Appendix 10-B

Hydrology Baseline Report

DILLON CONSULTING

NWP COAL CANADA LTD

Crown Mountain Coking Coal Project

Hydrology Baseline Report

April 2020 - 12-6231

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Acronyms & Abbreviations

MOECC	British Columbia Ministry of Environment and Climate Change Strategy
FLNRORD	British Columbia Ministry of Forests, Lands, Natural Resource Operations & Rural Development
Dillon	Dillon Consulting Limited
masl	meters above sea level
mbar	millibar
mm	millimeters
m^3/s	cubic meters per second
ROMt	run-of-mine tonnes
tpd	tonnes per day
WSC	Water Survey of Canada

Definitions

Barometric pressure	Force exerted by the atmosphere at a specific location on Earth.
Climate normals	Averaged meteorological data averaged over a certain time period (e.g., 1981 to 2010).
Crown Mountain Coking Coal Project	Referred to as “the Project”.
Precipitation	The falling of any product of the condensation of atmospheric water vapour (e.g., rain, sleet, snow, hail).
Precipitation rate	The amount of precipitation falling within a defined period of time.
Precipitation accumulation	The amount of cumulative precipitation within a defined period of time.

Executive Summary

NWP Coal Canada Ltd (NWP) is proposing to develop the Crown Mountain Coking Coal Project (the Project). The proposed Project is an open pit metallurgical coal mine in the Elk Valley coal field, located within the East Kootenay region of southeastern British Columbia (BC). The proposed Project is situated proximate to existing metallurgical coal mines, including Teck Coal Limited's Elkview Operations located 8 km to the southwest and Line Creek Operations located 12 km to the north. The mine is expected to produce approximately 10,150 tonnes per day (tpd) and up to 4.0 million run-of-mine tonnes (M ROMt) per year for 15 years.

To fulfill the Application Information Requirements (AIR) set out by the British Columbia Environmental Assessment Office (BC EAO) and Environmental Impact Statement (EIS) guidelines set out by the Canadian Environmental Assessment Agency (CEAA), Dillon Consulting Limited (Dillon) conducted a hydrology baseline study at the proposed Project site. Baseline hydrology information will be applied to the environmental assessment process as part of determining the potential impacts of the proposed Project on several Valued Components.

Study Area

The study areas that were adopted for the hydrology baseline study define the spatial limits for which potential hydrological impacts related to the Project will ultimately be evaluated. The overall study area is further defined by a local and regional study area, as described below.

- **Project Footprint Area** – The Project footprint consists of the proposed mine infrastructure and support facilities, including the plant area (raw coal stockpile area and processing plant), clean coal transportation route, rail load-out facility and rail siding, and ancillary facilities (i.e., water supply, power supply, natural gas supply, water, sewage treatment, fuel storage and explosives storage).
- **Local Study Area (LSA) –** The LSA includes the Project footprint and the surrounding area where potential impacts associated with Project activities could directly affect hydrologic conditions. The LSA covers an area of approximately 228.6 km^2, which encompasses the Project footprint and extends to the catchment boundaries for the Grave Creek and Alexander Creek watershed areas.
- **Regional Study Area (RSA) –** The RSA encompasses the full extent of the Elk River watershed and the portion of Lake Koocanusa located north of the Canada-USA border. The RSA extends beyond the LSA and covers a total geographic area of approximately 4,387.3 km^2. The RSA comprises the area where changes in the local hydrological environment could potentially be indirectly impacted by the Project in the regional area.

Hydrology Baseline Study Methodology

The baseline hydrology study involved the compilation and synthesis of available background information in addition to the development and implementation of a hydrometric monitoring program and analyses of long-term regional hydrology data.

A summary of the hydrometric monitoring station locations and the associated monitoring period for each is provided in **Table ES-1**.

Table ES-1. Summary of Hydrometric Monitoring Station Locations

Station Name	Watercourse	Latitude	Longitude	Monitoring Began	Monitoring Ended
A1	Alexander Creek	49°39'19.7"N	-114°43' 51.6"W	May 15, 2012	Ongoing
A3	Alexander Creek	49°46'17.5"N	-114°43'12.0"W	May 16, 2012	July 18, 2014
A3B	Alexander Creek	49°44'47.0"N	-114°42'57.6"W	July 18, 2014	May 2, 2016
WA1	West Alexander Creek	49°46'32.4"N	-114°43'19.2"W	May 16, 2012	May 2, 2016
G2	Grave Creek	49°49'55.7"N	-114°49'19.2"W	May 15, 2012	Ongoing

The hydrometric monitoring program involved the collection of continuous water level data at each of the stations over its corresponding monitoring period, together with periodic stream gauging measurements. Stream gauging was generally conducted approximately 2-4 times per year based on the seasonal freeze-up and runoff schedule.

A meteorology baseline study was undertaken in conjunction with the hydrometric monitoring program, which involved the installation of a climate station within the Project footprint for the purpose of collecting baseline data for various climate variables between January 2014 and May 2016. The hydrology baseline study involved a review and analysis of relevant climate data (i.e., temperature and precipitation) collected within the Project footprint in addition to regional climate statistics.

In addition, the hydrology baseline study involved the compilation and analysis of available hydrometric data for the purpose of establishing key streamflow statistics at several locations within the RSA, including mean annual and seasonal flow/yield, peak flood flows, and low flow data

Summary of Results

Local Study Area

Through a review of the annual and monthly runoff data for the common period of assessment for the hydrology baseline monitoring program (2014-2016), it is noted that most of the runoff occurred between April and July at all of the hydrometric monitoring stations in the LSA, with a significant portion of the runoff generated in the months of June and July. Furthermore, the mean annual and monthly runoff was generally highest at Station A3B, with the greatest annual value in 2014 (1,367.3 mm). The lowest proportion of runoff typically occurred in the late summer, winter, and early spring months at all of the hydrometric monitoring stations.

An assessment of monthly flow data over the baseline monitoring period indicates that the highest maximum flows in the Alexander Creek (A1) and Grave Creek (G2) occurred in 2013, while the lowest minimum flows at both these watercourses occurred in 2018 (not including 2019 as it is a partial year of

data). The highest average mean and maximum flows recorded across the stations are associated with Station A3B, in Alexander Creek and the lowest corresponding values occurred at Station WA1 in West Alexander Creek.

Regional Study Area

The mean monthly discharge data for the regional hydrometric stations evaluated as part of this study indicates that the highest flows generally occur in the late spring and summer months, which coincides with the timing of the annual freshet. Surrounding the Project, the mean yields of nearby watercourses are greatest for the Hosmer Creek, Michel Creek, and Line Creek stations, while the lowest mean yields occurred at the Grave Creek station.

Frequency analyses were performed for seven hydrometric stations located in the RSA. A summary of the key hydrology statistics is provided in **Table ES-2**.

Table ES-2. Summary of Regional Hydrometric Station Information

Parameter	Elk River at Fernie	Elk River near Natal	Fording River at the Mouth	Hosmer Creek above Diversions	Grave Creek at the Mouth	Michel Creek below Natal	Line Creek at the Mouth
Station ID	08NK002	08NK016	08NK018	08NK026	08NK019	08NK020	08NK022
Drainage Area (km^2)	3,090	1,840	621	6.4	83.9	637	138
Period of Record	1919-2019	1950-2019	1970-2019	1981-2019	1970-1999	1970-1998	1971-2019
Mean Annual Flow (m^3/s)	47.73	26.20	8.09	0.12	1.08	10.72	2.14
Mean Annual Yield (mm)	487	447	411	596	406	531	694
10-Year Unit Area 7-Day Low Flow ($L/s/km^2$)	2.3	1.9	1.9	1.7	2.0	1.6	2.4
10-Year Unit Area Peak Discharge ($L/s/km^2$)	152.8	142.4	164.3	296.9	135.9	215.1	189.9

The results of the regional analysis indicate that the mean annual yields are highest at the Hosmer Creek, Michel Creek, and Line Creek stations, while the lowest values are represented by the Grave Creek station. With respect to 7-day low flow conditions, the lowest unit area values occurred at the Michel Creek and Hosmer Creek stations, with the highest values at the Line Creek and Elk River at Fernie stations. Unit area peak discharge rates were highest at the Hosmer Creek and Michael Creek stations, and lowest at the Grave Creek and Elk River at Fernie stations.

1.0 Introduction

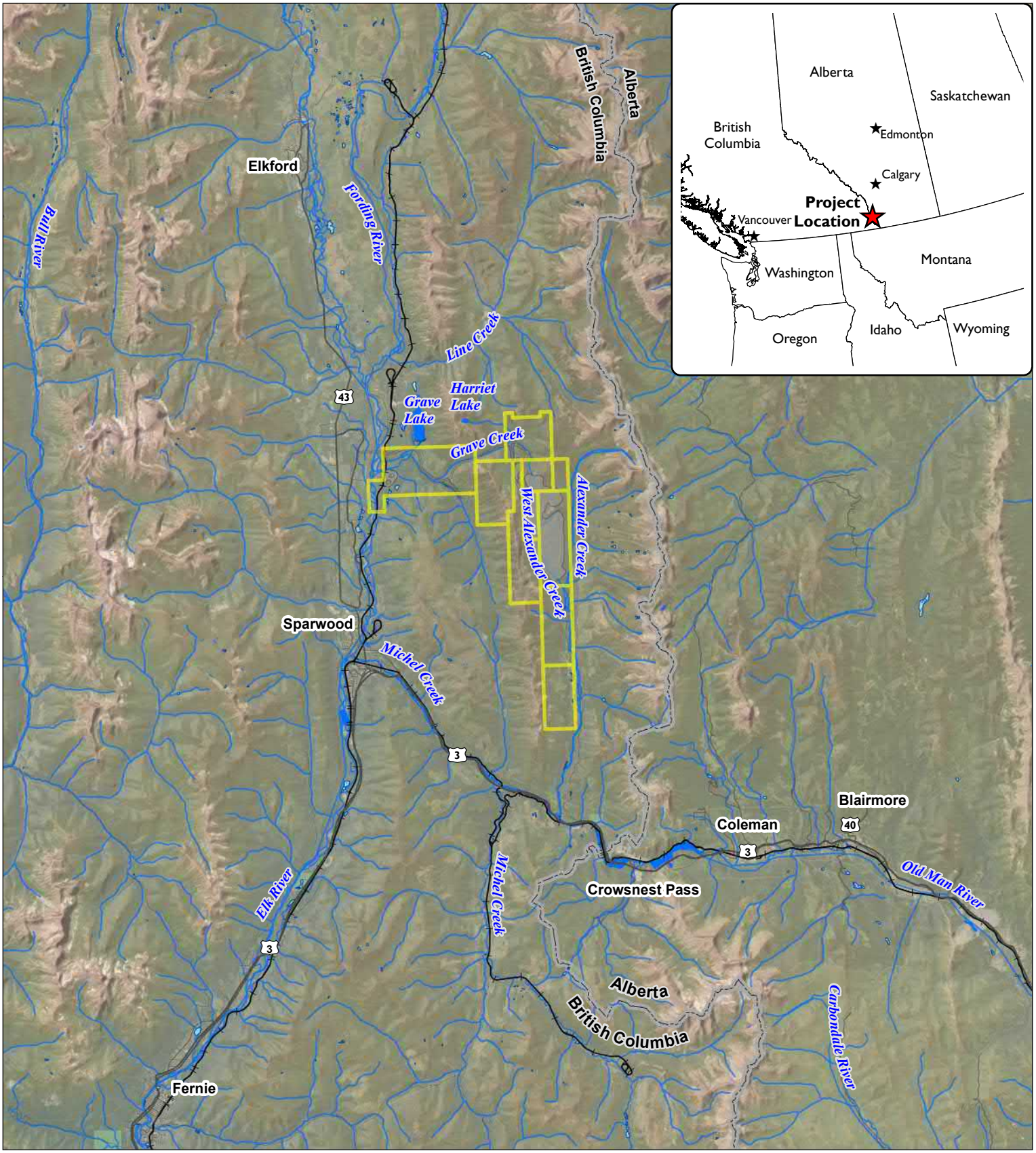
1.1 Overview

NWP Coal Canada Ltd (NWP) is proposing to develop the Crown Mountain Coking Coal Project (the Project) which is intended as an open pit metallurgical coal mine located within the Elk Valley coal field in the East Kootenay Region of southeastern British Columbia (BC; (**Figure 1**). NWP is a subsidiary of Jameson Resources Limited and Bathurst Resources Limited (Canada). The Project comprises ten coal licenses as shown on **Figure 1**. The Project is located between several existing metallurgical coal mines in the Elk Valley and Crowsnest coal fields, with Teck Coal Limited's (Teck) Elkview Operations located approximately 8 kilometres (km) southwest of the Project area and their Line Creek Operations located approximately 12 km north of the Project area. The Project area is located approximately 30 km by road from Sparwood, BC and is accessible by several Forest Service Roads, including Grave Creek Road in the northwest and Alexander Creek Road from the south.

The anticipated production capacity of the Project is up to 4.0 million run-of-mine tonnes (M ROMt) per annum for a duration of approximately 15 years, not including site decommissioning. This equates to a coal production capacity of approximately 10,150 tonnes per day (tpd). Exploration activities have indicated that the coal at the Project site is typical of coking coals produced from existing mines in the Elk Valley. The high quality metallurgical coal would be transported via railway to coastal BC, where it would be shipped overseas to be used in steelmaking.

Key components of the proposed Project include, but are not limited to:

- Surface extraction areas (3 pits – north pit, east pit, and south pit);
- Waste rock management areas;
- Plant area (includes raw coal stockpile area, a processing plant, and site support facilities);
- Clean coal transportation route (via an overland conveyor and haul road);
- Rail load-out facility and rail siding (includes various auxiliary facilities such as a guard house, light vehicle wash, drug and alcohol testing/orientation building, and a small dry);
- Power supply;
- Natural gas supply;
- Explosives storage;
- Fuel storage;
- Sewage treatment; and,
- Water supply.



Crown Mountain
Coking Coal Project

Hydrology Baseline Report
Project Location

Figure 1

LEGEND

- Project Footprint
- Coal Licences
- Provincial Park
- Waterbody
- Wetland
- Watercourse
- Highways
- Arterial Roads
- Local/Resource Roads
- Railway (Canadian Pacific)
- BC/Alberta Border

0 2.5 5 10 km

SCALE 1:300,000

MAP DRAWING INFORMATION:
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MAP CREATED BY: RBB
MAP CHECKED BY: JW
MAP PROJECTION: NAD 1983 UTM Zone 11N

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PROJECT: 12-6231
STATUS: FINAL
DATE: 2021-08-13

FILE LOCATION: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\Hydrology Maps\MXD\8_5x11\126231 Baseline Hydrology - Project Location.mxd

1.2 Purpose and Objectives

The Project is subject to both the *Canadian Environmental Assessment Act* (*CEAA*) 2012 and the *British Columbia Environmental Assessment Act (BC EAA)* 2002. Provincially, the Project is considered a Reviewable Project given that the production capacity of the mine will be greater than 250,000 tonnes per year of clean coal and will result in a disturbance greater than 750 hectares (ha) that was not previously permitted for disturbance (*BC EAA*, 2002). Federally, the Project is considered a Designated Project under the *CEAA* (2012) Regulations Designating Physical Projects, as the mine will have a production capacity of more than 3,000 tpd. Project-specific terms of reference were developed for the provincial EA process (EAO, 2018) and the federal EA process (CEAA, n.d.).

Under the project-specific provincial AIR and federal EIS guidelines for the Project's environmental assessment, characterization of baseline hydrological conditions is required to assess potential effects on the Surface Water Quantity (provincial) and Surface Water (federal) Valued Components as a result of Project activities. The purpose of the hydrology baseline program is to describe the existing baseline hydrological conditions within the Project study area, which can ultimately serve as the basis for which potential impacts related to the Project activities can be identified and evaluated. This baseline report presents a summary of the information on the hydrological conditions in the Project area and provides regional context based on publically available information.

This hydrology baseline report is organized into the following sections:

- **Section 2.0** describes the setting of the Project and relevant study areas;
- **Section 3.0** provides a summary of relevant background information;
- **Section 4.0** outlines the methodology adopted for the baseline study;
- **Section 5.0** presents the results of the baseline study; and,
- **Section 6.0** provides a summary of key baseline results.

1.3 Scope

The purpose of the hydrology baseline study is to provide an overview of existing hydrological conditions at key watercourses that may be impacted by the proposed Project, including Alexander Creek, West Alexander Creek, and Grave Creek.

The key objectives of the hydrology baseline study are as follows:

1. Compile, review, and analyze available long-term climate and hydrologic data to identify existing climate/hydrology characteristics and trends in the region.
2. Collect continuous hydrometric data for all drainage basins and watercourses that could be affected by the Project.
3. Produce daily flow data and annual hydrographs for each baseline hydrometric station.

4. Calculate hydrology statistics including annual runoff, low flows and peak flows, and monthly flow rates (minimum, average, and maximum).
5. Conduct statistical analyses using available regional hydrologic data.

An outline of the methodology that was applied to accomplish each of the hydrologic baseline study objectives is provided below in **Section 4.0**.

1.4 Applicable Standards

The siting, installation, and collection of data hydrometric stations and development of discharge measurements and stage-discharge rating curves were performed in accordance with the Ministry of Environment's *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE Guideline, 2012) and the Ministry of Environment and Climate Change Strategy *Manual of British Columbia Hydrometric Standards Version 1.*0 (BC MOECCS Manual, 2018).

2.0 Study Areas

The study areas that were adopted for the hydrology baseline study define the spatial limits for which potential hydrological impacts related to the Project will ultimately be evaluated. The overall study area is further defined by a local and regional study area, as described below.

2.1 Project Footprint

The centre of the Project is positioned approximately 12 km northeast of the District of Sparwood and approximately 5 km west of the provincial boundary between BC and Alberta (**Figure 1**). The Project property is accessible by several Forest Service Roads, including Grave Creek Road in the northwest and Alexander Creek Road from the south. By road, the Project is situated approximately 30 km from Sparwood.

The Project footprint consists of the proposed mine infrastructure and support facilities, including the plant area (raw coal stockpile area and processing plant), clean coal transportation route, rail load-out facility and rail siding, and ancillary facilities (i.e., water supply, power supply, natural gas supply, water, sewage treatment, fuel storage and explosives storage).

As shown on **Figure 2**, the Project footprint is located within portions of two watersheds, Grave Creek and Alexander Creek. The characteristics of the two watersheds are described below. The majority of the Project footprint is located within the Alexander Creek watershed, while the access roads leading to the mine are generally located within the Grave Creek watershed.

2.2 Local Study Area

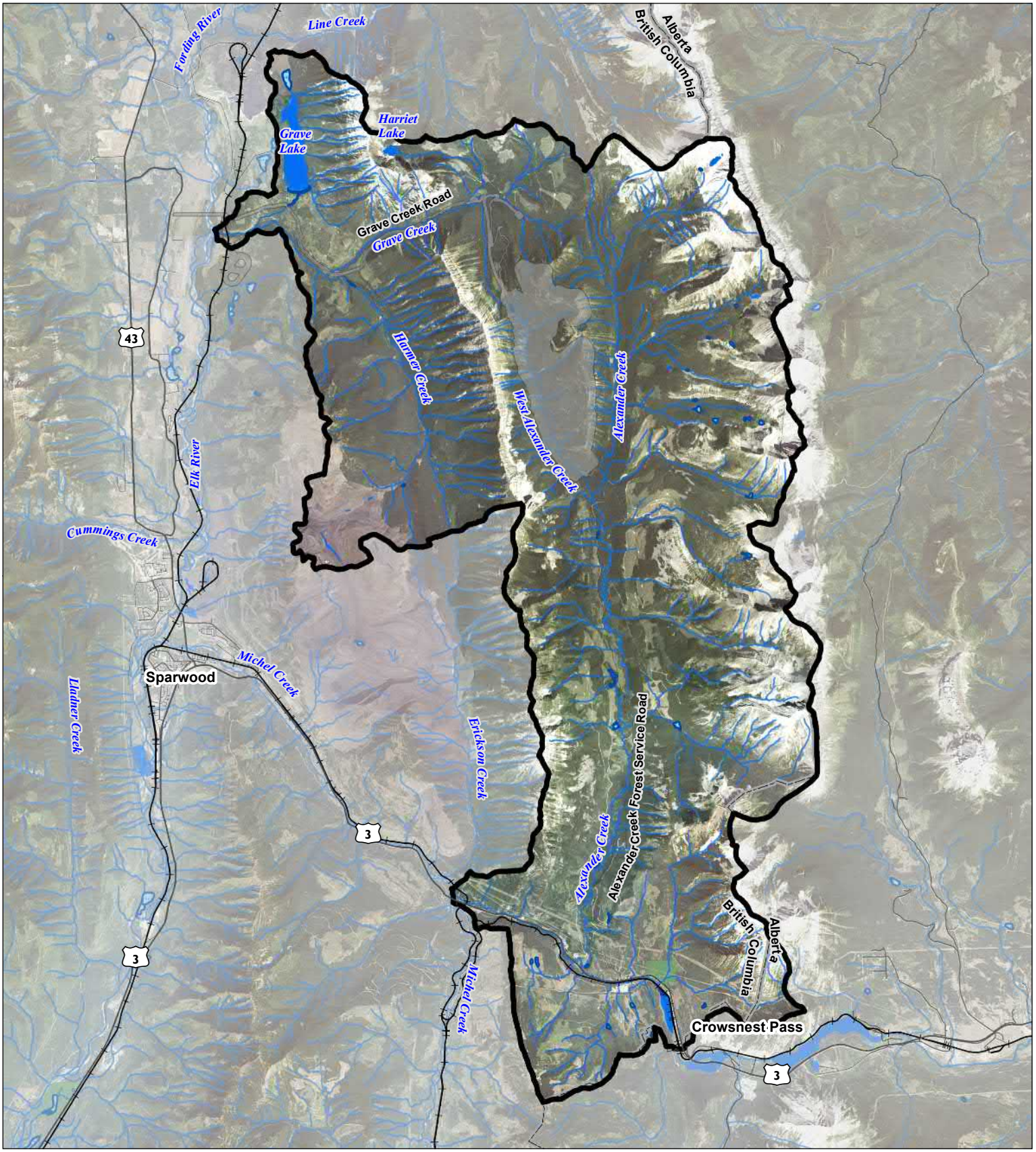
The Local Study Area (LSA) includes the Project footprint and the surrounding area where potential impacts associated with Project activities could directly affect hydrologic conditions. The Local Study Area covers an area of approximately 228.6 km^2, which encompasses the Project footprint and extends to the catchment boundaries for the Grave Creek watershed (including Harmer Creek) and Alexander Creek watershed areas (including West Alexander Creek; **Figure 2**).

Key watercourses in the area include Alexander Creek, West Alexander Creek, and Grave Creek. A description of the drainage basins for each of these watercourses is provided in **Section 3.1**.

2.3 Regional Study Area

The Regional Study Area (RSA) generally encompasses the full extent of the Elk River watershed and the portion of Lake Koocanusa located north of the Canada-USA border (**Figure 3**). The RSA extends beyond the LSA (described above) and covers a total geographic area of approximately 4,387.3 km^2. The Regional Study Area comprises the area where changes in the local hydrological environment could potentially be indirectly impacted by the Project in the regional area.

The headwaters of the Elk River watershed originate within Elk Lakes Provincial Park and the River flows in a southerly direction to its outlet into Lake Koocanusa, approximately 20 km north of the Canada-USA border. The Elk River has many significant tributaries, including the Fording River, Line Creek, Wigwam River, and Michel Creek. It is notable that streamflows in the lower reaches of the Elk River are regulated by a hydro-electric dam near Elko (Elko Dam), which is operated by BC Hydro.



Crown Mountain
Coking Coal Project

Hydrology Baseline Report
Local Study Area

Figure 2

LEGEND

- Local Study Area
- Project Footprint
- Provincial Park
- Waterbody
- Wetland
- Watercourse
- Highways
- Arterial Roads
- Local/Resource Roads
- Railway (Canadian Pacific)
- BC/Alberta Border

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MAP CREATED BY: RBB
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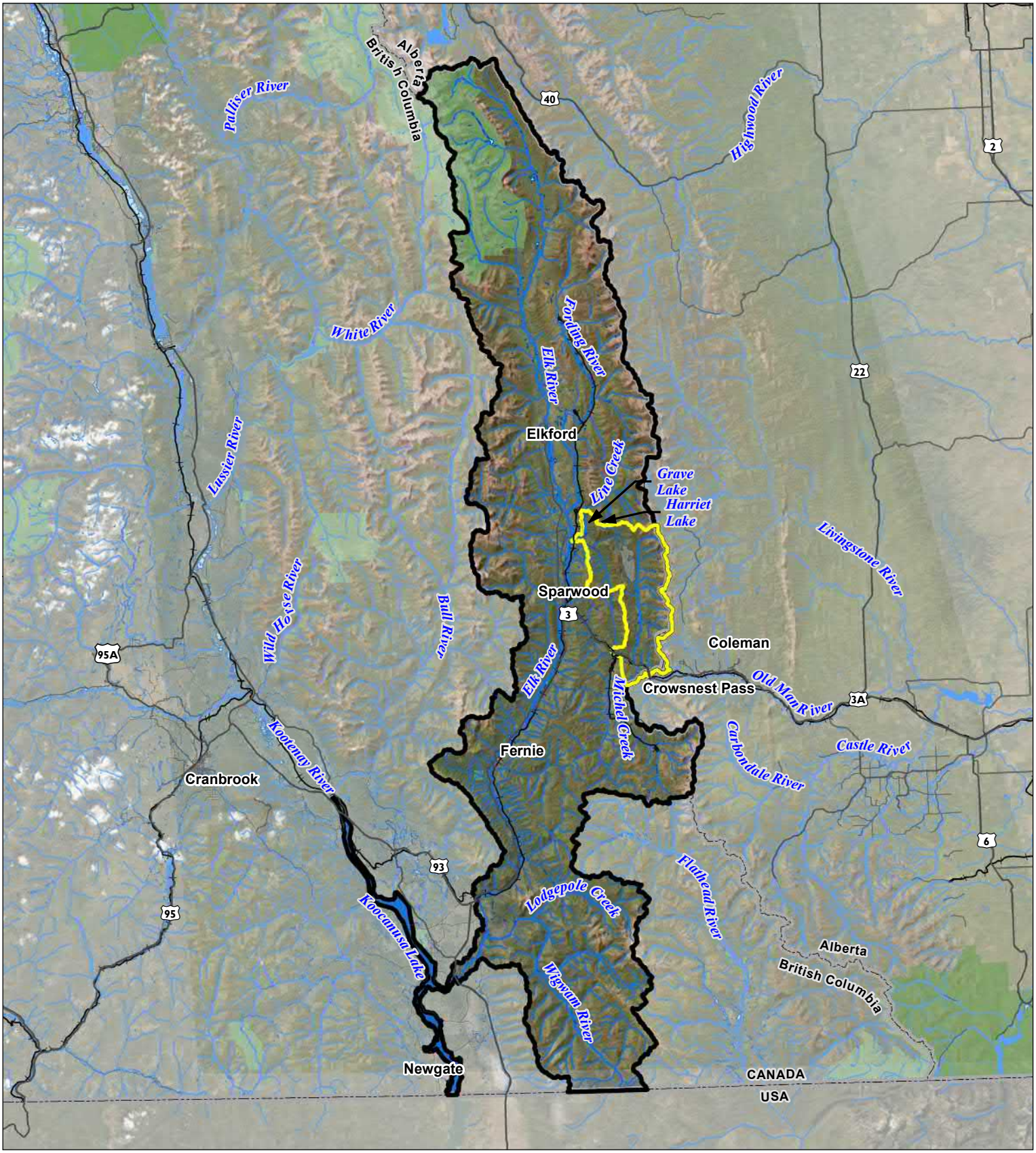

Crown Mountain
Coking Coal Project

Hydrology Baseline Report
Regional Study Area
Figure 3

LEGEND

- Regional Study Area
- Local Study Area
- Project Footprint
- National Park
- Provincial Park
- Waterbody
- Wetland
- Watercourse
- Highways
- Arterial Roads
- Local/Resource Roads
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- BC/Alberta Border

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3.0 Background Information

A summary of available background information related to the hydrologic characteristics of the LSA and RSA is provided below.

3.1 Data Compilation and Review of Background Information

Existing information for use in this background review was compiled from a wide range of sources including, but not limited to:

- Federal databases and mapping sites (e.g., Environment Canada);
- Provincial databases and mapping sites (e.g., BC Water Resources Atlas);
- BC Environmental Assessment Office (EAO) – other environmental assessments (EAs) and baseline for projects in the area (e.g., Line Creek Operations Phase II Project – Teck Coal Ltd.); and,
- Private sector studies (e.g., NWP, Tembec Industries);

Further details regarding the data collection methodology of background information and field surveys are discussed in **Section 4.0**.

3.2 Local Study Area

3.2.1.1 Local Study Area Watersheds

The LSA boundary is comprised of the watershed areas of Alexander Creek and Grave Creek, which are described below and shown on **Figure 4**.

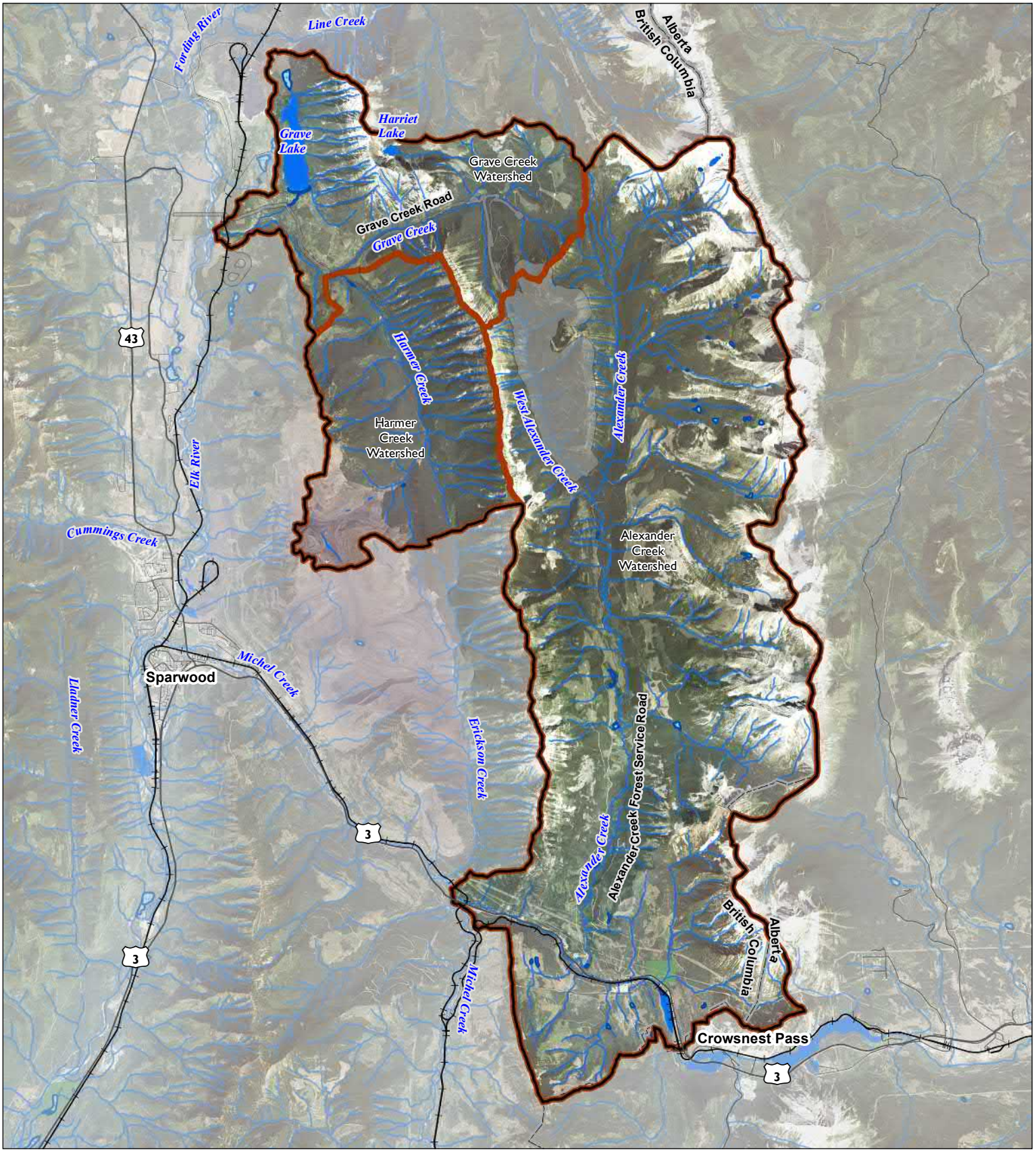
ALEXANDER CREEK WATERSHED

A summary of background information for the Alexander Creek watershed is provided in **Table 1**.

Table 1. Alexander Creek Watershed Information Summary

Watercourse	Watershed Area (km^2)	Elevation (m) [min – mean – max]	Mean Annual Discharge (m^3/s)	Annual Runoff (m^3/yr)	Current Allocations (m^3/yr)
Alexander Creek	184.9	1,352 – 1,878 – 2,656	2.952	93,151,224	8,302
West Alexander Creek	14.7	1,589 – 1,958 – 2,368	0.286	9,017,614	0

Source: FLNRORD, 2019



Crown Mountain
Coking Coal Project

Hydrology Baseline Report
Local Study Area Watersheds

Figure 4

LEGEND

- Local Study Area
- Project Footprint
- Provincial Park
- Watershed
- Waterbody
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- Watercourse
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Alexander Creek

The Alexander Creek watershed is the largest drainage basin in the LSA and covers a watershed area of approximately 184.9 km^2, which is oriented in a north to south direction. Currently, the land cover of Alexander Creek's watershed is coniferous, shrub, and barren (69.9%, 15.4%, and 8.7%, respectively; FLNRORD, 2019).

Alexander Creek flows in a southerly direction from its headwaters to its confluence with Michel Creek, which is approximately 10.7 km southeast of Sparwood. Michel Creek flows northwesterly along Highway 3 and ultimately discharges to the Elk River near Sparwood. The total length of Alexander Creek is approximately 25 km. As shown on **Figure 4**, Alexander Creek has numerous tributaries that generally consist of high-gradient mountain streams, which are generally characterized as having intermittent flow conditions. The most significant tributary to Alexander Creek is West Alexander Creek (described below).

There are no known flood risk areas in the Alexander Creek watershed.

West Alexander Creek

West Alexander Creek has a watershed area of approximately 14.7 km^2. The Project footprint is predominately located within the West Alexander Creek drainage basin.

West Alexander Creek flows in a south to southeast direction over a distance of approximately 6 km to its confluence with Alexander Creek. The watercourse has several tributaries, which generally consist of small, high-gradient mountain streams.

GRAVE CREEK WATERSHED

Table 2 provides a summary of watershed information for Grave Creek.

Table 2. Grave Creek Watershed Information Summary (FLNRORD, 2019)

Watercourse	Watershed Area (km^2)	Elevation (m) [min – mean – max]	Mean Annual Discharge (m^3/s)	Annual Runoff (m^3/yr)	Current Allocations (m^3/yr)
Grave Creek	80.9	1,254 – 1,764 – 2,463	1.088	34,331,932	0
Harmer Creek	39.0	1,389 – 1,783 – 2,450	0.530	16,716,113	0

Source: FLNRORD, 2019

Grave Creek

The Grave Creek watershed covers an area of approximately 80.9 km^2, which is oriented in a west to east direction. The current land cover of Grave Creek's watershed is coniferous, shrub, and barren

(88.1%, 7.7%, and 2.5%, respectively), with the remainder of the watershed generally consisting of water bodies (Grave Lake and Harriet Lake; FLNRORD, 2019).

Grave Creek generally flows westerly and drains into the Elk River, approximately 12.5 km north of Sparwood. Several tributaries drain into Grave Creek, the largest of which being Harmer Creek (described below) and the unnamed tributary that conveys flows from Grave Lake to Grave Creek. In addition, there are several smaller tributaries, which consist of high-gradient mountain streams where flows are generally intermittent.

There are no known flood risk areas in the Grave Creek watershed.

Water Survey of Canada (WSC) operated a hydrometric gauge on Grave Creek near its discharge location to the Elk River from 1970 to 1999 (Grave Creek at the Mouth – Station 08NK019). **Figure 5** provides a summary of the flow information for this station, which shows that Grave Creek flows are typically highest in the summer months.

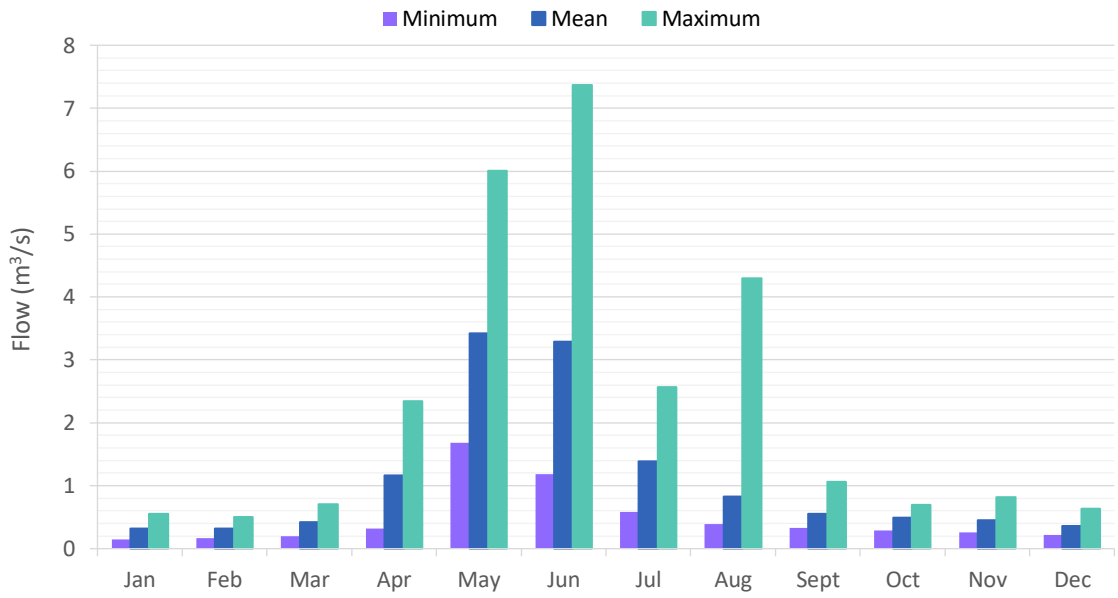


Figure 5. Monthly Flow Summary for Grave Creek at the Mouth – Station 08NK019 (WSC, 2019)

Harmer Creek

The Harmer Creek watershed covers an area of approximately 39 km^2 within the boundaries of the Grave Creek watershed. The watershed is generally oriented in a south to north direction. The current land cover of the watershed is coniferous, shrub, and barren (87.5%, 7.6%, and 4.9%, respectively; FLNRORD, 2019).

Harmer Creek generally flows northerly and drains into Grave Creek 12 km approximately northeast of Sparwood (**Figure 4**). This creek has several tributaries consisting of smaller high-gradient mountain streams.

3.2.1.2 RSA Watersheds

As noted above and shown on **Figure 3**, the RSA is comprised of the full extents of the Elk River and extends downstream to include the portion of Lake Koocanusa (along the Kootenay River) located north of the Canada-USA border. A description of the Elk River and its major tributaries is provided below.

ELK RIVER

The Elk River watershed covers an area of approximately 4,381 km^2 located in the southeastern corner of BC. The watershed is generally oriented in a north to south direction. The current land cover of the Elk River watershed is coniferous, shrub, and barren (68.4%, 14.8%, and 8.9%, respectively; FLNRORD, 2019).

The Elk River generally flows in a southerly direction from its headwaters in Elk Lakes Provincial Park and drains into Kootenay River at Koocanusa Lake approximately 33 km south of Sparwood. Streamflows in the lower reaches of the Elk River are regulated by a hydro-electric dam near Elko (Elko Dam), which is operated by BC Hydro.

WSC operates several hydrometric gauges along the Elk River and its tributaries. **Figures 6** and **7** provide a summary of monthly flow information for the stations at Elk River near Natal (08NK016) and Fernie (08NK002), respectively. As shown, the highest flow periods typically occur in the late spring and summer months, which generally coincides with timing of the annual freshet.

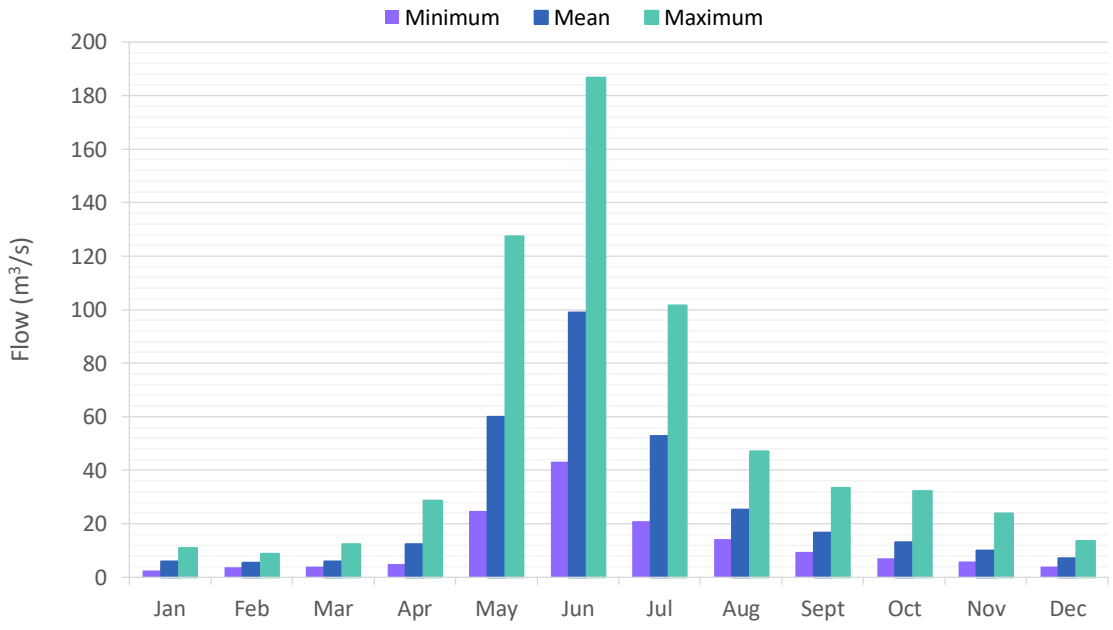


Figure 6. Monthly Flow Summary for Elk River near Natal – Station 08NK016 (WSC, 2019)

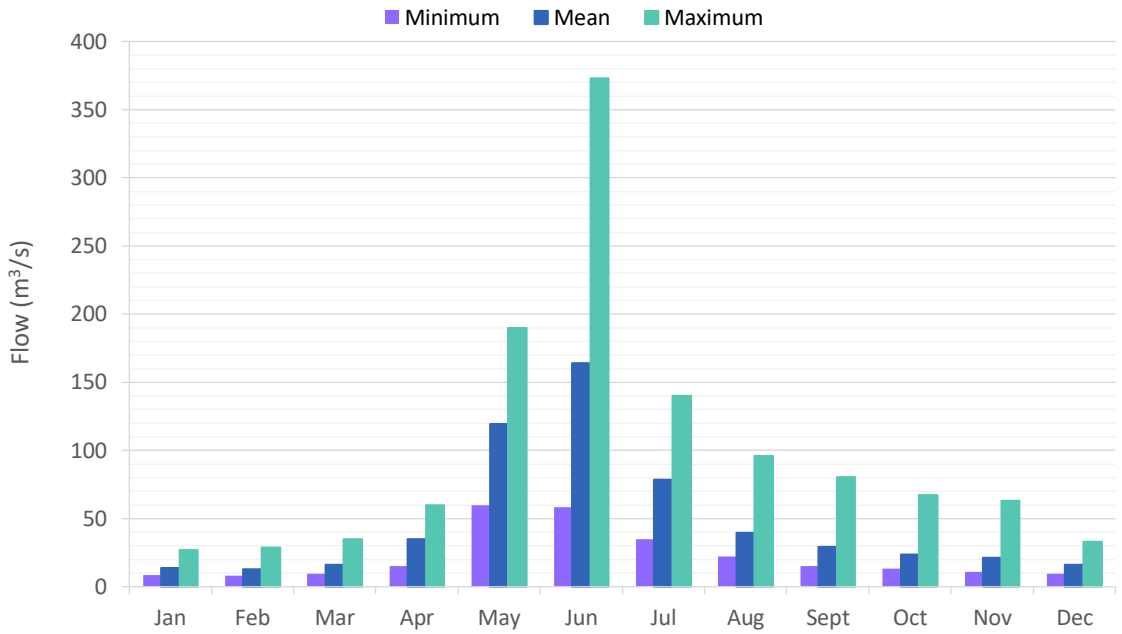


Figure 7. Monthly Flow Summary for Elk River at Fernie Station – Station 08NK002 (WCS, 2019)

ELK RIVER TRIBUTARIES

The Elk River has many significant tributaries, including the Fording River, Line Creek, Wigwam River, and Michel Creek. A summary of watershed information for Elk River and its major tributaries is provided in **Table 3**.

Table 3. Elk River Watershed Information Summary

Watercourse	Watershed Area (km^2)	Elevation (m) [min – mean – max]	Mean Annual Discharge (m^3/s)	Annual Runoff (m^3/yr)	Current Allocations (m^3/yr)
Elk River	4,381.0	981 – 1,820 – 3,124	75.373	542,936	99,303,917
Fording River	621.0	1,299 – 2,009 – 3,031	8.78	445,932	36,876,538
Line Creek	138.0	1,361 – 2,008 – 2,924	2.13	487,149	2,948,951
Michael Creek	646.0	1,234 – 1,813 – 2,735	10.845	529,806	29,760,249
Lodgepole Creek	177.0	1,034 – 1,697 – 2,526	3.69	656,633	0
Wigwam River	813.0	998 – 1,725 – 2,614	18.2	705,946	0

Source: FLNRORD, 2019

Fording River

The Fording River watershed covers an area of 621 km^2 in the northern portion of the Elk River watershed. The current land cover of the watershed is coniferous, shrub, and barren (60.3%, 13.7%, and 21.0%, respectively; FLNRORD, 2019). A summary of monthly flow information is provided in **Figure 8** (WSC, 2019).

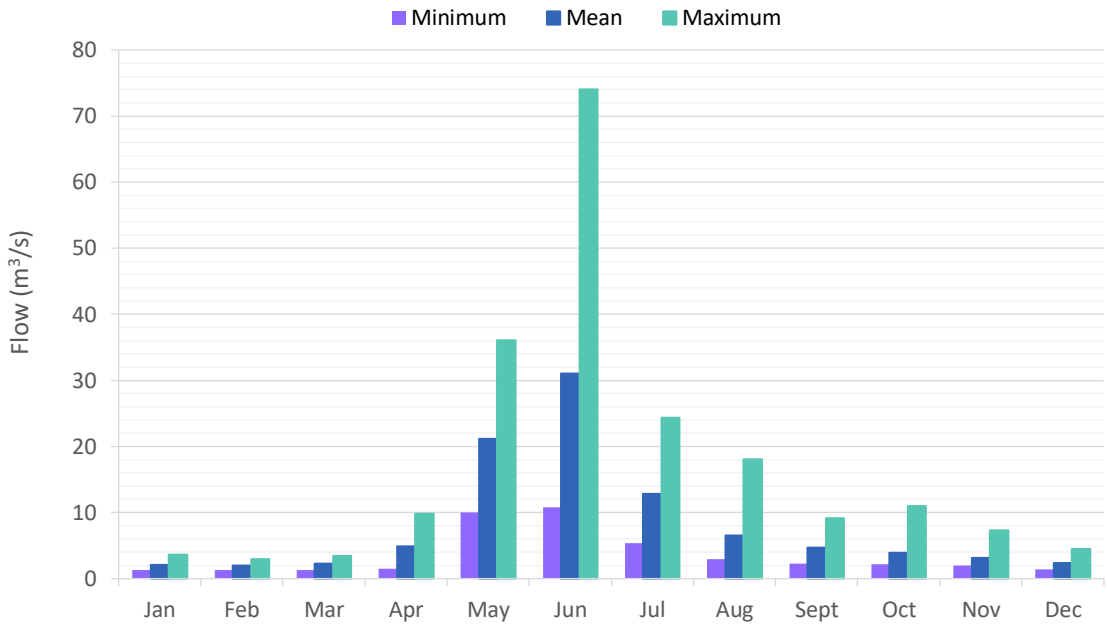


Figure 8. Monthly Flow Summary for Fording River at the Mouth – Station 08NK018 (WSC, 2019)

Line Creek

The Line Creek watershed covers an area of approximately 138 km^2 and is located within the northeastern portion of the Elk River. The current land cover of the watershed is coniferous, shrub, and barren (57.6%, 19.7%, and 17.8%, respectively; FLNRORD, 2019). A summary of monthly flow information is provided in **Figure 9** (WSC, 2019).

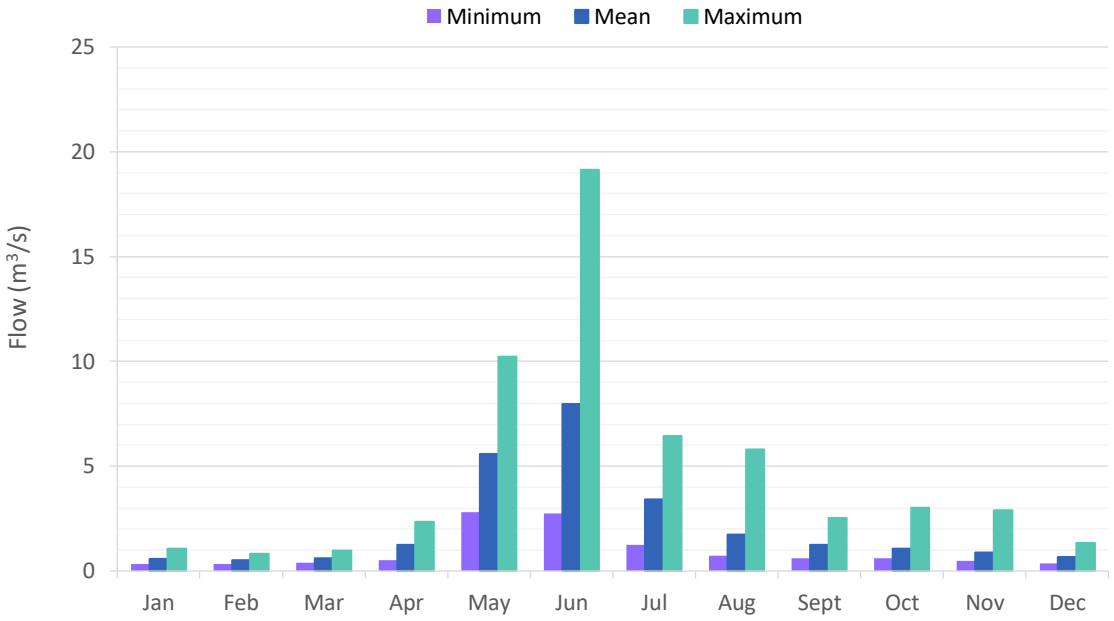


Figure 9. Monthly Flow Summary for Line Creek at the Mouth – Station 08NK022 (WSC, 2019)

Michel Creek

The Michel Creek watershed includes a total area of approximately 646 km^2, which is the second largest tributary area in the Elk River watershed. The current land cover of the watershed is coniferous, shrub, and barren (78.2%, 10.1%, and 7.6%, respectively; FLNRORD, 2019).

Michel Creek generally flows northerly and drains into the Elk River at Sparwood. Alexander Creek is a tributary of Michel Creek, with the confluence of the watercourses located along Highway 3 approximately 10.5 km southeast of Sparwood.

WSC operated a hydrometric gauge at Michel Creek below Natal (18NK020) from 1970 to 1998. **Figure 10** provides a summary of monthly flow information at this location.

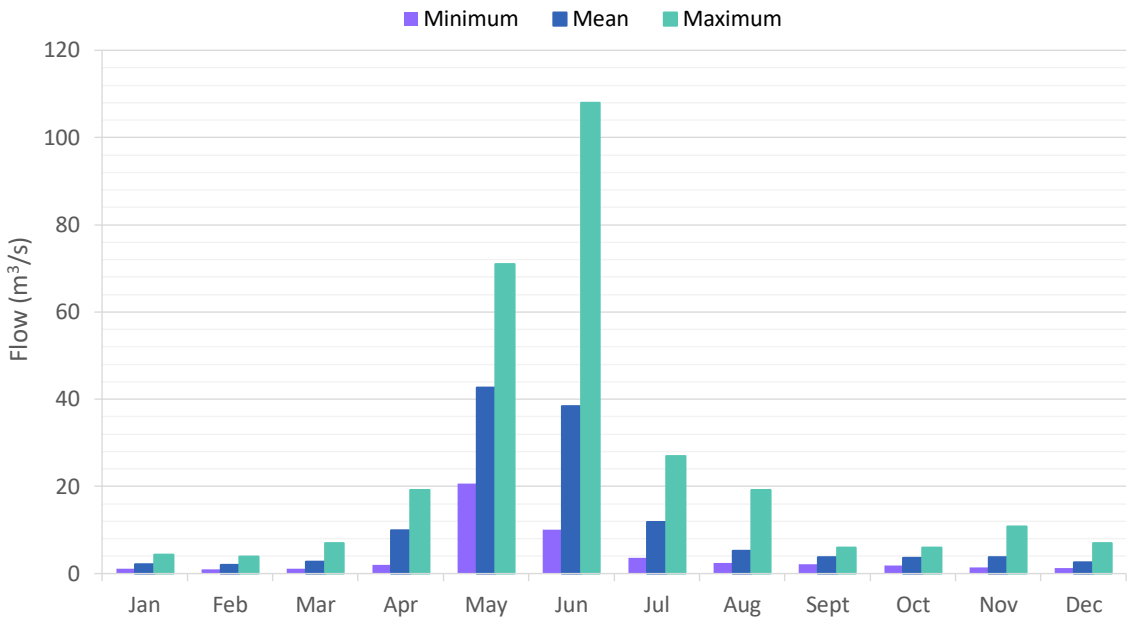


Figure 10. Monthly Flow Summary for Michel Creek below Natal – Station 08NK020 (WSC, 2019)

Wigwam River

The Wigwam River watershed covers an area of approximately 813 km^2, which represents the largest tributary area in the Elk River watershed. The watershed is generally oriented in a south to north direction, and the current land cover is coniferous, shrub, and deciduous (79.5%, 13.5%, and 2.4%, respectively; FLNRORD, 2019).

The Wigwam River generally flows in a northerly direction from its headwaters south of the Canada-USA border to its confluence with the Elk River approximately 10 km northeast of its outlet to Lake Koocanusa.

Lodgepole Creek

Lodgepole Creek is a tributary of the Wigwam River (described below) with a total watershed area of approximately 177 km^2. The watershed follows an east to west orientation and the current land cover is comprised of coniferous, shrub, and deciduous components (75.3%, 8.2%, and 8.7%, respectively; FLNRORD, 2019).

Lodgepole Creek generally flows west from its headwaters to it outlet to the Wigwam River, approximately 10 km upstream of its confluence with the Elk River. Notably, the Wigwam River watershed is located within the southern portion of the Elk River watershed.

4.0 Methodology

The baseline hydrology study involved the compilation and synthesis of available background information in addition to the development and implementation of a hydrometric monitoring program and analyses of long-term regional hydrology data. An outline of the methodology that was applied for each of the hydrologic baseline study objectives, as described in the Scope (**Section 1.3**), is provided below.

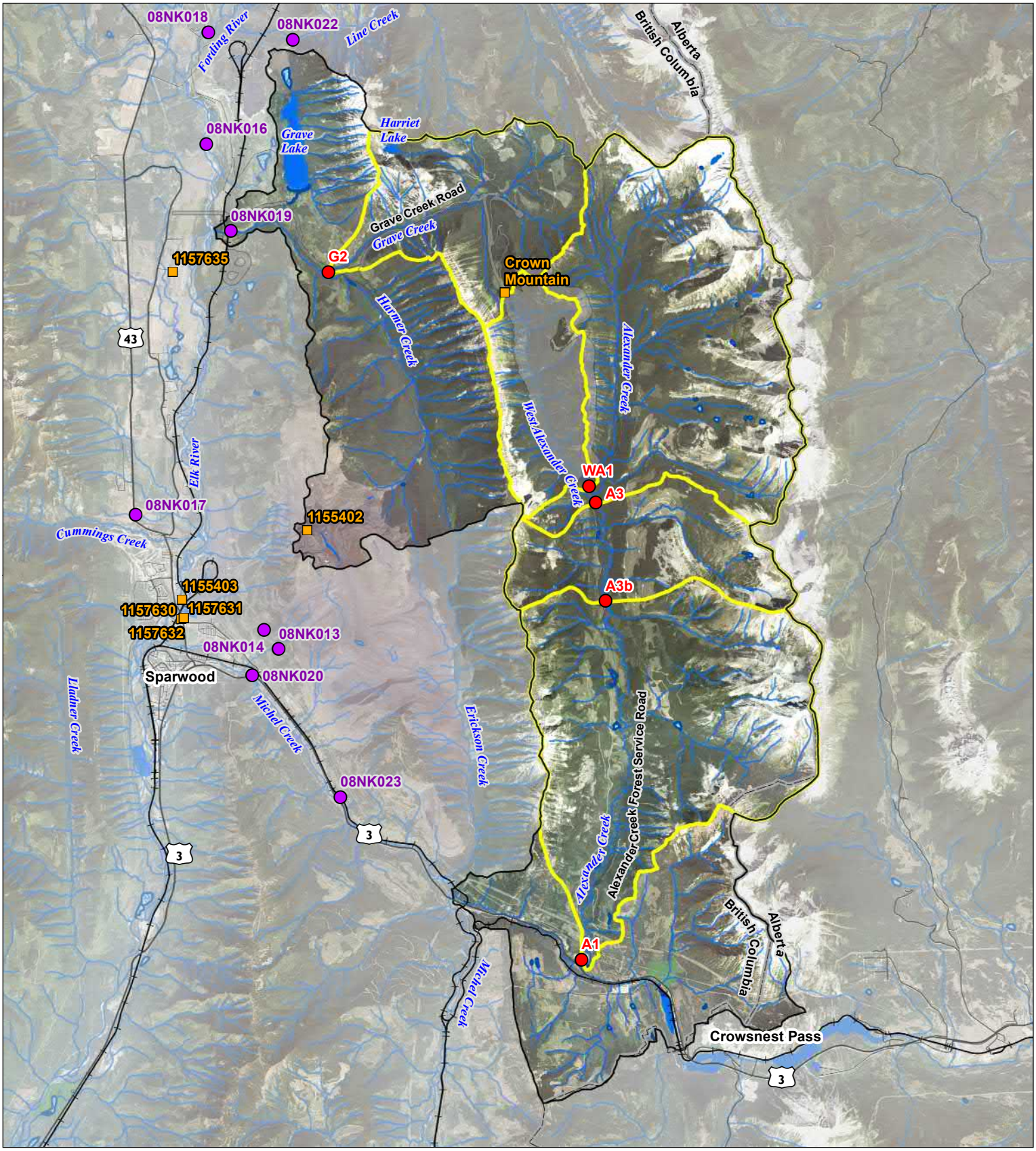
4.1 Climate Data Sources

4.1.1 Project Footprint and Local Study Area

A project-specific climate station was installed at a location within the Crown Mountain Coal License area in the headwaters of the Alexander/West Alexander watershed, which operated from January 2013 to May 2016.

