
***Eagle Gold
Streamflow Monitoring Report – 2019 Update***



**Project No. A562-1
19 March 2020**

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1. Introduction

1. Introduction

1.1 Scope of Report

This report presents a summary of all streamflow data (i.e., baseline, construction and operational data) collected for the Eagle Gold Project (Project) since August 2007, including hydrometric information summarized in previous reports (Jacques Whitford 2008; Stantec 2010; Stantec 2011; Stantec 2012; Knight Piésold 2013, Lorax 2017 and Lorax 2018).

An overview of the streamflow monitoring program is provided in Section 2. Methods for the measurement of streamflow and stage (both spot and continuous) are presented in Section 3, along with the approach used to develop the rating curves for each station, the paired stage-discharge measurements and associated rating curve error. Stage record corrections (*e.g.*, due to station relocation, frost jacking of the staff gauge, channel aggradation, *etc.*) are also presented.

In Section 4, streamflow data are presented in the following formats:

- Monthly tables showing average, maximum and minimum 15-minute discharge values (m^3/s);
- Monthly tables showing average discharge (m^3/s), average unit yields ($\text{L}/\text{s}/\text{km}^2$) and total runoff (mm);
- Time-series plots of continuous average daily discharge (m^3/s) and spot flow measurements (m^3/s), and;
- Time series plots of average daily unit yields ($\text{L}/\text{s}/\text{km}^2$), by year.

1.2 Previous Reports

The streamflow data collected at the Eagle Gold Project site from 2007 up to and including 2018, has been previously summarized in the following reports:

- *Dublin Gulch Project – Climate and Hydrology Environmental Baseline Report* (2008), prepared by Jacques Whitford AXYS (Burnaby, BC) for Strata Gold Corp. (Vancouver, BC).
- *Eagle Gold Project, Environmental Baseline Report: Hydrology* (2010), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., February 2010.

- *Eagle Gold Project, Environmental Data Summary Report: Hydrology 2011 Update* (2011), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2011.
- *Eagle Gold Project, Surface Water Balance Model Report* (2011), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2011.
- *Eagle Gold Project, Environmental Baseline Data Report: Hydrology 2011 Update* (2012), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2012.
- *Victoria Gold Corp., Eagle Gold Project – Hydrology Baseline Data Summary. VA101-290/6-10*, prepared by Knight Piésold Ltd. (Vancouver, BC) for Victoria Gold Corp., August 2013.
- *Victoria Gold Corp., Eagle Gold Project – Indirect Discharge Measurement at W-29 and Repair of Stream gauges at W-22, W-5 and W-29* (2013), prepared by Laberge Environmental Services (Whitehorse, YT) for Victoria Gold Corp., September 2013.
- *Victoria Gold Corp., Eagle Gold Project – Hydrology Baseline Report* (2017), prepared by Lorax Environmental Ltd. (Vancouver, BC) for Victoria Gold Corp., March 2017.
- *Victoria Gold Corp. Eagle Gold Project – Hydrometeorology Report. A413-3*, prepared by Lorax Environmental Services Ltd. (Vancouver, BC) for Victoria Gold Corp., March 2017.
- *Victoria Gold Corp., Eagle Gold Project – Hydrology Baseline Report* (2018), prepared by Lorax Environmental Ltd. (Vancouver, BC) for Victoria Gold Corp., March 2018.
- *Victoria Gold Corp., Eagle Gold Project – Streamflow Monitoring Report* (2019), prepared by Lorax Environmental Ltd. (Vancouver, BC) for Victoria Gold Corp., March 2019.

1.3 Project Area Characteristics

The majority of the Project site lies within the Dublin Gulch watershed, a second order tributary to the larger Haggart Creek watershed, which is a major tributary of the South McQuesten River. The South McQuesten River joins the Stewart River, which flows west to its eventual confluence with the Yukon River.

The hydrology of the region is characterized by a dominant snowmelt driven freshet signature, which typically occurs between early May and early June. The recession limb of the freshet tapers to a lower summer flow regime reflective of groundwater primarily, which is punctuated by periodic rainfall driven runoff events, typically one to four days in duration. Base flows are lowest in the winter and flow sub-ice; in the smaller creeks, groundwater is depleted in the winter and no flow conditions under the ice are typical.

In larger tributaries, groundwater discharge maintains limited amounts of streamflow below the ice throughout the winter (*i.e.*, November through end March). Aufeis (*i.e.*, groundwater that seeps and freezes onto- and adjacent to local watercourses) is present in several places throughout streams at the Project site. As with shelf ice in the streams, aufeis melts during the freshet, but may in some cases persist into the early summer.

Historical placer mining activities in the Project site streams have altered the natural channel conditions, and in some cases, have also altered the drainage areas of several sub-watersheds. More information is provided in Stantec (2012) as it relates to placer mining near the Project.

2. Climate Monitoring Locations

2. Streamflow Monitoring Program

2.1 Data Sources

Data collection was originally undertaken by Hallam Knight Piésold (1993 to 1995), then a new program was initiated in 2007 by Jacques Whitford AXYS (now Stantec Consulting Ltd., or Stantec). Field support for this program was provided by Laberge Environmental Services (Laberge), based out of Whitehorse since the inception of the program through 2018. All streamflow data collected at the Project site up to the end of 2018 has been previously summarized in the reports per Section 1.2.

Laberge continued to participate in the field program, conducting field visits with Victoria Gold staff during freshet and early summer. Since then, Victoria Gold site staff have assumed all hydrometric monitoring activities. Initial QA/QC of the streamflow data collected in 2019 and associated development and updates of rating curves were undertaken by Lorax Environmental. At the time report preparation, there are ten continuously recording hydrometric stations operating at the Project site. Of these, continuous data for nine stations are presented in this report, including the W99 station which was installed on Haggart Creek downstream of all Project activity in 2019. The tenth station, W45, has only a water level record for 2018 and 2019, as the stage and discharge record is not sufficient at this time to develop a preliminary rating curve and a continuous discharge record.

2.2 Project Site Hydrometric Stations

The number of continuously recording hydrometric stations has varied over the period of record, but eight of the ten stations presented in this report update have the most complete records (the ninth, W21, was installed in 2018, and the tenth, W99 was installed in 2019). In addition, several more stations are monitored as required by the Environmental Monitoring, Surveillance and Adaptive Management Plan (EMSAMP). The continuous hydrometric stations and the associated metadata are presented in Table 2-1 and shown in Figure 2-1, while the additional spot flow stations are described in Table 2-2.

Additional manual streamflow measurements have been collected (often concurrently with water quality samples) at an additional 20 locations at the Project site. Previously collected continuous streamflow records for the Eagle Creek Pond (WECP), W13, W20 and W31 stations span shorter durations (1 to 3 years), and are presented in previous reports.

**Table 2-1:
 Eagle Gold Project hydrometric stations**

Station ID	Station Name	Record Period	Northing	Easting	Drainage Area (km ²)	Median Basin Elevation (m)	Notes
W1	Dublin Gulch above Stewart Gulch	2007 – 2019	7,101,545	460,249	6.8	1,303	Continuous discharge time-series
W4	Haggart Creek below Dublin Gulch	2007 – 2019	7,101,223	458,144	76.9	1,125	Continuous discharge time-series
W5	Haggart Creek above Lynx Creek	2007 – 2019	7,095,888	457,815	97.5	1,091	Continuous discharge time-series
W6	Lynx Creek above Haggart Creek	2007 – 2019	7,095,964	458,099	100.9	1,049	Continuous discharge time-series
W21 ²	Dublin Gulch near the Mouth	2018 - 2019	7,101,261	458,359	10.1	1,216	Continuous discharge time-series
W22	Haggart Creek above Dublin Gulch	2007 – 2019	7,101,377	458,319	66.8	1,113	Continuous discharge time-series
W26	Stewart Gulch	2007 – 2019	7,101,443	460,331	1.3	1,183	Continuous discharge time-series, manual data only for 2007 - 2009, 2011.
W27	Eagle Creek near Camp	2007 – 2019	7,100,997	458,235	2.7	1,037	Continuous discharge time-series, manual data only for 2007 and 2018
W29 ³	Haggart Creek below Eagle Creek	2010 – 2015	7,099,583	458,225	86.1	1,112	Manual measurements for 2010, continuous data thereafter
W45	Eagle Creek at mouth	2018-2019	7,099,740	458,243	5.0	1,018	Continuous discharge time-series
W99	Haggart Creek above 15 Pup	2019	7,098,180	458,322	88.3	1,116	Continuous discharge time-series

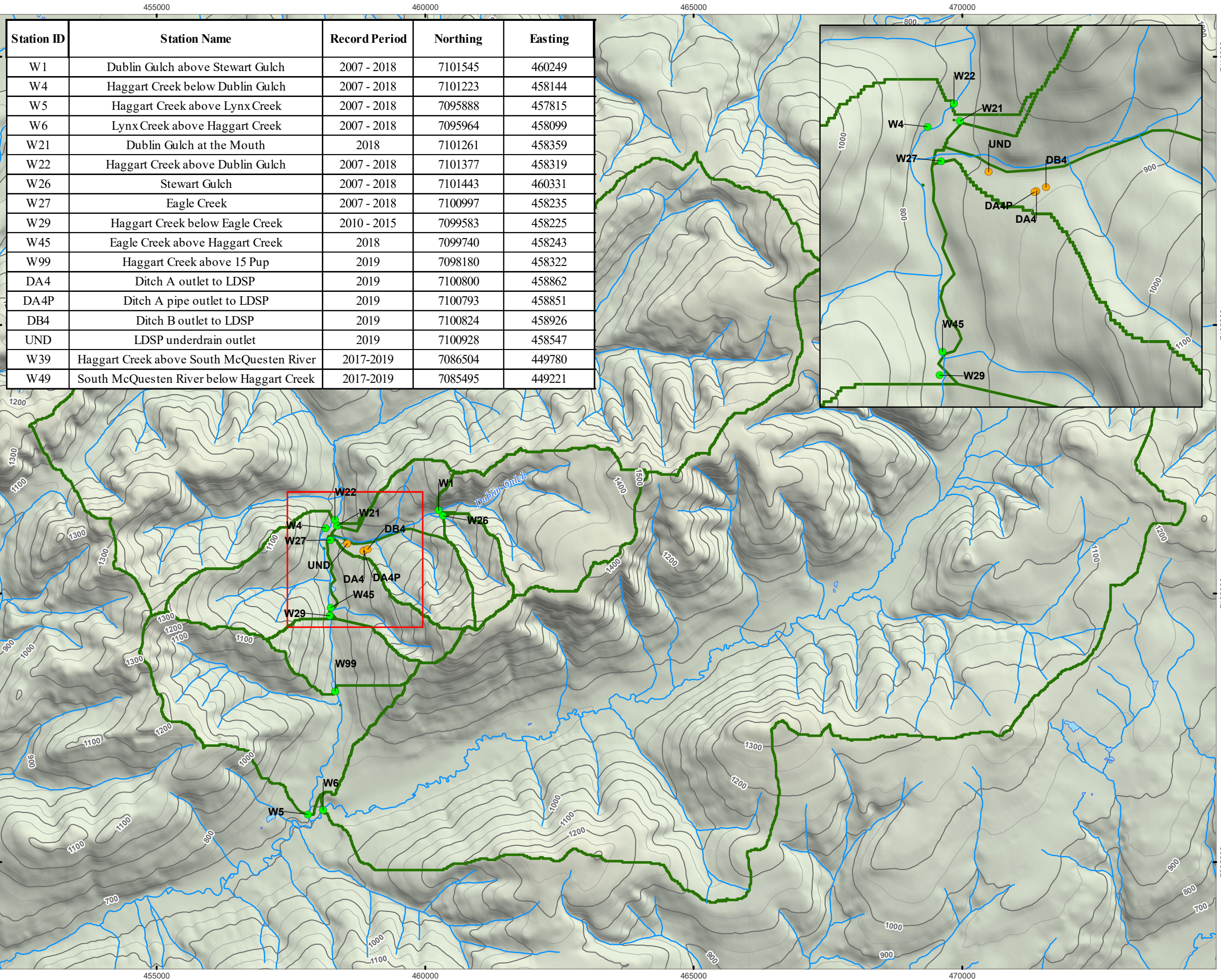
Notes:

1. Source of UTM co-ordinates, drainage area and median basin elevation (Knight-Piésold, 2013).
2. Water level sensor malfunctioned in 2019, therefore no continuous water level data are available for this year.
3. No continuous water level data are available for this station for 2016-2019, however manual measurements continue. See Section 2.2.3 for details.

**Table 2-2:
 Eagle Gold Project – additional flow monitoring stations specified in the EMSAMP**

Station ID	Station Name	UTM N	UTM E	Description
DA4*	Ditch A outlet to LDSP	7,100,800	458,862	Transfer between engineered structures
DA4P*	Ditch A pipe outlet to LDSP	7,100,793	458,851	Transfer between engineered structures
DB4*	Ditch B outlet to LDSP	7,100,824	458,926	Transfer between engineered structures
UND	LDSP underdrain outlet	7,100,928	458,547	Water management infrastructure
W23	Haggart Creek below Lynx Creek	7,095,683	457,790	Receiving Environment
W39	Haggart Creek above South McQuesten River	7,086,504	449,780	Receiving Environment
W49	South McQuesten River below Haggart Creek	7,085,495	449,221	Receiving Environment

*DA4 + DA4P + DB4 = LDSP (Lower Dublin Sediment Pond inflow)



Station ID	Station Name	Record Period	Northing	Easting
W1	Dublin Gulch above Stewart Gulch	2007 - 2018	7101545	460249
W4	Haggart Creek below Dublin Gulch	2007 - 2018	7101223	458144
W5	Haggart Creek above Lynx Creek	2007 - 2018	7095888	457815
W6	Lynx Creek above Haggart Creek	2007 - 2018	7095964	458099
W21	Dublin Gulch at the Mouth	2018	7101261	458359
W22	Haggart Creek above Dublin Gulch	2007 - 2018	7101377	458319
W26	Stewart Gulch	2007 - 2018	7101443	460331
W27	Eagle Creek	2007 - 2018	7100997	458235
W29	Haggart Creek below Eagle Creek	2010 - 2015	7099583	458225
W45	Eagle Creek above Haggart Creek	2018	7099740	458243
W99	Haggart Creek above 15 Pup	2019	7098180	458322
DA4	Ditch A outlet to LDSP	2019	7100800	458862
DA4P	Ditch A pipe outlet to LDSP	2019	7100793	458851
DB4	Ditch B outlet to LDSP	2019	7100824	458926
UND	LDSP underdrain outlet	2019	7100928	458547
W39	Haggart Creek above South McQuesten River	2017-2019	7086504	449780
W49	South McQuesten River below Haggart Creek	2017-2019	7085495	449221

LEGEND

- Continuous Hydrometric Station
- Manual Spot Flow Measurements
- Watershed Boundary
- Watercourse
- Waterbody
- Contour (100m)
- Contour (50m)

NOTES
Base data source:

STATUS
FOR INTERNAL USE ONLY

**EAGLE GOLD PROJECT
YUKON TERRITORY**

Hydrometric Station Network

PROJECTION Transverse Mercator UTM Zone 8	DATUM NAD83	CLIENT
Scale: 1:70,000 700 350 0 700 Metres		
FILE NO.		
PROJECT Eagle Gold	DWN GM	CKD SJ
OFFICE	DATE March 16, 2020	APVD DHF
		REV 1

Figure 1

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2.2.1 Hydrometric Station Summary

A brief summary of the hydrometric network history is provided below. Further details are available in the previous baseline reports listed in Section 1.2.

W1

- Installed in 2007 with a continuous water level recorder, staff guage, and stilling well and survey benchmarks
- Transducer malfunctions in 2013 and 2014 resulted in loss of data
- Channel bed can be unstable at high flows; channel condition reflects historical placer mining activity.
- The water level recorder returned inaccurate stage data for extended periods of time in 2019, and thus no continuous water level record is available from which to calculate discharge prior to August 5, 2019.

W4

- Installed in 2007 with a continuous water level recorder, staff guage, and stilling well and survey benchmarks
- Datalogger failure resulted in no continuous water level data for 2016

W5

- Installed in 2007 with a continuous water level recorder, staff guage, and stilling well and survey benchmarks
- Staff gauge was knocked over in the 2013 freshet and repaired in July 2013

W6

- Installed in 2007 with a continuous water level recorder, staff guage, and stilling well and survey benchmarks
- A portion of the 2014 record is influenced by a beaver dam located downstream of the control section – influence is minimal and it was possible to correct for the artificially elevated stage.

W21

- A staff gauge, stilling well and water level logger were installed on June 13, 2018.
- Six paired staff gauge:discharge measurements are available for this site, therefore the rating curve and estimated discharges are considered preliminary.
- The W21 water level logger experienced a malfunction in 2019 and no usable data were collected.

W22

- Installed in 2007 with a continuous water level recorder, staff gauge, and stilling well and survey benchmarks
- No data was available for 2011 due to a pressure transducer malfunction. The water level record estimated by Stantec was carried forward in this report.
- Staff gauge was knocked over in the 2013 freshet and repaired in July 2013

W26

- Manual measurements from 2007 to 2009, instrumented with a continuous water level recorder, staff gauge, and stilling well and survey benchmarks in 2009.
- V-notch weir installed in 2009, and replaced with a Parshall flume in August 2011
- Technical issues with datalogger installation in 2011 resulted in loss of continuous data – only manual measurements are available for this year.

W27

- Installed in 2007 with a continuous water level recorder, staff gauge, and stilling well and survey benchmarks however data is not reported due to apparent sedimentation in the stilling well resulting in a continuously rising water level
- V-notch weir installed in 2009, and replaced with a Parshall flume in August 2011
- Malfunction of pressure transducer in August 2015 resulted in loss of data for remainder of this year.
- Technical issues with datalogger and/or flume installation in 2018 resulted in loss of continuous water level data. Therefore, only manual measurements are available for this year.
- Issues with the datalogger resulted in loss of continuous water level data for the period of July 23 – August 31, 2019.

W29

- Manual measurements in 2010, instrumented with a continuous water level recorder, staff gauge, and stilling well and survey benchmarks in 2011
- Station was destroyed in the 2013 freshet, and a replacement pressure transducer was deployed on an anchor in the streambed just upstream; water levels were surveyed at the old location and the temporary installation to determine the required offset. A new stilling well was installed in July 2015 at the original gauge location.
- Datalogger malfunctions and channel stability issues, including frost jacking of the stilling well resulted in the loss of continuous water level data for 2016 through 2018.

- The stilling well and datalogger were decommissioned in 2019, and this station was replaced by W99.
- Manual measurements continue to be reported for this station in Table 3-11.

W45

- A staff gauge, stilling well and water level logger were installed on June 13, 2018
- Ten paired staff gauge:discharge measurements are available for this site, however there is not sufficient range in flow and stage data to develop a rating curve; thus only the stage data are provided with spot discharge measurements.
- As such, a continuous discharge record has not yet been developed for this station.

W99

- A staff gauge, stilling well and water level logger were installed on June 7, 2019
- Five paired staff gauge:discharge measurements are available for this site, therefore the rating curve and estimated discharges are considered preliminary.

The stations that were re-established in 2016 at Bawnboy Gulch upstream of Cascallen (W20) and Olive Gulch upstream of Dublin Gulch (W31) have water level records for 2016 and 2017, but these were not continued in 2018 or 2019. Further, neither station has sufficient manual flow and stage measurements with which to develop rating curves, and thus there are no continuous records of discharge for 2016 or 2017.

2.2.2 Manual Discharge Measurements

Over time, manual discharge measurements have been conducted using the following methods:

- Velocity area techniques using a current meter;
- Salt dilution;
- Calibrated V-notch weir;
- Calibrated Parshall flume;
- Bucket/Bag and stopwatch, and;
- Float-area method.

The majority of the manual discharge measurements were conducted using the velocity-area method, with approximately one quarter made using the salt dilution technique. Most winter measurements were made while ice encroached on the channel, and therefore salt dilution was the preferred method for winter flow measurements. Typically, one discharge measurement was made at each visit.

2.2.3 Stage Measurements and Corrections

All stations were instrumented with metric staff gauges, mounted to vertical angle iron in the stream channel, and regularly surveyed to nearby benchmarks. Continuously recording HOBO pressure transducers were installed in stilling wells and set to record water level every 15 minutes. These readings were corrected for fluctuations in barometric pressure in a post-processing step. During each site visit, the water level was noted on the staff gauge. These readings formed the basis for the continuous water level records, which were adjusted to match the manual stage readings. Regular surveys were conducted to determine the staff gauge zero datum and water level, and these measurements were used to correct the station records for changes due to shifts in the channel bed (*i.e.*, aggradation or scour), frost-jacking or station relocation following a high-magnitude flood event.

At each station, an annual offset was developed to bring the staff gauge measurements into line with the reference datum from the 2012 benchmark surveys. W27 was the exception, as no survey information was available for 2012, so 2009 was used as the benchmark reference year for this station following Knight Piésold (2013). In this way, the reference datum at each station was kept consistent for the duration of the record period, regardless of station location or streambed conditions.

Notable issues were encountered with the stage records in 2019 at W1 and W21 (water level record issues) and W6 (upward drifting water level record from July 2 onwards). The close correspondence in water level signatures between W4 and W6 allowed the W4 water level to be used to develop a W6 record from July 2019 onwards. There are now four consecutive years with no continuous water level at W29, as channel instability led to the rejection of the 2016 water level record, and in June 2017, the stilling well frost jacked completely out of the streambed. This station was located in a highly mobile channel that has not reached equilibrium yet, following historical placer mining disturbances, and is therefore challenging to gauge. This station was decommissioned and replaced by the new W99 station in 2019.

3. Climate Data Summary

3. Streamflow Record Development

3.1 General Approach

To develop continuous time-series of discharge for the Project streams, spot measurements of stage and discharge are combined with continuous water level records collected by the pressure transducers. Mathematical relationships are derived to describe the relationship between water level and discharge, and then applied to the continuous water level records to estimate discharge. By convention, assembled stage and discharge relationships are commonly referred to as rating curves, where the relationship between stage and discharge are unique and specific to each monitoring station.

3.2 Rating Curve Development

Adjustments for stage (Section 2.2.3) were made prior to the assembly of rating curves. Winter spot flow measurements provided information on the magnitude of winter discharge, but due to ice effects and greater measurement uncertainty for both stage and discharge, these measurements were not employed in the rating curve development process.

Rating curves were developed using the standard rating equation, and the coefficient, offset and exponent were selected to conform to hydraulic theory (*e.g.*, Maidment, 1993) and the stream channel properties.

$$Q = C(h - a)^n$$

Where:

Q = discharge (m³/s)

C = coefficient (function of channel geometry)

h = stage (m)

a = stage at point of zero flow, offset (m)

n = exponent (function of channel geometry)

The term C is usually 0.5 to 2.5 times the channel width at the control section, and n is often between 1.6 and 3 for moderate gradient streams. The BC RISC standards (RISC, 2009) state that ideally, a rating curve will be based on a minimum of 10 stage-discharge measurements. Given the long duration of monitoring activities at the Project site, all stations meet these guiding criteria, with the exceptions of W21 and W99. W21 was installed in 2018, and due to the limited record durations, the rating curve is based on six

paired measurements, respectively, and thus are considered preliminary. W99 was installed in 2019 and there are only five paired flow and stage measurements, so that the rating curve is still considered preliminary. Survey benchmarks are installed at both stations, and future measurements of level and discharge will be used to refine the rating curves, at which point the preliminary discharge records computed for 2019 will be updated.

3.3 Rating Curve Error

The overall quality of the discharge record can be assessed by reviewing the average and standard errors calculated from the differences between the measured discharges, and those estimated from the rating equation. A positive rating curve error is defined where the discharge calculated from the rating curve overestimates the value when compared to the measured discharge, and vice-versa for a negative error.

A summary of the error metrics for all stations is presented in Table 3-1, with reporting for each station in Table 3-2 through Table 3-10. Table 3-1 also reports rating curve control percentages by monitoring station. These values indicate the percent of time that a continuously recorded observation (15-minute intervals) falls between the highest and lowest manually recorded measurements for each monitoring station. For example, at the W6 station, 96% of the 15-minute water level measurements are lower than the highest recorded manual stage measurement. Therefore, the measurements used in the rating curve development are able to represent 96% of the entire continuous water level record, and only 4% of the continuous discharge data derived from the rating curve are based on an extrapolation beyond the highest manually recorded stage-discharge measurement.

For monitoring stations where effort is limited to manual flow measurements, period of record data for the stations are presented in Table 3-11 through Table 3-14.

Overall, the rating curves provide reasonable estimates of discharge across a wide range of flows at most of the Project stations. The rating curve errors presented in Table 3-1 indicate that the average errors are relatively low, ranging from -4% to 1%. The standard error, or the degree of variability about the average error values varies more between stations, from a high of 24% for station W1, to a low of 9% for station W6. Note that the W21 and W99 curves are currently comprised of less than ten paired stage: discharge measurements. Accordingly, these curves, and the hydrographs reported for W21 and W99, are considered preliminary and subject to change.

Rating curves for the site hydrometric stations are presented in Figure 3-1 through Figure 3-8. For the 2017 update, the rating equations were compared to those previously developed for each station to ensure that the coefficients and exponents were consistent through time. After examining the 2018 data, no further updates to the rating curves

developed in 2017 were necessary, and the same curves were applied to the 2018 continuous water level data. A similar conclusion was drawn based on inclusion of field data collected in 2019 within the rating relations per monitoring station. Note that because stations W26 and W27 are instrumented with Parshall flumes, rating curves were not developed for these stations. The rating curve plot and error table for the relatively new hydrometric station W99, are presented in Figure 3-8 and Table 3-13, and based on measurements collected in 2019.

**Table 3-1:
 Rating curve error metric summary for Eagle Gold Project
 site hydrometric stations**

Station	Measurements (n)	Average Error (%)	Standard Error (%)	Rating Curve Control
W1	41	-4%	24%	98%
W4	47	-1%	14%	98%
W5	40	1%	15%	97%
W6	34	-1%	9%	96%
W21	6	-4%	12%	79%
W22	40	1%	15%	100%
W26	32	--	--	100%
W27	48	--	--	100%
W29	18	-2%	10%	95%
W99	5	0%	9%	85%
Average	34	-1%	13%	95%

Notes:

1. Stations W26 and W27 currently have Parshall flumes installed, and therefore rating curves have not been developed for these sites as part of this baseline streamflow update.

