

2025 Steensby Rail Corridor Hydrometric Monitoring Report

Mary River Project
Baffinland Iron Mines Corporation

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Prepared by:



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1. INTRODUCTION

Stream flow is measured at the Mary River Project (the Project) as part of the Hydrometric Monitoring Program, which is a component study of the Project's Aquatic Effects Monitoring Plan (AEMP, Baffinland, 2025), and as a monitoring requirement of the Project's Type 'A' Water Licence issued by the Nunavut Water Board (NWB). As part of commitments from the Project's Water Licence Renewal, Baffinland Iron Mines Corporation (Baffinland) planned to reactivate the four hydrometric monitoring stations (BR11, BR25, BR96-2 and BR137) along the Steensby Railway corridor in 2025. The additional data would supplement existing baseline data collected for the 2012 Final Environmental Impact Statement (FEIS) (Baffinland, 2012). The stations have been used in the past to measure streamflow and data from 2025 will help characterize natural variation in hydrological conditions. As part of the commitment, if the supplemental baseline data deviates by more than two standard deviations from the original baseline, Baffinland will engage with Qikiqtani Inuit Association (QIA) to review the findings and collaboratively develop appropriate updates to the construction monitoring programs, if required, to ensure potential environmental changes are effectively captured and addressed.

Station identifiers, names, period of records, drainage areas, and station coordinates for the Steensby hydrometric stations are summarized in Table 1. The locations of the monitoring stations are shown on Figure 1 (attached).

Table 1 2025 Steensby Hydrometric Monitoring Program Stations

Station ID	Description	Period of Record	Drainage Area (km ²)	Coordinates (UTM)	
				Easting	Northing
BR11	Tributary of Angajurjualuk Lake	2008, 2012, 2025	53	573122	7904914
BR25	Tributary of Angajurjualuk Lake	2008, 2010, 2012, 2025	113	585420	7900082
BR96-2	Tributary of Cockburn Lake	2008, 2010, 2012, 2025	31	609300	7839474
BR-137	Outlet of 10km Lake on the Ikpikitturjuaq River	2008, 2012, 2025	314	598663	7807981

2. METHODS AND DATA COLLECTION

The 2025 Steensby hydrometric monitoring program consisted of water level or stage being measured at each station using a pressure transducer and data logger (Seametrics PT2X), which recorded water level and temperature at 15-minute intervals. The pressure transducers were installed in a stilling well at each station. The water level was measured manually during each site visit relative to at least two benchmarks installed in bedrock. The benchmarks have been maintained throughout the life of each station and differential levelling surveys were conducted during each site visit to relate water level to a local datum. The dataloggers were downloaded and checked for proper operation during each site visit. The data logger water level data were related to the local datum at the end of the season using the survey data.

Where flows permit safe access to a watercourse's channel, a Hach FH950 wading current meter was used to measure stream velocity. Discharge is estimated from the current meter velocity using the area-velocity technique (mid-section method) per the Water Survey of Canada (WSC) guidelines (WSC, 1999). Whenever possible, the stream is divided into a minimum of 20 sections to measure depth and velocity with the objective of having less than 5% of the flow in each section. At least two cross sections of depth and

velocity were measured during each site visit. Velocity is measured at 60% of the stream depths where the stream depth is less than or equal to 0.75 m at the time of measurement.

Where higher flows prevented the use of a wading current meter, dilution gauging using Rhodamine WT or an Acoustic Doppler Current Profiler (ADCP) was utilized to estimate discharge. The fluorescence of the Rhodamine WT is measured in-situ and recorded using a handheld fluorometer (YSI with EXO Rhodamine Sensor). Three-point calibration of the fluorometer is conducted in the field using a known concentration of Rhodamine WT solution and stream water. For estimating discharge, Rhodamine WT is added upstream of the station as an instantaneous release of a known volume. The fluorescence is recorded at a sufficient distance downstream to allow for complete mixing of the tracer. At least two measurements are typically performed during each site visit, and the stream discharge is estimated using the integration method.

A summary of the data collected in 2025 is provided in the following sections.

3. STAGE-DISCHARGE DATA

3.1 Overview

Reconnaissance of the hydrometric stations was initiated in June 2025 to monitor the onset and progression of snow melt and associated freshet flow. Each of the stations were installed as early as possible in June, when the stream channels were ice-free. Flow monitoring is not possible with ice in the channel as the melting process continuously modifies the stage discharge relationship. The onset of freshet occurred before some of the stations were able to be installed, due to the presence of ice. Site visits were conducted at all stations in June, July, August, and September. The stations were decommissioned for winter in early September in anticipation of freeze-up.

The stage-discharge data obtained in 2025 were compared to the existing rating curves, which were last presented in the 2012 FEIS Baseline Hydrology Report (Knight Piésold, 2012). The WSC Hydrometric Manual (EC, 2012) suggests that rating curves should not be extrapolated beyond twice the highest measured discharge. Where the observed water level is greater than twice the highest measured discharge, it is understood that flow data estimated from extrapolated rating curves are less reliable. Rating curves were extrapolated to the maximum recorded stage to capture the range of observed water level in 2025, relative to measured discharge. Rating curves for each station, inclusive of the data collected in 2025, are presented in Figures 2 to 5 (attached). A discussion of the 2025 data collected at each station and an interpretation of the fit of the rating curves is provided in the following sections.

3.2 BR11

The BR11 hydrometric station was installed on June 25. A stage-discharge measurement was recorded at the time of installation using dilution gauging and provides good validation of the middle portion of the rating curve presented in the 2012 FEIS Baseline Hydrology Report (Knight Piésold, 2012) (Figure 2 (attached)). Subsequent stage-discharge measurements were recorded in June and mid-July using dilution gauging. Stage discharge measurements were recorded in late July and in August using a wading current meter. The measurements are generally consistent with the existing rating curve. One of the stage-discharge measurements was slightly above the curve, however within the range of measurement uncertainty. The existing rating curve was used for the development of the 2025 flow record.

3.3 BR25

The BR25 hydrometric station was installed on June 25. A stage-discharge measurement was recorded at the time of installation using dilution gauging and provides good validation of the middle portion of the rating curve presented in the 2012 FEIS Baseline Hydrology Report (Knight Piésold, 2012) (Figure 3 (attached)). Subsequent stage-discharge measurements were recorded in June and July using dilution gauging. Two stage discharge measurements were recorded in August using a wading current meter. The measurements are generally consistent with the existing rating curve, however the stage-discharge measurement from late-June was above the curve, beyond the range of measurement uncertainty. This is likely an outlier, which could be due to incomplete mixing and an underestimation of discharge, rather than a change in the stage-discharge control at the station. The existing 2012 rating curve was used for the development of the 2025 flow record.

