flo-Mate 2000

[a] *Water levels referenced to site-specific arbitrary local datum.*
[b] *95% level of confidence.*

Table 3. Summary of Stage-Discharge Rating Equations, Doris North Project, 2014

Hydrometric Station	Rating Equation	Number of Flow Measurements Used in Curve	Root Mean Square Error (%)	Monitoring Period Used to Develop Curve (Years)[a]
Doris TL-2	$Q = 3.84(h\text{-}98.851)^{2.098}$	22	6.1	2013-2014
Doris TL-3	$Q = 2.79(h\text{-}96.766)^{2.427}$	8	5.7	2014
Roberts Hydro	$h<99.259 : \ Q = 7.00(h\text{-}98.894)^{1.931}$ $h>99.259 : \ Q = 15.33(h\text{-}99.002)^{2.009}$	23	7.5	2009-2014
Windy Hydro	$4.71(h\text{-}94.854)^{2.041}$	7	11.3	2014

[a] *In some cases not all of the data collected during the year(s) listed were used in the development of the rating curve (e.g., stage measurements affected by ice were excluded). See Section 3.6 for details.*

3.3 Hydrographs

Discharge hydrographs were generated at each active hydrometric station by applying the constructed rating equation to the collected stage record (Figures 2 to 5). Each hydrograph includes the 10-minute discharge showing the variance in daily measured discharge, daily mean discharge, and estimated discharge when mean daily discharge could not be calculated based on stage records. Estimation methods follow those detailed in previous reports (ERM Rescan 2014). Hydrographs also include manual flow measurements to show the goodness of fit for discharge measurements collected in 2014. Daily mean air temperature and daily mean precipitation collected at the Doris Meteorological station were included to provide context for the hydrologic response of the stream monitored at each station.

The relatively large variance observed in the 10-minute discharge at Windy Hydro is likely related a combination of factors that affect the stage record. These factors include the relatively shallow depth of the site, windy conditions (which sometimes create a seiche affect), and relatively high wave action.

3.4 Hydrologic Indices

Discharge and runoff (discharge normalised to drainage area) results for 2014 are presented in Tables 4 and 5, respectively. Annual peak flow and peak unit yield (an expression of discharge normalized to drainage area) for 2014 are presented in Tables 6 and 7, respectively. Data from 2009-2013 are provided for comparison. Observed low flows for 2014 are provided in Table 8.