**Table 3-2:
Station W1 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
8/14/2007	-	3.5	0.059	0.059	0%	
8/29/2007	-	3.494	0.062	0.055	-12%	
9/12/2007	-	3.513	0.063	0.068	8%	
9/26/2007	-	3.532	0.092	0.084	-9%	
10/19/2007	-	3.514	0.047	0.069	-	Stage affected by snow in channel
11/20/2007	Salt Dilution		0.04	-	-	Stage measurement not available
4/25/2008	Salt Dilution		0.015	-	-	Stage measurement not available
6/9/2008	-		0.072	-	-	Stage measurement not available
8/12/2008	-	3.614	0.177	0.175	-1%	Average of 2 measurements
10/20/2008	-	3.594	0.097	0.148	-	Stage affected by snow in channel
7/19/2009	Current Meter	3.467	0.045	0.039	-14%	
7/26/2009	-	3.454	0.032	0.032	1%	
8/9/2009	-	3.443	0.025	0.028	10%	
8/20/2009	-	3.438	0.044	0.025	-42%	
9/1/2009	Current Meter	3.459	0.074	0.035	-53%	
10/7/2009	Current Meter	3.447	0.055	0.029	-47%	
10/21/2009	-	3.455	0.036	0.033	-9%	
3/31/2010	Salt Dilution		0.021	-	-	Stage measurement not available
5/4/2010	-	3.520	0.055	0.074	-	Stage affected by snow in channel
6/1/2010	-	3.597	0.143	0.152	6%	
6/15/2010	-	3.558	0.113	0.108	-5%	
8/17/2010	-	3.542	0.234	0.092	-60%	
9/23/2010	-	3.509	-	0.065	-	Discharge measurement not available
10/19/2010	Salt Dilution	3.512	0.034	0.067	-	Stage affected by snow in channel
3/30/2011	Salt Dilution	-	0.017	-	-	Stage measurement not available
4/19/2011	Salt Dilution	3.450	0.021	0.031	-	Stage affected by snow in channel
5/4/2011	-	3.484	0.032	0.049	-	Stage affected by snow in channel
5/17/2011	Current Meter	3.593	0.147	0.147	0%	
5/18/2011	Current Meter	3.591	0.172	0.145	-16%	
6/7/2011	Current Meter	3.522	0.073	0.075	3%	
8/16/2011	Current Meter	3.573	0.190	0.124	-35%	
10/17/2011	Current Meter	3.535	0.084	0.086	3%	
11/16/2011	Salt Dilution	-	0.041	-	-	Stage measurement not available
12/6/2011	Salt Dilution	-	0.036	-	-	Stage measurement not available
4/18/2012	Salt Dilution	3.460	0.015	0.035	-	Stage affected by snow in channel
5/6/2012	Current Meter	3.469	0.023	0.040	-	Stage affected by snow in channel
8/15/2012	Current Meter	3.531	0.087	0.083	-5%	
10/16/2012	Current Meter	3.499	0.044	0.058	32%	
11/20/2012	Salt Dilution	-	0.033	-	-	Stage measurement not available
4/15/2013	Salt Dilution	-	0.010	-	-	Stage measurement not available
5/21/2013	Current Meter	0.099	0.051	0.069	34%	
7/25/2013	Current Meter	0.050	0.011	0.019	69%	
9/14/2013	Current Meter	0.064	0.039	0.030	-24%	
10/19/2013	Current Meter	0.065	0.036	0.031	-15%	
5/6/2014	Current Meter	-	0.381	-	-	Stage measurement not available
8/6/2014	Current Meter	0.083	0.055	0.049	-11%	
10/17/2014	-	0.095	-	-	-	Discharge measurement not available
6/18/2015	Current Meter	0.121	0.080	0.101	26%	
7/31/2015	Current Meter	0.159	0.181	0.169	-7%	
7/14/2016	Current Meter	0.178	0.202	0.210	4%	
7/15/2016	Salt dilution	-	0.374	-	-	Stage measurement not available
10/13/2016	Salt dilution	-	0.072	-	-	Stage measurement not available
3/15/2017	Salt dilution	-	0.019	-	-	Stage measurement not available
4/13/2017	Salt dilution	-	0.013	-	-	Stage measurement not available
5/3/2017	Salt dilution	-	0.040	-	-	Stage measurement not available
6/10/2017	Salt dilution	-	0.071	-	-	Stage measurement not available
8/3/2017	Salt dilution	0.078	0.045	0.043	-3%	
8/16/2017	Current Meter	0.079	0.045	0.045	-1%	
10/11/2017	Salt dilution	-	0.167	-	-	Stage affected by ice in channel
12/6/2017	Salt dilution	-	0.040	-	-	Stage affected by ice in channel
1/28/2018	Salt dilution	-	0.021	-	-	Stage affected by ice in channel
3/22/2018	Salt dilution	-	0.013	-	-	Stage affected by ice in channel
4/24/2018	Salt dilution	-	0.011	-	-	Stage affected by ice in channel
8/19/2018	Current Meter	0.118	0.108	9%	-14%	
8/19/2018	Salt dilution	0.119	0.096	9%	-1%	
8/26/2018	Salt dilution	0.147	0.117	14%	23%	
9/22/2018	Salt dilution	0.100	0.085	7%	-21%	
10/12/2018	Salt dilution	-	0.048	-	-	Stage affected by ice in channel
11/9/2018	Salt dilution	-	0.030	-	-	Stage affected by ice in channel
11/23/2018	Salt dilution	-	0.023	-	-	Stage affected by ice in channel
12/3/2018	Salt dilution	-	0.026	-	-	Stage affected by ice in channel
12/18/2018	Salt dilution	-	0.021	-	-	Stage affected by ice in channel
1/15/2019	Salt dilution	-	0.016	-	-	Stage affected by ice in channel
1/22/2019	Salt dilution	-	0.021	-	-	Stage affected by ice in channel
2/4/2019	Salt dilution	-	0.017	-	-	Stage affected by ice in channel
2/24/2019	Salt dilution	-	0.017	-	-	Stage affected by ice in channel

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
3/4/2019	Salt dilution	-	0.011	-	-	Stage affected by ice in channel
3/15/2019	Salt dilution	-	0.012	-	-	Stage affected by ice in channel
4/10/2019	Salt dilution	-	0.011	-	-	Stage affected by ice in channel
4/16/2019	Salt dilution	-	0.012	-	-	Stage affected by ice in channel
4/23/2019	Salt dilution	-	0.011	-	-	Stage affected by ice in channel
5/1/2019	Salt dilution	-	0.006	-	-	Stage affected by ice in channel
5/4/2019	Salt dilution	-	0.012	-	-	Stage measurement not available
6/3/2019	Salt dilution	-	0.061	-	-	Stage measurement not available
7/1/2019	Salt dilution	0.072	0.037	4%	-3%	
8/5/2019	Salt dilution	0.063	0.026	3%	5%	
9/7/2019	Salt dilution	0.061	0.025	3%	1%	
10/1/2019	Salt dilution	0.076	0.044	4%	-10%	
10/8/2019	Salt dilution	0.079	0.035	4%	20%	
10/8/2019	Salt dilution	-	0.035	-	-	Stage measurement not available
12/3/2019	Salt dilution	-	0.002	-	-	Stage affected by ice in channel
Average Error (%)					-4%	
Standard Error (%)					24%	

Notes:

1. Measurements highlighted in grey were conducted in ice-affected waters, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2019 are the staff gauge readings relative to the staff gauge datum from 2012.

**Table 3-3:
Station W4 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
8/13/2007	-	-	0.701	-	-	Stage measurement not available
8/15/2007	-	3.046	0.693	0.665	-4%	
8/28/2007	-	3.033	0.631	0.594	-6%	
9/11/2007	-	3.073	0.810	0.829	2%	
9/25/2007	-	3.091	0.737	-	-	Stage affected by snow in channel
10/19/2007	-	3.048	0.442	-	-	Stage affected by snow in channel
11/21/2007	-	-	0.360	-	-	Stage measurement not available
4/25/2008	Salt Dilution	-	0.050	-	-	Stage measurement not available
6/9/2008	-	3.056	0.740	0.724	-2%	
8/12/2008	-	3.164	1.575	1.543	-2%	
10/21/2008	-	3.104	0.926	-	-	Stage affected by snow in channel
7/18/2009	Current Meter	2.983	0.361	0.362	0%	
7/26/2009	Current Meter	2.966	0.303	0.298	-2%	
8/9/2009	Current Meter	2.973	0.298	0.323	8%	
8/20/2009	Current Meter	2.973	0.344	0.323	-6%	
9/2/2009	Current Meter	3.040	0.834	0.632	-24%	
10/7/2009	Current Meter	3.008	0.449	0.469	5%	
10/21/2009	Current Meter	2.999	0.430	0.429	0%	
5/4/2010	Current Meter	3.078	0.970	0.862	-11%	
6/15/2010	-	3.109	1.122	1.081	-4%	
8/17/2010	-	3.053	0.619	0.706	14%	
9/23/2010	-	3.024	-	-	-	Discharge measurement not available
10/19/2010	-	2.406	0.294	-	-	Stage affected by snow in channel
1/27/2011	Salt Dilution	-	0.187	-	-	Stage measurement not available
3/30/2011	Salt Dilution	-	0.212	-	-	Stage measurement not available
4/19/2011	Salt Dilution	-	0.229	-	-	Stage measurement not available
5/4/2011	Current Meter	3.128	0.445	-	-	Stage affected by snow in channel
5/17/2011	Current Meter	3.295	2.050	3.051	49%	
5/18/2011	Current Meter	3.554	-	-	-	Discharge measurement not available
6/7/2011	Current Meter	3.072	0.724	0.823	14%	
6/28/2011	Current Meter	3.032	0.741	0.589	-21%	
8/16/2011	Current Meter	3.169	1.970	1.590	-19%	
10/17/2011	Current Meter	3.065	0.591	0.778	32%	
11/16/2011	Salt Dilution	-	0.333	-	-	Stage measurement not available
12/6/2011	Salt Dilution	-	0.248	-	-	Stage measurement not available
2/14/2012	Salt Dilution	-	0.169	-	-	Stage measurement not available
4/17/2012	Salt Dilution	2.968	0.167	-	-	Stage affected by snow in channel
5/4/2012	Current Meter	3.069	0.759	0.804	6%	
8/15/2012	Current Meter	3.056	0.738	0.724	-2%	
10/16/2012	Current Meter	3.027	0.478	0.562	18%	
11/20/2012	Salt Dilution	-	0.277	-	-	Stage affected by snow in channel
2/19/2013	Salt Dilution	-	0.216	-	-	Stage measurement not available
5/21/2013	Current Meter	0.318	1.183	1.178	0%	
7/24/2013	Current Meter	0.160	0.322	0.325	1%	
9/14/2013	Current Meter	0.236	0.696	0.673	-3%	
10/19/2013	Current Meter	0.171	0.370	0.368	0%	
5/7/2014	-	0.485	-	-	-	Discharge measurement not available
8/6/2014	Current Meter	0.183	0.416	0.418	1%	
10/17/2014	Current Meter	0.212	0.707	0.551	-22%	
6/18/2015	Current Meter	0.234	0.699	0.663	-5%	
7/31/2015	Current Meter	0.349	1.609	1.402	-13%	
10/14/2015	-	0.251	-	-	-	Discharge measurement not available
7/14/2016	Current Meter	0.263	0.911	0.825	-9%	

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
3/15/2017	Current Meter	-	0.054	-	-	
4/13/2017	Current Meter	-	0.150	-	-	
6/8/2017	Current Meter	0.251	0.822	0.756	-8%	
8/3/2018	Current Meter	0.231	0.797	0.647	-19%	
8/16/2017	Current Meter	0.190	0.376	0.449	19%	
10/11/2017	Current Meter	0.265	0.832	0.837	1%	
12/5/2017	Current Meter	-	0.294	-	-	Stage affected by ice in channel
1/28/2018	Current Meter	-	0.198	-	-	Stage affected by ice in channel
2/13/2018	Current Meter	-	0.203	-	-	Stage affected by ice in channel
3/20/2018	Current Meter	-	0.162	-	-	Stage affected by ice in channel
4/25/2018	Current Meter	-	0.151	-	-	Stage affected by ice in channel
5/16/2018	Current Meter	0.500	3.271	2.797	-14%	
6/11/2018	Current Meter	0.371	1.827	1.609	-12%	
7/22/2018	Current Meter	0.218	0.618	0.600	-3%	
8/21/2018	Current Meter	0.261	0.851	0.838	-2%	
9/9/2018	Current Meter	0.258	0.777	0.820	6%	
10/24/2018	Current Meter	-	0.395	-	-	Stage affected by ice in channel
11/6/2018	Current Meter	-	0.275	-	-	Stage affected by ice in channel
11/25/2018	Current Meter	-	0.289	-	-	Stage affected by ice in channel
12/3/2018	Current Meter	-	0.250	-	-	Stage affected by ice in channel
12/17/2018	Current Meter	-	0.251	-	-	Stage affected by ice in channel
1/12/2019	Salt Dilution	-	0.291	-	-	Stage measurement not available
1/22/2019	Salt Dilution	-	0.225	-	-	Stage measurement not available
2/15/2019	Salt Dilution	-	0.160	-	-	Stage measurement not available
2/24/2019	Salt Dilution	-	0.166	-	-	Stage measurement not available
3/4/2019	Salt Dilution	-	0.165	-	-	Stage measurement not available
3/15/2019	Salt Dilution	-	0.160	-	-	Stage measurement not available
4/3/2019	Salt Dilution	-	0.187	-	-	Stage measurement not available
4/15/2019	Salt Dilution	-	0.166	-	-	Stage measurement not available
4/23/2019	Salt Dilution	-	0.201	-	-	Stage measurement not available
4/26/2019	Salt Dilution	-	0.200	-	-	Stage measurement not available
5/5/2019	Current Meter	0.100	0.195	0.142	-27%	
6/3/2019	Current Meter	0.275	1.000	0.923	-8%	
7/2/2019	Current Meter	0.161	0.293	0.342	17%	
8/2/2019	Current Meter	0.178	0.349	0.412	18%	
9/6/2019	Current Meter	0.134	0.230	0.243	6%	
10/3/2019	Salt Dilution	0.171	0.373	0.383	2%	
10/16/2019	Salt Dilution	-	0.336	-	-	Stage measurement not available
11/1/2019	Salt Dilution	-	0.174	-	-	Stage affected by ice in channel
12/3/2019	Salt Dilution	-	0.175	-	-	Stage affected by ice in channel
Average Error (%)					-1%	
Standard Error (%)					14%	

Notes:

1. Measurements highlighted in grey were conducted in ice-affected waters, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2019 are the staff gauge readings relative to the staff gauge datum from 2012.

**Table 3-4:
Station W5 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
8/12/2007	-	-	0.744	-	-	Stage measurement not available
8/28/2007	-	3.510	0.689	0.691	0%	
9/11/2007	-	3.546	0.896	0.914	2%	
9/25/2007	-	3.559	0.873	1.001	15%	
10/20/2007	-	3.699	0.323	-	-	Stage affected by snow in channel
11/21/2007	Salt Dilution	-	0.280	-	-	Stage measurement not available
4/25/2008	Salt Dilution	-	0.282	-	-	Stage measurement not available
6/10/2008	-	3.506	0.653	0.668	2%	
8/13/2008	-	-	1.900	-	-	Stage measurement not available
10/21/2008	-	3.633	1.230	-	-	Stage affected by snow in channel
7/20/2009	Current Meter	3.499	0.452	0.629	39%	
7/26/2009	-	3.476	0.419	0.507	21%	
8/9/2009	-	3.462	0.385	0.439	14%	
8/20/2009	-	3.456	0.458	0.411	-10%	
9/2/2009	Current Meter	3.526	0.895	0.787	-12%	
10/7/2009	Current Meter	3.473	0.605	0.492	-19%	
10/22/2009	-	3.573	0.466	-	-	Stage affected by snow in channel
5/4/2010	-	-	1.166	-	-	Stage measurement not available
5/30/2010	-	3.617	1.486	1.431	-4%	
6/15/2010	-	3.583	1.043	1.17	12%	
8/17/2010	-	3.509	0.674	0.686	2%	
5/17/2011	-	3.864	3.799	3.987	5%	
6/8/2011	-	3.532	0.868	0.824	-5%	
6/29/2011	Current Meter	3.523	0.965	0.769	-20%	
8/19/2011	-	3.609	1.357	1.367	1%	
10/18/2011	-	3.528	0.778	0.799	3%	
5/4/2012	Current Meter	3.579	1.285	1.141	-11%	
7/18/2012	-	3.612	-	-	-	Discharge measurement not available

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
8/16/2012	Current Meter	3.553	0.963	0.960	0%	
9/19/2012	-	3.503	-	-	-	Discharge measurement not available
10/17/2012	Current Meter	3.532	0.578	-	-	Stage affected by snow in channel
11/20/2012	Salt Dilution	-	0.278	-	-	Stage measurement not available
5/22/2013	Current Meter	0.280	1.877	1.801	-4%	
8/5/2013	-	0.120	-	-	-	
9/14/2013	Current Meter	0.195	0.948	0.918	-3%	
10/20/2013	Current Meter	0.145	0.510	0.528	4%	
8/5/2014	Current Meter	0.152	0.570	0.577	1%	
10/17/2014	Current Meter	0.185	0.864	0.832	-4%	
6/19/2015	Current Meter	0.175	0.735	0.750	2%	
7/30/2015	Current Meter	0.308	2.032	2.150	6%	
10/14/2015	-	0.200	-	-	-	Discharge measurement not available
7/13/2016	Current Meter	0.219	1.126	1.139	1%	
6/9/2017	Current Meter	0.193	0.933	0.900	-4%	
8/2/2017	Current Meter	0.147	0.607	0.542	-11%	
8/18/2017	Current Meter	0.144	0.580	0.522	-10%	
10/14/2017	Current Meter	-	1.143	-	-	Stage affected by ice in channel
12/6/2017	Salt Dilution	-	0.314	-	-	Stage affected by ice in channel
1/28/2018	Salt Dilution	-	0.219	-	-	Stage affected by ice in channel
5/17/2018	Current Meter	0.450	-	-	-	
6/13/2018	Current Meter	0.279	1.594	1.788	12%	
7/30/2018	Current Meter	0.139	0.516	0.488	-5%	
8/21/2018	Current Meter	0.219	0.993	1.139	15%	
9/10/2018	Current Meter	0.216	0.878	1.110	26%	
10/16/2018	Current Meter	-	0.308	-	-	Stage affected by ice in channel
11/30/2018	Salt Dilution	-	0.402	-	-	Stage affected by ice in channel
12/6/2018	Salt Dilution	-	0.475	-	-	Stage affected by ice in channel
12/18/2018	Salt Dilution	-	0.512	-	-	Stage affected by ice in channel
1/12/2019	Salt Dilution	-	0.377	-	-	Stage affected by ice in channel
1/26/2019	Salt Dilution	-	0.370	-	-	Stage affected by ice in channel
2/19/2019	Salt Dilution	-	0.155	-	-	Stage affected by ice in channel
2/25/2019	Salt Dilution	-	0.169	-	-	Stage affected by ice in channel
4/14/2019	Salt Dilution	-	0.379	-	-	Stage affected by ice in channel
5/3/2019	Salt Dilution	-	0.683	-	-	Stage measurement not available
6/2/2019	Current Meter	0.397	2.871	3.450	20%	
7/2/2019	Current Meter	0.121	0.386	0.377	-2%	
8/2/2019	Current Meter	0.090	0.328	0.217	-34%	
9/5/2019	Current Meter	0.080	0.275	0.174	-36%	
10/2/2019	Salt Dilution	0.151	0.455	0.570	25%	
10/7/2019	Salt Dilution	0.189	-	-	-	Discharge measurement not available
11/1/2019	Salt Dilution	-	0.191	-	-	Stage affected by ice in channel
11/5/2019	Salt Dilution	-	0.022	-	-	Stage affected by ice in channel
12/2/2019	Salt Dilution	-	0.099	-	-	Stage affected by ice in channel
Average Error (%)					1%	
Standard Error (%)					15%	

Notes:

1. Measurements highlighted in grey were conducted in ice-affected waters, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2019 are the staff gauge readings relative to the staff gauge datum from 2012.

**Table 3-5:
Station W6 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
8/28/2007	-	3.820	0.872	0.850	-2%	
9/11/2007	-	3.901	1.399	1.291	-8%	
9/25/2007	-	3.880	1.059	1.169	10%	
10/20/2007	-	3.787	0.231	-	-	Stage affected by snow in channel
11/21/2007	Salt Dilution	-	0.274	-	-	Stage measurement not available
4/25/2008	Salt Dilution	-	0.335	-	-	Stage measurement not available
6/10/2008	-	3.720	0.433	0.422	-3%	
8/13/2008	-	-	1.810	-	-	Stage measurement not available
10/21/2008	-	3.893	1.179	-	-	Stage affected by snow in channel
7/20/2009	Current Meter	3.701	0.408	0.356	-13%	
7/26/2009	-	3.715	0.533	0.404	-24%	
8/9/2009	-	3.710	0.343	0.386	13%	
8/20/2009	-	3.753	0.499	0.549	10%	
9/2/2009	Current Meter	3.873	1.161	1.130	-3%	
10/7/2009	Current Meter	-	0.771	-	-	Stage measurement not available
10/22/2009	-	-	0.521	-	-	Stage measurement not available
5/4/2010	-	-	2.474	-	-	Stage measurement not available
5/30/2010	-	3.807	0.824	0.787	-4%	
6/15/2010	-	3.846	1.003	0.983	-2%	
8/17/2010	-	3.763	0.550	0.590	7%	
10/19/2010	-	3.460	0.379	-	-	Stage affected by snow in channel
6/9/2011	-	-	0.962	-	-	Stage measurement not available
6/29/2011	Current Meter	2.905	1.216	-	-	Stage affected by snow in channel
8/19/2011	-	3.894	1.253	1.250	0%	
10/18/2011	-	3.786	0.703	0.690	-2%	
5/4/2012	Current Meter	3.959	1.806	1.656	-8%	
7/18/2012	-	3.987	-	-	-	Discharge measurement not available
8/16/2012	-	3.838	0.929	0.941	1%	
9/19/2012	-	3.817	-	0.836	-	Discharge measurement not available
10/17/2012	-	3.781	-	0.667	-	Discharge measurement not available
5/22/2013	Current Meter	0.453	2.971	2.650	-11%	
7/25/2013	-	0.172	-	-	-	Discharge measurement not available
9/14/2013	Current Meter	0.286	1.171	1.227	5%	
10/20/2013	Current Meter	0.196	0.699	0.652	-7%	
8/5/2014	Current Meter	0.245	0.449	-	-	Beaver dam downstream of gauge site, therefore unreliable stage.
10/17/2014	Current Meter	0.250	0.973	0.980	1%	
6/19/2015	Current Meter	0.201	0.702	0.680	-3%	
7/30/2015	Current Meter	0.271	1.173	1.121	-4%	
7/13/2016	Current Meter	0.317	1.345	1.458	8%	
6/9/2017	Current Meter	0.212	0.780	0.743	-5%	
8/2/2017	Current Meter	0.174	0.517	0.534	3%	
8/18/2017	Current Meter	0.177	0.449	0.550	22%	
9/22/2017	Current Meter	0.263	1.161	1.067	-8%	
10/14/2017	Current Meter	-	0.563	0.993	-	Stage affected by ice in channel
12/6/2017	Salt Dilution	-	0.365	-	-	Stage affected by ice in channel
1/28/2018	Salt Dilution	-	0.310	-	-	Stage affected by ice in channel
6/13/2018	Current Meter	0.314	1.437	1.457	1%	
7/30/2018	Current Meter	0.123	0.405	0.306	-24%	
8/21/2018	Current Meter	0.213	0.762	0.764	0%	
9/10/2018	Current Meter	0.238	0.864	0.919	6%	
10/16/2018	Current Meter	-	0.390	-	-	Stage affected by ice in channel
11/30/2018	Salt Dilution	-	0.402	-	-	Stage affected by ice in channel
12/13/2018	Salt Dilution	-	0.235	-	-	Stage affected by ice in channel
12/18/2018	Salt Dilution	-	0.268	-	-	Stage affected by ice in channel
1/12/2019	Salt Dilution	-	0.221	-	-	Stage affected by ice in channel
1/27/2019	Salt Dilution	-	0.219	-	-	Stage affected by ice in channel
2/21/2019	Salt Dilution	-	0.148	-	-	Stage affected by ice in channel
2/25/2019	Salt Dilution	-	0.155	-	-	Stage affected by ice in channel
5/8/2019	Salt Dilution	-	2.802	-	-	Stage affected by ice in channel
6/2/2019	Current Meter	-	2.900	-	-	Stage measurement not available
7/2/2019	Current Meter	0.111	0.258	0.258	0%	
8/2/2019	Current Meter	0.112	0.256	0.262	2%	
9/5/2019	Current Meter	-	0.258	-	-	Stage measurement not available
10/2/2019	Salt Dilution	0.151	0.406	0.431	6%	
Average Error (%)					-1%	
Standard Error (%)					9%	

Notes:

1. Measurements highlighted in grey were conducted in ice-affected waters, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2019 are the staff gauge readings relative to the staff gauge datum from 2012.

**Table 3-6:
Station W21 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
8/15/2007	Current Meter	-	0.059	-	-	Staff gauge not installed yet
8/28/2007	Current Meter	-	0.05	-	-	Staff gauge not installed yet
9/11/2007	Current Meter	-	0.071	-	-	Staff gauge not installed yet
9/25/2007	Current Meter	-	0.099	-	-	Staff gauge not installed yet
10/19/2007	Current Meter	-	0.043	-	-	Staff gauge not installed yet
11/21/2007	Current Meter	-	0.02	-	-	Staff gauge not installed yet
8/12/2008	Current Meter	-	0.25	-	-	Staff gauge not installed yet
10/21/2008	Current Meter	-	0.098	-	-	Staff gauge not installed yet
7/18/2009	Current Meter	0.150	0.012	-	-	
7/26/2009	Current Meter	0.150	0.008	-	-	
8/9/2009	Current Meter	0.130	0.008	-	-	
8/20/2009	Current Meter	0.160	0.012	-	-	
9/1/2009	Current Meter	0.200	0.067	-	-	
10/20/2009	Current Meter	0.274	0.362	-	-	
12/5/2017	Salt Dilution	-	0.031	-	-	Staff gauge not installed yet
4/24/2018	Salt Dilution	-	0.032	-	-	Staff gauge not installed yet
5/16/2018	Current Meter	-	0.485	-	-	Staff gauge not installed yet
6/11/2018	Current Meter	0.335	0.205	0.206	0%	
8/19/2018	Current Meter	0.302	0.139	0.130	-7%	
9/22/2018	Current Meter	0.291	0.109	0.106	-3%	
10/12/2018	Current Meter	0.273	0.064	0.069	9%	
12/3/2018	Salt Dilution	-	0.024	-	-	Stage affected by ice in channel
12/18/2018	Salt Dilution	-	0.023	-	-	Stage affected by ice in channel
1/15/2019	Salt Dilution	-	0.016	-	-	Stage affected by ice in channel
1/15/2019	Salt Dilution	-	0.010	-	-	Stage affected by ice in channel
1/21/2019	Salt Dilution	-	0.013	-	-	Stage affected by ice in channel
2/25/2019	Salt Dilution	-	0.007	-	-	Stage affected by ice in channel
4/15/2019	Salt Dilution	-	0.021	-	-	Stage affected by ice in channel
4/23/2019	Salt Dilution	-	0.024	-	-	Stage affected by ice in channel
5/4/2019	Salt Dilution	-	0.017	-	-	Stage affected by ice in channel
5/8/2019	Salt Dilution	-	0.019	-	-	Stage measurement not available
5/24/2019	Salt Dilution	-	0.086	-	-	Stage measurement not available
5/27/2019	Salt Dilution	-	0.048	-	-	Stage measurement not available
6/3/2019	Salt Dilution	0.265	0.072	0.054	-25%	
7/5/2019	Salt Dilution	-	0.030	-	-	Stage measurement not available
8/6/2019	Salt Dilution	-	0.018	-	-	Stage measurement not available
9/19/2019	Salt Dilution	0.288	0.100	0.100	0%	
10/1/2019	Salt Dilution	-	0.036	-	-	Stage measurement not available
10/8/2019	Salt Dilution	-	0.016	-	-	Stage measurement not available
11/5/2019	Salt Dilution	-	0.014	-	-	Stage affected by ice in channel
12/3/2019	Salt Dilution	-	0.001	-	-	Stage affected by ice in channel
Average Error (%)					-4%	
Standard Error (%)					12%	

Notes:

¹A rating curve for W21 was not developed in 2009, and no continuous discharge record is available for 2007-2009, therefore no error metrics are reported for this period.

**Table 3-7:
Station W22 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
8/13/2007	-	-	0.597	-	-	Stage measurement not available
8/15/2007	-	2.846	0.577	0.515	-11%	
8/28/2007	-	2.831	0.538	0.414	-23%	
9/11/2007	-	2.898	0.684	0.941	38%	
9/25/2007	-	2.877	0.641	0.755	18%	
10/19/2007	-	2.873	0.372	-	-	Stage affected by snow in channel
11/21/2007	Salt Dilution	-	0.343	-	-	Stage measurement not available
4/25/2008	Salt Dilution	-	0.266	-	-	Stage measurement not available
6/9/2008	-	2.866	0.688	0.666	-3%	
8/12/2008	-	2.927	1.237	1.226	-1%	
10/21/2008	-	2.936	0.741	-	-	Stage affected by snow in channel
4/21/2009	Salt Dilution	1.570	0.191	-	-	Stage affected by snow in channel
7/18/2009	Current Meter	2.809	0.749	0.284	-62%	
7/26/2009	-	2.809	0.294	0.284	-4%	
8/9/2009	-	2.810	0.278	0.289	4%	
8/20/2009	-	2.811	0.276	0.295	7%	
9/1/2009	Current Meter	2.874	0.749	0.730	-2%	
10/7/2009	Current Meter	2.824	0.361	0.370	3%	
3/31/2010	Salt Dilution	-	0.173	-	-	Stage measurement not available
5/4/2010	-	2.873	0.915	0.722	-21%	
6/15/2010	-	2.905	0.791	1.006	27%	
8/17/2010	-	2.847	0.531	0.522	-2%	
9/23/2010	-	2.816	-	-	-	Discharge measurement not available
10/19/2010	-	2.910	0.265	-	-	Stage affected by snow in channel
1/27/2011	Salt Dilution	-	0.158	-	-	Stage measurement not available
3/30/2011	Salt Dilution	-	0.203	-	-	Stage measurement not available

4/19/2011	Salt Dilution	-	0.194	-	-	Stage measurement not available
5/4/2011	Current Meter	2.975	0.418	-	-	Stage affected by snow in channel
5/17/2011	-	2.964	2.010	-	-	Uncertainty in dataset
5/18/2011	-	2.936	4.989	-	-	Uncertainty in dataset
6/7/2011	-	2.856	0.567	-	-	Uncertainty in dataset
6/28/2011	Current Meter	3.099	0.676	-	-	Uncertainty in dataset
8/16/2011	-	2.968	1.655	-	-	Uncertainty in dataset
10/17/2011	Current Meter	2.962	0.523	-	-	Stage affected by snow in channel
11/16/2011	Salt Dilution	-	0.288	-	-	Stage measurement not available
12/6/2011	Salt Dilution	-	0.207	-	-	Stage measurement not available
3/19/2012	Salt Dilution	-	0.154	-	-	Stage measurement not available
4/17/2012	Salt Dilution	2.790	0.117	-	-	Stage affected by snow in channel
5/4/2012	Current Meter	2.876	0.737	0.747	1%	
7/18/2012	-	2.924	1.055	1.195	13%	
8/15/2012	Current Meter	2.860	0.609	0.619	2%	
9/19/2012	-	2.841	-	-	-	Discharge measurement not available
10/16/2012	Current Meter	2.827	0.403	0.389	-4%	
11/20/2012	Salt Dilution	-	0.245	-	-	Stage measurement not available
12/17/2012	Salt Dilution	-	0.258	-	-	Stage measurement not available
2/19/2013	Salt Dilution	-	0.216	-	-	Stage measurement not available
4/15/2013	Salt Dilution	-	0.159	-	-	Stage measurement not available.
5/21/2013	Current Meter	0.215	0.994	0.935	-6%	
7/24/2013	Current Meter	-	0.264	-	-	Stage measurement not available
8/4/2013	-	0.105	-	-	-	Discharge measurement not available
9/14/2013	Current Meter	0.183	0.698	0.699	0%	
10/19/2013	Current Meter	0.113	0.309	0.293	-5%	
8/6/2014	Current Meter	0.135	0.391	0.404	3%	
10/17/2014	Current Meter	0.165	0.587	0.580	-1%	
6/18/2015	Current Meter	0.178	0.633	0.665	5%	
7/31/2015	Current Meter	0.261	1.379	1.326	-4%	
10/14/2015	-	0.191	-	-	-	Discharge measurement not available
7/14/2016	Current Meter	0.193	0.731	0.769	5%	
5/4/2017	Current Meter	-	0.748	-	-	Stage measurement ice affected
6/8/2017	Current Meter	0.190	0.718	0.748	4%	
8/4/2017	Current Meter	0.155	0.471	0.518	10%	
8/16/2017	Current Meter	0.130	0.377	0.377	0%	
10/11/2017	Current Meter	-	0.698	-	-	Stage affected by ice in channel
12/6/2017	Salt Dilution	-	0.241	-	-	Stage affected by ice in channel
1/28/2018	Salt Dilution	-	0.176	-	-	Stage affected by ice in channel
2/13/2018	Salt Dilution	-	0.182	-	-	Stage affected by ice in channel
3/20/2018	Salt Dilution	-	0.172	-	-	Stage affected by ice in channel
4/25/2018	Current Meter	-	0.098	-	-	Stage affected by ice in channel
5/16/2018	Current Meter	0.410	3.015	2.971	-0.015	
6/11/2018	Current Meter	0.261	1.544	1.311	-0.151	
7/22/2018	Current Meter	0.151	0.473	0.486	0.028	
8/21/2018	Current Meter	0.200	0.760	0.809	0.065	
9/9/2018	Current Meter	0.190	0.660	0.738	0.117	
10/24/2018	Current Meter	-	0.065	-	-	Stage affected by ice in channel
11/6/2018	Salt Dilution	-	0.249	-	-	Stage affected by ice in channel
11/25/2018	Salt Dilution	-	0.189	-	-	Stage affected by ice in channel
12/3/2018	Salt Dilution	-	0.235	-	-	Stage affected by ice in channel
12/17/2018	Salt Dilution	-	0.216	-	-	Stage affected by ice in channel
1/15/2019	Salt Dilution	-	0.153	-	-	Stage measurement not available
1/26/2019	Salt Dilution	-	0.215	-	-	Stage measurement not available
1/26/2019	Salt Dilution	-	0.226	-	-	Stage measurement not available
2/19/2019	Salt Dilution	-	0.341	-	-	Stage measurement not available
2/25/2019	Salt Dilution	-	0.097	-	-	Stage measurement not available
3/4/2019	Salt Dilution	-	0.111	-	-	Stage measurement not available
3/15/2019	Salt Dilution	-	0.132	-	-	Stage measurement not available
4/3/2019	Salt Dilution	-	0.116	-	-	Stage measurement not available
4/15/2019	Salt Dilution	-	0.093	-	-	Stage measurement not available
4/23/2019	Salt Dilution	-	0.287	-	-	Stage measurement not available
4/26/2019	Salt Dilution	-	0.140	-	-	Stage measurement not available
5/5/2019	Salt Dilution	-	0.169	-	-	Stage affected by ice in channel
6/3/2019	Current Meter	0.228	1.030	1.026	0%	
7/2/2019	Current Meter	0.122	0.307	0.331	8%	
8/2/2019	Current Meter	0.109	0.237	0.270	14%	
9/6/2019	Current Meter	0.095	0.233	0.210	-10%	
10/3/2019	Salt Dilution	0.132	0.331	0.381	15%	
10/7/2019	Salt Dilution	-	0.545	-	-	Stage affected by ice in channel
11/1/2019	Salt Dilution	-	0.165	-	-	Stage measurement not available
12/3/2019	Salt Dilution	-	0.185	-	-	Stage measurement not available
Average Error (%)					1%	
Standard Error (%)					15%	

Notes:

1. Measurements highlighted in grey were conducted in ice-affected waters, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2019 are the staff gauge readings relative to the staff gauge datum from 2012.