3.4 BR96-2

The BR96-2 hydrometric station was installed on June 24. A stage-discharge measurement was recorded at the time of installation using dilution gauging and plotted above the rating curve presented in the 2012 FEIS Baseline Hydrology Report (Knight Piésold, 2012) (Figure 4 (attached)). Subsequent stage-discharge measurements were recorded in June, July, and August using dilution gauging and all plotted above the existing rating curve. Most of the 2010 and 2012 measurements also plotted above the rating curve, as was noted in Knight Piésold, (2013). Since the 2010, 2012, and 2025 data generally agree with each other, an adjusted rating curve was plotted assuming the overall channel shape has been generally consistent since 2010 (Figure 4). The adjusted rating curve is a good fit for all of the 2010 and most of the 2012 and 2025 data. The high flow measurement from 2012 is well below the adjusted rating curve, however the 2025 measurement with similar stage is in good agreement. The adjusted 2025 rating curve was used for the development of the 2025 flow record.

3.5 BR137

The BR137 hydrometric station was installed on June 25. A stage-discharge measurement was recorded at the time of installation using an ADCP and plotted slightly above the mid to lower portion of the rating curve presented in the 2012 FEIS Baseline Hydrology Report (Knight Piésold, 2012) (Figure 5 (attached)). Subsequent stage-discharge measurements were recorded in June using an ADCP, and in July and August using a wading current meter. The measurements were all in generally good agreement with the rating curve, within the range of measurement uncertainty. There is large uncertainty in measured discharge at this station from a combination of the very wide channel cross-section and a large boulder substrate. The 2025 measurements do not reflect a change to the channel control. Given that the stage-discharge control at this station is comprised of large, cobble/boulder substrate, is located at the outlet of a lake, and has low water velocities, the likelihood of a control change is further diminished. Therefore, it is assumed that the current rating curve is still valid and applicable, and it was used for the development of the 2025 flow record.

4. STREAMFLOW HYDROGRAPHS

Streamflow records were developed for each station by applying the water level data to the corresponding rating curves. The discharge hydrographs for the BR11, BR25, BR96-2, and BR137 hydrometric stations are presented in Figures 6 to 9 (attached). The data logger at BR137 was submerged by high water levels in mid-July and as a result, the water levels beyond when it was submerged were not recorded. The variable short-term changes in water level observed in August at BR137 are likely a result of residual water in the ventilation tube.

The discharge records from all stations were converted to equivalent unit runoff (discharge per unit area) and are presented for comparison purposes on Figure 10 (attached). The patterns of 2025 unit runoff among stations generally agree with each other, exhibiting similar timing and magnitude of runoff events and similar patterns to previous years.

The measured snowmelt freshet was similar to previous years and the stations were installed as soon as practical following the stream channel and station mounting locations becoming ice free. The majority of the freshet occurred before the stations were able to be installed. A strong diurnal melt pattern is evident into mid July at the BR11 and BR25 stations as they have higher elevation catchments. The two stations with more unique discharge records also performed as expected, with the smaller BR96-2 watershed exhibiting a lower magnitude freshet, less variability, and more muted response due to several lakes in its headwaters. The BR137 station exhibits highly attenuated discharge and a higher unit runoff compared to the other stations, resulting from the presence of several large lakes in its watershed.

5. COMPARISON TO BASELINE DATA

A comparison of the 2025 data to the baseline data presented in the FEIS (Baffinland, 2012) was part of Baffinland’s commitment to reactivating the four Steensby Rail corridor monitoring stations. If the data deviated by more than two standard deviations from the original baseline, Baffinland committed to engage with QIA to review the findings and collaboratively develop appropriate updates to the construction monitoring programs, if required, to ensure potential environmental changes are effectively captured and addressed.

The mean discharge (June-Sept) reported in the FEIS Hydrology Baseline Report (Knight Piésold, 2012) are presented in Table 2, along with one and two standard deviations (SD) of the mean. The 2025 mean discharge (June-Sept) for each station is also presented in Table 2.

Table 2 Comparison of 2025 Steensby Hydrometric Data to the Original Baseline

Station	Baseline Discharge (June-Sept) (m ³ /s)			2025 Discharge (June-Sept) (m ³ /s)
	Mean	1 SD	2 SD	Mean
BR11	2.8	1.9	3.8	2.97
BR25	5.3	3.4	6.8	3.44
BR96-2	1.1	0.48	0.96	0.90
BR137	8.4	4.1	8.2	12.2

The 2025 mean discharge for BR11 and BR96-2 are most comparable to baseline, with the BR11 flow slightly greater and the BR96-2 flow slightly less than baseline. The BR25 and BR137 stations had greater differences between the 2025 mean discharge and the original baseline. The 2025 BR137 mean discharge is underestimated somewhat due to the logger being submerged in July, as discussed in Section 4. However, the missing period of higher flow occurred over a relatively short time and would not substantially increase the mean June-September discharge. The mean 2025 discharge at all stations was within one standard deviation of the original baseline mean discharge.

6. SUMMARY AND RECOMMENDATIONS

The 2025 iteration of the Hydrometric Monitoring Program saw the reactivation of streamflow monitoring at four hydrometric stations along the Steensby rail corridor. The data collected confirmed that the rating curves from the 2012 FEIS Baseline Hydrology Report (Knight Piésold, 2012) continue to be applicable at

all except the BR96-2 station. A new rating curve is proposed for the BR96-2 station which better encompasses data collected in 2010, 2012, and 2025.

The mean discharge (June-Sept) for the Steensby rail hydrometric stations reported in the Hydrology Baseline Report (Knight Piesold, 2012) were compared to the mean discharge (June-Sept) measured in 2025. The mean 2025 measured discharge was within one standard deviation of the original baseline mean discharge at all stations.

It is recommended that any future hydrometric monitoring continue to target low flow and/or high flow periods, especially at BR96-2 to further validate the shifted rating relationship. Peak flows tend to occur in the spring but not always when the channels are ice-free or when conditions permit safe access for gauging. Following the rainfall event observed in July 2025, peak flows that occur in summer and fall months continue to be a good to target. It is recommended that if reinstalled, the BR137 logger be mounted in a higher location to avoid being inundated during abnormally high water levels. If the Steensby rail corridor stations are reinstalled in the future, regular monitoring events are recommended to continue to validate the rating curves and water level data.

7. REFERENCES

- Baffinland Iron Mines Corporation (Baffinland), 2012. Mary River Project - Final Environmental Impact Statement. February.
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- Knight Piesold, 2012. Baseline Hydrology Report. Prepared for Baffinland Iron Mines Corporation. NB102-181/30-7 Rev 1. January 4, 2012.
- Knight Piesold, 2013. 2012 Hydrometric Data Collection Program. Letter to: James Millard, Environmental Superintendent. NB12-00578. February 6, 2013.
- Water Survey of Canada (WSC), 1999. Hydrometric Technician Career Development Program. Lesson Package No. 10.1 – Principles of Discharge Measurement. Environment Canada, Fredericton, NB.