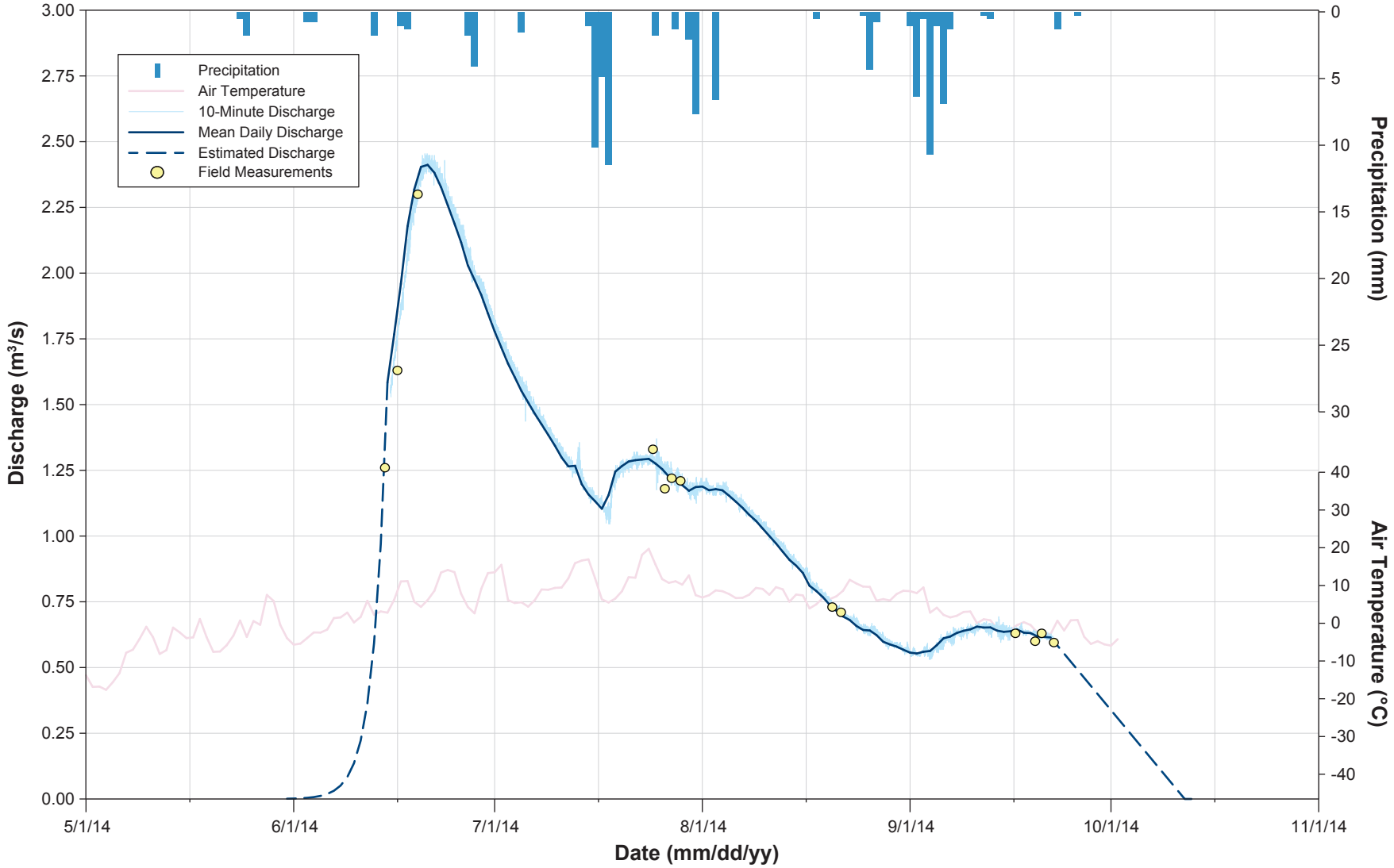
3.5 Lake Water Levels

Water level monitoring was conducted at Doris Lake, the Tailing Impoundment Area (TIA), and Windy Lake (at station Windy Hydro; Table 9). Pressure transducers at Doris Lake and the TIA have been monitoring water level (stage) continuously since 2004, with the following exception:

- Data from the TIA is missing from September 8, 2013 to March 16, 2014 because the datalogger associated with the permanent pressure transducer malfunctioned. The cause of the malfunction was unclear. The datalogger was removed from site for repairs and will be reinstalled when ice conditions permit in 2015. A temporary data logger and pressure transducer collected data through the open water season of 2014. The temporary station was removed in September 18, 2014.