**Table 3-8:
Station W23 – Discharge Measurement Summary**

Date	Method	Discharge (m ³ /s)	Date	Method	Discharge (m ³ /s)
2007-08-12	Current Meter	1.584	2018-01-28	Current Meter	0.478
2007-08-28	Current Meter	1.695	2018-02-13	Current Meter	0.565
2007-09-11	Current Meter	2.261	2018-04-25	Current Meter	0.392
2007-09-25	Current Meter	2.025	2018-06-13	Current Meter	3.031
2007-10-20	Current Meter	0.634	2018-07-22	Current Meter	1.125
2008-04-25	Current Meter	0.659	2018-08-20	Current Meter	1.801
2008-06-10	Current Meter	1.139	2018-10-14	Current Meter	0.963
2008-08-13	Current Meter	4.048	2018-12-06	Current Meter	0.517
2008-10-21	Current Meter	2.125	2019-01-18	Salt Dilution	0.716
2009-04-22	Salt Dilution	0.551	2019-02-19	Salt Dilution	0.489
2009-07-20	Current Meter	0.844	2019-03-21	Salt Dilution	0.545
2009-07-26	Current Meter	0.788	2019-03-21	Salt Dilution	0.502
2009-08-09	Current Meter	0.669	2019-04-19	Salt Dilution	0.603
2009-08-20	Current Meter	0.974	2019-05-03	Salt Dilution	0.640
2009-09-02	Current Meter	2.269	2019-05-09	Salt Dilution	1.633
2010-05-04	Current Meter	4.299	2019-06-25	Salt Dilution	0.788
2010-06-01	Current Meter	2.378	2019-07-02	Salt Dilution	0.700
2010-06-15	Current Meter	2.159	2019-08-02	Salt Dilution	0.649
2010-08-17	Current Meter	1.169	2019-09-05	Salt Dilution	0.476
2010-10-19	Current Meter	0.722	2019-10-02	Salt Dilution	0.807
2011-01-27	Salt Dilution	0.500	2019-11-01	Salt Dilution	0.300
2011-06-09	Current Meter	1.979	2019-11-01	Salt Dilution	0.290
2011-10-18	Current Meter	1.500	2019-12-02	Salt Dilution	0.035

**Table 3-9:
Station W26 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Comments
2010-06-02	-	0.168	0.030	
2010-06-15	-	0.152	0.023	
2010-06-18	-	0.120	0.013	
2010-09-23	-	0.110	0.010	
2010-10-19	-	0.065	0.003	Stage affected by snow in channel
2011-05-18	-	-	0.121	Stage measurement not available
2011-05-19	-	-	0.142	Stage measurement not available
2011-08-19	-	-	0.017	Stage measurement not available
2011-10-16	Flume	-	0.007	Stage affected by snow in channel
2011-11-16	Flume	-	0.003	Stage measurement not available
2012-07-17	Flume	0.117	0.020	
2012-08-15	Flume	0.090	0.012	
2013-07-25	Flume	-	0.001	Stage measurement not available
2013-09-15	Flume	0.040	0.004	
2014-08-06	Flume	0.047	0.005	
2014-10-17	Flume	0.059	0.007	
2015-07-31	Flume	0.131	0.024	
2015-10-14	Flume	0.192	0.043	
2016-07-14	Flume	0.120	0.017	
2017-08-03	Flume	0.025	0.003	
2017-08-16	Flume	0.330	0.098	
2017-09-20	Flume	0.070	0.009	
2017-10-11	Flume	0.065	0.008	
2018-06-13	Flume	-	0.024	Stage measurement not available
2018-07-13	Flume	0.020	0.002	
2018-08-26	Flume	0.060	0.008	
2018-09-09	Flume	0.070	0.011	
2019-06-01	Flume	-	0.009	Stage measurement not available
2019-08-05	Flume	-	0.000	Stage measurement not available
2019-10-01	Flume	0.023	0.005	
2019-10-08	Flume	0.012	0.003	
2019-11-05	Flume	-	0.002	Stage measurement not available

Notes:

1. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2018 are the staff gauge readings relative to the staff gauge datum from 2012.
2. A V-notch weir was installed in 2009, and replaced with a Parshall flume in August 2011.

**Table 3-10:
Station W27 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Comments
8/14/2007	Current Meter	-	0.015	-	Stage measurement not available
8/28/2007	-	-	0.039	-	Stage measurement not available
9/12/2007	-	-	0.017	-	Stage measurement not available
9/26/2007	Current Meter	-	0.017	-	Stage measurement not available
10/20/2007	-	-	0.011	-	Stage measurement not available
11/21/2007	-	-	0.004	-	Stage measurement not available
4/26/2008	Salt Dilution	-	0.011	-	Stage measurement not available
6/10/2008	-	0.185	0.026	0.023	
8/13/2008	Current Meter	-	0.050	-	Stage measurement not available
10/21/2008	Current Meter	0.250	0.051	0.056	
7/19/2009	-	0.209	0.033	0.034	
7/26/2009	-	0.201	0.033	0.030	
8/9/2009	-	0.187	0.024	0.024	
8/11/2009	-	0.189	0.023	0.025	
8/20/2009	-	0.193	0.026	0.026	
8/26/2009	-	0.221	0.038	0.040	
9/1/2009	-	0.197	0.029	0.028	
10/22/2009	-	-	0.013	-	Stage measurement not available
5/4/2010	Salt Dilution	-0.025	0.072	-	
5/5/2010	Salt Dilution	0.225	0.086	-	Average of 3 measurements
5/6/2010	-	0.209	0.069	-	
6/1/2010	Salt Dilution	0.258	0.035	0.061	Average of 3 measurements
6/2/2010	-	0.261	0.035	0.063	
6/15/2010	-	0.243	0.052	0.052	
6/16/2010	-	0.238	0.049	0.049	
6/18/2010	-	0.227	0.046	0.043	
9/23/2010	-	0.020	0.015	-	Erratic logger data
10/19/2010	-	0.025	0.014	-	Stage affected by snow in channel
3/30/2011	Salt Dilution	-	0.010	-	Stage measurement not available
4/19/2011	Salt Dilution	-	0.009	-	Stage measurement not available
5/17/2011	Current Meter	0.339	0.120	0.127	
5/18/2011	Current Meter	0.363	0.261	-	Erratic logger data
6/6/2011	-	0.165	0.016	0.016	
8/16/2011	-	0.008	0.031	-	Erratic logger data
10/17/2011	-	0.173	0.008	-	Stage affected by snow in channel
3/19/2012	-	-	0.004	-	Unreliable discharge measurement
4/17/2012	Flume	-	0.007	-	Stage measurement not available
5/6/2012	Flume	-	0.040	-	Stage affected by snow in channel
7/18/2012	Flume	0.281	0.025	0.077	
8/15/2012	Flume	0.207	0.027	0.033	
9/19/2012	Flume	0.158	0.018	0.014	
10/16/2012	Flume	-	0.014	-	Stage measurement not available
7/25/2013	Flume	0.127	0.030		
9/15/2013	Flume	0.110	0.023		
10/19/2013	Flume	0.119	0.027		
5/7/2014	Flume	0.130	0.032		
8/5/2014	Flume	0.119	0.027		
10/17/2014	Flume	0.073	0.013		
7/31/2015	Flume	0.187	0.054		
10/14/2015	Flume	0.149	0.038		
5/3/2016	Flume	0.260	0.090		
7/14/2016	Flume	0.145	0.038		
6/9/2017	Flume	0.101	0.024		
8/17/2017	Flume	0.100	0.021		
9/20/2017	Flume	0.072	0.012		
10/11/2017	Flume	0.021	0.002		
5/16/2018	Flume	0.044	0.006		
6/12/2018	Flume	0.018	0.002		
7/13/2018	Flume	0.030	0.004		
8/17/2018	Flume	0.030	0.004		
9/9/2018	Flume	0.040	0.006		
5/4/2019	Flume	-	0.001		Stage measurement not available
5/12/2019	Flume	-	0.003		Stage measurement not available
5/20/2019	Flume	-	0.005		Stage measurement not available
5/27/2019	Flume	-	0.002		Stage measurement not available
6/3/2019	Flume	-	0.007		Stage measurement not available
7/5/2019	Flume	-	0.008		Stage measurement not available
8/6/2019	Flume	-	0.005		Stage measurement not available
10/1/2019	Flume	0.039	0.003		
10/8/2019	Flume	-	0.005		Stage measurement not available

Notes:

1. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2018 are the staff gauge readings relative to the staff gauge datum from 2012.
2. A V-notch weir was installed in 2009, and replaced with a Parshall flume in August 2011.

**Table 3-11:
Station W29 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
2010-10-19	Current Meter	-	0.359	-	-	Stage measurement not available
2011-03-30	Salt Dilution	-	0.200	-	-	Stage measurement not available
2011-05-17	Current Meter	-	2.309	-	-	Stage measurement not available
2011-06-08	Current Meter	3.639	0.776	0.791	2%	
2011-06-28	Current Meter	3.630	0.839	0.735	-12%	
2011-08-16	-	3.788	1.971	1.986	1%	
2011-10-17	-	3.647	0.722	-	-	Stage affected by snow in channel
2011-11-16	Salt Dilution	-	0.377	-	-	Stage measurement not available
2011-12-06	Salt Dilution	-	0.269	-	-	Stage measurement not available
2012-05-04	Current Meter	3.644	0.859	-	-	Stage affected by snow in channel
2012-06-14	-	3.749	-	1.591	-5%	Discharge measurement not available
2012-07-18	-	3.702	-	-	-	Discharge measurement not available
2012-08-16	Current Meter	3.626	0.711	0.703	-1%	
2012-10-17	Current Meter	3.581	0.447	-	-	Stage affected by snow in channel
2012-11-20	Salt Dilution	-	0.264	-	-	Stage measurement not available
2012-12-17	Salt Dilution	-	0.281	-	-	Stage measurement not available
2013-02-19	Salt Dilution		0.350			Salt dilution, but based on few concentration determinations
2013-04-15	Current Meter	0.298	0.165	-	-	Stage affected by snow in channel
2013-05-21	Current Meter	0.366	1.513	1.628	8%	
2013-07-25	Current Meter	0.180	0.526	0.476	-9%	
2013-08-04	-	0.151	-	-	-	Discharge measurement not available
2013-09-14	Current Meter	0.275	0.793	0.884	11%	
2013-10-19	Current Meter	0.217	0.566	0.619	9%	
2014-08-05	Current Meter	0.191	0.505	0.516	2%	
2014-10-17	Current Meter	0.274	0.793	-	-	Stage affected by snow in channel
2015-06-18	Current Meter	0.208	0.709	0.582	-18%	
2015-07-31	Current Meter	0.385	1.834	1.534	-16%	
2015-10-14	Salt Dilution	0.274	0.754	-	-	Salt dilution, but based on few concentration determinations
2016-07-14	Current Meter	0.329	1.189	1.332	12%	
2017-06-09	Current Meter	-	0.865	-	-	Stage measurement not available
2017-08-04	Current Meter	0.259	0.600	0.562	-6%	
2017-08-16	Current Meter	-	0.501	-	-	Stage measurement not available
2017-10-13	Salt Dilution	-	1.124	-	-	Stage affected by ice in channel
2018-04-24	Current Meter	-	0.256	-	-	Stage affected by ice in channel
2018-06-12	Current Meter	0.355	1.546	1.406	-9%	
2018-07-22	Current Meter	0.237	0.665	0.735	11%	
2018-08-21	Current Meter	0.275	1.064	0.933	-12%	
2018-09-09	Current Meter	0.275	0.954	0.933	-2%	
2018-10-16	Current Meter	-	0.360	-	-	Stage affected by ice in channel
2018-11-06	Salt Dilution	-	0.380	-	-	Stage affected by ice in channel
2018-11-29	Salt Dilution	-	0.251	-	-	Stage affected by ice in channel
2018-12-04	Salt Dilution	-	0.200	-	-	Stage affected by ice in channel
2018-12-31	Salt Dilution	-	0.210	-	-	Stage affected by ice in channel
Station decommissioned at end of 2018 - moved to W99						
Average Error (%)					-2%	
Standard Error (%)					10%	

Notes:

1. Measurements highlighted in grey were conducted in ice-affected waters, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2018 are the staff gauge readings relative to the staff gauge datum from 2012.
3. Station decommissioned at the end of 2018 and moved to W99.

**Table 3-12:
Station W45 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Comments
10/11/2017	Salt Dilution	-	0.016	Stage measurement not available
5/16/2018	Salt Dilution	-	0.086	Stage measurement not available
6/12/2018	Salt Dilution	-	0.006	Stage measurement not available
7/2/2018	Salt Dilution	0.120	0.006	
7/13/2018	Salt Dilution	0.112	0.003	
8/17/2018	Salt Dilution	0.122	0.006	
9/23/2018	Salt Dilution	0.124	0.006	
10/25/2018	Salt Dilution	0.135	0.006	
11/21/2018	Salt Dilution	-	0.007	Stage measurement not available
12/3/2018	Salt Dilution	-	0.004	Stage measurement not available
12/17/2018	Salt Dilution	-	0.005	Stage measurement not available
4/14/2019	Salt Dilution		0.013	Stage measurement not available
4/23/2019	Salt Dilution		0.014	Stage measurement not available
4/26/2019	Salt Dilution		0.004	Stage measurement not available
5/4/2019	Salt Dilution		0.003	Stage measurement not available
5/12/2019	Salt Dilution		0.014	Stage measurement not available
5/20/2019	Salt Dilution		0.006	Stage measurement not available
5/27/2019	Salt Dilution		0.003	Stage measurement not available
6/3/2019	Salt Dilution	0.132	0.003	
7/5/2019	Salt Dilution	0.240	0.001	
8/6/2019	Salt Dilution		0.001	Stage measurement not available
9/19/2019	Salt Dilution	0.261	0.003	
10/1/2019	Salt Dilution	0.254	0.003	
10/8/2019	Salt Dilution	0.253	0.003	
11/5/2019	Salt Dilution		0.002	Stage measurement not available
11/5/2019	Salt Dilution		0.004	Stage measurement not available

Notes:

¹Due to the limited number of measurements for this station, no rating curve has been developed.

**Table 3-13:
Station W99 – Discharge Measurement Summary**

Date	Method	Stage (m)	Discharge (m ³ /s)	Rating Curve Discharge (m ³ /s)	Rating Curve Error (%)	Comments
4/14/2019	Salt Dilution	---	1.625	---	---	Stage measurement not available
4/22/2019	Salt Dilution	---	1.035	---	---	Stage measurement not available
5/4/2019	Current Meter	---	0.254	---	---	Stage measurement not available
6/3/2018	Current Meter	---	1.283	---	---	Stage measurement not available
6/10/2019	Current Meter	0.178	0.558	0.560	1%	
7/2/2019	Current Meter	0.141	0.373	0.380	2%	
8/2/2019	Current Meter	0.123	0.300	0.303	1%	
10/3/2019	Salt Dilution	0.161	0.426	0.474	11%	
10/7/2019	Salt Dilution	---	0.167	---	---	Stage measurement not available
10/16/2019	Salt Dilution	0.155	0.521	0.445	-15%	
11/1/2019	Salt Dilution	---	3.435	---	---	Stage measurement not available
12/3/2019	Salt Dilution	---	0.280	---	---	Stage measurement not available
Average Error (%)					0%	
Standard Error (%)					9%	

**Table 3-14:
 Additional Manual Discharge Measurements (W39 and W49)**

Station ID	Station Name	Date	Discharge (m ³ /s)
W39	Haggart Creek above South McQuesten River	2017-08-17	0.995
		2018-08-20	2.125
		2019-05-03	0.995
		2019-07-02	2.125
		2019-11-12	1.065
		2019-11-12	0.672
W49	South McQuesten River below Haggart Creek	2017-08-17	4.523
		2018-06-14	19.334
		2019-05-03	4.975
		2019-07-02	4.562
		2019-11-12	1.283

Notes:

¹Due to the limited number of measurements for these stations, no rating curves have been developed.

**Table 3-15:
 Station DA4 – Discharge Measurement Summary**

Date	Discharge (m ³ /s)	Date	Discharge (m ³ /s)
08-Apr-19	0.008	04-May-19	0.003
11-Apr-19	0.001	05-May-19	0.003
12-Apr-19	0.008	08-May-19	0.009
12-Apr-19	0.001	09-May-19	0.009
12-Apr-19	0.002	10-May-19	0.007
13-Apr-19	0.008	12-May-19	0.007
13-Apr-19	0.010	13-May-19	0.005
14-Apr-19	0.007	14-May-19	0.020
14-Apr-19	0.007	15-May-19	0.037
15-Apr-19	0.010	16-May-19	0.004
16-Apr-19	0.012	17-May-19	0.005
17-Apr-19	0.007	20-May-19	0.003
18-Apr-19	0.012	21-May-19	0.002
19-Apr-19	0.013	01-Jun-19	0.002
20-Apr-19	0.013	06-Jun-19	0.011
21-Apr-19	0.010	10-Jun-19	0.001
22-Apr-19	0.009	13-Jun-19	0.003
23-Apr-19	0.009	17-Jun-19	0.002
26-Apr-19	0.005	22-Jun-19	0.001
28-Apr-19	0.005	01-Jul-19	0.0003
29-Apr-19	0.007	13-Jul-19	0.0004
01-May-19	0.005	05-Aug-19	0.001
02-May-19	0.004	19-Sep-19	0.050
03-May-19	0.003		

**Table 3-16:
 Station DA4P – Discharge Measurement Summary**

Date	Discharge (m ³ /s)	Date	Discharge (m ³ /s)
13-Apr-19	0.004	08-May-19	0.017
14-Apr-19	0.005	09-May-19	0.013
14-Apr-19	0.006	10-May-19	0.013
15-Apr-19	0.005	12-May-19	0.011
16-Apr-19	0.005	13-May-19	0.010
17-Apr-19	0.003	16-May-19	0.010
18-Apr-19	0.001	17-May-19	0.006
19-Apr-19	0.000	18-May-19	0.011
21-Apr-19	0.003	20-May-19	0.009
23-Apr-19	0.001	21-May-19	0.009
29-Apr-19	0.005	01-Jun-19	0.003
01-May-19	0.007	06-Jun-19	0.004
02-May-19	0.003	10-Jun-19	0.001
03-May-19	0.002	13-Jun-19	0.005
04-May-19	0.001	17-Jun-19	0.005
05-May-19	0.002		

**Table 3-17:
 Station DB4 – Discharge Measurement Summary**

Date	Discharge (m ³ /s)	Date	Discharge (m ³ /s)
08-Apr-19	0.001	04-May-19	0.003
11-Apr-19	0.006	05-May-19	0.001
11-Apr-19	0.002	08-May-19	0.027
12-Apr-19	0.001	09-May-19	0.018
12-Apr-19	0.003	10-May-19	0.036
12-Apr-19	0.001	11-May-19	0.018
13-Apr-19	0.004	12-May-19	0.013
14-Apr-19	0.001	13-May-19	0.009
14-Apr-19	0.002	14-May-19	0.010
15-Apr-19	0.005	15-May-19	0.007
16-Apr-19	0.007	16-May-19	0.012
17-Apr-19	0.005	17-May-19	0.004
18-Apr-19	0.010	18-May-19	0.005
19-Apr-19	0.009	19-May-19	0.006
20-Apr-19	0.007	20-May-19	0.007
21-Apr-19	0.007	21-May-19	0.008
23-Apr-19	0.006	01-Jun-19	0.003
26-Apr-19	0.002	06-Jun-19	0.002
28-Apr-19	0.002	13-Jun-19	0.001
29-Apr-19	0.003	17-Jun-19	0.001
01-May-19	0.012	05-Aug-19	0.001
02-May-19	0.006	19-Sep-19	0.020
03-May-19	0.003		

**Table 3-18:
 Station UND – Discharge Measurement Summary**

Date	Discharge (m ³ /s)
2019-05-20	0.005
2019-06-10	0.010
2019-07-05	0.011
2019-08-17	0.007

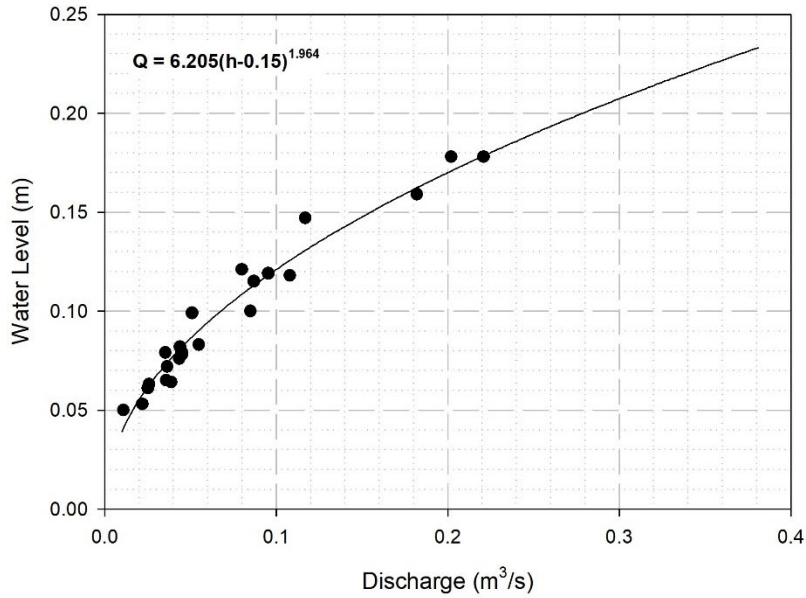


Figure 3-1: Rating curve for station W1 (2012 – 2019).

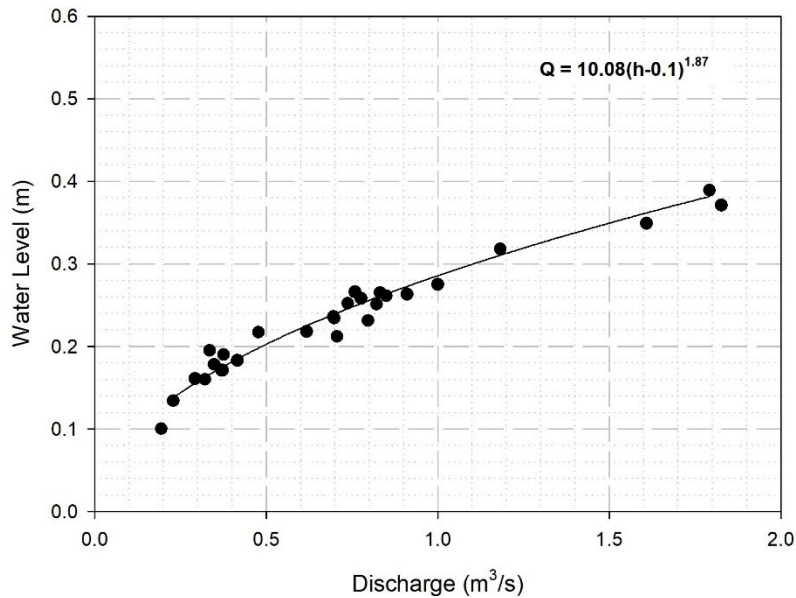


Figure 3-2: Rating curve for station W4 (2012 – 2019).

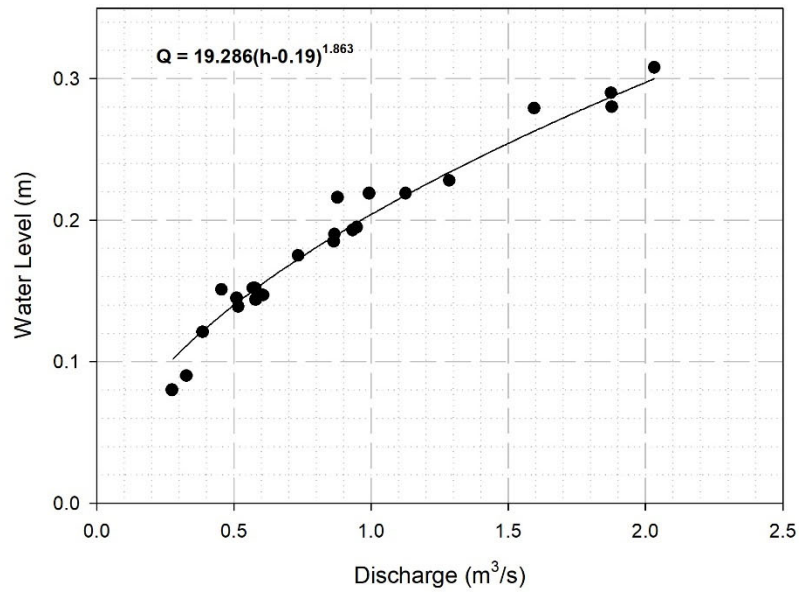


Figure 3-3: Rating curve for station W5 (2012 – 2019).

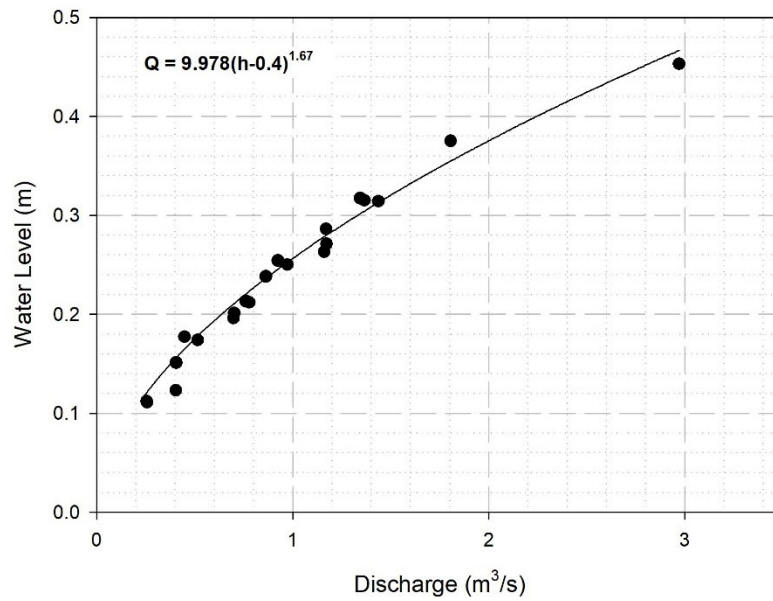


Figure 3-4: Rating curve for station W6 (2012 – 2019).

