Appendix V5-1D

Hope Bay Belt Project:
2009 Hydrology Baseline Report

MAC RESOURCES

Hope Bay Mining Limited

Hope Bay Belt Project:
2009 Hydrology Baseline Report

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2009 Hydrology Baseline Report, Hope Bay Belt Project

December 2009
Project #1009-02-03

Prepared for:

Hope Bay Mining Ltd.

Prepared by:

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Executive Summary

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Executive Summary

Environmental baseline studies were conducted by Rescan Environmental Services Ltd. (Rescan) in 2009, on behalf of Newmont Mining Corporation (Newmont), for the Hope Bay Belt Project. The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound. The nearest communities are Omingmaktok (75 km to the southwest of the property), Cambridge Bay, and Kingaok (Bathurst Inlet; 160 km to the southwest of the property).

The environmental baseline program conducted in 2009 was based on the plan to develop multiple deposits in the belt. The 2009 program was also based on Newmont's priorities as of early 2009, which included regulatory compliance with the existing Doris North Project permits and licences. Baseline work was primarily focused on the north end of the belt in 2009.

This report presents the findings of the 2009 hydrology baseline study. The primary objective of the 2009 hydrology monitoring was to collect additional hydrometric data relevant to the planned project to support permitting and project design. This report presents the methods used to collect and analyze hydrometric data for 2009 as well as a comparison of the results to on-site historical data and regional data.

A network of 13 lake and stream stations was operated during 2009. Eleven automated hydrometric stations were installed before or during freshet in 2009. Two hydrometric stations at Doris and Tail lakes were installed prior to 2009. The monitoring program commenced in mid June and continued through to late September when the majority of the stations were demobilized for the winter.

The estimated average runoff for the open-water season ranged from 95 to 168 mm across the Study Area. Estimated annual runoff was higher in the Windy-Glenn Watersheds (149 mm) than in the Doris-Roberts Watersheds (105 mm). Estimated runoff in the Koignuk Watershed and Reference-A Watershed was 134 mm and 88 mm, respectively.

The 2009 estimated runoff for Doris Outflow was 99 mm which agrees well with runoff values previously estimated for the Doris Watershed. This characterizes 2009 as an average year in terms of runoff.

Annual peak flows in the Project area occurred during the freshet period in late-June to early-July, driven by snowmelt. Observed instantaneous peak flows for the watersheds in the Study area ranged from 0.13 m^3/s at Tail Outflow to 133 m^3/s at the Koignuk River near its discharge point into Hope Bay. Similarly, instantaneous peak unit yields ranged from 17 $L/s/km^2$ at Patch Outflow to 45 $L/s/km^2$ at the Koignuk River.

Changes in lake water levels recorded from June 16 to September 21 ranged from 0.14 m to 0.35 m at Tail Lake and Doris Lake, respectively.

Tidal fluctuations were measured by an automated hydrometric station installed near the jetty at Roberts Bay from late July to early September. The tides in Roberts Bay were always microtidal (<2 m tidal range) and diurnal (one high tide and low tide per day) with larger tidal ranges (0.4 - 0.5 m) occurring during spring tides than during the neap tidal cycle (0.2 – 0.3 m). A strong storm surge was noted during early September.

Acknowledgements

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Acknowledgements

This report was prepared for Newmont Mining Corporation by Rescan Environmental Services Ltd. The 2009 hydrology fieldwork was conducted by Rescan scientists Greg Norton (M.Sc.), Xavier Pinto (M.Sc.), Katsky Venter (M.Sc.), and Tolga Olcay (M.Sc.). Field work assistance was provided by Wynter Kulliktana, Janet Kadlun, and Clarence Klengenberg. The report was written by Greg Norton, Jason Rempel (M.Sc.), and Xavier Pinto, and reviewed by Deborah Muggli (Ph.D., M.Sc., R.P.Bio.).

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HOPE BAY BELT PROJECT:
2009 Hydrology Baseline Report

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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, 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 three 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.

Newmont Mining Corporation (Newmont) acquired the property in 2008, and initially decided to consider the property as a whole to evaluate various options for responsible, long-term development of the belt. However, as of the fall of 2009, Newmont has decided to proceed with developing the already-permitted Doris North Project, which consists of a two year underground gold mine in the north end of the belt.

The environmental baseline program conducted in 2009 was based on the plan to develop multiple deposits in the belt, as indicated in Figure 1-2. The 2009 program was also based on Newmont's priorities as of early 2009, which included regulatory compliance with the existing Doris North Project permits and licences. Baseline programs for ecosystem mapping, vegetation, soils, and socio-community were deferred to 2010. Baseline work was primarily focused on the north end of the belt in 2009.

Results from the 2009 environmental baseline program are being reported in a series of reports, as follows:

- 2009 Hydrology Baseline Report;
- 2009 Meteorology Baseline Report;
- 2009 Freshwater Baseline Report;
- 2009 Freshwater Fish and Fish Habitat Baseline Report;
- 2009 Marine Baseline Report;
- 2009 Marine Fish and Fish Habitat Baseline Report.

In addition, baseline information obtained during 2009 was used to generate various compliance reports as specified in the Doris North Project Certificate (e.g., the Wildlife Monitoring and Mitigation Program Report), the Doris North Type A Water Licence, and the Doris North Roberts Bay Jetty Fisheries Authorization. Archaeology work was also conducted in 2009 and is being reported separately.

Figure 1-1

Hope Bay Belt Project Location

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PROJECT # 1009-002-01 GIS # HB-15-009 May 26 2009

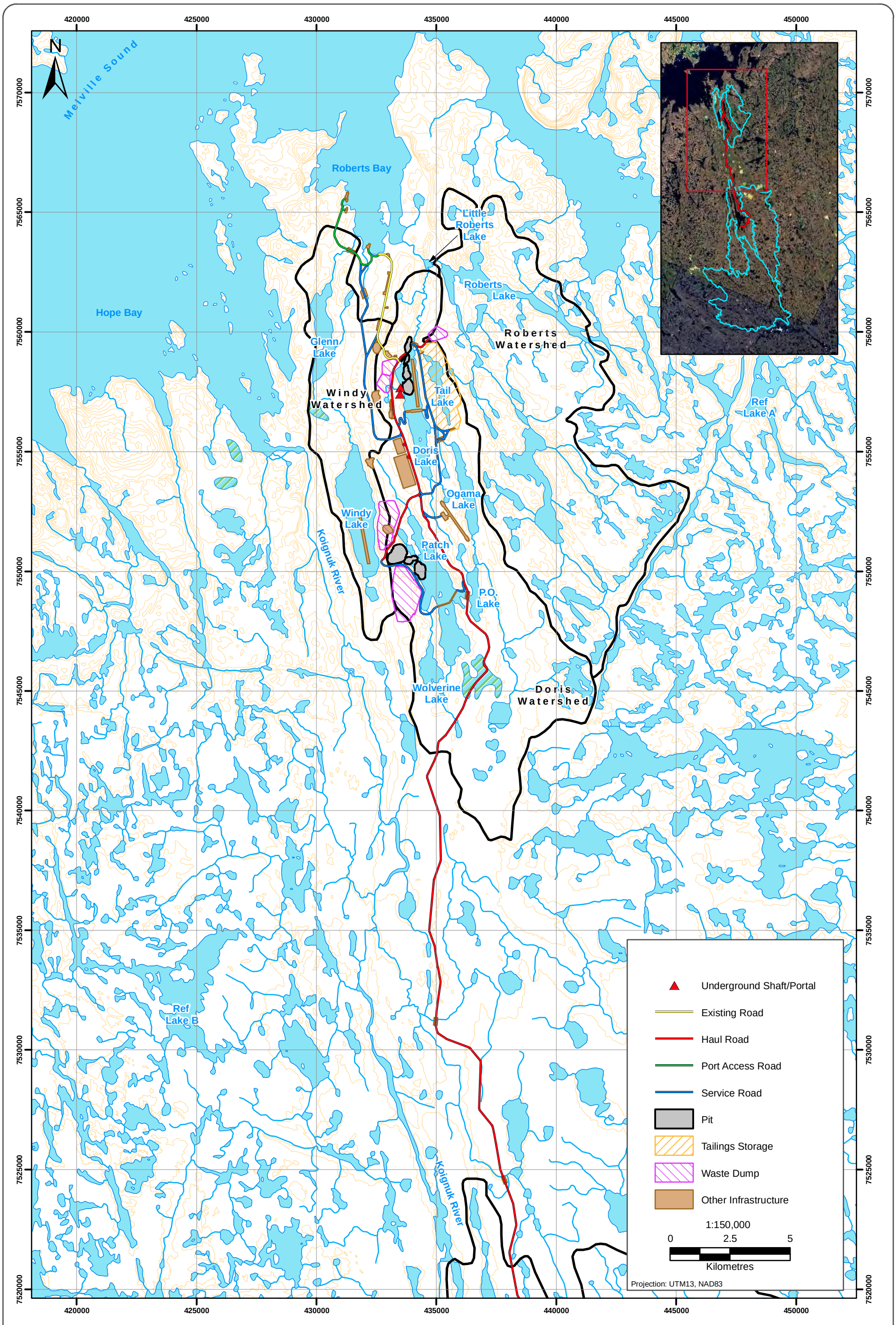

Figure 1-2

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Site Layout Options Considered for 2009 Baseline Program

Figure 1-2

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This report presents the results from the hydrology portion of the 2009 environmental baseline program. Preliminary estimates of key hydrological parameters (e.g., mean annual runoff and flow, and extreme flows) that describe hydrological conditions within the Study Area are prepared and compared against historical datasets for the Study Area as well as long-term hydrological datasets for rivers close to the project site. These estimates can be used for environmental impact assessment and to assist in engineering design. The main body of this report is divided into three sections, including:

- description of the hydrological setting of the project site;
- summary of 2009 field data collection and on-site monitoring program; and
- analysis of available on-site historical and regional hydrological datasets and comparison to derived key hydrological parameters.

2. Hydrological Setting

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2. Hydrological Setting

2.1 ARCTIC HYDROLOGY

The Hope Bay Study Area lies within the permafrost zone of the Canadian Arctic. This region is composed of vegetated tundra slopes dotted with lakes and wetland fens. Hydrologic processes are dominated by snow accumulation and melt, surface runoff, stream flow and lake hydrology. The annual flow hydrograph is controlled by long cold winters and short summers. Most of the annual runoff occurs during freshet and is derived from the melting snow pack. Late August and September precipitation events can also produce moderate runoff. Following freshet, a period of low flows typically extends through July and August. Due to the presence of permafrost, there is no groundwater support for smaller streams although there may be interaction between groundwater systems and larger rivers and/or lakes through taliks or openings in the permafrost. As a result, baseflow in streams is low and supported only by flow through the shallow upper active layer of the soil profile, the only part of the soil profile that melts in the summer months.

The hydrological year for the region is defined by freeze-up, which typically occurs in October for the Study Area. In small watersheds, like many of those in the Study Area, streams typically freeze to their bottom with zero flow during winter. Some larger rivers maintain flow year round, likely due to either groundwater discharge from taliks or flow from upstream lakes, where turbulent flow maintains ice free zones at the lake outlets. Water is stored in the snowpack during winter and is released in the spring freshet.

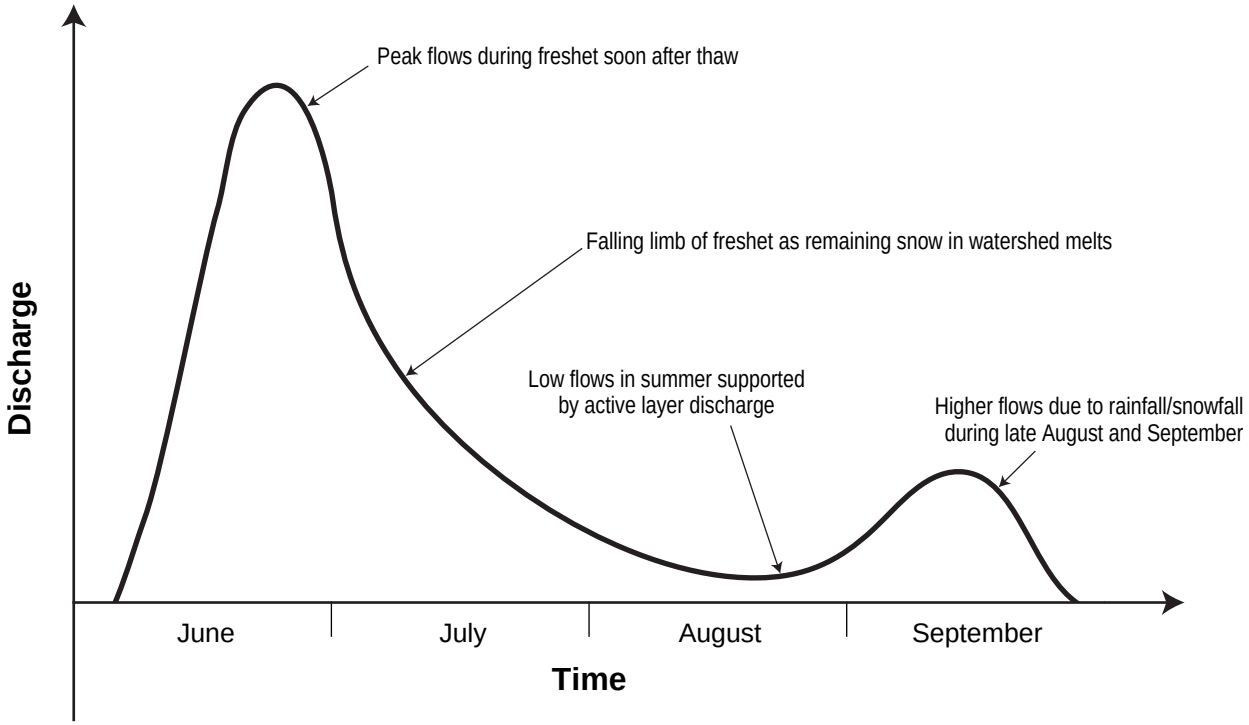
A conceptual hydrograph showing typical annual discharge patterns for small watersheds is shown in Figure 2.1-1. This figure shows a steep peak during freshet and a second peak in late August through September. The shapes of hydrographs and the responses of streams to both spring snowmelt and precipitation are strongly correlated to basin size. Smaller watersheds respond more rapidly to inputs than larger watersheds. The magnitude and timing of runoff events vary with watershed size and precipitation.

In very small basins the freshet can be as short as a few days and will often occur immediately after ice break-up. Flow in these basins may cease after freshet until the late summer rains begin. For rivers draining larger basins, the freshet peak may be delayed after ice break-up compared to smaller drainages as snowmelt from upper portions of the watershed is routed through the system.

Smaller watersheds can also have more dramatic responses to precipitation. In larger watersheds, the presence of lakes creates significant attenuation of water and diminishes the magnitude of peak flows. The attenuation of flows in lakes also reduces risks of flooding in the area due to lower downstream peak flows.

The overall shape of the annual flow hydrograph for Arctic watersheds is relatively easy to predict. However, predicting the volume of freshet or the size of the peak flow during freshet is much more difficult. This is due to a number of factors that influence freshet runoff, including:

- *Amount of snowpack available to be melted in spring.* Snowpack is dependent on the amount of snowfall during the previous winter and the amount of snow remaining in each watershed in May or June. Snow can be lost or redistributed due to sublimation, melting, or wind.



Note: Approximate scale only

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Theoretical Typical Annual Flow Hydrograph for a Small Northern Watershed

Figure 2.1-1

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- *Rate of temperature rise in spring.* This can greatly affect peak flow rates as a rapid increase in temperature after the snowpack has saturated can produce high melt rates. Also there can be differential melt rates on north and south facing slopes which may affect the size of the contributing area to the melt.
- *Timing of opening of stream channels linking lakes.* In the Study Area, snowmelt from hillslopes surrounding lakes can occur before the stream channel draining the lake becomes ice free. In this case, meltwater can be stored in the lake and then released once the channel is open to flow.
- *Soil moisture conditions and lake levels at the end of the previous summer.* If there was a dry summer during the previous year, lake levels could have been lowered and a soil moisture deficit could have developed within the hillslopes surrounding the lakes. As a result, a portion of the annual runoff will recharge the lakes and soil moisture and not be transmitted from the watershed as stream flow.

The amount of runoff during summer and fall is controlled by the relative impact of rainfall and evaporation. Open-water evaporation rates in summer often exceed total rainfall such that soil moisture deficits build up in the shallow active layer of the soil. Studies of hillslope processes in northern watersheds (e.g., Quinton and Marsh, 1998) have shown that summer rainfall may produce little or no runoff from hillslopes in the permafrost zone. In this case, stream flow increases only due to rain falling directly onto lake surfaces or when there is high intensity or lower intensity/higher duration rainfall.

2.2 STUDY AREA WATERSHEDS

The Study Area is coastal lowland characterized by extensive chains of lakes and low relief. The drainage basins are generally long and narrow and predominantly oriented along a north-south axis. Drainage basins are relatively flat, with a large percentage of lake area and high ridges along basin boundaries formed by rock outcrops. The local topography ranges from sea level at Roberts Bay to 158 m at the summit of Doris mesa, 3 km inland (Plates 2.2-1 and 2.2-2).

The Study Area included four main drainages (Figure 3.2-1): Koignuk (2937 km^2), Windy-Glenn (48 km^2), Doris-Roberts (194 km^2), and Reference-A (27 km^2). The Koignuk River Watershed drains north into Hope Bay. The Windy-Glenn Watershed is located east of the Koignuk River and flows north into Roberts Bay via Glenn Lake. The Doris-Roberts Watershed is located east of the Windy-Glenn Watershed, the outlet stream of Doris Lake flows north into Roberts Bay of Melville Sound via Little Roberts Lake. The Reference-A Lake Watershed is the easternmost basin in the Study Area and it drains northwest into Melville Sound.

2.3 AVAILABLE HYDROLOGICAL DATA

2.3.1 Historical Site Data

Various hydrology stations have been installed and operated throughout the Hope Bay Belt area since the mid 1990s. Multiple years of data are available for many major lake outflows for the Doris/Madrid area. Fewer years of data are available for the Boston area. Hydrometric monitoring in the area began in 1993 at several sites where flow and water levels were manually recorded. Automated monitoring began in 1995 and this continued to the present, although the number of stations has changed from year to year over that period (Table 2.3-1).

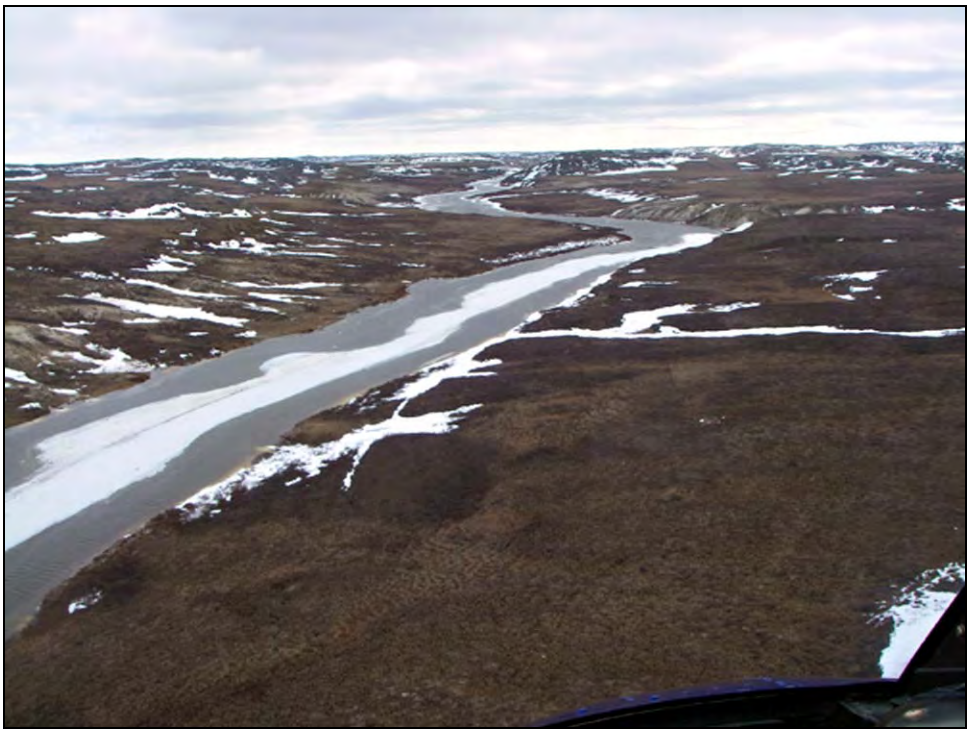

Plate 2.2-1. Koignuk River facing south.

Plate 2.2-2. Ogama Lake with Hope Bay in the background.

Table 2.3-1. Summary of Available Historic On-site Data Collected by Automated Hydrometric Stations

Monitoring Location	Coordinates UTM[a] (Easting, Northing)		Drainage (km^2)	Years of Automated Data Collection
Aimaokatalok Lake and Outflow	438,892	7,508,794	1241	2006-2008
Aimaokatalok River	441,634	7,499,360	769	2006-2008
Doris Lake	433,513	7,558,451	93.1	2004-2009
Doris Lake Outflow	434,063	7,559,507	93.1	1996-1998, 2000, 2003-2009
Fickle Duck Lake and Outflow	442,699	7,503,688	31.3	2006-2008
Glenn Lake Outflow	430,616	7,561,906	31.6	1996-1998, 2000, 2006-2009
Koignuk River	429,739	7,554,336	3192 [b]	2006-2009
Little Roberts Outflow	434,271	7,563,159	198.9	2003-2008
Ogama Inflow	436,617	7,550,891	64.6	1997
Ogama Lake and Outflow	435,648	7,555,130	72.1	1996-1998, 2006-2009
Patch Lake and Outflow	435,993	7,549,169	30	2006-2009
PO Lake	436,584	7,551,126	34.4	2007-2009
PO Lake Outflow	436,565	7,550,014	64.9	2007-2009
Roberts Lake and Outflow	435,289	7,562,800	97.8	2003-2009
Stickleback Lake and Outflow	442,009	7,504,121	2.8	1998, 2006-2008
Tail Lake	434,899	7,558,494	4.4	2004-2009
Tail Lake Outflow	434,273	7,559,147	4.4	2000, 2004-2009
Windy Lake and Outflow	431,507	7,555,043	13.9	2006-2009
Wolverine Lake and Outflow	435,222	7,545,888	1.97	2006-2009

[a] - UTM Zone 13W, NAD83
[b] - Value reported by Golder. Value reported by Rescan is 2,937 km^2

2.3.2 Regional Data

Table 2.3-2 and Figure 2.3-1 present the locations of regional hydrometric stations operated by the Water Survey of Canada (WSC). Data from these stations was used to supplement the on-site data collected for 2009 in order to calculate annual runoff estimates for the Koignuk River.

Table 2.3-2. Regional Water Survey of Canada (WSC) stations Relevant to the Study Area

Station Name	Station Number	Location		Drainage Area (km^2)	Period of Record
Burnside River near the mouth	10QC001	66°43'30" N	108°48'42" W	16,800	1976-present
Tree River near the mouth	10QA001	67°38'6" N	111°54'9" W	5,810	1968-present
Freshwater Creek near Cambridge Bay	10TF001	69°7'52" N	104°59'26" W	1,490	1970-present
Ellice River near the mouth	10QD001	67°42'30" N	104°08'21" W	16,900	1971-present
Back River below Beechy Lake	10RA001	65°11'14" N	106°5'9" W	19,600	1978-present
Contwoyto Lake at Lupin Mine	10QC003	65°46'37" N	111°13'1" W	not provided	1991-present
Fairy Lake River near outlet of Napaktulik Lake	10PC005	66°15'7" N	113°59'7" W	6,442	1993-present
Coppermine River above Copper Creek	10PC004	67°13'44" N	115°53'12" W	46,200	1987-2008
Kendall River near outlet of Dismal Lakes	10PC001	67°12'31" N	116°34'20" W	2,790	1969-present
Gordon River near the mouth	10QC002	66°48'36" N	107°6'4" W	1,530	1977-1994

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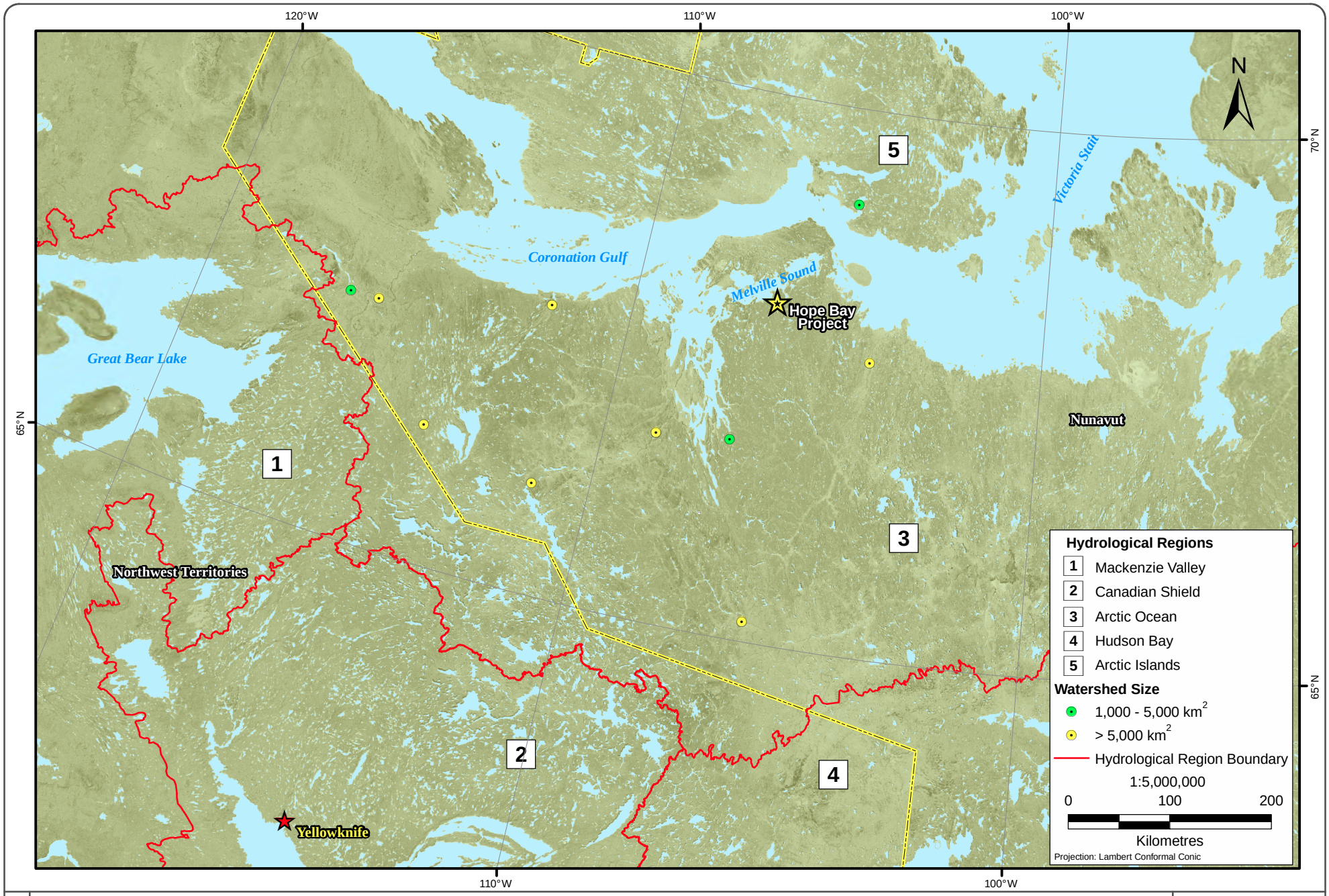

Figure 2.3-1

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WSC Hydrometric Stations Near the Study Area with >5 Year Records

Figure 2.3-1

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3. 2009 Field Data Collection

3. 2009 Field Data Collection

3.1 OBJECTIVES

Hydrological monitoring has been conducted to varying degrees within the Study Area since the mid 1990s. The primary objective of the 2009 monitoring program was to collect additional hydrometric data relevant to the planned project to support permitting and project design.

3.2 METHODS

3.2.1 Monitoring Network

A network of thirteen lake and stream stations was operated during 2009. Eleven automated hydrometric stations were installed before or during freshet in 2009. Two hydrometric stations at Doris and Tail lakes were installed prior to 2009 (Table 3.2-1, Figure 3.2-1).

Table 3.2-1. 2009 Automated Hydrometric Monitoring Stations

Station	Location	UTM Coordinates [a] (Easting, Northing)		Drainage Area (km2)	Monitoring Type
Doris-Roberts Watersheds					
Doris-Hydro	Doris Lake outflow	434,059	7,559,504	95	stream water level
Doris-Lake [b]	Doris Lake	433,512	7,558,452	95	lake water level
Ogama-Hydro	Ogama Lake outflow	435,501	7,555,173	75	stream water level
Patch-Hydro	Patch Lake outflow	436,062	7,549,169	32	lake water level
PO-Hydro	PO Lake outflow	436,549	7,550,584	68	lake water level
Roberts-Hydro	Roberts Lake outflow	435,310	7,562,560	98	lake water level
Tail-Hydro	Tail Lake outflow	434,300	7,559,158	4	stream water level
Tail-Lake [b]	Tail Lake	434,899	7,558,494	4	lake water level
Wolverine-Hydro	Wolverine Lake outflow	43,4802	7,545,443	3	lake water level
Windy-Glenn Watersheds					
Windy-Hydro	Windy Lake outflow	431,481	7,555,089	14	lake water level
Glenn-Hydro	Glenn Lake outflow	430,616	7,561,906	33	lake water level
Koignuk Watershed					
Koignuk-Hydro	Koignuk River	429,731	7,554,332	2937	stream water level
Reference-A Watershed					
Reference A-Hydro	Reference Lake outflow	448,494	7,561,212	27	lake water level
Tidal Gauge [c]					
Roberts Bay - Hydro	Roberts Bay, near proposed jetty	432,209	7,563,364	n/a	ocean water level

[a] - NAD 83, Zone 13 W
[b] - Station previously installed by Golder in 2004
[c] - for more details refer to section 3.2-5
n/a – not applicable

Each station installed in 2009 consisted of a 0-5 psi vented Instrumentation Northwest Inc. Aquistar PT-2X Smartsensor® that combines a pressure transducer and datalogger in one small diameter unit. The pressure transducers recorded water level at ten minute intervals. Each pressure transducer and cabling were inserted into a flexible aluminum conduit with one end of the conduit attached to a piece of angle iron. In rocky substrates, the angle iron was placed directly on the lake or stream bed

whereas in fine-grained substrates, the angle iron was attached to a wooden frame to spread the weight evenly and prevent the assembly from sinking into the substrate. At the outflow of Ogama Lake, the angle iron was anchored to ½ inch diameter pieces of reinforced bar which were drilled into bedrock and fixed in place with rock epoxy. A standard 1 m WSC staff gauge graduated to 0.01 m was also installed to allow for visual measurements of stage. The end connector of the pressure transducer/datalogger was housed in an aluminum waterproof box situated above the high water mark. Pressure transducers were installed as deep as possible to allow for monitoring of low lake and stream levels. Illustrations of station design are provided in Plate 3.2-1.

On shore benchmarks were established as survey control points at each lake and stream level station. During the installation of the stations the elevation of the pressure transducer and water level were surveyed using an automatic level. Surveys were also conducted at each station during subsequent site visits later in the summer (June/July) as a check against pressure transducers readings, to determine if there had been any drift in the readings.

The monitoring period for the stations installed in the spring of 2009 commenced in mid-June and continued through to late-September when the majority of the stations were demobilized for the winter (Table 3.2-2). The majority of the monitoring stations were demobilized at the end of the open-water period as freezing conditions can cause damage to the pressure transducer during the winter. Further, outlet channels completely freeze during the winter and flow levels reach zero. All stations were demobilized with the exception of Doris Lake and Tail Lake stations, which had monitoring instrumentation in water deep enough to prevent ice damage to the pressure transducer and therefore remained in operation as of late-September.

Table 3.2-2. 2009 Period of Operation for Hydrometric Monitoring Stations

Station	Period of Operation	Notes
Doris-Hydro	June 18 to September 21	
Doris-Lake	January 1 to August 28 [a]	Station was operated partially through 2004 at a temporary location before it was permanently installed at its current location in 2005
Glenn-Hydro	June 16 to September 21	
Koignuk-Hydro	June 16 to September 23	
Ogama-Hydro	June 17 to September 24	
Patch-Hydro	June 18 to September 24	
PO-Hydro	June 17 to September 23	
Reference A-Hydro	June 18 to September 23	
Roberts Bay-Hydro	July 28 to September 22	
Roberts-Hydro	June 17 to July 30	Station found vandalized during site visit in September 22.
Tail-Hydro	June 17 to September 21	
Tail-Lake	January 1 to August 28 [a]	Station was operated partially through 2004 at a temporary location before it was permanently installed at its current location in 2005
Windy-Hydro	June 16 to September 24	
Wolverine-Hydro	June 21 to July 28	Station was damaged by wildlife on July 28. Manual lake level readings taken on August 24 and September 24.

[a] *- Station operated through the 2008-2009 winter and remained in operation as of site visit on August 28, 2009.*

3.2.2 Manual Flow Measurements

Manual flow measurements during the open-water season were conducted during site visits in June, July, August, and September. The timing of the site visits was designed to capture the full range of flows that would be experienced at each monitoring station.

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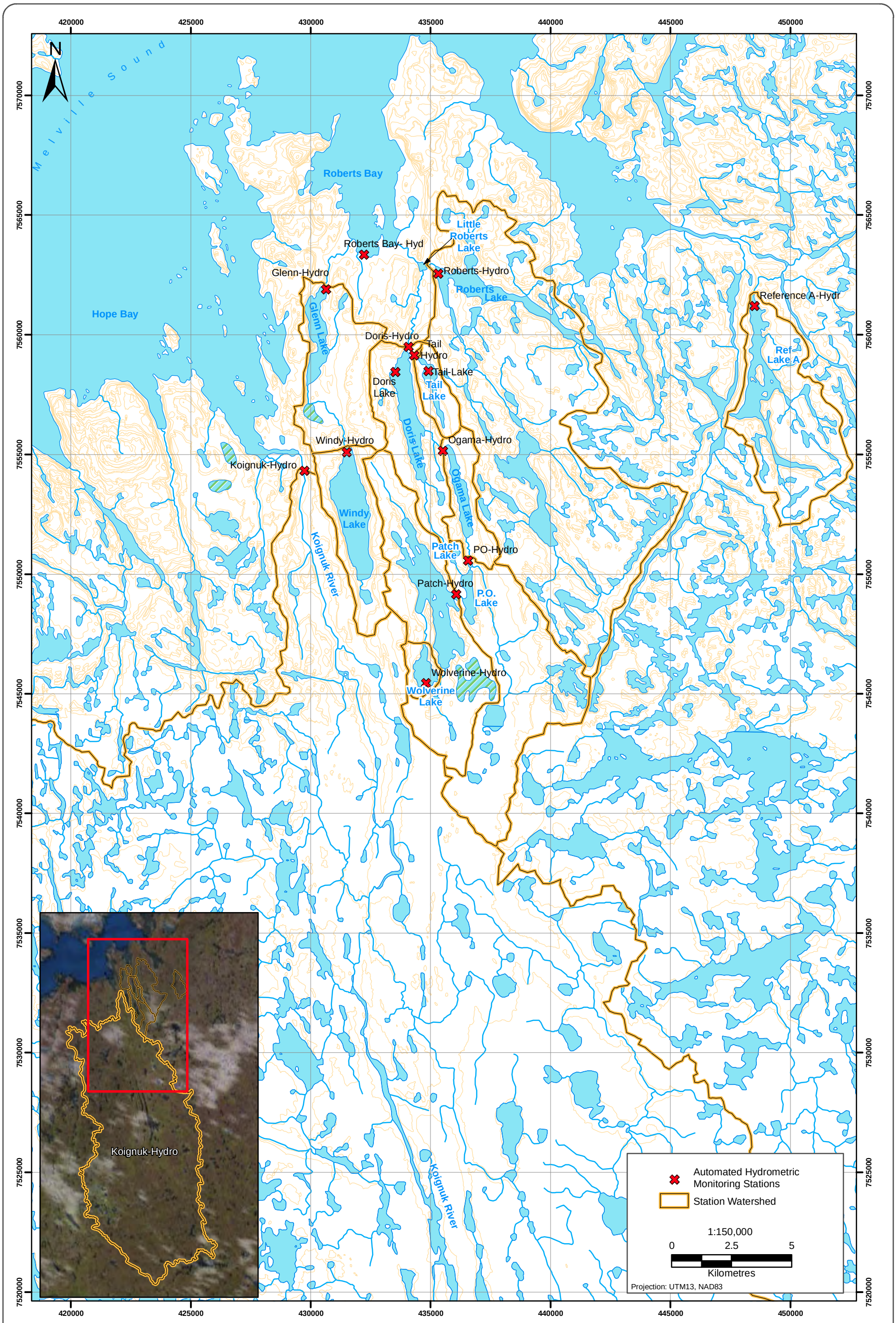

Figure 3.2-1

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2009 Hydrometric Monitoring Stations for Doris/Madrid Area, Hope Bay Belt Project

Figure 3.2-1

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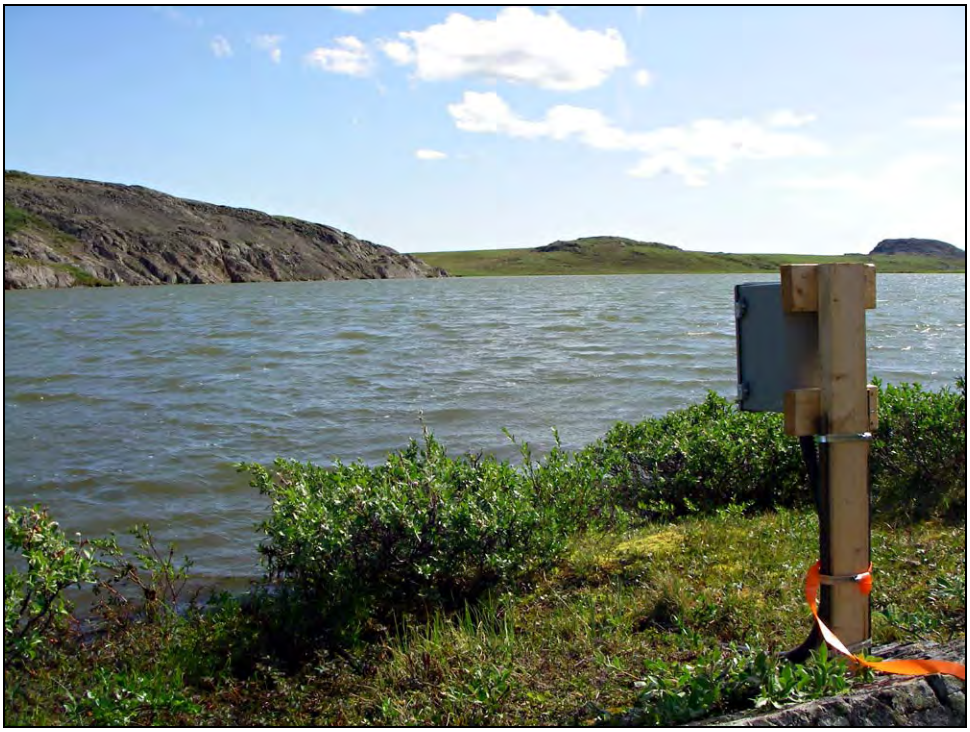


Plate 3.2-1. Photographs Illustrating Hydrometric Station Design

(continued)

Plate 3.2-1. Photographs Illustrating Hydrometric Station Design (completed)

At lake outlets, manual flow measurements were obtained by the velocity-area method using a Swoffer 2100 handheld velocity meter (Swoffer Instruments Inc.). Standard WSC methodologies for manual flow measurements were adopted (Terzi, 1981). Typically, channel wetted width was measured and equally divided into segments so that 20 to 30 vertical measurements were taken across the width of the channel with the aim of having each measurement interval accounting for less

than 10% of the total discharge. At each vertical, velocities were measured at 60% of depth from the surface when the depth of flow was <0.75 m and at 20% and 80% of depth from the surface when the depth of flow was >0.75 m. In most cases two replicate discharge measurements were conducted at each site in order to estimate the precision of the method. The average of the two measurements was taken to be the actual flow. The value of the two measurements provided the range of error associated with the actual flow.

During the open-water season, flow conditions at the Koignuk River were too dangerous to allow field personnel to safely wade and measure discharge with a handheld current velocity meter. Therefore, discharge was measured at this site by means of a StreamPro (Teledyne RD Instruments) acoustic Doppler current profiler (ADCP) following standard methodology (Rehmel et al. 2003, WSC 2004). The ADCP unit was towed from a boat across the river and measurements of velocity depth and position were collected as the boat traversed the measuring section. A single crossing, or transect, of the stream resulted in one measurement of discharge. At least four valid transects were collected during each site visit to reduce the effects of turbulence, directional bias, or other random errors. Transects were considered as valid if they were within 5% of the observed average. The average discharge from the multiple transects was taken to be the actual discharge for the river. The range of individual measurements was used as the error associated with the average discharge.

3.2.2.1 Winter Under Ice Flow Measurements

In May 2009 a 6-inch diameter ice auger was used to drill a hole through the surface ice at different locations on the Koignuk River (near its discharge point into Hope Bay) and on the Spyder River (approximately 20 km South of Boston Camp) and flow was measured by means of a Marsh-McBirney handheld velocity meter (Hach Company).

3.2.3 Stage-Discharge Rating Curves

Manual flow measurements obtained during 2009 were used to generate stage-discharge rating curves (rating curves) for each station. Rating curves are used to convert water level data (stage) recorded by the automated hydrometric stations into a continuous stream flow time-series. The quality of a rating curve depends on the number and accuracy of the individual data points used to generate the curve as well as hydraulic characteristics of the monitoring location. Although a minimum of three points can be used to generate a rating curve, each point adds increased robustness at varying flows. Flow measurements at the higher end of the flow range are especially important as they help in confining the high end of the rating curve. This is important as high flows often require extrapolation beyond the range of the observed data used to generate the rating curve and the rating relationship can change from low flow periods to high flow periods, depending on channel geometry.

3.2.4 Annual Hydrographs

For the operational period of each station, flows were calculated by applying the generated rating curves to the recorded stage data. In some cases, where recorded stage data were unreliable, flows were estimated from nearby stations when possible. Prior to recorded stage data, rising limbs of the hydrographs where estimated using manual flows measured before station installation and assuming a logarithmic growth function. After the removal of pressure transducers in the fall, hydrograph recession limbs were estimated assuming a linear decay function. Other functions were considered (e.g., logarithmic, polynomial) however the linear function was the most conservative and consistent with results obtained by Rescan in other Arctic locations (e.g., Ekati Diamond Mine).

For all lake stations, it was assumed that the lake outlet streams ceased to flow following a prolonged period of sub-zero temperatures. From previous monitoring years, it was estimated that flows from Tail Lake and Doris Lake ceased following 74 and 252 negative degree (Celsius) days (Golder 2009). This assumption was applied to the 2009 observed mean air temperatures from the Doris meteorological station to provide a date of zero flow of October 15 for Tail Lake and October 31 for Doris Lake. Because Tail Lake encompasses the smallest catchment area compared to the other catchments among the Doris-Roberts, Windy-Glenn, and Reference-A Watersheds it was assumed to stop flowing at an earlier date: October 15. All other gauged lakes were assumed to cease to flow on the same estimated date as Doris Lake.

Due to its larger size compared to the rest of the watersheds in the Study Area the Koignuk River (2,937 km^2) was assumed to stop flowing at a later date, on December 1. An examination of daily flow data (2005-2008) from the similarly sized WSC station at Kendall River (2,790 km^2) showed that the river stopped flowing around mid- to late-November. The Koignuk Watershed is relatively larger than the Kendall Watershed and is also located farther north, having therefore a climate more influenced by its proximity to the ocean. Thus, the assumption of December 1 as the date when flow ceases at the Koignuk is reasonable.