The climate station was installed at approximately 661597E/5521663N; UTM Zone 11N at an elevation of 1920 masl (**Figure 11**). This location was selected based on accessibility and suitability for installation and for a location supportive of monitoring of climatic parameters that are representative of local conditions at the Project site. In addition, the location was chosen based on the Ministry's climate station installation guidelines and recommendations.

The initial Crown Mountain climate station install was completed on November 28, 2013. The climate station was first operational on November 29, 2013. However, meteorological data analysed in the following sections exclude data collected prior to January 1, 2014.



Crown Mountain
Coking Coal Project

Hydrology Baseline Report
Climate and Hydrometric Monitoring Stations

Figure 11

LEGEND

- Local Study Area
- Project Footprint
- Stream Flow Monitoring Station Catchment Area
- Provincial Park
- Waterbody
- Wetland
- Watercourse
- Highways
- Arterial Roads
- Local/Resource Roads
- Railway (Canadian Pacific)
- BC/Alberta Border
- Climate Station (Dillon)
- Stream Flow Monitoring Station (Dillon)
- Hydrometric Station (Environment Canada)

0 0.5 1 2 3 4 5 km

SCALE 1:145,000

MAP DRAWING INFORMATION:
Dillon Created, ESRI Base Layers, Province of British Columbia GeoBC and Open Data BC. BC Water Resource Atlas, CANVEC.

MAP CREATED BY: RBB
MAP CHECKED BY: JNW
MAP PROJECTION: NAD 1983 UTM Zone 11N

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PROJECT: 12-6231
STATUS: FINAL
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FILE LOCATION: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\Hydrology Maps\MXD\8_5x11\126231 Baseline Hydrology - Climate and Hydrometric Monitoring Stations.mxd

Photos of the Crown Mountain climate station are provided in **Photo 1** and **Photo 2**.

Photo 1. Crown Mountain Climate Station Installation (November 29, 2013)

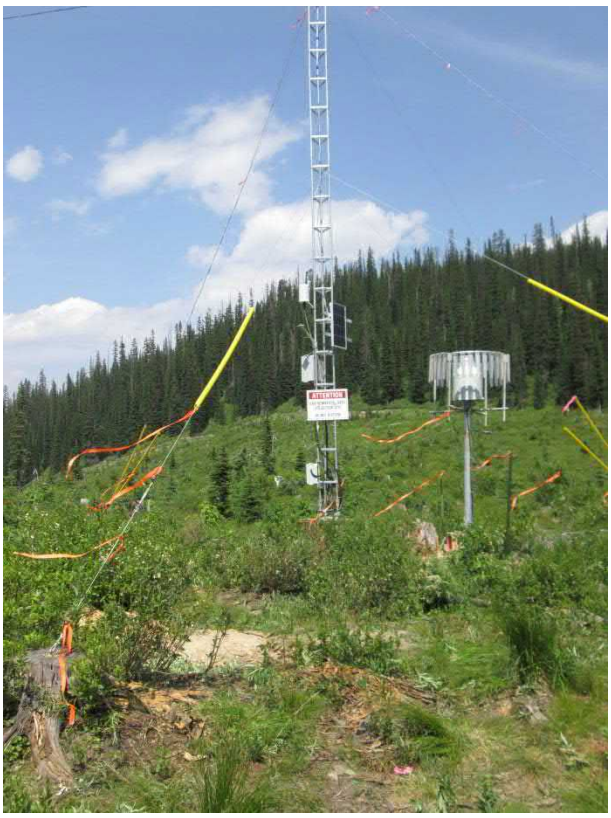


Photo 2. Crown Mountain Climate Station during Maintenance Trip (July 18, 2014)

The Crown Mountain climate station was equipped with instrumentation designed to measure and log the following meteorological parameters at 15-minute intervals:

- Atmospheric temperature;
- Barometric pressure;
- Relative humidity;
- Solar radiation;
- Wind speed;
- Wind direction; and,
- Precipitation rate and accumulation.

Further details on the specifications of the collection of meteorological data from the Crown Mountain climate station can be found under a separate cover titled *Crown Mountain Coal Coking Project Baseline Meteorology Report* (March 2020).

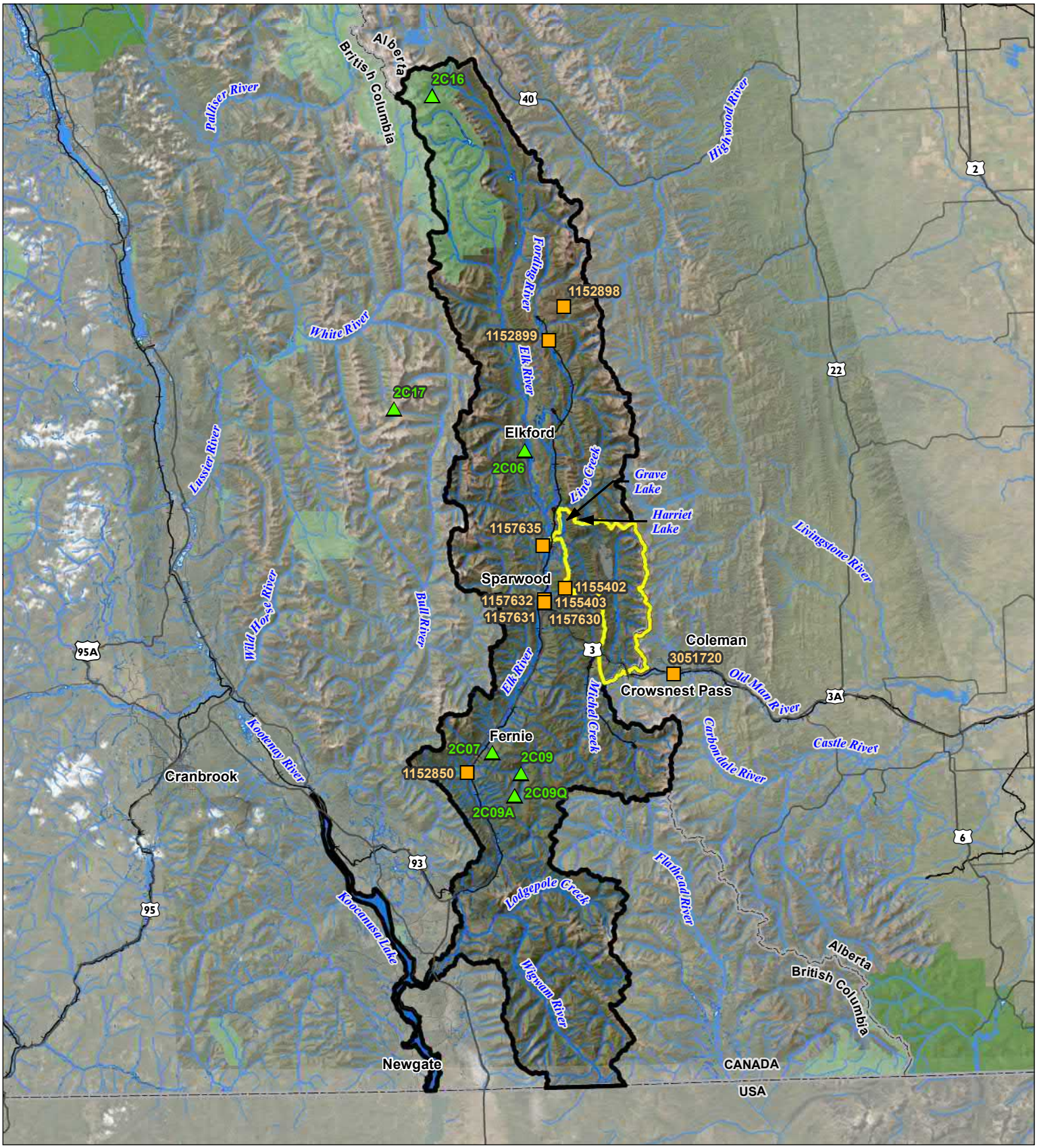
4.1.2 Regional Study Area

Continuous and seasonal climate data for the general Project area is also available from several Environment and Climate Change Canada (Environment Canada) operated climate stations. A summary of the available climate data are provided in **Table 4** and the locations of the stations are shown in **Figure 12**.

Table 4. Local and Regional Climate Stations

Climate Station Name (Province)	Station ID	Location (Lat/Long)	Elevation (masl)	Distance from Crown Mountain Station (km)	Period of Record	Meteorological Parameters		
						Temperature	Precipitation	Wind Speed & Direction
South Racehorse Creek (AB)	3055343	49°47'00"N 114°36'00"W	1,920	10.3 (SE)	2005 - present	✓	✓	
Sparwood A (BC)	1157635	49°50'00"N 114°53'00"W	1,158	11.1 (W)	2014 - present	✓	✓	✓
Sparwood (BC)	1157630	49°44'00"N 114°53'00"W	1,138	13.0 (SW)	1981 - present	✓	✓	✓
Sparwood CS (BC)	1177631	49°44'00"N 114°53'00"W	1,137	13.0 (SW)	1992 - present	✓	✓	✓
SugarLoaf (AB)	3056250	49°57'00"N 114°32'00"W	2,514	23.3 (E)	1961 - 2011	✓	✓	
Coleman (AB)	3051720	49°38'00"N 114°35'00"W	1,341	25.8 (SE)	1912 - 1997	✓	✓	
Crowsnest (AB)	3051R4R	49°37'00"N 114°28'00"W	1,303	31.9 (SE)	1993 - present	✓	✓	✓
Livingstone (AB)	3053925	49°53'00"N 114°23'00"W	1,417	32.2 (NE)	1958 - 2011	✓	✓	
Pasque Creek (AB)	3054R99	50°5'00"N 114°36'00"W	1,810	32.3 (NE)	2005 - present	✓	✓	
Livingstone LO (AB)	3053926	49°54'00"N 114°21'00"W	2,170	35.5 (NE)	1960 - 2011	✓	✓	
Fording River Cominco (BC)	1152899	50°09'00"N 114°51'00"W	1,585	37.0 (N)	1970 - 2017	✓	✓	
Ironstone LO (AB)	3053505	49°34'00"N 114°28'00"W	2,072	37.7 (SE)	1964 - 2011	✓	✓	
Hailstone Butte LO (AB)	3052995	50°10'00"N 114°27'00"W	2,373	45.9 (E)	1961 - 2011	✓	✓	
Fernie (BC)	1152850	49°29'00"N 115°04'00"W	1,001	46.3 (SW)	1913 - present	✓	✓	

Source: ECCC, 2019



Crown Mountain
Coking Coal Project

Hydrology Baseline Report
Regional Climate Stations

Figure 12

LEGEND

- Regional Study Area
- Local Study Area
- Project Footprint
- National Park
- Provincial Park
- Waterbody
- Wetland
- Watercourse
- Highways
- Arterial Roads
- Local/Resource Roads
- Railway (Canadian Pacific)
- BC/Alberta Border
- Climate Station
- Snow Station

0 5 10 20 km

SCALE 1:875,000

MAP DRAWING INFORMATION:
Dillon Created, ESRI Base Layers, Province of British Columbia GeoBC and Open Data BC. BC Water Resource Atlas, CANVEC, Environment and Climate Change Canada, 2019.

MAP CREATED BY: RBB
MAP CHECKED BY: JM
MAP PROJECTION: NAD 1983 UTM Zone 11N

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PROJECT: 12-6231
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DATE: 2021-08-13

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Snowpack data were compiled from the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development Automated Snow Pillow and Manual Snow Course Survey Data. Data were obtained from three stations located within the RSA (Mount Joffre 2C16, Fernie East 2C07, and Morrissey Ridge 2C09Q, 2C09A, and 2C09) and one station located just outside the RSA (Thunder Creek 2C17) (**Figure 12**). A summary of these stations is provided in **Table 5**.

Table 5. Local and Regional Snow Stations

Station Name	Station ID	Elevation (m)	Latitude	Longitude	Period of Record
Morrissey Ridge	2C09Q	1,860	49°27'00"N	114°58'00"W	2015 - 2016
Morrissey Ridge	2C09A	1,800	49°27'00"N	114°58'00"W	1984 - 2011
Morrissey Ridge	2C09	1,860	49°29'00"N	114°57'00"W	1961 - 1988
Fernie East	2C07	1,250	49°31'00"N	115°01'00"W	1951 - present
Fernie (Ne)	2C02A	1,070	49°31'00"N	115°02'00"W	1973 - 1987
Fernie	2C02	1,070	49°34'00"N	115°02'00"W	1938 - 1987
Fernie Ridge	2C08	1,710	49°36'00"N	115°03'00"W	1952 - 1952

Source: ECCC, 2019

4.2 Hydrology Data Sources

4.2.1 Local Study Area

Hydrometric Monitoring Stations

Hydrometric stations were installed to collect water level data at five locations (**Figure 11**) within the LSA: A1, A3, G2, WA1, and A3B (**Table 6**). Four of the stations were initially installed in May 2012 (A1, A3, G2, and WA1). Hydrometric station A3 was relocated in July 2014 to a more favourable location (A3B) to better capture the representative flows along Alexander Creek. Hydrometric station information is provided in **Appendix A**.

At each hydrometric station, continuous water level measurements were collected using a combination of pressure transducer/water level loggers models, including:

- Onset HOBO U-20 or Soloninst Levelogger (compensated with separate barometric logger);
- AquaStar PT12 non-vented pressure transducer and compensator; and/or
- AquaStar PT2X vented pressure transducer.

Data was recorded at 15 minute intervals during the data collection period for each of the hydrometric monitoring stations. The staff gauges were installed in a perforated stilling well, which was secured to the channel bank at each location with steel angle iron rebar together with a staff gauge.

Hydrometric station site selection, installation, and data collection followed protocols outlined in *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (MOE, 2016) and the *Manual of British Columbia Hydrometric Standards* (RISC, 2009).

Table 6 provides a summary of the hydrometric station locations and the corresponding monitoring period. The drainage area for each of the stations is shown on **Figures 13** to **17**. All of the hydrometric stations are located on watercourses down-gradient of the Project footprint. Hydrometric monitoring was not conducted up-gradient of the Project footprint, as there are no up-gradient watercourses.

Table 6. Summary of Hydrometric Station Locations

Station Name	Watercourse	Latitude	Longitude	Monitoring Began	Monitoring Ended	Substrate
A1	Alexander Creek	49°39'19.7"N	-114°43' 51.6"W	May 15, 2012	Ongoing	Gravel/cobble
A3	Alexander Creek	49°46'17.5"N	-114°43'12.0"W	May 16, 2012	July 18, 2014	Gravel/cobble
A3B	Alexander Creek	49°44'47.0"N	-114°42'57.6"W	July 18, 2014	May 2, 2016	Gravel/cobble
WA1	West Alexander	49°46'32.4"N	-114°43'19.2"W	May 16, 2012	May 2, 2016	Gravel/cobble/boulder
G2	Grave Creek	49°49'55.7"N	-114°49'19.2"W	May 15, 2012	Ongoing	Gravel/cobble/boulder

The hydrometric stations were decommissioned in May 2016. Stations A1 and G2 were re-installed in November 2017 and operated until December 2019.

Hydrometric Stream Gauging

In conjunction with the installation of water level loggers and staff gauges, manual stream gauging was conducted to measure discharge rates at each of the hydrometric monitoring stations. Stream gauging was generally conducted approximately 2-4 times per year based on the seasonal freeze-up and runoff schedule.

Stream gauging was performed by area-velocity methods using a portable Marsh McBurney Flo-Mate or FlowTracker acoustic doppler velocity meter and followed the *Manual of British Columbia Hydrometric Standards* (RISC, 2009) for "Grade A data". Flow estimates under a variety of flow conditions were then used for the development of a stage-discharge rating curve (**Section 5.2**).

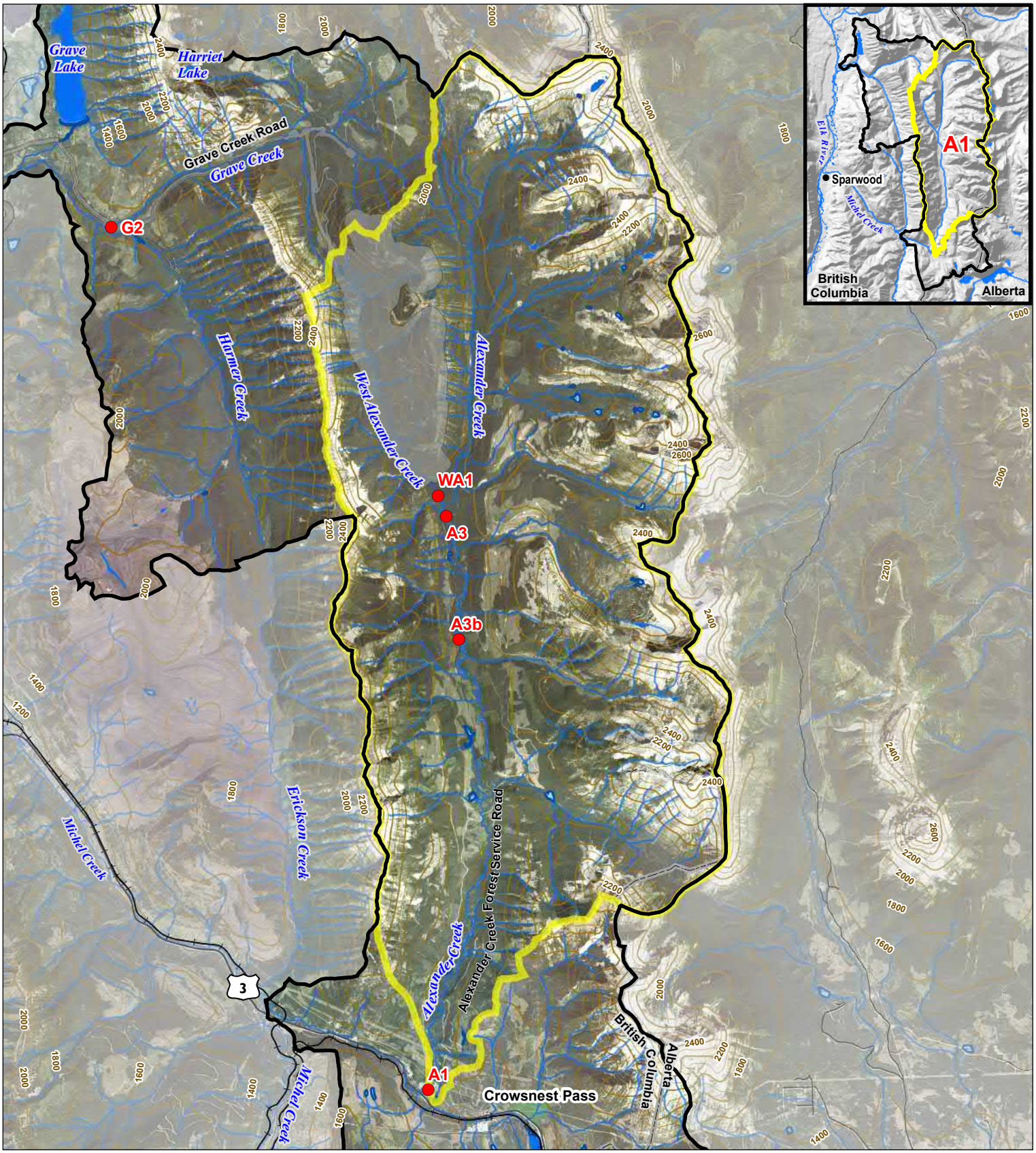
Each time a monitoring station was visited, data was downloaded from the data loggers and general maintenance checks of the stations were conducted. In addition, stream gauging measurements and staff gauge readings were recorded as part of each visit.

Table 7 provides a summary of the sampling dates and data collected for each visit to the stations. Each hydrometric station experienced some data gaps and erroneous data due to equipment requiring calibration and repairs at certain points throughout the data collection period. Periods with extremely high positive and negative fluctuations in the recorded pressure head are believed to be due to freeze up of the instream monitoring equipment during the winter months and were not included in analyses.

Table 7. Summary of Hydrometric Monitoring Dates

Year	A1		A3		A3B		G2		WA1	
	Stream Gauging	Logger Download/ Maintenance	Stream Gauging	Logger Download/ Maintenance	Stream Gauging	Logger Download/ Maintenance	Stream Gauging	Logger Download/ Maintenance	Stream Gauging	Logger Download/ Maintenance
2012	23-Jul	23-Jul	24-Jul	24-Jul	*Station not in operation*		25-Jul	25-Jul	24-Jul	24-Jul
	-	23-Nov	-	24-Nov			-	24-Nov	-	24-Nov
2013	-	12-May	-	12-May			-	13-May	-	12-May
	11-Jul	11-Jul	09-Jul	09-Jul			10-Jul	10-Jul	10-Jul	10-Jul
	15-Nov	15-Nov	15-Nov	15-Nov			15-Nov	15-Nov	15-Nov	15-Nov
2014	01-May	01-May	02-May	02-May			01-May	01-May	21-May	21-May
	-	27-Jun	12-Jun	27-Jun			-	NA	12-Jun	-
	30-Jul	30-Jul	July 18	July 18	30-Jul	July 18-	30-Jul	30-Jul	30-Jul	30-Jul
	15-Sep	15-Sep	*Station not in operation (decommissioned and relocated to A3B)*		15-Sep	15-Sep	15-Sep	15-Sep	15-Sep	15-Sep
	21-Nov	21-Nov			20-Nov	20-Nov	20-Nov	20-Nov	20-Nov	20-Nov
2015	-	05-Mar			-	03-Mar	-	04-Mar	-	03-Mar
	-	23-Apr			23-Apr	-	24-Apr	24-Apr	-	24-Apr
	-	15-May			-	15-May	-	14-May	-	14-May
	25-Jun	25-Jun			25-Jun	25-Jun	25-Jun	25-Jun	25-Jun	25-Jun
	16-Sep	16-Sep			16-Sep	16-Sep	16-Sep	16-Sep	16-Sep	16-Sep
	28-Nov	28-Nov			28-Nov	28-Nov	28-Nov	28-Nov	28-Nov	28-Nov
2016	-	02-May			-	02-May	-	02-May	-	02-May
2017	18-Nov	15-Nov			*Station not in operation (decommissioned)*		18-Nov	15-Nov	*Station not in operation (decommissioned)*	
2018	-	27-Feb					-	27-Feb		
	-	19-May					19-May	19-May		
	21-Jul	21-Jul					21-Jul	21-Jul		
	10-Nov	10-Nov					10-Nov	10-Nov		
2019	18-Jun	18-Jun					18-Jun	18-Jun		
	18-Sep	18-Sep					18-Sep	18-Sep		

Note: "-"indicates data not available due to freeze up.



Crown Mountain
Coking Coal Project

Hydrology Baseline Report
Streamflow Monitoring Station
A1 Drainage Area

Figure 13

LEGEND

- Local Study Area
- Project Footprint
- A1 Drainage Area
- Provincial Park
- Waterbody
- Wetland
- Watercourse
- Highways
- Arterial Roads
- Local/Resource Roads
- Railway (Canadian Pacific)
- Major Contour (200m)
- Minor Contour (100m)
- BC/Alberta Border
- Stream Flow Monitoring Station (Dillon)

0 750 1,500 3,000 Meters

SCALE 1:116,000

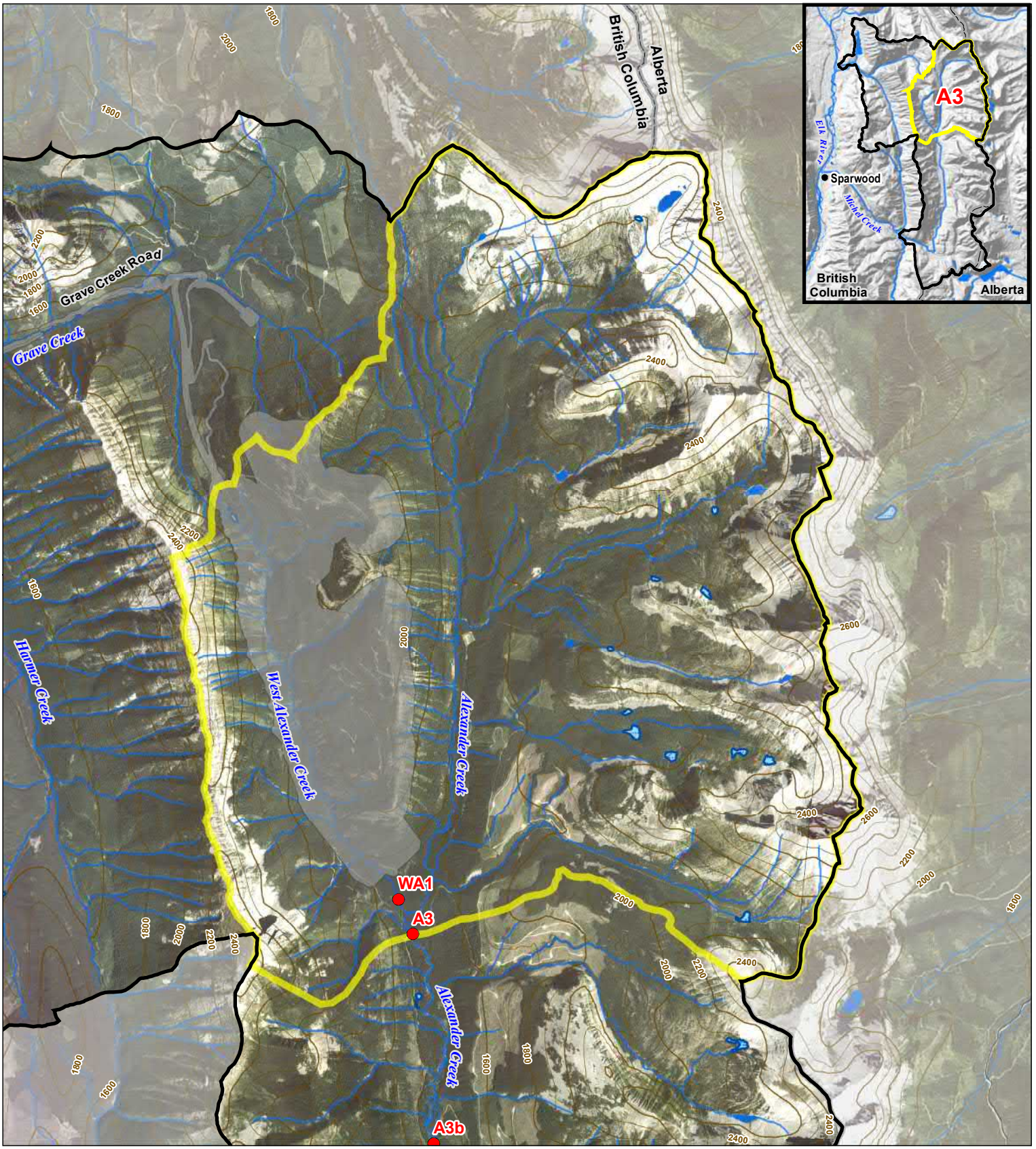
MAP DRAWING INFORMATION:
Dillon Created, ESRI Base Layers, Province of British Columbia GeoBC, Open Data BC, BC Water Resource Atlas, CANVEC.

MAP CREATED BY: RBB
MAP CHECKED BY: JNW
MAP PROJECTION: NAD 1983 UTM Zone 11N

DILLON CONSULTING

PROJECT: 12-6231
STATUS: FINAL
DATE: 2021-08-13

FILE LOCATION: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\Hydrology Maps\MXD\8_5x11\126231 Baseline Hydrology - Streamflow Monitoring Station A1.mxd



Crown Mountain Coking Coal Project

Hydrology Baseline Report
Streamflow Monitoring Station
A3 Drainage Area

Figure 14

LEGEND

- Local Study Area
- Project Footprint
- A3 Drainage Area
- Waterbody
- Wetland
- Watercourse
- Arterial Roads
- Local/Resource Roads
- Major Contour (200m)
- Minor Contour (100m)
- BC/Alberta Border
- Stream Flow Monitoring Station (Dillon)

0 250 500 1,000 Meters

SCALE 1:68,000

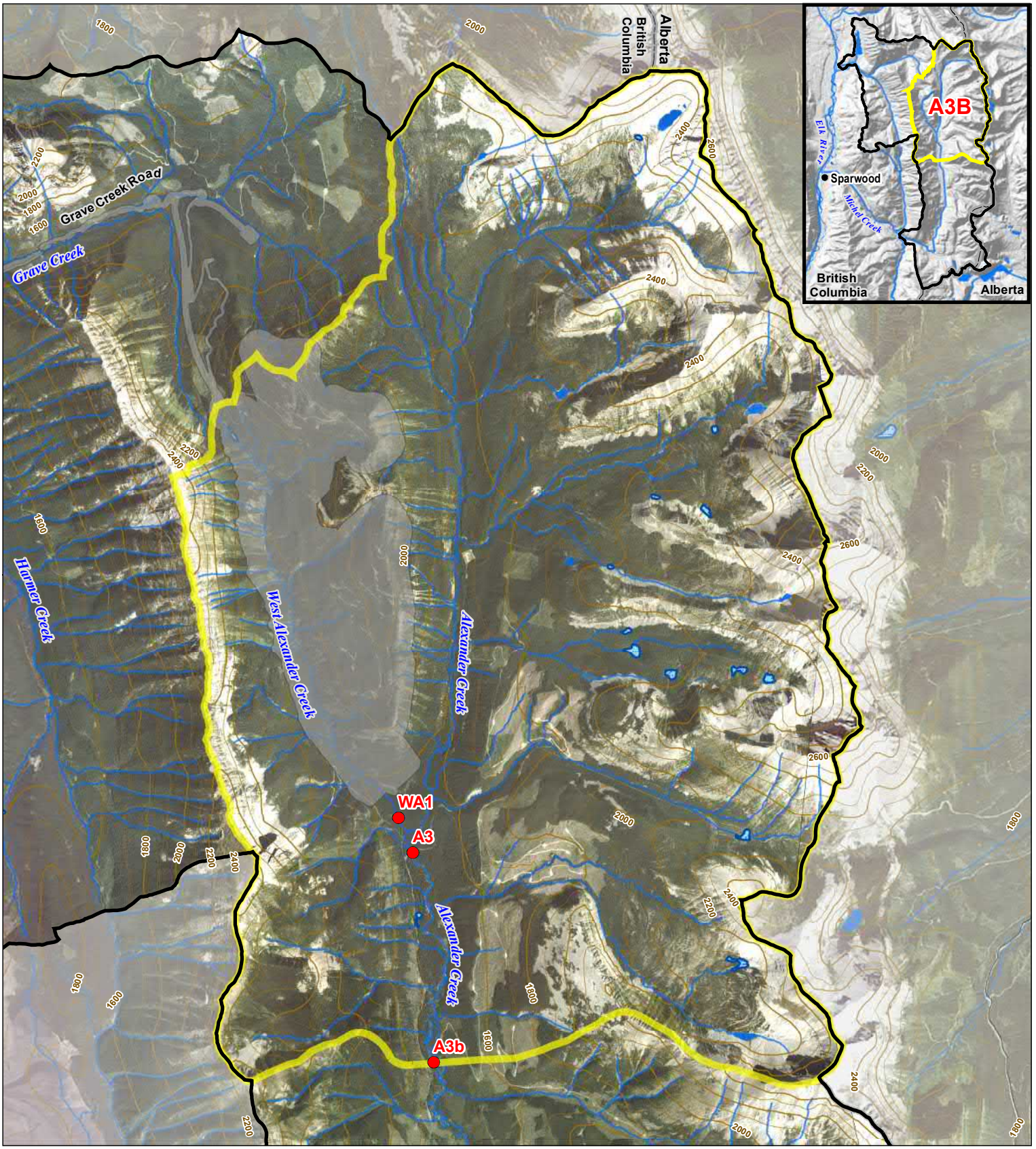
MAP DRAWING INFORMATION:
Dillon Created, ESRI Base Layers, Province of British Columbia GeoBC, Open Data BC, BC Water Resource Atlas, CANVEC.

MAP CREATED BY: RBB
MAP CHECKED BY: JNW
MAP PROJECTION: NAD 1983 UTM Zone 11N

DILLON CONSULTING

PROJECT: 12-6231
STATUS: FINAL
DATE: 2021-08-03

FILE LOCATION: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\Hydrology Maps\MXD\8_5x11\126231 Baseline Hydrology - Streamflow Monitoring Station A3.mxd



Crown Mountain Coking Coal Project

Hydrology Baseline Report
Streamflow Monitoring Station
A3B Drainage Area

Figure 15

LEGEND

- Local Study Area
- Project Footprint
- A3B Drainage Area
- Waterbody
- Wetland
- Watercourse
- Arterial Roads
- Local/Resource Roads
- Major Contour (200m)
- Minor Contour (100m)
- BC/Alberta Border
- Stream Flow Monitoring Station (Dillon)

0 250 500 1,000 Meters

SCALE 1:68,000

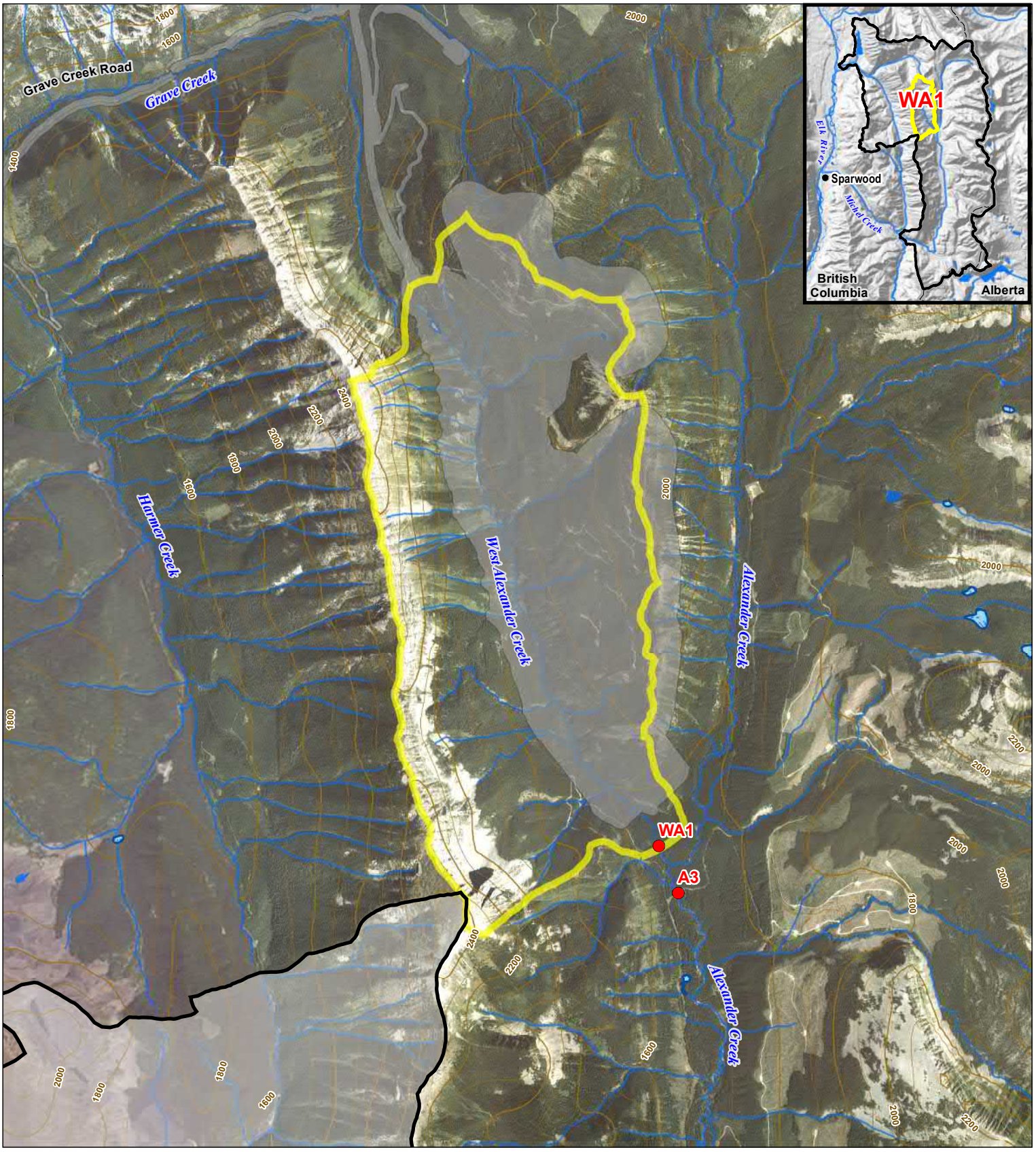
MAP DRAWING INFORMATION:
Dillon Created, ESRI Base Layers, Province of British Columbia GeoBC, Open Data BC, BC Water Resource Atlas, CANVEC.

MAP CREATED BY: RBB
MAP CHECKED BY: JNV
MAP PROJECTION: NAD 1983 UTM Zone 11N

DILLON CONSULTING

PROJECT: 12-6231
STATUS: FINAL
DATE: 2021-08-03

FILE LOCATION: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\Hydrology Maps\MXD\8_5x11\126231 Baseline Hydrology - Streamflow Monitoring Station A3b.mxd



Crown Mountain Coking Coal Project

Hydrology Baseline Report
Streamflow Monitoring Station WA1 Drainage Area

Figure 16

LEGEND

- Local Study Area
- Project Footprint
- WA1 Drainage Area
- Waterbody
- Wetland
- Watercourse
- Local/Resource Roads
- Major Contour (200m)
- Minor Contour (100m)
- Stream Flow Monitoring Station (Dillon)

0 250 500 1,000 Meters

SCALE 1:50,000

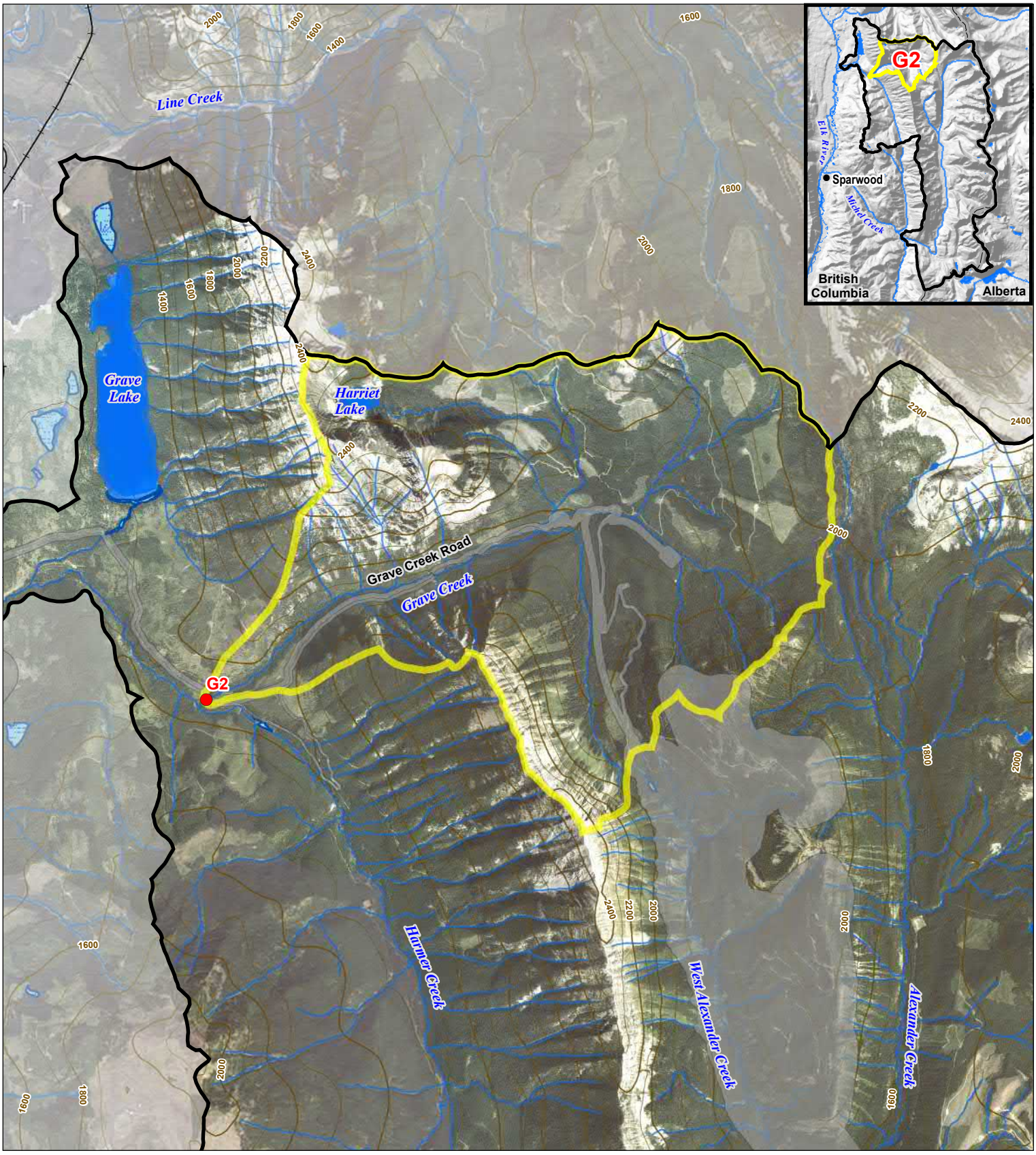
MAP DRAWING INFORMATION:
Dillon Created, ESRI Base Layers, Province of British Columbia GeoBC, Open Data BC, BC Water Resource Atlas, CANVEC.

MAP CREATED BY: RBB
MAP CHECKED BY: JNV
MAP PROJECTION: NAD 1983 UTM Zone 11N

DILLON CONSULTING

PROJECT: 12-6231
STATUS: FINAL
DATE: 2021-08-03

FILE LOCATION: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\Hydrology Maps\MXD\8_5x11\126231 Baseline Hydrology - Streamflow Monitoring Station WA1.mxd



Crown Mountain
Coking Coal Project

Hydrology Baseline Report
Streamflow Monitoring Station
G2 Drainage Area

Figure 17

LEGEND

- Local Study Area
- Project Footprint
- G2 Drainage Area
- Waterbody
- Wetland
- Watercourse
- Local/Resource Roads
- Railway (Canadian Pacific)
- Major Contour (200m)
- Minor Contour (100m)
- BC/Alberta Border
- Stream Flow Monitoring Station (Dillon)

0 250 500 1,000 Meters

SCALE 1:60,000

MAP DRAWING INFORMATION:
Dillon Created, ESRI Base Layers, Province of British Columbia GeoBC, Open Data BC, BC Water Resource Atlas, CANVEC.

MAP CREATED BY: RBB
MAP CHECKED BY: JNW
MAP PROJECTION: NAD 1983 UTM Zone 11N

DILLON CONSULTING

PROJECT: 12-6231
STATUS: FINAL
DATE: 2021-08-13

FILE LOCATION: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\Hydrology Maps\MXD\8_5x11\126231 Baseline Hydrology - Streamflow Monitoring Station G2.mxd

4.2.2 Regional Study Area

Hydrological information exists for the RSA around the Project area from hydrometric stations operated by Environment Canada (**Figure 18**). A summary of the stations within the area of interest is presented in **Table 8**.

Table 8. Regional Hydrometric Stations

Station Name	Station ID	Drainage Area (km^2)	Latitude	Longitude	Period of Record	Status
Elk River at Fernie	08NK002	3090	49°30'12''N	115°04'12''W	1919 – 2019	Active
Elk River near Natal	08NK016	1840	49°51'56''N	114°52'07''W	1950 – 2019	Active
Fording River at the Mouth	08NK018	621	49°53'38''N	114°51'59''W	1970 – 2019	Active
Grave Creek at the Mouth	08NK019	84	49°50'36''N	114°51'36''W	1970 – 1999	Discontinued
Michael Creek below Natal	08NK020	637	49°43'49''N	114°51'24''W	1970 –1998	Discontinued
Line Creek at the Mouth	08NK022	138	49°53'29''N	114°50'00''W	1971 – 2019	Active
Hosmer Creek above Diversions	08NK026	6.4	49°35'03''N	114°57'14''W	1981 –2019	Active

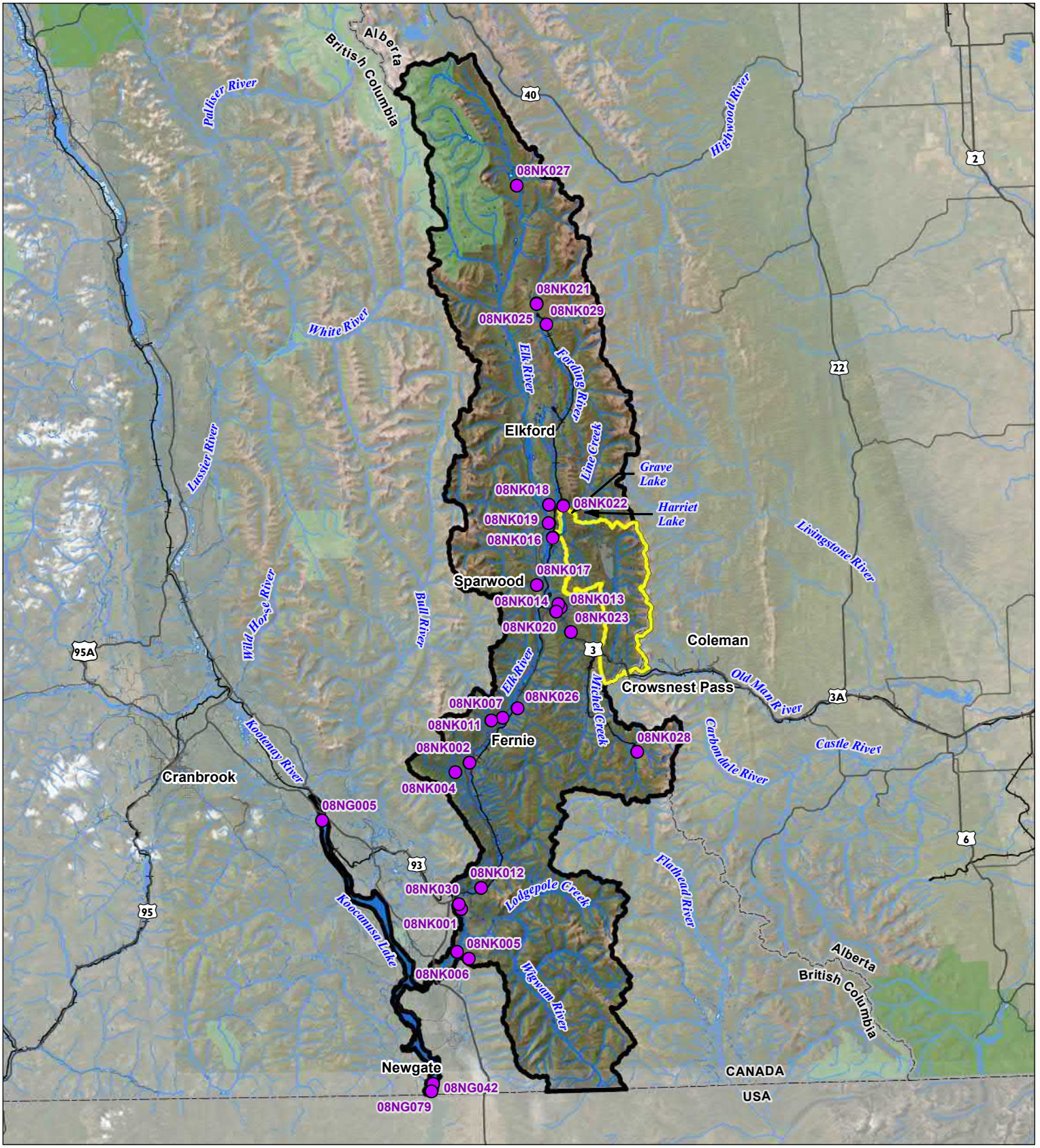
Source: ECCC, 2019

4.3 Quality Assurance & Quality Control

The data collection program for the hydrology baseline study was developed and conducted in general conformance with the *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (MOE, 2016) and the *Manual of British Columbia Hydrometric Standards* (RISC, 2009).

The following QA/QC activities were completed by Dillon or Dillon representatives:

- Project area hydrometric station locations were selected where channel characteristics and discharge measurements generally satisfied the criteria for 'Grade A' standards as prescribed by RISC (i.e., straight and stable channels with uniform flow conditions).
- All instrumentation and procedures satisfied 'Grade A' criteria, with exception of the water level loggers (Hobo U-20, Soloninst Leveloggers, and AquaStar PT12), which meet the 'Grade B' criteria for measurement precision. The AquaStar PT2X pressure transducers provide a 'Grade A' level of precision.
- Routine station maintenance was undertaken, including inspection of the condition of water level loggers and changing of desiccants and batteries, as required.
- Review and filtering of data of anomalous readings, such as during ice conditions, and verification of logger data by manual readings taken in the field, was conducted.



Crown Mountain
Coking Coal Project

Hydrology Baseline Report
Regional Hydrometric Stations

Figure 18

LEGEND

- Regional Study Area
- Local Study Area
- Project Footprint
- National Park
- Provincial Park
- Waterbody
- Wetland
- Watercourse
- Highways
- Arterial Roads
- Local/Resource Roads
- Railway (Canadian Pacific)
- BC/Aberta Border
- Hydrometric Station (Environment Canada)

0 5 10 20 km

SCALE 1:875,000

MAP DRAWING INFORMATION:
Dillon Created, ESRI Base Layers, Province of British Columbia GeoBC and Open Data BC. BC Water Resource Atlas, CANVEC, Environment and Climate Change Canada, 2019.

MAP CREATED BY: RBB
MAP CHECKED BY: JM
MAP PROJECTION: NAD 1983 UTM Zone 11N

DILLON CONSULTING

PROJECT: 12-6231
STATUS: FINAL
DATE: 2021-08-13

FILE LOCATION: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\Hydrology Maps\MXD\8_5x11\126231 Baseline Hydrology - Regional Hydrometric Stations.mxd

5.0 Results

Results of the meteorology program and baseline surface water hydrology program of the LSA are presented in **Sections 6.1** and **6.2**, respectively. The results of these programs were used to develop an understanding of hydrologic conditions of the study area, which are presented in **Section 6.3**.

5.1 Climate

5.1.1 Air Temperature

5.1.1.1 Project Footprint & Local Study Area

Mean daily average, minimum, and maximum air temperature values were calculated for January 2014 to May 2016, which were derived from the continuous data collected at the Crown Mountain climate station. Note that there were brief periods in July 2014 and March 2016 where temperature measurements were not collected due to an equipment malfunction. A summary of the mean daily temperature data is provided in **Table 9** and shown on **Figures 19** to **21.**

Table 9. Summary of Mean Daily Temperature Data (°C) at the Crown Mountain Climate Station [1,2]

Date	Mean Daily Average Temperature	Mean Daily Minimum Temperature	Mean Daily Maximum Temperature
January	-7.0	-10.0	-3.2
February	-7.3	-10.8	-2.8
March	-3.0	-6.6	1.5
April	1.9	-3.4	8.5
May	5.8	0.1	13.1
June	12.1	7.0	17.7
July	14.9	9.3	21.2
August	13.3	8.6	18.5
September	7.1	3.4	11.3
October	4.3	1.4	7.7
November	-6.3	-9.2	-3.1
December	-8.1	-10.9	-4.9
Average	**2.3**	**-1.8**	**7.1**
Overall Minimum	**-8.1**	**-10.9**	**-4.9**
Overall Maximum	**14.9**	**9.3**	**21.2**

Notes: 1. Based on data collected at the Crown Mountain climate station (January 2014- May 2016).
2. Temperature measurements not available between July 17-24, 2014 and March 14-18, 2016.