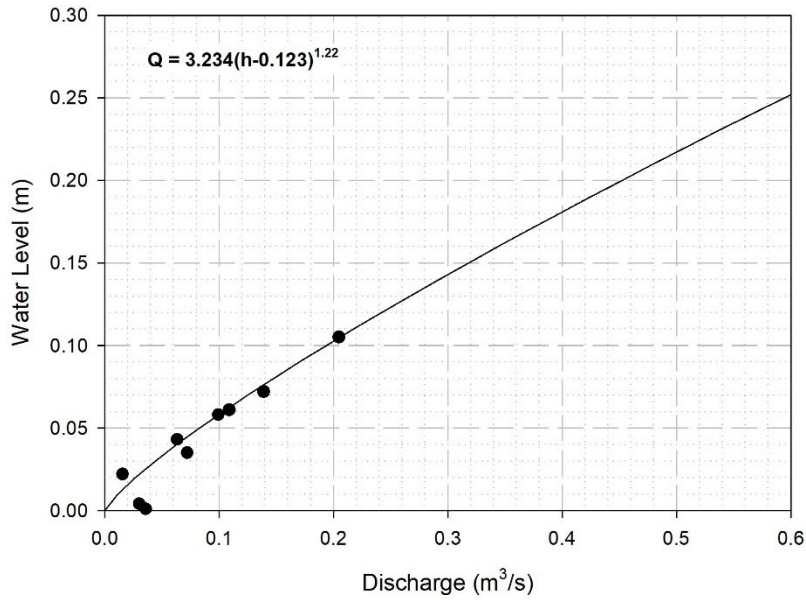


Figure 3-5: Preliminary rating curve for station W21 (2018, 2019).

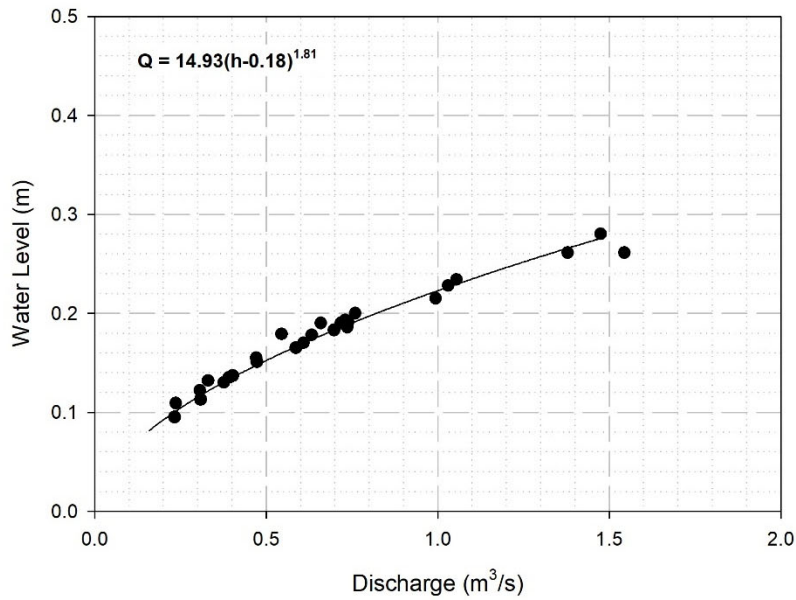


Figure 3-6: Rating curve for station W22 (2012 – 2019).

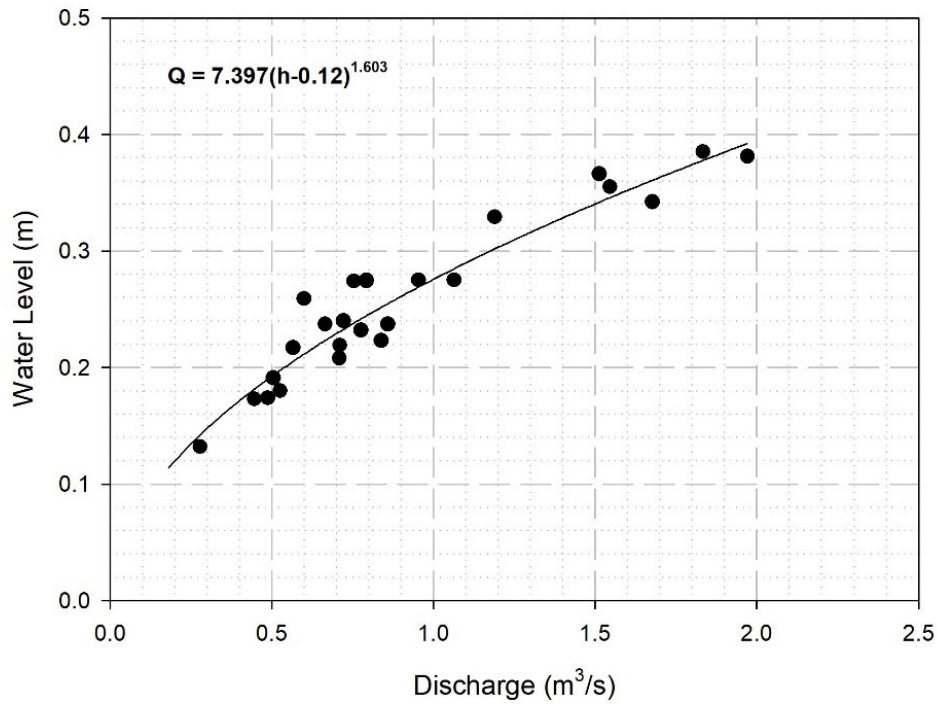


Figure 3-7: Rating curve for station W29 (2012 – 2019).

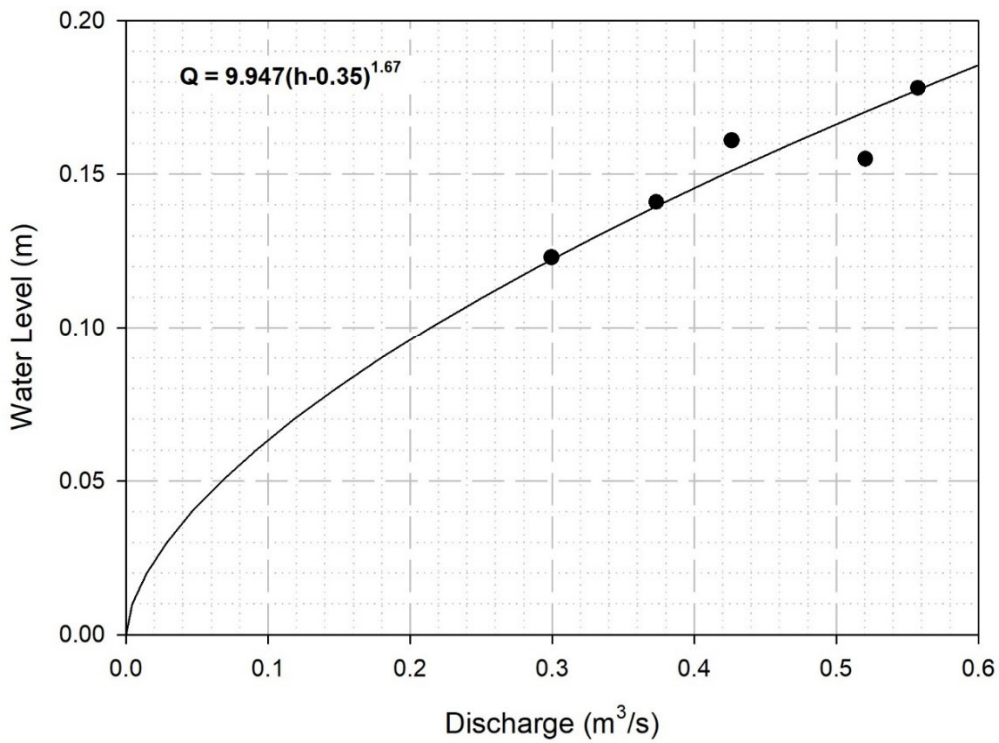


Figure 3-8: Rating curve for station W99 (2019).

3.4 Winter Streamflow Interpolation

Due to extensive channel icing and complete freezing to the bed in some cases, reliable continuous water level data is not available for the winter season (mid-October to early May in most years). However, spot flow measurements collected during the winter water quality sampling trips are available for most years. Where these measurements span the majority of the winter season, streamflows were estimated by interpolating between the spot flow measurements. This was done by assuming that mid-winter melt or rain events do not occur at site, and that the streamflows are a result of recession from the open-water season discharge regime to a steady-state baseflow driven by the local groundwater system discharging to the stream channel. This recession curve is defined by the equation (Maidment, 1993):

$$Q_t = Q_0 e^{-kt}$$

Where:

Q_t = discharge at time t (m^3/s)

Q_0 = initial discharge (both Q_t and Q_0 are measured within the same straight segment)

k = decay rate (negative for declining flows)

t = number of days between spot measurements (interpolation period)

The decay rate, denoted k , was unique to each pair of subsequent discharge measurements, and was commonly in the range of -1×10^{-3} to -0.5×10^{-5} .

4. Results

4. Results

4.1 Streamflow Records – Discharge

The computed flow records for all site stations listed in Table 2-1 are presented as average daily discharge time-series and plotted with spot discharge measurements and interpolated baseflows in Figure 4-1 through Figure 4-11. As a rating curve for W45 has not yet been developed, continuous water level data are presented for this station in Figure 4-10. The same flow records are also presented as unit yield plots, with each plot showing annual data for all stations on a single plot (refer to Figure 4-12 to Figure 4-25).

While discharge magnitude varies with watershed area (*i.e.*, larger basin areas result in higher discharge values), it is more often instructive to compare runoff and/or unit yields to remove the influence of watershed area. The variation in runoff and yields across the gauged basins at the Project site is relatively low, with unit yields averaging 13 ± 1.8 L/s/km² and an average runoff of 172 ± 44 mm for the open water season (Table 4-1).

W4 and W27 display slightly lower average unit yields than the other stations, and W1, W5 and W29 yield slightly more water on average. There appears to be lower than average yields at W26, however, this result is biased lower by the absence of data for the month of May, which is typically the month with the highest proportion of annual runoff. W1 appears to experience the highest overall yields, and in particular, the highest magnitude freshet (in yield terms). Higher than average yields at this station are sustained throughout the seasonal falling limb from September through November.

Table 4-2 through Table 4-21 present the monthly summaries of streamflow as discharge, unit yields and runoff, by station. As noted in Section 2.2.3, reliable continuous water level data is not available for W29 for 2016 through 2019.

**Table 4-1:
Summary of monthly average discharge, unit yield and runoff for Project site hydrometric stations.**

Station (Discharge Area)	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average/Total
W1 (6.8 km²)	Average Discharge (m ³ /s)	--	--	--	0.024	0.235	0.097	0.086	0.083	0.087	0.098	0.069	--	0.097
	Average Yield (L/s/km ²)	--	--	--	3.5	34.5	14.2	12.7	12.2	12.7	14.4	10.1	--	14.3
	Runoff (mm)	--	--	--	5	64	34	34	31	33	21	4	--	225
W4 (76.9 km²)	Average Discharge (m ³ /s)	--	--	--	0.256	2.064	0.976	0.773	0.813	0.856	0.778	--	--	0.931
	Average Yield (L/s/km ²)	--	--	--	3.3	26.8	12.7	10.1	10.6	11.1	10.1	--	--	12.1
	Runoff (mm)	--	--	--	2	53	30	27	28	29	17	--	--	185
W5 (97.5 km²)	Average Discharge (m ³ /s)	--	--	--	--	3.125	1.292	0.975	0.957	0.995	1.059	--	--	1.401
	Average Yield (L/s/km ²)	--	--	--	--	32.1	13.3	10.0	9.8	10.2	10.9	--	--	14.4
	Runoff (mm)	--	--	--	--	64	32	27	25	26	14	--	--	188
W6 (100.9 km²)	Average Discharge (m ³ /s)	--	--	--	--	3.656	1.024	0.919	1.044	1.131	0.965	0.574	--	1.330
	Average Yield (L/s/km ²)	--	--	--	--	36.2	10.2	9.1	10.3	11.2	9.6	5.7	--	13.2
	Runoff (mm)	--	--	--	--	59	22	23	27	29	15	3	--	178
W21 (66.8 km²)	Average Discharge (m ³ /s)	--	--	--	--	--	0.116	0.075	0.197	0.098	0.060	--	--	0.109
	Average Yield (L/s/km ²)	--	--	--	--	--	14.4	9.2	24.3	12.0	7.4	--	--	13.5
	Runoff (mm)	--	--	--	--	--	17	10	27	31	16	--	--	102
W22 (66.8 km²)	Average Discharge (m ³ /s)	--	--	--	0.531	2.170	0.851	0.656	0.752	0.766	0.723	0.937	--	0.923
	Average Yield (L/s/km ²)	--	--	--	7.9	32.5	12.7	9.8	11.3	11.5	10.8	14.0	--	13.8
	Runoff (mm)	--	--	--	13	57	32	25	29	30	16	15	--	216
W26 (1.3 km²)	Average Discharge (m ³ /s)	--	--	--	--	0.018	0.014	0.011	0.013	0.011	0.007	--	--	0.012
	Average Yield (L/s/km ²)	--	--	--	--	14.0	10.8	8.4	9.8	8.7	5.6	--	--	9.6
	Runoff (mm)	--	--	--	--	11	22	22	26	21	6	--	--	108
W27 (2.7 km²)	Average Discharge (m ³ /s)	--	--	--	--	0.068	0.031	0.027	0.025	0.021	0.028	--	--	0.033
	Average Yield (L/s/km ²)	--	--	--	--	25.1	11.5	9.9	9.1	7.9	10.3	--	--	12.3
	Runoff (mm)	--	--	--	--	48	28	22	23	20	11	--	--	152
W29 (8 km²)	Average Discharge (m ³ /s)	--	--	--	--	2.508	1.300	1.224	1.165	1.043	0.980	--	--	1.370
	Average Yield (L/s/km ²)	--	--	--	--	29.1	15.1	14.2	13.5	12.1	11.4	--	--	15.9
	Runoff (mm)	--	--	--	--	44	27	38	35	31	20	--	--	196
W99 (90.1 km²)	Average Discharge (m ³ /s)	--	--	--	--	--	0.574	0.321	0.270	0.470	0.403	--	--	0.408
	Average Yield (L/s/km ²)	--	--	--	--	--	6.4	3.6	3.0	5.2	4.5	--	--	4.5
	Runoff (mm)	--	--	--	--	--	13	10	8	14	6	--	--	50

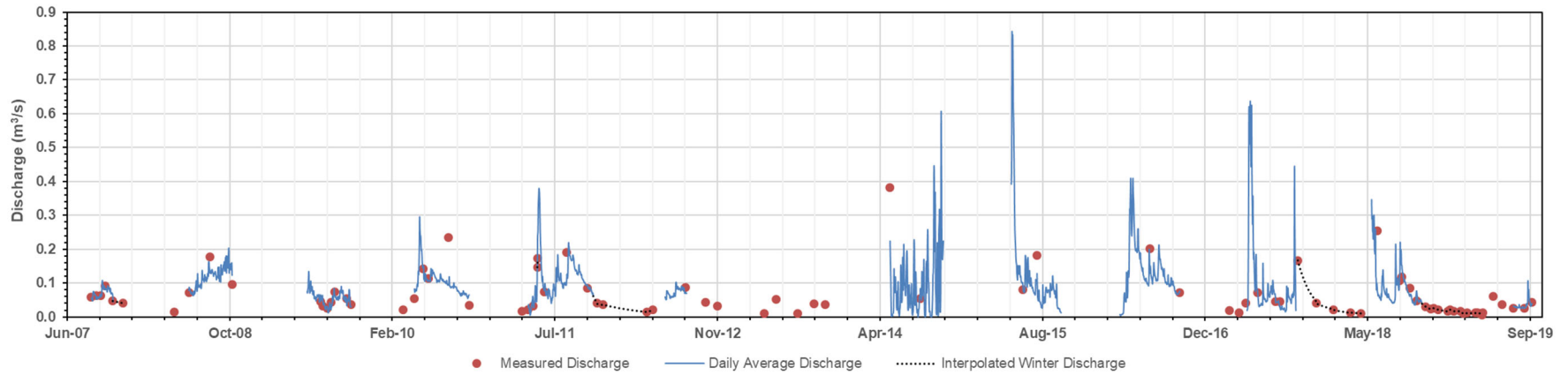


Figure 4-1: W1 Average daily discharge record (2007 to 2019)

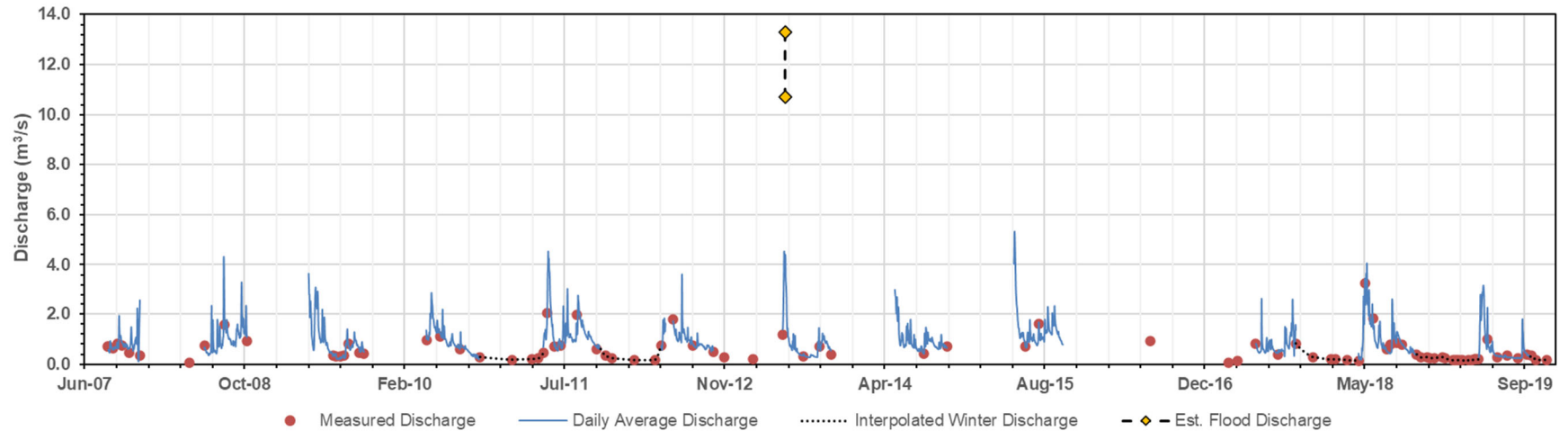


Figure 4-2: W4 Average daily discharge record (2007 to 2019). Note that values for May 29, 2013 are estimates based on high water marks and channel surveys at W29 extrapolated by drainage area to W4 (Laberge, 2013).

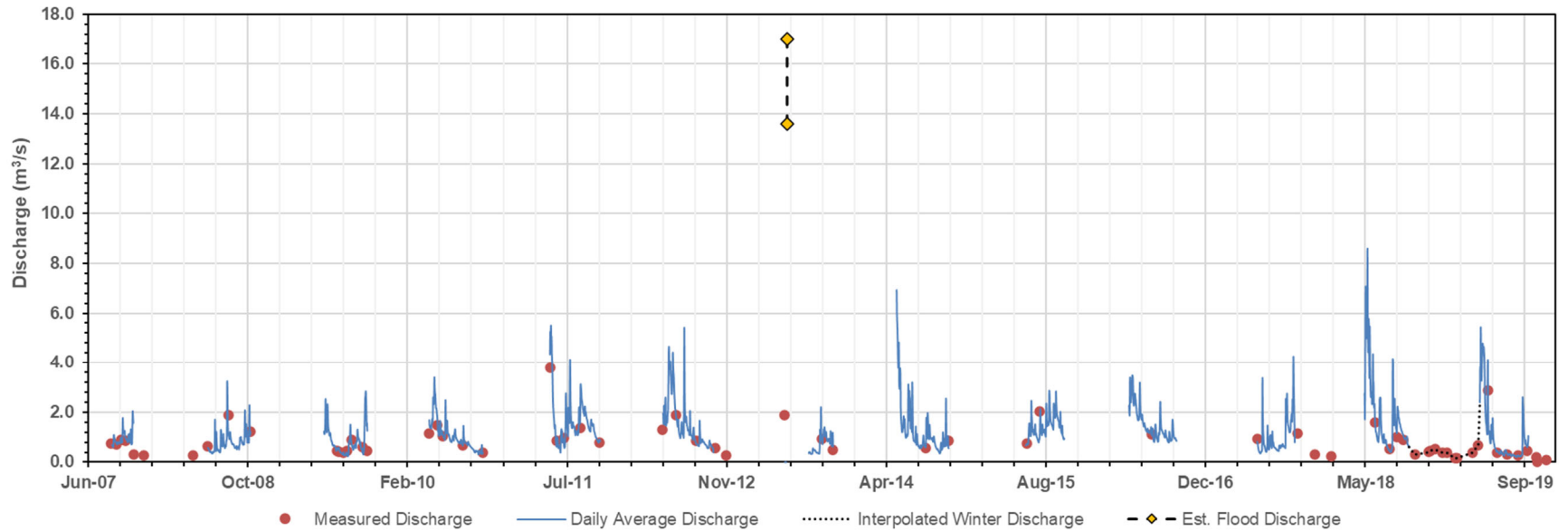


Figure 4-3: W5 Average daily discharge record (2007 to 2019). Note that values for May 29, 2013 are estimates based on high water marks and channel surveys at W29 extrapolated by drainage area to W5 (Laberge, 2013).

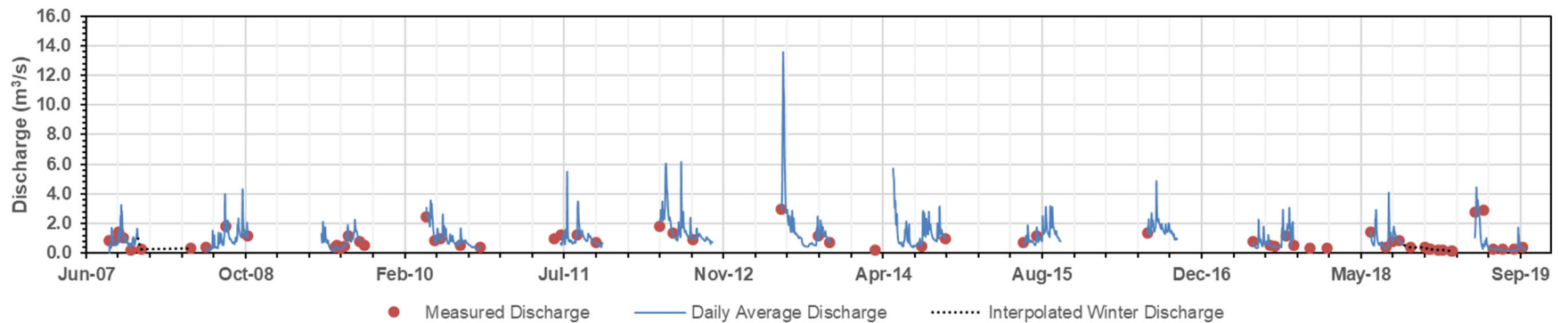


Figure 4-4: W6 Average daily discharge record (2007 to 2019)

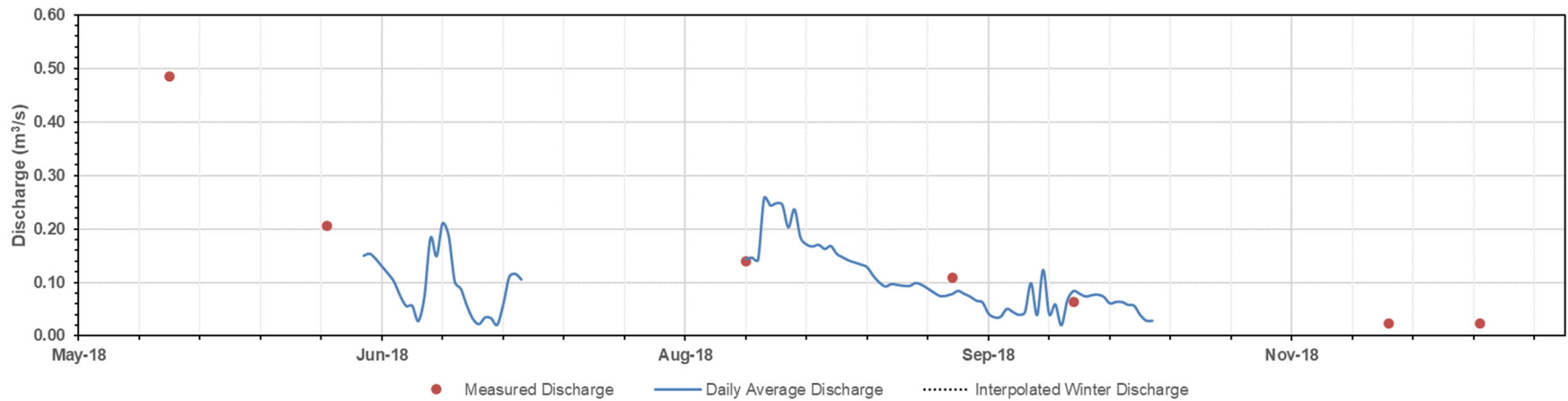


Figure 4-5: Preliminary W21 Average daily discharge record (2018)

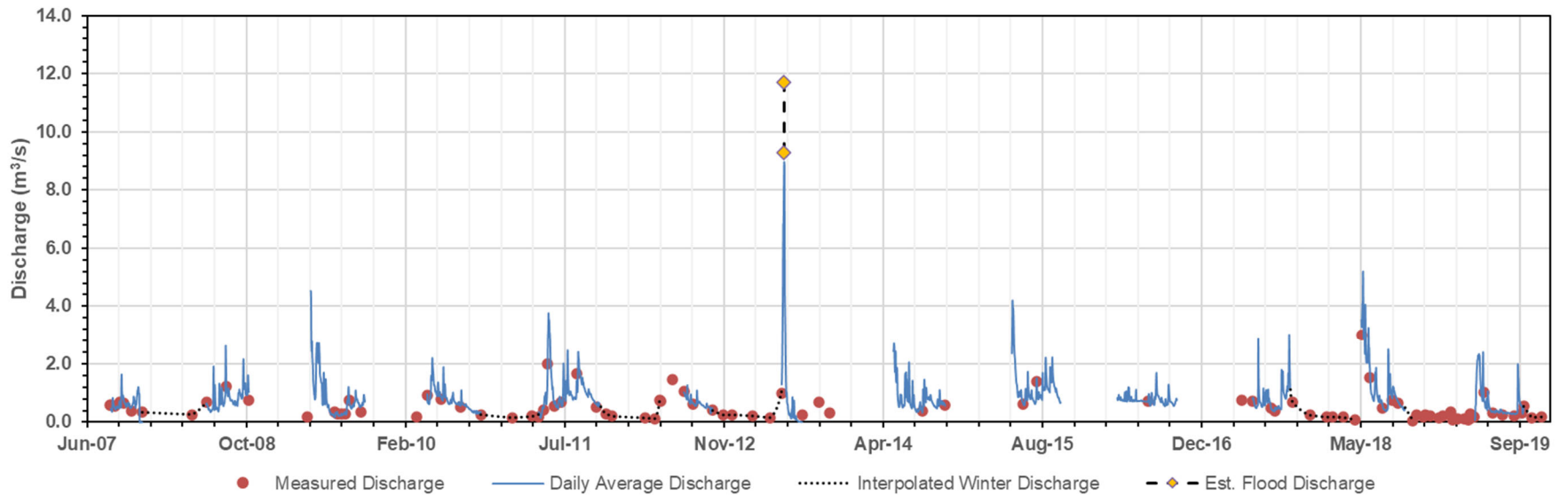


Figure 4-6: W22 Average daily discharge record (2007 to 2019). Note that values for May 29, 2013 are estimates based on high water marks and channel surveys at W29 extrapolated by drainage area to W22 (Laberge, 2013).