Figure 2

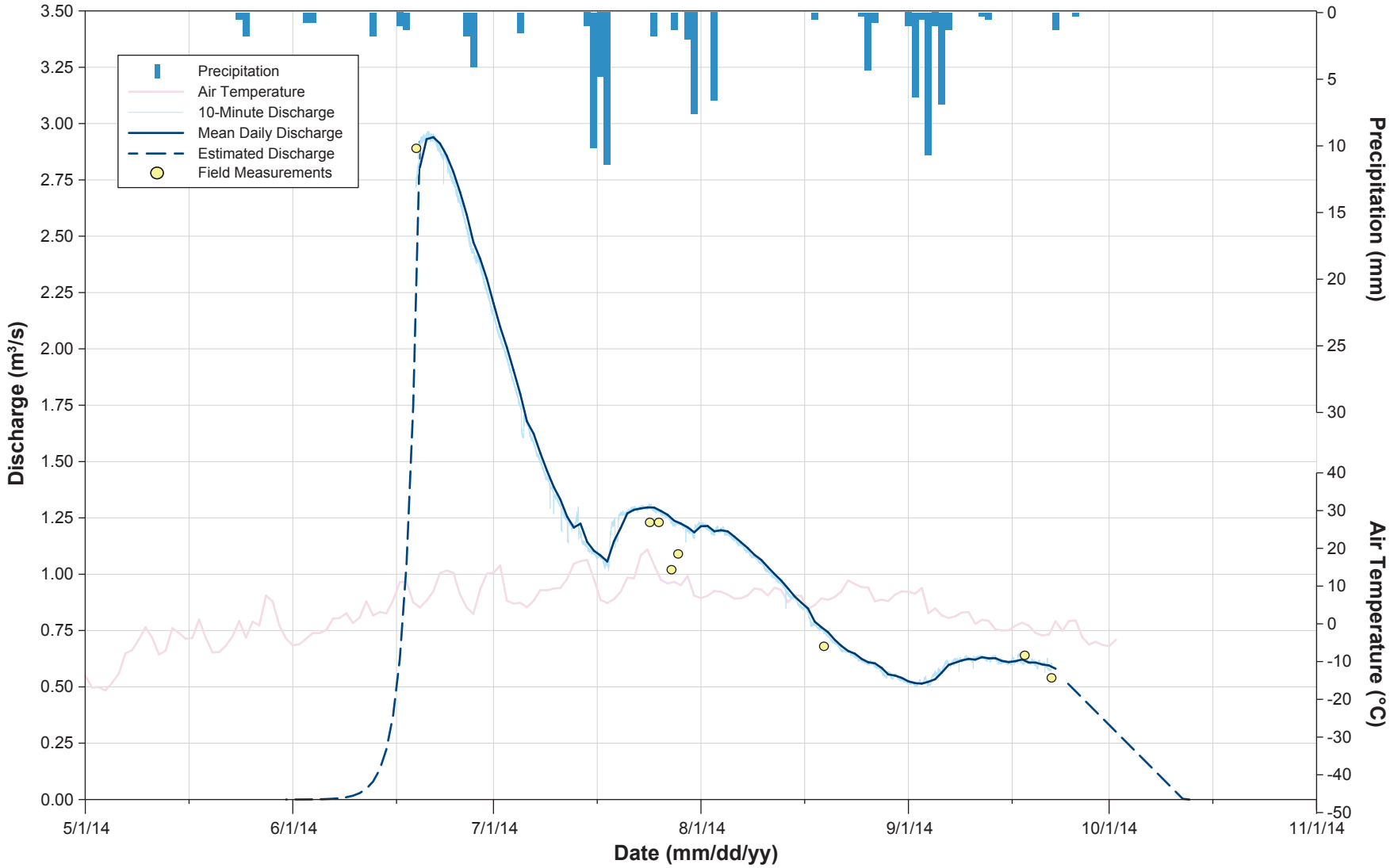
Annual Hydrograph at Station TL-2, Doris North Project, 2014



Notes: Precipitation and air temperature based on Doris North Meteorological Station.
Station installed June 15, 2014; demobilized September 22, 2014.
Mean daily discharge values between May 31 to June 14 are estimated using a logarithmic growth function.
Mean daily discharge values between Sept 23 to Oct 16 are estimated using a linear regression function.
The channel was assumed to be frozen to the bed from Jan 1 to May 31, and from Oct 16 to Dec 31, 2014.