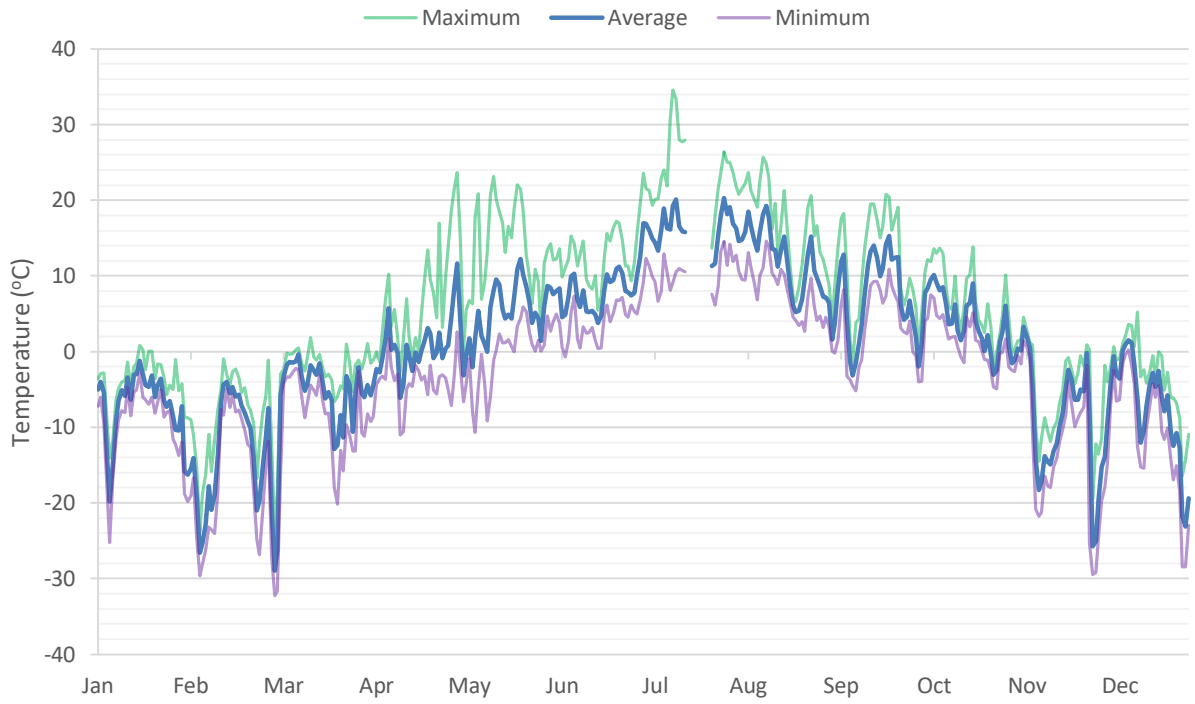


Figure 19. Daily Temperature Data at the Crown Mountain Climate Station (2014)

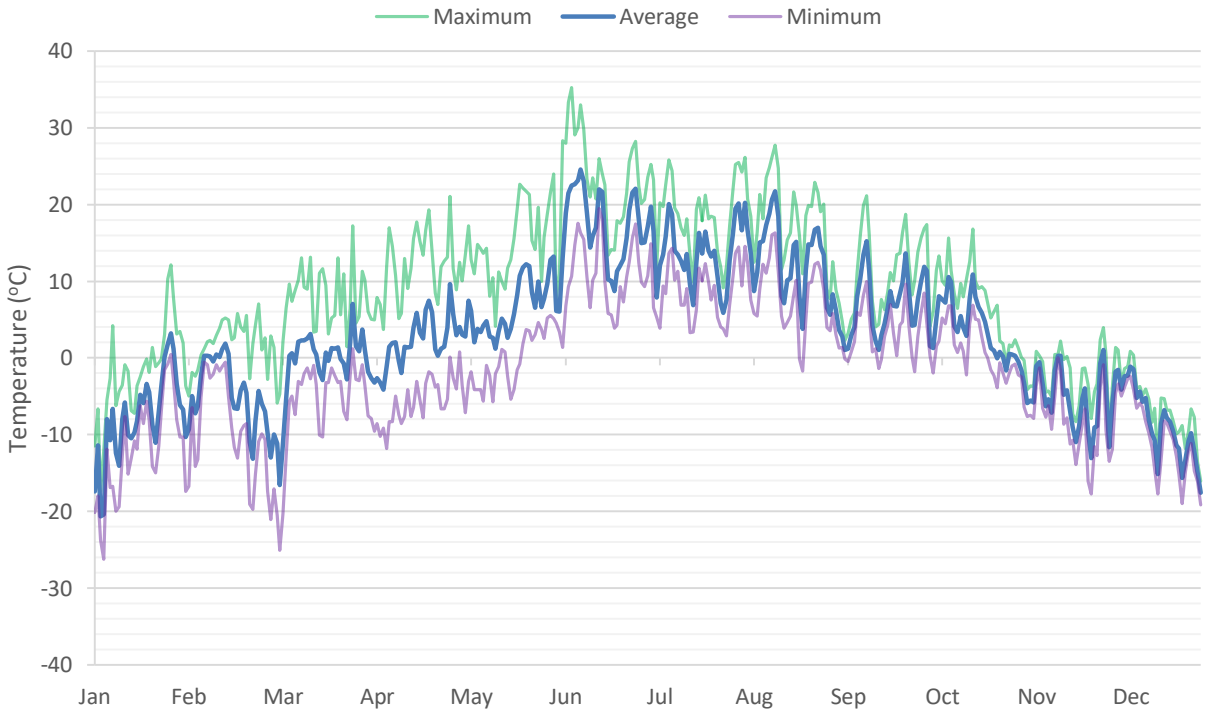


Figure 20. Daily Temperature Data at the Crown Mountain Climate Station (2015)

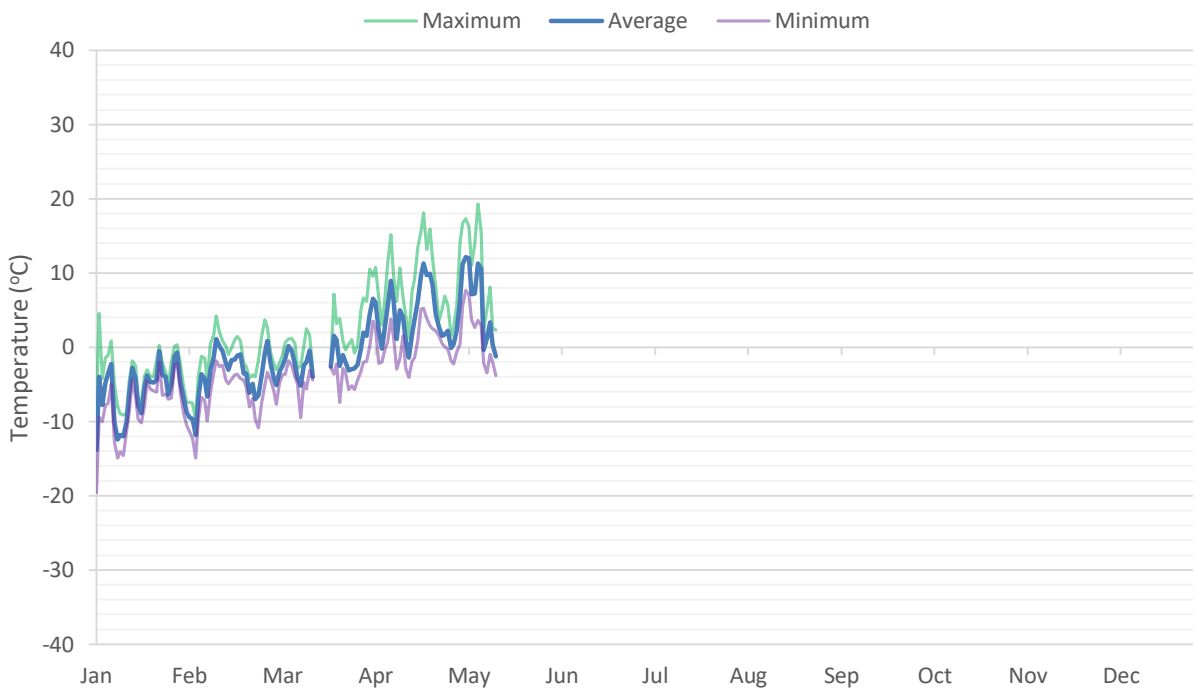


Figure 21. Daily Temperature Data at the Crown Mountain Climate Station (2016)

A review of the 2014 to 2016 climate data indicates the following:

- Mean daily average temperature ranged from a low of -13.4 °C in February 2014 to a maximum of 16.6 °C in June 2015;
- Mean daily minimum air temperature ranged from a low of -16.9 °C in February 2014 to a high of 10.2 °C in July 2015;
- Mean daily maximum air temperature ranged from a low of -9.0 °C in February 2014 to a high of 23.9 °C in July 2014; and,
- The extreme minimum temperature at the Crown Mountain station was recorded as -32.3°C on March 1, 2014 and the extreme maximum temperature was recorded as 35.2°C on June 7, 2015.

Additional information regarding the baseline temperature data collected within the Project footprint is provided in the *Crown Mountain Coal Coking Project Baseline Meteorology Report* (Dillon, 2020).

5.1.1.2 Regional Study Area

A review of available long-term meteorological data available from Environment and Climate Change Canada (i.e., climate normals for temperature and precipitation from 1981-2010) was conducted for weather stations in the RSA. A summary of mean monthly air temperature data for the RSA and LSA is provided in **Table 10**.

Table 10. Summary of Mean Monthly Air Temperature Data (°C) for the Regional and Local Study Areas

Month	CROWN MOUNTAIN Climate Station [1] (1,920 masl)	1981-2010 Climate Normals [2]		
		SPARWOOD Station 1157630 (1138 masl)	FERNIE Station 1152850 (1001 masl)	FORDING RIVER COMINCO Station 1152899 (1585 masl)
January	-7.05	-6.5	-5.2	-9.9
February	-7.25	-4.5	-3.8	-8.2
March	-3.03	0.2	0.8	-3.5
April	1.94	4.8	5.4	1.1
May	5.82	9.1	9.9	5.5
June	12.12	12.7	13.6	9.7
July	14.92	15.8	16.8	12.6
August	13.30	15.5	16.3	12.1
September	7.11	10.5	11.3	7.5
October	4.35	4.8	5.5	1.8
November	-6.26	-2	-1.1	-6.2
December	-7.08	-7.3	-6.1	-11.3
Average	**2.4**	**4.4**	**5.3**	**0.9**
Minimum	**-7.3**	**-7.3**	**-6.1**	**-11.3**
Maximum	**14.9**	**15.8**	**16.8**	**12.6**

Notes: *1. Based on data collected at the Crown Mountain climate station (January 2014 – May 2016).*
2. Source: ECCC, 2019

It is noteworthy that the Crown Mountain climate station was situated at a higher elevation on mountainous terrain. For the purposes of the hydrology baseline study, Environment Canada weather stations in similar hydrologic setting (i.e., in close proximity and elevation to the Crown Mountain station) were evaluated. The Environment Canada stations were used to provide a long-term perspective of the region's meteorological conditions.

Measured temperatures at the Crown Mountain climate station were not necessarily comparable to climate normals recorded at regional stations, as the Crown Mountain climate station is situated at an elevation of 1,920 masl, at least 335 masl higher than the regional stations. Temperatures are anticipated to be lower at higher elevations; therefore, temperatures recorded at the Crown Mountain station were typically lower than temperatures recorded at the regional stations.

The extreme minimum temperatures from the Crown Mountain station (-32.3°C in 2014 and -26.2°C in 2015) are less than the extreme minimum values from the regional climate stations, with a difference of 7.5°C to 16.7°C in 2014 and 13.6°C to 22.8°C in 2015. The extreme maximum temperatures from the Crown Mountain station (34.6°C in 2014 and 35.2°C in 2015) are within 2.3°C and 2.9°C of the extreme maximum temperatures from the climate normals, respectively, from 1981-2010 for Sparwood (36.5°C), Fernie (36.1°C), Coleman (35°C), and Fording River Cominco (37.5°C). A comparison of extreme temperatures between the Crown Station and regional data were not conducted for 2013 and 2016, as the Crown Mountain station did not collect complete temperature data for these years.

Further details on the meteorological conditions at the LSA and RSA can be found in the *Crown Mountain Coal Coking Project Baseline Meteorology Report* (2020).

5.1.2 Precipitation

5.1.2.1 Project Footprint & Local Study Area

Precipitation data was collected at the Crown Mountain climate station between January 2014 and May 2016. However, due to a malfunction of the precipitation gauge caused by high winds, some of the data that was collected was deemed to be inaccurate.

To characterize the precipitation conditions for the Crown Mountain Project area and LSA, a regression analysis was undertaken using data collected at nearby climate stations. Precipitation conditions can vary spatially and temporally and are influenced significantly by altitude, topography, and wind. The objective of the regression analysis was to identify a relationship for the mean summer (May-September) and mean winter (October-April) seasonal precipitation and the corresponding elevation at specific climate stations. The Sparwood (11557630) and Natal Harmer Ridge (1155402) climate stations were selected for the analysis, given their proximity to the Crown Mountain project area, elevation, and available period of record. For the purpose of the analysis, only the data for the common period of record for the two stations was utilized (1980-1990).

The results of the regression analysis are presented on **Figure 22**.

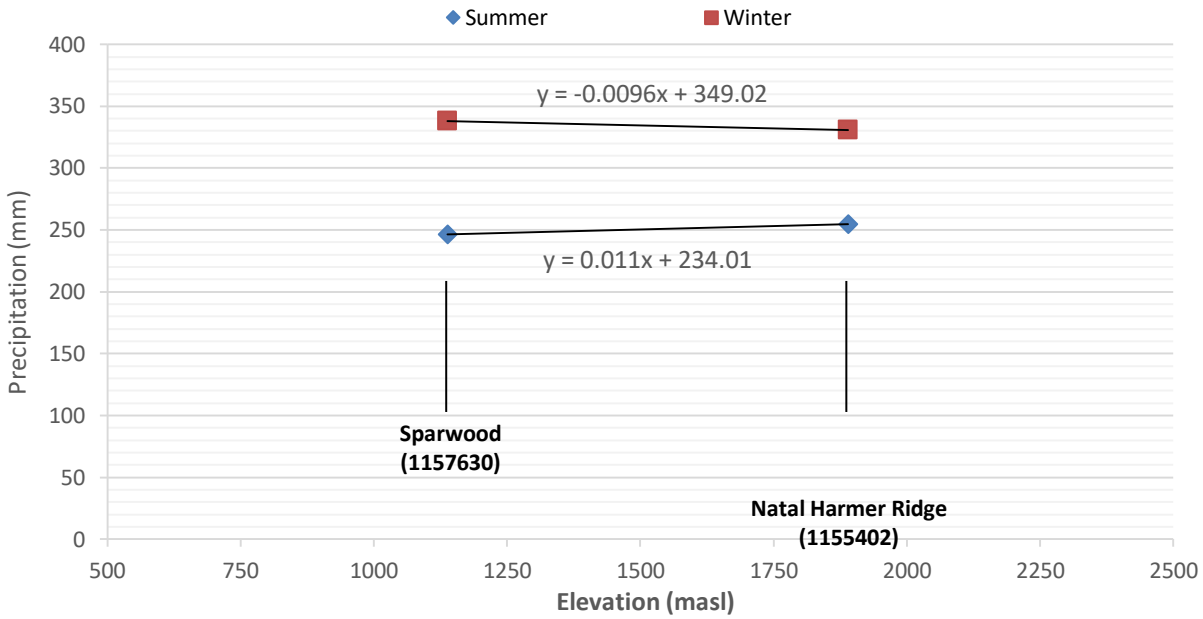


Figure 22. Regression Analysis for Mean Seasonal Precipitation (mm)

A summary of the measured and derived mean seasonal precipitation for the Sparwood and Natal Harmer Ridge climate stations, in addition to the Crown Mountain project area, is provided in **Table 11**.

Table 11. Summary of Measured and Derived Mean Seasonal Precipitation (mm)

Season	Relationship	SPARWOOD Station 1157630 (1,138 masl)		NATAL HARMER RIDGE Station 1155402 (1,890 masl)		CROWN MOUNTAIN (1,920 masl)
		Measured (1980-2019)	Derived	Measured (1971-1991)	Derived	Derived
Mean Summer (May-Sept)	y = 0.011x + 234.01	250.4	246.5	260.0	254.8	255.1
Mean Winter (Oct-April)	y = -0.0096x + 349.02	354.5	339.0	442.8	330.9	330.6

Note: x represents elevation (masl)

The results of the regression analysis indicate that the mean summer precipitation at the Crown Mountain site (1,920 masl) is 14.9 mm higher than at the Sparwood climate station (1,138 masl), and the mean winter precipitation is 23.9 mm lower, respectively.

The seasonal relationships for mean summer and winter precipitation were applied to derive the monthly precipitation for the Crown Mountain Project area. A summary of the total monthly precipitation at the Project area for the period of January 2014 to May 2016 is provided in **Table 12** and illustrated on **Figure 23**.

Table 12. Crown Mountain Project Area – Total Monthly Precipitation (mm)

Month	Minimum	Mean	Maximum
January	4.3	62.4	140.1
February	2.9	48.1	151.2
March	5.1	62.5	216.0
April	9.5	50.5	109.9
May	11.3	61.9	150.0
June	19.2	69.2	178.2
July	2.8	45.5	124.9
August	5.4	35.4	118.2
September	3.0	49.6	151.5
October	10.9	65.9	154.8
November	7.6	89.6	221.2
December	7.0	69.2	268.6

Note: Precipitation depths provided in millimetres

The monthly precipitation varied throughout the assessment period, with the lowest values generally corresponding to the summer months and higher precipitation in the early winter months.

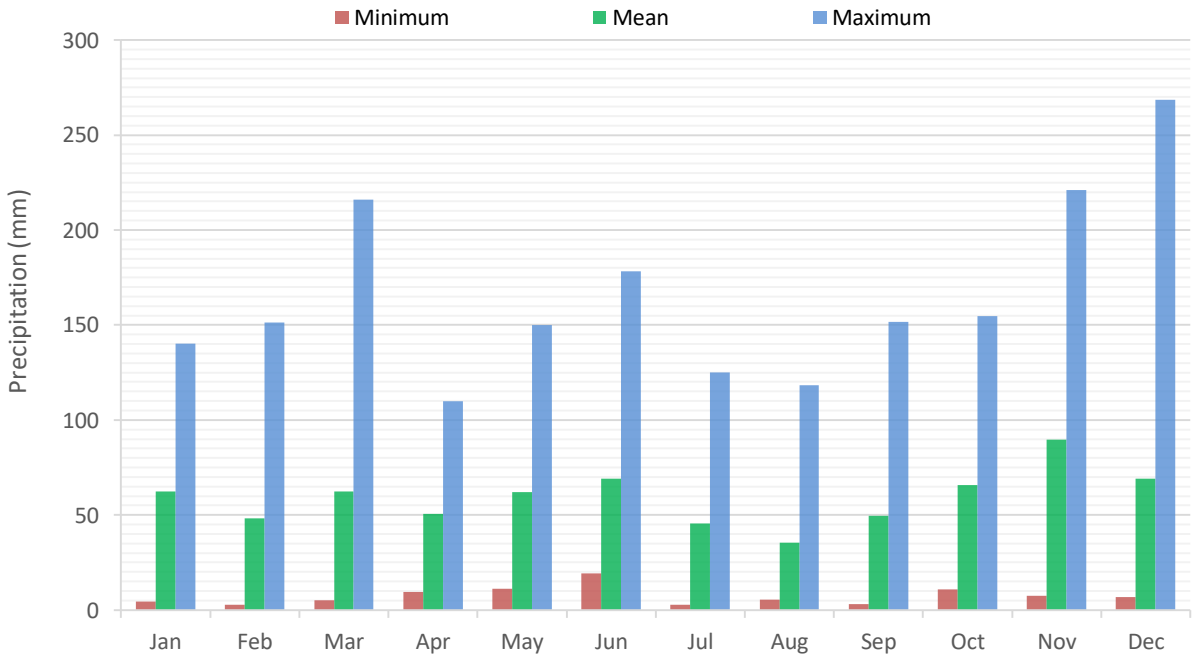


Figure 23. Monthly Precipitation (mm) Derived for the Crown Mountain Project Area

5.1.2.2 Regional Study Area

Table 13 provides a summary of mean monthly precipitation values (i.e., rain, snow, and total precipitation) for several climate stations at various locations and elevations within the RSA, which are based on the climate normal for the period of 1981-2010 (WSC, 2019).

The mean monthly data indicates that greater amounts of precipitation typically occur in the late fall and early winter months (predominately snowfall) and lower amounts of precipitation generally occur in the summer and early fall months (mostly rainfall). There is a notable difference in the amount, type, and distribution of precipitation between the Fernie climate station, which is at a lower elevation located in the southern portion of the RSA, and the Sparwood and Fording River climate stations that are at higher elevations and further north (**Figure 12**).

Table 13. Regional Study Area Mean Monthly and Annual Precipitation (mm)

Month	SPARWOOD Station 1157630 (1138 masl)			FERNIE Station 1152850 (1001 masl)			FORDING RIVER COMINCO Station 1152899 (1585 masl)		
	Rain	Snow	Total	Rain	Snow	Total	Rain	Snow	Total
January	17.3	50.4	53.9	55.8	83.5	139.3	3.7	41.7	45.5
February	12.4	37.0	40.9	41.5	46.4	88.0	3.1	30.8	33.9
March	17.0	31.7	44.2	60.6	37.2	97.8	7.1	37.6	44.8
April	27.9	17.4	41.4	80.0	12.9	92.8	14.4	29.4	43.8
May	52.0	8.6	60.4	88.8	3.1	91.8	40.0	19.1	59.1
June	67.7	1.8	69.3	109.8	0.2	110.0	82.1	3.7	85.7
July	46.8	0.0	46.8	67.0	0.0	67.0	58.0	0.1	58.1
August	34.8	0.1	34.9	51.9	0.0	51.9	46.5	0.6	47.1
September	43.4	4.2	47.4	75.4	0.4	75.8	40.6	7.9	48.5
October	39.6	11.3	48.8	109.4	6.4	115.7	22.6	17.9	40.5
November	39.1	47.3	72.1	123.0	56.2	179.1	17.1	43.8	60.9
December	13.2	54.2	53.4	39.0	78.7	117.7	4.6	44.7	49.2
Minimum	**12.4**	**0.0**	**34.9**	**39.0**	**0.0**	**51.9**	**3.1**	**0.1**	**33.9**
Average	**34.3**	**22.0**	**51.1**	**75.2**	**27.1**	**102.2**	**28.3**	**23.1**	**51.4**
Maximum	**67.7**	**54.2**	**72.1**	**123.0**	**83.5**	**179.1**	**82.1**	**44.7**	**85.7**
Total	**411.2**	**264.0**	**613.5**	**902.2**	**325.0**	**1226.9**	**339.8**	**277.3**	**617.1**

Source: 1981-2010 Climate Normals (WSC, 2019)

5.1.3 Snow Pack

5.1.3.1 Local Study Area

There are no snow survey stations operated by Provincial or Federal agencies located within the Project footprint or LSA. Accordingly, an assessment of snow pack data was not completed for these areas.

5.1.3.2 Local and Regional Study Areas

A frequency analysis was undertaken for the snow pack data collected at the snow stations located within or in close proximity to the Regional Study Area. A summary of the historical snow pack data is presented in **Table 14**, including the average annual data along with the 10 year and 100 year return period snow depth and snow water equivalent. The frequency analysis was completed using a log-normal distribution (maximum likelihood).

Table 14. Summary of Historical Snow Pack Data

Parameter	Upper Elk River (Station 2C06)	Fernie East (Station 2C07)	Morrissey Ridge (Station 2C09)	Morrissey Ridge (Station 2C09Q)	Mount Joffre (Station 2C16)	Thunder Creek (Station 2C17)
Period of Record	1948-2002	1951-2018	1961-1988	1938-2018	1969-2018	1969-2018
Elevation (masl)	1,340	1,250	1,860	1,860	1,750	2,010
Average SD (cm)	37.1	67.3	137	–	104	85.6
10-Year SD (cm)	71.2	103	207	–	139	114
100-Year SD (cm)	116	140	286	–	181	145
Average SWE (mm)	106	205	503	320	303	232
10-Year SWE (mm)	203	329	811	478	442	335
100-Year SWE (mm)	327	461	1,200	679	617	462

Notes: *1. SD = Snow Depth, SWE = Snow Water Equivalent*
2. Source – BC Data Catalogue

Further details on the snow pack analysis for the RSA can be found in the *Crown Mountain Coal Coking Project Baseline Meteorology Report* (2020).

5.2 Surface Water Hydrology

5.2.1 Local Study Area

The LSA includes five hydrometric monitoring stations at the key focus areas to where potential impacts associated with Project activities could potentially directly affect hydrologic conditions. The stations are located in the drainage basins and channels of Alexander Creek, West Alexander Creek, and Grave Creek.

Provided below is a summary of water level data and discharge measurements, together with the stage-discharge relationship and discharge hydrograph, for each of the baseline hydrometric stations.

5.2.1.1 Water Level Data

As noted in **Section 4.2**, continuous water level data was collected at the hydrometric monitoring stations, which consisted of a stilling well equipped with a water level logger (i.e., pressure transducer) together with a staff gauge. A summary of station information is provided in **Appendix A**.

The minimum, mean, and maximum water levels recorded at each station are summarized in **Table 15**, which are based on average daily data collected during the open water season (April 1 – November 30).

Table 15. Summary of Average Water Level Data (m) at Hydrometric Stations

Hydrometric Station	Period	Water Level (m)		
		Min	Mean	Max
A1	05/15/2012 – 05/02/2016	0.00	0.23	0.89
	11/14/2017 – 11/30/2019	0.24	0.35	0.73
G2	05/15/2012 – 05/02/2016	0.06	0.27	0.77
	11/14/2017 – 11/30/2019	0.07	0.21	0.84
WA1	05/15/2012 – 05/02/2016	0.18	0.33	0.57
A3B	06/27/2014 – 05/02/2016	0.04	0.19	0.70

Note: Water levels for open water season (April 1 – November 30).

It should be noted that the dataset for each station includes some data gaps and erroneous data due to equipment requiring calibration and repairs at certain points throughout the data collection period (refer to **Table 7**). Accordingly, the minimum, mean and maximum values reported above were determined based on available data collected at each station.

5.2.1.2 Discharge Measurements

Discharge measurements were collected through stream gauging for the purpose of establishing a stage-discharge relationship (i.e., rating curve) at each of the baseline hydrometric monitoring stations. The discharge measurements were conducted by employing the area-velocity method using a FlowTracker2 handheld acoustic doppler velocity meter. Discharge measurement records are provided in **Appendix B**.

5.2.1.3 Stage-Discharge Relationships

A summary of the rating curve equations representing the stage discharge relationship at each of the hydrometric monitoring stations location is provided in **Table 16**.

Table 16. Summary of Rating Curve Equations

Hydrometric Station	Rating Period	Rating Equation	Root Mean Square	Number of Rating Points Used
A1	Jul 2013 - Jun 2015	$Q = 1.0478e^{4.9747x}$	0.76	7
	Nov 2017 - Nov 2018	$Q = 0.0653e^{8.0582x}$	0.55	3
A3	Nov 2013 - Jun 2014	$Q = 11.961x^{3.6717}$	0.99	3
A3B	Sept 2014 - Sept 2015	$Q = 0.5403e^{6.6229x}$	0.98	5
WA1	Nov 2013 - Sept 2015	$Q = 41.526x^{4.7907}$	0.99	7
G2	Nov 2013 - Sept 2015	$Q = 0.0451e^{9.5108x}$	0.97	8
	Nov 2017 - Nov 2018	$Q = 0.033e^{7.798x}$	0.64	4

Note: x = stage level (m)

It was determined through a review of the data collected for station A3 that there was an inconsistency between the discharge measurements and water level data, which could not be reconciled. Consequently, it was decided to relocate the hydrometric station to location A3B. A discharge hydrograph was not developed for station A3.

5.2.1.4 Discharge Hydrographs

Discharge hydrographs for stations A1, A3B, WA1, and G2 are provided below in **Figures 24** to **27**. Daily flow data is provided in **Appendix C** and individual hydrographs are included in **Appendix D**.

As shown in **Figures 24** to **27**, the annual hydrographs for each of the four stations demonstrate the variability of flow conditions over the monitoring periods. Notably, minimal to near zero flows are annually observed in the late-fall to early-spring months at the four stations. The onset of annual freshet conditions have been noted to occur as early as the beginning of April in some years (e.g., 2016) across the stations. The freshet periods over the course of stream flow monitoring were found to generally persist into early July with low summer flows typically occurring at least by the end of August.

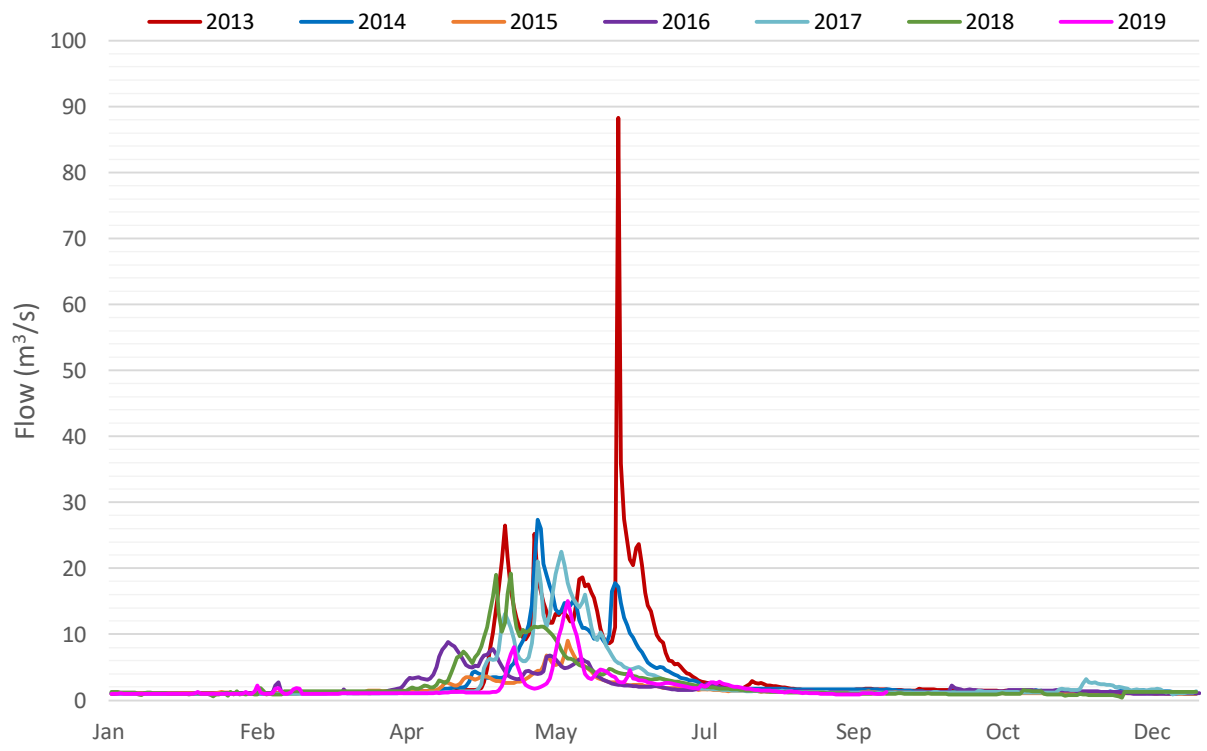


Figure 24. Discharge Hydrograph for Station A1

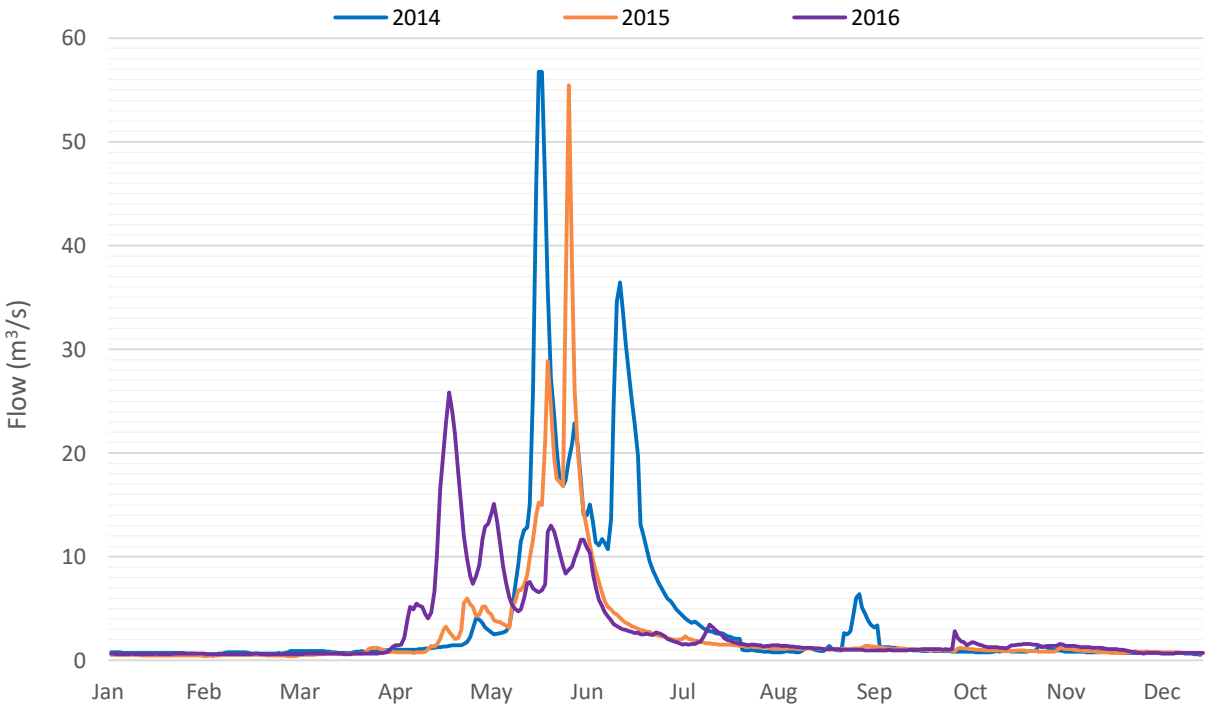


Figure 25. Discharge Hydrograph for Station A3B

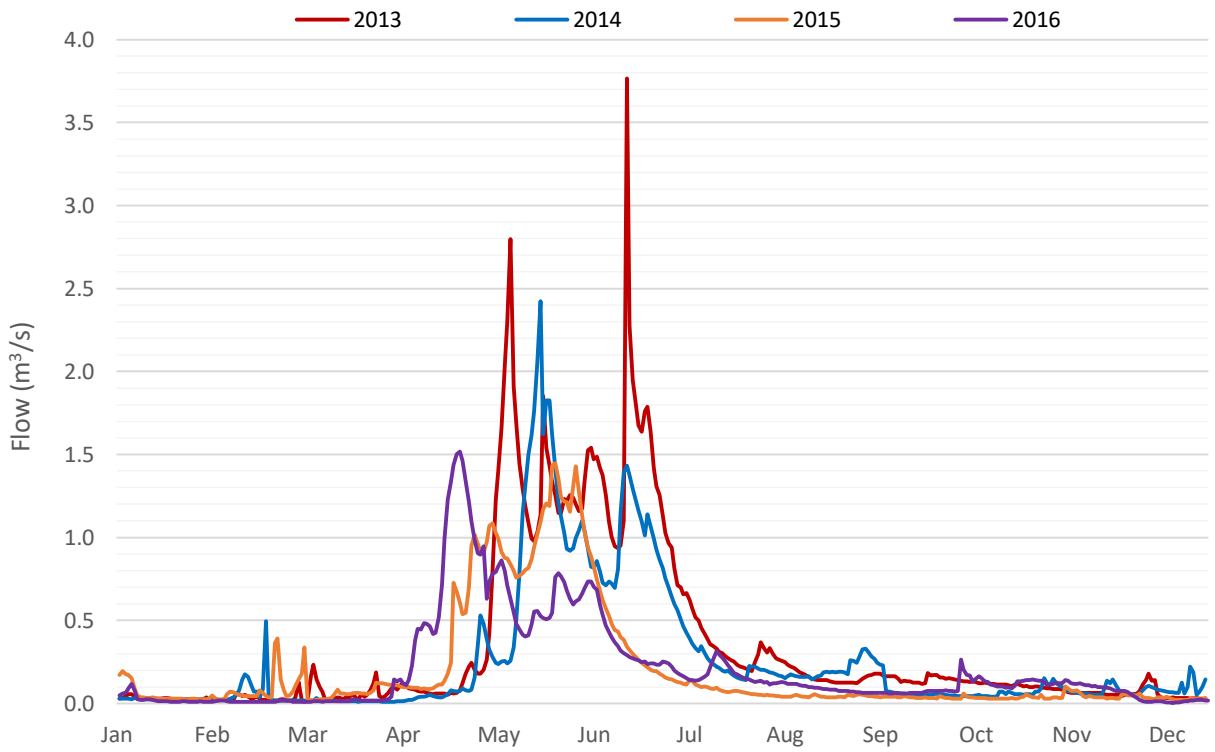


Figure 26. Discharge Hydrograph for Station WA1

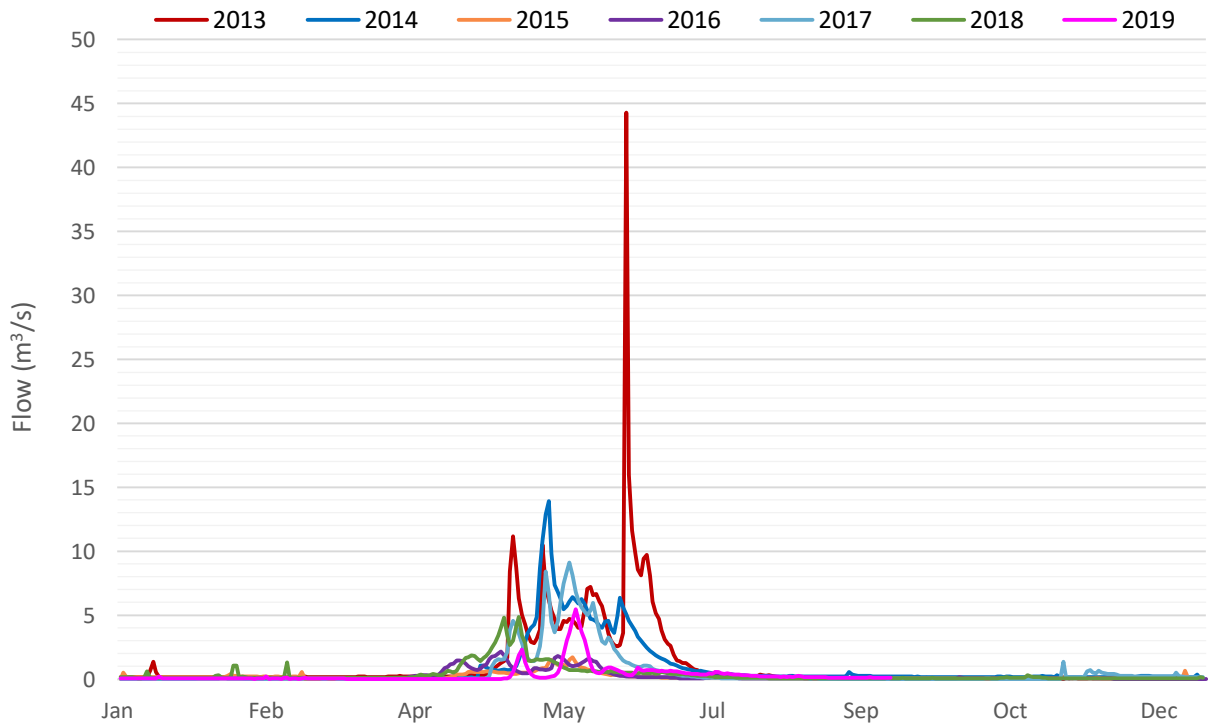


Figure 27. Discharge Hydrograph for Station G2

5.2.1.5 Regression Analyses and Flow Estimation

Regression analyses were undertaken to estimate flows and fill data gaps at each hydrometric monitoring station based on the discharge relationship with a nearby WSC gauge. This process was necessary to fill data gaps where data was missing or compromised due to freeze up or otherwise. The results of the regression analyses for each hydrometric monitoring station are summarized below.

Station A1

Through a review of available hydrometric data and the results of regression analyses for regional WSC gauges, it was determined that Station 08NK022 (Line Creek at the Mouth) provided the best relationship of discharge data for Station A1. However, daily discharge data was not available for 2018 so WSC Station 08NK026 (Hosmer Creek above Diversions) was used to fill gaps during this period. The regression equations that were applied to fill data gaps for daily discharge values at Station A1 are included in **Table 17** below.

Table 17. Regression Equations for Station A1

WSC Station	Regression Equation	Root Mean Square	Period
08NK022 (Line Creek at the Mouth)	$y = 0.0899x^2 + 0.456x + 0.5953$	0.8773	2013-2017, 2019
08NK026 (Hosmer Creek above Diversions)	$y = 16.36x + 0.554$	0.6414	2018

The relationship of daily discharges recorded at Station A1 and WSC Station 08NK022 (Line Creek at the Mouth) is shown on **Figure 28**.

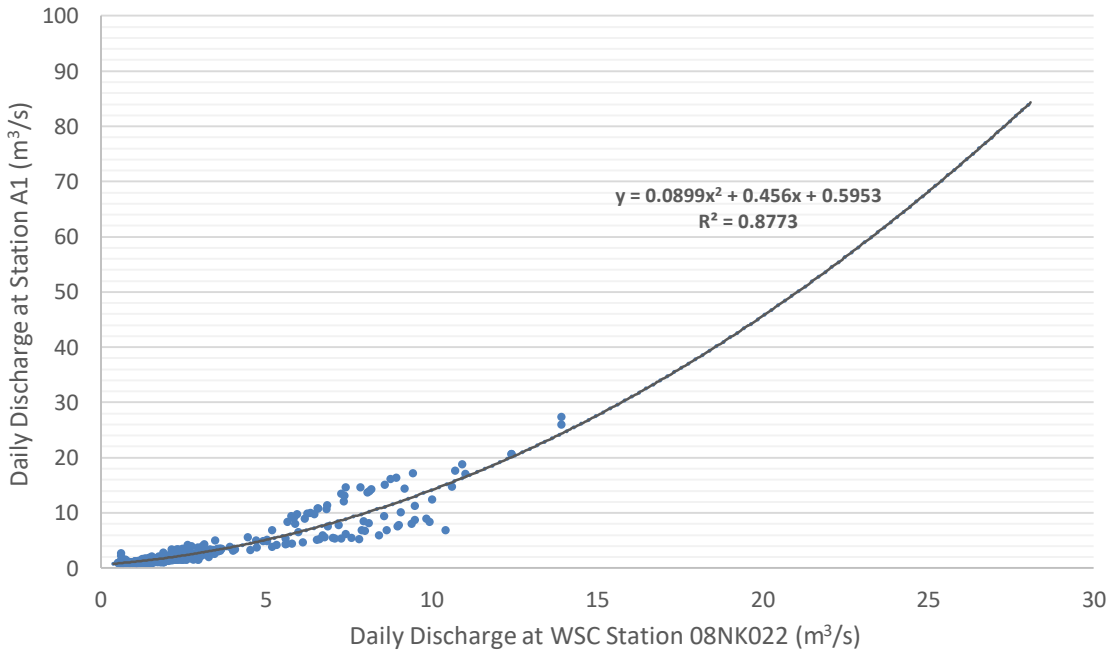


Figure 28. Discharge Relationship between Station A1 and 08NK022 (Line Creek at the Mouth)

The relationship of daily discharges recorded at Station A1 and WSC Station 08NK026 (Hosmer Creek above Diversions) is shown on **Figure 29**.

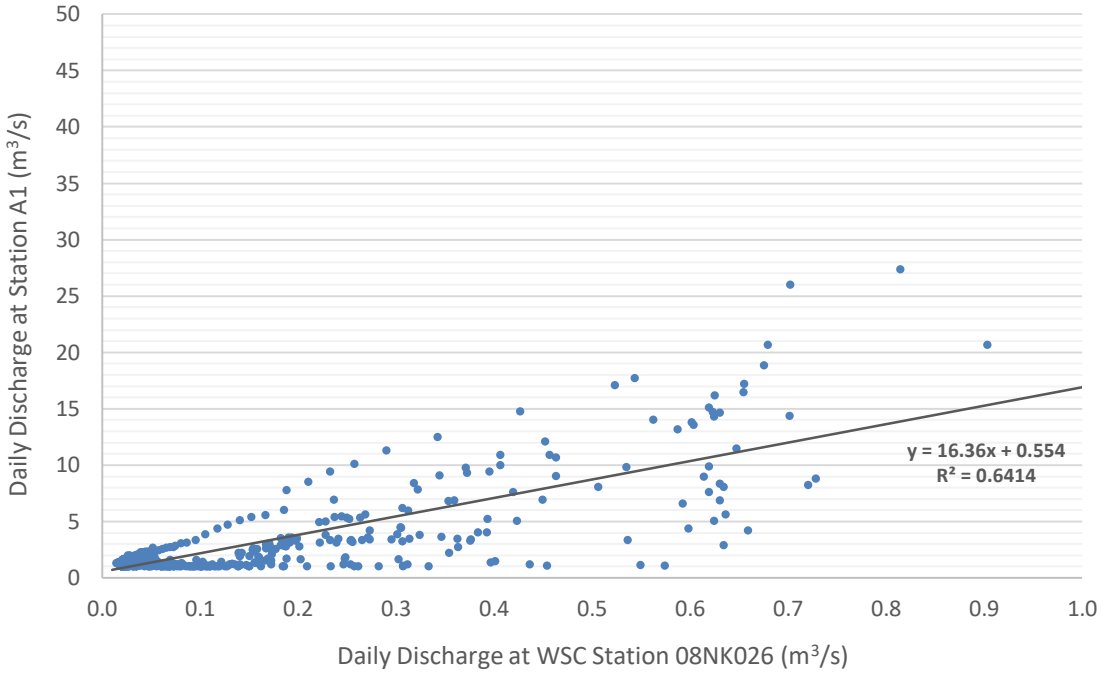


Figure 29. Discharge Relationship between Station A1 and 08NK026 (Hosmer Creek above Diversions)

Station A3B

The results of the regression analysis indicate that Station 08NK022 (Line Creek at the Mouth) provided the best relationship of discharge data for Station A3B, using the equation in **Table 18** below.

Table 18. Regression Equation for Station A3B

WSC Station	Regression Equation	Root Mean Square	Period
08NK022 (Line Creek at the Mouth)	$y = 0.2687x^2 + 0.3185x + 0.5744$	0.9335	2014-2016

The relationship of daily discharges recorded at Station A3B and WSC Station 08NK022 (Line Creek at the Mouth) is shown on **Figure 30**.

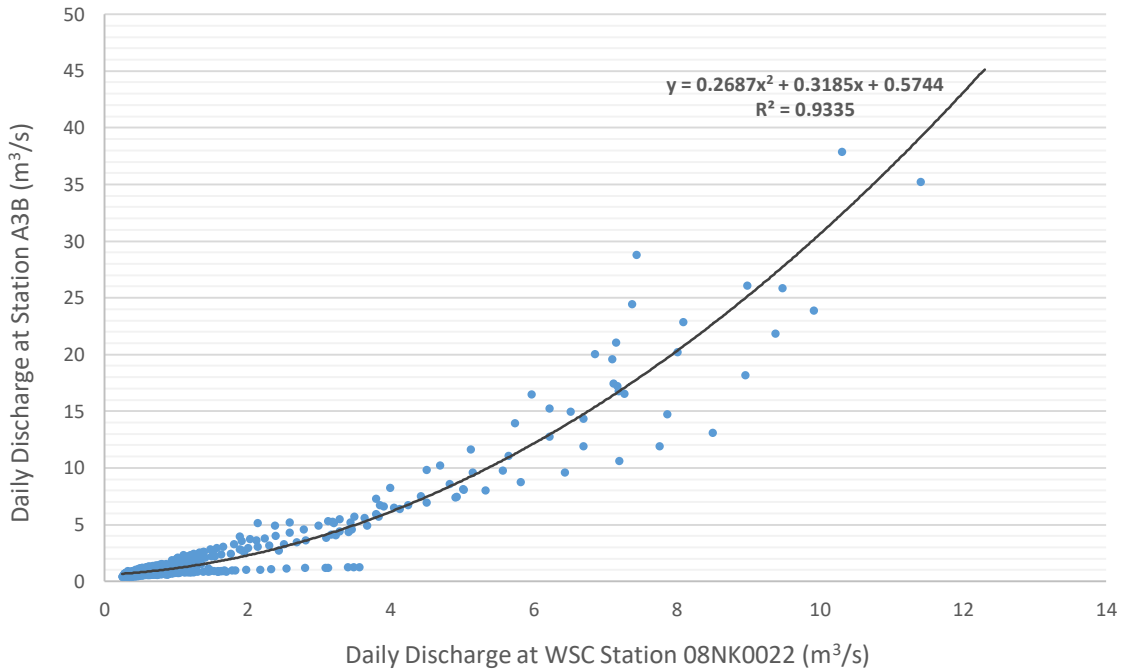


Figure 30. Discharge Relationship between Station A3B and 08NK022 (Line Creek at the Mouth)

Station WA1

Table 19 provides the regression equation for WA1, which is based on the relationship with Station 08NK022 (Line Creek at the Mouth).

Table 19. Regression Equation for Station WA1

WSC Station	Regression Equation	Root Mean Square	Period
08NK022 (Line Creek at the Mouth)	y = 0.1365x - 0.0405	0.7514	2013-2016

The relationship of daily discharges recorded at Station WA1 and WSC Station 08NK022 (Line Creek at the Mouth) is shown on **Figure 31**.

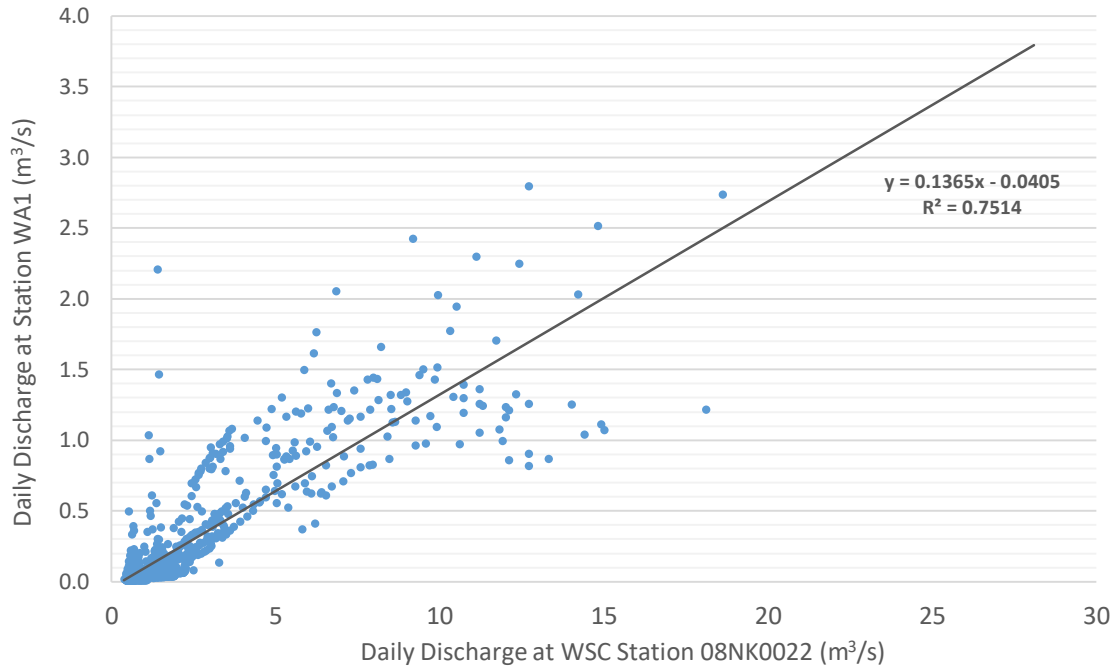


Figure 31. Discharge Relationship between Station WA1 and 08NK022 (Line Creek at the Mouth)

Station G2

It was determined through a review of available hydrometric data and the results of regression analyses that Station 08NK022 (Line Creek at the Mouth) provided the best relationship of discharge data for Station G2. However, daily discharge data was not available for 2018 so WSC Station 08NK026 (Hosmer Creek above Diversions) was used to fill gaps during this period. **Table 20** provides the regression equations for G2.

Table 20. Regression Equations for Station G2

WSC Station	Regression Equation	Root Mean Square	Period
08NK022 (Line Creek at the Mouth)	$y = 0.0595x^2 - 0.0988x + 0.2235$	0.5707	2013-2017, 2019
08NK026 (Hosmer Creek above Diversions)	$y = 3.0051x^2 + 2.9846x + 0.0362$	0.3403	2018

The relationship of daily discharges recorded at Station A1 and WSC Station 08NK022 (Line Creek at the Mouth) and 08NK026 (Hosmer Creek above Diversions) are shown on **Figures 32** and **33**, respectively.

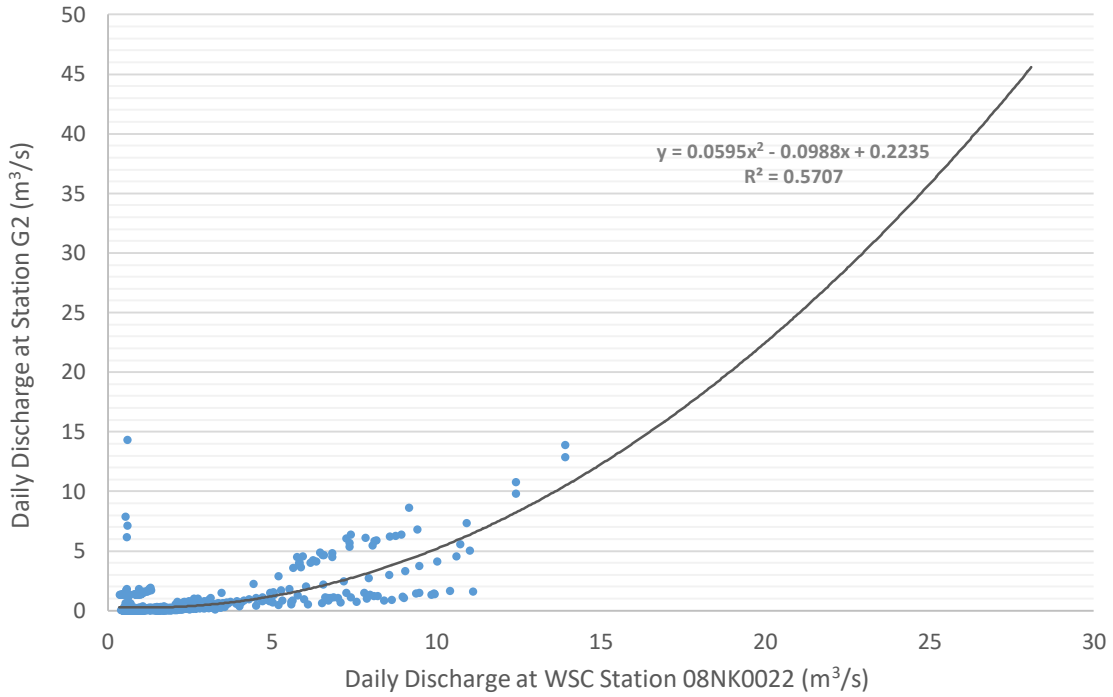


Figure 32. Discharge Relationship between Station G2 and 08NK022 (Line Creek at the Mouth)

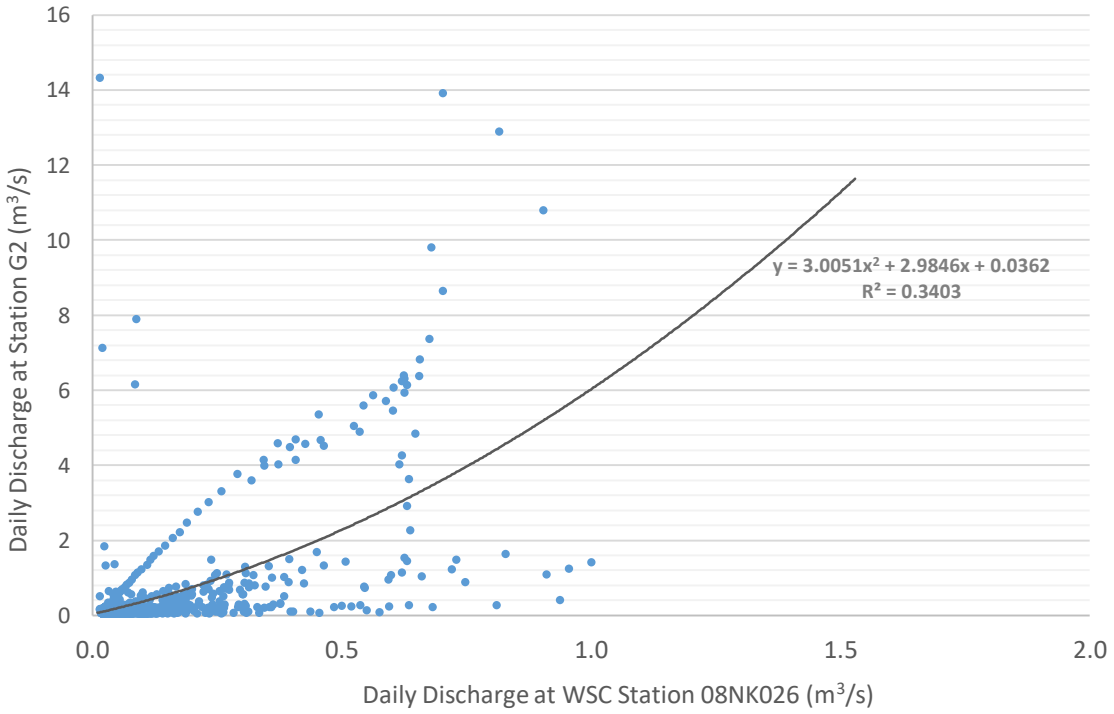


Figure 33. Discharge Relationship between Station G2 and 08NK026 (Hosmer Creek above Diversions)

5.3 Hydrologic Statistics

Key hydrologic indices and statistics for the LSA and RSA are provided to provide context to annual movement of water through the LSA. Information can be used to support further planning, engineering design, and assessment of potential impacts on the natural environment.

5.3.1 Local Study Area

5.3.1.1 Annual and Monthly Runoff

Annual and monthly runoff depth for each of the hydrometric monitoring stations is provided in **Table 21** and illustrated for years 2013 to 2019 in **Figures 34** to **40**, respectively.