3.2.5 Tidal Level

Tidal levels were recorded by an automated hydrometric station (tidal gauge) installed near the jetty at Roberts Bay on July 2009 (Figure 3.2-1 and Table 3.2-1). The station consisted of a Solinst M-10 Levelogger pressure transducer/data logger combination. The Levelogger was attached to a float and anchored to the ocean bottom and recorded water levels every 10 minutes. A Solinst Barologger was installed on shore and recorded atmospheric pressure to correct the Levelogger absolute pressure readings.

The elevation of the tidal gauge at Roberts Bay relative to a geodetic benchmark was surveyed using a total station prior to station demobilization.

The tidal gauge operated from July 28 to September 22 when the station was demobilized to prevent winter freeze up.

3.3 RESULTS

3.3.1 Manual Flow Measurements

Manual flow measurements were collected during the freshet period at each hydrometric station with additional measurements conducted in July, August, and September 2009 (Table 3.3-1 and Appendix 1). Between five and eight flow measurements were made at each station, with the exception of Wolverine-Hydro, for a total of 69 measurements.

Surface flows were not measured at Wolverine-Hydro because there was no defined outlet channel. Negligible amounts of flow were observed spread over a relatively wide area (approximately 40 m wide) on the north end of the lake. Flow was estimated at <10 L/s on a 50 cm wide rivulet located amid the marshes. On the south east end of the lake smaller flows were also spread over a marsh-like feature although they could not be measured.

Care was taken during the 2009 field season to collect multiple measurements during the freshet period and to capture a range of different flow conditions. Freshet peak flows were successfully captured at the majority of the monitoring stations. However, there is some degree of uncertainty as to whether the maximum measured flow at PO-Hydro (2 m^3/s on June 11) was the actual peak flow or whether the maximum flow for the open-water season occurred previous to the site visit in June 11.

Table 3.3-1. Summary of 2009 Manual Flow Measurements

Station	Date	Pressure Transducer Stage (m, referenced to arbitrary datum)	Flow (m^3/s)	Measuring Technique
Doris-Hydro	11-Jun	a	0.02	Velocity-Area (Swoffer)
	14-Jun	a	0.01	Velocity-Area (Swoffer)
	18-Jun	99.00	1.48	Velocity-Area (Swoffer)
	20-Jun	99.04	1.92	Velocity-Area (Swoffer)
	23-Jun	99.07	2.17	Velocity-Area (Swoffer)
	23-Jul	98.93	0.89	Velocity-Area (Swoffer)
	28-Jul	98.90	0.76	Velocity-Area (Swoffer)
	21-Sep	98.82	0.58	Velocity-Area (Swoffer)
Glenn-Hydro	11-Jun	a	0.01	Velocity-Area (Swoffer)
	14-Jun	a	0.01	Velocity-Area (Swoffer)
	16-Jun	98.67	0.02	Velocity-Area (Swoffer)
	22-Jun	98.69	0.97	Velocity-Area (Swoffer)
	24-Jun	98.67	0.87	Velocity-Area (Swoffer)
	23-Jul	98.56	0.37	Velocity-Area (Swoffer)
	26-Jul	98.57	0.42	Velocity-Area (Swoffer)
Koignuk-Hydro	5-May	a	0	Velocity-Area (Marsh-McBirney)
	23-May	a	0	Velocity-Area (Marsh-McBirney)
	19-Jun	98.67	80.29	Velocity-Area (ADCP)*
	21-Jun	98.77	94.92	Velocity-Area (ADCP)
	24-Jun	99.10	125.08	Velocity-Area (ADCP)
	23-Jul	97.93	31.32	Velocity-Area (ADCP)
	27-Jul	97.83	24.26	Velocity-Area (ADCP)
Ogama-Hydro	11-Jun	a	0.90	Velocity-Area (Swoffer)
	14-Jun	a	1.88	Velocity-Area (Swoffer)
	17-Jun	98.75	1.92	Velocity-Area (Swoffer)
	23-Jun	98.74	2.02	Velocity-Area (Swoffer)
	25-Jun	98.72	1.81	Velocity-Area (Swoffer)
	22-Jul	98.54	0.57	Velocity-Area (Swoffer)
	26-Jul	98.51	0.55	Velocity-Area (Swoffer)
Patch-Hydro	11- Jun	a	0	Visual estimation [b]
	18-Jun	99.07	0.28	Velocity-Area (Swoffer)
	21-Jun	99.10	0.46	Velocity-Area (Swoffer)
	23-Jun	99.11	0.50	Velocity-Area (Swoffer)
	24-Jul	99.09	0.38	Velocity-Area (Swoffer)
	28-Jul	99.08	0.32	Velocity-Area (Swoffer)
	24-Sep	99.00	0.21	Velocity-Area (Swoffer)
PO-Hydro	11-Jun	a	2.01	Velocity-Area (Swoffer)
	15-Jun	a	1.67	Velocity-Area (Swoffer)
	18-Jun	99.57	1.82	Velocity-Area (Swoffer)
	21-Jun	99.58	1.91	Velocity-Area (Swoffer)
	24-Jun	99.55	1.46	Velocity-Area (Swoffer)
	24-Jul	99.41	0.48	Velocity-Area (Swoffer)
	28-Jul	99.39	0.41	Velocity-Area (Swoffer)

(continued)

Table 3.3-1. Summary of 2009 Manual Flow Measurements (completed)

Station	Date	Pressure Transducer Stage (m, referenced to arbitrary datum)	Flow (m^3/s)	Measuring Technique
Reference A Hydro	12-Jun	a	0.03	Velocity-Area (Swoffer)
	15-Jun	a	0.10	Velocity-Area (Swoffer)
	18-Jun	99.30	0.21	Velocity-Area (Swoffer)
	22-Jun	99.39	0.39	Velocity-Area (Swoffer)
	25-Jun	99.42	0.44	Velocity-Area (Swoffer)
	24-Jul	99.39	0.31	Velocity-Area (Swoffer)
	28-Jul	99.38	0.24	Velocity-Area (Swoffer)
	23-Sep	99.34	0.14	Velocity-Area (Swoffer)
Roberts-Hydro	11-Jun	a	0	Visual estimation[b]
	15-Jun	a	0.41	Velocity-Area (Swoffer)
	17-Jun	99.26	1.45	Velocity-Area (Swoffer)
	22-Jun	99.31	2.76	Velocity-Area (Swoffer)
	25-Jun	99.31	2.48	Velocity-Area (Swoffer)
	23-Jul	99.14	0.88	Velocity-Area (Swoffer)
	26-Jul	99.14	0.79	Velocity-Area (Swoffer)
Spyder River	5-May	a	0	Velocity-Area (Marsh-McBirney)
Tail-Hydro	11-Jun	a	0.09	Velocity-Area (Swoffer)
	14-Jun	a	0.09	Velocity-Area (Swoffer)
	17-Jun	97.96	0.10	Velocity-Area (Swoffer)
	20-Jun	97.97	0.12	Velocity-Area (Swoffer)
	23-Jun	97.96	0.10	Velocity-Area (Swoffer)
	26-Jul	97.90	0.03	Velocity-Area (Swoffer)
	28-Aug	97.88	0.02	Velocity-Area (Swoffer)
Windy-Hydro	11-Jun	a	0.37	Velocity-Area (Swoffer)
	14-Jun	a	0.21	Velocity-Area (Swoffer)
	16-Jun	98.53	0.26	Velocity-Area (Swoffer)
	22-Jun	98.56	0.38	Velocity-Area (Swoffer)
	24-Jun	98.56	0.28	Velocity-Area (Swoffer)
	22-Jul	98.54	0.23	Velocity-Area (Swoffer)
	26-Jul	98.54	0.24	Velocity-Area (Swoffer)
	24-Sep	98.49	0.16	Velocity-Area (Swoffer)

** - Flows measured by means of an acoustic Doppler current profiler*
a - Station not installed
[b]- Outflow channel observed to be frozen, having zero flow

3.3.1.1 Winter Under Ice Flow Measurements

All streams in the study area cease to flow over the winter period. Assessment of winter flows in the area in May 2009 discovered that the Koignuk River does not flow year round. Ice thickness was assessed at different locations and no under-ice flows were measured (Table 3.3-2). It was assumed that under-ice water only existed in isolated pools separated by frozen sections of river.

3.3.2 Rating Curves

Rating curves for each station are summarized in Table 3.3.3 and provided in Appendix 2. Survey control points at each lake and stream level station are provided in Appendix 3.

Table 3.3-2. Winter Flows and Ice Thickness Measurements at the Koignuk River

Site	UTM Coordinates [a] Easting	Northing	Date Sampled	Ice Thickness (m)	Bottom Depth (m)	Flow (m^3/s)
Koignuk River Downstream	429,553	7,554,936	May 5	1.70	2.7	0
Koignuk River Midstream	430,490	7,549,055	May 23	1.80	2.9	0
Koignuk River Upstream	431,940	7,545,536	May 5	1.85	3.7	0
Spyder River, Reference 1	450,285	7,487,174	May 5	1.55	1.9	0
Spyder River, Reference 2	450,285	7.478,179	May 5	1.55	2.1	0

[a]- *NAD 83, Zone 13W*

Table 3.3-3. Summary of 2009 Stage-Discharge Rating Equations

Station	Rating Equation $Q = C (h-a)^B$	r^2	Number of Flow Measurements Used in Curve
Doris-Hydro			
low stage	$Q = 2.81(h-98.60)^{1.05}$	0.98	3
high stage	$Q = 14.60(h-98.60)^{2.49}$	0.99	4
Glenn-Hydro	$Q = 7.74(h-98.17)^{3.21}$	0.99	4
Koignuk-Hydro	$Q = 0.57(h-95.28)^{4.05}$	0.99	5
Ogama-Hydro	$Q = 1.12(h-97.64)^{5.78}$	0.99	5
Patch-Hydro	$Q = 4.64(h-98.69)^{2.71}$	0.81	6
PO-Hydro	$Q = 13.43(h-98.93)^{4.54}$	0.99	5
Reference A-Hydro	$Q = 15.74(h-99.25)^{1.98}$	0.95	5
Roberts-Hydro	$Q = 2.01(h-98.28)^{6.14}$	0.95	5
Tail-Hydro	$Q = 217.69(h-97.63)^{6.92}$	0.99	5
Windy-Hydro	$Q = 7.25(h-97.99)^{5.62}$	0.86	6

At Doris-Hydro a two-stage (high and low) rating curve was found to have better fit to the observed data than a single stage curve and was used to generate a hydrograph for this station. Low flows were well confined by the outlet channel. However, overbank flow during freshet period resulted in a shift in the slope of the rating curve at higher stages.

3.3.3 Stage Data

The majority of the automated hydrometric stations collected good quality useable water level data throughout the monitoring period. However, incomplete water level data were recorded at two stations (Roberts-Hydro and Wolverine-Hydro) during the 2009 monitoring period.

At Roberts-Hydro the station was found vandalized during a site visit on September 22. The period of useable water level data for this station extends from June 17 to July 30.

The Wolverine-Hydro station was damaged by wildlife. The period of useable continuous data for this station extends from June 21 to July 28. Continuous water level data were supplemented at Wolverine-Hydro by point measurements of lake water levels relative to established survey control points on August 24 and September 24.

An ice jam on the Koignuk River resulted in spurious water level data between June 19 and June 20 at Koignuk-Hydro (Figure 3.3-1). The ice jam occurred at the channel constriction where the Koignuk River discharges into Hope Bay and resulted in a 1.7 m spike in the recorded water level. Data recorded during this event were not used for discharge calculations.

3.3.4 Lake Levels

Lake levels were recorded at Doris, Glenn, Patch, PO, Reference-A, Roberts, Tail, Windy, and Wolverine lakes. The mean lake level variation for lakes in the Study Area was 0.22 m, ranging from 0.14 m at Tail Lake to 0.35 m at Doris Lake (Table 3.3-4). Lake water levels decreased after freshet until late-August when they were recharged from precipitation events. Lake levels are presented in Figures 3.3-2 and 3.3-3 and in tabular form in Appendix 4.

Table 3.3-4. Recorded Lake Water Levels for the 2009 Open-water Season

Lake	Min water level (m)	Max water level (m)	Water level change (m)	Lake Area (km^2)
Doris [a]	5.68	6.03	0.35	3.4
Tail [a]	4.95	5.09	0.14	0.8
Glenn	98.46	98.72	0.26	2.3
Patch	98.97	99.15	0.18	5.7
PO	99.37	99.58	0.22	0.8
Reference-A	99.29	99.45	0.16	3.9
Roberts	99.12	99.32	0.20	3.6
Windy	98.41	98.64	0.23	5.3
Wolverine	98.62	98.87	0.25	1.0

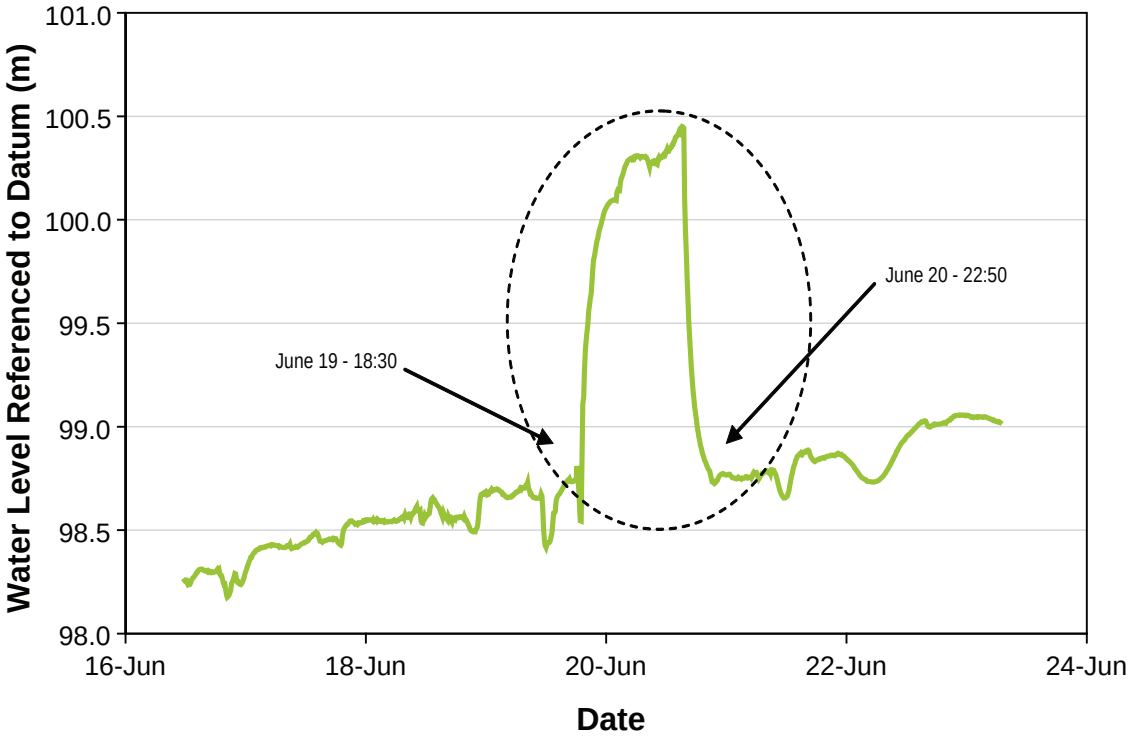
[a] *- water levels referenced to pressure transducer*

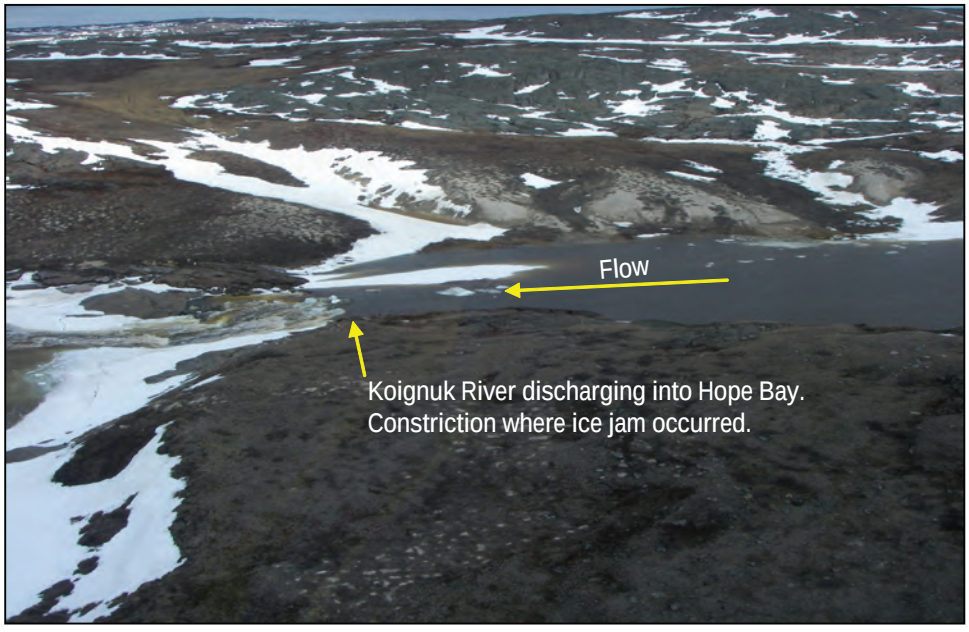
In some cases, when recorded stage data were unavailable, stage records were estimated using records from nearby stations. This was required at Doris Lake between June 15 and June 25, due to a transducer malfunction, and after August 2. From June 15 to June 18 average daily stage data were estimated using a linear function. From June 19 to June 25 and after August 2, average daily stage data were estimated based on calculated average daily stage data at Doris-Hydro using a relationship developed between the two stations for a period of concurrent observations (from June 26 to August 1). At Tail Lake average daily stage data were estimated after August 8 based on calculated average daily stage data at Tail-Hydro using a relationship developed between the two stations for a period of concurrent observations (from June 18 to July 20).

3.3.5 Hydrographs

Hydrographs were generated for the three stream level stations (Doris-Hydro, Tail-Hydro, and Koignuk-Hydro) as well as for the outflow of seven of the eight lake level monitoring stations. These are individually presented in Appendix 5. Due to the lack of well defined flows a rating curve could not be generated for Wolverine-Hydro, thus a hydrograph was not generated for this station.

Annual hydrographs are presented as mean daily flow (m^3/s; Figures 3.3-4 and 3.3-5) and as mean daily unit yield ($L/s/km^2$; Figure 3.3-6) for the open-water season (June 1 to October 31). Unit yield is a measure of flow normalized to watershed area that allows direct comparison of the hydrological response of watersheds with varying watershed areas.





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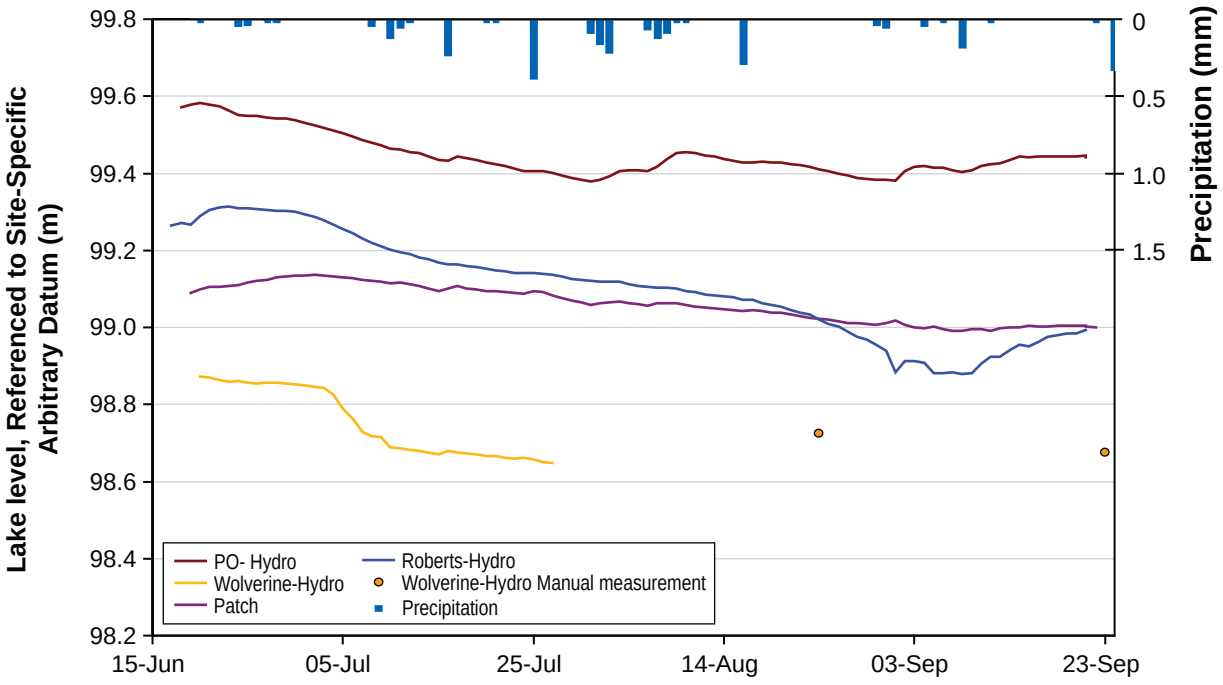
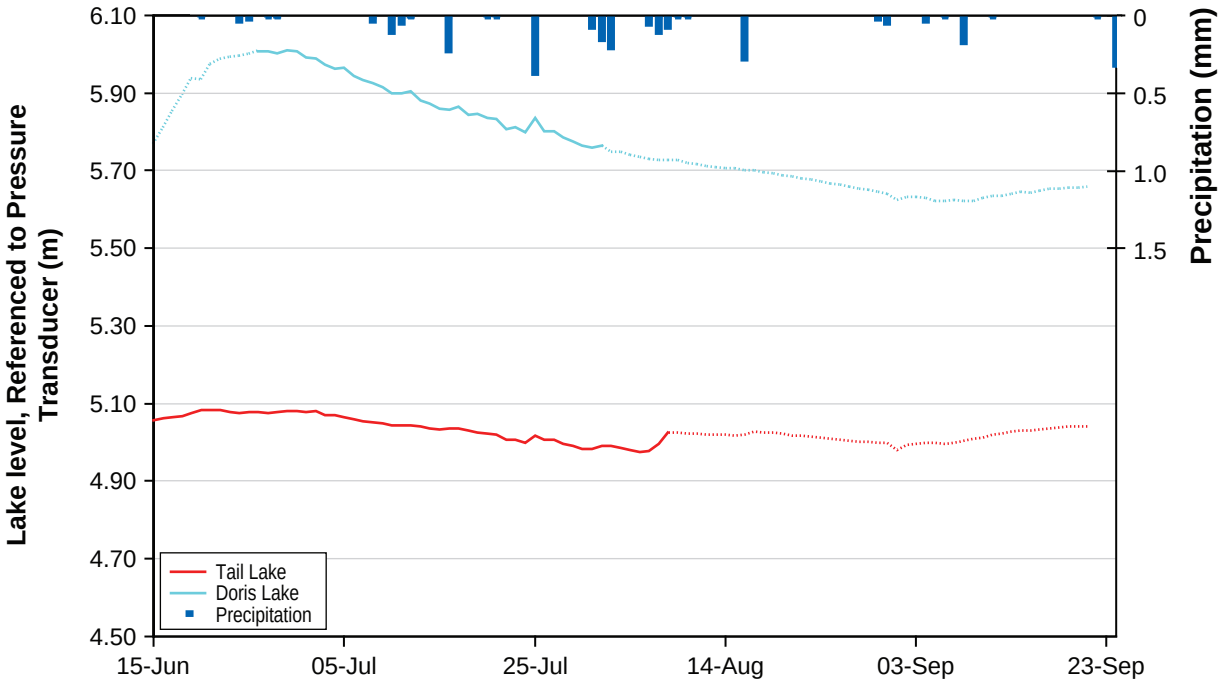
Irregularities in the Recorded Water Level Data Caused by Ice Jamming in the Koignuk River

Figure 3.3-1

Rescan Engineers & Scientists





Notes: Precipitation data from Doris Met meteorological station.
Dashed lines indicate stage values were estimated.

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Recorded Lake Water Levels in the Study Area

Figure 3.3-2

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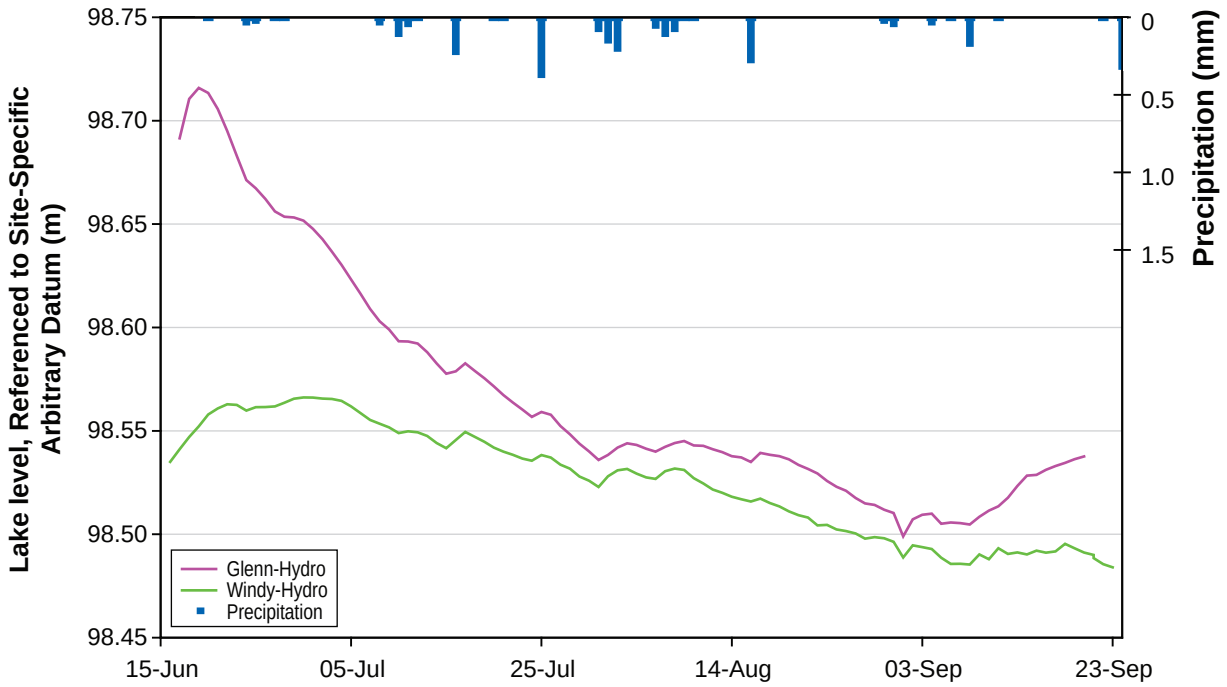

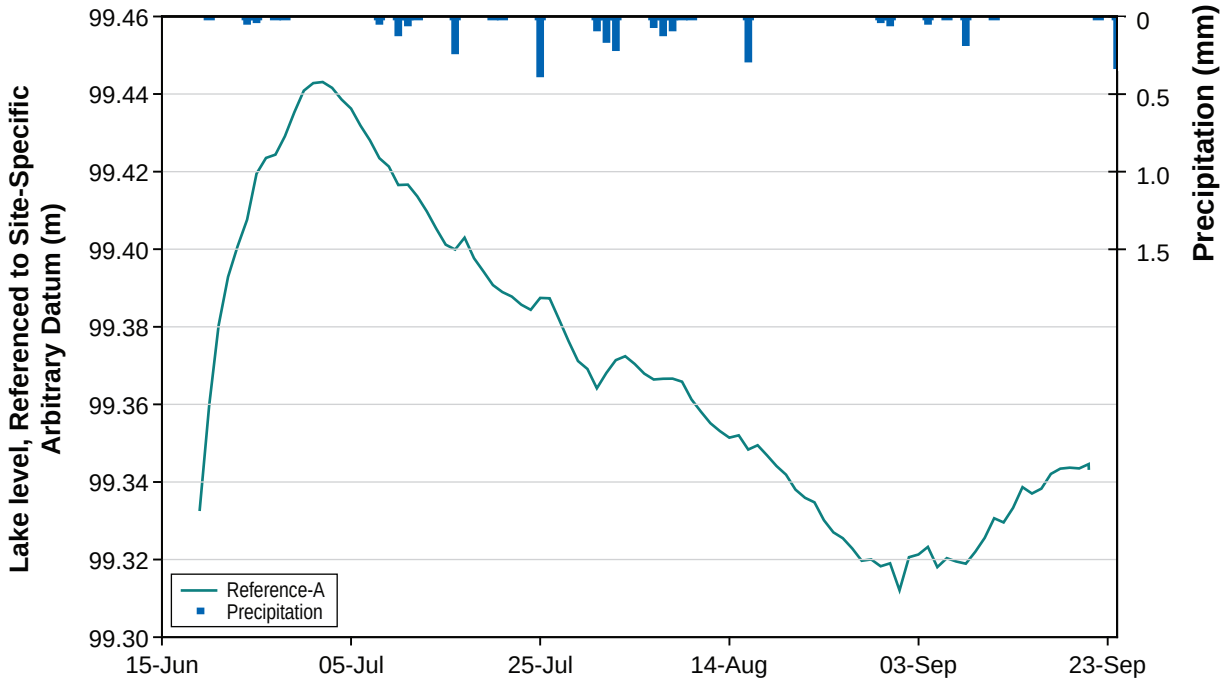

Note: Precipitation data from Doris Met meteorological station.

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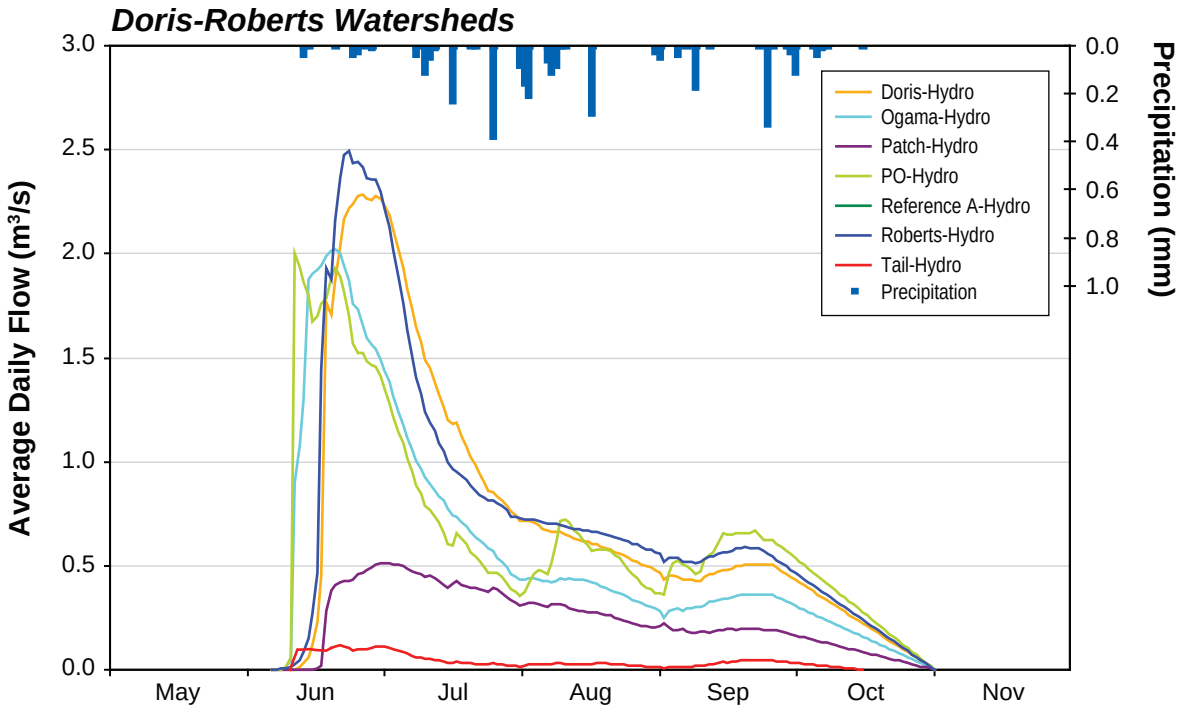
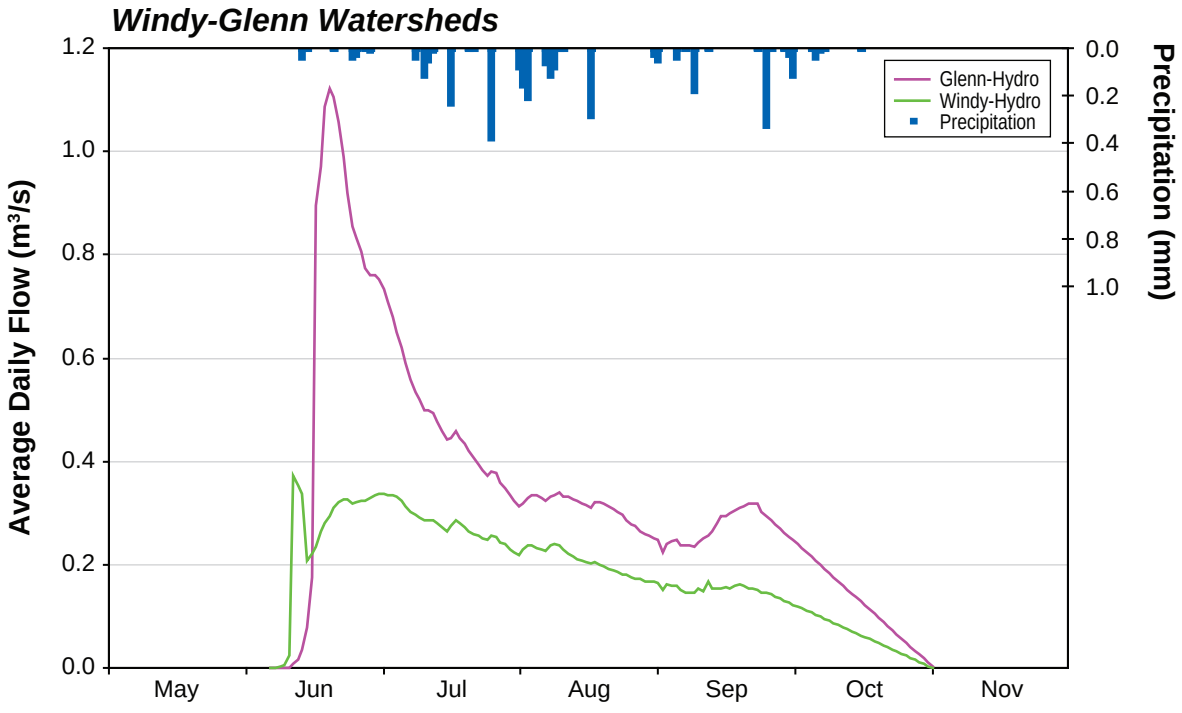
Recorded Lake Water Levels in the Study Area

Figure 3.3-3

Rescan Engineers & Scientists





Note: Average daily precipitation values from Doris Met meteorological station.

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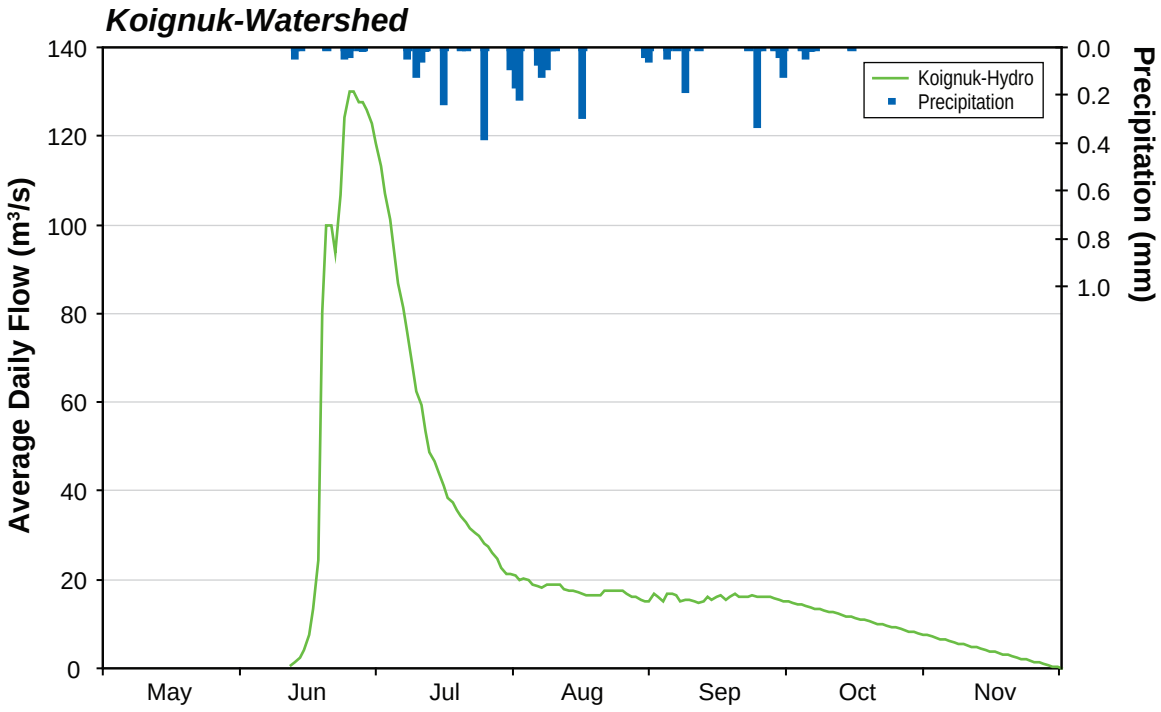
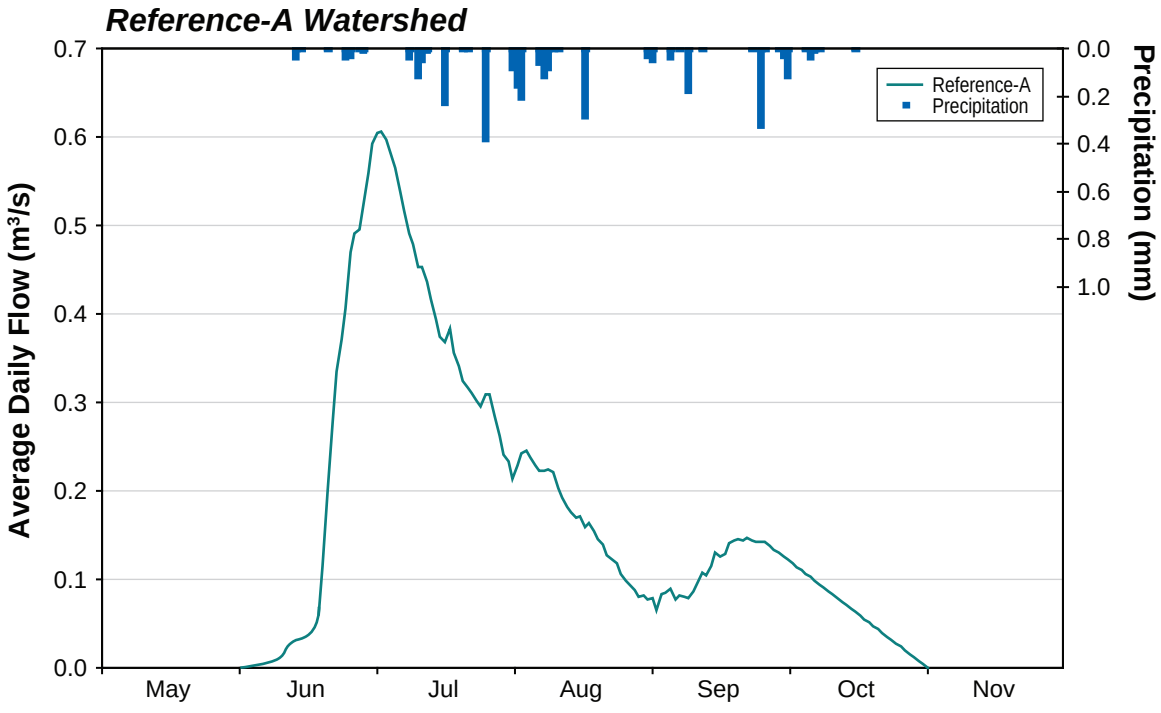
2009 Annual Flow Hydrographs Doris-Roberts and Windy-Glenn Watersheds

Figure 3.3-4

Rescan Engineers & Scientists





Note: Average daily precipitation values from Doris Met meteorological station.

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2009 Annual Flow Hydrographs Koignuk and Reference-A Watersheds

Figure 3.3-5

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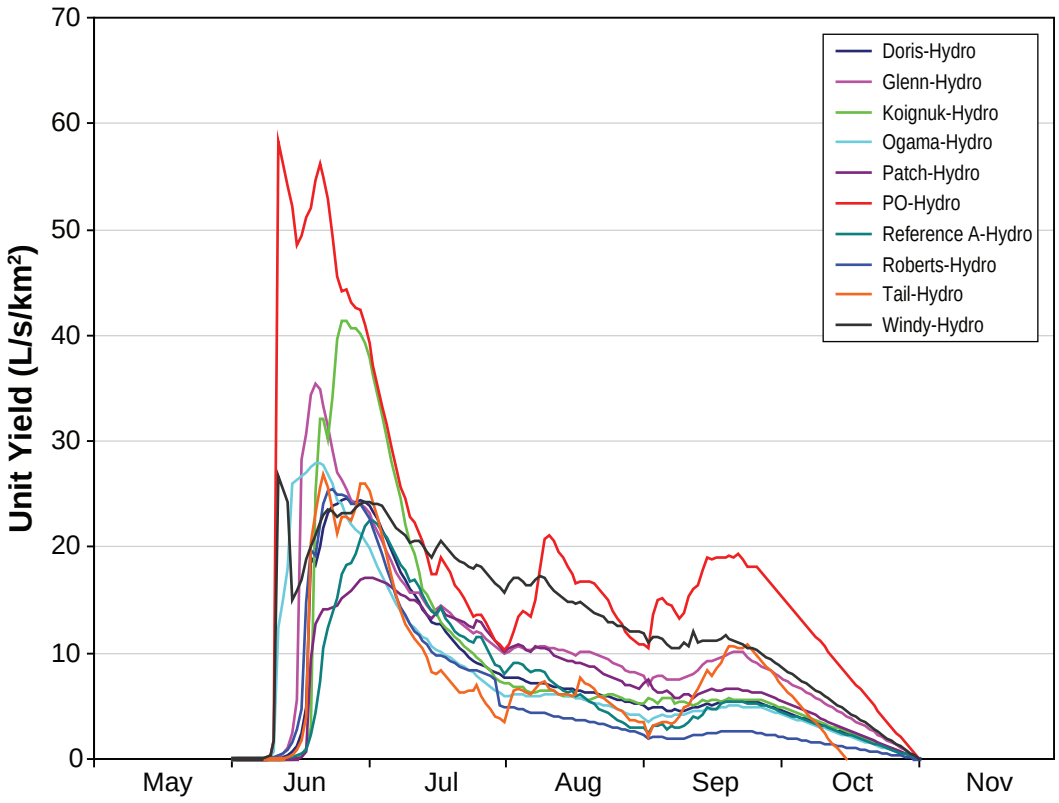

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2009 Open Water Season Unit Yield Hydrographs

Figure 3.3-6

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The onset of the spring freshet occurred in early June throughout the watersheds in the Study Area. Annual peak flows occurred in mid-June to early July in all watersheds as a result of inputs of water from melting snow (between June 11 and July 2, 2009). On average the freshet peak occurred approximately two weeks after streams began to flow. Flows steadily decreased throughout the Study Area from early July to late August. Flows increased through the first week of September due to increased rainfall and remained elevated until late September.