Figure 3

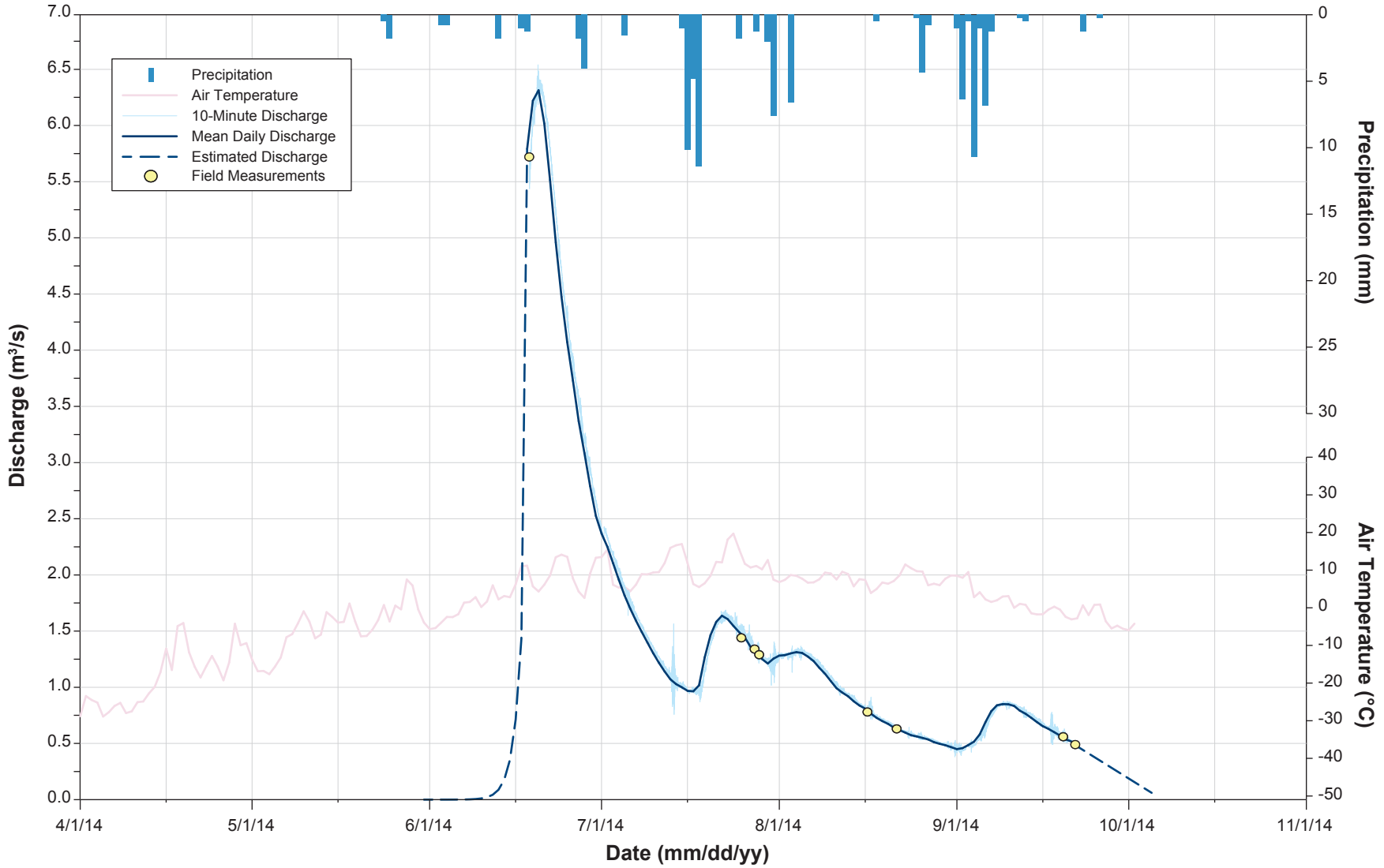
Annual Hydrograph at Station TL-3, Doris North Project, 2014



Notes: Precipitation and air temperature based on Doris North Meteorological Station.
Station installed June 20, 2014; demobilized September 23, 2014.
Mean daily discharge values between May 31 to June 19 are estimated using a logarithmic growth function.
Mean daily discharge values between Sept 24 to Oct 13 are estimated using a linear regression function.
The channel was assumed to be frozen to the bed from Jan 1 to May 31, and from Oct 14 to Dec 31, 2014.