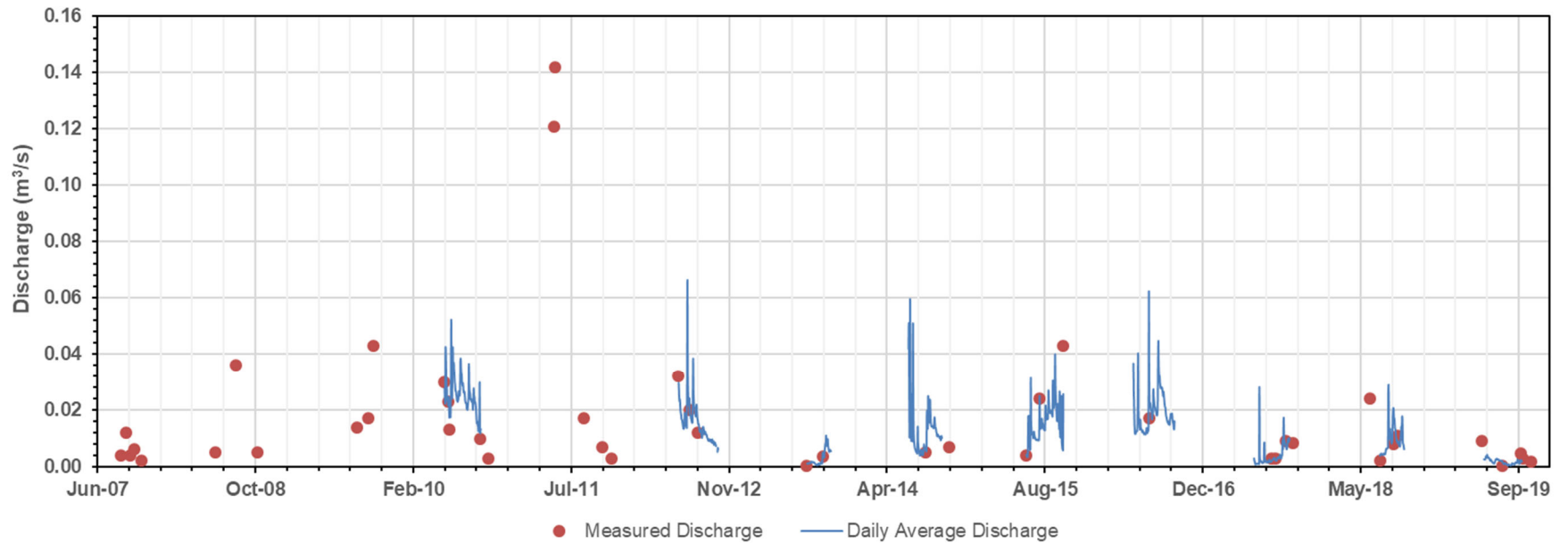


Figure 4-7: W26 Average daily discharge record (2007 to 2019)

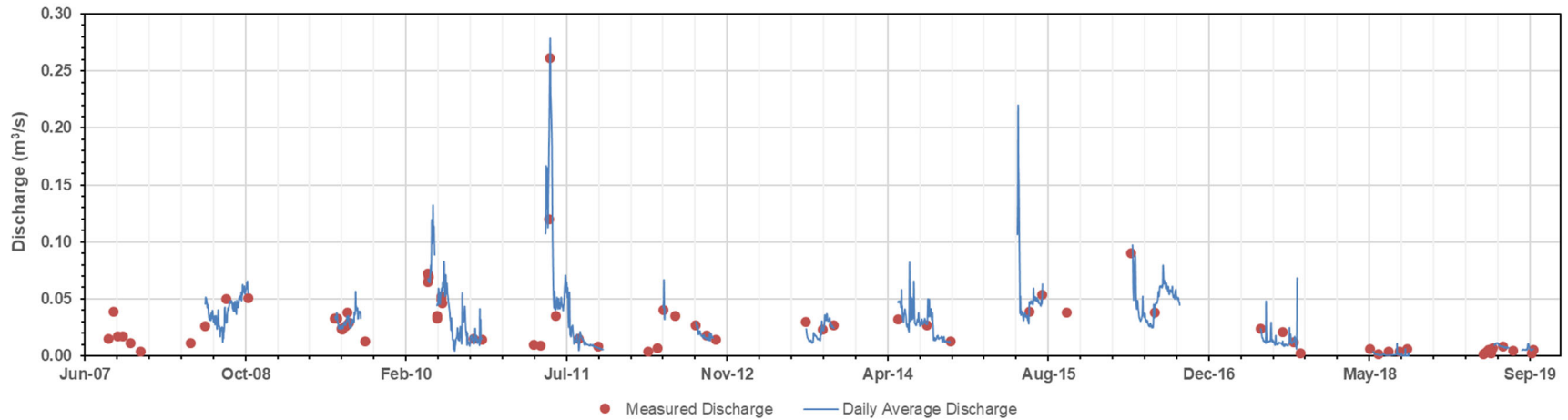


Figure 4-8: W27 Average daily discharge record (2007 to 2019)

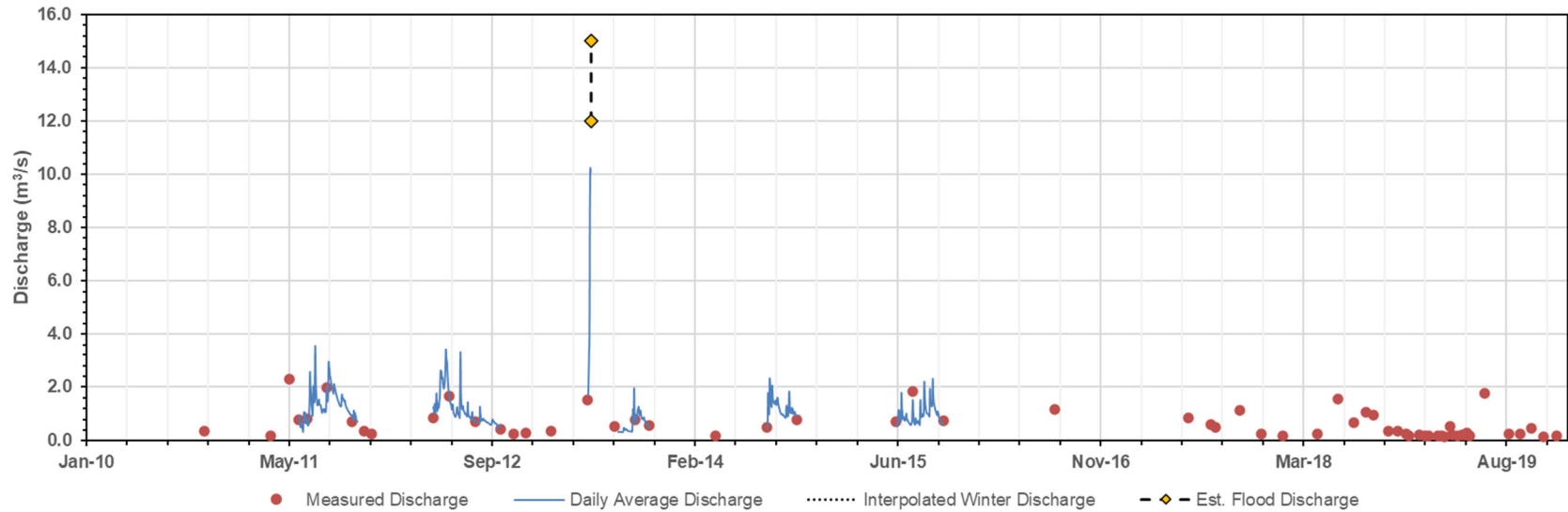


Figure 4-9: W29 Average daily discharge record (2011 to 2019). Note that values for May 29, 2013 are estimates based on high water marks and channel surveys at W29 (Laberge, 2013).

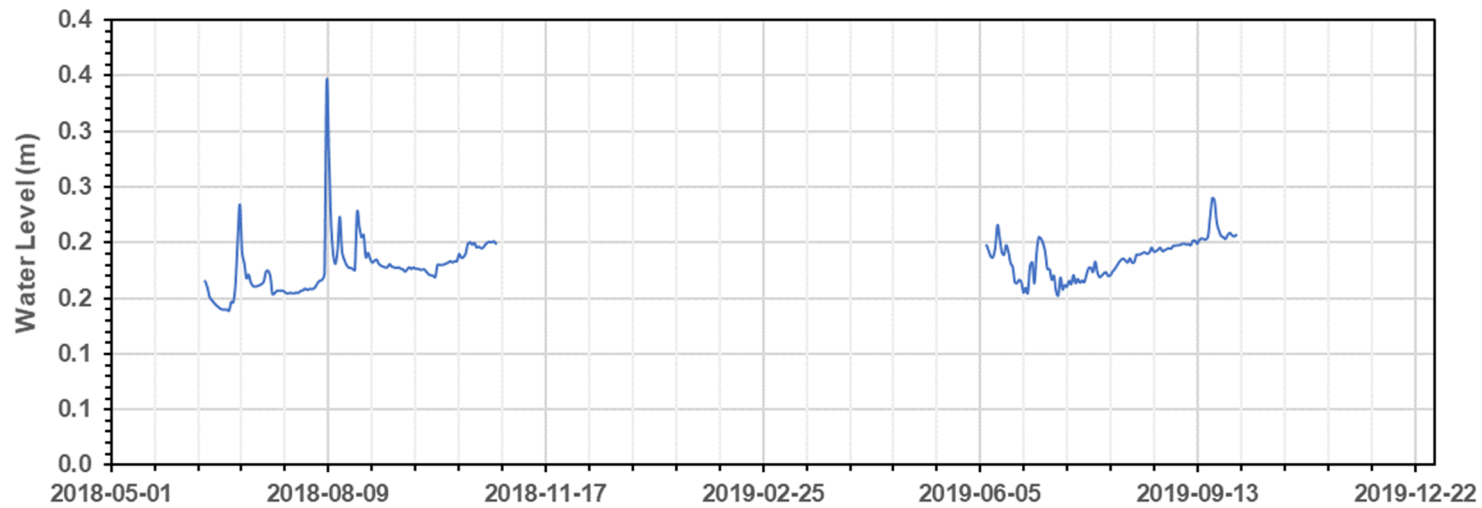


Figure 4-10: W45 Average daily water level record (2018 to 2019).

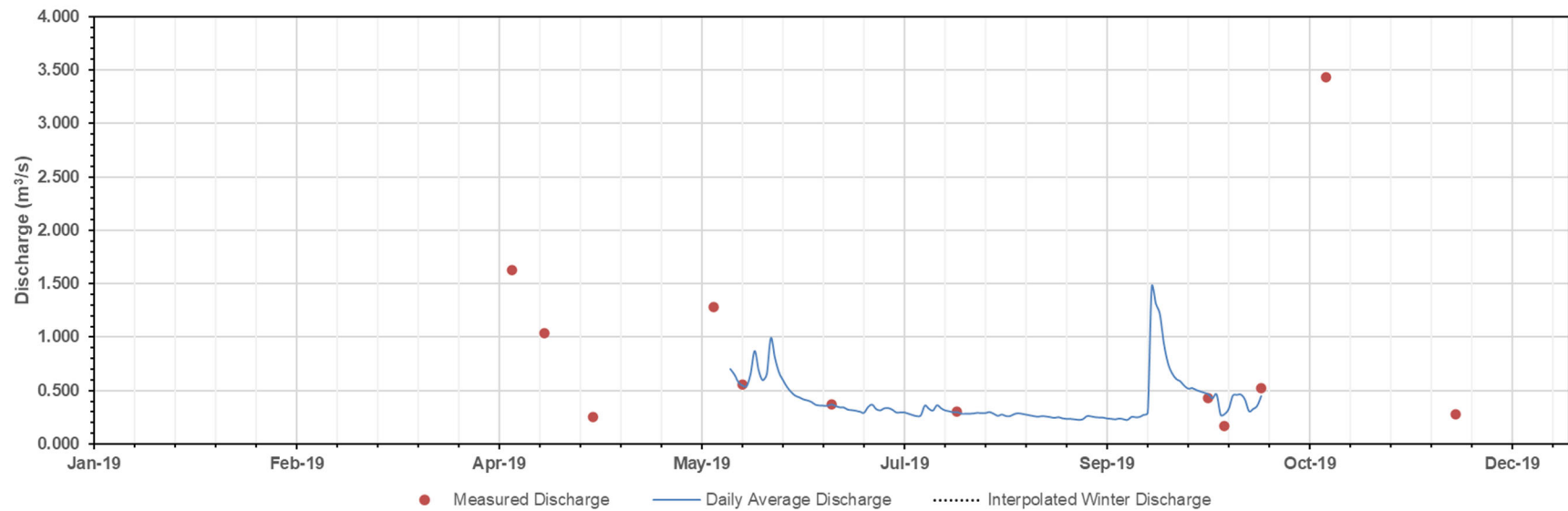


Figure 4-11: W99 Average daily discharge record (2019).

4.2 Streamflow Records – Unit Yields

Period of record (Figure 4-12) and unit yield plots per year (Figure 4-13 through Figure 4-25) are presented for the eight hydrometric stations in this section.

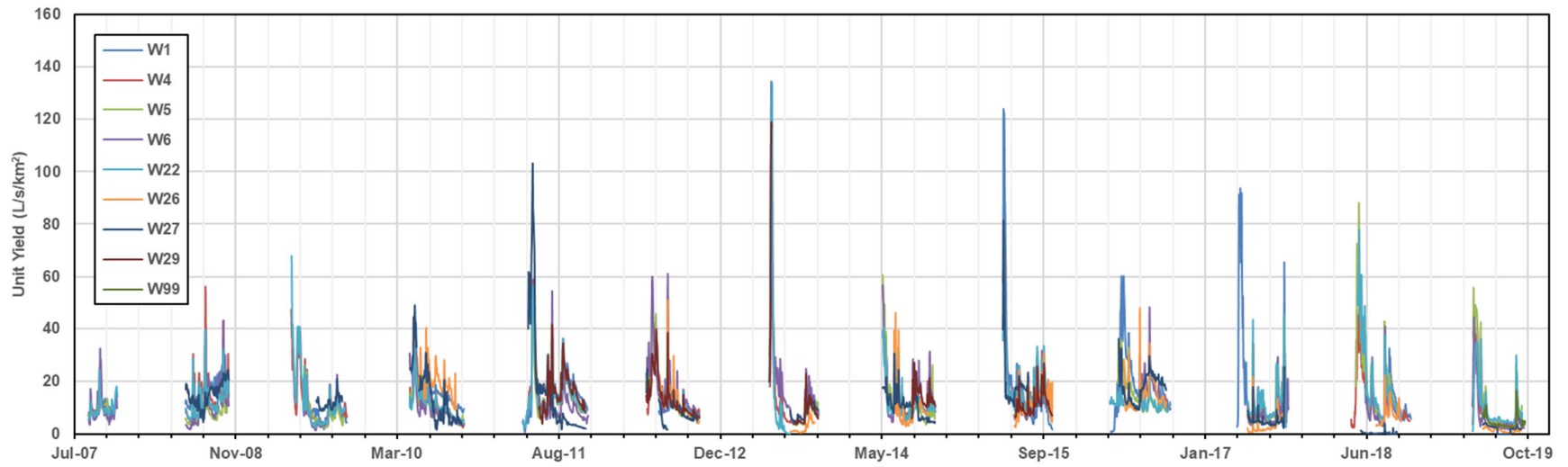


Figure 4-12: Average daily unit yield time-series for Project stations (2007-2019)

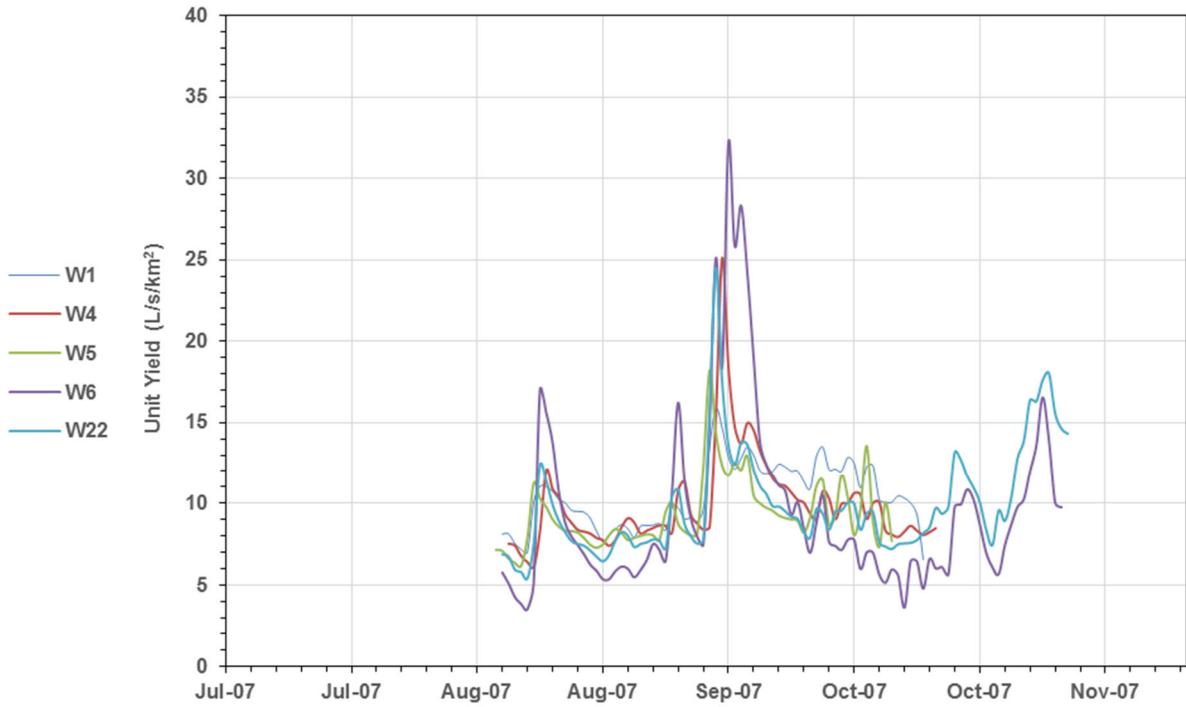


Figure 4-13: Average daily unit yield time-series for Project stations (2007)

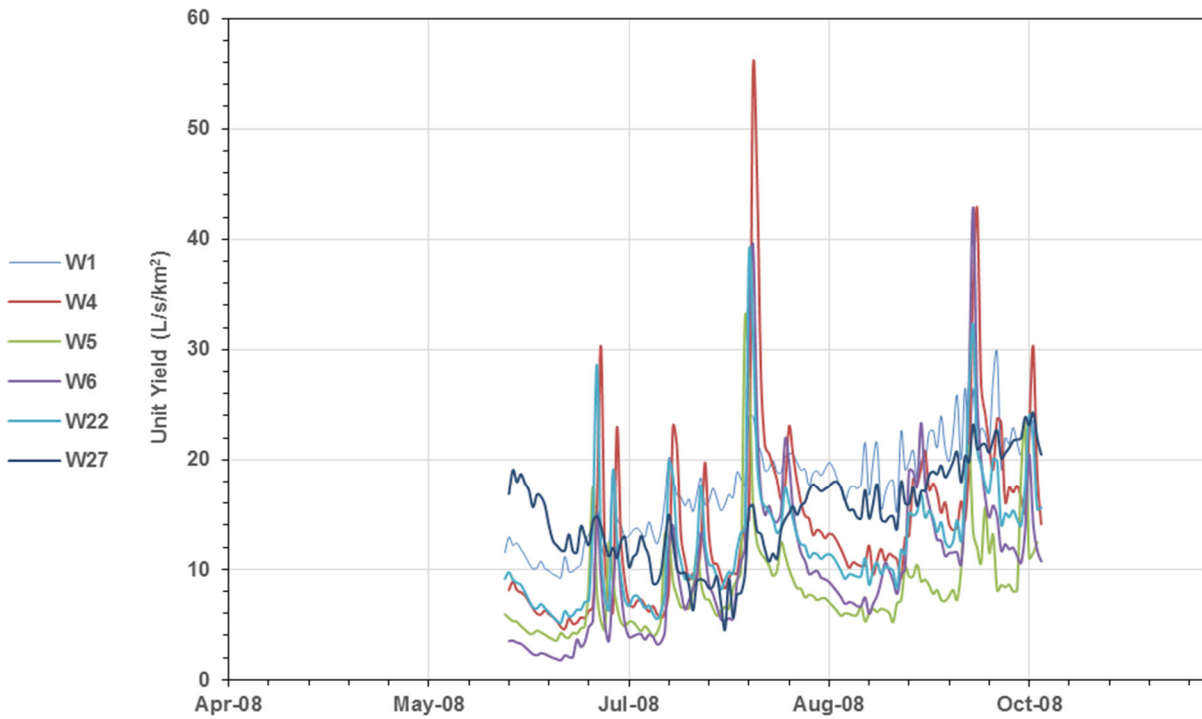


Figure 4-14: Average daily unit yield time-series for Project stations (2008)

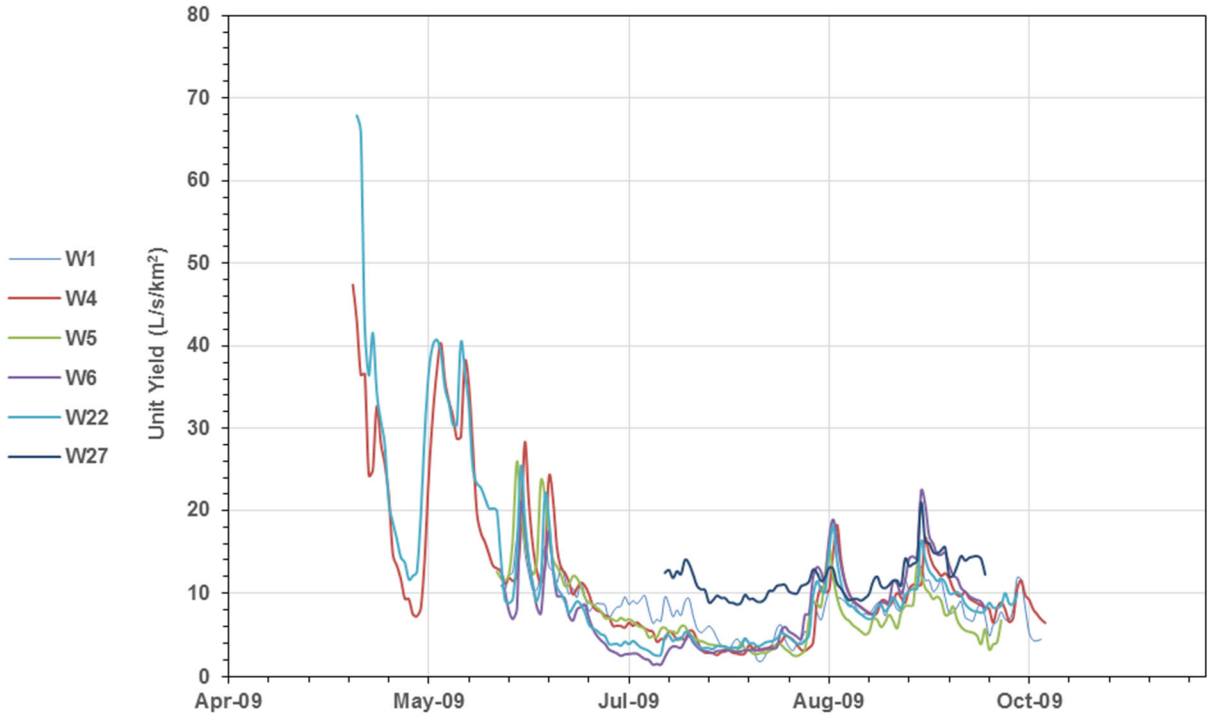


Figure 4-15: Average daily unit yield time-series for Project stations (2009)

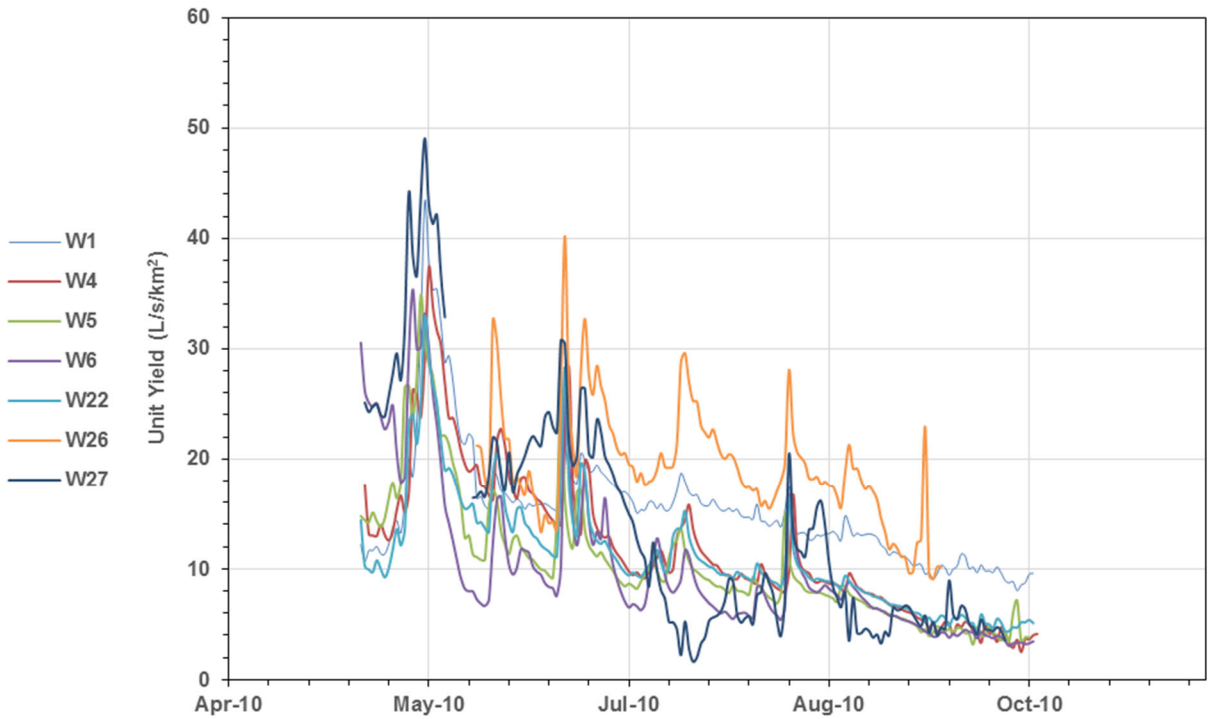


Figure 4-16: Average daily unit yield time-series for Project stations (2010)

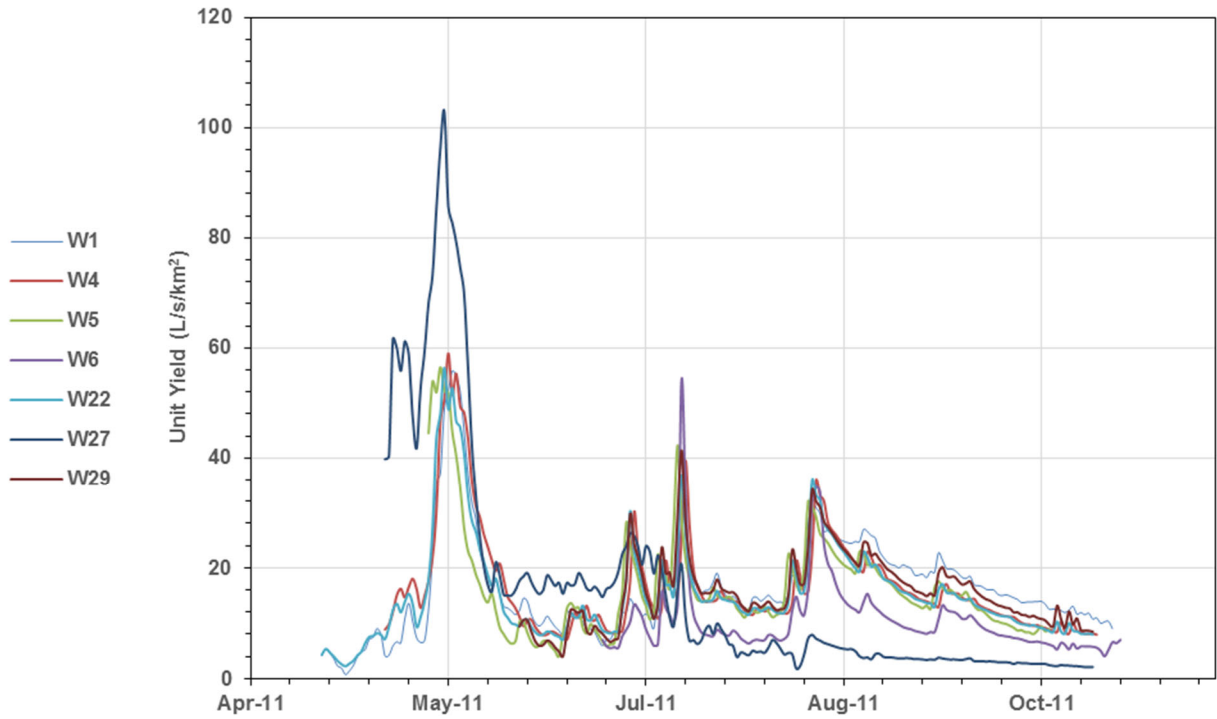


Figure 4-17: Average daily unit yield time-series for Project stations (2011)