Table 21. Monthly and Annual Runoff Depth (mm) at Hydrometric Monitoring Stations

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
A1 (147.6 km²)	2013	19.1	17.0	19.8	24.2	214.1	332.9	83.2	34.9	27.7	27.0	22.0	19.7	841.7
	2014	18.5	16.2	20.0	24.8	173.2	200.6	54.7	30.8	27.2	21.9	21.6	23.3	632.7
	2015	18.7	17.7	21.2	30.8	68.4	69.0	31.2	23.7	20.3	19.3	18.6	19.4	358.2
	2016	17.3	18.4	19.4	76.1	93.8	62.1	33.3	25.2	21.3	26.4	25.1	19.2	437.5
	2017	18.0	16.1	18.8	20.5	167.8	174.0	40.2	24.0	20.7	22.2	29.6	27.7	579.6
	2018	19.2	16.1	24.7	48.2	200.3	81.0	42.7	22.7	17.6	16.9	17.0	20.4	526.9
	2019	18.2	18.5	19.7	19.3	55.1	96.2	41.8	23.3	16.8	-	-	-	309.1
	Mean	**18.4**	**17.2**	**20.5**	**34.8**	**139.0**	**145.1**	**46.7**	**26.4**	**21.7**	**22.3**	**22.3**	**21.6**	**536.0**
WA1 (14.6 km²)	2013	5.5	4.4	11.6	16.9	227.2	263.3	95.6	38.4	26.2	23.8	13.5	10.6	737.0
	2014	4.9	11.1	2.8	8.4	176.8	177.1	67.1	32.9	27.0	9.4	15.0	15.9	548.4
	2015	10.2	12.6	13.9	48.6	186.8	106.9	19.4	8.2	7.4	6.2	8.2	6.4	434.6
	2016	4.8	2.1	2.8	123.5	117.6	76.1	35.8	19.7	11.7	22.1	20.5	4.4	441.1
	Mean	**6.3**	**7.6**	**7.8**	**49.4**	**177.1**	**155.8**	**54.5**	**24.8**	**18.1**	**15.4**	**14.3**	**9.3**	**540.3**
A3B (90.8 km²)	2014	21.4	18.4	25.1	34.3	447.8	535.1	118.6	28.2	64.4	25.4	26.7	21.9	1,367.3
	2015	14.6	13.5	19.7	48.2	280.3	323.4	55.2	34.6	33.2	29.6	26.4	23.0	901.8
	2016	18.7	16.5	19.1	251.8	269.5	161.7	62.0	38.4	28.9	41.9	38.9	23.0	970.3
	Mean	**18.2**	**16.1**	**21.3**	**111.5**	**332.5**	**340.1**	**78.6**	**33.7**	**42.2**	**32.3**	**30.7**	**22.6**	**1,079.8**
G2 (24.9 km²)	2013	25.0	15.3	18.3	24.0	416.4	786.1	111.9	14.8	7.2	6.2	6.7	8.3	1,440.0
	2014	7.8	6.6	7.0	10.3	424.0	461.8	77.3	24.3	23.9	18.5	48.1	41.6	1,151.3
	2015	17.0	19.4	6.9	16.0	77.4	53.9	12.0	7.8	7.0	6.6	7.6	9.1	240.9
	2016	6.0	5.2	6.0	60.5	123.7	64.0	12.4	5.1	3.6	6.2	5.3	3.8	301.6
	2017	4.0	3.7	3.8	3.6	322.9	336.4	23.2	4.4	3.5	3.8	26.9	25.1	761.2
	2018	14.0	23.9	13.7	58.0	241.0	59.4	29.3	8.1	7.4	10.0	10.4	7.4	482.5
	2019	6.5	7.1	4.5	3.5	58.5	148.7	49.5	19.6	11.6	-	-	-	309.6
	Mean	**11.5**	**11.6**	**8.6**	**25.1**	**237.7**	**272.9**	**45.1**	**12.0**	**9.2**	**8.5**	**17.5**	**15.9**	**675.6**

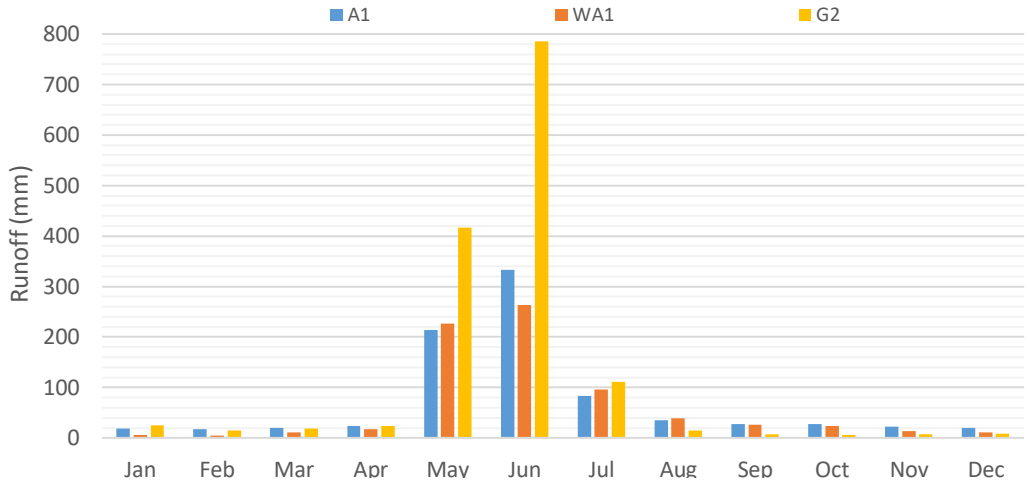


Figure 34. 2013 Monthly Watershed Runoff (mm)

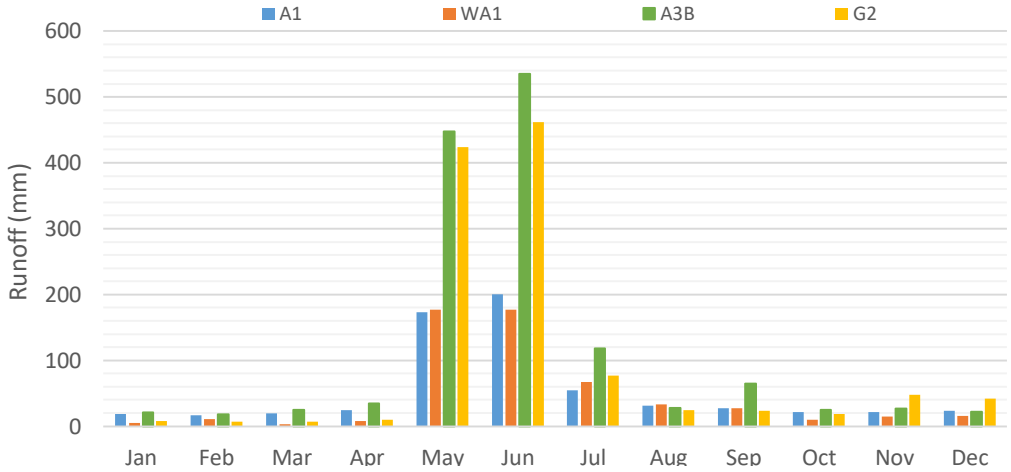


Figure 35. 2014 Monthly Watershed Runoff (mm)

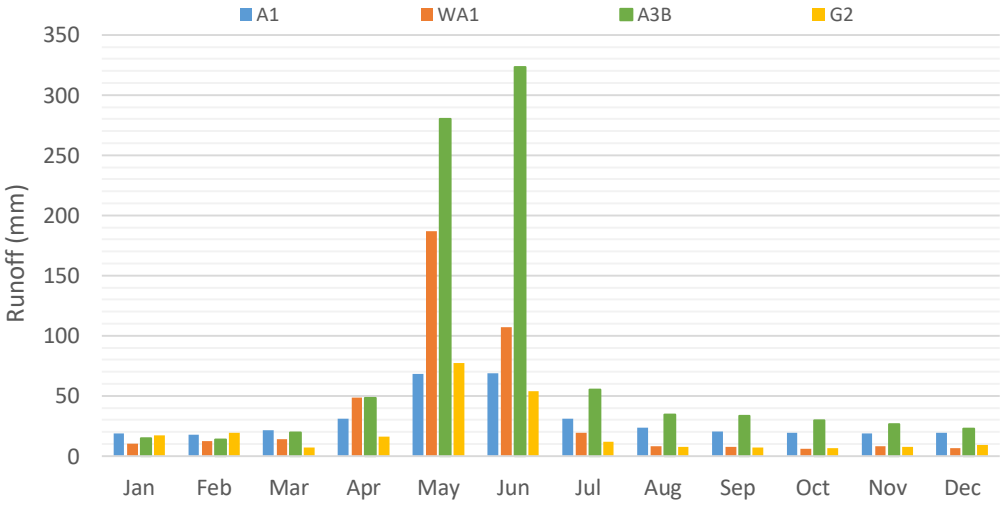


Figure 36. 2015 Monthly Watershed Runoff (mm)

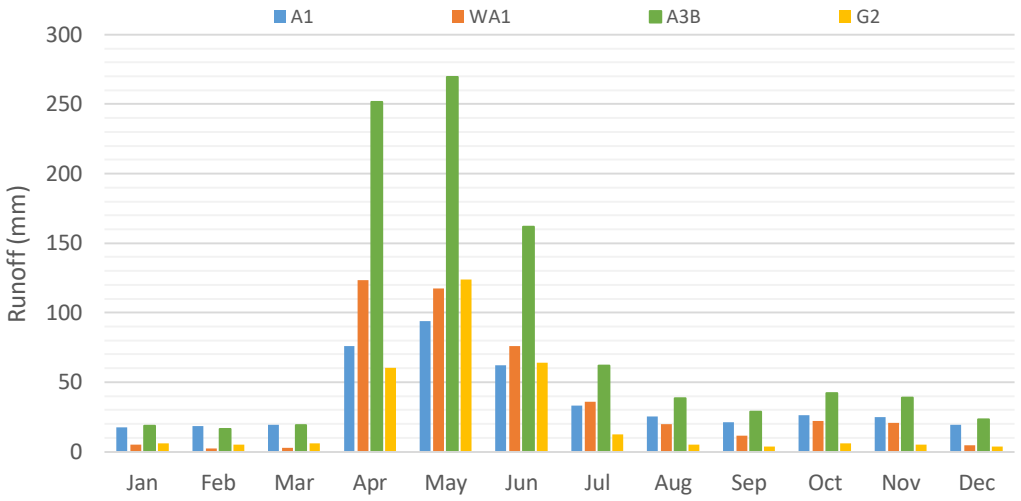


Figure 37. 2016 Monthly Watershed Runoff (mm)

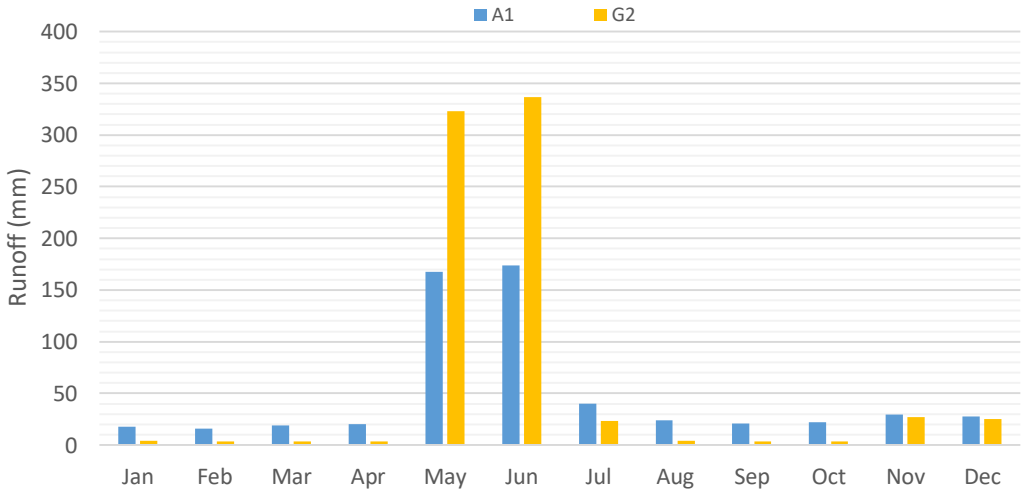


Figure 38. 2017 Monthly Watershed Runoff (mm)

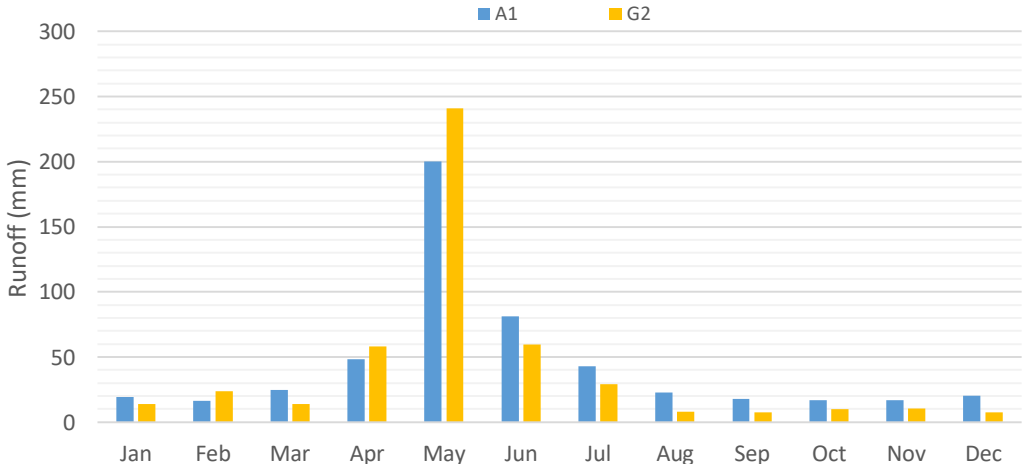


Figure 39. 2018 Monthly Watershed Runoff (mm)

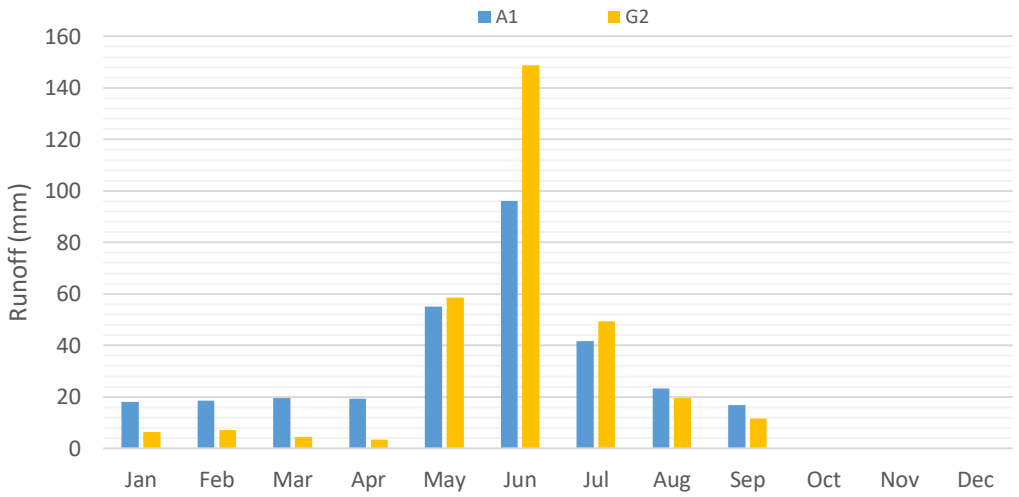


Figure 40. 2019 Monthly Watershed Runoff (mm)

Annual and monthly runoff percentage for each hydrometric station is provided in **Table 22** and illustrated in **Figures 41** to **47** for 2013 to 2019.

Table 22. Annual and Monthly Runoff Percentage at Hydrometric Monitoring Stations

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
A1	2013	2%	2%	2%	3%	25%	40%	10%	4%	3%	3%	3%	2%	100%
	2014	3%	3%	3%	4%	27%	32%	9%	5%	4%	3%	3%	4%	100%
	2015	5%	5%	6%	9%	19%	19%	9%	7%	6%	5%	5%	5%	100%
	2016	4%	4%	4%	17%	21%	14%	8%	6%	5%	6%	6%	4%	100%
	2017	3%	3%	3%	4%	29%	30%	7%	4%	4%	4%	5%	5%	100%
	2018	4%	3%	5%	9%	38%	15%	8%	4%	3%	3%	3%	4%	100%
	2019	6%	6%	6%	6%	18%	31%	14%	8%	5%	0%	0%	0%	100%
	Mean	**4%**	**4%**	**4%**	**7%**	**25%**	**26%**	**9%**	**5%**	**4%**	**4%**	**4%**	**3%**	**100%**
WA1	2013	1%	1%	2%	2%	31%	36%	13%	5%	4%	3%	2%	1%	100%
	2014	1%	2%	1%	2%	32%	32%	12%	6%	5%	2%	3%	3%	100%
	2015	2%	3%	3%	11%	43%	25%	4%	2%	2%	1%	2%	1%	100%
	2016	1%	0%	1%	28%	27%	17%	8%	4%	3%	5%	5%	1%	100%
	Mean	**1%**	**2%**	**1%**	**11%**	**33%**	**27%**	**9%**	**4%**	**3%**	**3%**	**3%**	**2%**	**100%**
A3B	2014	2%	1%	2%	3%	33%	39%	9%	2%	5%	2%	2%	2%	100%
	2015	2%	1%	2%	5%	31%	36%	6%	4%	4%	3%	3%	3%	100%
	2016	2%	2%	2%	26%	28%	17%	6%	4%	3%	4%	4%	2%	100%
	Mean	**2%**	**2%**	**2%**	**11%**	**31%**	**31%**	**7%**	**3%**	**4%**	**3%**	**3%**	**2%**	**100%**
G2	2013	2%	1%	1%	2%	29%	55%	8%	1%	0%	0%	0%	1%	100%
	2014	1%	1%	1%	1%	37%	40%	7%	2%	2%	2%	4%	4%	100%
	2015	7%	8%	3%	7%	32%	22%	5%	3%	3%	3%	3%	4%	100%
	2016	2%	2%	2%	20%	41%	21%	4%	2%	1%	2%	2%	1%	100%
	2017	1%	0%	1%	0%	42%	44%	3%	1%	0%	0%	4%	3%	100%
	2018	3%	5%	3%	12%	50%	12%	6%	2%	2%	2%	2%	2%	100%
	2019	2%	2%	1%	1%	19%	48%	16%	6%	4%	0%	0%	0%	100%
	Mean	**2%**	**3%**	**2%**	**6%**	**36%**	**35%**	**7%**	**2%**	**2%**	**1%**	**2%**	**2%**	**100%**

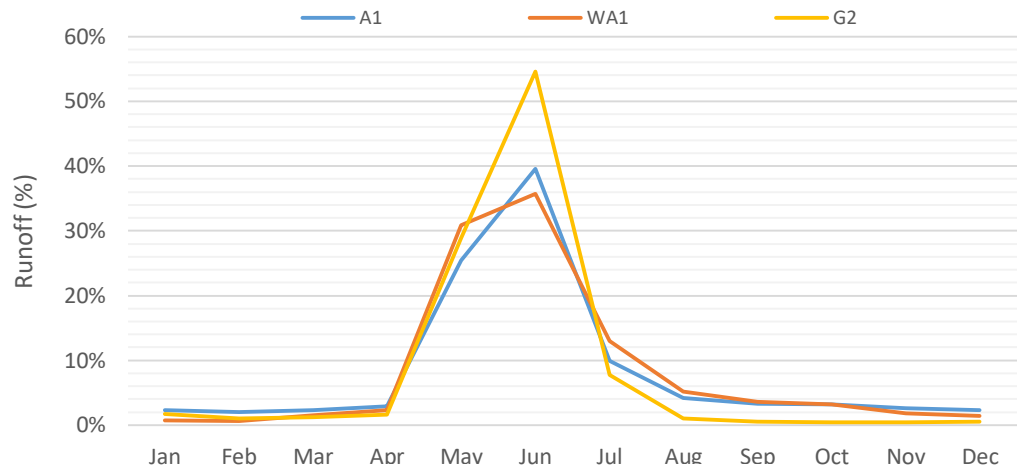


Figure 41. 2013 Monthly Watershed Runoff (%) at Hydrometric Monitoring Stations

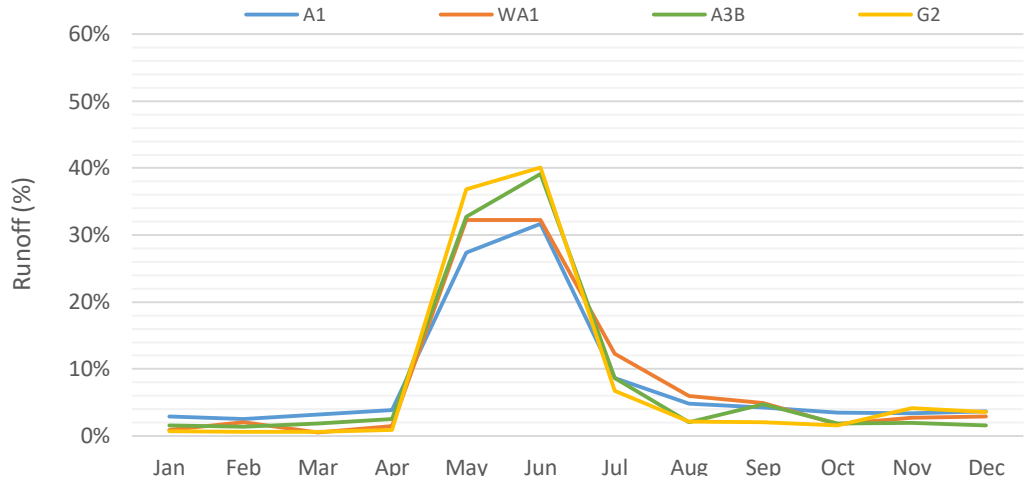


Figure 42. 2014 Monthly Watershed Runoff (%) at Hydrometric Monitoring Stations

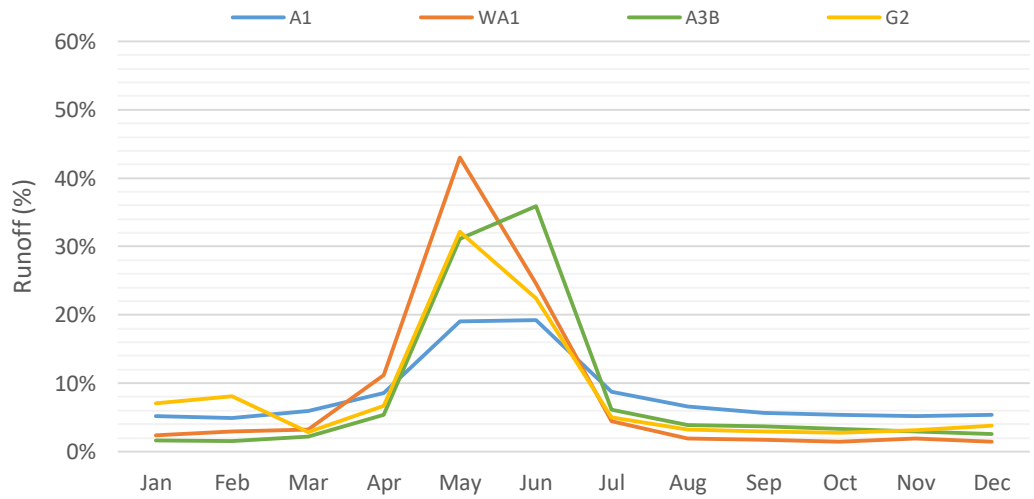


Figure 43. 2015 Monthly Watershed Runoff (%) at Hydrometric Monitoring Stations

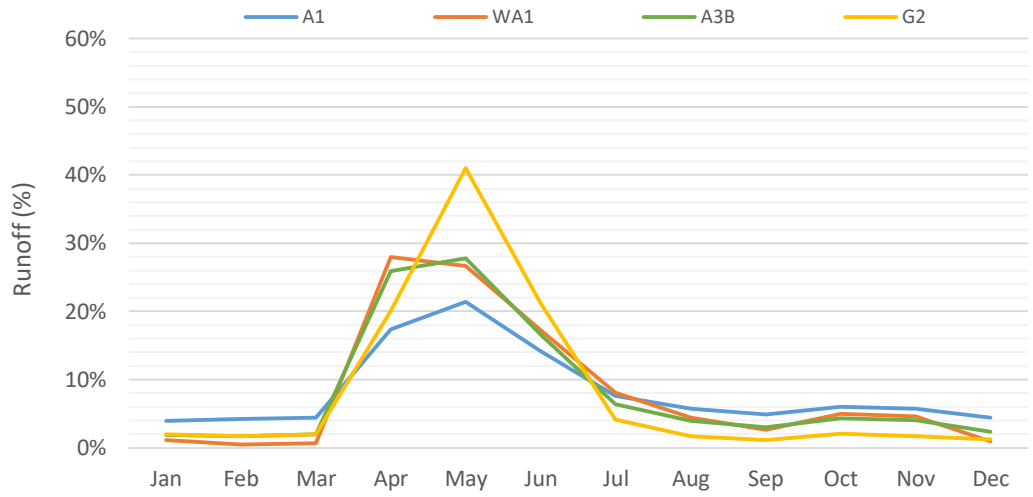


Figure 44. 2016 Monthly Watershed Runoff (%) at Hydrometric Monitoring Stations

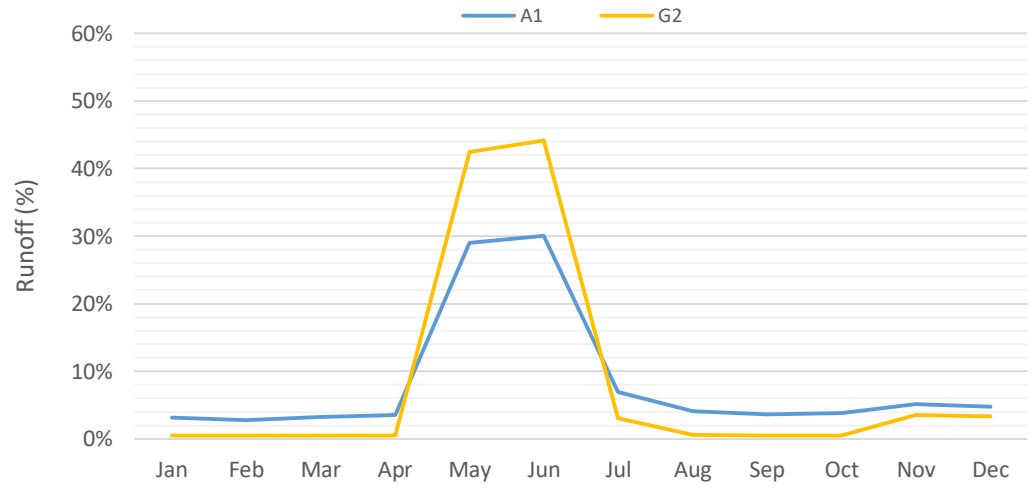


Figure 45. 2017 Monthly Watershed Runoff (%) at Hydrometric Monitoring Stations

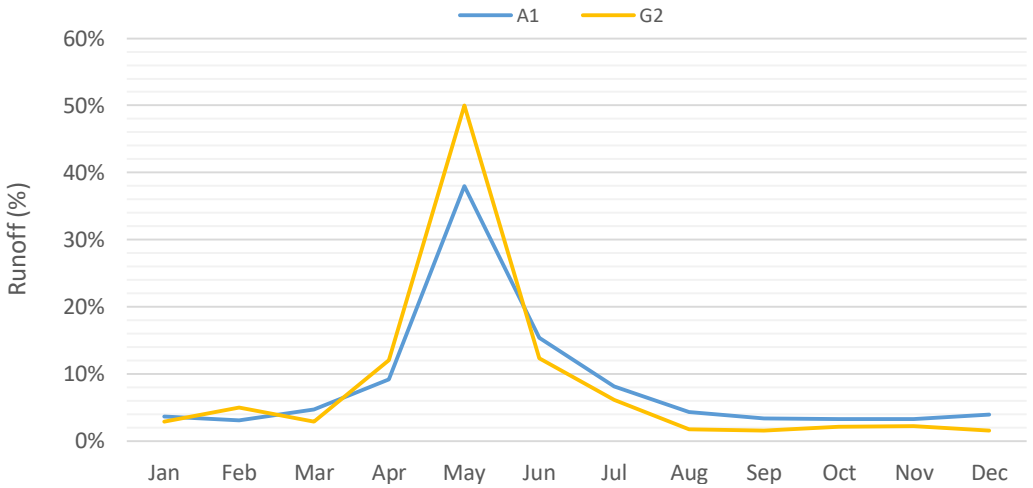


Figure 46. 2018 Monthly Watershed Runoff (%) at Hydrometric Monitoring Stations

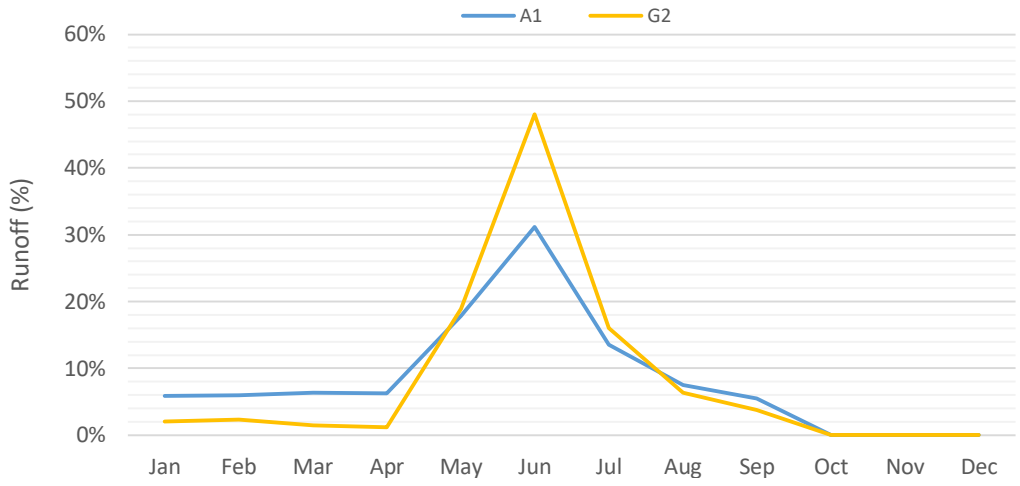


Figure 47. 2019 Monthly Watershed Runoff (%) at Hydrometric Monitoring Stations

Through a review of the annual and monthly runoff data for the common period of assessment (2014-2016), the following observations are noted:

- Most of the runoff occurred between April and July at all of the hydrometric stations, with a significant portion of the runoff generated in the months of June and July;
- Mean annual and monthly runoff was generally highest at Station A3B, with the greatest annual value in 2014 (1,367.3 mm). This can likely be attributed to the higher average elevation of the A3B watershed in comparison with the other stations, which would expect to result in an increase in precipitation and snowmelt; and,
- The lowest proportion of runoff typically occurred in the late summer, winter, and early spring months at all of the hydrometric monitoring stations.

Additional observations noted for the extended period of monitoring (2013 and 2017-2019) at Stations A1 and G2 indicate that the highest runoff depth occurred at G2 in June 2013 (786.1 mm), which accounted for 55% of the annual runoff for that year. Similarly, the highest runoff depth at A1 during the same month (332.9 mm), which is equivalent to 40% of the 2013 annual runoff.

5.3.1.2 Peak Flows

Peak flows and unit area yield values for each of the hydrologic monitoring stations are summarized in **Table 23**. As noted above, peak flows typically occur during the freshet in the summer months (June-August). Of the five monitoring stations, the highest peak flow occurred at Station A1 in 2013, while the highest yield values during the common monitoring period occurred at Station A3B in 2014.

Table 23. Peak Discharges and Unit Area Yields for Hydrometric Monitoring Stations

Hydrometric Station	Drainage Area (km^2)	Year	Peak Flow (m^3/s)	Yield ($L/s/km^2$)
A1	147.62	2013	88.25	597.8
		2014	27.40	185.6
		2015	9.04	61.2
		2016	8.82	59.7
		2017	22.52	152.6
		2018	19.20	130.0
		2019	15.00	101.6
		Mean	**27.17**	**184.1**
WA1	14.60	2013	3.77	257.9
		2014	2.42	166.1
		2015	1.45	99.1
		2016	1.52	103.9
		Mean	**2.29**	**156.74**
A3B	90.77	2014	56.77	795.2
		2015	55.43	776.5
		2016	25.85	362.2
		Mean	**46.02**	**644.6**
G2	24.87	2013	44.3	1780.2
		2014	13.9	559.7
		2015	1.69	68.1
		2016	2.17	87.1
		2017	9.14	367.3
		2018	4.87	195.6
		2019	5.46	219.5
		Mean	**11.65**	**468.2**

5.3.1.3 Mean, Minimum, and Maximum Daily Flows and & 7 Day Low Flows

Table 24 provides a summary of the average, minimum, and maximum daily flows, together with the minimum average 7 day low flows, for the hydrometric monitoring stations.

As indicated in **Table 24**, the highest maximum flows in the Alexander Creek (A1) and Grave Creek (G2) occurred in 2013, while the lowest minimum flows occurred in 2018 (not including 2019 as it is a partial year of data). The highest average mean and maximum flows are associated with Station A3B and the lowest corresponding values occurred at Station WA1.

Table 24. Minimum, Average, and Maximum Daily Flows and & 7 Day Low Flows

Hydrometric Station	Drainage Area	Year	Mean (m^3/s)	Minimum (m^3/s)	Maximum (m^3/s)	7 Day Low (m^3/s)
A1	147.62	2013	3.94	1.02	88.25	1.03
		2014	2.96	0.93	27.40	0.93
		2015	1.68	0.94	9.040	0.98
		2016	2.05	0.91	8.82	0.93
		2017	2.71	0.86	22.52	0.97
		2018	2.47	0.36	19.20	0.67
		2019*	1.98	0.84	15.00	0.86
		Average	**2.54**	**0.84**	**27.17**	**0.91**
WA1	14.60	2013	0.34	0.01	3.77	0.02
		2014	0.25	0.01	2.42	0.01
		2015	0.20	0.02	1.45	0.02
		2016	0.20	0.01	1.52	0.01
		Average	**0.25**	**0.01**	**2.29**	**0.02**
A3B	90.77	2014	3.94	0.56	56.77	0.61
		2015	2.60	0.40	55.43	0.44
		2016	2.79	0.59	25.86	0.60
		Average	**3.11**	**0.52**	**46.02**	**0.55**
G2	24.87	2013	1.14	0.04	44.28	0.04
		2014	0.87	0.04	13.92	0.06
		2015	0.19	0.03	1.70	0.03
		2016	0.24	0.03	2.17	0.03
		2017	0.60	0.03	9.14	0.03
		2018	0.38	0.05	4.87	0.05
		2019*	0.34	0.03	5.46	0.03
		Average	**0.54**	**0.04**	**11.65**	**0.04**

*Note: * partial year of data*

5.3.1.4 Flow Duration

Flow duration curves are provided below for each of the baseline stations (**Figures 48** to **51**). A flow duration curve is a cumulative frequency curve that shows the percent of time specified discharges were equaled or exceeded during a given period. Smaller basins generally produce a steeper curve due to their quicker hydrologic response times, whereas larger basins or those with more attenuation volume typically have a flatter curve due to their great storage and attenuation capacity.

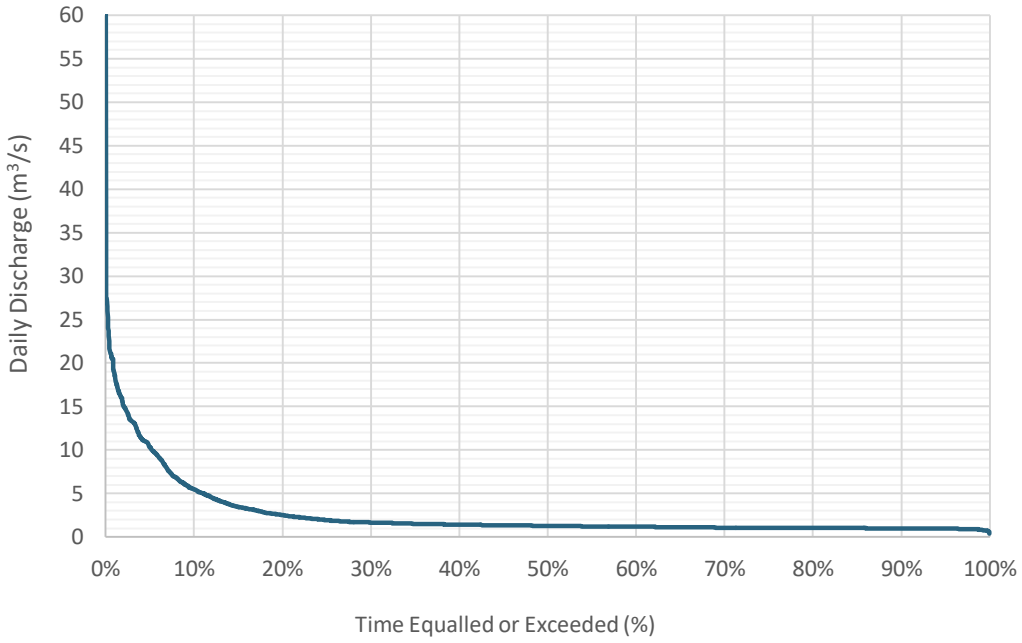


Figure 48. Flow Duration Curve for Station A1 (2013-2019)

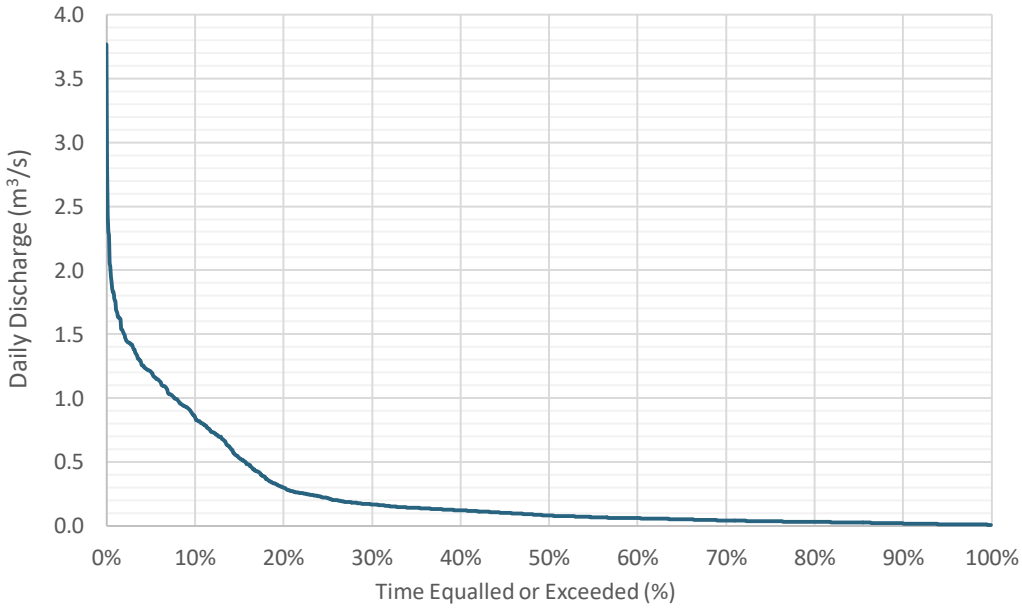


Figure 49. Flow Duration Curve for Station WA1 (2013-2016)

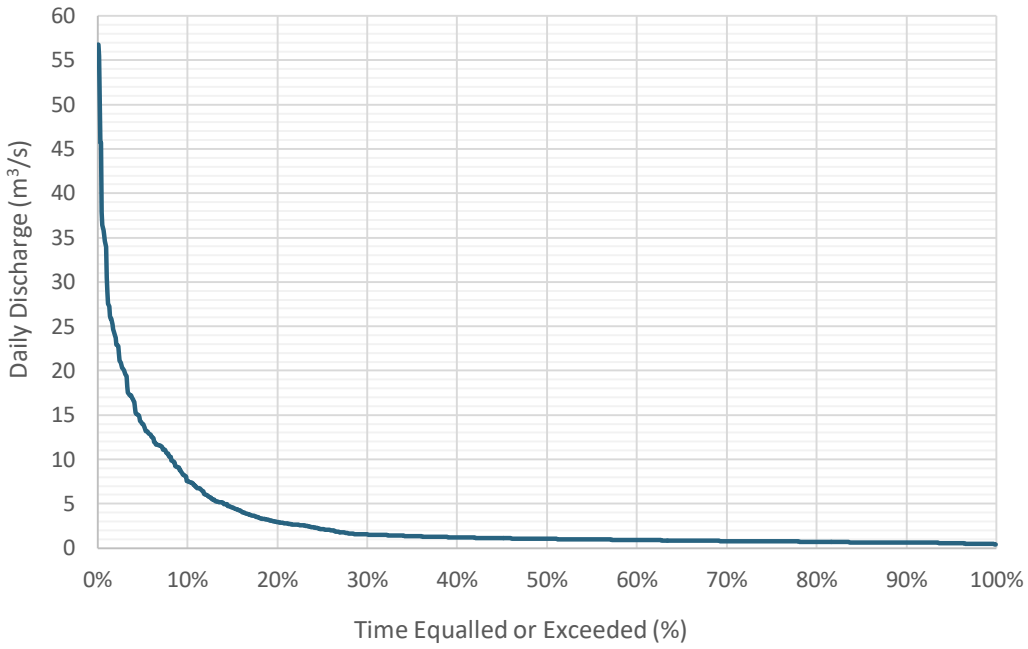


Figure 50. Flow Duration Curve for Station A3B (2014-2016)

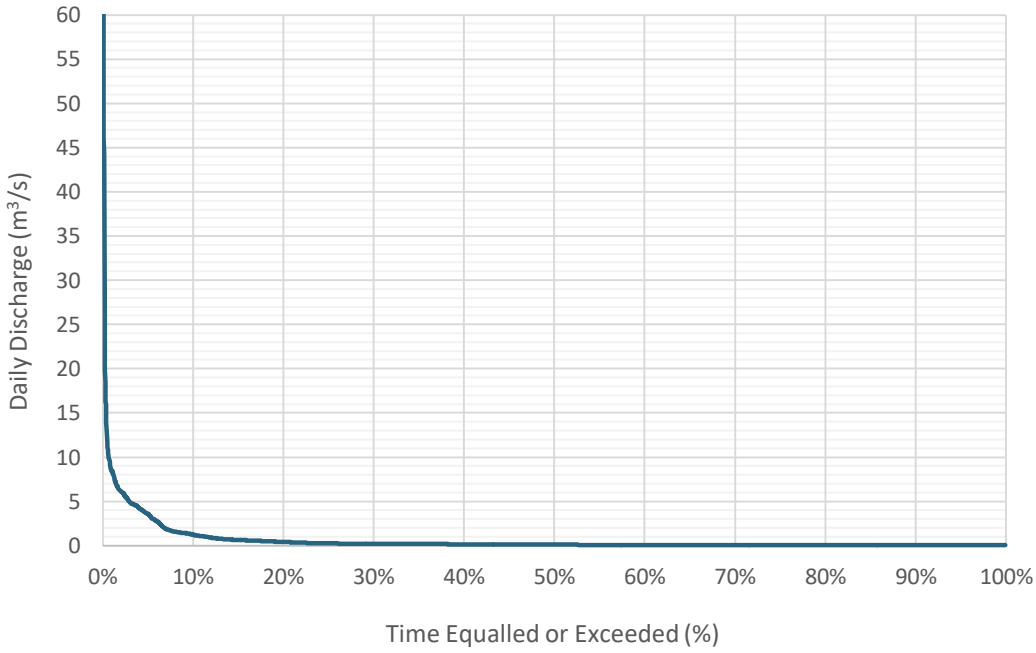


Figure 51. Flow Duration Curve for Station G2 (2013-2019)

The flow duration curves for the Alexander Creek watershed (i.e., A1, WA1, and A3b) are noted to demonstrate similar flow duration curve characteristics, potentially due to their similarity in watershed orientation and alignment, as compared to Grave Creek (i.e., G2), which is located on the western side of Erickson Ridge (in closer proximity to the Elk River).

5.3.2 Regional Study Area

The purpose of this section of the report is to provide a summary of relevant hydrologic information for the RSA, including the results of frequency analyses performed to estimate flood flow and low flow conditions. The hydrologic information presented in this section is based on recorded data obtained from WSC for hydrometric gauge stations located within the RSA.

5.3.2.1 Regional Hydrometric Data Summary

Long-term hydrologic analyses were completed for seven hydrometric stations located within the RSA to provide regional long-term context of stream flow trends. A summary of station information for the hydrometric gauges located in the RSA that were selected for the baseline analysis is provided in **Table 25**. **Figure 18** shows the location of the regional hydrometric stations.

Table 25. Summary of Regional Hydrometric Station Information

Parameter	Elk River at Fernie	Elk River near Natal	Fording River at the Mouth	Hosmer Creek above Diversions	Grave Creek at the Mouth	Michel Creek below Natal	Line Creek at the Mouth
Station ID	08NK002	08NK016	08NK018	08NK026	08NK019	08NK020	08NK022
Drainage Area (km^2)	3,090	1,840	621	6.4	83.9	637	138
Period of Record	1919-2019	1950-2019	1970-2019	1981-2019	1970-1999	1970-1998	1971-2019
Regulation Type	Natural	Natural	Natural	Natural	Natural	Natural	Natural

Table 26 provides a summary of mean seasonal and annual flow information for the regional hydrometric stations.

Table 26. Summary of Mean Seasonal and Annual Flows for Regional Hydrometric Stations

Parameter	Elk River at Fernie (08NK002)	Elk River near Natal (08NK016)	Fording River at the Mouth (08NK018)	Hosmer Creek above Diversions (08NK026)	Grave Creek at the Mouth (08NK019)	Michel Creek below Natal (08NK020)	Line Creek at the Mouth (08NK022)
Mean Winter Flow (m^3/s)[1]	17.24	7.89	2.61	0.05	0.39	4.00	0.72
Mean Summer Flow m^3/s)[2]	77.52	44.34	13.53	0.19	1.77	18.62	3.54
Mean Annual Flow (m^3/s)	47.73	26.20	8.09	0.12	1.08	10.72	2.14
Mean Annual Yield (mm)	487	447	411	596	406	531	694

Notes: 1. Winter season period is from October 1 to March 31.
2. Summer season period is from April 1 to September 30.

A summary of monthly and annual discharge data is provided in **Table 27** for the regional hydrometric stations.

Table 27. Monthly and Annual Discharges at Regional Hydrometric Stations

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Discharge (m^3/s)													
Elk River at Fernie (08NK002)	13.6	12.8	16.0	35.7	121.0	161.0	77.0	39.1	28.8	23.8	21.4	16.0	47.2
Elk River near Natal (08NK016)	5.9	5.4	5.8	12.3	59.9	98.9	52.8	25.4	16.8	13.1	9.9	7.1	26.1
Grave Creek at the Mouth (08NK019)	0.3	0.3	0.4	1.2	3.4	3.3	1.4	0.8	0.6	0.5	0.4	0.4	1.1
Line Creek at the Mouth (08NK022)	0.6	0.5	0.6	1.3	5.6	7.8	3.3	1.7	1.3	1.1	0.9	0.7	2.1
Fording River at the Mouth (08NK018)	2.1	1.9	2.2	5.1	21.2	30.5	12.7	6.5	4.7	3.9	3.1	2.4	8.0
Michael Creek below Natal (08NK020)	2.1	2.0	2.7	9.9	42.6	38.4	11.8	5.3	3.8	3.6	3.8	2.7	10.7
Hosmer Creek above Diversions (08NK026)	0.03	0.04	0.08	0.21	0.48	0.33	0.08	0.03	0.03	0.05	0.06	0.04	0.12
Mean Yield ($L/s/km^2$)													
Elk River at Fernie (08NK002)	4.4	4.1	5.2	11.6	39.2	52.1	24.9	12.7	9.3	7.7	6.9	5.2	15.3
Elk River near Natal (08NK016)	3.2	2.9	3.2	6.7	32.6	53.8	28.7	13.8	9.1	7.1	5.4	3.9	14.2
Grave Creek at the Mouth (08NK019)	3.8	3.8	5.0	14.2	40.8	39.2	16.4	9.8	6.6	5.8	5.4	4.4	12.9
Line Creek at the Mouth (08NK022)	4.1	3.9	4.4	9.6	40.4	56.6	24.1	12.3	9.1	7.9	6.6	4.8	15.3
Fording River at the Mouth (08NK018)	3.4	3.1	3.6	8.2	34.1	49.1	20.5	10.4	7.5	6.3	5.0	3.8	12.9
Michael Creek below Natal (08NK020)	3.3	3.1	4.3	15.5	66.9	60.3	18.5	8.3	5.9	5.6	5.9	4.2	16.8
Hosmer Creek above Diversions (08NK026)	5.0	6.1	11.7	32.5	74.5	50.8	11.9	5.0	5.0	7.5	10.0	5.9	18.8
Mean Yield (mm)													
Elk River at Fernie (08NK002)	11.8	10.1	13.9	29.9	104.9	135.1	66.7	33.9	24.2	20.6	18.0	13.9	481.5
Elk River near Natal (08NK016)	8.6	7.2	8.5	17.3	87.2	139.3	76.9	37.0	23.7	19.1	13.9	10.3	447.3
Grave Creek at the Mouth (08NK019)	10.3	9.3	13.4	36.8	109.2	101.6	44.1	26.3	17.0	15.6	13.9	11.7	405.9
Line Creek at the Mouth (08NK022)	11.0	9.5	11.8	24.8	108.1	146.7	64.6	33.0	23.7	21.2	17.0	13.0	482.2
Fording River at Mouth (08NK018)	9.1	7.6	9.6	21.2	91.4	127.3	54.8	27.8	19.5	17.0	13.0	10.3	407.3
Michael Creek below Natal (08NK020)	8.7	7.6	11.4	40.2	179.1	156.3	49.6	22.2	15.3	15.0	15.4	11.1	529.7
Hosmer Creek above Diversions (08NK026)	13.4	14.9	31.4	84.2	199.6	131.6	31.8	13.4	13.0	20.1	25.9	15.9	596.2

The mean monthly discharge data indicates that the highest flows generally occur in the late spring and summer months, which coincides with the timing of the annual freshet. The mean yields are greatest for the Hosmer Creek, Michel Creek, and Line Creek stations, while the lowest mean yields occurred at the Grave Creek station.

5.3.2.2 Frequency Analysis

Statistical frequency analyses were performed to estimate the flood flows and 7-day low flows for a range of recurrence intervals (return periods) for each of the regional hydrometric stations. The frequency analyses were undertaken using the software program HYFRAN and applied a log-normal distribution. A summary of the results is provided below.

FLOOD FLOWS

Table 28 provides a summary of the results of the frequency analysis that was conducted to estimate flood flows for a range of return periods at each of the selected regional hydrometric stations.

Table 28. Summary of Frequency Analyses of Instantaneous Peak Flows at Regional Hydrometric Stations

Return Period (Years)	Elk River at Fernie (08NK002)	Elk River near Natal (08NK016)	Fording River at the Mouth (08NK018)	Hosmer Creek above Diversions (08NK026)	Grave Creek at the Mouth (08NK019)	Michel Creek below Natal (08NK020)	Line Creek at the Mouth (08NK022)
Drainage Area (km2)	3,090	1,840	621	6.4	83.9	637	138
Peak Flows (m^3/s)							
2-Year	192.0	153.0	55.2	1.1	6.8	90.1	14.2
5-Year	384.0	218.0	82.8	1.6	9.5	118.0	21.1
10-Year	472.0	262.0	102.0	1.9	11.4	137.0	26.2
20 Year	569.0	304.0	122.0	2.1	13.3	154.0	31.4
50 Year	704.0	361.0	149.0	2.5	15.7	176.0	38.6
100 Year	814.0	404.0	170.0	2.8	17.5	192.0	44.3
Unit Area Peak Flows ($L/s/km^2$)							
2-Year	62.1	83.2	88.9	171.9	81.0	141.4	102.9
5-Year	124.3	118.5	133.3	250.0	113.2	185.2	152.9
10-Year	152.8	142.4	164.3	296.9	135.9	215.1	189.9
20 Year	184.1	165.2	196.5	328.1	158.5	241.8	227.5
50 Year	227.8	196.2	239.9	390.6	187.1	276.3	279.7
100 Year	263.4	219.6	273.8	437.5	208.6	301.4	321.0

Similar to the mean monthly yield data, the unit area peak flows are highest at the Hosmer Creek, Michel Creek, and Line Creek stations, while the lowest values are represented by the Grave Creek station.

LOW FLOWS

A summary of the frequency analyses that was performed to estimate the magnitude of 7-day low flows at each of the regional hydrometric stations is provided in **Table 29**.

Table 29. Summary of Frequency Analyses of 7-Day Low Flows at Regional Hydrometric Stations

Return Period (Years)	Elk River at Fernie (08NK002)	Elk River near Natal (08NK016)	Fording River at the Mouth (08NK018)	Hosmer Creek above Diversions (08NK026)	Grave Creek at the Mouth (08NK019)	Michel Creek below Natal (08NK020)	Line Creek at the Mouth (08NK022)
Drainage Area (km2)	3,090	1,840	621	6.4	83.9	637	138
7-Day Low Flows (m^3/s)							
2-Year	9.16	4.38	1.38	0.016	0.23	1.30	0.42
5-Year	7.72	3.71	1.30	0.013	0.19	1.09	0.36
10-Year	7.05	3.40	1.19	0.011	0.17	1.00	0.33
20 Year	6.55	3.16	1.11	0.010	0.16	0.92	0.30
50 Year	6.03	2.92	1.02	0.009	0.14	0.85	0.28
100 Year	5.70	2.76	0.97	0.009	0.13	0.80	0.27
Unit Area 7-Day Low Flows ($L/s/km^2$)							
2-Year	2.96	2.38	2.22	2.50	2.74	2.04	3.04
5-Year	2.50	2.02	2.09	2.03	2.26	1.71	2.61
10-Year	2.28	1.85	1.92	1.72	2.03	1.57	2.39
20 Year	2.12	1.72	1.79	1.56	1.91	1.44	2.17
50 Year	1.95	1.59	1.64	1.41	1.67	1.33	2.03
100 Year	1.84	1.50	1.56	1.41	1.55	1.26	1.96

As noted in the **Table 29**, the lowest 7-day unit area low flows occurred at the Michel Creek and Hosmer Creek stations, with the highest values at the Line Creek and Elk River at Fernie stations.

5.4 Climate Change

Available documentation related to the hydrologic impacts of climate change were compiled and reviewed with the objective of identifying historical and projected trends in the RSA. This included several studies, reports, and publications that have been undertaken in recent years to assess climate trends and variability in the region.

The climate and hydrology of the Columbia River basin have been the subject of several documents published by the Pacific Climate Impacts Consortium (PCIC), including:

- *Climate Extremes in the Columbia Basin Summary Report* (PCIC, 2014).
- *Climate Extremes in the Columbia Basin Summary Report: A Preliminary Assessment* (Murdock and Sobie, 2013).
- *Hydrologic Impacts of Climate Change on BC Water Resources – Summary Report for the Campbell, Columbia and Peace River Watersheds* (Zwiers et al, 2011).
- *Preliminary Analysis of Climate Variability and Change in the Canadian Columbia River Basin: Focus on Water Resources* (Murdock et al, 2006).
- *Climate Change in the Canadian Columbia Basin – Starting the Dialogue* (Columbia Basin Trust, 2006).

A summary of the historical and projected climate and hydrologic trends for the RSA is provided below.

5.4.1 Historical Trends

5.4.1.1 Background

A review of available documentation related to climate and hydrology trends in the upper Columbia River Basin identified the following key findings with respect to historical trends:

- During the 90 year period from 1913 to 2002:
  - Annual mean temperature rose by 1.4 °C, with increases occurring primarily in the winter season;
  - Annual minimum and maximum temperatures increased by 1.6 and 0.9 °C, respectively;
  - Annual precipitation rose by 26%, with annual rainfall increasing by 32% and annual snowfall decreasing by 6%; and,
  - Snowpack is declining with increasing temperatures, particularly at lower elevations.
- Glaciers in the Canadian Columbia River Basin have diminished in size.
- Historical streamflow records show a general trend towards earlier and larger spring freshet and smaller summer flows.

5.4.1.2 Climate

A review of historical data was undertaken for three climate stations in the RSA (Sparwood, Fernie, and Fording River Cominco) to identify trends in air temperature and precipitation since 1970 at various locations and elevations in the region.

The historical data for the three subject climate stations located in the RSA generally indicate that:

- There has been an overall increase in mean annual air temperatures over the assessment period, most notably at lower elevations.
- An increasing trend for rainfall occurred at the Sparwood and Fernie climate stations, while annual rainfall trended downwards at the Fording River Cominco climate station.
- Annual snowfall has decreased significantly at the Fernie and Fording River Cominco climate stations and increased at the Sparwood climate station.
- Overall, the historical climate data demonstrates that air temperatures have increased in the RSA and that there is considerable variability with respect to precipitation conditions.

Further information regarding historical climate trends in the RSA is provided in the *Crown Mountain Coal Coking Project Baseline Meteorology Report* (March 2020).

5.4.1.3 Streamflows

An assessment of historical streamflow data (WSC, 2019) was carried out to identify long-term trends at select hydrometric stations located in the RSA. The assessment involved a review of unit area mean annual, mean summer (July-September), and mean winter flows (January-March), which are presented on the following figures:

Figures 52 – 54: Grave Creek at the Mouth - Station 08NK019 (1970-1998);

Figures 55 – 57: Michel Creek below Natal - Station 08NK020 (1970-1994);

Figures 58 – 60: Elk River near Natal - Station 08NK016 (1951-2018); and

Figures 61 – 63: Elk River at Fernie - Station 08NK002 (1970-2018).

As noted, the period of record between the above-listed hydrometric stations varies considerably, with the longest datasets available for the two stations along the Elk River.