Figure 4

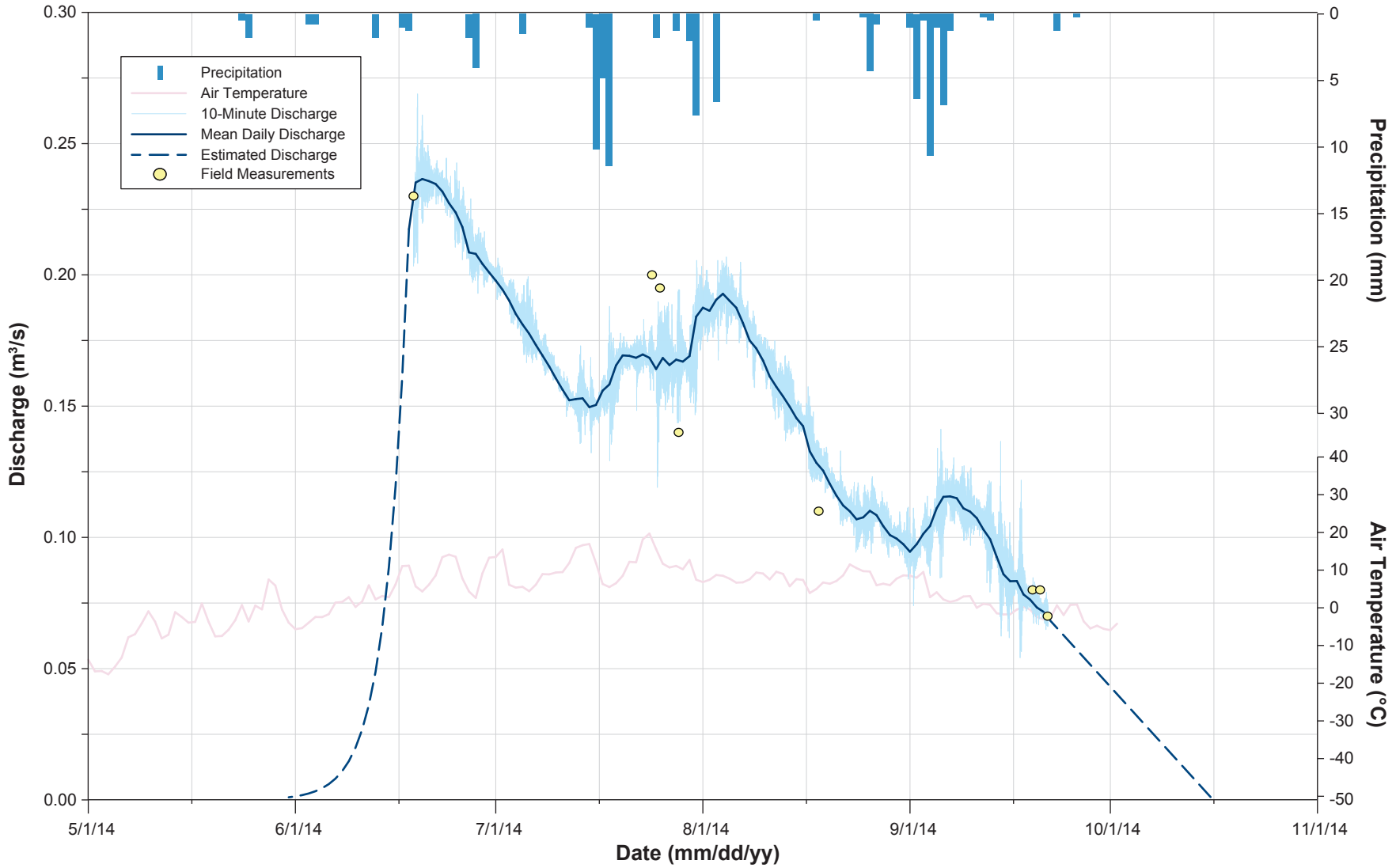
Annual Hydrograph at Station Roberts Hydro, Doris North Project, 2014



Notes: Precipitation and air temperature based on Doris North Meteorological Station.
Station installed June 18, 2014; demobilized September 21, 2014.
Mean daily discharge values between June 1 to June 18 are estimated using a logarithmic growth function.
Mean daily discharge values between Sept 22 to Oct 5 are estimated using a linear regression function.
The channel was assumed to be frozen to the bed from Jan 1 to May 31, and from Oct 6 to Dec 31, 2014.

Figure 5

Annual Hydrograph at Station Windy Hydro, Doris North Project, 2014



Notes: Precipitation and air temperature based on Doris North Meteorological Station.
Station installed June 18, 2014; demobilized September 21, 2014.
Mean daily discharge values between May 31 to June 18 are estimated using a logarithmic growth function.
Mean daily discharge values between Sept 22 to Oct 16 are estimated using a linear regression function.
The channel was assumed to be frozen to the bed from Jan 1 to May 31, and from Oct 16 to Dec 31, 2014.

Table 4. Observed and Annual Runoff, Doris North Project, 2009 to 2014[a]

Hydrometric Station	Total Runoff (mm)									
	2009 to 2013 Observed[b]								2014 Observed[b]	2014 Annual[c]
	2009	2010	2011	2012	2013	Min	Mean	Max		
Doris TL-2	87	121	184	104	40	40	107	184	105	*113*
Doris TL-3[d]	n/a	n/a	*183*	105	44	44	*111*	183	103	*120*
Roberts Hydro[e]	*87*	137	144	98	*56*	*56*	*104*	144	135	*138*
Windy Hydro	141	197	143	112	42	42	127	197	89	*98*

Notes:
[a] Italics denote estimated values.
[b] Calculated from recorded values during the open water season. Site-specific periods of record for historic data are presented in published baseline and compliance reports (Rescan 2009, 2011a, 2011b, 2012a, and 2012b, Rescan 2014), and site-specific periods of record for 2014 data are provided in Table 1.
[c] Annual values include estimated data for periods when stations were demobilized.
[d] Station established in July 2011: Values were estimated for June 2011; historical minimum and maximum values are not available.
[e] Roberts Hydro values from 2009 include estimated values for the period when the station was damaged.