At Roberts-Hydro stage recorded stage data were unavailable after July 30. In this case, average daily flow data were estimated based on calculated average daily flow data at Doris-Hydro using a relationship developed between the two stations for a period of concurrent observations (from June 24 to July 29) (Figure 3.3-7).

3.3.6 Tidal Level

The deployment of the tidal gauge showed the two main tidal cycles in Roberts Bay: 1) the fortnightly spring-neap cycle and 2) the daily diurnal high-low tidal cycle (Figure 3.3-8). Overall, the tides in Roberts Bay were microtidal (<2 m tidal range) and were generally diurnal with one daily high tide and low tide, respectively. There were only small differences between the daily tidal ranges of the spring and neap cycles as the spring tidal (new and full moon period) range exceeded 0.4 m while neap tidal ranges (1st and 3rd quarter moons) were typically between 0.2 m and 0.3 m.

The appearance of a major storm system coincided with a spring tide cycle in early September. This resulted in elevated water levels in Roberts Bay due to the accompanying storm surge and the elevated daily tidal heights typical of spring tides (Figure 3.3-8).

3.3.7 Important Hydrologic Variables

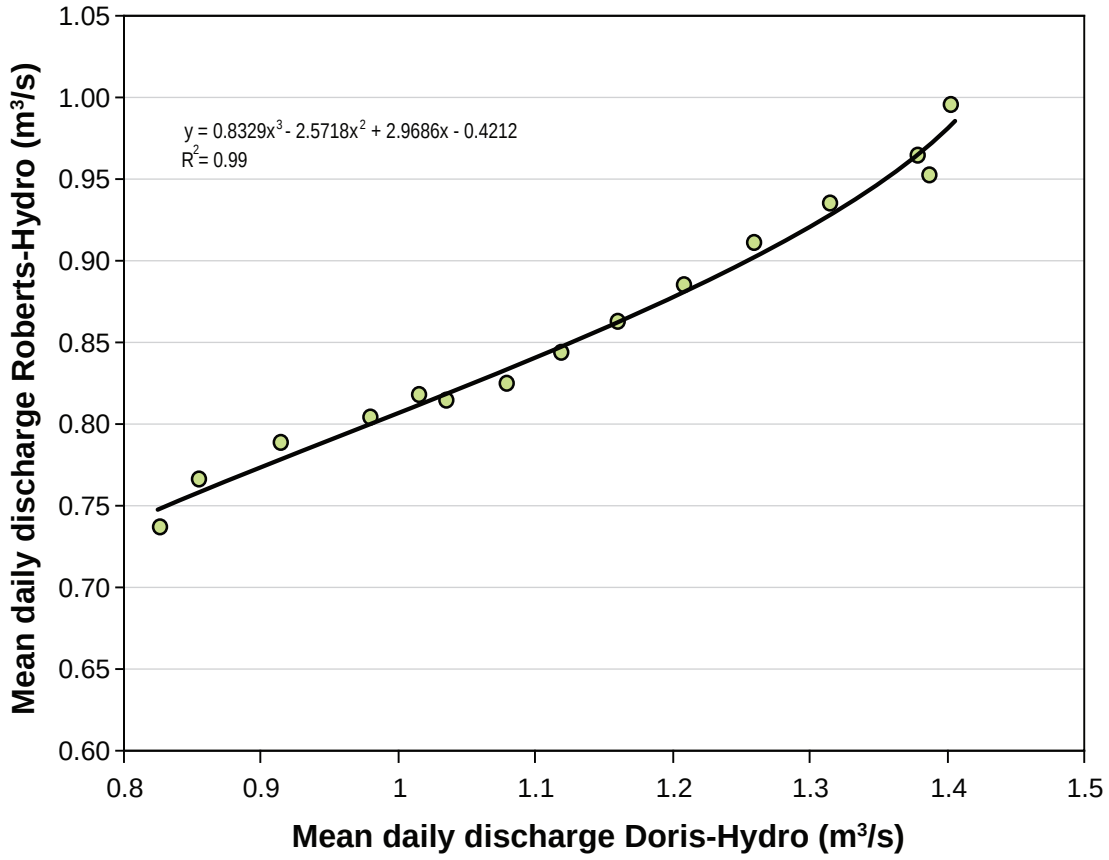
3.3.7.1 Calculated Average Runoff

Calculated runoff (Table 3.3-5) (over the open-water season) represents the total hydrologic response of a watershed to driving factors such as precipitation and air temperature. The calculated average runoff from gauged watersheds in the Study Area for the period of record in 2009 was 99 mm, ranging from 78 mm at Ogama-Hydro to 139 mm at Windy-Hydro. It is important to note that Roberts-Hydro was not included in the average calculation because the period of record for this station was limited to approximately six weeks (June 18 to July 29). Average calculated runoff was higher in the Windy-Glenn Watersheds (125 mm) than in the Doris-Roberts Watersheds (86 mm). The estimated average runoff for the open-water season from gauged watersheds in the Study Area was 116 mm; ranging from 95 to 168 mm at Patch-A-Hydro and Windy-Hydro, respectively.

3.3.7.2 Monthly Runoff Distribution

The monthly distribution of runoff is similar among the gauged catchments in the Study Area (Tables 3.3-6 and 3.3-7, and Figures 3.3-9 and 3.3-10). Maximum monthly runoff occurred during July in the majority of the watersheds, except for Ogama-Hydro, Tail-Hydro, and PO-Hydro where it occurred during June.

The mean flow over the open-water season (June 1 to October 15 for Tail Lake and June 1 to December 1 for Koignuk River) ranged from 0.04 m^3/s to 25.51 m^3/s at Tail-Hydro and Koignuk-Hydro, respectively (Table 3.3-8).



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Relation Developed to Estimate Flows at Roberts-Hydro Based on Calculated Flows at Doris-Hydro

Figure 3.3-7

Rescan Engineers & Scientists

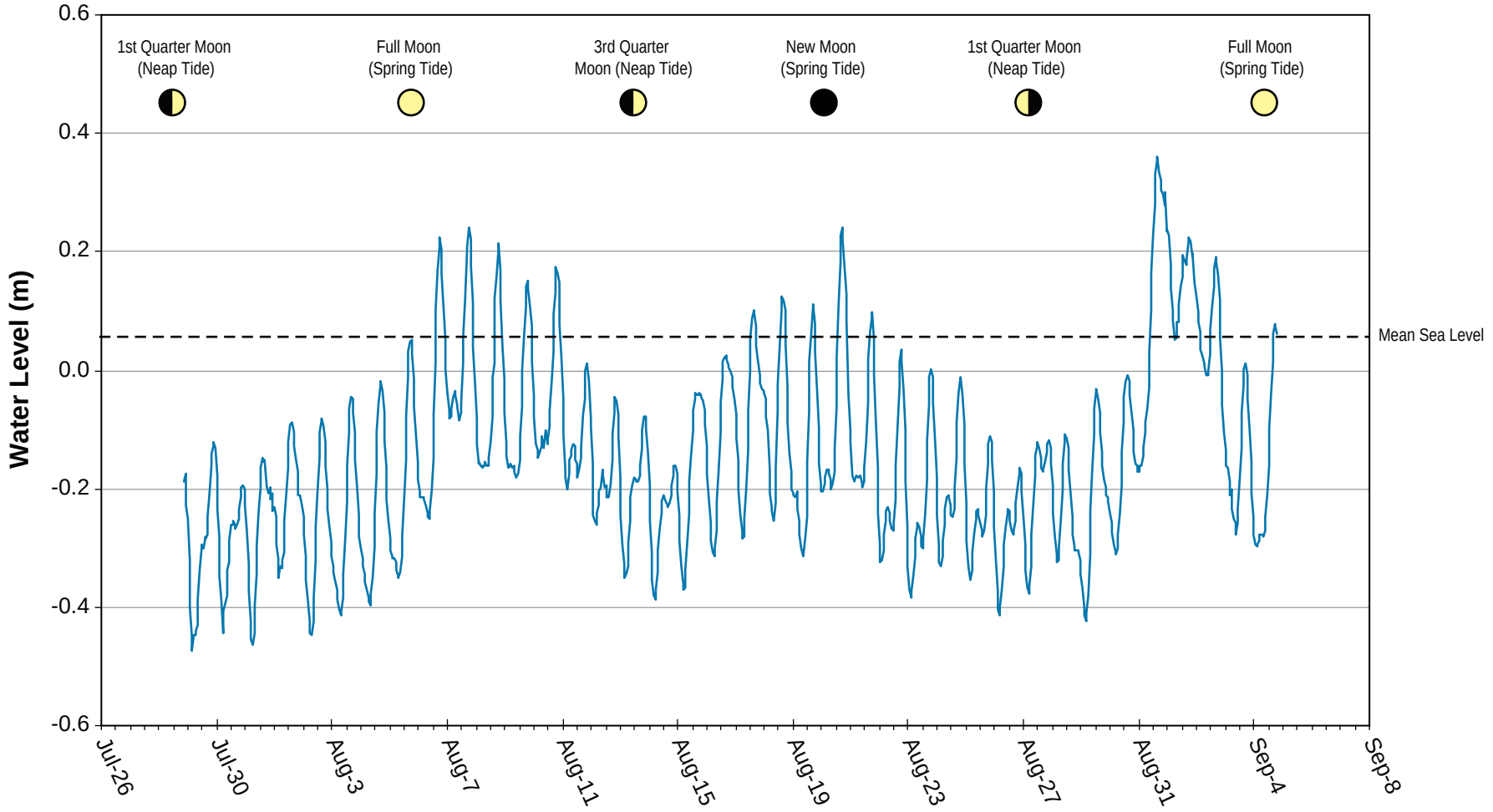

Figure 3.3-8

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Tidal Fluctuation at Roberts Bay, July to September, 2009

Figure 3.3-8

Rescan Engineers & Scientists

Table 3.3-5. 2009 Annual Runoff and Mean Annual Flow

Station	Watershed Area (km²)	Percent Lake Coverage in Watershed	Calculated Runoff Over 2009 Period of Record (mm)		Estimated Annual Runoff (mm)	Mean Annual Flow (m³/s)
Doris-Roberts Watersheds						
Doris-Hydro	95	20	87	(18-Jun to 20 Sept)	99	0.29
Ogama-Hydro	75	19	78	(18-Jun to 23-Sept)	99	0.23
Patch-Hydro	32	27	85	(18-Jun to 24-Sept)	95	0.10
PO-Hydro	68	19	95	(17-Jun to 23-Sept)	125	0.27
Roberts-Hydro	98	17	57	(18-Jun to 29-Jul)*	98	0.31
Tail-Hydro	4	19	86	(18-Jun to 21-Sept)	109	0.01
Windy-Glenn Watersheds						
Windy-Hydro	14	39	139	(16-Jun to 24-Sept)	168	0.07
Glenn-Hydro	33	25	110	(17-Jun to 21-Sept)	130	0.14
Koignuk Watershed						
Koignuk-Hydro	2937	18	116	(21-Jun to 24-Sept)	137	12.46
Reference-A Watershed						
Reference A-Hydro	27	22	89	(18-Jun to 23-Sept)	97	0.08
Mean			***99***		***116***	

** Not included in the observed mean annual calculation*

Table 3.3-6. 2009 Monthly Runoff Distribution (mm)

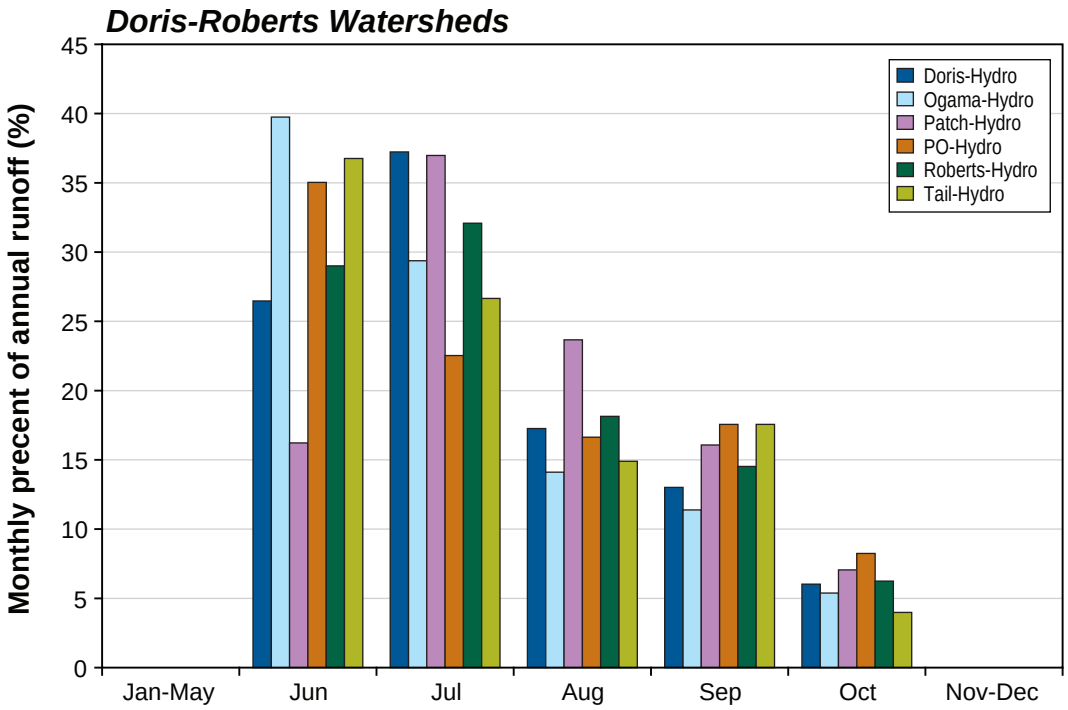
Station	Jan-May	Jun	Jul	Aug	Sep	Oct	Nov-Dec
Doris-Roberts Watersheds							
Doris-Hydro	0	*26*	37	17	*13*	*6*	0
Ogama-Hydro	0	*39*	29	14	*11*	*5*	0
Patch-Hydro	0	*15*	35	22	*15*	*7*	0
PO-Hydro	0	*44*	28	21	*22*	*10*	0
Roberts-Hydro	0	*28*	32	18	*14*	*6*	0
Tail-Hydro	0	*40*	29	16	*19*	*5*	0
Windy-Glenn Watersheds							
Windy-Hydro	0	*38*	53	39	27	11	0
Glenn-Hydro	0	*36*	38	25	21	10	0
Koignuk Watershed							
Koignuk-Hydro	0	42	48	16	*14*	*10*	3
Reference-A Watershed							
Reference A-Hydro	0	19	47	16	*10*	*6*	0

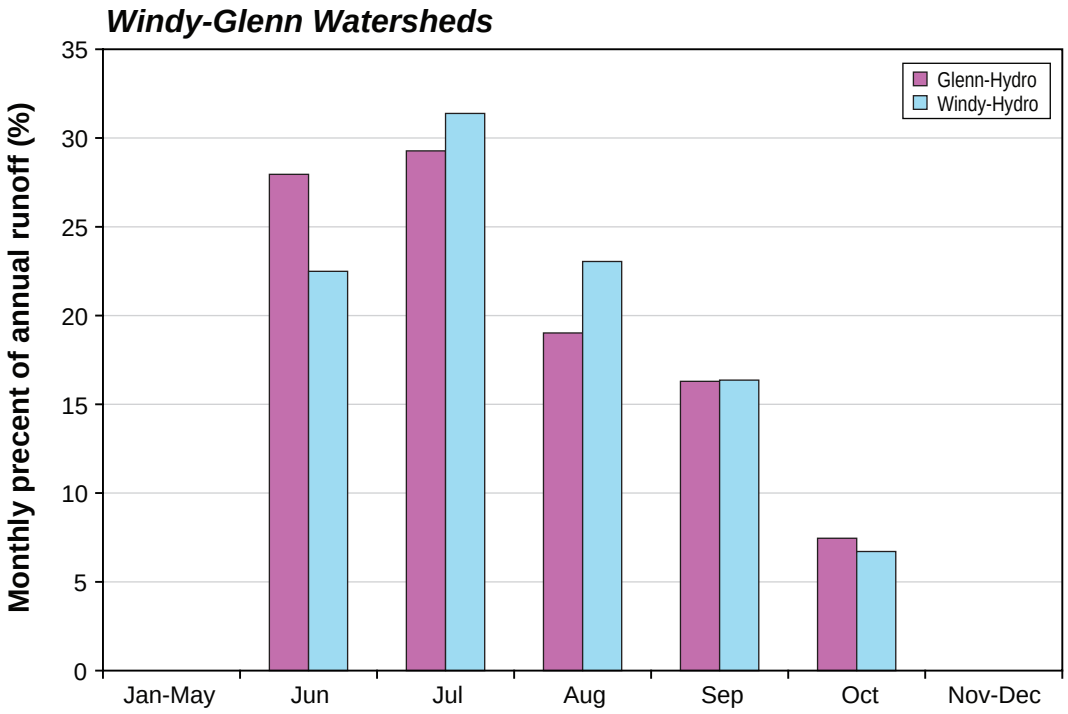
Italicized values are based on estimated mean daily flow data.

Table 3.3-7. 2009 Monthly Runoff Distribution (%)

Station	Jan-May	Jun	Jul	Aug	Sep	Oct	Nov-Dec
Doris-Roberts Watersheds							
Doris-Hydro	0	*26*	37	17	*13*	*6*	0
Ogama-Hydro	0	*40*	29	14	*11*	*5*	0
Patch-Hydro	0	*16*	37	24	*16*	*7*	0
PO-Hydro	0	*35*	23	17	*18*	*8*	0
Roberts-Hydro	0	*28*	32	*18*	*15*	*6*	0
Tail-Hydro	0	*37*	27	15	*17*	*4*	0
Windy-Glenn Watersheds							
Glenn-Hydro	0	*28*	29	19	*16*	*7*	0
Windy-Hydro	0	*22*	31	23	*16*	*7*	0
Koignuk Watershed							
Koignuk-Hydro	0	*31*	36	12	*10*	*8*	*3*
Reference-A Watershed							
Reference A-Hydro	0	*20*	48	*16*	*10*	*6*	0

Italicized values are based on estimated mean daily flow data.





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Monthly Runoff Distribution (%) for 2009 Doris-Roberts and Windy-Glenn Watersheds

Figure 3.3-9

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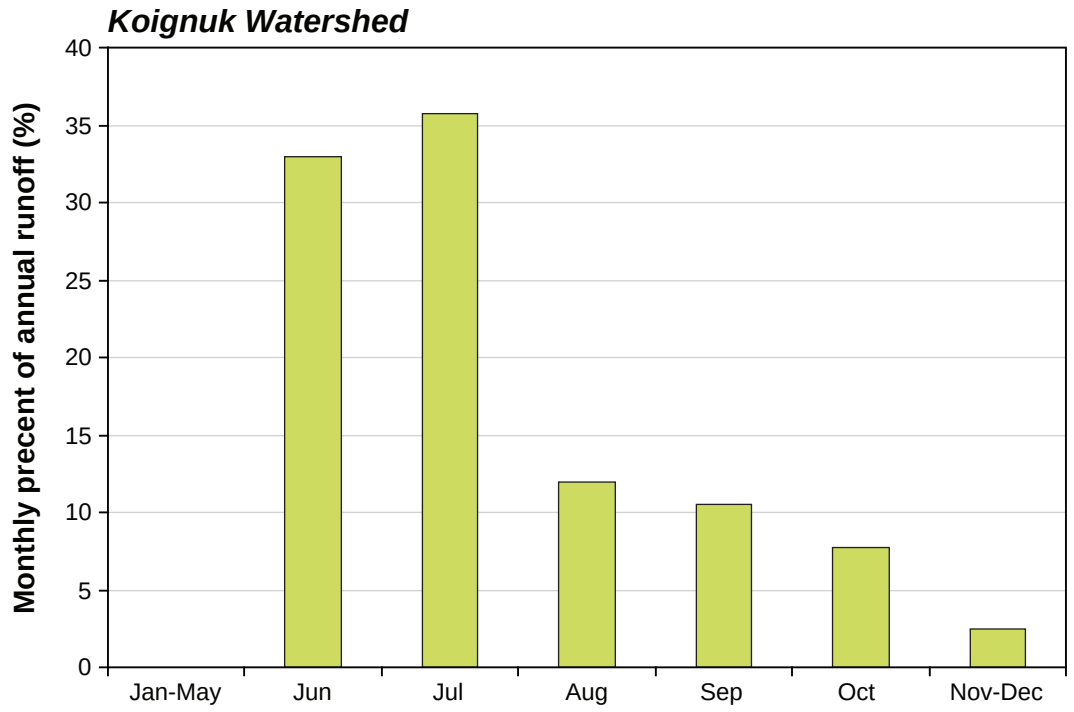

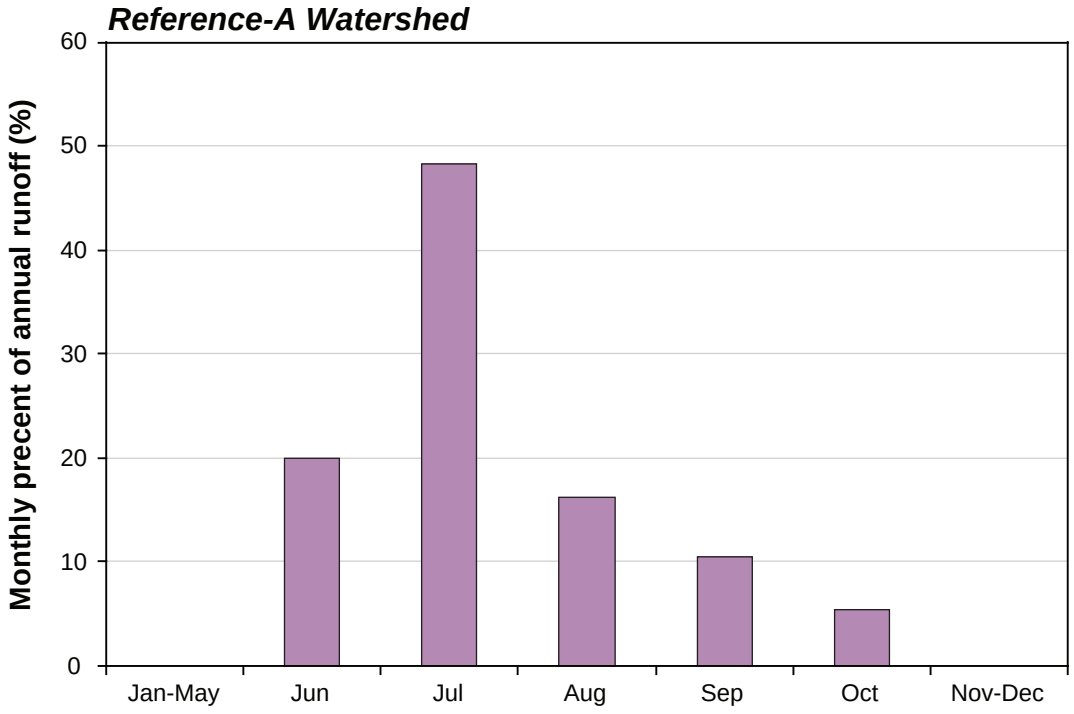

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Monthly Runoff Distribution (%) for 2009 Koignuk and Reference-A Watersheds

Figure 3.3-10

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Table 3.3-8. Mean Flow for the Open-water Season (m^3/s)

	Jan-May	Jun	Jul	Aug	Sept	Oct	Nov-Dec	Mean (m^3/s)[a]
Doris-Roberts Watersheds								
Doris-Hydro	0	0.95	1.30	0.60	0.47	0.21	0	0.71
Ogama-Hydro	0	1.14	0.81	0.39	0.33	0.15	0	0.56
Patch-Hydro	0	0.19	0.42	0.27	0.19	0.08	0	0.23
PO-Hydro	0	1.14	0.71	0.52	0.57	0.26	0	0.64
Roberts-Hydro	0	1.05	1.16	0.66	0.54	0.23	0	0.73
Tail-Hydro	0	0.07	0.05	0.03	0.03	0.01	0	0.04
Windy-Glenn Watersheds								
Windy-Hydro	0	0.21	0.28	0.20	0.15	0.06	0	0.18
Glenn-Hydro	0	0.47	0.47	0.31	0.27	0.12	0	0.33
Koignuk Watershed								
Koignuk-Hydro	0	51.28	53.07	17.64	15.93	11.32	3.82, 0	25.51
Reference-A Watershed								
Reference A-Hydro	0	0.20	0.47	0.16	0.11	0.06	0	0.20

[a] *- calculated from June to November for Koignuk-Hydro and from June to October for all the other stations*

3.3.7.3 Peak and Low Flows

Observed instantaneous peak flows for the watersheds in the Study Area ranged from 0.13 m^3/s at Tail-Hydro to 133 m^3/s at Koignuk-Hydro. Similarly, instantaneous peak unit yields ranged from 17.07 $L/s/km^2$ at Patch-Hydro to 45.33 $L/s/km^2$ at Koignuk-Hydro (Table 3.3-9).

Table 3.3-9. 2009 Annual Peak Flow and Yield

	Peak Flow (m^3/s)			Peak Unit Yield ($L/s/km^2$)	
Station	**Instantaneous**	**Daily**	**Date**	**Instantaneous**	**Daily**
Doris-Roberts Watersheds					
Doris-Hydro	2.39	2.29	(28-June)	25.24	24.17
Ogama-Hydro	2.26	2.02	(19-June)	30.20	26.96
Patch-Hydro	0.55	0.51	(17-July)	17.07	15.93
PO-Hydro	1.95	1.93	(20-June)	28.78	28.59
Roberts-Hydro	2.55	2.49	(22-June)	26.03	25.47
Tail-Hydro	0.13	0.12	(21-June)	29.64	27.43
Windy-Glenn Watersheds					
Windy-Hydro	0.36	0.34	(30-June)	25.76	23.91
Glenn-Hydro	1.15	1.12	(19-June)	34.41	33.59
Koignuk Watershed					
Koignuk-Hydro	133	130.10	(24-June)	45.33	44.30
Reference Watershed					
Reference A-Hydro	0.85	0.78	(1-July)	31.11	28.59

Low flows in the Arctic occur at two different times of year depending on the size of the river and its catchment. Smaller streams reach their lowest flows in the open-water season in summer or early fall and then produce zero flow throughout the winter. Larger rivers may produce flow year round and reach their lowest flows during late winter (e.g., March or April). The observed low flows at the ten Hope Bay hydrometric stations occurred in early September in most watersheds, except at PO-Hydro where it occurred in July 31 (Table 3.3-10). Minimum flows ranged from 0.009 m^3/s at Tail-Hydro to 14.621 m^3/s at Koignuk-Hydro. The daily minimum flows over the monitoring period for various monitoring locations are presented in (Table 3.3-10).

Table 3.3-10. Daily Minimum Flows (July – September 2009)

Station	Observed (m^3/s)		Watershed Area (km^2)	% Lake coverage in watershed
Doris-Roberts Watersheds				
Doris-Hydro	0.428	(September 8)	94.6	20
Ogama-Hydro	0.248	(September 1)	74.9	19
Patch-Hydro	00.175	(September 7)	32.2	27
PO-Hydro	0.355	(July 31)	67.6	19
Roberts-Hydro	0.515	(September 8)	97.9	17
Tail-Hydro	0.009	(September 1)	4.2	19
Windy-Glenn Watersheds				
Windy-Hydro	0.45	(September 8)	33	39
Glenn-Hydro	0.223	(September 1)	14	25
Koignuk Watersheds				
Koignuk-Hydro	14.621	(September 11)	2937	18
Reference-A Watershed				
Reference A-Hydro	0.0060	(September 1)	27.2	22

4. Historical Site Data and Regional Analysis

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4. Historical Site Data and Regional Analysis

4.1 COMPARISON OF 2009 DATA WITH REGIONAL AND HISTORICAL SITE DATA

The Hope Bay Project is located within the Arctic Tundra climate region of Canada, based on the Canadian Climate Regions (MSC, 2009). General climatic conditions for the region in 2009 were as follows:

- Winter 2008/09 was 2°C warmer than the long-term average (rank 10/62), with 14% higher precipitation than average (rank 25/62).
- Spring temperatures were equivalent to the long-term average (rank 31/62), with 19% higher precipitation that average (rank 16/62).
- Summer temperatures were 0.9°C above average (rank 18/62), with 4.6% less precipitation than average (rank 48/62).

At the time this report was prepared 2009 provisional data for the WSC station at Kendall River were available for analysis. Additional Real Time hydrometric data were available from WSC for a number of stations in the area (e.g., Freshwater Creek, Tree River, and Ellice River); however, the results available are not reliable without additional screening and quality control by WSC technicians. The calculated runoff for the 2009 open-water season at Kendall River was 179 mm. Based on a runoff frequency analysis using historical data for this station (28 years of data; 1970-1990 and 2002-2008), 2009 would be characterized as slightly wetter than average, having a return period of 1 in 5 years.

Figures 4.1-1 to 4.1-9 show the 2009 hydrographs for site-specific gauges along with available historical data. In general, 2009 appears to reflect average conditions, which is consistent with the general climatic conditions described above. The timing of the freshet peak was also quite typical, with flow beginning in the second week of June, and peaking around the 19th to 21st. Peak flow rates were commonly about half the magnitude of the 2008 hydrograph, which generally produced the flows of record at these sites. With the drier than average summer, there were no significant secondary peak flows in the hydrographs from to late summer rain events, which are commonly observed in other years (especially 2008).

4.2 REVIEW OF PREVIOUS REGIONAL ANALYSIS

In order to undertake a hydrological assessment for mine site development, for engineering design and for the environmental assessment process, there is a need for estimates of a number of key hydrological parameters, such as average annual runoff, average and extreme flow rates, and low flows. In order to make robust estimates of these parameters, long-term flow records (i.e., at least 10 years) are required. When there is not sufficient data from on-site gauges for this purpose, estimates are generally derived through analysis of regional long-term datasets. An initial regional analysis to derive estimates of annual and monthly runoff for the site was completed in 2003 (AMEC, 2003). A synthetic long-term record was developed for the Doris Outflow station by developing a regression equation between observed flows at Doris with the observed flows for the corresponding period at the WSC station Ellice River (10QD001). A synthetic record was also developed for Tail Outflow by developing a second regression equation between observed flows at Tail and observed flows at Doris. Finally, runoff characteristics for Little Roberts Lake Outflow were assumed to be the same as those for Doris. Frequency analysis was completed on the synthetic records to develop return period estimates for annual runoff (Table 4.2-1), and average monthly flow (Table 4.2-2).

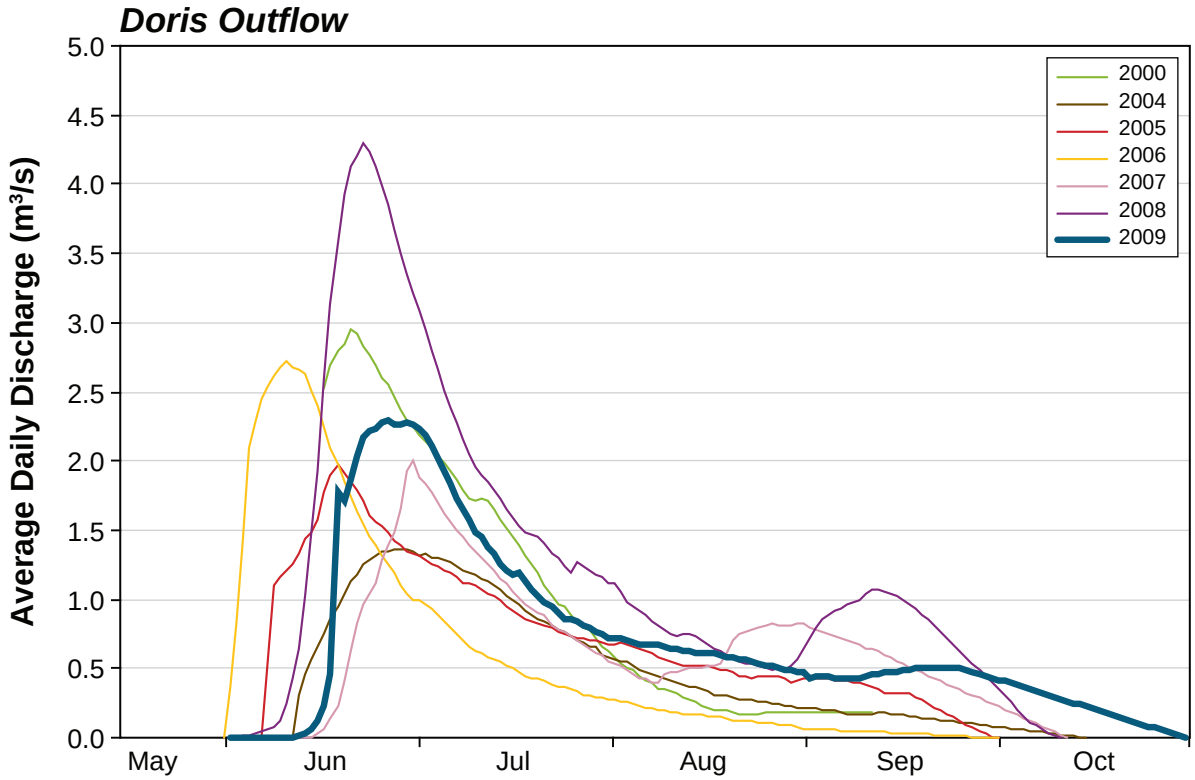

Figure 4.1-1

Historical Hydrographs for Doris Outflow

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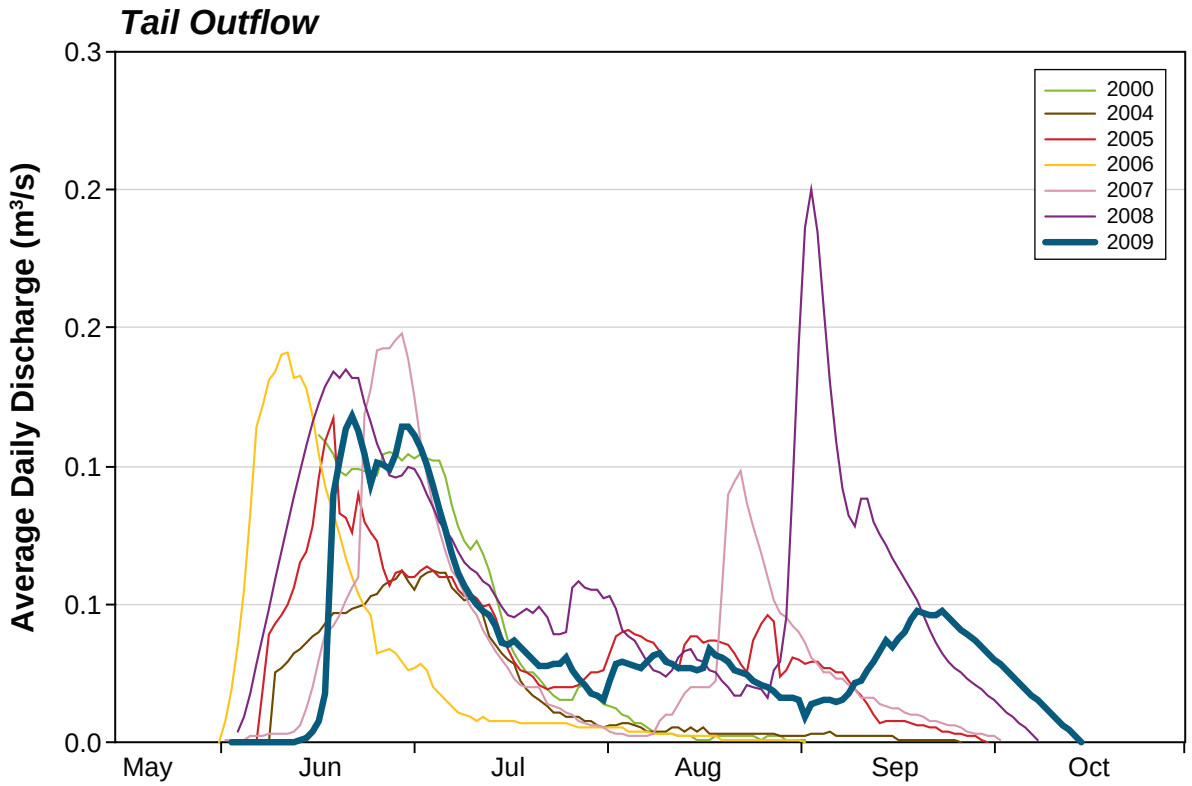

Figure 4.1-2

Historical Hydrographs for Tail Outflow

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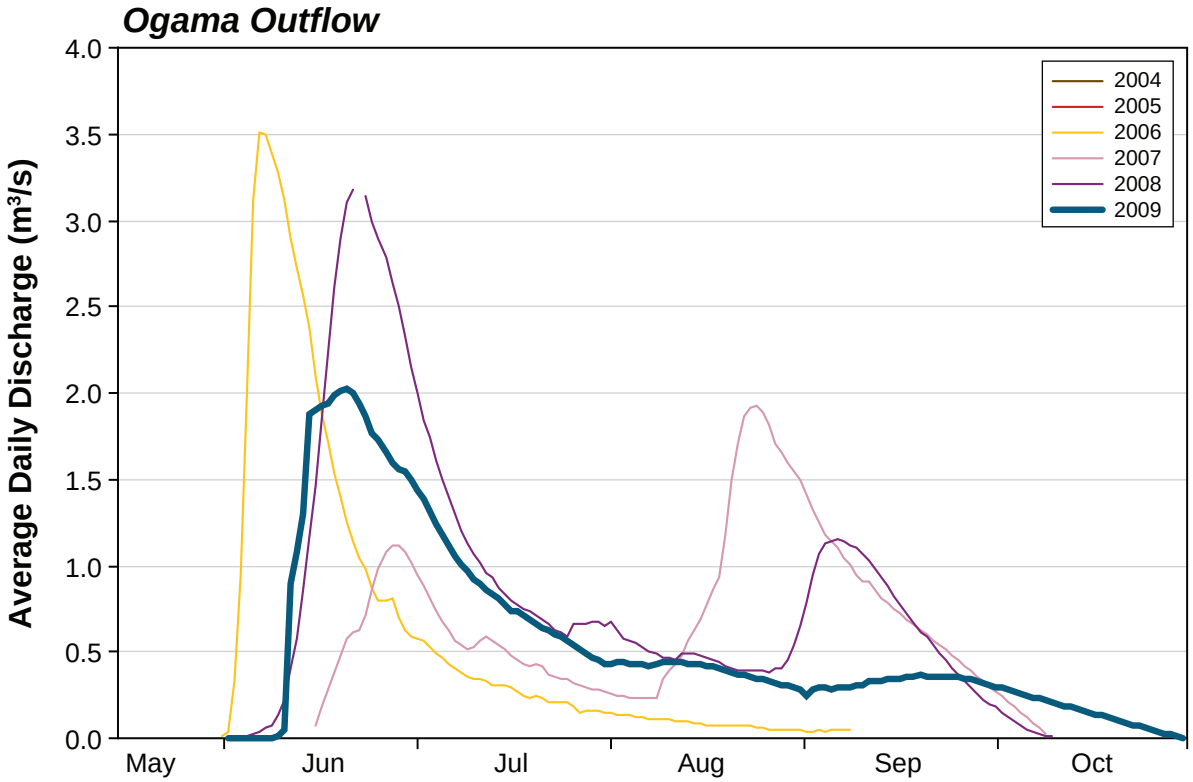

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Historical Hydrographs for Ogama Outflow

Figure 4.1-3

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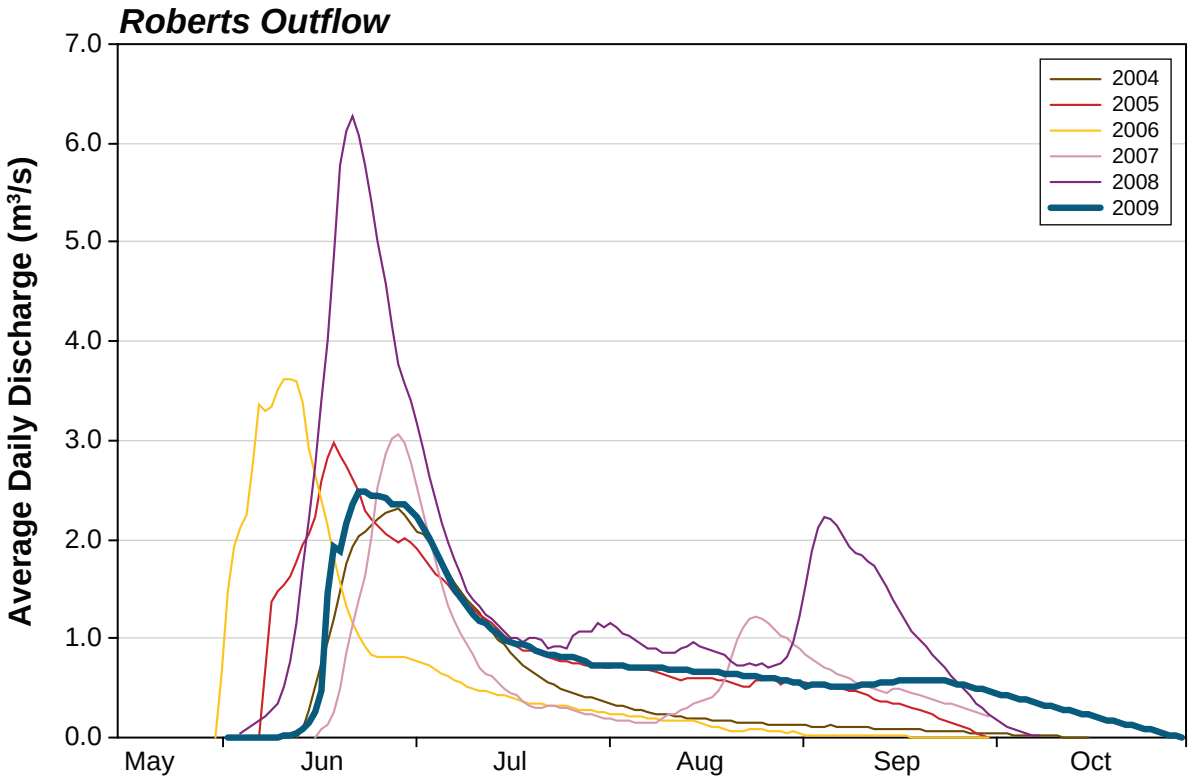

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Historical Hydrographs for Roberts Outflow