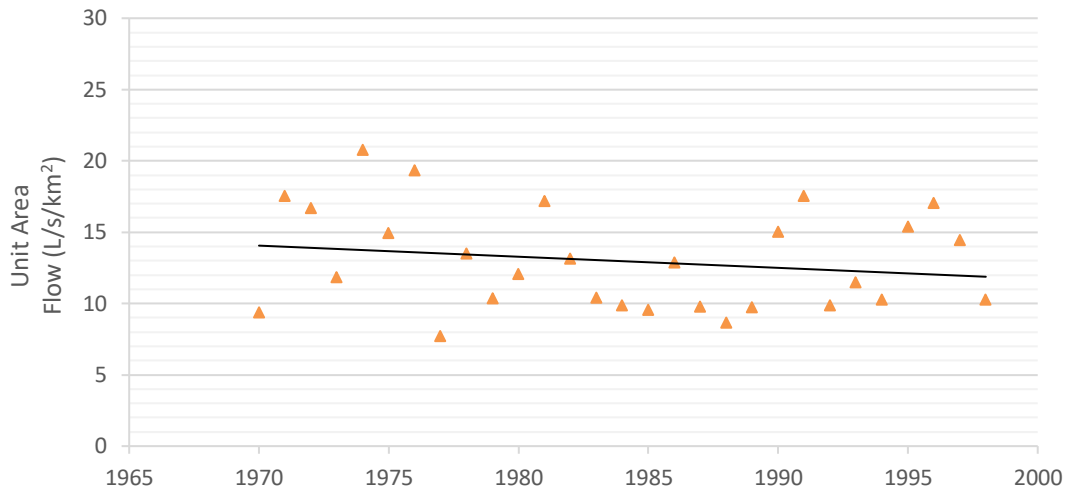


Figure 52. Mean Annual Flows for Grave Creek at the Mouth – Station 08NK019 (WSC, 2019)

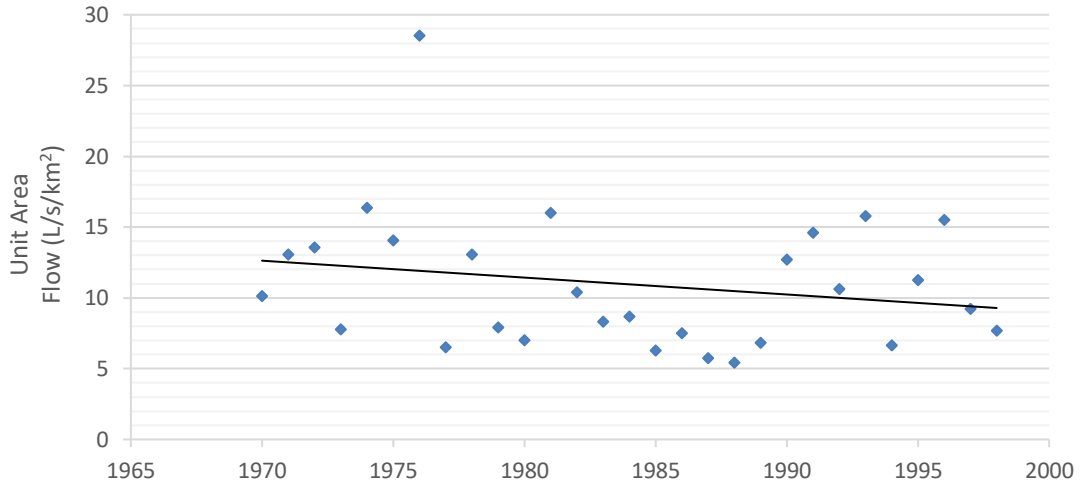


Figure 53. Mean Summer Flows for Grave Creek at the Mouth – Station 08NK019 (WSC, 2019)

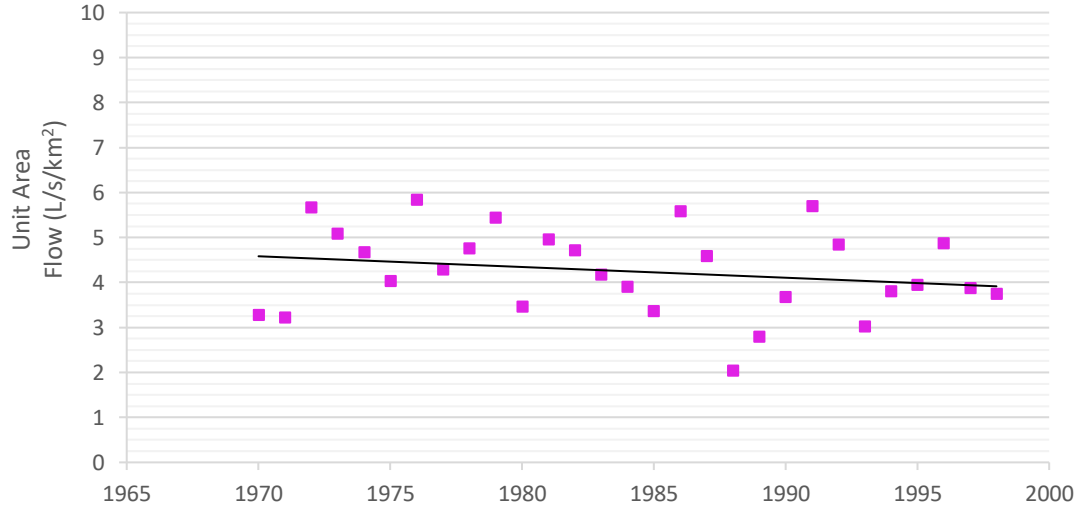


Figure 54. Mean Winter Flows for Grave Creek below Natal – Station 08NK020 (WSC, 2019)

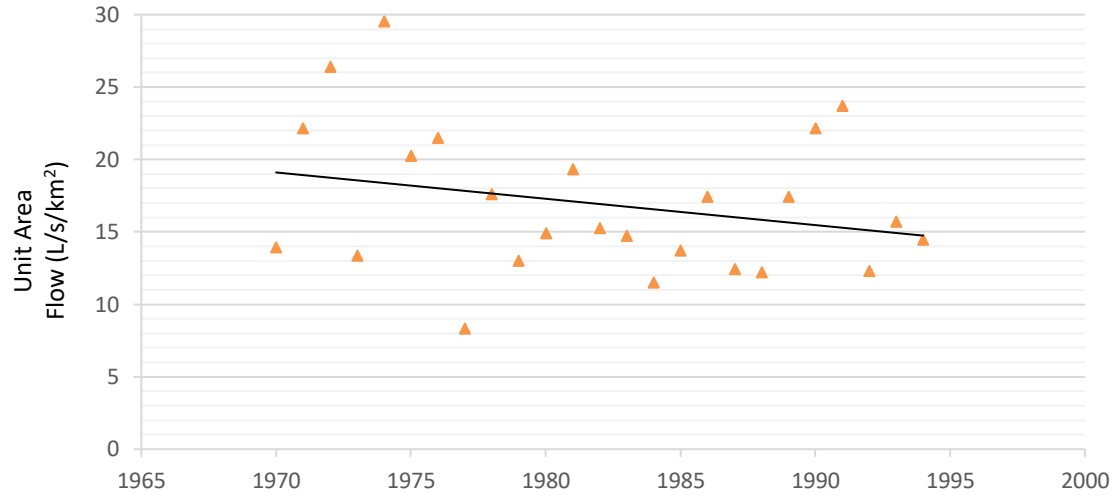


Figure 55. Mean Annual Flows for Michel Creek below Natal – Station 08NK020 (WSC, 2019)

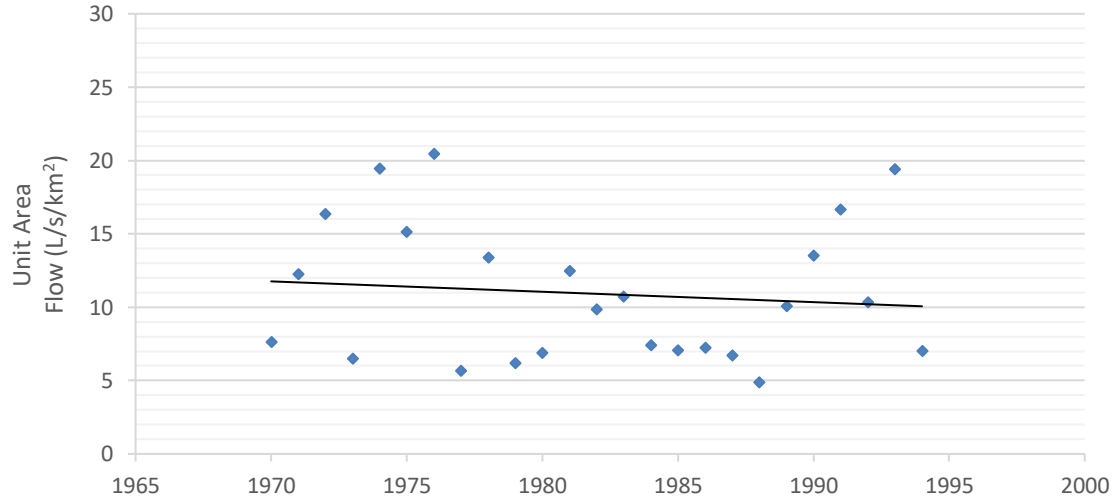


Figure 56. Mean Summer Flows for Michel Creek below Natal – Station 08NK020 (WSC, 2019)

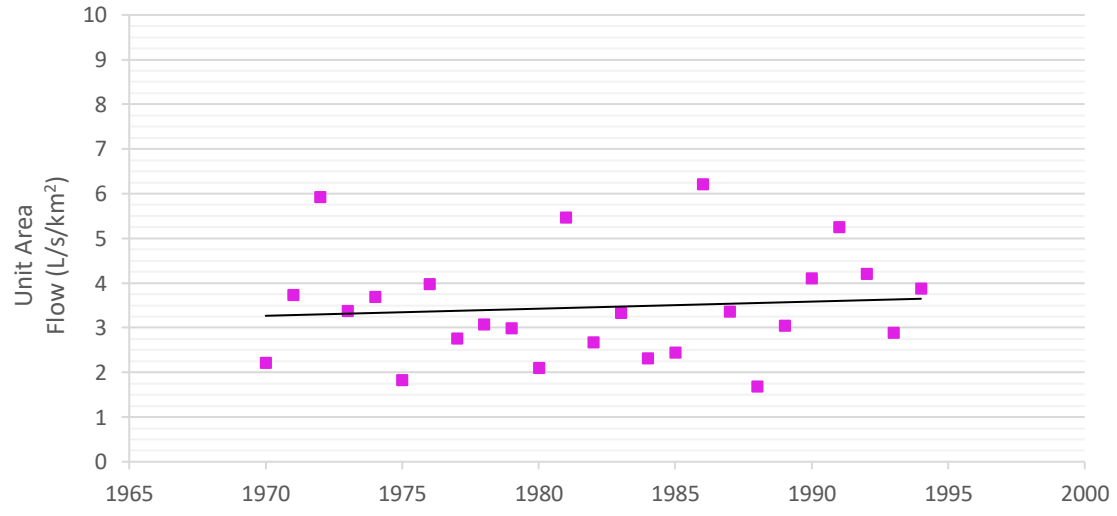


Figure 57. Mean Winter Flows for Michel Creek below Natal – Station 08NK020 (WSC, 2019)

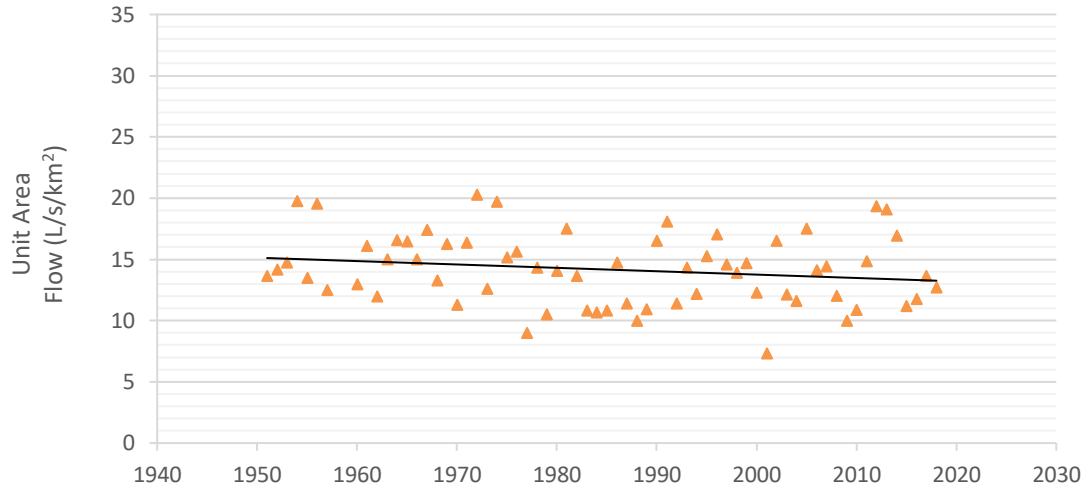


Figure 58. Mean Annual Flows for Elk River near Natal – Station 08NK016 (WSC, 2019)

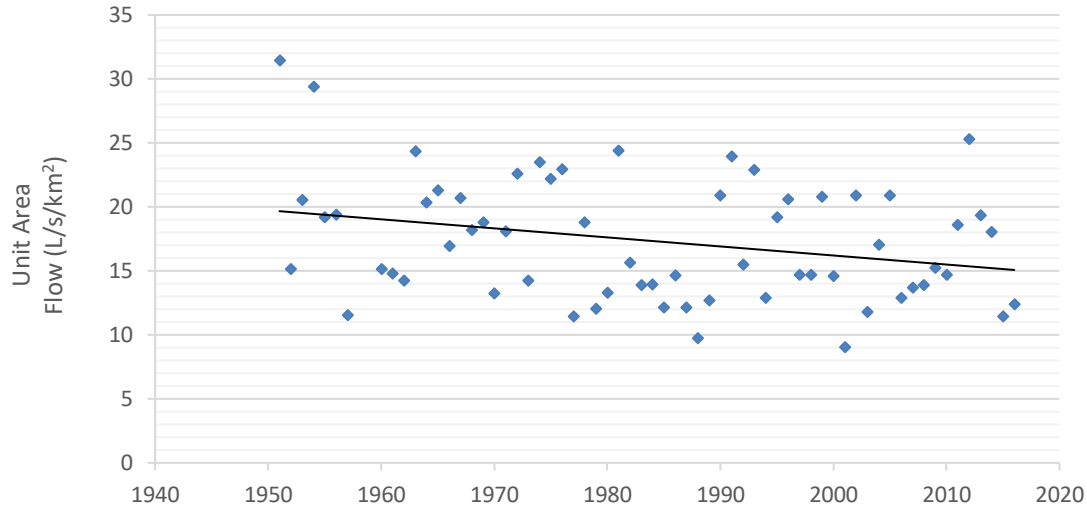


Figure 59. Mean Summer Flows for Elk River near Natal – Station 08NK016 (WSC, 2019)

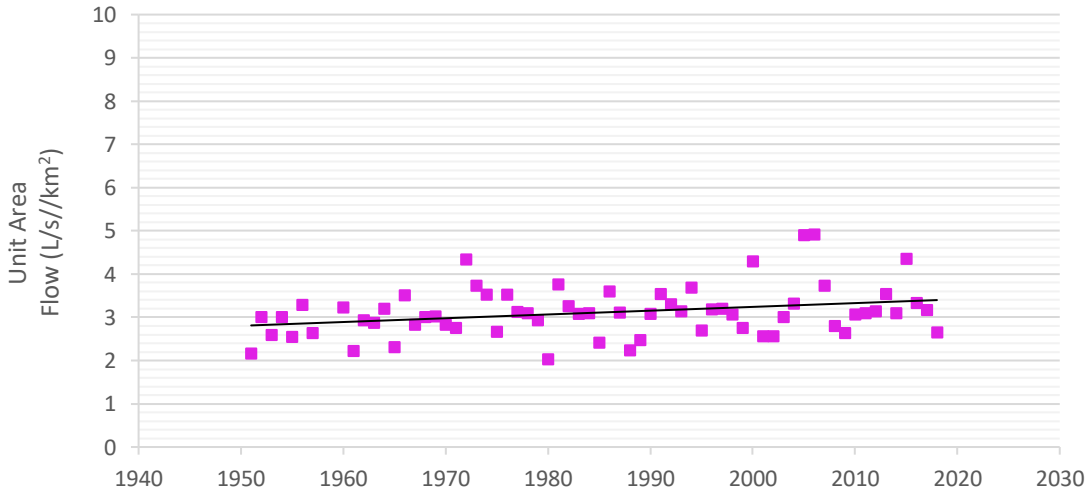


Figure 60. Mean Winter Flows for Elk River near Natal – Station 08NK016 (WSC, 2019)

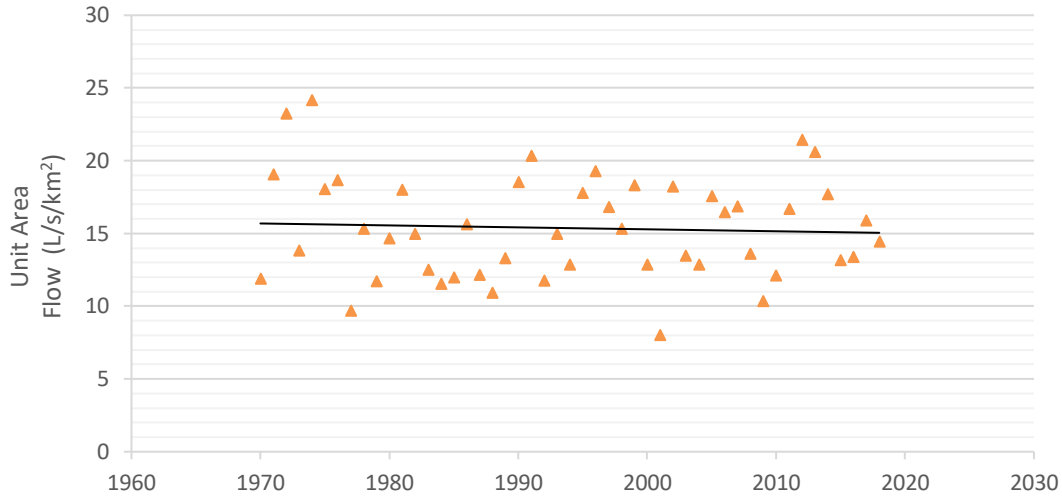


Figure 61. Mean Annual Flows for Elk River at Fernie – Station 08NK002 (WSC, 2019)

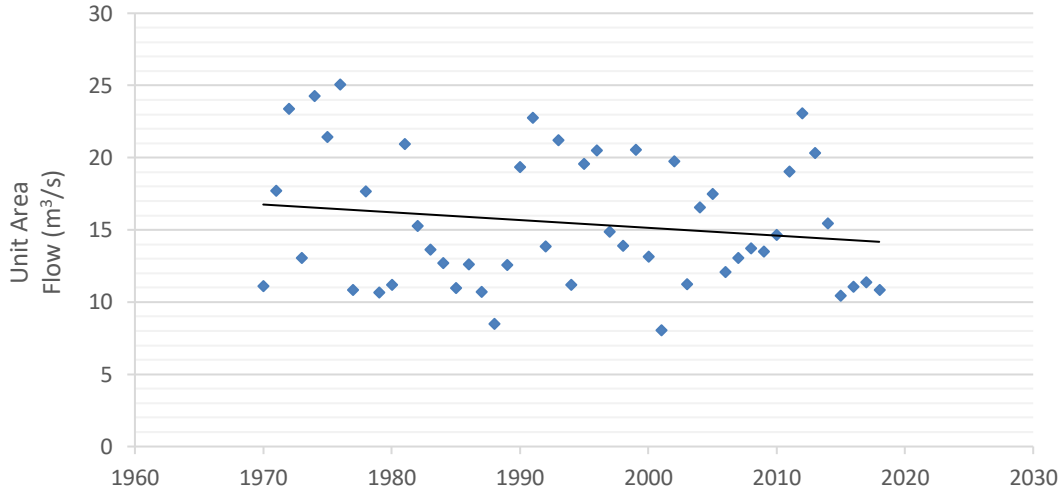


Figure 62. Mean Summer Flows for Elk River at Fernie – Station 08NK002 (WSC, 2019)

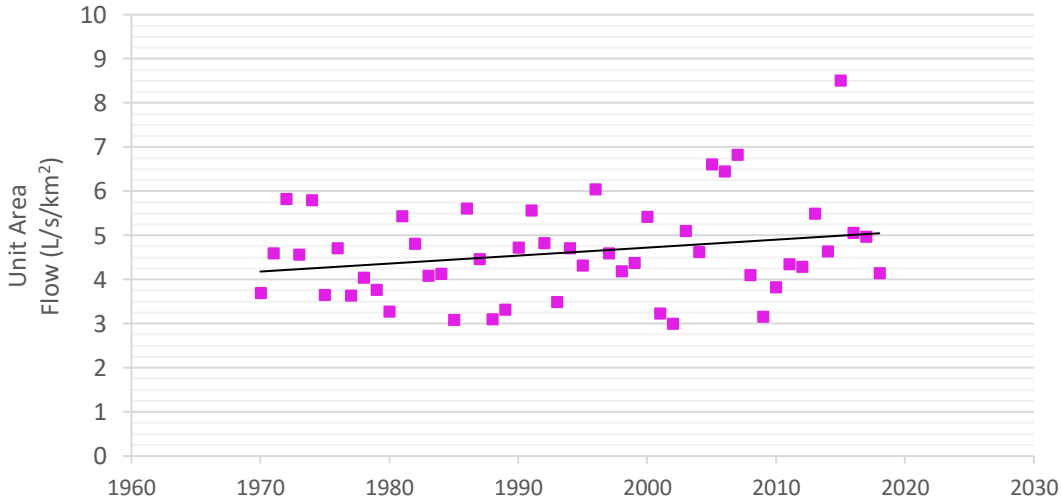


Figure 63. Mean Winter Flows for Elk River at Fernie – Station 08NK002 (WSC, 2019)

Through a review of the above figures, the following trends were identified:

- **Mean annual flows –** There was a declining trend at all four of the hydrometric stations over their respective period of record, with the most significant decline at Michel Creek near Natal – 8NK020 (approximately 0.18 L/s/km^2 per year on average between 1970 and 1998) and the smallest decline at Elk River near Fernie – 08NK002 (approximately 0.02 L/s/km^2 per year on average between 1970 and 2018).
- **Mean summer flows (July-September)** – A decreasing trend occurred at all four stations, with the most significant decline at Grave Creek at the Mouth – 08NK019 (approximately 0.12 L/s/km^2 per year on average between 1970 and 1998) and the smallest decline at Elk River near Fernie – 08NK002 (approximately 0.06 L/s/km^2 per year on average between 1970 and 2018).
- **Mean winter flows (January-March)** – There was an increasing trend at all stations with the exception of Grave Creek at the Mouth – 08NK019. The most significant increase in mean winter flows occurred at Elk River near Fernie – 08NK002 (approximately 0.02 L/s/km^2 per year on average between 1970 and 2018).

5.4.2 Projected Trends

5.4.2.1 Climate

Future climate projections have been developed for the Columbia River Basin (CRB) by PCIC through detailed modelling using an ensemble of Global Climate Models. The climate projections are for the period of 2041–2070, relative to a baseline period of 1971–2000. The results of the projections are presented in the *Climate Extremes in the Columbia Basin Summary Report* (PCIC, 2014). A summary of the climate projections is provided below.

- Annual mean temperature is projected to increase, with increases projected in all seasons.
- The annual total basin-averaged precipitation is projected to increase.
- Most projections show an increase in precipitation in the winter months and decreased precipitation in the summer.
- Future projections indicate a potential increase in precipitation extremes.

5.4.2.2 Streamflows

Recent studies indicate that increasing temperatures and altered precipitation patterns will impact the hydrology of western North America (Zwiers et al, 2011). Estimates of future streamflow were undertaken by PCIC for the 2050s period, which resulted in the following findings:

- Annual streamflows are expected to increase in the Upper Columbia River for the 2050s.
- Monthly streamflows are projected to increase during the late fall and winter.
- Monthly streamflows are projected to lower in the late summer and early fall.

6.0 Summary

The Crown Mountain Coal Coking Project hydrology baseline program involved the compilation of available background information, followed by the development and implementation of a comprehensive hydrometric monitoring program, together with an analysis of key hydrologic indices. The background information review included the collection and synthesis of relevant meteorological, hydrological, and hydrometric data for both regional and local scales.

The hydrometric monitoring program involved site reconnaissance, followed by the installation of five water level gauging stations (A1, A3, A3B, WA1, and G2), which comprised of stilling wells equipped with pressure transducers together with a staff gauge. Manual discharge measurements were collected through periodic stream gauging to establish a rating curve (stage-discharge relationship) at each of the hydrometric monitoring station locations. Upon review of the hydrometric data for Station A3, it was determined that there was not a suitable correlation between the water level data and discharge measurements collected. Accordingly, this station was not included in the analysis for the hydrology baseline program.

Through a review of the annual and monthly runoff data for the common period of assessment for the monitoring program (i.e., 2014 to 2016), it is noted that most of the runoff occurred between April and July at all of the hydrometric stations, with a significant portion of the runoff generated in the months of June and July. Furthermore, the mean annual and monthly runoff was generally highest at Station A3B, with the greatest annual value in 2014 (1,367.3 mm). The lowest proportion of runoff typically occurred in the late summer, winter, and early spring months at all of the hydrometric monitoring stations.

An assessment of monthly flow data indicates that the highest maximum flows in the Alexander Creek (A1) and Grave Creek (G2) occurred in 2013, while the lowest minimum flows occurred in 2018 (not including 2019 as it is a partial year of data). The highest average mean and maximum flows are associated with Station A3B and the lowest corresponding values occurred at Station WA1. The mean monthly discharge data for the regional hydrometric stations indicates that the highest flows generally occur in the late spring and summer months, which coincides with the timing of the annual freshet. The mean yields are greatest for the Hosmer Creek, Michel Creek, and Line Creek stations, while the lowest mean yields occurred at the Grave Creek station.

Frequency analyses were also performed for seven regional hydrometric stations, and the results indicated that mean monthly yield and unit area peak flows are highest at the Hosmer Creek, Michel Creek, and Line Creek stations, while the lowest values are represented by the Grave Creek station (i.e., G2). With respect to 7-day low flow conditions, the lowest unit area values occurred at the Michel Creek and Hosmer Creek stations, with the highest values at the Line Creek and Elk River at Fernie stations.

References

British Columbia Ministry of Environment (MOE). (2011). *Meteorological Data and Sensing Requirements in the BC Ministry of Environment*.

British Columbia Ministry of Environment (MOE). (2012). *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators, Version 1*.

British Columbia Ministry of Environment and Climate Change Strategy (MOECC). (2019). *Archive manual snow survey data for various stations* [Data file]. Retrieved from https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-science-data/water-data-tools/snow-survey-data

British Columbia Ministry of Water, Lands, and Air Protection, Air Resources Branch. (2013). *Air Monitoring Site Selection and Exposure Criteria*.

British Columbia Ministry of Forest, Lands, Natural Resource Operations & Rural Development. (2019). *Kootenay Boundary Water Tool*. Retrieved from https://kwt.bcwatertool.ca

Columbia Basin Trust. (2006). *Climate Change in the Canadian Columbia Basin – Starting the Dialogue.* Retrieved from https://www.pacificclimate.org/sites/default/files/publications/CBT.StartingDialogue.Oct2006.pdf

Dillon Consulting Limited. (2020). *Crown Mountain Coal Coking Project Baseline Meteorology Report*.

Environment and Climate Change Canada. (2019a). *1981-2010 Climate Normals for various climate stations* [Data file]. Retrieved from https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

Environment and Climate Change Canada. (2019b). *Meteorological data for various climate stations [*Data file]. Retrieved from https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

Environment and Climate Change Canada. (2019c). *Hydrometric streamflow data for multiple gauge stations*. [Data file]. Retrieved from https://wateroffice.ec.gc.ca/search/historical_e.html

Murdock, T.Q., Fraser, J., and Pearce, C. (2006). *Preliminary Analysis of Climate Variability and Change in the Canadian Columbia River Basin: Focus on Water Resources*. Pacific Climate Impacts Consortium. Retrieved from https://pacificclimate.org/sites/default/files/publications/Murdock.CBTPreliminaryAssessment.Jul2007.pdf

Pacific Climate Impacts Consortium. (2014). *Climate Extremes in the Columbia Basin Summary Report*. Retrieved from https://www.pacificclimate.org/sites/default/files/publications/Summary-Climate_Extremes_in_the_Columbia_Basin.pdf

Resources Information Standards Committee. (2009).*Manual of British Columbia Hydrometric Standards Version 1.0*. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/science-data/man_bc_hydrometric_stand_v10.pdf

Zwiers, F., Schnorbus, M.A., Maruszeczka, G.D. (2011). *Hydrologic Impacts of Climate Change on BC Water Resources – Summary Report for the Campbell, Columbia and Peace River Watersheds*. Pacific Climate Impacts Consortium. Retrieved from https://www.pacificclimate.org/sites/default/files/publications/Zwiers.HydroImpactsSummary-CampbellPeaceColumbia.Jul2011-SCREEN.pdf

Appendix A

Project Area Hydrometric Station Summary Information

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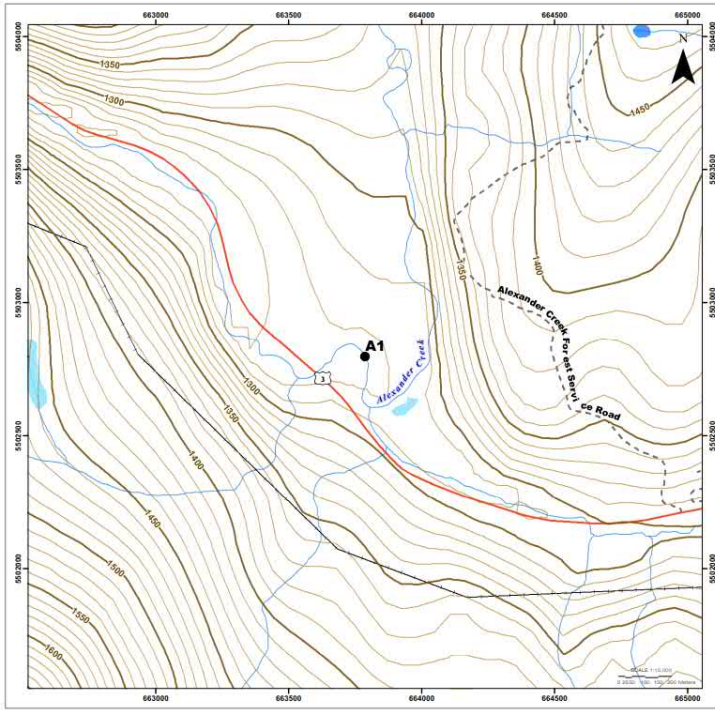
General Site Information and Location

Project Number:	12-6231	**Site ID:**	A1
Water-course:	Alexander Creek	**Drainage Area (km²):**	153.95
Latitude:	49° 39' 19.65" N	**Longitude:**	-114° 43' 51.60 W
Channel morphology:	Stable riffle, pool morphology with gravel and cobble substrate.		
Operational Period:	May 15, 2012 - present	**Transducer:**	HOBO U-20 / AquaStar PT12 / AquaStar PT2X
Available Data Period:	May 2012 – May 2013 Nov 2013 – June 2014 July 18 – 30, 2014 October 2014 – March 2015 May 2015 – April 2016 Nov 2017 – Feb 2018 May 2018 - present		



Site Photos

Photo 1. Photo of station A1, including the water level logger, looking upstream Alexander Creek during freshet. (May, 2014)

Photo 2. Photo of station A1 looking downstream Alexander Creek during freshet. (May, 2014)

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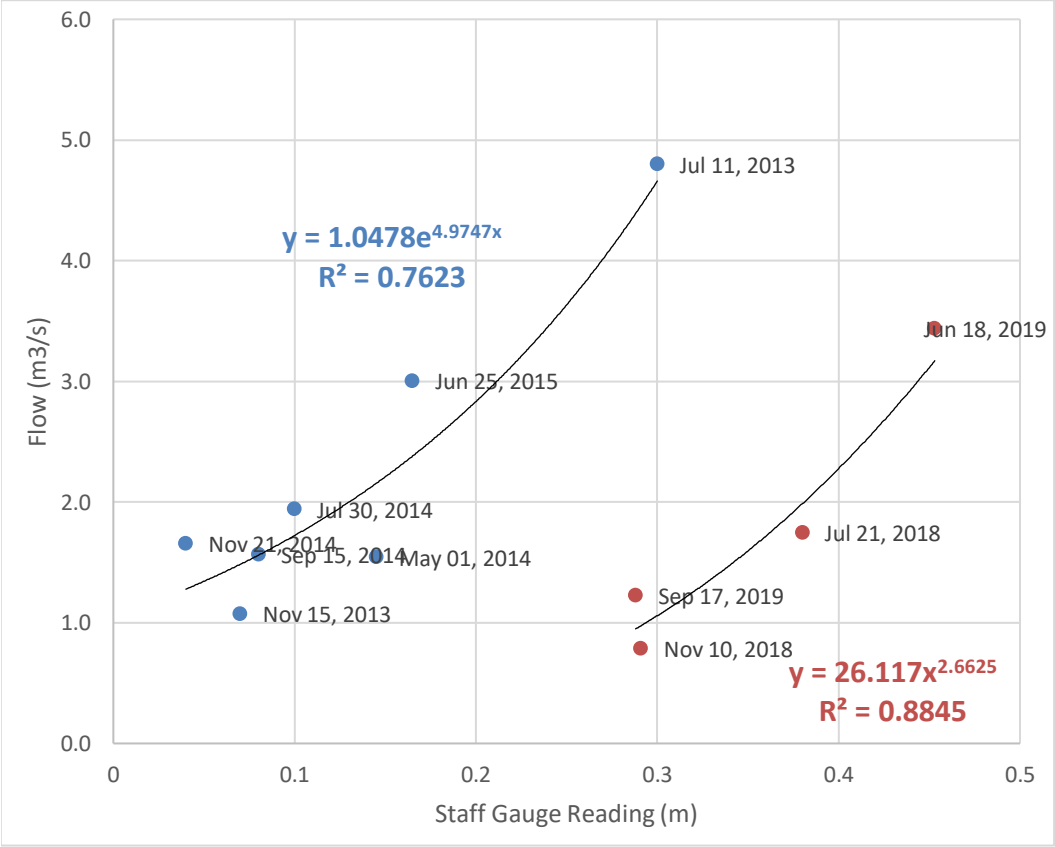
A1 Stage and Discharge Measurements

Rating Period	Rating Equation (x =water level (m))	Root Mean Square	# of Rating Points Used
Jul 2013 - Jun 2015	$Q = 1.0478e^{4.9747x}$	0.76	7
Nov 2017 – Sept 2019	$Q = 26.117^{x2.6625}$	0.88	4
Date	**Staff Gauge (m)**	**Average Discharge (m^3/s)**	
2013-07-11	0.3	4.803	
2013-11-15	0.07	1.079	
2014-05-01	0.145	1.546	
2014-07-30	0.1	1.944	
2014-09-15	0.08	1.568	
2014-11-21	0.04	1.661	
2015-06-25	0.165	3.006	
2018-07-21	0.38	1.750	
2018-11-10	0.291	0.789	
2019-06-18	0.453	3.444	
2019-09-17	0.288	1.228	

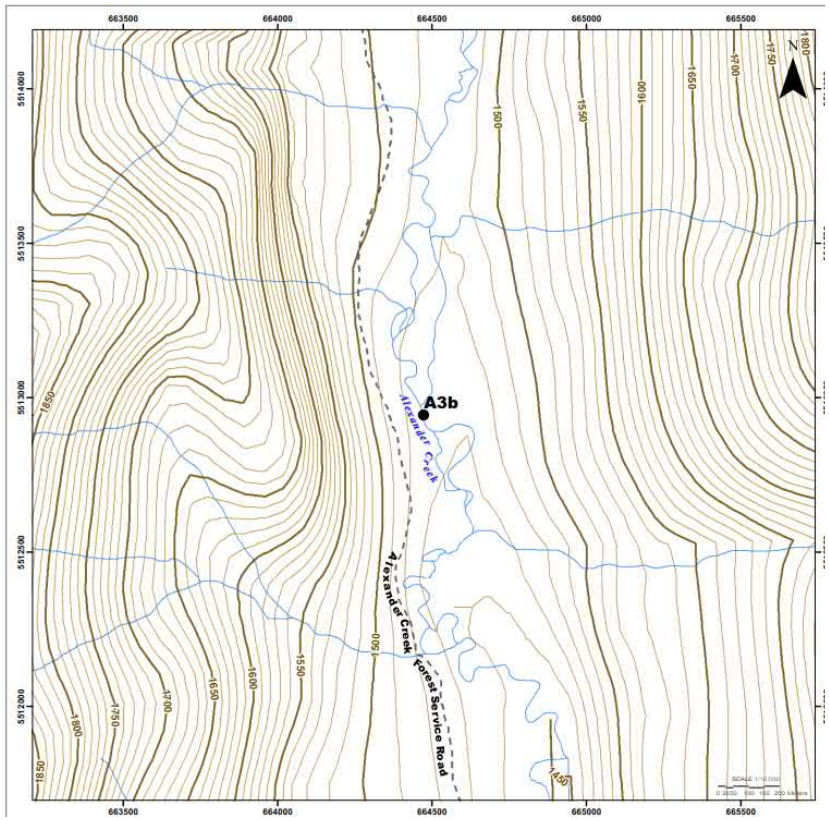
A1 Rating Curve



DILLON CONSULTING

General Site Information and Location

Project Number:	12-6231	**Site ID:**	A3B
Water-course:	Alexander Creek	**Drainage Area (km²):**	69.58
Latitude:	49° 44' 47.04"N	**Longitude:**	-114° 42' 57.60" W
Channel morphology:	Stable riffle, pool morphology with gravel and cobble substrate.		
Operational Period:	July 18, 2014 – May 2, 2016	**Transducer:**	HOBO U-20 / AquaStar PT12 / AquaStar PT2X
Available Data Period:	July 2014 – Feb 2015 June 2015 – April 2016		



Site Photos

Photo 1. Photo of station A3B looking upstream Alexander Creek during freshet. (May, 2015)

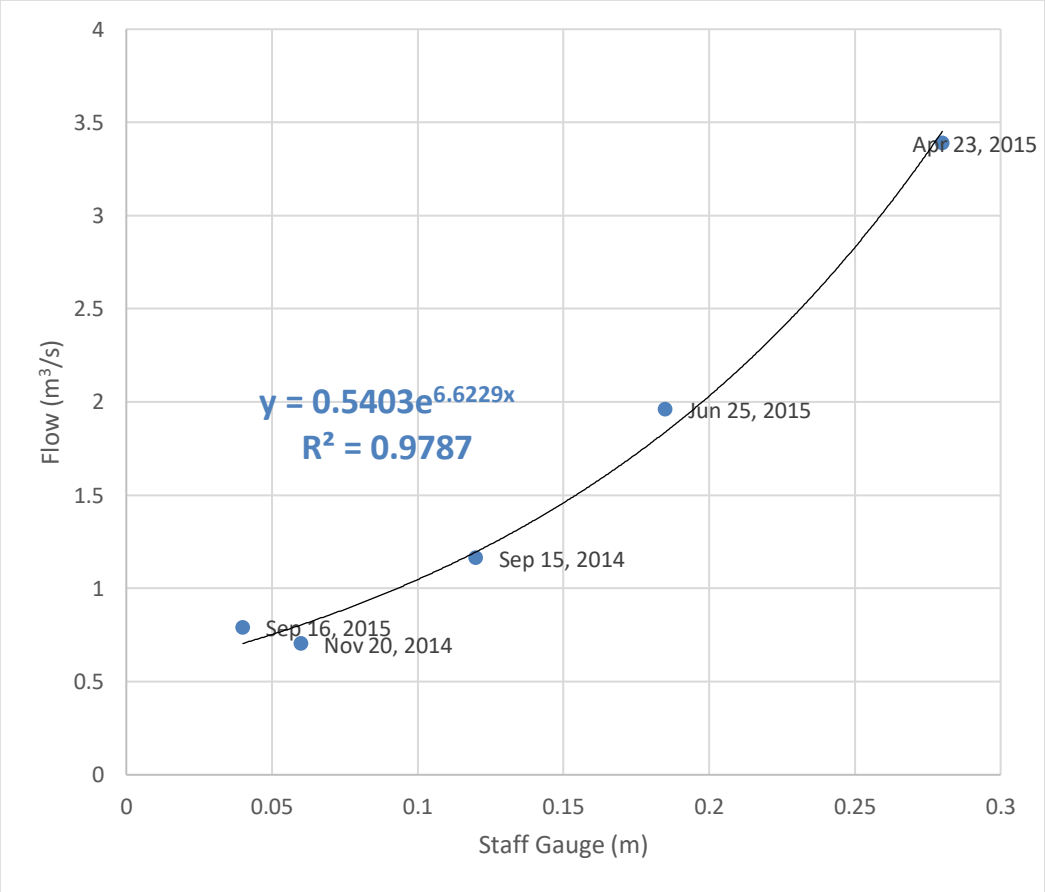
Photo 2. Photo of station A3B, including the water level logger, looking downstream Alexander Creek during freshet. (May, 2015)

DILLON CONSULTING

A3B Stage and Discharge Measurements

Rating Period	Rating Equation (x =water level (m))	Root Mean Square	# of Rating Points Used
Sept 2014 - Sept 2015	$Q = 0.5403e^{6.6229x}$	0.98	5
Date	**Staff Gauge (m)**	**Average Discharge (m^3/s)**	
2014-09-15	0.12	1.16	
2014-11-20	0.06	0.70	
2015-04-23	0.28	3.39	
2015-06-25	0.19	1.96	
2015-09-16	0.04	0.79	

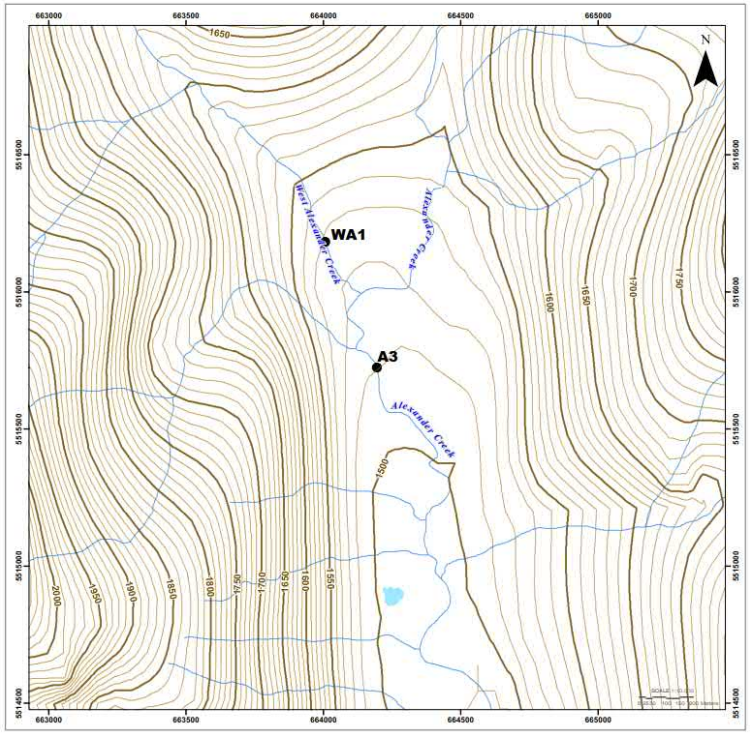
A3B Rating Curve



DILLON CONSULTING

General Site Information and Location

Project Number:	12-6231	**Site ID:**	WA1
Water-course:	West Alexander Creek	**Drainage Area (km²):**	14.23
Latitude:	49° 46' 32.41" N	**Longitude:**	-114° 43' 19.20" W
Channel morphology:	Stable riffle, pool morphology with boulder and cobble with some gravel substrate.		
Operational Period:	May 16, 2012 – May 2, 2016	**Transducer:**	HOBO U-20 / AquaStar PT12 / AquaStar PT2X
Available Data Period:	May 2012 – May 2013 Nov 2013 – May 2014 July, 2014 October 2014 – March 2015 May 2015 – April 2016		



Site Photos

Photo 1. Photo of station WA1, including the water level logger, looking upstream West Alexander Creek during freshet. (May, 2014)

Photo 2. Photo of station WA1 looking downstream West Alexander Creek during freshet. (May, 2014)

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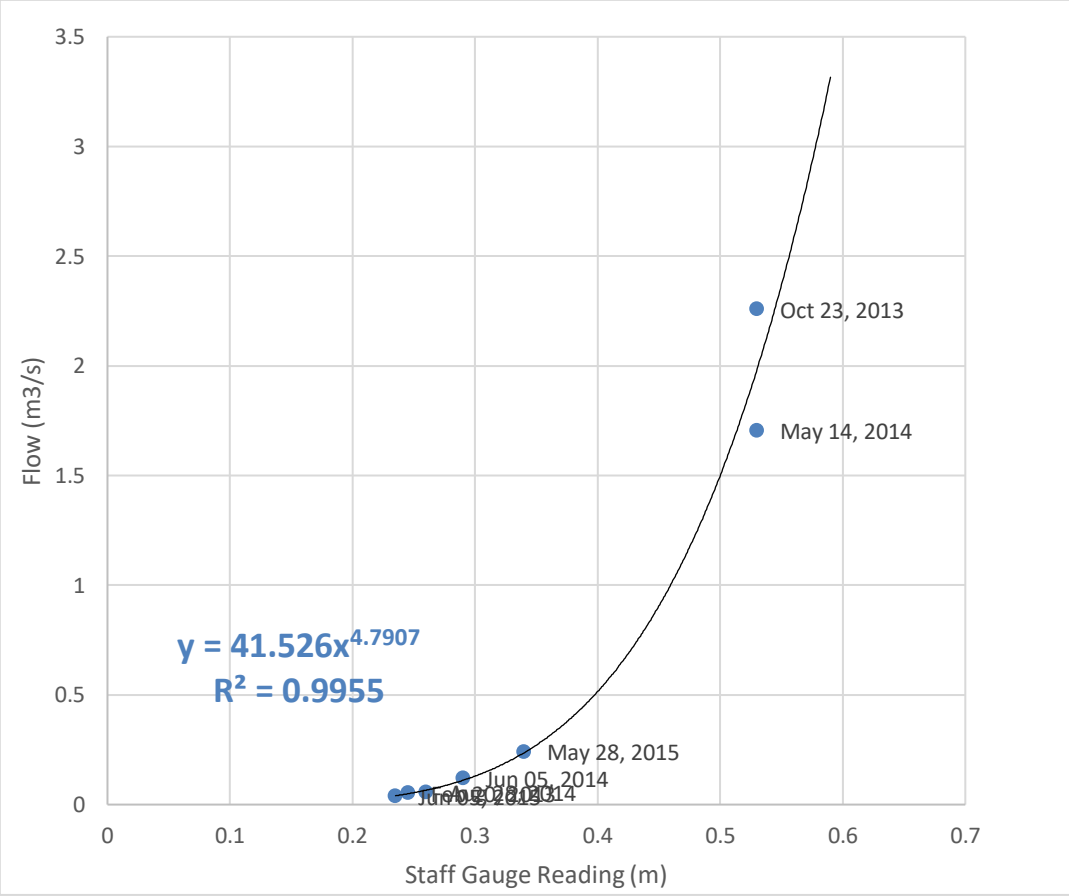
WA1 Stage and Discharge Measurements

Rating Period	Rating Equation (x =water level (m))	Root Mean Square	# of Rating Points Used
Nov 2013 - Sept 2015	$Q = 41.526x^{4.7907}$	0.99	7
Date	**Staff Gauge (m)**	**Average Discharge (m^3/s)**	
2013-11-15	0.245	0.05	
2014-05-21	0.53	2.26	
2014-06-12	0.53	1.71	
2014-07-30	0.29	0.12	
2014-09-15	0.26	0.06	
2015-06-25	0.34	0.24	
2015-09-16	0.235	0.04	

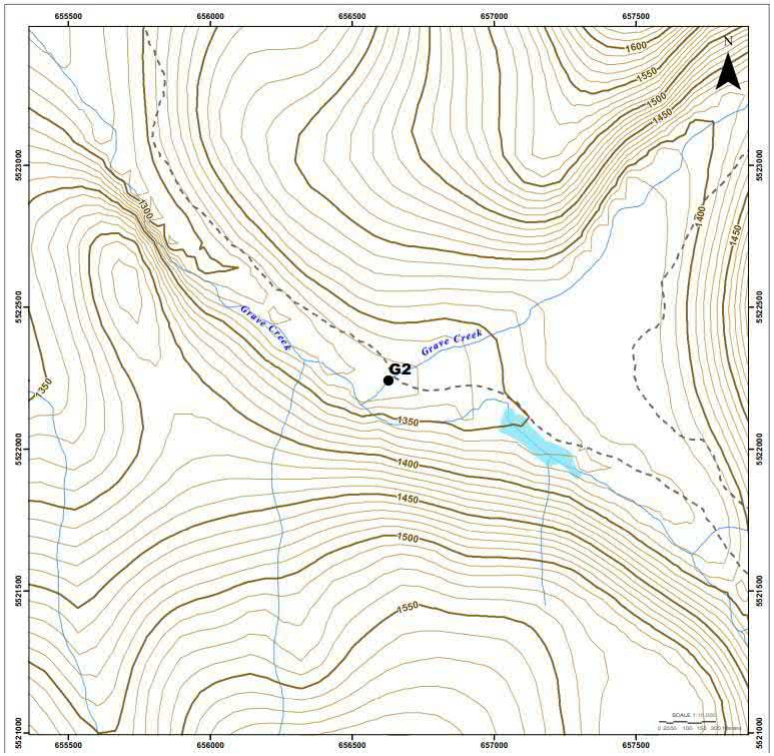
WA1 Rating Curve



DILLON CONSULTING

General Site Information and Location

Project Number:	12-6231	**Site ID:**	G2
Water-course:	Graves Creek	**Drainage Area (km²):**	24.79
Latitude:	49° 49' 55.70" N	**Longitude:**	-114° 49' 19.2" W
Channel morphology:	Stable riffle, pool morphology with gravel, cobble, and boulder substrate.		
Operational Period:	May 15, 2012 - present	**Transducer:**	HOBO U-20 / AquaStar PT12 / AquaStar PT2X
Available Data Period:	May 2012 – May 2013 Nov 2013 – Feb 2015 May 2015 – April 2016 Nov 2017 – Feb 2018 May 2018 - present		



Site Photos

Photo 1. Photo of station G2, including the water level logger, looking upstream Graves Creek during freshet. (May, 2016)

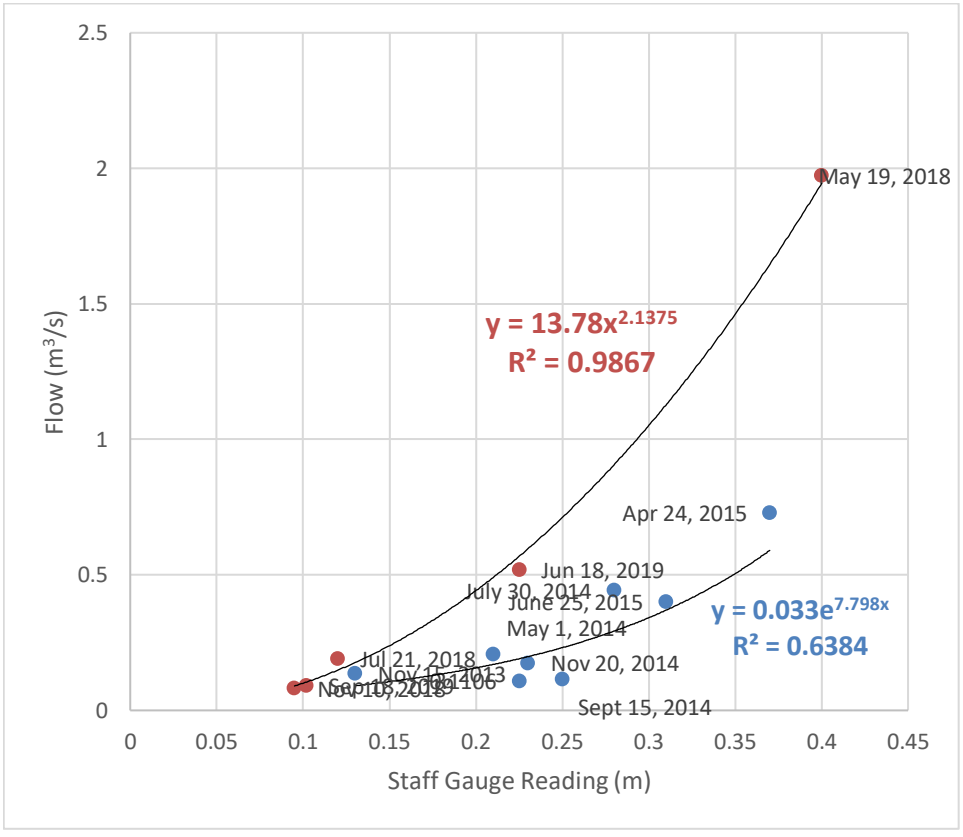
Photo 2. Photo of station G2 looking downstream Graves Creek during freshet. (May, 2016)

DILLON CONSULTING

G2 Stage and Discharge Measurements

Rating Period	Rating Equation (x =water level (m))	Root Mean Square	# of Rating Points Used
Nov 2013 - Sept 2015	$Q = 0.033e^{7.798x}$	0.64	8
May 2018 – Sept 2019	$Q = 13.78x^{2.1375}$	0.99	5
Date	**Staff Gauge (m)**	**Average Discharge (m³/s)**	
2013-11-15	0.13	0.14	
2014-05-01	0.21	0.21	
2014-07-30	0.28	0.44	
2014-09-15	0.25	0.12	
2014-11-20	0.23	0.18	
2015-04-24	0.37	0.73	
2015-06-25	0.31	0.40	
2015-09-16	0.225	0.11	
2018-05-19	0.4	1.98	
2018-07-21	0.12	0.19	
2018-11-10	0.095	0.08	
2019-06-18	0.225	0.521	
2019-09-18	0.102	0.093	

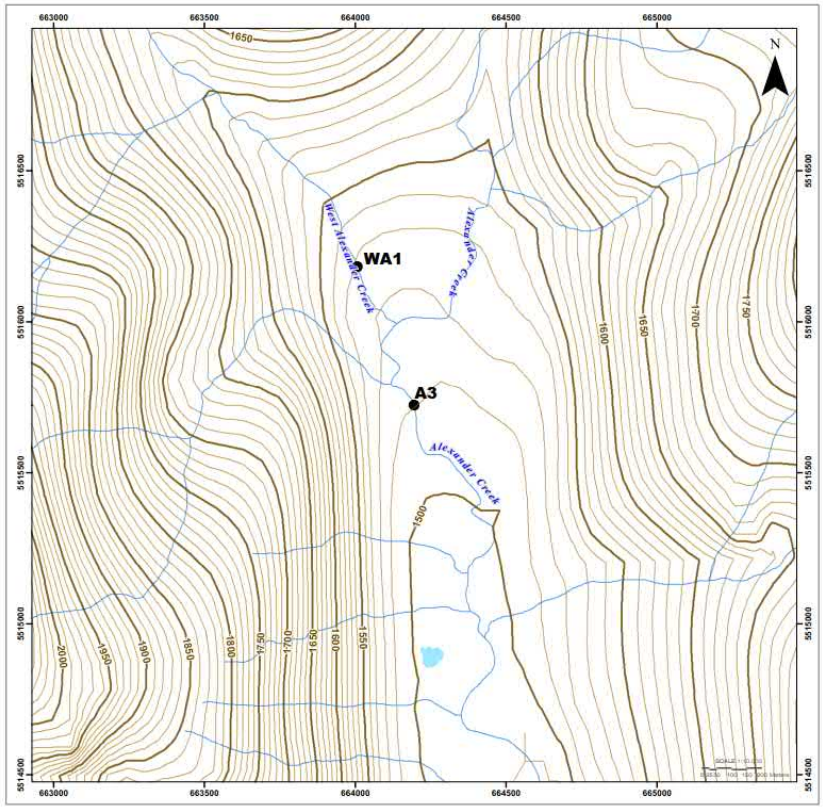
G2 Rating Curve



DILLON CONSULTING

General Site Information and Location

Project Number:	12-6231	**Site ID:**	A3
Water-course:	Alexander Creek	**Drainage Area (km²):**	69.58
Latitude:	49° 46' 17.51 N	**Longitude:**	-114° 43' 12 W
Channel morphology:	Stable riffle, pool morphology with gravel and cobble substrate.		
Operational Period:	May 16, 2012 – July 18, 2014	**Transducer:**	HOBO U-20 / AquaStar PT12 / AquaStar PT2X
Available Data Period:	May 2012 – May 2013 Nov 2013 – July 2014		



Site Photos

Photo 1. Photo of station A3 looking upstream Alexander Creek during freshet. (June, 2014)

Photo 2. Photo of station A3, including the water level logger, looking downstream Alexander Creek during freshet. (June, 2014)

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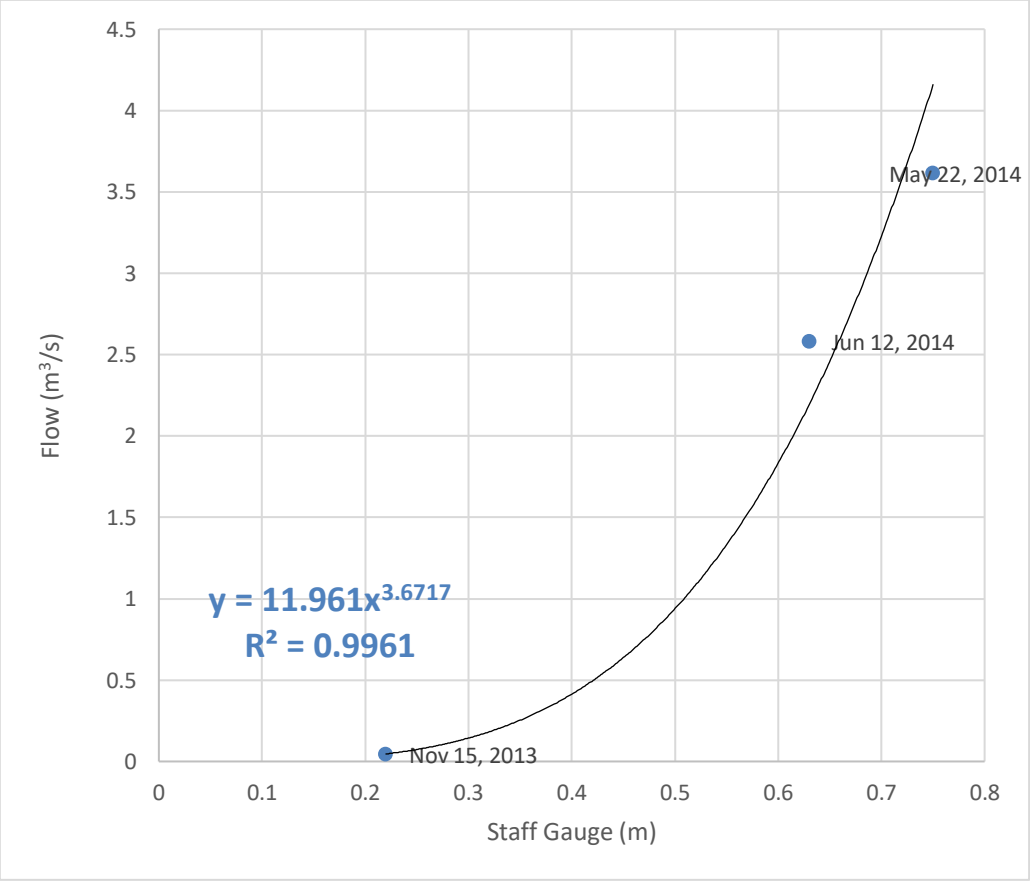
A3 Stage and Discharge Measurements