Table 5. Observed and Annual Mean Discharge, Doris North Project, 2009 to 2014[a]

Hydrometric Station	Mean Discharge (m^3/s)									
	2009 to 2013 Observed[b]								2014 Observed[b]	2014 Annual[c]
	2009	2010	2011	2012	2013	Min	Mean	Max		
Doris TL-2	1.00	1.15	1.58	1.16	0.46	0.46	1.07	1.58	1.15	*0.34*
Doris TL-3[d]	n/a	n/a	*1.58*	1.23	0.53	0.53	1.11	1.58	1.19	*0.36*
Roberts Hydro[e]	*1.02*	1.40	1.68	1.16	*0.67*	0.67	1.19	1.68	1.50	*0.41*
Windy Hydro	0.23	0.30	0.26	0.22	0.07	0.07	0.22	0.30	0.15	*0.04*

Notes:
[a] Italics denote estimated values
[b] Calculated from recorded values during the open water season. Site-specific periods of record for historic data are presented in published baseline and compliance reports (Rescan 2009, 2011a, 2011b, 2012a, and 2012b, Rescan 2014), and site-specific periods of record for 2014 data are provided in Table 1.
[c] Annual values include estimated data for periods of when stations were demobilized.
[d] Station established in July 2011: Values were estimated for June 2011; historical minimum and maximum values are not available.
[e] Roberts Hydro values from 2009 include estimated values for the period when the station was damaged.

Table 6. Peak Flow, Doris North Project, 2009 to 2014[a]

Hydrometric Station	Peak Flow (m^3/s)								
	2009 to 2013								
	2009	2010	2011	2012	2013	Min	Mean	Max	2014 (Date)
Doris TL-2									
Instantaneous	2.39	4.61	5.88	3.62	1.00	1.00	3.50	5.88	2.45 (June 20)
Daily	2.29	4.44	5.77	3.56	0.98	0.98	3.41	5.77	2.41 (June 21)
Doris TL-3[b]									
Instantaneous	n/a	n/a	5.96	3.83	1.29	1.29	3.69	5.96	2.97 (June 21)
Daily	n/a	n/a	5.86	3.78	1.25	1.25	3.63	5.86	2.94 (June 22)
Roberts Hydro									
Instantaneous	2.55	5.84	7.47	3.63	2.01	2.01	4.30	7.47	6.54 (June 19)
Daily	2.49	5.78	7.34	3.60	1.97	1.97	4.24	7.34	6.31 (June 20)
Windy Hydro									
Instantaneous	0.36	0.49	0.66	0.37	0.13	0.13	0.40	0.66	0.27 (June 19)
Daily	0.34	0.46	0.64	0.36	0.12	0.12	0.38	0.64	0.24 (June 20)

Notes:
[a] Italics denote estimated values.
[b] Station established in July 2011; historical minimum and maximum values are not available. Peak flow values for 2011 were estimated from modelled data.

Table 7. Peak Unit Yield, Doris North Project, 2009 to 2014[a]

Hydrometric Station	Peak Unit Yield ($L/s/km^2$)								
	2009 to 2013								
	2009	2010	2011	2012	2013	Min	Mean	Max	2014 (Date)
Doris TL-2									
Instantaneous	25.24	48.57	62.19	38.29	10.55	10.55	36.97	62.19	25.94 (June 20)
Daily	24.17	46.73	60.97	37.65	10.37	10.37	35.98	60.97	25.50 (June 21)
Doris TL-3[b]									
Instantaneous	n/a	n/a	62.51	40.14	13.50	13.50	38.72	62.51	31.13 (June 21)
Daily	n/a	n/a	61.50	39.66	13.15	13.15	38.10	61.51	30.85 (June 22)
Roberts Hydro									
Instantaneous	26.03	59.59	76.35	37.09	20.58	20.58	43.93	76.35	69.13 (June 19)
Daily	25.47	58.97	75.00	36.82	20.10	20.10	43.27	75.00	66.74 (June 20)
Windy Hydro									
Instantaneous	25.76	34.95	46.62	25.93	9.21	9.21	28.49	46.62	19.07 (June 19)
Daily	23.91	32.55	45.47	25.49	8.25	8.25	27.13	45.47	16.77 (June 20)

Notes:
[a] Italics denote estimated values.
[b] Station established in July 2011. Historical minimum and maximum values are not available. Peak unit yield values for 2011 were estimated from modelled data.