Figure 4.1-4

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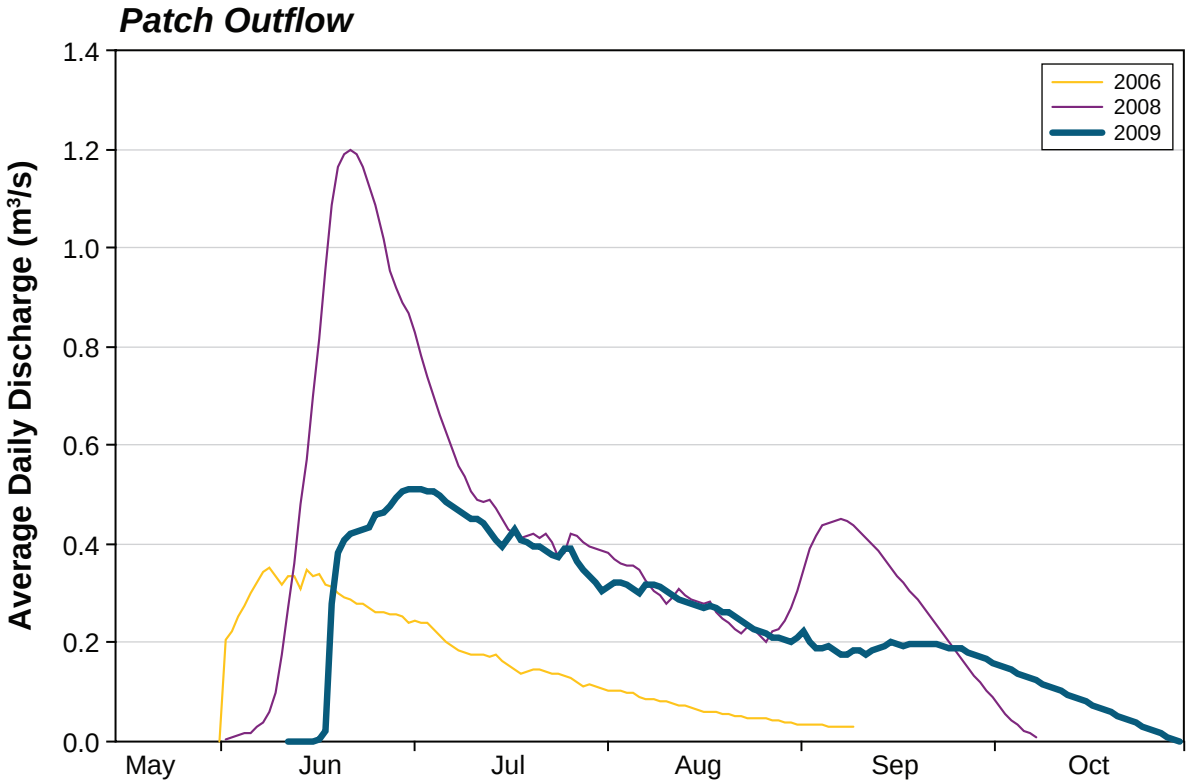

Figure 4.1-5

Historical Hydrographs for Patch Outflow

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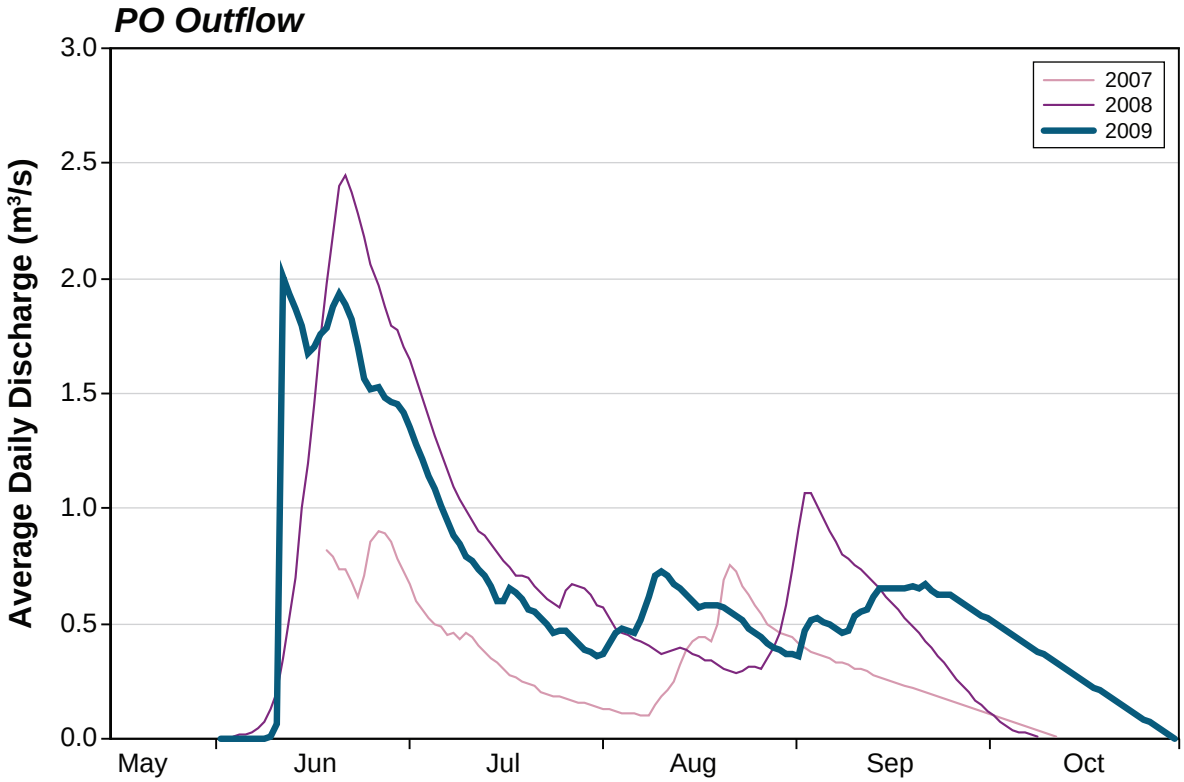

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Historical Hydrographs for PO Outflow

Figure 4.1-6

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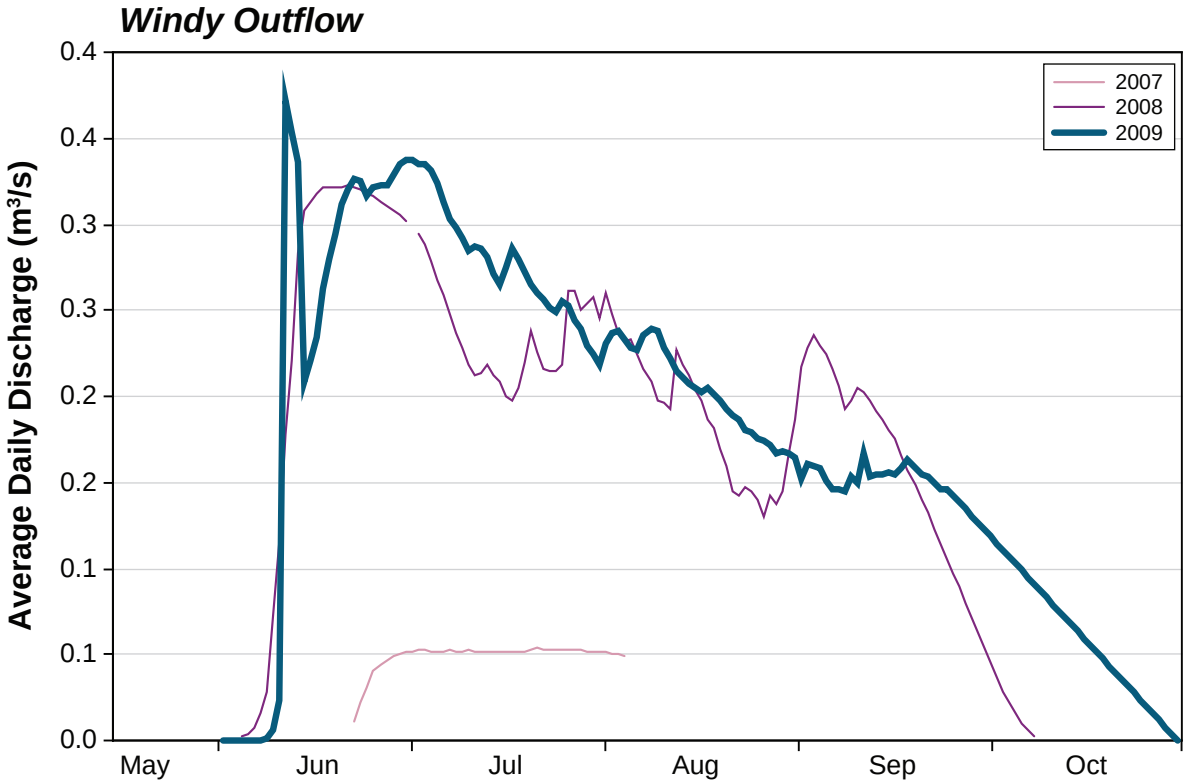

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Historical Hydrographs for Windy Outflow

Figure 4.1-7

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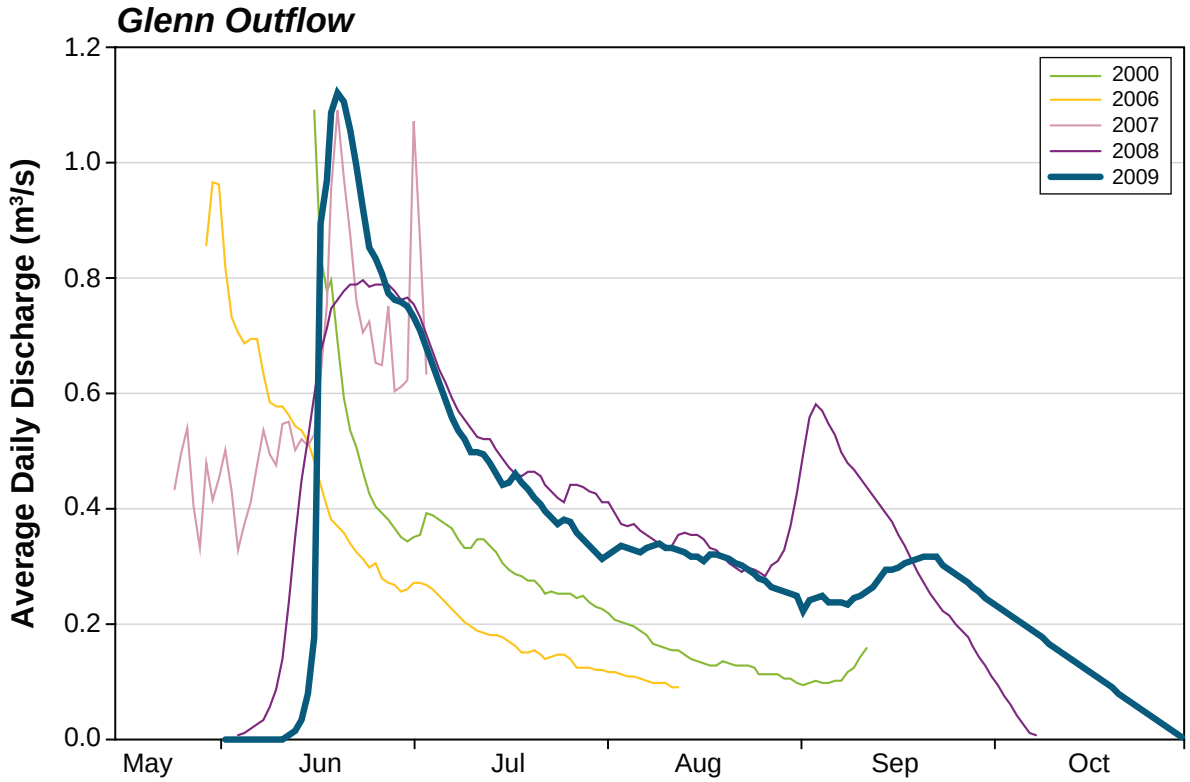

Figure 4.1-8

Historical Hydrographs for Glenn Outflow

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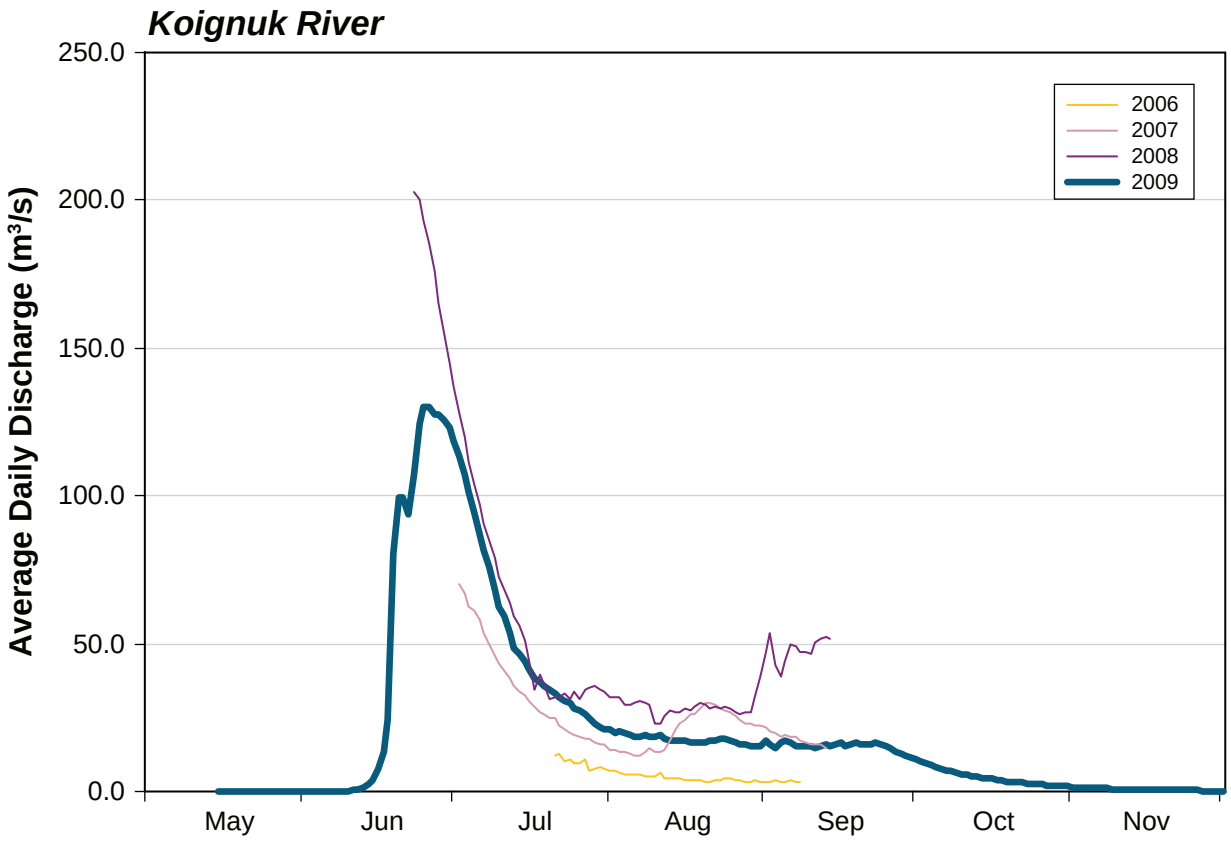

Figure 4.1-9

Historical Hydrographs for Koignuk River

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Table 4.2-1. Return Period Estimates of Annual Runoff from AMEC (2003)

	Estimated Annual Runoff (mm)				
Stream	**1:100 Yr Dry**	**1:10 Yr Dry**	**1:2 Yr (Mean)**	**1:10 Yr Wet**	**1:100 Yr Wet**
Doris Outflow	88.1	97.0	134	188	309
Tail Outflow	63.8	74.1	111	159	246
Little Roberts Outflow	88.1	97.0	134	188	309

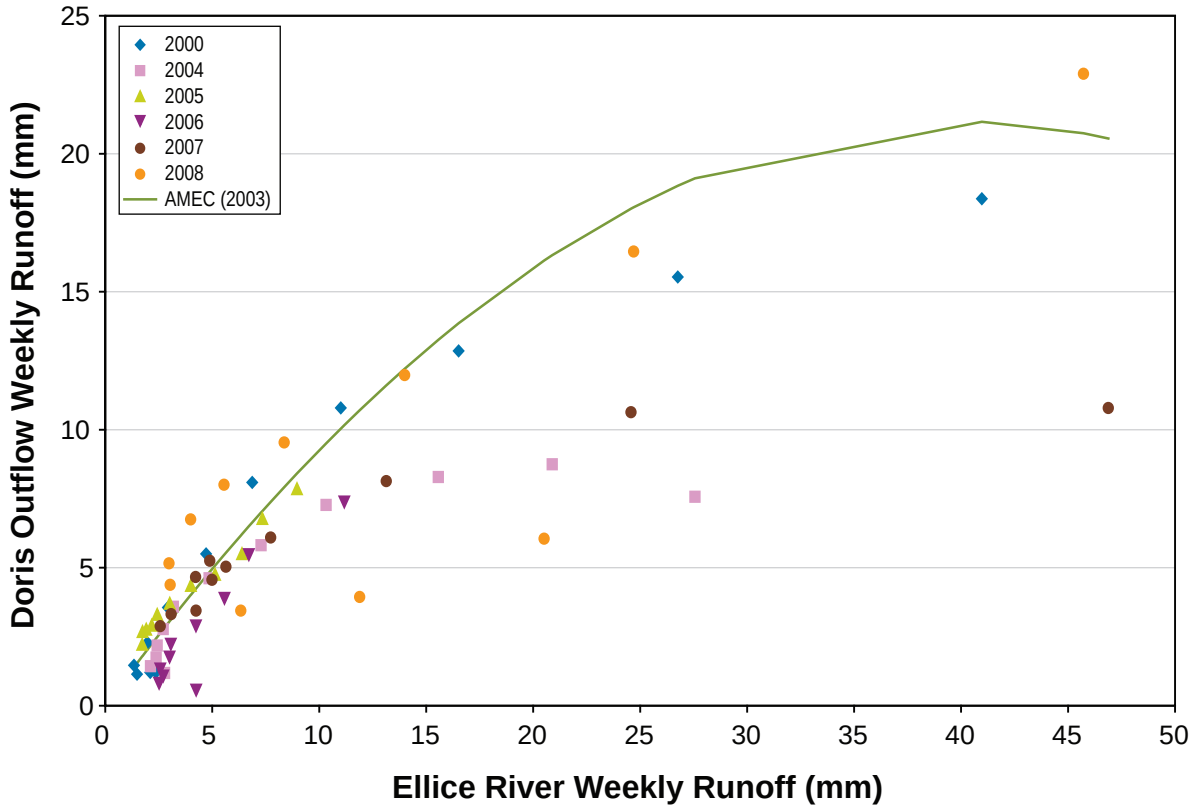
Table 4.2-2. Estimates of Mean Monthly Runoff from AMEC (2003)

	Doris Outflow		Tail Outflow		Little Roberts Outflow	
Month	**Runoff (mm)**	**% of Annual**	**Runoff (mm)**	**% of Annual**	**Runoff (mm)**	**% of Annual**
June	57.4	43	60.0	54	57.4	43
July	35.6	27	28.3	26	35.6	27
August	15.0	11	8.8	8	15.0	11
September	19.2	14	11.0	10	19.2	14
October	6.7	5	2.9	2	6.7	5
Annual	*134*	*100*	*111*	*100*	*134*	*100*

There are sparse hydrological data available for the Canadian Arctic, especially on small watersheds. The 2003 regional analysis used Ellice River as an analogue because it was the nearest long-term station to the Study Area with data that overlapped with the on-site data to derive the regression. However, it is important to note that Ellice River has a watershed area of 16,900 km^2, and that results from this gauge were applied to watersheds ranging from 4 to 200 km^2.

The 2003 regional analysis methodology was repeated for Doris Outflow using available data from 2000 to 2008 (Figure 4.2-1). The results indicate that there is high variability, and that the regression relationship is not constant from one year to the next. Some of this variability is likely due to differences in weather between the two watersheds. For example, the 2008 data show a secondary peak for Ellice River that was not observed at Doris Outflow. It is not clear what physically controls the variability, however, two general groups can be observed in the data: years 2000, 2005 and 2008; and years 2004, 2006, and 2007. The 2003 regression fits well with the first group, which predicts higher runoff at Doris for the same observed flow at Ellice. Applying this regression over the long-term record will result in over-estimated annual runoff results.

Following a number of years of additional on-site data collection, a more detailed water balance model was completed in 2008 for 10 lakes in the Study Area (Golder, 2009). The water balance model was set up on a daily time step for the period 1948 to 2008, using a synthetic precipitation record derived for the Study Area based on long-term climate records from Cambridge Bay. The basic water balance for each lake outflow considered rainfall and snowmelt runoff, direct precipitation to the lake surface, inflow from upstream watersheds, changes in lake storage, lake evaporation and outflow to downstream watersheds. The model was calibrated using runoff coefficients from land surfaces, stage-discharge rating curves at lake outflows, and simple temperature based models for snowmelt, spring ice melt and winter freeze-up in lake outflow channels. The calibrated model was used to generate a daily time series for each lake outflow, and frequency analyses were performed to characterize key discharge parameters (Tables 4.2-3 to 4.2-5).



Correlation of Weekly Runoff between Ellice River and Doris Outflow

Figure 4.2-1

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Table 4.2-3. Summary of Annual Runoff Return Period Estimates for Lakes in the Study Area from Golder (2009)

	Annual Runoff (mm)										
	Dry					Mean	Wet				
Station Id	100	50	20	10	5	2	5	10	20	50	100
Wolverine Outflow	19	24	33	42	53	77	107	126	144	166	182
Patch Outflow	35	40	48	56	66	87	114	131	148	168	182
PO Outflow	54	59	66	74	84	105	131	147	162	181	194
Ogama Outflow	52	57	65	72	82	103	129	146	161	179	193
Tail Outflow	25	30	37	44	53	72	96	111	124	141	153
Doris Outflow	47	52	60	68	77	99	125	141	157	176	189
Roberts Outflow	39	44	52	60	70	92	119	136	152	171	185
Little Roberts Outflow	44	49	57	64	74	96	122	138	154	172	186
Windy Outflow	19	23	31	39	50	73	104	124	144	169	188
Glenn Outflow	41	45	51	58	67	86	111	128	143	164	179

Table 4.2-4. Summary of Peak Daily Flow Return Period Estimates for Lakes in the Study Area from Golder (2009)

	Peak Daily Flow (m^3/s) Return Period (years)					
Station Id	2	5	10	20	50	100
Wolverine Outflow	0.056	0.084	0.104	0.126	0.157	0.183
Patch Outflow	0.693	0.995	1.22	1.45	1.78	2.06
PO Outflow	1.29	1.74	2.04	2.34	2.74	3.04
Ogama Outflow	1.41	1.88	2.18	2.48	2.85	3.12
Tail Outflow	0.122	0.171	0.211	0.256	0.326	0.389
Doris Outflow	1.68	2.21	2.55	2.87	3.27	3.56
Roberts Outflow	2.13	3	3.64	4.3	5.22	5.97
Little Roberts Outflow	3.82	5.18	6.07	6.94	8.05	8.89
Windy Outflow	0.304	0.48	0.621	0.776	1.01	1.22
Glenn Outflow	0.484	0.687	0.839	1	1.23	1.43

Table 4.2-5. Summary of 7-Day Low-Flow Return Period Estimates for Lakes in the Study Area from Golder (2009)

	August 7-day Low Flow (m^3/s) Return Period (years)					
Station Id	2	5	10	20	50	100
Wolverine Outflow	0.012	0.006	0.005	0.004	0.003	0.002
Patch Outflow	0.138	0.085	0.068	0.056	0.046	0.041
PO Outflow	0.464	0.331	0.281	0.246	0.213	0.194
Ogama Outflow	0.502	0.352	0.295	0.255	0.218	0.196
Tail Outflow	0.007	0.001	0.001	0	0	0
Doris Outflow	0.579	0.381	0.308	0.257	0.21	0.183
Roberts Outflow	0.459	0.284	0.227	0.189	0.155	0.137
Little Roberts Outflow	1.093	0.702	0.567	0.475	0.391	0.343
Windy Outflow	0.039	0.02	0.014	0.011	0.008	0.007
Glenn Outflow	0.204	0.147	0.124	0.108	0.093	0.085

The model estimates predict a mean annual runoff for Doris Outflow of 99 mm, compared to 134 mm from the 2003 regional analysis. The 2009 calculated runoff for this station was 99 mm, equivalent to the model estimate. Comparatively, this would equate to 1-in-10 year dry conditions based on the return period estimates made in 2003. Given the general climatic conditions described above for the Arctic Tundra climate region, it would be expected that 2009 was near, or slightly wetter than average, suggesting the water balance model estimates to be more accurate.

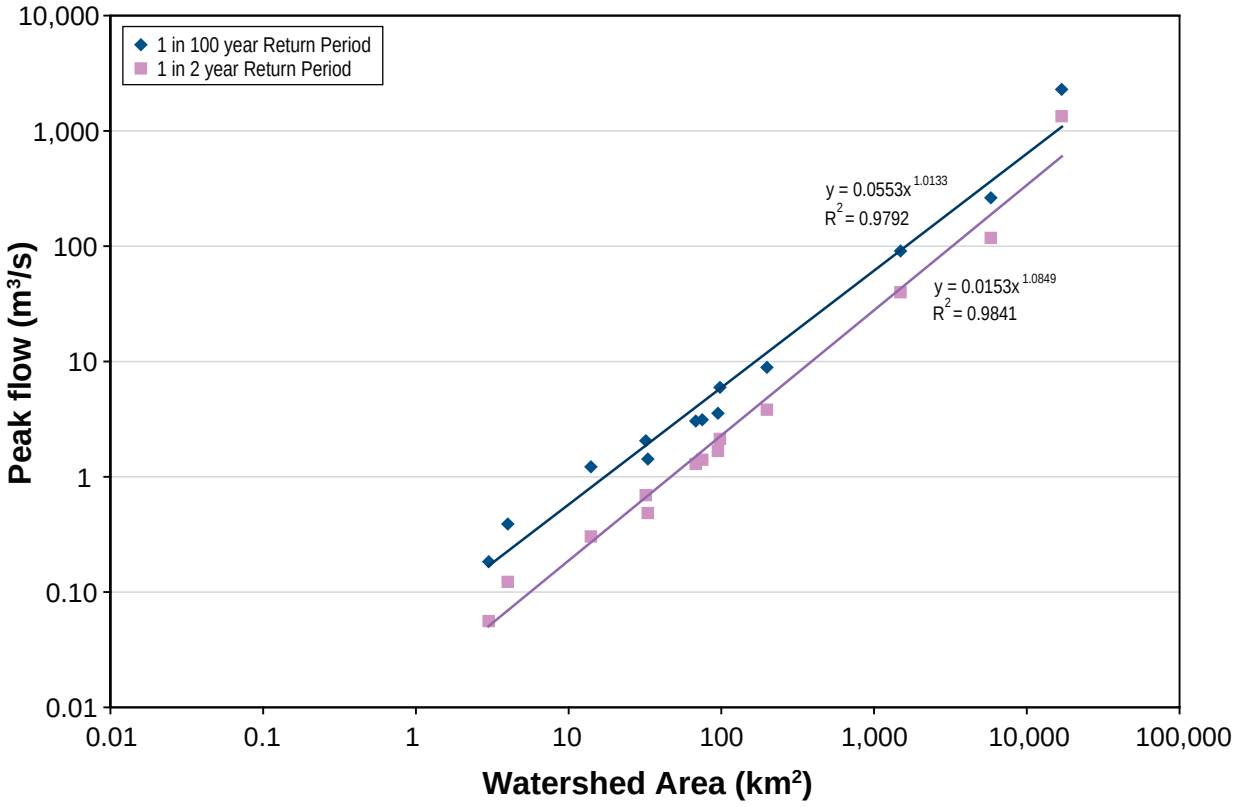
4.3 APPLICABILITY

Results of the more detailed water balance model appear to provide good estimates of annual runoff for the Study Area. Site specific estimates were generated for 10 watersheds. In general, the results from Little Roberts Lake can be used to describe average conditions for some catchments in the Study Area (i.e., Doris, Ogama, Patch, PO, and Tail lakes) , as results for the smaller sites are nested within this watershed.

Peak and low flow results from the water balance model as well as data from three long-term WSC station (Freshwater Creek (1,490 km^2), Tree River (5,810 km^2), and Ellice River (16,900 km^2) were plotted against watershed area to derive generalized prediction equations for the Study Area (Figures 4.2-2 and 4.2-3). The equations from these plots can be used to estimate peak and low flows for any watershed area of interest. For example, Table 4.2-6 summarizes estimates for the Koignuk River and Reference-A at the location of the hydrometric stations. The 1-in-100 year peak flow is shown, as this is a common design parameter for sizing of ditches, diversion channels, or stream crossings. The average and 1-in-10 year 7-day low flows are shown as they are common indices for water use planning. The low flow provides an estimate of the normal baseflow conditions during the open-water season, which is important to the sustained health of a stream's aquatic community.

Table 4.2-6. Peak and Low Flow Estimates for Koignuk River and Reference-A Watershed

Watershed	Watershed Area (km^2)	Average Annual Peak Flow (m^3/s)	1-in-100 Year Peak Flow (m^3/s)	Average Annual 7-day August Low Flow (m^3/s)	1-in-10 Year 7-day August Low Flow (m^3/s)
Koignuk River	2,937	88.5	181	15.8	4.5
Reference-A	27	0.546	1.56	0.11	0.03



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Relation Between Watershed Area and Peak Flows with Different Return Periods

Figure 4.2-2

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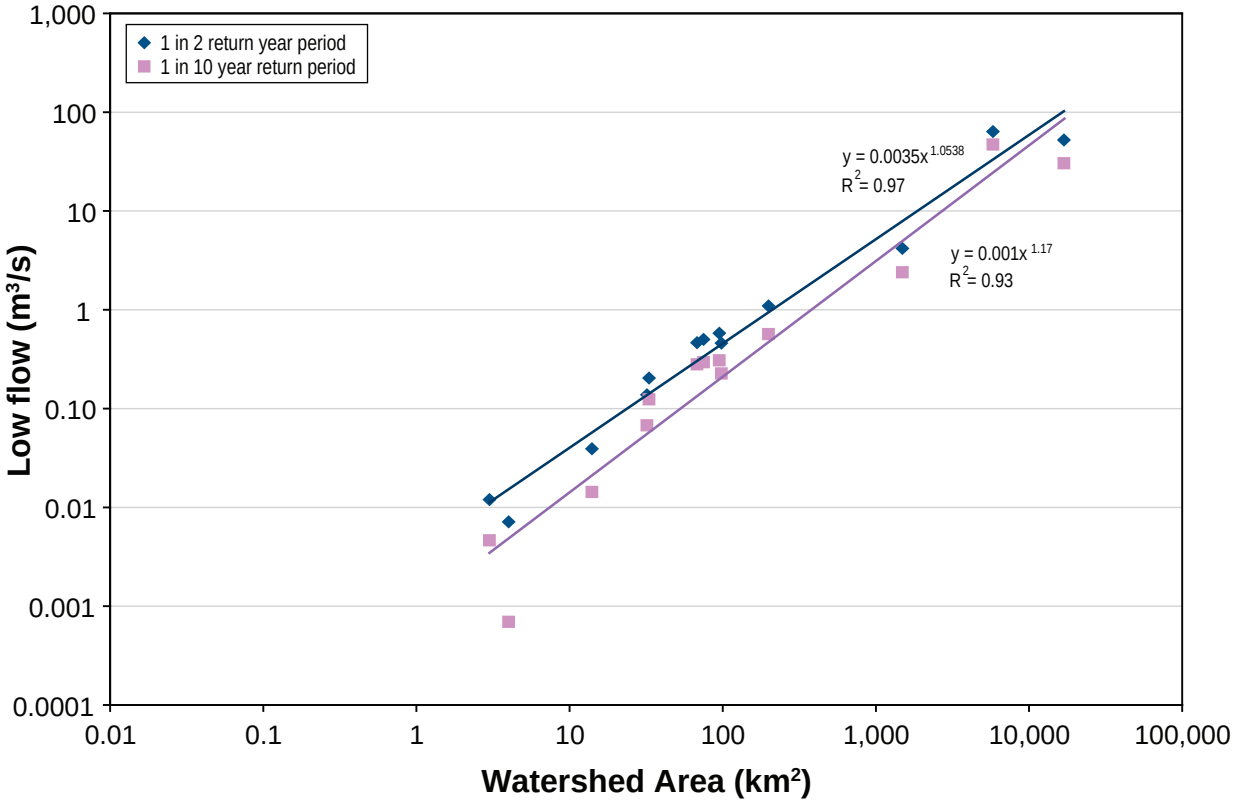

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Relation Between Watershed Area and 7-day Low Flows of Different Return Periods

Figure 4.2-3

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Appendix 1

Manual Flow Measurements

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Engineers and Scientists

Manual Flow Measurements at Windy-Hydro in 2009

Date Monitored:	**11-Jun-09**	**Date Monitored:**	**11-Jun-09**
Time (24 hr):	**15:55**	**Run: 1**	**Time (24 hr):**	**15:55**	**Run: 2**
Personnel:	**Xavier Pinto, Katsky Venter**	**Personnel:**	**Xavier Pinto, Katsky Venter**
Method:	**Velocity - area with Swoffer**	**Method:**	**Velocity - area with Swoffer**
Staff Gauge (m):		**Staff Gauge (m):**	
Pressure Transducer (m):		**Pressure Transducer (m):**	
Discharge (m^3/s):	**0.374**	**Discharge (m^3/s):**	**0.370**

Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total	Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total
	1	0	0	0	0		3.6	0	0	0	0
	1.15	10	0	0	0		3.5	23	0	0	0
	1.3	14	0.14	0.00294	1	left bank	3.35	25	0.19	0.00713	2
	1.45	17	0.19	0.00485	1		3.2	35	0.37	0.0194	5
	1.6	24	0.27	0.0097	3		3.05	58	0.54	0.0470	13
	1.75	28	0.32	0.0134	4		2.9	58	0.5	0.0435	12
	1.9	36	0.37	0.0200	5		2.75	58	0.44	0.0383	10
	2.05	49	0.45	0.0331	9		2.6	59	0.42	0.0372	10
	2.2	53	0.35	0.0278	7		2.45	59	0.43	0.0381	10
	2.35	57	0.39	0.0333	9		2.3	59	0.42	0.0372	10
	2.5	58	0.42	0.0365	10		2.15	52	0.41	0.0320	9
	2.65	58	0.46	0.0400	11		2	50	0.4	0.0300	8
	2.8	58	0.46	0.0400	11		1.85	30	0.33	0.0149	4
	2.95	57	0.56	0.0479	13		1.7	27	0.31	0.0126	3
	3.1	54	0.51	0.0413	11		1.55	23	0.23	0.00794	2
	3.25	30	0.49	0.0221	6		1.4	15	0.14	0.00315	1
	3.4	23	0.03	0.00104	0		1.25	13	0.07	0.00137	0
	3.55	21	0	0	0		1.1	9	0	0	0
	3.6	0	0	0	0		1	0	0	0	0

Date Monitored:	**14-Jun-09**	**Date Monitored:**	**14-Jun-09**
Time (24 hr):	**17:25**	**Run: 1**	**Time (24 hr):**	**17:25**	**Run: 2**
Personnel:	**Xavier Pinto, Katsky Venter**	**Personnel:**	**Xavier Pinto, Katsky Venter**
Method:	**Velocity - area with Swoffer**	**Method:**	**Velocity - area with Swoffer**
Staff Gauge (m):		**Staff Gauge (m):**	
Pressure Transducer (m):		**Pressure Transducer (m):**	
Discharge (m^3/s):	**0.204**	**Discharge (m^3/s):**	**0.214**

Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total	Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total
	5.2	0	0	0	0		7.2	0	0	0	0
	5.25	4	0	0	0		7.07	43	0.04	0.00198	1
	5.3	5	0	0	0	left bank	6.97	46	0.22	0.0101	5
	5.35	8	0	0	0		6.87	49	0.42	0.0206	10
	5.4	10	0.01	0.0000500	0		6.77	51	0.46	0.0235	11
	5.45	12	0.05	0.000300	0		6.67	48	0.44	0.0211	10
	5.5	13	0.1	0.000650	0		6.57	47	0.41	0.0193	9
	5.55	17	0.24	0.00204	1		6.47	47	0.42	0.0197	9
	5.6	21	0.27	0.00284	1		6.37	46	0.3	0.0138	6
	5.65	21	0.28	0.00294	1		6.27	47	0.35	0.0165	8
	5.7	25	0.31	0.00387	2		6.17	45	0.26	0.0117	5
	5.75	25	0.31	0.00387	2		6.07	45	0.26	0.0117	5
	5.8	30	0.28	0.00420	2		5.97	43	0.34	0.0146	7
	5.85	32	0.25	0.00400	2		5.87	34	0.27	0.00918	4
	5.9	33	0.27	0.00446	2		5.77	30	0.3	0.00900	4
	5.95	39	0.29	0.00565	3		5.67	22	0.3	0.00660	3
	6	45	0.21	0.00472	2		5.57	17	0.21	0.00357	2
	6.05	46	0.28	0.00644	3		5.47	12	0.09	0.00108	1
	6.1	45	0.28	0.00630	3		5.37	10	0	0	0
	6.15	45	0.31	0.00698	3		5.27	7	0	0	0
	6.2	46	0.29	0.00667	3		5.2	0	0	0	0
	6.25	48	0.29	0.00696	3						
	6.3	47	0.3	0.00705	3						
	6.35	46	0.33	0.00759	4						
	6.4	47	0.32	0.00752	4						
	6.45	48	0.39	0.00936	5						
	6.5	50	0.4	0.0100	5						
	6.55	50	0.37	0.00925	5						
	6.6	48	0.41	0.0148	7						
	6.7	50	0.45	0.0225	11						
	6.8	51	0.43	0.0219	11						
	6.9	48	0.28	0.0134	7						
	7	44	0.15	0.00660	3						
	7.1	22	0.03	0.000660	0						
	7.2	14	0	0	0						

Date Monitored:	**16-Jun-09**		**Date Monitored:**	**16-Jun-09**	
Time (24 hr):	**7:34**	**Run: 1**	**Time (24 hr):**	**7:34**	**Run: 2**
Personnel:	**Xavier Pinto, Greg Norton**		**Personnel:**	**Xavier Pinto, Greg Norton**	
Method:	**Velocity - area with Swoffer**		**Method:**	**Velocity - area with Swoffer**	
Staff Gauge (m):			**Staff Gauge (m):**		
Pressure Transducer (m):	**98.533**		**Pressure Transducer (m):**	**98.533**	
Discharge (m^3/s):	**0.272**		**Discharge (m^3/s):**	**0.252**	

Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total	Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total
	0.8	0	0.00	0	0		4.5	0	0.00	0	0
	1	11	0.00	0	0		4.3	18	0.03	0.00104	0
	1.2	15	0.00	0	0	left bank	4.1	19	0.07	0.00276	1
	1.4	17	0.00	0	0		3.9	25.5	0.15	0.00740	3
	1.6	26	0.12	0.00603	2		3.7	31	0.16	0.00989	4
	1.8	27	0.25	0.01332	5		3.5	31	0.26	0.0162	6
	2	31	0.29	0.0180	7		3.3	34	0.30	0.0207	8
	2.2	35.5	0.44	0.0309	11		3.1	35	0.32	0.0223	9
	2.4	39	0.45	0.0351	13		2.9	37.5	0.32	0.0239	9
	2.6	45	0.39	0.0353	13		2.7	41	0.39	0.0321	13
	2.8	40	0.41	0.0325	12		2.5	42	0.36	0.0305	12
	3	39	0.28	0.0215	8		2.3	37	0.42	0.0311	12
	3.2	35	0.30	0.0213	8		2.1	35	0.41	0.0284	11
	3.4	32	0.26	0.0167	6		1.9	30	0.32	0.0191	8
	3.6	34	0.25	0.0168	6		1.7	26	0.13	0.00679	3
	3.8	41	0.20	0.0167	6		1.5	23	0.00	0	0
	4	32	0.07	0.00464	2		1.3	0	0.00	0	0
	4.2	20	0.06	0.00290	1		0.8	0	0.00	0	0
	4.5	0	0	0	0						

Date Monitored:	**22-Jun-09**		**Date Monitored:**	**22-Jun-09**	
Time (24 hr):	**17:39**	**Run: 1**	**Time (24 hr):**	**17:39**	**Run: 2**
Personnel:	**Xavier Pinto, Greg Norton**		**Personnel:**	**Xavier Pinto, Greg Norton**	
Method:	**Velocity - area with Swoffer**		**Method:**	**Velocity - area with Swoffer**	
Staff Gauge (m):			**Staff Gauge (m):**		
Pressure Transducer (m):	**98.562**		**Pressure Transducer (m):**	**98.562**	
Discharge (m^3/s):	**0.369**		**Discharge (m^3/s):**	**0.388**	

Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total	Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total
left bank	0.4	0	0.00	0	0	right bank	3.85	0	0.00	0	0
	1.8	20	0.00	0	0		3.75	11	0.03	0.000393	0
	2	23	0.13	0.00518	1		3.6	19	0.30	0.00856	2
	2.15	26	0.09	0.00335	1		3.45	20	0.23	0.00686	2
	2.3	25	0.14	0.00536	1		3.3	24	0.43	0.0129	3
	2.45	32	0.57	0.0229	6		3.2	40	0.44	0.0177	5
	2.55	52	0.79	0.0409	11		3.1	46	0.67	0.0309	8
	2.65	50	0.97	0.0486	13		3	55	0.87	0.0480	12
	2.75	50	0.97	0.0486	13		2.9	54	0.93	0.0502	13
	2.85	53	0.96	0.0508	14		2.8	51	0.99	0.0503	13
	2.95	54	0.87	0.0471	13		2.7	50	0.94	0.0472	12
	3.05	50	0.91	0.0457	12		2.6	52	0.63	0.0327	8
	3.15	45	0.36	0.0161	4		2.5	51	0.83	0.0529	14
	3.25	27	0.51	0.0174	5		2.35	30	0.27	0.0143	4
	3.4	20	0.23	0.00686	2		2.15	25	0.19	0.00813	2
	3.55	20	0.23	0.00686	2		2	22	0.19	0.00716	2
	3.7	15	0.14	0.00322	1		1.8	20	0.00	0	0
right bank	3.85	0	0.00	0	0	left bank	0.4	0	0.00	0	0

Date Monitored:	**24-Jun-09**
Time (24 hr):	**14:30**
Personnel:	**Xavier Pinto, Greg Norton**
Method:	**Velocity - area with Swoffer**
Staff Gauge (m):	
Pressure Transducer (m):	**98.556**
Discharge (m^3/s):	**0.286**

Run: 1

Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total
left bank	0.2	0	0.00	0	0
	1.6	9	0.00	0	0
	1.7	20	0.16	0.00317	1
	1.8	25	0.09	0.00216	1
	1.9	24	0.09	0.00207	1
	2	26	0.19	0.00486	2
	2.1	28	0.16	0.00443	2
	2.2	51	0.52	0.0198	7
	2.25	52	0.52	0.0135	5
	2.3	52	0.72	0.0187	7
	2.35	51	0.85	0.0216	8
	2.4	50	0.89	0.0223	8
	2.45	50	0.94	0.0234	8
	2.5	50	0.88	0.0219	8
	2.55	52	0.89	0.0232	8
	2.6	53	0.95	0.0252	9
	2.65	54	0.94	0.0253	9
right bank	2.7	54	0.89	0.0120	4
	2.75	54	0.86	0.0117	4
	2.8	46	0.66	0.00827	3
	2.85	43	0.36	0.00400	1
	2.9	40	0.52	0.00537	2
	3	24	0.36	0.00576	2
	3.1	21	0.22	0.00243	1
	3.2	20	0.20	0.00206	1
	3.3	16	0.20	0.00181	1
	3.4	15	0.19	0.00145	1
	3.5	0	0	0	0

Date Monitored:	**24-Jun-09**
Time (24 hr):	**14:30**
Personnel:	**Xavier Pinto, Greg Norton**
Method:	**Velocity - area with Swoffer**
Staff Gauge (m):	
Pressure Transducer (m):	**98.556**
Discharge (m^3/s):	**0.281**

Run: 2

Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total
right bank	3.5	0	0.00	0	0
	3.45	9	0.07	0.000486	0
	3.35	18	0.20	0.00363	1
	3.25	20	0.23	0.00460	2
	3.15	20	0.16	0.00317	1
	3.05	23	0.27	0.00629	2
	2.95	27	0.33	0.00894	3
	2.85	44	0.30	0.0113	4
	2.78	46	0.68	0.0187	7
	2.73	53	0.95	0.0252	9
	2.68	53	0.92	0.0244	9
	2.63	54	0.91	0.0245	9
	2.58	50	0.91	0.0227	8
	2.53	50	0.91	0.0227	8
	2.48	50	0.92	0.0230	8
	2.43	50	0.91	0.0227	8
	2.38	51	0.88	0.0224	8
left bank	2.33	52	0.81	0.0104	4
	2.28	52	0.63	0.00823	3
	2.23	51	0.42	0.00537	2
	2.15	33	0.30	0.00508	2
	2.05	25	0.14	0.00209	1
	1.95	25	0.14	0.00180	1
	1.85	25	0.10	0.00126	0
	1.75	23	0.13	0.00155	1
	1.65	19	0.10	0.00106	0
	1.55	20	0.00	0	0
	0.2	0	0	0	0