Rating Period	Rating Equation (x =water level (m))	Root Mean Square	# of Rating Points Used
Nov 2013 - Jun 2014	$Q = 11.961x^{3.6717}$	0.99	3
Date	**Staff Gauge (m)**	**Average Discharge (m^3/s)**	
2013-11-15	0.22	0.04	
2014-05-22	0.75	3.61	
2014-06-12	0.63	2.58	

A3 Rating Curve



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Appendix B

Streamflow Measurement Records

Site:	A1		**Date :**	2013-07-11	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	12:30 PM	MST	**Staff Gauge :**	0.070	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	GG		**Sensor :**		m
Measurement Recorded By:					
Data Entered By:			**Total Width:**	14.85	
Data Entry Date:			**Total Area:**	4.78	

Average Velocity:	1.01	m/s	
Total Discharge:	**4.803**	m^3/s	

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m²]	Discharge [m³/s]	% of Total Discharge	Notes
1.75	0.175		0		0.00	0		0.00	0.000	0.0%	
2.1	0.425		0		0.00	0.05		0.02	0.000	0.0%	
2.6	0.5		0.75		0.75	0.06		0.03	0.023	0.5%	
3.1	0.5		0.4		0.40	0.08		0.04	0.016	0.3%	
3.6	0.5		0		0.00	0.02		0.01	0.000	0.0%	
4.1	0.5		0		0.00	0		0.00	0.000	0.0%	
4.6	0.5		0.21		0.21	0.13		0.07	0.014	0.3%	
5.1	0.5		0.61		0.61	0.2		0.10	0.061	1.3%	
5.6	0.5		0.71		0.71	0.24		0.12	0.085	1.8%	
6.1	0.5		0.52		0.52	0.16		0.08	0.042	0.9%	
6.6	0.5		0.7		0.70	0.2		0.10	0.070	1.5%	
7.1	0.5		0.76		0.76	0.26		0.13	0.099	2.1%	
7.60	0.50		0.84		0.84	0.300		0.15	0.126	2.6%	
8.10	0.50		0.90		0.90	0.340		0.17	0.153	3.2%	
8.60	0.50		1.13		1.13	0.400		0.20	0.226	4.7%	
9.10	0.50		1.13		1.13	0.380		0.19	0.215	4.5%	
9.60	0.50		1.11		1.11	0.540		0.27	0.300	6.2%	
10.10	0.50		1.22		1.22	0.520		0.26	0.317	6.6%	
10.60	0.50		1.25		1.25	0.420		0.21	0.263	5.5%	
11.10	0.50		1.21		1.21	0.500		0.25	0.303	6.3%	
11.60	0.50		1.37		1.37	0.500		0.25	0.343	7.1%	
12.10	0.50		1.44		1.44	0.640		0.32	0.461	9.6%	
12.60	0.50		1.17		1.17	0.600		0.30	0.351	7.3%	
13.10	0.50		0.84		0.84	0.580		0.29	0.244	5.1%	
13.60	0.50		1.24		1.24	0.540		0.27	0.335	7.0%	
14.10	0.50		1.26		1.26	0.540		0.27	0.340	7.1%	
14.60	0.50		0.51		0.51	0.460		0.23	0.117	2.4%	
15.10	0.50		0.81		0.81	0.320		0.16	0.130	2.7%	
15.60	0.50		0.44		0.44	0.280		0.14	0.062	1.3%	
16.10	0.50		0.74		0.74	0.300		0.15	0.111	2.3%	
16.60	0.25		0.00		0.00	0.000		0.00	0.000	0.0%	

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Site:	A1		**Date :**	2013-11-15	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	12:00 PM	MST	**Staff Gauge :**	0.070	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Paul Donahue				
Data Entered By:			**Total Width:**	9.00	
Data Entry Date:			**Total Area:**	3.06	

Average Velocity:	0.35	m/s
Total Discharge:	**1.079**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
6.50	0.25		0.07		0.07	0.180		0.05	0.003	0.3%	
7.00	0.50		0.02		0.02	0.160		0.08	0.002	0.1%	
7.50	0.50		0.33		0.33	0.240		0.12	0.040	3.7%	
8.00	0.50		0.50		0.50	0.380		0.19	0.095	8.8%	
8.50	0.50		0.24		0.24	0.430		0.22	0.052	4.8%	
9.00	0.50		0.40		0.40	0.450		0.23	0.090	8.3%	
9.50	0.50		0.45		0.45	0.430		0.22	0.097	9.0%	
10.00	0.50		0.44		0.44	0.370		0.19	0.081	7.5%	
10.50	0.50		0.28		0.28	0.460		0.23	0.064	6.0%	
11.00	0.50		0.28		0.28	0.440		0.22	0.062	5.7%	
11.50	0.50		0.59		0.59	0.380		0.19	0.112	10.4%	
12.00	0.50		0.24		0.24	0.430		0.22	0.052	4.8%	
12.50	0.50		0.45		0.45	0.400		0.20	0.090	8.3%	
13.00	0.50		0.45		0.45	0.470		0.24	0.106	9.8%	
13.50	0.50		0.35		0.35	0.380		0.19	0.067	6.2%	
14.00	0.50		0.38		0.38	0.200		0.10	0.038	3.5%	
14.50	0.50		0.26		0.26	0.220		0.11	0.029	2.6%	
15.00	0.50		0.02		0.02	0.160		0.08	0.002	0.1%	
15.50	0.25		0.00		0.00	0.040		0.01	0.000	0.0%	

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Site:	A1		**Date :**	2014-05-01	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	11:00 AM	MST	**Staff Gauge :**	0.145	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Michael Keating				
Data Entered By:			**Total Width:**	10.30	
Data Entry Date:			**Total Area:**	4.04	

Average Velocity:	0.38	m/s	
Total Discharge:	**1.546**	m^3/s	

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
5	0.15		0.00		0.00	0.00		0.00	0.000		
5.30	0.40		0.00		0.00	0.030		0.01	0.000	0.0%	
5.80	0.50		0.00		0.00	0.080		0.04	0.000	0.0%	
6.30	0.50		0.03		0.03	0.080		0.04	0.001	0.1%	
6.80	0.50		0.07		0.07	0.140		0.07	0.005	0.3%	
7.30	0.50		0.01		0.01	0.290		0.15	0.001	0.1%	
7.80	0.50		0.04		0.04	0.320		0.16	0.006	0.4%	
8.30	0.50		0.18		0.18	0.400		0.20	0.036	2.3%	
8.80	0.50		0.19		0.19	0.480		0.24	0.046	2.9%	
9.30	0.50		0.39		0.39	0.540		0.27	0.105	6.8%	
9.80	0.50		0.35		0.35	0.560		0.28	0.098	6.3%	
10.30	0.50		0.14		0.14	0.550		0.28	0.039	2.5%	
10.80	0.50		0.39		0.39	0.600		0.30	0.117	7.6%	
11.30	0.50		0.57		0.57	0.390		0.20	0.111	7.2%	
11.80	0.50		0.52		0.52	0.500		0.25	0.130	8.4%	
12.30	0.50		0.72		0.72	0.530		0.27	0.191	12.3%	
12.80	0.50		0.39		0.39	0.560		0.28	0.109	7.1%	
13.30	0.50		0.51		0.51	0.480		0.24	0.122	7.9%	
13.80	0.50		0.73		0.73	0.470		0.24	0.172	11.1%	
14.30	0.50		0.54		0.54	0.510		0.26	0.138	8.9%	
14.80	0.50		0.43		0.43	0.460		0.23	0.099	6.4%	
15.3	0.25		0.36		0.36	0.220		0.06	0.020	1.3%	

DILLON CONSULTING

Site:	A1		**Date :**	2014-07-30	
Location at Site:					
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**		
Measurement Start Time:		MST	**Staff Gauge :**	0.100	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	J. Enns				
Data Entered By:			**Total Width:**	9.40	
Data Entry Date:			**Total Area:**	3.77	

Average Velocity:	0.52	m/s
Total Discharge:	**1.944**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
0.6											Left Bank
0.84	0.47		0.18		0.18	0.28		0.13	0.024	1.2%	
1.31	0.47		0.14		0.14	0.46		0.22	0.030	1.6%	
1.78	0.47		0.32		0.32	0.48		0.23	0.072	3.7%	
2.25	0.47		0.81		0.81	0.44		0.21	0.168	8.6%	
2.72	0.47		0.27		0.27	0.45		0.21	0.057	2.9%	
3.19	0.47		0.58		0.58	0.47		0.22	0.128	6.6%	
3.66	0.47		0.66		0.66	0.45		0.21	0.140	7.2%	
4.13	0.47		0.52		0.52	0.52		0.24	0.127	6.5%	
4.60	0.47		0.19		0.19	0.47		0.22	0.042	2.2%	
5.07	0.47		0.77		0.77	0.52		0.24	0.188	9.7%	
5.54	0.47		0.99		0.99	0.46		0.22	0.214	11.0%	
6.01	0.47		0.28		0.28	0.45		0.21	0.059	3.0%	
6.48	0.47		0.73		0.73	0.55		0.26	0.189	9.7%	
6.95	0.47		0.78		0.78	0.49		0.23	0.180	9.2%	
7.42	0.47		0.60		0.60	0.4		0.19	0.113	5.8%	
7.89	0.47		0.52		0.52	0.44		0.21	0.108	5.5%	
8.36	0.47		0.48		0.48	0.35		0.16	0.079	4.1%	
8.83	0.47		0.25		0.25	0.18		0.08	0.021	1.1%	
9.30	0.47		0.13		0.13	0.1		0.05	0.006	0.3%	
9.77	0.47		0.01		0.01	0.07		0.03	0.000	0.0%	
10											Right Bank

Site:	A1		**Date :**	2014-09-15	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	1:30 PM	MST	**Staff Gauge :**	0.080	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Michael Keating				
Data Entered By:			**Total Width:**	9.00	
Data Entry Date:			**Total Area:**	3.15	

Average Velocity:	0.50	m/s
Total Discharge:	**1.568**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
1.2											Left Bank
1.42	0.34		0.17		0.17	0.240		0.08	0.014	0.9%	
1.87	0.40		0.56		0.56	0.280		0.11	0.063	4.0%	
2.22	0.40		0.62		0.62	0.180		0.07	0.045	2.8%	
2.67	0.40		0.46		0.46	0.440		0.18	0.081	5.2%	
3.02	0.40		0.43		0.43	0.510		0.20	0.088	5.6%	
3.47	0.45		0.12		0.12	0.440		0.20	0.024	1.5%	
3.92	0.45		0.41		0.41	0.410		0.18	0.076	4.8%	
4.37	0.45		0.89		0.89	0.320		0.14	0.128	8.2%	
4.82	0.45		0.32		0.32	0.440		0.20	0.063	4.0%	
5.27	0.40		0.32		0.32	0.440		0.18	0.056	3.6%	
5.62	0.40		1.04		1.04	0.280		0.11	0.116	7.4%	
6.07	0.45		0.94		0.94	0.390		0.18	0.165	10.5%	
6.52	0.45		0.42		0.42	0.460		0.21	0.087	5.5%	
6.97	0.45		0.45		0.45	0.460		0.21	0.093	5.9%	
7.42	0.45		0.63		0.63	0.440		0.20	0.125	8.0%	
7.87	0.45		0.63		0.63	0.400		0.18	0.113	7.2%	
8.32	0.45		0.48		0.48	0.350		0.16	0.076	4.8%	
8.77	0.45		0.55		0.55	0.330		0.15	0.082	5.2%	
9.22	0.45		0.43		0.43	0.290		0.13	0.056	3.6%	
9.67	0.49		0.19		0.19	0.190		0.09	0.018	1.1%	
10.2											Right Bank

DILLON CONSULTING

Site:	A1		**Date :**	2014-11-21	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	11:00 AM	MST	**Staff Gauge :**	0.040	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Michael Keating				
Data Entered By:			**Total Width:**	9.00	
Data Entry Date:			**Total Area:**	2.90	

Average Velocity:	0.57	m/s
Total Discharge:	**1.661**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
0.5											Left Bank
0.73	0.34		0.18		0.18	0.220		0.07	0.013	0.8%	
1.18	0.45		0.51		0.51	0.170		0.08	0.039	2.3%	
1.63	0.45		0.51		0.51	0.235		0.11	0.054	3.2%	
2.08	0.45		0.65		0.65	0.470		0.21	0.137	8.3%	
2.53	0.45		0.42		0.42	0.440		0.20	0.083	5.0%	
2.98	0.45		0.40		0.40	0.440		0.20	0.079	4.8%	
3.43	0.45		0.72		0.72	0.330		0.15	0.107	6.4%	
3.88	0.45		1.08		1.08	0.250		0.11	0.122	7.3%	
4.33	0.45		0.40		0.40	0.440		0.20	0.079	4.8%	
4.78	0.45		0.97		0.97	0.380		0.17	0.166	10.0%	
5.23	0.45		0.76		0.76	0.440		0.20	0.150	9.1%	
5.68	0.45		0.74		0.74	0.400		0.18	0.133	8.0%	
6.13	0.45		0.33		0.33	0.420		0.19	0.062	3.8%	
6.58	0.45		0.68		0.68	0.350		0.16	0.107	6.4%	
7.03	0.45		0.65		0.65	0.390		0.18	0.114	6.9%	
7.48	0.45		0.56		0.56	0.330		0.15	0.083	5.0%	
7.93	0.45		0.52		0.52	0.310		0.14	0.073	4.4%	
8.38	0.45		0.37		0.37	0.250		0.11	0.042	2.5%	
8.83	0.45		0.20		0.20	0.170		0.08	0.015	0.9%	
9.28	0.33		0.04		0.04	0.070		0.02	0.001	0.1%	
9.5											Right Bank

DILLON CONSULTING

Site:	A1		**Date :**	2015-06-15	
Location at Site:					
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**		
Measurement Start Time:		MST	**Staff Gauge :**	0.165	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	T Phillips		**Sensor :**		m
Measurement Recorded By:	G. Abbott				
Data Entered By:			**Total Width:**	9.50	
Data Entry Date:			**Total Area:**	4.24	

Average Velocity:	0.71	m/s
Total Discharge:	**3.006**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
1.2											Left Bank
1.44	0.48		0.43		0.43	0.330		0.16	0.067	2.2%	
1.92	0.48		0.51		0.51	0.410		0.19	0.099	3.3%	
2.39	0.48		0.73		0.73	0.450		0.21	0.156	5.2%	
2.87	0.48		0.66		0.66	0.510		0.24	0.160	5.3%	
3.34	0.48		0.41		0.41	0.500		0.24	0.097	3.2%	
3.82	0.48		0.67		0.67	0.500		0.24	0.159	5.3%	
4.29	0.48		0.97		0.97	0.490		0.23	0.226	7.5%	
4.77	0.48		1.25		1.25	0.580		0.28	0.344	11.5%	
5.24	0.48		0.72		0.72	0.570		0.27	0.195	6.5%	
5.72	0.48		0.73		0.73	0.570		0.27	0.198	6.6%	
6.19	0.48		1.12		1.12	0.510		0.24	0.271	9.0%	
6.67	0.48		0.66		0.66	0.500		0.24	0.157	5.2%	
7.14	0.48		0.69		0.69	0.530		0.25	0.174	5.8%	
7.62	0.48		0.86		0.86	0.510		0.24	0.208	6.9%	
8.09	0.48		0.81		0.81	0.490		0.23	0.189	6.3%	
8.57	0.48		0.62		0.62	0.440		0.21	0.130	4.3%	
9.04	0.48		0.55		0.55	0.370		0.18	0.097	3.2%	
9.52	0.48		0.29		0.29	0.350		0.17	0.048	1.6%	
9.99	0.48		0.26		0.26	0.230		0.11	0.028	0.9%	
10.47	0.48		0.08		0.08	0.080		0.04	0.003	0.1%	
10.7											Right Bank

DILLON CONSULTING

Site:	A1		**Date :**	2018-07-21	
Location at Site:					
Flow Metre Model Used:	Flowtracker 2		**Calibration Info:**		
Measurement Start Time:	1:45 PM	MST	**Staff Gauge :**	0.380	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Tyler Fortin				
Data Entered By:			**Total Width:**	9.00	
Data Entry Date:			**Total Area:**	3.27	

Average Velocity:	0.54	m/s	
Total Discharge:	**1.750**	m^3/s	

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
14.50											Left Bank
14.73	0.34		0.38		0.38	0.170		0.06	0.022	1.3%	
15.18	0.45		0.32		0.32	0.175		0.08	0.025	1.4%	
15.63	0.45		0.56		0.56	0.255		0.11	0.064	3.7%	
16.08	0.45		0.52		0.52	0.320		0.14	0.075	4.3%	
16.53	0.45		0.65		0.65	0.380		0.17	0.111	6.4%	
16.98	0.45		0.71		0.71	0.460		0.21	0.147	8.4%	
17.43	0.45		0.47		0.47	0.500		0.23	0.106	6.0%	
17.88	0.45		0.35		0.35	0.450		0.20	0.071	4.1%	
18.33	0.45		0.54		0.54	0.485		0.22	0.118	6.7%	
18.78	0.45		0.71		0.71	0.480		0.22	0.153	8.8%	
19.23	0.45		0.53		0.53	0.500		0.23	0.119	6.8%	
19.68	0.45		0.71		0.71	0.495		0.22	0.158	9.0%	
20.13	0.45		0.52		0.52	0.470		0.21	0.110	6.3%	
20.58	0.45		0.52		0.52	0.420		0.19	0.098	5.6%	
21.03	0.45		0.51		0.51	0.360		0.16	0.083	4.7%	
21.48	0.45		0.71		0.71	0.385		0.17	0.123	7.0%	
21.93	0.45		0.49		0.49	0.310		0.14	0.068	3.9%	
22.38	0.45		0.45		0.45	0.310		0.14	0.063	3.6%	
22.83	0.45		0.27		0.27	0.270		0.12	0.033	1.9%	
23.28	0.34		0.05		0.05	0.145		0.05	0.002	0.1%	
23.50											Right Bank

DILLON CONSULTING

Site:	A1		**Date :**	2018-11-10	
Location at Site:					
Flow Metre Model Used:	Flowtracker 2		**Calibration Info:**		
Measurement Start Time:		MST	**Staff Gauge :**	0.291	m
Measurement Finish Time:		MST	**Staff Gauge :**	0.291	m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Tyler Fortin				
Data Entered By:			**Total Width:**	8.80	
Data Entry Date:			**Total Area:**	2.44	

Average Velocity:	0.32	m/s
Total Discharge:	**0.789**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
1.20											Left Bank
1.42	0.33		0.00		0.00	0.070		0.02	0.000	0.0%	
1.86	0.44		0.31		0.31	0.180		0.08	0.025	3.1%	
2.30	0.44		0.18		0.18	0.260		0.11	0.021	2.6%	
2.74	0.44		0.33		0.33	0.280		0.12	0.041	5.2%	
3.18	0.44		0.56		0.56	0.310		0.14	0.076	9.7%	
3.62	0.44		0.44		0.44	0.340		0.15	0.066	8.3%	
4.06	0.44		0.30		0.30	0.320		0.14	0.042	5.4%	
4.50	0.44		0.10		0.10	0.250		0.11	0.011	1.4%	
4.94	0.33		0.63		0.63	0.300		0.10	0.062	7.9%	
5.16	0.22		0.66		0.66	0.300		0.07	0.044	5.5%	
5.38	0.33		0.53		0.53	0.360		0.12	0.063	8.0%	
5.82	0.44		0.40		0.40	0.430		0.19	0.076	9.6%	
6.26	0.44		0.18		0.18	0.450		0.20	0.036	4.5%	
6.70	0.44		0.27		0.27	0.390		0.17	0.046	5.9%	
7.14	0.44		0.33		0.33	0.360		0.16	0.052	6.6%	
7.58	0.44		0.16		0.16	0.300		0.13	0.021	2.7%	
8.02	0.44		0.30		0.30	0.310		0.14	0.041	5.2%	
8.46	0.44		0.35		0.35	0.210		0.09	0.032	4.1%	
8.90	0.44		0.15		0.15	0.180		0.08	0.012	1.5%	
9.34	0.44		0.28		0.28	0.160		0.07	0.020	2.5%	
9.78	0.33		0.06		0.06	0.160		0.05	0.003	0.4%	
10.00											Right Bank

DILLON CONSULTING

Site:	A1		**Date :**	2019-06-18		
Location at Site:						
Flow Metre Model Used:	Flowtracker 2		**Calibration Info:**			
Measurement Start Time:	12:25 PM	MST	**Staff Gauge :**	0.453	m	
Measurement Finish Time:		MST	**Staff Gauge :**	0.453	m	
Measurement Performed By:	Tyler Phillips		**Sensor :**		m	
Measurement Recorded By:	Nicole Zathey					
Data Entered By:			**Total Width:**	10.40	**Average Velocity:**	0.76 m/s
Data Entry Date:			**Total Area:**	4.52	**Total Discharge:**	**3.444** m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
0.90											Left Bank
1.16	0.39		0.04		0.04	0.075		0.03	0.001	0.0%	
1.68	0.52		0.13		0.13	0.100		0.05	0.007	0.2%	
2.20	0.52		0.37		0.37	0.155		0.08	0.030	0.9%	
2.72	0.52		0.46		0.46	0.280		0.15	0.067	1.9%	
3.24	0.52		0.45		0.45	0.340		0.18	0.080	2.3%	
3.76	0.52		0.63		0.63	0.430		0.22	0.141	4.1%	
4.28	0.52		0.69		0.69	0.458		0.24	0.165	4.8%	
4.80	0.52		1.11		1.11	0.560		0.29	0.324	9.4%	
5.32	0.52		1.21		1.21	0.505		0.26	0.317	9.2%	
5.84	0.52		0.87		0.87	0.525		0.27	0.237	6.9%	
6.36	0.33		0.80		0.80	0.590		0.19	0.155	4.5%	
6.50	0.26		1.13		1.13	0.615		0.16	0.181	5.2%	
6.88	0.45		1.06		1.06	0.645		0.29	0.307	8.9%	
7.40	0.52		0.60		0.60	0.660		0.34	0.206	6.0%	
7.92	0.52		0.68		0.68	0.650		0.34	0.229	6.6%	
8.44	0.52		0.74		0.74	0.585		0.30	0.226	6.6%	
8.96	0.52		0.94		0.94	0.550		0.29	0.269	7.8%	
9.48	0.52		0.65		0.65	0.485		0.25	0.164	4.8%	
10.00	0.52		0.74		0.74	0.435		0.23	0.166	4.8%	
10.52	0.52		0.69		0.69	0.390		0.20	0.139	4.0%	
11.04	0.39		0.22		0.22	0.390		0.15	0.034	1.0%	
11.30											Right Bank

DILLON CONSULTING

Site:	A1		**Date :**	2019-09-17		
Location at Site:						
Flow Metre Model Used:	HACH HF950		**Calibration Info:**			
Measurement Start Time:	3:15 PM	MST	**Staff Gauge :**	0.288	m	
Measurement Finish Time:		MST	**Staff Gauge :**	0.288	m	
Measurement Performed By:	Tyler Phillips		**Sensor :**		m	
Measurement Recorded By:	Katie Peterson					
Data Entered By:			**Total Width:**	9.00	**Average Velocity:**	0.44 m/s
Data Entry Date:			**Total Area:**	2.80	**Total Discharge:**	**1.228** m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
2.10											Left Bank
2.32	0.34		0.02		0.02	0.080		0.03	0.001	0.0%	
2.77	0.45		0.13		0.13	0.140		0.06	0.008	0.7%	
3.22	0.45		0.35		0.35	0.190		0.09	0.030	2.4%	
3.67	0.45		0.39		0.39	0.280		0.13	0.049	4.0%	
4.12	0.45		0.58		0.58	0.320		0.14	0.084	6.8%	
4.57	0.45		0.56		0.56	0.400		0.18	0.101	8.2%	
5.02	0.45		0.52		0.52	0.400		0.18	0.094	7.6%	
5.47	0.45		0.35		0.35	0.380		0.17	0.060	4.9%	
5.92	0.45		0.40		0.40	0.440		0.20	0.079	6.4%	
6.37	0.45		0.55		0.55	0.380		0.17	0.094	7.7%	
6.82	0.34		0.65		0.65	0.440		0.15	0.097	7.9%	
7.05	0.23		0.44		0.44	0.460		0.10	0.046	3.7%	
7.27	0.34		0.47		0.47	0.460		0.15	0.072	5.9%	
7.72	0.45		0.67		0.67	0.400		0.18	0.121	9.8%	
8.17	0.34		0.45		0.45	0.400		0.14	0.061	5.0%	
8.40	0.23		0.51		0.51	0.320		0.07	0.037	3.0%	
8.62	0.34		0.39		0.39	0.300		0.10	0.039	3.2%	
9.07	0.45		0.39		0.39	0.340		0.15	0.060	4.9%	
9.52	0.45		0.42		0.42	0.280		0.13	0.053	4.3%	
9.97	0.45		0.10		0.10	0.260		0.12	0.012	1.0%	
10.42	0.45		0.22		0.22	0.240		0.11	0.024	1.9%	
10.87	0.34		0.15		0.15	0.160		0.05	0.008	0.7%	
11.10											Right Bank

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Site:	A3B		**Date :**	2014-09-15	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	12:30 PM	MST	**Staff Gauge :**	0.120	m
Measurement Finish Time:	12:40 PM	MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Michael Keating				
Data Entered By:			**Total Width:**	8.60	
Data Entry Date:			**Total Area:**	2.03	

Average Velocity:	0.57	m/s
Total Discharge:	**1.164**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
1.60											Left Bank
1.81	0.32		0.33		0.33	0.080		0.03	0.008	0.7%	
2.24	0.43		0.54		0.54	0.230		0.10	0.053	4.6%	
2.67	0.43		0.97		0.97	0.220		0.09	0.092	7.9%	
3.10	0.43		0.52		0.52	0.270		0.12	0.060	5.2%	
3.53	0.43		0.62		0.62	0.310		0.13	0.083	7.1%	
3.96	0.43		0.78		0.78	0.400		0.17	0.134	11.5%	
4.39	0.43		0.73		0.73	0.330		0.14	0.104	8.9%	
4.82	0.43		0.72		0.72	0.320		0.14	0.099	8.5%	
5.25	0.43		0.59		0.59	0.210		0.09	0.053	4.6%	
5.68	0.43		0.75		0.75	0.310		0.13	0.100	8.6%	
6.11	0.43		0.60		0.60	0.270		0.12	0.070	6.0%	
6.54	0.43		0.45		0.45	0.240		0.10	0.046	4.0%	
6.97	0.43		0.54		0.54	0.200		0.09	0.046	4.0%	
7.40	0.43		0.46		0.46	0.220		0.09	0.044	3.7%	
7.83	0.43		0.29		0.29	0.240		0.10	0.030	2.6%	
8.26	0.43		0.49		0.49	0.230		0.10	0.048	4.2%	
8.69	0.43		0.40		0.40	0.210		0.09	0.036	3.1%	
9.12	0.43		0.39		0.39	0.180		0.08	0.030	2.6%	
9.55	0.43		0.20		0.20	0.150		0.06	0.013	1.1%	
9.98	0.33		0.29		0.29	0.150		0.05	0.014	1.2%	
10.20											Right Bank

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Site:	A3B		**Date :**	2014-11-20	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	2:17 PM	MST	**Staff Gauge :**	0.060	m
Measurement Finish Time:	2:40 PM	MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Michael Keating				
Data Entered By:			**Total Width:**	8.60	
Data Entry Date:			**Total Area:**	1.84	

Average Velocity:	0.38	m/s
Total Discharge:	**0.703**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
2.10											Left Bank
2.32	0.33		0.01		0.01	0.060		0.02	0.000	0.0%	
2.75	0.43		0.01		0.01	0.060		0.03	0.000	0.0%	
3.18	0.43		0.13		0.13	0.070		0.03	0.004	0.6%	
3.61	0.43		0.29		0.29	0.110		0.05	0.014	2.0%	
4.04	0.43		0.19		0.19	0.160		0.07	0.013	1.9%	
4.47	0.43		0.27		0.27	0.240		0.10	0.028	4.0%	
4.90	0.43		0.10		0.10	0.240		0.10	0.010	1.5%	
5.33	0.43		0.33		0.33	0.190		0.08	0.027	3.8%	
5.76	0.43		0.35		0.35	0.230		0.10	0.035	4.9%	
6.19	0.43		0.46		0.46	0.210		0.09	0.042	5.9%	
6.62	0.43		0.62		0.62	0.210		0.09	0.056	8.0%	
7.05	0.43		0.37		0.37	0.200		0.09	0.032	4.5%	
7.48	0.43		0.40		0.40	0.260		0.11	0.045	6.4%	
7.91	0.43		0.37		0.37	0.310		0.13	0.049	7.0%	
8.34	0.43		0.52		0.52	0.260		0.11	0.058	8.3%	
8.77	0.43		0.49		0.49	0.310		0.13	0.065	9.3%	
9.20	0.43		0.50		0.50	0.350		0.15	0.075	10.7%	
9.63	0.43		0.50		0.50	0.370		0.16	0.080	11.3%	
10.06	0.43		0.43		0.43	0.340		0.15	0.063	8.9%	
10.49	0.32		0.17		0.17	0.140		0.04	0.008	1.1%	
10.70											Right Bank

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Site:	A3B		**Date :**	2015-04-23	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:		MST	**Staff Gauge :**	0.280	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:			**Sensor :**		m
Measurement Recorded By:					
Data Entered By:			**Total Width:**	9.60	
Data Entry Date:			**Total Area:**	4.25	

Average Velocity:	0.80	m/s
Total Discharge:	**3.388**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
3.15	0.51		0.11		0.11	0.150		0.08	0.008	0.2%	
3.66	0.51		0.45		0.45	0.460		0.23	0.105	3.1%	
4.16	0.51		0.70		0.70	0.600		0.30	0.212	6.3%	
4.67	0.51		0.84		0.84	0.650		0.33	0.276	8.1%	
5.17	0.51		0.95		0.95	0.630		0.32	0.302	8.9%	
5.68	0.51		1.01		1.01	0.570		0.29	0.291	8.6%	
6.18	0.51		1.02		1.02	0.560		0.28	0.288	8.5%	
6.69	0.51		0.75		0.75	0.480		0.24	0.182	5.4%	
7.19	0.51		0.90		0.90	0.480		0.24	0.218	6.4%	
7.70	0.51		0.79		0.79	0.470		0.24	0.188	5.5%	
8.20	0.51		0.77		0.77	0.480		0.24	0.187	5.5%	
8.71	0.51		0.80		0.80	0.440		0.22	0.178	5.2%	
9.21	0.51		0.91		0.91	0.440		0.22	0.202	6.0%	
9.72	0.51		0.99		0.99	0.480		0.24	0.240	7.1%	
10.22	0.51		0.74		0.74	0.410		0.21	0.153	4.5%	
10.73	0.51		0.68		0.68	0.350		0.18	0.120	3.5%	
11.23	0.51		0.71		0.71	0.280		0.14	0.100	3.0%	
11.74	0.51		0.77		0.77	0.230		0.12	0.089	2.6%	
12.24	0.51		0.49		0.49	0.190		0.10	0.047	1.4%	
12.75	0.51		0.04		0.04	0.060		0.03	0.001	0.0%	

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Site:	A3B		**Date :**	2015-06-25			
Location at Site:							
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**				
Measurement Start Time:		MST	**Staff Gauge :**	0.185	m		
Measurement Finish Time:		MST	**Staff Gauge :**		m		
Measurement Performed By:	Tyler Phillips		**Sensor :**		m		
Measurement Recorded By:	G. Abbott						
Data Entered By:			**Total Width:**	8.74		**Average Velocity:**	0.70 m/s
Data Entry Date:			**Total Area:**	2.80		**Total Discharge:**	**1.963** m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
1.40	0.46		0.31		0.31	0.130		0.06	0.019	0.9%	Right Bank
1.86	0.46		0.52		0.52	0.150		0.07	0.036	1.8%	
2.32	0.46		0.26		0.26	0.210		0.10	0.025	1.3%	
2.78	0.46		0.67		0.67	0.200		0.09	0.062	3.1%	
3.24	0.46		0.75		0.75	0.240		0.11	0.083	4.2%	
3.70	0.46		0.65		0.65	0.260		0.12	0.078	4.0%	
4.16	0.46		0.68		0.68	0.250		0.12	0.078	4.0%	
4.62	0.46		0.80		0.80	0.270		0.12	0.099	5.1%	
5.08	0.46		0.59		0.59	0.290		0.13	0.079	4.0%	
5.54	0.46		0.59		0.59	0.380		0.17	0.103	5.3%	
6.00	0.46		0.92		0.92	0.380		0.17	0.161	8.2%	
6.46	0.46		0.80		0.80	0.330		0.15	0.121	6.2%	
6.92	0.46		0.88		0.88	0.320		0.15	0.130	6.6%	
7.38	0.46		0.84		0.84	0.390		0.18	0.151	7.7%	
7.84	0.46		0.75		0.75	0.410		0.19	0.141	7.2%	
8.30	0.46		0.79		0.79	0.430		0.20	0.156	8.0%	
8.76	0.46		0.85		0.85	0.480		0.22	0.188	9.6%	
9.22	0.46		0.77		0.77	0.460		0.21	0.163	8.3%	
9.68	0.46		0.53		0.53	0.340		0.16	0.083	4.2%	
10.14	0.46		0.10		0.10	0.170		0.08	0.008	0.4%	Left Bank

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Site:	A3B		**Date :**	2015-09-16		
Location at Site:						
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**			
Measurement Start Time:	13:26	MST	**Staff Gauge :**	0.040	m	
Measurement Finish Time:	13:37	MST	**Staff Gauge :**	0.040	m	
Measurement Performed By:	Tyler Phillips		**Sensor :**		m	
Measurement Recorded By:	M. Calabrese					
Data Entered By:			**Total Width:**	7.79	**Average Velocity:**	0.44 m/s
Data Entry Date:			**Total Area:**	1.81	**Total Discharge:**	**0.791** m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
2.91	0.41		0.34		0.34	0.17		0.07	0.024	3.0%	
3.32	0.41		0.54		0.54	0.32		0.13	0.071	9.0%	
3.73	0.41		0.57		0.57	0.34		0.14	0.079	10.0%	
4.14	0.41		0.64		0.64	0.33		0.14	0.087	11.0%	
4.55	0.41		0.58		0.58	0.32		0.13	0.076	9.6%	
4.96	0.41		0.51		0.51	0.31		0.13	0.065	8.2%	
5.37	0.41		0.50		0.50	0.27		0.11	0.055	7.0%	
5.78	0.41		0.40		0.40	0.28		0.11	0.046	5.8%	
6.19	0.41		0.36		0.36	0.25		0.10	0.037	4.7%	
6.60	0.41		0.55		0.55	0.26		0.11	0.059	7.4%	
7.01	0.41		0.37		0.37	0.22		0.09	0.033	4.2%	
7.42	0.41		0.53		0.53	0.15		0.06	0.033	4.1%	
7.83	0.41		0.36		0.36	0.15		0.06	0.022	2.8%	
8.24	0.41		0.36		0.36	0.19		0.08	0.028	3.5%	
8.65	0.41		0.22		0.22	0.19		0.08	0.017	2.2%	
9.06	0.41		0.41		0.41	0.17		0.07	0.029	3.6%	
9.47	0.41		0.21		0.21	0.18		0.07	0.016	2.0%	
9.88	0.41		0.11		0.11	0.14		0.06	0.006	0.8%	
10.29	0.41		0.15		0.15	0.11		0.05	0.007	0.9%	
10.70	0.41		0.06		0.06	0.07		0.03	0.002	0.2%	

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Site:	WA1		**Date :**	2013-11-15	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	10:45 AM	MST	**Staff Gauge :**	0.245	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Paul Donahue				
Data Entered By:			**Total Width:**	2.10	
Data Entry Date:			**Total Area:**	0.18	

Average Velocity:	0.30	m/s		
Total Discharge:	**0.053**	m^3/s		

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m²]	Discharge [m³/s]	% of Total Discharge	Notes
2.20	0.05		0.00		0.00	0.03		0.00	0.000	0.0%	
2.30	0.10		0.06		0.06	0.07		0.01	0.000	0.8%	
2.40	0.10		0.17		0.17	0.08		0.01	0.001	2.6%	
2.50	0.10		0.24		0.24	0.085		0.01	0.002	3.9%	
2.60	0.10		0.31		0.31	0.085		0.01	0.003	5.0%	
2.70	0.10		0.34		0.34	0.09		0.01	0.003	5.8%	
2.80	0.10		0.36		0.36	0.1		0.01	0.004	6.8%	
2.90	0.10		0.45		0.45	0.12		0.01	0.005	10.3%	
3.00	0.10		0.09		0.09	0.1		0.01	0.001	1.7%	
3.10	0.10		0.05		0.05	0.09		0.01	0.000	0.9%	
3.20	0.10		0.36		0.36	0.1		0.01	0.004	6.8%	
3.30	0.10		0.36		0.36	0.09		0.01	0.003	6.2%	
3.40	0.10		0.45		0.45	0.09		0.01	0.004	7.7%	
3.50	0.10		0.42		0.42	0.08		0.01	0.003	6.4%	
3.60	0.10		0.43		0.43	0.075		0.01	0.003	6.1%	
3.70	0.10		0.47		0.47	0.085		0.01	0.004	7.6%	
3.80	0.10		0.41		0.41	0.085		0.01	0.003	6.6%	
3.90	0.10		0.34		0.34	0.12		0.01	0.004	7.8%	
4.00	0.10		0.23		0.23	0.1		0.01	0.002	4.4%	
4.10	0.10		0.16		0.16	0.09		0.01	0.001	2.7%	
4.20	0.10		0.00		0.00	0		0.00	0.000	0.0%	
4.30	0.05		0.00		0.00	0		0.00	0.000	0.0%	

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Site:	WA1		**Date :**	2014-05-21	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:		MST	**Staff Gauge :**	0.530	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Jason Gravelle		**Sensor :**		m
Measurement Recorded By:	Tyler Phillips				
Data Entered By:			**Total Width:**	4.00	
Data Entry Date:			**Total Area:**	2.21	

Average Velocity:	1.02	m/s	
Total Discharge:	**2.259**	m^3/s	

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
1.60											Left Bank
1.70	0.20		0.60		0.60	0.610		0.12	0.073	3.2%	
1.90	0.20		0.73		0.73	0.630		0.13	0.092	4.1%	
2.10	0.20		0.90		0.90	0.590		0.12	0.106	4.7%	
2.30	0.20		0.93		0.93	0.610		0.12	0.113	5.0%	
2.50	0.20		1.07		1.07	0.590		0.12	0.126	5.6%	
2.70	0.20		0.97		0.97	0.600		0.12	0.116	5.2%	
2.90	0.20		1.17		1.17	0.590		0.12	0.138	6.1%	
3.10	0.20		1.15		1.15	0.600		0.12	0.138	6.1%	
3.30	0.20		1.05		1.05	0.570		0.11	0.120	5.3%	
3.50	0.20		1.09		1.09	0.600		0.12	0.131	5.8%	
3.70	0.20		0.92		0.92	0.620		0.12	0.114	5.1%	
3.90	0.20		1.37		1.37	0.630		0.13	0.173	7.6%	
4.10	0.20		1.50		1.50	0.660		0.13	0.198	8.8%	
4.30	0.20		1.65		1.65	0.650		0.13	0.215	9.5%	
4.50	0.20		1.35		1.35	0.610		0.12	0.165	7.3%	
4.70	0.20		1.06		1.06	0.520		0.10	0.110	4.9%	
4.90	0.20		0.67		0.67	0.480		0.10	0.064	2.8%	
5.10	0.20		0.51		0.51	0.420		0.08	0.043	1.9%	
5.30	0.20		0.36		0.36	0.320		0.06	0.023	1.0%	
5.50	0.20		0.01		0.01	0.150		0.03	0.000	0.0%	
5.60											Right Bank

DILLON CONSULTING

Site:	WA1		**Date :**	2014-06-12	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:		MST	**Staff Gauge :**	0.530	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	J. Enns				
Data Entered By:			**Total Width:**	3.80	
Data Entry Date:			**Total Area:**	2.10	

Average Velocity:	0.81	m/s
Total Discharge:	**1.705**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
1.10											Left Bank
1.20	0.19		0.10		0.10	0.310		0.06	0.006	0.3%	
1.39	0.19		0.32		0.32	0.470		0.09	0.029	1.7%	
1.58	0.19		0.35		0.35	0.520		0.10	0.035	2.0%	
1.77	0.19		0.86		0.86	0.540		0.10	0.088	5.2%	
1.96	0.19		1.08		1.08	0.560		0.11	0.115	6.7%	
2.15	0.19		1.13		1.13	0.580		0.11	0.125	7.3%	
2.34	0.19		1.24		1.24	0.630		0.12	0.148	8.7%	
2.53	0.19		1.10		1.10	0.660		0.13	0.138	8.1%	
2.72	0.19		0.79		0.79	0.620		0.12	0.093	5.5%	
2.91	0.19		0.63		0.63	0.610		0.12	0.073	4.3%	
3.10	0.19		0.88		0.88	0.620		0.12	0.104	6.1%	
3.29	0.19		0.93		0.93	0.650		0.12	0.115	6.7%	
3.48	0.19		0.99		0.99	0.630		0.12	0.119	6.9%	
3.67	0.19		0.92		0.92	0.580		0.11	0.101	5.9%	
3.86	0.19		1.06		1.06	0.460		0.09	0.093	5.4%	
4.05	0.19		0.89		0.89	0.560		0.11	0.095	5.6%	
4.24	0.19		0.89		0.89	0.510		0.10	0.086	5.1%	
4.43	0.19		0.65		0.65	0.570		0.11	0.070	4.1%	
4.62	0.19		0.42		0.42	0.600		0.11	0.048	2.8%	
4.81	0.19		0.39		0.39	0.350		0.07	0.026	1.5%	
4.90											Right Bank

DILLON CONSULTING

Site:	WA1		**Date :**	2014-07-30		
Location at Site:						
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**			
Measurement Start Time:		MST	**Staff Gauge :**	0.290	m	
Measurement Finish Time:		MST	**Staff Gauge :**		m	
Measurement Performed By:	Tyler Phillips		**Sensor :**		m	
Measurement Recorded By:	J. Enns					
Data Entered By:			**Total Width:**	3.60	**Average Velocity:**	0.13 m/s
Data Entry Date:			**Total Area:**	0.97	**Total Discharge:**	**0.122** m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
0.80											Left Bank
0.92	0.24		0.01		0.01	0.290		0.07	0.001	0.6%	
1.16	0.24		0.12		0.12	0.270		0.06	0.008	6.4%	
1.40	0.24		0.11		0.11	0.320		0.08	0.008	7.0%	
1.64	0.24		0.18		0.18	0.350		0.08	0.015	12.4%	
1.88	0.24		0.10		0.10	0.330		0.08	0.008	6.5%	
2.12	0.24		0.11		0.11	0.320		0.08	0.008	7.0%	
2.36	0.24		0.13		0.13	0.320		0.08	0.010	8.2%	
2.60	0.24		0.16		0.16	0.260		0.06	0.010	8.2%	
2.84	0.24		0.18		0.18	0.280		0.07	0.012	10.0%	
3.08	0.24		0.19		0.19	0.300		0.07	0.014	11.3%	
3.32	0.24		0.16		0.16	0.290		0.07	0.011	9.2%	
3.56	0.24		0.14		0.14	0.270		0.06	0.009	7.5%	
3.80	0.24		0.10		0.10	0.210		0.05	0.005	4.1%	
4.04	0.24		0.05		0.05	0.150		0.04	0.002	1.5%	
4.28	0.24		0.02		0.02	0.070		0.02	0.000	0.3%	
4.40											Right Bank

DILLON CONSULTING

Site:	WA1		**Date :**	2014-07-30	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	11:00 AM	MST	**Staff Gauge :**	0.260	m
Measurement Finish Time:	11:25 AM	MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Michael Keating				
Data Entered By:			**Total Width:**	2.50	
Data Entry Date:			**Total Area:**	0.20	

Average Velocity:	0.28	m/s
Total Discharge:	**0.057**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
2.00											Left Bank
2.13	0.19		0.11		0.11	0.050		0.01	0.001	1.8%	
2.38	0.25		0.25		0.25	0.090		0.02	0.006	9.9%	
2.63	0.25		0.20		0.20	0.090		0.02	0.005	7.9%	
2.88	0.25		0.40		0.40	0.080		0.02	0.008	14.1%	
3.13	0.25		0.32		0.32	0.090		0.02	0.007	12.7%	
3.38	0.25		0.40		0.40	0.080		0.02	0.008	14.1%	
3.63	0.25		0.35		0.35	0.100		0.03	0.009	15.4%	
3.88	0.25		0.17		0.17	0.130		0.03	0.006	9.7%	
4.13	0.25		0.30		0.30	0.070		0.02	0.005	9.2%	
4.38	0.19		0.26		0.26	0.060		0.01	0.003	5.1%	
4.50											Right Bank

DILLON CONSULTING

Site:	WA1		**Date :**	2015-06-25	
Location at Site:					
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**		
Measurement Start Time:		MST	**Staff Gauge :**	0.340	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	G. Abbott				
Data Entered By:			**Total Width:**	3.80	
Data Entry Date:			**Total Area:**	1.11	

Average Velocity:	0.22	m/s	
Total Discharge:	**0.241**	m^3/s	

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m²]	Discharge [m³/s]	% of Total Discharge	Notes
1.55											Left Bank
1.65	0.19		0.09		0.09	0.060		0.01	0.001	0.4%	
1.84	0.19		0.08		0.08	0.120		0.02	0.002	0.8%	
2.03	0.19		0.10		0.10	0.220		0.04	0.004	1.7%	
2.22	0.19		0.11		0.11	0.230		0.04	0.005	2.0%	
2.41	0.19		0.18		0.18	0.250		0.05	0.009	3.5%	
2.60	0.19		0.22		0.22	0.290		0.06	0.012	5.0%	
2.79	0.19		0.21		0.21	0.310		0.06	0.012	5.1%	
2.98	0.19		0.25		0.25	0.320		0.06	0.015	6.3%	
3.17	0.19		0.27		0.27	0.340		0.06	0.017	7.2%	
3.36	0.19		0.22		0.22	0.310		0.06	0.013	5.4%	
3.55	0.19		0.19		0.19	0.300		0.06	0.011	4.5%	
3.74	0.19		0.21		0.21	0.340		0.06	0.014	5.6%	
3.93	0.19		0.19		0.19	0.330		0.06	0.012	4.9%	
4.12	0.19		0.25		0.25	0.320		0.06	0.015	6.3%	
4.31	0.19		0.31		0.31	0.360		0.07	0.021	8.8%	
4.50	0.19		0.29		0.29	0.370		0.07	0.020	8.4%	
4.69	0.19		0.28		0.28	0.370		0.07	0.020	8.2%	
4.88	0.19		0.21		0.21	0.380		0.07	0.015	6.3%	
5.07	0.19		0.17		0.17	0.330		0.06	0.011	4.4%	
5.26	0.19		0.21		0.21	0.310		0.06	0.012	5.1%	
5.35											Right Bank

DILLON CONSULTING

Site:	WA1		**Date :**	2015-09-16	
Location at Site:					
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**		
Measurement Start Time:	13:19	MST	**Staff Gauge :**	0.235	m
Measurement Finish Time:	13:38	MST	**Staff Gauge :**	0.235	m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	M. Calabrese				
Data Entered By:			**Total Width:**	2.70	
Data Entry Date:			**Total Area:**	0.27	

Average Velocity:	0.15	m/s
Total Discharge:	**0.039**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
3.35	0.30		0.02		0.02	0.06		0.02	0.000	0.9%	
3.65	0.30		0.13		0.13	0.08		0.02	0.003	8.0%	
3.95	0.30		0.09		0.09	0.09		0.03	0.002	6.2%	
4.25	0.30		0.12		0.12	0.11		0.03	0.004	10.2%	
4.55	0.30		0.22		0.22	0.12		0.04	0.008	20.3%	
4.85	0.30		0.18		0.18	0.10		0.03	0.005	13.8%	
5.15	0.30		0.21		0.21	0.10		0.03	0.006	16.2%	
5.45	0.30		0.20		0.20	0.10		0.03	0.006	15.4%	
5.75	0.30		0.14		0.14	0.08		0.02	0.003	8.6%	
6.05	0.30		0.01		0.01	0.05		0.02	0.000	0.4%	

DILLON CONSULTING

Site:	G2		**Date :**	2013-11-15	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	2:30 PM	MST	**Staff Gauge :**	0.130	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Paul Donahue				
Data Entered By:			**Total Width:**	2.50	
Data Entry Date:			**Total Area:**	0.51	

Average Velocity:	0.27	m/s
Total Discharge:	**0.139**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
2.40	0.13		0.00		0.00	0.05		0.01	0.000	0.0%	
2.65	0.25		0.03		0.03	0.09		0.02	0.001	0.5%	
2.90	0.25		0.13		0.13	0.22		0.06	0.007	5.2%	
3.15	0.25		0.27		0.27	0.17		0.04	0.011	8.3%	
3.40	0.25		0.32		0.32	0.16		0.04	0.013	9.2%	
3.65	0.25		0.40		0.40	0.17		0.04	0.017	12.3%	
3.90	0.25		0.85		0.85	0.21		0.05	0.045	32.2%	
4.15	0.25		0.61		0.61	0.17		0.04	0.026	18.7%	
4.40	0.25		0.12		0.12	0.11		0.03	0.003	2.4%	
4.65	0.25		0.09		0.09	0.7		0.18	0.016	11.4%	
4.90	0.13		0.00		0.00	0.04		0.01	0.000	0.0%	

DILLON CONSULTING

Site:	G2		**Date :**	2014-05-01		
Location at Site:						
Flow Metre Model Used:			**Calibration Info:**			
Measurement Start Time:	12:51 PM	MST	**Staff Gauge :**	0.210	m	
Measurement Finish Time:	1:28 PM	MST	**Staff Gauge :**		m	
Measurement Performed By:	Tyler Phillips		**Sensor :**		m	
Measurement Recorded By:	Michael Keating					
Data Entered By:			**Total Width:**	3.10	**Average Velocity:**	0.34 m/s
Data Entry Date:			**Total Area:**	0.61	**Total Discharge:**	**0.208** m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
3.60											
3.70	0.13		0.17		0.17	0.090		0.01	0.002	0.9%	
3.85	0.15		0.08		0.08	0.090		0.01	0.001	0.5%	
4.00	0.15		0.06		0.06	0.220		0.03	0.002	1.0%	
4.15	0.15		0.10		0.10	0.160		0.02	0.002	1.2%	
4.30	0.15		0.12		0.12	0.170		0.03	0.003	1.5%	
4.45	0.15		0.17		0.17	0.210		0.03	0.005	2.6%	
4.60	0.15		0.21		0.21	0.250		0.04	0.008	3.8%	
4.75	0.15		0.61		0.61	0.340		0.05	0.031	15.0%	
4.90	0.15		0.48		0.48	0.220		0.03	0.016	7.6%	
5.05	0.15		0.43		0.43	0.240		0.04	0.015	7.4%	
5.20	0.15		0.66		0.66	0.270		0.04	0.027	12.9%	
5.35	0.15		0.12		0.12	0.230		0.03	0.004	2.0%	
5.50	0.15		0.21		0.21	0.240		0.04	0.008	3.6%	
5.65	0.15		0.32		0.32	0.300		0.05	0.014	6.9%	
5.80	0.15		0.60		0.60	0.280		0.04	0.025	12.1%	
5.95	0.15		0.64		0.64	0.240		0.04	0.023	11.1%	
6.10	0.15		0.30		0.30	0.240		0.04	0.011	5.2%	
6.25	0.15		0.29		0.29	0.160		0.02	0.007	3.3%	
6.40	0.15		0.15		0.15	0.080		0.01	0.002	0.9%	
6.55	0.15		0.11		0.11	0.070		0.01	0.001	0.6%	
6.70											

DILLON CONSULTING

Site:	G2		**Date :**	2014-07-30	
Location at Site:					
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**		
Measurement Start Time:		MST	**Staff Gauge :**	0.410	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	J. Gravelle				
Data Entered By:			**Total Width:**	2.70	
Data Entry Date:			**Total Area:**	0.83	

Average Velocity:	0.53	m/s	
Total Discharge:	**0.444**	m^3/s	

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
1.40											Left Bank
1.50	0.25		0.36		0.36	0.080		0.02	0.007	1.6%	
1.75	0.25		0.05		0.05	0.120		0.03	0.002	0.3%	
2.00	0.25		0.01		0.01	0.170		0.04	0.000	0.1%	
2.25	0.25		0.34		0.34	0.200		0.05	0.017	3.8%	
2.50	0.25		0.57		0.57	0.250		0.06	0.036	8.0%	
2.75	0.25		0.34		0.34	0.250		0.06	0.021	4.8%	
3.00	0.25		0.62		0.62	0.250		0.06	0.039	8.7%	
3.25	0.25		0.90		0.90	0.450		0.11	0.101	22.8%	
3.50	0.25		0.86		0.86	0.490		0.12	0.105	23.7%	
3.75	0.25		0.74		0.74	0.550		0.14	0.102	22.9%	
4.00	0.25		0.11		0.11	0.520		0.13	0.014	3.2%	
4.10											Right Bank

DILLON CONSULTING

Site:	G2		**Date :**	2014-09-15	
Location at Site:					
Flow Metre Model Used:			**Calibration Info:**		
Measurement Start Time:	3:30 PM	MST	**Staff Gauge :**	0.250	m
Measurement Finish Time:	3:45 PM	MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Michael Keating				
Data Entered By:			**Total Width:**	2.20	
Data Entry Date:			**Total Area:**	0.42	

Average Velocity:	0.27	m/s
Total Discharge:	**0.116**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
2.10											Left Bank
2.21	0.17		0.26		0.26	0.160		0.03	0.007	5.9%	
2.43	0.22		0.24		0.24	0.230		0.05	0.012	10.5%	
2.65	0.22		0.19		0.19	0.300		0.07	0.013	10.8%	
2.87	0.22		0.44		0.44	0.250		0.06	0.024	20.8%	
3.09	0.22		0.22		0.22	0.190		0.04	0.009	7.9%	
3.31	0.22		0.30		0.30	0.230		0.05	0.015	13.1%	
3.53	0.22		0.55		0.55	0.170		0.04	0.021	17.7%	
3.75	0.22		0.35		0.35	0.200		0.04	0.015	13.3%	
3.97	0.22		0.00		0.00	0.140		0.03	0.000	0.0%	
4.19	0.17		0.00		0.00	0.130		0.02	0.000	0.0%	
4.30											Right Bank

DILLON CONSULTING

Site:	G2		**Date :**	2014-11-20					
Location at Site:									
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**						
Measurement Start Time:	9:45 AM	MST	**Staff Gauge :**	0.230	m				
Measurement Finish Time:	3:45 PM	MST	**Staff Gauge :**		m				
Measurement Performed By:	Tyler Phillips		**Sensor :**		m				
Measurement Recorded By:	Michael Keating								
Data Entered By:			**Total Width:**	0.00			**Average Velocity:**	#DIV/0!	m/s
Data Entry Date:			**Total Area:**	0.00			**Total Discharge:**	**0.000**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m²]	Discharge [m³/s]	% of Total Discharge	Notes
					0.00			0.00	0.000	#DIV/0!	Right Bank
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	
					0.00			0.00	0.000	#DIV/0!	Left Bank

DILLON CONSULTING

Site:	G2		**Date :**	2015-04-24	
Location at Site:					
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**		
Measurement Start Time:	9:35 AM	MST	**Staff Gauge :**	0.310	m
Measurement Finish Time:	10:05 AM	MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	Jeremy Enns				
Data Entered By:			**Total Width:**	3.60	
Data Entry Date:			**Total Area:**	1.02	

Average Velocity:	0.72	m/s
Total Discharge:	**0.731**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
2.92	0.24		0.03		0.03	0.12		0.03	0.001	0.1%	Right Bank
3.16	0.24		0.16		0.16	0.25		0.06	0.010	1.3%	
3.40	0.24		0.19		0.19	0.28		0.07	0.013	1.7%	
3.64	0.24		0.49		0.49	0.3		0.07	0.035	4.8%	
3.88	0.24		0.76		0.76	0.35		0.08	0.064	8.7%	
4.12	0.24		0.68		0.68	0.46		0.11	0.075	10.3%	
4.36	0.24		1.38		1.38	0.42		0.10	0.139	19.0%	
4.60	0.24		1.12		1.12	0.35		0.08	0.094	12.9%	
4.84	0.24		1.08		1.08	0.37		0.09	0.096	13.1%	
5.08	0.24		1.10		1.10	0.3		0.07	0.079	10.8%	
5.32	0.24		0.85		0.85	0.22		0.05	0.045	6.1%	
5.56	0.24		0.44		0.44	0.21		0.05	0.022	3.0%	
5.80	0.24		0.59		0.59	0.21		0.05	0.030	4.1%	
6.04	0.24		0.25		0.25	0.18		0.04	0.011	1.5%	
6.28	0.24		0.38		0.38	0.15		0.04	0.014	1.9%	
6.52	0.24		0.26		0.26	0.06		0.01	0.004	0.5%	Left Bank

DILLON CONSULTING

Site:	G2		**Date :**	2015-06-25	
Location at Site:					
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**		
Measurement Start Time:	10:20 AM	MST	**Staff Gauge :**	0.310	m
Measurement Finish Time:	11:15 AM	MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	G. Abbott				
Data Entered By:			**Total Width:**	3.22	
Data Entry Date:			**Total Area:**	0.80	