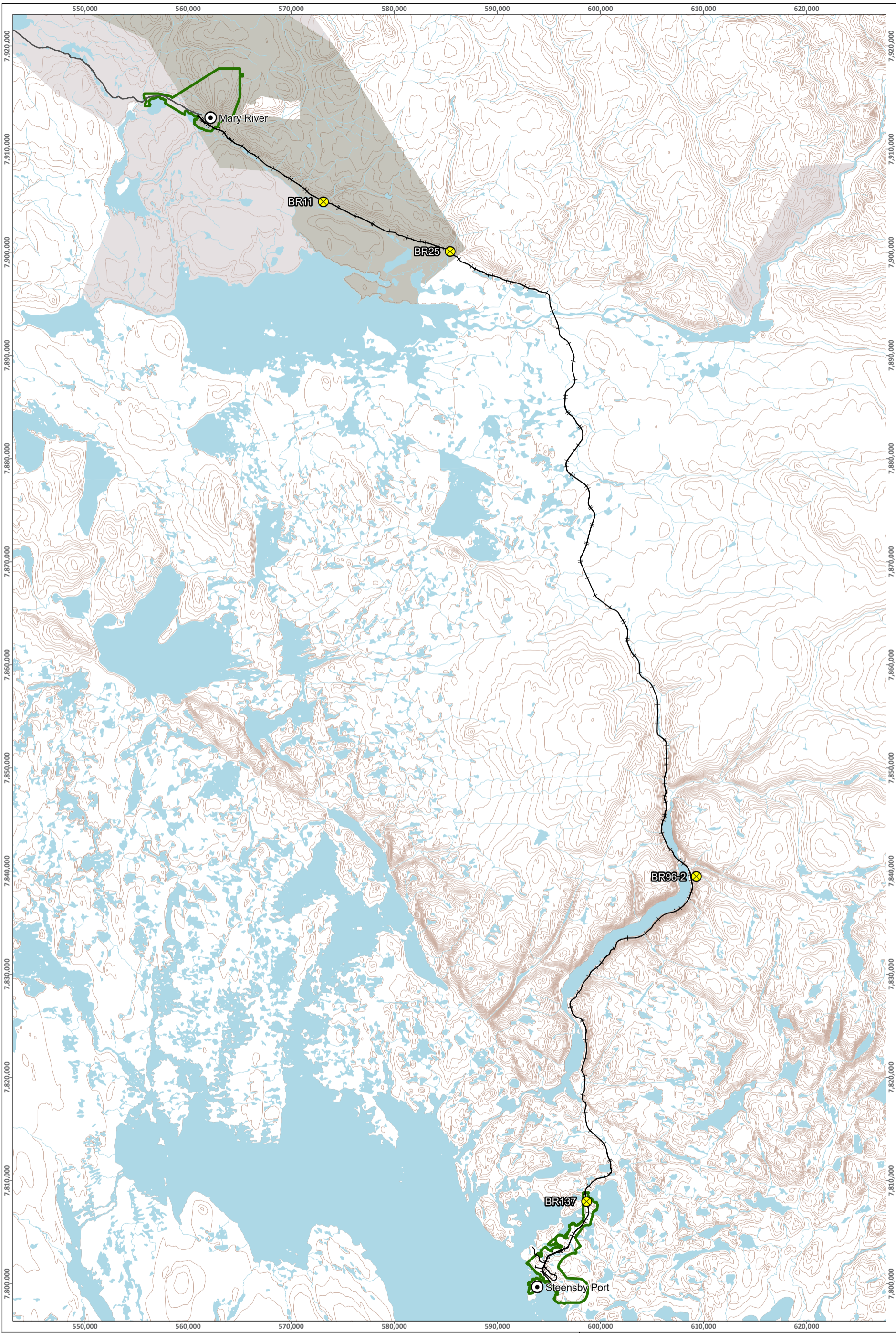
8. CERTIFICATION

This document was prepared by the undersigned.

Prepared by:



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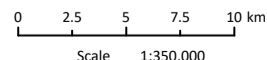
LEGEND

- Project Facility Location
- Hydrology Site
- Milne Inlet Tote Road
- Steensby Rail
- Contour (20 m Interval)
- IOL Surface Only
- IOL Surface and Subsurface
- Project Development Area

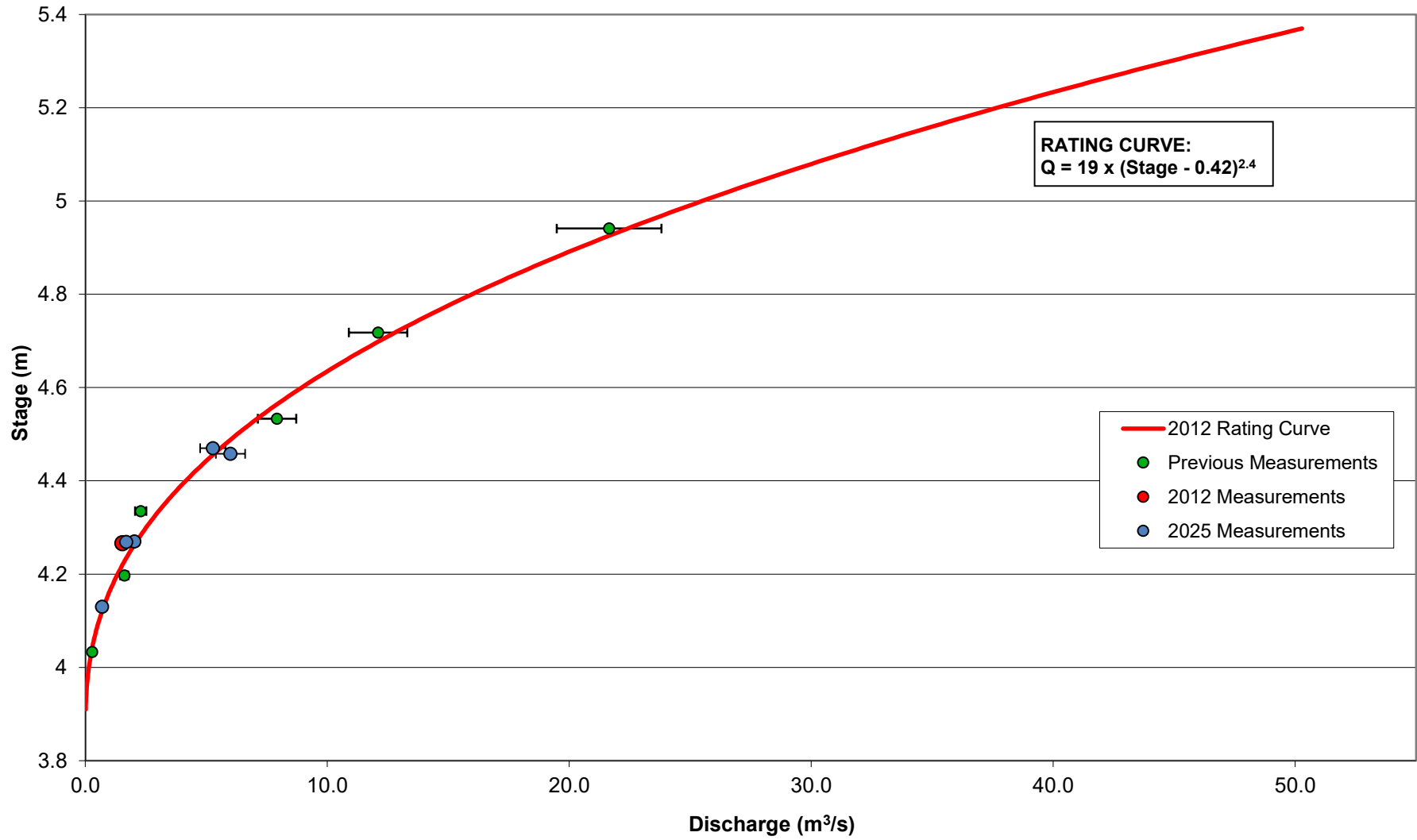
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Steensby Hydrology Locations