Date Monitored:	**22-Jul-09**
Time (24 hr):	**15:04**
Personnel:	**Xavier Pinto, Wynter Kulliktana**
Method:	**Velocity - area with Swoffer**
Staff Gauge (m):	
Pressure Transducer (m):	**98.541**
Discharge (m^3/s):	**0.227**

Run: 1

Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total
RB	1.6	0	0	0	0
	1.65	12	0	0	0
	1.7	15	0.01	0.0000750	0
	1.75	16	0.01	0.0000800	0
	1.8	18	0.13	0.00117	1
	1.85	22	0.05	0.000550	0
	1.9	37	0.18	0.00333	1
	1.95	44	0.2	0.00440	2
	2	45	0.15	0.00338	1
	2.05	45	0.16	0.00360	2
	2.1	45	0.27	0.00608	3
	2.15	46	0.37	0.00851	4
	2.2	47	0.4	0.00940	4
	2.25	48	0.51	0.0122	5
	2.3	47	0.54	0.0127	6
	2.35	47	0.54	0.0127	6
	2.4	47	0.6	0.0141	6
	2.45	46	0.63	0.0145	6
	2.5	46	0.6	0.0138	6
	2.55	46	0.6	0.0138	6
	2.6	43	0.53	0.0114	5
	2.65	43	0.56	0.0120	5
	2.7	43	0.56	0.0120	5
	2.75	42	0.54	0.0113	5
	2.8	40	0.53	0.0106	5
	2.85	41	0.47	0.00964	4
	2.9	42	0.4	0.00840	4
	2.95	42	0.33	0.00693	3
	3	41	0.27	0.00553	2
	3.05	40	0.15	0.00300	1
	3.1	38	0.1	0.00190	1
LB	3.15	0	0	0	0

Date Monitored:	**26-Jul-09**
Time (24 hr):	**15:09** **Run: 1**
Personnel:	**Xavier Pinto, Wynter Kulliktana**
Method:	**Velocity - area with Swoffer**
Staff Gauge (m):	
Pressure Transducer (m):	**98.535**
Discharge (m^3/s):	**0.236**

Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total
right bank	1.1	0	0	0	0
	1.15	20	0.15	0.00150	1
	1.2	20	0.22	0.00330	1
	1.3	38	0.46	0.0131	6
	1.35	40	0.57	0.0114	5
	1.4	42	0.56	0.0118	5
	1.45	43	0.61	0.0131	6
	1.5	44	0.6	0.0132	6
	1.55	44	0.6	0.0132	6
	1.6	43	0.63	0.0135	6
	1.65	42	0.55	0.0116	5
	1.7	43	0.6	0.0129	5
	1.75	44	0.57	0.0125	5
	1.8	44	0.54	0.0119	5
	1.85	44	0.56	0.0123	5
	1.9	44	0.46	0.0101	4
	1.95	44	0.45	0.00990	4
	2	45	0.46	0.0104	4
	2.05	45	0.4	0.00900	4
	2.1	44	0.41	0.00902	4
	2.15	42	0.35	0.00735	3
	2.2	41	0.31	0.00953	4
	2.3	29	0.24	0.00696	3
	2.4	21	0.2	0.00420	2
	2.5	20	0.13	0.00260	1
	2.6	16	0.05	0.00120	1
left bank	2.8	0	0	0	0

Date Monitored:	**24-Sep-09**
Time (24 hr):	**17:12** **Run: 1**
Personnel:	**Xavier Pinto-Swoffer; Tolga Olcay- Notes**
Method:	**Velocity - area with Swoffer**
Staff Gauge (m):	
Pressure Transducer (m):	**98.489**
Discharge (m^3/s):	**0.157**

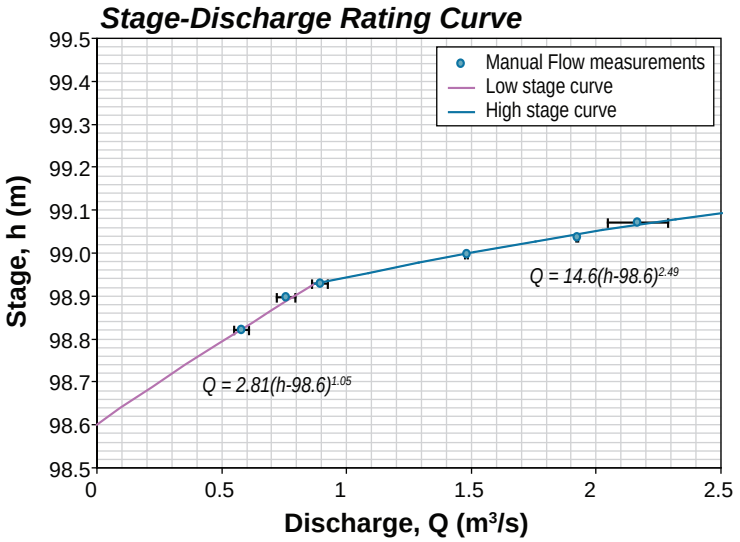
Notes	Station (m)	Depth (cm)	Velocity (m/s)	Q (m^3/s)	% of Total
right bank	6.4	0	0.00	0	0
	6.5	10	0.00	0	0
	6.6	12	0.00	0	0
	6.7	16	0.14	0.00227	1
	6.8	19	0.23	0.00432	3
	6.9	22	0.20	0.00437	3
	7	37	0.24	0.00893	6
	7.1	36	0.47	0.0169	11
	7.2	34	0.71	0.0181	12
	7.25	32	0.72	0.0116	7
	7.3	31	0.64	0.00991	6
	7.35	30	0.71	0.0107	7
	7.4	30	0.61	0.00916	6
	7.45	26	0.58	0.00757	5
	7.5	27	0.48	0.00652	4
	7.55	26	0.40	0.00517	3
	7.6	28	0.37	0.00775	5
	7.7	26	0.26	0.00665	4
	7.8	28	0.30	0.00835	5
	7.9	24	0.33	0.00588	4
	7.95	23	0.31	0.00359	2
	8	25	0.37	0.00462	3
	8.05	28	0.34	0.00226	1
	8.1	28	0.26	0.00179	1
	8.2	23	0.03	0.000362	0
left bank	8.3	18	0.01	0.000146	0
	8.4	0	0	0	

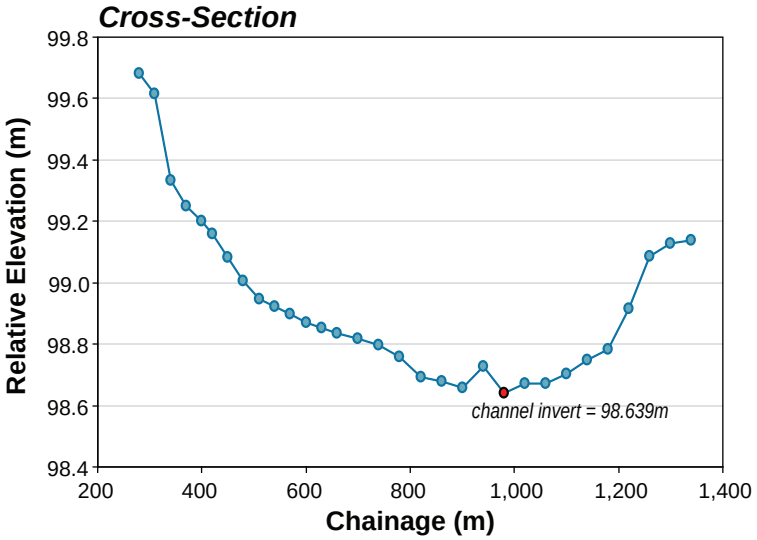
Appendix 2

Rating Curves

Rescan™
Engineers and Scientists

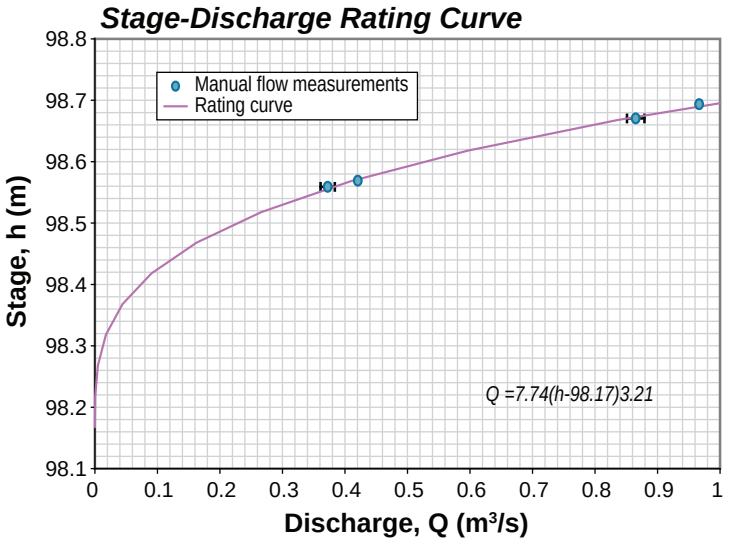
Lake outlet, facing upstream (S)

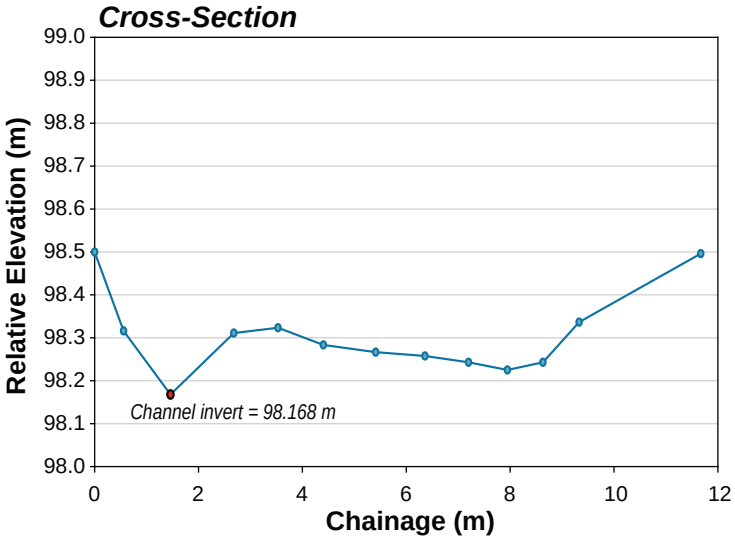




Note: Stage and elevations are referenced to arbitrary datum.

Lake Outlet facing upstream (SW)

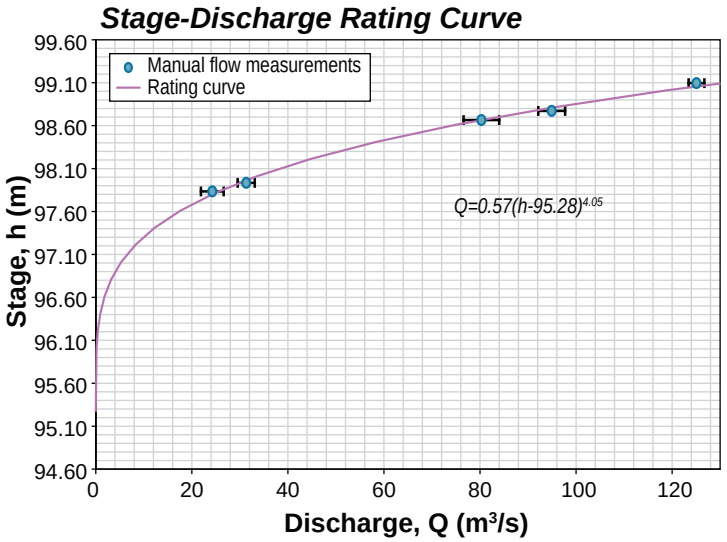


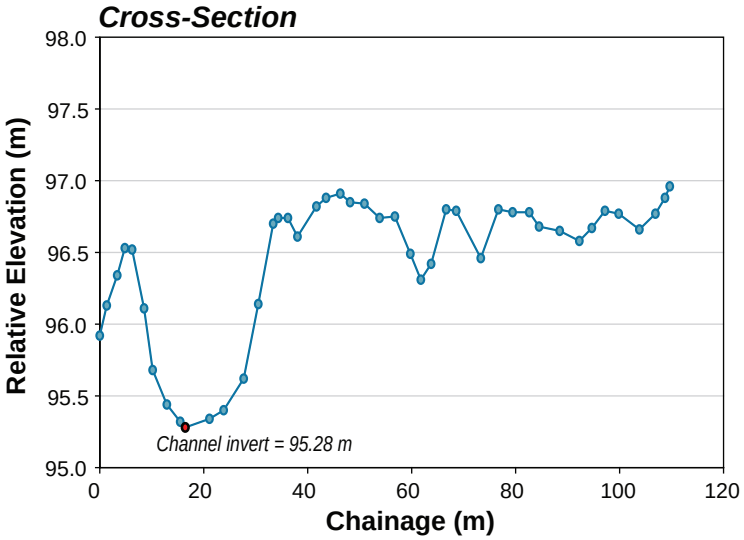


Note: Stage and elevations are referenced to arbitrary datum.

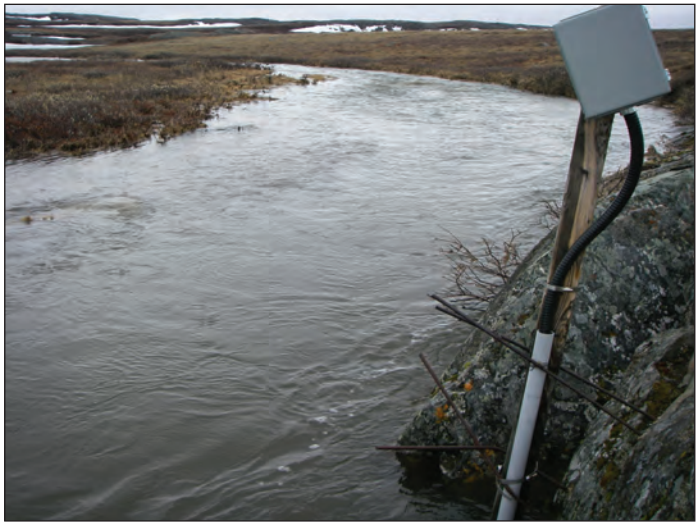
Facing upstream (SW) from the station

Cross-section right at the station

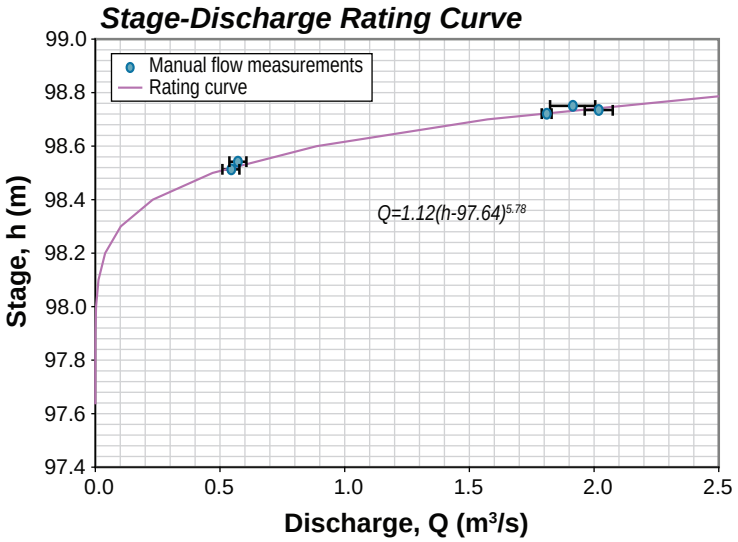


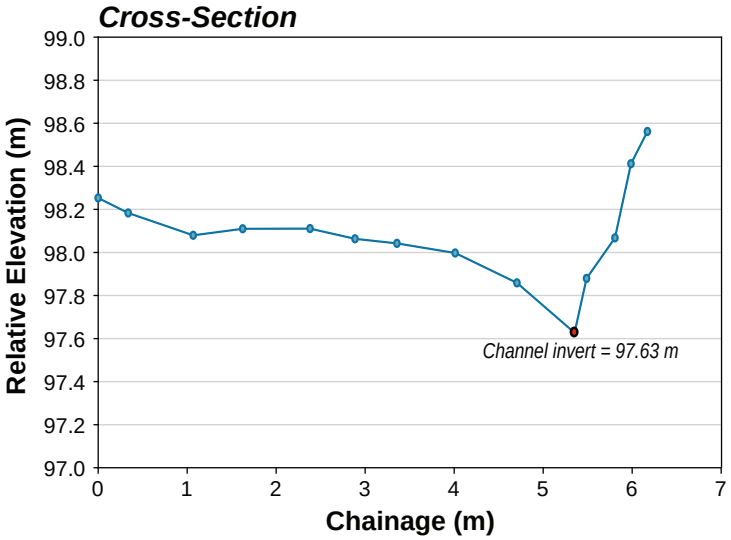


Note: Stage and elevations are referenced to arbitrary datum.



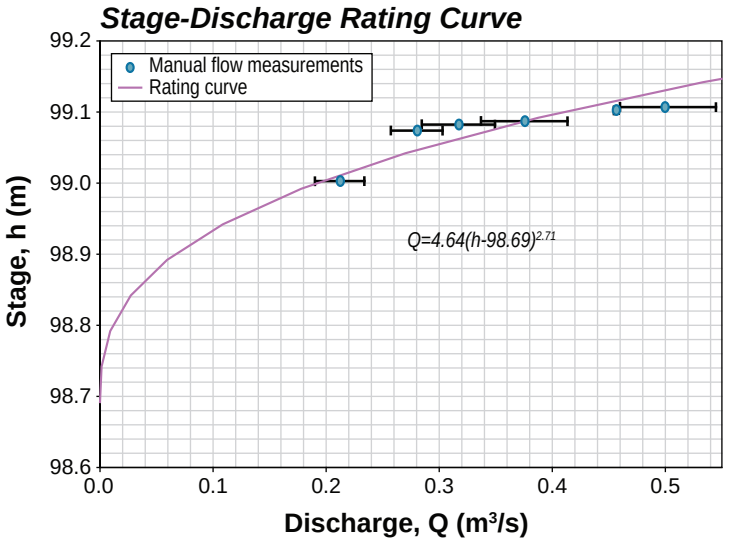
Cross section at the station, facing upstream (SE)

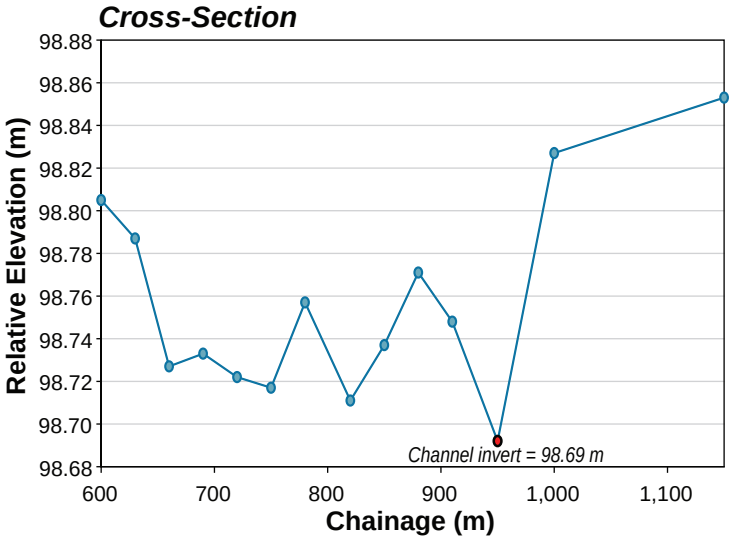




Note: Stage and elevations are referenced to arbitrary datum.

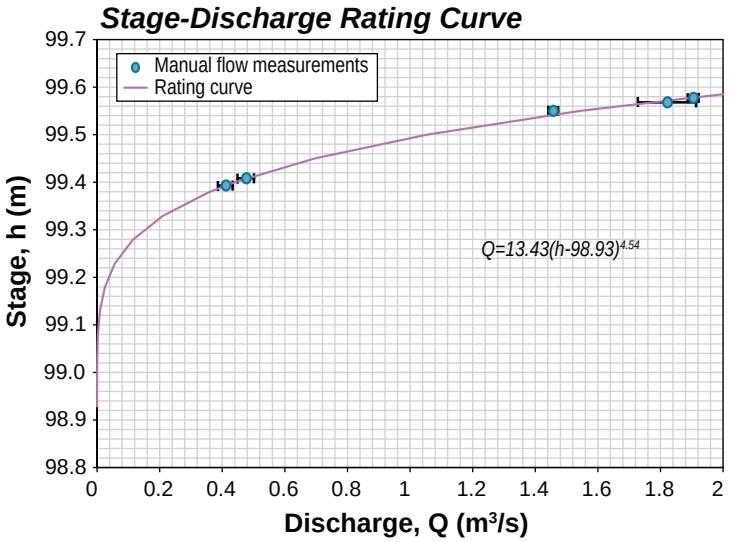
Lake outlet facing upstream (W)

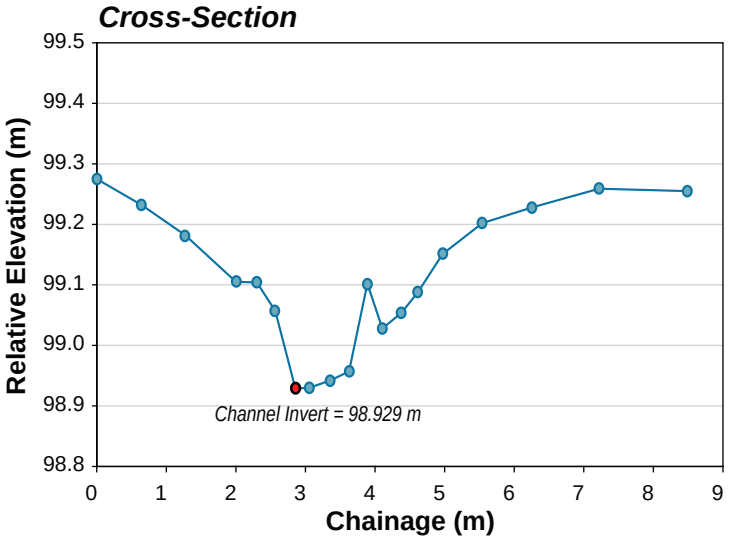




Note: Stage and elevations are referenced to arbitrary datum.

Lake outlet facing upstream (S)

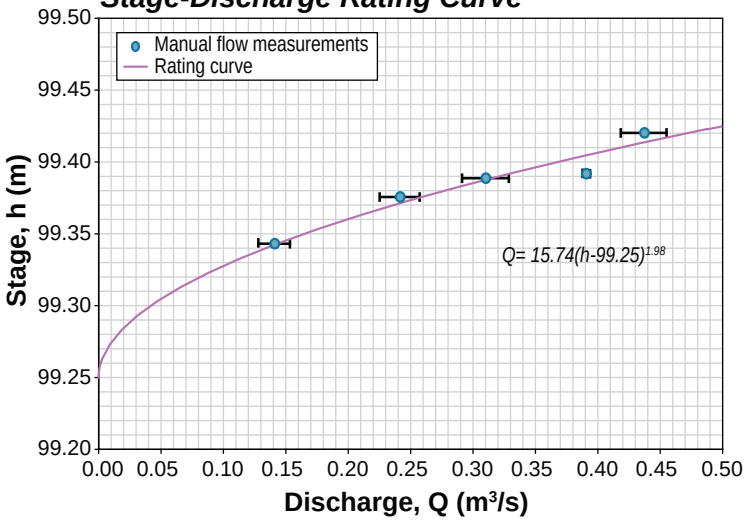




Note: Stage and elevations are referenced to arbitrary datum.

Lake outlet facing upstream (S)

Stage-Discharge Rating Curve

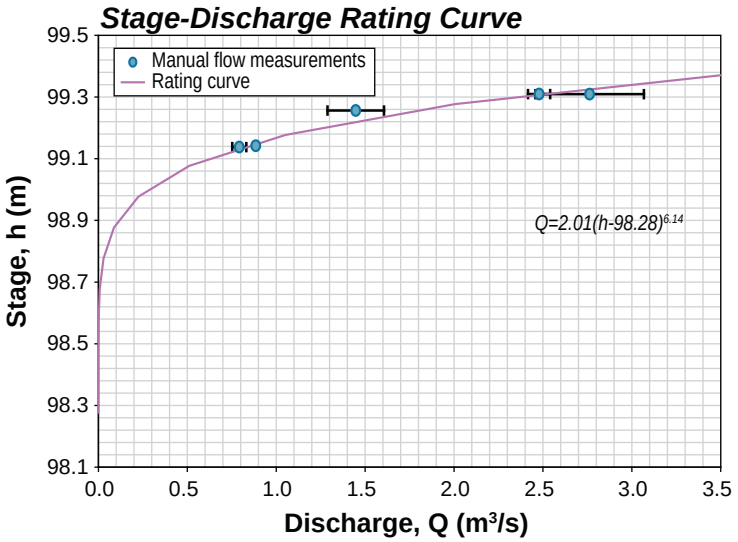


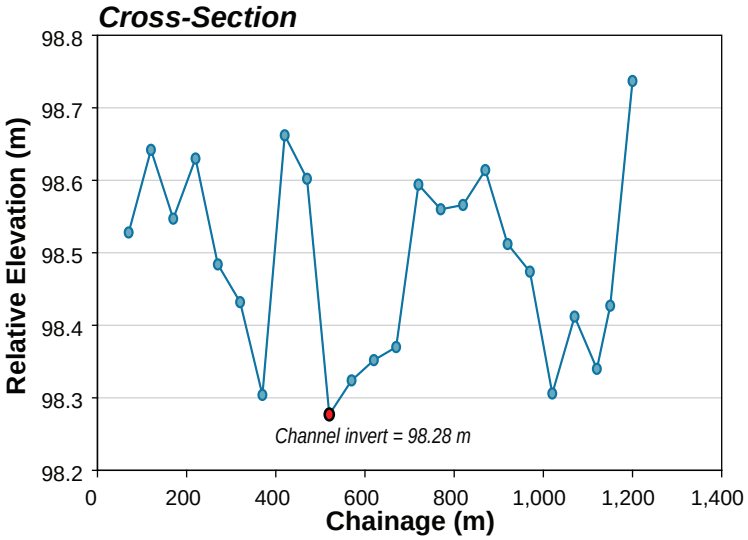
Cross-Section

No cross-section available

Note: Stage and elevations are referenced to arbitrary datum.

Lake outlet facing upstream (E)

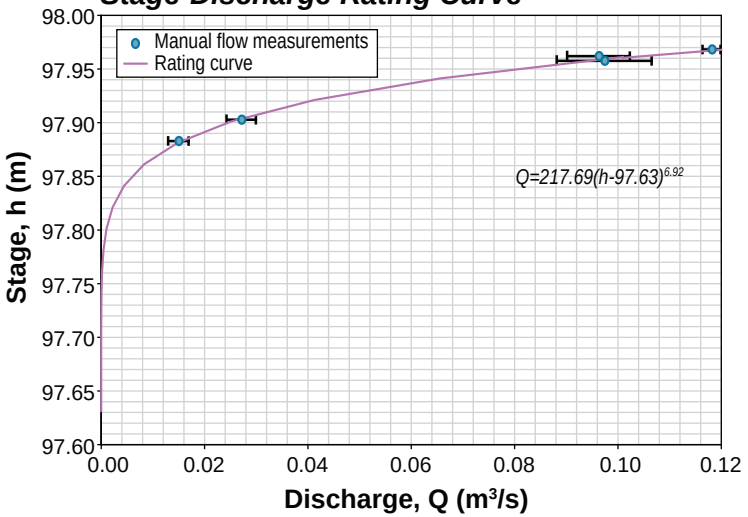




Note: Stage and elevations are referenced to arbitrary datum.

Lake outlet facing upstream (SE)

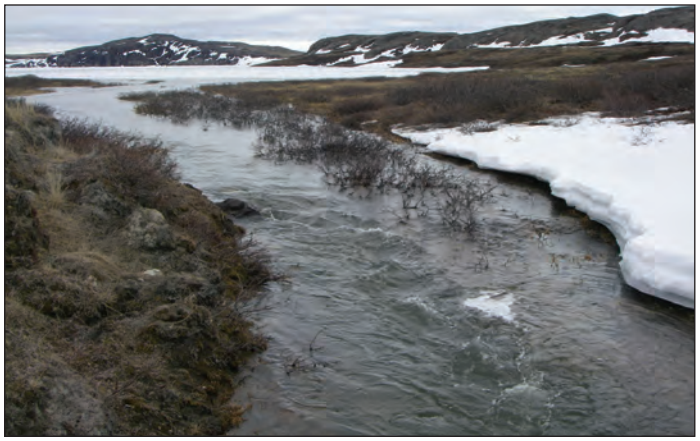
Stage-Discharge Rating Curve



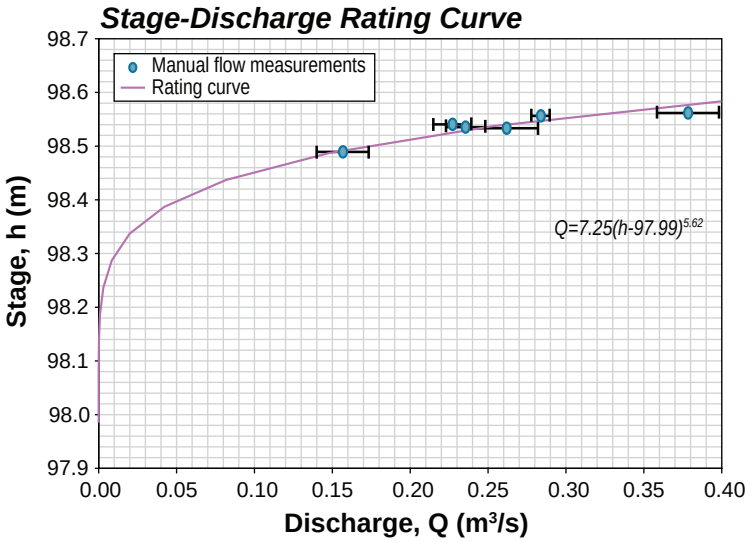
Cross-Section

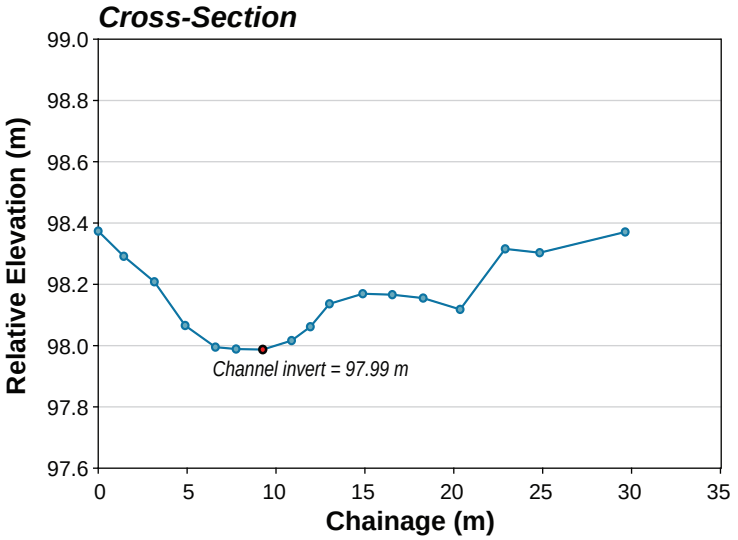
No cross-section available

Note: Stage and elevations are referenced to arbitrary datum.



Lake outlet facing upstream (S)





Note: Stage and elevations are referenced to arbitrary datum.

Appendix 3

Survey Control Points

Rescan™
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Summary of Survey Control Points used at the Hydrometric Stations

Station ID	Survey Point	Elevation (m)	Date	Notes
Doris-Hydro	Benchmark 59	100.000		arbitrary elevation
	Benchmark 58	100.617		
	Pressure transducer	98.054	20-Jun-09	
Ogama-Hydro	Benchamrk 41	100.000		arbitrary elevation
	Benchmark 42	100.100		
	Pressure transducer	97.999	23-Jun-09	
Patch-Hydro	Benchmark 53	100.000		arbitrary elevation
	Benchmark 52	99.567		
	Benchmark 54	99.309		
	Pressure transducer	98.522	21-Jun-09	Temporary install
	Pressure transducer	98.297	21-Jun-09	Final install after moving transducer
PO-Hydro	Benchmark 40	100.000		arbitrary elevation
	Benchmark 39	100.313		
	Benchamrk 38	99.818		
	Pressure transducer	98.613	28-Jul-09	
Roberts-Hydro	Benchmark 50	100.000		arbitrary elevation
	Benchmark 64	99.745		
	Benchmark 49	99.868		
	Pressure transducer	98.012	22-Jun-09	Temporary install
	Pressure transducer	98.004	26-Jul-09	Final install after moving transducer
Tail-Hydro	Benchmark Golder	100.000		arbitrary elevation
	Benchmark 43	99.300		
	Pressure transducer	97.661	23-Jun-09	
Wolverine-Hydro	Benchmark 61	100.000		arbitrary elevation
	Benchmark 60	98.874		
	Pressure transducer	97.788	21-Jun-09	
Windy-Hydro	Benchmark 44	100.000		arbitrary elevation
	Benchmark 45	99.116		
	Pressure transducer	98.125	24-Jun-09	Temporary install
	Pressure transducer	97.996	24-Jun-09	Final install after moving transducer
Glenn-Hydro	Benchmark 3	100.000		arbitrary elevation
	Benchmark 2	99.032		
	Benchmark 1	98.670		
	Pressure transducer	97.572	16-Jun-09	Temporary install
	Pressure transducer	97.124	22-Jun-09	Final install after moving transducer
Koignuk-Hydro	Benchmark 68	100.000		arbitrary elevation
	Benchmark 67	100.155		
	Benchmark 66	98.900		
	Pressure transducer	97.415	16-Jun-09	Temporary install
	Pressure transducer	96.864	19-Jun-09	Final install after moving transducer
	Pressure transducer	96.309	27-Jul-09	Transducer relocated to deeper water
Reference-Hydro	Benchmark 56	100.000		arbitrary elevation
	Benchmark 57	100.375		
	Benchmark 55	99.952		
	Pressure transducer	98.731	22-Jun-09	Temporary install
	Pressure transducer	98.463	22-Jun-09	Final install after moving transducer

Appendix 4

Lake Water Levels

Rescan™
Engineers and Scientists

Summary of Daily Mean Water Level (m) at Doris Lake

Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)
1-Jan		1-Mar		1-May		1-Jul	5.993	1-Sep	5.620	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	5.988	2-Sep	5.630	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	5.972	3-Sep	5.632	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	5.963	4-Sep	5.630	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	5.966	5-Sep	5.620	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	5.943	6-Sep	5.620	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	5.934	7-Sep	5.620	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	5.926	8-Sep	5.620	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	5.916	9-Sep	5.620	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	5.900	10-Sep	5.630	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	5.898	11-Sep	5.640	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	5.905	12-Sep	5.640	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	5.880	13-Sep	5.640	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	5.874	14-Sep	5.650	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	5.861	15-Sep	5.645	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	5.857	16-Sep	5.650	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	5.866	17-Sep	5.650	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	5.845	18-Sep	5.650	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	5.847	19-Sep	5.660	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	5.837	20-Sep	5.660	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	5.832	21-Sep	5.660	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	5.806	22-Sep		22-Nov	
23-Jan		23-Mar		23-May		23-Jul	5.811	23-Sep		23-Nov	
24-Jan		24-Mar		24-May		24-Jul	5.800	24-Sep		24-Nov	
25-Jan		25-Mar		25-May		25-Jul	5.835	25-Sep		25-Nov	
26-Jan		26-Mar		26-May		26-Jul	5.803	26-Sep		26-Nov	
27-Jan		27-Mar		27-May	2.465	27-Jul	5.801	27-Sep		27-Nov	
28-Jan		28-Mar		28-May	1.610	28-Jul	5.786	28-Sep		28-Nov	
29-Jan		29-Mar		29-May	1.867	29-Jul	5.774	29-Sep		29-Nov	
30-Jan		30-Mar		30-May	4.588	30-Jul	5.764	30-Sep		30-Nov	
31-Jan		31-Mar		31-May	5.133	31-Jul	5.759	1-Oct		1-Dec	
1-Feb		1-Apr		1-Jun	5.498	1-Aug	5.764	2-Oct		2-Dec	
2-Feb		2-Apr		2-Jun	5.486	2-Aug	*5.749*	3-Oct		3-Dec	
3-Feb		3-Apr		3-Jun	5.539	3-Aug	*5.748*	4-Oct		4-Dec	
4-Feb		4-Apr		4-Jun	5.582	4-Aug	*5.741*	5-Oct		5-Dec	
5-Feb		5-Apr		5-Jun	5.555	5-Aug	*5.735*	6-Oct		6-Dec	
6-Feb		6-Apr		6-Jun	5.506	6-Aug	*5.730*	7-Oct		7-Dec	
7-Feb		7-Apr		7-Jun	5.452	7-Aug	*5.729*	8-Oct		8-Dec	
8-Feb		8-Apr		8-Jun	5.389	8-Aug	*5.728*	9-Oct		9-Dec	
9-Feb		9-Apr		9-Jun	5.517	9-Aug	*5.727*	10-Oct		10-Dec	
10-Feb		10-Apr		10-Jun	*5.517*	10-Aug	*5.720*	11-Oct		11-Dec	
11-Feb		11-Apr		11-Jun	*5.517*	11-Aug	*5.717*	12-Oct		12-Dec	
12-Feb		12-Apr		12-Jun	*5.517*	12-Aug	*5.712*	13-Oct		13-Dec	
13-Feb		13-Apr		13-Jun	*5.517*	13-Aug	*5.710*	14-Oct		14-Dec	
14-Feb		14-Apr		14-Jun	*5.517*	14-Aug	*5.708*	15-Oct		15-Dec	
15-Feb		15-Apr		15-Jun	*5.517*	15-Aug	*5.706*	16-Oct		16-Dec	
16-Feb		16-Apr		16-Jun	*5.517*	16-Aug	*5.701*	17-Oct		17-Dec	
17-Feb		17-Apr		17-Jun	*5.517*	17-Aug	*5.701*	18-Oct		18-Dec	
18-Feb		18-Apr		18-Jun	*5.517*	18-Aug	*5.696*	19-Oct		19-Dec	
19-Feb		19-Apr		19-Jun	*5.517*	19-Aug	*5.693*	20-Oct		20-Dec	
20-Feb		20-Apr		20-Jun	*5.517*	20-Aug	*5.689*	21-Oct		21-Dec	
21-Feb		21-Apr		21-Jun	*5.517*	21-Aug	*5.685*	22-Oct		22-Dec	
22-Feb		22-Apr		22-Jun	*5.517*	22-Aug	*5.681*	23-Oct		23-Dec	
23-Feb		23-Apr		23-Jun	*5.517*	23-Aug	*5.678*	24-Oct		24-Dec	
24-Feb		24-Apr		24-Jun	*5.517*	24-Aug	*5.672*	25-Oct		25-Dec	
25-Feb		25-Apr		25-Jun	*5.517*	25-Aug	*5.667*	26-Oct		26-Dec	
26-Feb		26-Apr		26-Jun	6.008	26-Aug	*5.664*	27-Oct		27-Dec	
27-Feb		27-Apr		27-Jun	6.006	27-Aug	*5.658*	28-Oct		28-Dec	
28-Feb		28-Apr		28-Jun	6.003	28-Aug	*5.650*	29-Oct		29-Dec	
		29-Apr		29-Jun	6.011	29-Aug	*5.650*	30-Oct		30-Dec	
		30-Apr		30-Jun	6.006	30-Aug	*5.640*	31-Oct		31-Dec	
						31-Aug	*5.640*				

Note: Estimated values are italicized

Summary of Daily Mean Water Level (m) at Wolverine Lake

Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)
1-Jan		1-Mar		1-May		1-Jul	98.85	1-Sep		1-Nov	
2-Jan		2-Mar		2-May		2-Jul	98.85	2-Sep		2-Nov	
3-Jan		3-Mar		3-May		3-Jul	98.84	3-Sep		3-Nov	
4-Jan		4-Mar		4-May		4-Jul	98.82	4-Sep		4-Nov	
5-Jan		5-Mar		5-May		5-Jul	98.79	5-Sep		5-Nov	
6-Jan		6-Mar		6-May		6-Jul	98.76	6-Sep		6-Nov	
7-Jan		7-Mar		7-May		7-Jul	98.73	7-Sep		7-Nov	
8-Jan		8-Mar		8-May		8-Jul	98.72	8-Sep		8-Nov	
9-Jan		9-Mar		9-May		9-Jul	98.72	9-Sep		9-Nov	
10-Jan		10-Mar		10-May		10-Jul	98.69	10-Sep		10-Nov	
11-Jan		11-Mar		11-May		11-Jul	98.69	11-Sep		11-Nov	
12-Jan		12-Mar		12-May		12-Jul	98.68	12-Sep		12-Nov	
13-Jan		13-Mar		13-May		13-Jul	98.68	13-Sep		13-Nov	
14-Jan		14-Mar		14-May		14-Jul	98.67	14-Sep		14-Nov	
15-Jan		15-Mar		15-May		15-Jul	98.67	15-Sep		15-Nov	
16-Jan		16-Mar		16-May		16-Jul	98.68	16-Sep		16-Nov	
17-Jan		17-Mar		17-May		17-Jul	98.68	17-Sep		17-Nov	
18-Jan		18-Mar		18-May		18-Jul	98.67	18-Sep		18-Nov	
19-Jan		19-Mar		19-May		19-Jul	98.67	19-Sep		19-Nov	
20-Jan		20-Mar		20-May		20-Jul	98.67	20-Sep		20-Nov	
21-Jan		21-Mar		21-May		21-Jul	98.67	21-Sep		21-Nov	
22-Jan		22-Mar		22-May		22-Jul	98.66	22-Sep		22-Nov	
23-Jan		23-Mar		23-May		23-Jul	98.66	23-Sep		23-Nov	
24-Jan		24-Mar		24-May		24-Jul	98.66	24-Sep		24-Nov	
25-Jan		25-Mar		25-May		25-Jul	98.65	25-Sep		25-Nov	
26-Jan		26-Mar		26-May		26-Jul	98.65	26-Sep		26-Nov	
27-Jan		27-Mar		27-May		27-Jul		27-Sep		27-Nov	
28-Jan		28-Mar		28-May		28-Jul		28-Sep		28-Nov	
29-Jan		29-Mar		29-May		29-Jul		29-Sep		29-Nov	
30-Jan		30-Mar		30-May		30-Jul		30-Sep		30-Nov	
31-Jan		31-Mar		31-May		31-Jul		1-Oct		1-Dec	
1-Feb		1-Apr		1-Jun		1-Aug		2-Oct		2-Dec	
2-Feb		2-Apr		2-Jun		2-Aug		3-Oct		3-Dec	
3-Feb		3-Apr		3-Jun		3-Aug		4-Oct		4-Dec	
4-Feb		4-Apr		4-Jun		4-Aug		5-Oct		5-Dec	
5-Feb		5-Apr		5-Jun		5-Aug		6-Oct		6-Dec	
6-Feb		6-Apr		6-Jun		6-Aug		7-Oct		7-Dec	
7-Feb		7-Apr		7-Jun		7-Aug		8-Oct		8-Dec	
8-Feb		8-Apr		8-Jun		8-Aug		9-Oct		9-Dec	
9-Feb		9-Apr		9-Jun		9-Aug		10-Oct		10-Dec	
10-Feb		10-Apr		10-Jun		10-Aug		11-Oct		11-Dec	
11-Feb		11-Apr		11-Jun		11-Aug		12-Oct		12-Dec	
12-Feb		12-Apr		12-Jun		12-Aug		13-Oct		13-Dec	
13-Feb		13-Apr		13-Jun		13-Aug		14-Oct		14-Dec	
14-Feb		14-Apr		14-Jun		14-Aug		15-Oct		15-Dec	
15-Feb		15-Apr		15-Jun		15-Aug		16-Oct		16-Dec	
16-Feb		16-Apr		16-Jun		16-Aug		17-Oct		17-Dec	
17-Feb		17-Apr		17-Jun		17-Aug		18-Oct		18-Dec	
18-Feb		18-Apr		18-Jun		18-Aug		19-Oct		19-Dec	
19-Feb		19-Apr		19-Jun		19-Aug		20-Oct		20-Dec	
20-Feb		20-Apr		20-Jun	98.87	20-Aug		21-Oct		21-Dec	
21-Feb		21-Apr		21-Jun	98.87	21-Aug		22-Oct		22-Dec	
22-Feb		22-Apr		22-Jun	98.86	22-Aug		23-Oct		23-Dec	
23-Feb		23-Apr		23-Jun	98.86	23-Aug		24-Oct		24-Dec	
24-Feb		24-Apr		24-Jun	98.86	24-Aug		25-Oct		25-Dec	
25-Feb		25-Apr		25-Jun	98.86	25-Aug		26-Oct		26-Dec	
26-Feb		26-Apr		26-Jun	98.85	26-Aug		27-Oct		27-Dec	
27-Feb		27-Apr		27-Jun	98.86	27-Aug		28-Oct		28-Dec	
28-Feb		28-Apr		28-Jun	98.86	28-Aug		29-Oct		29-Dec	
		29-Apr		29-Jun	98.85	29-Aug		30-Oct		30-Dec	
		30-Apr		30-Jun	98.85	30-Aug		31-Oct		31-Dec	
						31-Aug					