Average Velocity:	0.51	m/s
Total Discharge:	**0.403**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
1.82	0.23		0.35		0.35	0.06		0.01	0.005	1.2%	
2.05	0.23		0.27		0.27	0.24		0.06	0.015	3.7%	
2.28	0.23		0.07		0.07	0.17		0.04	0.003	0.7%	
2.51	0.23		0.23		0.23	0.26		0.06	0.014	3.4%	
2.74	0.23		0.38		0.38	0.28		0.06	0.024	6.1%	
2.97	0.23		0.61		0.61	0.29		0.07	0.041	10.1%	
3.2	0.23		0.84		0.84	0.32		0.07	0.062	15.3%	
3.43	0.23		0.84		0.84	0.33		0.08	0.064	15.8%	
3.66	0.23		0.96		0.96	0.32		0.07	0.071	17.5%	
3.89	0.23		0.96		0.96	0.27		0.06	0.060	14.8%	
4.12	0.23		0.41		0.41	0.27		0.06	0.025	6.3%	
4.35	0.23		0.05		0.05	0.28		0.06	0.003	0.8%	
4.58	0.23		0.29		0.29	0.17		0.04	0.011	2.8%	
4.81	0.23		0.13		0.13	0.12		0.03	0.004	0.9%	
5.04	0.23		0.13		0.13	0.08		0.02	0.002	0.6%	

DILLON CONSULTING

Site:	G2		**Date :**	2015-09-16	
Location at Site:					
Flow Metre Model Used:	Swoffer 2100		**Calibration Info:**		
Measurement Start Time:	10:20 AM	MST	**Staff Gauge :**	0.225	m
Measurement Finish Time:	11:15 AM	MST	**Staff Gauge :**	0.225	m
Measurement Performed By:	Tyler Phillips		**Sensor :**		m
Measurement Recorded By:	M. Calabrese				
Data Entered By:			**Total Width:**	1.98	
Data Entry Date:			**Total Area:**	0.34	

Average Velocity:	0.32	m/s
Total Discharge:	**0.111**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m²]	Discharge [m³/s]	% of Total Discharge	Notes
3.01	0.22		0.02		0.02	0.07		0.02	0.000	0.3%	
3.23	0.22		0.03		0.03	0.17		0.04	0.001	1.0%	
3.45	0.22		0.05		0.05	0.17		0.04	0.002	1.7%	
3.67	0.22		0.42		0.42	0.17		0.04	0.016	14.2%	
3.89	0.22		0.39		0.39	0.21		0.05	0.018	16.3%	
4.11	0.22		0.38		0.38	0.17		0.04	0.014	12.8%	
4.33	0.22		0.41		0.41	0.19		0.04	0.017	15.5%	
4.55	0.22		0.60		0.60	0.20		0.04	0.026	23.9%	
4.77	0.22		0.50		0.50	0.12		0.03	0.013	11.9%	
4.99	0.22		0.15		0.15	0.08		0.02	0.003	2.4%	

DILLON CONSULTING

Site:	G2		**Date :**	2018-05-19			
Location at Site:							
Flow Metre Model Used:	Flowtracker 2		**Calibration Info:**		Range of SG		
Measurement Start Time:	10:00 AM	MST	**Staff Gauge :**	0.400	`+/-.01	m	
Measurement Finish Time:		MST	**Staff Gauge :**	0.400		m	
Measurement Performed By:	Tyler Phillips		**Sensor :**		m		
Measurement Recorded By:	Jason Gravelle						
Data Entered By:			**Total Width:**	9.20	**Average Velocity:**	0.53	m/s
Data Entry Date:			**Total Area:**	3.70	**Total Discharge:**	**1.975**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth [m]		Area [m^2]	Discharge [m^3/s]	% of Total Discharge	Notes
2.90											Left Bank
3.13	0.35		0.02		0.02	0.170		0.06	0.001	0.1%	
3.59	0.46		0.45		0.45	0.305		0.14	0.063	3.2%	
4.05	0.46		0.68		0.68	0.420		0.19	0.131	6.7%	
4.51	0.46		0.74		0.74	0.475		0.22	0.162	8.2%	
4.97	0.46		0.62		0.62	0.550		0.25	0.157	7.9%	
5.43	0.46		0.61		0.61	0.555		0.26	0.156	7.9%	
5.89	0.46		0.56		0.56	0.510		0.23	0.131	6.7%	
6.35	0.46		0.43		0.43	0.475		0.22	0.094	4.8%	
6.81	0.46		0.35		0.35	0.475		0.22	0.076	3.9%	
7.27	0.46		0.37		0.37	0.500		0.23	0.085	4.3%	
7.73	0.46		0.41		0.41	0.480		0.22	0.091	4.6%	
8.19	0.46		0.49		0.49	0.540		0.25	0.122	6.2%	
8.65	0.46		0.43		0.43	0.570		0.26	0.113	5.7%	
9.11	0.46		0.54		0.54	0.485		0.22	0.120	6.1%	
9.57	0.46		0.73		0.73	0.390		0.18	0.131	6.6%	
10.03	0.46		0.63		0.63	0.335		0.15	0.097	4.9%	
10.49	0.46		0.63		0.63	0.290		0.13	0.084	4.3%	
10.95	0.46		0.67		0.67	0.215		0.10	0.066	3.4%	
11.41	0.46		0.63		0.63	0.200		0.09	0.058	2.9%	
11.87	0.35		0.56		0.56	0.190		0.07	0.037	1.9%	
12.10											Right Bank

DILLON CONSULTING

Site:	G2		**Date :**	2018-07-21	
Location at Site:					
Flow Metre Model Used:	Flowtracker 2		**Calibration Info:**		m
Measurement Start Time:		MST	**Staff Gauge :**	0.120	m
Measurement Finish Time:		MST	**Staff Gauge :**		m
Measurement Performed By:	Tyler Phillips		**Sensor :**		
Measurement Recorded By:	Tyler Fortin				
Data Entered By:			**Total Width:**	4.40	
Data Entry Date:			**Total Area:**	0.58	

Average Velocity:	0.33	m/s
Total Discharge:	**0.192**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m²]	Discharge [m³/s]	% of Total Discharge	Notes
8.20											Left Bank
8.31	0.17		0.25		0.25	0.060		0.01	0.002	1.3%	
8.53	0.22		0.07		0.07	0.080		0.02	0.001	0.6%	
8.75	0.22		0.03		0.03	0.080		0.02	0.001	0.3%	
8.97	0.22		0.35		0.35	0.100		0.02	0.008	4.0%	
9.19	0.22		0.50		0.50	0.105		0.02	0.012	6.0%	
9.41	0.22		0.29		0.29	0.090		0.02	0.006	3.0%	
9.63	0.22		0.41		0.41	0.100		0.02	0.009	4.7%	
9.85	0.22		0.32		0.32	0.080		0.02	0.006	2.9%	
10.07	0.22		0.26		0.26	0.125		0.03	0.007	3.7%	
10.29	0.22		0.17		0.17	0.110		0.02	0.004	2.1%	
10.51	0.22		0.30		0.30	0.125		0.03	0.008	4.3%	
10.73	0.22		0.10		0.10	0.150		0.03	0.003	1.7%	
10.95	0.22		0.34		0.34	0.160		0.04	0.012	6.2%	
11.17	0.22		0.35		0.35	0.170		0.04	0.013	6.8%	
11.39	0.22		0.22		0.22	0.205		0.05	0.010	5.2%	
11.61	0.17		0.33		0.33	0.220		0.04	0.012	6.2%	
11.72	0.11		0.58		0.58	0.210		0.02	0.013	7.0%	
11.83	0.11		0.60		0.60	0.220		0.02	0.015	7.6%	
11.94	0.11		0.61		0.61	0.205		0.02	0.014	7.2%	
12.05	0.17		0.56		0.56	0.170		0.03	0.016	8.2%	
12.27	0.22		0.39		0.39	0.190		0.04	0.016	8.5%	
12.49	0.17		0.17		0.17	0.175		0.03	0.005	2.6%	
12.60											Right Bank

DILLON CONSULTING

Site:	G2		**Date :**	2018-11-10			
Location at Site:							
Flow Metre Model Used:	Flowtracker 2		**Calibration Info:**		Range of SG		
Measurement Start Time:	11:40 AM	MST	**Staff Gauge :**	0.095	0.005	m	
Measurement Finish Time:		MST	**Staff Gauge :**	0.095	0.005	m	
Measurement Performed By:	Tyler Phillips		**Sensor :**		m		
Measurement Recorded By:	Tyler Fortin						
Data Entered By:			**Total Width:**	4.20	**Average Velocity:**	0.22	m/s
Data Entry Date:			**Total Area:**	0.38	**Total Discharge:**	**0.084**	m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
1.30											Left Bank
1.41	0.16		0.01		0.01	0.030		0.00	0.000	0.1%	
1.62	0.21		0.03		0.03	0.060		0.01	0.000	0.4%	
1.83	0.21		0.09		0.09	0.050		0.01	0.001	1.1%	
2.04	0.21		0.13		0.13	0.070		0.01	0.002	2.3%	
2.25	0.21		0.17		0.17	0.060		0.01	0.002	2.5%	
2.46	0.21		0.22		0.22	0.050		0.01	0.002	2.7%	
2.67	0.21		0.27		0.27	0.040		0.01	0.002	2.7%	
2.88	0.21		0.08		0.08	0.050		0.01	0.001	1.0%	
3.09	0.21		0.12		0.12	0.080		0.02	0.002	2.4%	
3.30	0.21		0.16		0.16	0.090		0.02	0.003	3.6%	
3.51	0.21		0.18		0.18	0.080		0.02	0.003	3.6%	
3.72	0.21		0.17		0.17	0.100		0.02	0.004	4.2%	
3.93	0.21		0.14		0.14	0.150		0.03	0.004	5.2%	
4.14	0.21		0.16		0.16	0.150		0.03	0.005	6.0%	
4.35	0.16		0.29		0.29	0.130		0.02	0.006	6.9%	
4.45	0.11		0.23		0.23	0.140		0.01	0.003	4.0%	
4.56	0.11		0.17		0.17	0.150		0.02	0.003	3.3%	
4.67	0.11		0.32		0.32	0.150		0.02	0.005	6.0%	
4.77	0.11		0.41		0.41	0.140		0.01	0.006	7.2%	
4.88	0.11		0.49		0.49	0.140		0.01	0.007	8.6%	
4.98	0.10		0.52		0.52	0.130		0.01	0.007	8.0%	
5.08	0.11		0.44		0.44	0.130		0.01	0.006	7.1%	
5.19	0.16		0.26		0.26	0.130		0.02	0.005	6.4%	
5.40	0.16		0.24		0.24	0.100		0.02	0.004	4.4%	
5.50											Right Bank

DILLON CONSULTING

Site:	G2		**Date :**	2019-06-18		
Location at Site:						
Flow Metre Model Used:	Flowtracker 2		**Calibration Info:**			
Measurement Start Time:		MST	**Staff Gauge :**	0.225	m	
Measurement Finish Time:		MST	**Staff Gauge :**	0.225	m	
Measurement Performed By:	Tyler Phillips		**Sensor :**		m	
Measurement Recorded By:	Nicole Zathey					
Data Entered By:			**Total Width:**	3.00	**Average Velocity:**	0.75 m/s
Data Entry Date:			**Total Area:**	0.70	**Total Discharge:**	**0.521** m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
1.10											Left Bank
1.17	0.11		0.40		0.40	0.180		0.02	0.008	1.5%	
1.32	0.15		0.39		0.39	0.195		0.03	0.012	2.2%	
1.47	0.15		0.39		0.39	0.285		0.04	0.017	3.2%	
1.62	0.12		0.86		0.86	0.270		0.03	0.027	5.1%	
1.70	0.08		0.88		0.88	0.305		0.02	0.020	3.9%	
1.77	0.11		1.42		1.42	0.310		0.03	0.048	9.3%	
1.92	0.12		0.69		0.69	0.300		0.03	0.024	4.6%	
2.00	0.08		0.47		0.47	0.330		0.02	0.012	2.2%	
2.07	0.08		1.49		1.49	0.320		0.02	0.036	6.9%	
2.15	0.08		1.52		1.52	0.340		0.03	0.039	7.5%	
2.22	0.08		1.49		1.49	0.330		0.02	0.037	7.1%	
2.30	0.08		0.60		0.60	0.320		0.02	0.014	2.7%	
2.37	0.08		1.25		1.25	0.310		0.02	0.029	5.6%	
2.45	0.08		1.05		1.05	0.350		0.03	0.028	5.3%	
2.52	0.11		0.79		0.79	0.290		0.03	0.025	4.9%	
2.67	0.15		0.79		0.79	0.280		0.04	0.033	6.3%	
2.82	0.15		0.55		0.55	0.280		0.04	0.023	4.4%	
2.97	0.15		0.49		0.49	0.280		0.04	0.021	4.0%	
3.12	0.15		0.65		0.65	0.225		0.03	0.022	4.2%	
3.27	0.15		0.65		0.65	0.205		0.03	0.020	3.9%	
3.42	0.15		0.39		0.39	0.155		0.02	0.009	1.7%	
3.57	0.15		0.27		0.27	0.160		0.02	0.006	1.2%	
3.72	0.15		0.48		0.48	0.115		0.02	0.008	1.6%	
3.87	0.15		0.24		0.24	0.100		0.02	0.004	0.7%	
4.02	0.12		0.04		0.04	0.070		0.01	0.000	0.1%	
4.10											Right Bank

DILLON CONSULTING

Site:	G2		**Date :**	2019-09-18		
Location at Site:						
Flow Metre Model Used:	HACH FH950		**Calibration Info:**			
Measurement Start Time:		MST	**Staff Gauge :**	0.102	m	
Measurement Finish Time:		MST	**Staff Gauge :**	0.102	m	
Measurement Performed By:	Tyler Phillips		**Sensor :**		m	
Measurement Recorded By:	Katie Peterson					
Data Entered By:			**Total Width:**	2.20	**Average Velocity:**	0.26 m/s
Data Entry Date:			**Total Area:**	0.36	**Total Discharge:**	**0.093** m^3/s

X [m]	Width [m]	Velocity @ 0.2D [m/s]	Velocity @ 0.6D [m/s]	Velocity @ 0.8D [m/s]	Avg Velocity [m/s]	Avg Depth		Area [m^2]	Discharge [m^3/s]	%of Total Discharge	Notes
1.10											Left Bank
1.15	0.08		0.01		0.01	0.030		0.00	0.000	0.0%	
1.26	0.11		0.02		0.02	0.080		0.01	0.000	0.2%	
1.37	0.11		0.05		0.05	0.080		0.01	0.000	0.5%	
1.48	0.11		0.19		0.19	0.100		0.01	0.002	2.2%	
1.59	0.11		0.12		0.12	0.100		0.01	0.001	1.4%	
1.70	0.11		0.06		0.06	0.140		0.02	0.001	1.0%	
1.81	0.09		0.37		0.37	0.160		0.01	0.005	5.4%	
1.87	0.05		0.39		0.39	0.170		0.01	0.004	3.9%	
1.92	0.08		0.40		0.40	0.180		0.01	0.006	6.2%	
2.03	0.11		0.31		0.31	0.190		0.02	0.006	6.9%	
2.14	0.11		0.15		0.15	0.220		0.02	0.004	3.9%	
2.25	0.08		0.25		0.25	0.220		0.02	0.004	4.7%	
2.30	0.05		0.63		0.63	0.220		0.01	0.008	8.2%	
2.36	0.06		0.75		0.75	0.220		0.01	0.009	9.7%	
2.41	0.06		0.73		0.73	0.220		0.01	0.009	9.5%	
2.47	0.09		0.10		0.10	0.230		0.02	0.002	2.1%	
2.58	0.11		0.02		0.02	0.210		0.02	0.000	0.5%	
2.69	0.11		0.26		0.26	0.250		0.03	0.007	7.7%	
2.80	0.09		0.47		0.47	0.230		0.02	0.010	10.4%	
2.87	0.06		0.35		0.35	0.240		0.01	0.005	5.4%	
2.92	0.08		0.20		0.20	0.230		0.02	0.004	3.9%	
3.03	0.11		0.11		0.11	0.190		0.02	0.002	2.5%	
3.14	0.11		0.20		0.20	0.130		0.01	0.003	3.1%	
3.25	0.08		0.07		0.07	0.120		0.01	0.001	0.7%	
3.30											Right Bank

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Appendix C

Daily Discharge Data

Appendix C-1a. 2013 Summary of Daily Discharge at Station A1

2013	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	1.097	1.037	1.080	1.224	1.577	13.462	13.440	1.814	1.479	1.693	1.380	1.170
02	1.105	1.044	1.114	1.303	1.563	13.170	11.465	2.115	1.473	1.693	1.356	1.161
03	1.110	1.050	1.102	1.362	1.570	12.573	9.940	2.410	1.466	1.617	1.350	1.108
04	1.111	1.053	1.059	1.392	1.637	11.927	9.072	2.903	1.466	1.617	1.362	1.084
05	1.106	1.052	1.033	1.441	1.889	12.119	8.744	2.664	1.460	1.577	1.362	1.055
06	1.093	1.048	1.050	1.479	2.720	15.046	7.182	2.481	1.511	1.597	1.338	1.028
07	1.074	1.040	1.045	1.479	4.778	18.326	5.987	2.654	1.577	1.583	1.338	1.022
08	1.055	1.031	1.039	1.485	7.494	18.592	5.870	2.428	1.644	1.557	1.309	1.035
09	1.040	1.023	1.061	1.492	10.232	17.282	5.441	2.272	1.686	1.550	1.320	1.051
10	1.033	1.020	1.085	1.404	13.919	17.540	5.511	2.205	1.693	1.524	1.291	1.073
11	1.034	1.026	1.078	1.404	16.771	16.268	5.097	2.164	1.728	1.498	1.291	1.080
12	1.039	1.035	1.086	1.392	21.076	15.529	4.585	2.115	1.735	1.498	1.291	1.104
13	1.047	1.041	1.117	1.374	26.520	13.440	4.102	2.043	1.728	1.492	1.280	1.109
14	1.056	1.041	1.140	1.368	21.649	10.910	3.948	1.965	1.686	1.498	1.268	1.114
15	1.065	1.036	1.175	1.356	16.771	9.652	3.583	1.919	1.665	1.492	1.257	1.119
16	1.070	1.037	1.153	1.326	14.103	8.834	3.301	1.851	1.665	1.460	1.246	1.124
17	1.070	1.046	1.142	1.350	12.464	8.672	3.042	1.785	1.658	1.460	1.229	1.130
18	1.062	1.047	1.070	1.314	10.829	8.889	2.835	1.735	1.665	1.466	1.263	1.132
19	1.046	1.042	1.078	1.314	9.482	11.032	2.748	1.693	1.577	1.447	1.268	1.110
20	1.031	1.035	1.134	1.297	9.257	88.245	2.645	1.644	1.492	1.429	1.224	1.087
21	1.024	1.029	1.114	1.286	9.998	35.882	2.517	1.583	1.524	1.429	1.145	1.067
22	1.036	1.028	1.128	1.303	11.548	27.490	2.454	1.570	1.505	1.416	1.126	1.067
23	1.042	1.032	1.097	1.274	25.256	24.022	2.358	1.550	1.505	1.410	1.138	1.068
24	1.042	1.037	1.036	1.274	18.592	21.362	2.272	1.537	1.466	1.410	1.147	1.068
25	1.041	1.038	1.048	1.297	16.519	20.510	2.197	1.537	1.479	1.410	1.146	1.068
26	1.038	1.038	1.074	1.356	14.807	23.118	2.156	1.544	1.466	1.392	1.153	1.069
27	1.032	1.043	1.090	1.447	13.417	23.719	2.043	1.505	1.435	1.374	1.160	1.069
28	1.025	1.062	1.086	1.492	11.695	20.510	1.972	1.492	1.447	1.423	1.166	1.070
29	1.024		1.099	1.524	11.716	16.268	1.942	1.479	1.764	1.435	1.170	1.070
30	1.024		1.122	1.518	13.058	14.336	1.911	1.473	1.686	1.404	1.172	1.071
31	1.030		1.163		12.859		1.851	1.473		1.362		1.071
Mean	1.055	1.039	1.094	1.378	11.799	18.958	4.587	1.923	1.578	1.491	1.252	1.085
Max	1.111	1.062	1.175	1.524	26.520	88.245	13.440	2.903	1.764	1.693	1.380	1.170
Min	1.024	1.020	1.033	1.224	1.563	8.672	1.851	1.473	1.435	1.362	1.126	1.022

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Appendix C-1b. 2014 Summary of Daily Discharge at Station A1

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	1.072	0.932	1.069	1.070	2.775	13.595	5.316	1.747	1.645	1.306	1.153	0.995
02	1.066	0.933	1.129	1.071	4.214	14.750	5.003	1.744	1.642	1.298	1.141	1.312
03	1.057	0.933	1.135	1.075	4.386	14.677	4.870	1.740	1.639	1.219	1.132	1.282
04	1.048	0.933	1.142	1.068	4.036	14.337	5.029	1.737	1.636	1.261	1.211	1.256
05	1.038	0.933	1.149	1.067	3.862	15.123	4.923	1.734	1.632	1.259	1.205	1.332
06	1.030	0.960	1.156	1.080	3.668	14.059	4.572	1.730	1.629	1.281	1.246	1.416
07	1.021	0.988	1.163	1.090	3.437	12.100	4.321	1.727	1.626	1.285	1.539	1.423
08	1.022	1.017	1.159	1.128	3.395	10.927	4.078	1.724	1.623	1.279	1.478	1.353
09	1.024	1.048	1.156	1.237	3.452	10.922	3.878	1.720	1.620	1.240	1.430	1.365
10	1.026	1.050	1.153	1.219	3.514	10.715	3.639	1.717	1.617	1.219	1.276	1.413
11	1.028	1.052	1.149	1.215	3.390	10.048	3.419	1.714	1.614	1.247	1.101	1.449
12	1.030	1.054	1.146	1.202	3.387	9.351	3.301	1.710	1.610	1.183	1.386	1.501
13	1.032	1.056	1.143	1.171	3.603	9.475	3.175	1.707	1.607	1.190	1.350	1.510
14	1.034	1.059	1.121	1.210	4.067	9.780	3.053	1.704	1.604	1.178	1.309	1.460
15	1.036	1.061	1.099	1.225	5.106	9.128	3.032	1.700	1.611	1.195	1.314	1.402
16	1.037	1.029	1.077	1.239	5.636	8.450	2.864	1.697	1.579	1.204	1.326	1.369
17	1.034	0.998	1.057	1.293	6.930	9.873	2.701	1.694	1.598	1.153	1.338	1.375
18	1.031	0.967	1.036	1.341	8.117	16.486	2.289	1.690	1.611	1.179	1.356	1.371
19	1.028	0.967	1.037	1.388	9.008	17.740	2.108	1.687	1.625	1.161	1.350	1.370
20	1.025	0.966	1.039	1.486	9.910	17.125	2.071	1.684	1.572	1.140	1.344	1.351
21	1.022	0.965	1.040	1.576	11.485	14.781	2.009	1.681	1.513	1.140	1.274	1.353
22	1.023	0.965	1.042	1.656	14.417	12.502	1.892	1.677	1.485	1.134	1.111	1.313
23	1.024	0.964	1.064	1.734	20.676	11.335	1.912	1.674	1.499	1.203	1.057	1.262
24	1.012	0.964	1.086	1.759	27.397	10.157	1.838	1.671	1.476	1.209	1.060	1.292
25	1.001	0.963	1.110	1.852	26.011	9.464	1.800	1.668	1.427	1.163	1.048	1.239
26	0.989	1.017	1.183	1.928	20.713	8.543	1.757	1.664	1.415	1.222	1.048	1.197
27	0.978	0.959	1.129	1.947	18.874	7.834	1.743	1.661	1.329	1.171	1.084	0.983
28	0.966	1.013	1.072	1.937	17.261	7.280	1.688	1.658	1.334	1.141	1.242	0.963
29	0.954		1.057	1.960	16.213	6.439	1.697	1.655	1.329	1.172	1.016	0.959
30	0.942		1.073	2.138	13.805	5.682	1.671	1.652	1.335	1.166	0.970	0.988
31	0.931		1.069		13.179		1.751	1.648		1.152		0.998
Mean	1.018	0.991	1.104	1.412	9.546	11.423	3.013	1.697	1.549	1.205	1.230	1.286
Max	1.072	1.061	1.183	2.138	27.397	17.740	5.316	1.747	1.645	1.306	1.539	1.510
Min	0.931	0.932	1.036	1.067	2.775	5.682	1.671	1.648	1.329	1.134	0.970	0.959

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Appendix C-1c. 2015 Summary of Daily Discharge at Station A1

2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	1.004	1.011	1.007	1.410	3.531	5.443	2.100	1.473	1.182	1.072	1.048	1.078
02	1.011	1.016	1.002	1.404	3.312	6.936	2.105	1.472	1.167	1.101	1.048	1.075
03	1.017	1.017	1.002	1.404	3.143	9.037	2.095	1.456	1.138	1.069	1.048	1.157
04	1.024	1.018	1.015	1.398	3.277	7.892	2.031	1.457	1.086	1.058	1.048	1.176
05	1.024	1.060	1.027	1.368	3.602	6.932	1.851	1.439	1.095	1.049	1.048	1.151
06	1.017	1.197	1.049	1.350	3.608	6.063	1.837	1.347	1.098	1.051	1.048	1.141
07	1.011	1.235	1.034	1.356	3.559	5.576	1.855	1.309	1.087	1.068	1.048	1.142
08	1.025	1.176	1.045	1.344	3.371	5.452	1.856	1.337	1.074	1.068	1.048	1.151
09	1.039	1.132	1.053	1.338	3.123	5.139	1.860	1.304	1.185	1.105	1.048	1.182
10	1.041	1.129	1.060	1.332	2.959	4.735	1.801	1.325	1.262	1.152	1.048	1.184
11	1.043	1.115	1.063	1.326	2.936	4.408	2.004	1.390	1.304	1.163	1.048	1.204
12	1.045	1.126	1.073	1.297	2.819	3.874	2.036	1.348	1.326	1.081	1.048	1.178
13	1.047	1.116	1.080	1.309	2.663	3.384	1.869	1.375	1.306	1.075	1.048	1.173
14	1.049	1.108	1.175	1.303	2.632	3.172	1.783	1.353	1.264	1.051	1.148	1.140
15	1.047	1.106	1.280	1.303	2.581	3.099	1.739	1.257	1.148	1.048	1.091	1.083
16	1.045	1.092	1.190	1.314	2.590	2.884	1.704	1.299	1.109	1.048	1.048	1.075
17	1.043	1.109	1.187	1.368	2.816	2.745	1.563	1.324	1.111	1.048	1.052	1.010
18	1.042	1.082	1.176	1.410	2.857	2.757	1.630	1.302	1.111	1.048	1.059	1.005
19	1.031	1.083	1.177	1.416	2.950	2.673	1.624	1.275	1.152	1.069	1.048	1.039
20	1.021	1.068	1.188	1.518	3.175	2.566	1.605	1.278	1.201	1.056	1.048	1.022
21	1.030	1.080	1.205	1.735	3.487	2.457	1.619	1.257	1.298	1.048	1.048	1.014
22	1.033	1.037	1.207	2.091	3.845	2.443	1.578	1.215	1.151	1.048	1.048	0.997
23	1.036	1.033	1.193	2.825	4.216	2.326	1.523	1.220	1.130	1.048	1.048	0.978
24	1.036	1.028	1.187	2.587	4.502	2.277	1.528	1.225	1.128	1.048	1.048	0.970
25	1.034	1.024	1.178	2.380	4.443	2.349	1.500	1.232	1.149	1.048	1.048	0.972
26	1.032	1.019	1.206	2.261	5.278	2.346	1.499	1.244	1.187	1.048	1.101	0.992
27	1.030	1.015	1.263	2.240	6.822	2.309	1.397	1.221	1.078	1.048	1.099	0.998
28	1.030	1.011	1.466	2.521	6.201	2.288	1.411	1.232	1.065	1.048	1.072	0.990
29	1.020		1.460	3.163	5.650	2.094	1.424	1.214	1.068	1.048	1.093	0.973
30	1.016		1.454	3.512	5.361	2.172	1.464	1.163	1.074	1.048	1.087	0.959
31	1.012		1.441		5.499		1.480	1.108		1.048		0.943
Mean	1.030	1.080	1.166	1.753	3.768	3.928	1.722	1.305	1.158	1.065	1.060	1.069
Max	1.049	1.235	1.466	3.512	6.822	9.037	2.105	1.473	1.326	1.163	1.148	1.204
Min	1.004	1.011	1.002	1.297	2.581	2.094	1.397	1.108	1.065	1.048	1.048	0.943

Appendix C-1d. 2016 Summary of Daily Discharge at Station A1

2016	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.933	0.937	1.048	1.140	4.961	4.817	2.139	1.492	1.246	1.252	1.544	1.252
02	0.935	0.929	1.048	1.229	5.243	4.989	2.131	1.511	1.229	1.252	1.557	1.257
03	0.940	0.910	1.048	1.409	5.165	5.110	2.067	1.518	1.229	1.257	1.544	1.246
04	0.953	0.931	1.048	1.519	6.241	5.469	1.972	1.479	1.218	1.263	1.518	1.218
05	0.970	0.939	1.048	1.663	6.797	5.826	1.844	1.485	1.213	1.246	1.524	1.181
06	0.974	0.957	1.048	1.745	6.924	6.241	1.764	1.416	1.212	1.252	1.473	1.135
07	0.980	0.966	1.048	1.864	7.329	6.256	1.693	1.447	1.211	1.229	1.392	1.088
08	0.968	1.048	1.048	2.219	7.729	5.928	1.665	1.460	1.209	1.252	1.410	1.047
09	0.955	1.048	1.048	2.928	7.004	5.696	1.590	1.479	1.202	2.205	1.435	1.017
10	0.954	1.048	1.048	3.401	6.002	4.765	1.537	1.485	1.205	1.859	1.466	1.001
11	0.962	1.048	1.048	3.329	5.165	4.235	1.544	1.479	1.197	1.700	1.460	0.998
12	0.966	1.048	1.048	3.437	4.396	3.672	1.524	1.435	1.206	1.672	1.460	1.004
13	0.968	1.048	1.048	3.477	3.786	3.376	1.550	1.435	1.202	1.485	1.544	1.013
14	0.964	1.048	1.048	3.261	3.484	3.134	1.577	1.441	1.201	1.583	1.524	1.018
15	0.962	1.048	1.048	3.235	3.259	2.903	1.644	1.429	1.196	1.658	1.460	1.013
16	0.963	1.048	1.048	3.128	3.155	2.739	1.714	1.404	1.194	1.590	1.441	1.002
17	0.956	1.048	1.086	3.313	3.238	2.562	1.949	1.386	1.212	1.511	1.435	0.992
18	0.955	1.048	1.048	3.904	3.740	2.463	2.230	1.380	1.189	1.485	1.454	0.985
19	0.954	1.048	1.626	5.085	4.408	2.375	2.535	1.356	1.195	1.410	1.410	0.984
20	0.953	1.048	1.048	6.641	4.458	2.306	2.419	1.350	1.195	1.392	1.398	0.988
21	0.955	1.048	1.054	7.631	4.174	2.272	2.281	1.338	1.186	1.374	1.392	0.994
22	0.952	1.048	1.048	8.264	4.078	2.213	2.164	1.338	1.197	1.368	1.374	1.003
23	0.956	1.048	1.048	8.815	4.007	2.197	2.019	1.320	1.206	1.362	1.386	1.013
24	0.948	1.123	1.048	8.396	4.090	2.131	1.874	1.303	1.211	1.338	1.350	1.023
25	0.950	2.256	1.049	8.111	4.358	2.156	1.764	1.297	1.210	1.350	1.344	1.031
26	0.947	2.706	1.048	7.614	6.562	2.051	1.721	1.286	1.211	1.314	1.338	1.037
27	0.946	1.048	1.048	6.905	6.829	2.075	1.651	1.286	1.229	1.386	1.332	1.040
28	0.955	1.048	1.048	6.003	6.593	2.083	1.617	1.280	1.252	1.505	1.309	1.041
29	0.951	1.048	1.052	5.382	6.211	2.043	1.577	1.257	1.257	1.505	1.280	1.039
30	0.945		1.050	5.016	5.653	2.027	1.563	1.257	1.252	1.524	1.257	1.036
31	0.931		1.116		5.151		1.518	1.252		1.537		1.032
Mean	0.955	1.123	1.070	4.336	5.167	3.537	1.833	1.390	1.212	1.455	1.427	1.056
Max	0.980	2.706	1.626	8.815	7.729	6.256	2.535	1.518	1.257	2.205	1.557	1.257
Min	0.931	0.910	1.048	1.140	3.155	2.027	1.518	1.252	1.186	1.229	1.257	0.984

Appendix C-1e. 2017 Summary of Daily Discharge at Station A1

2017	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	1.026	0.973	0.988	1.076	1.338	22.524	3.843	1.416	1.200	1.190	1.235	2.339
02	1.021	0.971	0.986	1.073	1.326	20.510	3.752	1.392	1.195	1.212	1.174	2.310
03	1.016	0.969	0.972	1.074	1.356	17.800	3.605	1.404	1.190	1.213	1.132	2.242
04	1.013	0.968	0.980	1.077	1.631	16.519	3.408	1.386	1.193	1.263	1.135	1.929
05	1.011	0.967	0.973	1.074	2.445	15.286	3.186	1.429	1.186	1.235	1.149	2.024
06	1.011	0.965	0.976	1.089	4.843	14.571	2.992	1.398	1.194	1.193	1.125	1.925
07	1.007	0.966	0.954	1.105	5.885	14.103	2.844	1.344	1.208	1.206	1.116	1.811
08	1.002	0.969	0.948	1.125	6.317	14.807	2.729	1.350	1.213	1.199	1.138	1.707
09	0.997	0.971	0.974	1.107	6.076	16.020	2.599	1.356	1.173	1.171	1.175	1.486
10	0.992	0.974	0.985	1.108	6.226	13.553	2.490	1.374	1.165	1.182	1.186	1.542
11	0.987	0.977	0.985	1.114	7.595	11.093	2.454	1.386	1.175	1.174	1.165	1.638
12	0.982	1.001	0.975	1.085	11.444	9.595	2.349	1.398	1.146	1.161	1.168	1.519
13	0.982	0.995	0.975	1.101	13.081	9.090	2.230	1.362	1.123	1.159	1.161	1.535
14	0.983	1.010	0.979	1.108	12.183	10.291	2.115	1.429	1.137	1.157	1.164	1.424
15	0.985	0.989	1.058	1.095	10.950	9.652	2.019	1.344	1.175	1.163	1.666	1.590
16	0.987	1.003	1.121	1.105	9.220	8.228	1.844	1.326	1.190	1.171	1.716	1.665
17	0.989	1.014	1.076	1.107	7.198	7.445	1.814	1.368	1.197	1.190	1.647	1.685
18	0.989	0.998	1.218	1.126	6.332	6.765	1.756	1.303	1.193	1.203	1.614	1.761
19	0.988	0.995	1.167	1.152	5.885	6.047	1.778	1.286	1.213	1.429	1.596	1.602
20	0.987	0.991	1.136	1.171	5.885	5.596	1.756	1.291	1.177	1.344	1.591	1.365
21	0.985	0.985	1.065	1.180	6.516	5.525	1.764	1.268	1.173	1.268	1.550	1.142
22	0.984	0.995	1.075	1.200	8.672	5.083	1.665	1.309	1.182	1.252	1.654	1.404
23	0.984	0.995	1.077	1.235	12.378	4.804	1.637	1.280	1.186	1.235	2.571	0.858
24	0.984	0.961	1.063	1.274	21.076	4.700	1.617	1.218	1.185	1.229	3.200	0.961
25	0.983	0.972	1.065	1.286	17.540	4.713	1.577	1.224	1.191	1.229	2.761	1.064
26	0.983	0.956	1.065	1.309	12.925	4.909	1.563	1.224	1.176	1.246	2.630	1.022
27	0.982	0.958	1.073	1.309	11.175	5.016	1.505	1.218	1.167	1.252	2.735	1.062
28	0.979	0.974	1.061	1.362	13.036	4.791	1.473	1.246	1.189	1.235	2.570	1.139
29	0.977		1.055	1.374	16.020	4.333	1.435	1.218	1.174	1.246	2.473	1.145
30	0.976		1.066	1.368	19.131	3.995	1.410	1.186	1.171	1.240	2.395	1.148
31	0.974		1.077		21.076		1.435	1.195		1.229		1.333
Mean	0.992	0.981	1.038	1.166	9.250	9.912	2.214	1.320	1.181	1.222	1.686	1.528
Max	1.026	1.014	1.218	1.374	21.076	22.524	3.843	1.429	1.213	1.429	3.200	2.339
Min	0.974	0.956	0.948	1.073	1.326	3.995	1.410	1.186	1.123	1.157	1.116	0.858

Appendix C-1f. 2018 Summary of Daily Discharge at Station A1

2018	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	1.233	0.946	1.321	1.383	6.316	7.553	3.131	1.521	1.042	0.945	0.925	0.767
02	1.225	0.979	1.321	1.383	5.602	6.762	3.176	1.486	1.035	1.023	1.010	0.756
03	1.216	0.854	1.330	1.383	6.453	6.336	3.211	1.483	1.034	0.980	1.586	0.760
04	1.177	0.619	1.330	1.383	7.074	6.275	3.253	1.487	1.028	0.947	1.501	0.642
05	1.165	0.837	1.339	1.383	8.180	6.085	3.188	1.449	1.020	0.947	1.437	0.608
06	1.193	0.878	1.339	1.374	9.510	5.622	3.085	1.413	1.000	0.945	1.401	0.360
07	1.190	1.036	1.347	1.365	11.043	5.329	3.024	1.381	0.984	0.937	1.347	1.236
08	1.155	1.019	1.347	1.365	13.219	5.131	2.930	1.355	0.973	0.923	1.330	1.236
09	1.151	0.681	1.347	1.401	15.622	5.056	2.820	1.329	0.970	0.921	1.347	1.236
10	0.882	1.232	1.356	1.483	18.994	4.884	2.767	1.304	1.000	0.913	0.946	1.244
11	0.767	0.889	1.356	1.743	13.276	4.604	2.683	1.298	0.998	0.906	0.896	1.244
12	1.034	1.379	1.356	1.982	10.386	4.290	2.573	1.296	0.985	0.904	0.872	1.244
13	1.175	0.895	1.356	1.794	11.720	4.052	2.482	1.279	1.004	0.915	0.885	1.253
14	1.175	0.952	1.365	1.733	16.084	4.004	2.405	1.255	1.050	0.898	0.870	1.253
15	1.097	0.903	1.365	1.939	19.196	3.853	2.347	1.232	1.014	0.878	0.866	1.253
16	1.056	0.927	1.365	2.248	13.360	4.134	2.270	1.212	1.019	0.873	0.872	1.253
17	1.036	0.961	1.374	2.102	10.966	4.761	2.195	1.201	1.062	0.878	0.646	1.244
18	1.082	0.837	1.374	1.939	9.678	4.650	2.132	1.185	1.005	0.894	0.747	1.244
19	1.027	0.902	1.374	1.971	10.707	4.385	2.078	1.175	0.979	0.901	0.746	1.244
20	1.010	1.860	1.374	2.294	10.242	4.172	2.022	1.167	0.978	0.909	0.745	1.244
21	1.000	1.342	1.374	3.016	10.489	4.082	1.959	1.155	0.991	0.922	0.739	1.244
22	0.996	0.876	1.383	2.859	10.961	4.010	1.895	1.135	1.030	0.919	0.953	1.236
23	0.985	1.009	1.383	2.581	11.149	3.974	1.836	1.125	1.030	0.915	0.914	1.236
24	0.990	0.867	1.383	3.003	11.051	3.804	1.793	1.126	1.006	0.913	0.828	1.236
25	0.990	0.861	1.383	4.193	11.192	3.675	1.760	1.135	0.986	0.910	0.799	1.236
26	0.982	0.845	1.383	5.457	11.135	3.578	1.725	1.119	0.967	0.935	0.785	1.227
27	0.868	0.831	1.383	6.531	10.748	3.443	1.711	1.169	0.958	1.037	0.784	1.227
28	0.964	1.321	1.383	6.730	10.314	3.374	1.674	1.124	0.958	1.018	0.779	1.227
29	1.058		1.383	7.343	9.893	3.277	1.641	1.094	0.947	0.998	0.771	1.227
30	1.031		1.383	7.013	9.232	3.231	1.607	1.087	0.955	0.964	0.766	1.227
31	0.978		1.383		8.434		1.560	1.060		0.949		1.227
Mean	1.061	0.983	1.363	2.746	11.040	4.613	2.353	1.253	1.000	0.933	0.970	1.125
Max	1.233	1.860	1.383	7.343	19.196	7.553	3.253	1.521	1.062	1.037	1.586	1.253
Min	0.767	0.619	1.321	1.365	5.602	3.231	1.560	1.060	0.947	0.873	0.646	0.360

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Appendix C-1g. 2019 Summary of Daily Discharge at Station A1

2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	1.006	0.994	0.954	1.070	1.201	10.995	2.652	1.820	0.915			
02	1.011	1.002	1.196	1.063	1.185	13.208	2.553	1.771	0.908			
03	1.018	1.000	1.615	1.059	1.173	15.002	2.400	1.706	0.872			
04	1.019	1.000	1.859	1.058	1.170	13.350	2.384	1.631	0.863			
05	1.003	1.000	1.708	1.057	1.169	11.247	2.496	1.567	0.882			
06	0.996	1.000	0.970	1.059	1.172	9.822	2.604	1.542	0.842			
07	0.989	1.000	0.948	1.055	1.199	7.948	2.615	1.466	0.837			
08	0.981	1.000	0.947	1.047	1.197	5.388	2.514	1.428	0.839			
09	0.989	1.000	0.946	1.054	1.232	3.954	2.420	1.432	0.898			
10	1.009	1.000	0.944	1.046	1.287	3.362	2.346	1.427	1.075			
11	1.006	1.000	0.945	1.043	1.485	3.158	2.234	1.351	1.088			
12	1.006	1.000	0.947	1.041	2.119	3.594	2.124	1.345	1.050			
13	1.007	1.000	0.945	1.037	3.607	4.264	2.013	1.272	1.060			
14	0.985	1.000	0.945	1.034	5.387	4.614	1.976	1.305	1.010			
15	0.959	1.272	0.952	1.028	7.019	4.556	1.883	1.202	0.970			
16	0.966	0.974	0.957	1.027	8.039	4.318	1.809	1.244	0.942			
17	0.989	0.971	0.974	1.019	5.662	3.949	1.749	1.361	0.930			
18	1.000	1.340	1.004	1.021	4.266	3.694	2.322	1.237	1.280			
19	1.001	2.252	1.030	1.088	2.993	3.446	2.049	1.233				
20	0.993	1.142	1.045	1.124	2.338	2.830	2.207	1.160				
21	0.980	0.964	1.058	1.114	2.005	2.699	2.696	1.105				
22	0.957	0.964	1.076	1.135	1.834	2.678	2.704	1.142				
23	0.975	0.961	1.091	1.184	1.783	3.533	2.556	1.083				
24	0.976	1.070	1.096	1.207	1.836	4.555	2.771	1.066				
25	0.968	1.712	1.084	1.217	2.020	3.304	2.533	1.068				
26	0.998	1.819	1.074	1.246	2.250	3.184	2.384	1.045				
27	0.996	1.235	1.061	1.242	2.511	3.048	2.295	0.990				
28	0.993	0.956	1.059	1.235	3.327	3.041	2.168	1.001				
29	1.038		1.056	1.220	4.760	2.935	2.054	0.993				
30	1.286		1.062	1.212	7.288	2.710	1.998	0.958				
31	0.991		1.071		9.701		1.915	0.925				
Mean	1.003	1.130	1.084	1.101	3.039	5.480	2.304	1.286	0.959			
Max	1.286	2.252	1.859	1.246	9.701	15.002	2.771	1.820	1.280			
Min	0.957	0.956	0.944	1.019	1.169	2.678	1.749	0.925	0.837			

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Appendix C-2a. 2014 Summary of Daily Discharge at Station A3B

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.799	0.610	0.796	0.914	2.278	16.857	8.766	0.995	0.974	0.937	0.855	0.901
02	0.791	0.612	0.883	0.945	3.069	17.410	8.058	0.970	0.994	0.951	0.869	0.867
03	0.778	0.612	0.893	0.976	4.034	19.347	7.503	1.009	2.641	0.911	0.850	0.825
04	0.765	0.612	0.903	1.008	3.915	20.868	6.982	0.988	2.547	0.888	0.906	0.788
05	0.752	0.612	0.914	1.038	3.627	22.889	6.414	0.938	2.834	0.894	0.901	0.748
06	0.740	0.647	0.924	1.073	3.190	20.634	5.963	0.901	4.195	0.898	0.950	0.726
07	0.728	0.684	0.934	1.055	2.967	17.196	5.707	0.870	6.022	0.896	1.429	0.708
08	0.730	0.723	0.929	1.038	2.704	14.077	5.274	0.853	6.425	0.889	1.359	0.698
09	0.732	0.766	0.924	1.029	2.547	13.962	4.922	0.833	5.099	0.879	1.319	0.715
10	0.735	0.769	0.919	1.020	2.594	15.055	4.619	0.817	4.486	0.867	1.227	0.744
11	0.738	0.772	0.914	1.008	2.641	13.170	4.309	0.797	3.798	0.858	1.088	0.782
12	0.740	0.775	0.910	1.038	2.673	11.414	4.034	0.782	3.459	0.851	1.026	0.818
13	0.743	0.778	0.905	1.064	2.834	11.106	3.812	0.769	3.190	0.831	0.983	0.829
14	0.746	0.781	0.872	1.091	3.296	11.692	3.643	0.862	3.350	0.822	0.955	0.815
15	0.749	0.784	0.839	1.118	4.721	11.311	3.753	0.921	1.240	0.836	0.921	0.808
16	0.750	0.739	0.808	1.146	7.082	10.735	3.576	0.861	1.283	0.835	0.880	0.780
17	0.746	0.696	0.778	1.174	9.253	13.619	3.315	0.836	1.283	0.815	0.862	0.765
18	0.742	0.656	0.749	1.203	11.483	24.645	3.099	0.802	1.267	0.798	0.844	0.756
19	0.738	0.655	0.751	1.232	12.546	34.596	2.976	0.789	1.242	0.788	0.841	0.750
20	0.734	0.654	0.753	1.262	12.801	36.441	2.847	0.994	1.197	0.783	0.829	0.746
21	0.730	0.653	0.755	1.293	15.094	33.992	2.766	1.137	1.142	0.779	0.824	0.742
22	0.730	0.653	0.757	1.323	25.887	30.479	2.659	1.213	1.099	0.776	0.827	0.736
23	0.732	0.652	0.788	1.365	45.689	27.538	2.567	1.184	1.067	0.843	0.813	0.720
24	0.716	0.651	0.821	1.386	56.767	25.262	2.611	1.055	1.039	0.883	0.794	0.711
25	0.701	0.651	0.855	1.484	56.767	22.741	2.489	0.997	1.015	0.842	0.776	0.704
26	0.685	0.723	0.890	1.440	45.689	19.802	2.359	0.943	0.998	0.918	0.766	0.689
27	0.670	0.645	0.785	1.484	35.820	13.115	2.246	0.909	0.980	0.920	0.809	0.679
28	0.654	0.717	0.806	1.496	27.214	11.946	2.174	1.082	0.952	0.897	0.927	0.669
29	0.639		0.827	1.587	23.733	10.632	2.091	1.397	0.933	0.874	0.821	0.628
30	0.623		0.855	1.780	20.354	9.638	2.060	1.100	0.936	0.855	0.828	0.618
31	0.609		0.884		17.239		1.020	1.020		0.848		0.560
Mean	0.725	0.689	0.849	1.202	15.178	18.739	4.020	0.956	2.256	0.860	0.936	0.743
Max	0.799	0.784	0.934	1.780	56.767	36.441	8.766	1.397	6.425	0.951	1.429	0.901
Min	0.609	0.610	0.749	0.914	2.278	9.638	1.020	0.769	0.933	0.776	0.766	0.560

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Appendix C-2b. 2015 Summary of Daily Discharge at Station A3B

2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.573	0.447	0.438	1.082	5.444	16.802	2.608	1.360	1.044	0.998	0.982	0.755
02	0.567	0.449	0.442	0.972	5.144	35.233	2.485	1.344	1.112	0.979	0.958	0.729
03	0.556	0.450	0.424	0.859	4.318	55.432	2.387	1.320	1.131	1.014	0.932	0.705
04	0.549	0.446	0.404	0.797	4.381	37.875	2.318	1.296	1.099	0.991	0.917	0.735
05	0.536	0.451	0.517	0.825	5.190	26.133	2.259	1.273	1.129	0.981	0.902	0.745
06	0.532	0.506	0.516	0.782	5.212	20.263	2.151	1.275	1.157	0.966	0.882	0.756
07	0.528	0.549	0.519	0.787	4.656	16.565	2.076	1.253	1.148	0.952	0.868	0.772
08	0.528	0.562	0.521	0.768	4.444	14.353	2.027	1.224	1.137	0.945	0.866	0.802
09	0.521	0.566	0.543	0.782	3.876	12.776	1.973	1.207	1.192	0.936	0.867	0.889
10	0.522	0.557	0.566	0.771	3.721	11.074	1.993	1.187	1.398	0.938	0.863	0.866
11	0.508	0.551	0.583	0.815	3.683	9.615	2.064	1.163	1.413	1.183	0.862	0.859
12	0.501	0.547	0.608	0.758	3.478	8.639	2.362	1.151	1.372	1.212	0.851	0.858
13	0.502	0.544	0.635	0.785	3.386	7.564	2.110	1.131	1.339	1.163	0.886	0.860
14	0.497	0.546	0.658	0.799	3.138	6.511	2.008	1.125	1.303	1.129	1.197	0.857
15	0.494	0.546	0.671	0.810	5.219	5.737	1.916	1.168	1.254	1.095	1.150	0.809
16	0.487	0.542	0.660	0.873	5.649	5.201	1.874	1.182	1.216	1.071	1.079	0.835
17	0.482	0.533	0.644	1.109	6.758	4.928	1.791	1.163	1.179	1.052	1.068	0.778
18	0.480	0.527	0.633	1.376	6.765	4.607	1.724	1.129	1.141	1.030	1.078	0.803
19	0.474	0.526	0.621	1.334	7.295	4.399	1.670	1.104	1.105	1.006	1.024	0.787
20	0.475	0.526	0.620	1.518	8.261	4.131	1.679	1.089	1.086	0.994	0.988	0.783
21	0.465	0.520	0.657	2.081	9.828	3.890	1.609	1.138	1.173	0.987	0.949	0.787
22	0.468	0.471	0.680	2.933	11.643	3.647	1.573	1.159	1.177	0.977	0.919	0.792
23	0.460	0.485	0.667	3.261	13.964	3.474	1.542	1.175	1.148	0.968	0.888	0.790
24	0.459	0.481	0.636	2.753	15.254	3.301	1.507	1.153	1.115	0.955	0.900	0.781
25	0.457	0.479	0.635	2.366	15.005	3.191	1.509	1.133	1.088	0.946	0.883	0.727
26	0.457	0.477	0.657	2.095	21.107	3.093	1.537	1.109	1.078	0.940	0.842	0.720
27	0.460	0.473	0.782	2.150	28.843	2.974	1.513	1.088	1.073	0.930	0.819	0.734
28	0.459	0.451	1.091	2.933	24.452	2.865	1.497	1.070	1.053	0.924	0.801	0.718
29	0.459		1.213	5.538	19.614	2.772	1.455	1.060	1.033	0.915	0.783	0.719
30	0.456		1.194	5.948	17.499	2.739	1.415	1.081	1.012	0.935	0.774	0.702
31	0.455		1.242		17.224		1.381	1.071		0.948		0.683
Mean	0.496	0.507	0.667	1.689	9.498	11.326	1.871	1.174	1.164	1.002	0.926	0.779
Max	0.573	0.566	1.242	5.948	28.843	55.432	2.608	1.360	1.413	1.212	1.197	0.889
Min	0.455	0.446	0.404	0.758	3.138	2.739	1.381	1.060	1.012	0.915	0.774	0.683

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Appendix C-2c. 2016 Summary of Daily Discharge at Station A3B

2016	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.656	0.648	0.627	0.718	7.408	8.378	2.673	1.473	1.064	1.073	1.564	1.073
02	0.636	0.622	0.629	0.783	8.153	8.764	2.657	1.507	1.038	1.073	1.587	1.082
03	0.634	0.601	0.627	0.974	9.160	9.038	2.532	1.518	1.038	1.082	1.564	1.064
04	0.620	0.596	0.624	1.299	11.622	9.851	2.351	1.451	1.020	1.091	1.518	1.020
05	0.601	0.589	0.626	1.438	12.911	10.668	2.108	1.462	1.012	1.064	1.529	0.962
06	0.600	0.608	0.649	1.446	13.207	11.622	1.960	1.344	1.010	1.073	1.440	0.892
07	0.620	0.609	0.642	1.554	14.154	11.657	1.830	1.397	1.008	1.038	1.303	0.823
08	0.637	0.605	0.639	2.232	15.094	10.902	1.780	1.418	1.006	1.073	1.334	0.765
09	0.634	0.606	0.639	3.991	13.394	10.370	1.646	1.451	0.995	2.801	1.376	0.723
10	0.629	0.607	0.646	5.197	11.072	8.260	1.552	1.462	0.999	2.136	1.429	0.700
11	0.623	0.608	0.641	4.926	9.160	7.082	1.564	1.451	0.987	1.843	1.418	0.696
12	0.622	0.616	0.644	5.509	7.436	5.850	1.529	1.376	1.001	1.792	1.418	0.705
13	0.626	0.622	0.650	5.312	6.097	5.212	1.575	1.376	0.995	1.462	1.564	0.717
14	0.628	0.623	0.649	5.143	5.444	4.700	1.622	1.386	0.994	1.634	1.529	0.725
15	0.634	0.622	0.645	4.432	4.964	4.215	1.742	1.365	0.985	1.767	1.418	0.717
16	0.637	0.628	0.640	4.086	4.743	3.876	1.868	1.323	0.982	1.646	1.386	0.703
17	0.632	0.628	0.642	4.598	4.919	3.515	2.307	1.293	1.010	1.507	1.376	0.689
18	0.627	0.636	0.640	6.659	5.998	3.314	2.850	1.282	0.974	1.462	1.408	0.680
19	0.626	0.635	0.621	10.271	7.464	3.138	3.459	1.242	0.984	1.334	1.334	0.678
20	0.627	0.633	0.624	16.519	7.575	3.001	3.226	1.232	0.984	1.303	1.313	0.683
21	0.625	0.632	0.634	20.056	6.948	2.933	2.950	1.213	0.969	1.272	1.303	0.691
22	0.644	0.628	0.644	22.895	6.736	2.818	2.720	1.213	0.987	1.262	1.272	0.703
23	0.653	0.622	0.648	25.855	6.579	2.785	2.441	1.184	1.001	1.252	1.293	0.717
24	0.650	0.612	0.656	23.926	6.762	2.657	2.164	1.155	1.008	1.213	1.232	0.730
25	0.651	0.612	0.662	21.879	7.354	2.704	1.960	1.146	1.007	1.232	1.223	0.742
26	0.647	0.612	0.665	18.234	12.366	2.501	1.881	1.127	1.008	1.174	1.213	0.751
27	0.643	0.611	0.670	14.771	12.985	2.547	1.755	1.127	1.038	1.293	1.203	0.755
28	0.659	0.622	0.669	11.969	12.438	2.563	1.694	1.118	1.073	1.496	1.165	0.756
29	0.655	0.629	0.669	9.776	11.553	2.486	1.622	1.082	1.082	1.496	1.118	0.754
30	0.653		0.675	8.123	10.272	2.456	1.598	1.082	1.073	1.529	1.082	0.749
31	0.647		0.698		9.130		1.518	1.073		1.552		0.743
Mean	0.635	0.618	0.646	8.819	9.132	5.662	2.101	1.301	1.011	1.420	1.364	0.780
Max	0.659	0.648	0.698	25.855	15.094	11.657	3.459	1.518	1.082	2.801	1.587	1.082
Min	0.600	0.589	0.621	0.718	4.743	2.456	1.518	1.073	0.969	1.038	1.082	0.678

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Appendix C-3a. 2013 Summary of Daily Discharge at Station WA1