Projection: NAD 1983 UTM ZONE 17N.
Base Map: © King's Printer for Ontario, 2026.
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FIGURE

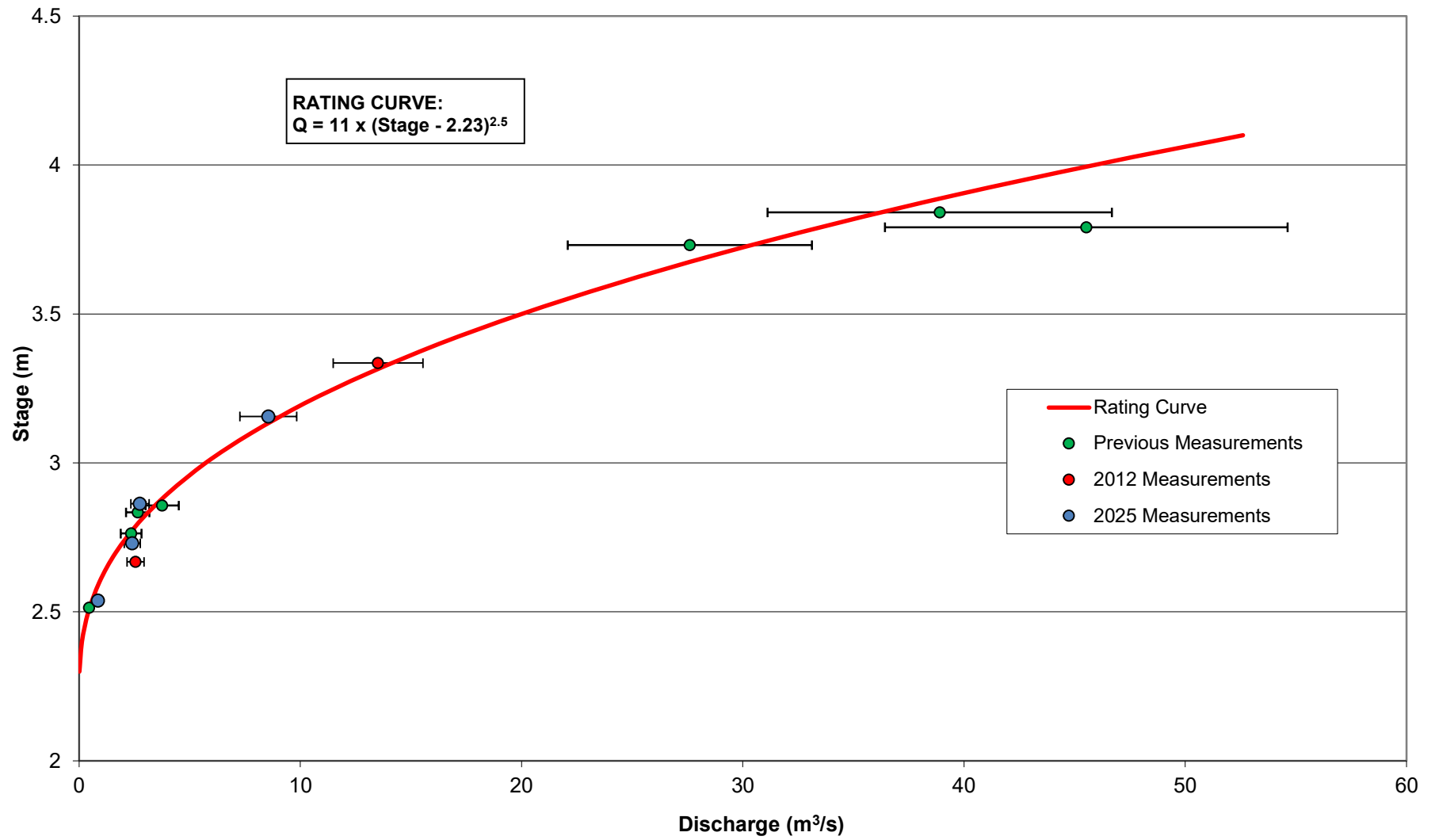


NOTES:

1. RATING CURVE SHOWN TO MAXIMUM RECORDED STAGE IN 2025

Figure 2

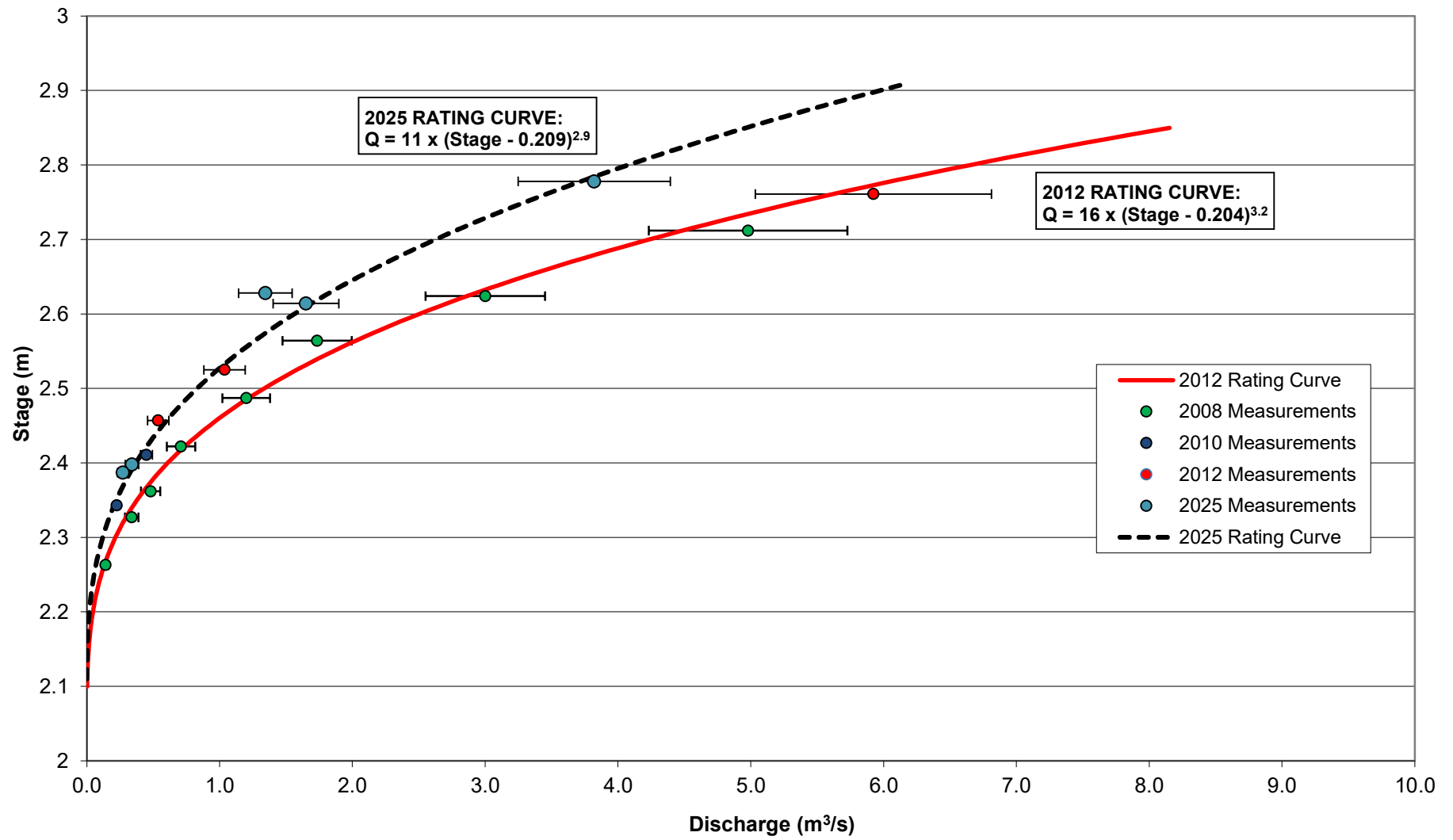
BR11 Rating Curve



NOTES:

1. RATING CURVE SHOWN TO MAXIMUM RECORDED STAGE IN 2025

Figure 3 BR25 Rating Curve

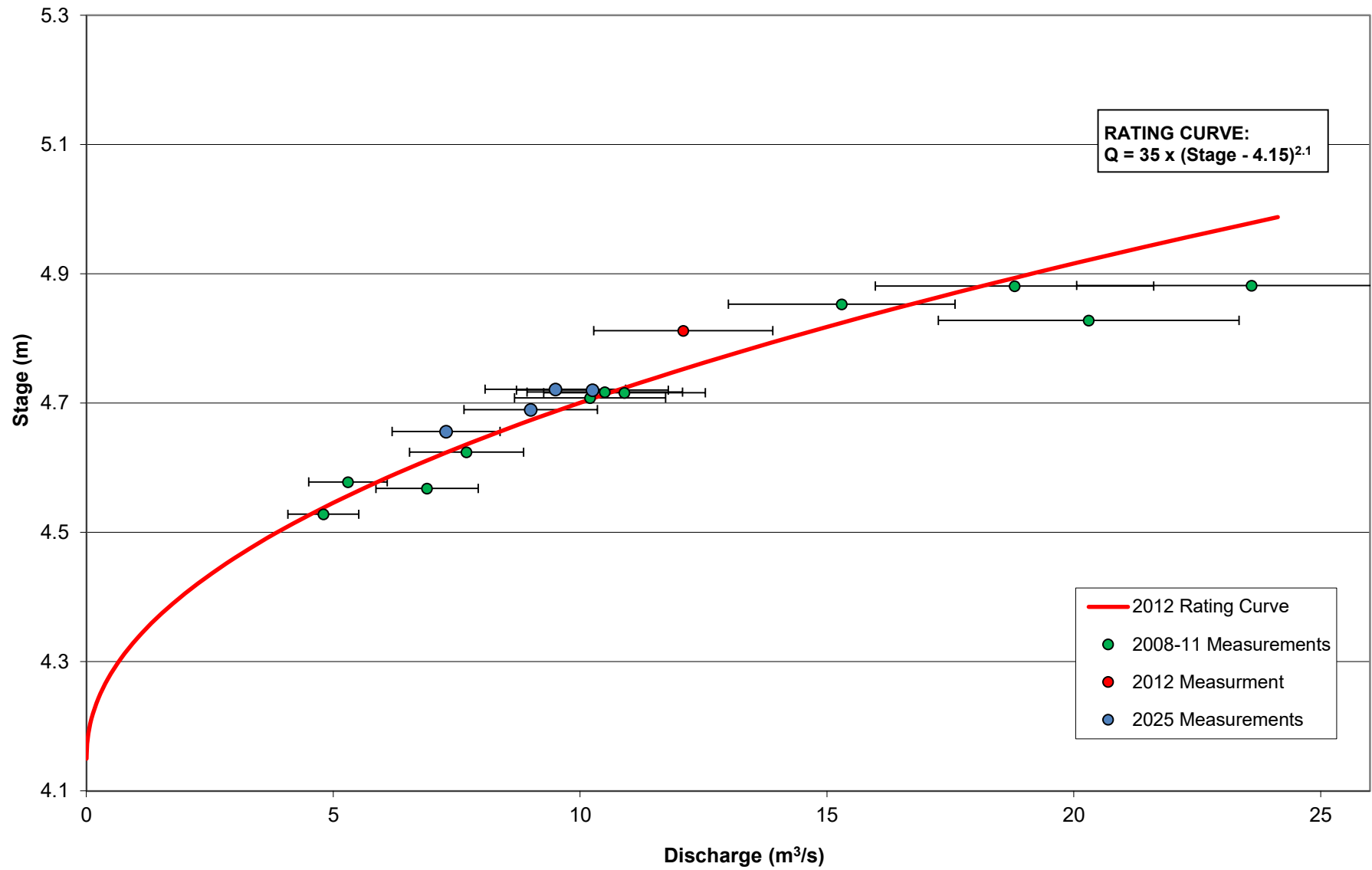


NOTES:

1. RATING CURVE SHOWN TO MAXIMUM RECORDED STAGE IN 2025

Figure 4

BR96-2 Rating Curve



NOTES:
 1. RATING CURVE SHOWN TO MAXIMUM RECORDED 2025 STAGE

Figure 5 BR137 Rating Curve

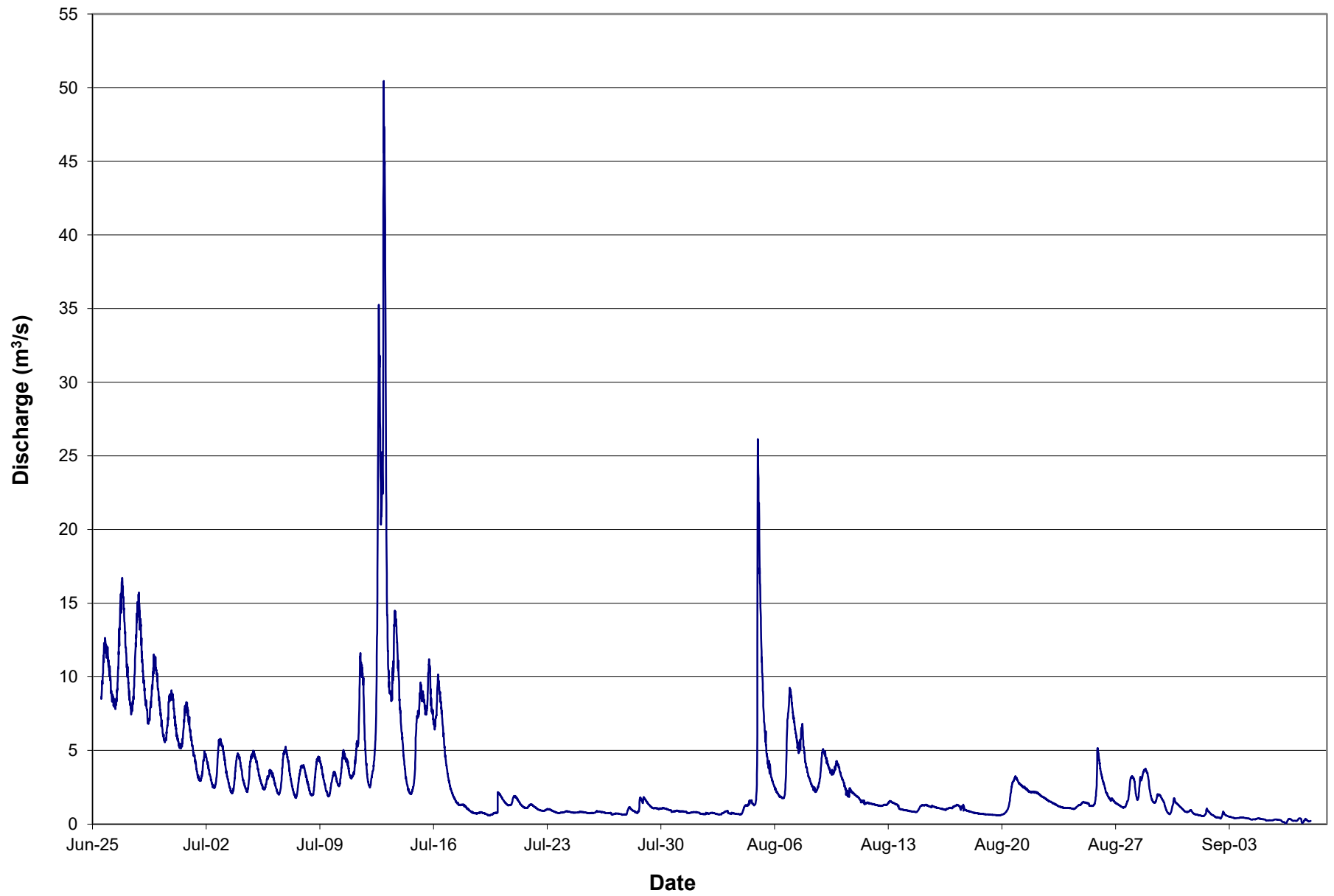


Figure 6 BR11 2025 Streamflow Record

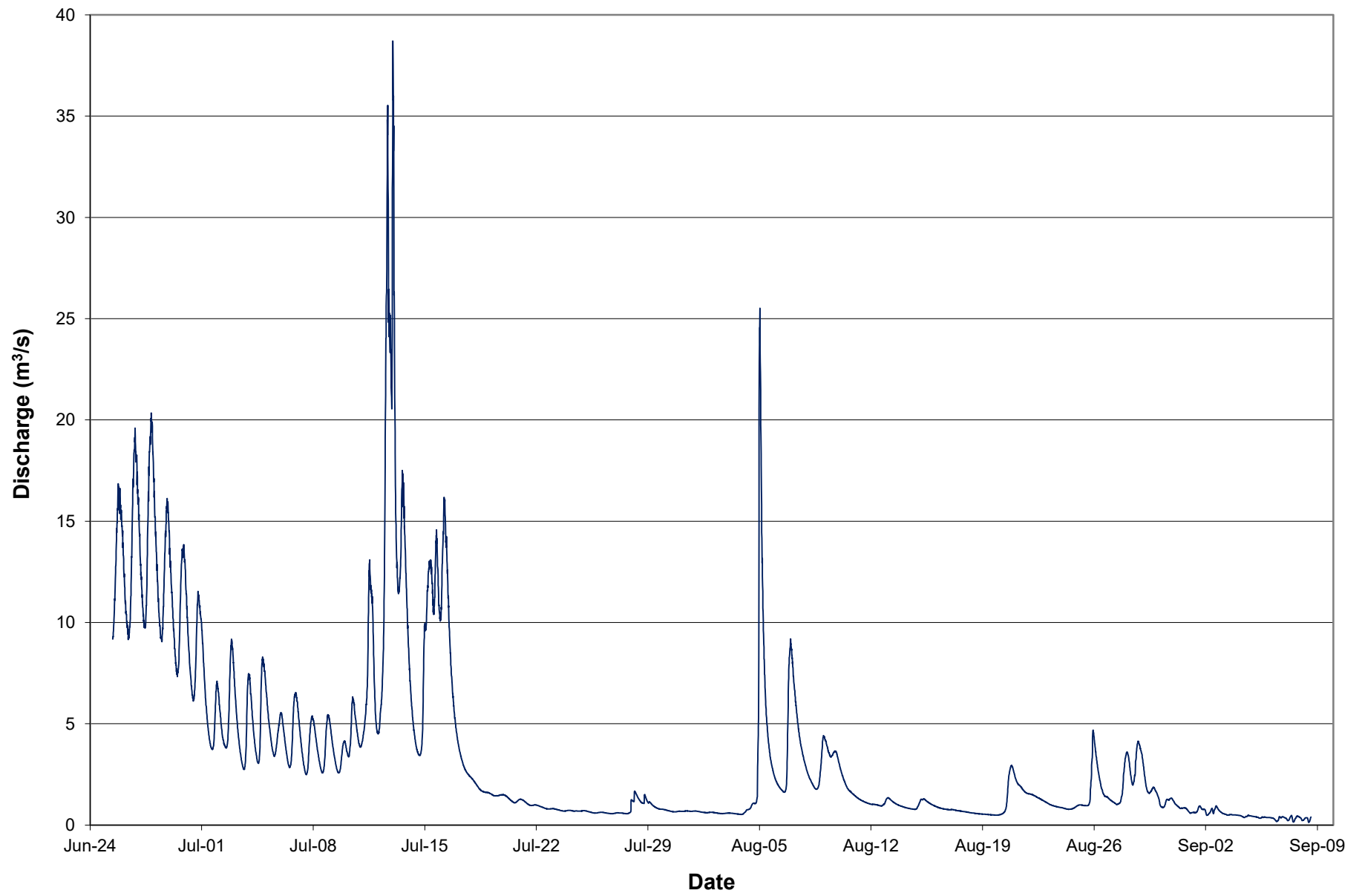


Figure 7 **BR25 2025 Streamflow Record**

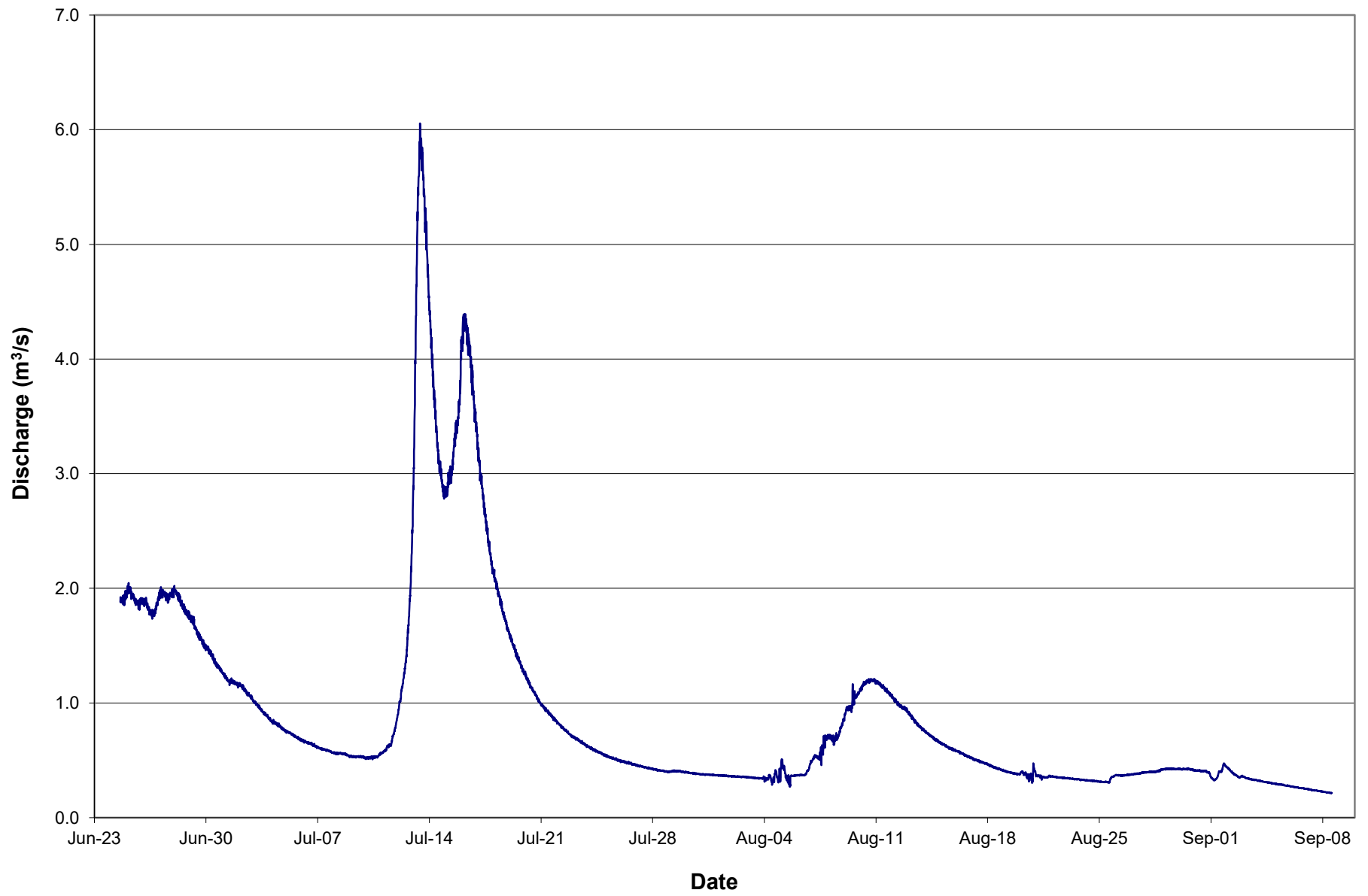