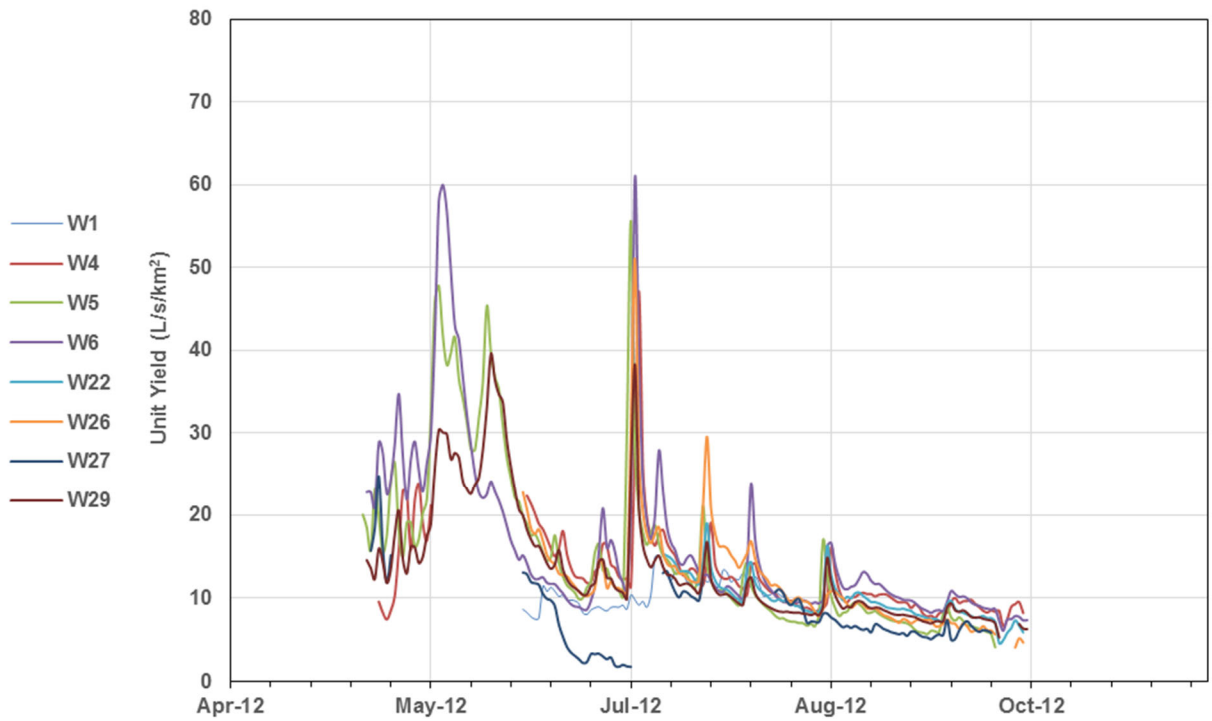


Figure 4-18: Average daily unit yield time-series for Project stations (2012)

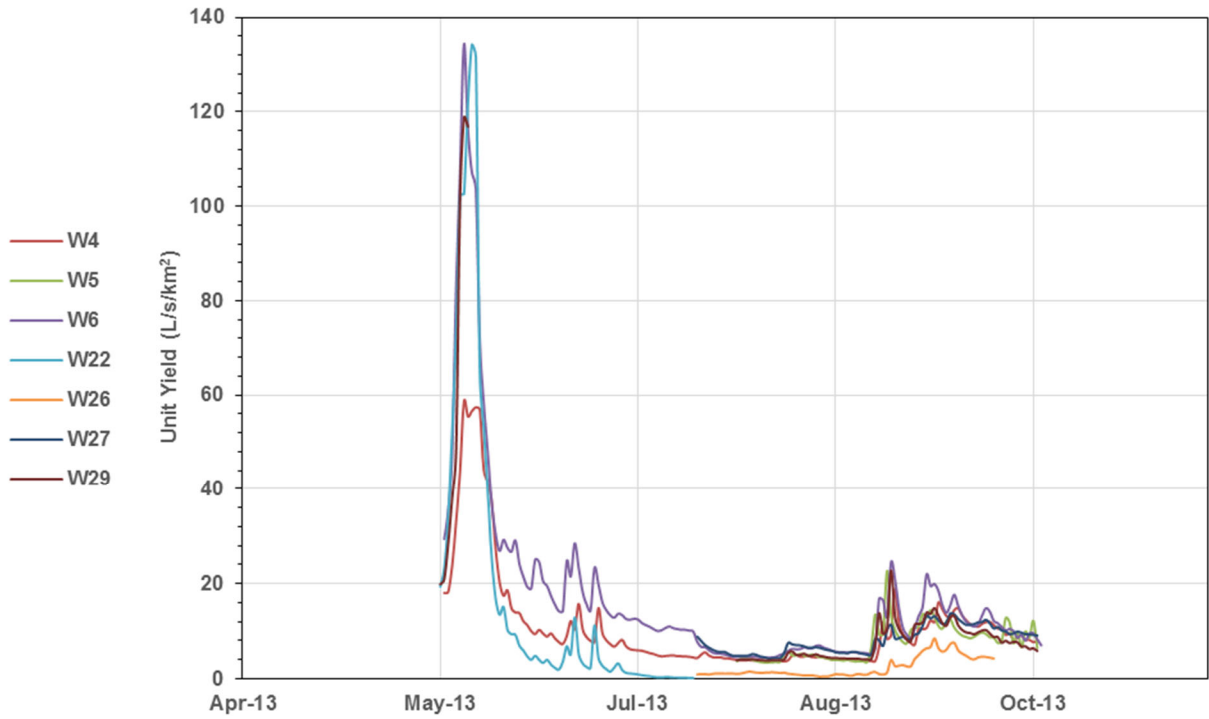


Figure 4-19: Average daily unit yield time-series for Project stations (2013)

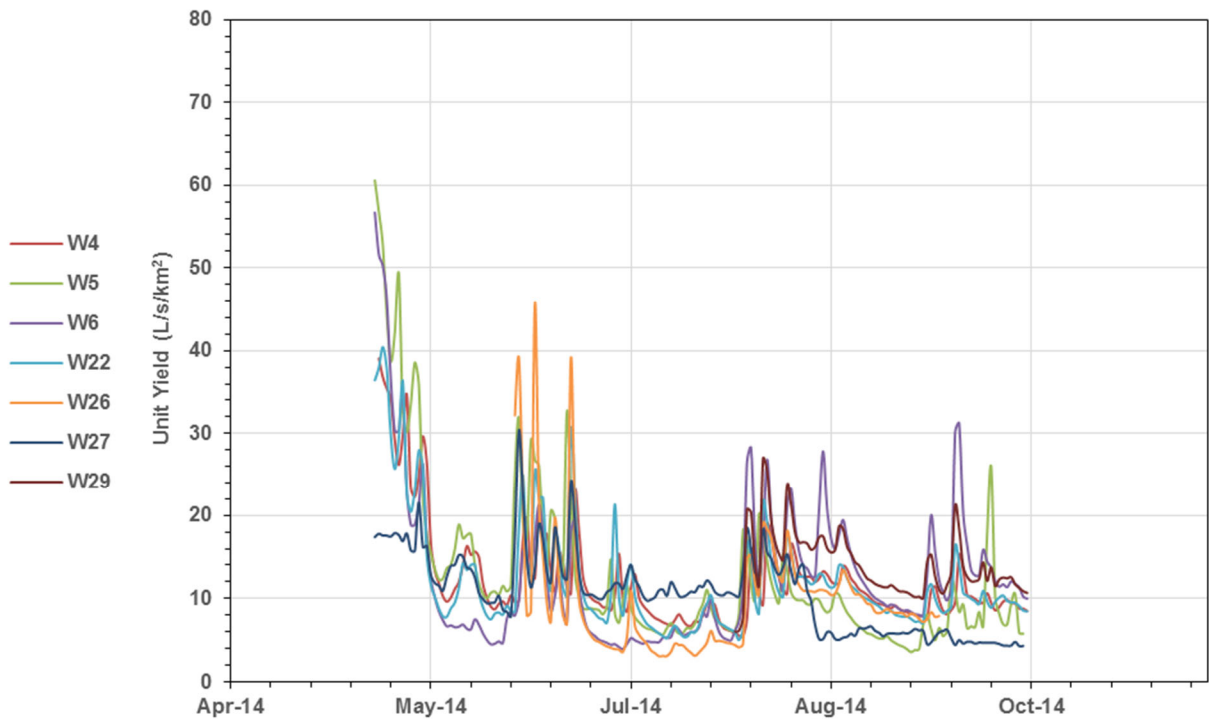


Figure 4-20: Average daily unit yield time-series for Project stations (2014)

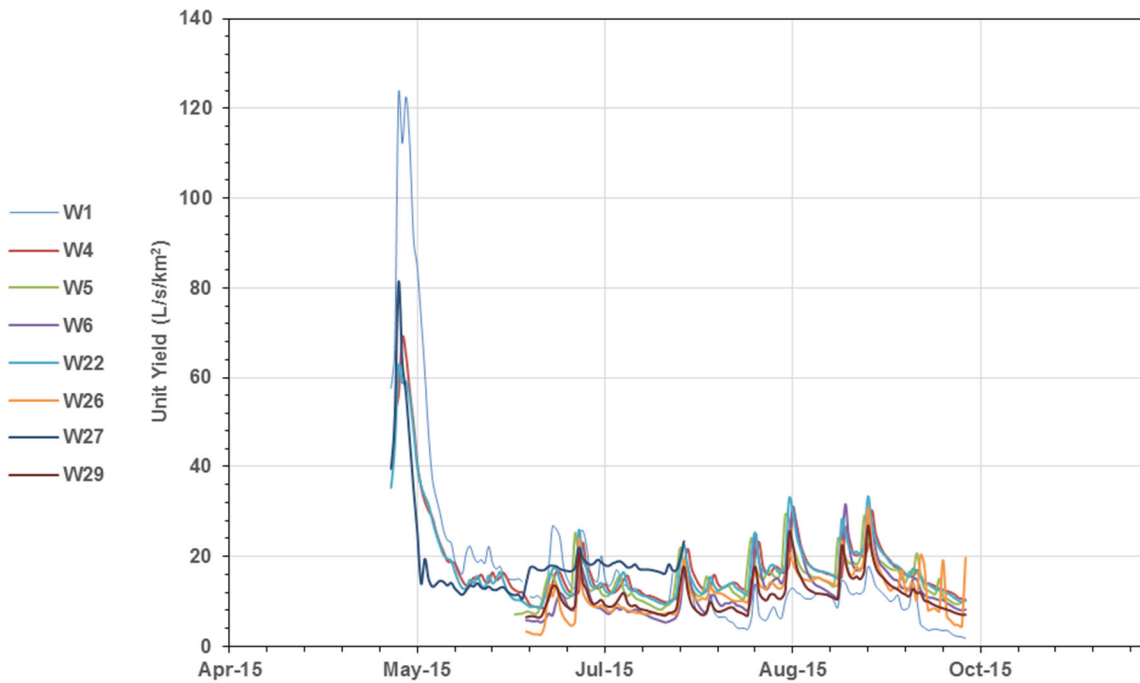


Figure 4-21: Average daily unit yield time-series for Project stations (2015)

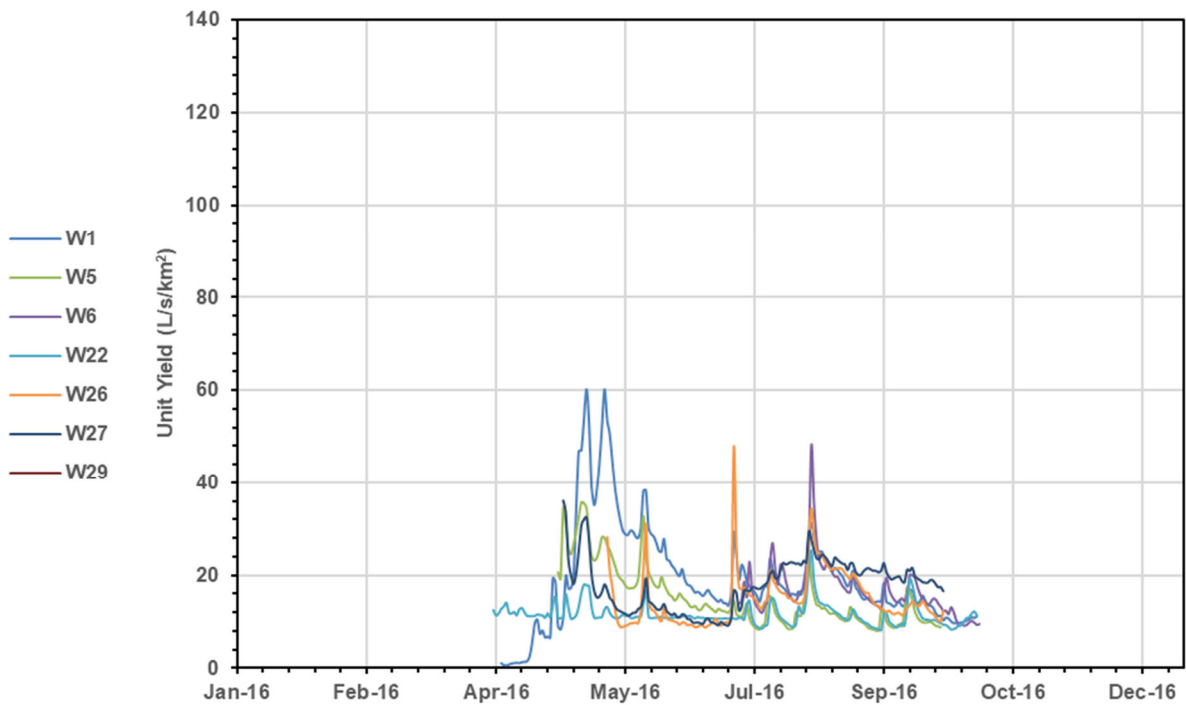


Figure 4-22: Average daily unit yield time-series for Project stations (2016)

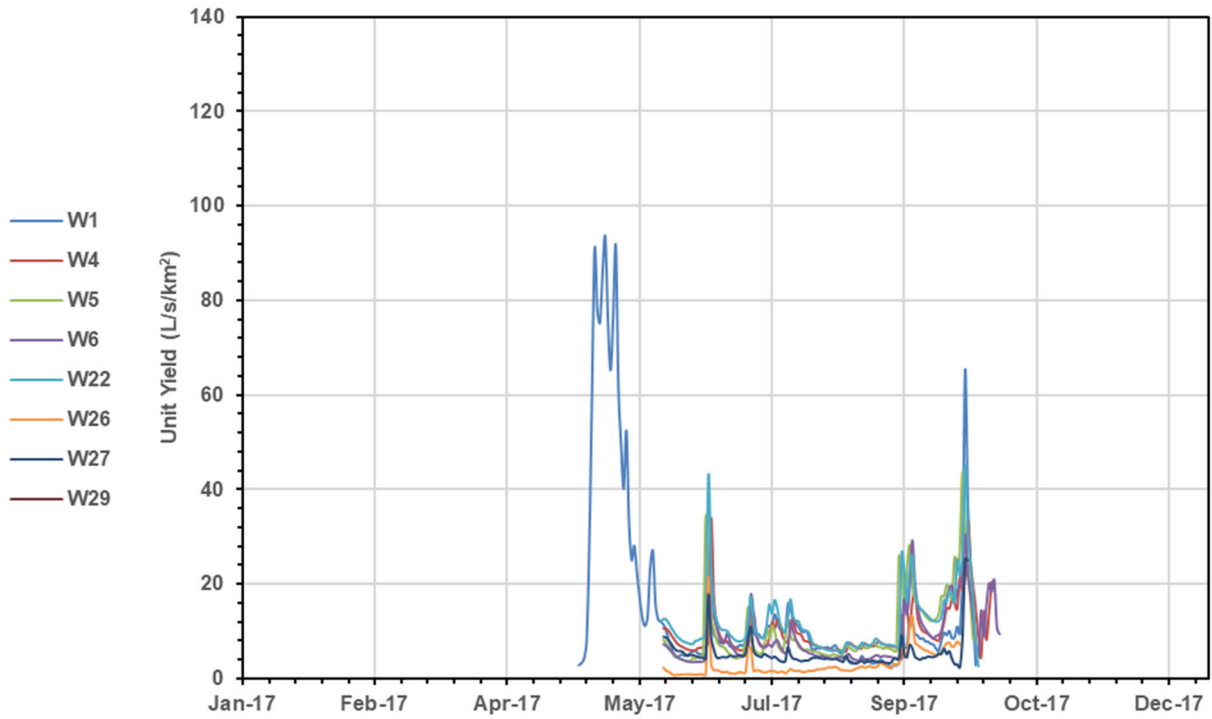


Figure 4-23: Average daily unit yield time-series for Project stations (2017)

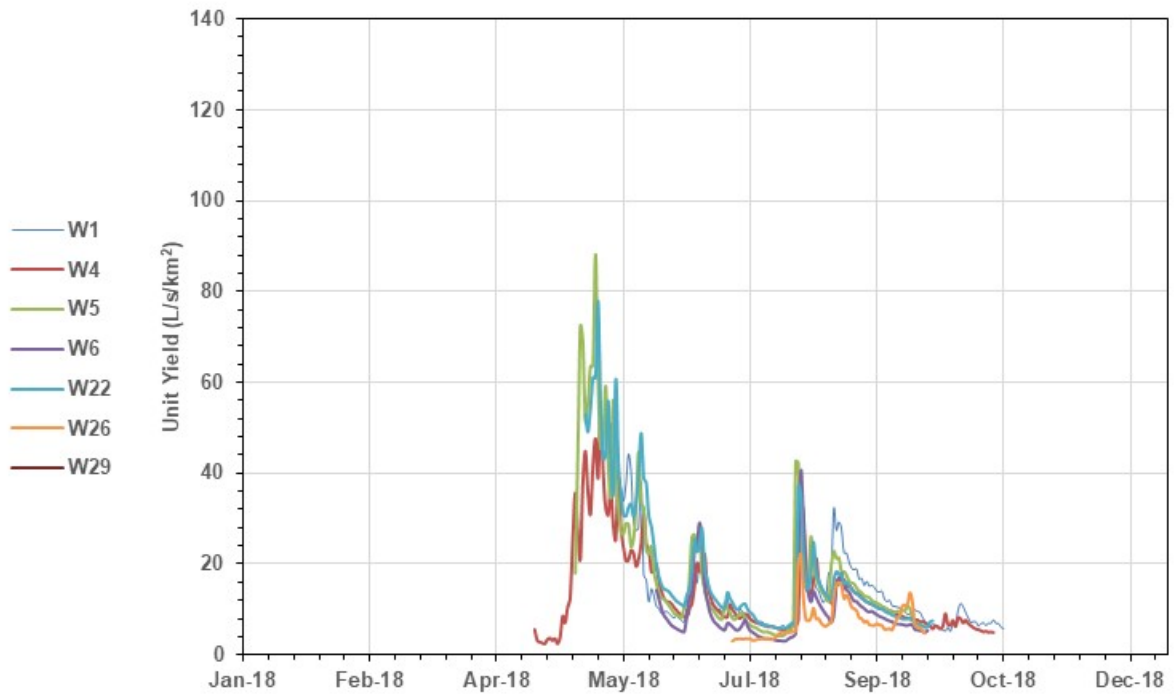


Figure 4-24: Average daily unit yield time-series for Project stations (2018)

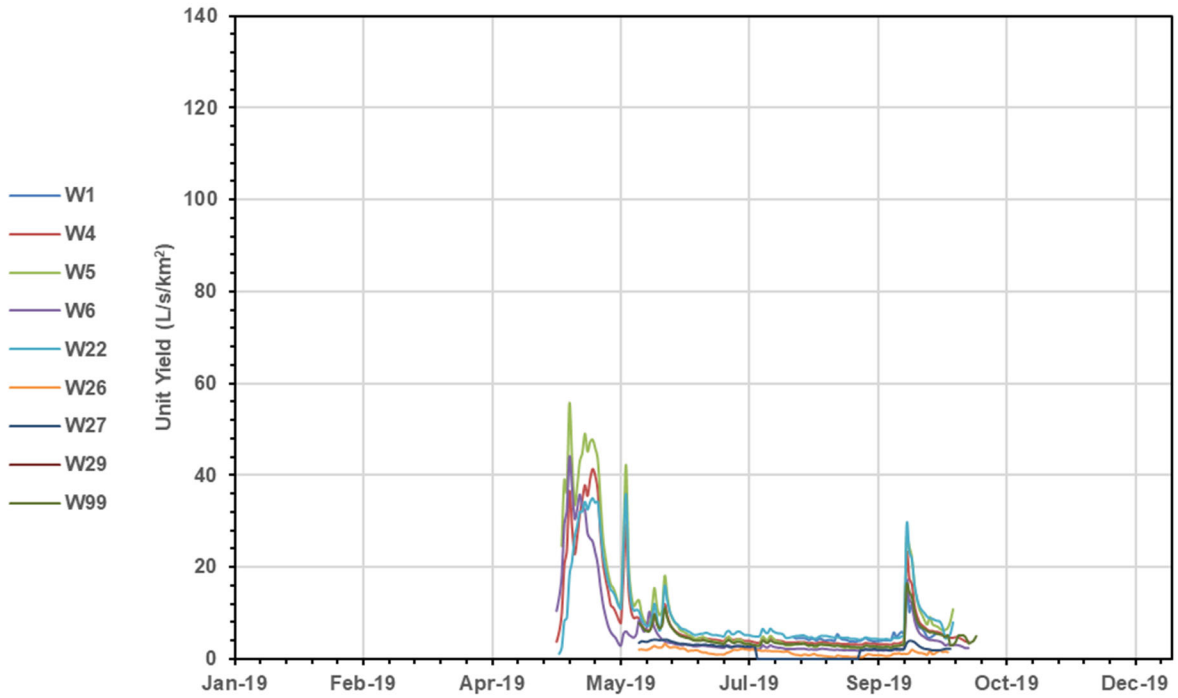


Figure 4-25: Average daily unit yield time-series for Project stations (2019)

4.3 Streamflow Records – Monthly Summary Tables

Monthly summary tables are presented for the eight hydrometric stations in this section.

Table 4-2:
W1 Summary statistics for 15-minute discharge record. All values are in m³/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	0.062	0.074	0.077	--	--
	Maximum	--	--	--	--	--	--	--	0.096	0.128	0.097	--	--
	Minimum	--	--	--	--	--	--	--	0.044	0.049	0.042	--	--
2008	Average	--	--	--	--	--	0.074	0.102	0.130	0.133	0.154	--	--
	Maximum	--	--	--	--	--	0.106	0.184	0.207	0.251	0.265	--	--
	Minimum	--	--	--	--	--	0.054	0.067	0.091	0.085	0.075	--	--
2009	Average	--	--	--	--	--	0.083	0.054	0.035	0.063	0.049	--	--
	Maximum	--	--	--	--	--	0.244	0.083	0.099	0.109	0.117	--	--
	Minimum	--	--	--	--	--	0.012	0.012	0.002	0.026	0.006	--	--
2010	Average	--	--	--	--	0.149	0.117	0.114	0.097	0.078	0.065	--	--
	Maximum	--	--	--	--	0.344	0.195	0.148	0.164	0.126	0.085	--	--
	Minimum	--	--	--	--	0.060	0.092	0.090	0.075	0.054	0.047	--	--
2011	Average	--	--	--	0.024	0.151	0.075	0.104	0.133	0.143	0.094	0.069	--
	Maximum	--	--	--	0.045	0.482	0.138	0.257	0.290	0.215	0.124	0.091	--
	Minimum	--	--	--	0.003	0.017	0.026	0.034	0.072	0.117	0.063	0.053	--
2012	Average	--	--	--	--	--	0.064	0.075	0.079	--	--	--	--
	Maximum	--	--	--	--	--	0.095	0.123	0.096	--	--	--	--
	Minimum	--	--	--	--	--	0.047	0.052	0.066	--	--	--	--
2013	Average	--	--	--	--	--	--	--	--	--	--	--	--
	Maximum	--	--	--	--	--	--	--	--	--	--	--	--
	Minimum	--	--	--	--	--	--	--	--	--	--	--	--
2014	Average	--	--	--	--	0.076	0.091	0.066	0.091	0.120	0.217	--	--
	Maximum	--	--	--	--	0.781	0.273	0.284	0.289	0.557	0.719	--	--
	Minimum	--	--	--	--	0.000	0.000	0.000	0.000	0.000	0.000	--	--
2015	Average	--	--	--	--	0.433	0.120	0.103	0.056	0.080	0.026	--	--
	Maximum	--	--	--	--	1.304	0.295	0.202	0.250	0.172	0.086	--	--
	Minimum	--	--	--	--	0.116	0.067	0.001	0.022	0.033	0.010	--	--
2016	Average	--	--	--	0.024	0.231	0.163	0.121	0.138	0.096	0.070	--	--
	Maximum	--	--	--	0.104	0.583	0.326	0.346	0.255	0.148	0.093	--	--
	Minimum	--	--	--	0.002	0.033	0.095	0.083	0.089	0.061	0.055	--	--
2017	Average	--	--	--	--	0.335	0.066	0.068	0.036	0.055	0.212	--	--
	Maximum	--	--	--	--	1.006	0.281	0.198	0.076	0.289	0.535	--	--
	Minimum	--	--	--	--	0.001	0.025	0.038	0.017	0.008	0.000	--	--
2018	Average	--	--	--	--	0.269	0.116	0.062	0.115	0.078	0.048	--	--
	Maximum	--	--	--	--	0.415	0.474	0.148	0.311	0.131	0.131	--	--
	Minimum	--	--	--	--	0.169	0.039	0.032	0.033	0.025	0.018	--	--
2019	Average	--	--	--	--	--	--	--	0.029	0.039	--	--	--
	Maximum	--	--	--	--	--	--	--	0.045	0.166	--	--	--
	Minimum	--	--	--	--	--	--	--	0.020	0.021	--	--	--
All Years	Average	--	--	--	0.024	0.235	0.097	0.087	0.083	0.087	0.101	0.069	--
	Maximum	--	--	--	0.104	1.304	0.474	0.346	0.311	0.557	0.719	0.091	--
	Minimum	--	--	--	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.053	--

**Table 4-3:
W1 Summary statistics for daily discharge, unit yield and runoff**

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	18	30	20	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	0.06	0.07	0.08	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	9.03	10.85	11.14	--	--
	Runoff (mm)	--	--	--	--	--	--	--	14.0	28.1	19.3	--	--
2008	# days with data	--	--	--	--	--	22	31	31	30	20	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.07	0.10	0.13	0.13	0.15	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	10.85	15.03	19.08	19.55	22.64	--	--
	Runoff (mm)	--	--	--	--	--	20.6	40.3	51.1	50.7	39.1	--	--
2009	# days with data	--	--	--	--	--	23	31	31	30	21	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.08	0.05	0.04	0.06	0.05	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	12.19	7.88	5.18	9.28	7.21	--	--
	Runoff (mm)	--	--	--	--	--	24.2	21.1	13.9	24.1	13.1	--	--
2010	# days with data	--	--	--	--	28	30	31	31	30	19	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.15	0.12	0.11	0.10	0.08	0.07	--	--
	Average Yield (L/s/km ²)	--	--	--	--	21.54	17.20	16.72	14.25	11.43	9.61	--	--
	Runoff (mm)	--	--	--	--	52.1	44.6	44.8	38.2	29.6	15.8	--	--
2011	# days with data	--	--	--	12	31	30	31	31	30	31	5	--
	Average Discharge (m ³ /s)	--	--	--	0.02	0.15	0.07	0.10	0.13	0.14	0.09	0.07	--
	Average Yield (L/s/km ²)	--	--	--	3.38	22.18	10.99	15.23	19.57	21.04	13.83	10.10	--
	Runoff (mm)	--	--	--	3.5	59.4	28.5	40.8	52.4	54.5	37.0	4.4	--
2012	# days with data	--	--	--	--	--	18	31	18	--	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.06	0.08	0.08	--	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	9.33	11.03	11.54	--	--	--	--
	Runoff (mm)	--	--	--	--	--	14.5	29.6	17.9	--	--	--	--
2013	# days with data	--	--	--	--	--	--	--	--	--	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	--	--	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	--	--	--	--	--
	Runoff (mm)	--	--	--	--	--	--	--	--	--	--	--	--
2014	# days with data	--	--	--	--	23	30	31	31	29	17	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.07	0.09	0.06	0.08	0.11	0.20	--	--
	Average Yield (L/s/km ²)	--	--	--	--	10.85	13.35	9.27	12.46	16.79	29.78	--	--
	Runoff (mm)	--	--	--	--	21.6	34.6	24.8	33.4	42.1	43.7	--	--
2015	# days with data	--	--	--	--	18	29	28	31	30	14	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.43	0.12	0.10	0.06	0.08	0.03	--	--
	Average Yield (L/s/km ²)	--	--	--	--	63.51	17.26	14.47	8.24	11.71	3.78	--	--
	Runoff (mm)	--	--	--	--	98.8	43.2	35.0	22.1	30.3	4.6	--	--
2016	# days with data	--	--	--	19	31	30	31	31	30	13	--	--
	Average Discharge (m ³ /s)	--	--	--	0.02	0.23	0.16	0.12	0.14	0.10	0.07	--	--
	Average Yield (L/s/km ²)	--	--	--	3.59	33.94	23.96	17.80	20.24	14.12	10.32	--	--
	Runoff (mm)	--	--	--	5.9	90.9	62.1	47.7	54.2	36.6	11.6	--	--
2017	# days with data	--	--	--	--	24	30	31	31	30	5	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.33	0.07	0.07	0.04	0.06	0.20	--	--
	Average Yield (L/s/km ²)	--	--	--	--	48.73	9.72	10.01	5.27	8.11	28.95	--	--
	Runoff (mm)	--	--	--	--	101.1	25.2	26.8	14.1	21.0	12.5	--	--
2018	# days with data	--	--	--	--	6	30	31	31	30	28	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.3	0.1	0.1	0.1	0.1	0.0	--	--
	Average Yield (L/s/km ²)	--	--	--	--	40.9	17.1	9.1	16.9	11.4	7.1	--	--
	Runoff (mm)	--	--	--	--	21.2	44.4	24.4	45.3	29.6	17.2	--	--
2019	# days with data	--	--	--	--	14	--	--	26	30	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	0.0	0.0	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	4.3	5.8	--	--	--
	Runoff (mm)	--	--	--	--	--	--	--	9.6	15.0	--	--	--
All Years	Average Discharge (m ³ /s)	--	--	--	0.02	0.23	0.10	0.09	0.08	0.09	0.10	0.07	--
	Average Yield (L/s/km ²)	--	--	--	3.48	34.52	14.20	12.66	12.17	12.73	14.44	10.10	--
	Average Runoff (mm)	--	--	--	4.7	63.6	34.2	33.5	30.5	32.9	21.4	4.4	--