Summary of Daily Mean Water Level (m) at Tail Lake

Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)
1-Jan	4.972	1-Mar	4.980	1-May	4.989	1-Jul	5.078	1-Sep	4.980	1-Nov	
2-Jan	4.970	2-Mar	4.979	2-May	4.988	2-Jul	5.081	2-Sep	4.995	2-Nov	
3-Jan	4.972	3-Mar	4.978	3-May	4.989	3-Jul	5.071	3-Sep	4.997	3-Nov	
4-Jan	4.975	4-Mar	4.982	4-May	4.990	4-Jul	5.071	4-Sep	4.999	4-Nov	
5-Jan	4.975	5-Mar	4.984	5-May	4.990	5-Jul	5.065	5-Sep	4.999	5-Nov	
6-Jan	4.975	6-Mar	4.984	6-May	4.990	6-Jul	5.059	6-Sep	4.998	6-Nov	
7-Jan	4.974	7-Mar	4.984	7-May	4.989	7-Jul	5.054	7-Sep	5.000	7-Nov	
8-Jan	4.975	8-Mar	4.986	8-May	4.989	8-Jul	5.051	8-Sep	5.004	8-Nov	
9-Jan	4.976	9-Mar	4.984	9-May	4.989	9-Jul	5.049	9-Sep	5.011	9-Nov	
10-Jan	4.974	10-Mar	4.984	10-May	4.988	10-Jul	5.044	10-Sep	5.013	10-Nov	
11-Jan	4.976	11-Mar	4.984	11-May	4.988	11-Jul	5.045	11-Sep	5.019	11-Nov	
12-Jan	4.976	12-Mar	4.984	12-May	4.989	12-Jul	5.043	12-Sep	5.023	12-Nov	
13-Jan	4.976	13-Mar	4.984	13-May	4.988	13-Jul	5.040	13-Sep	5.027	13-Nov	
14-Jan	4.976	14-Mar	4.984	14-May	4.987	14-Jul	5.037	14-Sep	5.032	14-Nov	
15-Jan	4.974	15-Mar	4.984	15-May	4.987	15-Jul	5.033	15-Sep	5.029	15-Nov	
16-Jan	4.974	16-Mar	4.983	16-May	4.987	16-Jul	5.035	16-Sep	5.033	16-Nov	
17-Jan	4.974	17-Mar	4.983	17-May	4.987	17-Jul	5.036	17-Sep	5.035	17-Nov	
18-Jan	4.971	18-Mar	4.982	18-May	4.986	18-Jul	5.031	18-Sep	5.040	18-Nov	
19-Jan	4.970	19-Mar	4.982	19-May	4.985	19-Jul	5.025	19-Sep	5.042	19-Nov	
20-Jan	4.974	20-Mar	4.982	20-May	4.985	20-Jul	5.022	20-Sep	5.042	20-Nov	
21-Jan	4.977	21-Mar	4.981	21-May	4.984	21-Jul	5.020	21-Sep	5.040	21-Nov	
22-Jan	4.978	22-Mar	4.983	22-May	4.983	22-Jul	5.007	22-Sep		22-Nov	
23-Jan	4.977	23-Mar	4.983	23-May	4.984	23-Jul	5.008	23-Sep		23-Nov	
24-Jan	4.977	24-Mar	4.983	24-May	4.985	24-Jul	5.000	24-Sep		24-Nov	
25-Jan	4.977	25-Mar	4.983	25-May	4.985	25-Jul	5.017	25-Sep		25-Nov	
26-Jan	4.976	26-Mar	4.982	26-May	4.984	26-Jul	5.008	26-Sep		26-Nov	
27-Jan	4.972	27-Mar	4.981	27-May	4.984	27-Jul	5.006	27-Sep		27-Nov	
28-Jan	4.970	28-Mar	4.980	28-May	4.983	28-Jul	4.997	28-Sep		28-Nov	
29-Jan	4.970	29-Mar	4.982	29-May	4.983	29-Jul	4.992	29-Sep		29-Nov	
30-Jan	4.970	30-Mar	4.983	30-May	4.983	30-Jul	4.984	30-Sep		30-Nov	
31-Jan	4.975	31-Mar	4.984	31-May	4.983	31-Jul	4.983	1-Oct		1-Dec	
1-Feb	4.977	1-Apr	4.985	1-Jun	4.983	1-Aug	4.991	2-Oct		2-Dec	
2-Feb	4.976	2-Apr	4.984	2-Jun	4.984	2-Aug	4.992	3-Oct		3-Dec	
3-Feb	4.976	3-Apr	4.985	3-Jun	4.985	3-Aug	4.986	4-Oct		4-Dec	
4-Feb	4.973	4-Apr	4.985	4-Jun	4.986	4-Aug	4.980	5-Oct		5-Dec	
5-Feb	4.972	5-Apr	4.985	5-Jun	4.986	5-Aug	4.976	6-Oct		6-Dec	
6-Feb	4.972	6-Apr	4.983	6-Jun	4.988	6-Aug	4.978	7-Oct		7-Dec	
7-Feb	4.971	7-Apr	4.984	7-Jun	4.993	7-Aug	4.995	8-Oct		8-Dec	
8-Feb	4.970	8-Apr	4.985	8-Jun	5.008	8-Aug	*5.026*	9-Oct		9-Dec	
9-Feb	4.970	9-Apr	4.985	9-Jun	5.031	9-Aug	*5.027*	10-Oct		10-Dec	
10-Feb	4.972	10-Apr	4.983	10-Jun	5.049	10-Aug	*5.023*	11-Oct		11-Dec	
11-Feb	4.976	11-Apr	4.983	11-Jun	5.053	11-Aug	*5.022*	12-Oct		12-Dec	
12-Feb	4.976	12-Apr	4.984	12-Jun	5.052	12-Aug	*5.020*	13-Oct		13-Dec	
13-Feb	4.978	13-Apr	4.986	13-Jun	5.050	13-Aug	*5.019*	14-Oct		14-Dec	
14-Feb	4.977	14-Apr	4.983	14-Jun	5.053	14-Aug	*5.020*	15-Oct		15-Dec	
15-Feb	4.976	15-Apr	4.985	15-Jun	5.057	15-Aug	*5.019*	16-Oct		16-Dec	
16-Feb	4.977	16-Apr	4.987	16-Jun	5.062	16-Aug	*5.019*	17-Oct		17-Dec	
17-Feb	4.978	17-Apr	4.988	17-Jun	5.065	17-Aug	*5.028*	18-Oct		18-Dec	
18-Feb	4.978	18-Apr	4.990	18-Jun	5.069	18-Aug	*5.026*	19-Oct		19-Dec	
19-Feb	4.979	19-Apr	4.990	19-Jun	5.076	19-Aug	*5.025*	20-Oct		20-Dec	
20-Feb	4.980	20-Apr	4.991	20-Jun	5.082	20-Aug	*5.023*	21-Oct		21-Dec	
21-Feb	4.981	21-Apr	4.992	21-Jun	5.084	21-Aug	*5.019*	22-Oct		22-Dec	
22-Feb	4.981	22-Apr	4.991	22-Jun	5.083	22-Aug	*5.018*	23-Oct		23-Dec	
23-Feb	4.981	23-Apr	4.991	23-Jun	5.079	23-Aug	*5.016*	24-Oct		24-Dec	
24-Feb	4.981	24-Apr	4.992	24-Jun	5.075	24-Aug	*5.013*	25-Oct		25-Dec	
25-Feb	4.981	25-Apr	4.990	25-Jun	5.079	25-Aug	*5.011*	26-Oct		26-Dec	
26-Feb	4.980	26-Apr	4.990	26-Jun	5.078	26-Aug	*5.008*	27-Oct		27-Dec	
27-Feb	4.980	27-Apr	4.991	27-Jun	5.076	27-Aug	*5.005*	28-Oct		28-Dec	
28-Feb	4.980	28-Apr	4.989	28-Jun	5.078	28-Aug	*5.001*	29-Oct		29-Dec	
		29-Apr	4.989	29-Jun	5.080	29-Aug	*5.000*	30-Oct		30-Dec	
		30-Apr	4.989	30-Jun	5.081	30-Aug	*5.000*	31-Oct		31-Dec	
						31-Aug	*4.999*				

Note: Estimated values are italicized

Summary of Daily Mean Water Level (m) at Roberts Lake

Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)
1-Jan		1-Mar		1-May		1-Jul	99.29	1-Sep	*98.91*	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	99.29	2-Sep	*98.91*	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	99.28	3-Sep	*98.91*	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	99.27	4-Sep	*98.88*	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	99.26	5-Sep	*98.88*	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	99.24	6-Sep	*98.88*	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	99.23	7-Sep	*98.88*	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	99.22	8-Sep	*98.88*	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	99.21	9-Sep	*98.91*	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	99.20	10-Sep	*98.92*	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	99.19	11-Sep	*98.92*	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	99.19	12-Sep	*98.94*	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	99.18	13-Sep	*98.96*	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	99.18	14-Sep	*98.95*	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	99.17	15-Sep	*98.96*	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	99.16	16-Sep	*98.98*	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	99.16	17-Sep	*98.98*	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	99.16	18-Sep	*98.98*	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	99.16	19-Sep	*98.98*	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	99.15	20-Sep	*98.99*	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	99.15	21-Sep		21-Nov	
22-Jan		22-Mar		22-May		22-Jul	99.15	22-Sep		22-Nov	
23-Jan		23-Mar		23-May		23-Jul	99.14	23-Sep		23-Nov	
24-Jan		24-Mar		24-May		24-Jul	99.14	24-Sep		24-Nov	
25-Jan		25-Mar		25-May		25-Jul	99.14	25-Sep		25-Nov	
26-Jan		26-Mar		26-May		26-Jul	99.14	26-Sep		26-Nov	
27-Jan		27-Mar		27-May		27-Jul	99.13	27-Sep		27-Nov	
28-Jan		28-Mar		28-May		28-Jul	99.13	28-Sep		28-Nov	
29-Jan		29-Mar		29-May		29-Jul	99.12	29-Sep		29-Nov	
30-Jan		30-Mar		30-May		30-Jul	*99.12*	30-Sep		30-Nov	
31-Jan		31-Mar		31-May		31-Jul	*99.12*	1-Oct		1-Dec	
1-Feb		1-Apr		1-Jun		1-Aug	*99.12*	2-Oct		2-Dec	
2-Feb		2-Apr		2-Jun		2-Aug	*99.12*	3-Oct		3-Dec	
3-Feb		3-Apr		3-Jun		3-Aug	*99.11*	4-Oct		4-Dec	
4-Feb		4-Apr		4-Jun		4-Aug	*99.11*	5-Oct		5-Dec	
5-Feb		5-Apr		5-Jun		5-Aug	*99.10*	6-Oct		6-Dec	
6-Feb		6-Apr		6-Jun		6-Aug	*99.10*	7-Oct		7-Dec	
7-Feb		7-Apr		7-Jun		7-Aug	*99.10*	8-Oct		8-Dec	
8-Feb		8-Apr		8-Jun		8-Aug	*99.10*	9-Oct		9-Dec	
9-Feb		9-Apr		9-Jun		9-Aug	*99.09*	10-Oct		10-Dec	
10-Feb		10-Apr		10-Jun		10-Aug	*99.09*	11-Oct		11-Dec	
11-Feb		11-Apr		11-Jun		11-Aug	*99.09*	12-Oct		12-Dec	
12-Feb		12-Apr		12-Jun		12-Aug	*99.08*	13-Oct		13-Dec	
13-Feb		13-Apr		13-Jun		13-Aug	*99.08*	14-Oct		14-Dec	
14-Feb		14-Apr		14-Jun		14-Aug	*99.08*	15-Oct		15-Dec	
15-Feb		15-Apr		15-Jun		15-Aug	*99.07*	16-Oct		16-Dec	
16-Feb		16-Apr		16-Jun		16-Aug	*99.07*	17-Oct		17-Dec	
17-Feb		17-Apr		17-Jun	99.26	17-Aug	*99.06*	18-Oct		18-Dec	
18-Feb		18-Apr		18-Jun	99.27	18-Aug	*99.06*	19-Oct		19-Dec	
19-Feb		19-Apr		19-Jun	99.27	19-Aug	*99.05*	20-Oct		20-Dec	
20-Feb		20-Apr		20-Jun	99.29	20-Aug	*99.04*	21-Oct		21-Dec	
21-Feb		21-Apr		21-Jun	99.30	21-Aug	*99.04*	22-Oct		22-Dec	
22-Feb		22-Apr		22-Jun	99.31	22-Aug	*99.03*	23-Oct		23-Dec	
23-Feb		23-Apr		23-Jun	99.31	23-Aug	*99.02*	24-Oct		24-Dec	
24-Feb		24-Apr		24-Jun	99.31	24-Aug	*99.01*	25-Oct		25-Dec	
25-Feb		25-Apr		25-Jun	99.31	25-Aug	*99.00*	26-Oct		26-Dec	
26-Feb		26-Apr		26-Jun	99.31	26-Aug	*98.99*	27-Oct		27-Dec	
27-Feb		27-Apr		27-Jun	99.30	27-Aug	*98.97*	28-Oct		28-Dec	
28-Feb		28-Apr		28-Jun	99.30	28-Aug	*98.97*	29-Oct		29-Dec	
		29-Apr		29-Jun	99.30	29-Aug	*98.96*	30-Oct		30-Dec	
		30-Apr		30-Jun	99.30	30-Aug	*98.94*	31-Oct		31-Dec	
						31-Aug	*98.88*				

Note: Estimated values are italicized

Summary of Daily Mean Water Level (m) at Windy Lake

Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)
1-Jan		1-Mar		1-May		1-Jul	98.57	1-Sep	98.49	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	98.57	2-Sep	98.49	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	98.57	3-Sep	98.49	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	98.56	4-Sep	98.49	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	98.56	5-Sep	98.49	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	98.56	6-Sep	98.49	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	98.56	7-Sep	98.49	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	98.55	8-Sep	98.49	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	98.55	9-Sep	98.49	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	98.55	10-Sep	98.49	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	98.55	11-Sep	98.49	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	98.55	12-Sep	98.49	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	98.55	13-Sep	98.49	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	98.54	14-Sep	98.49	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	98.54	15-Sep	98.49	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	98.55	16-Sep	98.49	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	98.55	17-Sep	98.50	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	98.55	18-Sep	98.49	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	98.54	19-Sep	98.49	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	98.54	20-Sep	98.49	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	98.54	21-Sep	98.49	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	98.54	22-Sep	98.49	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	98.54	23-Sep	98.48	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	98.54	24-Sep		24-Nov	
25-Jan		25-Mar		25-May		25-Jul	98.54	25-Sep		25-Nov	
26-Jan		26-Mar		26-May		26-Jul	98.53	26-Sep		26-Nov	
27-Jan		27-Mar		27-May		27-Jul	98.53	27-Sep		27-Nov	
28-Jan		28-Mar		28-May		28-Jul	98.53	28-Sep		28-Nov	
29-Jan		29-Mar		29-May		29-Jul	98.53	29-Sep		29-Nov	
30-Jan		30-Mar		30-May		30-Jul	98.52	30-Sep		30-Nov	
31-Jan		31-Mar		31-May		31-Jul	98.53	1-Oct		1-Dec	
1-Feb		1-Apr		1-Jun		1-Aug	98.53	2-Oct		2-Dec	
2-Feb		2-Apr		2-Jun		2-Aug	98.53	3-Oct		3-Dec	
3-Feb		3-Apr		3-Jun		3-Aug	98.53	4-Oct		4-Dec	
4-Feb		4-Apr		4-Jun		4-Aug	98.53	5-Oct		5-Dec	
5-Feb		5-Apr		5-Jun		5-Aug	98.53	6-Oct		6-Dec	
6-Feb		6-Apr		6-Jun		6-Aug	98.53	7-Oct		7-Dec	
7-Feb		7-Apr		7-Jun		7-Aug	98.53	8-Oct		8-Dec	
8-Feb		8-Apr		8-Jun		8-Aug	98.53	9-Oct		9-Dec	
9-Feb		9-Apr		9-Jun		9-Aug	98.53	10-Oct		10-Dec	
10-Feb		10-Apr		10-Jun		10-Aug	98.52	11-Oct		11-Dec	
11-Feb		11-Apr		11-Jun		11-Aug	98.52	12-Oct		12-Dec	
12-Feb		12-Apr		12-Jun		12-Aug	98.52	13-Oct		13-Dec	
13-Feb		13-Apr		13-Jun		13-Aug	98.52	14-Oct		14-Dec	
14-Feb		14-Apr		14-Jun		14-Aug	98.52	15-Oct		15-Dec	
15-Feb		15-Apr		15-Jun		15-Aug	98.52	16-Oct		16-Dec	
16-Feb		16-Apr		16-Jun	98.54	16-Aug	98.52	17-Oct		17-Dec	
17-Feb		17-Apr		17-Jun	98.54	17-Aug	98.52	18-Oct		18-Dec	
18-Feb		18-Apr		18-Jun	98.55	18-Aug	98.51	19-Oct		19-Dec	
19-Feb		19-Apr		19-Jun	98.55	19-Aug	98.51	20-Oct		20-Dec	
20-Feb		20-Apr		20-Jun	98.56	20-Aug	98.51	21-Oct		21-Dec	
21-Feb		21-Apr		21-Jun	98.56	21-Aug	98.51	22-Oct		22-Dec	
22-Feb		22-Apr		22-Jun	98.56	22-Aug	98.50	23-Oct		23-Dec	
23-Feb		23-Apr		23-Jun	98.56	23-Aug	98.50	24-Oct		24-Dec	
24-Feb		24-Apr		24-Jun	98.56	24-Aug	98.50	25-Oct		25-Dec	
25-Feb		25-Apr		25-Jun	98.56	25-Aug	98.50	26-Oct		26-Dec	
26-Feb		26-Apr		26-Jun	98.56	26-Aug	98.50	27-Oct		27-Dec	
27-Feb		27-Apr		27-Jun	98.56	27-Aug	98.50	28-Oct		28-Dec	
28-Feb		28-Apr		28-Jun	98.56	28-Aug	98.50	29-Oct		29-Dec	
		29-Apr		29-Jun	98.57	29-Aug	98.50	30-Oct		30-Dec	
		30-Apr		30-Jun	98.57	30-Aug	98.50	31-Oct		31-Dec	
						31-Aug	98.49				

Summary of Daily Mean Water Level (m) at Reference-A Lake

Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)
1-Jan		1-Mar		1-May		1-Jul	99.44	1-Sep	99.32	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	99.44	2-Sep	99.32	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	99.44	3-Sep	99.32	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	99.44	4-Sep	99.32	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	99.44	5-Sep	99.32	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	99.43	6-Sep	99.32	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	99.43	7-Sep	99.32	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	99.42	8-Sep	99.32	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	99.42	9-Sep	99.33	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	99.42	10-Sep	99.33	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	99.42	11-Sep	99.33	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	99.41	12-Sep	99.33	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	99.41	13-Sep	99.34	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	99.41	14-Sep	99.34	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	99.40	15-Sep	99.34	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	99.40	16-Sep	99.34	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	99.40	17-Sep	99.34	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	99.40	18-Sep	99.34	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	99.39	19-Sep	99.34	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	99.39	20-Sep	99.34	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	99.39	21-Sep	99.34	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	99.39	22-Sep		22-Nov	
23-Jan		23-Mar		23-May		23-Jul	99.39	23-Sep		23-Nov	
24-Jan		24-Mar		24-May		24-Jul	99.39	24-Sep		24-Nov	
25-Jan		25-Mar		25-May		25-Jul	99.39	25-Sep		25-Nov	
26-Jan		26-Mar		26-May		26-Jul	99.38	26-Sep		26-Nov	
27-Jan		27-Mar		27-May		27-Jul	99.38	27-Sep		27-Nov	
28-Jan		28-Mar		28-May		28-Jul	99.37	28-Sep		28-Nov	
29-Jan		29-Mar		29-May		29-Jul	99.37	29-Sep		29-Nov	
30-Jan		30-Mar		30-May		30-Jul	99.36	30-Sep		30-Nov	
31-Jan		31-Mar		31-May		31-Jul	99.37	1-Oct		1-Dec	
1-Feb		1-Apr		1-Jun		1-Aug	99.37	2-Oct		2-Dec	
2-Feb		2-Apr		2-Jun		2-Aug	99.37	3-Oct		3-Dec	
3-Feb		3-Apr		3-Jun		3-Aug	99.37	4-Oct		4-Dec	
4-Feb		4-Apr		4-Jun		4-Aug	99.37	5-Oct		5-Dec	
5-Feb		5-Apr		5-Jun		5-Aug	99.37	6-Oct		6-Dec	
6-Feb		6-Apr		6-Jun		6-Aug	99.37	7-Oct		7-Dec	
7-Feb		7-Apr		7-Jun		7-Aug	99.37	8-Oct		8-Dec	
8-Feb		8-Apr		8-Jun		8-Aug	99.37	9-Oct		9-Dec	
9-Feb		9-Apr		9-Jun		9-Aug	99.36	10-Oct		10-Dec	
10-Feb		10-Apr		10-Jun		10-Aug	99.36	11-Oct		11-Dec	
11-Feb		11-Apr		11-Jun		11-Aug	99.36	12-Oct		12-Dec	
12-Feb		12-Apr		12-Jun		12-Aug	99.35	13-Oct		13-Dec	
13-Feb		13-Apr		13-Jun		13-Aug	99.35	14-Oct		14-Dec	
14-Feb		14-Apr		14-Jun		14-Aug	99.35	15-Oct		15-Dec	
15-Feb		15-Apr		15-Jun		15-Aug	99.35	16-Oct		16-Dec	
16-Feb		16-Apr		16-Jun		16-Aug	99.35	17-Oct		17-Dec	
17-Feb		17-Apr		17-Jun		17-Aug	99.35	18-Oct		18-Dec	
18-Feb		18-Apr		18-Jun		18-Aug	99.34	19-Oct		19-Dec	
19-Feb		19-Apr		19-Jun	99.33	19-Aug	99.34	20-Oct		20-Dec	
20-Feb		20-Apr		20-Jun	99.36	20-Aug	99.34	21-Oct		21-Dec	
21-Feb		21-Apr		21-Jun	99.38	21-Aug	99.34	22-Oct		22-Dec	
22-Feb		22-Apr		22-Jun	99.39	22-Aug	99.33	23-Oct		23-Dec	
23-Feb		23-Apr		23-Jun	99.40	23-Aug	99.33	24-Oct		24-Dec	
24-Feb		24-Apr		24-Jun	99.41	24-Aug	99.33	25-Oct		25-Dec	
25-Feb		25-Apr		25-Jun	99.42	25-Aug	99.33	26-Oct		26-Dec	
26-Feb		26-Apr		26-Jun	99.42	26-Aug	99.32	27-Oct		27-Dec	
27-Feb		27-Apr		27-Jun	99.42	27-Aug	99.32	28-Oct		28-Dec	
28-Feb		28-Apr		28-Jun	99.43	28-Aug	99.32	29-Oct		29-Dec	
		29-Apr		29-Jun	99.44	29-Aug	99.32	30-Oct		30-Dec	
		30-Apr		30-Jun	99.44	30-Aug	99.32	31-Oct		31-Dec	
						31-Aug	99.31				

Summary of Daily Mean Water Level (m) at PO Lake

Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)
1-Jan		1-Mar		1-May		1-Jul	99.53	1-Sep	99.41	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	99.52	2-Sep	99.42	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	99.52	3-Sep	99.42	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	99.51	4-Sep	99.41	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	99.50	5-Sep	99.41	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	99.50	6-Sep	99.41	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	99.49	7-Sep	99.40	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	99.48	8-Sep	99.41	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	99.47	9-Sep	99.42	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	99.46	10-Sep	99.42	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	99.46	11-Sep	99.43	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	99.46	12-Sep	99.44	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	99.45	13-Sep	99.44	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	99.44	14-Sep	99.44	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	99.43	15-Sep	99.44	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	99.43	16-Sep	99.44	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	99.44	17-Sep	99.44	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	99.44	18-Sep	99.44	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	99.43	19-Sep	99.44	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	99.43	20-Sep	99.45	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	99.42	21-Sep	99.44	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	99.42	22-Sep		22-Nov	
23-Jan		23-Mar		23-May		23-Jul	99.41	23-Sep		23-Nov	
24-Jan		24-Mar		24-May		24-Jul	99.53	24-Sep		24-Nov	
25-Jan		25-Mar		25-May		25-Jul	99.52	25-Sep		25-Nov	
26-Jan		26-Mar		26-May		26-Jul	99.52	26-Sep		26-Nov	
27-Jan		27-Mar		27-May		27-Jul	99.51	27-Sep		27-Nov	
28-Jan		28-Mar		28-May		28-Jul	99.50	28-Sep		28-Nov	
29-Jan		29-Mar		29-May		29-Jul	99.50	29-Sep		29-Nov	
30-Jan		30-Mar		30-May		30-Jul	99.49	30-Sep		30-Nov	
31-Jan		31-Mar		31-May		31-Jul	99.48	1-Oct		1-Dec	
1-Feb		1-Apr		1-Jun		1-Aug	99.47	2-Oct		2-Dec	
2-Feb		2-Apr		2-Jun		2-Aug	99.46	3-Oct		3-Dec	
3-Feb		3-Apr		3-Jun		3-Aug	99.46	4-Oct		4-Dec	
4-Feb		4-Apr		4-Jun		4-Aug	99.46	5-Oct		5-Dec	
5-Feb		5-Apr		5-Jun		5-Aug	99.45	6-Oct		6-Dec	
6-Feb		6-Apr		6-Jun		6-Aug	99.44	7-Oct		7-Dec	
7-Feb		7-Apr		7-Jun		7-Aug	99.43	8-Oct		8-Dec	
8-Feb		8-Apr		8-Jun		8-Aug	99.43	9-Oct		9-Dec	
9-Feb		9-Apr		9-Jun		9-Aug	99.44	10-Oct		10-Dec	
10-Feb		10-Apr		10-Jun		10-Aug	99.44	11-Oct		11-Dec	
11-Feb		11-Apr		11-Jun		11-Aug	99.43	12-Oct		12-Dec	
12-Feb		12-Apr		12-Jun		12-Aug	99.43	13-Oct		13-Dec	
13-Feb		13-Apr		13-Jun		13-Aug	99.42	14-Oct		14-Dec	
14-Feb		14-Apr		14-Jun		14-Aug	99.42	15-Oct		15-Dec	
15-Feb		15-Apr		15-Jun		15-Aug	99.41	16-Oct		16-Dec	
16-Feb		16-Apr		16-Jun		16-Aug	99.43	17-Oct		17-Dec	
17-Feb		17-Apr		17-Jun		17-Aug	99.43	18-Oct		18-Dec	
18-Feb		18-Apr		18-Jun	99.57	18-Aug	99.43	19-Oct		19-Dec	
19-Feb		19-Apr		19-Jun	99.58	19-Aug	99.43	20-Oct		20-Dec	
20-Feb		20-Apr		20-Jun	99.58	20-Aug	99.42	21-Oct		21-Dec	
21-Feb		21-Apr		21-Jun	99.58	21-Aug	99.42	22-Oct		22-Dec	
22-Feb		22-Apr		22-Jun	99.57	22-Aug	99.42	23-Oct		23-Dec	
23-Feb		23-Apr		23-Jun	99.56	23-Aug	99.41	24-Oct		24-Dec	
24-Feb		24-Apr		24-Jun	99.55	24-Aug	99.40	25-Oct		25-Dec	
25-Feb		25-Apr		25-Jun	99.55	25-Aug	99.40	26-Oct		26-Dec	
26-Feb		26-Apr		26-Jun	99.55	26-Aug	99.39	27-Oct		27-Dec	
27-Feb		27-Apr		27-Jun	99.54	27-Aug	99.39	28-Oct		28-Dec	
28-Feb		28-Apr		28-Jun	99.54	28-Aug	99.39	29-Oct		29-Dec	
		29-Apr		29-Jun	99.54	29-Aug	99.38	30-Oct		30-Dec	
		30-Apr		30-Jun	99.54	30-Aug	99.38	31-Oct		31-Dec	
						31-Aug	99.38				

Summary of Daily Mean Water Level (m) at Patch Lake

Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)
1-Jan		1-Mar		1-May		1-Jul	99.14	1-Sep	99.01	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	99.14	2-Sep	99.00	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	99.13	3-Sep	99.00	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	99.13	4-Sep	99.00	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	99.13	5-Sep	98.99	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	99.13	6-Sep	98.99	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	99.12	7-Sep	98.99	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	99.12	8-Sep	98.99	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	99.12	9-Sep	99.00	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	99.11	10-Sep	98.99	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	99.12	11-Sep	99.00	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	99.11	12-Sep	99.00	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	99.11	13-Sep	99.00	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	99.10	14-Sep	99.01	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	99.10	15-Sep	99.00	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	99.10	16-Sep	99.00	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	99.11	17-Sep	99.00	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	99.10	18-Sep	99.01	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	99.10	19-Sep	99.00	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	99.10	20-Sep	99.00	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	99.09	21-Sep	99.00	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	99.09	22-Sep	99.00	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	99.09	23-Sep		23-Nov	
24-Jan		24-Mar		24-May		24-Jul	99.09	24-Sep		24-Nov	
25-Jan		25-Mar		25-May		25-Jul	99.09	25-Sep		25-Nov	
26-Jan		26-Mar		26-May		26-Jul	99.08	26-Sep		26-Nov	
27-Jan		27-Mar		27-May		27-Jul	99.08	27-Sep		27-Nov	
28-Jan		28-Mar		28-May		28-Jul	99.07	28-Sep		28-Nov	
29-Jan		29-Mar		29-May		29-Jul	99.06	29-Sep		29-Nov	
30-Jan		30-Mar		30-May		30-Jul	99.06	30-Sep		30-Nov	
31-Jan		31-Mar		31-May		31-Jul	99.06	1-Oct		1-Dec	
1-Feb		1-Apr		1-Jun		1-Aug	99.09	2-Oct		2-Dec	
2-Feb		2-Apr		2-Jun		2-Aug	99.09	3-Oct		3-Dec	
3-Feb		3-Apr		3-Jun		3-Aug	99.08	4-Oct		4-Dec	
4-Feb		4-Apr		4-Jun		4-Aug	99.08	5-Oct		5-Dec	
5-Feb		5-Apr		5-Jun		5-Aug	99.07	6-Oct		6-Dec	
6-Feb		6-Apr		6-Jun		6-Aug	99.06	7-Oct		7-Dec	
7-Feb		7-Apr		7-Jun		7-Aug	99.06	8-Oct		8-Dec	
8-Feb		8-Apr		8-Jun		8-Aug	99.06	9-Oct		9-Dec	
9-Feb		9-Apr		9-Jun		9-Aug	99.06	10-Oct		10-Dec	
10-Feb		10-Apr		10-Jun		10-Aug	99.05	11-Oct		11-Dec	
11-Feb		11-Apr		11-Jun		11-Aug	99.05	12-Oct		12-Dec	
12-Feb		12-Apr		12-Jun		12-Aug	99.05	13-Oct		13-Dec	
13-Feb		13-Apr		13-Jun		13-Aug	99.05	14-Oct		14-Dec	
14-Feb		14-Apr		14-Jun		14-Aug	99.04	15-Oct		15-Dec	
15-Feb		15-Apr		15-Jun		15-Aug	99.04	16-Oct		16-Dec	
16-Feb		16-Apr		16-Jun		16-Aug	99.04	17-Oct		17-Dec	
17-Feb		17-Apr		17-Jun		17-Aug	99.04	18-Oct		18-Dec	
18-Feb		18-Apr		18-Jun		18-Aug	99.04	19-Oct		19-Dec	
19-Feb		19-Apr		19-Jun	99.09	19-Aug	99.04	20-Oct		20-Dec	
20-Feb		20-Apr		20-Jun	99.10	20-Aug	99.03	21-Oct		21-Dec	
21-Feb		21-Apr		21-Jun	99.10	21-Aug	99.03	22-Oct		22-Dec	
22-Feb		22-Apr		22-Jun	99.11	22-Aug	99.02	23-Oct		23-Dec	
23-Feb		23-Apr		23-Jun	99.11	23-Aug	99.02	24-Oct		24-Dec	
24-Feb		24-Apr		24-Jun	99.11	24-Aug	99.02	25-Oct		25-Dec	
25-Feb		25-Apr		25-Jun	99.12	25-Aug	99.02	26-Oct		26-Dec	
26-Feb		26-Apr		26-Jun	99.12	26-Aug	99.01	27-Oct		27-Dec	
27-Feb		27-Apr		27-Jun	99.12	27-Aug	99.01	28-Oct		28-Dec	
28-Feb		28-Apr		28-Jun	99.13	28-Aug	99.01	29-Oct		29-Dec	
		29-Apr		29-Jun	99.13	29-Aug	99.01	30-Oct		30-Dec	
		30-Apr		30-Jun	99.14	30-Aug	99.01	31-Oct		31-Dec	
						31-Aug	99.02				

Summary of Daily Mean Water Level (m) at Glenn Lake

Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)	Date	Water Level (m)
1-Jan		1-Mar		1-May		1-Jul	98.65	1-Sep	98.51	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	98.64	2-Sep	98.51	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	98.64	3-Sep	98.51	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	98.63	4-Sep	98.51	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	98.62	5-Sep	98.51	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	98.62	6-Sep	98.51	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	98.61	7-Sep	98.50	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	98.60	8-Sep	98.51	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	98.60	9-Sep	98.51	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	98.59	10-Sep	98.51	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	98.59	11-Sep	98.52	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	98.59	12-Sep	98.52	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	98.59	13-Sep	98.53	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	98.58	14-Sep	98.53	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	98.58	15-Sep	98.53	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	98.58	16-Sep	98.53	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	98.58	17-Sep	98.53	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	98.58	18-Sep	98.54	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	98.58	19-Sep	98.50	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	98.57	20-Sep		20-Nov	
21-Jan		21-Mar		21-May		21-Jul	98.57	21-Sep		21-Nov	
22-Jan		22-Mar		22-May		22-Jul	98.56	22-Sep		22-Nov	
23-Jan		23-Mar		23-May		23-Jul	98.56	23-Sep		23-Nov	
24-Jan		24-Mar		24-May		24-Jul	98.56	24-Sep		24-Nov	
25-Jan		25-Mar		25-May		25-Jul	98.56	25-Sep		25-Nov	
26-Jan		26-Mar		26-May		26-Jul	98.56	26-Sep		26-Nov	
27-Jan		27-Mar		27-May		27-Jul	98.55	27-Sep		27-Nov	
28-Jan		28-Mar		28-May		28-Jul	98.55	28-Sep		28-Nov	
29-Jan		29-Mar		29-May		29-Jul	98.54	29-Sep		29-Nov	
30-Jan		30-Mar		30-May		30-Jul	98.54	30-Sep		30-Nov	
31-Jan		31-Mar		31-May		31-Jul	98.54	1-Oct		1-Dec	
1-Feb		1-Apr		1-Jun		1-Aug	98.54	2-Oct		2-Dec	
2-Feb		2-Apr		2-Jun		2-Aug	98.54	3-Oct		3-Dec	
3-Feb		3-Apr		3-Jun		3-Aug	98.54	4-Oct		4-Dec	
4-Feb		4-Apr		4-Jun		4-Aug	98.54	5-Oct		5-Dec	
5-Feb		5-Apr		5-Jun		5-Aug	98.54	6-Oct		6-Dec	
6-Feb		6-Apr		6-Jun		6-Aug	98.54	7-Oct		7-Dec	
7-Feb		7-Apr		7-Jun		7-Aug	98.54	8-Oct		8-Dec	
8-Feb		8-Apr		8-Jun		8-Aug	98.54	9-Oct		9-Dec	
9-Feb		9-Apr		9-Jun		9-Aug	98.55	10-Oct		10-Dec	
10-Feb		10-Apr		10-Jun		10-Aug	98.54	11-Oct		11-Dec	
11-Feb		11-Apr		11-Jun		11-Aug	98.54	12-Oct		12-Dec	
12-Feb		12-Apr		12-Jun		12-Aug	98.54	13-Oct		13-Dec	
13-Feb		13-Apr		13-Jun		13-Aug	98.54	14-Oct		14-Dec	
14-Feb		14-Apr		14-Jun		14-Aug	98.54	15-Oct		15-Dec	
15-Feb		15-Apr		15-Jun		15-Aug	98.54	16-Oct		16-Dec	
16-Feb		16-Apr		16-Jun		16-Aug	98.53	17-Oct		17-Dec	
17-Feb		17-Apr		17-Jun	98.69	17-Aug	98.54	18-Oct		18-Dec	
18-Feb		18-Apr		18-Jun	98.71	18-Aug	98.54	19-Oct		19-Dec	
19-Feb		19-Apr		19-Jun	98.72	19-Aug	98.54	20-Oct		20-Dec	
20-Feb		20-Apr		20-Jun	98.71	20-Aug	98.54	21-Oct		21-Dec	
21-Feb		21-Apr		21-Jun	98.71	21-Aug	98.53	22-Oct		22-Dec	
22-Feb		22-Apr		22-Jun	98.70	22-Aug	98.53	23-Oct		23-Dec	
23-Feb		23-Apr		23-Jun	98.68	23-Aug	98.53	24-Oct		24-Dec	
24-Feb		24-Apr		24-Jun	98.67	24-Aug	98.53	25-Oct		25-Dec	
25-Feb		25-Apr		25-Jun	98.67	25-Aug	98.52	26-Oct		26-Dec	
26-Feb		26-Apr		26-Jun	98.66	26-Aug	98.52	27-Oct		27-Dec	
27-Feb		27-Apr		27-Jun	98.66	27-Aug	98.52	28-Oct		28-Dec	
28-Feb		28-Apr		28-Jun	98.65	28-Aug	98.51	29-Oct		29-Dec	
		29-Apr		29-Jun	98.65	29-Aug	98.51	30-Oct		30-Dec	
		30-Apr		30-Jun	98.65	30-Aug	98.51	31-Oct		31-Dec	
						31-Aug	98.51				

Appendix 5
Hydrographs

Rescan™
Engineers and Scientists

Summary of Daily Mean Flow (m^3/s) at Doris-Hydro

Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)
1-Jan		1-Mar		1-May		1-Jul	2.23	1-Sep	0.432	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	2.18	2-Sep	0.451	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	2.11	3-Sep	0.450	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	2.02	4-Sep	0.448	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	1.93	5-Sep	0.430	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	1.83	6-Sep	0.431	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	1.73	7-Sep	0.431	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	1.65	8-Sep	0.428	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	1.57	9-Sep	0.430	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	1.49	10-Sep	0.445	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	1.45	11-Sep	0.457	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	1.38	12-Sep	0.458	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	1.32	13-Sep	0.470	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	1.26	14-Sep	0.481	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	1.20	15-Sep	0.48	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	1.18	16-Sep	0.49	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	1.19	17-Sep	0.50	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	1.12	18-Sep	0.499	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	1.07	19-Sep	0.505	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	1.03	20-Sep	0.503	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	0.98	21-Sep	0.503	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	0.94	22-Sep	0.503	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	0.90	23-Sep	0.503	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	0.86	24-Sep	0.503	24-Nov	
25-Jan		25-Mar		25-May		25-Jul	0.85	25-Sep	0.503	25-Nov	
26-Jan		26-Mar		26-May		26-Jul	0.84	26-Sep	0.489	26-Nov	
27-Jan		27-Mar		27-May		27-Jul	0.81	27-Sep	0.475	27-Nov	
28-Jan		28-Mar		28-May		28-Jul	0.79	28-Sep	0.461	28-Nov	
29-Jan		29-Mar		29-May		29-Jul	0.76	29-Sep	0.45	29-Nov	
30-Jan		30-Mar		30-May		30-Jul	0.74	30-Sep	0.43	30-Nov	
31-Jan		31-Mar		31-May		31-Jul	0.72	1-Oct	0.42	1-Dec	
1-Feb		1-Apr		1-Jun	0	1-Aug	0.71	2-Oct	0.41	2-Dec	
2-Feb		2-Apr		2-Jun	0	2-Aug	0.710	3-Oct	0.39	3-Dec	
3-Feb		3-Apr		3-Jun	0	3-Aug	0.71	4-Oct	0.38	4-Dec	
4-Feb		4-Apr		4-Jun	0	4-Aug	0.69	5-Oct	0.36	5-Dec	
5-Feb		5-Apr		5-Jun	0	5-Aug	0.68	6-Oct	0.34	6-Dec	
6-Feb		6-Apr		6-Jun	0	6-Aug	0.67	7-Oct	0.336	7-Dec	
7-Feb		7-Apr		7-Jun	0	7-Aug	0.67	8-Oct	0.322	8-Dec	
8-Feb		8-Apr		8-Jun	0	8-Aug	0.67	9-Oct	0.308	9-Dec	
9-Feb		9-Apr		9-Jun	0	9-Aug	0.66	10-Oct	0.294	10-Dec	
10-Feb		10-Apr		10-Jun	0	10-Aug	0.65	11-Oct	0.280	11-Dec	
11-Feb		11-Apr		11-Jun	0.002	11-Aug	0.640	12-Oct	0.266	12-Dec	
12-Feb		12-Apr		12-Jun	0.015	12-Aug	0.63	13-Oct	0.252	13-Dec	
13-Feb		13-Apr		13-Jun	0.03	13-Aug	0.62	14-Oct	0.238	14-Dec	
14-Feb		14-Apr		14-Jun	0.059	14-Aug	0.62	15-Oct	0.224	15-Dec	
15-Feb		15-Apr		15-Jun	0.117	15-Aug	0.62	16-Oct	0.210	16-Dec	
16-Feb		16-Apr		16-Jun	0.231	16-Aug	0.604	17-Oct	0.196	17-Dec	
17-Feb		17-Apr		17-Jun	0.455	17-Aug	0.604	18-Oct	0.182	18-Dec	
18-Feb		18-Apr		18-Jun	1.77	18-Aug	0.592	19-Oct	0.167	19-Dec	
19-Feb		19-Apr		19-Jun	1.71	19-Aug	0.586	20-Oct	0.154	20-Dec	
20-Feb		20-Apr		20-Jun	1.87	20-Aug	0.577	21-Oct	0.139	21-Dec	
21-Feb		21-Apr		21-Jun	2.04	21-Aug	0.567	22-Oct	0.126	22-Dec	
22-Feb		22-Apr		22-Jun	2.17	22-Aug	0.559	23-Oct	0.111	23-Dec	
23-Feb		23-Apr		23-Jun	2.22	23-Aug	0.55	24-Oct	0.090	24-Dec	
24-Feb		24-Apr		24-Jun	2.24	24-Aug	0.54	25-Oct	0.084	25-Dec	
25-Feb		25-Apr		25-Jun	2.28	25-Aug	0.53	26-Oct	0.069	26-Dec	
26-Feb		26-Apr		26-Jun	2.29	26-Aug	0.52	27-Oct	0.056	27-Dec	
27-Feb		27-Apr		27-Jun	2.26	27-Aug	0.50	28-Oct	0.042	28-Dec	
28-Feb		28-Apr		28-Jun	2.26	28-Aug	0.49	29-Oct	*0.028*	29-Dec	
29-Feb		29-Apr		29-Jun	2.28	29-Aug	0.49	30-Oct	*0.014*	30-Dec	
		30-Apr		30-Jun	2.26	30-Aug	0.48	31-Oct	*0.000*	31-Dec	
						31-Aug	0.468				