Figure 8 BR96-2 Streamflow Record

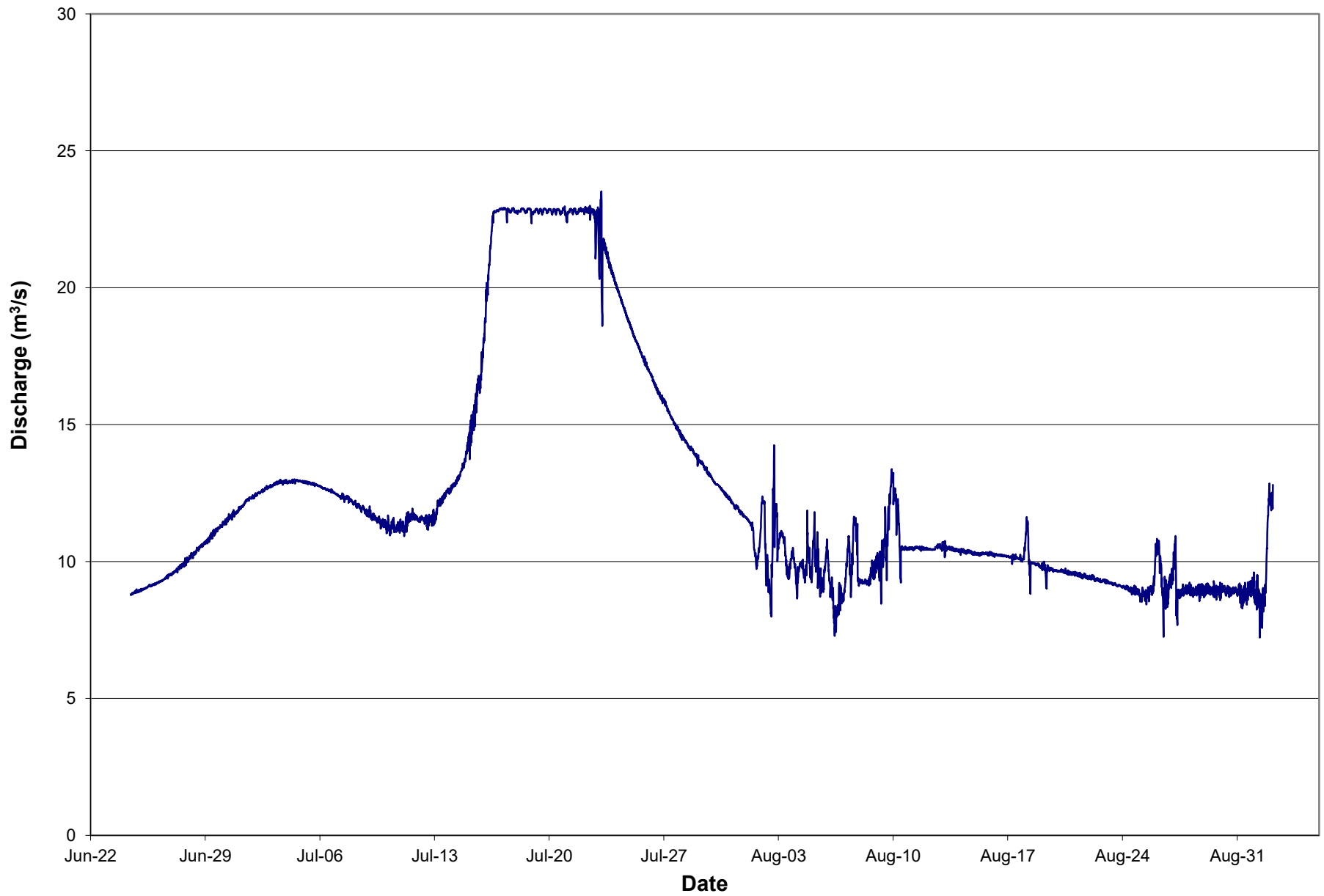


Figure 9

BR137 2025 Streamflow Record

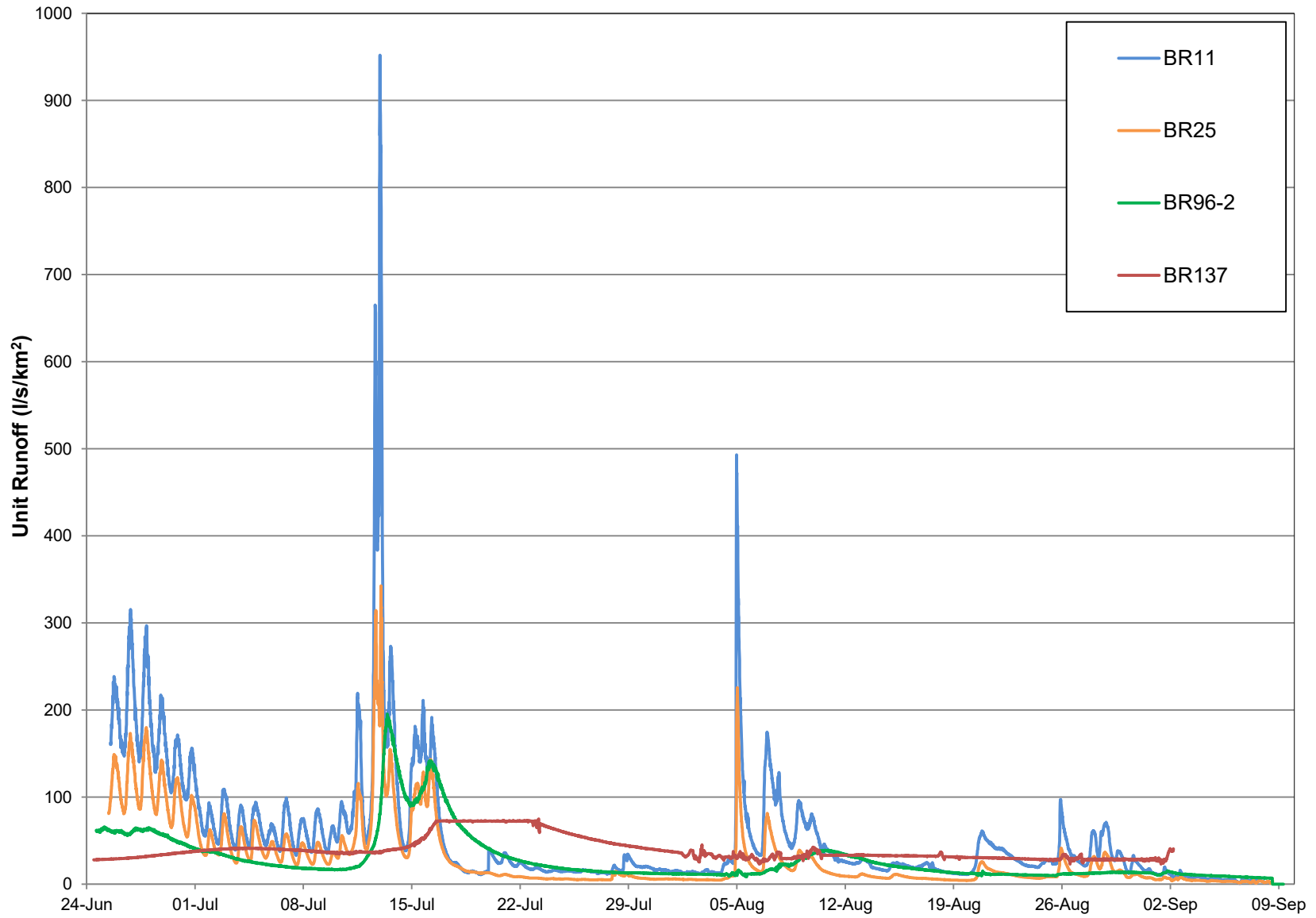


Figure 10 Comparison of 2025 Unit Runoff