Table 4-4:
W4 Summary statistics for 15-minute discharge record. All values are in m³/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	0.641	0.875	0.768	--	--
	Maximum	--	--	--	--	--	--	--	1.047	2.281	2.061	--	--
	Minimum	--	--	--	--	--	--	--	0.416	0.560	0.499	--	--
2008	Average	--	--	--	--	--	0.479	0.868	1.334	1.034	1.666	--	--
	Maximum	--	--	--	--	--	0.742	4.241	6.649	2.237	5.001	--	--
	Minimum	--	--	--	--	--	0.307	0.378	0.543	0.594	0.614	--	--
2009	Average	--	--	--	--	1.949	1.109	0.406	0.426	0.795	0.654	--	--
	Maximum	--	--	--	--	5.288	3.115	0.706	1.565	1.473	1.230	--	--
	Minimum	--	--	--	--	0.060	0.554	0.090	0.159	0.531	0.296	--	--
2010	Average	--	--	--	--	1.619	1.355	0.879	0.723	0.492	0.306	--	--
	Maximum	--	--	--	--	3.059	2.780	1.338	1.558	0.833	0.497	--	--
	Minimum	--	--	--	--	0.764	0.921	0.643	0.555	0.021	0.021	--	--
2011	Average	--	--	--	--	2.218	0.845	1.301	1.430	1.268	0.768	--	--
	Maximum	--	--	--	--	5.350	1.764	3.743	3.321	1.986	1.220	--	--
	Minimum	--	--	--	--	0.614	0.492	0.573	0.802	0.942	0.564	--	--
2012	Average	--	--	--	--	1.224	1.211	1.271	0.833	0.726	0.662	--	--
	Maximum	--	--	--	--	2.086	1.871	4.834	1.484	0.899	0.846	--	--
	Minimum	--	--	--	--	0.475	0.817	0.781	0.591	0.544	0.405	--	--
2013	Average	--	--	--	--	3.341	1.065	0.420	0.317	0.749	0.753	--	--
	Maximum	--	--	--	--	7.034	3.902	0.818	0.421	1.903	0.996	--	--
	Minimum	--	--	--	--	1.155	0.540	0.287	0.259	0.265	0.465	--	--
2014	Average	--	--	--	--	1.664	1.004	0.671	0.899	0.759	0.727	--	--
	Maximum	--	--	--	--	4.388	2.274	2.035	2.456	1.311	1.041	--	--
	Minimum	--	--	--	--	0.614	0.625	0.488	0.383	0.452	0.579	--	--
2015	Average	--	--	--	--	2.781	1.014	1.019	1.271	1.470	0.962	--	--
	Maximum	--	--	--	--	7.008	1.510	2.324	3.133	2.699	1.373	--	--
	Minimum	--	--	--	--	1.144	0.566	0.690	0.825	1.004	0.717	--	--
2016	Average	--	--	--	--	--	--	--	--	--	--	--	--
	Maximum	--	--	--	--	--	--	--	--	--	--	--	--
	Minimum	--	--	--	--	--	--	--	--	--	--	--	--
2017	Average	--	--	--	--	--	0.718	0.665	0.522	0.934	1.254	--	--
	Maximum	--	--	--	--	--	5.411	1.431	0.771	2.545	2.904	--	--
	Minimum	--	--	--	--	--	0.408	0.412	0.404	0.309	0.168	--	--
2018	Average	--	--	--	0.237	1.987	1.266	0.687	1.088	0.693	0.488	--	--
	Maximum	--	--	--	0.592	5.742	2.623	2.121	4.161	1.091	1.247	--	--
	Minimum	--	--	--	0.150	0.136	0.597	0.377	0.384	0.263	0.304	--	--
2019	Average	--	--	--	--	1.814	0.645	0.319	0.267	0.472	0.366	--	--
	Maximum	--	--	--	--	4.105	3.468	0.424	0.329	2.905	0.504	--	--
	Minimum	--	--	--	--	0.178	0.304	0.239	0.224	0.220	0.219	--	--
All Years	Average	--	--	--	0.237	1.993	0.985	0.773	0.818	0.856	0.773	0.847	--
	Maximum	--	--	--	0.592	7.034	5.411	4.834	6.649	2.905	5.001	1.145	--
	Minimum	--	--	--	0.150	0.060	0.304	0.090	0.159	0.021	0.021	0.565	--

**Table 4-5:
W4 Summary statistics for daily discharge, unit yield and runoff**

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	18	30	31	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	0.64	0.87	0.77	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	8.30	11.38	9.98	--	--
	Runoff (mm)	--	--	--	--	--	--	--	12.9	29.5	26.7	--	--
2008	# days with data	--	--	--	--	--	22	31	31	30	21	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.48	0.87	1.34	1.03	1.65	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	6.30	11.29	17.40	13.45	21.48	--	--
	Runoff (mm)	--	--	--	--	--	12.0	30.2	46.6	34.9	39.0	--	--
2009	# days with data	--	--	--	--	31	30	31	31	30	21	--	--
	Average Discharge (m ³ /s)	--	--	--	--	2.01	1.11	0.41	0.43	0.80	0.65	--	--
	Average Yield (L/s/km ²)	--	--	--	--	26.12	14.42	5.28	5.54	10.34	8.48	--	--
	Runoff (mm)	--	--	--	--	70.0	37.4	14.1	14.8	26.8	15.4	--	--
2010	# days with data	--	--	--	--	28	30	31	31	30	19	--	--
	Average Discharge (m ³ /s)	--	--	--	--	1.61	1.35	0.88	0.72	0.49	0.31	--	--
	Average Yield (L/s/km ²)	--	--	--	--	20.96	17.62	11.43	9.40	6.40	3.98	--	--
	Runoff (mm)	--	--	--	--	50.7	45.7	30.6	25.2	16.6	6.5	--	--
2011	# days with data	--	--	--	--	28	30	31	31	30	31	--	--
	Average Discharge (m ³ /s)	--	--	--	--	2.18	0.85	1.30	1.43	1.27	0.77	--	--
	Average Yield (L/s/km ²)	--	--	--	--	28.41	10.99	16.91	18.60	16.49	9.99	--	--
	Runoff (mm)	--	--	--	--	68.7	28.5	45.3	49.8	42.7	26.8	--	--
2012	# days with data	--	--	--	--	14	18	31	31	30	16	--	--
	Average Discharge (m ³ /s)	--	--	--	--	1.23	1.23	1.27	0.83	0.73	0.66	--	--
	Average Yield (L/s/km ²)	--	--	--	--	16.02	15.93	16.53	10.83	9.44	8.57	--	--
	Runoff (mm)	--	--	--	--	19.4	24.8	44.3	29.0	24.5	11.9	--	--
2013	# days with data	--	--	--	--	11	30	31	31	30	19	--	--
	Average Discharge (m ³ /s)	--	--	--	--	3.26	1.07	0.42	0.32	0.75	0.75	--	--
	Average Yield (L/s/km ²)	--	--	--	--	42.39	13.85	5.46	4.12	9.75	9.72	--	--
	Runoff (mm)	--	--	--	--	40.3	35.9	14.6	11.0	25.3	15.9	--	--
2014	# days with data	--	--	--	--	25	30	31	31	30	17	--	--
	Average Discharge (m ³ /s)	--	--	--	--	1.69	1.00	0.67	0.90	0.76	0.72	--	--
	Average Yield (L/s/km ²)	--	--	--	--	21.93	13.06	8.73	11.69	9.87	9.42	--	--
	Runoff (mm)	--	--	--	--	47.4	33.8	23.4	31.3	25.6	13.8	--	--
2015	# days with data	--	--	--	--	18	30	31	31	30	14	--	--
	Average Discharge (m ³ /s)	--	--	--	--	2.81	1.01	1.02	1.27	1.47	0.96	--	--
	Average Yield (L/s/km ²)	--	--	--	--	36.55	13.18	13.24	16.53	19.11	12.45	--	--
	Runoff (mm)	--	--	--	--	56.8	34.2	35.5	44.3	49.5	15.1	--	--
2016	# days with data	--	--	--	--	--	--	--	--	--	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	--	--	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	--	--	--	--	--
	Runoff (mm)	--	--	--	--	--	--	--	--	--	--	--	--
2017	# days with data	--	--	--	--	--	23	31	31	30	11	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.72	0.67	0.52	0.93	1.26	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	9.39	8.65	6.78	12.14	16.37	--	--
	Runoff (mm)	--	--	--	--	--	18.7	23.2	18.2	31.5	15.6	--	--
2018	# days with data	--	--	--	6	31	30	31	31	30	24	--	--
	Average Discharge (m ³ /s)	--	--	--	0.3	2.0	1.3	0.7	1.1	0.7	0.5	--	--
	Average Yield (L/s/km ²)	--	--	--	3.3	25.8	16.5	8.9	14.1	9.0	6.3	--	--
	Runoff (mm)	--	--	--	1.7	69.2	42.7	23.9	37.9	23.4	13.1	--	--
2019	# days with data	--	--	--	--	26	30	31	31	30	13	--	--
	Average Discharge (m ³ /s)	--	--	--	--	1.8	0.6	0.3	0.3	0.5	0.4	--	--
	Average Yield (L/s/km ²)	--	--	--	--	23.3	8.4	4.2	3.5	6.1	4.7	--	--
	Runoff (mm)	--	--	--	--	52.3	21.7	11.1	9.3	15.9	5.3	--	--
All Years	Average Discharge (m ³ /s)	--	--	--	0.26	2.06	0.98	0.77	0.81	0.86	0.78	--	--
	Average Yield (L/s/km ²)	--	--	--	3.34	26.83	12.69	10.06	10.57	11.13	10.12	--	--
	Average Runoff (mm)	--	--	--	1.7	52.8	30.5	26.9	27.5	28.8	17.1	--	--

Table 4-6:
W5 Summary statistics for 15-minute discharge record. All values are in m³/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	0.788	0.970	1.083	--	--
	Maximum	--	--	--	--	--	--	--	1.221	2.065	2.135	--	--
	Minimum	--	--	--	--	--	--	--	0.548	0.679	0.678	--	--
2008	Average	--	--	--	--	--	0.431	0.726	0.994	0.703	1.202	--	--
	Maximum	--	--	--	--	--	0.622	3.599	4.574	1.228	4.904	--	--
	Minimum	--	--	--	--	--	0.315	0.336	0.490	0.463	0.410	--	--
2009	Average	--	--	--	--	--	1.425	0.589	0.474	0.768	1.187	--	--
	Maximum	--	--	--	--	--	3.461	0.944	1.669	1.508	2.903	--	--
	Minimum	--	--	--	--	--	0.825	0.225	0.156	0.441	0.156	--	--
2010	Average	--	--	--	--	1.990	1.273	0.991	0.817	0.569	0.423	--	--
	Maximum	--	--	--	--	3.623	3.180	1.428	1.709	0.910	0.916	--	--
	Minimum	--	--	--	--	1.060	0.817	0.742	0.623	0.124	0.081	--	--
2011	Average	--	--	--	--	3.554	0.859	1.681	1.756	1.625	0.984	--	--
	Maximum	--	--	--	--	7.146	1.682	4.928	3.588	2.631	1.586	--	--
	Minimum	--	--	--	--	1.273	0.264	0.447	0.934	1.117	0.551	--	--
2012	Average	--	--	--	--	2.599	2.119	1.626	0.924	0.734	0.621	--	--
	Maximum	--	--	--	--	6.239	5.160	6.883	1.996	1.007	0.794	--	--
	Minimum	--	--	--	--	0.819	0.837	0.871	0.566	0.497	0.344	--	--
2013	Average	--	--	--	--	--	--	--	0.417	0.933	0.893	--	--
	Maximum	--	--	--	--	--	--	--	0.623	3.880	2.321	--	--
	Minimum	--	--	--	--	--	--	--	0.284	0.315	0.579	--	--
2014	Average	--	--	--	--	2.916	1.625	0.769	1.055	0.615	0.926	--	--
	Maximum	--	--	--	--	7.135	4.536	2.807	3.277	1.323	3.345	--	--
	Minimum	--	--	--	--	1.072	0.801	0.488	0.542	0.322	0.496	--	--
2015	Average	--	--	--	--	--	1.066	1.227	1.541	1.762	1.237	--	--
	Maximum	--	--	--	--	--	1.860	2.965	3.814	3.041	3.056	--	--
	Minimum	--	--	--	--	--	0.627	0.734	0.953	1.258	0.883	--	--
2016	Average	--	--	--	--	2.540	1.685	1.152	1.202	1.007	--	--	--
	Maximum	--	--	--	--	4.003	3.725	1.790	2.854	2.334	--	--	--
	Minimum	--	--	--	--	1.578	1.112	0.771	0.755	0.731	--	--	--
2017	Average	--	--	--	--	--	0.772	0.724	0.584	1.557	2.392	--	--
	Maximum	--	--	--	--	--	6.140	1.729	0.840	4.196	4.631	--	--
	Minimum	--	--	--	--	--	0.279	0.360	0.395	0.522	0.231	--	--
2018	Average	--	--	--	--	4.921	1.951	0.857	1.614	1.015	--	--	--
	Maximum	--	--	--	--	11.424	4.799	3.145	6.815	1.708	--	--	--
	Minimum	--	--	--	--	1.471	0.743	0.354	0.323	0.504	--	--	--
2019	Average	--	--	--	--	3.299	1.102	0.381	0.283	0.685	0.701	--	--
	Maximum	--	--	--	--	6.205	5.798	0.594	0.434	4.118	1.664	--	--
	Minimum	--	--	--	--	1.026	0.324	0.153	0.132	0.170	0.315	--	--
All Years	Average	--	--	--	--	3.082	1.357	0.975	0.970	0.995	1.000	--	--
	Maximum	--	--	--	--	17.273	6.140	6.883	6.815	4.196	4.904	--	--
	Minimum	--	--	--	--	0.819	0.264	0.153	0.132	0.124	0.081	--	--

**Table 4-7:
W5 Summary statistics for daily discharge, unit yield and runoff**

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	18	30	20	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	0.79	0.97	1.09	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	8.06	9.94	11.22	--	--
	Runoff (mm)	--	--	--	--	--	--	--	12.5	25.8	19.4	--	--
2008	# days with data	--	--	--	--	--	21	31	31	30	21	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.43	0.73	1.00	0.70	1.20	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	4.46	7.44	10.22	7.21	12.33	--	--
	Runoff (mm)	--	--	--	--	--	8.1	19.9	27.4	18.7	22.4	--	--
2009	# days with data	--	--	--	--	--	23	31	31	30	22	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	1.42	0.59	0.47	0.77	1.19	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	14.56	6.04	4.86	7.88	12.19	--	--
	Runoff (mm)	--	--	--	--	--	28.9	16.2	13.0	20.4	23.2	--	--
2010	# days with data	--	--	--	--	28	30	31	31	30	19	--	--
	Average Discharge (m ³ /s)	--	--	--	--	1.99	1.27	0.99	0.82	0.57	0.42	--	--
	Average Yield (L/s/km ²)	--	--	--	--	20.36	13.06	10.16	8.38	5.83	4.32	--	--
	Runoff (mm)	--	--	--	--	49.3	33.8	27.2	22.4	15.1	7.1	--	--
2011	# days with data	--	--	--	--	15	30	31	31	30	21	--	--
	Average Discharge (m ³ /s)	--	--	--	--	3.59	0.86	1.68	1.76	1.62	0.98	--	--
	Average Yield (L/s/km ²)	--	--	--	--	36.82	8.81	17.24	18.01	16.67	10.09	--	--
	Runoff (mm)	--	--	--	--	47.7	22.8	46.2	48.2	43.2	18.3	--	--
2012	# days with data	--	--	--	--	27	30	31	31	30	10	--	--
	Average Discharge (m ³ /s)	--	--	--	--	2.59	2.12	1.63	0.92	0.73	0.61	--	--
	Average Yield (L/s/km ²)	--	--	--	--	26.52	21.73	16.68	9.47	7.53	6.29	--	--
	Runoff (mm)	--	--	--	--	61.9	56.3	44.7	25.4	19.5	5.4	--	--
2013	# days with data	--	--	--	--	--	--	--	27	30	20	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	0.42	0.93	0.89	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	4.26	9.57	9.09	--	--
	Runoff (mm)	--	--	--	--	--	--	--	9.9	24.8	15.7	--	--
2014	# days with data	--	--	--	--	25	30	31	31	30	17	--	--
	Average Discharge (m ³ /s)	--	--	--	--	3.03	1.63	0.77	1.05	0.62	0.92	--	--
	Average Yield (L/s/km ²)	--	--	--	--	31.09	16.67	7.88	10.81	6.31	9.41	--	--
	Runoff (mm)	--	--	--	--	67.2	43.2	21.1	29.0	16.4	13.8	--	--
2015	# days with data	--	--	--	--	--	15	31	31	30	14	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.98	1.23	1.54	1.76	1.23	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	10.01	12.58	15.81	18.07	12.63	--	--
	Runoff (mm)	--	--	--	--	--	13.0	33.7	42.3	46.8	15.3	--	--
2016	# days with data	--	--	--	--	28	30	31	31	30	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	2.54	1.69	1.15	1.20	1.01	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	26.01	17.28	11.81	12.32	10.33	--	--	--
	Runoff (mm)	--	--	--	--	62.9	44.8	31.6	33.0	26.8	--	--	--
2017	# days with data	--	--	--	--	--	22	31	31	30	5	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.77	0.72	0.58	1.56	2.39	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	7.92	7.42	5.99	15.97	24.54	--	--
	Runoff (mm)	--	--	--	--	--	15.1	19.9	16.1	41.4	10.6	--	--
2018	# days with data	--	--	--	--	20	30	31	31	28	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	4.9	2.0	0.9	1.6	1.0	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	49.9	20.0	8.8	16.6	10.3	--	--	--
	Runoff (mm)	--	--	--	--	86.2	51.9	23.6	44.3	24.9	--	--	--
2019	# days with data	--	--	--	--	24	30	31	31	30	7	--	--
	Average Discharge (m ³ /s)	--	--	--	--	3.3	1.1	0.4	0.3	0.7	0.7	--	--
	Average Yield (L/s/km ²)	--	--	--	--	33.7	11.3	3.9	2.9	7.0	7.4	--	--
	Runoff (mm)	--	--	--	--	69.8	29.3	10.5	7.8	18.2	4.5	--	--
All Years	Average Discharge (m ³ /s)	--	--	--	--	3.12	1.29	0.97	0.96	0.99	1.06	--	--
	Average Yield (L/s/km ²)	--	--	--	--	32.05	13.26	10.00	9.82	10.20	10.87	--	--
	Average Runoff (mm)	--	--	--	--	63.6	31.6	26.8	25.5	26.3	14.2	--	--

Table 4-8:
W6 Summary statistics for 15-minute discharge record. All values are in m³/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	0.783	1.303	0.725	--	--
	Maximum	--	--	--	--	--	--	--	2.057	4.249	1.494	--	--
	Minimum	--	--	--	--	--	--	--	0.299	0.467	0.239	--	--
2008	Average	--	--	--	--	--	0.274	0.741	1.340	1.121	1.665	--	--
	Maximum	--	--	--	--	--	0.545	1.780	4.636	2.652	5.172	--	--
	Minimum	--	--	--	--	--	0.136	0.265	0.456	0.542	0.675	--	--
2009	Average	--	--	--	--	--	1.063	0.318	0.647	1.223	0.964	--	--
	Maximum	--	--	--	--	--	2.266	0.675	1.988	2.509	1.118	--	--
	Minimum	--	--	--	--	--	0.617	0.038	0.267	0.724	0.709	--	--
2010	Average	--	--	--	--	2.213	1.181	0.946	0.779	0.578	0.379	--	--
	Maximum	--	--	--	--	4.325	2.817	1.811	1.840	0.948	0.544	--	--
	Minimum	--	--	--	--	0.746	0.626	0.580	0.509	0.247	0.112	--	--
2011	Average	--	--	--	--	--	0.626	1.180	1.350	1.101	0.708	0.569	--
	Maximum	--	--	--	--	--	1.207	6.749	3.864	1.630	1.169	0.722	--
	Minimum	--	--	--	--	--	0.535	0.525	0.591	0.797	0.340	0.385	--
2012	Average	--	--	--	--	3.349	1.506	1.854	1.183	1.048	0.842	--	--
	Maximum	--	--	--	--	7.528	2.769	7.120	2.681	1.367	1.054	--	--
	Minimum	--	--	--	--	1.511	0.814	0.991	0.912	0.803	0.497	--	--
2013	Average	--	--	--	--	8.676	2.479	1.055	0.546	1.308	1.084	--	--
	Maximum	--	--	--	--	17.947	6.767	1.754	0.738	2.809	2.429	--	--
	Minimum	--	--	--	--	2.496	1.337	0.489	0.412	0.499	0.686	--	--
2014	Average	--	--	--	--	2.106	1.034	0.892	1.661	1.282	1.324	--	--
	Maximum	--	--	--	--	6.637	2.706	2.186	3.689	3.653	2.651	--	--
	Minimum	--	--	--	--	0.572	0.419	0.375	0.834	0.774	0.960	--	--
2015	Average	--	--	--	--	--	0.765	0.879	1.402	1.722	1.039	--	--
	Maximum	--	--	--	--	--	1.269	2.255	3.733	3.688	1.635	--	--
	Minimum	--	--	--	--	--	0.486	0.508	0.712	1.046	0.784	--	--
2016	Average	--	--	--	--	--	--	1.788	2.057	1.541	1.046	--	--
	Maximum	--	--	--	--	--	--	2.992	5.348	2.116	1.688	--	--
	Minimum	--	--	--	--	--	--	1.177	1.367	1.073	0.686	--	--
2017	Average	--	--	--	--	--	0.677	0.778	0.462	1.294	1.566	--	--
	Maximum	--	--	--	--	--	3.127	1.958	0.635	3.253	3.264	--	--
	Minimum	--	--	--	--	--	0.295	0.440	0.371	0.389	0.328	--	--
2018	Average	--	--	--	--	--	1.145	0.672	1.239	0.763	--	--	--
	Maximum	--	--	--	--	--	3.203	3.131	4.880	1.221	--	--	--
	Minimum	--	--	--	--	--	0.468	0.278	0.266	0.383	--	--	--
2019	Average					2.108	0.487	0.263	0.209	0.418	0.311		
	Maximum					5.138	1.077	0.370	0.272	2.821	0.452		
	Minimum					0.280	0.247	0.181	0.166	0.162	0.161		
All Years	Average	--	--	--	--	2.976	1.121	0.918	1.060	1.133	0.950	0.903	--
	Maximum	--	--	--	--	17.947	6.767	7.120	5.348	4.249	5.172	1.788	--
	Minimum	--	--	--	--	0.280	0.136	0.038	0.166	0.162	0.112	0.385	--

**Table 4-9:
W6 Summary statistics for daily discharge, unit yield and runoff**

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	18	30	31	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	0.78	1.30	0.73	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	7.70	12.91	7.19	--	--
	Runoff (mm)	--	--	--	--	--	--	--	12.0	33.5	19.2	--	--
2008	# days with data	--	--	--	--	--	21	31	31	30	21	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.28	0.74	1.34	1.12	1.66	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	2.74	7.35	13.31	11.11	16.41	--	--
	Runoff (mm)	--	--	--	--	--	5.0	19.7	35.7	28.8	29.8	--	--
2009	# days with data	--	--	--	--	--	23	31	31	30	7	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	1.07	0.32	0.65	1.22	0.96	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	10.60	3.15	6.41	12.12	9.48	--	--
	Runoff (mm)	--	--	--	--	--	21.1	8.4	17.2	31.4	5.7	--	--
2010	# days with data	--	--	--	--	28	30	31	31	30	19	--	--
	Average Discharge (m ³ /s)	--	--	--	--	2.23	1.18	0.95	0.78	0.58	0.38	--	--
	Average Yield (L/s/km ²)	--	--	--	--	22.09	11.71	9.37	7.72	5.73	3.75	--	--
	Runoff (mm)	--	--	--	--	53.4	30.3	25.1	20.7	14.9	6.1	--	--
2011	# days with data	--	--	--	--	--	2	31	31	30	31	7	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.65	1.18	1.35	1.10	0.71	0.57	--
	Average Yield (L/s/km ²)	--	--	--	--	--	6.42	11.69	13.38	10.91	7.02	5.69	--
	Runoff (mm)	--	--	--	--	--	1.1	31.3	35.8	28.3	18.8	3.4	--
2012	# days with data	--	--	--	--	27	30	31	31	30	17	--	--
	Average Discharge (m ³ /s)	--	--	--	--	3.33	1.51	1.85	1.18	1.05	0.84	--	--
	Average Yield (L/s/km ²)	--	--	--	--	32.98	14.92	18.37	11.72	10.38	8.32	--	--
	Runoff (mm)	--	--	--	--	76.9	38.7	49.2	31.4	26.9	12.2	--	--
2013	# days with data	--	--	--	--	10	30	31	31	30	20	--	--
	Average Discharge (m ³ /s)	--	--	--	--	8.43	2.48	1.06	0.55	1.31	1.08	--	--
	Average Yield (L/s/km ²)	--	--	--	--	83.51	24.57	10.46	5.41	12.96	10.66	--	--
	Runoff (mm)	--	--	--	--	72.2	63.7	28.0	14.5	33.6	18.4	--	--
2014	# days with data	--	--	--	--	25	30	31	31	30	17	--	--
	Average Discharge (m ³ /s)	--	--	--	--	2.20	1.03	0.56	1.58	1.28	1.32	--	--
	Average Yield (L/s/km ²)	--	--	--	--	21.84	10.25	5.57	15.62	12.71	13.05	--	--
	Runoff (mm)	--	--	--	--	47.2	26.6	14.9	41.8	32.9	19.2	--	--
2015	# days with data	--	--	--	--	--	12	31	31	30	14	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.75	0.88	1.40	1.72	1.03	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	7.48	8.71	13.89	17.06	10.26	--	--
	Runoff (mm)	--	--	--	--	--	7.8	23.3	37.2	44.2	12.4	--	--
2016	# days with data	--	--	--	--	--	--	19	31	30	14	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	1.78	2.06	1.54	1.05	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	17.6	20.4	15.3	10.4	--	--
	Runoff (mm)	--	--	--	--	--	--	28.9	54.6	39.6	12.5	--	--
2017	# days with data	--	--	--	--	--	22	31	31	30	14	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.68	0.78	0.46	1.29	1.54	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	6.72	7.71	4.58	12.82	15.28	--	--
	Runoff (mm)	--	--	--	--	--	12.8	20.6	12.3	33.2	18.5	--	--
2018	# days with data	--	--	--	--	--	18	31	31	28	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	1.2	0.7	1.2	0.8	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	11.4	6.7	12.3	7.6	--	--	--
	Runoff (mm)	--	--	--	--	--	17.8	17.8	32.9	18.3	--	--	--
2019	# days with data	--	--	--	--	26	30	31	31	30	13	--	--
	Average Discharge (m ³ /s)	--	--	--	--	2.1	0.5	0.3	0.2	0.4	0.3	--	--
	Average Yield (L/s/km ²)	--	--	--	--	20.7	4.8	2.6	2.1	4.1	3.0	--	--
	Runoff (mm)	--	--	--	--	46.6	12.5	7.0	5.6	10.7	3.4	--	--
All Years	Average Discharge (m ³ /s)	--	--	--	--	3.66	1.02	0.92	1.04	1.13	0.97	0.57	--
	Average Yield (L/s/km ²)	--	--	--	--	36.23	10.15	9.10	10.35	11.21	9.57	5.69	--
	Average Runoff (mm)	--	--	--	--	59.3	21.6	22.9	27.0	28.9	14.7	3.4	--

Table 4-10:
W21 Summary statistics for preliminary 15-minute discharge record. All values are in m³/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	Average	--	--	--	--	--	0.114	0.074	0.200	0.098	0.060	--	--
	Maximum	--	--	--	--	--	0.295	0.270	0.349	0.187	0.251	--	--
	Minimum	--	--	--	--	--	0.003	0.009	0.127	0.000	0.000	--	--
All Years	Average	--	--	--	--	--	0.114	0.074	0.200	0.098	0.060	--	--
	Maximum	--	--	--	--	--	0.295	0.270	0.349	0.187	0.251	--	--
	Minimum	--	--	--	--	--	0.003	0.009	0.127	0.000	0.000	--	--

Table 4-11:
W21 Summary statistics for preliminary daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	# days with data	--	--	--	--	--	14	13	13	30	25	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.12	0.07	0.20	0.10	0.06	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	14.35	9.20	24.30	12.04	7.37	--	--
	Runoff (mm)	--	--	--	--	--	1.2	0.8	2.1	1.0	0.6	--	--
All Years	Average Discharge (m ³ /s)	--	--	--	--	--	0.12	0.07	0.20	0.10	0.06	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	14.35	9.20	24.30	12.04	7.37	--	--
	Runoff (mm)	--	--	--	--	--	17.4	10.3	27.3	31.2	15.9	--	--