Note: Estimated values are italicized

Summary of Daily Mean Flow (m^3/s) at Glenn-Hydro

Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)
1-Jan		1-Mar		1-May		1-Jul	0.73	1-Sep	0.223	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	0.71	2-Sep	0.241	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	0.68	3-Sep	0.246	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	0.65	4-Sep	0.247	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	0.62	5-Sep	0.236	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	0.59	6-Sep	0.238	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	0.56	7-Sep	0.236	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	0.54	8-Sep	0.235	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	0.52	9-Sep	0.244	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	0.50	10-Sep	0.251	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	0.50	11-Sep	0.255	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	0.49	12-Sep	0.265	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	0.48	13-Sep	0.28	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	0.46	14-Sep	0.293	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	0.44	15-Sep	0.294	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	0.45	16-Sep	0.299	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	0.46	17-Sep	0.305	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	0.45	18-Sep	0.309	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	0.43	19-Sep	0.314	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	0.42	20-Sep	0.317	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	0.41	21-Sep	0.317	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	0.39	22-Sep	0.318	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	0.38	23-Sep	0.302	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	0.37	24-Sep	0.294	24-Nov	
25-Jan		25-Mar		25-May		25-Jul	0.38	25-Sep	0.286	25-Nov	
26-Jan		26-Mar		26-May		26-Jul	0.38	26-Sep	0.278	26-Nov	
27-Jan		27-Mar		27-May		27-Jul	0.36	27-Sep	0.27	27-Nov	
28-Jan		28-Mar		28-May		28-Jul	0.35	28-Sep	0.262	28-Nov	
29-Jan		29-Mar		29-May		29-Jul	0.33	29-Sep	0.254	29-Nov	
30-Jan		30-Mar		30-May		30-Jul	0.32	30-Sep	0.246	30-Nov	
31-Jan		31-Mar		31-May		31-Jul	0.31	1-Oct	0.239	1-Dec	
1-Feb		1-Apr		1-Jun	0.00	1-Aug	0.32	2-Oct	0.231	2-Dec	
2-Feb		2-Apr		2-Jun	0.00	2-Aug	0.33	3-Oct	0.223	3-Dec	
3-Feb		3-Apr		3-Jun	0.00	3-Aug	0.34	4-Oct	0.215	4-Dec	
4-Feb		4-Apr		4-Jun	0.00	4-Aug	0.33	5-Oct	0.207	5-Dec	
5-Feb		5-Apr		5-Jun	0.00	5-Aug	0.33	6-Oct	0.199	6-Dec	
6-Feb		6-Apr		6-Jun	0.00	6-Aug	0.32	7-Oct	0.192	7-Dec	
7-Feb		7-Apr		7-Jun	0.00	7-Aug	0.33	8-Oct	0.184	8-Dec	
8-Feb		8-Apr		8-Jun	0.00	8-Aug	0.34	9-Oct	0.176	9-Dec	
9-Feb		9-Apr		9-Jun	0.00	9-Aug	0.34	10-Oct	0.17	10-Dec	
10-Feb		10-Apr		10-Jun	0.00	10-Aug	0.33	11-Oct	0.16	11-Dec	
11-Feb		11-Apr		11-Jun	0.01	11-Aug	0.33	12-Oct	0.152	12-Dec	
12-Feb		12-Apr		12-Jun	0.02	12-Aug	0.33	13-Oct	0.144	13-Dec	
13-Feb		13-Apr		13-Jun	0.03	13-Aug	0.32	14-Oct	0.136	14-Dec	
14-Feb		14-Apr		14-Jun	0.08	14-Aug	0.32	15-Oct	0.128	15-Dec	
15-Feb		15-Apr		15-Jun	0.18	15-Aug	0.32	16-Oct	0.121	16-Dec	
16-Feb		16-Apr		16-Jun	0.90	16-Aug	0.31	17-Oct	0.113	17-Dec	
17-Feb		17-Apr		17-Jun	0.97	17-Aug	0.32	18-Oct	0.105	18-Dec	
18-Feb		18-Apr		18-Jun	1.09	18-Aug	0.32	19-Oct	0.096	19-Dec	
19-Feb		19-Apr		19-Jun	1.12	19-Aug	0.32	20-Oct	0.089	20-Dec	
20-Feb		20-Apr		20-Jun	1.11	20-Aug	0.31	21-Oct	0.081	21-Dec	
21-Feb		21-Apr		21-Jun	1.06	21-Aug	0.31	22-Oct	0.073	22-Dec	
22-Feb		22-Apr		22-Jun	0.99	22-Aug	0.30	23-Oct	0.07	23-Dec	
23-Feb		23-Apr		23-Jun	0.92	23-Aug	0.30	24-Oct	0.057	24-Dec	
24-Feb		24-Apr		24-Jun	0.85	24-Aug	0.29	25-Oct	0.049	25-Dec	
25-Feb		25-Apr		25-Jun	0.83	25-Aug	0.28	26-Oct	0.042	26-Dec	
26-Feb		26-Apr		26-Jun	0.81	26-Aug	0.27	27-Oct	0.034	27-Dec	
27-Feb		27-Apr		27-Jun	0.77	27-Aug	0.27	28-Oct	0.026	28-Dec	
28-Feb		28-Apr		28-Jun	0.76	28-Aug	0.26	29-Oct	0.018	29-Dec	
29-Feb		29-Apr		29-Jun	0.76	29-Aug	0.26	30-Oct	0.009	30-Dec	
		30-Apr		30-Jun	0.75	30-Aug	0.25	31-Oct	0.002	31-Dec	
						31-Aug	0.25				

Note: Estimated values are italicized

Summary of Daily Mean Flow (m^3/s) at TGN-H1

Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)
1-Jan		1-Mar		1-May		1-Jul	121.0	1-Sep	18.60	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	116.0	2-Sep	17.82	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	110.0	3-Sep	16.50	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	104.0	4-Sep	18.40	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	96.9	5-Sep	18.60	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	89.6	6-Sep	18.20	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	84.0	7-Sep	16.70	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	78.5	8-Sep	17.20	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	71.00	9-Sep	17.20	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	65.50	10-Sep	16.80	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	62.10	11-Sep	16.20	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	56.40	12-Sep	16.80	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	51.40	13-Sep	17.80	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	49.50	14-Sep	17.10	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	46.80	15-Sep	17.80	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	43.90	16-Sep	17.90	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	40.90	17-Sep	17.20	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	39.80	18-Sep	17.60	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	38.20	19-Sep	18.30	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	36.90	20-Sep	17.80	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	35.50	21-Sep	17.60	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	34.00	22-Sep	17.70	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	32.90	23-Sep	18.00	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	31.90	24-Sep	17.90	24-Nov	
25-Jan		25-Mar		25-May		25-Jul	30.50	25-Sep	17.90	25-Nov	
26-Jan		26-Mar		26-May		26-Jul	29.60	26-Sep	17.90	26-Nov	
27-Jan		27-Mar		27-May		27-Jul	28.10	27-Sep	17.30	27-Nov	
28-Jan		28-Mar		28-May		28-Jul	26.90	28-Sep	16.90	28-Nov	
29-Jan		29-Mar		29-May		29-Jul	24.80	29-Sep	16.4	29-Nov	
30-Jan		30-Mar		30-May		30-Jul	23.20	30-Sep	15.80	30-Nov	
31-Jan		31-Mar		31-May		31-Jul	23.00	1-Oct	15.30	1-Dec	
1-Feb		1-Apr		1-Jun	0.0	1-Aug	22.90	2-Oct	14.80	2-Dec	
2-Feb		2-Apr		2-Jun	0.0	2-Aug	21.60	3-Oct	14.30	3-Dec	
3-Feb		3-Apr		3-Jun	0.0	3-Aug	21.90	4-Oct	13.80	4-Dec	
4-Feb		4-Apr		4-Jun	0.0	4-Aug	21.60	5-Oct	13.30	5-Dec	
5-Feb		5-Apr		5-Jun	0.0	5-Aug	20.80	6-Oct	12.80	6-Dec	
6-Feb		6-Apr		6-Jun	0.0	6-Aug	20.30	7-Oct	12.20	7-Dec	
7-Feb		7-Apr		7-Jun	0.0	7-Aug	20.00	8-Oct	11.80	8-Dec	
8-Feb		8-Apr		8-Jun	0.0	8-Aug	20.70	9-Oct	11.30	9-Dec	
9-Feb		9-Apr		9-Jun	0.0	9-Aug	20.60	10-Oct	10.70	10-Dec	
10-Feb		10-Apr		10-Jun	0.0	10-Aug	21.00	11-Oct	10.20	11-Dec	
11-Feb		11-Apr		11-Jun	0.0	11-Aug	20.70	12-Oct	9.71	12-Dec	
12-Feb		12-Apr		12-Jun	0.0	12-Aug	19.60	13-Oct	9.20	13-Dec	
13-Feb		13-Apr		13-Jun	0.0	13-Aug	20.00	14-Oct	8.69	14-Dec	
14-Feb		14-Apr		14-Jun	0.1	14-Aug	19.00	15-Oct	8.18	15-Dec	
15-Feb		15-Apr		15-Jun	0.4	15-Aug	18.80	16-Oct	7.67	16-Dec	
16-Feb		16-Apr		16-Jun	1.1	16-Aug	18.70	17-Oct	7.16	17-Dec	
17-Feb		17-Apr		17-Jun	3.2	17-Aug	18.20	18-Oct	6.65	18-Dec	
18-Feb		18-Apr		18-Jun	9.3	18-Aug	18.00	19-Oct	6.14	19-Dec	
19-Feb		19-Apr		19-Jun	80.3	19-Aug	18.00	20-Oct	5.62	20-Dec	
20-Feb		20-Apr		20-Jun	102.0	20-Aug	18.20	21-Oct	5.11	21-Dec	
21-Feb		21-Apr		21-Jun	102.0	21-Aug	19.20	22-Oct	4.60	22-Dec	
22-Feb		22-Apr		22-Jun	96.4	22-Aug	19.20	23-Oct	4.09	23-Dec	
23-Feb		23-Apr		23-Jun	109.5	23-Aug	19.30	24-Oct	3.58	24-Dec	
24-Feb		24-Apr		24-Jun	126.4	24-Aug	19.30	25-Oct	3.07	25-Dec	
25-Feb		25-Apr		25-Jun	132.3	25-Aug	19.10	26-Oct	2.56	26-Dec	
26-Feb		26-Apr		26-Jun	132.2	26-Aug	18.30	27-Oct	2.05	27-Dec	
27-Feb		27-Apr		27-Jun	130.1	27-Aug	17.80	28-Oct	1.53	28-Dec	
28-Feb		28-Apr		28-Jun	129.9	28-Aug	17.60	29-Oct	1.02	29-Dec	
29-Feb		29-Apr		29-Jun	128.2	29-Aug	17.20	30-Oct	0.51	30-Dec	
		30-Apr		30-Jun	125.3	30-Aug	16.80	31-Oct	0.00	31-Dec	
						31-Aug	16.70				

Note: Estimated values are italicized

Summary of Daily Mean Flow (m^3/s) at Ogama - Hydro

Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)
1-Jan		1-Mar		1-May		1-Jul	1.44	1-Sep	0.25	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	1.4	2-Sep	0.28	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	1.31	3-Sep	0.29	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	1.24	4-Sep	0.30	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	1.18	5-Sep	0.28	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	1.12	6-Sep	0.29	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	1.06	7-Sep	0.30	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	1.01	8-Sep	0.30	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	0.97	9-Sep	0.30	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	0.92	10-Sep	0.31	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	0.89	11-Sep	0.33	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	0.86	12-Sep	0.33	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	0.83	13-Sep	0.33	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	0.81	14-Sep	0.34	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	0.77	15-Sep	0.34	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	0.74	16-Sep	0.35	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	0.73	17-Sep	0.35	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	0.71	18-Sep	0.36	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	0.69	19-Sep	0.36	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	0.66	20-Sep	0.36	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	0.64	21-Sep	0.36	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	0.63	22-Sep	0.36	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	0.61	23-Sep	0.358	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	0.59	24-Sep	0.358	24-Nov	
25-Jan		25-Mar		25-May		25-Jul	0.57	25-Sep	0.358	25-Nov	
26-Jan		26-Mar		26-May		26-Jul	0.54	26-Sep	0.348	26-Nov	
27-Jan		27-Mar		27-May		27-Jul	0.52	27-Sep	0.338	27-Nov	
28-Jan		28-Mar		28-May		28-Jul	0.49	28-Sep	0.33	28-Nov	
29-Jan		29-Mar		29-May		29-Jul	0.46	29-Sep	0.32	29-Nov	
30-Jan		30-Mar		30-May		30-Jul	0.45	30-Sep	0.31	30-Nov	
31-Jan		31-Mar		31-May		31-Jul	0.43	1-Oct	0.30	1-Dec	
1-Feb		1-Apr		1-Jun	0.00	1-Aug	0.43	2-Oct	0.29	2-Dec	
2-Feb		2-Apr		2-Jun	0.00	2-Aug	0.44	3-Oct	0.28	3-Dec	
3-Feb		3-Apr		3-Jun	0.00	3-Aug	0.44	4-Oct	0.27	4-Dec	
4-Feb		4-Apr		4-Jun	0.00	4-Aug	0.43	5-Oct	0.25	5-Dec	
5-Feb		5-Apr		5-Jun	0.00	5-Aug	0.43	6-Oct	0.25	6-Dec	
6-Feb		6-Apr		6-Jun	0.00	6-Aug	0.43	7-Oct	0.24	7-Dec	
7-Feb		7-Apr		7-Jun	0.00	7-Aug	0.42	8-Oct	0.23	8-Dec	
8-Feb		8-Apr		8-Jun	0.00	8-Aug	0.43	9-Oct	0.22	9-Dec	
9-Feb		9-Apr		9-Jun	0.01	9-Aug	0.44	10-Oct	0.21	10-Dec	
10-Feb		10-Apr		10-Jun	0.05	10-Aug	0.44	11-Oct	0.20	11-Dec	
11-Feb		11-Apr		11-Jun	0.90	11-Aug	0.44	12-Oct	0.19	12-Dec	
12-Feb		12-Apr		12-Jun	1.08	12-Aug	0.44	13-Oct	0.18	13-Dec	
13-Feb		13-Apr		13-Jun	1.30	13-Aug	0.43	14-Oct	0.17	14-Dec	
14-Feb		14-Apr		14-Jun	1.88	14-Aug	0.43	15-Oct	0.16	15-Dec	
15-Feb		15-Apr		15-Jun	1.90	15-Aug	0.43	16-Oct	0.15	16-Dec	
16-Feb		16-Apr		16-Jun	1.92	16-Aug	0.42	17-Oct	0.14	17-Dec	
17-Feb		17-Apr		17-Jun	1.94	17-Aug	0.41	18-Oct	0.13	18-Dec	
18-Feb		18-Apr		18-Jun	1.99	18-Aug	0.40	19-Oct	0.12	19-Dec	
19-Feb		19-Apr		19-Jun	2.01	19-Aug	0.39	20-Oct	0.11	20-Dec	
20-Feb		20-Apr		20-Jun	2.02	20-Aug	0.38	21-Oct	0.100	21-Dec	
21-Feb		21-Apr		21-Jun	2.00	21-Aug	0.37	22-Oct	0.09	22-Dec	
22-Feb		22-Apr		22-Jun	1.94	22-Aug	0.37	23-Oct	0.08	23-Dec	
23-Feb		23-Apr		23-Jun	1.87	23-Aug	0.36	24-Oct	0.070	24-Dec	
24-Feb		24-Apr		24-Jun	1.76	24-Aug	0.35	25-Oct	0.060	25-Dec	
25-Feb		25-Apr		25-Jun	1.73	25-Aug	0.34	26-Oct	0.05	26-Dec	
26-Feb		26-Apr		26-Jun	1.65	26-Aug	0.33	27-Oct	0.040	27-Dec	
27-Feb		27-Apr		27-Jun	1.59	27-Aug	0.32	28-Oct	0.030	28-Dec	
28-Feb		28-Apr		28-Jun	1.56	28-Aug	0.31	29-Oct	0.020	29-Dec	
29-Feb		29-Apr		29-Jun	1.54	29-Aug	0.30	30-Oct	0.010	30-Dec	
		30-Apr		30-Jun	1.49	30-Aug	0.30	31-Oct	0.000	31-Dec	
						31-Aug	0.28				

Note: Estimated values are italicized

Summary of Daily Mean Flow (m^3/s) at Patch - Hydro

Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)
1-Jan		1-Mar		1-May		1-Jul	0.51	1-Sep	0.224	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	0.5	2-Sep	0.201	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	0.51	3-Sep	0.190	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	0.51	4-Sep	0.189	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	0.50	5-Sep	0.194	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	0.49	6-Sep	0.183	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	0.48	7-Sep	0.175	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	0.47	8-Sep	0.175	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	0.46	9-Sep	0.183	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	0.45	10-Sep	0.183	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	0.45	11-Sep	0.175	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	0.44	12-Sep	0.185	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	0.43	13-Sep	0.189	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	0.41	14-Sep	0.192	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	0.40	15-Sep	0.200	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	0.41	16-Sep	0.196	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	0.43	17-Sep	0.193	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	0.41	18-Sep	0.198	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	0.40	19-Sep	0.200	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	0.40	20-Sep	0.199	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	0.39	21-Sep	0.198	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	0.39	22-Sep	0.196	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	0.38	23-Sep	0.191	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	0.37	24-Sep	0.187	24-Nov	
25-Jan		25-Mar		25-May		25-Jul	0.39	25-Sep	0.187	25-Nov	
26-Jan		26-Mar		26-May		26-Jul	0.39	26-Sep	0.187	26-Nov	
27-Jan		27-Mar		27-May		27-Jul	0.365	27-Sep	0.182	27-Nov	
28-Jan		28-Mar		28-May		28-Jul	0.350	28-Sep	0.177	28-Nov	
29-Jan		29-Mar		29-May		29-Jul	0.333	29-Sep	0.171	29-Nov	
30-Jan		30-Mar		30-May		30-Jul	0.321	30-Sep	0.166	30-Nov	
31-Jan		31-Mar		31-May		31-Jul	0.306	1-Oct	0.161	1-Dec	
1-Feb		1-Apr		1-Jun	0	1-Aug	0.315	2-Oct	0.155	2-Dec	
2-Feb		2-Apr		2-Jun	0	2-Aug	0.321	3-Oct	0.150	3-Dec	
3-Feb		3-Apr		3-Jun	0	3-Aug	0.324	4-Oct	0.145	4-Dec	
4-Feb		4-Apr		4-Jun	0	4-Aug	0.318	5-Oct	0.139	5-Dec	
5-Feb		5-Apr		5-Jun	0	5-Aug	0.309	6-Oct	0.134	6-Dec	
6-Feb		6-Apr		6-Jun	0	6-Aug	0.302	7-Oct	0.128	7-Dec	
7-Feb		7-Apr		7-Jun	0	7-Aug	0.317	8-Oct	0.123	8-Dec	
8-Feb		8-Apr		8-Jun	0	8-Aug	0.316	9-Oct	0.118	9-Dec	
9-Feb		9-Apr		9-Jun	0	9-Aug	0.313	10-Oct	0.112	10-Dec	
10-Feb		10-Apr		10-Jun	0	10-Aug	0.307	11-Oct	0.107	11-Dec	
11-Feb		11-Apr		11-Jun	0	11-Aug	0.296	12-Oct	0.102	12-Dec	
12-Feb		12-Apr		12-Jun	0	12-Aug	0.289	13-Oct	0.096	13-Dec	
13-Feb		13-Apr		13-Jun	0	13-Aug	0.285	14-Oct	0.091	14-Dec	
14-Feb		14-Apr		14-Jun	0	14-Aug	0.279	15-Oct	0.086	15-Dec	
15-Feb		15-Apr		15-Jun	0	15-Aug	0.276	16-Oct	0.080	16-Dec	
16-Feb		16-Apr		16-Jun	0	16-Aug	0.273	17-Oct	0.075	17-Dec	
17-Feb		17-Apr		17-Jun	0.02	17-Aug	0.274	18-Oct	0.070	18-Dec	
18-Feb		18-Apr		18-Jun	0.28	18-Aug	0.269	19-Oct	0.064	19-Dec	
19-Feb		19-Apr		19-Jun	0.381	19-Aug	0.263	20-Oct	0.059	20-Dec	
20-Feb		20-Apr		20-Jun	0.407	20-Aug	0.260	21-Oct	0.054	21-Dec	
21-Feb		21-Apr		21-Jun	0.422	21-Aug	0.252	22-Oct	0.048	22-Dec	
22-Feb		22-Apr		22-Jun	0.425	22-Aug	0.243	23-Oct	0.043	23-Dec	
23-Feb		23-Apr		23-Jun	0.429	23-Aug	0.235	24-Oct	0.037	24-Dec	
24-Feb		24-Apr		24-Jun	0.434	24-Aug	0.229	25-Oct	0.032	25-Dec	
25-Feb		25-Apr		25-Jun	0.457	25-Aug	0.225	26-Oct	0.027	26-Dec	
26-Feb		26-Apr		26-Jun	0.466	26-Aug	0.218	27-Oct	0.021	27-Dec	
27-Feb		27-Apr		27-Jun	0.477	27-Aug	0.211	28-Oct	0.016	28-Dec	
28-Feb		28-Apr		28-Jun	0.493	28-Aug	0.209	29-Oct	0.011	29-Dec	
29-Feb		29-Apr		29-Jun	0.506	29-Aug	0.205	30-Oct	*0.005*	30-Dec	
		30-Apr		30-Jun	0.511	30-Aug	0.201	31-Oct	*0.000*	31-Dec	
						31-Aug	0.212				

Note: Estimated values are italicized

Summary of Daily Mean Stage (m) at PO - Hydro

Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)
1-Jan		1-Mar		1-May		1-Jul	1.35	1-Sep	0.362	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	1.3	2-Sep	0.469	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	1.21	3-Sep	0.515	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	1.14	4-Sep	0.525	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	1.09	5-Sep	0.504	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	1.02	6-Sep	0.501	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	0.95	7-Sep	0.479	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	0.89	8-Sep	0.457	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	0.85	9-Sep	0.472	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	0.79	10-Sep	0.529	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	0.77	11-Sep	0.552	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	0.73	12-Sep	0.563	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	0.71	13-Sep	0.614	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	0.66	14-Sep	0.655	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	0.60	15-Sep	0.650	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	0.60	16-Sep	0.653	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	0.66	17-Sep	0.654	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	0.63	18-Sep	0.654	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	0.60	19-Sep	0.659	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	0.57	20-Sep	0.654	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	0.55	21-Sep	0.668	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	0.52	22-Sep	0.648	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	0.49	23-Sep	0.624	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	0.46	24-Sep	0.624	24-Nov	
25-Jan		25-Mar		25-May		25-Jul	0.47	25-Sep	0.624	25-Nov	
26-Jan		26-Mar		26-May		26-Jul	0.47	26-Sep	0.607	26-Nov	
27-Jan		27-Mar		27-May		27-Jul	0.446	27-Sep	0.590	27-Nov	
28-Jan		28-Mar		28-May		28-Jul	0.415	28-Sep	0.572	28-Nov	
29-Jan		29-Mar		29-May		29-Jul	0.386	29-Sep	0.555	29-Nov	
30-Jan		30-Mar		30-May		30-Jul	0.373	30-Sep	0.538	30-Nov	
31-Jan		31-Mar		31-May		31-Jul	0.355	1-Oct	0.520	1-Dec	
1-Feb		1-Apr		1-Jun	0.00	1-Aug	0.372	2-Oct	0.503	2-Dec	
2-Feb		2-Apr		2-Jun	0.00	2-Aug	0.412	3-Oct	0.486	3-Dec	
3-Feb		3-Apr		3-Jun	0.00	3-Aug	0.460	4-Oct	0.468	4-Dec	
4-Feb		4-Apr		4-Jun	0.00	4-Aug	0.477	5-Oct	0.451	5-Dec	
5-Feb		5-Apr		5-Jun	0.00	5-Aug	0.472	6-Oct	0.434	6-Dec	
6-Feb		6-Apr		6-Jun	0.00	6-Aug	0.463	7-Oct	0.416	7-Dec	
7-Feb		7-Apr		7-Jun	0.00	7-Aug	0.515	8-Oct	0.399	8-Dec	
8-Feb		8-Apr		8-Jun	0.00	8-Aug	0.619	9-Oct	0.381	9-Dec	
9-Feb		9-Apr		9-Jun	0.01	9-Aug	0.713	10-Oct	0.364	10-Dec	
10-Feb		10-Apr		10-Jun	0.06	10-Aug	0.725	11-Oct	0.347	11-Dec	
11-Feb		11-Apr		11-Jun	2.01	11-Aug	0.708	12-Oct	0.329	12-Dec	
12-Feb		12-Apr		12-Jun	1.93	12-Aug	0.672	13-Oct	0.312	13-Dec	
13-Feb		13-Apr		13-Jun	1.86	13-Aug	0.652	14-Oct	0.295	14-Dec	
14-Feb		14-Apr		14-Jun	1.80	14-Aug	0.623	15-Oct	0.277	15-Dec	
15-Feb		15-Apr		15-Jun	1.67	15-Aug	0.599	16-Oct	0.260	16-Dec	
16-Feb		16-Apr		16-Jun	1.70	16-Aug	0.570	17-Oct	0.243	17-Dec	
17-Feb		17-Apr		17-Jun	1.76	17-Aug	0.577	18-Oct	0.225	18-Dec	
18-Feb		18-Apr		18-Jun	1.79	18-Aug	0.579	19-Oct	0.208	19-Dec	
19-Feb		19-Apr		19-Jun	1.88	19-Aug	0.576	20-Oct	0.191	20-Dec	
20-Feb		20-Apr		20-Jun	1.93	20-Aug	0.569	21-Oct	0.173	21-Dec	
21-Feb		21-Apr		21-Jun	1.89	21-Aug	0.551	22-Oct	0.156	22-Dec	
22-Feb		22-Apr		22-Jun	1.82	22-Aug	0.535	23-Oct	0.139	23-Dec	
23-Feb		23-Apr		23-Jun	1.70	23-Aug	0.514	24-Oct	0.121	24-Dec	
24-Feb		24-Apr		24-Jun	1.57	24-Aug	0.482	25-Oct	0.104	25-Dec	
25-Feb		25-Apr		25-Jun	1.52	25-Aug	0.459	26-Oct	0.087	26-Dec	
26-Feb		26-Apr		26-Jun	1.53	26-Aug	0.439	27-Oct	0.069	27-Dec	
27-Feb		27-Apr		27-Jun	1.48	27-Aug	0.413	28-Oct	0.052	28-Dec	
28-Feb		28-Apr		28-Jun	1.47	28-Aug	0.394	29-Oct	0.035	29-Dec	
29-Feb		29-Apr		29-Jun	1.46	29-Aug	0.385	30-Oct	*0.017*	30-Dec	
		30-Apr		30-Jun	1.41	30-Aug	0.370	31-Oct	*0.000*	31-Dec	
						31-Aug	0.369				

Note: As of the most recent visit to the site Oct 2008 the station was still active
The station could not be accessed after Oct 2008 due to avalanche hazard

Summary of Daily Mean Stage (m) at Roberts A-Hydro

Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)
1-Jan		1-Mar		1-May		1-Jul	2.22	1-Sep	0.519	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	2.1	2-Sep	0.538	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	2.01	3-Sep	0.537	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	1.88	4-Sep	0.535	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	1.76	5-Sep	0.518	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	1.63	6-Sep	0.518	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	1.51	7-Sep	0.518	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	1.41	8-Sep	0.515	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	1.32	9-Sep	0.517	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	1.24	10-Sep	0.533	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	1.19	11-Sep	0.545	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	1.15	12-Sep	0.546	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	1.09	13-Sep	0.557	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	1.05	14-Sep	0.567	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	1.00	15-Sep	0.564	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	0.96	16-Sep	0.572	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	0.95	17-Sep	0.581	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	0.94	18-Sep	0.584	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	0.91	19-Sep	0.588	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	0.88	20-Sep	0.587	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	0.86	21-Sep	0.587	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	0.84	22-Sep	0.587	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	0.82	23-Sep	0.572	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	0.81	24-Sep	0.557	24-Nov	
25-Jan		25-Mar		25-May		25-Jul	0.82	25-Sep	0.542	25-Nov	
26-Jan		26-Mar		26-May		26-Jul	0.80	26-Sep	0.526	26-Nov	
27-Jan		27-Mar		27-May		27-Jul	0.788	27-Sep	0.512	27-Nov	
28-Jan		28-Mar		28-May		28-Jul	0.765	28-Sep	0.497	28-Nov	
29-Jan		29-Mar		29-May		29-Jul	0.736	29-Sep	0.482	29-Nov	
30-Jan		30-Mar		30-May		30-Jul	0.737	30-Sep	0.467	30-Nov	
31-Jan		31-Mar		31-May		31-Jul	0.726	1-Oct	0.452	1-Dec	
1-Feb		1-Apr		1-Jun	0	1-Aug	0.723	2-Oct	0.437	2-Dec	
2-Feb		2-Apr		2-Jun	0	2-Aug	0.724	3-Oct	0.421	3-Dec	
3-Feb		3-Apr		3-Jun	0	3-Aug	0.722	4-Oct	0.406	4-Dec	
4-Feb		4-Apr		4-Jun	0	4-Aug	0.714	5-Oct	0.391	5-Dec	
5-Feb		5-Apr		5-Jun	0	5-Aug	0.707	6-Oct	0.376	6-Dec	
6-Feb		6-Apr		6-Jun	0.001	6-Aug	0.702	7-Oct	0.361	7-Dec	
7-Feb		7-Apr		7-Jun	0.003	7-Aug	0.700	8-Oct	0.346	8-Dec	
8-Feb		8-Apr		8-Jun	0.005	8-Aug	0.699	9-Oct	0.331	9-Dec	
9-Feb		9-Apr		9-Jun	0.009	9-Aug	0.697	10-Oct	0.316	10-Dec	
10-Feb		10-Apr		10-Jun	0.016	10-Aug	0.689	11-Oct	0.301	11-Dec	
11-Feb		11-Apr		11-Jun	0.028	11-Aug	0.685	12-Oct	0.286	12-Dec	
12-Feb		12-Apr		12-Jun	0.0492	12-Aug	0.678	13-Oct	0.271	13-Dec	
13-Feb		13-Apr		13-Jun	0.086	13-Aug	0.675	14-Oct	0.256	14-Dec	
14-Feb		14-Apr		14-Jun	0.152	14-Aug	0.672	15-Oct	0.241	15-Dec	
15-Feb		15-Apr		15-Jun	0.267	15-Aug	0.670	16-Oct	0.226	16-Dec	
16-Feb		16-Apr		16-Jun	0.469	16-Aug	0.663	17-Oct	0.211	17-Dec	
17-Feb		17-Apr		17-Jun	1.44	17-Aug	0.663	18-Oct	0.195	18-Dec	
18-Feb		18-Apr		18-Jun	1.93	18-Aug	0.654	19-Oct	0.181	19-Dec	
19-Feb		19-Apr		19-Jun	1.88	19-Aug	0.651	20-Oct	0.166	20-Dec	
20-Feb		20-Apr		20-Jun	2.16	20-Aug	0.644	21-Oct	0.151	21-Dec	
21-Feb		21-Apr		21-Jun	2.36	21-Aug	0.640	22-Oct	0.135	22-Dec	
22-Feb		22-Apr		22-Jun	2.48	22-Aug	0.631	23-Oct	0.120	23-Dec	
23-Feb		23-Apr		23-Jun	2.49	23-Aug	0.626	24-Oct	0.105	24-Dec	
24-Feb		24-Apr		24-Jun	2.43	24-Aug	0.616	25-Oct	0.090	25-Dec	
25-Feb		25-Apr		25-Jun	2.44	25-Aug	0.607	26-Oct	0.075	26-Dec	
26-Feb		26-Apr		26-Jun	2.42	26-Aug	0.601	27-Oct	0.060	27-Dec	
27-Feb		27-Apr		27-Jun	2.36	27-Aug	0.591	28-Oct	0.045	28-Dec	
28-Feb		28-Apr		28-Jun	2.36	28-Aug	0.581	29-Oct	0.030	29-Dec	
29-Feb		29-Apr		29-Jun	2.36	29-Aug	0.577	30-Oct	*0.015*	30-Dec	
		30-Apr		30-Jun	2.29	30-Aug	0.567	31-Oct	*0.000*	31-Dec	
						31-Aug	0.556				

Summary of Daily Mean Stage (m) at Reference A-Hydro

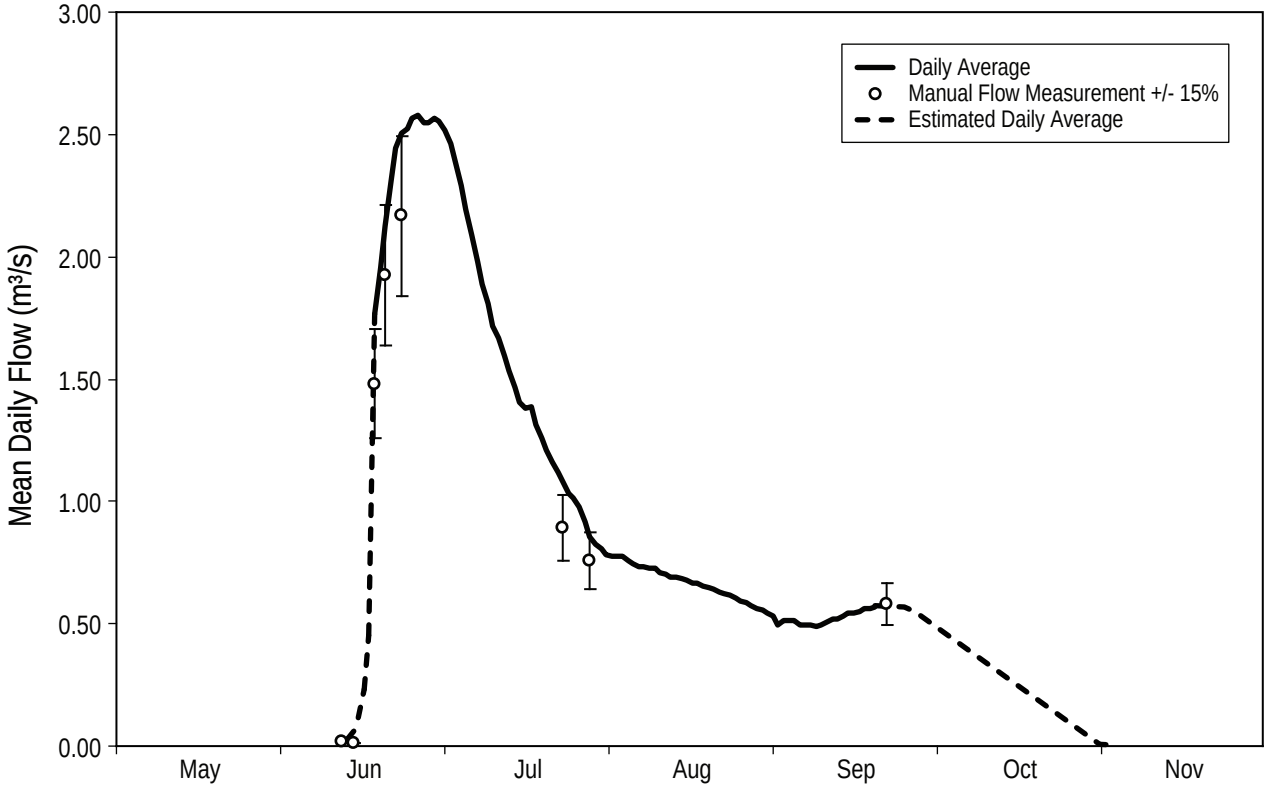
Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)
1-Jan		1-Mar		1-May		1-Jul	0.60	1-Sep	0.065	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	0.6	2-Sep	0.083	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	0.60	3-Sep	0.084	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	0.58	4-Sep	0.089	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	0.56	5-Sep	0.077	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	0.54	6-Sep	0.082	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	0.52	7-Sep	0.080	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	0.49	8-Sep	0.079	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	0.48	9-Sep	0.086	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	0.45	10-Sep	0.095	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	0.45	11-Sep	0.108	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	0.44	12-Sep	0.105	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	0.42	13-Sep	0.115	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	0.39	14-Sep	0.130	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	0.37	15-Sep	0.125	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	0.37	16-Sep	0.129	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	0.38	17-Sep	0.140	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	0.36	18-Sep	0.144	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	0.34	19-Sep	0.145	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	0.32	20-Sep	0.144	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	0.32	21-Sep	0.148	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	0.31	22-Sep	0.144	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	0.30	23-Sep	0.142	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	0.30	24-Sep	0.142	24-Nov	
25-Jan		25-Mar		25-May		25-Jul	0.31	25-Sep	0.142	25-Nov	
26-Jan		26-Mar		26-May		26-Jul	0.31	26-Sep	0.138	26-Nov	
27-Jan		27-Mar		27-May		27-Jul	0.285	27-Sep	0.134	27-Nov	
28-Jan		28-Mar		28-May		28-Jul	0.262	28-Sep	0.130	28-Nov	
29-Jan		29-Mar		29-May		29-Jul	0.241	29-Sep	0.126	29-Nov	
30-Jan		30-Mar		30-May		30-Jul	0.233	30-Sep	0.122	30-Nov	
31-Jan		31-Mar		31-May		31-Jul	0.214	1-Oct	0.118	1-Dec	
1-Feb		1-Apr		1-Jun	0	1-Aug	0.229	2-Oct	0.114	2-Dec	
2-Feb		2-Apr		2-Jun	0	2-Aug	0.242	3-Oct	0.110	3-Dec	
3-Feb		3-Apr		3-Jun	0	3-Aug	0.246	4-Oct	0.106	4-Dec	
4-Feb		4-Apr		4-Jun	0	4-Aug	0.238	5-Oct	0.102	5-Dec	
5-Feb		5-Apr		5-Jun	0	5-Aug	0.228	6-Oct	0.098	6-Dec	
6-Feb		6-Apr		6-Jun	0	6-Aug	0.223	7-Oct	0.095	7-Dec	
7-Feb		7-Apr		7-Jun	0	7-Aug	0.223	8-Oct	0.091	8-Dec	
8-Feb		8-Apr		8-Jun	0	8-Aug	0.224	9-Oct	0.087	9-Dec	
9-Feb		9-Apr		9-Jun	0	9-Aug	0.220	10-Oct	0.083	10-Dec	
10-Feb		10-Apr		10-Jun	0	10-Aug	0.204	11-Oct	0.079	11-Dec	
11-Feb		11-Apr		11-Jun	0	11-Aug	0.192	12-Oct	0.075	12-Dec	
12-Feb		12-Apr		12-Jun	0	12-Aug	0.182	13-Oct	0.071	13-Dec	
13-Feb		13-Apr		13-Jun	0	13-Aug	0.175	14-Oct	0.067	14-Dec	
14-Feb		14-Apr		14-Jun	0.01	14-Aug	0.170	15-Oct	0.063	15-Dec	
15-Feb		15-Apr		15-Jun	0.009	15-Aug	0.172	16-Oct	0.059	16-Dec	
16-Feb		16-Apr		16-Jun	0.014	16-Aug	0.160	17-Oct	0.055	17-Dec	
17-Feb		17-Apr		17-Jun	0.023	17-Aug	0.163	18-Oct	0.051	18-Dec	
18-Feb		18-Apr		18-Jun	0.0602	18-Aug	0.155	19-Oct	0.047	19-Dec	
19-Feb		19-Apr		19-Jun	0.115	19-Aug	0.146	20-Oct	0.043	20-Dec	
20-Feb		20-Apr		20-Jun	0.199	20-Aug	0.139	21-Oct	0.039	21-Dec	
21-Feb		21-Apr		21-Jun	0.28	21-Aug	0.128	22-Oct	0.035	22-Dec	
22-Feb		22-Apr		22-Jun	0.334	22-Aug	0.122	23-Oct	0.032	23-Dec	
23-Feb		23-Apr		23-Jun	0.371	23-Aug	0.119	24-Oct	0.028	24-Dec	
24-Feb		24-Apr		24-Jun	0.406	24-Aug	0.106	25-Oct	0.024	25-Dec	
25-Feb		25-Apr		25-Jun	0.469	25-Aug	0.098	26-Oct	0.020	26-Dec	
26-Feb		26-Apr		26-Jun	0.49	26-Aug	0.095	27-Oct	0.016	27-Dec	
27-Feb		27-Apr		27-Jun	0.496	27-Aug	0.088	28-Oct	0.012	28-Dec	
28-Feb		28-Apr		28-Jun	0.523	28-Aug	0.081	29-Oct	0.008	29-Dec	
29-Feb		29-Apr		29-Jun	0.56	29-Aug	0.081	30-Oct	*0.004*	30-Dec	
		30-Apr		30-Jun	0.593	30-Aug	0.077	31-Oct	*0.000*	31-Dec	
						31-Aug	0.080				