2013	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.031	0.020	0.037	0.062	0.180	1.256	1.255	0.194	0.127	0.171	0.106	0.051
02	0.034	0.020	0.130	0.090	0.181	1.239	1.131	0.248	0.126	0.171	0.100	0.051
03	0.043	0.019	0.019	0.098	0.201	1.202	1.027	0.295	0.125	0.156	0.099	0.045
04	0.057	0.020	0.008	0.084	0.266	1.161	0.964	0.368	0.125	0.156	0.101	0.052
05	0.055	0.020	0.017	0.110	0.428	1.173	0.940	0.334	0.123	0.148	0.101	0.058
06	0.040	0.020	0.161	0.121	0.799	1.349	0.815	0.306	0.134	0.152	0.096	0.057
07	0.032	0.019	0.234	0.107	1.224	1.527	0.710	0.332	0.148	0.149	0.096	0.056
08	0.031	0.018	0.144	0.089	1.404	1.540	0.699	0.298	0.162	0.144	0.089	0.059
09	0.031	0.056	0.097	0.088	1.662	1.472	0.658	0.273	0.170	0.142	0.092	0.075
10	0.032	0.056	0.072	0.083	2.027	1.486	0.665	0.263	0.171	0.137	0.085	0.114
11	0.024	0.044	0.019	0.076	2.300	1.417	0.624	0.256	0.178	0.132	0.085	0.141
12	0.026	0.051	0.018	0.071	2.798	1.376	0.571	0.248	0.179	0.132	0.085	0.180
13	0.021	0.039	0.030	0.071	1.909	1.255	0.518	0.235	0.178	0.130	0.082	0.138
14	0.025	0.028	0.027	0.062	1.690	1.094	0.500	0.222	0.170	0.132	0.080	0.142
15	0.028	0.033	0.037	0.060	1.445	1.006	0.456	0.213	0.166	0.130	0.067	0.055
16	0.032	0.040	0.032	0.057	1.295	0.946	0.421	0.201	0.166	0.123	0.065	0.035
17	0.033	0.028	0.025	0.061	1.195	0.934	0.387	0.189	0.164	0.123	0.063	0.035
18	0.030	0.021	0.040	0.059	1.088	0.951	0.358	0.179	0.166	0.125	0.063	0.035
19	0.025	0.022	0.037	0.059	0.994	1.102	0.346	0.171	0.148	0.121	0.063	0.034
20	0.024	0.018	0.061	0.059	0.978	3.765	0.331	0.162	0.130	0.117	0.063	0.035
21	0.023	0.018	0.038	0.053	1.031	2.277	0.312	0.149	0.137	0.117	0.063	0.034
22	0.023	0.018	0.021	0.063	1.136	1.950	0.302	0.147	0.133	0.114	0.063	0.033
23	0.025	0.019	0.054	0.061	1.854	1.800	0.287	0.142	0.133	0.112	0.063	0.032
24	0.025	0.024	0.040	0.065	1.540	1.677	0.273	0.140	0.125	0.112	0.062	0.031
25	0.024	0.023	0.051	0.081	1.431	1.636	0.261	0.140	0.127	0.112	0.063	0.031
26	0.023	0.017	0.080	0.123	1.335	1.759	0.254	0.141	0.125	0.108	0.063	0.031
27	0.022	0.017	0.121	0.178	1.254	1.786	0.235	0.133	0.118	0.104	0.056	0.031
28	0.020	0.016	0.185	0.223	1.146	1.636	0.223	0.130	0.121	0.115	0.054	0.031
29	0.027		0.045	0.246	1.147	1.417	0.218	0.127	0.185	0.118	0.052	0.031
30	0.039		0.034	0.202	1.232	1.308	0.212	0.126	0.170	0.111	0.051	0.030
31	0.023		0.046		1.219		0.201	0.126		0.101		0.030
Mean	0.030	0.027	0.063	0.095	1.238	1.483	0.521	0.209	0.148	0.130	0.076	0.058
Max	0.057	0.056	0.234	0.246	2.798	3.765	1.255	0.368	0.185	0.171	0.106	0.180
Min	0.020	0.016	0.008	0.053	0.180	0.934	0.201	0.126	0.118	0.101	0.051	0.030

Appendix C-3b. 2014 Summary of Daily Discharge at Station WA1

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.030	0.023	0.018	0.012	0.354	0.919	0.865	0.223	0.186	0.055	0.055	0.111
02	0.030	0.023	0.018	0.012	0.532	0.937	0.817	0.220	0.174	0.059	0.056	0.080
03	0.031	0.022	0.018	0.012	0.479	0.997	0.756	0.209	0.261	0.053	0.054	0.062
04	0.028	0.022	0.017	0.012	0.388	1.042	0.699	0.204	0.257	0.053	0.072	0.058
05	0.027	0.022	0.017	0.012	0.320	1.099	0.643	0.203	0.245	0.051	0.070	0.055
06	0.031	0.022	0.014	0.012	0.279	1.035	0.599	0.196	0.280	0.049	0.093	0.053
07	0.029	0.030	0.016	0.017	0.244	0.930	0.562	0.189	0.327	0.048	0.153	0.052
08	0.028	0.038	0.032	0.021	0.236	0.825	0.505	0.182	0.331	0.047	0.119	0.050
09	0.028	0.047	0.013	0.023	0.251	0.821	0.464	0.174	0.309	0.046	0.109	0.062
10	0.027	0.081	0.025	0.029	0.256	0.859	0.426	0.170	0.282	0.045	0.150	0.081
11	0.024	0.145	0.021	0.035	0.241	0.792	0.391	0.164	0.267	0.045	0.121	0.097
12	0.030	0.174	0.018	0.042	0.255	0.725	0.361	0.152	0.245	0.044	0.108	0.107
13	0.030	0.162	0.016	0.041	0.336	0.713	0.335	0.163	0.234	0.043	0.097	0.099
14	0.028	0.109	0.016	0.043	0.500	0.736	0.313	0.174	0.230	0.043	0.086	0.091
15	0.027	0.072	0.014	0.051	0.783	0.721	0.346	0.168	0.073	0.048	0.076	0.082
16	0.027	0.071	0.014	0.043	1.141	0.698	0.309	0.164	0.070	0.051	0.070	0.080
17	0.026	0.037	0.013	0.039	1.304	0.809	0.274	0.160	0.068	0.046	0.066	0.076
18	0.026	0.083	0.013	0.037	1.499	1.147	0.253	0.159	0.065	0.044	0.064	0.071
19	0.026	0.497	0.013	0.036	1.616	1.390	0.238	0.159	0.063	0.043	0.060	0.069
20	0.026	0.055	0.012	0.043	1.764	1.431	0.222	0.163	0.061	0.042	0.058	0.066
21	0.026	0.020	0.013	0.056	2.057	1.376	0.214	0.145	0.059	0.042	0.059	0.064
22	0.025	0.018	0.009	0.079	2.424	1.295	0.200	0.152	0.056	0.041	0.056	0.062
23	0.025	0.018	0.014	0.077	1.622	1.222	0.192	0.163	0.055	0.070	0.054	0.127
24	0.025	0.018	0.012	0.071	1.827	1.163	0.197	0.167	0.054	0.071	0.052	0.060
25	0.024	0.018	0.014	0.074	1.827	1.095	0.181	0.187	0.053	0.058	0.051	0.098
26	0.024	0.018	0.014	0.091	1.622	1.011	0.167	0.192	0.054	0.072	0.050	0.222
27	0.024	0.018	0.013	0.081	1.417	1.140	0.158	0.187	0.052	0.063	0.078	0.188
28	0.025	0.017	0.012	0.074	1.214	1.068	0.149	0.192	0.051	0.058	0.137	0.052
29	0.024		0.012	0.084	1.123	0.993	0.144	0.189	0.050	0.056	0.120	0.068
30	0.024		0.012	0.158	1.027	0.928	0.141	0.192	0.053	0.055	0.145	0.097
31	0.023		0.012		0.931		0.224	0.190		0.054		0.147
Mean	0.027	0.067	0.015	0.047	0.964	0.997	0.366	0.179	0.152	0.051	0.085	0.087
Max	0.031	0.497	0.032	0.158	2.424	1.431	0.865	0.223	0.331	0.072	0.153	0.222
Min	0.023	0.017	0.009	0.012	0.236	0.698	0.141	0.145	0.050	0.041	0.050	0.050

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Appendix C-3c. 2015 Summary of Daily Discharge at Station WA1

2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.173	0.047	0.106	0.112	0.961	1.156	0.180	0.056	0.038	0.032	0.054	0.031
02	0.197	0.030	0.144	0.111	0.922	1.309	0.168	0.054	0.054	0.031	0.045	0.030
03	0.175	0.024	0.180	0.111	0.907	1.430	0.157	0.053	0.048	0.044	0.039	0.052
04	0.170	0.024	0.338	0.110	0.972	1.276	0.148	0.051	0.043	0.035	0.037	0.057
05	0.154	0.025	0.017	0.103	1.071	1.130	0.144	0.049	0.052	0.034	0.033	0.050
06	0.088	0.056	0.023	0.099	1.084	1.026	0.137	0.051	0.058	0.032	0.054	0.048
07	0.049	0.070	0.018	0.100	1.029	0.941	0.129	0.050	0.054	0.031	0.030	0.048
08	0.037	0.067	0.022	0.097	0.993	0.886	0.125	0.047	0.049	0.030	0.030	0.050
09	0.036	0.059	0.024	0.096	0.911	0.826	0.117	0.045	0.046	0.029	0.030	0.058
10	0.035	0.053	0.026	0.095	0.879	0.748	0.116	0.044	0.044	0.031	0.036	0.036
11	0.033	0.048	0.027	0.093	0.874	0.677	0.140	0.041	0.041	0.059	0.035	0.033
12	0.038	0.045	0.030	0.086	0.841	0.623	0.135	0.040	0.039	0.041	0.033	0.031
13	0.032	0.044	0.031	0.089	0.801	0.571	0.112	0.039	0.038	0.037	0.033	0.030
14	0.031	0.045	0.056	0.088	0.758	0.526	0.106	0.039	0.040	0.036	0.101	0.026
15	0.030	0.044	0.082	0.088	0.769	0.482	0.099	0.048	0.040	0.035	0.091	0.036
16	0.029	0.043	0.060	0.091	0.785	0.443	0.102	0.052	0.042	0.034	0.074	0.036
17	0.029	0.078	0.059	0.103	0.803	0.434	0.097	0.045	0.041	0.033	0.074	0.032
18	0.029	0.063	0.057	0.112	0.816	0.401	0.091	0.042	0.039	0.032	0.078	0.040
19	0.028	0.043	0.057	0.114	0.870	0.384	0.085	0.039	0.038	0.031	0.064	0.034
20	0.027	0.039	0.060	0.136	0.942	0.343	0.096	0.037	0.037	0.031	0.043	0.025
21	0.029	0.035	0.064	0.179	1.021	0.320	0.082	0.047	0.045	0.031	0.039	0.023
22	0.028	0.364	0.065	0.243	1.092	0.298	0.076	0.055	0.039	0.030	0.043	0.022
23	0.026	0.393	0.061	0.726	1.169	0.278	0.072	0.048	0.037	0.030	0.041	0.022
24	0.026	0.145	0.060	0.672	1.206	0.261	0.069	0.041	0.036	0.030	0.038	0.022
25	0.028	0.079	0.057	0.608	1.191	0.246	0.071	0.039	0.035	0.029	0.036	0.023
26	0.027	0.045	0.064	0.537	1.432	0.230	0.077	0.037	0.034	0.030	0.037	0.030
27	0.027	0.048	0.078	0.547	1.447	0.217	0.077	0.036	0.035	0.032	0.037	0.035
28	0.026	0.073	0.125	0.697	1.352	0.205	0.073	0.036	0.035	0.030	0.029	0.030
29	0.026		0.123	0.950	1.238	0.196	0.067	0.036	0.034	0.029	0.035	0.025
30	0.027		0.122	1.016	1.218	0.196	0.062	0.041	0.033	0.037	0.033	0.025
31	0.028		0.119		1.211		0.059	0.040		0.042		0.035
Mean	0.055	0.076	0.076	0.274	1.018	0.602	0.106	0.044	0.041	0.034	0.046	0.035
Max	0.197	0.393	0.338	1.016	1.447	1.430	0.180	0.056	0.058	0.059	0.101	0.058
Min	0.026	0.024	0.017	0.086	0.758	0.196	0.059	0.036	0.033	0.029	0.029	0.022

Appendix C-3d. 2016 Summary of Daily Discharge at Station WA1

2016	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.049	0.011	0.011	0.040	0.895	0.596	0.252	0.130	0.074	0.076	0.141	0.076
02	0.059	0.014	0.011	0.144	0.946	0.613	0.250	0.134	0.070	0.076	0.144	0.077
03	0.065	0.018	0.011	0.135	0.631	0.626	0.239	0.136	0.070	0.077	0.141	0.074
04	0.090	0.019	0.011	0.143	0.733	0.661	0.223	0.127	0.067	0.078	0.136	0.067
05	0.116	0.016	0.012	0.121	0.783	0.695	0.200	0.129	0.066	0.074	0.137	0.058
06	0.077	0.014	0.013	0.109	0.794	0.733	0.185	0.114	0.066	0.076	0.126	0.046
07	0.024	0.011	0.013	0.141	0.828	0.735	0.171	0.121	0.065	0.070	0.108	0.034
08	0.020	0.011	0.012	0.227	0.860	0.705	0.166	0.123	0.065	0.076	0.112	0.022
09	0.021	0.010	0.012	0.382	0.800	0.683	0.151	0.127	0.063	0.263	0.118	0.014
10	0.024	0.010	0.013	0.450	0.712	0.590	0.140	0.129	0.064	0.203	0.125	0.009
11	0.025	0.011	0.012	0.444	0.631	0.533	0.141	0.127	0.062	0.172	0.123	0.008
12	0.020	0.011	0.012	0.484	0.551	0.467	0.137	0.118	0.064	0.167	0.123	0.010
13	0.017	0.011	0.012	0.480	0.481	0.430	0.142	0.118	0.063	0.129	0.141	0.012
14	0.015	0.011	0.012	0.465	0.444	0.399	0.148	0.119	0.063	0.149	0.137	0.014
15	0.013	0.010	0.012	0.420	0.415	0.368	0.162	0.117	0.062	0.164	0.123	0.012
16	0.012	0.010	0.013	0.426	0.402	0.344	0.175	0.111	0.061	0.151	0.119	0.009
17	0.012	0.010	0.013	0.520	0.413	0.319	0.219	0.107	0.066	0.134	0.118	0.006
18	0.012	0.011	0.014	0.715	0.476	0.304	0.267	0.106	0.060	0.129	0.122	0.004
19	0.011	0.010	0.024	0.996	0.552	0.290	0.314	0.100	0.062	0.112	0.112	0.004
20	0.011	0.010	0.025	1.229	0.557	0.279	0.297	0.099	0.061	0.108	0.110	0.005
21	0.011	0.010	0.023	1.337	0.526	0.273	0.275	0.096	0.059	0.104	0.108	0.007
22	0.013	0.010	0.016	1.436	0.515	0.264	0.256	0.096	0.062	0.103	0.104	0.009
23	0.012	0.013	0.018	1.502	0.507	0.261	0.231	0.092	0.064	0.101	0.107	0.012
24	0.011	0.016	0.018	1.517	0.516	0.250	0.205	0.088	0.065	0.096	0.099	0.015
25	0.011	0.017	0.017	1.465	0.546	0.254	0.185	0.086	0.065	0.099	0.097	0.018
26	0.011	0.017	0.017	1.338	0.762	0.237	0.177	0.084	0.065	0.091	0.096	0.019
27	0.011	0.018	0.017	1.216	0.785	0.241	0.163	0.084	0.070	0.107	0.095	0.020
28	0.013	0.012	0.016	1.097	0.765	0.242	0.156	0.082	0.076	0.133	0.089	0.021
29	0.012	0.012	0.017	0.986	0.731	0.235	0.148	0.077	0.077	0.133	0.082	0.020
30	0.011		0.020	0.903	0.679	0.233	0.145	0.077	0.076	0.137	0.077	0.019
31	0.011		0.025		0.630		0.136	0.076		0.140		0.018
Mean	0.026	0.013	0.015	0.696	0.641	0.429	0.195	0.107	0.066	0.120	0.116	0.024
Max	0.116	0.019	0.025	1.517	0.946	0.735	0.314	0.136	0.077	0.263	0.144	0.077
Min	0.011	0.010	0.011	0.040	0.402	0.233	0.136	0.076	0.059	0.070	0.077	0.004

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Appendix C-4a. 2013 Summary of Daily Discharge at Station G2

2013	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.164	0.160	0.163	0.207	0.285	4.735	4.724	0.106	0.055	0.085	0.045	0.083
02	0.168	0.158	0.165	0.204	0.289	4.598	3.812	0.166	0.055	0.085	0.043	0.082
03	0.167	0.161	0.156	0.213	0.317	4.321	3.125	0.236	0.054	0.073	0.042	0.083
04	0.167	0.158	0.199	0.230	0.384	4.023	2.743	0.369	0.054	0.073	0.043	0.083
05	0.163	0.158	0.156	0.240	0.561	4.111	2.601	0.302	0.053	0.068	0.043	0.083
06	0.162	0.158	0.153	0.231	0.769	5.482	1.938	0.254	0.059	0.071	0.042	0.083
07	0.167	0.156	0.155	0.221	0.898	7.062	1.455	0.300	0.068	0.069	0.042	0.080
08	0.163	0.156	0.153	0.226	1.098	7.192	1.409	0.240	0.077	0.065	0.039	0.079
09	0.161	0.159	0.154	0.222	1.249	6.555	1.243	0.202	0.084	0.064	0.040	0.078
10	0.181	0.170	0.154	0.216	1.414	6.680	1.270	0.187	0.085	0.061	0.038	0.078
11	0.638	0.162	0.154	0.214	1.639	6.066	1.112	0.177	0.091	0.058	0.038	0.078
12	1.366	0.160	0.159	0.211	8.415	5.712	0.923	0.166	0.092	0.058	0.038	0.078
13	0.576	0.154	0.163	0.215	11.151	4.724	0.753	0.151	0.091	0.057	0.037	0.077
14	0.176	0.155	0.174	0.212	8.700	3.560	0.700	0.135	0.084	0.058	0.037	0.077
15	0.172	0.157	0.170	0.215	6.308	2.998	0.579	0.125	0.081	0.057	0.089	0.076
16	0.165	0.155	0.158	0.209	5.036	2.640	0.489	0.113	0.081	0.053	0.087	0.076
17	0.163	0.155	0.162	0.208	4.271	2.569	0.410	0.101	0.080	0.053	0.089	0.076
18	0.161	0.154	0.179	0.207	3.523	2.664	0.350	0.092	0.081	0.054	0.090	0.076
19	0.162	0.154	0.166	0.206	2.923	3.615	0.326	0.085	0.068	0.052	0.077	0.077
20	0.169	0.167	0.168	0.209	2.824	44.279	0.297	0.077	0.057	0.050	0.081	0.076
21	0.169	0.154	0.165	0.207	3.151	15.977	0.263	0.069	0.061	0.050	0.082	0.075
22	0.165	0.152	0.198	0.211	3.850	11.644	0.247	0.067	0.058	0.049	0.085	0.075
23	0.165	0.163	0.226	0.212	10.510	9.887	0.223	0.064	0.058	0.048	0.088	0.075
24	0.161	0.153	0.208	0.212	7.192	8.557	0.202	0.062	0.054	0.048	0.086	0.074
25	0.162	0.153	0.166	0.240	6.186	8.135	0.185	0.062	0.055	0.048	0.086	0.074
26	0.163	0.154	0.165	0.285	5.368	9.433	0.175	0.063	0.054	0.046	0.086	0.074
27	0.160	0.154	0.166	0.302	4.713	9.735	0.151	0.058	0.050	0.045	0.085	0.074
28	0.153	0.153	0.168	0.316	3.917	8.135	0.136	0.057	0.052	0.049	0.085	0.074
29	0.164		0.175	0.299	3.926	6.066	0.130	0.055	0.097	0.050	0.084	0.073
30	0.161		0.173	0.296	4.546	5.145	0.124	0.055	0.084	0.047	0.083	0.073
31	0.161		0.185		4.453		0.113	0.055		0.043		0.073
Mean	0.232	0.157	0.170	0.230	3.867	7.543	1.039	0.137	0.069	0.058	0.064	0.077
Max	1.366	0.170	0.226	0.316	11.151	44.279	4.724	0.369	0.097	0.085	0.090	0.083
Min	0.153	0.152	0.153	0.204	0.285	2.569	0.113	0.055	0.050	0.043	0.037	0.073

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Appendix C-4b. 2014 Summary of Daily Discharge at Station G2

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.073	0.070	0.063	0.065	0.128	6.069	1.718	0.275	0.189	0.185	0.173	0.178
02	0.074	0.068	0.064	0.065	1.053	6.408	1.590	0.269	0.190	0.181	0.176	0.196
03	0.073	0.076	0.064	0.065	1.082	6.145	1.492	0.264	0.540	0.175	0.171	0.189
04	0.072	0.094	0.064	0.065	0.900	5.940	1.349	0.259	0.370	0.173	0.189	0.185
05	0.075	0.094	0.065	0.066	0.807	6.250	1.235	0.254	0.307	0.170	0.194	0.179
06	0.073	0.078	0.063	0.067	0.767	5.880	1.141	0.247	0.274	0.165	0.215	0.178
07	0.073	0.064	0.063	0.075	0.693	5.352	1.075	0.240	0.250	0.162	0.266	0.175
08	0.073	0.066	0.068	0.099	0.660	4.702	0.967	0.236	0.238	0.160	0.232	0.173
09	0.072	0.065	0.066	0.102	0.695	4.681	0.883	0.232	0.248	0.160	0.222	0.189
10	0.073	0.066	0.064	0.104	0.752	4.524	0.823	0.227	0.247	0.159	0.198	0.239
11	0.072	0.066	0.064	0.100	0.719	4.150	0.755	0.222	0.237	0.159	0.159	0.257
12	0.072	0.066	0.065	0.095	0.705	4.024	0.698	0.218	0.233	0.159	0.295	0.260
13	0.073	0.066	0.065	0.095	0.807	4.497	0.649	0.215	0.229	0.155	0.164	0.248
14	0.073	0.065	0.064	0.100	1.035	4.588	0.616	0.258	0.225	0.154	0.175	0.232
15	0.076	0.065	0.065	0.096	1.534	3.988	0.656	0.238	0.219	0.161	0.177	0.224
16	0.079	0.065	0.065	0.095	2.272	3.611	0.621	0.223	0.212	0.173	0.178	0.217
17	0.077	0.065	0.064	0.095	2.930	4.894	0.548	0.216	0.207	0.162	0.176	0.210
18	0.075	0.065	0.064	0.094	3.637	6.387	0.504	0.211	0.202	0.156	0.175	0.204
19	0.074	0.065	0.065	0.099	4.028	5.608	0.474	0.215	0.198	0.154	0.177	0.197
20	0.073	0.065	0.065	0.108	4.272	5.055	0.447	0.221	0.196	0.153	0.172	0.194
21	0.073	0.064	0.067	0.123	4.844	4.571	0.462	0.222	0.195	0.152	0.176	0.192
22	0.072	0.064	0.065	0.124	8.645	4.149	0.418	0.217	0.192	0.153	0.174	0.188
23	0.071	0.064	0.065	0.122	10.802	3.769	0.402	0.215	0.191	0.210	0.169	0.186
24	0.071	0.066	0.065	0.123	12.891	3.315	0.435	0.208	0.188	0.232	0.166	0.183
25	0.071	0.065	0.065	0.128	13.918	3.020	0.393	0.203	0.186	0.184	0.165	0.180
26	0.071	0.065	0.065	0.122	9.809	2.766	0.358	0.198	0.188	0.219	0.163	0.177
27	0.070	0.064	0.064	0.117	7.366	2.471	0.338	0.193	0.186	0.198	0.178	0.176
28	0.070	0.063	0.064	0.118	6.823	2.221	0.322	0.203	0.184	0.185	0.178	0.172
29	0.070		0.065	0.147	6.312	2.062	0.308	0.204	0.184	0.179	0.178	0.343
30	0.070		0.064	0.081	5.468	1.861	0.297	0.201	0.183	0.175	0.178	0.037
31	0.071		0.064		5.720		0.287	0.192		0.173		0.036
Mean	0.073	0.068	0.065	0.098	3.938	4.432	0.718	0.226	0.230	0.172	0.187	0.193
Max	0.079	0.094	0.068	0.147	13.918	6.408	1.718	0.275	0.540	0.232	0.295	0.343
Min	0.070	0.063	0.063	0.065	0.128	1.861	0.287	0.192	0.183	0.152	0.159	0.036

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Appendix C-4c. 2015 Summary of Daily Discharge at Station G2

2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.036	0.149	0.223	0.048	0.574	1.491	0.140	0.079	0.071	0.059	0.075	0.060
02	0.512	0.147	0.163	0.047	0.540	1.695	0.134	0.078	0.075	0.059	0.068	0.062
03	0.167	0.147	0.574	0.047	0.547	1.336	0.129	0.077	0.070	0.071	0.064	0.065
04	0.164	0.146	0.035	0.047	0.605	1.076	0.130	0.076	0.077	0.063	0.062	0.063
05	0.164	0.147	0.035	0.044	0.623	0.928	0.125	0.078	0.084	0.062	0.060	0.061
06	0.160	0.255	0.034	0.042	0.590	0.844	0.119	0.077	0.080	0.061	0.058	0.061
07	0.157	0.411	0.034	0.043	0.574	0.779	0.119	0.075	0.073	0.060	0.059	0.063
08	0.154	0.282	0.034	0.042	0.516	0.732	0.111	0.074	0.070	0.059	0.059	0.087
09	0.155	0.242	0.034	0.042	0.492	0.656	0.108	0.072	0.068	0.058	0.060	0.073
10	0.153	0.219	0.033	0.041	0.502	0.572	0.156	0.071	0.066	0.059	0.059	0.068
11	0.151	0.210	0.033	0.041	0.480	0.521	0.183	0.070	0.065	0.081	0.058	0.066
12	0.150	0.206	0.033	0.039	0.460	0.468	0.129	0.069	0.064	0.066	0.056	0.066
13	0.149	0.202	0.033	0.039	0.432	0.423	0.122	0.069	0.064	0.063	0.062	0.065
14	0.148	0.202	0.033	0.039	0.425	0.374	0.112	0.076	0.065	0.062	0.150	0.065
15	0.148	0.199	0.037	0.039	0.458	0.337	0.121	0.084	0.077	0.061	0.133	0.064
16	0.147	0.196	0.033	0.040	0.491	0.345	0.117	0.077	0.086	0.061	0.093	0.085
17	0.147	0.186	0.033	0.044	0.490	0.317	0.110	0.073	0.065	0.060	0.084	0.065
18	0.146	0.192	0.033	0.048	0.504	0.293	0.103	0.070	0.063	0.060	0.090	0.063
19	0.145	0.190	0.033	0.049	0.540	0.263	0.108	0.068	0.062	0.059	0.075	0.062
20	0.146	0.185	0.033	0.060	0.604	0.243	0.100	0.074	0.062	0.059	0.068	0.061
21	0.147	0.177	0.034	0.092	0.698	0.228	0.096	0.081	0.068	0.059	0.065	0.061
22	0.146	0.222	0.034	0.161	0.816	0.214	0.093	0.076	0.064	0.059	0.065	0.061
23	0.143	0.196	0.034	0.206	0.881	0.205	0.090	0.071	0.063	0.059	0.067	0.061
24	0.141	0.176	0.033	0.379	0.882	0.193	0.090	0.069	0.062	0.058	0.068	0.107
25	0.141	0.177	0.033	0.350	1.307	0.182	0.096	0.067	0.061	0.058	0.105	0.658
26	0.144	0.172	0.034	0.345	1.501	0.172	0.096	0.066	0.060	0.058	0.095	0.064
27	0.147	0.170	0.036	0.410	1.325	0.165	0.095	0.065	0.061	0.059	0.061	0.059
28	0.147	0.188	0.054	0.575	1.123	0.160	0.089	0.064	0.061	0.059	0.062	0.058
29	0.147		0.053	0.628	1.103	0.167	0.085	0.065	0.060	0.058	0.062	0.058
30	0.148		0.052	0.582	1.127	0.148	0.082	0.067	0.060	0.061	0.060	0.057
31	0.149		0.051		1.083		0.081	0.064		0.064		0.058
Mean	0.158	0.200	0.064	0.154	0.719	0.518	0.112	0.072	0.068	0.061	0.073	0.085
Max	0.512	0.411	0.574	0.628	1.501	1.695	0.183	0.084	0.086	0.081	0.150	0.658
Min	0.036	0.146	0.033	0.039	0.425	0.148	0.081	0.064	0.060	0.058	0.056	0.057

Appendix C-4d. 2016 Summary of Daily Discharge at Station G2

2016	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.074	0.053	0.053	0.079	0.804	1.008	0.172	0.057	0.036	0.036	0.063	0.036
02	0.078	0.065	0.053	0.099	1.067	1.072	0.170	0.059	0.035	0.036	0.065	0.036
03	0.062	0.054	0.053	0.111	1.138	1.117	0.156	0.060	0.035	0.036	0.063	0.036
04	0.056	0.053	0.054	0.108	1.556	1.253	0.136	0.055	0.034	0.036	0.060	0.034
05	0.055	0.052	0.055	0.107	1.780	1.392	0.111	0.056	0.034	0.036	0.061	0.033
06	0.055	0.052	0.055	0.123	1.832	1.556	0.097	0.049	0.034	0.036	0.055	0.033
07	0.055	0.052	0.054	0.152	2.000	1.562	0.085	0.052	0.034	0.035	0.046	0.033
08	0.055	0.052	0.054	0.225	2.167	1.432	0.081	0.053	0.034	0.036	0.048	0.034
09	0.055	0.052	0.055	0.286	1.865	1.341	0.070	0.055	0.034	0.187	0.050	0.035
10	0.055	0.052	0.054	0.277	1.461	0.989	0.062	0.056	0.034	0.114	0.054	0.036
11	0.054	0.052	0.054	0.314	1.138	0.799	0.063	0.055	0.034	0.086	0.053	0.036
12	0.053	0.053	0.055	0.321	0.856	0.608	0.061	0.050	0.034	0.082	0.053	0.036
13	0.053	0.052	0.054	0.301	0.645	0.512	0.064	0.050	0.034	0.056	0.063	0.035
14	0.053	0.052	0.054	0.269	0.547	0.438	0.068	0.051	0.034	0.069	0.061	0.035
15	0.053	0.052	0.054	0.263	0.476	0.369	0.077	0.050	0.034	0.080	0.053	0.035
16	0.053	0.052	0.055	0.294	0.444	0.323	0.088	0.047	0.034	0.070	0.051	0.036
17	0.053	0.054	0.055	0.387	0.469	0.275	0.131	0.046	0.034	0.059	0.050	0.037
18	0.053	0.053	0.054	0.577	0.630	0.249	0.192	0.045	0.033	0.056	0.052	0.037
19	0.053	0.053	0.055	0.860	0.860	0.227	0.268	0.043	0.034	0.048	0.048	0.037
20	0.053	0.053	0.056	0.953	0.878	0.211	0.238	0.042	0.034	0.046	0.047	0.037
21	0.054	0.053	0.056	1.144	0.778	0.202	0.204	0.042	0.033	0.045	0.046	0.037
22	0.054	0.053	0.058	1.227	0.745	0.189	0.177	0.042	0.034	0.044	0.045	0.036
23	0.054	0.052	0.057	1.487	0.720	0.185	0.146	0.040	0.034	0.043	0.046	0.035
24	0.054	0.052	0.057	1.449	0.749	0.170	0.117	0.039	0.034	0.042	0.042	0.035
25	0.053	0.053	0.056	1.438	0.843	0.175	0.097	0.039	0.034	0.042	0.042	0.035
26	0.053	0.054	0.056	1.208	1.685	0.152	0.090	0.038	0.034	0.040	0.042	0.034
27	0.055	0.054	0.056	1.014	1.793	0.158	0.079	0.038	0.035	0.046	0.041	0.034
28	0.054	0.053	0.056	0.859	1.697	0.159	0.073	0.037	0.036	0.058	0.039	0.034
29	0.054	0.053	0.057	0.755	1.544	0.151	0.068	0.036	0.036	0.058	0.037	0.034
30	0.053		0.062	0.724	1.324	0.147	0.066	0.036	0.036	0.061	0.036	0.034
31	0.053		0.065		1.133		0.060	0.036		0.062		0.034
Mean	0.055	0.053	0.056	0.580	1.149	0.614	0.115	0.047	0.034	0.057	0.050	0.035
Max	0.078	0.065	0.065	1.487	2.167	1.562	0.268	0.060	0.036	0.187	0.065	0.037
Min	0.053	0.052	0.053	0.079	0.444	0.147	0.060	0.036	0.033	0.035	0.036	0.033

Appendix C-4e. 2017 Summary of Daily Discharge at Station G2

2017	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.035	0.038	0.037	0.033	0.042	9.137	0.665	0.049	0.034	0.033	0.035	0.396
02	0.035	0.038	0.037	0.033	0.041	8.135	0.634	0.046	0.034	0.034	0.033	0.361
03	0.035	0.038	0.038	0.033	0.043	6.806	0.586	0.047	0.033	0.034	0.033	0.242
04	0.035	0.039	0.038	0.033	0.075	6.186	0.522	0.046	0.034	0.036	0.033	0.287
05	0.036	0.039	0.038	0.033	0.245	5.596	0.453	0.050	0.033	0.035	0.033	0.287
06	0.036	0.039	0.038	0.033	1.018	5.256	0.395	0.047	0.034	0.034	0.032	0.280
07	0.036	0.039	0.040	0.033	1.415	5.036	0.353	0.042	0.034	0.034	0.032	0.262
08	0.036	0.039	0.040	0.032	1.586	5.368	0.320	0.042	0.034	0.034	0.033	0.216
09	0.036	0.038	0.038	0.033	1.490	5.947	0.285	0.043	0.033	0.033	0.033	0.229
10	0.037	0.038	0.037	0.033	1.550	4.777	0.256	0.045	0.033	0.033	0.033	0.203
11	0.037	0.038	0.037	0.033	2.111	3.643	0.247	0.046	0.033	0.033	0.033	0.226
12	0.037	0.036	0.038	0.033	3.802	2.973	0.221	0.047	0.033	0.033	0.033	0.216
13	0.037	0.037	0.038	0.033	4.557	2.751	0.192	0.043	0.032	0.033	0.033	0.199
14	0.037	0.036	0.038	0.033	4.141	3.282	0.166	0.050	0.033	0.033	1.340	0.216
15	0.037	0.037	0.033	0.033	3.578	2.998	0.146	0.042	0.033	0.033	0.177	0.233
16	0.037	0.036	0.032	0.033	2.808	2.379	0.111	0.041	0.033	0.033	0.167	0.229
17	0.037	0.035	0.033	0.033	1.945	2.048	0.106	0.044	0.034	0.033	0.160	0.223
18	0.037	0.036	0.034	0.032	1.592	1.767	0.096	0.039	0.034	0.034	0.154	0.206
19	0.037	0.037	0.033	0.033	1.415	1.478	0.099	0.038	0.034	0.050	0.167	0.210
20	0.037	0.037	0.033	0.033	1.415	1.302	0.096	0.038	0.033	0.042	0.141	0.206
21	0.037	0.037	0.033	0.033	1.666	1.275	0.097	0.037	0.033	0.037	0.178	0.204
22	0.037	0.037	0.033	0.034	2.569	1.107	0.081	0.039	0.033	0.036	0.624	0.523
23	0.037	0.037	0.033	0.035	4.231	1.003	0.076	0.037	0.033	0.035	0.734	0.194
24	0.037	0.039	0.033	0.037	8.415	0.965	0.073	0.034	0.033	0.035	0.510	0.192
25	0.037	0.038	0.033	0.038	6.680	0.970	0.068	0.035	0.033	0.035	0.484	0.181
26	0.037	0.040	0.033	0.039	4.484	1.042	0.066	0.035	0.033	0.036	0.660	0.171
27	0.037	0.039	0.033	0.039	3.680	1.082	0.058	0.034	0.033	0.036	0.523	0.172
28	0.038	0.038	0.033	0.043	4.536	0.999	0.055	0.036	0.033	0.035	0.468	0.177
29	0.038		0.034	0.045	5.947	0.834	0.050	0.034	0.033	0.036	0.432	0.172
30	0.038		0.033	0.044	7.456	0.716	0.048	0.033	0.033	0.035	0.408	0.159
31	0.038		0.033		8.415		0.050	0.034		0.035		0.152
Mean	0.037	0.038	0.035	0.035	2.998	3.229	0.215	0.041	0.033	0.035	0.259	0.233
Max	0.038	0.040	0.040	0.045	8.415	9.137	0.665	0.050	0.034	0.050	1.340	0.523
Min	0.035	0.035	0.032	0.032	0.041	0.716	0.048	0.033	0.032	0.033	0.032	0.152

Appendix C-4f. 2018 Summary of Daily Discharge at Station G2

2018	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.144	0.107	0.113	0.135	1.610	0.726	0.473	0.100	0.056	0.091	0.124	0.071
02	0.142	0.244	0.113	0.135	1.413	0.697	0.548	0.105	0.056	0.087	0.291	0.071
03	0.138	0.290	0.116	0.135	1.647	0.709	0.491	0.107	0.053	0.085	0.206	0.069
04	0.138	0.127	0.116	0.135	1.814	0.716	0.444	0.101	0.051	0.084	0.177	0.066
05	0.154	0.121	0.119	0.135	2.109	0.675	0.426	0.094	0.050	0.083	0.154	0.051
06	0.109	0.123	0.119	0.132	2.456	0.645	0.421	0.089	0.051	0.084	0.141	0.067
07	0.085	0.158	0.122	0.128	2.850	0.636	0.398	0.086	0.053	0.082	0.122	0.066
08	0.084	1.060	0.122	0.128	3.399	0.645	0.382	0.083	0.056	0.080	0.116	0.069
09	0.166	1.044	0.122	0.141	3.995	0.623	0.392	0.079	0.058	0.079	0.086	0.070
10	0.608	0.129	0.125	0.170	4.817	0.613	0.377	0.077	0.063	0.080	0.081	0.073
11	0.104	0.232	0.125	0.260	3.413	0.575	0.354	0.077	0.061	0.083	0.076	0.072
12	0.104	0.141	0.125	0.340	2.682	0.554	0.323	0.080	0.063	0.087	0.081	0.068
13	0.103	0.131	0.125	0.277	3.022	0.558	0.298	0.077	0.083	0.085	0.083	0.066
14	0.097	0.119	0.128	0.256	4.108	0.565	0.283	0.073	0.078	0.084	0.082	0.063
15	0.101	0.122	0.128	0.326	4.866	0.638	0.269	0.071	0.076	0.083	0.078	0.062
16	0.103	0.124	0.128	0.427	3.434	0.580	0.255	0.069	0.115	0.082	0.056	0.062
17	0.120	0.120	0.132	0.379	2.830	0.543	0.241	0.069	0.083	0.081	0.078	0.063
18	0.101	0.114	0.132	0.326	1.477	0.535	0.233	0.066	0.076	0.081	0.074	0.062
19	0.101	0.108	0.132	0.336	1.412	0.519	0.219	0.065	0.074	0.083	0.072	0.063
20	0.104	0.119	0.132	0.441	1.452	0.522	0.175	0.067	0.077	0.085	0.073	0.063
21	0.107	0.122	0.132	0.667	1.552	0.523	0.148	0.062	0.089	0.084	0.079	0.059
22	0.108	0.118	0.135	0.618	1.527	0.521	0.143	0.059	0.085	0.082	0.077	0.064
23	0.113	0.120	0.135	0.532	1.535	0.487	0.145	0.060	0.077	0.086	0.074	0.063
24	0.112	0.122	0.135	0.663	1.573	0.484	0.142	0.065	0.075	0.093	0.073	0.063
25	0.108	0.118	0.135	1.015	1.580	0.489	0.141	0.061	0.073	0.110	0.072	0.062
26	0.112	1.316	0.135	1.373	1.444	0.467	0.141	0.084	0.073	0.176	0.072	0.062
27	0.115	0.110	0.135	1.668	1.335	0.466	0.127	0.067	0.079	0.129	0.071	0.063
28	0.123	0.113	0.135	1.722	1.222	0.465	0.125	0.061	0.080	0.117	0.073	0.064
29	0.128		0.135	1.886	1.085	0.488	0.114	0.064	0.082	0.110	0.073	0.063
30	0.105		0.135	1.798	0.921	0.434	0.106	0.059	0.077	0.105	0.073	0.145
31	0.105		0.135		0.809		0.102	0.056		0.102		0.094
Mean	0.130	0.245	0.128	0.556	2.238	0.570	0.272	0.075	0.071	0.092	0.100	0.068
Max	0.608	1.316	0.135	1.886	4.866	0.726	0.548	0.107	0.115	0.176	0.291	0.145
Min	0.084	0.107	0.113	0.128	0.809	0.434	0.102	0.056	0.050	0.079	0.056	0.051

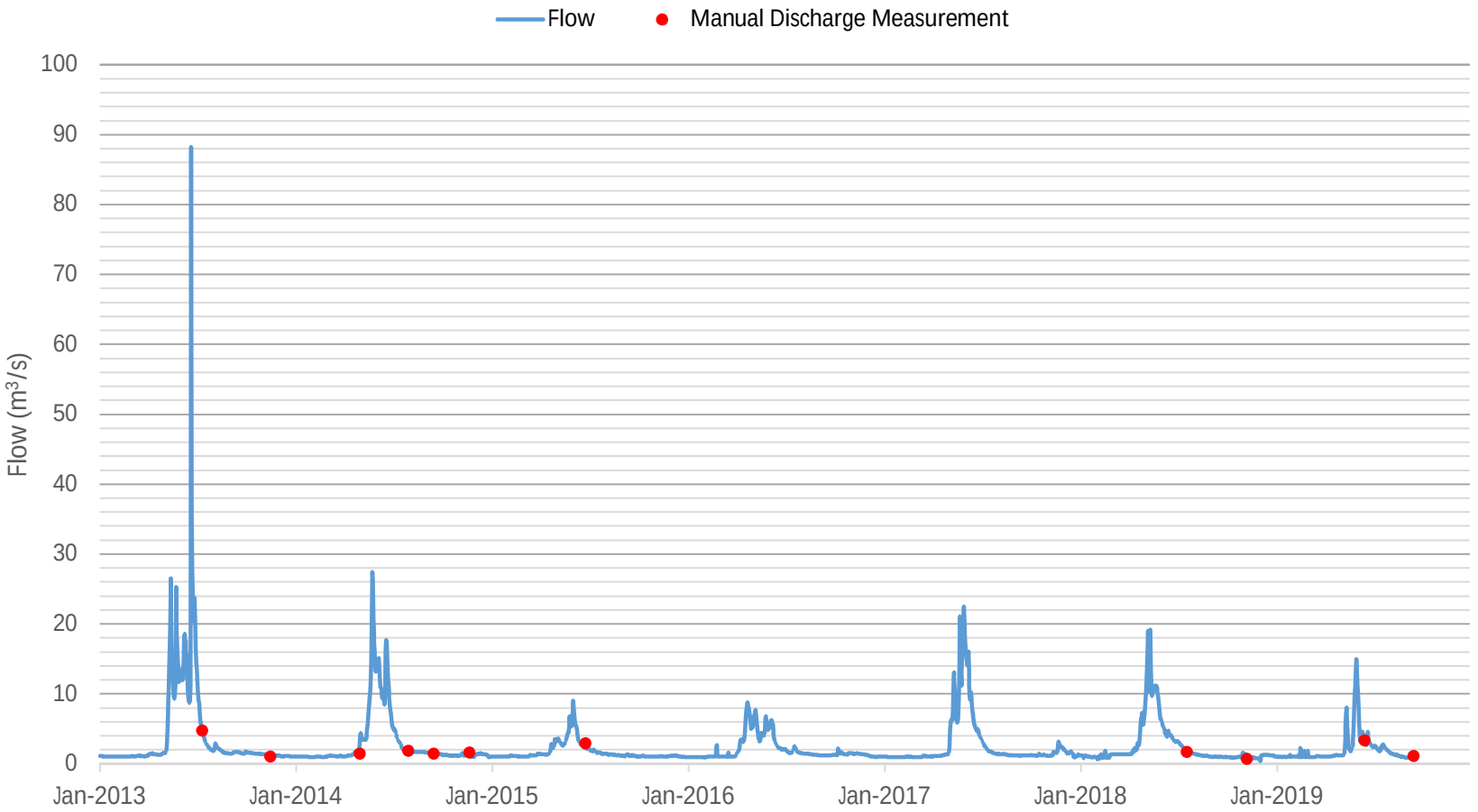
Appendix C-4g. 2019 Summary of Daily Discharge at Station G2

2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0.061	0.061	0.040	0.033	0.034	3.598	0.607	0.276	0.117			
02	0.063	0.061	0.034	0.033	0.033	4.616	0.644	0.252	0.126			
03	0.063	0.061	0.073	0.033	0.033	5.461	0.608	0.241	0.108			
04	0.059	0.061	0.114	0.033	0.033	4.682	0.632	0.230	0.117			
05	0.058	0.061	0.087	0.034	0.033	3.713	0.653	0.215	0.115			
06	0.056	0.061	0.038	0.033	0.033	3.073	0.618	0.212	0.104			
07	0.056	0.061	0.040	0.034	0.034	2.260	0.600	0.200	0.104			
08	0.059	0.061	0.041	0.034	0.034	1.223	0.571	0.195	0.100			
09	0.058	0.061	0.041	0.034	0.035	0.702	0.523	0.197	0.129			
10	0.056	0.061	0.041	0.034	0.038	0.508	0.471	0.193	0.143			
11	0.055	0.061	0.041	0.034	0.056	0.445	0.448	0.185	0.122			
12	0.055	0.061	0.041	0.034	0.167	0.582	0.421	0.206	0.106			
13	0.083	0.061	0.041	0.034	0.587	0.809	0.400	0.184	0.107			
14	0.193	0.061	0.041	0.034	1.222	0.934	0.397	0.188	0.103			
15	0.056	0.037	0.040	0.035	1.871	0.913	0.364	0.171	0.098			
16	0.056	0.038	0.040	0.035	2.298	0.828	0.353	0.197	0.104			
17	0.056	0.038	0.038	0.035	1.328	0.700	0.343	0.245	0.105			
18	0.058	0.042	0.036	0.035	0.810	0.615	0.460	0.190	0.103			
19	0.057	0.198	0.035	0.033	0.396	0.534	0.389	0.186				
20	0.054	0.033	0.034	0.032	0.218	0.349	0.543	0.162				
21	0.053	0.039	0.033	0.033	0.143	0.312	0.539	0.143				
22	0.052	0.039	0.033	0.033	0.109	0.306	0.439	0.159				
23	0.051	0.039	0.033	0.033	0.100	0.563	0.403	0.139				
24	0.050	0.033	0.033	0.034	0.110	0.913	0.440	0.142				
25	0.049	0.088	0.033	0.034	0.146	0.691	0.397	0.157				
26	0.050	0.107	0.033	0.036	0.197	0.671	0.371	0.151				
27	0.049	0.035	0.033	0.035	0.262	0.726	0.358	0.130				
28	0.047	0.040	0.033	0.035	0.497	0.737	0.346	0.136				
29	0.050		0.034	0.034	0.987	0.691	0.312	0.127				
30	0.047		0.033	0.034	1.982	0.650	0.310	0.127				
31	0.050		0.033		3.020		0.290	0.120				
Mean	0.060	0.059	0.042	0.034	0.543	1.427	0.460	0.182	0.112			
Max	0.193	0.198	0.114	0.036	3.020	5.461	0.653	0.276	0.143			
Min	0.047	0.033	0.033	0.032	0.033	0.306	0.290	0.120	0.098			

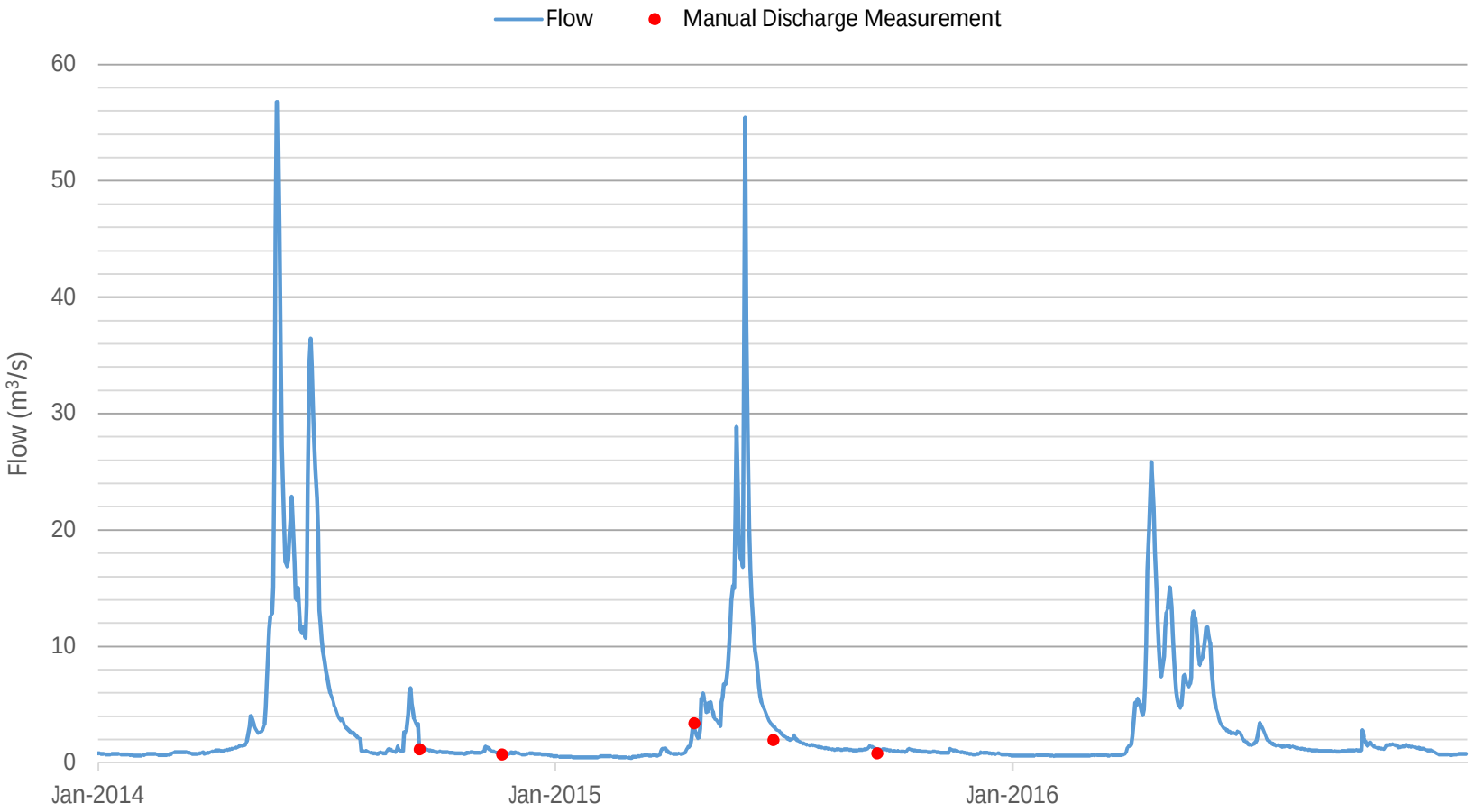
Appendix D

Hydrographs

DILLON CONSULTING



DILLON CONSULTING



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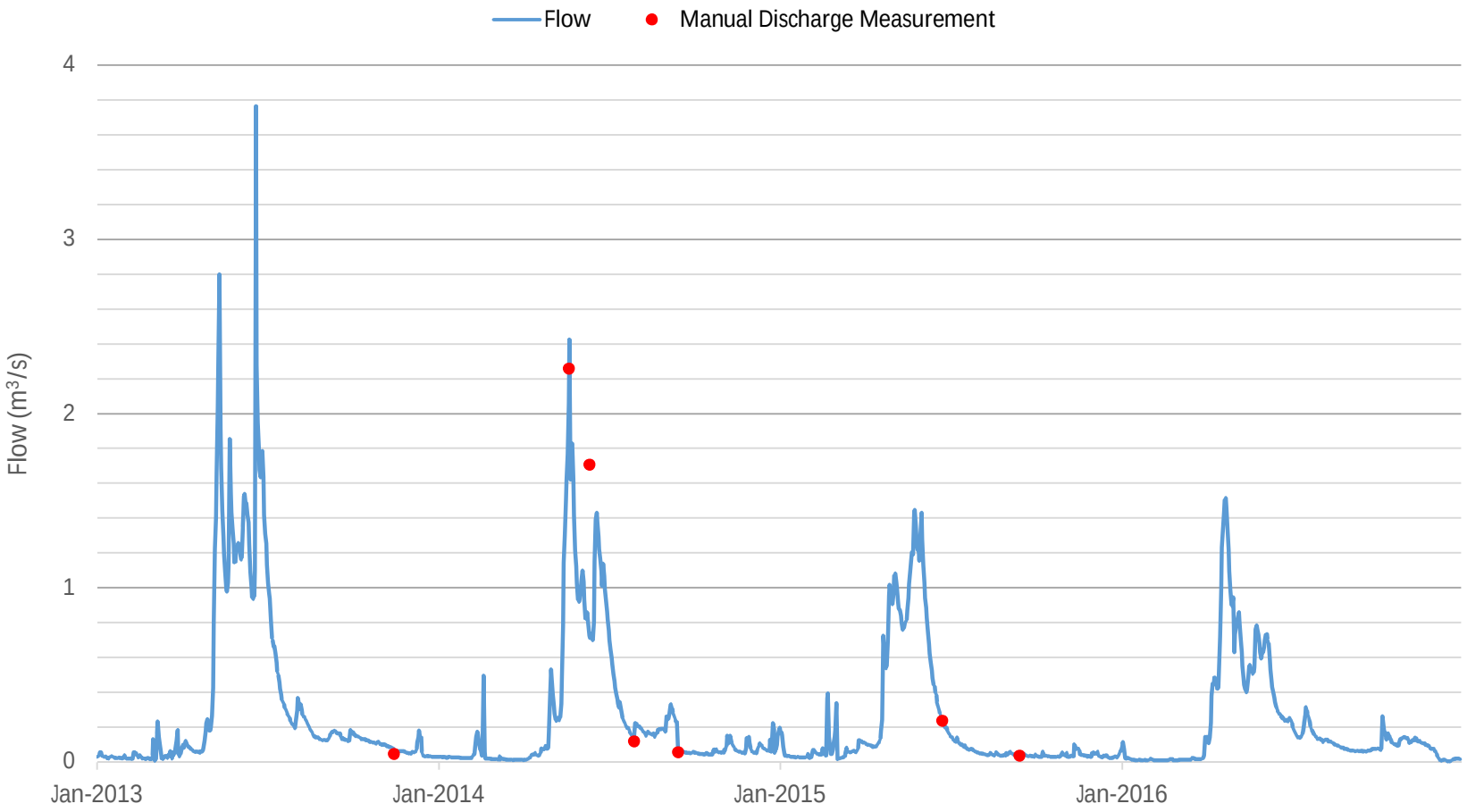
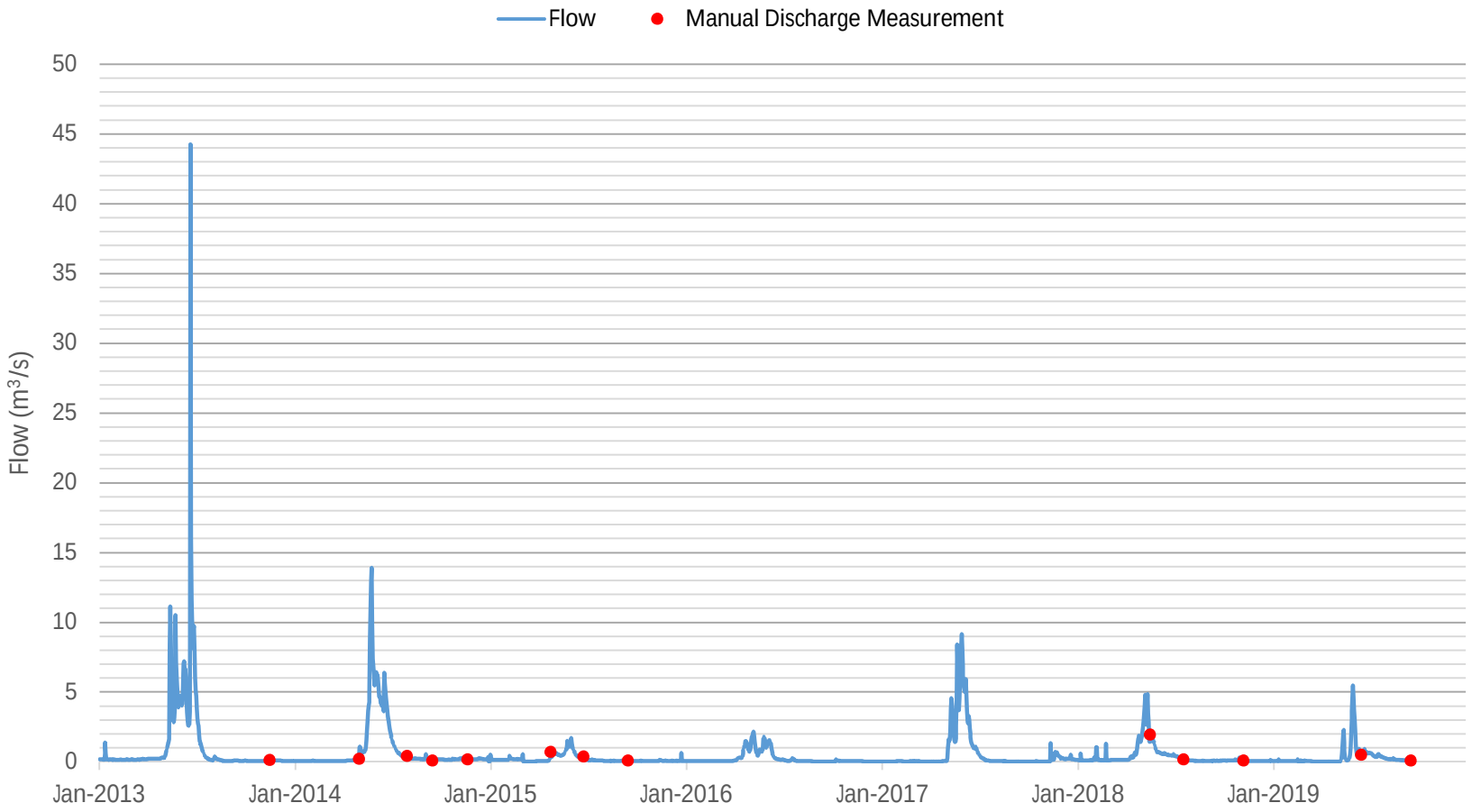


DILLON CONSULTING



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