Table 4-12:
W22 Summary statistics for 15-minute discharge record. All values are in m³/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	0.518	0.701	0.608	0.937	--
	Maximum	--	--	--	--	--	--	--	0.927	1.951	1.028	1.342	--
	Minimum	--	--	--	--	--	--	--	0.320	0.425	0.440	0.558	--
2008	Average	--	--	--	--	--	0.462	0.727	0.943	0.788	1.233	--	--
	Maximum	--	--	--	--	--	0.685	3.198	3.928	1.335	2.773	--	--
	Minimum	--	--	--	--	--	0.297	0.324	0.469	0.495	0.473	--	--
2009	Average	--	--	--	--	2.070	0.959	0.273	0.404	0.658	0.638	--	--
	Maximum	--	--	--	--	5.340	2.355	0.474	1.312	1.222	1.010	--	--
	Minimum	--	--	--	--	0.193	0.330	0.056	0.186	0.433	0.371	--	--
2010	Average	--	--	--	--	1.164	1.024	0.749	0.642	0.451	0.338	--	--
	Maximum	--	--	--	--	2.395	2.510	1.112	1.296	0.675	0.474	--	--
	Minimum	--	--	--	--	0.503	0.693	0.578	0.520	0.106	0.112	--	--
2011	Average	--	--	--	0.257	1.596	0.696	1.121	1.244	1.103	0.668	--	--
	Maximum	--	--	--	0.485	4.473	1.354	3.075	2.889	1.728	1.061	--	--
	Minimum	--	--	--	0.125	0.405	0.428	0.499	0.698	0.819	0.491	--	--
2012	Average	--	--	--	--	--	--	0.929	0.699	0.594	0.466	--	--
	Maximum	--	--	--	--	--	--	2.003	1.259	0.757	0.600	--	--
	Minimum	--	--	--	--	--	--	0.729	0.519	0.460	0.190	--	--
2013	Average	--	--	--	--	5.565	0.654	0.062	--	--	--	--	--
	Maximum	--	--	--	--	20.630	4.736	0.362	--	--	--	--	--
	Minimum	--	--	--	--	1.179	0.105	0.002	--	--	--	--	--
2014	Average	--	--	--	--	1.365	0.927	0.548	0.785	0.649	0.649	--	--
	Maximum	--	--	--	--	3.143	2.561	2.737	2.543	1.197	0.904	--	--
	Minimum	--	--	--	--	0.467	0.457	0.310	0.245	0.385	0.523	--	--
2015	Average	--	--	--	--	2.432	0.870	0.896	1.121	1.328	0.841	--	--
	Maximum	--	--	--	--	5.322	1.503	2.104	2.911	2.408	1.206	--	--
	Minimum	--	--	--	--	1.002	0.531	0.574	0.701	0.978	0.620	--	--
2016	Average	--	--	--	0.796	0.845	0.750	0.732	0.851	0.719	0.660	--	--
	Maximum	--	--	--	1.455	1.513	1.426	1.407	2.104	1.464	0.906	--	--
	Minimum	--	--	--	0.660	0.581	0.660	0.531	0.543	0.507	0.426	--	--
2017	Average	--	--	--	--	--	0.793	0.753	0.478	1.041	1.429	--	--
	Maximum	--	--	--	--	--	5.287	1.474	0.729	2.846	3.330	--	--
	Minimum	--	--	--	--	--	0.431	0.471	0.321	0.404	0.060	--	--
2018	Average	--	--	--	--	3.335	1.543	0.717	1.024	0.598	--	--	--
	Maximum	--	--	--	--	7.264	3.547	2.252	3.745	0.925	--	--	--
	Minimum	--	--	--	--	1.951	0.668	0.346	0.337	0.315	--	--	--
2019	Average	--	--	--	--	1.473	0.687	0.368	0.319	0.560	0.433	--	--
	Maximum	--	--	--	--	2.680	3.371	0.524	0.398	2.951	1.129	--	--
	Minimum	--	--	--	--	0.015	0.289	0.275	0.254	0.248	0.169	--	--
All Years	Average	--	--	--	0.613	1.847	0.864	0.655	0.761	0.766	0.693	0.937	--
	Maximum	--	--	--	1.455	20.630	5.287	3.198	3.928	2.951	3.330	1.342	--
	Minimum	--	--	--	0.125	0.015	0.105	0.002	0.186	0.106	0.060	0.558	--

Table 4-13:
W22 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	18	30	31	12	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	0.52	0.70	0.61	0.94	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	7.71	10.49	9.10	14.02	--
	Runoff (mm)	--	--	--	--	--	--	--	12.0	27.2	24.4	14.5	--
2008	# days with data	--	--	--	--	--	22	31	31	30	21	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.47	0.73	0.94	0.79	1.23	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	6.99	10.88	14.14	11.80	18.39	--	--
	Runoff (mm)	--	--	--	--	--	13.3	29.1	37.9	30.6	33.4	--	--
2009	# days with data	--	--	--	--	29	30	31	31	30	20	--	--
	Average Discharge (m ³ /s)	--	--	--	--	2.10	0.96	0.27	0.40	0.66	0.64	--	--
	Average Yield (L/s/km ²)	--	--	--	--	31.46	14.36	4.08	6.05	9.84	9.56	--	--
	Runoff (mm)	--	--	--	--	78.8	37.2	10.9	16.2	25.5	16.5	--	--
2010	# days with data	--	--	--	--	28	30	31	31	30	19	--	--
	Average Discharge (m ³ /s)	--	--	--	--	1.16	1.02	0.75	0.64	0.45	0.34	--	--
	Average Yield (L/s/km ²)	--	--	--	--	17.36	15.34	11.22	9.61	6.75	5.07	--	--
	Runoff (mm)	--	--	--	--	42.0	39.8	30.0	25.7	17.5	8.3	--	--
2011	# days with data	--	--	--	12	31	30	31	31	30	31	--	--
	Average Discharge (m ³ /s)	--	--	--	0.27	1.60	0.70	1.12	1.24	1.10	0.67	--	--
	Average Yield (L/s/km ²)	--	--	--	3.98	23.90	10.42	16.78	18.63	16.52	10.00	--	--
	Runoff (mm)	--	--	--	4.1	64.0	27.0	44.9	49.9	42.8	26.8	--	--
2012	# days with data	--	--	--	--	--	--	14	31	30	16	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	0.93	0.70	0.59	0.46	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	13.95	10.46	8.89	6.95	--	--
	Runoff (mm)	--	--	--	--	--	--	16.9	28.0	23.0	9.6	--	--
2013	# days with data	--	--	--	--	11	30	24	--	--	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	5.22	0.65	0.06	--	--	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	78.11	9.79	0.92	--	--	--	--	--
	Runoff (mm)	--	--	--	--	74.2	25.4	1.9	--	--	--	--	--
2014	# days with data	--	--	--	--	25	30	31	31	30	17	--	--
	Average Discharge (m ³ /s)	--	--	--	--	1.41	0.93	0.55	0.79	0.65	0.65	--	--
	Average Yield (L/s/km ²)	--	--	--	--	21.06	13.88	8.20	11.75	9.72	9.68	--	--
	Runoff (mm)	--	--	--	--	45.5	36.0	22.0	31.5	25.2	14.2	--	--
2015	# days with data	--	--	--	--	18	29	31	31	30	14	--	--
	Average Discharge (m ³ /s)	--	--	--	--	2.43	0.86	0.90	1.12	1.33	0.84	--	--
	Average Yield (L/s/km ²)	--	--	--	--	36.38	12.93	13.42	16.79	19.88	12.51	--	--
	Runoff (mm)	--	--	--	--	56.6	32.4	35.9	45.0	51.5	15.1	--	--
2016	# days with data	--	--	--	22	31	30	31	31	30	13	--	--
	Average Discharge (m ³ /s)	--	--	--	0.80	0.84	0.75	0.73	0.85	0.72	0.66	--	--
	Average Yield (L/s/km ²)	--	--	--	11.9	12.6	11.2	11.0	12.7	10.8	9.9	--	--
	Runoff (mm)	--	--	--	22.6	33.6	29.1	29.3	34.1	27.9	11.2	--	--
2017	# days with data	--	--	--	--	--	23	31	31	30	6	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.79	0.75	0.48	1.04	1.42	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	11.88	11.27	7.16	15.58	21.29	--	--
	Runoff (mm)	--	--	--	--	--	23.6	30.2	19.2	40.4	11.0	--	--
2018	# days with data	--	--	--	--	16	30	31	31	30	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	3.3	1.5	0.7	1.0	0.6	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	50.1	23.1	10.7	15.3	9.0	--	--	--
	Runoff (mm)	--	--	--	--	69.2	59.9	28.7	41.1	23.2	--	--	--
2019	# days with data	--	--	--	--	25	30	31	31	30	7	--	--
	Average Discharge (m ³ /s)	--	--	--	--	1.4	0.7	0.4	0.3	0.6	0.4	--	--
	Average Yield (L/s/km ²)	--	--	--	--	21.5	10.3	5.5	4.8	8.4	6.6	--	--
	Runoff (mm)	--	--	--	--	46.4	26.7	14.7	12.8	21.7	4.0	--	--
All Years	Average Discharge (m ³ /s)	--	--	--	0.53	2.17	0.85	0.66	0.75	0.77	0.72	0.94	--
	Average Yield (L/s/km ²)	--	--	--	7.95	32.49	12.74	9.82	11.26	11.46	10.82	14.02	--
	Average Runoff (mm)	--	--	--	13.4	56.7	31.8	24.6	29.4	29.7	15.9	14.5	--

Table 4-14:
W26 Summary statistics for 15-minute discharge record. All values are in m³/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	Average	--	--	--	--	--	0.028	0.029	0.024	0.019	--	--	--
	Maximum	--	--	--	--	--	0.079	0.044	0.041	0.063	--	--	--
	Minimum	--	--	--	--	--	0.013	0.019	0.016	0.010	--	--	--
2011	Average	--	--	--	--	--	--	--	--	--	--	--	--
	Maximum	--	--	--	--	--	--	--	--	--	--	--	--
	Minimum	--	--	--	--	--	--	--	--	--	--	--	--
2012	Average	--	--	--	--	--	0.019	0.022	0.016	0.010	0.008	--	--
	Maximum	--	--	--	--	--	0.032	0.094	0.024	0.014	0.010	--	--
	Minimum	--	--	--	--	--	0.012	0.013	0.009	0.007	0.004	--	--
2013	Average	--	--	--	--	--	--	0.001	0.001	0.005	0.006	--	--
	Maximum	--	--	--	--	--	--	0.002	0.003	0.012	0.007	--	--
	Minimum	--	--	--	--	--	--	0.001	0.000	0.000	0.004	--	--
2014	Average	--	--	--	--	--	0.022	0.006	0.015	0.012	--	--	--
	Maximum	--	--	--	--	--	0.094	0.019	0.042	0.019	--	--	--
	Minimum	--	--	--	--	--	0.006	0.003	0.005	0.008	--	--	--
2015	Average	--	--	--	--	--	0.009	0.012	0.017	0.021	0.012	--	--
	Maximum	--	--	--	--	--	0.027	0.047	0.031	0.044	0.058	--	--
	Minimum	--	--	--	--	--	0.003	0.005	0.012	0.015	0.005	--	--
2016	Average	--	--	--	--	0.02	0.015	0.020	0.026	0.017	--	--	--
	Maximum	--	--	--	--	0.06	0.071	0.143	0.050	0.022	--	--	--
	Minimum	--	--	--	--	0.01	0.010	0.011	0.017	0.012	--	--	--
2017	Average	--	--	--	--	--	0.003	0.002	0.003	0.008	--	--	--
	Maximum	--	--	--	--	--	0.080	0.029	0.005	0.033	--	--	--
	Minimum	--	--	--	--	--	0.000	0.001	0.001	0.001	--	--	--
2018	Average	--	--	--	--	--	--	0.005	0.013	0.010	--	--	--
	Maximum	--	--	--	--	--	--	0.008	0.054	0.030	--	--	--
	Minimum	--	--	--	--	--	--	0.003	0.005	0.005	--	--	--
2019	Average	--	--	--	--	--	0.003	0.002	0.001	0.001	0.002	--	--
	Maximum	--	--	--	--	--	0.005	0.003	0.003	0.005	0.003	--	--
	Minimum	--	--	--	--	--	0.002	0.001	0.000	0.000	0.001	--	--
All Years	Average	--	--	--	--	0.018	0.016	0.013	0.014	0.012	0.008	--	--
	Maximum	--	--	--	--	0.060	0.094	0.143	0.054	0.063	0.058	--	--
	Minimum	--	--	--	--	0.010	0.000	0.001	0.000	0.000	0.001	--	--

Table 4-15:
W26 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	# days with data	--	--	--	--	--	29	31	31	26	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.03	0.03	0.02	0.02	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	21.44	22.18	18.71	14.30	--	--	--
	Runoff (mm)	--	--	--	--	--	53.7	59.4	50.1	32.1	--	--	--
2011	# days with data	--	--	--	--	--	--	--	--	--	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	--	--	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	--	--	--	--	--
	Runoff (mm)	--	--	--	--	--	--	--	--	--	--	--	--
2012	# days with data	--	--	--	--	--	18	31	31	30	12	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.02	0.02	0.02	0.01	0.01	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	14.56	17.00	12.00	7.83	5.85	--	--
	Runoff (mm)	--	--	--	--	--	22.6	45.5	32.1	20.3	6.1	--	--
2013	# days with data	--	--	--	--	--	--	7	31	30	8	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	0.00	0.00	0.00	0.01	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	0.98	0.97	3.61	4.42	--	--
	Runoff (mm)	--	--	--	--	--	--	0.6	2.6	9.4	3.1	--	--
2014	# days with data	--	--	--	--	--	20	31	31	25	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.02	0.01	0.01	0.01	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	17.19	4.50	11.19	8.98	--	--	--
	Runoff (mm)	--	--	--	--	--	29.7	12.0	30.0	19.4	--	--	--
2015	# days with data	--	--	--	--	--	12	31	31	30	14	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.01	0.01	0.02	0.02	0.01	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	6.55	9.00	12.87	16.26	10.48	--	--
	Runoff (mm)	--	--	--	--	--	6.8	24.1	34.5	42.2	12.7	--	--
2016	# days with data	--	--	--	--	9	30	31	31	30	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.02	0.01	0.02	0.03	0.02	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	13.97	11.38	15.46	20.21	12.73	--	--	--
	Runoff (mm)	--	--	--	--	10.9	29.5	41.4	54.1	33.0	--	--	--
2017	# days with data	--	--	--	--	--	22	31	31	29	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.00	0.00	0.00	0.01	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	2.12	1.74	2.12	5.99	--	--	--
	Runoff (mm)	--	--	--	--	--	4.0	4.7	5.7	15.0	--	--	--
2018	# days with data	--	--	--	--	--	--	19	31	27	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	0.0	0.0	0.0	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	3.5	9.7	7.5	--	--	--
	Runoff (mm)	--	--	--	--	--	--	5.8	26.0	17.6	--	--	--
2019	# days with data	--	--	--	--	--	24	31	31	30	5	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.0	0.0	0.0	0.0	0.0	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	2.3	1.6	0.8	1.0	1.6	--	--
	Runoff (mm)	--	--	--	--	--	4.8	4.3	2.2	2.7	0.7	--	--
All Years	Average Discharge (m ³ /s)	--	--	--	--	0.02	0.01	0.01	0.01	0.01	0.01	--	--
	Average Yield (L/s/km ²)	--	--	--	--	13.97	10.79	8.44	9.84	8.70	5.59	--	--
	Average Runoff (mm)	--	--	--	--	10.9	21.6	22.0	26.4	21.3	5.6	--	--

Table 4-16:
W27 Summary statistics for 15-minute discharge record. All values are in m³/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	--	--	--	--	--
	Maximum	--	--	--	--	--	--	--	--	--	--	--	--
	Minimum	--	--	--	--	--	--	--	--	--	--	--	--
2008	Average	--	--	--	--	--	0.040	0.030	0.037	0.045	0.058	--	--
	Maximum	--	--	--	--	--	0.061	0.053	0.059	0.062	0.075	--	--
	Minimum	--	--	--	--	--	0.003	0.001	0.001	0.022	0.024	--	--
2009	Average	--	--	--	--	--	--	0.031	0.028	0.034	0.038	--	--
	Maximum	--	--	--	--	--	--	0.048	0.079	0.082	0.046	--	--
	Minimum	--	--	--	--	--	--	0.021	0.021	0.021	0.028	--	--
2010	Average	--	--	--	--	0.090	0.057	0.029	0.025	0.014	0.016	--	--
	Maximum	--	--	--	--	0.146	0.115	0.070	0.076	0.074	0.105	--	--
	Minimum	--	--	--	--	0.011	0.037	0.001	0.006	0.001	0.001	--	--
2011	Average	--	--	--	--	0.160	0.046	0.041	0.014	0.010	0.007	--	--
	Maximum	--	--	--	--	0.335	0.070	0.111	0.044	0.014	0.010	--	--
	Minimum	--	--	--	--	0.037	0.032	0.011	0.003	0.008	0.005	--	--
2012	Average	--	--	--	--	0.047	--	0.030	0.023	0.016	0.017	--	--
	Maximum	--	--	--	--	0.128	--	0.315	0.036	0.040	0.021	--	--
	Minimum	--	--	--	--	0.018	--	0.021	0.015	0.012	0.015	--	--
2013	Average	--	--	--	--	--	--	0.018	0.015	0.025	0.028	--	--
	Maximum	--	--	--	--	--	--	0.030	0.061	0.123	0.035	--	--
	Minimum	--	--	--	--	--	--	0.014	0.010	0.012	0.021	--	--
2014	Average	--	--	--	--	0.042	0.037	0.030	0.031	0.015	0.012	--	--
	Maximum	--	--	--	--	0.088	0.144	0.050	0.097	0.020	0.014	--	--
	Minimum	--	--	--	--	0.027	0.012	0.024	0.012	0.010	0.010	--	--
2015	Average	--	--	--	--	0.081	0.039	0.049	--	--	--	--	--
	Maximum	--	--	--	--	0.304	0.052	0.241	--	--	--	--	--
	Minimum	--	--	--	--	0.005	0.027	0.041	--	--	--	--	--
2016	Average	--	--	--	--	0.053	0.033	0.041	0.06	0.05	--	--	--
	Maximum	--	--	--	--	0.123	0.064	0.127	0.14	0.07	--	--	--
	Minimum	--	--	--	--	0.029	0.024	0.023	0.05	0.04	--	--	--
2017	Average	--	--	--	--	--	0.017	0.013	0.01	0.01	0.07	--	--
	Maximum	--	--	--	--	--	0.100	0.095	0.03	0.10	0.08	--	--
	Minimum	--	--	--	--	--	0.010	0.009	0.01	0.01	0.05	--	--
2018	Average	--	--	--	--	0.00	0.001	0.001	0.00	0.00	--	--	--
	Maximum	--	--	--	--	0.01	0.016	0.004	0.02	0.04	--	--	--
	Minimum	--	--	--	--	0.00	0.000	0.000	0.00	0.00	--	--	--
2019	Average	--	--	--	--	--	0.010	0.008	--	0.006	0.006	--	--
	Maximum	--	--	--	--	--	0.013	0.011	--	0.012	0.007	--	--
	Minimum	--	--	--	--	--	0.007	0.006	--	0.004	0.004	--	--
All Years	Average	--	--	--	--	0.086	0.031	0.024	0.021	0.020	0.025	--	--
	Maximum	--	--	--	--	0.335	0.144	0.315	0.138	0.123	0.105	--	--
	Minimum	--	--	--	--	0.001	0.000	0.000	0.000	0.000	0.001	--	--

**Table 4-17:
W27 Summary statistics for daily discharge, unit yield and runoff**

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	--	--	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	--	--	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	--	--	--	--	--
	Runoff (mm)	--	--	--	--	--	--	--	--	--	--	--	--
2008	# days with data	--	--	--	--	--	21	31	31	30	21	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.040	0.030	0.036	0.045	0.058	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	14.77	10.94	13.22	16.75	21.50	--	--
	Runoff (mm)	--	--	--	--	--	26.8	29.3	35.4	43.4	39.0	--	--
2009	# days with data	--	--	--	--	--	--	13	31	30	7	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	0.032	0.028	0.034	0.038	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	11.70	10.42	12.44	14.01	--	--
	Runoff (mm)	--	--	--	--	--	--	13.1	27.9	32.2	8.5	--	--
2010	# days with data	--	--	--	--	21	30	31	31	30	19	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.090	0.057	0.029	0.025	0.014	0.016	--	--
	Average Yield (L/s/km ²)	--	--	--	--	33.21	21.18	10.70	9.36	5.31	5.94	--	--
	Runoff (mm)	--	--	--	--	60.3	54.9	28.6	25.1	13.8	9.7	--	--
2011	# days with data	--	--	--	--	27	30	31	31	30	31	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.159	0.045	0.041	0.014	0.010	0.007	--	--
	Average Yield (L/s/km ²)	--	--	--	--	58.90	16.85	15.25	5.29	3.71	2.64	--	--
	Runoff (mm)	--	--	--	--	137.4	43.7	40.9	14.2	9.6	7.1	--	--
2012	# days with data	--	--	--	--	6	--	11	17	30	8	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.046	--	0.030	0.023	0.016	0.017	--	--
	Average Yield (L/s/km ²)	--	--	--	--	16.99	--	11.16	8.59	5.96	6.38	--	--
	Runoff (mm)	--	--	--	--	8.8	--	10.6	12.6	15.5	4.4	--	--
2013	# days with data	--	--	--	--	--	--	7	31	30	19	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	0.018	0.015	0.025	0.028	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	6.79	5.58	9.35	10.46	--	--
	Runoff (mm)	--	--	--	--	--	--	4.1	14.9	24.2	17.2	--	--
2014	# days with data	--	--	--	--	25	30	31	31	30	16	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.042	0.037	0.030	0.031	0.016	0.012	--	--
	Average Yield (L/s/km ²)	--	--	--	--	15.56	13.86	11.08	11.41	5.75	4.57	--	--
	Runoff (mm)	--	--	--	--	33.6	35.9	29.7	30.6	14.9	6.3	--	--
2015	# days with data	--	--	--	--	18	30	31	--	--	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.081	0.039	0.049	--	--	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	30.12	14.30	18.14	--	--	--	--	--
	Runoff (mm)	--	--	--	--	46.8	37.1	48.6	--	--	--	--	--
2016	# days with data	--	--	--	--	26	30	31	31	30	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.054	0.033	0.041	0.06	0.05	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	20.03	12.07	15.33	22.93	19.61	--	--	--
	Runoff (mm)	--	--	--	--	45.0	31.3	41.0	61.4	50.8	--	--	--
2017	# days with data	--	--	--	--	--	22	31	31	30	2	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.017	0.013	0.01	0.01	0.07	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	6.40	4.95	3.86	4.77	25.15	--	--
	Runoff (mm)	--	--	--	--	--	12.2	13.3	10.3	12.4	4.3	--	--
2018	# days with data	--	--	--	--	7	30	31	31	14	--	--	--
	Average Discharge (m ³ /s)	--	--	--	--	0.0	0.0	0.0	0.0	0.0	--	--	--
	Average Yield (L/s/km ²)	--	--	--	--	1.0	0.4	0.3	0.5	0.4	--	--	--
	Runoff (mm)	--	--	--	--	0.6	1.0	0.7	1.3	0.5	--	--	--
2019	# days with data	--	--	--	--	--	24	21	--	30	6	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.0	0.0	--	0.0	0.0	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	3.7	2.8	--	2.3	2.1	--	--
	Runoff (mm)	--	--	--	--	--	7.6	5.1	--	6.1	1.1	--	--
All Years	Average Discharge (m ³ /s)	--	--	--	--	0.07	0.03	0.03	0.02	0.02	0.03	--	--
	Average Yield (L/s/km ²)	--	--	--	--	25.12	11.50	9.93	9.11	7.85	10.30	--	--
	Average Runoff (mm)	--	--	--	--	47.5	27.8	22.1	23.4	20.3	10.8	--	--

Table 4-18:
W29 Summary statistics for 15-minute discharge record. All values are in m³/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	Average	--	--	--	--	--	0.720	1.561	1.662	1.606	1.003	--	--
	Maximum	--	--	--	--	--	1.269	4.466	3.312	2.407	1.629	--	--
	Minimum	--	--	--	--	--	0.229	0.441	0.914	1.223	0.623	--	--
2012	Average	--	--	--	--	1.690	1.736	1.222	0.823	0.714	0.638	--	--
	Maximum	--	--	--	--	3.259	3.766	4.497	1.429	0.881	0.786	--	--
	Minimum	--	--	--	--	0.653	0.823	0.786	0.656	0.577	0.432	--	--
2013	Average	--	--	--	--	5.019	--	--	0.380	0.866	0.711	--	--
	Maximum	--	--	--	--	13.604	--	--	0.535	2.818	0.935	--	--
	Minimum	--	--	--	--	1.370	--	--	0.308	0.328	0.448	--	--
2014	Average	--	--	--	--	--	--	--	1.467	1.110	1.063	--	--
	Maximum	--	--	--	--	--	--	--	4.955	2.568	1.703	--	--
	Minimum	--	--	--	--	--	--	--	0.495	0.692	0.864	--	--
2015	Average	--	--	--	--	--	0.789	0.856	0.954	1.249	0.771	--	--
	Maximum	--	--	--	--	--	1.460	2.406	3.023	2.477	1.275	--	--
	Minimum	--	--	--	--	--	0.494	0.543	0.007	0.859	0.582	--	--
2018	Average	--	--	--	--	--	1.642	1.259	1.689	0.710	1.346	--	--
	Maximum	--	--	--	--	--	1.985	1.984	2.888	1.673	2.623	--	--
	Minimum	--	--	--	--	--	1.144	0.493	0.620	0.177	0.356	--	--
All Years	Average	--	--	--	--	2.352	1.307	1.224	1.171	1.043	0.987	--	--
	Maximum	--	--	--	--	13.604	3.766	4.497	4.955	2.818	2.623	--	--
	Minimum	--	--	--	--	0.653	0.229	0.441	0.007	0.177	0.356	--	--

Table 4-19:
W29 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	# days with data	--	--	--	--	--	23	31	31	30	31	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.72	1.56	1.66	1.61	1.00	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	8.39	18.12	19.31	18.66	11.65	--	--
	Runoff (mm)	--	--	--	--	--	16.7	48.5	51.7	48.4	31.2	--	--
2012	# days with data	--	--	--	--	27	30	31	31	30	13	--	--
	Average Discharge (m ³ /s)	--	--	--	--	1.68	1.74	1.22	0.82	0.71	0.62	--	--
	Average Yield (L/s/km ²)	--	--	--	--	19.52	20.16	14.19	9.55	8.29	7.21	--	--
	Runoff (mm)	--	--	--	--	45.5	52.3	38.0	25.6	21.5	8.1	--	--
2013	# days with data	--	--	--	--	8	--	--	28	30	19	--	--
	Average Discharge (m ³ /s)	--	--	--	--	5.30	--	--	0.38	0.87	0.71	--	--
	Average Yield (L/s/km ²)	--	--	--	--	61.54	--	--	4.40	10.06	8.21	--	--
	Runoff (mm)	--	--	--	--	42.5	--	--	10.6	26.1	13.5	--	--
2014	# days with data	--	--	--	--	--	--	--	27	30	17	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	--	--	1.44	1.11	1.06	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	--	--	16.74	12.89	12.31	--	--
	Runoff (mm)	--	--	--	--	--	--	--	39.1	33.4	18.1	--	--
2015	# days with data	--	--	--	--	--	12	31	31	30	14	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.78	0.86	0.95	1.25	0.77	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	9.04	9.94	11.09	14.51	8.90	--	--
	Runoff (mm)	--	--	--	--	--	9.4	26.6	29.7	37.6	10.8	--	--
2018	# days with data	--	--	--	--	--	19.0	31.0	31.0	30.0	29.0	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	1.6	1.3	1.7	0.7	1.4	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	19.0	14.6	19.6	8.2	15.7	--	--
	Runoff (mm)	--	--	--	--	--	31.3	39.2	52.5	21.4	39.3	--	--
All Years	Average Discharge (m ³ /s)	--	--	--	--	2.51	1.30	1.22	1.16	1.04	0.98	--	--
	Average Yield (L/s/km ²)	--	--	--	--	29.13	15.10	14.22	13.53	12.11	11.38	--	--
	Runoff (mm)	--	--	--	--	44.0	27.4	38.1	34.9	31.4	20.2	--	--

Table 4-20:
W99 Summary statistics for 15-minute discharge record. All values are in m³/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	Average	--	--	--	--	--	0.571	0.321	0.270	0.470	0.401	--	--
	Maximum	--	--	--	--	--	1.084	0.421	0.332	2.164	0.888	--	--
	Minimum	--	--	--	--	--	0.314	0.230	0.208	0.201	0.070	--	--
All Years	Average	--	--	--	--	--	0.571	0.321	0.270	0.470	0.401	--	--
	Maximum	--	--	--	--	--	1.084	0.421	0.332	2.164	0.888	--	--
	Minimum	--	--	--	--	--	0.314	0.230	0.208	0.201	0.070	--	--

Table 4-21:
W99 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	# days with data	--	--	--	--	--	24	31	31	30	16	--	--
	Average Discharge (m ³ /s)	--	--	--	--	--	0.57	0.32	0.27	0.47	0.40	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	6.37	3.57	3.00	5.22	4.47	--	--
	Runoff (mm)	--	--	--	--	--	13.2	9.6	8.0	13.5	6.2	--	--
All Years	Average Discharge (m ³ /s)	--	--	--	--	--	0.57	0.32	0.27	0.47	0.40	--	--
	Average Yield (L/s/km ²)	--	--	--	--	--	6.37	3.57	3.00	5.22	4.47	--	--
	Average Runoff (mm)	--	--	--	--	--	13.2	9.6	8.0	13.5	6.2	--	--

5. Closure

5. **Closure**

We trust that this report meets your expectations at this time. Please contact the undersigned with any questions or comments.

Sincerely,

LORAX ENVIRONMENTAL SERVICES LTD.

Prepared by:



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