Summary of Daily Mean Stage (m) at Tail - Hydro

Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)
1-Jan		1-Mar		1-May		1-Jul	0.11	1-Sep	0.009	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	0.1	2-Sep	0.014	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	0.10	3-Sep	0.015	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	0.09	4-Sep	0.015	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	0.08	5-Sep	0.015	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	0.08	6-Sep	0.015	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	0.07	7-Sep	0.016	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	0.06	8-Sep	0.018	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	0.06	9-Sep	0.021	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	0.05	10-Sep	0.022	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	0.05	11-Sep	0.026	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	0.05	12-Sep	0.029	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	0.05	13-Sep	0.033	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	0.04	14-Sep	0.037	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	0.04	15-Sep	0.034	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	0.04	16-Sep	0.037	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	0.04	17-Sep	0.040	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	0.03	18-Sep	0.044	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	0.03	19-Sep	0.047	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	0.03	20-Sep	0.047	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	0.03	21-Sep	0.046	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	0.03	22-Sep	0.046	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	0.03	23-Sep	0.047	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	0.03	24-Sep	0.045	24-Nov	
25-Jan		25-Mar		25-May		25-Jul	0.03	25-Sep	0.043	25-Nov	
26-Jan		26-Mar		26-May		26-Jul	0.03	26-Sep	0.041	26-Nov	
27-Jan		27-Mar		27-May		27-Jul	0.023	27-Sep	0.039	27-Nov	
28-Jan		28-Mar		28-May		28-Jul	0.021	28-Sep	0.037	28-Nov	
29-Jan		29-Mar		29-May		29-Jul	0.018	29-Sep	0.034	29-Nov	
30-Jan		30-Mar		30-May		30-Jul	0.017	30-Sep	0.032	30-Nov	
31-Jan		31-Mar		31-May		31-Jul	0.015	1-Oct	0.030	1-Dec	
1-Feb		1-Apr		1-Jun	0	1-Aug	0.022	2-Oct	0.028	2-Dec	
2-Feb		2-Apr		2-Jun	0	2-Aug	0.028	3-Oct	0.026	3-Dec	
3-Feb		3-Apr		3-Jun	0	3-Aug	0.029	4-Oct	0.024	4-Dec	
4-Feb		4-Apr		4-Jun	0	4-Aug	0.029	5-Oct	0.022	5-Dec	
5-Feb		5-Apr		5-Jun	0	5-Aug	0.027	6-Oct	0.019	6-Dec	
6-Feb		6-Apr		6-Jun	0	6-Aug	0.027	7-Oct	0.017	7-Dec	
7-Feb		7-Apr		7-Jun	0	7-Aug	0.029	8-Oct	0.015	8-Dec	
8-Feb		8-Apr		8-Jun	0	8-Aug	0.032	9-Oct	0.013	9-Dec	
9-Feb		9-Apr		9-Jun	0	9-Aug	0.032	10-Oct	0.011	10-Dec	
10-Feb		10-Apr		10-Jun	0	10-Aug	0.029	11-Oct	0.009	11-Dec	
11-Feb		11-Apr		11-Jun	0	11-Aug	0.028	12-Oct	0.006	12-Dec	
12-Feb		12-Apr		12-Jun	0	12-Aug	0.027	13-Oct	0.004	13-Dec	
13-Feb		13-Apr		13-Jun	0.001	13-Aug	0.027	14-Oct	0.002	14-Dec	
14-Feb		14-Apr		14-Jun	0.002	14-Aug	0.027	15-Oct	0.000	15-Dec	
15-Feb		15-Apr		15-Jun	0.003	15-Aug	0.026	16-Oct		16-Dec	
16-Feb		16-Apr		16-Jun	0.008	16-Aug	0.027	17-Oct		17-Dec	
17-Feb		17-Apr		17-Jun	0.018	17-Aug	0.034	18-Oct		18-Dec	
18-Feb		18-Apr		18-Jun	0.08	18-Aug	0.032	19-Oct		19-Dec	
19-Feb		19-Apr		19-Jun	0.102	19-Aug	0.031	20-Oct		20-Dec	
20-Feb		20-Apr		20-Jun	0.113	20-Aug	0.029	21-Oct		21-Dec	
21-Feb		21-Apr		21-Jun	0.118	21-Aug	0.026	22-Oct		22-Dec	
22-Feb		22-Apr		22-Jun	0.113	22-Aug	0.026	23-Oct		23-Dec	
23-Feb		23-Apr		23-Jun	0.104	23-Aug	0.024	24-Oct		24-Dec	
24-Feb		24-Apr		24-Jun	0.094	24-Aug	0.022	25-Oct		25-Dec	
25-Feb		25-Apr		25-Jun	0.1	25-Aug	0.021	26-Oct		26-Dec	
26-Feb		26-Apr		26-Jun	0.1	26-Aug	0.020	27-Oct		27-Dec	
27-Feb		27-Apr		27-Jun	0.09	27-Aug	0.018	28-Oct		28-Dec	
28-Feb		28-Apr		28-Jun	0.104	28-Aug	0.016	29-Oct		29-Dec	
29-Feb		29-Apr		29-Jun	0.115	29-Aug	0.016	30-Oct		30-Dec	
		30-Apr		30-Jun	0.114	30-Aug	0.016	31-Oct		31-Dec	
						31-Aug	0.015				

Summary of Daily Mean Stage (m) at Windy - Hydro

Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)	Date	Flow (m^3/s)
1-Jan		1-Mar		1-May		1-Jul	0.34	1-Sep	0.152	1-Nov	
2-Jan		2-Mar		2-May		2-Jul	0.3	2-Sep	0.161	2-Nov	
3-Jan		3-Mar		3-May		3-Jul	0.33	3-Sep	0.159	3-Nov	
4-Jan		4-Mar		4-May		4-Jul	0.33	4-Sep	0.158	4-Nov	
5-Jan		5-Mar		5-May		5-Jul	0.32	5-Sep	0.151	5-Nov	
6-Jan		6-Mar		6-May		6-Jul	0.31	6-Sep	0.146	6-Nov	
7-Jan		7-Mar		7-May		7-Jul	0.30	7-Sep	0.146	7-Nov	
8-Jan		8-Mar		8-May		8-Jul	0.30	8-Sep	0.145	8-Nov	
9-Jan		9-Mar		9-May		9-Jul	0.29	9-Sep	0.153	9-Nov	
10-Jan		10-Mar		10-May		10-Jul	0.28	10-Sep	0.149	10-Nov	
11-Jan		11-Mar		11-May		11-Jul	0.29	11-Sep	0.167	11-Nov	
12-Jan		12-Mar		12-May		12-Jul	0.29	12-Sep	0.154	12-Nov	
13-Jan		13-Mar		13-May		13-Jul	0.28	13-Sep	0.155	13-Nov	
14-Jan		14-Mar		14-May		14-Jul	0.27	14-Sep	0.155	14-Nov	
15-Jan		15-Mar		15-May		15-Jul	0.26	15-Sep	0.156	15-Nov	
16-Jan		16-Mar		16-May		16-Jul	0.28	16-Sep	0.155	16-Nov	
17-Jan		17-Mar		17-May		17-Jul	0.29	17-Sep	0.158	17-Nov	
18-Jan		18-Mar		18-May		18-Jul	0.28	18-Sep	0.163	18-Nov	
19-Jan		19-Mar		19-May		19-Jul	0.27	19-Sep	0.158	19-Nov	
20-Jan		20-Mar		20-May		20-Jul	0.27	20-Sep	0.155	20-Nov	
21-Jan		21-Mar		21-May		21-Jul	0.26	21-Sep	0.153	21-Nov	
22-Jan		22-Mar		22-May		22-Jul	0.26	22-Sep	0.150	22-Nov	
23-Jan		23-Mar		23-May		23-Jul	0.25	23-Sep	0.146	23-Nov	
24-Jan		24-Mar		24-May		24-Jul	0.25	24-Sep	0.146	24-Nov	
25-Jan		25-Mar		25-May		25-Jul	0.26	25-Sep	0.142	25-Nov	
26-Jan		26-Mar		26-May		26-Jul	0.25	26-Sep	0.138	26-Nov	
27-Jan		27-Mar		27-May		27-Jul	0.244	27-Sep	0.134	27-Nov	
28-Jan		28-Mar		28-May		28-Jul	0.239	28-Sep	0.131	28-Nov	
29-Jan		29-Mar		29-May		29-Jul	0.230	29-Sep	0.127	29-Nov	
30-Jan		30-Mar		30-May		30-Jul	0.225	30-Sep	0.123	30-Nov	
31-Jan		31-Mar		31-May		31-Jul	0.218	1-Oct	0.119	1-Dec	
1-Feb		1-Apr		1-Jun	0	1-Aug	0.230	2-Oct	0.115	2-Dec	
2-Feb		2-Apr		2-Jun	0	2-Aug	0.237	3-Oct	0.111	3-Dec	
3-Feb		3-Apr		3-Jun	0	3-Aug	0.239	4-Oct	0.107	4-Dec	
4-Feb		4-Apr		4-Jun	0	4-Aug	0.233	5-Oct	0.103	5-Dec	
5-Feb		5-Apr		5-Jun	0	5-Aug	0.229	6-Oct	0.099	6-Dec	
6-Feb		6-Apr		6-Jun	0	6-Aug	0.227	7-Oct	0.095	7-Dec	
7-Feb		7-Apr		7-Jun	0	7-Aug	0.236	8-Oct	0.091	8-Dec	
8-Feb		8-Apr		8-Jun	0.002	8-Aug	0.239	9-Oct	0.087	9-Dec	
9-Feb		9-Apr		9-Jun	0.006	9-Aug	0.237	10-Oct	0.083	10-Dec	
10-Feb		10-Apr		10-Jun	0.024	10-Aug	0.228	11-Oct	0.079	11-Dec	
11-Feb		11-Apr		11-Jun	0.372	11-Aug	0.222	12-Oct	0.075	12-Dec	
12-Feb		12-Apr		12-Jun	0.354	12-Aug	0.215	13-Oct	0.071	13-Dec	
13-Feb		13-Apr		13-Jun	0.337	13-Aug	0.212	14-Oct	0.067	14-Dec	
14-Feb		14-Apr		14-Jun	0.209	14-Aug	0.207	15-Oct	0.063	15-Dec	
15-Feb		15-Apr		15-Jun	0.221	15-Aug	0.205	16-Oct	0.059	16-Dec	
16-Feb		16-Apr		16-Jun	0.234	16-Aug	0.203	17-Oct	0.055	17-Dec	
17-Feb		17-Apr		17-Jun	0.263	17-Aug	0.205	18-Oct	0.051	18-Dec	
18-Feb		18-Apr		18-Jun	0.279	18-Aug	0.201	19-Oct	0.047	19-Dec	
19-Feb		19-Apr		19-Jun	0.294	19-Aug	0.197	20-Oct	0.044	20-Dec	
20-Feb		20-Apr		20-Jun	0.311	20-Aug	0.192	21-Oct	0.040	21-Dec	
21-Feb		21-Apr		21-Jun	0.32	21-Aug	0.189	22-Oct	0.036	22-Dec	
22-Feb		22-Apr		22-Jun	0.327	22-Aug	0.186	23-Oct	0.032	23-Dec	
23-Feb		23-Apr		23-Jun	0.326	23-Aug	0.180	24-Oct	0.028	24-Dec	
24-Feb		24-Apr		24-Jun	0.317	24-Aug	0.179	25-Oct	0.024	25-Dec	
25-Feb		25-Apr		25-Jun	0.322	25-Aug	0.175	26-Oct	0.020	26-Dec	
26-Feb		26-Apr		26-Jun	0.322	26-Aug	0.174	27-Oct	0.016	27-Dec	
27-Feb		27-Apr		27-Jun	0.323	27-Aug	0.172	28-Oct	0.012	28-Dec	
28-Feb		28-Apr		28-Jun	0.329	28-Aug	0.167	29-Oct	0.008	29-Dec	
29-Feb		29-Apr		29-Jun	0.335	29-Aug	0.168	30-Oct	*0.004*	30-Dec	
		30-Apr		30-Jun	0.337	30-Aug	0.167	31-Oct	*0.000*	31-Dec	
						31-Aug	0.164				

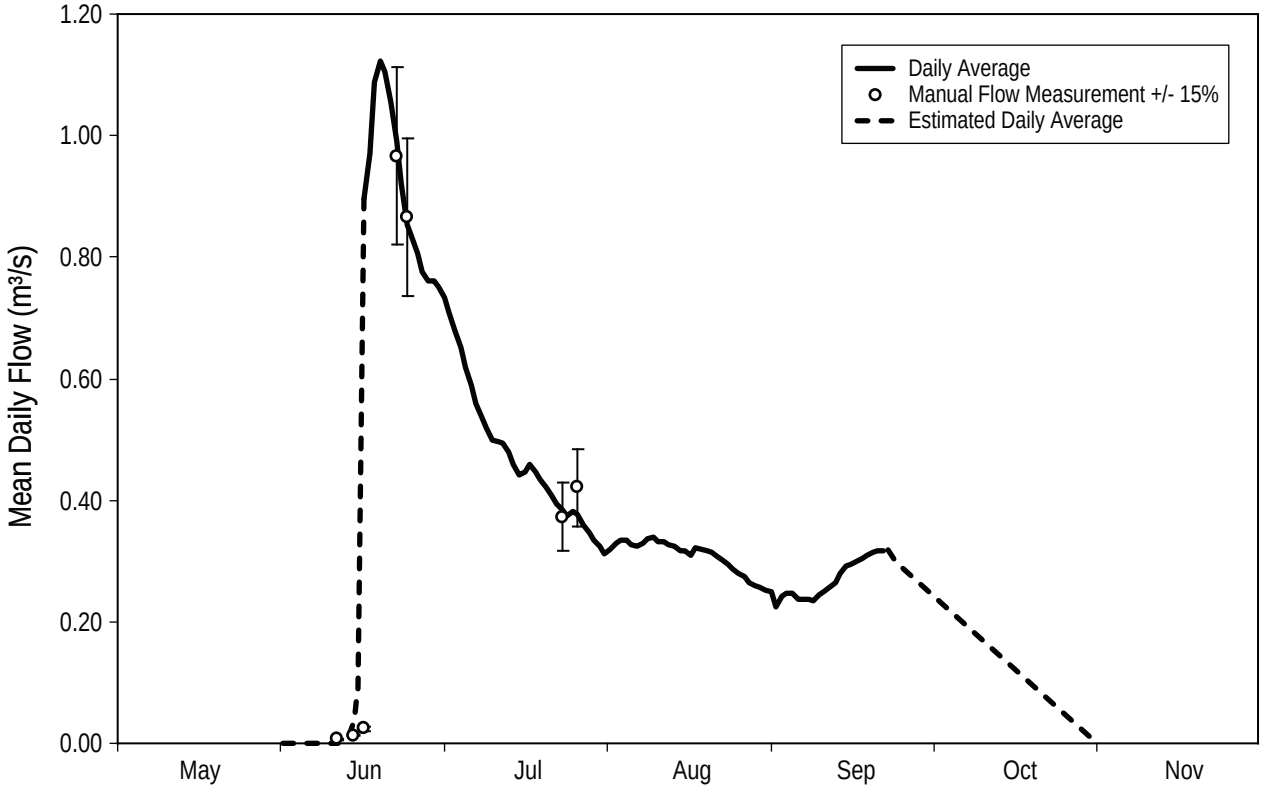


Appendix 5

NEWMONT The Gold Company

Annual Hydrograph at Doris-Hydro, 2009

Rescan Engineers & Scientists

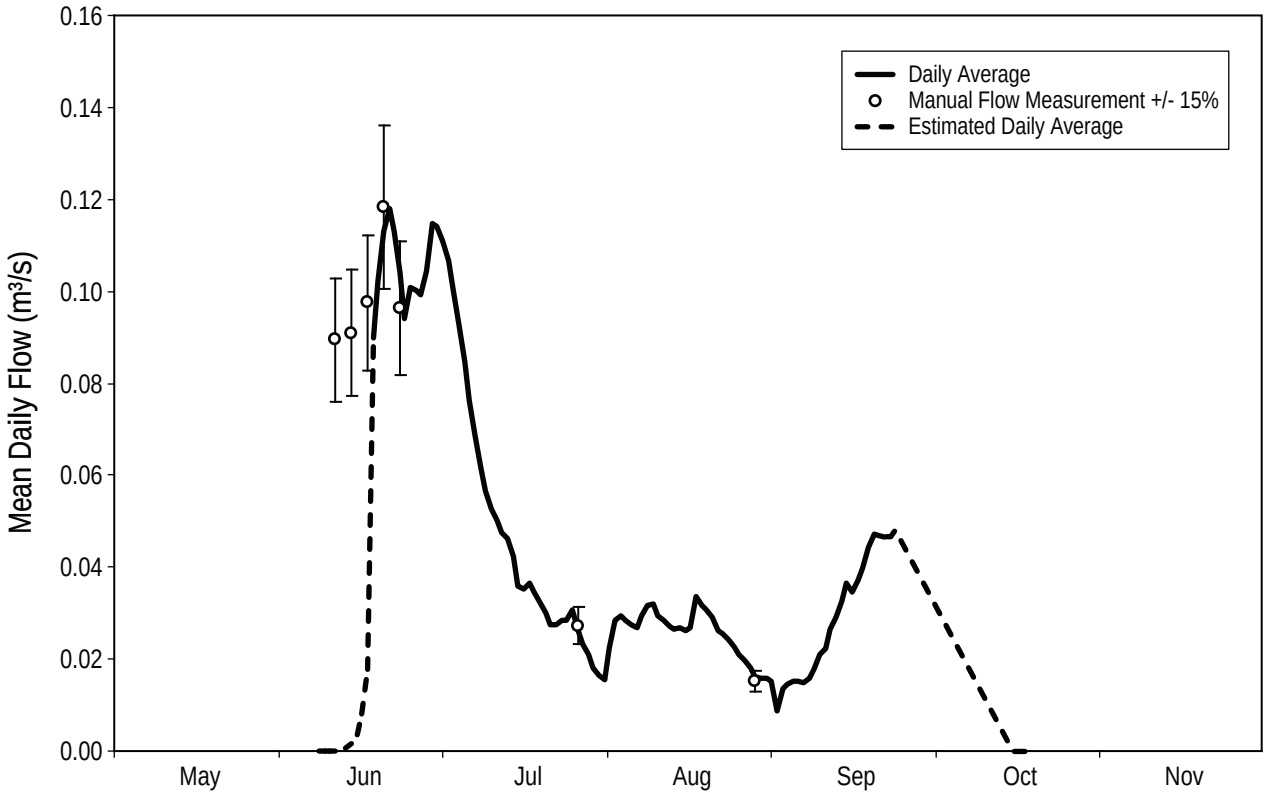


Appendix 5

NEWMONT™ The Gold Company

Annual Hydrograph at Glenn-Hydro, 2009

Rescan™ Engineers & Scientists

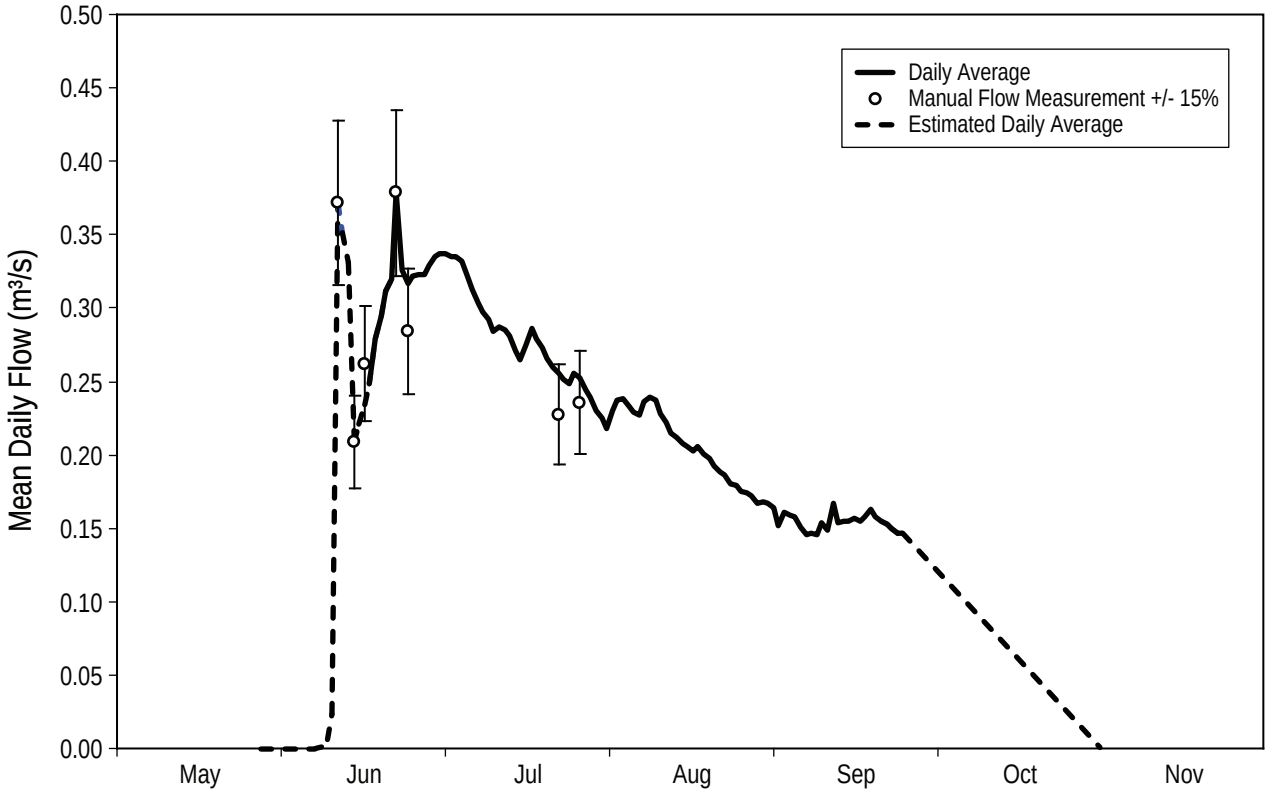


NEWMONT
The Gold Company

Annual Hydrograph at Tail-Hydro, 2009

Appendix 5

Rescan™
Engineers & Scientists

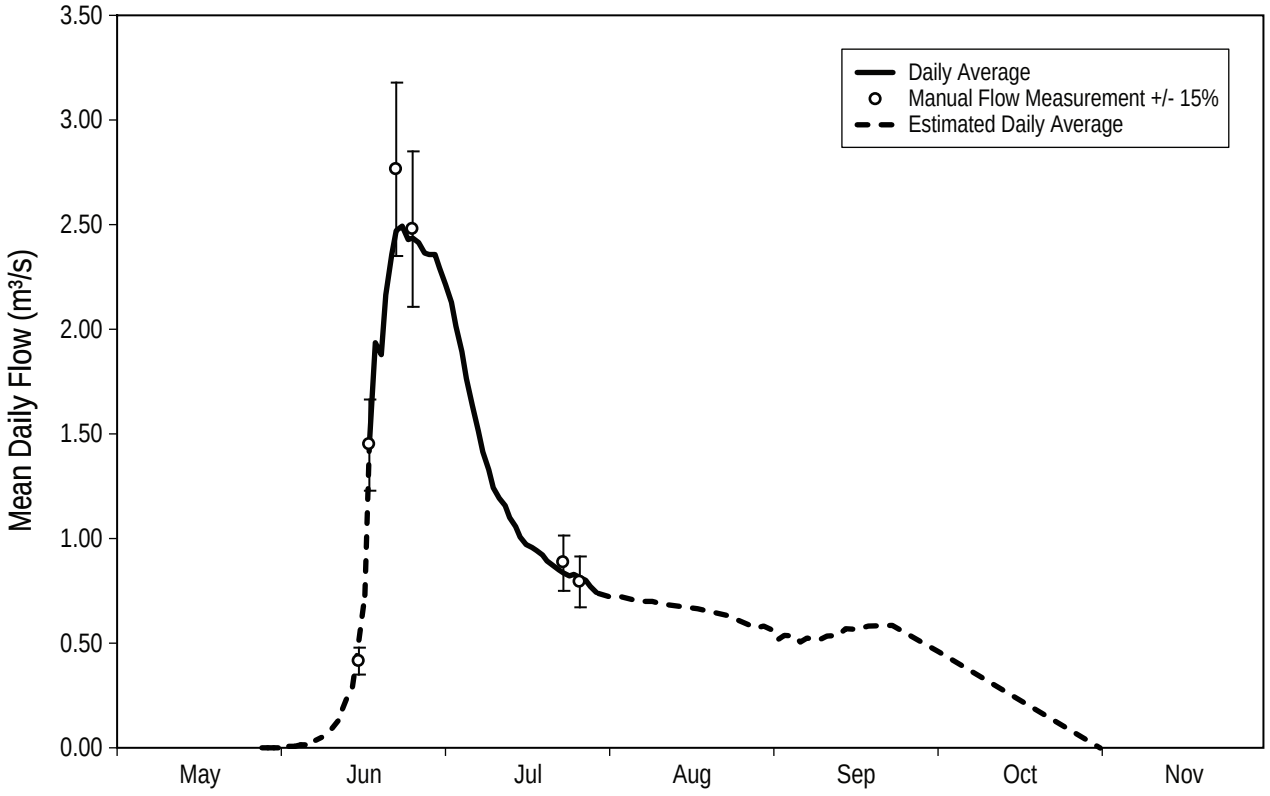


Appendix 5

NEWMONT™ The Gold Company

Annual Hydrograph at Windy-Hydro, 2009

Rescan™ Engineers & Scientists

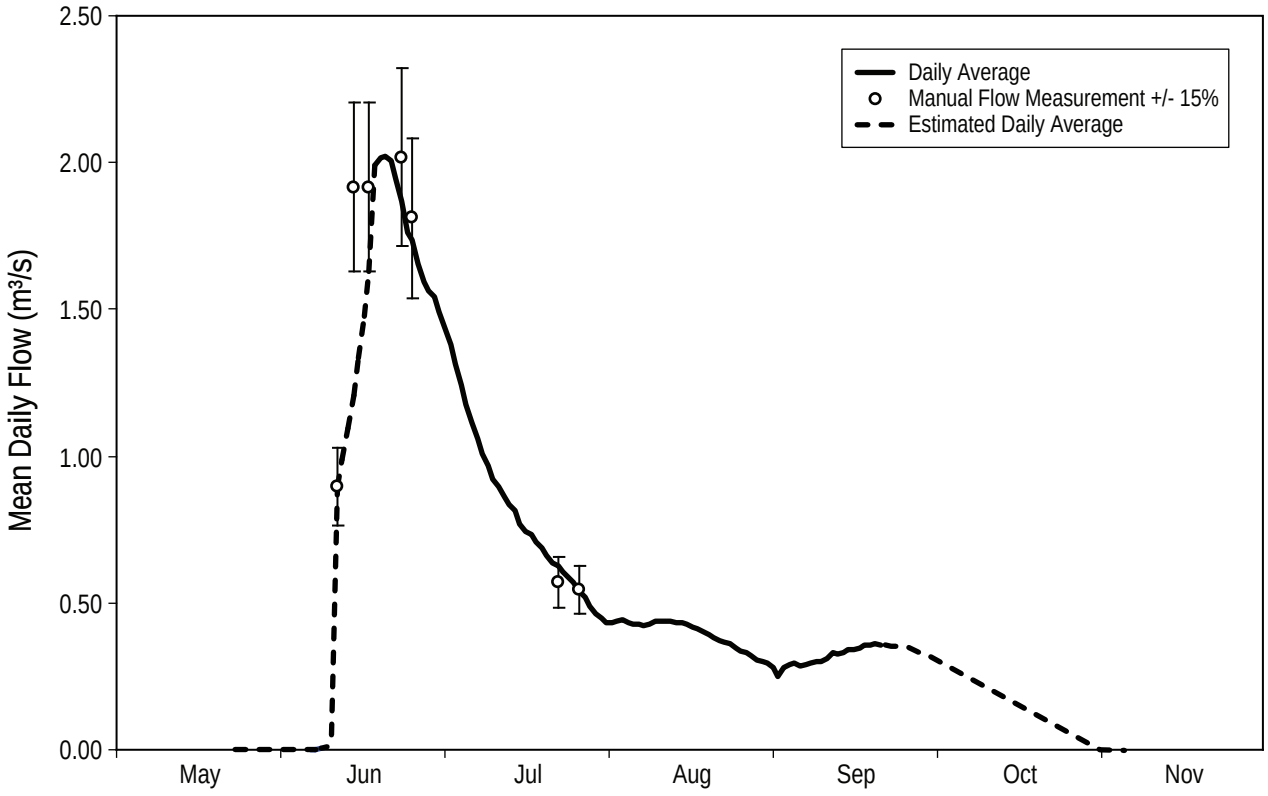


Appendix 5

NEWMONT™ The Gold Company

Annual Hydrograph at Roberts-Hydro, 2009

Rescan™ Engineers & Scientists

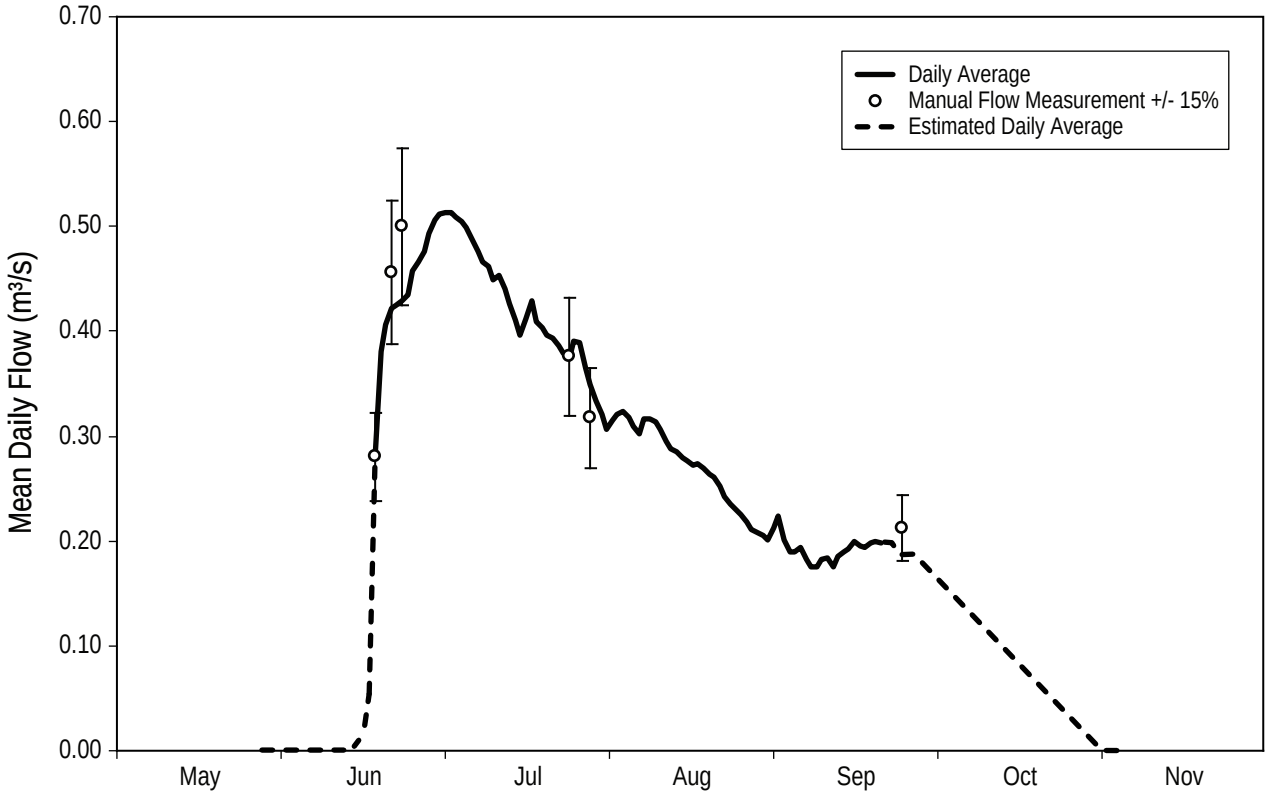


NEWMONT™ The Gold Company

Annual Hydrograph at Ogama-Hydro, 2009

Appendix 5

Rescan™ Engineers & Scientists



Appendix 5

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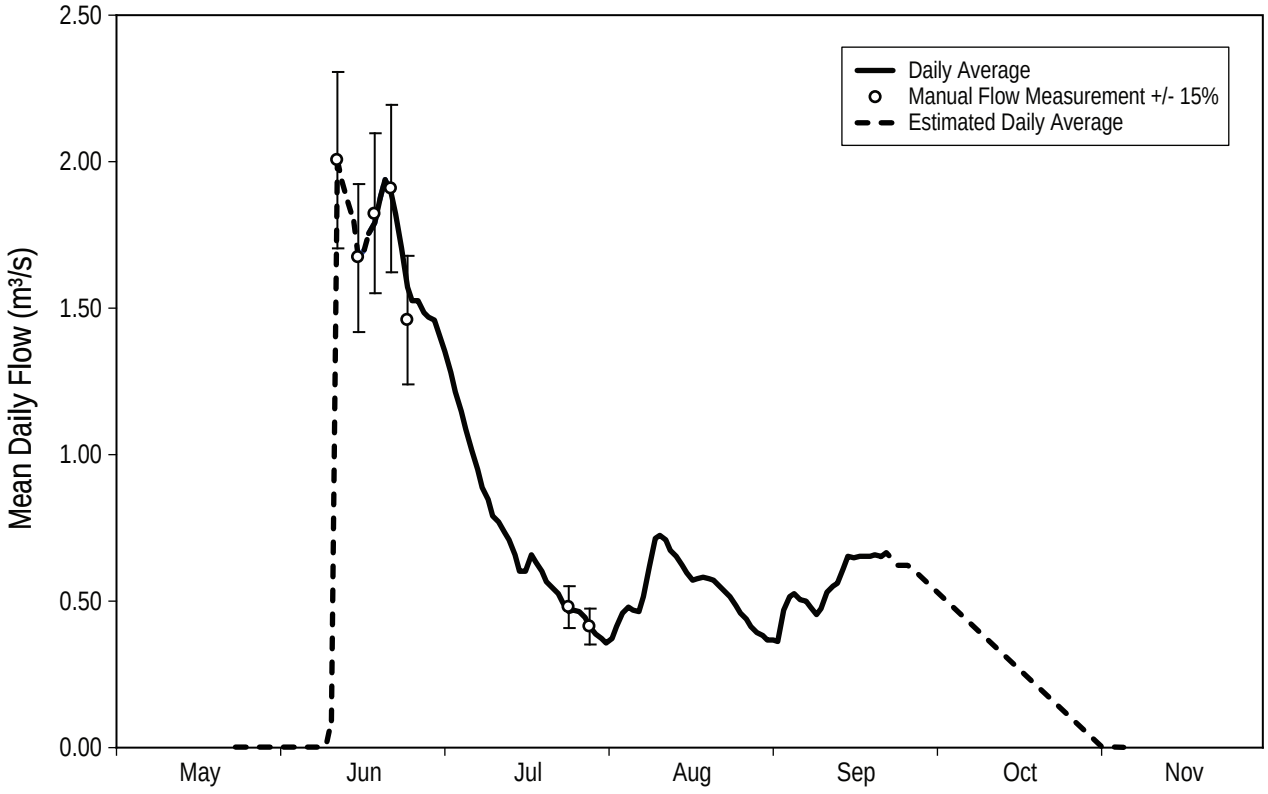
Annual Hydrograph at Patch-Hydro, 2009

Rescan™ Engineers & Scientists



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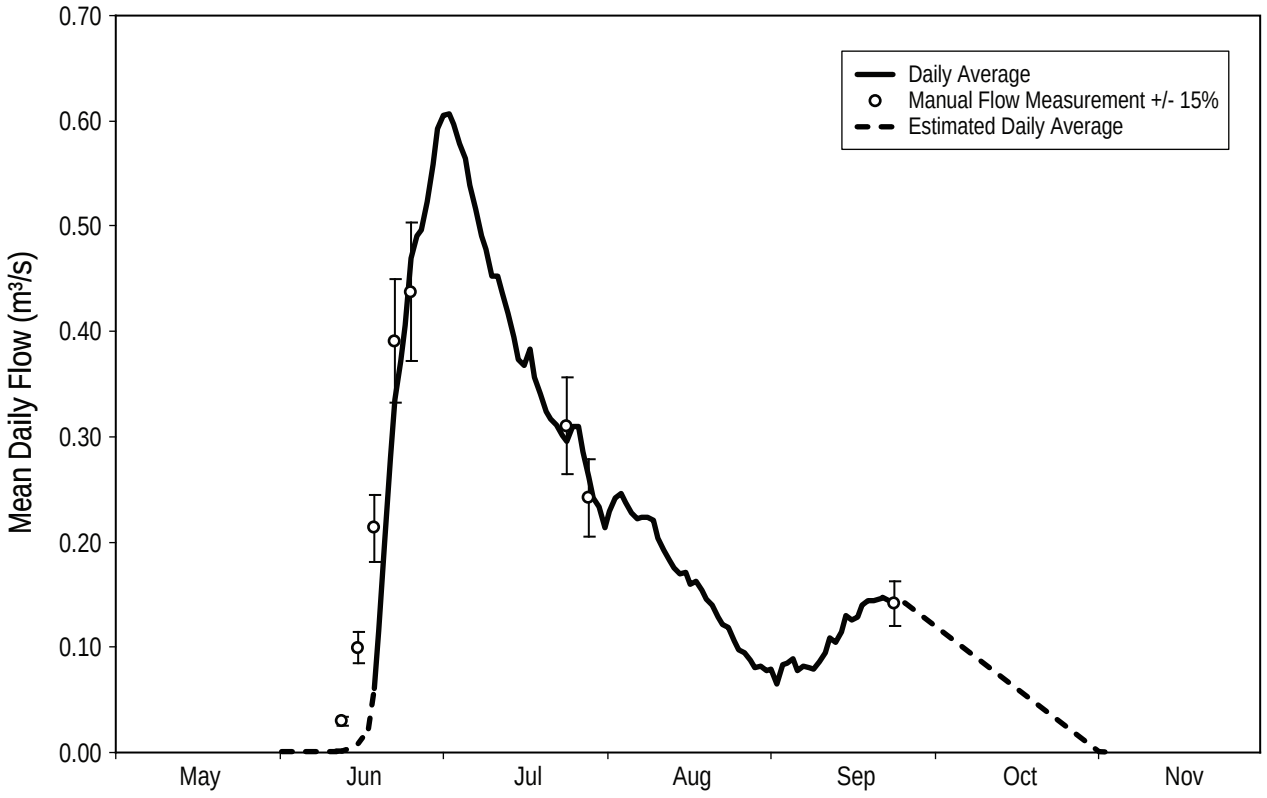
Annual Hydrograph at PO-Hydro, 2009

Appendix 5

Rescan™ Engineers & Scientists



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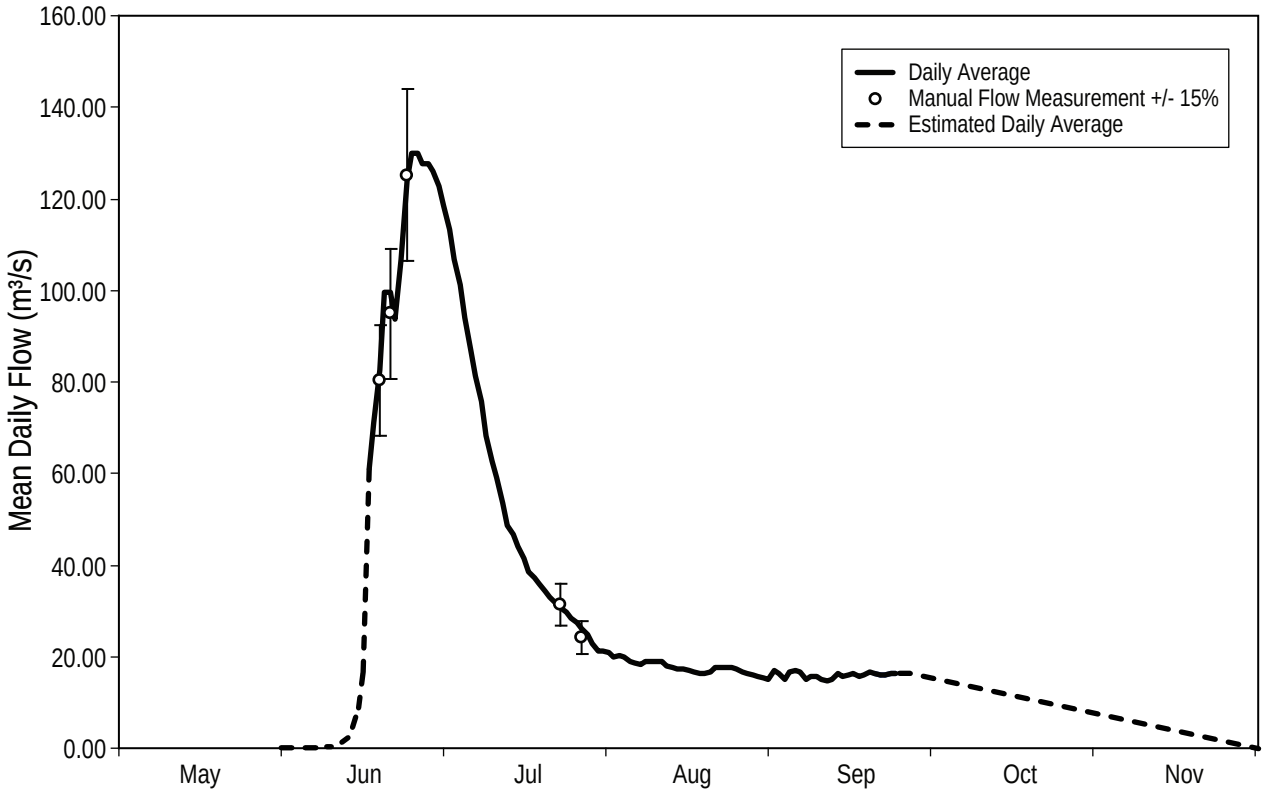
Annual Hydrograph at Reference-A-Hydro, 2009

Appendix 5

Rescan™ Engineers & Scientists



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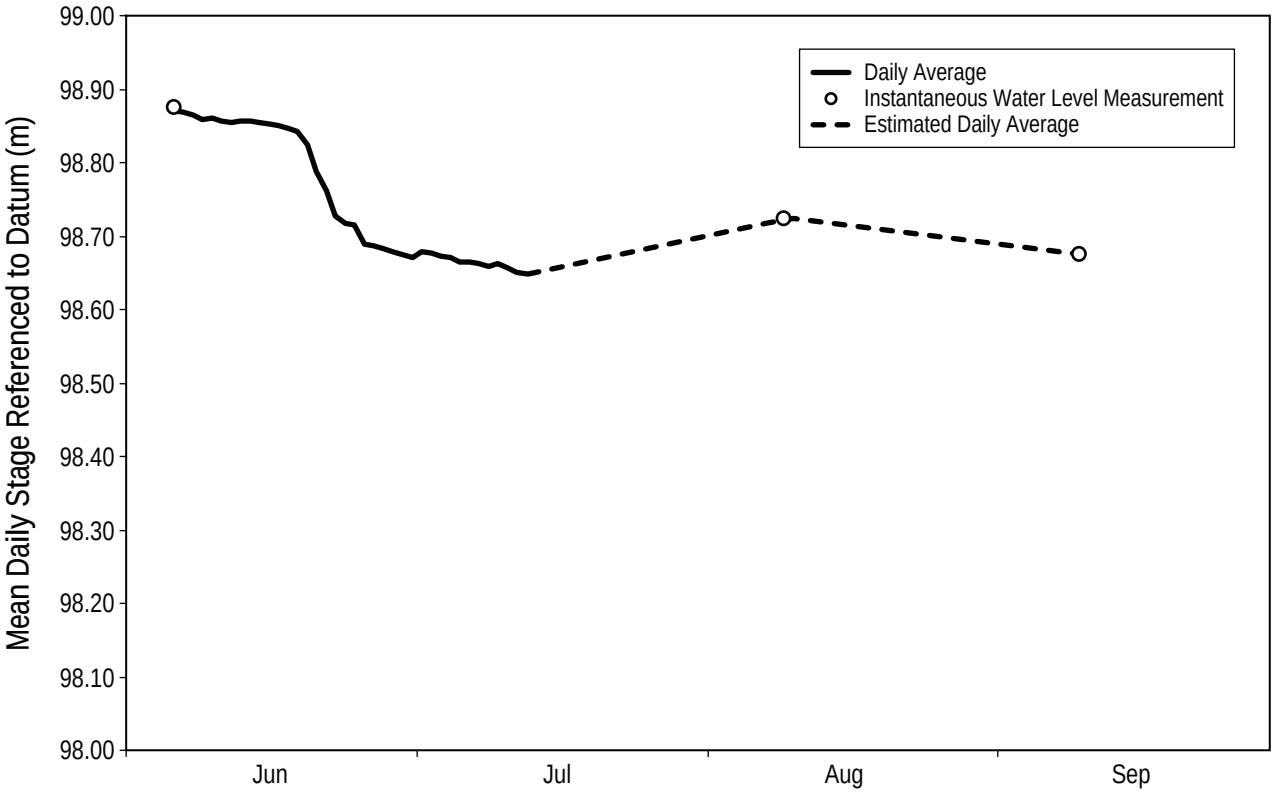
Annual Hydrograph at Koignuk-Hydro, 2009

Appendix 5

Rescan™ Engineers & Scientists



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Water Levels at Wolverine-Hydro, 2009

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