Table 8. Observed Low Flows, Doris North Project, 2009 to 2014[a]

Hydrometric Station	Daily Low Flow (m^3/s)								
	2009 to 2013								2014 (Date)
	2009	2010	2011	2012	2013	Min	Mean	Max	
Doris TL-2	0.43	0.45	0.40	0.14	0.09	0.09	0.30	0.45	0.55 (Sept 21)
Doris TL-3[b]	n/a	n/a	0.37	0.17	0.09	0.09	0.21	0.37	0.51 (Sept 3)
Roberts Hydro[c]	*0.52*	0.33	0.12	0.11	0.11	0.11	*0.24*	*0.52*	0.45 (Sept 1)
Windy Hydro	0.15	0.16	0.11	0.06	0.02	0.02	0.10	0.16	0.07 (Sept 21)

Notes:
[a] *Italics denote estimated values.*
[b] *Station established in July 2011. Historical minimum and maximum values are not available.*
[c] *Roberts Hydro station was damaged in 2009. Observed low flow value for 2009 was estimated from modelled data.*

Table 9. Lake Water Level Variations in Doris Lake and the TIA, Doris North Project, 2014

Lake	Lake Area (km^2)	Drainage Area at Lake Outlet (km^2)	Period of Operation in 2014	Min Water Level (m)	Max Water Level (m)	Mean Water Level (m)	Water Level Change (m)
Doris[ab]	3.4	94.6	January 1 - September 21	5.458	6.139	5.627	0.681
TIA[ab]	0.8	4.2	March 16 - September 18	5.159	5.565	5.328	0.406
Windy	5.3	14.1	June 5 - September 8	0.479	0.604	0.546	0.125

Notes:
[a] *Data is monitored continuously. The end date in the Period of Operation column notes the last day of data collected during the final site visit. Dataloggers will collect data through winter 2014/15.*
[b] *Stage data was adjusted relative to a local arbitrary datum. A secondary pressure transducer was installed in July 2014 to augment the stage record at each site.*

3.6 Quality Assurance

Quality Assurance/Quality Control was completed at each hydrometric station. At station TL-2, all measurements collected in 2014 were within 15% of the established stage-discharge rating curve. The measurements collected in 2014 validated the rating curve constructed in 2013, and no new curves were necessary. No corrections were made to the stage record. At station TL-3, measurements collected in 2014 varied by more than 15% from the rating curve, and so a new stage-discharge relationship was created. All measurements collected in 2014 were within 15% of the new rating curve. No corrections were made to the stage record. At station Roberts Hydro, a rating shift was introduced in July, suggesting a gradual change in the stage-discharge relationship. All measurements were within 10% of the shifted rating curve. No changes were made to the stage record. At station Windy Hydro, a shift was introduced in late June, suggesting a gradual change in the stage-discharge relationship. No changes were made to the stage record.

At station TL-2, recorded discharge was used to determine the allowable pumping rate from the TIA to ensure that discharge remained less than 10% of background flow levels. Data was recorded for 96 days in 2014. Discharge from the TIA exceeded 10% of background flow on two occasions (September 9th and 21st). Discharge was 10.3 % of the background volumetric flow at TL-2 on September 9th (i.e., a 0.3% exceedance), and 15.0 % of daily volumetric flow at TL-2 on September 21st (i.e., a 5% exceedance). On both occasions, the volume of discharge was within the range of natural variation of Doris Creek and no adverse effects on the stream channel or biological communities are expected.

4. SUMMARY

In 2014, observed runoff for the gauged basins ranged from 89 to 135 mm, and annual runoff ranged from 98 to 138 mm (Table 4). The winter of 2013/2014 was an average precipitation year in the Arctic Tundra climatic region according to Environment Canada's Climate Trends and Variations Bulletin: Environment Canada ranked winter 2013/2014 the 39th wettest winter out of 66 years of record (-5.4% below normal) for this region (EC 2014). Precipitation in summer was slightly (7.1%)greater than the mean precipitation for the region (21st wettest of 66 years on record). Runoff for the monitored watersheds during the 2014 open water season was 2 to 7% lower than the 2009 to 2013 average along Doris Creek, 31% lower than the average at Windy Hydro, and 26% above the average at Roberts Hydro.

Daily peak flows ranged from 0.2 to 6.3 m^3/s, while instantaneous peak flows ranged from 0.3 to 6.5 m^3/s. Along Doris Creek, peak flows were approximately 20% below the 2009 to 2013 average at station TL-3 and 30% below the 2009 to 2013 average at station TL-2. Daily peak flows were 2.9 and 2.4 m^3/s respectively. Instantaneous peak flows were 3.0 and 2.5 m^3/s respectively. Daily and instantaneous peak flows at Windy Hydro were approximately 35% below the 2009 to 2013 average peakflows of 0.2 m^3/s and 0.3 m^3/s, respectively. At Roberts Hydro, daily and instantaneous peak flows were approximately 50% above the 2009 to 2013 average peak flows of 6.3 m^3/s and 6.5 m^3/s, respectively.

Recorded low flows at active stations in the Project area were much higher in 2014 (ranging from 84 to 125% above the observed mean) at all stations except Windy Hydro, which was approximately 25% lower than the observed mean low flows. This may be related to the timing of station demobilization in 2014 compared to previous years: Stations typically have been demobilized in early September, but were demobilized in late September in 2014. A rise in discharge was recorded at all sites except Windy Hydro in mid-September 2014, which likely explains the higher than average low flows recorded in 2014.

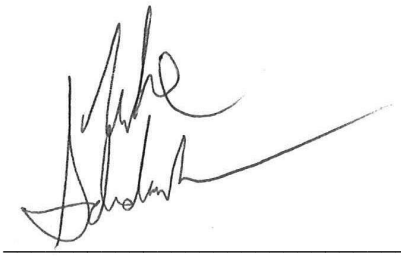
During the monitoring period over which pumping occurred (94 days), discharge exceeded 10% of background flow on two occasions (September 9th and 21st) representing a 98% level of compliance. Discharge was 10.3 % of the background volumetric flow on September 9th (i.e., 0.3% exceedance), and 15.0 % of the background volumetric flow on September 21st (i.e., 5% exceedance).

Summary of Compliance Points

Doris North Project Certificate	Compliance	Results
Proponent will monitor stage and discharge in Doris Outflow both upstream and downstream of the decant discharge point to provide information that can be used in assessing the accuracy of the impact predictions relating to fish habitat downstream.	Yes	Hydrometric station TL-2 is located upstream of the discharge location. Station TL-3 is located downstream of the discharge location. Each station collects and records stage at 10-minute intervals during the open water season. A minimum of eight discharge measurements were completed at each location and were used to convert recorded stage to discharge using a stage-discharge relationship.
Doris North Project Type A Water Licence		
Part G. Item 31. The Licensee shall ensure that water within the Tailings Impoundment Area is maintained at an elevation of least 28.3 metres above sea level such that a minimum of four (4) metres of water cover is maintained over the tailings at all times.	Yes	Though tailings have not yet been deposited in the TIA, water levels have been monitored almost continuously, with a data gap from September 8, 2013 to March 16, 2014 due to a datalogger malfunction and after September 18, 2014 when the temporary datalogger and pressure transducer were removed.
Part G. Item 31. The Licensee shall ensure that the flow from the Tailings Impoundment Area into Doris Creek at monitoring station TL-4 does not exceed 10% of the background flow in Doris Creek as measured at monitoring station TL-2 at the time of discharge.	No	During the monitoring period over which pumping occurred (94 days), discharge exceeded 10% of background flow on two occasions (September 9 and 21. Discharge was 10.3% of the background volumetric flow on September 9 (i.e., 0.3% exceedance), and 15.0% of the background volumetric flow on September 21 (i.e., 5% exceedance).
Part J. Item 2: The Licensee shall install appropriate instrumentation in Doris Creek at Monitoring Station TL-2, to monitor flow when ice conditions allow for such measurements to be taken, on a real time and continuous basis.	Yes	Real time continuous monitoring was conducted at station TL-2 when ice conditions allowed to provide flow predictions for TIA dewatering operations.
Part J. Item 3. The Licensee shall undertake the Water Monitoring Program detailed in the Tables of Schedule J[a]	Yes	Automated hydrometric stations TL-2 and TL-3 were operated throughout the open-water season in 2014. Stage-discharge measurements were collected at each site and annual discharge hydrographs were generated.
Interim Water Management Plan		
Section 4.2: Continuous monitoring of Doris Lake water levels and outflows will continue under the hydrologic baseline characterization. These data will be used to calibrate the existing water balance and quality model.	Yes	Though mining has not yet commenced, water levels are continuously monitored in Doris Lake, although ice affected stage readings are discarded during QA/QC review.

Note:
[a] ERM Rescan monitors discharge at sites TL-2 and TL-3. All other requirements under this element are monitored by TMAC and presented elsewhere.

Prepared By:



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